



CryptoAuthLib

v3.4.1

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## Chapter 1

# CryptoAuthLib - Microchip CryptoAuthentication Library

### Introduction

This library implements the APIs required to communicate with Microchip Security device. The family of devices supported currently are:

- [ATSHA204A](#)
- [ATECC108A](#)
- [ATECC508A](#)
- [ATECC608A](#)
- [ATECC608B](#)

The best place to start is with the [Microchip Trust Platform](#)

Online API documentation is at <https://microchiptech.github.io/cryptoauthlib/>

Latest software and examples can be found at:

- <https://www.microchip.com/design-centers/security-ics/trust-platform>
- <http://www.microchip.com/SWLibraryWeb/product.aspx?product=CryptoAuthLib>

Prerequisite hardware to run CryptoAuthLib examples:

- [CryptoAuth Trust Platform Development Kit](#)

Alternatively a Microchip MCU and Adapter Board:

- [ATSAMR21 Xplained Pro](#) or [ATSAMD21 Xplained Pro](#)
- [CryptoAuth Xplained Pro Extension Board](#) or [CryptoAuthentication SOIC Socket Board](#) to accept SOIC parts

For most development, using socketed top-boards is preferable until your configuration is well tested, then you can commit it to a CryptoAuth Xplained Pro Extension, for example. Keep in mind that once you lock a device, it will not be changeable.

## Examples

- Watch [CryptoAuthLib Documents](#) for new examples coming online.
- Node Authentication Example Using Asymmetric PKI is a complete, all-in-one example demonstrating all the stages of crypto authentication starting from provisioning the Crypto Authentication device ATECC608/ATECC508A with keys and certificates to demonstrating an authentication sequence using asymmetric techniques. <http://www.microchip.com/SWLibraryWeb/product.aspx?product=CryptoAuthLib>

## Configuration

In order to properly configured the library there must be a header file in your project named `atca_config.h` at minimum this needs to contain defines for the hal and device types being used. Most integrations have an configuration mechanism for generating this file. See the `atca_config.h.in` template which is configured by CMake for Linux, MacOS, & Windows projects.

An example of the configuration:

```
/* Cryptoauthlib Configuration File */
#ifndef ATCA_CONFIG_H
#define ATCA_CONFIG_H
/* Include HALS */
#define ATCA_HAL_I2C
/* Included device support */
#define ATCA_ATECC608_SUPPORT
/* \brief How long to wait after an initial wake failure for the POST to
 * complete.
 * If Power-on self test (POST) is enabled, the self test will run on waking
 * from sleep or during power-on, which delays the wake reply.
 */
#ifndef ATCA_POST_DELAY_MSEC
#define ATCA_POST_DELAY_MSEC 25
#endif
#endif // ATCA_CONFIG_H
```

There are two major compiler defines that affect the operation of the library.

- `ATCA_NO_POLL` can be used to revert to a non-polling mechanism for device responses. Normally responses are polled for after sending a command, giving quicker response times. However, if `ATCA_NO_POLL` is defined, then the library will simply delay the max execution time of a command before reading the response.
- `ATCA_NO_HEAP` can be used to remove the use of malloc/free from the main library. This can be helpful for smaller MCUs that don't have a heap implemented. If just using the basic API, then there shouldn't be any code changes required. The lower-level API will no longer use the new/delete functions and the init/release functions should be used directly.

Some specific options are available in the fully documented configuration files `lib/calib/calib_config.h`, `atca_configuration.h`, `lib/crypto/crypto_config.h`, `lib/host/atca_host_config.h` which is also the place where features can be selected. We provide some configurations focused on specific use cases and the checks are enabled by default.

## Release notes

See Release Notes

---

## Host Device Support

CryptoAuthLib will run on a variety of platforms from small micro-controllers to desktop host systems. See [hal readme](#)

If you have specific microcontrollers or platforms you need support for, please contact us through the Microchip portal with your request.

## CryptoAuthLib Architecture

Cryptoauthlib API documentation is at <https://microchiptech.github.io/cryptoauthlib/>

The library is structured to support portability to:

- multiple hardware/microcontroller platforms
- multiple environments including bare-metal, RTOS and Windows/Linux/macOS
- multiple chip communication protocols (I2C, SPI, and SWI)

All platform dependencies are contained within the HAL (hardware abstraction layer).

## Directory Structure

```
lib - primary library source code
lib/atcacert - certificate data and i/o methods
lib/calib - the Basic Cryptoauth API
lib/crypto - Software crypto implementations external crypto libraries support (primarily SHA1 and SHA256)
lib/hal - hardware abstraction layer code for supporting specific platforms
lib/host - support functions for common host-side calculations
lib/jwt - json web token functions
test - Integration test and examples. See test/cmd-processor.c for main() implementation.
For production code, test directories should be excluded by not compiling it
into a project, so it is up to the developer to include or not as needed. Test
code adds significant bulk to an application - it's not intended to be included
in production code.
```

## Tests

There is a set of integration tests found in the test directory which will at least partially demonstrate the use of the objects. Some tests may depend upon a certain device being configured in a certain way and may not work for all devices or specific configurations of the device. See test readme

## Using CryptoAuthLib (Microchip CryptoAuth Library)

The best place to start is with the [Microchip Trust Platform](#)

Also application examples are included as part of the Harmony 3 framework and can be copied from the Harmony Content Manager or found with the Harmony 3 Framework [Cryptoauthlib\\_apps](#)

## Incorporating CryptoAuthLib in a Linux project using USB HID devices

The Linux HID HAL files use the Linux udev development software package.

To install the udev development package under Ubuntu Linux, please type the following command at the terminal window:

```
sudo apt-get install libudev-dev
```

This adds the udev development development software package to the Ubuntu Linux installation.

The Linux HID HAL files also require a udev rule to be added to change the permissions of the USB HID Devices. Please add a new udev rule for the Microchip CryptoAuth USB devices.

```
cd /etc/udev/rules.d
sudo touch mchp-cryptoauth.rules
```

Edit the mchp-cryptoauth.rules file and add the following line to the file:

```
SUBSYSTEM=="hidraw", ATTRS{idVendor}=="03eb", ATTRS{idProduct}=="2312", MODE="0666"
```

## Chapter 2

# License

MBEDTLS Interface Functions that enable mbedtls objects to use cryptoauthlib functions

Replace mbedtls ECDSA Functions with hardware acceleration & hardware key security.

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mbedTLS Interface Functions that enable mbedtls objects to use cryptoauthlib functions

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## **Chapter 3**

### **openssl directory - Purpose**

This directory contains the interfacing and wrapper functions to integrate openssl as the software crypto library.





## Chapter 4

# Application Support

This directory is for application specific implementation of various use cases.

Methods in this directory provide a simple API to perform potentially complex combinations of calls to the main library or API.

[IP Protection with Symmetric Authentication](#)

[PKCS11 Application Information](#)

[Secure boot using ATECC608](#)

### 4.1 IP Protection with Symmetric Authentication

The IP protection can be easily integrated to the existing projects. The user project should include [symmetric\\_authentication.c](#) & [symmetric\\_authentication.h](#) files which contains the api

- [symmetric\\_authenticate\(\)](#) - For Performing the authentication between host & device.

### User Considerations

- The user should take care on how the master key should be stored on the MCU side.
- The api's in the file doesn't do the provisioning of the chip and user should take care of the provisioning.

With the provisioned cryptoauthentication device and after doing the cryptoauthlib initialisation, user should only be calling the function [symmetric\\_authenticate\(\)](#) with its necessary parameters for the authentication. The returned authentication status should be used in the application.

### Examples

For more information about IP protection and its example project refer [Microchip github](#)

## 4.2 PKCS11 Application Information

### Setting up cryptoauthlib as a PKCS11 Provider for your system (LINUX)

These instructions are for building, installing and configuring cryptoauthlib as a pkcs11 provider. These instructions are for commonly available Linux systems with package managers.

#### Update libp11 on the system. The version should be at minimum 0.4.10

- Install the build dependencies for the system:

```
```bash
```

#### Debian like systems

```
$ sudo apt-get build-dep libengine-pkcs11-openssl1.1 ```
```

```
```bash
```

#### RPM based systems

```
$ yum-builddep engine-pkcs11 ```
```

- Change to a sane directory

```
```bash cd ~ ```
```

- Get the latest version of libp11

```
```bash $ git clone https://github.com/OpenSC/libp11.git ```
```

- Rerun the build configuration tools:

```
``` $ cd libp11 $ ./bootstrap $ ./configure ```
```

- Build the library:

```
```bash $ make ```
```

- Install the library:

```
```bash $ sudo make install ```
```

#### Build and Install cryptoauthlib with PKCS11 support

- Install the build dependencies for the system:

```
```bash
```

#### Debian like systems

```
$ sudo apt-get install cmake libudev-dev ```
```

```
```bash
```

### RPM based systems

```
$ yum install cmake $ yum install libudev-devel ``
```

- Change to a sane directory

```
``bash cd ~ ``
```

- Get the latest version of cryptoauthlib with PKCS11 support

```
``bash $ git clone --single-branch -b pkcs11 https://github.com/MicrochipTech/cryptoauthlib ``
```

- Rerun the build configuration tools:

```
``bash $ cd cryptoauthlib $ cmake . ``
```

- Build the library:

```
``bash $ make ``
```

- Install the library:

```
``bash $ sudo make install ``
```

### Configuring the cryptoauthlib PKCS11 library

By default the following files will be created.

- /etc/cryptoauthlib/cryptoauthlib.conf

```
``text
```

### Cryptoauthlib Configuration File

```
filestore = /var/lib/cryptoauthlib ``
```

- /var/lib/cryptoauthlib/slot.conf.tmpl

```
``text
```

### Reserved Configuration for a device

**The objects in this file will be created and marked as undeletable**

**These are processed in order. Configuration parameters must be comma**

**delimited and may not contain spaces**

```
interface = i2c,0xB0 freeslots = 1,2,3
```

### Slot 0 is the primary private key

```
object = private,device,0
```

## Slot 10 is the certificate data for the device's public key

```
#object = certificate,device,10
```

## Slot 12 is the intermediate/signer certificate data

```
#object = certificate,signer,12
```

## Slot 15 is a public key

```
object = public,root,15 ``
```

### cryptoauthlib.conf

This file provides the basic configuration information for the library. The only variable is "filestore" which is where cryptoauthlib will find device specific configuration and where it will store object files from pkcs11 operations.

### slot.conf.tmpl

This is a template for device configuration files that cryptoauthlib will use to map devices and their resources into pkcs11 tokens and objects.

A device file must be named <pkcs11\_slot\_number>.conf

For a single device:

```
$ cd /var/lib/cryptoauthlib
$ cp slot.conf.tmpl 0.conf
```

Then edit 0.conf to match the device configuration being used.

**interface** Allows values: 'hid', 'i2c' If using i2c specify the address in hex for the device. This is in the device format (upper 7 bits define the address) so will not appear the same as the i2cdetect address (lower 7 bits)

**freeslots** This is a list of slots that may be used by the library when a pkcs11 operation that creates new objects is used. When the library is initialized it will scan for files of the form <pkcs11\_slot\_num>.<device\_slot\_num>.conf which defines the object using that device resource.

## Using p11-kit-proxy

This is an optional step but is very helpful for using multiple pkcs11 libraries in a system. Detailed setup can be found at [p11-glue](#)

```
# Debian like systems
$ sudo apt-get install p11-kit
# RPM based systems
$ yum install p11-kit
```

- Create or edit the global configuration file /etc/pkcs11/pkcs11.conf. The directory /etc/pkcs11 may require creation first.
- ``

**This setting controls whether to load user configuration from the**

**`~/.config/pkcs11` directory. Possible values:**

**none: No user configuration**

**merge: Merge the user config over the system configuration (default)**

**only: Only user configuration, ignore system configuration**

user-config: merge ```

- Create a module configuration file.

- User module name (only available for a single user): `~/.config/pkcs11/modules/cryptoauthlib.module`

- Global module name (available to the whole system): `/usr/share/p11-kit/modules/cryptoauthlib.module`  
``` module: /usr/lib/libcryptoauth.so critical: yes trust-policy: yes managed: yes log-calls: no ```

For more details on the configuration files see the [configuration documentation](#).

## Without using p11-kit-proxy

OpenSSL (via the libp11 project above) and p11tool support p11-kit-proxy natively so do not require additional set up if it is being used. If p11-kit-proxy is not being used then OpenSSL will have to be manually configured to use libp11 and cryptoauthlib

This requires editing the default openssl.cnf file. To locate the file being used by the system run the following command:

```
$ openssl version -a | grep OPENSSLDIR:
OPENSSLDIR: "/usr/lib/ssl"
```

This gives the default path where openssl is compiled to find the openssl.cnf file

In this case the file to edit will be `/usr/lib/ssl/openssl.cnf`

This line must be placed at the top, before any sections are defined:

```
openssl_conf = openssl_init
```

This should be added to the bottom of the file:

```
[openssl_init]
engines=engine_section
[engine_section]
pkcs11 = pkcs11_section
[pkcs11_section]
engine_id = pkcs11
# Wherever the engine installed by libp11 is. For example it could be:
# /usr/lib/arm-linux-gnueabi/hf/engines-1.1/libpkcs11.so
dynamic_path = /usr/lib/ssl/engines/libpkcs11.so
MODULE_PATH = /usr/lib/libcryptoauth.so
init = 0
```

## Testing

To use p11tool it has to be installed:

```
# Debian like systems
$ sudo apt-get install gnutls-bin
# RPM based systems
$ yum install gnutls-utils
```

**Note:** If not using p11-kit-proxy then the provider has to be specified in p11tool calls:

```
$ p11tool --provider=/usr/lib/libcryptoauth.so
```

- Get the public key for a private key (as defined by the 0.conf file cited above):

```
```bash $ p11tool --export-pubkey "pkcs11:token=0123EE;object=device;type=private" warning: --login was
not specified and it may be required for this operation. warning: no --outfile was specified and the public
key will be printed on screen. -----BEGIN PUBLIC KEY----- MFkwEwYHKoZIzj0CAQYIKoZIzj0DAQcDQg
AE9wzUq1EUAoNrG01rXYjNd35mxKuA Ojw/klrNEBciSLL0Tljs/gvFS7N8AFXDK18vpxxu6yKzF2LRd7R
Y8yEFw== -----END PUBLIC KEY----- ```
```

- Get the public key and decode it using OpenSSL

```
```bash $ p11tool --export-pubkey "pkcs11:token=0123EE;object=device;type=private" | openssl pkey -pubin
-text -noout warning: --login was not specified and it may be required for this operation. warning: no --outfile
was specified and the public key will be printed on screen. Public-Key: (256 bit) pub: 04:f7:0c:d4:ab:51
:14:02:83:6b:1b:4d:6b:5d:88: cd:77:7e:66:c4:ab:80:3a:3c:3f:92:52:2b:34:40: 5c:89:22:cb:39:32:e3:b3:f8:2f
:15:2e:cd:f0:01: 57:0c:ad:7c:be:9c:71:bb:ac:a4:cc:5d:8b:45:de: d1:63:cc:84:17 ASN1 OID: prime256v1 NIST
CURVE: P-256 ```
```

- Create a CSR for the private key

```
```bash $ openssl req -engine pkcs11 -key "pkcs11:token=0123EE;object=device;type=private" -keyform en-
gine -new -out new_device.csr -subj "/CN=NEW CSR EXAMPLE" engine "pkcs11" set.

$ cat new_device.csr -----BEGIN CERTIFICATE REQUEST----- MIHVMHwCAQAwGjEYMBYGA1UEAww
PTkVXIENTUiBWFwEwYHKoZIzj0CAQYIKoZIzj0DAQcDQgAE9wzUq1EUAoNrG01rXYj
Nd35mxKuAOjw/klrNEBciSLL OTLjs/gvFS7N8AFXDK18vpxxu6yKzF2LRd7RY8yEF6AAMaGcCqGS
M49BAMCA0kA MEYCIQDUPeLfPcOwtZxYJDYXPdI2UhpReVn6kK2IKCCX6byM8QlHAlfqnggtcCi W21x
LAzabr8A4mHyfIIQ1ofYBg8QO9jZ -----END CERTIFICATE REQUEST----- ```
```

- Verify the newly created csr

```
```bash $ openssl req -in new_device.csr -verify -text -noout verify OK Certificate Request: Data: Version:
1 (0x0) Subject: CN = NEW CSR EXAMPLE Subject Public Key Info: Public Key Algorithm: id-ecPublicKey
Public-Key: (256 bit) pub: 04:f7:0c:d4:ab:51:14:02:83:6b:1b:4d:6b:5d:88: cd:77:7e:66:c4:ab:80:3a:3c:3f
:92:52:2b:34:40: 5c:89:22:cb:39:32:e3:b3:f8:2f:15:2e:cd:f0:01: 57:0c:ad:7c:be:9c:71:bb:ac:a4:cc:5d:8b:45
:de: d1:63:cc:84:17 ASN1 OID: prime256v1 NIST CURVE: P-256 Attributes: a0:00 Signature Algorithm:
ecdsa-with-SHA256 30:46:02:21:00:d4:3d:e2:df:3d:c3:b0:b5:9c:58:24:36:17: 3d:d9:76:52:1a:51:79:59:fa
:90:ad:a5:28:20:97:e9:bc:8c: f1:02:21:00:87:ea:7e:78:20:b5:c0:a2:5b:6d:71:2c:0c:da: 6e:bf:00:e2:61:f2:7c
:82:10:d6:87:d8:06:0f:10:3b:d8:d9 ```
```

## 4.3 Secure boot using ATECC608

The SecureBoot command is a new feature on the [ATECC608A](#) device compared to earlier CryptoAuthentication devices from Microchip. This feature helps the MCU to identify fraudulent code installed on it. When this feature is implemented, the MCU can send a firmware digest and signature to the ATECC608. The ATECC608 validates this information (ECDSA verify) and responds to host with a yes or no answer.

The ATECC608 provides options to reduce the firmware verification time by storing the signature or digest after a good full verification (FullStore mode of the SecureBoot command).

### 4.3 Secure boot using ATECC608

---

- When the ATECC608 stores the digest (SecureBootMode is FullDig), the host only needs to send the firmware digest, which is compared to the stored copy. This skips the comparatively lengthy ECDSA verify, speeding up the secure boot process.
- When the ATECC608 stores the signature (SecureBootMode is FullSig), the host only needs to send the firmware digest, which is verified against the stored signature using ECDSA. This saves time by not needing to send the signature in the command over the bus.

The ATECC608 also provides wire protection features for the SecureBoot command, which can be used to encrypt the digest being sent from the host to the ATECC608 and add a MAC to the verify result coming back to the host so it can't be forced to a success state. This feature makes use of a shared secret between the host and ATECC608, called the IO protection key.

The secure boot feature can be easily integrated to an existing project. The project should include the following files from the `secure_boot` folder:

- [secure\\_boot.c](#)
- [secure\\_boot.h](#)
- [secure\\_boot\\_memory.h](#)
- [io\\_protection\\_key.h](#)

The project should also implement the following platform-specific APIs:

- [secure\\_boot\\_init\\_memory\(\)](#)
- [secure\\_boot\\_read\\_memory\(\)](#)
- [secure\\_boot\\_deinit\\_memory\(\)](#)
- [secure\\_boot\\_mark\\_full\\_copy\\_completion\(\)](#)
- [secure\\_boot\\_check\\_full\\_copy\\_completion\(\)](#)
- [io\\_protection\\_get\\_key\(\)](#)
- [io\\_protection\\_set\\_key\(\)](#)

The project can set the secure boot configuration with the following defines:

- `SECURE_BOOT_CONFIGURATION`
- `SECURE_BOOT_DIGEST_ENCRYPT_ENABLED`
- `SECURE_BOOT_UPGRADE_SUPPORT`

The secure boot process is performed by initializing CryptoAuthLib and calling the [secure\\_boot\\_process\(\)](#) function.



## Implementation Considerations

- Need to perform SHA256 calculations on the host. CryptoAuthLib provides a software implementation in [lib/crypto/atca\\_crypto\\_sw\\_sha2.c](#)
- When using the wire protection features:
  - The host needs to be able to generate a nonce (number used once). This is the NumIn parameter to the Nonce command that is sent before the SecureBoot command. The ATECC608 can not be used to generate NumIn, but it should come from a good random or non-repeating source in the host.
  - If the host has any protected internal memory, it should be used to store its copy of the IO protection key.
- Secure boot depends on proper protections of the boot loader code in the host. If the code can be easily changed, then the secure boot process can be easily skipped. Boot loader should ideally be stored in an immutable (unchangeable) location like a boot ROM or write-protected flash.
- Note that these APIs don't provision the ATECC608. They assume the ATECC608 has already been configured and provisioned with the necessary keys for secure boot.

## Examples

For more information about secure boot, please see the example implementation project and documentation at: [https://github.com/MicrochipTech/cryptoauth\\_usecase\\_secureboot](https://github.com/MicrochipTech/cryptoauth_usecase_secureboot)

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## Chapter 8

# Module Documentation

### 8.1 Basic Crypto API methods (atcab\_)

These methods provide the most convenient, simple API to CryptoAuth chips.

#### Macros

- `#define atcab_get_addr(...) calib_get_addr(__VA_ARGS__)`
- `#define atca_execute_command(...) calib_execute_command(__VA_ARGS__)`
- `#define SHA_CONTEXT_MAX_SIZE (109)`

#### Functions

- `ATCA_STATUS atcab_version (char *ver_str)`  
*basic API methods are all prefixed with atcab\_ (CryptoAuthLib Basic) the fundamental premise of the basic API is it is based on a single interface instance and that instance is global, so all basic API commands assume that one global device is the one to operate on.*
- `ATCA_STATUS atcab_init_ext (ATCADevice *device, ATCAfaceCfg *cfg)`  
*Creates and initializes a ATCADevice context.*
- `ATCA_STATUS atcab_init (ATCAfaceCfg *cfg)`  
*Creates a global ATCADevice object used by Basic API.*
- `ATCA_STATUS atcab_init_device (ATCADevice ca_device)`  
*Initialize the global ATCADevice object to point to one of your choosing for use with all the atcab\_ basic API.*
- `ATCA_STATUS atcab_release_ext (ATCADevice *device)`  
*release (free) the an ATCADevice instance.*
- `ATCA_STATUS atcab_release (void)`  
*release (free) the global ATCADevice instance. This must be called in order to release or free up the interface.*
- `ATCADevice atcab_get_device (void)`  
*Get the global device object.*
- `ATCADeviceType atcab_get_device_type_ext (ATCADevice device)`  
*Get the selected device type of rthe device context.*
- `ATCADeviceType atcab_get_device_type (void)`  
*Get the current device type configured for the global ATCADevice.*
- `uint8_t atcab_get_device_address (ATCADevice device)`  
*Get the current device address based on the configured device and interface.*

- bool [atcab\\_is\\_ca\\_device](#) (ATCADeviceType dev\_type)  
*Check whether the device is cryptoauth device.*
- bool [atcab\\_is\\_ta\\_device](#) (ATCADeviceType dev\_type)  
*Check whether the device is Trust Anchor device.*
- [ATCA\\_STATUS atcab\\_pbkdf2\\_sha256\\_ext](#) (ATCADevice device, const uint32\_t iter, const uint16\_t slot, const uint8\_t \*salt, const size\_t salt\_len, uint8\_t \*result, size\_t result\_len)
- [ATCA\\_STATUS atcab\\_pbkdf2\\_sha256](#) (const uint32\_t iter, const uint16\_t slot, const uint8\_t \*salt, const size\_t salt\_len, uint8\_t \*result, size\_t result\_len)
- [ATCA\\_STATUS \\_atcab\\_exit](#) (void)
- [ATCA\\_STATUS atcab\\_wakeup](#) (void)  
*wakeup the CryptoAuth device*
- [ATCA\\_STATUS atcab\\_idle](#) (void)  
*idle the CryptoAuth device*
- [ATCA\\_STATUS atcab\\_sleep](#) (void)  
*invoke sleep on the CryptoAuth device*
- [ATCA\\_STATUS atcab\\_get\\_zone\\_size](#) (uint8\_t zone, uint16\_t slot, size\_t \*size)  
*Gets the size of the specified zone in bytes.*
- [ATCA\\_STATUS atcab\\_aes](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*aes\_in, uint8\_t \*aes\_out)  
*Compute the AES-128 encrypt, decrypt, or GFM calculation.*
- [ATCA\\_STATUS atcab\\_aes\\_encrypt](#) (uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*plaintext, uint8\_t \*ciphertext)  
*Perform an AES-128 encrypt operation with a key in the device.*
- [ATCA\\_STATUS atcab\\_aes\\_encrypt\\_ext](#) (ATCADevice device, uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*plaintext, uint8\_t \*ciphertext)  
*Perform an AES-128 encrypt operation with a key in the device.*
- [ATCA\\_STATUS atcab\\_aes\\_decrypt](#) (uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*ciphertext, uint8\_t \*plaintext)  
*Perform an AES-128 decrypt operation with a key in the device.*
- [ATCA\\_STATUS atcab\\_aes\\_decrypt\\_ext](#) (ATCADevice device, uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*ciphertext, uint8\_t \*plaintext)  
*Perform an AES-128 decrypt operation with a key in the device.*
- [ATCA\\_STATUS atcab\\_aes\\_gfm](#) (const uint8\_t \*h, const uint8\_t \*input, uint8\_t \*output)  
*Perform a Galois Field Multiply (GFM) operation.*
- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_init](#) (atca\_aes\_gcm\_ctx\_t \*ctx, uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*iv, size\_t iv\_size)  
*Initialize context for AES GCM operation with an existing IV, which is common when starting a decrypt operation.*
- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_init\\_rand](#) (atca\_aes\_gcm\_ctx\_t \*ctx, uint16\_t key\_id, uint8\_t key\_block, size\_t rand\_size, const uint8\_t \*free\_field, size\_t free\_field\_size, uint8\_t \*iv)  
*Initialize context for AES GCM operation with a IV composed of a random and optional fixed(free) field, which is common when starting an encrypt operation.*
- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_aad\\_update](#) (atca\_aes\_gcm\_ctx\_t \*ctx, const uint8\_t \*aad, uint32\_t aad\_size)  
*Process Additional Authenticated Data (AAD) using GCM mode and a key within the ATECC608 device.*
- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_encrypt\\_update](#) (atca\_aes\_gcm\_ctx\_t \*ctx, const uint8\_t \*plaintext, uint32\_t plaintext\_size, uint8\_t \*ciphertext)  
*Encrypt data using GCM mode and a key within the ATECC608 device. [atcab\\_aes\\_gcm\\_init\(\)](#) or [atcab\\_aes\\_gcm\\_init\\_rand\(\)](#) should be called before the first use of this function.*
- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_encrypt\\_finish](#) (atca\_aes\_gcm\_ctx\_t \*ctx, uint8\_t \*tag, size\_t tag\_size)  
*Complete a GCM encrypt operation returning the authentication tag.*
- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_decrypt\\_update](#) (atca\_aes\_gcm\_ctx\_t \*ctx, const uint8\_t \*ciphertext, uint32\_t ciphertext\_size, uint8\_t \*plaintext)  
*Decrypt data using GCM mode and a key within the ATECC608 device. [atcab\\_aes\\_gcm\\_init\(\)](#) or [atcab\\_aes\\_gcm\\_init\\_rand\(\)](#) should be called before the first use of this function.*

- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_decrypt\\_finish](#) (atca\_aes\_gcm\_ctx\_t \*ctx, const uint8\_t \*tag, size\_t tag\_size, bool \*is\_verified)  
*Complete a GCM decrypt operation verifying the authentication tag.*
- [ATCA\\_STATUS atcab\\_checkmac](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*challenge, const uint8\_t \*response, const uint8\_t \*other\_data)  
*Compares a MAC response with input values.*
- [ATCA\\_STATUS atcab\\_counter](#) (uint8\_t mode, uint16\_t counter\_id, uint32\_t \*counter\_value)  
*Compute the Counter functions.*
- [ATCA\\_STATUS atcab\\_counter\\_increment](#) (uint16\_t counter\_id, uint32\_t \*counter\_value)  
*Increments one of the device's monotonic counters.*
- [ATCA\\_STATUS atcab\\_counter\\_read](#) (uint16\_t counter\_id, uint32\_t \*counter\_value)  
*Read one of the device's monotonic counters.*
- [ATCA\\_STATUS atcab\\_derivekey](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*mac)  
*Executes the DeviveKey command for deriving a new key from a nonce (TempKey) and an existing key.*
- [ATCA\\_STATUS atcab\\_ecdh\\_base](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*public\_key, uint8\_t \*pms, uint8\_t \*out\_nonce)  
*Base function for generating premaster secret key using ECDH.*
- [ATCA\\_STATUS atcab\\_ecdh](#) (uint16\_t key\_id, const uint8\_t \*public\_key, uint8\_t \*pms)  
*ECDH command with a private key in a slot and the premaster secret is returned in the clear.*
- [ATCA\\_STATUS atcab\\_ecdh\\_enc](#) (uint16\_t key\_id, const uint8\_t \*public\_key, uint8\_t \*pms, const uint8\_t \*read\_key, uint16\_t read\_key\_id, const uint8\_t num\_in[(20)])  
*ECDH command with a private key in a slot and the premaster secret is read from the next slot.*
- [ATCA\\_STATUS atcab\\_ecdh\\_ioenc](#) (uint16\_t key\_id, const uint8\_t \*public\_key, uint8\_t \*pms, const uint8\_t \*io\_key)  
*ECDH command with a private key in a slot and the premaster secret is returned encrypted using the IO protection key.*
- [ATCA\\_STATUS atcab\\_ecdh\\_tempkey](#) (const uint8\_t \*public\_key, uint8\_t \*pms)  
*ECDH command with a private key in TempKey and the premaster secret is returned in the clear.*
- [ATCA\\_STATUS atcab\\_ecdh\\_tempkey\\_ioenc](#) (const uint8\_t \*public\_key, uint8\_t \*pms, const uint8\_t \*io\_key)  
*ECDH command with a private key in TempKey and the premaster secret is returned encrypted using the IO protection key.*
- [ATCA\\_STATUS atcab\\_gendig](#) (uint8\_t zone, uint16\_t key\_id, const uint8\_t \*other\_data, uint8\_t other\_data\_size)  
*Issues a GenDig command, which performs a SHA256 hash on the source data indicated by zone with the contents of TempKey. See the CryptoAuth datasheet for your chip to see what the values of zone correspond to.*
- [ATCA\\_STATUS atcab\\_genkey\\_base](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*other\_data, uint8\_t \*public\_key)  
*Issues GenKey command, which can generate a private key, compute a public key, nd/or compute a digest of a public key.*
- [ATCA\\_STATUS atcab\\_genkey](#) (uint16\_t key\_id, uint8\_t \*public\_key)  
*Issues GenKey command, which generates a new random private key in slot/handle and returns the public key.*
- [ATCA\\_STATUS atcab\\_get\\_pubkey](#) (uint16\_t key\_id, uint8\_t \*public\_key)  
*Uses GenKey command to calculate the public key from an existing private key in a slot.*
- [ATCA\\_STATUS atcab\\_get\\_pubkey\\_ext](#) (ATCADevice device, uint16\_t key\_id, uint8\_t \*public\_key)  
*Uses GenKey command to calculate the public key from an existing private key in a slot.*
- [ATCA\\_STATUS atcab\\_hmac](#) (uint8\_t mode, uint16\_t key\_id, uint8\_t \*digest)  
*Issues a HMAC command, which computes an HMAC/SHA-256 digest of a key stored in the device, a challenge, and other information on the device.*
- [ATCA\\_STATUS atcab\\_info\\_base](#) (uint8\_t mode, uint16\_t param2, uint8\_t \*out\_data)  
*Issues an Info command, which return internal device information and can control GPIO and the persistent latch.*
- [ATCA\\_STATUS atcab\\_info](#) (uint8\_t \*revision)  
*Use the Info command to get the device revision (DevRev).*
- [ATCA\\_STATUS atcab\\_info\\_set\\_latch](#) (bool state)

- Use the Info command to set the persistent latch state for an ATECC608 device.
- [ATCA\\_STATUS atcab\\_info\\_get\\_latch](#) (bool \*state)  
Use the Info command to get the persistent latch current state for an ATECC608 device.
  - [ATCA\\_STATUS atcab\\_kdf](#) (uint8\_t mode, uint16\_t key\_id, const uint32\_t details, const uint8\_t \*message, uint8\_t \*out\_data, uint8\_t \*out\_nonce)  
Executes the KDF command, which derives a new key in PRF, AES, or HKDF modes.
  - [ATCA\\_STATUS atcab\\_lock](#) (uint8\_t mode, uint16\_t summary\_crc)  
The Lock command prevents future modifications of the Configuration and/or Data and OTP zones. If the device is so configured, then this command can be used to lock individual data slots. This command fails if the designated area is already locked.
  - [ATCA\\_STATUS atcab\\_lock\\_config\\_zone](#) (void)  
Unconditionally (no CRC required) lock the config zone.
  - [ATCA\\_STATUS atcab\\_lock\\_config\\_zone\\_crc](#) (uint16\_t summary\_crc)  
Lock the config zone with summary CRC.
  - [ATCA\\_STATUS atcab\\_lock\\_data\\_zone](#) (void)  
Unconditionally (no CRC required) lock the data zone (slots and OTP). for CryptoAuth devices and lock the setup for Trust Anchor device.
  - [ATCA\\_STATUS atcab\\_lock\\_data\\_zone\\_crc](#) (uint16\_t summary\_crc)  
Lock the data zone (slots and OTP) with summary CRC.
  - [ATCA\\_STATUS atcab\\_lock\\_data\\_slot](#) (uint16\_t slot)  
Lock an individual slot in the data zone on an ATECC device. Not available for ATSHA devices. Slot must be configured to be slot lockable (KeyConfig.Lockable=1) (for cryptoauth devices) or Lock an individual handle in shared data element on an Trust Anchor device (for Trust Anchor devices).
  - [ATCA\\_STATUS atcab\\_mac](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*challenge, uint8\_t \*digest)  
Executes MAC command, which computes a SHA-256 digest of a key stored in the device, a challenge, and other information on the device.
  - [ATCA\\_STATUS atcab\\_nonce\\_base](#) (uint8\_t mode, uint16\_t zero, const uint8\_t \*num\_in, uint8\_t \*rand\_out)  
Executes Nonce command, which loads a random or fixed nonce/data into the device for use by subsequent commands.
  - [ATCA\\_STATUS atcab\\_nonce](#) (const uint8\_t \*num\_in)  
Execute a Nonce command in pass-through mode to initialize TempKey to a specified value.
  - [ATCA\\_STATUS atcab\\_nonce\\_load](#) (uint8\_t target, const uint8\_t \*num\_in, uint16\_t num\_in\_size)  
Execute a Nonce command in pass-through mode to load one of the device's internal buffers with a fixed value.
  - [ATCA\\_STATUS atcab\\_nonce\\_rand](#) (const uint8\_t \*num\_in, uint8\_t \*rand\_out)  
Execute a Nonce command to generate a random nonce combining a host nonce (num\_in) and a device random number.
  - [ATCA\\_STATUS atcab\\_challenge](#) (const uint8\_t \*num\_in)  
Execute a Nonce command in pass-through mode to initialize TempKey to a specified value.
  - [ATCA\\_STATUS atcab\\_challenge\\_seed\\_update](#) (const uint8\_t \*num\_in, uint8\_t \*rand\_out)  
Execute a Nonce command to generate a random challenge combining a host nonce (num\_in) and a device random number.
  - [ATCA\\_STATUS atcab\\_priv\\_write](#) (uint16\_t key\_id, const uint8\_t priv\_key[36], uint16\_t write\_key\_id, const uint8\_t write\_key[32], const uint8\_t num\_in[(20)])  
Executes PrivWrite command, to write externally generated ECC private keys into the device.
  - [ATCA\\_STATUS atcab\\_random](#) (uint8\_t \*rand\_out)  
Executes Random command, which generates a 32 byte random number from the device.
  - [ATCA\\_STATUS atcab\\_random\\_ext](#) (ATCADevice device, uint8\_t \*rand\_out)  
Executes Random command, which generates a 32 byte random number from the device.
  - [ATCA\\_STATUS atcab\\_read\\_zone](#) (uint8\_t zone, uint16\_t slot, uint8\_t block, uint8\_t offset, uint8\_t \*data, uint8\_t len)  
Executes Read command, which reads either 4 or 32 bytes of data from a given slot, configuration zone, or the OTP zone.
  - [ATCA\\_STATUS atcab\\_is\\_locked](#) (uint8\_t zone, bool \*is\_locked)

- Executes Read command, which reads the configuration zone to see if the specified zone is locked.*

  - [ATCA\\_STATUS atcab\\_is\\_config\\_locked](#) (bool \*is\_locked)

*This function check whether configuration zone is locked or not.*
- [ATCA\\_STATUS atcab\\_is\\_data\\_locked](#) (bool \*is\_locked)

*This function check whether data/setup zone is locked or not.*
- [ATCA\\_STATUS atcab\\_is\\_slot\\_locked](#) (uint16\_t slot, bool \*is\_locked)

*This function check whether slot/handle is locked or not.*
- [ATCA\\_STATUS atcab\\_is\\_private\\_ext](#) (ATCADevice device, uint16\_t slot, bool \*is\_private)

*Check to see if the key is a private key or not.*
- [ATCA\\_STATUS atcab\\_is\\_private](#) (uint16\_t slot, bool \*is\_private)
- [ATCA\\_STATUS atcab\\_read\\_bytes\\_zone\\_ext](#) (ATCADevice device, uint8\_t zone, uint16\_t slot, size\_t offset, uint8\_t \*data, size\_t length)
- [ATCA\\_STATUS atcab\\_read\\_bytes\\_zone](#) (uint8\_t zone, uint16\_t slot, size\_t offset, uint8\_t \*data, size\_t length)

*Used to read an arbitrary number of bytes from any zone configured for clear reads.*
- [ATCA\\_STATUS atcab\\_read\\_serial\\_number](#) (uint8\_t \*serial\_number)

*This function returns serial number of the device.*
- [ATCA\\_STATUS atcab\\_read\\_pubkey](#) (uint16\_t slot, uint8\_t \*public\_key)

*Executes Read command to read an ECC P256 public key from a slot configured for clear reads.*
- [ATCA\\_STATUS atcab\\_read\\_pubkey\\_ext](#) (ATCADevice device, uint16\_t slot, uint8\_t \*public\_key)

*Executes Read command to read an ECC P256 public key from a slot configured for clear reads.*
- [ATCA\\_STATUS atcab\\_read\\_sig](#) (uint16\_t slot, uint8\_t \*sig)

*Executes Read command to read a 64 byte ECDSA P256 signature from a slot configured for clear reads.*
- [ATCA\\_STATUS atcab\\_read\\_config\\_zone](#) (uint8\_t \*config\_data)

*Executes Read command to read the complete device configuration zone.*
- [ATCA\\_STATUS atcab\\_cmp\\_config\\_zone](#) (uint8\_t \*config\_data, bool \*same\_config)

*Compares a specified configuration zone with the configuration zone currently on the device.*
- [ATCA\\_STATUS atcab\\_read\\_enc](#) (uint16\_t key\_id, uint8\_t block, uint8\_t \*data, const uint8\_t \*enc\_key, const uint16\_t enc\_key\_id, const uint8\_t num\_in[(20)])

*Executes Read command on a slot configured for encrypted reads and decrypts the data to return it as plaintext.*
- [ATCA\\_STATUS atcab\\_secureboot](#) (uint8\_t mode, uint16\_t param2, const uint8\_t \*digest, const uint8\_t \*signature, uint8\_t \*mac)

*Executes Secure Boot command, which provides support for secure boot of an external MCU or MPU.*
- [ATCA\\_STATUS atcab\\_secureboot\\_mac](#) (uint8\_t mode, const uint8\_t \*digest, const uint8\_t \*signature, const uint8\_t \*num\_in, const uint8\_t \*io\_key, bool \*is\_verified)

*Executes Secure Boot command with encrypted digest and validated MAC response using the IO protection key.*
- [ATCA\\_STATUS atcab\\_selftest](#) (uint8\_t mode, uint16\_t param2, uint8\_t \*result)

*Executes the SelfTest command, which performs a test of one or more of the cryptographic engines within the ATCC608 chip.*
- [ATCA\\_STATUS atcab\\_sha\\_base](#) (uint8\_t mode, uint16\_t length, const uint8\_t \*data\_in, uint8\_t \*data\_out, uint16\_t \*data\_out\_size)

*Executes SHA command, which computes a SHA-256 or HMAC/SHA-256 digest for general purpose use by the host system.*
- [ATCA\\_STATUS atcab\\_sha\\_start](#) (void)

*Executes SHA command to initialize SHA-256 calculation engine.*
- [ATCA\\_STATUS atcab\\_sha\\_update](#) (const uint8\_t \*message)

*Executes SHA command to add 64 bytes of message data to the current context.*
- [ATCA\\_STATUS atcab\\_sha\\_end](#) (uint8\_t \*digest, uint16\_t length, const uint8\_t \*message)

*Executes SHA command to complete SHA-256 or HMAC/SHA-256 operation.*
- [ATCA\\_STATUS atcab\\_sha\\_read\\_context](#) (uint8\_t \*context, uint16\_t \*context\_size)

*Executes SHA command to read the SHA-256 context back. Only for ATECC608 with SHA-256 contexts. HMAC not supported.*

- **ATCA\_STATUS atcab\_sha\_write\_context** (const uint8\_t \*context, uint16\_t context\_size)  
*Executes SHA command to write (restore) a SHA-256 context into the the device. Only supported for ATECC608 with SHA-256 contexts.*
- **ATCA\_STATUS atcab\_sha** (uint16\_t length, const uint8\_t \*message, uint8\_t \*digest)  
*Use the SHA command to compute a SHA-256 digest.*
- **ATCA\_STATUS atcab\_hw\_sha2\_256** (const uint8\_t \*data, size\_t data\_size, uint8\_t \*digest)  
*Use the SHA command to compute a SHA-256 digest.*
- **ATCA\_STATUS atcab\_hw\_sha2\_256\_init** (atca\_sha256\_ctx\_t \*ctx)  
*Initialize a SHA context for performing a hardware SHA-256 operation on a device. Note that only one SHA operation can be run at a time.*
- **ATCA\_STATUS atcab\_hw\_sha2\_256\_update** (atca\_sha256\_ctx\_t \*ctx, const uint8\_t \*data, size\_t data\_size)  
*Add message data to a SHA context for performing a hardware SHA-256 operation on a device.*
- **ATCA\_STATUS atcab\_hw\_sha2\_256\_finish** (atca\_sha256\_ctx\_t \*ctx, uint8\_t \*digest)  
*Finish SHA-256 digest for a SHA context for performing a hardware SHA-256 operation on a device.*
- **ATCA\_STATUS atcab\_sha\_hmac\_init** (atca\_hmac\_sha256\_ctx\_t \*ctx, uint16\_t key\_slot)  
*Executes SHA command to start an HMAC/SHA-256 operation.*
- **ATCA\_STATUS atcab\_sha\_hmac\_update** (atca\_hmac\_sha256\_ctx\_t \*ctx, const uint8\_t \*data, size\_t data\_size)  
*Executes SHA command to add an arbitrary amount of message data to a HMAC/SHA-256 operation.*
- **ATCA\_STATUS atcab\_sha\_hmac\_finish** (atca\_hmac\_sha256\_ctx\_t \*ctx, uint8\_t \*digest, uint8\_t target)  
*Executes SHA command to complete a HMAC/SHA-256 operation.*
- **ATCA\_STATUS atcab\_sha\_hmac** (const uint8\_t \*data, size\_t data\_size, uint16\_t key\_slot, uint8\_t \*digest, uint8\_t target)  
*Use the SHA command to compute an HMAC/SHA-256 operation.*
- **ATCA\_STATUS atcab\_sha\_hmac\_ext** (ATCADevice device, const uint8\_t \*data, size\_t data\_size, uint16\_t key\_slot, uint8\_t \*digest, uint8\_t target)  
*Use the SHA command to compute an HMAC/SHA-256 operation.*
- **ATCA\_STATUS atcab\_sign\_base** (uint8\_t mode, uint16\_t key\_id, uint8\_t \*signature)  
*Executes the Sign command, which generates a signature using the ECDSA algorithm.*
- **ATCA\_STATUS atcab\_sign** (uint16\_t key\_id, const uint8\_t \*msg, uint8\_t \*signature)  
*Executes Sign command, to sign a 32-byte external message using the private key in the specified slot. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
- **ATCA\_STATUS atcab\_sign\_ext** (ATCADevice device, uint16\_t key\_id, const uint8\_t \*msg, uint8\_t \*signature)  
*Executes Sign command, to sign a 32-byte external message using the private key in the specified slot. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
- **ATCA\_STATUS atcab\_sign\_internal** (uint16\_t key\_id, bool is\_invalidate, bool is\_full\_sn, uint8\_t \*signature)  
*Executes Sign command to sign an internally generated message.*
- **ATCA\_STATUS atcab\_updateextra** (uint8\_t mode, uint16\_t new\_value)  
*Executes UpdateExtra command to update the values of the two extra bytes within the Configuration zone (bytes 84 and 85).*
- **ATCA\_STATUS atcab\_verify** (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*signature, const uint8\_t \*public\_key, const uint8\_t \*other\_data, uint8\_t \*mac)  
*Executes the Verify command, which takes an ECDSA [R,S] signature and verifies that it is correctly generated from a given message and public key. In all cases, the signature is an input to the command.*
- **ATCA\_STATUS atcab\_verify\_extern** (const uint8\_t \*message, const uint8\_t \*signature, const uint8\_t \*public\_key, bool \*is\_verified)  
*Executes the Verify command, which verifies a signature (ECDSA verify operation) with all components (message, signature, and public key) supplied. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
- **ATCA\_STATUS atcab\_verify\_extern\_ext** (ATCADevice device, const uint8\_t \*message, const uint8\_t \*signature, const uint8\_t \*public\_key, bool \*is\_verified)



Executes the Verify command, which verifies a signature (ECDSA verify operation) with all components (message, signature, and public key) supplied. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.

- [ATCA\\_STATUS atcab\\_verify\\_extern\\_mac](#) (const uint8\_t \*message, const uint8\_t \*signature, const uint8\_t \*public\_key, const uint8\_t \*num\_in, const uint8\_t \*io\_key, bool \*is\_verified)
- [ATCA\\_STATUS atcab\\_verify\\_stored](#) (const uint8\_t \*message, const uint8\_t \*signature, uint16\_t key\_id, bool \*is\_verified)

Executes the Verify command, which verifies a signature (ECDSA verify operation) with a public key stored in the device. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.

- [ATCA\\_STATUS atcab\\_verify\\_stored\\_ext](#) (ATCADevice device, const uint8\_t \*message, const uint8\_t \*signature, uint16\_t key\_id, bool \*is\_verified)

Executes the Verify command, which verifies a signature (ECDSA verify operation) with a public key stored in the device. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.

- [ATCA\\_STATUS atcab\\_verify\\_stored\\_with\\_tempkey](#) (const uint8\_t \*signature, uint16\_t key\_id, bool \*is\_verified)

Executes the Verify command, which verifies a signature (ECDSA verify operation) with a public key stored in the device. keyConfig.reqrndom bit should be set and the message to be signed should be already loaded into TempKey for all devices.

- [ATCA\\_STATUS atcab\\_verify\\_stored\\_mac](#) (const uint8\_t \*message, const uint8\_t \*signature, uint16\_t key\_id, const uint8\_t \*num\_in, const uint8\_t \*io\_key, bool \*is\_verified)
- [ATCA\\_STATUS atcab\\_verify\\_validate](#) (uint16\_t key\_id, const uint8\_t \*signature, const uint8\_t \*other\_data, bool \*is\_verified)

Executes the Verify command in Validate mode to validate a public key stored in a slot.

- [ATCA\\_STATUS atcab\\_verify\\_invalidate](#) (uint16\_t key\_id, const uint8\_t \*signature, const uint8\_t \*other\_data, bool \*is\_verified)

Executes the Verify command in Invalidate mode which invalidates a previously validated public key stored in a slot.

- [ATCA\\_STATUS atcab\\_write](#) (uint8\_t zone, uint16\_t address, const uint8\_t \*value, const uint8\_t \*mac)

Executes the Write command, which writes either one four byte word or a 32-byte block to one of the EEPROM zones on the device. Depending upon the value of the WriteConfig byte for this slot, the data may be required to be encrypted by the system prior to being sent to the device. This command cannot be used to write slots configured as ECC private keys.

- [ATCA\\_STATUS atcab\\_write\\_zone](#) (uint8\_t zone, uint16\_t slot, uint8\_t block, uint8\_t offset, const uint8\_t \*data, uint8\_t len)

Executes the Write command, which writes either 4 or 32 bytes of data into a device zone.

- [ATCA\\_STATUS atcab\\_write\\_bytes\\_zone\\_ext](#) (ATCADevice device, uint8\_t zone, uint16\_t slot, size\_t offset\_bytes, const uint8\_t \*data, size\_t length)
- [ATCA\\_STATUS atcab\\_write\\_bytes\\_zone](#) (uint8\_t zone, uint16\_t slot, size\_t offset\_bytes, const uint8\_t \*data, size\_t length)

Executes the Write command, which writes data into the configuration, otp, or data zones with a given byte offset and length. Offset and length must be multiples of a word (4 bytes).

- [ATCA\\_STATUS atcab\\_write\\_pubkey](#) (uint16\_t slot, const uint8\_t \*public\_key)

Uses the write command to write a public key to a slot in the proper format.

- [ATCA\\_STATUS atcab\\_write\\_config\\_zone](#) (const uint8\_t \*config\_data)

Executes the Write command, which writes the configuration zone.

- [ATCA\\_STATUS atcab\\_write\\_enc](#) (uint16\_t key\_id, uint8\_t block, const uint8\_t \*data, const uint8\_t \*enc\_key, const uint16\_t enc\_key\_id, const uint8\_t num\_in[(20)])

Executes the Write command, which performs an encrypted write of a 32 byte block into given slot.

- [ATCA\\_STATUS atcab\\_write\\_config\\_counter](#) (uint16\_t counter\_id, uint32\_t counter\_value)

Initialize one of the monotonic counters in device with a specific value.

## Variables

- [ATCADevice \\_gDevice](#)
- [ATCA\\_STATUS atcab\\_printbin](#) (uint8\_t \*binary, size\_t bin\_len, bool add\_space)



## 8.1.1 Detailed Description

These methods provide the most convenient, simple API to CryptoAuth chips.

## 8.1.2 Macro Definition Documentation

### 8.1.2.1 atca\_execute\_command

```
#define atca_execute_command(  
    ... ) calib_execute_command(__VA_ARGS__)
```

### 8.1.2.2 atcab\_get\_addr

```
#define atcab_get_addr(  
    ... ) calib_get_addr(__VA_ARGS__)
```

### 8.1.2.3 SHA\_CONTEXT\_MAX\_SIZE

```
#define SHA_CONTEXT_MAX_SIZE (109)
```

## 8.1.3 Function Documentation

### 8.1.3.1 \_atcab\_exit()

```
ATCA_STATUS _atcab_exit (  
    void )
```

### 8.1.3.2 atcab\_aes()

```
ATCA_STATUS atcab_aes (  
    uint8_t mode,  
    uint16_t key_id,  
    const uint8_t * aes_in,  
    uint8_t * aes_out )
```

Compute the AES-128 encrypt, decrypt, or GFM calculation.

## 8.1 Basic Crypto API methods (atcab\_)

---

### Parameters

in	<i>mode</i>	The mode for the AES command.
in	<i>key_id</i>	Key location. Can either be a slot number or ATCA_TEMPKEY_KEYID for TempKey.
in	<i>aes_in</i>	Input data to the AES command (16 bytes).
out	<i>aes_out</i>	Output data from the AES command is returned here (16 bytes).

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.3 atcab\_aes\_decrypt()

```
ATCA_STATUS atcab_aes_decrypt (
    uint16_t key_id,
    uint8_t key_block,
    const uint8_t * ciphertext,
    uint8_t * plaintext )
```

Perform an AES-128 decrypt operation with a key in the device.

### Parameters

in	<i>key_id</i>	Key location. Can either be a slot number or ATCA_TEMPKEY_KEYID for TempKey.
in	<i>key_block</i>	Index of the 16-byte block to use within the key location for the actual key.
in	<i>ciphertext</i>	Input ciphertext to be decrypted (16 bytes).
out	<i>plaintext</i>	Output plaintext is returned here (16 bytes).

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.4 atcab\_aes\_decrypt\_ext()

```
ATCA_STATUS atcab_aes_decrypt_ext (
    ATCADevice device,
    uint16_t key_id,
    uint8_t key_block,
    const uint8_t * ciphertext,
    uint8_t * plaintext )
```

Perform an AES-128 decrypt operation with a key in the device.

**Parameters**

in	<i>device</i>	Device context pointer
in	<i>key_id</i>	Key location. Can either be a slot number or ATCA_TEMPKEY_KEYID for TempKey.
in	<i>key_block</i>	Index of the 16-byte block to use within the key location for the actual key.
in	<i>ciphertext</i>	Input ciphertext to be decrypted (16 bytes).
out	<i>plaintext</i>	Output plaintext is returned here (16 bytes).

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.5 atcab\_aes\_encrypt()**

```
ATCA_STATUS atcab_aes_encrypt (
    uint16_t key_id,
    uint8_t key_block,
    const uint8_t * plaintext,
    uint8_t * ciphertext )
```

Perform an AES-128 encrypt operation with a key in the device.

**Parameters**

in	<i>key_id</i>	Key location. Can either be a slot number or ATCA_TEMPKEY_KEYID for TempKey.
in	<i>key_block</i>	Index of the 16-byte block to use within the key location for the actual key.
in	<i>plaintext</i>	Input plaintext to be encrypted (16 bytes).
out	<i>ciphertext</i>	Output ciphertext is returned here (16 bytes).

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.6 atcab\_aes\_encrypt\_ext()**

```
ATCA_STATUS atcab_aes_encrypt_ext (
    ATCADevice device,
    uint16_t key_id,
    uint8_t key_block,
    const uint8_t * plaintext,
    uint8_t * ciphertext )
```

Perform an AES-128 encrypt operation with a key in the device.

## 8.1 Basic Crypto API methods (atcab\_)

---

### Parameters

in	<i>device</i>	Device context pointer
in	<i>key_id</i>	Key location. Can either be a slot number or ATCA_TEMPKEY_KEYID for TempKey.
in	<i>key_block</i>	Index of the 16-byte block to use within the key location for the actual key.
in	<i>plaintext</i>	Input plaintext to be encrypted (16 bytes).
out	<i>ciphertext</i>	Output ciphertext is returned here (16 bytes).

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.7 atcab\_aes\_gcm\_aad\_update()

```
ATCA_STATUS atcab_aes_gcm_aad_update (
    atca_aes_gcm_ctx_t * ctx,
    const uint8_t * aad,
    uint32_t aad_size )
```

Process Additional Authenticated Data (AAD) using GCM mode and a key within the ATECC608 device.

This can be called multiple times. [atcab\\_aes\\_gcm\\_init\(\)](#) or [atcab\\_aes\\_gcm\\_init\\_rand\(\)](#) should be called before the first use of this function. When there is AAD to include, this should be called before [atcab\\_aes\\_gcm\\_encrypt\\_update\(\)](#) or [atcab\\_aes\\_gcm\\_decrypt\\_update\(\)](#).

### Parameters

in	<i>ctx</i>	AES GCM context
in	<i>aad</i>	Additional authenticated data to be added
in	<i>aad_size</i>	Size of aad in bytes

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.8 atcab\_aes\_gcm\_decrypt\_finish()

```
ATCA_STATUS atcab_aes_gcm_decrypt_finish (
    atca_aes_gcm_ctx_t * ctx,
    const uint8_t * tag,
    size_t tag_size,
    bool * is_verified )
```

Complete a GCM decrypt operation verifying the authentication tag.

## Parameters

in	<i>ctx</i>	AES GCM context structure.
in	<i>tag</i>	Expected authentication tag.
in	<i>tag_size</i>	Size of tag in bytes (12 to 16 bytes).
out	<i>is_verified</i>	Returns whether or not the tag verified.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 8.1.3.9 atcab\_aes\_gcm\_decrypt\_update()

```
ATCA_STATUS atcab_aes_gcm_decrypt_update (
    atca_aes_gcm_ctx_t * ctx,
    const uint8_t * ciphertext,
    uint32_t ciphertext_size,
    uint8_t * plaintext )
```

Decrypt data using GCM mode and a key within the ATECC608 device. [atcab\\_aes\\_gcm\\_init\(\)](#) or [atcab\\_aes\\_gcm\\_init\\_rand\(\)](#) should be called before the first use of this function.

## Parameters

in	<i>ctx</i>	AES GCM context structure.
in	<i>ciphertext</i>	Ciphertext to be decrypted.
in	<i>ciphertext_size</i>	Size of ciphertext in bytes.
out	<i>plaintext</i>	Decrypted data is returned here.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 8.1.3.10 atcab\_aes\_gcm\_encrypt\_finish()

```
ATCA_STATUS atcab_aes_gcm_encrypt_finish (
    atca_aes_gcm_ctx_t * ctx,
    uint8_t * tag,
    size_t tag_size )
```

Complete a GCM encrypt operation returning the authentication tag.

## Parameters

in	<i>ctx</i>	AES GCM context structure.
out	<i>tag</i>	Authentication tag is returned here.
in	<i>tag_size</i>	Tag size in bytes (12 to 16 bytes).

## 8.1 Basic Crypto API methods (atcab\_)

---

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.11 atcab\_aes\_gcm\_encrypt\_update()

```
ATCA_STATUS atcab_aes_gcm_encrypt_update (
    atca_aes_gcm_ctx_t * ctx,
    const uint8_t * plaintext,
    uint32_t plaintext_size,
    uint8_t * ciphertext )
```

Encrypt data using GCM mode and a key within the ATECC608 device. [atcab\\_aes\\_gcm\\_init\(\)](#) or [atcab\\_aes\\_gcm\\_init\\_rand\(\)](#) should be called before the first use of this function.

### Parameters

in	<i>ctx</i>	AES GCM context structure.
in	<i>plaintext</i>	Plaintext to be encrypted (16 bytes).
in	<i>plaintext_size</i>	Size of plaintext in bytes.
out	<i>ciphertext</i>	Encrypted data is returned here.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.12 atcab\_aes\_gcm\_init()

```
ATCA_STATUS atcab_aes_gcm_init (
    atca_aes_gcm_ctx_t * ctx,
    uint16_t key_id,
    uint8_t key_block,
    const uint8_t * iv,
    size_t iv_size )
```

Initialize context for AES GCM operation with an existing IV, which is common when starting a decrypt operation.

### Parameters

in	<i>ctx</i>	AES GCM context to be initialized.
in	<i>key_id</i>	Key location. Can either be a slot number or ATCA_TEMPKEY_KEYID for TempKey.
in	<i>key_block</i>	Index of the 16-byte block to use within the key location for the actual key.
in	<i>iv</i>	Initialization vector.
in	<i>iv_size</i>	Size of IV in bytes. Standard is 12 bytes.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.13 atcab\_aes\_gcm\_init\_rand()**

```
ATCA_STATUS atcab_aes_gcm_init_rand (
    atca_aes_gcm_ctx_t * ctx,
    uint16_t key_id,
    uint8_t key_block,
    size_t rand_size,
    const uint8_t * free_field,
    size_t free_field_size,
    uint8_t * iv )
```

Initialize context for AES GCM operation with a IV composed of a random and optional fixed(free) field, which is common when starting an encrypt operation.

**Parameters**

in	<i>ctx</i>	AES CTR context to be initialized.
in	<i>key_id</i>	Key location. Can either be a slot number or ATCA_TEMPKEY_KEYID for TempKey.
in	<i>key_block</i>	Index of the 16-byte block to use within the key location for the actual key.
in	<i>rand_size</i>	Size of the random field in bytes. Minimum and recommended size is 12 bytes. Max is 32 bytes.
in	<i>free_field</i>	Fixed data to include in the IV after the random field. Can be NULL if not used.
in	<i>free_field_size</i>	Size of the free field in bytes.
out	<i>iv</i>	Initialization vector is returned here. Its size will be <i>rand_size</i> and <i>free_field_size</i> combined.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.14 atcab\_aes\_gfm()**

```
ATCA_STATUS atcab_aes_gfm (
    const uint8_t * h,
    const uint8_t * input,
    uint8_t * output )
```

Perform a Galois Field Multiply (GFM) operation.

**Parameters**

in	<i>h</i>	First input value (16 bytes).
in	<i>input</i>	Second input value (16 bytes).
out	<i>output</i>	GFM result is returned here (16 bytes).

## 8.1 Basic Crypto API methods (atcab\_)

---

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.15 atcab\_challenge()

```
ATCA_STATUS atcab_challenge (
    const uint8_t * num_in )
```

Execute a Nonce command in pass-through mode to initialize TempKey to a specified value.

### Parameters

in	<i>num_in</i>	Data to be loaded into TempKey (32 bytes).
----	---------------	--

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.16 atcab\_challenge\_seed\_update()

```
ATCA_STATUS atcab_challenge_seed_update (
    const uint8_t * num_in,
    uint8_t * rand_out )
```

Execute a Nonce command to generate a random challenge combining a host nonce (num\_in) and a device random number.

### Parameters

in	<i>num_in</i>	Host nonce to be combined with the device random number (20 bytes).
out	<i>rand_out</i>	Internally generated 32-byte random number that was used in the nonce/challenge calculation is returned here. Can be NULL if not needed.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.17 atcab\_checkmac()

```
ATCA_STATUS atcab_checkmac (
    uint8_t mode,
```



```

uint16_t key_id,
const uint8_t * challenge,
const uint8_t * response,
const uint8_t * other_data )

```

Compares a MAC response with input values.

#### Parameters

in	<i>mode</i>	Controls which fields within the device are used in the message
in	<i>key_id</i>	Key location in the CryptoAuth device to use for the MAC
in	<i>challenge</i>	Challenge data (32 bytes)
in	<i>response</i>	MAC response data (32 bytes)
in	<i>other_data</i>	OtherData parameter (13 bytes)

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.18 atcab\_cmp\_config\_zone()

```

ATCA_STATUS atcab_cmp_config_zone (
    uint8_t * config_data,
    bool * same_config )

```

Compares a specified configuration zone with the configuration zone currently on the device.

This only compares the static portions of the configuration zone and skips those that are unique per device (first 16 bytes) and areas that can change after the configuration zone has been locked (e.g. LastKeyUse).

#### Parameters

in	<i>config_data</i>	Full configuration data to compare the device against.
out	<i>same_config</i>	Result is returned here. True if the static portions on the configuration zones are the same.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.19 atcab\_counter()

```

ATCA_STATUS atcab_counter (
    uint8_t mode,
    uint16_t counter_id,
    uint32_t * counter_value )

```

Compute the Counter functions.

## 8.1 Basic Crypto API methods (atcab\_)

---

### Parameters

in	<i>mode</i>	the mode used for the counter
in	<i>counter_id</i>	The counter to be used
out	<i>counter_value</i>	pointer to the counter value returned from device

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.20 atcab\_counter\_increment()

```
ATCA_STATUS atcab_counter_increment (
    uint16_t counter_id,
    uint32_t * counter_value )
```

Increments one of the device's monotonic counters.

### Parameters

in	<i>counter_id</i>	Counter to be incremented
out	<i>counter_value</i>	New value of the counter is returned here. Can be NULL if not needed.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.21 atcab\_counter\_read()

```
ATCA_STATUS atcab_counter_read (
    uint16_t counter_id,
    uint32_t * counter_value )
```

Read one of the device's monotonic counters.

### Parameters

in	<i>counter_id</i>	Counter to be read
out	<i>counter_value</i>	Counter value is returned here.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.22 atcab\_derivekey()

```
ATCA_STATUS atcab_derivekey (
    uint8_t mode,
    uint16_t key_id,
    const uint8_t * mac )
```

Executes the DeviveKey command for deriving a new key from a nonce (TempKey) and an existing key.

#### Parameters

in	<i>mode</i>	Bit 2 must match the value in TempKey.SourceFlag
in	<i>key_id</i>	Key slot to be written
in	<i>mac</i>	Optional 32 byte MAC used to validate operation. NULL if not required.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.23 atcab\_ecdh()

```
ATCA_STATUS atcab_ecdh (
    uint16_t key_id,
    const uint8_t * public_key,
    uint8_t * pms )
```

ECDH command with a private key in a slot and the premaster secret is returned in the clear.

#### Parameters

in	<i>key_id</i>	Slot of private key for ECDH computation
in	<i>public_key</i>	Public key input to ECDH calculation. X and Y integers in big-endian format. 64 bytes for P256 key.
out	<i>pms</i>	Computed ECDH premaster secret is returned here. 32 bytes.

#### Returns

ATCA\_SUCCESS on success

### 8.1.3.24 atcab\_ecdh\_base()

```
ATCA_STATUS atcab_ecdh_base (
    uint8_t mode,
    uint16_t key_id,
```

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```
const uint8_t * public_key,  
uint8_t * pms,  
uint8_t * out_nonce )
```

Base function for generating premaster secret key using ECDH.

### Parameters

in	<i>mode</i>	Mode to be used for ECDH computation
in	<i>key_id</i>	Slot of key for ECDH computation
in	<i>public_key</i>	Public key input to ECDH calculation. X and Y integers in big-endian format. 64 bytes for P256 key.
out	<i>pms</i>	Computed ECDH pre-master secret is returned here (32 bytes) if returned directly. Otherwise NULL.
out	<i>out_nonce</i>	Nonce used to encrypt pre-master secret. NULL if output encryption not used.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.25 atcab\_ecdh\_enc()

```
ATCA_STATUS atcab_ecdh_enc (  
    uint16_t key_id,  
    const uint8_t * public_key,  
    uint8_t * pms,  
    const uint8_t * read_key,  
    uint16_t read_key_id,  
    const uint8_t num_in[ (20) ] )
```

ECDH command with a private key in a slot and the premaster secret is read from the next slot.

This function only works for even numbered slots with the proper configuration.

### Parameters

in	<i>key_id</i>	Slot of key for ECDH computation
in	<i>public_key</i>	Public key input to ECDH calculation. X and Y integers in big-endian format. 64 bytes for P256 key.
out	<i>pms</i>	Computed ECDH premaster secret is returned here (32 bytes).
in	<i>read_key</i>	Read key for the premaster secret slot (key_id 1).
in	<i>read_key_id</i>	Read key slot for read_key.
in	<i>num_in</i>	20 byte host nonce to inject into Nonce calculation

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.26 atcab\_ecdh\_ioenc()**

```

ATCA_STATUS atcab_ecdh_ioenc (
    uint16_t key_id,
    const uint8_t * public_key,
    uint8_t * pms,
    const uint8_t * io_key )

```

ECDH command with a private key in a slot and the premaster secret is returned encrypted using the IO protection key.

**Parameters**

in	<i>key_id</i>	Slot of key for ECDH computation
in	<i>public_key</i>	Public key input to ECDH calculation. X and Y integers in big-endian format. 64 bytes for P256 key.
out	<i>pms</i>	Computed ECDH premaster secret is returned here (32 bytes).
in	<i>io_key</i>	IO protection key.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.27 atcab\_ecdh\_tempkey()**

```

ATCA_STATUS atcab_ecdh_tempkey (
    const uint8_t * public_key,
    uint8_t * pms )

```

ECDH command with a private key in TempKey and the premaster secret is returned in the clear.

**Parameters**

in	<i>public_key</i>	Public key input to ECDH calculation. X and Y integers in big-endian format. 64 bytes for P256 key.
out	<i>pms</i>	Computed ECDH premaster secret is returned here (32 bytes).

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.28 atcab\_ecdh\_tempkey\_ioenc()**

```

ATCA_STATUS atcab_ecdh_tempkey_ioenc (
    const uint8_t * public_key,

```

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```
uint8_t * pms,  
const uint8_t * io_key )
```

ECDH command with a private key in TempKey and the premaster secret is returned encrypted using the IO protection key.

### Parameters

in	<i>public_key</i>	Public key input to ECDH calculation. X and Y integers in big-endian format. 64 bytes for P256 key.
out	<i>pms</i>	Computed ECDH premaster secret is returned here (32 bytes).
in	<i>io_key</i>	IO protection key.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.29 atcab\_gendig()

```
ATCA_STATUS atcab_gendig (  
    uint8_t zone,  
    uint16_t key_id,  
    const uint8_t * other_data,  
    uint8_t other_data_size )
```

Issues a GenDig command, which performs a SHA256 hash on the source data indicated by zone with the contents of TempKey. See the CryptoAuth datasheet for your chip to see what the values of zone correspond to.

### Parameters

in	<i>zone</i>	Designates the source of the data to hash with TempKey.
in	<i>key_id</i>	Indicates the key, OTP block, or message order for shared nonce mode.
in	<i>other_data</i>	Four bytes of data for SHA calculation when using a NoMac key, 32 bytes for "Shared Nonce" mode, otherwise ignored (can be NULL).
in	<i>other_data_size</i>	Size of other_data in bytes.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.30 atcab\_genkey()

```
ATCA_STATUS atcab_genkey (  
    uint16_t key_id,  
    uint8_t * public_key )
```

Issues GenKey command, which generates a new random private key in slot/handle and returns the public key.

**Parameters**

in	<i>key_id</i>	Slot number where an ECC private key is configured. Can also be ATCA_TEMPKEY_KEYID to generate a private key in TempKey.
out	<i>public_key</i>	Public key will be returned here. Format will be the X and Y integers in big-endian format. 64 bytes for P256 curve. Set to NULL if public key isn't required.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.31 atcab\_genkey\_base()**

```
ATCA_STATUS atcab_genkey_base (
    uint8_t mode,
    uint16_t key_id,
    const uint8_t * other_data,
    uint8_t * public_key )
```

Issues GenKey command, which can generate a private key, compute a public key, and/or compute a digest of a public key.

**Parameters**

in	<i>mode</i>	Mode determines what operations the GenKey command performs.
in	<i>key_id</i>	Slot to perform the GenKey command on.
in	<i>other_data</i>	OtherData for PubKey digest calculation. Can be set to NULL otherwise.
out	<i>public_key</i>	If the mode indicates a public key will be calculated, it will be returned here. Format will be the X and Y integers in big-endian format. 64 bytes for P256 curve. Set to NULL if public key isn't required.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.32 atcab\_get\_device()**

```
ATCADevice atcab_get_device (
    void )
```

Get the global device object.

**Returns**

instance of global ATCADevice

### 8.1.3.33 atcab\_get\_device\_address()

```
uint8_t atcab_get_device_address (
    ATCADevice device )
```

Get the current device address based on the configured device and interface.

#### Returns

the device address if applicable else 0xFF

### 8.1.3.34 atcab\_get\_device\_type()

```
ATCADeviceType atcab_get_device_type (
    void )
```

Get the current device type configured for the global ATCADevice.

#### Returns

Device type if basic api is initialized or ATCA\_DEV\_UNKNOWN.

### 8.1.3.35 atcab\_get\_device\_type\_ext()

```
ATCADeviceType atcab_get_device_type_ext (
    ATCADevice device )
```

Get the selected device type of the device context.

#### Parameters

in	<i>device</i>	Device context pointer
----	---------------	------------------------

#### Returns

Device type if basic api is initialized or ATCA\_DEV\_UNKNOWN.

### 8.1.3.36 atcab\_get\_pubkey()

```
ATCA_STATUS atcab_get_pubkey (
    uint16_t key_id,
    uint8_t * public_key )
```

Uses GenKey command to calculate the public key from an existing private key in a slot.



## Parameters

in	<i>key_id</i>	Slot number of the private key.
out	<i>public_key</i>	Public key will be returned here. Format will be the X and Y integers in big-endian format. 64 bytes for P256 curve. Set to NULL if public key isn't required.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 8.1.3.37 atcab\_get\_pubkey\_ext()

```
ATCA_STATUS atcab_get_pubkey_ext (
    ATCADevice device,
    uint16_t key_id,
    uint8_t * public_key )
```

Uses GenKey command to calculate the public key from an existing private key in a slot.

## Parameters

in	<i>key_id</i>	Slot number of the private key.
out	<i>public_key</i>	Public key will be returned here. Format will be the X and Y integers in big-endian format. 64 bytes for P256 curve. Set to NULL if public key isn't required.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 8.1.3.38 atcab\_get\_zone\_size()

```
ATCA_STATUS atcab_get_zone_size (
    uint8_t zone,
    uint16_t slot,
    size_t * size )
```

Gets the size of the specified zone in bytes.

## Parameters

in	<i>zone</i>	Zone to get size information from. Config(0), OTP(1), or Data(2) which requires a slot.
in	<i>slot</i>	If zone is Data(2), the slot to query for size.
out	<i>size</i>	Zone size is returned here.

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### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.39 atcab\_hmac()

```
ATCA_STATUS atcab_hmac (
    uint8_t mode,
    uint16_t key_id,
    uint8_t * digest )
```

Issues a HMAC command, which computes an HMAC/SHA-256 digest of a key stored in the device, a challenge, and other information on the device.

### Parameters

in	<i>mode</i>	Controls which fields within the device are used in the message.
in	<i>key_id</i>	Which key is to be used to generate the response. Bits 0:3 only are used to select a slot but all 16 bits are used in the HMAC message.
out	<i>digest</i>	HMAC digest is returned in this buffer (32 bytes).

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.40 atcab\_hw\_sha2\_256()

```
ATCA_STATUS atcab_hw_sha2_256 (
    const uint8_t * data,
    size_t data_size,
    uint8_t * digest )
```

Use the SHA command to compute a SHA-256 digest.

### Parameters

in	<i>data</i>	Message data to be hashed.
in	<i>data_size</i>	Size of data in bytes.
out	<i>digest</i>	Digest is returned here (32 bytes).

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.1.3.41 atcab\_hw\_sha2\_256\_finish()

```
ATCA_STATUS atcab_hw_sha2_256_finish (
    atca_sha256_ctx_t * ctx,
    uint8_t * digest )
```

Finish SHA-256 digest for a SHA context for performing a hardware SHA-256 operation on a device.

Parameters

in	ctx	SHA256 context
out	digest	SHA256 digest is returned here (32 bytes)

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.1.3.42 atcab\_hw\_sha2\_256\_init()

```
ATCA_STATUS atcab_hw_sha2_256_init (
    atca_sha256_ctx_t * ctx )
```

Initialize a SHA context for performing a hardware SHA-256 operation on a device. Note that only one SHA operation can be run at a time.

Parameters

in	ctx	SHA256 context
----	-----	----------------

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.1.3.43 atcab\_hw\_sha2\_256\_update()

```
ATCA_STATUS atcab_hw_sha2_256_update (
    atca_sha256_ctx_t * ctx,
    const uint8_t * data,
    size_t data_size )
```

Add message data to a SHA context for performing a hardware SHA-256 operation on a device.

Parameters

in	ctx	SHA256 context
in	data	Message data to be added to hash.
in	data_size	Size of data in bytes.

## 8.1 Basic Crypto API methods (atcab\_)

---

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.44 atcab\_idle()

```
ATCA_STATUS atcab_idle (
    void )
```

idle the CryptoAuth device

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.45 atcab\_info()

```
ATCA_STATUS atcab_info (
    uint8_t * revision )
```

Use the Info command to get the device revision (DevRev).

### Parameters

out	<i>revision</i>	Device revision is returned here (4 bytes).
-----	-----------------	---

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.46 atcab\_info\_base()

```
ATCA_STATUS atcab_info_base (
    uint8_t mode,
    uint16_t param2,
    uint8_t * out_data )
```

Issues an Info command, which return internal device information and can control GPIO and the persistent latch.

### Parameters

in	<i>mode</i>	Selects which mode to be used for info command.
in	<i>param2</i>	Selects the particular fields for the mode.
out	<i>out_data</i>	Response from info command (4 bytes). Can be set to NULL if not required.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.47 atcab\_info\_get\_latch()**

```
ATCA_STATUS atcab_info_get_latch (
    bool * state )
```

Use the Info command to get the persistent latch current state for an ATECC608 device.

**Parameters**

out	state	The state is returned here. Set (true) or Cleared (false).
-----	-------	--

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.48 atcab\_info\_set\_latch()**

```
ATCA_STATUS atcab_info_set_latch (
    bool state )
```

Use the Info command to set the persistent latch state for an ATECC608 device.

**Parameters**

out	state	Persistent latch state. Set (true) or clear (false).
-----	-------	--

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.49 atcab\_init()**

```
ATCA_STATUS atcab_init (
    ATCAIfaceCfg * cfg )
```

Creates a global ATCADevice object used by Basic API.

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---

### Parameters

in	<i>cfg</i>	Logical interface configuration. Some predefined configurations can be found in <a href="#">atca_cfgs.h</a>
----	------------	---

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.50 atcab\_init\_device()

```
ATCA_STATUS atcab_init_device (  
    ATCADevice ca_device )
```

Initialize the global ATCADevice object to point to one of your choosing for use with all the atcab\_ basic API.

### Parameters

in	<i>ca_device</i>	ATCADevice instance to use as the global Basic API crypto device instance
----	------------------	---

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.51 atcab\_init\_ext()

```
ATCA_STATUS atcab_init_ext (  
    ATCADevice * device,  
    ATCAIfaceCfg * cfg )
```

Creates and initializes a ATCADevice context.

### Parameters

out	<i>device</i>	Pointer to the device context pointer
in	<i>cfg</i>	Logical interface configuration. Some predefined configurations can be found in <a href="#">atca_cfgs.h</a>

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.52 atcab\_is\_ca\_device()

```
bool atcab_is_ca_device (
    ATCADeviceType dev_type )
```

Check whether the device is cryptoauth device.

#### Returns

True if device is cryptoauth device or False.

### 8.1.3.53 atcab\_is\_config\_locked()

```
ATCA_STATUS atcab_is_config_locked (
    bool * is_locked )
```

This function check whether configuration zone is locked or not.

#### Parameters

out	<i>is_locked</i>	Lock state returned here. True if locked.
-----	------------------	---

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.54 atcab\_is\_data\_locked()

```
ATCA_STATUS atcab_is_data_locked (
    bool * is_locked )
```

This function check whether data/setup zone is locked or not.

#### Parameters

out	<i>is_locked</i>	Lock state returned here. True if locked.
-----	------------------	---

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.55 atcab\_is\_locked()

```
ATCA_STATUS atcab_is_locked (
    uint8_t zone,
    bool * is_locked )
```

Executes Read command, which reads the configuration zone to see if the specified zone is locked.

#### Parameters

in	<i>zone</i>	The zone to query for locked (use LOCK_ZONE_CONFIG or LOCK_ZONE_DATA).
out	<i>is_locked</i>	Lock state returned here. True if locked.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.56 atcab\_is\_private()

```
ATCA_STATUS atcab_is_private (
    uint16_t slot,
    bool * is_private )
```

### 8.1.3.57 atcab\_is\_private\_ext()

```
ATCA_STATUS atcab_is_private_ext (
    ATCADevice device,
    uint16_t slot,
    bool * is_private )
```

Check to see if the key is a private key or not.

This function will issue the Read command as many times as is required to read the requested data.

#### Parameters

in	<i>slot</i>	Slot number to read from if zone is <a href="#">ATCA_ZONE_DATA(2)</a> . Ignored for all other zones.
out	<i>is_private</i>	Returned valud if successful. True if key is private.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.



8.1.3.58 atcab\_is\_slot\_locked()

```
ATCA_STATUS atcab_is_slot_locked (
    uint16_t slot,
    bool * is_locked )
```

This function check whether slot/handle is locked or not.

Parameters

in	slot	Slot to query for locked
out	is_locked	Lock state returned here. True if locked.

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.1.3.59 atcab\_is\_ta\_device()

```
bool atcab_is_ta_device (
    ATCADeviceType dev_type )
```

Check whether the device is Trust Anchor device.

Returns

True if device is Trust Anchor device or False.

8.1.3.60 atcab\_kdf()

```
ATCA_STATUS atcab_kdf (
    uint8_t mode,
    uint16_t key_id,
    const uint32_t details,
    const uint8_t * message,
    uint8_t * out_data,
    uint8_t * out_nonce )
```

Executes the KDF command, which derives a new key in PRF, AES, or HKDF modes.

Generally this function combines a source key with an input string and creates a result key/digest/array.

Parameters

in	mode	Mode determines KDF algorithm (PRF,AES,HKDF), source key location, and target key locations.
in	key_id	Source and target key slots if locations are in the EEPROM. Source key slot is the LSB and target key slot is the MSB.
in	details	Further information about the computation, depending on the algorithm (4 bytes).
in	message	Input value from system (up to 128 bytes). Actual size of message is 16 bytes for AES algorithm or is encoded in the MSB of the details parameter for other algorithms.
out	out_data	Output of the KDF function is returned here. If the result remains in the device, this can

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.61 atcab\_lock()

```
ATCA_STATUS atcab_lock (
    uint8_t mode,
    uint16_t summary_crc )
```

The Lock command prevents future modifications of the Configuration and/or Data and OTP zones. If the device is so configured, then this command can be used to lock individual data slots. This command fails if the designated area is already locked.

### Parameters

in	<i>mode</i>	Zone, and/or slot, and summary check (bit 7).
in	<i>summary_crc</i>	CRC of the config or data zones. Ignored for slot locks or when mode bit 7 is set.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.62 atcab\_lock\_config\_zone()

```
ATCA_STATUS atcab_lock_config_zone (
    void )
```

Unconditionally (no CRC required) lock the config zone.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.63 atcab\_lock\_config\_zone\_crc()

```
ATCA_STATUS atcab_lock_config_zone_crc (
    uint16_t summary_crc )
```

Lock the config zone with summary CRC.

The CRC is calculated over the entire config zone contents. 48 bytes for TA100, 88 bytes for ATSHA devices, 128 bytes for ATECC devices. Lock will fail if the provided CRC doesn't match the internally calculated one.

## Parameters

in	<i>summary_crc</i>	Expected CRC over the config zone.
----	--------------------	------------------------------------

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.64 atcab\_lock\_data\_slot()**

```
ATCA_STATUS atcab_lock_data_slot (
    uint16_t slot )
```

Lock an individual slot in the data zone on an ATECC device. Not available for ATSHA devices. Slot must be configured to be slot lockable (KeyConfig.Lockable=1) (for cryptoauth devices) or Lock an individual handle in shared data element on an Trust Anchor device (for Trust Anchor devices).

## Parameters

in	<i>slot</i>	Slot to be locked in data zone.
----	-------------	---------------------------------

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.65 atcab\_lock\_data\_zone()**

```
ATCA_STATUS atcab_lock_data_zone (
    void )
```

Unconditionally (no CRC required) lock the data zone (slots and OTP). for CryptoAuth devices and lock the setup for Trust Anchor device.

ConfigZone must be locked and DataZone must be unlocked for the zone to be successfully locked.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.66 atcab\_lock\_data\_zone\_crc()**

```
ATCA_STATUS atcab_lock_data_zone_crc (
    uint16_t summary_crc )
```

Lock the data zone (slots and OTP) with summary CRC.

The CRC is calculated over the concatenated contents of all the slots and OTP at the end. Private keys (KeyConfig.Private=1) are skipped. Lock will fail if the provided CRC doesn't match the internally calculated one.

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### Parameters

in	<i>summary_crc</i>	Expected CRC over the data zone.
----	--------------------	----------------------------------

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.67 atcab\_mac()

```
ATCA_STATUS atcab_mac (
    uint8_t mode,
    uint16_t key_id,
    const uint8_t * challenge,
    uint8_t * digest )
```

Executes MAC command, which computes a SHA-256 digest of a key stored in the device, a challenge, and other information on the device.

### Parameters

in	<i>mode</i>	Controls which fields within the device are used in the message
in	<i>key_id</i>	Key in the CryptoAuth device to use for the MAC
in	<i>challenge</i>	Challenge message (32 bytes). May be NULL if mode indicates a challenge isn't required.
out	<i>digest</i>	MAC response is returned here (32 bytes).

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.68 atcab\_nonce()

```
ATCA_STATUS atcab_nonce (
    const uint8_t * num_in )
```

Execute a Nonce command in pass-through mode to initialize TempKey to a specified value.

### Parameters

in	<i>num_in</i>	Data to be loaded into TempKey (32 bytes).
----	---------------	--

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.69 atcab\_nonce\_base()**

```
ATCA_STATUS atcab_nonce_base (
    uint8_t mode,
    uint16_t zero,
    const uint8_t * num_in,
    uint8_t * rand_out )
```

Executes Nonce command, which loads a random or fixed nonce/data into the device for use by subsequent commands.

**Parameters**

in	<i>mode</i>	Controls the mechanism of the internal RNG or fixed write.
in	<i>zero</i>	Param2, normally 0, but can be used to indicate a nonce calculation mode (bit 15).
in	<i>num_in</i>	Input value to either be included in the nonce calculation in random modes (20 bytes) or to be written directly (32 bytes or 64 bytes(ATECC608)) in pass-through mode.
out	<i>rand_out</i>	If using a random mode, the internally generated 32-byte random number that was used in the nonce calculation is returned here. Can be NULL if not needed.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.70 atcab\_nonce\_load()**

```
ATCA_STATUS atcab_nonce_load (
    uint8_t target,
    const uint8_t * num_in,
    uint16_t num_in_size )
```

Execute a Nonce command in pass-through mode to load one of the device's internal buffers with a fixed value.

For the ATECC608, available targets are TempKey (32 or 64 bytes), Message Digest Buffer (32 or 64 bytes), or the Alternate Key Buffer (32 bytes). For all other devices, only TempKey (32 bytes) is available.

**Parameters**

in	<i>target</i>	Target device buffer to load. Can be NONCE_MODE_TARGET_TEMPKEY, NONCE_MODE_TARGET_MSGDIGBUF, or NONCE_MODE_TARGET_ALTKEYBUF.
in	<i>num_in</i>	Data to load into the buffer.
in	<i>num_in_size</i>	Size of num_in in bytes. Can be 32 or 64 bytes depending on device and target.

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### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.71 atcab\_nonce\_rand()

```
ATCA_STATUS atcab_nonce_rand (
    const uint8_t * num_in,
    uint8_t * rand_out )
```

Execute a Nonce command to generate a random nonce combining a host nonce (num\_in) and a device random number.

### Parameters

in	<i>num_in</i>	Host nonce to be combined with the device random number (20 bytes).
out	<i>rand_out</i>	Internally generated 32-byte random number that was used in the nonce/challenge calculation is returned here. Can be NULL if not needed.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.72 atcab\_pbkdf2\_sha256()

```
ATCA_STATUS atcab_pbkdf2_sha256 (
    const uint32_t iter,
    const uint16_t slot,
    const uint8_t * salt,
    const size_t salt_len,
    uint8_t * result,
    size_t result_len )
```

#### 8.1.3.73 atcab\_pbkdf2\_sha256\_ext()

```
ATCA_STATUS atcab_pbkdf2_sha256_ext (
    ATCADevice device,
    const uint32_t iter,
    const uint16_t slot,
    const uint8_t * salt,
    const size_t salt_len,
    uint8_t * result,
    size_t result_len )
```

**8.1.3.74 atcab\_printbin()**

```
ATCA_STATUS atcab_printbin (
    uint8_t * binary,
    size_t bin_len,
    bool add_space )
```

**8.1.3.75 atcab\_priv\_write()**

```
ATCA_STATUS atcab_priv_write (
    uint16_t key_id,
    const uint8_t priv_key[36],
    uint16_t write_key_id,
    const uint8_t write_key[32],
    const uint8_t num_in[ (20) ] )
```

Executes PrivWrite command, to write externally generated ECC private keys into the device.

**Parameters**

in	<i>key_id</i>	Slot to write the external private key into.
in	<i>priv_key</i>	External private key (36 bytes) to be written. The first 4 bytes should be zero for P256 curve.
in	<i>write_key_id</i>	Write key slot. Ignored if write_key is NULL.
in	<i>write_key</i>	Write key (32 bytes). If NULL, perform an unencrypted PrivWrite, which is only available when the data zone is unlocked.
in	<i>num_in</i>	20 byte host nonce to inject into Nonce calculation

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.76 atcab\_random()**

```
ATCA_STATUS atcab_random (
    uint8_t * rand_out )
```

Executes Random command, which generates a 32 byte random number from the device.

**Parameters**

out	<i>rand_out</i>	32 bytes of random data is returned here.
-----	-----------------	---

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.77 atcab\_random\_ext()

```
ATCA_STATUS atcab_random_ext (
    ATCADevice device,
    uint8_t * rand_out )
```

Executes Random command, which generates a 32 byte random number from the device.

### Parameters

in	<i>device</i>	Device context pointer
out	<i>rand_out</i>	32 bytes of random data is returned here.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.78 atcab\_read\_bytes\_zone()

```
ATCA_STATUS atcab_read_bytes_zone (
    uint8_t zone,
    uint16_t slot,
    size_t offset,
    uint8_t * data,
    size_t length )
```

Used to read an arbitrary number of bytes from any zone configured for clear reads.

This function will issue the Read command as many times as is required to read the requested data.

### Parameters

in	<i>zone</i>	Zone to read data from. Option are <a href="#">ATCA_ZONE_CONFIG(0)</a> , <a href="#">ATCA_ZONE_OTP(1)</a> , or <a href="#">ATCA_ZONE_DATA(2)</a> .
in	<i>slot</i>	Slot number to read from if zone is <a href="#">ATCA_ZONE_DATA(2)</a> . Ignored for all other zones.
in	<i>offset</i>	Byte offset within the zone to read from.
out	<i>data</i>	Read data is returned here.
in	<i>length</i>	Number of bytes to read starting from the offset.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.



8.1.3.79 atcab\_read\_bytes\_zone\_ext()

```
ATCA_STATUS atcab_read_bytes_zone_ext (
    ATCADevice device,
    uint8_t zone,
    uint16_t slot,
    size_t offset,
    uint8_t * data,
    size_t length )
```

8.1.3.80 atcab\_read\_config\_zone()

```
ATCA_STATUS atcab_read_config_zone (
    uint8_t * config_data )
```

Executes Read command to read the complete device configuration zone.

Parameters

out	<i>config_data</i>	Configuration zone data is returned here. 88 bytes for ATSHA devices, 128 bytes for ATECC devices and 48 bytes for Trust Anchor devices.
-----	--------------------	--

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.1.3.81 atcab\_read\_enc()

```
ATCA_STATUS atcab_read_enc (
    uint16_t key_id,
    uint8_t block,
    uint8_t * data,
    const uint8_t * enc_key,
    const uint16_t enc_key_id,
    const uint8_t num_in[ (20) ] )
```

Executes Read command on a slot configured for encrypted reads and decrypts the data to return it as plaintext.

Data zone must be locked for this command to succeed. Can only read 32 byte blocks.

Parameters

in	<i>key_id</i>	The slot ID to read from.
in	<i>block</i>	Index of the 32 byte block within the slot to read.
out	<i>data</i>	Decrypted (plaintext) data from the read is returned here (32 bytes).
in	<i>enc_key</i>	32 byte ReadKey for the slot being read.
in	<i>enc_key_id</i>	KeyID of the ReadKey being used.
in	<i>num_in</i>	20 byte host nonce to inject into Nonce calculation

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returns ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.82 atcab\_read\_pubkey()

```
ATCA_STATUS atcab_read_pubkey (
    uint16_t slot,
    uint8_t * public_key )
```

Executes Read command to read an ECC P256 public key from a slot configured for clear reads.

This function assumes the public key is stored using the ECC public key format specified in the datasheet.

#### Parameters

in	<i>slot</i>	Slot number to read from. Only slots 8 to 15 are large enough for a public key.
out	<i>public_key</i>	Public key is returned here (64 bytes). Format will be the 32 byte X and Y big-endian integers concatenated.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.83 atcab\_read\_pubkey\_ext()

```
ATCA_STATUS atcab_read_pubkey_ext (
    ATCADevice device,
    uint16_t slot,
    uint8_t * public_key )
```

Executes Read command to read an ECC P256 public key from a slot configured for clear reads.

This function assumes the public key is stored using the ECC public key format specified in the datasheet.

#### Parameters

in	<i>device</i>	Device context pointer
in	<i>slot</i>	Slot number to read from. Only slots 8 to 15 are large enough for a public key.
out	<i>public_key</i>	Public key is returned here (64 bytes). Format will be the 32 byte X and Y big-endian integers concatenated.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.1.3.84 atcab\_read\_serial\_number()

```
ATCA_STATUS atcab_read_serial_number (
    uint8_t * serial_number )
```

This function returns serial number of the device.

Parameters

out	<i>serial_number</i>	9 byte serial number is returned here.
-----	----------------------	--

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.1.3.85 atcab\_read\_sig()

```
ATCA_STATUS atcab_read_sig (
    uint16_t slot,
    uint8_t * sig )
```

Executes Read command to read a 64 byte ECDSA P256 signature from a slot configured for clear reads.

Parameters

in	<i>slot</i>	Slot number to read from. Only slots 8 to 15 are large enough for a signature.
out	<i>sig</i>	Signature will be returned here (64 bytes). Format will be the 32 byte R and S big-endian integers concatenated.

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.1.3.86 atcab\_read\_zone()

```
ATCA_STATUS atcab_read_zone (
    uint8_t zone,
    uint16_t slot,
    uint8_t block,
    uint8_t offset,
    uint8_t * data,
    uint8_t len )
```

Executes Read command, which reads either 4 or 32 bytes of data from a given slot, configuration zone, or the OTP zone.

When reading a slot or OTP, data zone must be locked and the slot configuration must not be secret for a slot to be successfully read.

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### Parameters

in	<i>zone</i>	Zone to be read from device. Options are ATCA_ZONE_CONFIG, ATCA_ZONE_OTP, or ATCA_ZONE_DATA.
in	<i>slot</i>	Slot number for data zone and ignored for other zones.
in	<i>block</i>	32 byte block index within the zone.
in	<i>offset</i>	4 byte work index within the block. Ignored for 32 byte reads.
out	<i>data</i>	Read data is returned here.
in	<i>len</i>	Length of the data to be read. Must be either 4 or 32.

returns ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.87 atcab\_release()

```
ATCA_STATUS atcab_release (  
    void )
```

release (free) the global ATCADevice instance. This must be called in order to release or free up the interface.

### Returns

Returns ATCA\_SUCCESS .

### 8.1.3.88 atcab\_release\_ext()

```
ATCA_STATUS atcab_release_ext (  
    ATCADevice * device )
```

release (free) the an ATCADevice instance.

### Parameters

in	<i>device</i>	Pointer to the device context pointer
----	---------------	---------------------------------------

### Returns

Returns ATCA\_SUCCESS .

### 8.1.3.89 atcab\_secureboot()

```
ATCA_STATUS atcab_secureboot (  
    uint8_t mode,  
    uint16_t param2,
```

```

const uint8_t * digest,
const uint8_t * signature,
uint8_t * mac )

```

Executes Secure Boot command, which provides support for secure boot of an external MCU or MPU.

#### Parameters

in	<i>mode</i>	Mode determines what operations the SecureBoot command performs.
in	<i>param2</i>	Not used, must be 0.
in	<i>digest</i>	Digest of the code to be verified (32 bytes).
in	<i>signature</i>	Signature of the code to be verified (64 bytes). Can be NULL when using the FullStore mode.
out	<i>mac</i>	Validating MAC will be returned here (32 bytes). Can be NULL if not required.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.90 atcab\_secureboot\_mac()

```

ATCA_STATUS atcab_secureboot_mac (
    uint8_t mode,
    const uint8_t * digest,
    const uint8_t * signature,
    const uint8_t * num_in,
    const uint8_t * io_key,
    bool * is_verified )

```

Executes Secure Boot command with encrypted digest and validated MAC response using the IO protection key.

#### Parameters

in	<i>mode</i>	Mode determines what operations the SecureBoot command performs.
in	<i>digest</i>	Digest of the code to be verified (32 bytes). This is the plaintext digest (not encrypted).
in	<i>signature</i>	Signature of the code to be verified (64 bytes). Can be NULL when using the FullStore mode.
in	<i>num_in</i>	Host nonce (20 bytes).
in	<i>io_key</i>	IO protection key (32 bytes).
out	<i>is_verified</i>	Verify result is returned here.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

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### 8.1.3.91 atcab\_selftest()

```
ATCA_STATUS atcab_selftest (
    uint8_t mode,
    uint16_t param2,
    uint8_t * result )
```

Executes the SelfTest command, which performs a test of one or more of the cryptographic engines within the ATECC608 chip.

#### Parameters

in	<i>mode</i>	Functions to test. Can be a bit field combining any of the following: SELFTEST_MODE_RNG, SELFTEST_MODE_ECDSA_VERIFY, SELFTEST_MODE_ECDSA_SIGN, SELFTEST_MODE_ECDH, SELFTEST_MODE_AES, SELFTEST_MODE_SHA, SELFTEST_MODE_ALL.
in	<i>param2</i>	Currently unused, should be 0.
out	<i>result</i>	Results are returned here as a bit field.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.92 atcab\_sha()

```
ATCA_STATUS atcab_sha (
    uint16_t length,
    const uint8_t * message,
    uint8_t * digest )
```

Use the SHA command to compute a SHA-256 digest.

#### Parameters

in	<i>length</i>	Size of message parameter in bytes.
in	<i>message</i>	Message data to be hashed.
out	<i>digest</i>	Digest is returned here (32 bytes).

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.93 atcab\_sha\_base()

```
ATCA_STATUS atcab_sha_base (
    uint8_t mode,
```

```
uint16_t length,
const uint8_t * data_in,
uint8_t * data_out,
uint16_t * data_out_size )
```

Executes SHA command, which computes a SHA-256 or HMAC/SHA-256 digest for general purpose use by the host system.

Only the Start(0) and Compute(1) modes are available for ATSHA devices.

#### Parameters

in	<i>mode</i>	SHA command mode Start(0), Update/Compute(1), End(2), Public(3), HMACstart(4), HMACend(5), Read_Context(6), or Write_Context(7). Also message digest target location for the ATECC608.
in	<i>length</i>	Number of bytes in the message parameter or KeySlot for the HMAC key if Mode is HMACstart(4) or Public(3).
in	<i>data_in</i>	Message bytes to be hashed or Write_Context if restoring a context on the ATECC608. Can be NULL if not required by the mode.
out	<i>data_out</i>	Data returned by the command (digest or context).
in, out	<i>data_out_size</i>	As input, the size of the data_out buffer. As output, the number of bytes returned in data_out.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.94 atcab\_sha\_end()

```
ATCA_STATUS atcab_sha_end (
    uint8_t * digest,
    uint16_t length,
    const uint8_t * message )
```

Executes SHA command to complete SHA-256 or HMAC/SHA-256 operation.

#### Parameters

out	<i>digest</i>	Digest from SHA-256 or HMAC/SHA-256 will be returned here (32 bytes).
in	<i>length</i>	Length of any remaining data to include in hash. Max 64 bytes.
in	<i>message</i>	Remaining data to include in hash. NULL if length is 0.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

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### 8.1.3.95 atcab\_sha\_hmac()

```
ATCA_STATUS atcab_sha_hmac (
    const uint8_t * data,
    size_t data_size,
    uint16_t key_slot,
    uint8_t * digest,
    uint8_t target )
```

Use the SHA command to compute an HMAC/SHA-256 operation.

#### Parameters

in	<i>data</i>	Message data to be hashed.
in	<i>data_size</i>	Size of data in bytes.
in	<i>key_slot</i>	Slot key id to use for the HMAC calculation
out	<i>digest</i>	Digest is returned here (32 bytes).
in	<i>target</i>	Where to save the digest internal to the device. For ATECC608, can be SHA_MODE_TARGET_TEMPKEY, SHA_MODE_TARGET_MSGDIGBUF, or SHA_MODE_TARGET_OUT_ONLY. For all other devices, SHA_MODE_TARGET_TEMPKEY is the only option.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.96 atcab\_sha\_hmac\_ext()

```
ATCA_STATUS atcab_sha_hmac_ext (
    ATCADevice device,
    const uint8_t * data,
    size_t data_size,
    uint16_t key_slot,
    uint8_t * digest,
    uint8_t target )
```

Use the SHA command to compute an HMAC/SHA-256 operation.

#### Parameters

in	<i>device</i>	Device context pointer
in	<i>data</i>	Message data to be hashed.
in	<i>data_size</i>	Size of data in bytes.
in	<i>key_slot</i>	Slot key id to use for the HMAC calculation
out	<i>digest</i>	Digest is returned here (32 bytes).
in	<i>target</i>	Where to save the digest internal to the device. For ATECC608, can be SHA_MODE_TARGET_TEMPKEY, SHA_MODE_TARGET_MSGDIGBUF, or SHA_MODE_TARGET_OUT_ONLY. For all other devices, SHA_MODE_TARGET_TEMPKEY is the only option.



**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.97 atcab\_sha\_hmac\_finish()**

```
ATCA_STATUS atcab_sha_hmac_finish (
    atca_hmac_sha256_ctx_t * ctx,
    uint8_t * digest,
    uint8_t target )
```

Executes SHA command to complete a HMAC/SHA-256 operation.

**Parameters**

in	<i>ctx</i>	HMAC/SHA-256 context
out	<i>digest</i>	HMAC/SHA-256 result is returned here (32 bytes).
in	<i>target</i>	Where to save the digest internal to the device. For ATECC608, can be SHA_MODE_TARGET_TEMPKEY, SHA_MODE_TARGET_MSGDIGBUF, or SHA_MODE_TARGET_OUT_ONLY. For all other devices, SHA_MODE_TARGET_TEMPKEY is the only option.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.98 atcab\_sha\_hmac\_init()**

```
ATCA_STATUS atcab_sha_hmac_init (
    atca_hmac_sha256_ctx_t * ctx,
    uint16_t key_slot )
```

Executes SHA command to start an HMAC/SHA-256 operation.

**Parameters**

in	<i>ctx</i>	HMAC/SHA-256 context
in	<i>key_slot</i>	Slot key id to use for the HMAC calculation

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.99 atcab\_sha\_hmac\_update()

```
ATCA_STATUS atcab_sha_hmac_update (
    atca_hmac_sha256_ctx_t * ctx,
    const uint8_t * data,
    size_t data_size )
```

Executes SHA command to add an arbitrary amount of message data to a HMAC/SHA-256 operation.

#### Parameters

in	<i>ctx</i>	HMAC/SHA-256 context
in	<i>data</i>	Message data to add
in	<i>data_size</i>	Size of message data in bytes

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.100 atcab\_sha\_read\_context()

```
ATCA_STATUS atcab_sha_read_context (
    uint8_t * context,
    uint16_t * context_size )
```

Executes SHA command to read the SHA-256 context back. Only for ATECC608 with SHA-256 contexts. HMAC not supported.

#### Parameters

out	<i>context</i>	Context data is returned here.
in, out	<i>context_size</i>	As input, the size of the context buffer in bytes. As output, the size of the returned context data.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.101 atcab\_sha\_start()

```
ATCA_STATUS atcab_sha_start (
    void )
```

Executes SHA command to initialize SHA-256 calculation engine.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.102 atcab\_sha\_update()

```
ATCA_STATUS atcab_sha_update (
    const uint8_t * message )
```

Executes SHA command to add 64 bytes of message data to the current context.

#### Parameters

in	<i>message</i>	64 bytes of message data to add to add to operation.
----	----------------	--

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.103 atcab\_sha\_write\_context()

```
ATCA_STATUS atcab_sha_write_context (
    const uint8_t * context,
    uint16_t context_size )
```

Executes SHA command to write (restore) a SHA-256 context into the the device. Only supported for ATECC608 with SHA-256 contexts.

#### Parameters

in	<i>context</i>	Context data to be restored.
in	<i>context_size</i>	Size of the context data in bytes.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.104 atcab\_sign()

```
ATCA_STATUS atcab_sign (
    uint16_t key_id,
    const uint8_t * msg,
    uint8_t * signature )
```

Executes Sign command, to sign a 32-byte external message using the private key in the specified slot. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.

## 8.1 Basic Crypto API methods (atcab\_)

### Parameters

in	<i>key_id</i>	Slot of the private key to be used to sign the message.
in	<i>msg</i>	32-byte message to be signed. Typically the SHA256 hash of the full message.
out	<i>signature</i>	Signature will be returned here. Format is R and S integers in big-endian format. 64 bytes for P256 curve.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.105 atcab\_sign\_base()

```
ATCA_STATUS atcab_sign_base (
    uint8_t mode,
    uint16_t key_id,
    uint8_t * signature )
```

Executes the Sign command, which generates a signature using the ECDSA algorithm.

### Parameters

in	<i>mode</i>	Mode determines what the source of the message to be signed.
in	<i>key_id</i>	Private key slot used to sign the message.
out	<i>signature</i>	Signature is returned here. Format is R and S integers in big-endian format. 64 bytes for P256 curve.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.106 atcab\_sign\_ext()

```
ATCA_STATUS atcab_sign_ext (
    ATCADevice device,
    uint16_t key_id,
    const uint8_t * msg,
    uint8_t * signature )
```

Executes Sign command, to sign a 32-byte external message using the private key in the specified slot. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.

### Parameters

in	<i>device</i>	Device context pointer
in	<i>key_id</i>	Slot of the private key to be used to sign the message.
in	<i>msg</i>	32-byte message to be signed. Typically the SHA256 hash of the full message.
out	<i>signature</i>	Signature will be returned here. Format is R and S integers in big-endian format. 64 bytes for P256 curve.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.107 atcab\_sign\_internal()**

```
ATCA_STATUS atcab_sign_internal (
    uint16_t key_id,
    bool is_invalidate,
    bool is_full_sn,
    uint8_t * signature )
```

Executes Sign command to sign an internally generated message.

**Parameters**

in	<i>key_id</i>	Slot of the private key to be used to sign the message.
in	<i>is_invalidate</i>	Set to true if the signature will be used with the Verify(Invalidate) command. false for all other cases.
in	<i>is_full_sn</i>	Set to true if the message should incorporate the device's full serial number.
out	<i>signature</i>	Signature is returned here. Format is R and S integers in big-endian format. 64 bytes for P256 curve.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.108 atcab\_sleep()**

```
ATCA_STATUS atcab_sleep (
    void )
```

invoke sleep on the CryptoAuth device

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.1.3.109 atcab\_updateextra()**

```
ATCA_STATUS atcab_updateextra (
    uint8_t mode,
    uint16_t new_value )
```

Executes UpdateExtra command to update the values of the two extra bytes within the Configuration zone (bytes 84 and 85).

Can also be used to decrement the limited use counter associated with the key in slot NewValue.

## 8.1 Basic Crypto API methods (atcab\_)

### Parameters

in	<i>mode</i>	Mode determines what operations the UpdateExtra command performs.
in	<i>new_value</i>	Value to be written.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.110 atcab\_verify()

```
ATCA_STATUS atcab_verify (
    uint8_t mode,
    uint16_t key_id,
    const uint8_t * signature,
    const uint8_t * public_key,
    const uint8_t * other_data,
    uint8_t * mac )
```

Executes the Verify command, which takes an ECDSA [R,S] signature and verifies that it is correctly generated from a given message and public key. In all cases, the signature is an input to the command.

For the Stored, External, and ValidateExternal Modes, the contents of TempKey (or Message Digest Buffer in some cases for the ATECC608) should contain the 32 byte message.

### Parameters

in	<i>mode</i>	Verify command mode and options
in	<i>key_id</i>	Stored mode, the slot containing the public key to be used for the verification. ValidateExternal mode, the slot containing the public key to be validated. External mode, KeyID contains the curve type to be used to Verify the signature. Validate or Invalidate mode, the slot containing the public key to be (in)validated.
in	<i>signature</i>	Signature to be verified. R and S integers in big-endian format. 64 bytes for P256 curve.
in	<i>public_key</i>	If mode is External, the public key to be used for verification. X and Y integers in big-endian format. 64 bytes for P256 curve. NULL for all other modes.
in	<i>other_data</i>	If mode is Validate, the bytes used to generate the message for the validation (19 bytes). NULL for all other modes.
out	<i>mac</i>	If mode indicates a validating MAC, then the MAC will will be returned here. Can be NULL otherwise.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.1.3.111 atcab\_verify\_extern()

```
ATCA_STATUS atcab_verify_extern (
    const uint8_t * message,
```

```

const uint8_t * signature,
const uint8_t * public_key,
bool * is_verified )

```

Executes the Verify command, which verifies a signature (ECDSA verify operation) with all components (message, signature, and public key) supplied. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.

#### Parameters

in	<i>message</i>	32 byte message to be verified. Typically the SHA256 hash of the full message.
in	<i>signature</i>	Signature to be verified. R and S integers in big-endian format. 64 bytes for P256 curve.
in	<i>public_key</i>	The public key to be used for verification. X and Y integers in big-endian format. 64 bytes for P256 curve.
out	<i>is_verified</i>	Boolean whether or not the message, signature, public key verified.

#### Returns

ATCA\_SUCCESS on verification success or failure, because the command still completed successfully.

#### 8.1.3.112 atcab\_verify\_extern\_ext()

```

ATCA_STATUS atcab_verify_extern_ext (
    ATCADevice device,
    const uint8_t * message,
    const uint8_t * signature,
    const uint8_t * public_key,
    bool * is_verified )

```

Executes the Verify command, which verifies a signature (ECDSA verify operation) with all components (message, signature, and public key) supplied. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.

#### Parameters

in	<i>device</i>	Device context pointer
in	<i>message</i>	32 byte message to be verified. Typically the SHA256 hash of the full message.
in	<i>signature</i>	Signature to be verified. R and S integers in big-endian format. 64 bytes for P256 curve.
in	<i>public_key</i>	The public key to be used for verification. X and Y integers in big-endian format. 64 bytes for P256 curve.
out	<i>is_verified</i>	Boolean whether or not the message, signature, public key verified.

#### Returns

ATCA\_SUCCESS on verification success or failure, because the command still completed successfully.

### 8.1.3.113 atcab\_verify\_extern\_mac()

```
ATCA_STATUS atcab_verify_extern_mac (
    const uint8_t * message,
    const uint8_t * signature,
    const uint8_t * public_key,
    const uint8_t * num_in,
    const uint8_t * io_key,
    bool * is_verified )
```

### 8.1.3.114 atcab\_verify\_invalidate()

```
ATCA_STATUS atcab_verify_invalidate (
    uint16_t key_id,
    const uint8_t * signature,
    const uint8_t * other_data,
    bool * is_verified )
```

Executes the Verify command in Invalidate mode which invalidates a previously validated public key stored in a slot.

This command can only be run after GenKey has been used to create a PubKey digest of the public key to be invalidated in TempKey (mode=0x10).

#### Parameters

in	<i>key_id</i>	Slot containing the public key to be invalidated.
in	<i>signature</i>	Signature to be verified. R and S integers in big-endian format. 64 bytes for P256 curve.
in	<i>other_data</i>	19 bytes of data used to build the verification message.
out	<i>is_verified</i>	Boolean whether or not the message, signature, validation public key verified.

#### Returns

ATCA\_SUCCESS on verification success or failure, because the command still completed successfully.

### 8.1.3.115 atcab\_verify\_stored()

```
ATCA_STATUS atcab_verify_stored (
    const uint8_t * message,
    const uint8_t * signature,
    uint16_t key_id,
    bool * is_verified )
```

Executes the Verify command, which verifies a signature (ECDSA verify operation) with a public key stored in the device. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.



## Parameters

in	<i>message</i>	32 byte message to be verified. Typically the SHA256 hash of the full message.
in	<i>signature</i>	Signature to be verified. R and S integers in big-endian format. 64 bytes for P256 curve.
in	<i>key_id</i>	Slot containing the public key to be used in the verification.
out	<i>is_verified</i>	Boolean whether or not the message, signature, public key verified.

## Returns

ATCA\_SUCCESS on verification success or failure, because the command still completed successfully.

## 8.1.3.116 atcab\_verify\_stored\_ext()

```
ATCA_STATUS atcab_verify_stored_ext (
    ATCADevice device,
    const uint8_t * message,
    const uint8_t * signature,
    uint16_t key_id,
    bool * is_verified )
```

Executes the Verify command, which verifies a signature (ECDSA verify operation) with a public key stored in the device. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.

## Parameters

in	<i>device</i>	Device context pointer
in	<i>message</i>	32 byte message to be verified. Typically the SHA256 hash of the full message.
in	<i>signature</i>	Signature to be verified. R and S integers in big-endian format. 64 bytes for P256 curve.
in	<i>key_id</i>	Slot containing the public key to be used in the verification.
out	<i>is_verified</i>	Boolean whether or not the message, signature, public key verified.

## Returns

ATCA\_SUCCESS on verification success or failure, because the command still completed successfully.

## 8.1.3.117 atcab\_verify\_stored\_mac()

```
ATCA_STATUS atcab_verify_stored_mac (
    const uint8_t * message,
    const uint8_t * signature,
    uint16_t key_id,
    const uint8_t * num_in,
    const uint8_t * io_key,
    bool * is_verified )
```

### 8.1.3.118 atcab\_verify\_stored\_with\_tempkey()

```
ATCA_STATUS atcab_verify_stored_with_tempkey (
    const uint8_t * signature,
    uint16_t key_id,
    bool * is_verified )
```

Executes the Verify command, which verifies a signature (ECDSA verify operation) with a public key stored in the device. keyConfig.reqrandom bit should be set and the message to be signed should be already loaded into TempKey for all devices.

Please refer to TEST(atca\_cmd\_basic\_test, verify\_stored\_on\_reqrandom\_set) in atca\_tests\_verify.c for proper use of this api

#### Parameters

in	<i>device</i>	Device context pointer
in	<i>signature</i>	Signature to be verified. R and S integers in big-endian format. 64 bytes for P256 curve.
in	<i>key_id</i>	Slot containing the public key to be used in the verification.
out	<i>is_verified</i>	Boolean whether or not the message, signature, public key verified.

#### Returns

ATCA\_SUCCESS on verification success or failure, because the command still completed successfully.

### 8.1.3.119 atcab\_verify\_validate()

```
ATCA_STATUS atcab_verify_validate (
    uint16_t key_id,
    const uint8_t * signature,
    const uint8_t * other_data,
    bool * is_verified )
```

Executes the Verify command in Validate mode to validate a public key stored in a slot.

This command can only be run after GenKey has been used to create a PubKey digest of the public key to be validated in TempKey (mode=0x10).

#### Parameters

in	<i>key_id</i>	Slot containing the public key to be validated.
in	<i>signature</i>	Signature to be verified. R and S integers in big-endian format. 64 bytes for P256 curve.
in	<i>other_data</i>	19 bytes of data used to build the verification message.
out	<i>is_verified</i>	Boolean whether or not the message, signature, validation public key verified.

#### Returns

ATCA\_SUCCESS on verification success or failure, because the command still completed successfully.

8.1.3.120 atcab\_version()

```
ATCA_STATUS atcab_version (
    char * ver_str )
```

basic API methods are all prefixed with atcab\_ (CryptoAuthLib Basic) the fundamental premise of the basic API is it is based on a single interface instance and that instance is global, so all basic API commands assume that one global device is the one to operate on.

returns a version string for the CryptoAuthLib release. The format of the version string returned is "yyyymmdd"

Parameters

out	ver_str	ptr to space to receive version string
-----	---------	--

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.1.3.121 atcab\_wakeup()

```
ATCA_STATUS atcab_wakeup (
    void )
```

wakeup the CryptoAuth device

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.1.3.122 atcab\_write()

```
ATCA_STATUS atcab_write (
    uint8_t zone,
    uint16_t address,
    const uint8_t * value,
    const uint8_t * mac )
```

Executes the Write command, which writes either one four byte word or a 32-byte block to one of the EEPROM zones on the device. Depending upon the value of the WriteConfig byte for this slot, the data may be required to be encrypted by the system prior to being sent to the device. This command cannot be used to write slots configured as ECC private keys.

Parameters

in	zone	Zone/Param1 for the write command.
in	address	Address/Param2 for the write command.
in	value	Plain-text data to be written or cipher-text for encrypted writes. 32 or 4 bytes depending on
in	mac	MAC required for encrypted writes (32 bytes). Set to NULL if not required.

## 8.1 Basic Crypto API methods (atcab\_)

---

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.123 atcab\_write\_bytes\_zone()

```
ATCA_STATUS atcab_write_bytes_zone (
    uint8_t zone,
    uint16_t slot,
    size_t offset_bytes,
    const uint8_t * data,
    size_t length )
```

Executes the Write command, which writes data into the configuration, otp, or data zones with a given byte offset and length. Offset and length must be multiples of a word (4 bytes).

Config zone must be unlocked for writes to that zone. If data zone is unlocked, only 32-byte writes are allowed to slots and OTP and the offset and length must be multiples of 32 or the write will fail.

### Parameters

in	<i>zone</i>	Zone to write data to: <a href="#">ATCA_ZONE_CONFIG(0)</a> , <a href="#">ATCA_ZONE_OTP(1)</a> , or <a href="#">ATCA_ZONE_DATA(2)</a> .
in	<i>slot</i>	If zone is <a href="#">ATCA_ZONE_DATA(2)</a> , the slot number to write to. Ignored for all other zones.
in	<i>offset_bytes</i>	Byte offset within the zone to write to. Must be a multiple of a word (4 bytes).
in	<i>data</i>	Data to be written.
in	<i>length</i>	Number of bytes to be written. Must be a multiple of a word (4 bytes).

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.124 atcab\_write\_bytes\_zone\_ext()

```
ATCA_STATUS atcab_write_bytes_zone_ext (
    ATCADevice device,
    uint8_t zone,
    uint16_t slot,
    size_t offset_bytes,
    const uint8_t * data,
    size_t length )
```

### 8.1.3.125 atcab\_write\_config\_counter()

```
ATCA_STATUS atcab_write_config_counter (
    uint16_t counter_id,
    uint32_t counter_value )
```

Initialize one of the monotonic counters in device with a specific value.

The monotonic counters are stored in the configuration zone using a special format. This encodes a binary count value into the 8 byte encoded value required. Can only be set while the configuration zone is unlocked.

#### Parameters

in	<i>counter_id</i>	Counter to be written.
in	<i>counter_value</i>	Counter value to set.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.126 atcab\_write\_config\_zone()

```
ATCA_STATUS atcab_write_config_zone (
    const uint8_t * config_data )
```

Executes the Write command, which writes the configuration zone.

First 16 bytes are skipped as they are not writable. LockValue and LockConfig are also skipped and can only be changed via the Lock command.

This command may fail if UserExtra and/or Selector bytes have already been set to non-zero values.

#### Parameters

in	<i>config_data</i>	Data to the config zone data. This should be 88 bytes for SHA devices and 128 bytes for ECC devices.
----	--------------------	--

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.127 atcab\_write\_enc()

```
ATCA_STATUS atcab_write_enc (
    uint16_t key_id,
```

## 8.1 Basic Crypto API methods (atcab\_)

```
uint8_t block,  
const uint8_t * data,  
const uint8_t * enc_key,  
const uint16_t enc_key_id,  
const uint8_t num_in[ (20) ] )
```

Executes the Write command, which performs an encrypted write of a 32 byte block into given slot.

The function takes clear text bytes and encrypts them for writing over the wire. Data zone must be locked and the slot configuration must be set to encrypted write for the block to be successfully written.

### Parameters

in	<i>key_id</i>	Slot ID to write to.
in	<i>block</i>	Index of the 32 byte block to write in the slot.
in	<i>data</i>	32 bytes of clear text data to be written to the slot
in	<i>enc_key</i>	WriteKey to encrypt with for writing
in	<i>enc_key_id</i>	The KeyID of the WriteKey
in	<i>num_in</i>	20 byte host nonce to inject into Nonce calculation

returns ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.128 atcab\_write\_pubkey()

```
ATCA_STATUS atcab_write_pubkey (  
    uint16_t slot,  
    const uint8_t * public_key )
```

Uses the write command to write a public key to a slot in the proper format.

### Parameters

in	<i>slot</i>	Slot number to write. Only slots 8 to 15 are large enough to store a public key.
in	<i>public_key</i>	Public key to write into the slot specified. X and Y integers in big-endian format. 64 bytes for P256 curve.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.1.3.129 atcab\_write\_zone()

```
ATCA_STATUS atcab_write_zone (  
    uint8_t zone,  
    uint16_t slot,  
    uint8_t block,  
    uint8_t offset,
```

```
const uint8_t * data,  
uint8_t len )
```

Executes the Write command, which writes either 4 or 32 bytes of data into a device zone.

## 8.1 Basic Crypto API methods (atcab\_)

---

### Parameters

in	<i>zone</i>	Device zone to write to (0=config, 1=OTP, 2=data).
in	<i>slot</i>	If writing to the data zone, it is the slot to write to, otherwise it should be 0.
in	<i>block</i>	32-byte block to write to.
in	<i>offset</i>	4-byte word within the specified block to write to. If performing a 32-byte write, this should be 0.
in	<i>data</i>	Data to be written.
in	<i>len</i>	Number of bytes to be written. Must be either 4 or 32.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 8.1.4 Variable Documentation

### 8.1.4.1 \_gDevice

`ATCADevice _gDevice` [extern]



## 8.2 Configuration (cfg\_)

Logical device configurations describe the CryptoAuth device type and logical interface.

Logical device configurations describe the CryptoAuth device type and logical interface.

## 8.3 ATCADevice (atca\_)

ATCADevice object - composite of command and interface objects.

### Data Structures

- struct [\\_atsha204a\\_config](#)
- struct [\\_atecc508a\\_config](#)
- struct [\\_atecc608\\_config](#)
- struct [atca\\_device](#)

[atca\\_device](#) is the C object backing ATCADevice. See the [atca\\_device.h](#) file for details on the ATCADevice methods

### Macros

- #define [ATCA\\_PACKED](#)
- #define [ATCA\\_AES\\_ENABLE\\_EN\\_SHIFT](#) (0)
- #define [ATCA\\_AES\\_ENABLE\\_EN\\_MASK](#) (0x01u << [ATCA\\_AES\\_ENABLE\\_EN\\_SHIFT](#))
- #define [ATCA\\_I2C\\_ENABLE\\_EN\\_SHIFT](#) (0)
- #define [ATCA\\_I2C\\_ENABLE\\_EN\\_MASK](#) (0x01u << [ATCA\\_I2C\\_ENABLE\\_EN\\_SHIFT](#))
- #define [ATCA\\_COUNTER\\_MATCH\\_EN\\_SHIFT](#) (0)
- #define [ATCA\\_COUNTER\\_MATCH\\_EN\\_MASK](#) (0x01u << [ATCA\\_COUNTER\\_MATCH\\_EN\\_SHIFT](#))
- #define [ATCA\\_COUNTER\\_MATCH\\_KEY\\_SHIFT](#) (4)
- #define [ATCA\\_COUNTER\\_MATCH\\_KEY\\_MASK](#) (0x0Fu << [ATCA\\_COUNTER\\_MATCH\\_KEY\\_SHIFT](#))
- #define [ATCA\\_COUNTER\\_MATCH\\_KEY\(v\)](#) ([ATCA\\_COUNTER\\_MATCH\\_KEY\\_MASK](#) & (v << [ATCA\\_COUNTER\\_MATCH\\_KEY\\_SHIFT](#)))
- #define [ATCA\\_CHIP\\_MODE\\_I2C\\_EXTRA\\_SHIFT](#) (0)
- #define [ATCA\\_CHIP\\_MODE\\_I2C\\_EXTRA\\_MASK](#) (0x01u << [ATCA\\_CHIP\\_MODE\\_I2C\\_EXTRA\\_SHIFT](#))
- #define [ATCA\\_CHIP\\_MODE\\_TTL\\_EN\\_SHIFT](#) (1)
- #define [ATCA\\_CHIP\\_MODE\\_TTL\\_EN\\_MASK](#) (0x01u << [ATCA\\_CHIP\\_MODE\\_TTL\\_EN\\_SHIFT](#))
- #define [ATCA\\_CHIP\\_MODE\\_WDG\\_LONG\\_SHIFT](#) (2)
- #define [ATCA\\_CHIP\\_MODE\\_WDG\\_LONG\\_MASK](#) (0x01u << [ATCA\\_CHIP\\_MODE\\_WDG\\_LONG\\_SHIFT](#))
- #define [ATCA\\_CHIP\\_MODE\\_CLK\\_DIV\\_SHIFT](#) (3)
- #define [ATCA\\_CHIP\\_MODE\\_CLK\\_DIV\\_MASK](#) (0x1Fu << [ATCA\\_CHIP\\_MODE\\_CLK\\_DIV\\_SHIFT](#))
- #define [ATCA\\_CHIP\\_MODE\\_CLK\\_DIV\(v\)](#) ([ATCA\\_CHIP\\_MODE\\_CLK\\_DIV\\_MASK](#) & (v << [ATCA\\_CHIP\\_MODE\\_CLK\\_DIV\\_SHIFT](#)))
- #define [ATCA\\_SLOT\\_CONFIG\\_READKEY\\_SHIFT](#) (0)
- #define [ATCA\\_SLOT\\_CONFIG\\_READKEY\\_MASK](#) (0x0Fu << [ATCA\\_SLOT\\_CONFIG\\_READKEY\\_SHIFT](#))
- #define [ATCA\\_SLOT\\_CONFIG\\_READKEY\(v\)](#) ([ATCA\\_SLOT\\_CONFIG\\_READKEY\\_MASK](#) & (v << [ATCA\\_SLOT\\_CONFIG\\_READKEY\\_SHIFT](#)))
- #define [ATCA\\_SLOT\\_CONFIG\\_NOMAC\\_SHIFT](#) (4)
- #define [ATCA\\_SLOT\\_CONFIG\\_NOMAC\\_MASK](#) (0x01u << [ATCA\\_SLOT\\_CONFIG\\_NOMAC\\_SHIFT](#))
- #define [ATCA\\_SLOT\\_CONFIG\\_LIMITED\\_USE\\_SHIFT](#) (5)
- #define [ATCA\\_SLOT\\_CONFIG\\_LIMITED\\_USE\\_MASK](#) (0x01u << [ATCA\\_SLOT\\_CONFIG\\_LIMITED\\_USE\\_SHIFT](#))
- #define [ATCA\\_SLOT\\_CONFIG\\_ENCRYPTED\\_READ\\_SHIFT](#) (6)
- #define [ATCA\\_SLOT\\_CONFIG\\_ENCRYPTED\\_READ\\_MASK](#) (0x01u << [ATCA\\_SLOT\\_CONFIG\\_ENCRYPTED\\_READ\\_SHIFT](#))
- #define [ATCA\\_SLOT\\_CONFIG\\_IS\\_SECRET\\_SHIFT](#) (7)
- #define [ATCA\\_SLOT\\_CONFIG\\_IS\\_SECRET\\_MASK](#) (0x01u << [ATCA\\_SLOT\\_CONFIG\\_IS\\_SECRET\\_SHIFT](#))
- #define [ATCA\\_SLOT\\_CONFIG\\_WRITE\\_KEY\\_SHIFT](#) (8)
- #define [ATCA\\_SLOT\\_CONFIG\\_WRITE\\_KEY\\_MASK](#) (0x0Fu << [ATCA\\_SLOT\\_CONFIG\\_WRITE\\_KEY\\_SHIFT](#))
- #define [ATCA\\_SLOT\\_CONFIG\\_WRITE\\_KEY\(v\)](#) ([ATCA\\_SLOT\\_CONFIG\\_WRITE\\_KEY\\_MASK](#) & (v << [ATCA\\_SLOT\\_CONFIG\\_WRITE\\_KEY\\_SHIFT](#)))
- #define [ATCA\\_SLOT\\_CONFIG\\_WRITE\\_CONFIG\\_SHIFT](#) (12)
- #define [ATCA\\_SLOT\\_CONFIG\\_WRITE\\_CONFIG\\_MASK](#) (0x0Fu << [ATCA\\_SLOT\\_CONFIG\\_WRITE\\_CONFIG\\_SHIFT](#))

- #define ATCA\_SLOT\_CONFIG\_WRITE\_CONFIG(v) (ATCA\_SLOT\_CONFIG\_WRITE\_CONFIG\_MASK & (v << ATCA\_SLOT\_CONFIG\_WRITE\_CONFIG\_SHIFT))
- #define ATCA\_SLOT\_CONFIG\_EXT\_SIG\_SHIFT (0)
- #define ATCA\_SLOT\_CONFIG\_EXT\_SIG\_MASK (0x01u << ATCA\_SLOT\_CONFIG\_EXT\_SIG\_SHIFT)
- #define ATCA\_SLOT\_CONFIG\_INT\_SIG\_SHIFT (1)
- #define ATCA\_SLOT\_CONFIG\_INT\_SIG\_MASK (0x01u << ATCA\_SLOT\_CONFIG\_INT\_SIG\_SHIFT)
- #define ATCA\_SLOT\_CONFIG\_ECDH\_SHIFT (2)
- #define ATCA\_SLOT\_CONFIG\_ECDH\_MASK (0x01u << ATCA\_SLOT\_CONFIG\_ECDH\_SHIFT)
- #define ATCA\_SLOT\_CONFIG\_WRITE\_ECDH\_SHIFT (3)
- #define ATCA\_SLOT\_CONFIG\_WRITE\_ECDH\_MASK (0x01u << ATCA\_SLOT\_CONFIG\_WRITE\_ECDH\_SHIFT)
- #define ATCA\_SLOT\_CONFIG\_GEN\_KEY\_SHIFT (8)
- #define ATCA\_SLOT\_CONFIG\_GEN\_KEY\_MASK (0x01u << ATCA\_SLOT\_CONFIG\_GEN\_KEY\_SHIFT)
- #define ATCA\_SLOT\_CONFIG\_PRIV\_WRITE\_SHIFT (9)
- #define ATCA\_SLOT\_CONFIG\_PRIV\_WRITE\_MASK (0x01u << ATCA\_SLOT\_CONFIG\_PRIV\_WRITE\_SHIFT)
- #define ATCA\_USE\_LOCK\_ENABLE\_SHIFT (0)
- #define ATCA\_USE\_LOCK\_ENABLE\_MASK (0x0Fu << ATCA\_USE\_LOCK\_ENABLE\_SHIFT)
- #define ATCA\_USE\_LOCK\_KEY\_SHIFT (4)
- #define ATCA\_USE\_LOCK\_KEY\_MASK (0x0Fu << ATCA\_USE\_LOCK\_KEY\_SHIFT)
- #define ATCA\_VOL\_KEY\_PERM\_SLOT\_SHIFT (0)
- #define ATCA\_VOL\_KEY\_PERM\_SLOT\_MASK (0x0Fu << ATCA\_VOL\_KEY\_PERM\_SLOT\_SHIFT)
- #define ATCA\_VOL\_KEY\_PERM\_SLOT(v) (ATCA\_VOL\_KEY\_PERM\_SLOT\_MASK & (v << ATCA\_VOL\_KEY\_PERM\_SLOT\_SHIFT))
- #define ATCA\_VOL\_KEY\_PERM\_EN\_SHIFT (7)
- #define ATCA\_VOL\_KEY\_PERM\_EN\_MASK (0x01u << ATCA\_VOL\_KEY\_PERM\_EN\_SHIFT)
- #define ATCA\_SECURE\_BOOT\_MODE\_SHIFT (0)
- #define ATCA\_SECURE\_BOOT\_MODE\_MASK (0x03u << ATCA\_SECURE\_BOOT\_MODE\_SHIFT)
- #define ATCA\_SECURE\_BOOT\_MODE(v) (ATCA\_SECURE\_BOOT\_MODE\_MASK & (v << ATCA\_SECURE\_BOOT\_MODE\_SHIFT))
- #define ATCA\_SECURE\_BOOT\_PERSIST\_EN\_SHIFT (3)
- #define ATCA\_SECURE\_BOOT\_PERSIST\_EN\_MASK (0x01u << ATCA\_SECURE\_BOOT\_PERSIST\_EN\_SHIFT)
- #define ATCA\_SECURE\_BOOT\_RAND\_NONCE\_SHIFT (4)
- #define ATCA\_SECURE\_BOOT\_RAND\_NONCE\_MASK (0x01u << ATCA\_SECURE\_BOOT\_RAND\_NONCE\_SHIFT)
- #define ATCA\_SECURE\_BOOT\_DIGEST\_SHIFT (8)
- #define ATCA\_SECURE\_BOOT\_DIGEST\_MASK (0x0Fu << ATCA\_SECURE\_BOOT\_DIGEST\_SHIFT)
- #define ATCA\_SECURE\_BOOT\_DIGEST(v) (ATCA\_SECURE\_BOOT\_DIGEST\_MASK & (v << ATCA\_SECURE\_BOOT\_DIGEST\_SHIFT))
- #define ATCA\_SECURE\_BOOT\_PUB\_KEY\_SHIFT (12)
- #define ATCA\_SECURE\_BOOT\_PUB\_KEY\_MASK (0x0Fu << ATCA\_SECURE\_BOOT\_PUB\_KEY\_SHIFT)
- #define ATCA\_SECURE\_BOOT\_PUB\_KEY(v) (ATCA\_SECURE\_BOOT\_PUB\_KEY\_MASK & (v << ATCA\_SECURE\_BOOT\_PUB\_KEY\_SHIFT))
- #define ATCA\_SLOT\_LOCKED(v) ((0x01 << v) & 0xFFFFu)
- #define ATCA\_CHIP\_OPT\_POST\_EN\_SHIFT (0)
- #define ATCA\_CHIP\_OPT\_POST\_EN\_MASK (0x01u << ATCA\_CHIP\_OPT\_POST\_EN\_SHIFT)
- #define ATCA\_CHIP\_OPT\_IO\_PROT\_EN\_SHIFT (1)
- #define ATCA\_CHIP\_OPT\_IO\_PROT\_EN\_MASK (0x01u << ATCA\_CHIP\_OPT\_IO\_PROT\_EN\_SHIFT)
- #define ATCA\_CHIP\_OPT\_KDF\_AES\_EN\_SHIFT (2)
- #define ATCA\_CHIP\_OPT\_KDF\_AES\_EN\_MASK (0x01u << ATCA\_CHIP\_OPT\_KDF\_AES\_EN\_SHIFT)
- #define ATCA\_CHIP\_OPT\_ECDH\_PROT\_SHIFT (8)
- #define ATCA\_CHIP\_OPT\_ECDH\_PROT\_MASK (0x03u << ATCA\_CHIP\_OPT\_ECDH\_PROT\_SHIFT)
- #define ATCA\_CHIP\_OPT\_ECDH\_PROT(v) (ATCA\_CHIP\_OPT\_ECDH\_PROT\_MASK & (v << ATCA\_CHIP\_OPT\_ECDH\_PROT\_SHIFT))
- #define ATCA\_CHIP\_OPT\_KDF\_PROT\_SHIFT (10)
- #define ATCA\_CHIP\_OPT\_KDF\_PROT\_MASK (0x03u << ATCA\_CHIP\_OPT\_KDF\_PROT\_SHIFT)
- #define ATCA\_CHIP\_OPT\_KDF\_PROT(v) (ATCA\_CHIP\_OPT\_KDF\_PROT\_MASK & (v << ATCA\_CHIP\_OPT\_KDF\_PROT\_SHIFT))
- #define ATCA\_CHIP\_OPT\_IO\_PROT\_KEY\_SHIFT (12)
- #define ATCA\_CHIP\_OPT\_IO\_PROT\_KEY\_MASK (0x0Fu << ATCA\_CHIP\_OPT\_IO\_PROT\_KEY\_SHIFT)
- #define ATCA\_CHIP\_OPT\_IO\_PROT\_KEY(v) (ATCA\_CHIP\_OPT\_IO\_PROT\_KEY\_MASK & (v << ATCA\_CHIP\_OPT\_IO\_PROT\_KEY\_SHIFT))
- #define ATCA\_KEY\_CONFIG\_OFFSET(x) (96UL + (x) \* 2)

- `#define ATCA_KEY_CONFIG_PRIVATE_SHIFT (0)`
- `#define ATCA_KEY_CONFIG_PRIVATE_MASK (0x01u << ATCA_KEY_CONFIG_PRIVATE_SHIFT)`
- `#define ATCA_KEY_CONFIG_PUB_INFO_SHIFT (1)`
- `#define ATCA_KEY_CONFIG_PUB_INFO_MASK (0x01u << ATCA_KEY_CONFIG_PUB_INFO_SHIFT)`
- `#define ATCA_KEY_CONFIG_KEY_TYPE_SHIFT (2)`
- `#define ATCA_KEY_CONFIG_KEY_TYPE_MASK (0x07u << ATCA_KEY_CONFIG_KEY_TYPE_SHIFT)`
- `#define ATCA_KEY_CONFIG_KEY_TYPE(v) (ATCA_KEY_CONFIG_KEY_TYPE_MASK & (v << ATCA_KEY_CONFIG_KEY_TYPE_SHIFT))`
- `#define ATCA_KEY_CONFIG_LOCKABLE_SHIFT (5)`
- `#define ATCA_KEY_CONFIG_LOCKABLE_MASK (0x01u << ATCA_KEY_CONFIG_LOCKABLE_SHIFT)`
- `#define ATCA_KEY_CONFIG_REQ_RANDOM_SHIFT (6)`
- `#define ATCA_KEY_CONFIG_REQ_RANDOM_MASK (0x01u << ATCA_KEY_CONFIG_REQ_RANDOM_SHIFT)`
- `#define ATCA_KEY_CONFIG_REQ_AUTH_SHIFT (7)`
- `#define ATCA_KEY_CONFIG_REQ_AUTH_MASK (0x01u << ATCA_KEY_CONFIG_REQ_AUTH_SHIFT)`
- `#define ATCA_KEY_CONFIG_AUTH_KEY_SHIFT (8)`
- `#define ATCA_KEY_CONFIG_AUTH_KEY_MASK (0x0Fu << ATCA_KEY_CONFIG_AUTH_KEY_SHIFT)`
- `#define ATCA_KEY_CONFIG_AUTH_KEY(v) (ATCA_KEY_CONFIG_AUTH_KEY_MASK & (v << ATCA_KEY_CONFIG_AUTH_KEY_SHIFT))`
- `#define ATCA_KEY_CONFIG_PERSIST_DISABLE_SHIFT (12)`
- `#define ATCA_KEY_CONFIG_PERSIST_DISABLE_MASK (0x01u << ATCA_KEY_CONFIG_PERSIST_DISABLE_SHIFT)`
- `#define ATCA_KEY_CONFIG_RFU_SHIFT (13)`
- `#define ATCA_KEY_CONFIG_RFU_MASK (0x01u << ATCA_KEY_CONFIG_RFU_SHIFT)`
- `#define ATCA_KEY_CONFIG_X509_ID_SHIFT (14)`
- `#define ATCA_KEY_CONFIG_X509_ID_MASK (0x03u << ATCA_KEY_CONFIG_X509_ID_SHIFT)`
- `#define ATCA_KEY_CONFIG_X509_ID(v) (ATCA_KEY_CONFIG_X509_ID_MASK & (v << ATCA_KEY_CONFIG_X509_ID_SHIFT))`

### Typedefs

- `typedef struct _atsha204a_config atsha204a_config_t`
- `typedef struct _atecc508a_config atecc508a_config_t`
- `typedef struct _atecc608_config atecc608_config_t`
- `typedef struct atca_device * ATCADevice`

### Enumerations

- `enum ATCADeviceState { ATCA_DEVICE_STATE_UNKNOWN = 0, ATCA_DEVICE_STATE_SLEEP, ATCA_DEVICE_STATE_IDLE, ATCA_DEVICE_STATE_ACTIVE }`

*ATCADeviceState says about device state.*

- `enum ATCADeviceType {`  
`ATSHA204A = 0, ATECC108A = 1, ATECC508A = 2, ATECC608A = 3,`  
`ATECC608B = 3, ATECC608 = 3, ATSHA206A = 4, ECC204 = 5,`  
`ECC206 = 6, TA010 = 7, RNG90 = 8, SHA104 = 9,`  
`SHA105 = 10, SHA106 = 11, TA100 = 0x10, ATCA_DEV_UNKNOWN = 0x20 }`

*The supported Device type in CryptoAuthLib library.*

### Functions

- `ATCADevice newATCADevice (ATCAIfaceCfg *cfg)`  
*constructor for a Microchip CryptoAuth device*
- `void deleteATCADevice (ATCADevice *ca_dev)`  
*destructor for a device NULLs reference after object is freed*
- `ATCA_STATUS initATCADevice (ATCAIfaceCfg *cfg, ATCADevice ca_dev)`  
*Initializer for an Microchip CryptoAuth device.*
- `ATCAIface atGetIFace (ATCADevice dev)`  
*returns a reference to the ATCAIface interface object for the device*
- `ATCA_STATUS releaseATCADevice (ATCADevice ca_dev)`  
*Release any resources associated with the device.*

### 8.3.1 Detailed Description

ATCADevice object - composite of command and interface objects.

### 8.3.2 Macro Definition Documentation

#### 8.3.2.1 ATCA\_AES\_ENABLE\_EN\_MASK

```
#define ATCA_AES_ENABLE_EN_MASK (0x01u << ATCA_AES_ENABLE_EN_SHIFT)
```

#### 8.3.2.2 ATCA\_AES\_ENABLE\_EN\_SHIFT

```
#define ATCA_AES_ENABLE_EN_SHIFT (0)
```

#### 8.3.2.3 ATCA\_CHIP\_MODE\_CLK\_DIV

```
#define ATCA_CHIP_MODE_CLK_DIV(  
    v ) (ATCA_CHIP_MODE_CLK_DIV_MASK & (v << ATCA_CHIP_MODE_CLK_DIV_SHIFT))
```

#### 8.3.2.4 ATCA\_CHIP\_MODE\_CLK\_DIV\_MASK

```
#define ATCA_CHIP_MODE_CLK_DIV_MASK (0x1Fu << ATCA_CHIP_MODE_CLK_DIV_SHIFT)
```

#### 8.3.2.5 ATCA\_CHIP\_MODE\_CLK\_DIV\_SHIFT

```
#define ATCA_CHIP_MODE_CLK_DIV_SHIFT (3)
```

#### 8.3.2.6 ATCA\_CHIP\_MODE\_I2C\_EXTRA\_MASK

```
#define ATCA_CHIP_MODE_I2C_EXTRA_MASK (0x01u << ATCA_CHIP_MODE_I2C_EXTRA_SHIFT)
```

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### 8.3.2.7 ATCA\_CHIP\_MODE\_I2C\_EXTRA\_SHIFT

```
#define ATCA_CHIP_MODE_I2C_EXTRA_SHIFT (0)
```

### 8.3.2.8 ATCA\_CHIP\_MODE\_TTL\_EN\_MASK

```
#define ATCA_CHIP_MODE_TTL_EN_MASK (0x01u << ATCA_CHIP_MODE_TTL_EN_SHIFT)
```

### 8.3.2.9 ATCA\_CHIP\_MODE\_TTL\_EN\_SHIFT

```
#define ATCA_CHIP_MODE_TTL_EN_SHIFT (1)
```

### 8.3.2.10 ATCA\_CHIP\_MODE\_WDG\_LONG\_MASK

```
#define ATCA_CHIP_MODE_WDG_LONG_MASK (0x01u << ATCA_CHIP_MODE_WDG_LONG_SHIFT)
```

### 8.3.2.11 ATCA\_CHIP\_MODE\_WDG\_LONG\_SHIFT

```
#define ATCA_CHIP_MODE_WDG_LONG_SHIFT (2)
```

### 8.3.2.12 ATCA\_CHIP\_OPT\_ECDH\_PROT

```
#define ATCA_CHIP_OPT_ECDH_PROT(  
    v ) (ATCA_CHIP_OPT_ECDH_PROT_MASK & (v << ATCA_CHIP_OPT_ECDH_PROT_SHIFT))
```

### 8.3.2.13 ATCA\_CHIP\_OPT\_ECDH\_PROT\_MASK

```
#define ATCA_CHIP_OPT_ECDH_PROT_MASK (0x03u << ATCA_CHIP_OPT_ECDH_PROT_SHIFT)
```

#### 8.3.2.14 ATCA\_CHIP\_OPT\_ECDH\_PROT\_SHIFT

```
#define ATCA_CHIP_OPT_ECDH_PROT_SHIFT (8)
```

#### 8.3.2.15 ATCA\_CHIP\_OPT\_IO\_PROT\_EN\_MASK

```
#define ATCA_CHIP_OPT_IO_PROT_EN_MASK (0x01u << ATCA_CHIP_OPT_IO_PROT_EN_SHIFT)
```

#### 8.3.2.16 ATCA\_CHIP\_OPT\_IO\_PROT\_EN\_SHIFT

```
#define ATCA_CHIP_OPT_IO_PROT_EN_SHIFT (1)
```

#### 8.3.2.17 ATCA\_CHIP\_OPT\_IO\_PROT\_KEY

```
#define ATCA_CHIP_OPT_IO_PROT_KEY(  
    v ) (ATCA_CHIP_OPT_IO_PROT_KEY_MASK & (v << ATCA_CHIP_OPT_IO_PROT_KEY_SHIFT))
```

#### 8.3.2.18 ATCA\_CHIP\_OPT\_IO\_PROT\_KEY\_MASK

```
#define ATCA_CHIP_OPT_IO_PROT_KEY_MASK (0x0Fu << ATCA_CHIP_OPT_IO_PROT_KEY_SHIFT)
```

#### 8.3.2.19 ATCA\_CHIP\_OPT\_IO\_PROT\_KEY\_SHIFT

```
#define ATCA_CHIP_OPT_IO_PROT_KEY_SHIFT (12)
```

#### 8.3.2.20 ATCA\_CHIP\_OPT\_KDF\_AES\_EN\_MASK

```
#define ATCA_CHIP_OPT_KDF_AES_EN_MASK (0x01u << ATCA_CHIP_OPT_KDF_AES_EN_SHIFT)
```

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### 8.3.2.21 ATCA\_CHIP\_OPT\_KDF\_AES\_EN\_SHIFT

```
#define ATCA_CHIP_OPT_KDF_AES_EN_SHIFT (2)
```

### 8.3.2.22 ATCA\_CHIP\_OPT\_KDF\_PROT

```
#define ATCA_CHIP_OPT_KDF_PROT(  
    v ) (ATCA_CHIP_OPT_KDF_PROT_MASK & (v << ATCA_CHIP_OPT_KDF_PROT_SHIFT))
```

### 8.3.2.23 ATCA\_CHIP\_OPT\_KDF\_PROT\_MASK

```
#define ATCA_CHIP_OPT_KDF_PROT_MASK (0x03u << ATCA_CHIP_OPT_KDF_PROT_SHIFT)
```

### 8.3.2.24 ATCA\_CHIP\_OPT\_KDF\_PROT\_SHIFT

```
#define ATCA_CHIP_OPT_KDF_PROT_SHIFT (10)
```

### 8.3.2.25 ATCA\_CHIP\_OPT\_POST\_EN\_MASK

```
#define ATCA_CHIP_OPT_POST_EN_MASK (0x01u << ATCA_CHIP_OPT_POST_EN_SHIFT)
```

### 8.3.2.26 ATCA\_CHIP\_OPT\_POST\_EN\_SHIFT

```
#define ATCA_CHIP_OPT_POST_EN_SHIFT (0)
```

### 8.3.2.27 ATCA\_COUNTER\_MATCH\_EN\_MASK

```
#define ATCA_COUNTER_MATCH_EN_MASK (0x01u << ATCA_COUNTER_MATCH_EN_SHIFT)
```



### 8.3.2.28 ATCA\_COUNTER\_MATCH\_EN\_SHIFT

```
#define ATCA_COUNTER_MATCH_EN_SHIFT (0)
```

### 8.3.2.29 ATCA\_COUNTER\_MATCH\_KEY

```
#define ATCA_COUNTER_MATCH_KEY(  
    v ) (ATCA_COUNTER_MATCH_KEY_MASK & (v << ATCA_COUNTER_MATCH_KEY_SHIFT))
```

### 8.3.2.30 ATCA\_COUNTER\_MATCH\_KEY\_MASK

```
#define ATCA_COUNTER_MATCH_KEY_MASK (0x0Fu << ATCA_COUNTER_MATCH_KEY_SHIFT)
```

### 8.3.2.31 ATCA\_COUNTER\_MATCH\_KEY\_SHIFT

```
#define ATCA_COUNTER_MATCH_KEY_SHIFT (4)
```

### 8.3.2.32 ATCA\_I2C\_ENABLE\_EN\_MASK

```
#define ATCA_I2C_ENABLE_EN_MASK (0x01u << ATCA_I2C_ENABLE_EN_SHIFT)
```

### 8.3.2.33 ATCA\_I2C\_ENABLE\_EN\_SHIFT

```
#define ATCA_I2C_ENABLE_EN_SHIFT (0)
```

### 8.3.2.34 ATCA\_KEY\_CONFIG\_AUTH\_KEY

```
#define ATCA_KEY_CONFIG_AUTH_KEY(  
    v ) (ATCA_KEY_CONFIG_AUTH_KEY_MASK & (v << ATCA_KEY_CONFIG_AUTH_KEY_SHIFT))
```

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### 8.3.2.35 ATCA\_KEY\_CONFIG\_AUTH\_KEY\_MASK

```
#define ATCA_KEY_CONFIG_AUTH_KEY_MASK (0x0Fu << ATCA_KEY_CONFIG_AUTH_KEY_SHIFT)
```

### 8.3.2.36 ATCA\_KEY\_CONFIG\_AUTH\_KEY\_SHIFT

```
#define ATCA_KEY_CONFIG_AUTH_KEY_SHIFT (8)
```

### 8.3.2.37 ATCA\_KEY\_CONFIG\_KEY\_TYPE

```
#define ATCA_KEY_CONFIG_KEY_TYPE(  
    v ) (ATCA_KEY_CONFIG_KEY_TYPE_MASK & (v << ATCA_KEY_CONFIG_KEY_TYPE_SHIFT))
```

### 8.3.2.38 ATCA\_KEY\_CONFIG\_KEY\_TYPE\_MASK

```
#define ATCA_KEY_CONFIG_KEY_TYPE_MASK (0x07u << ATCA_KEY_CONFIG_KEY_TYPE_SHIFT)
```

### 8.3.2.39 ATCA\_KEY\_CONFIG\_KEY\_TYPE\_SHIFT

```
#define ATCA_KEY_CONFIG_KEY_TYPE_SHIFT (2)
```

### 8.3.2.40 ATCA\_KEY\_CONFIG\_LOCKABLE\_MASK

```
#define ATCA_KEY_CONFIG_LOCKABLE_MASK (0x01u << ATCA_KEY_CONFIG_LOCKABLE_SHIFT)
```

### 8.3.2.41 ATCA\_KEY\_CONFIG\_LOCKABLE\_SHIFT

```
#define ATCA_KEY_CONFIG_LOCKABLE_SHIFT (5)
```

#### 8.3.2.42 ATCA\_KEY\_CONFIG\_OFFSET

```
#define ATCA_KEY_CONFIG_OFFSET(  
    x ) (96UL + (x) * 2)
```

#### 8.3.2.43 ATCA\_KEY\_CONFIG\_PERSIST\_DISABLE\_MASK

```
#define ATCA_KEY_CONFIG_PERSIST_DISABLE_MASK (0x01u << ATCA_KEY_CONFIG_PERSIST_DISABLE_SHIFT)
```

#### 8.3.2.44 ATCA\_KEY\_CONFIG\_PERSIST\_DISABLE\_SHIFT

```
#define ATCA_KEY_CONFIG_PERSIST_DISABLE_SHIFT (12)
```

#### 8.3.2.45 ATCA\_KEY\_CONFIG\_PRIVATE\_MASK

```
#define ATCA_KEY_CONFIG_PRIVATE_MASK (0x01u << ATCA_KEY_CONFIG_PRIVATE_SHIFT)
```

#### 8.3.2.46 ATCA\_KEY\_CONFIG\_PRIVATE\_SHIFT

```
#define ATCA_KEY_CONFIG_PRIVATE_SHIFT (0)
```

#### 8.3.2.47 ATCA\_KEY\_CONFIG\_PUB\_INFO\_MASK

```
#define ATCA_KEY_CONFIG_PUB_INFO_MASK (0x01u << ATCA_KEY_CONFIG_PUB_INFO_SHIFT)
```

#### 8.3.2.48 ATCA\_KEY\_CONFIG\_PUB\_INFO\_SHIFT

```
#define ATCA_KEY_CONFIG_PUB_INFO_SHIFT (1)
```

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---

### 8.3.2.49 ATCA\_KEY\_CONFIG\_REQ\_AUTH\_MASK

```
#define ATCA_KEY_CONFIG_REQ_AUTH_MASK (0x01u << ATCA_KEY_CONFIG_REQ_AUTH_SHIFT)
```

### 8.3.2.50 ATCA\_KEY\_CONFIG\_REQ\_AUTH\_SHIFT

```
#define ATCA_KEY_CONFIG_REQ_AUTH_SHIFT (7)
```

### 8.3.2.51 ATCA\_KEY\_CONFIG\_REQ\_RANDOM\_MASK

```
#define ATCA_KEY_CONFIG_REQ_RANDOM_MASK (0x01u << ATCA_KEY_CONFIG_REQ_RANDOM_SHIFT)
```

### 8.3.2.52 ATCA\_KEY\_CONFIG\_REQ\_RANDOM\_SHIFT

```
#define ATCA_KEY_CONFIG_REQ_RANDOM_SHIFT (6)
```

### 8.3.2.53 ATCA\_KEY\_CONFIG\_RFU\_MASK

```
#define ATCA_KEY_CONFIG_RFU_MASK (0x01u << ATCA_KEY_CONFIG_RFU_SHIFT)
```

### 8.3.2.54 ATCA\_KEY\_CONFIG\_RFU\_SHIFT

```
#define ATCA_KEY_CONFIG_RFU_SHIFT (13)
```

### 8.3.2.55 ATCA\_KEY\_CONFIG\_X509\_ID

```
#define ATCA_KEY_CONFIG_X509_ID(  
    v ) (ATCA_KEY_CONFIG_X509_ID_MASK & (v << ATCA_KEY_CONFIG_X509_ID_SHIFT))
```

### 8.3.2.56 ATCA\_KEY\_CONFIG\_X509\_ID\_MASK

```
#define ATCA_KEY_CONFIG_X509_ID_MASK (0x03u << ATCA_KEY_CONFIG_X509_ID_SHIFT)
```

### 8.3.2.57 ATCA\_KEY\_CONFIG\_X509\_ID\_SHIFT

```
#define ATCA_KEY_CONFIG_X509_ID_SHIFT (14)
```

### 8.3.2.58 ATCA\_PACKED

```
#define ATCA_PACKED
```

### 8.3.2.59 ATCA\_SECURE\_BOOT\_DIGEST

```
#define ATCA_SECURE_BOOT_DIGEST(  
    v ) (ATCA_SECURE_BOOT_DIGEST_MASK & (v << ATCA_SECURE_BOOT_DIGEST_SHIFT))
```

### 8.3.2.60 ATCA\_SECURE\_BOOT\_DIGEST\_MASK

```
#define ATCA_SECURE_BOOT_DIGEST_MASK (0x0Fu << ATCA_SECURE_BOOT_DIGEST_SHIFT)
```

### 8.3.2.61 ATCA\_SECURE\_BOOT\_DIGEST\_SHIFT

```
#define ATCA_SECURE_BOOT_DIGEST_SHIFT (8)
```

### 8.3.2.62 ATCA\_SECURE\_BOOT\_MODE

```
#define ATCA_SECURE_BOOT_MODE(  
    v ) (ATCA_SECURE_BOOT_MODE_MASK & (v << ATCA_SECURE_BOOT_MODE_SHIFT))
```

## 8.3 ATCADevice (atca\_)

---

### 8.3.2.63 ATCA\_SECURE\_BOOT\_MODE\_MASK

```
#define ATCA_SECURE_BOOT_MODE_MASK (0x03u << ATCA_SECURE_BOOT_MODE_SHIFT)
```

### 8.3.2.64 ATCA\_SECURE\_BOOT\_MODE\_SHIFT

```
#define ATCA_SECURE_BOOT_MODE_SHIFT (0)
```

### 8.3.2.65 ATCA\_SECURE\_BOOT\_PERSIST\_EN\_MASK

```
#define ATCA_SECURE_BOOT_PERSIST_EN_MASK (0x01u << ATCA_SECURE_BOOT_PERSIST_EN_SHIFT)
```

### 8.3.2.66 ATCA\_SECURE\_BOOT\_PERSIST\_EN\_SHIFT

```
#define ATCA_SECURE_BOOT_PERSIST_EN_SHIFT (3)
```

### 8.3.2.67 ATCA\_SECURE\_BOOT\_PUB\_KEY

```
#define ATCA_SECURE_BOOT_PUB_KEY(  
    v ) (ATCA_SECURE_BOOT_PUB_KEY_MASK & (v << ATCA_SECURE_BOOT_PUB_KEY_SHIFT))
```

### 8.3.2.68 ATCA\_SECURE\_BOOT\_PUB\_KEY\_MASK

```
#define ATCA_SECURE_BOOT_PUB_KEY_MASK (0x0Fu << ATCA_SECURE_BOOT_PUB_KEY_SHIFT)
```

### 8.3.2.69 ATCA\_SECURE\_BOOT\_PUB\_KEY\_SHIFT

```
#define ATCA_SECURE_BOOT_PUB_KEY_SHIFT (12)
```

**8.3.2.70 ATCA\_SECURE\_BOOT\_RAND\_NONCE\_MASK**

```
#define ATCA_SECURE_BOOT_RAND_NONCE_MASK (0x01u << ATCA_SECURE_BOOT_RAND_NONCE_SHIFT)
```

**8.3.2.71 ATCA\_SECURE\_BOOT\_RAND\_NONCE\_SHIFT**

```
#define ATCA_SECURE_BOOT_RAND_NONCE_SHIFT (4)
```

**8.3.2.72 ATCA\_SLOT\_CONFIG\_ECDH\_MASK**

```
#define ATCA_SLOT_CONFIG_ECDH_MASK (0x01u << ATCA_SLOT_CONFIG_ECDH_SHIFT)
```

**8.3.2.73 ATCA\_SLOT\_CONFIG\_ECDH\_SHIFT**

```
#define ATCA_SLOT_CONFIG_ECDH_SHIFT (2)
```

**8.3.2.74 ATCA\_SLOT\_CONFIG\_ENCRYPTED\_READ\_MASK**

```
#define ATCA_SLOT_CONFIG_ENCRYPTED_READ_MASK (0x01u << ATCA_SLOT_CONFIG_ENCRYPTED_READ_SHIFT)
```

**8.3.2.75 ATCA\_SLOT\_CONFIG\_ENCRYPTED\_READ\_SHIFT**

```
#define ATCA_SLOT_CONFIG_ENCRYPTED_READ_SHIFT (6)
```

**8.3.2.76 ATCA\_SLOT\_CONFIG\_EXT\_SIG\_MASK**

```
#define ATCA_SLOT_CONFIG_EXT_SIG_MASK (0x01u << ATCA_SLOT_CONFIG_EXT_SIG_SHIFT)
```

**8.3.2.77 ATCA\_SLOT\_CONFIG\_EXT\_SIG\_SHIFT**

```
#define ATCA_SLOT_CONFIG_EXT_SIG_SHIFT (0)
```

### 8.3.2.78 ATCA\_SLOT\_CONFIG\_GEN\_KEY\_MASK

```
#define ATCA_SLOT_CONFIG_GEN_KEY_MASK (0x01u << ATCA_SLOT_CONFIG_GEN_KEY_SHIFT)
```

### 8.3.2.79 ATCA\_SLOT\_CONFIG\_GEN\_KEY\_SHIFT

```
#define ATCA_SLOT_CONFIG_GEN_KEY_SHIFT (8)
```

### 8.3.2.80 ATCA\_SLOT\_CONFIG\_INT\_SIG\_MASK

```
#define ATCA_SLOT_CONFIG_INT_SIG_MASK (0x01u << ATCA_SLOT_CONFIG_INT_SIG_SHIFT)
```

### 8.3.2.81 ATCA\_SLOT\_CONFIG\_INT\_SIG\_SHIFT

```
#define ATCA_SLOT_CONFIG_INT_SIG_SHIFT (1)
```

### 8.3.2.82 ATCA\_SLOT\_CONFIG\_IS\_SECRET\_MASK

```
#define ATCA_SLOT_CONFIG_IS_SECRET_MASK (0x01u << ATCA_SLOT_CONFIG_IS_SECRET_SHIFT)
```

### 8.3.2.83 ATCA\_SLOT\_CONFIG\_IS\_SECRET\_SHIFT

```
#define ATCA_SLOT_CONFIG_IS_SECRET_SHIFT (7)
```

### 8.3.2.84 ATCA\_SLOT\_CONFIG\_LIMITED\_USE\_MASK

```
#define ATCA_SLOT_CONFIG_LIMITED_USE_MASK (0x01u << ATCA_SLOT_CONFIG_LIMITED_USE_SHIFT)
```

### 8.3.2.85 ATCA\_SLOT\_CONFIG\_LIMITED\_USE\_SHIFT

```
#define ATCA_SLOT_CONFIG_LIMITED_USE_SHIFT (5)
```



#### 8.3.2.86 ATCA\_SLOT\_CONFIG\_NOMAC\_MASK

```
#define ATCA_SLOT_CONFIG_NOMAC_MASK (0x01u << ATCA_SLOT_CONFIG_NOMAC_SHIFT)
```

#### 8.3.2.87 ATCA\_SLOT\_CONFIG\_NOMAC\_SHIFT

```
#define ATCA_SLOT_CONFIG_NOMAC_SHIFT (4)
```

#### 8.3.2.88 ATCA\_SLOT\_CONFIG\_PRIV\_WRITE\_MASK

```
#define ATCA_SLOT_CONFIG_PRIV_WRITE_MASK (0x01u << ATCA_SLOT_CONFIG_PRIV_WRITE_SHIFT)
```

#### 8.3.2.89 ATCA\_SLOT\_CONFIG\_PRIV\_WRITE\_SHIFT

```
#define ATCA_SLOT_CONFIG_PRIV_WRITE_SHIFT (9)
```

#### 8.3.2.90 ATCA\_SLOT\_CONFIG\_READKEY

```
#define ATCA_SLOT_CONFIG_READKEY(  
    v ) (ATCA_SLOT_CONFIG_READKEY_MASK & (v << ATCA_SLOT_CONFIG_READKEY_SHIFT))
```

#### 8.3.2.91 ATCA\_SLOT\_CONFIG\_READKEY\_MASK

```
#define ATCA_SLOT_CONFIG_READKEY_MASK (0x0Fu << ATCA_SLOT_CONFIG_READKEY_SHIFT)
```

#### 8.3.2.92 ATCA\_SLOT\_CONFIG\_READKEY\_SHIFT

```
#define ATCA_SLOT_CONFIG_READKEY_SHIFT (0)
```

## 8.3 ATCADevice (atca\_)

---

### 8.3.2.93 ATCA\_SLOT\_CONFIG\_WRITE\_CONFIG

```
#define ATCA_SLOT_CONFIG_WRITE_CONFIG(  
    v ) (ATCA_SLOT_CONFIG_WRITE_CONFIG_MASK & (v << ATCA_SLOT_CONFIG_WRITE_CONFIG_SHIFT))
```

### 8.3.2.94 ATCA\_SLOT\_CONFIG\_WRITE\_CONFIG\_MASK

```
#define ATCA_SLOT_CONFIG_WRITE_CONFIG_MASK (0x0Fu << ATCA_SLOT_CONFIG_WRITE_CONFIG_SHIFT)
```

### 8.3.2.95 ATCA\_SLOT\_CONFIG\_WRITE\_CONFIG\_SHIFT

```
#define ATCA_SLOT_CONFIG_WRITE_CONFIG_SHIFT (12)
```

### 8.3.2.96 ATCA\_SLOT\_CONFIG\_WRITE\_ECDH\_MASK

```
#define ATCA_SLOT_CONFIG_WRITE_ECDH_MASK (0x01u << ATCA_SLOT_CONFIG_WRITE_ECDH_SHIFT)
```

### 8.3.2.97 ATCA\_SLOT\_CONFIG\_WRITE\_ECDH\_SHIFT

```
#define ATCA_SLOT_CONFIG_WRITE_ECDH_SHIFT (3)
```

### 8.3.2.98 ATCA\_SLOT\_CONFIG\_WRITE\_KEY

```
#define ATCA_SLOT_CONFIG_WRITE_KEY(  
    v ) (ATCA_SLOT_CONFIG_WRITE_KEY_MASK & (v << ATCA_SLOT_CONFIG_WRITE_KEY_SHIFT))
```

### 8.3.2.99 ATCA\_SLOT\_CONFIG\_WRITE\_KEY\_MASK

```
#define ATCA_SLOT_CONFIG_WRITE_KEY_MASK (0x0Fu << ATCA_SLOT_CONFIG_WRITE_KEY_SHIFT)
```

**8.3.2.100 ATCA\_SLOT\_CONFIG\_WRITE\_KEY\_SHIFT**

```
#define ATCA_SLOT_CONFIG_WRITE_KEY_SHIFT (8)
```

**8.3.2.101 ATCA\_SLOT\_LOCKED**

```
#define ATCA_SLOT_LOCKED(  
    v ) ((0x01 << v) & 0xFFFFu)
```

**8.3.2.102 ATCA\_USE\_LOCK\_ENABLE\_MASK**

```
#define ATCA_USE_LOCK_ENABLE_MASK (0x0Fu << ATCA_USE_LOCK_ENABLE_SHIFT)
```

**8.3.2.103 ATCA\_USE\_LOCK\_ENABLE\_SHIFT**

```
#define ATCA_USE_LOCK_ENABLE_SHIFT (0)
```

**8.3.2.104 ATCA\_USE\_LOCK\_KEY\_MASK**

```
#define ATCA_USE_LOCK_KEY_MASK (0x0Fu << ATCA_USE_LOCK_KEY_SHIFT)
```

**8.3.2.105 ATCA\_USE\_LOCK\_KEY\_SHIFT**

```
#define ATCA_USE_LOCK_KEY_SHIFT (4)
```

**8.3.2.106 ATCA\_VOL\_KEY\_PERM\_EN\_MASK**

```
#define ATCA_VOL_KEY_PERM_EN_MASK (0x01u << ATCA_VOL_KEY_PERM_EN_SHIFT)
```

## 8.3 ATCADevice (atca\_)

---

### 8.3.2.107 ATCA\_VOL\_KEY\_PERM\_EN\_SHIFT

```
#define ATCA_VOL_KEY_PERM_EN_SHIFT (7)
```

### 8.3.2.108 ATCA\_VOL\_KEY\_PERM\_SLOT

```
#define ATCA_VOL_KEY_PERM_SLOT(  
    v ) (ATCA_VOL_KEY_PERM_SLOT_MASK & (v << ATCA_VOL_KEY_PERM_SLOT_SHIFT))
```

### 8.3.2.109 ATCA\_VOL\_KEY\_PERM\_SLOT\_MASK

```
#define ATCA_VOL_KEY_PERM_SLOT_MASK (0x0Fu << ATCA_VOL_KEY_PERM_SLOT_SHIFT)
```

### 8.3.2.110 ATCA\_VOL\_KEY\_PERM\_SLOT\_SHIFT

```
#define ATCA_VOL_KEY_PERM_SLOT_SHIFT (0)
```

## 8.3.3 Typedef Documentation

### 8.3.3.1 ATCADevice

```
typedef struct atca_device* ATCADevice
```

### 8.3.3.2 atecc508a\_config\_t

```
typedef struct _atecc508a_config atecc508a_config_t
```

### 8.3.3.3 atecc608\_config\_t

```
typedef struct _atecc608_config atecc608_config_t
```

### 8.3.3.4 atsha204a\_config\_t

```
typedef struct _atsha204a_config atsha204a_config_t
```

## 8.3.4 Enumeration Type Documentation

### 8.3.4.1 ATCADeviceState

```
enum ATCADeviceState
```

ATCADeviceState says about device state.

#### Enumerator

ATCA_DEVICE_STATE_UNKNOWN	
ATCA_DEVICE_STATE_SLEEP	
ATCA_DEVICE_STATE_IDLE	
ATCA_DEVICE_STATE_ACTIVE	

### 8.3.4.2 ATCADeviceType

```
enum ATCADeviceType
```

The supported Device type in Cryptoauthlib library.

#### Enumerator

ATSHA204A	
ATECC108A	
ATECC508A	
ATECC608A	
ATECC608B	
ATECC608	
ATSHA206A	
ECC204	
ECC206	
TA010	
RNG90	
SHA104	
SHA105	
SHA106	
TA100	
ATCA_DEV_UNKNOWN	

### 8.3.5 Function Documentation

#### 8.3.5.1 atGetIFace()

```
ATCAIface atGetIFace (
    ATCADevice dev )
```

returns a reference to the ATCAIface interface object for the device

##### Parameters

in	<i>dev</i>	reference to a device
----	------------	-----------------------

##### Returns

reference to the ATCAIface object for the device

#### 8.3.5.2 deleteATCADevice()

```
void deleteATCADevice (
    ATCADevice * ca_dev )
```

destructor for a device NULLs reference after object is freed

##### Parameters

in	<i>ca_dev</i>	pointer to a reference to a device
----	---------------	------------------------------------

#### 8.3.5.3 initATCADevice()

```
ATCA_STATUS initATCADevice (
    ATCAIfaceCfg * cfg,
    ATCADevice ca_dev )
```

Initializer for an Microchip CryptoAuth device.

##### Parameters

in	<i>cfg</i>	pointer to an interface configuration object
in, out	<i>ca_dev</i>	As input, pre-allocated structure to be initialized. mCommands and mIface members should point to existing structures to be initialized.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.3.5.4 newATCADevice()**

```
ATCADevice newATCADevice (
    ATCAIfaceCfg * cfg )
```

constructor for a Microchip CryptoAuth device

**Parameters**

in	<i>cfg</i>	Interface configuration object
----	------------	--------------------------------

**Returns**

Reference to a new ATCADevice on success. NULL on failure.

**8.3.5.5 releaseATCADevice()**

```
ATCA_STATUS releaseATCADevice (
    ATCADevice ca_dev )
```

Release any resources associated with the device.

**Parameters**

in	<i>ca_dev</i>	Device to release
----	---------------	-------------------

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

## 8.4 ATCAIface (atca\_)

Abstract interface to all CryptoAuth device types. This interface connects to the HAL implementation and abstracts the physical details of the device communication from all the upper layers of CryptoAuthLib.

### Data Structures

- struct [devtype\\_names\\_t](#)
- struct [ATCAIfaceCfg](#)
- struct [ATCAHAL\\_t](#)  
*HAL Driver Structure.*
- struct [atca\\_iface](#)  
*atca\_iface is the context structure for a configured interface*

### Macros

- #define [ATCA\\_IFACECFG\\_NAME\(x\)](#)
- #define [ATCA\\_IFACECFG\\_VALUE\(c, v\) c->v](#)

### Typedefs

- typedef struct [atca\\_iface](#) \* [ATCAIface](#)
- typedef struct [atca\\_iface](#) [atca\\_iface\\_t](#)  
*atca\_iface is the context structure for a configured interface*

### Enumerations

- enum [ATCAIfaceType](#) {  
[ATCA\\_I2C\\_IFACE](#) = 0, [ATCA\\_SWI\\_IFACE](#) = 1, [ATCA\\_UART\\_IFACE](#) = 2, [ATCA\\_SPI\\_IFACE](#) = 3,  
[ATCA\\_HID\\_IFACE](#) = 4, [ATCA\\_KIT\\_IFACE](#) = 5, [ATCA\\_CUSTOM\\_IFACE](#) = 6, [ATCA\\_I2C\\_GPIO\\_IFACE](#) = 7,  
[ATCA\\_SWI\\_GPIO\\_IFACE](#) = 8, [ATCA\\_SPI\\_GPIO\\_IFACE](#) = 9, [ATCA\\_UNKNOWN\\_IFACE](#) = 0xFE }
- enum [ATCAKitType](#) {  
[ATCA\\_KIT\\_AUTO\\_IFACE](#), [ATCA\\_KIT\\_I2C\\_IFACE](#), [ATCA\\_KIT\\_SWI\\_IFACE](#), [ATCA\\_KIT\\_SPI\\_IFACE](#),  
[ATCA\\_KIT\\_UNKNOWN\\_IFACE](#) }

### Functions

- [ATCA\\_STATUS initATCAIface](#) ([ATCAIfaceCfg](#) \*cfg, [ATCAIface](#) ca\_iface)  
*Initializer for ATCAIface objects.*
- [ATCAIface newATCAIface](#) ([ATCAIfaceCfg](#) \*cfg)  
*Constructor for ATCAIface objects.*
- [ATCA\\_STATUS atinit](#) ([ATCAIface](#) ca\_iface)  
*Performs the HAL initialization by calling intermediate HAL wrapper function. If using the basic API, the [atcab\\_init\(\)](#) function should be called instead.*
- [ATCA\\_STATUS atsend](#) ([ATCAIface](#) ca\_iface, uint8\_t address, uint8\_t \*txdata, int txlength)  
*Sends the data to the device by calling intermediate HAL wrapper function.*
- [ATCA\\_STATUS atreceive](#) ([ATCAIface](#) ca\_iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*Receives data from the device by calling intermediate HAL wrapper function.*



- **ATCA\_STATUS atcontrol** (ATCAIface ca\_iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations with the underlying hal driver.*
- **ATCA\_STATUS atwake** (ATCAIface ca\_iface)  
*Wakes up the device by calling intermediate HAL wrapper function. The `atcab_wakeup()` function should be used instead.*
- **ATCA\_STATUS atidle** (ATCAIface ca\_iface)  
*Puts the device into idle state by calling intermediate HAL wrapper function. The `atcab_idle()` function should be used instead.*
- **ATCA\_STATUS atsleep** (ATCAIface ca\_iface)  
*Puts the device into sleep state by calling intermediate HAL wrapper function. The `atcab_sleep()` function should be used instead.*
- **ATCAIfaceCfg \* atgetifacecfg** (ATCAIface ca\_iface)  
*Returns the logical interface configuration for the device.*
- **void \* atgetifacehaldat** (ATCAIface ca\_iface)  
*Returns the HAL data pointer for the device.*
- **bool ifacetype\_is\_kit** (ATCAIfaceType iface\_type)  
*Check if the given interface is a "kit protocol" one.*
- **bool atca\_iface\_is\_kit** (ATCAIface ca\_iface)  
*Check if the given interface is configured as a "kit protocol" one where transactions are atomic.*
- **bool atca\_iface\_is\_swi** (ATCAIface ca\_iface)  
*Check if the given interface is configured as a SWI.*
- **int atca\_iface\_get\_retries** (ATCAIface ca\_iface)  
*Retrieve the number of retries for a configured interface.*
- **uint16\_t atca\_iface\_get\_wake\_delay** (ATCAIface ca\_iface)  
*Retrieve the wake/retry delay for a configured interface/device.*
- **uint8\_t ifacecfg\_get\_address** (ATCAIfaceCfg \*cfg)  
*Retrieves the device address given an interface configuration.*
- **ATCA\_STATUS ifacecfg\_set\_address** (ATCAIfaceCfg \*cfg, uint8\_t addr, ATCAKitType kitiface)  
*Change the address of the selected device.*
- **ATCA\_STATUS releaseATCAIface** (ATCAIface ca\_iface)  
*Instruct the HAL driver to release any resources associated with this interface.*
- **void deleteATCAIface** (ATCAIface \*ca\_iface)  
*Instruct the HAL driver to release any resources associated with this interface, then delete the object.*
- **ATCADeviceType iface\_get\_device\_type\_by\_name** (const char \*name)  
*Get the ATCADeviceType for a string that looks like a part number.*

## 8.4.1 Detailed Description

Abstract interface to all CryptoAuth device types. This interface connects to the HAL implementation and abstracts the physical details of the device communication from all the upper layers of CryptoAuthLib.

## 8.4.2 Macro Definition Documentation

### 8.4.2.1 ATCA\_IFACECFG\_NAME

```
#define ATCA_IFACECFG_NAME(  
    x )
```

## 8.4 ATCAIface (atca\_)

---

### 8.4.2.2 ATCA\_IFACECFG\_VALUE

```
#define ATCA_IFACECFG_VALUE(  
    c,  
    v ) c->v
```

## 8.4.3 Typedef Documentation

### 8.4.3.1 atca\_iface\_t

```
typedef struct atca_iface atca_iface_t
```

[atca\\_iface](#) is the context structure for a configured interface

### 8.4.3.2 ATCAIface

```
typedef struct atca_iface* ATCAIface
```

## 8.4.4 Enumeration Type Documentation

### 8.4.4.1 ATCAIfaceType

```
enum ATCAIfaceType
```

#### Enumerator

ATCA_I2C_IFACE	Native I2C Driver
ATCA_SWI_IFACE	SWI or 1-Wire over UART/USART
ATCA_UART_IFACE	Kit v1 over UART/USART
ATCA_SPI_IFACE	Native SPI Driver
ATCA_HID_IFACE	Kit v1 over HID
ATCA_KIT_IFACE	Kit v2 (Binary/Bridging)
ATCA_CUSTOM_IFACE	Custom HAL functions provided during interface init
ATCA_I2C_GPIO_IFACE	I2C "Bitbang" Driver
ATCA_SWI_GPIO_IFACE	SWI or 1-Wire using a GPIO
ATCA_SPI_GPIO_IFACE	SWI or 1-Wire using a GPIO
ATCA_UNKNOWN_IFACE	

#### 8.4.4.2 ATCAKitType

enum `ATCAKitType`

##### Enumerator

<code>ATCA_KIT_AUTO_IFACE</code>	
<code>ATCA_KIT_I2C_IFACE</code>	
<code>ATCA_KIT_SWI_IFACE</code>	
<code>ATCA_KIT_SPI_IFACE</code>	
<code>ATCA_KIT_UNKNOWN_IFACE</code>	

### 8.4.5 Function Documentation

#### 8.4.5.1 `atca_iface_get_retries()`

```
int atca_iface_get_retries (
    ATCAIface ca_iface )
```

Retrieve the number of retries for a configured interface.

#### 8.4.5.2 `atca_iface_get_wake_delay()`

```
uint16_t atca_iface_get_wake_delay (
    ATCAIface ca_iface )
```

Retrieve the wake/retry delay for a configured interface/device.

#### 8.4.5.3 `atca_iface_is_kit()`

```
bool atca_iface_is_kit (
    ATCAIface ca_iface )
```

Check if the given interface is configured as a "kit protocol" one where transactions are atomic.

##### Returns

true if the interface is considered a kit

## 8.4 ATCAIface (atca\_)

---

### 8.4.5.4 atca\_iface\_is\_swi()

```
bool atca_iface_is_swi (
    ATCAIface ca_iface )
```

Check if the given interface is configured as a SWI.

#### Returns

true if the interface is considered a kit

### 8.4.5.5 atcontrol()

```
ATCA_STATUS atcontrol (
    ATCAIface ca_iface,
    uint8_t option,
    void * param,
    size_t paramlen )
```

Perform control operations with the underlying hal driver.

#### Parameters

in	<i>ca_iface</i>	Device to interact with.
in	<i>option</i>	Control parameter identifier
in	<i>param</i>	Optional pointer to parameter value
in	<i>paramlen</i>	Length of the parameter

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.4.5.6 atgetifacecfg()

```
ATCAIfaceCfg * atgetifacecfg (
    ATCAIface ca_iface )
```

Returns the logical interface configuration for the device.

#### Parameters

in	<i>ca_iface</i>	Device interface.
----	-----------------	-------------------

**Returns**

Logical interface configuration.

**8.4.5.7 atgetifacehaldat()**

```
void * atgetifacehaldat (
    ATCAIface ca_iface )
```

Returns the HAL data pointer for the device.

**Parameters**

in	<i>ca_iface</i>	Device interface.
----	-----------------	-------------------

**Returns**

HAL data pointer.

**8.4.5.8 atidle()**

```
ATCA_STATUS atidle (
    ATCAIface ca_iface )
```

Puts the device into idle state by calling intermediate HAL wrapper function. The [atcab\\_idle\(\)](#) function should be used instead.

**Parameters**

in	<i>ca_iface</i>	Device to interact with.
----	-----------------	--------------------------

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.4.5.9 atinit()**

```
ATCA_STATUS atinit (
    ATCAIface ca_iface )
```

Performs the HAL initialization by calling intermediate HAL wrapper function. If using the basic API, the [atcab\\_init\(\)](#) function should be called instead.

## 8.4 ATCAiface (atca\_)

---

### Parameters

in	<i>ca_iface</i>	Device to interact with.
----	-----------------	--------------------------

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.4.5.10 atreceive()

```
ATCA_STATUS atreceive (
    ATCAiface ca_iface,
    uint8_t word_address,
    uint8_t * rxdata,
    uint16_t * rxlength )
```

Receives data from the device by calling intermediate HAL wrapper function.

### Parameters

in	<i>ca_iface</i>	Device to interact with.
in	<i>word_address</i>	device transaction type
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.4.5.11 atsend()

```
ATCA_STATUS atsend (
    ATCAiface ca_iface,
    uint8_t address,
    uint8_t * txdata,
    int txlength )
```

Sends the data to the device by calling intermediate HAL wrapper function.

### Parameters

in	<i>ca_iface</i>	Device to interact with.
in	<i>word_address</i>	device transaction type
in	<i>txdata</i>	Data to be transmitted to the device.
in	<i>txlength</i>	Number of bytes to be transmitted to the device.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.4.5.12 atsleep()**

```
ATCA_STATUS atsleep (
    ATCAIface ca_iface )
```

Puts the device into sleep state by calling intermediate HAL wrapper function. The [atcab\\_sleep\(\)](#) function should be used instead.

**Parameters**

in	<i>ca_iface</i>	Device to interact with.
----	-----------------	--------------------------

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.4.5.13 atwake()**

```
ATCA_STATUS atwake (
    ATCAIface ca_iface )
```

Wakes up the device by calling intermediate HAL wrapper function. The [atcab\\_wakeup\(\)](#) function should be used instead.

**Parameters**

in	<i>ca_iface</i>	Device to interact with.
----	-----------------	--------------------------

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.4.5.14 deleteATCAIface()**

```
void deleteATCAIface (
    ATCAIface * ca_iface )
```

Instruct the HAL driver to release any resources associated with this interface, then delete the object.

## 8.4 ATCAIface (atca\_)

---

### Parameters

in	<i>ca_iface</i>	Device interface.
----	-----------------	-------------------

#### 8.4.5.15 iface\_get\_device\_type\_by\_name()

```
ATCADeviceType iface_get_device_type_by_name (
    const char * name )
```

Get the ATCADeviceType for a string that looks like a part number.

#### 8.4.5.16 ifacecfg\_get\_address()

```
uint8_t ifacecfg_get_address (
    ATCAIfaceCfg * cfg )
```

Retrieves the device address given an interface configuration.

#### 8.4.5.17 ifacecfg\_set\_address()

```
ATCA_STATUS ifacecfg_set_address (
    ATCAIfaceCfg * cfg,
    uint8_t addr,
    ATCAKitType kitiface )
```

Change the address of the selected device.

### Parameters

in	<i>cfg</i>	Interface configuration structure to update
in	<i>addr</i>	Desired address
in	<i>kitiface</i>	Optional parameter to set the kit iface type

#### 8.4.5.18 ifacetype\_is\_kit()

```
bool ifacetype_is_kit (
    ATCAIfaceType iface_type )
```

Check if the given interface is a "kit protocol" one.



**Returns**

true if the interface type is considered a kit

**8.4.5.19 initATCAIface()**

```
ATCA_STATUS initATCAIface (
    ATCAIfaceCfg * cfg,
    ATCAIface ca_iface )
```

Initializer for ATCAIface objects.

**Parameters**

in	<i>cfg</i>	Logical configuration for the interface
in	<i>ca_iface</i>	Interface structure to initialize.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.4.5.20 newATCAIface()**

```
ATCAIface newATCAIface (
    ATCAIfaceCfg * cfg )
```

Constructor for ATCAIface objects.

**Parameters**

in	<i>cfg</i>	Logical configuration for the interface
----	------------	---

**Returns**

New interface instance on success. NULL on failure.

**8.4.5.21 releaseATCAIface()**

```
ATCA_STATUS releaseATCAIface (
    ATCAIface ca_iface )
```

Instruct the HAL driver to release any resources associated with this interface.

## 8.4 ATCAIface (atca\_)

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### Parameters

in	<i>ca_iface</i>	Device interface.
----	-----------------	-------------------

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 8.5 Certificate manipulation methods (atcacert\_)

These methods provide convenient ways to perform certification I/O with CryptoAuth chips and perform certificate manipulation in memory.

### Data Structures

- struct [atcacert\\_tm\\_utc\\_s](#)
- struct [atcacert\\_device\\_loc\\_s](#)
- struct [atcacert\\_cert\\_loc\\_s](#)
- struct [atcacert\\_cert\\_element\\_s](#)
- struct [atcacert\\_def\\_s](#)
- struct [atcacert\\_build\\_state\\_s](#)

### Macros

- #define [FALSE](#) (0)
- #define [TRUE](#) (1)
- #define [ATCACERT\\_E\\_SUCCESS](#) 0  
*Operation completed successfully.*
- #define [ATCACERT\\_E\\_ERROR](#) 1  
*General error.*
- #define [ATCACERT\\_E\\_BAD\\_PARAMS](#) 2  
*Invalid/bad parameter passed to function.*
- #define [ATCACERT\\_E\\_BUFFER\\_TOO\\_SMALL](#) 3  
*Supplied buffer for output is too small to hold the result.*
- #define [ATCACERT\\_E\\_DECODING\\_ERROR](#) 4  
*Data being decoded/parsed has an invalid format.*
- #define [ATCACERT\\_E\\_INVALID\\_DATE](#) 5  
*Date is invalid.*
- #define [ATCACERT\\_E\\_UNIMPLEMENTED](#) 6  
*Function is unimplemented for the current configuration.*
- #define [ATCACERT\\_E\\_UNEXPECTED\\_ELEM\\_SIZE](#) 7  
*A certificate element size was not what was expected.*
- #define [ATCACERT\\_E\\_ELEM\\_MISSING](#) 8  
*The certificate element isn't defined for the certificate definition.*
- #define [ATCACERT\\_E\\_ELEM\\_OUT\\_OF\\_BOUNDS](#) 9  
*Certificate element is out of bounds for the given certificate.*
- #define [ATCACERT\\_E\\_BAD\\_CERT](#) 10  
*Certificate structure is bad in some way.*
- #define [ATCACERT\\_E\\_WRONG\\_CERT\\_DEF](#) 11
- #define [ATCACERT\\_E\\_VERIFY\\_FAILED](#) 12  
*Certificate or challenge/response verification failed.*
- #define [ATCACERT\\_E\\_INVALID\\_TRANSFORM](#) 13  
*Invalid transform passed to function.*
- #define [DATEFMT\\_ISO8601\\_SEP](#) 0  
*ISO8601 full date YYYY-MM-DDThh:mm:ssZ.*
- #define [DATEFMT\\_RFC5280\\_UTC](#) 1  
*RFC 5280 (X.509) 4.1.2.5.1 UTCTime format YYMMDDhhmmssZ.*
- #define [DATEFMT\\_POSIX\\_UINT32\\_BE](#) 2

- POSIX (aka UNIX) date format. Seconds since Jan 1, 1970. 32 bit unsigned integer, big endian.*
- #define [DATEFMT\\_POSIX\\_UINT32\\_LE](#) 3
- POSIX (aka UNIX) date format. Seconds since Jan 1, 1970. 32 bit unsigned integer, little endian.*
- #define [DATEFMT\\_RFC5280\\_GEN](#) 4
- RFC 5280 (X.509) 4.1.2.5.2 GeneralizedTime format YYYYMMDDhhmmssZ.*
- #define [DATEFMT\\_ISO8601\\_SEP\\_SIZE](#) (20)
- #define [DATEFMT\\_RFC5280\\_UTC\\_SIZE](#) (13)
- #define [DATEFMT\\_POSIX\\_UINT32\\_BE\\_SIZE](#) (4)
- #define [DATEFMT\\_POSIX\\_UINT32\\_LE\\_SIZE](#) (4)
- #define [DATEFMT\\_RFC5280\\_GEN\\_SIZE](#) (15)
- #define [DATEFMT\\_MAX\\_SIZE](#) [DATEFMT\\_ISO8601\\_SEP\\_SIZE](#)
- #define [ATCACERT\\_DATE\\_FORMAT\\_SIZES\\_COUNT](#) 5
- #define [ATCA\\_PACKED](#)

### Typedefs

- typedef struct [atcacert\\_tm\\_utc\\_s](#) [atcacert\\_tm\\_utc\\_t](#)
- typedef uint8\_t [atcacert\\_date\\_format\\_t](#)
- typedef enum [atcacert\\_cert\\_type\\_e](#) [atcacert\\_cert\\_type\\_t](#)
- typedef enum [atcacert\\_cert\\_sn\\_src\\_e](#) [atcacert\\_cert\\_sn\\_src\\_t](#)
- typedef enum [atcacert\\_device\\_zone\\_e](#) [atcacert\\_device\\_zone\\_t](#)
- typedef enum [atcacert\\_transform\\_e](#) [atcacert\\_transform\\_t](#)
- How to transform the data from the device to the certificate.*
- typedef enum [atcacert\\_std\\_cert\\_element\\_e](#) [atcacert\\_std\\_cert\\_element\\_t](#)
- typedef struct [atcacert\\_device\\_loc\\_s](#) [atcacert\\_device\\_loc\\_t](#)
- typedef struct [atcacert\\_cert\\_loc\\_s](#) [atcacert\\_cert\\_loc\\_t](#)
- typedef struct [atcacert\\_cert\\_element\\_s](#) [atcacert\\_cert\\_element\\_t](#)
- typedef struct [atcacert\\_def\\_s](#) [atcacert\\_def\\_t](#)
- typedef struct [atcacert\\_build\\_state\\_s](#) [atcacert\\_build\\_state\\_t](#)

### Enumerations

- enum [atcacert\\_cert\\_type\\_e](#) { [CERTTYPE\\_X509](#), [CERTTYPE\\_CUSTOM](#) }
- enum [atcacert\\_cert\\_sn\\_src\\_e](#) {  
[SNSRC\\_STORED](#) = 0x0, [SNSRC\\_STORED\\_DYNAMIC](#) = 0x7, [SNSRC\\_DEVICE\\_SN](#) = 0x8, [SNSRC\\_SIGNER\\_ID](#) = 0x9,  
[SNSRC\\_PUB\\_KEY\\_HASH](#) = 0xA, [SNSRC\\_DEVICE\\_SN\\_HASH](#) = 0xB, [SNSRC\\_PUB\\_KEY\\_HASH\\_POS](#) = 0xC, [SNSRC\\_DEVICE\\_SN\\_HASH\\_POS](#) = 0xD,  
[SNSRC\\_PUB\\_KEY\\_HASH\\_RAW](#) = 0xE, [SNSRC\\_DEVICE\\_SN\\_HASH\\_RAW](#) = 0xF }
- enum [atcacert\\_device\\_zone\\_e](#) { [DEVZONE\\_CONFIG](#) = 0x00, [DEVZONE\\_OTP](#) = 0x01, [DEVZONE\\_DATA](#) = 0x02, [DEVZONE\\_NONE](#) = 0x07 }
- enum [atcacert\\_transform\\_e](#) {  
[TF\\_NONE](#), [TF\\_REVERSE](#), [TF\\_BIN2HEX\\_UC](#), [TF\\_BIN2HEX\\_LC](#),  
[TF\\_HEX2BIN\\_UC](#), [TF\\_HEX2BIN\\_LC](#), [TF\\_BIN2HEX\\_SPACE\\_UC](#), [TF\\_BIN2HEX\\_SPACE\\_LC](#),  
[TF\\_HEX2BIN\\_SPACE\\_UC](#), [TF\\_HEX2BIN\\_SPACE\\_LC](#) }
- How to transform the data from the device to the certificate.*
- enum [atcacert\\_std\\_cert\\_element\\_e](#) {  
[STDCERT\\_PUBLIC\\_KEY](#), [STDCERT\\_SIGNATURE](#), [STDCERT\\_ISSUE\\_DATE](#), [STDCERT\\_EXPIRE\\_DATE](#),  
[STDCERT\\_SIGNER\\_ID](#), [STDCERT\\_CERT\\_SN](#), [STDCERT\\_AUTH\\_KEY\\_ID](#), [STDCERT\\_SUBJ\\_KEY\\_ID](#),  
[STDCERT\\_NUM\\_ELEMENTS](#) }

## Functions

- int [atcacert\\_read\\_device\\_loc](#) (const [atcacert\\_device\\_loc\\_t](#) \*device\_loc, uint8\_t \*data)  
*Read the data from a device location.*
- int [atcacert\\_read\\_cert](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t ca\_public\_key[64], uint8\_t \*cert, size\_t \*cert\_size)  
*Reads the certificate specified by the certificate definition from the ATECC508A device.*
- int [atcacert\\_write\\_cert](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size)  
*Take a full certificate and write it to the ATECC508A device according to the certificate definition.*
- int [atcacert\\_create\\_csr](#) (const [atcacert\\_def\\_t](#) \*csr\_def, uint8\_t \*csr, size\_t \*csr\_size)  
*Creates a CSR specified by the CSR definition from the ATECC508A device. This process involves reading the dynamic CSR data from the device and combining it with the template found in the CSR definition, then signing it. Return the CSR in der format.*
- int [atcacert\\_create\\_csr\\_pem](#) (const [atcacert\\_def\\_t](#) \*csr\_def, char \*csr, size\_t \*csr\_size)  
*Creates a CSR specified by the CSR definition from the ATECC508A device. This process involves reading the dynamic CSR data from the device and combining it with the template found in the CSR definition, then signing it. Return the CSR in der format.*
- int [atcacert\\_get\\_response](#) (uint8\_t device\_private\_key\_slot, const uint8\_t challenge[32], uint8\_t \*response[64])  
*Calculates the response to a challenge sent from the host.*
- int [atcacert\\_read\\_subj\\_key\\_id](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t subj\_key\_id[20])  
*Reads the subject key ID based on a certificate definition.*
- int [atcacert\\_read\\_cert\\_size](#) (const [atcacert\\_def\\_t](#) \*cert\_def, size\_t \*cert\_size)  
*Return the actual certificate size in bytes for a given cert def. Certificate can be variable size, so this gives the absolute buffer size when reading the certificates.*
- int [atcacert\\_date\\_enc](#) ([atcacert\\_date\\_format\\_t](#) format, const [atcacert\\_tm\\_utc\\_t](#) \*timestamp, uint8\_t \*formatted\_date, size\_t \*formatted\_date\_size)  
*Format a timestamp according to the format type.*
- int [atcacert\\_date\\_dec](#) ([atcacert\\_date\\_format\\_t](#) format, const uint8\_t \*formatted\_date, size\_t formatted\_date\_size, [atcacert\\_tm\\_utc\\_t](#) \*timestamp)  
*Parse a formatted timestamp according to the specified format.*
- int [atcacert\\_date\\_enc\\_compcert](#) (const [atcacert\\_tm\\_utc\\_t](#) \*issue\_date, uint8\_t expire\_years, uint8\_t enc\_dates[3])  
*Encode the issue and expire dates in the format used by the compressed certificate.*
- int [atcacert\\_date\\_dec\\_compcert](#) (const uint8\_t enc\_dates[3], [atcacert\\_date\\_format\\_t](#) expire\_date\_format, [atcacert\\_tm\\_utc\\_t](#) \*issue\_date, [atcacert\\_tm\\_utc\\_t](#) \*expire\_date)  
*Decode the issue and expire dates from the format used by the compressed certificate.*
- int [atcacert\\_date\\_get\\_max\\_date](#) ([atcacert\\_date\\_format\\_t](#) format, [atcacert\\_tm\\_utc\\_t](#) \*timestamp)  
*Return the maximum date available for the given format.*
- int [atcacert\\_date\\_enc\\_iso8601\\_sep](#) (const [atcacert\\_tm\\_utc\\_t](#) \*timestamp, uint8\_t formatted\_date[(20)])
- int [atcacert\\_date\\_dec\\_iso8601\\_sep](#) (const uint8\_t formatted\_date[(20)], [atcacert\\_tm\\_utc\\_t](#) \*timestamp)
- int [atcacert\\_date\\_enc\\_rfc5280\\_utc](#) (const [atcacert\\_tm\\_utc\\_t](#) \*timestamp, uint8\_t formatted\_date[(13)])
- int [atcacert\\_date\\_dec\\_rfc5280\\_utc](#) (const uint8\_t formatted\_date[(13)], [atcacert\\_tm\\_utc\\_t](#) \*timestamp)
- int [atcacert\\_date\\_enc\\_rfc5280\\_gen](#) (const [atcacert\\_tm\\_utc\\_t](#) \*timestamp, uint8\_t formatted\_date[(15)])
- int [atcacert\\_date\\_dec\\_rfc5280\\_gen](#) (const uint8\_t formatted\_date[(15)], [atcacert\\_tm\\_utc\\_t](#) \*timestamp)
- int [atcacert\\_date\\_enc\\_posix\\_uint32\\_be](#) (const [atcacert\\_tm\\_utc\\_t](#) \*timestamp, uint8\_t formatted\_date[(4)])
- int [atcacert\\_date\\_dec\\_posix\\_uint32\\_be](#) (const uint8\_t formatted\_date[(4)], [atcacert\\_tm\\_utc\\_t](#) \*timestamp)
- int [atcacert\\_date\\_enc\\_posix\\_uint32\\_le](#) (const [atcacert\\_tm\\_utc\\_t](#) \*timestamp, uint8\_t formatted\_date[(4)])
- int [atcacert\\_date\\_dec\\_posix\\_uint32\\_le](#) (const uint8\_t formatted\_date[(4)], [atcacert\\_tm\\_utc\\_t](#) \*timestamp)
- int [atcacert\\_get\\_device\\_locs](#) (const [atcacert\\_def\\_t](#) \*cert\_def, [atcacert\\_device\\_loc\\_t](#) \*device\_locs, size\_t \*device\_locs\_count, size\_t device\_locs\_max\_count, size\_t block\_size)  
*Add all the device locations required to rebuild the specified certificate (cert\_def) to a device locations list.*
- int [atcacert\\_cert\\_build\\_start](#) ([atcacert\\_build\\_state\\_t](#) \*build\_state, const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t \*cert\_size, const uint8\_t ca\_public\_key[64])

*Starts the certificate rebuilding process.*

- int **atccert\_cert\_build\_process** (atccert\_build\_state\_t \*build\_state, const atccert\_device\_loc\_t \*device\_loc, const uint8\_t \*device\_data)

*Process information read from the ATECC device. If it contains information for the certificate, it will be incorporated into the certificate.*

- int **atccert\_cert\_build\_finish** (atccert\_build\_state\_t \*build\_state)

*Completes any final certificate processing required after all data from the device has been incorporated.*

- int **atccert\_get\_device\_data** (const atccert\_def\_t \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, const atccert\_device\_loc\_t \*device\_loc, uint8\_t \*device\_data)

*Gets the dynamic data that would be saved to the specified device location. This function is primarily used to break down a full certificate into the dynamic components to be saved to a device.*

- int **atccert\_set\_subj\_public\_key** (const atccert\_def\_t \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const uint8\_t subj\_public\_key[64])

*Sets the subject public key and subject key ID in a certificate.*

- int **atccert\_get\_subj\_public\_key** (const atccert\_def\_t \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t subj\_public\_key[64])

*Gets the subject public key from a certificate.*

- int **atccert\_get\_subj\_key\_id** (const atccert\_def\_t \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t subj\_key\_id[20])

*Gets the subject key ID from a certificate.*

- int **atccert\_set\_signature** (const atccert\_def\_t \*cert\_def, uint8\_t \*cert, size\_t \*cert\_size, size\_t max\_cert\_size, const uint8\_t signature[64])

*Sets the signature in a certificate. This may alter the size of the X.509 certificates.*

- int **atccert\_get\_signature** (const atccert\_def\_t \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t signature[64])

*Gets the signature from a certificate.*

- int **atccert\_set\_issue\_date** (const atccert\_def\_t \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const atccert\_tm\_utc\_t \*timestamp)

*Sets the issue date (notBefore) in a certificate. Will be formatted according to the date format specified in the certificate definition.*

- int **atccert\_get\_issue\_date** (const atccert\_def\_t \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, atccert\_tm\_utc\_t \*timestamp)

*Gets the issue date from a certificate. Will be parsed according to the date format specified in the certificate definition.*

- int **atccert\_set\_expire\_date** (const atccert\_def\_t \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const atccert\_tm\_utc\_t \*timestamp)

*Sets the expire date (notAfter) in a certificate. Will be formatted according to the date format specified in the certificate definition.*

- int **atccert\_get\_expire\_date** (const atccert\_def\_t \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, atccert\_tm\_utc\_t \*timestamp)

*Gets the expire date from a certificate. Will be parsed according to the date format specified in the certificate definition.*

- int **atccert\_set\_signer\_id** (const atccert\_def\_t \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const uint8\_t signer\_id[2])

*Sets the signer ID in a certificate. Will be formatted as 4 upper-case hex digits.*

- int **atccert\_get\_signer\_id** (const atccert\_def\_t \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t signer\_id[2])

*Gets the signer ID from a certificate. Will be parsed as 4 upper-case hex digits.*

- int **atccert\_set\_cert\_sn** (const atccert\_def\_t \*cert\_def, uint8\_t \*cert, size\_t \*cert\_size, size\_t max\_cert\_size, const uint8\_t \*cert\_sn, size\_t cert\_sn\_size)

*Sets the certificate serial number in a certificate.*

- int **atccert\_gen\_cert\_sn** (const atccert\_def\_t \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const uint8\_t device\_sn[9])

*Sets the certificate serial number by generating it from other information in the certificate using the scheme specified by sn\_source in cert\_def. See the.*

- int [atcacert\\_get\\_cert\\_sn](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t \*cert\_↵\_sn, size\_t \*cert\_sn\_size)  
*Gets the certificate serial number from a certificate.*
- int [atcacert\\_set\\_auth\\_key\\_id](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const uint8\_t auth\_public\_key[64])  
*Sets the authority key ID in a certificate. Note that this takes the actual public key creates a key ID from it.*
- int [atcacert\\_set\\_auth\\_key\\_id\\_raw](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const uint8\_t \*auth\_key\_id)  
*Sets the authority key ID in a certificate.*
- int [atcacert\\_get\\_auth\\_key\\_id](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t auth\_key\_id[20])  
*Gets the authority key ID from a certificate.*
- int [atcacert\\_set\\_comp\\_cert](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t \*cert\_size, size\_t max\_↵cert\_size, const uint8\_t comp\_cert[72])  
*Sets the signature, issue date, expire date, and signer ID found in the compressed certificate. This also checks fields common between the cert\_def and the compressed certificate to make sure they match.*
- int [atcacert\\_get\\_comp\\_cert](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t\_↵t comp\_cert[72])  
*Generate the compressed certificate for the given certificate.*
- int [atcacert\\_get\\_tbs](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, const uint8\_t \*\*tbs, size\_t \*tbs\_size)  
*Get a pointer to the TBS data in a certificate.*
- int [atcacert\\_get\\_tbs\\_digest](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t\_↵t tbs\_digest[32])  
*Get the SHA256 digest of certificate's TBS data.*
- int [atcacert\\_set\\_cert\\_element](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const [atcacert\\_cert\\_loc\\_t](#) \*cert\_loc, uint8\_t \*cert, size\_t cert\_size, const uint8\_t \*data, size\_t data\_size)  
*Sets an element in a certificate. The data\_size must match the size in cert\_loc.*
- int [atcacert\\_get\\_cert\\_element](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const [atcacert\\_cert\\_loc\\_t](#) \*cert\_loc, const uint8\_t \*cert, size\_t cert\_size, uint8\_t \*data, size\_t data\_size)  
*Gets an element from a certificate.*
- int [atcacert\\_get\\_key\\_id](#) (const uint8\_t public\_key[64], uint8\_t key\_id[20])  
*Calculates the key ID for a given public ECC P256 key.*
- int [atcacert\\_merge\\_device\\_loc](#) ([atcacert\\_device\\_loc\\_t](#) \*device\_locs, size\_t \*device\_locs\_count, size\_t\_↵t device\_locs\_max\_count, const [atcacert\\_device\\_loc\\_t](#) \*device\_loc, size\_t block\_size)  
*Merge a new device location into a list of device locations. If the new location overlaps with an existing location, the existing one will be modified to encompass both. Otherwise the new location is appended to the end of the list.*
- int [atcacert\\_is\\_device\\_loc\\_overlap](#) (const [atcacert\\_device\\_loc\\_t](#) \*device\_loc1, const [atcacert\\_device\\_loc\\_t](#) \*device\_loc2)  
*Determines if the two device locations overlap.*
- void [atcacert\\_public\\_key\\_add\\_padding](#) (const uint8\_t raw\_key[64], uint8\_t padded\_key[72])  
*Takes a raw P256 ECC public key and converts it to the padded version used by ATECC devices. Input and output buffers can point to the same location to do an in-place transform.*
- void [atcacert\\_public\\_key\\_remove\\_padding](#) (const uint8\_t padded\_key[72], uint8\_t raw\_key[64])  
*Takes a padded public key used by ATECC devices and converts it to a raw P256 ECC public key. Input and output buffers can point to the same location to do an in-place transform.*
- int [atcacert\\_transform\\_data](#) ([atcacert\\_transform\\_t](#) transform, const uint8\_t \*data, size\_t data\_size, uint8\_t \*destination, size\_t \*destination\_size)  
*Apply the specified transform to the specified data.*
- int [atcacert\\_max\\_cert\\_size](#) (const [atcacert\\_def\\_t](#) \*cert\_def, size\_t \*max\_cert\_size)  
*Return the maximum possible certificate size in bytes for a given cert def. Certificate can be variable size, so this gives an appropriate buffer size when reading the certificates.*
- int [atcacert\\_der\\_enc\\_length](#) (uint32\_t length, uint8\_t \*der\_length, size\_t \*der\_length\_size)

## 8.5 Certificate manipulation methods (atcacert\_)

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*Encode a length in DER format.*

- int [atcacert\\_der\\_dec\\_length](#) (const uint8\_t \*der\_length, size\_t \*der\_length\_size, uint32\_t \*length)

*Decode a DER format length.*

- int [atcacert\\_der\\_adjust\\_length](#) (uint8\_t \*der\_length, size\_t \*der\_length\_size, int delta\_length, uint32\_t \*new\_length)
- int [atcacert\\_der\\_enc\\_integer](#) (const uint8\_t \*int\_data, size\_t int\_data\_size, uint8\_t is\_unsigned, uint8\_t \*der\_int, size\_t \*der\_int\_size)

*Encode an ASN.1 integer in DER format, including tag and length fields.*

- int [atcacert\\_der\\_dec\\_integer](#) (const uint8\_t \*der\_int, size\_t \*der\_int\_size, uint8\_t \*int\_data, size\_t \*int\_data\_size)

*Decode an ASN.1 DER encoded integer.*

- int [atcacert\\_der\\_enc\\_ecdsa\\_sig\\_value](#) (const uint8\_t raw\_sig[64], uint8\_t \*der\_sig, size\_t \*der\_sig\_size)

*Formats a raw ECDSA P256 signature in the DER encoding found in X.509 certificates.*

- int [atcacert\\_der\\_dec\\_ecdsa\\_sig\\_value](#) (const uint8\_t \*der\_sig, size\_t \*der\_sig\_size, uint8\_t raw\_sig[64])

*Parses an ECDSA P256 signature in the DER encoding as found in X.509 certificates.*

- int [atcacert\\_verify\\_cert\\_hw](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, const uint8\_t ca\_public\_key[64])

*Verify a certificate against its certificate authority's public key using the host's ATECC device for crypto functions.*

- int [atcacert\\_gen\\_challenge\\_hw](#) (uint8\_t challenge[32])

*Generate a random challenge to be sent to the client using the RNG on the host's ATECC device.*

- int [atcacert\\_verify\\_response\\_hw](#) (const uint8\_t device\_public\_key[64], const uint8\_t challenge[32], const uint8\_t response[64])

*Verify a client's response to a challenge using the host's ATECC device for crypto functions.*

- int [atcacert\\_verify\\_cert\\_sw](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, const uint8\_t ca\_public\_key[64])

*Verify a certificate against its certificate authority's public key using software crypto functions. The function is currently not implemented.*

- int [atcacert\\_gen\\_challenge\\_sw](#) (uint8\_t challenge[32])

*Generate a random challenge to be sent to the client using a software PRNG. The function is currently not implemented.*

- int [atcacert\\_verify\\_response\\_sw](#) (const uint8\_t device\_public\_key[64], const uint8\_t challenge[32], const uint8\_t response[64])

*Verify a client's response to a challenge using software crypto functions. The function is currently not implemented.*

### Variables

- const size\_t [ATCACERT\\_DATE\\_FORMAT\\_SIZES](#) [5]

### 8.5.1 Detailed Description

These methods provide convenient ways to perform certification I/O with CryptoAuth chips and perform certificate manipulation in memory.

### 8.5.2 Macro Definition Documentation



### 8.5.2.1 ATCA\_PACKED

```
#define ATCA_PACKED
```

### 8.5.2.2 ATCACERT\_DATE\_FORMAT\_SIZES\_COUNT

```
#define ATCACERT_DATE_FORMAT_SIZES_COUNT 5
```

### 8.5.2.3 ATCACERT\_E\_BAD\_CERT

```
#define ATCACERT_E_BAD_CERT 10
```

Certificate structure is bad in some way.

### 8.5.2.4 ATCACERT\_E\_BAD\_PARAMS

```
#define ATCACERT_E_BAD_PARAMS 2
```

Invalid/bad parameter passed to function.

### 8.5.2.5 ATCACERT\_E\_BUFFER\_TOO\_SMALL

```
#define ATCACERT_E_BUFFER_TOO_SMALL 3
```

Supplied buffer for output is too small to hold the result.

### 8.5.2.6 ATCACERT\_E\_DECODING\_ERROR

```
#define ATCACERT_E_DECODING_ERROR 4
```

Data being decoded/parsed has an invalid format.

### 8.5.2.7 ATCACERT\_E\_ELEM\_MISSING

```
#define ATCACERT_E_ELEM_MISSING 8
```

The certificate element isn't defined for the certificate definition.

### 8.5.2.8 ATCACERT\_E\_ELEM\_OUT\_OF\_BOUNDS

```
#define ATCACERT_E_ELEM_OUT_OF_BOUNDS 9
```

Certificate element is out of bounds for the given certificate.

### 8.5.2.9 ATCACERT\_E\_ERROR

```
#define ATCACERT_E_ERROR 1
```

General error.

### 8.5.2.10 ATCACERT\_E\_INVALID\_DATE

```
#define ATCACERT_E_INVALID_DATE 5
```

Date is invalid.

### 8.5.2.11 ATCACERT\_E\_INVALID\_TRANSFORM

```
#define ATCACERT_E_INVALID_TRANSFORM 13
```

Invalid transform passed to function.

### 8.5.2.12 ATCACERT\_E\_SUCCESS

```
#define ATCACERT_E_SUCCESS 0
```

Operation completed successfully.

#### 8.5.2.13 ATCACERT\_E\_UNEXPECTED\_ELEM\_SIZE

```
#define ATCACERT_E_UNEXPECTED_ELEM_SIZE 7
```

A certificate element size was not what was expected.

#### 8.5.2.14 ATCACERT\_E\_UNIMPLEMENTED

```
#define ATCACERT_E_UNIMPLEMENTED 6
```

Function is unimplemented for the current configuration.

#### 8.5.2.15 ATCACERT\_E\_VERIFY\_FAILED

```
#define ATCACERT_E_VERIFY_FAILED 12
```

Certificate or challenge/response verification failed.

#### 8.5.2.16 ATCACERT\_E\_WRONG\_CERT\_DEF

```
#define ATCACERT_E_WRONG_CERT_DEF 11
```

#### 8.5.2.17 DATEFMT\_ISO8601\_SEP

```
#define DATEFMT_ISO8601_SEP 0
```

ISO8601 full date YYYY-MM-DDThh:mm:ssZ.

Date formats.

#### 8.5.2.18 DATEFMT\_ISO8601\_SEP\_SIZE

```
#define DATEFMT_ISO8601_SEP_SIZE (20)
```

#### 8.5.2.19 DATEFMT\_MAX\_SIZE

```
#define DATEFMT_MAX_SIZE DATEFMT\_ISO8601\_SEP\_SIZE
```

### 8.5.2.20 DATEFMT\_POSIX\_UINT32\_BE

```
#define DATEFMT_POSIX_UINT32_BE 2
```

POSIX (aka UNIX) date format. Seconds since Jan 1, 1970. 32 bit unsigned integer, big endian.

### 8.5.2.21 DATEFMT\_POSIX\_UINT32\_BE\_SIZE

```
#define DATEFMT_POSIX_UINT32_BE_SIZE (4)
```

### 8.5.2.22 DATEFMT\_POSIX\_UINT32\_LE

```
#define DATEFMT_POSIX_UINT32_LE 3
```

POSIX (aka UNIX) date format. Seconds since Jan 1, 1970. 32 bit unsigned integer, little endian.

### 8.5.2.23 DATEFMT\_POSIX\_UINT32\_LE\_SIZE

```
#define DATEFMT_POSIX_UINT32_LE_SIZE (4)
```

### 8.5.2.24 DATEFMT\_RFC5280\_GEN

```
#define DATEFMT_RFC5280_GEN 4
```

RFC 5280 (X.509) 4.1.2.5.2 GeneralizedTime format YYYYMMDDhhmmssZ.

### 8.5.2.25 DATEFMT\_RFC5280\_GEN\_SIZE

```
#define DATEFMT_RFC5280_GEN_SIZE (15)
```

### 8.5.2.26 DATEFMT\_RFC5280\_UTC

```
#define DATEFMT_RFC5280_UTC 1
```

RFC 5280 (X.509) 4.1.2.5.1 UTCTime format YYMMDDhhmmssZ.

#### 8.5.2.27 DATEFMT\_RFC5280.UTC\_SIZE

```
#define DATEFMT_RFC5280.UTC_SIZE (13)
```

#### 8.5.2.28 FALSE

```
#define FALSE (0)
```

#### 8.5.2.29 TRUE

```
#define TRUE (1)
```

### 8.5.3 Typedef Documentation

#### 8.5.3.1 atccert\_build\_state\_t

```
typedef struct atccert_build_state_s atccert_build_state_t
```

Tracks the state of a certificate as it's being rebuilt from device information.

#### 8.5.3.2 atccert\_cert\_element\_t

```
typedef struct atccert_cert_element_s atccert_cert_element_t
```

Defines a generic dynamic element for a certificate including the device and template locations.

#### 8.5.3.3 atccert\_cert\_loc\_t

```
typedef struct atccert_cert_loc_s atccert_cert_loc_t
```

Defines a chunk of data in a certificate template.

#### 8.5.3.4 atccert\_cert\_sn\_src\_t

```
typedef enum atccert_cert_sn_src_e atccert_cert_sn_src_t
```

Sources for the certificate serial number.

### 8.5.3.5 atcacert\_cert\_type\_t

```
typedef enum atcacert_cert_type_e atcacert_cert_type_t
```

Types of certificates.

### 8.5.3.6 atcacert\_date\_format\_t

```
typedef uint8_t atcacert_date_format_t
```

### 8.5.3.7 atcacert\_def\_t

```
typedef struct atcacert_def_s atcacert_def_t
```

Defines a certificate and all the pieces to work with it.

If any of the standard certificate elements (std\_cert\_elements) are not a part of the certificate definition, set their count to 0 to indicate their absence.

### 8.5.3.8 atcacert\_device\_loc\_t

```
typedef struct atcacert_device_loc_s atcacert_device_loc_t
```

Defines a chunk of data in an ATECC device.

### 8.5.3.9 atcacert\_device\_zone\_t

```
typedef enum atcacert_device_zone_e atcacert_device_zone_t
```

ATECC device zones. The values match the Zone Encodings as specified in the datasheet.

### 8.5.3.10 atcacert\_std\_cert\_element\_t

```
typedef enum atcacert_std_cert_element_e atcacert_std_cert_element_t
```

Standard dynamic certificate elements.

### 8.5.3.11 atcacert\_tm\_utc\_t

```
typedef struct atcacert_tm_utc_s atcacert_tm_utc_t
```

Holds a broken-down date in UTC. Mimics atcacert\_tm\_utc\_t from time.h.

#### 8.5.3.12 atcacert\_transform\_t

```
typedef enum atcacert_transform_e atcacert_transform_t
```

How to transform the data from the device to the certificate.

### 8.5.4 Enumeration Type Documentation

#### 8.5.4.1 atcacert\_cert\_sn\_src\_e

```
enum atcacert_cert_sn_src_e
```

Sources for the certificate serial number.

## 8.5 Certificate manipulation methods (atcacert\_)

### Enumerator

SNSRC_STORED	Cert serial is stored on the device.
SNSRC_STORED_DYNAMIC	Cert serial is stored on the device with the first byte being the DER size (X509 certs only).
SNSRC_DEVICE_SN	Cert serial number is 0x40(MSB) + 9-byte device serial number. Only applies to device certificates.
SNSRC_SIGNER_ID	Cert serial number is 0x40(MSB) + 2-byte signer ID. Only applies to signer certificates.
SNSRC_PUB_KEY_HASH	Cert serial number is the SHA256(Subject public key + Encoded dates), with uppermost 2 bits set to 01.
SNSRC_DEVICE_SN_HASH	Cert serial number is the SHA256(Device SN + Encoded dates), with uppermost 2 bits set to 01. Only applies to device certificates.
SNSRC_PUB_KEY_HASH_POS	Deprecated, don't use. Cert serial number is the SHA256(Subject public key + Encoded dates), with MSBit set to 0 to ensure it's positive.
SNSRC_DEVICE_SN_HASH_POS	Deprecated, don't use. Cert serial number is the SHA256(Device SN + Encoded dates), with MSBit set to 0 to ensure it's positive. Only applies to device certificates.
SNSRC_PUB_KEY_HASH_RAW	Deprecated, don't use. Cert serial number is the SHA256(Subject public key + Encoded dates).
SNSRC_DEVICE_SN_HASH_RAW	Deprecated, don't use. Cert serial number is the SHA256(Device SN + Encoded dates). Only applies to device certificates.

### 8.5.4.2 atcacert\_cert\_type\_e

enum `atcacert_cert_type_e`

Types of certificates.

### Enumerator

CERTTYPE_X509	Standard X509 certificate.
CERTTYPE_CUSTOM	Custom format.

### 8.5.4.3 atcacert\_device\_zone\_e

enum `atcacert_device_zone_e`

ATECC device zones. The values match the Zone Encodings as specified in the datasheet.

### Enumerator

DEVZONE_CONFIG	Configuration zone.
DEVZONE_OTP	One Time Programmable zone.
DEVZONE_DATA	Data zone (slots).
DEVZONE_NONE	Special value used to indicate there is no device location.



#### 8.5.4.4 atcacert\_std\_cert\_element\_e

enum `atcacert_std_cert_element_e`

Standard dynamic certificate elements.

##### Enumerator

STDCERT_PUBLIC_KEY	
STDCERT_SIGNATURE	
STDCERT_ISSUE_DATE	
STDCERT_EXPIRE_DATE	
STDCERT_SIGNER_ID	
STDCERT_CERT_SN	
STDCERT_AUTH_KEY_ID	
STDCERT_SUBJ_KEY_ID	
STDCERT_NUM_ELEMENTS	Special item to give the number of elements in this enum.

#### 8.5.4.5 atcacert\_transform\_e

enum `atcacert_transform_e`

How to transform the data from the device to the certificate.

##### Enumerator

TF_NONE	No transform, data is used byte for byte.
TF_REVERSE	Reverse the bytes (e.g. change endianness)
TF_BIN2HEX_UC	Convert raw binary into ASCII hex, uppercase.
TF_BIN2HEX_LC	Convert raw binary into ASCII hex, lowercase.
TF_HEX2BIN_UC	Convert ASCII hex, uppercase to binary.
TF_HEX2BIN_LC	Convert ASCII hex, lowercase to binary.
TF_BIN2HEX_SPACE_UC	Convert raw binary into ASCII hex, uppercase space between bytes.
TF_BIN2HEX_SPACE_LC	Convert raw binary into ASCII hex, lowercase space between bytes.
TF_HEX2BIN_SPACE_UC	Convert ASCII hex, uppercase with spaces between bytes to binary.
TF_HEX2BIN_SPACE_LC	Convert ASCII hex, lowercase with spaces between bytes to binary.

### 8.5.5 Function Documentation

## 8.5 Certificate manipulation methods (atcacert\_)

---

### 8.5.5.1 atcacert\_cert\_build\_finish()

```
int atcacert_cert_build_finish (
    atcacert_build_state_t * build_state )
```

Completes any final certificate processing required after all data from the device has been incorporated.

The final certificate and its size in bytes are contained in the cert and cert\_size elements of the build\_state structure. This will be the same buffers as supplied to the atcacert\_cert\_build\_start function at the beginning of the certificate rebuilding process.

#### Parameters

in	<i>build_state</i>	Current certificate build state.
----	--------------------	----------------------------------

#### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

### 8.5.5.2 atcacert\_cert\_build\_process()

```
int atcacert_cert_build_process (
    atcacert_build_state_t * build_state,
    const atcacert_device_loc_t * device_loc,
    const uint8_t * device_data )
```

Process information read from the ATECC device. If it contains information for the certificate, it will be incorporated into the certificate.

#### Parameters

in	<i>build_state</i>	Current certificate building state.
in	<i>device_loc</i>	Device location structure describing where on the device the following data came from.
in	<i>device_data</i>	Actual data from the device. It should represent the offset and byte count specified in the device_loc parameter.

#### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

### 8.5.5.3 atcacert\_cert\_build\_start()

```
int atcacert_cert_build_start (
    atcacert_build_state_t * build_state,
    const atcacert_def_t * cert_def,
```

```
uint8_t * cert,
size_t * cert_size,
const uint8_t ca_public_key[64] )
```

Starts the certificate rebuilding process.

#### Parameters

out	<i>build_state</i>	Structure is initialized to start the certificate building process. Will be passed to the other certificate building functions.
in	<i>cert_def</i>	Certificate definition for the certificate being built.
in	<i>cert</i>	Buffer to contain the rebuilt certificate.
in	<i>cert_size</i>	As input, the size of the cert buffer in bytes. This value will be adjusted to the current/final size of the certificate through the building process.
in	<i>ca_public_key</i>	ECC P256 public key of the certificate authority (issuer) for the certificate being built. Set to NULL if the authority key id is not needed, set properly in the cert_def template, or stored on the device as specified in the cert_def cert_elements.

#### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.4 atcacert\_create\_csr()

```
int atcacert_create_csr (
    const atcacert_def_t * csr_def,
    uint8_t * csr,
    size_t * csr_size )
```

Creates a CSR specified by the CSR definition from the ATECC508A device. This process involves reading the dynamic CSR data from the device and combining it with the template found in the CSR definition, then signing it. Return the CSR in der format.

#### Parameters

in	<i>csr_def</i>	CSR definition describing where to find the dynamic CSR information on the device and how to incorporate it into the template.
out	<i>csr</i>	Buffer to receive the CSR.
in, out	<i>csr_size</i>	As input, the size of the CSR buffer in bytes. As output, the size of the CSR returned in cert in bytes.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 8.5 Certificate manipulation methods (atcacert\_)

### 8.5.5.5 atcacert\_create\_csr\_pem()

```
int atcacert_create_csr_pem (
    const atcacert_def_t * csr_def,
    char * csr,
    size_t * csr_size )
```

Creates a CSR specified by the CSR definition from the ATECC508A device. This process involves reading the dynamic CSR data from the device and combining it with the template found in the CSR definition, then signing it. Return the CSR in der format.

#### Parameters

in	<i>csr_def</i>	CSR definition describing where to find the dynamic CSR information on the device and how to incorporate it into the template.
out	<i>csr</i>	Buffer to received the CSR formatted as PEM.
in, out	<i>csr_size</i>	As input, the size of the CSR buffer in bytes. As output, the size of the CSR as PEM returned in cert in bytes.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.5.5.6 atcacert\_date\_dec()

```
int atcacert_date_dec (
    atcacert_date_format_t format,
    const uint8_t * formatted_date,
    size_t formatted_date_size,
    atcacert_tm_utc_t * timestamp )
```

Parse a formatted timestamp according to the specified format.

#### Parameters

in	<i>format</i>	Format to parse the formatted date as.
in	<i>formatted_date</i>	Formatted date to be parsed.
in	<i>formatted_date_size</i>	Size of the formatted date in bytes.
out	<i>timestamp</i>	Parsed timestamp is returned here.

#### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

### 8.5.5.7 atcacert\_date\_dec\_compcert()

```
int atcacert_date_dec_compcert (
    const uint8_t enc_dates[3],
    atcacert_date_format_t expire_date_format,
    atcacert_tm_utc_t * issue_date,
    atcacert_tm_utc_t * expire_date )
```

Decode the issue and expire dates from the format used by the compressed certificate.

#### Parameters

in	<i>enc_dates</i>	Encoded date from the compressed certificate. 3 bytes.
in	<i>expire_date_format</i>	Expire date format. Only used to determine max date when no expiration date is specified by the encoded date.
out	<i>issue_date</i>	Decoded issue date is returned here.
out	<i>expire_date</i>	Decoded expire date is returned here. If there is no expiration date, the expire date will be set to a maximum value for the given <i>expire_date_format</i> .

#### Returns

0 on success

### 8.5.5.8 atcacert\_date\_dec\_iso8601\_sep()

```
int atcacert_date_dec_iso8601_sep (
    const uint8_t formatted_date[(20)],
    atcacert_tm_utc_t * timestamp )
```

### 8.5.5.9 atcacert\_date\_dec\_posix\_uint32\_be()

```
int atcacert_date_dec_posix_uint32_be (
    const uint8_t formatted_date[(4)],
    atcacert_tm_utc_t * timestamp )
```

### 8.5.5.10 atcacert\_date\_dec\_posix\_uint32\_le()

```
int atcacert_date_dec_posix_uint32_le (
    const uint8_t formatted_date[(4)],
    atcacert_tm_utc_t * timestamp )
```

## 8.5 Certificate manipulation methods (atcacert\_)

---

### 8.5.5.11 atcacert\_date\_dec\_rfc5280\_gen()

```
int atcacert_date_dec_rfc5280_gen (
    const uint8_t formatted_date[(15)],
    atcacert_tm_utc_t * timestamp )
```

### 8.5.5.12 atcacert\_date\_dec\_rfc5280\_utc()

```
int atcacert_date_dec_rfc5280_utc (
    const uint8_t formatted_date[(13)],
    atcacert_tm_utc_t * timestamp )
```

### 8.5.5.13 atcacert\_date\_enc()

```
int atcacert_date_enc (
    atcacert_date_format_t format,
    const atcacert_tm_utc_t * timestamp,
    uint8_t * formatted_date,
    size_t * formatted_date_size )
```

Format a timestamp according to the format type.

#### Parameters

in	<i>format</i>	Format to use.
in	<i>timestamp</i>	Timestamp to format.
out	<i>formatted_date</i>	Formatted date will be returned in this buffer.
in, out	<i>formatted_date_size</i>	As input, the size of the formatted_date buffer. As output, the size of the returned formatted_date.

#### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

### 8.5.5.14 atcacert\_date\_enc\_compcert()

```
int atcacert_date_enc_compcert (
    const atcacert_tm_utc_t * issue_date,
    uint8_t expire_years,
    uint8_t enc_dates[3] )
```

Encode the issue and expire dates in the format used by the compressed certificate.

## Parameters

in	<i>issue_date</i>	Issue date to encode. Note that minutes and seconds will be ignored.
in	<i>expire_years</i>	Expire date is expressed as a number of years past the issue date. 0 should be used if there is no expire date.
out	<i>enc_dates</i>	Encoded dates for use in the compressed certificate is returned here. 3 bytes.

## Returns

0 on success

**8.5.5.15 atcacert\_date\_enc\_iso8601\_sep()**

```
int atcacert_date_enc_iso8601_sep (
    const atcacert_tm_utc_t * timestamp,
    uint8_t formatted_date[ (20)] )
```

**8.5.5.16 atcacert\_date\_enc\_posix\_uint32\_be()**

```
int atcacert_date_enc_posix_uint32_be (
    const atcacert_tm_utc_t * timestamp,
    uint8_t formatted_date[ (4)] )
```

**8.5.5.17 atcacert\_date\_enc\_posix\_uint32\_le()**

```
int atcacert_date_enc_posix_uint32_le (
    const atcacert_tm_utc_t * timestamp,
    uint8_t formatted_date[ (4)] )
```

**8.5.5.18 atcacert\_date\_enc\_rfc5280\_gen()**

```
int atcacert_date_enc_rfc5280_gen (
    const atcacert_tm_utc_t * timestamp,
    uint8_t formatted_date[ (15)] )
```

## 8.5 Certificate manipulation methods (atcacert\_)

---

### 8.5.5.19 atcacert\_date\_enc\_rfc5280\_utc()

```
int atcacert_date_enc_rfc5280_utc (
    const atcacert_tm_utc_t * timestamp,
    uint8_t formatted_date[13] )
```

### 8.5.5.20 atcacert\_date\_get\_max\_date()

```
int atcacert_date_get_max_date (
    atcacert_date_format_t format,
    atcacert_tm_utc_t * timestamp )
```

Return the maximum date available for the given format.

#### Parameters

in	<i>format</i>	Format to get the max date for.
out	<i>timestamp</i>	Max date is returned here.

#### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

### 8.5.5.21 atcacert\_der\_adjust\_length()

```
int atcacert_der_adjust_length (
    uint8_t * der_length,
    size_t * der_length_size,
    int delta_length,
    uint32_t * new_length )
```

### 8.5.5.22 atcacert\_der\_dec\_ecdsa\_sig\_value()

```
int atcacert_der_dec_ecdsa_sig_value (
    const uint8_t * der_sig,
    size_t * der_sig_size,
    uint8_t raw_sig[64] )
```

Parses an ECDSA P256 signature in the DER encoding as found in X.509 certificates.

This will parse the DER encoding of the signatureValue field as found in an X.509 certificate (RFC 5280). x509\_sig should include the tag, length, and value. The value of the signatureValue is the DER encoding of the ECDSA-Sig-Value as specified by RFC 5480 and SECG SEC1.



## Parameters

in	<i>der_sig</i>	X.509 format signature (TLV of signatureValue) to be parsed.
in, out	<i>der_sig_size</i>	As input, size of the <i>der_sig</i> buffer in bytes. As output, size of the DER x.509 signature parsed from the buffer.
out	<i>raw_sig</i>	Parsed P256 ECDSA signature will be returned in this buffer. Formatted as R and S integers concatenated together. 64 bytes.

## Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

## 8.5.5.23 atcacert\_der\_dec\_integer()

```
int atcacert_der_dec_integer (
    const uint8_t * der_int,
    size_t * der_int_size,
    uint8_t * int_data,
    size_t * int_data_size )
```

Decode an ASN.1 DER encoded integer.

X.680 ( <http://www.itu.int/rec/T-REC-X.680/en>) section 19.8, for tag value X.690 ( <http://www.itu.int/rec/T-REC-X.690/en>) section 8.3, for encoding

## Parameters

in	<i>der_int</i>	DER encoded ASN.1 integer, including the tag and length fields.
in, out	<i>der_int_size</i>	As input, the size of the <i>der_int</i> buffer in bytes. As output, the size of the DER integer decoded in bytes.
out	<i>int_data</i>	Decode integer is returned in this buffer in a signed big-endian format.
in, out	<i>int_data_size</i>	As input, the size of <i>int_data</i> in bytes. As output, the size of the decoded integer in bytes.

## Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

## 8.5.5.24 atcacert\_der\_dec\_length()

```
int atcacert_der_dec_length (
    const uint8_t * der_length,
    size_t * der_length_size,
    uint32_t * length )
```

Decode a DER format length.

X.690 ( <http://www.itu.int/rec/T-REC-X.690/en>) section 8.1.3, for encoding

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### Parameters

in	<i>der_length</i>	DER encoded length.
in, out	<i>der_length_size</i>	As input, the size of the <i>der_length</i> buffer in bytes. As output, the size of the DER encoded length that was decoded.
out	<i>length</i>	Decoded length is returned here.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.25 atcacert\_der\_enc\_ecdsa\_sig\_value()

```
int atcacert_der_enc_ecdsa_sig_value (
    const uint8_t raw_sig[64],
    uint8_t * der_sig,
    size_t * der_sig_size )
```

Formats a raw ECDSA P256 signature in the DER encoding found in X.509 certificates.

This will return the DER encoding of the signatureValue field as found in an X.509 certificate (RFC 5280). This include the tag, length, and value. The value of the signatureValue is the DER encoding of the ECDSA-Sig-Value as specified by RFC 5480 and SECG SEC1.

### Parameters

in	<i>raw_sig</i>	P256 ECDSA signature to be formatted. Input format is R and S integers concatenated together. 64 bytes.
out	<i>der_sig</i>	X.509 format signature (TLV of signatureValue) will be returned in this buffer.
in, out	<i>der_sig_size</i>	As input, the size of the <i>x509_sig</i> buffer in bytes. As output, the size of the returned X.509 signature in bytes.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.26 atcacert\_der\_enc\_integer()

```
int atcacert_der_enc_integer (
    const uint8_t * int_data,
    size_t int_data_size,
    uint8_t is_unsigned,
    uint8_t * der_int,
    size_t * der_int_size )
```

Encode an ASN.1 integer in DER format, including tag and length fields.

X.680 ( <http://www.itu.int/rec/T-REC-X.680/en>) section 19.8, for tag value X.690 ( <http://www.itu.int/rec/T-REC-X.690/en>) section 8.3, for encoding

**Parameters**

in	<i>int_data</i>	Raw integer in big-endian format.
in	<i>int_data_size</i>	Size of the raw integer in bytes.
in	<i>is_unsigned</i>	Indicate whether the input integer should be treated as unsigned.
out	<i>der_int</i>	DER encoded integer is returned in this buffer.
in, out	<i>der_int_size</i>	As input, the size of the der_int buffer in bytes. As output, the size of the DER integer returned in bytes.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.27 atcacert\_der\_enc\_length()**

```
int atcacert_der_enc_length (
    uint32_t length,
    uint8_t * der_length,
    size_t * der_length_size )
```

Encode a length in DER format.

X.690 ( <http://www.itu.int/rec/T-REC-X.690/en>) section 8.1.3, for encoding

**Parameters**

in	<i>length</i>	Length to be encoded.
out	<i>der_length</i>	DER encoded length will returned in this buffer.
in, out	<i>der_length_size</i>	As input, size of der_length buffer in bytes. As output, the size of the DER length encoding in bytes.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.28 atcacert\_gen\_cert\_sn()**

```
int atcacert_gen_cert_sn (
    const atcacert_def_t * cert_def,
    uint8_t * cert,
    size_t cert_size,
    const uint8_t device_sn[9] )
```

Sets the certificate serial number by generating it from other information in the certificate using the scheme specified by sn\_source in cert\_def. See the.

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This method requires certain elements in the certificate be set properly as they're used for generating the serial number. See `atcacert_cert_sn_src_t` for what elements should be set in the certificate beforehand. If the `sn_source` is set to `SNSRC_STORED` or `SNSRC_STORED_DYNAMIC`, the function will return `ATCACERT_E_SUCCESS` without making any changes to the certificate.

### Parameters

in	<i>cert_def</i>	Certificate definition for the certificate.
in, out	<i>cert</i>	Certificate to update.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
in	<i>device_sn</i>	Device serial number, only used if required by the <code>sn_source</code> scheme. Can be set to NULL, if not required.

### Returns

`ATCACERT_E_SUCCESS` on success, otherwise an error code.

### 8.5.5.29 atcacert\_gen\_challenge\_hw()

```
int atcacert_gen_challenge_hw (  
    uint8_t challenge[32] )
```

Generate a random challenge to be sent to the client using the RNG on the host's ATECC device.

### Parameters

out	<i>challenge</i>	Random challenge is return here. 32 bytes.
-----	------------------	--

### Returns

`ATCACERT_E_SUCCESS` on success, otherwise an error code.

### 8.5.5.30 atcacert\_gen\_challenge\_sw()

```
int atcacert_gen_challenge_sw (  
    uint8_t challenge[32] )
```

Generate a random challenge to be sent to the client using a software PRNG. The function is currently not implemented.

### Parameters

out	<i>challenge</i>	Random challenge is return here. 32 bytes.
-----	------------------	--

**Returns**

ATCA\_UNIMPLEMENTED , as the function is currently not implemented.

**8.5.5.31 atcacert\_get\_auth\_key\_id()**

```
int atcacert_get_auth_key_id (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    uint8_t auth_key_id[20] )
```

Gets the authority key ID from a certificate.

**Parameters**

in	<i>cert_def</i>	Certificate definition for the certificate.
in	<i>cert</i>	Certificate to get element from.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
out	<i>auth_key_id</i>	Authority key ID is returned in this buffer. 20 bytes.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.32 atcacert\_get\_cert\_element()**

```
int atcacert_get_cert_element (
    const atcacert_def_t * cert_def,
    const atcacert_cert_loc_t * cert_loc,
    const uint8_t * cert,
    size_t cert_size,
    uint8_t * data,
    size_t data_size )
```

Gets an element from a certificate.

**Parameters**

in	<i>cert_def</i>	Certificate definition for the certificate.
in	<i>cert_loc</i>	Certificate location for this element.
in	<i>cert</i>	Certificate to get element from.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
out	<i>data</i>	Element data will be returned in this buffer. This buffer must be large enough to hold cert_loc.count bytes.
in	<i>data_size</i>	Expected size of the cert element data.

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---

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.33 atcacert\_get\_cert\_sn()

```
int atcacert_get_cert_sn (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    uint8_t * cert_sn,
    size_t * cert_sn_size )
```

Gets the certificate serial number from a certificate.

### Parameters

in	<i>cert_def</i>	Certificate definition for the certificate.
in	<i>cert</i>	Certificate to get element from.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
out	<i>cert_sn</i>	Certificate SN will be returned in this buffer.
in, out	<i>cert_sn_size</i>	As input, the size of the cert_sn buffer. As output, the size of the certificate SN (cert_sn) in bytes.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.34 atcacert\_get\_comp\_cert()

```
int atcacert_get_comp_cert (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    uint8_t comp_cert[72] )
```

Generate the compressed certificate for the given certificate.

### Parameters

in	<i>cert_def</i>	Certificate definition for the certificate.
in	<i>cert</i>	Certificate to generate the compressed certificate for.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
out	<i>comp_cert</i>	Compressed certificate is returned in this buffer. 72 bytes.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.35 atcacert\_get\_device\_data()**

```
int atcacert_get_device_data (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    const atcacert_device_loc_t * device_loc,
    uint8_t * device_data )
```

Gets the dynamic data that would be saved to the specified device location. This function is primarily used to break down a full certificate into the dynamic components to be saved to a device.

The atcacert\_add\_device\_locs function can be used to generate a list of device locations a particular certificate definition requires.

**Parameters**

in	<i>cert_def</i>	Certificate definition for the certificate we're getting data from.
in	<i>cert</i>	Certificate to get the device data from.
in	<i>cert_size</i>	Size of the certificate in bytes.
in	<i>device_loc</i>	Device location to request data for.
out	<i>device_data</i>	Buffer that represents the device data in device_loc. Required to be at least device_loc.count in size.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.36 atcacert\_get\_device\_locs()**

```
int atcacert_get_device_locs (
    const atcacert_def_t * cert_def,
    atcacert_device_loc_t * device_locs,
    size_t * device_locs_count,
    size_t device_locs_max_count,
    size_t block_size )
```

Add all the device locations required to rebuild the specified certificate (cert\_def) to a device locations list.

The block\_size parameter will adjust all added device locations to have a offset and count that aligns with that block size. This allows one to generate a list of device locations that matches specific read or write semantics (e.g. 4 byte or 32 byte reads).

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### Parameters

in	<i>cert_def</i>	Certificate definition containing all the device locations to add to the list.
in, out	<i>device_locs</i>	List of device locations to add to.
in, out	<i>device_locs_count</i>	As input, existing size of the device locations list. As output, the new size of the device locations list.
in	<i>device_locs_max_count</i>	Maximum number of elements device_locs can hold.
in	<i>block_size</i>	Block size to align all offsets and counts to when adding device locations.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.37 atcacert\_get\_expire\_date()

```
int atcacert_get_expire_date (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    atcacert_tm_utc_t * timestamp )
```

Gets the expire date from a certificate. Will be parsed according to the date format specified in the certificate definition.

### Parameters

in	<i>cert_def</i>	Certificate definition for the certificate.
in	<i>cert</i>	Certificate to get element from.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
out	<i>timestamp</i>	Expire date is returned in this structure.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.38 atcacert\_get\_issue\_date()

```
int atcacert_get_issue_date (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    atcacert_tm_utc_t * timestamp )
```

Gets the issue date from a certificate. Will be parsed according to the date format specified in the certificate definition.



**Parameters**

in	<i>cert_def</i>	Certificate definition for the certificate.
in	<i>cert</i>	Certificate to get element from.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
out	<i>timestamp</i>	Issue date is returned in this structure.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.39 atcacert\_get\_key\_id()**

```
int atcacert_get_key_id (
    const uint8_t public_key[64],
    uint8_t key_id[20] )
```

Calculates the key ID for a given public ECC P256 key.

Uses method 1 for calculating the keyIdentifier as specified by RFC 5280, section 4.2.1.2: (1) The keyIdentifier is composed of the 160-bit SHA-1 hash of the value of the BIT STRING subjectPublicKey (excluding the tag, length, and number of unused bits).

**Parameters**

in	<i>public_key</i>	ECC P256 public key to calculate key ID for. Formatted as the X and Y integers concatenated together. 64 bytes.
in	<i>key_id</i>	Calculated key ID will be returned in this buffer. 20 bytes.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.40 atcacert\_get\_response()**

```
int atcacert_get_response (
    uint8_t device_private_key_slot,
    const uint8_t challenge[32],
    uint8_t response[64] )
```

Calculates the response to a challenge sent from the host.

The challenge-response protocol is an ECDSA Sign and Verify. This performs the ECDSA Sign on the challenge and returns the signature as the response.

## 8.5 Certificate manipulation methods (atcacert\_)

### Parameters

in	<i>device_private_key_slot</i>	Slot number for the device's private key. This must be the same slot used to generate the public key included in the device's certificate.
in	<i>challenge</i>	Challenge to generate the response for. Must be 32 bytes.
out	<i>response</i>	Response will be returned in this buffer. 64 bytes.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.5.5.41 atcacert\_get\_signature()

```
int atcacert_get_signature (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    uint8_t signature[64] )
```

Gets the signature from a certificate.

### Parameters

in	<i>cert_def</i>	Certificate definition for the certificate.
in	<i>cert</i>	Certificate to get element from.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
out	<i>signature</i>	Signature is returned in this buffer. Formatted as R and S integers concatenated together. 64 bytes.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.42 atcacert\_get\_signer\_id()

```
int atcacert_get_signer_id (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    uint8_t signer_id[2] )
```

Gets the signer ID from a certificate. Will be parsed as 4 upper-case hex digits.

**Parameters**

in	<i>cert_def</i>	Certificate definition for the certificate.
in	<i>cert</i>	Certificate to get element from.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
out	<i>signer_id</i>	Signer ID will be returned in this buffer. 2 bytes.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.43 atcacert\_get\_subj\_key\_id()**

```
int atcacert_get_subj_key_id (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    uint8_t subj_key_id[20] )
```

Gets the subject key ID from a certificate.

**Parameters**

in	<i>cert_def</i>	Certificate definition for the certificate.
in	<i>cert</i>	Certificate to get element from.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
out	<i>subj_key_id</i>	Subject key ID is returned in this buffer. 20 bytes.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.44 atcacert\_get\_subj\_public\_key()**

```
int atcacert_get_subj_public_key (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    uint8_t subj_public_key[64] )
```

Gets the subject public key from a certificate.

## 8.5 Certificate manipulation methods (atcacert\_)

---

### Parameters

in	<i>cert_def</i>	Certificate definition for the certificate.
in	<i>cert</i>	Certificate to get element from.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
out	<i>subj_public_key</i>	Subject public key is returned in this buffer. Formatted at X and Y integers concatenated together. 64 bytes.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.45 atcacert\_get\_tbs()

```
int atcacert_get_tbs (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    const uint8_t ** tbs,
    size_t * tbs_size )
```

Get a pointer to the TBS data in a certificate.

### Parameters

in	<i>cert_def</i>	Certificate definition for the certificate.
in	<i>cert</i>	Certificate to get the TBS data pointer for.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
out	<i>tbs</i>	Pointer to a const pointer that will be set the start of the TBS data.
out	<i>tbs_size</i>	Size of the TBS data will be returned here.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.46 atcacert\_get\_tbs\_digest()

```
int atcacert_get_tbs_digest (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    uint8_t tbs_digest[32] )
```

Get the SHA256 digest of certificate's TBS data.

**Parameters**

in	<i>cert_def</i>	Certificate definition for the certificate.
in	<i>cert</i>	Certificate to get the TBS data pointer for.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
out	<i>tbs_digest</i>	TBS data digest will be returned here. 32 bytes.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.47 atcacert\_is\_device\_loc\_overlap()**

```
int atcacert_is_device_loc_overlap (
    const atcacert_device_loc_t * device_loc1,
    const atcacert_device_loc_t * device_loc2 )
```

Determines if the two device locations overlap.

**Parameters**

in	<i>device_loc1</i>	First device location to check.
in	<i>device_loc2</i>	Second device location o check.

**Returns**

0 (false) if they don't overlap, non-zero if the do overlap.

**8.5.5.48 atcacert\_max\_cert\_size()**

```
int atcacert_max_cert_size (
    const atcacert_def_t * cert_def,
    size_t * max_cert_size )
```

Return the maximum possible certificate size in bytes for a given cert def. Certificate can be variable size, so this gives an appropriate buffer size when reading the certificates.

**Parameters**

in	<i>cert_def</i>	Certificate definition to find a max size for.
out	<i>max_cert_size</i>	Maximum certificate size will be returned here in bytes.

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### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.49 atcacert\_merge\_device\_loc()

```
int atcacert_merge_device_loc (
    atcacert_device_loc_t * device_locs,
    size_t * device_locs_count,
    size_t device_locs_max_count,
    const atcacert_device_loc_t * device_loc,
    size_t block_size )
```

Merge a new device location into a list of device locations. If the new location overlaps with an existing location, the existing one will be modified to encompass both. Otherwise the new location is appended to the end of the list.

The `block_size` parameter will adjust all added device locations to have an offset and count that aligns with that block size. This allows one to generate a list of device locations that matches specific read/write semantics (e.g. 4 byte or 32 byte reads). Note that this `block_size` only applies to the `device_loc` being added. Existing device locations in the list won't be modified to match the block size.

### Parameters

in, out	<i>device_locs</i>	Existing device location list to merge the new device location into.
in, out	<i>device_locs_count</i>	As input, the existing number of items in the <code>device_locs</code> list. As output, the new size of the <code>device_locs</code> list.
in	<i>device_locs_max_count</i>	Maximum number of items the <code>device_locs</code> list can hold.
in	<i>device_loc</i>	New device location to be merged into the <code>device_locs</code> list.
in	<i>block_size</i>	Block size to align all offsets and counts to when adding device location.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.50 atcacert\_public\_key\_add\_padding()

```
void atcacert_public_key_add_padding (
    const uint8_t raw_key[64],
    uint8_t padded_key[72] )
```

Takes a raw P256 ECC public key and converts it to the padded version used by ATECC devices. Input and output buffers can point to the same location to do an in-place transform.

### Parameters

in	<i>raw_key</i>	Public key as X and Y integers concatenated together. 64 bytes.
out	<i>padded_key</i>	Padded key is returned in this buffer. X and Y integers are padded with 4 bytes of 0 in the MSB. 72 bytes.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.51 atcacert\_public\_key\_remove\_padding()**

```
void atcacert_public_key_remove_padding (
    const uint8_t padded_key[72],
    uint8_t raw_key[64] )
```

Takes a padded public key used by ATECC devices and converts it to a raw P256 ECC public key. Input and output buffers can point to the same location to do an in-place transform.

**Parameters**

out	<i>padded_key</i>	X and Y integers are padded with 4 bytes of 0 in the MSB. 72 bytes.
in	<i>raw_key</i>	Raw key is returned in this buffer. Public key as X and Y integers concatenated together. 64 bytes.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.52 atcacert\_read\_cert()**

```
int atcacert_read_cert (
    const atcacert_def_t * cert_def,
    const uint8_t ca_public_key[64],
    uint8_t * cert,
    size_t * cert_size )
```

Reads the certificate specified by the certificate definition from the ATECC508A device.

This process involves reading the dynamic cert data from the device and combining it with the template found in the certificate definition.

**Parameters**

in	<i>cert_def</i>	Certificate definition describing where to find the dynamic certificate information on the device and how to incorporate it into the template.
in	<i>ca_public_key</i>	The ECC P256 public key of the certificate authority that signed this certificate. Formatted as the 32 byte X and Y integers concatenated together (64 bytes total). Set to NULL if the authority key id is not needed, set properly in the cert_def template, or stored on the device as specified in the cert_def cert_elements.
out	<i>cert</i>	Buffer to received the certificate.
in, out	<i>cert_size</i>	As input, the size of the cert buffer in bytes. As output, the size of the certificate returned in cert in bytes.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.53 atcacert\_read\_cert\_size()

```
int atcacert_read_cert_size (
    const atcacert_def_t * cert_def,
    size_t * cert_size )
```

Return the actual certificate size in bytes for a given cert def. Certificate can be variable size, so this gives the absolute buffer size when reading the certificates.

### Parameters

in	<i>cert_def</i>	Certificate definition to find a max size for.
out	<i>cert_size</i>	Certificate size will be returned here in bytes.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.54 atcacert\_read\_device\_loc()

```
int atcacert_read_device_loc (
    const atcacert_device_loc_t * device_loc,
    uint8_t * data )
```

Read the data from a device location.

### Parameters

in	<i>device_loc</i>	Device location to read data from.
out	<i>data</i>	Data read is returned here.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.55 atcacert\_read\_subj\_key\_id()

```
int atcacert_read_subj_key_id (
    const atcacert_def_t * cert_def,
    uint8_t subj_key_id[20] )
```



Reads the subject key ID based on a certificate definition.

## 8.5 Certificate manipulation methods (atcacert\_)

### Parameters

in	<i>cert_def</i>	Certificate definition
out	<i>subj_key_id</i>	Subject key ID is returned in this buffer. 20 bytes.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.56 atcacert\_set\_auth\_key\_id()

```
int atcacert_set_auth_key_id (
    const atcacert_def_t * cert_def,
    uint8_t * cert,
    size_t cert_size,
    const uint8_t auth_public_key[64] )
```

Sets the authority key ID in a certificate. Note that this takes the actual public key creates a key ID from it.

### Parameters

in	<i>cert_def</i>	Certificate definition for the certificate.
in, out	<i>cert</i>	Certificate to update.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
in	<i>auth_public_key</i>	Authority public key as X and Y integers concatenated together. 64 bytes.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.57 atcacert\_set\_auth\_key\_id\_raw()

```
int atcacert_set_auth_key_id_raw (
    const atcacert_def_t * cert_def,
    uint8_t * cert,
    size_t cert_size,
    const uint8_t * auth_key_id )
```

Sets the authority key ID in a certificate.

### Parameters

in	<i>cert_def</i>	Certificate definition for the certificate.
in, out	<i>cert</i>	Certificate to update.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
in	<i>auth_key_id</i>	Authority key ID. Same size as defined in the cert_def.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.58 atcacert\_set\_cert\_element()**

```
int atcacert_set_cert_element (
    const atcacert_def_t * cert_def,
    const atcacert_cert_loc_t * cert_loc,
    uint8_t * cert,
    size_t cert_size,
    const uint8_t * data,
    size_t data_size )
```

Sets an element in a certificate. The data\_size must match the size in cert\_loc.

**Parameters**

in	<i>cert_def</i>	Certificate definition for the certificate.
in	<i>cert_loc</i>	Certificate location for this element.
in, out	<i>cert</i>	Certificate to update.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
in	<i>data</i>	Element data to insert into the certificate. Buffer must contain cert_loc.count bytes to be copied into the certificate.
in	<i>data_size</i>	Size of the data in bytes.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.59 atcacert\_set\_cert\_sn()**

```
int atcacert_set_cert_sn (
    const atcacert_def_t * cert_def,
    uint8_t * cert,
    size_t * cert_size,
    size_t max_cert_size,
    const uint8_t * cert_sn,
    size_t cert_sn_size )
```

Sets the certificate serial number in a certificate.

**Parameters**

in	<i>cert_def</i>	Certificate definition for the certificate.
in, out	<i>cert</i>	Certificate to update.
in, out	<i>cert_size</i>	Size of the certificate (cert) in bytes.
in	<i>max_cert_size</i>	Maximum size of the cert buffer.
in	<i>cert_sn</i>	Certificate serial number
in	<i>cert_sn_size</i>	Size of the certificate serial number in bytes.

## 8.5 Certificate manipulation methods (atcacert\_)

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

### 8.5.5.60 atcacert\_set\_comp\_cert()

```
int atcacert_set_comp_cert (
    const atcacert_def_t * cert_def,
    uint8_t * cert,
    size_t * cert_size,
    size_t max_cert_size,
    const uint8_t comp_cert[72] )
```

Sets the signature, issue date, expire date, and signer ID found in the compressed certificate. This also checks fields common between the cert\_def and the compressed certificate to make sure they match.

### Parameters

in	<i>cert_def</i>	Certificate definition for the certificate.
in, out	<i>cert</i>	Certificate to update.
in, out	<i>cert_size</i>	As input, size of the certificate (cert) in bytes. As output, the new size of the certificate.
in	<i>max_cert_size</i>	Maximum size of the cert buffer.
in	<i>comp_cert</i>	Compressed certificate. 72 bytes.

### Returns

ATCACERT\_E\_SUCCESS on success. ATCACERT\_E\_WRONG\_CERT\_DEF if the template ID, chain ID, and/or SN source don't match between the cert\_def and the compressed certificate.

### 8.5.5.61 atcacert\_set\_expire\_date()

```
int atcacert_set_expire_date (
    const atcacert_def_t * cert_def,
    uint8_t * cert,
    size_t cert_size,
    const atcacert_tm_utc_t * timestamp )
```

Sets the expire date (notAfter) in a certificate. Will be formatted according to the date format specified in the certificate definition.

### Parameters

in	<i>cert_def</i>	Certificate definition for the certificate.
in, out	<i>cert</i>	Certificate to update.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
in	<i>timestamp</i>	Expire date.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.62 atcacert\_set\_issue\_date()**

```
int atcacert_set_issue_date (
    const atcacert_def_t * cert_def,
    uint8_t * cert,
    size_t cert_size,
    const atcacert_tm_utc_t * timestamp )
```

Sets the issue date (notBefore) in a certificate. Will be formatted according to the date format specified in the certificate definition.

**Parameters**

in	<i>cert_def</i>	Certificate definition for the certificate.
in, out	<i>cert</i>	Certificate to update.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
in	<i>timestamp</i>	Issue date.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.63 atcacert\_set\_signature()**

```
int atcacert_set_signature (
    const atcacert_def_t * cert_def,
    uint8_t * cert,
    size_t * cert_size,
    size_t max_cert_size,
    const uint8_t signature[64] )
```

Sets the signature in a certificate. This may alter the size of the X.509 certificates.

**Parameters**

in	<i>cert_def</i>	Certificate definition for the certificate.
in, out	<i>cert</i>	Certificate to update.
in, out	<i>cert_size</i>	As input, size of the certificate (cert) in bytes. As output, the new size of the certificate.
in	<i>max_cert_size</i>	Maximum size of the cert buffer.
in	<i>signature</i>	Signature as R and S integers concatenated together. 64 bytes.

## 8.5 Certificate manipulation methods (atcacert\_)

---

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.64 atcacert\_set\_signer\_id()

```
int atcacert_set_signer_id (
    const atcacert_def_t * cert_def,
    uint8_t * cert,
    size_t cert_size,
    const uint8_t signer_id[2] )
```

Sets the signer ID in a certificate. Will be formatted as 4 upper-case hex digits.

### Parameters

in	<i>cert_def</i>	Certificate definition for the certificate.
in, out	<i>cert</i>	Certificate to update.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
in	<i>signer_id</i>	Signer ID.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 8.5.5.65 atcacert\_set\_subj\_public\_key()

```
int atcacert_set_subj_public_key (
    const atcacert_def_t * cert_def,
    uint8_t * cert,
    size_t cert_size,
    const uint8_t subj_public_key[64] )
```

Sets the subject public key and subject key ID in a certificate.

### Parameters

in	<i>cert_def</i>	Certificate definition for the certificate.
in, out	<i>cert</i>	Certificate to update.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
in	<i>subj_public_key</i>	Subject public key as X and Y integers concatenated together. 64 bytes.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.66 atccert\_transform\_data()**

```
int atccert_transform_data (
    atccert_transform_t transform,
    const uint8_t * data,
    size_t data_size,
    uint8_t * destination,
    size_t * destination_size )
```

Apply the specified transform to the specified data.

**Parameters**

in	<i>transform</i>	Transform to be performed.
in	<i>data</i>	Input data to be transformed.
in	<i>data_size</i>	Size of the input data in bytes.
out	<i>destination</i>	Destination buffer to hold the transformed data.
in, out	<i>destination_size</i>	As input, the size of the destination buffer. As output the size of the transformed data.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.5.5.67 atccert\_verify\_cert\_hw()**

```
int atccert_verify_cert_hw (
    const atccert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    const uint8_t ca_public_key[64] )
```

Verify a certificate against its certificate authority's public key using the host's ATECC device for crypto functions.

**Parameters**

in	<i>cert_def</i>	Certificate definition describing how to extract the TBS and signature components from the certificate specified.
in	<i>cert</i>	Certificate to verify.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
in	<i>ca_public_key</i>	The ECC P256 public key of the certificate authority that signed this certificate. Formatted as the 32 byte X and Y integers concatenated together (64 bytes total).

## 8.5 Certificate manipulation methods (atcacert\_)

### Returns

ATCACERT\_E\_SUCCESS if the verify succeeds, ATCACERT\_VERIFY\_FAILED or ATCA\_EXECUTION\_ERROR if it fails to verify. ATCA\_EXECUTION\_ERROR may occur when the public key is invalid and doesn't fall on the P256 curve.

### 8.5.5.68 atcacert\_verify\_cert\_sw()

```
int atcacert_verify_cert_sw (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size,
    const uint8_t ca_public_key[64] )
```

Verify a certificate against its certificate authority's public key using software crypto functions. The function is currently not implemented.

### Parameters

in	<i>cert_def</i>	Certificate definition describing how to extract the TBS and signature components from the certificate specified.
in	<i>cert</i>	Certificate to verify.
in	<i>cert_size</i>	Size of the certificate (cert) in bytes.
in	<i>ca_public_key</i>	The ECC P256 public key of the certificate authority that signed this certificate. Formatted as the 32 byte X and Y integers concatenated together (64 bytes total).

### Returns

ATCA\_UNIMPLEMENTED , as the function is currently not implemented.

### 8.5.5.69 atcacert\_verify\_response\_hw()

```
int atcacert_verify_response_hw (
    const uint8_t device_public_key[64],
    const uint8_t challenge[32],
    const uint8_t response[64] )
```

Verify a client's response to a challenge using the host's ATECC device for crypto functions.

The challenge-response protocol is an ECDSA Sign and Verify. This performs an ECDSA verify on the response returned by the client, verifying the client has the private key counter-part to the public key returned in its certificate.

### Parameters

in	<i>device_public_key</i>	Device public key as read from its certificate. Formatted as the X and Y integers concatenated together. 64 bytes.
in	<i>challenge</i>	Challenge that was sent to the client. 32 bytes.
in	<i>response</i>	Response returned from the client to be verified. 64 bytes.



**Returns**

ATCACERT\_E\_SUCCESS if the verify succeeds, ATCACERT\_VERIFY\_FAILED or ATCA\_EXECUTION\_ERROR if it fails to verify. ATCA\_EXECUTION\_ERROR may occur when the public key is invalid and doesn't fall on the P256 curve.

**8.5.5.70 atcacert\_verify\_response\_sw()**

```
int atcacert_verify_response_sw (
    const uint8_t device_public_key[64],
    const uint8_t challenge[32],
    const uint8_t response[64] )
```

Verify a client's response to a challenge using software crypto functions. The function is currently not implemented.

The challenge-response protocol is an ECDSA Sign and Verify. This performs an ECDSA verify on the response returned by the client, verifying the client has the private key counter-part to the public key returned in its certificate.

**Parameters**

in	<i>device_public_key</i>	Device public key as read from its certificate. Formatted as the X and Y integers concatenated together. 64 bytes.
in	<i>challenge</i>	Challenge that was sent to the client. 32 bytes.
in	<i>response</i>	Response returned from the client to be verified. 64 bytes.

**Returns**

ATCA\_UNIMPLEMENTED , as the function is currently not implemented.

**8.5.5.71 atcacert\_write\_cert()**

```
int atcacert_write_cert (
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size )
```

Take a full certificate and write it to the ATECC508A device according to the certificate definition.

**Parameters**

in	<i>cert_def</i>	Certificate definition describing where the dynamic certificate information is and how to store it on the device.
in	<i>cert</i>	Full certificate to be stored.
in	<i>cert_size</i>	Size of the full certificate in bytes.

## 8.5 Certificate manipulation methods (atcacert\_)

---

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

## 8.5.6 Variable Documentation

### 8.5.6.1 ATCACERT\_DATE\_FORMAT\_SIZES

```
const size_t ATCACERT_DATE_FORMAT_SIZES[5] [extern]
```

## 8.6 Basic Crypto API methods for CryptoAuth Devices (calib\_)

These methods provide a simple API to CryptoAuth chips.

### 8.6.0.1 calib directory - Purpose

The purpose of this directory is to contain the files implementing the APIs for a basic interface to the core CryptoAuthLib library.

High-level functions like these make it very convenient to use the library when standard configurations and defaults are in play. They are the easiest to use when developing examples or trying to understand the "flow" of an authentication operation without getting overwhelmed by the details.

This makes simple jobs easy and if you need more sophistication and power, you can employ the full power of the CryptoAuthLib object model.

See the Doxygen documentation in `cryptoauthlib/docs` for details on the API of the calib commands.

### Data Structures

- struct [atca\\_sha256\\_ctx](#)

### Typedefs

- typedef struct [atca\\_sha256\\_ctx](#) [atca\\_sha256\\_ctx\\_t](#)
- typedef [atca\\_sha256\\_ctx\\_t](#) [atca\\_hmac\\_sha256\\_ctx\\_t](#)

### Functions

- [ATCA\\_STATUS calib\\_wakeup](#) ([ATCADevice](#) device)  
*wakeup the CryptoAuth device*
- [ATCA\\_STATUS calib\\_idle](#) ([ATCADevice](#) device)  
*idle the CryptoAuth device*
- [ATCA\\_STATUS calib\\_sleep](#) ([ATCADevice](#) device)  
*invoke sleep on the CryptoAuth device*
- [ATCA\\_STATUS \\_calib\\_exit](#) ([ATCADevice](#) device)  
*common cleanup code which idles the device after any operation*
- [ATCA\\_STATUS calib\\_get\\_addr](#) (uint8\_t zone, uint16\_t slot, uint8\_t block, uint8\_t offset, uint16\_t \*addr)  
*Compute the address given the zone, slot, block, and offset.*
- [ATCA\\_STATUS calib\\_get\\_zone\\_size](#) ([ATCADevice](#) device, uint8\_t zone, uint16\_t slot, size\_t \*size)  
*Gets the size of the specified zone in bytes.*
- [ATCA\\_STATUS calib\\_ecc204\\_get\\_addr](#) (uint8\_t zone, uint16\_t slot, uint8\_t block, uint8\_t offset, uint16\_t \*addr)
- [ATCA\\_STATUS calib\\_is\\_locked](#) ([ATCADevice](#) device, uint8\_t zone, bool \*is\_locked)
- [ATCA\\_STATUS calib\\_is\\_locked\\_ext](#) ([ATCADevice](#) device, uint8\_t zone, bool \*is\_locked)
- [ATCA\\_STATUS calib\\_is\\_slot\\_locked](#) ([ATCADevice](#) device, uint16\_t slot, bool \*is\_locked)
- [ATCA\\_STATUS calib\\_is\\_private](#) ([ATCADevice](#) device, uint16\_t slot, bool \*is\_private)  
*Executes Read command, which reads the configuration zone to see if the specified slot is locked.*
- [ATCA\\_STATUS calib\\_ecc204\\_is\\_locked](#) ([ATCADevice](#) device, uint8\_t zone, bool \*is\_locked)

- `ATCA_STATUS calib_ecc204_is_data_locked` (`ATCADevice` device, `bool *is_locked`)
- `ATCA_STATUS calib_ecc204_is_config_locked` (`ATCADevice` device, `bool *is_locked`)
- `ATCADeviceType calib_get_devicetype` (`uint8_t` revision[4])  
*Parse the revision field to get the device type.*
- `ATCA_STATUS calib_info_base` (`ATCADevice` device, `uint8_t` mode, `uint16_t` param2, `uint8_t *out_data`)  
*Issues an Info command, which return internal device information and can control GPIO and the persistent latch.*
- `ATCA_STATUS calib_info` (`ATCADevice` device, `uint8_t *revision`)  
*Use the Info command to get the device revision (DevRev).*
- `ATCA_STATUS calib_info_privkey_valid` (`ATCADevice` device, `uint16_t` key\_id, `uint8_t *is_valid`)  
*Use Info command to check ECC Private key stored in key slot is valid or not.*
- `ATCA_STATUS calib_info_lock_status` (`ATCADevice` device, `uint16_t` param2, `uint8_t *is_locked`)

### 8.6.1 Detailed Description

These methods provide a simple API to CryptoAuth chips.

### 8.6.2 Typedef Documentation

#### 8.6.2.1 `atca_hmac_sha256_ctx_t`

```
typedef atca_sha256_ctx_t atca_hmac_sha256_ctx_t
```

#### 8.6.2.2 `atca_sha256_ctx_t`

```
typedef struct atca_sha256_ctx atca_sha256_ctx_t
```

### 8.6.3 Function Documentation

#### 8.6.3.1 `_calib_exit()`

```
ATCA_STATUS _calib_exit (  
    ATCADevice device )
```

common cleanup code which idles the device after any operation

#### Parameters

in	<code>device</code>	Device context pointer
----	---------------------	------------------------

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.6.3.2 calib\_ecc204\_get\_addr()**

```
ATCA_STATUS calib_ecc204_get_addr (
    uint8_t zone,
    uint16_t slot,
    uint8_t block,
    uint8_t offset,
    uint16_t * addr )
```

**8.6.3.3 calib\_ecc204\_is\_config\_locked()**

```
ATCA_STATUS calib_ecc204_is_config_locked (
    ATCADevice device,
    bool * is_locked )
```

**8.6.3.4 calib\_ecc204\_is\_data\_locked()**

```
ATCA_STATUS calib_ecc204_is_data_locked (
    ATCADevice device,
    bool * is_locked )
```

**8.6.3.5 calib\_ecc204\_is\_locked()**

```
ATCA_STATUS calib_ecc204_is_locked (
    ATCADevice device,
    uint8_t zone,
    bool * is_locked )
```

**8.6.3.6 calib\_get\_addr()**

```
ATCA_STATUS calib_get_addr (
    uint8_t zone,
    uint16_t slot,
    uint8_t block,
    uint8_t offset,
    uint16_t * addr )
```

Compute the address given the zone, slot, block, and offset.

### Parameters

in	<i>zone</i>	Zone to get address from. Config(0), OTP(1), or Data(2) which requires a slot.
in	<i>slot</i>	Slot Id number for data zone and zero for other zones.
in	<i>block</i>	Block number within the data or configuration or OTP zone .
in	<i>offset</i>	Offset Number within the block of data or configuration or OTP zone.
out	<i>addr</i>	Pointer to the address of data or configuration or OTP zone.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.6.3.7 calib\_get\_devicetype()

```
ATCADeviceType calib_get_devicetype (  
    uint8_t revision[4] )
```

Parse the revision field to get the device type.

#### 8.6.3.8 calib\_get\_zone\_size()

```
ATCA_STATUS calib_get_zone_size (  
    ATCADevice device,  
    uint8_t zone,  
    uint16_t slot,  
    size_t * size )
```

Gets the size of the specified zone in bytes.

### Parameters

in	<i>device</i>	Device context pointer
in	<i>zone</i>	Zone to get size information from. Config(0), OTP(1), or Data(2) which requires a slot.
in	<i>slot</i>	If zone is Data(2), the slot to query for size.
out	<i>size</i>	Zone size is returned here.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.6.3.9 calib\_idle()

```
ATCA_STATUS calib_idle (  
    ATCADevice device )
```

idle the CryptoAuth device

#### Parameters

in	<i>device</i>	Device context pointer
----	---------------	------------------------

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.6.3.10 calib\_info()

```
ATCA_STATUS calib_info (
    ATCADevice device,
    uint8_t * revision )
```

Use the Info command to get the device revision (DevRev).

#### Parameters

in	<i>device</i>	Device context pointer
out	<i>revision</i>	Device revision is returned here (4 bytes).

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.6.3.11 calib\_info\_base()

```
ATCA_STATUS calib_info_base (
    ATCADevice device,
    uint8_t mode,
    uint16_t param2,
    uint8_t * out_data )
```

Issues an Info command, which return internal device information and can control GPIO and the persistent latch.

#### Parameters

in	<i>device</i>	Device context pointer
in	<i>mode</i>	Selects which mode to be used for info command.
in	<i>param2</i>	Selects the particular fields for the mode.
out	<i>out_data</i>	Response from info command (4 bytes). Can be set to NULL if not required.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.6.3.12 calib\_info\_lock\_status()

```
ATCA_STATUS calib_info_lock_status (
    ATCADevice device,
    uint16_t param2,
    uint8_t * is_locked )
```

#### 8.6.3.13 calib\_info\_privkey\_valid()

```
ATCA_STATUS calib_info_privkey_valid (
    ATCADevice device,
    uint16_t key_id,
    uint8_t * is_valid )
```

Use Info command to check ECC Private key stored in key slot is valid or not.

### Parameters

in	<i>device</i>	Device context pointer
in	<i>key_id</i>	ECC private key slot id For ECC204, key_id is 0x00
out	<i>is_valid</i>	return private key is valid or invalid

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.6.3.14 calib\_is\_locked()

```
ATCA_STATUS calib_is_locked (
    ATCADevice device,
    uint8_t zone,
    bool * is_locked )
```

#### 8.6.3.15 calib\_is\_locked\_ext()

```
ATCA_STATUS calib_is_locked_ext (
    ATCADevice device,
    uint8_t zone,
    bool * is_locked )
```



### 8.6.3.16 calib\_is\_private()

```
ATCA_STATUS calib_is_private (
    ATCADevice device,
    uint16_t slot,
    bool * is_private )
```

Executes Read command, which reads the configuration zone to see if the specified slot is locked.

#### Parameters

in	<i>device</i>	Device context pointer
in	<i>slot</i>	Slot to query for locked (slot 0-15)
out	<i>is_locked</i>	Lock state returned here. True if locked.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

Check if a slot is a private key

#### Parameters

in	<i>device</i>	Device context pointer
in	<i>slot</i>	Slot to query (slot 0-15)
out	<i>is_private</i>	return true if private

#### Returns

ATCA\_SUCCESS on success, otherwise an error code

### 8.6.3.17 calib\_is\_slot\_locked()

```
ATCA_STATUS calib_is_slot_locked (
    ATCADevice device,
    uint16_t slot,
    bool * is_locked )
```

### 8.6.3.18 calib\_sleep()

```
ATCA_STATUS calib_sleep (
    ATCADevice device )
```

invoke sleep on the CryptoAuth device

## 8.6 Basic Crypto API methods for CryptoAuth Devices (calib\_)

---

### Parameters

in	<i>device</i>	Device context pointer
----	---------------	------------------------

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.6.3.19 calib\_wakeup()

```
ATCA_STATUS calib_wakeup (  
    ATCADevice device )
```

wakeup the CryptoAuth device

### Parameters

in	<i>device</i>	Device context pointer
----	---------------	------------------------

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 8.7 Software crypto methods (atcac\_)

These methods provide a software implementation of various crypto algorithms.

### 8.7.0.1 crypto directory - Purpose

This directory contains software implementations of cryptographic functions. The functions at the base level are wrappers that will point to the final implementations of the software crypto functions.

### Functions

- int [atcac\\_sw\\_sha1\\_init](#) ([atcac\\_sha1\\_ctx](#) \*ctx)  
*Initialize context for performing SHA1 hash in software.*
- int [atcac\\_sw\\_sha1\\_update](#) ([atcac\\_sha1\\_ctx](#) \*ctx, const uint8\_t \*data, size\_t data\_size)  
*Add data to a SHA1 hash.*
- int [atcac\\_sw\\_sha1\\_finish](#) ([atcac\\_sha1\\_ctx](#) \*ctx, uint8\_t digest[(20)])
- int [atcac\\_sw\\_sha1](#) (const uint8\_t \*data, size\_t data\_size, uint8\_t digest[(20)])
- int [atcac\\_sw\\_sha2\\_256\\_init](#) ([atcac\\_sha2\\_256\\_ctx](#) \*ctx)  
*Initialize context for performing SHA256 hash in software.*
- int [atcac\\_sw\\_sha2\\_256\\_update](#) ([atcac\\_sha2\\_256\\_ctx](#) \*ctx, const uint8\_t \*data, size\_t data\_size)  
*Add data to a SHA256 hash.*
- int [atcac\\_sw\\_sha2\\_256\\_finish](#) ([atcac\\_sha2\\_256\\_ctx](#) \*ctx, uint8\_t digest[(32)])
- int [atcac\\_sw\\_sha2\\_256](#) (const uint8\_t \*data, size\_t data\_size, uint8\_t digest[(32)])
- ATCA\_STATUS [atcac\\_sha256\\_hmac\\_init](#) ([atcac\\_hmac\\_sha256\\_ctx](#) \*ctx, const uint8\_t \*key, const uint8\_t key\_len)  
*Initialize context for performing HMAC (sha256) in software.*
- ATCA\_STATUS [atcac\\_sha256\\_hmac\\_update](#) ([atcac\\_hmac\\_sha256\\_ctx](#) \*ctx, const uint8\_t \*data, size\_t data\_size)  
*Update HMAC context with input data.*
- ATCA\_STATUS [atcac\\_sha256\\_hmac\\_finish](#) ([atcac\\_hmac\\_sha256\\_ctx](#) \*ctx, uint8\_t \*digest, size\_t \*digest\_len)  
*Finish CMAC calculation and clear the HMAC context.*
- ATCA\_STATUS [atcac\\_sha256\\_hmac\\_counter](#) ([atcac\\_hmac\\_sha256\\_ctx](#) \*ctx, uint8\_t \*label, size\_t label\_len, uint8\_t \*data, size\_t data\_len, uint8\_t \*digest, size\_t diglen)

### 8.7.1 Detailed Description

These methods provide a software implementation of various crypto algorithms.

### 8.7.2 Function Documentation

### 8.7.2.1 atcac\_sha256\_hmac\_counter()

```
ATCA_STATUS atcac_sha256_hmac_counter (
    atcac_hmac_sha256_ctx * ctx,
    uint8_t * label,
    size_t label_len,
    uint8_t * data,
    size_t data_len,
    uint8_t * digest,
    size_t diglen )
```

### 8.7.2.2 atcac\_sha256\_hmac\_finish()

```
ATCA_STATUS atcac_sha256_hmac_finish (
    atcac_hmac_sha256_ctx * ctx,
    uint8_t * digest,
    size_t * digest_len )
```

Finish CMAC calculation and clear the HMAC context.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	pointer to a sha256-hmac context
out	<i>digest</i>	hmac value
in, out	<i>digest_len</i>	length of hmac

### 8.7.2.3 atcac\_sha256\_hmac\_init()

```
ATCA_STATUS atcac_sha256_hmac_init (
    atcac_hmac_sha256_ctx * ctx,
    const uint8_t * key,
    const uint8_t key_len )
```

Initialize context for performing HMAC (sha256) in software.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	pointer to a sha256-hmac context
in	<i>key</i>	key value to use
in	<i>key_len</i>	length of the key

8.7.2.4 atcac\_sha256\_hmac\_update()

```
ATCA_STATUS atcac_sha256_hmac_update (
    atcac_hmac_sha256_ctx * ctx,
    const uint8_t * data,
    size_t data_size )
```

Update HMAC context with input data.

Returns

ATCA\_SUCCESS on success, otherwise an error code.

Parameters

in	<i>ctx</i>	pointer to a sha256-hmac context
in	<i>data</i>	input data
in	<i>data_size</i>	length of input data

8.7.2.5 atcac\_sw\_sha1()

```
int atcac_sw_shal (
    const uint8_t * data,
    size_t data_size,
    uint8_t digest[(20)] )
```

8.7.2.6 atcac\_sw\_sha1\_finish()

```
int atcac_sw_shal_finish (
    atcac_shal_ctx * ctx,
    uint8_t digest[(20)] )
```

8.7.2.7 atcac\_sw\_sha1\_init()

```
int atcac_sw_shal_init (
    atcac_shal_ctx * ctx )
```

Initialize context for performing SHA1 hash in software.

Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 8.7 Software crypto methods (atcac\_)

---

### Parameters

in	<i>ctx</i>	pointer to a hash context
----	------------	---------------------------

### 8.7.2.8 atcac\_sw\_sha1\_update()

```
int atcac_sw_sha1_update (
    atcac_sha1_ctx * ctx,
    const uint8_t * data,
    size_t data_size )
```

Add data to a SHA1 hash.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### Parameters

in	<i>ctx</i>	pointer to a hash context
in	<i>data</i>	input data buffer
in	<i>data_size</i>	input data length

### 8.7.2.9 atcac\_sw\_sha2\_256()

```
int atcac_sw_sha2_256 (
    const uint8_t * data,
    size_t data_size,
    uint8_t digest[(32)] )
```

### 8.7.2.10 atcac\_sw\_sha2\_256\_finish()

```
int atcac_sw_sha2_256_finish (
    atcac_sha2_256_ctx * ctx,
    uint8_t digest[(32)] )
```

8.7.2.11 `atcac_sw_sha2_256_init()`

```
int atcac_sw_sha2_256_init (
    atcac_sha2_256_ctx * ctx )
```

Initialize context for performing SHA256 hash in software.

Returns

ATCA\_SUCCESS on success, otherwise an error code.

Parameters

in	<i>ctx</i>	pointer to a hash context
----	------------	---------------------------

8.7.2.12 `atcac_sw_sha2_256_update()`

```
int atcac_sw_sha2_256_update (
    atcac_sha2_256_ctx * ctx,
    const uint8_t * data,
    size_t data_size )
```

Add data to a SHA256 hash.

Returns

ATCA\_SUCCESS on success, otherwise an error code.

Parameters

in	<i>ctx</i>	pointer to a hash context
in	<i>data</i>	input data buffer
in	<i>data_size</i>	input data length

## 8.8 Hardware abstraction layer (hal\_)

These methods define the hardware abstraction layer for communicating with a CryptoAuth device.

### 8.8.0.1 HAL Directory - Purpose

This directory contains all the Hardware Abstraction Layer (HAL) files used to adapt the upper levels of atca-ng and abstractions to physical hardware.

HAL contains physical implementations for I2C, SWI, SPI, UART and timers for specific hardware platforms.

**Include just those HAL files you require based on platform type.**

### Cryptoauthlib HAL Architecture

Cryptoauthlib has several intermediate conceptual layers

1. The highest layer of cryptoauthlib (outside of integration APIS) that may be used with an application is the `atcab_api` functions. These are general purpose functions that present a simple and consistent crypto interface to the application regardless of the device being used.
2. `calib_`, `talib_` APIs are the library functions behind `atcab_` ones that generate the correct command packets and process the received responses. Device specific logic is handled by the library here
3. `hal_` these functions perform the transmit/recieve of data for a given interface. These are split into sublayers
  - The HAL layer is the first hal layer that presents the interface expected by the higher level library. When using a native driver and no further interpretation is required this layer is all that is required.
  - The PHY layer if for hals that perform an interpretation or additional protocol logic. In this situation the HAL performs protocol interpretation while the phy performs the physical communication

**HAL and PHY Requirements** The hal and phy layers have the same construction. A hal or phy must have the following functions and their signatures

- `ATCA_STATUS hal_<name>init(ATCAIface iface, ATCAIfaceCfg *cfg);`
- `ATCA_STATUS hal_<name>post_init(ATCAIface iface);`
- `ATCA_STATUS hal_<name>send(ATCAIface iface, uint8_t address, uint8_t *txdata, int txlength);`
- `ATCA_STATUS hal_<name>receive(ATCAIface iface, uint8_t address, uint8_t *rxdata, uint16_t *rxlength);`
- `ATCA_STATUS hal_<name>control(ATCAIface iface, uint8_t option, void* param, size_t paramlen);`
- `ATCA_STATUS hal_<name>_release(void *hal_data);`

If the hal is a native driver no phy is required. See the tables below for which hal is required to be ported based on a configured interface

### CryptoAuthLib Supported HAL Layers



Device Interface	Physical Interface	HAL	PHY
i2c	i2c	hal_i2c	
	gpio	hal_i2c_gpio	hal_gpio
spi	spi	hal_spi	
swi	uart	hal_swi	hal_uart
	gpio	hal_swi_gpio	hal_gpio
any	uart	kit	hal_uart
	hid	kit	hal_hid
	any (user provided)	kit_bridge	

### Microchip Harmony 3 for all PIC32 & ARM products - Use the Harmony 3 Configurator to generate and configure projects

Obtain library and configure using [Harmony 3](#)

Interface	Files	API	Notes
I2C	<a href="#">hal_i2c_harmony.c</a>	plib.↔ h	For all Harmony 3 based projects
SPI	<a href="#">hal_spi_harmony.c</a>	plib.↔ h	
UART	<a href="#">hal_uart_harmony.c</a>	plib.↔ h	}

### Microchip 8 & 16 bit products - AVR, PIC16/18, PIC24/DSPIC

Obtain library and integration through [Microchip Code Configurator](#)

### OS & RTOS integrations

Use [CMake](#) to configure the library in Linux, Windows, and MacOS environments

OS	Interface	Files	API	Notes
Linux	I2C	<a href="#">hal_linux_i2c_userspace.c/h</a>	i2c-dev	
Linux	SPI	<a href="#">hal_linux_spi_userspace.c/h</a>	spidev	
Linux/Mac		<a href="#">hal_linux.c</a>		For all Linux/Mac projects
Windows		<a href="#">hal_windows.c</a>		For all Windows projects
All	kit-hid	<a href="#">hal_all_platforms_kit_hidapi.c/h</a>	hidapi	Works for Windows, Linux, and Mac
freeRTOS		<a href="#">hal_freertos.c</a>		freeRTOS common routines

### Legacy Support - [Atmel START](#) for AVR, ARM based processors (SAM)

Interface	Files	API	Notes
	<a href="#">hal_timer_start.c</a>	START	Timer implementation
I2C	<a href="#">hal_i2c_start.c/h</a>	START	
SWI	<a href="#">swi_uart_start.c/h</a>	START	SWI using UART

## Legacy Support - ASF3 for ARM Cortex-m0 &amp; Cortex-m based processors (SAM)

SAM Micros	Interface	Files	API	Notes
cortex-m0	I2C	<a href="#">hal_sam0_i2c_asf.c/h</a>	ASF3	SAMD21, SAMB11, etc
cortex-m3/4/7	I2C	<a href="#">hal_sam_i2c_asf.c/h</a>	ASF3	SAM4S, SAMG55, SAMV71, etc
all		<a href="#">hal_sam_timer_asf.c</a>	ASF3	Common timer hal for all platforms

## Data Structures

- struct [atca\\_hal\\_kit\\_phy\\_t](#)
- struct [i2c\\_start\\_instance](#)
- struct [atca\\_i2c\\_host\\_s](#)
- struct [i2c\\_sam\\_instance](#)
- struct [atcal2Cmaster](#)  
*this is the hal\_data for ATCA HAL for ASF SERCOM*
- struct [atcaSWImaster](#)  
*this is the hal\_data for ATCA HAL for ASF SERCOM*

## Macros

- #define [ATCA\\_POLLING\\_INIT\\_TIME\\_MSEC](#) 1
- #define [ATCA\\_POLLING\\_FREQUENCY\\_TIME\\_MSEC](#) 2
- #define [ATCA\\_POLLING\\_MAX\\_TIME\\_MSEC](#) 2500
- #define [MAX\\_I2C\\_BUSES](#) 3
- #define [KIT\\_MAX\\_SCAN\\_COUNT](#) 8
- #define [KIT\\_MAX\\_TX\\_BUF](#) 32
- #define [KIT\\_TX\\_WRAP\\_SIZE](#) (10)
- #define [KIT\\_MSG\\_SIZE](#) (32)
- #define [KIT\\_RX\\_WRAP\\_SIZE](#) (KIT\_MSG\_SIZE + 6)
- #define [MAX\\_SWI\\_BUSES](#) 6
- #define [RECEIVE\\_MODE](#) 0
- #define [TRANSMIT\\_MODE](#) 1
- #define [RX\\_DELAY](#) 10
- #define [TX\\_DELAY](#) 90
- #define [DEBUG\\_PIN\\_1](#) EXT2\_PIN\_5
- #define [DEBUG\\_PIN\\_2](#) EXT2\_PIN\_6
- #define [MAX\\_SWI\\_BUSES](#) 6
- #define [RECEIVE\\_MODE](#) 0
- #define [TRANSMIT\\_MODE](#) 1
- #define [RX\\_DELAY](#) 10
- #define [TX\\_DELAY](#) 93

## Typedefs

- typedef void(\* [start\\_change\\_baudrate](#)) (ATCAIface iface, uint32\_t speed)
- typedef struct [i2c\\_start\\_instance](#) [i2c\\_start\\_instance\\_t](#)
- typedef struct [atca\\_i2c\\_host\\_s](#) [atca\\_i2c\\_host\\_t](#)
- typedef void(\* [sam\\_change\\_baudrate](#)) (ATCAIface iface, uint32\_t speed)
- typedef struct [i2c\\_sam\\_instance](#) [i2c\\_sam\\_instance\\_t](#)
- typedef struct [atcal2Cmaster](#) [ATCAI2CMaster\\_t](#)  
*this is the hal\_data for ATCA HAL for ASF SERCOM*
- typedef struct [atcaSWImaster](#) [ATCASWIMaster\\_t](#)  
*this is the hal\_data for ATCA HAL for ASF SERCOM*
- typedef struct [atcaSWImaster](#) [ATCASWIMaster\\_t](#)  
*this is the hal\_data for ATCA HAL for ASF SERCOM*

## Enumerations

- enum `ATCA_HAL_CONTROL` {  
`ATCA_HAL_CONTROL_WAKE` = 0, `ATCA_HAL_CONTROL_IDLE` = 1, `ATCA_HAL_CONTROL_SLEEP` = 2, `ATCA_HAL_CONTROL_RESET` = 3,  
`ATCA_HAL_CONTROL_SELECT` = 4, `ATCA_HAL_CONTROL_DESELECT` = 5, `ATCA_HAL_CHANGE_BAUD` = 6, `ATCA_HAL_FLUSH_BUFFER` = 7,  
`ATCA_HAL_CONTROL_DIRECTION` = 8 }

## Functions

- `ATCA_STATUS hal_iface_init` (`ATCAIfaceCfg` \*, `ATCAHAL_t` \*\*hal, `ATCAHAL_t` \*\*phy)  
*Standard HAL API for ATCA to initialize a physical interface.*
- `ATCA_STATUS hal_iface_release` (`ATCAIfaceType`, void \*hal\_data)  
*releases a physical interface, HAL knows how to interpret hal\_data*
- `ATCA_STATUS hal_check_wake` (const uint8\_t \*response, int response\_size)  
*Utility function for hal\_wake to check the reply.*
- void `atca_delay_ms` (uint32\_t ms)  
*Timer API for legacy implementations.*
- void `atca_delay_us` (uint32\_t delay)  
*This function delays for a number of microseconds.*
- void `hal_rtos_delay_ms` (uint32\_t ms)  
*Timer API implemented at the HAL level.*
- void `hal_delay_ms` (uint32\_t delay)  
*This function delays for a number of milliseconds.*
- void `hal_delay_us` (uint32\_t delay)  
*This function delays for a number of microseconds.*
- `ATCA_STATUS hal_create_mutex` (void \*\*ppMutex, char \*pName)  
*Optional hal interfaces.*
- `ATCA_STATUS hal_destroy_mutex` (void \*pMutex)
- `ATCA_STATUS hal_lock_mutex` (void \*pMutex)
- `ATCA_STATUS hal_unlock_mutex` (void \*pMutex)
- `ATCA_STATUS hal_iface_register_hal` (`ATCAIfaceType` iface\_type, `ATCAHAL_t` \*hal, `ATCAHAL_t` \*\*old\_hal, `ATCAHAL_t` \*phy, `ATCAHAL_t` \*\*old\_phy)  
*Register/Replace a HAL with a.*
- uint8\_t `hal_is_command_word` (uint8\_t word\_address)  
*Utility function for hal\_wake to check the reply.*
- `ATCA_STATUS hal_kit_hid_init` (`ATCAIface` iface, `ATCAIfaceCfg` \*cfg)  
*HAL implementation of Kit USB HID init.*
- `ATCA_STATUS hal_kit_hid_post_init` (`ATCAIface` iface)  
*HAL implementation of Kit HID post init.*
- `ATCA_STATUS hal_kit_hid_send` (`ATCAIface` iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)  
*HAL implementation of kit protocol send over USB HID.*
- `ATCA_STATUS hal_kit_hid_receive` (`ATCAIface` iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxsize)  
*HAL implementation of send over USB HID.*
- `ATCA_STATUS hal_kit_hid_control` (`ATCAIface` iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations for the kit protocol.*
- `ATCA_STATUS hal_kit_hid_release` (void \*hal\_data)  
*Close the physical port for HID.*
- void \* `hal_malloc` (size\_t size)

- void [hal\\_free](#) (void \*ptr)
- [ATCA\\_STATUS hal\\_i2c\\_discover\\_buses](#) (int i2c\_buses[], int max\_buses)  
*discover i2c buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-prior knowledge*
- [ATCA\\_STATUS hal\\_i2c\\_discover\\_devices](#) (int bus\_num, [ATCAIfaceCfg](#) cfg[], int \*found)  
*discover any CryptoAuth devices on a given logical bus number*
- [ATCA\\_STATUS hal\\_i2c\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*hal\_i2c\_init manages requests to initialize a physical interface. it manages use counts so when an interface has released the physical layer, it will disable the interface for some other use. You can have multiple ATCAIface instances using the same bus, and you can have multiple ATCAIface instances on multiple i2c buses, so hal\_i2c\_init manages these things and ATCAIface is abstracted from the physical details.*
- [ATCA\\_STATUS hal\\_i2c\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of I2C post init.*
- [ATCA\\_STATUS hal\\_i2c\\_send](#) ([ATCAIface](#) iface, uint8\_t address, uint8\_t \*txdata, int txlength)  
*HAL implementation of I2C send over START.*
- [ATCA\\_STATUS hal\\_i2c\\_receive](#) ([ATCAIface](#) iface, uint8\_t address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*HAL implementation of I2C receive function for START I2C.*
- [ATCA\\_STATUS change\\_i2c\\_speed](#) ([ATCAIface](#) iface, uint32\_t speed)  
*method to change the bus speed of I2C*
- [ATCA\\_STATUS hal\\_i2c\\_control](#) ([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations for the kit protocol.*
- [ATCA\\_STATUS hal\\_i2c\\_release](#) (void \*hal\_data)  
*manages reference count on given bus and releases resource if no more references exist*
- [ATCA\\_STATUS hal\\_i2c\\_init](#) (void \*hal, [ATCAIfaceCfg](#) \*cfg)  
*hal\_i2c\_init manages requests to initialize a physical interface. it manages use counts so when an interface has released the physical layer, it will disable the interface for some other use. You can have multiple ATCAIface instances using the same bus, and you can have multiple ATCAIface instances on multiple i2c buses, so hal\_i2c\_init manages these things and ATCAIface is abstracted from the physical details.*
- [ATCA\\_STATUS hal\\_i2c\\_wake](#) ([ATCAIface](#) iface)  
*wake up CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_idle](#) ([ATCAIface](#) iface)  
*idle CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_sleep](#) ([ATCAIface](#) iface)  
*sleep CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_kit\\_attach\\_phy](#) ([ATCAIfaceCfg](#) \*cfg, [atca\\_hal\\_kit\\_phy\\_t](#) \*phy)  
*Helper function that connects a physical layer context structure that will be used by the kit protocol bridge.*
- [ATCA\\_STATUS hal\\_kit\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*HAL implementation of Kit USB HID init.*
- [ATCA\\_STATUS hal\\_kit\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of Kit HID post init.*
- [ATCA\\_STATUS hal\\_kit\\_send](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)  
*HAL implementation of kit protocol send over USB HID.*
- [ATCA\\_STATUS hal\\_kit\\_receive](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxsize)  
*HAL implementation of send over USB HID.*
- [ATCA\\_STATUS hal\\_kit\\_control](#) ([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)  
*Kit Protocol Control.*
- [ATCA\\_STATUS hal\\_kit\\_release](#) (void \*hal\_data)  
*Close the physical port for HID.*
- void [hal\\_delay\\_10us](#) (uint32\_t delay)  
*This function delays for a number of tens of microseconds.*
- void [atca\\_delay\\_10us](#) (uint32\_t delay)  
*This function delays for a number of tens of microseconds.*

- [ATCA\\_STATUS hal\\_spi\\_discover\\_buses](#) (int spi\_buses[], int max\_buses)  
*discover spi buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-priori knowledge*
- [ATCA\\_STATUS hal\\_spi\\_discover\\_devices](#) (int bus\_num, [ATCAIfaceCfg](#) cfg[], int \*found)  
*discover any TA100 devices on a given logical bus number*
- [ATCA\\_STATUS hal\\_spi\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*initialize an SPI interface using given config*
- [ATCA\\_STATUS hal\\_spi\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of SPI post init.*
- [ATCA\\_STATUS hal\\_spi\\_select](#) ([ATCAIface](#) iface)  
*HAL implementation to assert the device chip select.*
- [ATCA\\_STATUS hal\\_spi\\_deselect](#) ([ATCAIface](#) iface)  
*HAL implementation to deassert the device chip select.*
- [ATCA\\_STATUS hal\\_spi\\_send](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)  
*HAL implementation of SPI send over Harmony.*
- [ATCA\\_STATUS hal\\_spi\\_receive](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*HAL implementation of SPI receive function for HARMONY SPI.*
- [ATCA\\_STATUS hal\\_spi\\_control](#) ([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations for the kit protocol.*
- [ATCA\\_STATUS hal\\_spi\\_release](#) (void \*hal\_data)  
*manages reference count on given bus and releases resource if no more references exist*
- [ATCA\\_STATUS hal\\_swi\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*initialize an SWI interface using given config*
- [ATCA\\_STATUS hal\\_swi\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of SWI post init.*
- [ATCA\\_STATUS hal\\_swi\\_send](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)  
*HAL implementation of SWI send command over UART.*
- [ATCA\\_STATUS hal\\_swi\\_receive](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*HAL implementation of SWI receive function over UART.*
- [ATCA\\_STATUS hal\\_swi\\_wake](#) ([ATCAIface](#) iface)  
*Send Wake flag via SWI.*
- [ATCA\\_STATUS hal\\_swi\\_sleep](#) ([ATCAIface](#) iface)  
*Send Sleep flag via SWI.*
- [ATCA\\_STATUS hal\\_swi\\_idle](#) ([ATCAIface](#) iface)  
*Send Idle flag via SWI.*
- [ATCA\\_STATUS hal\\_swi\\_control](#) ([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations for the kit protocol.*
- [ATCA\\_STATUS hal\\_swi\\_release](#) (void \*hal\_data)  
*manages reference count on given bus and releases resource if no more references exist*
- char \* [strnchr](#) (const char \*s, size\_t count, int c)
- const char \* [kit\\_id\\_from\\_devtype](#) ([ATCADeviceType](#) devtype)
- const char \* [kit\\_interface\\_from\\_kittype](#) ([ATCAKitType](#) kittype)
- const char \* [kit\\_interface](#) ([ATCAKitType](#) kittype)
- [ATCA\\_STATUS kit\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)
- [ATCA\\_STATUS kit\\_post\\_init](#) ([ATCAIface](#) iface)
- [ATCA\\_STATUS kit\\_send](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)
- [ATCA\\_STATUS kit\\_receive](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxsize)
- [ATCA\\_STATUS kit\\_control](#) ([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)
- [ATCA\\_STATUS kit\\_release](#) (void \*hal\_data)
- [ATCA\\_STATUS kit\\_wrap\\_cmd](#) (const uint8\_t \*txdata, int txlength, char \*pkitbuf, int \*nkitbuf, const char \*target)

- `ATCA_STATUS kit_parse_rsp` (const char \*pkitbuf, int nkitbuf, uint8\_t \*kitstatus, uint8\_t \*rxdata, int \*nrxddata)
- `ATCA_STATUS kit_wake` (ATCAIface iface)
- `ATCA_STATUS kit_idle` (ATCAIface iface)
- `ATCA_STATUS kit_sleep` (ATCAIface iface)
- `ATCA_STATUS swi_uart_init` (ATCASWIMaster\_t \*instance)  
*Implementation of SWI UART init.*
- `ATCA_STATUS swi_uart_deinit` (ATCASWIMaster\_t \*instance)  
*Implementation of SWI UART deinit.*
- void `swi_uart_setbaud` (ATCASWIMaster\_t \*instance, uint32\_t baudrate)  
*implementation of SWI UART change baudrate.*
- void `swi_uart_mode` (ATCASWIMaster\_t \*instance, uint8\_t mode)  
*implementation of SWI UART change mode.*
- void `swi_uart_discover_buses` (int swi\_uart\_buses[], int max\_buses)  
*discover UART buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-priori knowledge*
- `ATCA_STATUS swi_uart_send_byte` (ATCASWIMaster\_t \*instance, uint8\_t data)  
*HAL implementation of SWI UART send byte over ASF. This function send one byte over UART.*
- `ATCA_STATUS swi_uart_receive_byte` (ATCASWIMaster\_t \*instance, uint8\_t \*data)  
*HAL implementation of SWI UART receive bytes over ASF. This function receive one byte over UART.*

### Variables

- struct port\_config `pin_conf`

### 8.8.1 Detailed Description

These methods define the hardware abstraction layer for communicating with a CryptoAuth device.

These methods define the hardware abstraction layer for communicating with a CryptoAuth device using SWI Interface.

These methods define the hardware abstraction layer for communicating with a TA100 device.

< Uncomment when debugging

These methods define the hardware abstraction layer for communicating with a CryptoAuth device using I2C driver of ASF.

### 8.8.2 Macro Definition Documentation

#### 8.8.2.1 ATCA\_POLLING\_FREQUENCY\_TIME\_MSEC

```
#define ATCA_POLLING_FREQUENCY_TIME_MSEC 2
```

### 8.8.2.2 ATCA\_POLLING\_INIT\_TIME\_MSEC

```
#define ATCA_POLLING_INIT_TIME_MSEC 1
```

### 8.8.2.3 ATCA\_POLLING\_MAX\_TIME\_MSEC

```
#define ATCA_POLLING_MAX_TIME_MSEC 2500
```

### 8.8.2.4 DEBUG\_PIN\_1

```
#define DEBUG_PIN_1 EXT2_PIN_5
```

### 8.8.2.5 DEBUG\_PIN\_2

```
#define DEBUG_PIN_2 EXT2_PIN_6
```

### 8.8.2.6 KIT\_MAX\_SCAN\_COUNT

```
#define KIT_MAX_SCAN_COUNT 8
```

### 8.8.2.7 KIT\_MAX\_TX\_BUF

```
#define KIT_MAX_TX_BUF 32
```

### 8.8.2.8 KIT\_MSG\_SIZE

```
#define KIT_MSG_SIZE (32)
```

### 8.8.2.9 KIT\_RX\_WRAP\_SIZE

```
#define KIT_RX_WRAP_SIZE (KIT_MSG_SIZE + 6)
```

### 8.8.2.10 KIT\_TX\_WRAP\_SIZE

```
#define KIT_TX_WRAP_SIZE (10)
```

### 8.8.2.11 MAX\_I2C\_BUSES

```
#define MAX_I2C_BUSES 3
```

### 8.8.2.12 MAX\_SWI\_BUSES [1/2]

```
#define MAX_SWI_BUSES 6
```

- this HAL implementation assumes you've included the ASF SERCOM UART libraries in your project, otherwise, the HAL layer will not compile because the ASF UART drivers are a dependency \*

### 8.8.2.13 MAX\_SWI\_BUSES [2/2]

```
#define MAX_SWI_BUSES 6
```

- this HAL implementation assumes you've included the ASF SERCOM UART libraries in your project, otherwise, the HAL layer will not compile because the ASF UART drivers are a dependency \*

### 8.8.2.14 RECEIVE\_MODE [1/2]

```
#define RECEIVE_MODE 0
```

### 8.8.2.15 RECEIVE\_MODE [2/2]

```
#define RECEIVE_MODE 0
```



**8.8.2.16 RX\_DELAY [1/2]**

```
#define RX_DELAY 10
```

**8.8.2.17 RX\_DELAY [2/2]**

```
#define RX_DELAY 10
```

**8.8.2.18 TRANSMIT\_MODE [1/2]**

```
#define TRANSMIT_MODE 1
```

**8.8.2.19 TRANSMIT\_MODE [2/2]**

```
#define TRANSMIT_MODE 1
```

**8.8.2.20 TX\_DELAY [1/2]**

```
#define TX_DELAY 90
```

**8.8.2.21 TX\_DELAY [2/2]**

```
#define TX_DELAY 93
```

**8.8.3 Typedef Documentation****8.8.3.1 atca\_i2c\_host\_t**

```
typedef struct atca\_i2c\_host\_s atca\_i2c\_host\_t
```

### 8.8.3.2 ATCAI2CMaster\_t

```
typedef struct atcaI2Cmaster ATCAI2CMaster_t
```

this is the hal\_data for ATCA HAL for ASF SERCOM

### 8.8.3.3 ATCASWIMaster\_t [1/2]

```
typedef struct atcaSWImaster ATCASWIMaster_t
```

this is the hal\_data for ATCA HAL for ASF SERCOM

### 8.8.3.4 ATCASWIMaster\_t [2/2]

```
typedef struct atcaSWImaster ATCASWIMaster_t
```

this is the hal\_data for ATCA HAL for ASF SERCOM

### 8.8.3.5 i2c\_sam\_instance\_t

```
typedef struct i2c_sam_instance i2c_sam_instance_t
```

### 8.8.3.6 i2c\_start\_instance\_t

```
typedef struct i2c_start_instance i2c_start_instance_t
```

### 8.8.3.7 sam\_change\_baudrate

```
typedef void(* sam_change_baudrate) (ATCAIface iface, uint32_t speed)
```

### 8.8.3.8 start\_change\_baudrate

```
typedef void(* start_change_baudrate) (ATCAIface iface, uint32_t speed)
```

## 8.8.4 Enumeration Type Documentation

### 8.8.4.1 ATCA\_HAL\_CONTROL

```
enum ATCA_HAL_CONTROL
```

## Enumerator

ATCA_HAL_CONTROL_WAKE	
ATCA_HAL_CONTROL_IDLE	
ATCA_HAL_CONTROL_SLEEP	
ATCA_HAL_CONTROL_RESET	
ATCA_HAL_CONTROL_SELECT	
ATCA_HAL_CONTROL_DESELECT	
ATCA_HAL_CHANGE_BAUD	
ATCA_HAL_FLUSH_BUFFER	
ATCA_HAL_CONTROL_DIRECTION	

## 8.8.5 Function Documentation

### 8.8.5.1 atca\_delay\_10us()

```
void atca_delay_10us (
    uint32_t delay )
```

This function delays for a number of tens of microseconds.

## Parameters

in	<i>delay</i>	number of 0.01 milliseconds to delay
----	--------------	--------------------------------------

### 8.8.5.2 atca\_delay\_ms()

```
void atca_delay_ms (
    uint32_t delay )
```

Timer API for legacy implementations.

This function delays for a number of milliseconds.

You can override this function if you like to do something else in your system while delaying.

## Parameters

in	<i>delay</i>	number of milliseconds to delay
----	--------------	---------------------------------

### 8.8.5.3 atca\_delay\_us()

```
void atca_delay_us (
    uint32_t delay )
```

This function delays for a number of microseconds.

#### Parameters

in	<i>delay</i>	number of 0.001 milliseconds to delay
in	<i>delay</i>	number of microseconds to delay

### 8.8.5.4 change\_i2c\_speed()

```
ATCA_STATUS change_i2c_speed (
    ATCAIface iface,
    uint32_t speed )
```

method to change the bus speed of I2C

method to change the bus speed of I2C

#### Parameters

in	<i>iface</i>	interface on which to change bus speed
in	<i>speed</i>	baud rate (typically 100000 or 400000)
in	<i>iface</i>	interface on which to change bus speed
in	<i>speed</i>	baud rate (typically 100000 or 400000)

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.8.5.5 hal\_check\_wake()

```
ATCA_STATUS hal_check_wake (
    const uint8_t * response,
    int response_size )
```

Utility function for hal\_wake to check the reply.

#### Parameters

in	<i>response</i>	Wake response to be checked.
in	<i>response_size</i>	Size of the response to check.

Returns

ATCA\_SUCCESS for expected wake, ATCA\_STATUS\_SELFTEST\_ERROR if the power on self test failed, ATCA\_WAKE\_FAILED for other failures.

8.8.5.6 hal\_create\_mutex()

```
ATCA_STATUS hal_create_mutex (
    void ** ppMutex,
    char * pName )
```

Optional hal interfaces.

Application callback for creating a mutex object.

Parameters

in, out	ppMutex	location to receive ptr to mutex
in, out	pName	String used to identify the mutex
	[IN/OUT] UT	ppMutex location to receive ptr to mutex
	[IN]	pName Name of the mutex for systems using named objects

8.8.5.7 hal\_delay\_10us()

```
void hal_delay_10us (
    uint32_t delay )
```

This function delays for a number of tens of microseconds.

Parameters

in	delay	number of 0.01 milliseconds to delay
----	-------	--------------------------------------

8.8.5.8 hal\_delay\_ms()

```
void hal_delay_ms (
    uint32_t delay )
```

This function delays for a number of milliseconds.

You can override this function if you like to do something else in your system while delaying.

### Parameters

in	<i>delay</i>	number of milliseconds to delay
----	--------------	---------------------------------

### 8.8.5.9 hal\_delay\_us()

```
void hal_delay_us (
    uint32_t delay )
```

This function delays for a number of microseconds.

### Parameters

in	<i>delay</i>	number of microseconds to delay
----	--------------	---------------------------------

### 8.8.5.10 hal\_destroy\_mutex()

```
ATCA_STATUS hal_destroy_mutex (
    void * pMutex )
```

### 8.8.5.11 hal\_free()

```
void hal_free (
    void * ptr )
```

### 8.8.5.12 hal\_i2c\_control()

```
ATCA_STATUS hal_i2c_control (
    ATCAIface iface,
    uint8_t option,
    void * param,
    size_t paramlen )
```

Perform control operations for the kit protocol.

### Parameters

in	<i>iface</i>	Interface to interact with.
in	<i>option</i>	Control parameter identifier
in	<i>param</i>	Optional pointer to parameter value
in	<i>paramlen</i>	Length of the parameter

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.8.5.13 hal\_i2c\_discover\_buses()**

```
ATCA_STATUS hal_i2c_discover_buses (
    int i2c_buses[],
    int max_buses )
```

discover i2c buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-prior knowledge

This HAL implementation assumes you've included the ASF TWI libraries in your project, otherwise, the HAL layer will not compile because the ASF TWI drivers are a dependency.

logical to physical bus mapping structure

discover i2c buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-priori knowledge

**Parameters**

in	<i>i2c_buses</i>	- an array of logical bus numbers
in	<i>max_buses</i>	- maximum number of buses the app wants to attempt to discover

**Returns**

ATCA\_SUCCESS

discover i2c buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-priori knowledge

**Parameters**

in	<i>i2c_buses</i>	- an array of logical bus numbers
in	<i>max_buses</i>	- maximum number of buses the app wants to attempt to discover

**Returns**

ATCA\_SUCCESS

discover i2c buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-priori knowledge

**Parameters**

in	<i>i2c_buses</i>	- an array of logical bus numbers
in	<i>max_buses</i>	- maximum number of buses the app wants to attempt to discover return ATCA_SUCCESS

### 8.8.5.14 hal\_i2c\_discover\_devices()

```
ATCA_STATUS hal_i2c_discover_devices (
    int bus_num,
    ATCAIfaceCfg cfg[],
    int * found )
```

discover any CryptoAuth devices on a given logical bus number

#### Parameters

in	<i>bus_num</i>	logical bus number on which to look for CryptoAuth devices
out	<i>cfg</i>	pointer to head of an array of interface config structures which get filled in by this method
out	<i>found</i>	number of devices found on this bus

#### Returns

ATCA\_SUCCESS

#### Parameters

in	<i>bus_num</i>	- logical bus number on which to look for CryptoAuth devices
out	<i>cfg[]</i>	- pointer to head of an array of interface config structures which get filled in by this method
out	<i>*found</i>	- number of devices found on this bus

#### Returns

ATCA\_SUCCESS

#### Parameters

in	<i>bus_num</i>	Logical bus number on which to look for CryptoAuth devices
out	<i>cfg</i>	Pointer to head of an array of interface config structures which get filled in by this method
out	<i>found</i>	Number of devices found on this bus

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.8.5.15 hal\_i2c\_idle()

```
ATCA_STATUS hal_i2c_idle (
    ATCAIface iface )
```

idle CryptoAuth device using I2C bus



Parameters

in	<i>iface</i>	interface to logical device to idle
----	--------------	-------------------------------------

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.8.5.16 hal\_i2c\_init() [1/2]

```
ATCA_STATUS hal_i2c_init (
    ATCAIFace iface,
    ATCAIFaceCfg * cfg )
```

hal\_i2c\_init manages requests to initialize a physical interface. it manages use counts so when an interface has released the physical layer, it will disable the interface for some other use. You can have multiple ATCAIFace instances using the same bus, and you can have multiple ATCAIFace instances on multiple i2c buses, so hal\_i2c\_init manages these things and ATCAIFace is abstracted from the physical details.

HAL implementation of I2C init.

- this HAL implementation assumes you've included the START Twi libraries in your project, otherwise, the HAL layer will not compile because the START TWI drivers are a dependency \*

initialize an I2C interface using given config

Parameters

in	<i>hal</i>	- opaque ptr to HAL data
in	<i>cfg</i>	- interface configuration

Returns

ATCA\_SUCCESS on success, otherwise an error code.

this implementation assumes I2C peripheral has been enabled by user. It only initialize an I2C interface using given config.

Parameters

in	<i>hal</i>	pointer to HAL specific data that is maintained by this HAL
in	<i>cfg</i>	pointer to HAL specific configuration data that is used to initialize this HAL

Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 8.8.5.17 hal\_i2c\_init() [2/2]

```
ATCA_STATUS hal_i2c_init (
    void * hal,
    ATCAIFaceCfg * cfg )
```

hal\_i2c\_init manages requests to initialize a physical interface. it manages use counts so when an interface has released the physical layer, it will disable the interface for some other use. You can have multiple ATCAIFace instances using the same bus, and you can have multiple ATCAIFace instances on multiple i2c buses, so hal\_i2c\_init manages these things and ATCAIFace is abstracted from the physical details.

hal\_i2c\_init manages requests to initialize a physical interface. It manages use counts so when an interface has released the physical layer, it will disable the interface for some other use. You can have multiple ATCAIFace instances using the same bus, and you can have multiple ATCAIFace instances on multiple i2c buses, so hal\_i2c\_init manages these things and ATCAIFace is abstracted from the physical details.

initialize an I2C interface using given config

- this HAL implementation assumes you've included the START Twi libraries in your project, otherwise, the HAL layer will not compile because the START TWI drivers are a dependency \*

initialize an I2C interface using given config

## Parameters

in	hal	- opaque ptr to HAL data
in	cfg	- interface configuration

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

- this HAL implementation assumes you've included the ASF SERCOM I2C libraries in your project, otherwise, the HAL layer will not compile because the ASF I2C drivers are a dependency \*

## Parameters

in	hal	- opaque ptr to HAL data
in	cfg	- interface configuration

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

initialize an I2C interface using given config

## Parameters

in	hal	- opaque ptr to HAL data
in	cfg	- interface configuration

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

- this HAL implementation assumes you've included the ASF Twi libraries in your project, otherwise, the HAL layer will not compile because the ASF TWI drivers are a dependency \*

initialize an I2C interface using given config

**Parameters**

in	<i>hal</i>	- opaque ptr to HAL data
in	<i>cfg</i>	- interface configuration

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.8.5.18 hal\_i2c\_post\_init()**

```
ATCA_STATUS hal_i2c_post_init (  
    ATCAIface iface )
```

HAL implementation of I2C post init.

**Parameters**

in	<i>iface</i>	instance
----	--------------	----------

**Returns**

ATCA\_SUCCESS

**Parameters**

in	<i>iface</i>	instance
----	--------------	----------

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**8.8.5.19 hal\_i2c\_receive()**

```
ATCA_STATUS hal_i2c_receive (  
    ATCAIface iface,
```

## 8.8 Hardware abstraction layer (hal\_)

---

```
uint8_t word_address,  
uint8_t * rxdata,  
uint16_t * rxlength )
```

HAL implementation of I2C receive function for START I2C.

HAL implementation of I2C receive function for ASF I2C.

HAL implementation of I2C receive function.

### Parameters

in	<i>iface</i>	Device to interact with.
in	<i>word_address</i>	device transaction type
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### Parameters

in	<i>iface</i>	Device to interact with.
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### Parameters

in	<i>iface</i>	Device to interact with.
in	<i>address</i>	device address
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### Parameters

in	<i>iface</i>	Device to interact with.
in	<i>word_address</i>	device word address
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.8.5.20 hal\_i2c\_release()

```
ATCA_STATUS hal_i2c_release (
    void * hal_data )
```

manages reference count on given bus and releases resource if no more refences exist

manages reference count on given bus and releases resource if no more refernces exist

Parameters

in	hal_data	- opaque pointer to hal data structure - known only to the HAL implementation
----	----------	---

Returns

ATCA\_SUCCESS on success, otherwise an error code.

Parameters

in	hal_data	- opaque pointer to hal data structure - known only to the HAL implementation return ATCA_SUCCESS
in	hal_data	- opaque pointer to hal data structure - known only to the HAL implementation

Returns

ATCA\_SUCCESS

8.8.5.21 hal\_i2c\_send()

```
ATCA_STATUS hal_i2c_send (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * txdata,
    int txlength )
```

HAL implementation of I2C send over START.

HAL implementation of I2C send over ASF.

HAL implementation of I2C send.

## 8.8 Hardware abstraction layer (hal\_)

---

### Parameters

in	<i>iface</i>	instance
in	<i>word_address</i>	device transaction type
in	<i>txdata</i>	pointer to space to bytes to send
in	<i>txlength</i>	number of bytes to send

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### Parameters

in	<i>iface</i>	instance
in	<i>txdata</i>	pointer to space to bytes to send
in	<i>txlength</i>	number of bytes to send

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### Parameters

in	<i>iface</i>	instance
in	<i>word_address</i>	device word address
in	<i>txdata</i>	pointer to space to bytes to send
in	<i>txlength</i>	number of bytes to send

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.8.5.22 hal\_i2c\_sleep()

```
ATCA_STATUS hal_i2c_sleep (
    ATCAIface iface )
```

sleep CryptoAuth device using I2C bus

### Parameters

in	<i>iface</i>	interface to logical device to sleep
----	--------------	--------------------------------------

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.8.5.23 hal\_i2c\_wake()

```
ATCA_STATUS hal_i2c_wake (
    ATCAIface iface )
```

wake up CryptoAuth device using I2C bus

Parameters

in	<i>iface</i>	interface to logical device to wakeup
----	--------------	---------------------------------------

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.8.5.24 hal\_iface\_init()

```
ATCA_STATUS hal_iface_init (
    ATCAIfaceCfg * cfg,
    ATCAHAL_t ** hal,
    ATCAHAL_t ** phy )
```

Standard HAL API for ATCA to initialize a physical interface.

Parameters

in	<i>cfg</i>	pointer to ATCAIfaceCfg object
in	<i>hal</i>	pointer to ATCAHAL_t intermediate data structure

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.8.5.25 hal\_iface\_register\_hal()

```
ATCA_STATUS hal_iface_register_hal (
    ATCAIfaceType iface_type,
    ATCAHAL_t * hal,
```

## 8.8 Hardware abstraction layer (hal\_)

---

```
ATCAHAL_t ** old_hal,  
ATCAHAL_t * phy,  
ATCAHAL_t ** old_phy )
```

Register/Replace a HAL with a.

### Parameters

in	<i>iface_type</i>	- the type of physical interface to register
in	<i>hal</i>	pointer to the new <a href="#">ATCAHAL_t</a> structure to register
out	<i>old</i>	pointer to the existing <a href="#">ATCAHAL_t</a> structure

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.8.5.26 hal\_iface\_release()

```
ATCA_STATUS hal_iface_release (  
    ATCAInterfaceType iface_type,  
    void * hal_data )
```

releases a physical interface, HAL knows how to interpret hal\_data

### Parameters

in	<i>iface_type</i>	- the type of physical interface to release
in	<i>hal_data</i>	- pointer to opaque hal data maintained by HAL implementation for this interface type

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.8.5.27 hal\_is\_command\_word()

```
uint8_t hal_is_command_word (  
    uint8_t word_address )
```

Utility function for hal\_wake to check the reply.

### Parameters

in	<i>word_address</i>	Command to check
----	---------------------	------------------



Returns

true if the word\_address is considered a command

8.8.5.28 hal\_kit\_attach\_phy()

```
ATCA_STATUS hal_kit_attach_phy (
    ATCAIfaceCfg * cfg,
    atca_hal_kit_phy_t * phy )
```

Helper function that connects a physical layer context structure that will be used by the kit protocol bridge.

Returns

ATCA\_STATUS

Parameters

<i>cfg</i>	[IN] Interface configuration structure
<i>phy</i>	[IN] Structure with physical layer interface functions and context

8.8.5.29 hal\_kit\_control()

```
ATCA_STATUS hal_kit_control (
    ATCAIface iface,
    uint8_t option,
    void * param,
    size_t paramlen )
```

Kit Protocol Control.

Parameters

in	<i>iface</i>	ATCAIface instance that is the interface object to send the bytes over
in	<i>option</i>	Control option to use

Returns

ATCA\_STATUS

8.8.5.30 hal\_kit\_hid\_control()

```
ATCA_STATUS hal_kit_hid_control (
    ATCAIface iface,
```

## 8.8 Hardware abstraction layer (hal\_)

---

```
uint8_t option,  
void * param,  
size_t paramlen )
```

Perform control operations for the kit protocol.

### Parameters

in	<i>iface</i>	Interface to interact with.
in	<i>option</i>	Control parameter identifier
in	<i>param</i>	Optional pointer to parameter value
in	<i>paramlen</i>	Length of the parameter

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.8.5.31 hal\_kit\_hid\_init()

```
ATCA_STATUS hal_kit_hid_init (  
    ATCAIface iface,  
    ATCAIfaceCfg * cfg )
```

HAL implementation of Kit USB HID init.

### Parameters

in	<i>hal</i>	pointer to HAL specific data that is maintained by this HAL
in	<i>cfg</i>	pointer to HAL specific configuration data that is used to initialize this HAL

### Returns

ATCA\_STATUS

### 8.8.5.32 hal\_kit\_hid\_post\_init()

```
ATCA_STATUS hal_kit_hid_post_init (  
    ATCAIface iface )
```

HAL implementation of Kit HID post init.

### Parameters

in	<i>iface</i>	instance
----	--------------	----------

Returns

ATCA\_STATUS

8.8.5.33 hal\_kit\_hid\_receive()

```
ATCA_STATUS hal_kit_hid_receive (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * rxdata,
    uint16_t * rxsize )
```

HAL implementation of send over USB HID.

Parameters

in	<i>iface</i>	instance
in	<i>word_address</i>	determine device transaction type
in	<i>rxdata</i>	pointer to space to receive the data
in, out	<i>rxsize</i>	ptr to expected number of receive bytes to request

Returns

ATCA\_STATUS

8.8.5.34 hal\_kit\_hid\_release()

```
ATCA_STATUS hal_kit_hid_release (
    void * hal_data )
```

Close the physical port for HID.

Parameters

in	<i>hal_data</i>	The hardware abstraction data specific to this HAL
----	-----------------	--

Returns

ATCA\_STATUS

8.8.5.35 hal\_kit\_hid\_send()

```
ATCA_STATUS hal_kit_hid_send (
    ATCAIface iface,
```

## 8.8 Hardware abstraction layer (hal\_)

---

```
uint8_t word_address,  
uint8_t * txdata,  
int txlength )
```

HAL implementation of kit protocol send over USB HID.

### Parameters

in	<i>iface</i>	instance
in	<i>word_address</i>	determine device transaction type
in	<i>txdata</i>	pointer to bytes to send
in	<i>txlength</i>	number of bytes to send

### Returns

ATCA\_STATUS

### 8.8.5.36 hal\_kit\_init()

```
ATCA_STATUS hal_kit_init (  
    ATCAIface iface,  
    ATCAIfaceCfg * cfg )
```

HAL implementation of Kit USB HID init.

### Parameters

in	<i>iface</i>	instance
in	<i>cfg</i>	pointer to HAL specific configuration data that is used to initialize this HAL

### Returns

ATCA\_STATUS

### 8.8.5.37 hal\_kit\_post\_init()

```
ATCA_STATUS hal_kit_post_init (  
    ATCAIface iface )
```

HAL implementation of Kit HID post init.

### Parameters

in	<i>iface</i>	instance
----	--------------	----------

Returns

ATCA\_STATUS

8.8.5.38 hal\_kit\_receive()

```
ATCA_STATUS hal_kit_receive (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * rxdata,
    uint16_t * rxsize )
```

HAL implementation of send over USB HID.

Parameters

in	<i>iface</i>	instance
in	<i>word_address</i>	determine device transaction type
in	<i>rxdata</i>	pointer to space to receive the data
in, out	<i>rxsize</i>	ptr to expected number of receive bytes to request

Returns

ATCA\_STATUS

8.8.5.39 hal\_kit\_release()

```
ATCA_STATUS hal_kit_release (
    void * hal_data )
```

Close the physical port for HID.

Parameters

in	<i>hal_data</i>	The hardware abstraction data specific to this HAL
----	-----------------	--

Returns

ATCA\_STATUS

8.8.5.40 hal\_kit\_send()

```
ATCA_STATUS hal_kit_send (
    ATCAIface iface,
```

## 8.8 Hardware abstraction layer (hal\_)

---

```
uint8_t word_address,  
uint8_t * txdata,  
int txlength )
```

HAL implementation of kit protocol send over USB HID.

### Parameters

in	<i>iface</i>	instance
in	<i>word_address</i>	determine device transaction type
in	<i>txdata</i>	pointer to bytes to send
in	<i>txlength</i>	number of bytes to send

### Returns

ATCA\_STATUS

#### 8.8.5.41 hal\_lock\_mutex()

```
ATCA_STATUS hal_lock_mutex (  
    void * pMutex )
```

#### 8.8.5.42 hal\_malloc()

```
void* hal_malloc (  
    size_t size )
```

#### 8.8.5.43 hal\_rtos\_delay\_ms()

```
void hal_rtos_delay_ms (  
    uint32_t delay )
```

Timer API implemented at the HAL level.

This function delays for a number of milliseconds.

You can override this function if you like to do something else in your system while delaying.

### Parameters

in	<i>delay</i>	Number of milliseconds to delay
----	--------------	---------------------------------

#### 8.8.5.44 hal\_spi\_control()

```
ATCA_STATUS hal_spi_control (
    ATCAIface iface,
    uint8_t option,
    void * param,
    size_t paramlen )
```

Perform control operations for the kit protocol.

##### Parameters

in	<i>iface</i>	Interface to interact with.
in	<i>option</i>	Control parameter identifier
in	<i>param</i>	Optional pointer to parameter value
in	<i>paramlen</i>	Length of the parameter

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.8.5.45 hal\_spi\_deselect()

```
ATCA_STATUS hal_spi_deselect (
    ATCAIface iface )
```

HAL implementation to deassert the device chip select.

##### Parameters

in	<i>iface</i>	Device to interact with.
----	--------------	--------------------------

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.8.5.46 hal\_spi\_discover\_buses()

```
ATCA_STATUS hal_spi_discover_buses (
    int spi_buses[],
    int max_buses )
```

discover spi buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-priori knowledge

## 8.8 Hardware abstraction layer (hal\_)

---

### Parameters

in	<i>spi_buses</i>	- an array of logical bus numbers
in	<i>max_buses</i>	- maximum number of buses the app wants to attempt to discover

### Returns

ATCA\_SUCCESS

### 8.8.5.47 hal\_spi\_discover\_devices()

```
ATCA_STATUS hal_spi_discover_devices (
    int bus_num,
    ATCAIfaceCfg cfg[],
    int * found )
```

discover any TA100 devices on a given logical bus number

### Parameters

in	<i>bus_num</i>	logical bus number on which to look for TA100 devices
out	<i>cfg</i>	pointer to head of an array of interface config structures which get filled in by this method
out	<i>found</i>	number of devices found on this bus

### Returns

ATCA\_SUCCESS

### 8.8.5.48 hal\_spi\_init()

```
ATCA_STATUS hal_spi_init (
    ATCAIface iface,
    ATCAIfaceCfg * cfg )
```

initialize an SPI interface using given config

### Parameters

in	<i>hal</i>	- opaque ptr to HAL data
in	<i>cfg</i>	- interface configuration

### Returns

ATCA\_SUCCESS on success, otherwise an error code.



8.8.5.49 hal\_spi\_post\_init()

```
ATCA_STATUS hal_spi_post_init (
    ATCAIface iface )
```

HAL implementation of SPI post init.

Parameters

in	iface	instance
----	-------	----------

Returns

ATCA\_SUCCESS

8.8.5.50 hal\_spi\_receive()

```
ATCA_STATUS hal_spi_receive (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * rxdata,
    uint16_t * rxlength )
```

HAL implementation of SPI receive function for HARMONY SPI.

Parameters

in	iface	Device to interact with.
in	word_address	device transaction type
out	rxdata	Data received will be returned here.
in, out	rxlength	As input, the size of the rxdata buffer. As output, the number of bytes received.

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.8.5.51 hal\_spi\_release()

```
ATCA_STATUS hal_spi_release (
    void * hal_data )
```

manages reference count on given bus and releases resource if no more refences exist

## 8.8 Hardware abstraction layer (hal\_)

---

### Parameters

in	<i>hal_data</i>	- opaque pointer to hal data structure - known only to the HAL implementation
----	-----------------	---

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.8.5.52 hal\_spi\_select()

```
ATCA_STATUS hal_spi_select (
    ATCAIface iface )
```

HAL implementation to assert the device chip select.

### Parameters

in	<i>iface</i>	Device to interact with.
----	--------------	--------------------------

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.8.5.53 hal\_spi\_send()

```
ATCA_STATUS hal_spi_send (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * txdata,
    int txlength )
```

HAL implementation of SPI send over Harmony.

### Parameters

in	<i>iface</i>	instance
in	<i>word_address</i>	device transaction type
in	<i>txdata</i>	pointer to space to bytes to send
in	<i>txlength</i>	number of bytes to send

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.8.5.54 hal\_swi\_control()

```
ATCA_STATUS hal_swi_control (
    ATCAIface iface,
    uint8_t option,
    void * param,
    size_t paramlen )
```

Perform control operations for the kit protocol.

Parameters

in	<i>iface</i>	Interface to interact with.
in	<i>option</i>	Control parameter identifier
in	<i>param</i>	Optional pointer to parameter value
in	<i>paramlen</i>	Length of the parameter

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.8.5.55 hal\_swi\_idle()

```
ATCA_STATUS hal_swi_idle (
    ATCAIface iface )
```

Send Idle flag via SWI.

Parameters

in	<i>iface</i>	interface of the logical device to idle
----	--------------	---

Returns

ATCA\_SUCCE

8.8.5.56 hal\_swi\_init()

```
ATCA_STATUS hal_swi_init (
    ATCAIface iface,
    ATCAIfaceCfg * cfg )
```

initialize an SWI interface using given config

## 8.8 Hardware abstraction layer (hal\_)

---

### Parameters

in	<i>hal</i>	- opaque ptr to HAL data
in	<i>cfg</i>	- interface configuration

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.8.5.57 hal\_swi\_post\_init()

```
ATCA_STATUS hal_swi_post_init (  
    ATCAIface iface )
```

HAL implementation of SWI post init.

### Parameters

in	<i>iface</i>	instance
----	--------------	----------

### Returns

ATCA\_SUCCESS

### 8.8.5.58 hal\_swi\_receive()

```
ATCA_STATUS hal_swi_receive (  
    ATCAIface iface,  
    uint8_t word_address,  
    uint8_t * rxdata,  
    uint16_t * rxlength )
```

HAL implementation of SWI receive function over UART.

### Parameters

in	<i>iface</i>	Device to interact with.
in	<i>word_address</i>	device transaction type
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.8.5.59 hal\_swi\_release()

```
ATCA_STATUS hal_swi_release (
    void * hal_data )
```

manages reference count on given bus and releases resource if no more refences exist

Parameters

in	hal_data	- opaque pointer to hal data structure - known only to the HAL implementation
----	----------	---

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.8.5.60 hal\_swi\_send()

```
ATCA_STATUS hal_swi_send (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * txdata,
    int txlength )
```

HAL implementation of SWI send command over UART.

Parameters

in	iface	instance
in	word_address	device transaction type
in	txdata	pointer to space to bytes to send
in	txlength	number of bytes to send

Returns

ATCA\_SUCCESS on success, otherwise an error code.

8.8.5.61 hal\_swi\_sleep()

```
ATCA_STATUS hal_swi_sleep (
    ATCAIface iface )
```

Send Sleep flag via SWI.

## 8.8 Hardware abstraction layer (hal\_)

---

### Parameters

in	<i>iface</i>	interface of the logical device to sleep
----	--------------	--

### Returns

ATCA\_SUCCESS

### 8.8.5.62 hal\_swi\_wake()

```
ATCA_STATUS hal_swi_wake (
    ATCAIface iface )
```

Send Wake flag via SWI.

### Parameters

in	<i>iface</i>	interface of the logical device to wake up
----	--------------	--

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.8.5.63 hal\_unlock\_mutex()

```
ATCA_STATUS hal_unlock_mutex (
    void * pMutex )
```

### 8.8.5.64 kit\_control()

```
ATCA_STATUS kit_control (
    ATCAIface iface,
    uint8_t option,
    void * param,
    size_t paramlen )
```

### 8.8.5.65 kit\_id\_from\_devtype()

```
const char * kit_id_from_devtype (
    ATCADeviceType devtype )
```

Kit Protocol is key

#### 8.8.5.66 kit\_idle()

```
ATCA_STATUS kit_idle (
    ATCAIface iface )
```

#### 8.8.5.67 kit\_init()

```
ATCA_STATUS kit_init (
    ATCAIface iface,
    ATCAIfaceCfg * cfg )
```

#### 8.8.5.68 kit\_interface()

```
const char * kit_interface (
    ATCAKitType kittype )
```

Kit parser physical interface string

#### 8.8.5.69 kit\_interface\_from\_kittype()

```
const char * kit_interface_from_kittype (
    ATCAKitType kittype )
```

Kit interface from device

#### 8.8.5.70 kit\_parse\_rsp()

```
ATCA_STATUS kit_parse_rsp (
    const char * pkitbuf,
    int nkitbuf,
    uint8_t * kitstatus,
    uint8_t * rxdata,
    int * nrxdata )
```

#### 8.8.5.71 kit\_post\_init()

```
ATCA_STATUS kit_post_init (
    ATCAIface iface )
```

### 8.8.5.72 kit\_receive()

```
ATCA_STATUS kit_receive (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * rxdata,
    uint16_t * rxsize )
```

### 8.8.5.73 kit\_release()

```
ATCA_STATUS kit_release (
    void * hal_data )
```

### 8.8.5.74 kit\_send()

```
ATCA_STATUS kit_send (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * txdata,
    int txlength )
```

### 8.8.5.75 kit\_sleep()

```
ATCA_STATUS kit_sleep (
    ATCAIface iface )
```

### 8.8.5.76 kit\_wake()

```
ATCA_STATUS kit_wake (
    ATCAIface iface )
```

### 8.8.5.77 kit\_wrap\_cmd()

```
ATCA_STATUS kit_wrap_cmd (
    const uint8_t * txdata,
    int txlength,
    char * pkitbuf,
    int * nkitbuf,
    const char * target )
```



8.8.5.78 strnchr()

```
char* strnchr (
    const char * s,
    size_t count,
    int c )
```

8.8.5.79 swi\_uart\_deinit()

```
ATCA_STATUS swi_uart_deinit (
    ATCASWIMaster_t * instance )
```

Implementation of SWI UART deinit.

HAL implementation of SWI UART deinit.

Parameters

in	<i>instance</i>	instance
----	-----------------	----------

Returns

ATCA\_SUCCESS on success, otherwise an error code.

Parameters

in	<i>instance</i>	instance
----	-----------------	----------

Returns

ATCA\_SUCCESS

8.8.5.80 swi\_uart\_discover\_buses()

```
void swi_uart_discover_buses (
    int swi_uart_buses[],
    int max_buses )
```

discover UART buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-priori knowledge

Parameters

in	<i>swi_uart_buses</i>	- an array of logical bus numbers
in	<i>max_buses</i>	- maximum number of buses the app wants to attempt to discover

### 8.8.5.81 swi\_uart\_init()

```
ATCA_STATUS swi_uart_init (
    ATCASWIMaster_t * instance )
```

Implementation of SWI UART init.

HAL implementation of SWI UART init.

- this HAL implementation assumes you've included the ASF SERCOM UART libraries in your project, otherwise, the HAL layer will not compile because the ASF UART drivers are a dependency \*

#### Parameters

in	<i>instance</i>	instance
----	-----------------	----------

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

- this HAL implementation assumes you've included the START SERCOM UART libraries in your project, otherwise, the HAL layer will not compile because the START UART drivers are a dependency \*

#### Parameters

in	<i>instance</i>	instance
----	-----------------	----------

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.8.5.82 swi\_uart\_mode()

```
void swi_uart_mode (
    ATCASWIMaster_t * instance,
    uint8_t mode )
```

implementation of SWI UART change mode.

HAL implementation of SWI UART change mode.

#### Parameters

in	<i>instance</i>	instance
in	<i>mode</i>	(TRANSMIT_MODE or RECEIVE_MODE)

#### 8.8.5.83 swi\_uart\_receive\_byte()

```
ATCA_STATUS swi_uart_receive_byte (
    ATCASWIMaster_t * instance,
    uint8_t * data )
```

HAL implementation of SWI UART receive bytes over ASF. This function receive one byte over UART.

##### Parameters

in	<i>instance</i>	instance
out	<i>data</i>	pointer to space to receive the data

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.8.5.84 swi\_uart\_send\_byte()

```
ATCA_STATUS swi_uart_send_byte (
    ATCASWIMaster_t * instance,
    uint8_t data )
```

HAL implementation of SWI UART send byte over ASF. This function send one byte over UART.

##### Parameters

in	<i>instance</i>	instance
in	<i>data</i>	number of byte to send

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 8.8.5.85 swi\_uart\_setbaud()

```
void swi_uart_setbaud (
    ATCASWIMaster_t * instance,
    uint32_t baudrate )
```

implementation of SWI UART change baudrate.

HAL implementation of SWI UART change baudrate.

### Parameters

in	<i>instance</i>	instance
in	<i>baudrate</i>	(typically 230400 , 160000 or 115200)
in	<i>instance</i>	instance
in	<i>baudrate</i>	(typically 230400 or 115200)

## 8.8.6 Variable Documentation

### 8.8.6.1 pin\_conf

```
struct port_config pin_conf
```

## 8.9 Host side crypto methods (atcah\_)

Use these functions if your system does not use an ATCADevice as a host but implements the host in firmware. The functions provide host-side cryptographic functionality for an ATECC client device. They are intended to accompany the CryptoAuthLib functions. They can be called directly from an application, or integrated into an API.

### Data Structures

- struct [atca\\_temp\\_key](#)  
*Structure to hold TempKey fields.*
- struct [atca\\_include\\_data\\_in\\_out](#)  
*Input / output parameters for function [atca\\_include\\_data\(\)](#).*
- struct [atca\\_nonce\\_in\\_out](#)  
*Input/output parameters for function [atca\\_nonce\(\)](#).*
- struct [atca\\_io\\_decrypt\\_in\\_out](#)
- struct [atca\\_verify\\_mac](#)
- struct [atca\\_secureboot\\_enc\\_in\\_out](#)
- struct [atca\\_secureboot\\_mac\\_in\\_out](#)
- struct [atca\\_mac\\_in\\_out](#)  
*Input/output parameters for function [atca\\_mac\(\)](#).*
- struct [atca\\_hmac\\_in\\_out](#)  
*Input/output parameters for function [atca\\_hmac\(\)](#).*
- struct [atca\\_gen\\_dig\\_in\\_out](#)  
*Input/output parameters for function [atcah\\_gen\\_dig\(\)](#).*
- struct [atca\\_write\\_mac\\_in\\_out](#)  
*Input/output parameters for function [atcah\\_write\\_auth\\_mac\(\)](#) and [atcah\\_privwrite\\_auth\\_mac\(\)](#).*
- struct [atca\\_derive\\_key\\_in\\_out](#)  
*Input/output parameters for function [atcah\\_derive\\_key\(\)](#).*
- struct [atca\\_derive\\_key\\_mac\\_in\\_out](#)  
*Input/output parameters for function [atcah\\_derive\\_key\\_mac\(\)](#).*
- struct [atca\\_decrypt\\_in\\_out](#)  
*Input/output parameters for function [atca\\_decrypt\(\)](#).*
- struct [atca\\_check\\_mac\\_in\\_out](#)  
*Input/output parameters for function [atcah\\_check\\_mac\(\)](#).*
- struct [atca\\_verify\\_in\\_out](#)  
*Input/output parameters for function [atcah\\_verify\(\)](#).*
- struct [atca\\_gen\\_key\\_in\\_out](#)  
*Input/output parameters for calculating the PubKey digest put into TempKey by the GenKey command with the [atcah\\_gen\\_key\\_msg\(\)](#) function.*
- struct [atca\\_sign\\_internal\\_in\\_out](#)  
*Input/output parameters for calculating the message and digest used by the Sign(internal) command. Used with the [atcah\\_sign\\_internal\\_msg\(\)](#) function.*
- struct [atca\\_session\\_key\\_in\\_out](#)  
*Input/Output paramters for calculating the session key by the nonce command. Used with the [atcah\\_gen\\_session\\_key\(\)](#) function.*

## Typedefs

- typedef struct [atca\\_temp\\_key](#) [atca\\_temp\\_key\\_t](#)  
*Structure to hold TempKey fields.*
- typedef struct [atca\\_nonce\\_in\\_out](#) [atca\\_nonce\\_in\\_out\\_t](#)
- typedef struct [atca\\_io\\_decrypt\\_in\\_out](#) [atca\\_io\\_decrypt\\_in\\_out\\_t](#)
- typedef struct [atca\\_verify\\_mac](#) [atca\\_verify\\_mac\\_in\\_out\\_t](#)
- typedef struct [atca\\_secureboot\\_enc\\_in\\_out](#) [atca\\_secureboot\\_enc\\_in\\_out\\_t](#)
- typedef struct [atca\\_secureboot\\_mac\\_in\\_out](#) [atca\\_secureboot\\_mac\\_in\\_out\\_t](#)
- typedef struct [atca\\_mac\\_in\\_out](#) [atca\\_mac\\_in\\_out\\_t](#)
- typedef struct [atca\\_gen\\_dig\\_in\\_out](#) [atca\\_gen\\_dig\\_in\\_out\\_t](#)  
*Input/output parameters for function [atcah\\_gen\\_dig\(\)](#).*
- typedef struct [atca\\_write\\_mac\\_in\\_out](#) [atca\\_write\\_mac\\_in\\_out\\_t](#)  
*Input/output parameters for function [atcah\\_write\\_auth\\_mac\(\)](#) and [atcah\\_privwrite\\_auth\\_mac\(\)](#).*
- typedef struct [atca\\_check\\_mac\\_in\\_out](#) [atca\\_check\\_mac\\_in\\_out\\_t](#)  
*Input/output parameters for function [atcah\\_check\\_mac\(\)](#).*
- typedef struct [atca\\_verify\\_in\\_out](#) [atca\\_verify\\_in\\_out\\_t](#)
- typedef struct [atca\\_gen\\_key\\_in\\_out](#) [atca\\_gen\\_key\\_in\\_out\\_t](#)  
*Input/output parameters for calculating the PubKey digest put into TempKey by the GenKey command with the [atcah\\_gen\\_key\\_msg\(\)](#) function.*
- typedef struct [atca\\_sign\\_internal\\_in\\_out](#) [atca\\_sign\\_internal\\_in\\_out\\_t](#)  
*Input/output parameters for calculating the message and digest used by the Sign(internal) command. Used with the [atcah\\_sign\\_internal\\_msg\(\)](#) function.*
- typedef struct [atca\\_session\\_key\\_in\\_out](#) [atca\\_session\\_key\\_in\\_out\\_t](#)  
*Input/Output paramters for calculating the session key by the nonce command. Used with the [atcah\\_gen\\_session\\_key\(\)](#) function.*

## Functions

- [ATCA\\_STATUS atcah\\_nonce](#) (struct [atca\\_nonce\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_mac](#) (struct [atca\\_mac\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_check\\_mac](#) (struct [atca\\_check\\_mac\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_hmac](#) (struct [atca\\_hmac\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_gen\\_dig](#) (struct [atca\\_gen\\_dig\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_gen\\_mac](#) (struct [atca\\_gen\\_dig\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_write\\_auth\\_mac](#) (struct [atca\\_write\\_mac\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_privwrite\\_auth\\_mac](#) (struct [atca\\_write\\_mac\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_derive\\_key](#) (struct [atca\\_derive\\_key\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_derive\\_key\\_mac](#) (struct [atca\\_derive\\_key\\_mac\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_decrypt](#) (struct [atca\\_decrypt\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_sha256](#) (int32\_t len, const uint8\_t \*message, uint8\_t \*digest)
- uint8\_t \* [atcah\\_include\\_data](#) (struct [atca\\_include\\_data\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_gen\\_key\\_msg](#) (struct [atca\\_gen\\_key\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_config\\_to\\_sign\\_internal](#) (ATCADeviceType device\_type, struct [atca\\_sign\\_internal\\_in\\_out](#) \*param, const uint8\_t \*config)
- [ATCA\\_STATUS atcah\\_sign\\_internal\\_msg](#) (ATCADeviceType device\_type, struct [atca\\_sign\\_internal\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_verify\\_mac](#) ([atca\\_verify\\_mac\\_in\\_out\\_t](#) \*param)
- [ATCA\\_STATUS atcah\\_secureboot\\_enc](#) ([atca\\_secureboot\\_enc\\_in\\_out\\_t](#) \*param)
- [ATCA\\_STATUS atcah\\_secureboot\\_mac](#) ([atca\\_secureboot\\_mac\\_in\\_out\\_t](#) \*param)
- [ATCA\\_STATUS atcah\\_encode\\_counter\\_match](#) (uint32\_t counter, uint8\_t \*counter\_match)
- [ATCA\\_STATUS atcah\\_io\\_decrypt](#) (struct [atca\\_io\\_decrypt\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_ecc204\\_write\\_auth\\_mac](#) (struct [atca\\_write\\_mac\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_gen\\_session\\_key](#) ([atca\\_session\\_key\\_in\\_out\\_t](#) \*param)

## Variables

- `uint8_t * p_temp`  
*[out] pointer to output buffer*
- `const uint8_t * otp`  
*[in] pointer to one-time-programming data*
- `const uint8_t * sn`  
*[in] pointer to serial number data*
- `uint8_t mode`  
*[in] Mode parameter used in Nonce command (Param1).*
- `uint16_t zero`  
*[in] Zero parameter used in Nonce command (Param2).*
- `const uint8_t * num_in`  
*[in] Pointer to 20-byte NumIn data used in Nonce command.*
- `const uint8_t * rand_out`  
*[in] Pointer to 32-byte RandOut data from Nonce command.*
- `struct atca_temp_key * temp_key`  
*[in,out] Pointer to TempKey structure.*
- `uint8_t mode`  
*[in] Mode parameter used in MAC command (Param1).*
- `uint16_t key_id`  
*[in] KeyID parameter used in MAC command (Param2).*
- `const uint8_t * challenge`  
*[in] Pointer to 32-byte Challenge data used in MAC command, depending on mode.*
- `const uint8_t * key`  
*[in] Pointer to 32-byte key used to generate MAC digest.*
- `const uint8_t * otp`  
*[in] Pointer to 11-byte OTP, optionally included in MAC digest, depending on mode.*
- `const uint8_t * sn`  
*[in] Pointer to 9-byte SN, optionally included in MAC digest, depending on mode.*
- `uint8_t * response`  
*[out] Pointer to 32-byte SHA-256 digest (MAC).*
- `struct atca_temp_key * temp_key`  
*[in,out] Pointer to TempKey structure.*
- `uint8_t mode`  
*[in] Mode parameter used in HMAC command (Param1).*
- `uint16_t key_id`  
*[in] KeyID parameter used in HMAC command (Param2).*
- `const uint8_t * key`  
*[in] Pointer to 32-byte key used to generate HMAC digest.*
- `const uint8_t * otp`  
*[in] Pointer to 11-byte OTP, optionally included in HMAC digest, depending on mode.*
- `const uint8_t * sn`  
*[in] Pointer to 9-byte SN, optionally included in HMAC digest, depending on mode.*
- `uint8_t * response`  
*[out] Pointer to 32-byte SHA-256 HMAC digest.*
- `struct atca_temp_key * temp_key`  
*[in,out] Pointer to TempKey structure.*
- `uint8_t * crypto_data`  
*[in,out] Pointer to 32-byte data. Input encrypted data from Read command (Contents field), output decrypted.*
- `struct atca_temp_key * temp_key`

- [in,out]* Pointer to TempKey structure.
- uint16\_t [curve\\_type](#)
  - [in]* Curve type used in Verify command (Param2).
- const uint8\_t \* [signature](#)
  - [in]* Pointer to ECDSA signature to be verified
- const uint8\_t \* [public\\_key](#)
  - [in]* Pointer to the public key to be used for verification
- struct [atca\\_temp\\_key](#) \* [temp\\_key](#)
  - [in,out]* Pointer to TempKey structure.

### Definitions for ATECC Message Sizes to Calculate a SHA256 Hash

"||" is the concatenation operator. The number in braces is the length of the hash input value in bytes.

- #define [ATCA\\_MSG\\_SIZE\\_NONCE](#) (55)
  - RandOut{32} || NumIn{20} || OpCode{1} || Mode{1} || LSB of Param2{1}.*
- #define [ATCA\\_MSG\\_SIZE\\_MAC](#) (88)
  - (Key or TempKey){32} || (Challenge or TempKey){32} || OpCode{1} || Mode{1} || Param2{2} || (OTP0\_7 or 0){8} || (OTP8\_10 or 0){3} || SN8{1} || (SN4\_7 or 0){4} || SN0\_1{2} || (SN2\_3 or 0){2}*
- #define [ATCA\\_MSG\\_SIZE\\_HMAC](#) (88)
- #define [ATCA\\_MSG\\_SIZE\\_GEN\\_DIG](#) (96)
  - KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2} || 0{25} || TempKey{32}.*
- #define [ATCA\\_MSG\\_SIZE\\_DERIVE\\_KEY](#) (96)
  - KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2} || 0{25} || TempKey{32}.*
- #define [ATCA\\_MSG\\_SIZE\\_DERIVE\\_KEY\\_MAC](#) (39)
  - KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2}.*
- #define [ATCA\\_MSG\\_SIZE\\_ENCRYPT\\_MAC](#) (96)
  - KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2} || 0{25} || TempKey{32}.*
- #define [ATCA\\_MSG\\_SIZE\\_SESSION\\_KEY](#) (96)
  - TransportKey{32} || 0x15{1} || 0x00{1} || KeyId{2} || SN8{1} || SN0\_1{2} || 0{25} || Nonce{32}.*
- #define [ATCA\\_MSG\\_SIZE\\_PRIVWRITE\\_MAC](#) (96)
  - KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2} || 0{21} || PlainText{36}.*
- #define [ATCA\\_COMMAND\\_HEADER\\_SIZE](#) ( 4)
- #define [ATCA\\_GENDIG\\_ZEROS\\_SIZE](#) (25)
- #define [ATCA\\_WRITE\\_MAC\\_ZEROS\\_SIZE](#) (25)
- #define [ATCA\\_PRIVWRITE\\_MAC\\_ZEROS\\_SIZE](#) (21)
- #define [ATCA\\_PRIVWRITE\\_PLAIN\\_TEXT\\_SIZE](#) (36)
- #define [ATCA\\_DERIVE\\_KEY\\_ZEROS\\_SIZE](#) (25)
- #define [ATCA\\_HMAC\\_BLOCK\\_SIZE](#) (64)
- #define [ENCRYPTION\\_KEY\\_SIZE](#) (64)

### Default Fixed Byte Values of Serial Number (SN[0:1] and SN[8])

- #define [ATCA\\_SN\\_0\\_DEF](#) (0x01)
- #define [ATCA\\_SN\\_1\\_DEF](#) (0x23)
- #define [ATCA\\_SN\\_8\\_DEF](#) (0xEE)



## Definition for TempKey Mode

- `#define MAC_MODE_USE_TEMPKEY_MASK ((uint8_t)0x03)`  
*mode mask for MAC command when using TempKey*

### 8.9.1 Detailed Description

Use these functions if your system does not use an ATCADevice as a host but implements the host in firmware. The functions provide host-side cryptographic functionality for an ATECC client device. They are intended to accompany the CryptoAuthLib functions. They can be called directly from an application, or integrated into an API.

Modern compilers can garbage-collect unused functions. If your compiler does not support this feature, you can just discard this module from your project if you do use an ATECC as a host. Or, if you don't, delete the functions you do not use.

### 8.9.2 Macro Definition Documentation

#### 8.9.2.1 ATCA\_COMMAND\_HEADER\_SIZE

```
#define ATCA_COMMAND_HEADER_SIZE ( 4)
```

#### 8.9.2.2 ATCA\_DERIVE\_KEY\_ZEROS\_SIZE

```
#define ATCA_DERIVE_KEY_ZEROS_SIZE (25)
```

#### 8.9.2.3 ATCA\_GENDIG\_ZEROS\_SIZE

```
#define ATCA_GENDIG_ZEROS_SIZE (25)
```

#### 8.9.2.4 ATCA\_HMAC\_BLOCK\_SIZE

```
#define ATCA_HMAC_BLOCK_SIZE (64)
```

### 8.9.2.5 ATCA\_MSG\_SIZE\_DERIVE\_KEY

```
#define ATCA_MSG_SIZE_DERIVE_KEY (96)
```

KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2} || 0{25} || TempKey{32}.

### 8.9.2.6 ATCA\_MSG\_SIZE\_DERIVE\_KEY\_MAC

```
#define ATCA_MSG_SIZE_DERIVE_KEY_MAC (39)
```

KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2}.

### 8.9.2.7 ATCA\_MSG\_SIZE\_ENCRYPT\_MAC

```
#define ATCA_MSG_SIZE_ENCRYPT_MAC (96)
```

KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2} || 0{25} || TempKey{32}.

### 8.9.2.8 ATCA\_MSG\_SIZE\_GEN\_DIG

```
#define ATCA_MSG_SIZE_GEN_DIG (96)
```

KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2} || 0{25} || TempKey{32}.

### 8.9.2.9 ATCA\_MSG\_SIZE\_HMAC

```
#define ATCA_MSG_SIZE_HMAC (88)
```

### 8.9.2.10 ATCA\_MSG\_SIZE\_MAC

```
#define ATCA_MSG_SIZE_MAC (88)
```

(Key or TempKey){32} || (Challenge or TempKey){32} || OpCode{1} || Mode{1} || Param2{2} || (OTP0\_7 or 0){8} || (OTP8\_10 or 0){3} || SN8{1} || (SN4\_7 or 0){4} || SN0\_1{2} || (SN2\_3 or 0){2}

#### 8.9.2.11 ATCA\_MSG\_SIZE\_NONCE

```
#define ATCA_MSG_SIZE_NONCE (55)
```

RandOut{32} || NumIn{20} || OpCode{1} || Mode{1} || LSB of Param2{1}.

#### 8.9.2.12 ATCA\_MSG\_SIZE\_PRIVWRITE\_MAC

```
#define ATCA_MSG_SIZE_PRIVWRITE_MAC (96)
```

KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2} || 0{21} || PlainText{36}.

#### 8.9.2.13 ATCA\_MSG\_SIZE\_SESSION\_KEY

```
#define ATCA_MSG_SIZE_SESSION_KEY (96)
```

TransportKey{32} || 0x15{1} || 0x00{1} || KeyId{2} || SN8{1} || SN0\_1{2} || 0{25} || Nonce{32}.

#### 8.9.2.14 ATCA\_PRIVWRITE\_MAC\_ZEROS\_SIZE

```
#define ATCA_PRIVWRITE_MAC_ZEROS_SIZE (21)
```

#### 8.9.2.15 ATCA\_PRIVWRITE\_PLAIN\_TEXT\_SIZE

```
#define ATCA_PRIVWRITE_PLAIN_TEXT_SIZE (36)
```

#### 8.9.2.16 ATCA\_SN\_0\_DEF

```
#define ATCA_SN_0_DEF (0x01)
```

#### 8.9.2.17 ATCA\_SN\_1\_DEF

```
#define ATCA_SN_1_DEF (0x23)
```

### 8.9.2.18 ATCA\_SN\_8\_DEF

```
#define ATCA_SN_8_DEF (0xEE)
```

### 8.9.2.19 ATCA\_WRITE\_MAC\_ZEROS\_SIZE

```
#define ATCA_WRITE_MAC_ZEROS_SIZE (25)
```

### 8.9.2.20 ENCRYPTION\_KEY\_SIZE

```
#define ENCRYPTION_KEY_SIZE (64)
```

### 8.9.2.21 MAC\_MODE\_USE\_TEMPKEY\_MASK

```
#define MAC_MODE_USE_TEMPKEY_MASK ((uint8_t) 0x03)
```

mode mask for MAC command when using TempKey

## 8.9.3 Typedef Documentation

### 8.9.3.1 atca\_check\_mac\_in\_out\_t

```
typedef struct atca_check_mac_in_out atca_check_mac_in_out_t
```

Input/output parameters for function [atcah\\_check\\_mac\(\)](#).

### 8.9.3.2 atca\_gen\_dig\_in\_out\_t

```
typedef struct atca_gen_dig_in_out atca_gen_dig_in_out_t
```

Input/output parameters for function [atcah\\_gen\\_dig\(\)](#).

### 8.9.3.3 atca\_gen\_key\_in\_out\_t

```
typedef struct atca_gen_key_in_out atca_gen_key_in_out_t
```

Input/output parameters for calculating the PubKey digest put into TempKey by the GenKey command with the [atcah\\_gen\\_key\\_msg\(\)](#) function.

### 8.9.3.4 atca\_io\_decrypt\_in\_out\_t

```
typedef struct atca_io_decrypt_in_out atca_io_decrypt_in_out_t
```

### 8.9.3.5 atca\_mac\_in\_out\_t

```
typedef struct atca_mac_in_out atca_mac_in_out_t
```

### 8.9.3.6 atca\_nonce\_in\_out\_t

```
typedef struct atca_nonce_in_out atca_nonce_in_out_t
```

### 8.9.3.7 atca\_secureboot\_enc\_in\_out\_t

```
typedef struct atca_secureboot_enc_in_out atca_secureboot_enc_in_out_t
```

### 8.9.3.8 atca\_secureboot\_mac\_in\_out\_t

```
typedef struct atca_secureboot_mac_in_out atca_secureboot_mac_in_out_t
```

### 8.9.3.9 atca\_session\_key\_in\_out\_t

```
typedef struct atca_session_key_in_out atca_session_key_in_out_t
```

Input/Output paramters for calculating the session key by the nonce command. Used with the [atcah\\_gen\\_session\\_key\(\)](#) function.

### 8.9.3.10 atca\_sign\_internal\_in\_out\_t

```
typedef struct atca_sign_internal_in_out atca_sign_internal_in_out_t
```

Input/output parameters for calculating the message and digest used by the Sign(internal) command. Used with the [atcah\\_sign\\_internal\\_msg\(\)](#) function.

### 8.9.3.11 atca\_temp\_key\_t

```
typedef struct atca_temp_key atca_temp_key_t
```

Structure to hold TempKey fields.

### 8.9.3.12 atca\_verify\_in\_out\_t

```
typedef struct atca_verify_in_out atca_verify_in_out_t
```

### 8.9.3.13 atca\_verify\_mac\_in\_out\_t

```
typedef struct atca_verify_mac atca_verify_mac_in_out_t
```

### 8.9.3.14 atca\_write\_mac\_in\_out\_t

```
typedef struct atca_write_mac_in_out atca_write_mac_in_out_t
```

Input/output parameters for function [atcah\\_write\\_auth\\_mac\(\)](#) and [atcah\\_privwrite\\_auth\\_mac\(\)](#).

## 8.9.4 Function Documentation

### 8.9.4.1 atcah\_check\_mac()

```
ATCA_STATUS atcah_check_mac (
    struct atca_check_mac_in_out * param )
```

#### 8.9.4.2 atcah\_config\_to\_sign\_internal()

```
ATCA_STATUS atcah_config_to_sign_internal (
    ATCADeviceType device_type,
    struct atca_sign_internal_in_out * param,
    const uint8_t * config )
```

#### 8.9.4.3 atcah\_decrypt()

```
ATCA_STATUS atcah_decrypt (
    struct atca_decrypt_in_out * param )
```

#### 8.9.4.4 atcah\_derive\_key()

```
ATCA_STATUS atcah_derive_key (
    struct atca_derive_key_in_out * param )
```

#### 8.9.4.5 atcah\_derive\_key\_mac()

```
ATCA_STATUS atcah_derive_key_mac (
    struct atca_derive_key_mac_in_out * param )
```

#### 8.9.4.6 atcah\_ecc204\_write\_auth\_mac()

```
ATCA_STATUS atcah_ecc204_write_auth_mac (
    struct atca_write_mac_in_out * param )
```

#### 8.9.4.7 atcah\_encode\_counter\_match()

```
ATCA_STATUS atcah_encode_counter_match (
    uint32_t counter,
    uint8_t * counter_match )
```

### 8.9.4.8 atcah\_gen\_dig()

```
ATCA_STATUS atcah_gen_dig (
    struct atca_gen_dig_in_out * param )
```

### 8.9.4.9 atcah\_gen\_key\_msg()

```
ATCA_STATUS atcah_gen_key_msg (
    struct atca_gen_key_in_out * param )
```

### 8.9.4.10 atcah\_gen\_mac()

```
ATCA_STATUS atcah_gen_mac (
    struct atca_gen_dig_in_out * param )
```

### 8.9.4.11 atcah\_gen\_session\_key()

```
ATCA_STATUS atcah_gen_session_key (
    atca_session_key_in_out_t * param )
```

### 8.9.4.12 atcah\_hmac()

```
ATCA_STATUS atcah_hmac (
    struct atca_hmac_in_out * param )
```

### 8.9.4.13 atcah\_include\_data()

```
uint8_t* atcah_include_data (
    struct atca_include_data_in_out * param )
```

### 8.9.4.14 atcah\_io\_decrypt()

```
ATCA_STATUS atcah_io_decrypt (
    struct atca_io_decrypt_in_out * param )
```



#### 8.9.4.15 atcah\_mac()

```
ATCA_STATUS atcah_mac (
    struct atca_mac_in_out * param )
```

#### 8.9.4.16 atcah\_nonce()

```
ATCA_STATUS atcah_nonce (
    struct atca_nonce_in_out * param )
```

#### 8.9.4.17 atcah\_privwrite\_auth\_mac()

```
ATCA_STATUS atcah_privwrite_auth_mac (
    struct atca_write_mac_in_out * param )
```

#### 8.9.4.18 atcah\_secureboot\_enc()

```
ATCA_STATUS atcah_secureboot_enc (
    atca_secureboot_enc_in_out_t * param )
```

#### 8.9.4.19 atcah\_secureboot\_mac()

```
ATCA_STATUS atcah_secureboot_mac (
    atca_secureboot_mac_in_out_t * param )
```

#### 8.9.4.20 atcah\_sha256()

```
ATCA_STATUS atcah_sha256 (
    int32_t len,
    const uint8_t * message,
    uint8_t * digest )
```

### 8.9.4.21 atcah\_sign\_internal\_msg()

```
ATCA_STATUS atcah_sign_internal_msg (
    ATCADeviceType device_type,
    struct atca_sign_internal_in_out * param )
```

### 8.9.4.22 atcah\_verify\_mac()

```
ATCA_STATUS atcah_verify_mac (
    atca_verify_mac_in_out_t * param )
```

### 8.9.4.23 atcah\_write\_auth\_mac()

```
ATCA_STATUS atcah_write_auth_mac (
    struct atca_write_mac_in_out * param )
```

## 8.9.5 Variable Documentation

### 8.9.5.1 challenge

challenge

[in] Pointer to 32-byte Challenge data used in MAC command, depending on mode.

### 8.9.5.2 crypto\_data

crypto\_data

[in,out] Pointer to 32-byte data. Input encrypted data from Read command (Contents field), output decrypted.

### 8.9.5.3 curve\_type

curve\_type

[in] Curve type used in Verify command (Param2).

**8.9.5.4 key [1/2]**

`key`

[in] Pointer to 32-byte key used to generate MAC digest.

**8.9.5.5 key [2/2]**

`key`

[in] Pointer to 32-byte key used to generate HMAC digest.

**8.9.5.6 key\_id [1/2]**

`key_id`

[in] KeyID parameter used in MAC command (Param2).

**8.9.5.7 key\_id [2/2]**

`key_id`

[in] KeyID parameter used in HMAC command (Param2).

**8.9.5.8 mode [1/3]**

`mode`

[in] Mode parameter used in Nonce command (Param1).

**8.9.5.9 mode [2/3]**

`mode`

[in] Mode parameter used in MAC command (Param1).

### 8.9.5.10 mode [3/3]

mode

[in] Mode parameter used in HMAC command (Param1).

### 8.9.5.11 num\_in

num\_in

[in] Pointer to 20-byte NumIn data used in Nonce command.

### 8.9.5.12 otp [1/3]

otp

[in] pointer to one-time-programming data

### 8.9.5.13 otp [2/3]

otp

[in] Pointer to 11-byte OTP, optionally included in MAC digest, depending on mode.

### 8.9.5.14 otp [3/3]

otp

[in] Pointer to 11-byte OTP, optionally included in HMAC digest, depending on mode.

### 8.9.5.15 p\_temp

p\_temp

[out] pointer to output buffer

**8.9.5.16 public\_key**

`public_key`

[in] Pointer to the public key to be used for verification

**8.9.5.17 rand\_out**

`rand_out`

[in] Pointer to 32-byte RandOut data from Nonce command.

**8.9.5.18 response [1/2]**

`response`

[out] Pointer to 32-byte SHA-256 digest (MAC).

**8.9.5.19 response [2/2]**

`response`

[out] Pointer to 32-byte SHA-256 HMAC digest.

**8.9.5.20 signature**

`signature`

[in] Pointer to ECDSA signature to be verified

**8.9.5.21 sn [1/3]**

`sn`

[in] pointer to serial number data

### 8.9.5.22 `sn` [2/3]

`sn`

[in] Pointer to 9-byte SN, optionally included in MAC digest, depending on mode.

### 8.9.5.23 `sn` [3/3]

`sn`

[in] Pointer to 9-byte SN, optionally included in HMAC digest, depending on mode.

### 8.9.5.24 `temp_key` [1/5]

`temp_key`

[in,out] Pointer to TempKey structure.

### 8.9.5.25 `temp_key` [2/5]

`temp_key`

[in,out] Pointer to TempKey structure.

### 8.9.5.26 `temp_key` [3/5]

`temp_key`

[in,out] Pointer to TempKey structure.

### 8.9.5.27 `temp_key` [4/5]

`temp_key`

[in,out] Pointer to TempKey structure.

### 8.9.5.28 `temp_key` [5/5]

`temp_key`

[in,out] Pointer to TempKey structure.

### 8.9.5.29 `zero`

`zero`

[in] Zero parameter used in Nonce command (Param2).

## 8.10 JSON Web Token (JWT) methods (atca\_jwt\_)

Methods for signing and verifying JSON Web Token (JWT) tokens.

### Data Structures

- struct `atca_jwt_t`  
*Structure to hold metadata information about the jwt being built.*

### Functions

- `ATCA_STATUS atca_jwt_init (atca_jwt_t *jwt, char *buf, uint16_t buflen)`  
*Initialize a JWT structure.*
- `ATCA_STATUS atca_jwt_add_claim_string (atca_jwt_t *jwt, const char *claim, const char *value)`  
*Add a string claim to a token.*
- `ATCA_STATUS atca_jwt_add_claim_numeric (atca_jwt_t *jwt, const char *claim, int32_t value)`  
*Add a numeric claim to a token.*
- `ATCA_STATUS atca_jwt_finalize (atca_jwt_t *jwt, uint16_t key_id)`  
*Close the claims of a token, encode them, then sign the result.*
- void `atca_jwt_check_payload_start (atca_jwt_t *jwt)`  
*Check the provided context to see what character needs to be added in order to append a claim.*

### 8.10.1 Detailed Description

Methods for signing and verifying JSON Web Token (JWT) tokens.

### 8.10.2 Function Documentation

#### 8.10.2.1 atca\_jwt\_add\_claim\_numeric()

```
ATCA_STATUS atca_jwt_add_claim_numeric (  
    atca_jwt_t * jwt,  
    const char * claim,  
    int32_t value )
```

Add a numeric claim to a token.

Note

This function does not escape strings so the user has to ensure the claim is valid first

Parameters

in	<i>jwt</i>	JWT Context to use
in	<i>claim</i>	Name of the claim to be inserted
in	<i>value</i>	Integer value to be inserted

### 8.10.2.2 atca\_jwt\_add\_claim\_string()

```
ATCA_STATUS atca_jwt_add_claim_string (
    atca_jwt_t * jwt,
    const char * claim,
    const char * value )
```

Add a string claim to a token.

#### Note

This function does not escape strings so the user has to ensure they are valid for use in a JSON string first

#### Parameters

in	<i>jwt</i>	JWT Context to use
in	<i>claim</i>	Name of the claim to be inserted
in	<i>value</i>	Null terminated string to be insterted

### 8.10.2.3 atca\_jwt\_check\_payload\_start()

```
void atca_jwt_check_payload_start (
    atca_jwt_t * jwt )
```

Check the provided context to see what character needs to be added in order to append a claim.

#### Parameters

in	<i>jwt</i>	JWT Context to use
----	------------	--------------------

### 8.10.2.4 atca\_jwt\_finalize()

```
ATCA_STATUS atca_jwt_finalize (
    atca_jwt_t * jwt,
    uint16_t key_id )
```

Close the claims of a token, encode them, then sign the result.

#### Parameters

in	<i>jwt</i>	JWT Context to use
in	<i>key_id</i> <i>_id</i>	Key Id (Slot number) used to sign



8.10.2.5 atca\_jwt\_init()

```
ATCA_STATUS atca_jwt_init (
    atca_jwt_t * jwt,
    char * buf,
    uint16_t buflen )
```

Initialize a JWT structure.

Parameters

in	<i>jwt</i>	JWT Context to initialize
in, out	<i>buf</i>	Pointer to a buffer to store the token
in	<i>buflen</i>	Length of the buffer

## 8.11 mbedTLS Wrapper methods (atca\_mbedtls\_)

These methods are for interfacing cryptoauthlib to mbedtls.

### 8.11.0.1 mbedtls directory - Purpose

This directory contains the interfacing and wrapper functions to integrate mbedtls as the software crypto library as well as provide elliptic curve cryptography (ECC) hardware acceleration.

### Data Structures

- struct [atca\\_mbedtls\\_ekey\\_s](#)

### Typedefs

- typedef struct [atca\\_mbedtls\\_ekey\\_s](#) [atca\\_mbedtls\\_ekey\\_t](#)

### Functions

- int [atca\\_mbedtls\\_ecdsa\\_sign](#) (const mbedtls\_mpi \*d, mbedtls\_mpi \*r, mbedtls\_mpi \*s, const unsigned char \*buf, size\_t buf\_len)
- int [atca\\_mbedtls\\_pk\\_init\\_ext](#) (ATCADevice device, struct mbedtls\_pk\_context \*pkey, const uint16\_t slotid)  
*Initializes an mbedtls pk context for use with EC operations.*
- int [atca\\_mbedtls\\_pk\\_init](#) (struct mbedtls\_pk\_context \*pkey, const uint16\_t slotid)  
*Initializes an mbedtls pk context for use with EC operations.*
- int [atca\\_mbedtls\\_cert\\_add](#) (struct mbedtls\_x509\_crt \*cert, const struct [atcacert\\_def\\_s](#) \*cert\_def)
- int [atca\\_mbedtls\\_ecdh\\_slot\\_cb](#) (void)  
*ECDH Callback to obtain the "slot" used in ECDH operations from the application.*
- int [atca\\_mbedtls\\_ecdh\\_ioprot\\_cb](#) (uint8\_t secret[32])  
*ECDH Callback to obtain the IO Protection secret from the application.*

### 8.11.1 Detailed Description

These methods are for interfacing cryptoauthlib to mbedtls.

### 8.11.2 Typedef Documentation

#### 8.11.2.1 atca\_mbedtls\_ekey\_t

```
typedef struct atca\_mbedtls\_ekey\_s atca\_mbedtls\_ekey\_t
```

Structure to hold metadata - is written into the mbedtls pk structure as the private key bignum value 'd' which otherwise would be unused. Bignums can be any arbitrary length of bytes

## 8.11.3 Function Documentation

### 8.11.3.1 `atca_mbedtls_cert_add()`

```
int atca_mbedtls_cert_add (
    struct mbedtls_x509_crt * cert,
    const struct atcacert_def_s * cert_def )
```

### 8.11.3.2 `atca_mbedtls_ecdh_ioprot_cb()`

```
int atca_mbedtls_ecdh_ioprot_cb (
    uint8_t secret[32] )
```

ECDH Callback to obtain the IO Protection secret from the application.

#### Parameters

out	secret	32 byte array used to store the secret
-----	--------	--

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.11.3.3 `atca_mbedtls_ecdh_slot_cb()`

```
int atca_mbedtls_ecdh_slot_cb (
    void )
```

ECDH Callback to obtain the "slot" used in ECDH operations from the application.

#### Returns

Slot Number

### 8.11.3.4 `atca_mbedtls_ecdsa_sign()`

```
int atca_mbedtls_ecdsa_sign (
    const mbedtls_mpi * d,
    mbedtls_mpi * r,
    mbedtls_mpi * s,
    const unsigned char * buf,
    size_t buf_len )
```

### 8.11.3.5 atca\_mbedtls\_pk\_init()

```
int atca_mbedtls_pk_init (
    mbedtls_pk_context * pkey,
    const uint16_t slotid )
```

Initializes an mbedtls pk context for use with EC operations.

#### Parameters

in, out	<i>pkey</i>	ptr to space to receive version string
in	<i>slotid</i>	Associated with this key

#### Returns

0 on success, otherwise an error code.

### 8.11.3.6 atca\_mbedtls\_pk\_init\_ext()

```
int atca_mbedtls_pk_init_ext (
    ATCADevice device,
    mbedtls_pk_context * pkey,
    const uint16_t slotid )
```

Initializes an mbedtls pk context for use with EC operations.

#### Parameters

in, out	<i>pkey</i>	ptr to space to receive version string
in	<i>slotid</i>	Associated with this key

#### Returns

0 on success, otherwise an error code.

## 8.12 Attributes (pkcs11\_attrib\_)

### Data Structures

- struct [\\_pkcs11\\_mech\\_table\\_e](#)

### Macros

- `#define` [PKCS11\\_MECH\\_ECC508\\_EC\\_CAPABILITY](#) ([CKF\\_EC\\_F\\_P](#) | [CKF\\_EC\\_NAMEDCURVE](#) | [CKF\\_EC\\_UNCOMPRESS](#))
- `#define` [TABLE\\_SIZE](#)(x) `sizeof(x) / sizeof(x[0])`

### Typedefs

- typedef struct [\\_pkcs11\\_mech\\_table\\_e](#) [pkcs11\\_mech\\_table\\_e](#)
- typedef struct [\\_pkcs11\\_mech\\_table\\_e](#) \* [pkcs11\\_mech\\_table\\_ptr](#)

### Functions

- [CK\\_RV](#) [pkcs11\\_attrib\\_fill](#) ([CK\\_ATTRIBUTE\\_PTR](#) pAttribute, const [CK\\_VOID\\_PTR](#) pData, const [CK\\_ULONG](#) ulSize)  
*Perform the necessary checks and copy data into an attribute structure.*
- [CK\\_RV](#) [pkcs11\\_attrib\\_value](#) ([CK\\_ATTRIBUTE\\_PTR](#) pAttribute, const [CK\\_ULONG](#) ulValue, const [CK\\_ULONG](#) ulSize)  
*Helper function to write a numerical value to an attribute buffer.*
- [CK\\_RV](#) [pkcs11\\_attrib\\_false](#) (const [CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV](#) [pkcs11\\_attrib\\_true](#) (const [CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV](#) [pkcs11\\_attrib\\_empty](#) (const [CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV](#) [pkcs11\\_cert\\_get\\_encoded](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV](#) [pkcs11\\_cert\\_get\\_type](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV](#) [pkcs11\\_cert\\_get\\_subject](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV](#) [pkcs11\\_cert\\_get\\_subject\\_key\\_id](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV](#) [pkcs11\\_cert\\_get\\_authority\\_key\\_id](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV](#) [pkcs11\\_cert\\_get\\_trusted\\_flag](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV](#) [pkcs11\\_cert\\_x509\\_write](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- void [pkcs11\\_config\\_init\\_private](#) ([pkcs11\\_object\\_ptr](#) pObject, char \*label, size\_t len)
- void [pkcs11\\_config\\_init\\_public](#) ([pkcs11\\_object\\_ptr](#) pObject, char \*label, size\_t len)
- void [pkcs11\\_config\\_init\\_secret](#) ([pkcs11\\_object\\_ptr](#) pObject, char \*label, size\_t len, uint8\_t keylen)
- void [pkcs11\\_config\\_init\\_cert](#) ([pkcs11\\_object\\_ptr](#) pObject, char \*label, size\_t len)
- void [pkcs11\\_config\\_split\\_string](#) (char \*s, char splitter, int \*argc, char \*argv[])
- [CK\\_RV](#) [pkcs11\\_config\\_cert](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pLibCtx, [pkcs11\\_slot\\_ctx\\_ptr](#) pSlot, [pkcs11\\_object\\_ptr](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pLabel)
- [CK\\_RV](#) [pkcs11\\_config\\_key](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pLibCtx, [pkcs11\\_slot\\_ctx\\_ptr](#) pSlot, [pkcs11\\_object\\_ptr](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pLabel)
- [CK\\_RV](#) [pkcs11\\_config\\_remove\\_object](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pLibCtx, [pkcs11\\_slot\\_ctx\\_ptr](#) pSlot, [pkcs11\\_object\\_ptr](#) pObject)
- [CK\\_RV](#) [pkcs11\\_config\\_load\\_objects](#) ([pkcs11\\_slot\\_ctx\\_ptr](#) slot\_ctx)
- [CK\\_RV](#) [pkcs11\\_config\\_load](#) ([pkcs11\\_slot\\_ctx\\_ptr](#) slot\_ctx)
- [CK\\_RV](#) [pkcs11\\_encrypt\\_init](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hObject)

- [CK\\_RV pkcs11\\_encrypt](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG](#) ulDataLen, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG\\_PTR](#) pulEncryptedDataLen)
- [CK\\_RV pkcs11\\_encrypt\\_update](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG](#) ulDataLen, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG\\_PTR](#) pulEncryptedDataLen)
- [CK\\_RV pkcs11\\_encrypt\\_final](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG\\_PTR](#) pulEncryptedDataLen)  
*Finishes a multiple-part encryption operation.*
- [CK\\_RV pkcs11\\_decrypt\\_init](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hObject)
- [CK\\_RV pkcs11\\_decrypt](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG](#) ulEncryptedDataLen, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG\\_PTR](#) pulDataLen)
- [CK\\_RV pkcs11\\_decrypt\\_update](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG](#) ulEncryptedDataLen, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG\\_PTR](#) pulDataLen)
- [CK\\_RV pkcs11\\_decrypt\\_final](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG\\_PTR](#) pulDataLen)  
*Finishes a multiple-part decryption operation.*
- [CK\\_RV pkcs11\\_find\\_init](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount)
- [CK\\_RV pkcs11\\_find\\_continue](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phObject, [CK\\_ULONG](#) ulMaxObjectCount, [CK\\_ULONG\\_PTR](#) pulObjectCount)
- [CK\\_RV pkcs11\\_find\\_finish](#) ([CK\\_SESSION\\_HANDLE](#) hSession)
- [CK\\_RV pkcs11\\_find\\_get\\_attribute](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE](#) hObject, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount)
- [CK\\_RV pkcs11\\_get\\_lib\\_info](#) ([CK\\_INFO\\_PTR](#) pInfo)  
*Obtains general information about Cryptoki.*
- [pkcs11\\_lib\\_ctx\\_ptr](#) [pkcs11\\_get\\_context](#) (void)  
*Retrieve the current library context.*
- [CK\\_RV pkcs11\\_lock\\_context](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_unlock\\_context](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_lock\\_device](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_unlock\\_device](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_lock\\_both](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_unlock\\_both](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_init\\_check](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) \*ppContext, [CK\\_BBOOL](#) lock)  
*Check if the library is initialized properly.*
- [CK\\_RV pkcs11\\_init](#) ([CK\\_C\\_INITIALIZE\\_ARGS\\_PTR](#) pInitArgs)  
*Initializes the PKCS11 API Library for Cryptoauthlib.*
- [CK\\_RV pkcs11\\_deinit](#) ([CK\\_VOID\\_PTR](#) pReserved)
- [CK\\_RV pkcs11\\_key\\_write](#) ([CK\\_VOID\\_PTR](#) pSession, [CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV pkcs11\\_key\\_generate](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phKey)
- [CK\\_RV pkcs11\\_key\\_generate\\_pair](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_ATTRIBUTE\\_PTR](#) pPublicKeyTemplate, [CK\\_ULONG](#) ulPublicKeyAttributeCount, [CK\\_ATTRIBUTE\\_PTR](#) pPrivateKeyTemplate, [CK\\_ULONG](#) ulPrivateKeyAttributeCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phPublicKey, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phPrivateKey)
- [CK\\_RV pkcs11\\_key\\_derive](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hBaseKey, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phKey)
- [CK\\_RV C\\_Initialize](#) ([CK\\_VOID\\_PTR](#) pInitArgs)  
*Initializes Cryptoki library NOTES: If pInitArgs is a non-NULL\_PTR is must dereference to a [CK\\_C\\_INITIALIZE\\_ARGS](#) structure.*
- [CK\\_RV C\\_Finalize](#) ([CK\\_VOID\\_PTR](#) pReserved)  
*Clean up miscellaneous Cryptoki-associated resources.*

- **CK\_RV C\_GetInfo** (**CK\_INFO\_PTR** pInfo)  
*Obtains general information about Cryptoki.*
- **CK\_RV C\_GetFunctionList** (**CK\_FUNCTION\_LIST\_PTR\_PTR** ppFunctionList)  
*Obtains entry points of Cryptoki library functions.*
- **CK\_RV C\_GetSlotList** (**CK\_BBOOL** tokenPresent, **CK\_SLOT\_ID\_PTR** pSlotList, **CK\_ULONG\_PTR** pulCount)  
*Obtains a list of slots in the system.*
- **CK\_RV C\_GetSlotInfo** (**CK\_SLOT\_ID** slotID, **CK\_SLOT\_INFO\_PTR** pInfo)  
*Obtains information about a particular slot.*
- **CK\_RV C\_GetTokenInfo** (**CK\_SLOT\_ID** slotID, **CK\_TOKEN\_INFO\_PTR** pInfo)  
*Obtains information about a particular token.*
- **CK\_RV C\_GetMechanismList** (**CK\_SLOT\_ID** slotID, **CK\_MECHANISM\_TYPE\_PTR** pMechanismList, **CK\_ULONG\_PTR** pulCount)  
*Obtains a list of mechanisms supported by a token (in a slot)*
- **CK\_RV C\_GetMechanismInfo** (**CK\_SLOT\_ID** slotID, **CK\_MECHANISM\_TYPE** type, **CK\_MECHANISM\_INFO\_PTR** pInfo)  
*Obtains information about a particular mechanism of a token (in a slot)*
- **CK\_RV C\_InitToken** (**CK\_SLOT\_ID** slotID, **CK\_UTF8CHAR\_PTR** pPin, **CK\_ULONG** ulPinLen, **CK\_UTF8CHAR\_PTR** pLabel)  
*Initializes a token (in a slot)*
- **CK\_RV C\_InitPIN** (**CK\_SESSION\_HANDLE** hSession, **CK\_UTF8CHAR\_PTR** pPin, **CK\_ULONG** ulPinLen)  
*Initializes the normal user's PIN.*
- **CK\_RV C\_SetPIN** (**CK\_SESSION\_HANDLE** hSession, **CK\_UTF8CHAR\_PTR** pOldPin, **CK\_ULONG** ulOldLen, **CK\_UTF8CHAR\_PTR** pNewPin, **CK\_ULONG** ulNewLen)  
*Modifies the PIN of the current user.*
- **CK\_RV C\_OpenSession** (**CK\_SLOT\_ID** slotID, **CK\_FLAGS** flags, **CK\_VOID\_PTR** pApplication, **CK\_NOTIFY** notify, **CK\_SESSION\_HANDLE\_PTR** phSession)  
*Opens a connection between an application and a particular token or sets up an application callback for token insertion.*
- **CK\_RV C\_CloseSession** (**CK\_SESSION\_HANDLE** hSession)  
*Close the given session.*
- **CK\_RV C\_CloseAllSessions** (**CK\_SLOT\_ID** slotID)  
*Close all open sessions.*
- **CK\_RV C\_GetSessionInfo** (**CK\_SESSION\_HANDLE** hSession, **CK\_SESSION\_INFO\_PTR** pInfo)  
*Retrieve information about the specified session.*
- **CK\_RV C\_GetOperationState** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pOperationState, **CK\_ULONG\_PTR** pulOperationStateLen)  
*Obtains the cryptographic operations state of a session.*
- **CK\_RV C\_SetOperationState** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pOperationState, **CK\_ULONG** ulOperationStateLen, **CK\_OBJECT\_HANDLE** hEncryptionKey, **CK\_OBJECT\_HANDLE** hAuthenticationKey)  
*Sets the cryptographic operations state of a session.*
- **CK\_RV C\_Login** (**CK\_SESSION\_HANDLE** hSession, **CK\_USER\_TYPE** userType, **CK\_UTF8CHAR\_PTR** pPin, **CK\_ULONG** ulPinLen)  
*Login on the token in the specified session.*
- **CK\_RV C\_Logout** (**CK\_SESSION\_HANDLE** hSession)  
*Log out of the token in the specified session.*
- **CK\_RV C\_CreateObject** (**CK\_SESSION\_HANDLE** hSession, **CK\_ATTRIBUTE\_PTR** pTemplate, **CK\_ULONG** ulCount, **CK\_OBJECT\_HANDLE\_PTR** phObject)  
*Create a new object on the token in the specified session using the given attribute template.*
- **CK\_RV C\_CopyObject** (**CK\_SESSION\_HANDLE** hSession, **CK\_OBJECT\_HANDLE** hObject, **CK\_ATTRIBUTE\_PTR** pTemplate, **CK\_ULONG** ulCount, **CK\_OBJECT\_HANDLE\_PTR** phNewObject)

- Create a copy of the object with the specified handle.*
- **CK\_RV C\_DestroyObject** (**CK\_SESSION\_HANDLE** hSession, **CK\_OBJECT\_HANDLE** hObject)
- Destroy the specified object.*
- **CK\_RV C\_GetObjectSize** (**CK\_SESSION\_HANDLE** hSession, **CK\_OBJECT\_HANDLE** hObject, **CK\_ULONG\_PTR** pulSize)
- Obtains the size of an object in bytes.*
- **CK\_RV C\_GetAttributeValue** (**CK\_SESSION\_HANDLE** hSession, **CK\_OBJECT\_HANDLE** hObject, **CK\_ATTRIBUTE\_PTR** pTemplate, **CK\_ULONG** ulCount)
- Obtains an attribute value of an object.*
- **CK\_RV C\_SetAttributeValue** (**CK\_SESSION\_HANDLE** hSession, **CK\_OBJECT\_HANDLE** hObject, **CK\_ATTRIBUTE\_PTR** pTemplate, **CK\_ULONG** ulCount)
- Change or set the value of the specified attributes on the specified object.*
- **CK\_RV C\_FindObjectsInit** (**CK\_SESSION\_HANDLE** hSession, **CK\_ATTRIBUTE\_PTR** pTemplate, **CK\_ULONG** ulCount)
- Initializes an object search in the specified session using the specified attribute template as search parameters.*
- **CK\_RV C\_FindObjects** (**CK\_SESSION\_HANDLE** hSession, **CK\_OBJECT\_HANDLE\_PTR** phObject, **CK\_ULONG** ulMaxObjectCount, **CK\_ULONG\_PTR** pulObjectCount)
- Continue the search for objects in the specified session.*
- **CK\_RV C\_FindObjectsFinal** (**CK\_SESSION\_HANDLE** hSession)
- Finishes an object search operation (and cleans up)*
- **CK\_RV C\_EncryptInit** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_OBJECT\_HANDLE** hObject)
- Initializes an encryption operation using the specified mechanism and session.*
- **CK\_RV C\_Encrypt** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pData, **CK\_ULONG** ulDataLen, **CK\_BYTE\_PTR** pEncryptedData, **CK\_ULONG\_PTR** pulEncryptedDataLen)
- Perform a single operation encryption operation in the specified session.*
- **CK\_RV C\_EncryptUpdate** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pData, **CK\_ULONG** ulDataLen, **CK\_BYTE\_PTR** pEncryptedData, **CK\_ULONG\_PTR** pulEncryptedDataLen)
- Continues a multiple-part encryption operation.*
- **CK\_RV C\_EncryptFinal** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pEncryptedData, **CK\_ULONG\_PTR** pulEncryptedDataLen)
- Finishes a multiple-part encryption operation.*
- **CK\_RV C\_DecryptInit** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_OBJECT\_HANDLE** hObject)
- Initialize decryption using the specified object.*
- **CK\_RV C\_Decrypt** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pEncryptedData, **CK\_ULONG** ulEncryptedDataLen, **CK\_BYTE\_PTR** pData, **CK\_ULONG\_PTR** pulDataLen)
- Perform a single operation decryption in the given session.*
- **CK\_RV C\_DecryptUpdate** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pEncryptedData, **CK\_ULONG** ulEncryptedDataLen, **CK\_BYTE\_PTR** pData, **CK\_ULONG\_PTR** pulDataLen)
- Continues a multiple-part decryption operation.*
- **CK\_RV C\_DecryptFinal** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pData, **CK\_ULONG\_PTR** pulDataLen)
- Finishes a multiple-part decryption operation.*
- **CK\_RV C\_DigestInit** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism)
- Initializes a message-digesting operation using the specified mechanism in the specified session.*
- **CK\_RV C\_Digest** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pData, **CK\_ULONG** ulDataLen, **CK\_BYTE\_PTR** pDigest, **CK\_ULONG\_PTR** pulDigestLen)
- Digest the specified data in a one-pass operation and return the resulting digest.*
- **CK\_RV C\_DigestUpdate** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pPart, **CK\_ULONG** ulPartLen)
- Continues a multiple-part digesting operation.*
- **CK\_RV C\_DigestKey** (**CK\_SESSION\_HANDLE** hSession, **CK\_OBJECT\_HANDLE** hObject)



*Update a running digest operation by digesting a secret key with the specified handle.*

- **CK\_RV C\_DigestFinal** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pDigest, **CK\_ULONG\_PTR** pulDigestLen)

*Finishes a multiple-part digesting operation.*

- **CK\_RV C\_SignInit** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_OBJECT\_HANDLE** hKey)

*Initialize a signing operation using the specified key and mechanism.*

- **CK\_RV C\_Sign** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pData, **CK\_ULONG** ulDataLen, **CK\_BYTE\_PTR** pSignature, **CK\_ULONG\_PTR** pulSignatureLen)

*Sign the data in a single pass operation.*

- **CK\_RV C\_SignUpdate** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pPart, **CK\_ULONG** ulPartLen)

*Continues a multiple-part signature operation.*

- **CK\_RV C\_SignFinal** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pSignature, **CK\_ULONG\_PTR** pulSignatureLen)

*Finishes a multiple-part signature operation.*

- **CK\_RV C\_SignRecoverInit** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_OBJECT\_HANDLE** hKey)

*Initializes a signature operation, where the data can be recovered from the signature.*

- **CK\_RV C\_SignRecover** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pData, **CK\_ULONG** ulDataLen, **CK\_BYTE\_PTR** pSignature, **CK\_ULONG\_PTR** pulSignatureLen)

*Signs single-part data, where the data can be recovered from the signature.*

- **CK\_RV C\_VerifyInit** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_OBJECT\_HANDLE** hKey)

*Initializes a verification operation using the specified key and mechanism.*

- **CK\_RV C\_Verify** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pData, **CK\_ULONG** ulDataLen, **CK\_BYTE\_PTR** pSignature, **CK\_ULONG** ulSignatureLen)

*Verifies a signature on single-part data.*

- **CK\_RV C\_VerifyUpdate** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pPart, **CK\_ULONG** ulPartLen)

*Continues a multiple-part verification operation.*

- **CK\_RV C\_VerifyFinal** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pSignature, **CK\_ULONG** ulSignatureLen)

*Finishes a multiple-part verification operation.*

- **CK\_RV C\_VerifyRecoverInit** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_OBJECT\_HANDLE** hKey)

*Initializes a verification operation where the data is recovered from the signature.*

- **CK\_RV C\_VerifyRecover** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pSignature, **CK\_ULONG** ulSignatureLen, **CK\_BYTE\_PTR** pData, **CK\_ULONG\_PTR** pulDataLen)

*Verifies a signature on single-part data, where the data is recovered from the signature.*

- **CK\_RV C\_DigestEncryptUpdate** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pPart, **CK\_ULONG** ulPartLen, **CK\_BYTE\_PTR** pEncryptedPart, **CK\_ULONG\_PTR** pulEncryptedPartLen)

*Continues simultaneous multiple-part digesting and encryption operations.*

- **CK\_RV C\_DecryptDigestUpdate** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pPart, **CK\_ULONG** ulPartLen, **CK\_BYTE\_PTR** pDecryptedPart, **CK\_ULONG\_PTR** pulDecryptedPartLen)

*Continues simultaneous multiple-part decryption and digesting operations.*

- **CK\_RV C\_SignEncryptUpdate** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pPart, **CK\_ULONG** ulPartLen, **CK\_BYTE\_PTR** pEncryptedPart, **CK\_ULONG\_PTR** pulEncryptedPartLen)

*Continues simultaneous multiple-part signature and encryption operations.*

- **CK\_RV C\_DecryptVerifyUpdate** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pEncryptedPart, **CK\_ULONG** ulEncryptedPartLen, **CK\_BYTE\_PTR** pPart, **CK\_ULONG\_PTR** pulPartLen)

*Continues simultaneous multiple-part decryption and verification operations.*

- **CK\_RV C\_GenerateKey** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_ATTRIBUTE\_PTR** pTemplate, **CK\_ULONG** ulCount, **CK\_OBJECT\_HANDLE\_PTR** phKey)

*Generates a secret key using the specified mechanism.*

- **CK\_RV C\_GenerateKeyPair** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_ATTRIBUTE\_PTR** pPublicKeyTemplate, **CK\_ULONG** ulPublicKeyAttributeCount, **CK\_ATTRIBUTE\_PTR** pPrivateKeyTemplate, **CK\_ULONG** ulPrivateKeyAttributeCount, **CK\_OBJECT\_HANDLE\_PTR** phPublicKey, **CK\_OBJECT\_HANDLE\_PTR** phPrivateKey)  
*Generates a public-key/private-key pair using the specified mechanism.*
- **CK\_RV C\_WrapKey** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_OBJECT\_HANDLE** hWrappingKey, **CK\_OBJECT\_HANDLE** hKey, **CK\_BYTE\_PTR** pWrappedKey, **CK\_ULONG\_PTR** pulWrappingKeyLen, **CK\_ULONG\_PTR** pulWrappedKeyLen)  
*Wraps (encrypts) the specified key using the specified wrapping key and mechanism.*
- **CK\_RV C\_UnwrapKey** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_OBJECT\_HANDLE** hUnwrappingKey, **CK\_BYTE\_PTR** pWrappedKey, **CK\_ULONG** ulWrappedKeyLen, **CK\_ATTRIBUTE\_PTR** pTemplate, **CK\_ULONG** ulCount, **CK\_OBJECT\_HANDLE\_PTR** phKey)  
*Unwraps (decrypts) the specified key using the specified unwrapping key.*
- **CK\_RV C\_DeriveKey** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_OBJECT\_HANDLE** hBaseKey, **CK\_ATTRIBUTE\_PTR** pTemplate, **CK\_ULONG** ulCount, **CK\_OBJECT\_HANDLE\_PTR** phKey)  
*Derive a key from the specified base key.*
- **CK\_RV C\_SeedRandom** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pSeed, **CK\_ULONG** ulSeedLen)  
*Mixes in additional seed material to the random number generator.*
- **CK\_RV C\_GenerateRandom** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pRandomData, **CK\_ULONG** ulRandomLen)  
*Generate the specified amount of random data.*
- **CK\_RV C\_GetFunctionStatus** (**CK\_SESSION\_HANDLE** hSession)  
*Legacy function - see PKCS#11 v2.40.*
- **CK\_RV C\_CancelFunction** (**CK\_SESSION\_HANDLE** hSession)  
*Legacy function.*
- **CK\_RV C\_WaitForSlotEvent** (**CK\_FLAGS** flags, **CK\_SLOT\_ID\_PTR** pSlot, **CK\_VOID\_PTR** pReserved)  
*Wait for a slot event (token insertion, removal, etc) on the specified slot to occur.*
- **CK\_RV pkcs11\_mech\_get\_list** (**CK\_SLOT\_ID** slotID, **CK\_MECHANISM\_TYPE\_PTR** pMechanismList, **CK\_ULONG\_PTR** pulCount)
- **CK\_RV pkcs11\_mech\_get\_info** (**CK\_SLOT\_ID** slotID, **CK\_MECHANISM\_TYPE** type, **CK\_MECHANISM\_INFO\_PTR** pInfo)
- **CK\_RV pkcs11\_object\_alloc** (**CK\_SLOT\_ID** slotID, **pkcs11\_object\_ptr** \*ppObject)
- **CK\_RV pkcs11\_object\_free** (**pkcs11\_object\_ptr** pObject)
- **CK\_RV pkcs11\_object\_check** (**pkcs11\_object\_ptr** \*ppObject, **CK\_OBJECT\_HANDLE** hObject)
- **CK\_RV pkcs11\_object\_get\_handle** (**pkcs11\_object\_ptr** pObject, **CK\_OBJECT\_HANDLE\_PTR** phObject)
- **CK\_RV pkcs11\_object\_get\_owner** (**pkcs11\_object\_ptr** pObject, **CK\_SLOT\_ID\_PTR** pSlotID)
- **CK\_RV pkcs11\_object\_get\_name** (**CK\_VOID\_PTR** pObject, **CK\_ATTRIBUTE\_PTR** pAttribute)
- **CK\_RV pkcs11\_object\_get\_class** (**CK\_VOID\_PTR** pObject, **CK\_ATTRIBUTE\_PTR** pAttribute)
- **CK\_RV pkcs11\_object\_get\_type** (**CK\_VOID\_PTR** pObject, **CK\_ATTRIBUTE\_PTR** pAttribute)
- **CK\_RV pkcs11\_object\_get\_destroyable** (**CK\_VOID\_PTR** pObject, **CK\_ATTRIBUTE\_PTR** pAttribute)
- **CK\_RV pkcs11\_object\_get\_size** (**CK\_SESSION\_HANDLE** hSession, **CK\_OBJECT\_HANDLE** hObject, **CK\_ULONG\_PTR** pulSize)
- **CK\_RV pkcs11\_object\_find** (**CK\_SLOT\_ID** slotID, **pkcs11\_object\_ptr** \*ppObject, **CK\_ATTRIBUTE\_PTR** pTemplate, **CK\_ULONG** ulCount)
- **CK\_RV pkcs11\_object\_create** (**CK\_SESSION\_HANDLE** hSession, **CK\_ATTRIBUTE\_PTR** pTemplate, **CK\_ULONG** ulCount, **CK\_OBJECT\_HANDLE\_PTR** phObject)  
*Create a new object on the token in the specified session using the given attribute template.*
- **CK\_RV pkcs11\_object\_destroy** (**CK\_SESSION\_HANDLE** hSession, **CK\_OBJECT\_HANDLE** hObject)  
*Destroy the specified object.*
- **CK\_RV pkcs11\_object\_deinit** (**pkcs11\_lib\_ctx\_ptr** pContext)
- **ATCA\_STATUS pkcs11\_object\_load\_handle\_info** (**pkcs11\_lib\_ctx\_ptr** pContext)
- **CK\_RV pkcs11\_object\_is\_private** (**pkcs11\_object\_ptr** pObject, **CK\_BBOOL** \*is\_private)

Checks the attributes of the underlying cryptographic asset to determine if it is a private key - this changes the way the associated public key is referenced.

- [CK\\_RV pkcs11\\_os\\_create\\_mutex](#) ([CK\\_VOID\\_PTR\\_PTR](#) ppMutex)

Application callback for creating a mutex object.

- [CK\\_RV pkcs11\\_os\\_destroy\\_mutex](#) ([CK\\_VOID\\_PTR](#) pMutex)
- [CK\\_RV pkcs11\\_os\\_lock\\_mutex](#) ([CK\\_VOID\\_PTR](#) pMutex)
- [CK\\_RV pkcs11\\_os\\_unlock\\_mutex](#) ([CK\\_VOID\\_PTR](#) pMutex)
- [pkcs11\\_session\\_ctx\\_ptr pkcs11\\_get\\_session\\_context](#) ([CK\\_SESSION\\_HANDLE](#) hSession)
- [CK\\_RV pkcs11\\_session\\_check](#) ([pkcs11\\_session\\_ctx\\_ptr](#) \*pSession, [CK\\_SESSION\\_HANDLE](#) hSession)

Check if the session is initialized properly.

- [CK\\_RV pkcs11\\_session\\_open](#) ([CK\\_SLOT\\_ID](#) slotID, [CK\\_FLAGS](#) flags, [CK\\_VOID\\_PTR](#) pApplication, [CK\\_NOTIFY](#) notify, [CK\\_SESSION\\_HANDLE\\_PTR](#) phSession)
- [CK\\_RV pkcs11\\_session\\_close](#) ([CK\\_SESSION\\_HANDLE](#) hSession)
- [CK\\_RV pkcs11\\_session\\_closeall](#) ([CK\\_SLOT\\_ID](#) slotID)

Close all sessions for a given slot - not actually all open sessions.

- [CK\\_RV pkcs11\\_session\\_get\\_info](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_SESSION\\_INFO\\_PTR](#) pInfo)

Obtains information about a particular session.

- [CK\\_RV pkcs11\\_session\\_login](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_USER\\_TYPE](#) userType, [CK\\_UTF8CHAR\\_PTR](#) pPin, [CK\\_ULONG](#) ulPinLen)
- [CK\\_RV pkcs11\\_session\\_logout](#) ([CK\\_SESSION\\_HANDLE](#) hSession)
- [CK\\_RV pkcs11\\_signature\\_sign\\_init](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hKey)

Initialize a signing operation using the specified key and mechanism.

- [CK\\_RV pkcs11\\_signature\\_sign](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG](#) ulDataLen, [CK\\_BYTE\\_PTR](#) pSignature, [CK\\_ULONG\\_PTR](#) pulSignatureLen)

Sign the data in a single pass operation.

- [CK\\_RV pkcs11\\_signature\\_sign\\_continue](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pPart, [CK\\_ULONG](#) ulPartLen)

Continues a multiple-part signature operation.

- [CK\\_RV pkcs11\\_signature\\_sign\\_finish](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pSignature, [CK\\_ULONG\\_PTR](#) pulSignatureLen)

Finishes a multiple-part signature operation.

- [CK\\_RV pkcs11\\_signature\\_verify\\_init](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hKey)

Initializes a verification operation using the specified key and mechanism.

- [CK\\_RV pkcs11\\_signature\\_verify](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG](#) ulDataLen, [CK\\_BYTE\\_PTR](#) pSignature, [CK\\_ULONG](#) ulSignatureLen)

Verifies a signature on single-part data.

- [CK\\_RV pkcs11\\_signature\\_verify\\_continue](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pPart, [CK\\_ULONG](#) ulPartLen)

Continues a multiple-part verification operation.

- [CK\\_RV pkcs11\\_signature\\_verify\\_finish](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pSignature, [CK\\_ULONG](#) ulSignatureLen)

Finishes a multiple-part verification operation.

- [pkcs11\\_slot\\_ctx\\_ptr pkcs11\\_slot\\_get\\_context](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) lib\_ctx, [CK\\_SLOT\\_ID](#) slotID)

Retrieve the current slot context.

- [pkcs11\\_slot\\_ctx\\_ptr pkcs11\\_slot\\_get\\_new\\_context](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) lib\_ctx)
- [CK\\_VOID\\_PTR pkcs11\\_slot\\_initslots](#) ([CK\\_ULONG](#) pulCount)
- [CK\\_RV pkcs11\\_slot\\_config](#) ([CK\\_SLOT\\_ID](#) slotID)
- [CK\\_RV pkcs11\\_slot\\_init](#) ([CK\\_SLOT\\_ID](#) slotID)

This is an internal function that initializes a pkcs11 slot - it must already have the locks in place before being called.

- [CK\\_RV pkcs11\\_slot\\_get\\_list](#) ([CK\\_BBOOL](#) tokenPresent, [CK\\_SLOT\\_ID\\_PTR](#) pSlotList, [CK\\_ULONG\\_PTR](#) pulCount)

- `CK_RV pkcs11_slot_get_info` (`CK_SLOT_ID` slotID, `CK_SLOT_INFO_PTR` pInfo)  
*Obtains information about a particular slot.*
- `CK_RV pkcs11_token_init` (`CK_SLOT_ID` slotID, `CK_UTF8CHAR_PTR` pPin, `CK_ULONG` ulPinLen, `CK_UTF8CHAR_PTR` pLabel)
- `CK_RV pkcs11_token_get_access_type` (`CK_VOID_PTR` pObject, `CK_ATTRIBUTE_PTR` pAttribute)
- `CK_RV pkcs11_token_get_writable` (`CK_VOID_PTR` pObject, `CK_ATTRIBUTE_PTR` pAttribute)
- `CK_RV pkcs11_token_get_storage` (`CK_VOID_PTR` pObject, `CK_ATTRIBUTE_PTR` pAttribute)
- `CK_RV pkcs11_token_get_info` (`CK_SLOT_ID` slotID, `CK_TOKEN_INFO_PTR` pInfo)  
*Obtains information about a particular token.*
- `CK_RV pkcs11_token_random` (`CK_SESSION_HANDLE` hSession, `CK_BYTE_PTR` pRandomData, `CK_ULONG` ulRandomLen)  
*Generate the specified amount of random data.*
- `CK_RV pkcs11_token_convert_pin_to_key` (const `CK_UTF8CHAR_PTR` pPin, const `CK_ULONG` ulPinLen, const `CK_UTF8CHAR_PTR` pSalt, const `CK_ULONG` ulSaltLen, `CK_BYTE_PTR` pKey, `CK_ULONG` ulKeyLen)
- `CK_RV pkcs11_token_set_pin` (`CK_SESSION_HANDLE` hSession, `CK_UTF8CHAR_PTR` pOldPin, `CK_ULONG` ulOldLen, `CK_UTF8CHAR_PTR` pNewPin, `CK_ULONG` ulNewLen)
- `void pkcs11_util_escape_string` (`CK_UTF8CHAR_PTR` buf, `CK_ULONG` buf\_len)
- `CK_RV pkcs11_util_convert_rv` (`ATCA_STATUS` status)
- `int pkcs11_util_memset` (`void *dest`, `size_t destsz`, `int ch`, `size_t count`)

## Variables

- const `pkcs11_attrib_model pkcs11_cert_x509public_attributes` []
- const `CK_ULONG pkcs11_cert_x509public_attributes_count` = sizeof( `pkcs11_cert_x509public_attributes` ) / sizeof( `pkcs11_cert_x509public_attributes` [0])
- const `pkcs11_attrib_model pkcs11_cert_wtlspublic_attributes` []
- const `CK_ULONG pkcs11_cert_wtlspublic_attributes_count` = sizeof( `pkcs11_cert_wtlspublic_attributes` ) / sizeof( `pkcs11_cert_wtlspublic_attributes` [0])
- const `pkcs11_attrib_model pkcs11_cert_x509_attributes` []
- const `CK_ULONG pkcs11_cert_x509_attributes_count` = sizeof( `pkcs11_cert_x509_attributes` ) / sizeof( `pkcs11_cert_x509_attributes` [0])
- const char `pkcs11_lib_manufacturer_id` [] = "Microchip Technology Inc"
- const char `pkcs11_lib_description` [] = "Cryptoauthlib PKCS11 Interface"
- const `pkcs11_attrib_model pkcs11_key_public_attributes` []
- const `CK_ULONG pkcs11_key_public_attributes_count` = sizeof( `pkcs11_key_public_attributes` ) / sizeof( `pkcs11_key_public_attributes` [0])
- const `pkcs11_attrib_model pkcs11_key_ec_public_attributes` []
- const `pkcs11_attrib_model pkcs11_key_private_attributes` []
- const `CK_ULONG pkcs11_key_private_attributes_count` = sizeof( `pkcs11_key_private_attributes` ) / sizeof( `pkcs11_key_private_attributes` [0])
- const `pkcs11_attrib_model pkcs11_key_rsa_private_attributes` []
- const `pkcs11_attrib_model pkcs11_key_ec_private_attributes` []
- const `pkcs11_attrib_model pkcs11_key_secret_attributes` []
- const `CK_ULONG pkcs11_key_secret_attributes_count` = sizeof( `pkcs11_key_secret_attributes` ) / sizeof( `pkcs11_key_secret_attributes` [0])
- `pkcs11_object_cache_t pkcs11_object_cache` [`PKCS11_MAX_OBJECTS_ALLOWED`]
- const `pkcs11_attrib_model pkcs11_object_monotonic_attributes` []
- const `CK_ULONG pkcs11_object_monotonic_attributes_count` = sizeof( `pkcs11_object_monotonic_attributes` ) / sizeof( `pkcs11_object_monotonic_attributes` [0])

## 8.12.1 Detailed Description

## 8.12.2 Macro Definition Documentation

### 8.12.2.1 PKCS11\_MECH\_ECC508\_EC\_CAPABILITY

```
#define PKCS11_MECH_ECC508_EC_CAPABILITY (CKF_EC_F_P | CKF_EC_NAMEDCURVE | CKF_EC_UNCOMPRESS)
```

### 8.12.2.2 TABLE\_SIZE

```
#define TABLE_SIZE(  
    x ) sizeof(x) / sizeof(x[0])
```

## 8.12.3 Typedef Documentation

### 8.12.3.1 pcks11\_mech\_table\_e

```
typedef struct _pcks11_mech_table_e pcks11_mech_table_e
```

### 8.12.3.2 pcks11\_mech\_table\_ptr

```
typedef struct _pcks11_mech_table_e * pcks11_mech_table_ptr
```

## 8.12.4 Function Documentation

### 8.12.4.1 C\_CancelFunction()

```
CK_RV C_CancelFunction (  
    CK_SESSION_HANDLE hSession )
```

Legacy function.

### 8.12.4.2 C\_CloseAllSessions()

```
CK_RV C_CloseAllSessions (
    CK_SLOT_ID slotID )
```

Close all open sessions.

### 8.12.4.3 C\_CloseSession()

```
CK_RV C_CloseSession (
    CK_SESSION_HANDLE hSession )
```

Close the given session.

### 8.12.4.4 C\_CopyObject()

```
CK_RV C_CopyObject (
    CK_SESSION_HANDLE hSession,
    CK_OBJECT_HANDLE hObject,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount,
    CK_OBJECT_HANDLE_PTR phNewObject )
```

Create a copy of the object with the specified handle.

### 8.12.4.5 C\_CreateObject()

```
CK_RV C_CreateObject (
    CK_SESSION_HANDLE hSession,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount,
    CK_OBJECT_HANDLE_PTR phObject )
```

Create a new object on the token in the specified session using the given attribute template.

### 8.12.4.6 C\_Decrypt()

```
CK_RV C_Decrypt (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pEncryptedData,
    CK_ULONG ulEncryptedDataLen,
    CK_BYTE_PTR pData,
    CK_ULONG_PTR pulDataLen )
```

Perform a single operation decryption in the given session.

#### 8.12.4.7 C\_DecryptDigestUpdate()

```
CK_RV C_DecryptDigestUpdate (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pPart,
    CK_ULONG ulPartLen,
    CK_BYTE_PTR pDecryptedPart,
    CK_ULONG_PTR pulDecryptedPartLen )
```

Continues simultaneous multiple-part decryption and digesting operations.

#### 8.12.4.8 C\_DecryptFinal()

```
CK_RV C_DecryptFinal (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG_PTR pDataLen )
```

Finishes a multiple-part decryption operation.

#### 8.12.4.9 C\_DecryptInit()

```
CK_RV C_DecryptInit (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hObject )
```

Initialize decryption using the specified object.

#### 8.12.4.10 C\_DecryptUpdate()

```
CK_RV C_DecryptUpdate (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pEncryptedData,
    CK_ULONG ulEncryptedDataLen,
    CK_BYTE_PTR pData,
    CK_ULONG_PTR pDataLen )
```

Continues a multiple-part decryption operation.

### 8.12.4.11 C\_DecryptVerifyUpdate()

```
CK_RV C_DecryptVerifyUpdate (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pEncryptedPart,
    CK_ULONG ulEncryptedPartLen,
    CK_BYTE_PTR pPart,
    CK_ULONG_PTR pulPartLen )
```

Continues simultaneous multiple-part decryption and verification operations.

### 8.12.4.12 C\_DeriveKey()

```
CK_RV C_DeriveKey (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hBaseKey,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount,
    CK_OBJECT_HANDLE_PTR phKey )
```

Derive a key from the specified base key.

### 8.12.4.13 C\_DestroyObject()

```
CK_RV C_DestroyObject (
    CK_SESSION_HANDLE hSession,
    CK_OBJECT_HANDLE hObject )
```

Destroy the specified object.

### 8.12.4.14 C\_Digest()

```
CK_RV C_Digest (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG ulDataLen,
    CK_BYTE_PTR pDigest,
    CK_ULONG_PTR pulDigestLen )
```

Digest the specified data in a one-pass operation and return the resulting digest.



#### 8.12.4.15 C\_DigestEncryptUpdate()

```
CK_RV C_DigestEncryptUpdate (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pPart,
    CK_ULONG ulPartLen,
    CK_BYTE_PTR pEncryptedPart,
    CK_ULONG_PTR pulEncryptedPartLen )
```

Continues simultaneous multiple-part digesting and encryption operations.

#### 8.12.4.16 C\_DigestFinal()

```
CK_RV C_DigestFinal (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pDigest,
    CK_ULONG_PTR pulDigestLen )
```

Finishes a multiple-part digesting operation.

#### 8.12.4.17 C\_DigestInit()

```
CK_RV C_DigestInit (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism )
```

Initializes a message-digesting operation using the specified mechanism in the specified session.

#### 8.12.4.18 C\_DigestKey()

```
CK_RV C_DigestKey (
    CK_SESSION_HANDLE hSession,
    CK_OBJECT_HANDLE hObject )
```

Update a running digest operation by digesting a secret key with the specified handle.

#### 8.12.4.19 C\_DigestUpdate()

```
CK_RV C_DigestUpdate (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pPart,
    CK_ULONG ulPartLen )
```

Continues a multiple-part digesting operation.

### 8.12.4.20 C\_Encrypt()

```
CK_RV C_Encrypt (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG ulDataLen,
    CK_BYTE_PTR pEncryptedData,
    CK_ULONG_PTR pulEncryptedDataLen )
```

Perform a single operation encryption operation in the specified session.

### 8.12.4.21 C\_EncryptFinal()

```
CK_RV C_EncryptFinal (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pEncryptedData,
    CK_ULONG_PTR pulEncryptedDataLen )
```

Finishes a multiple-part encryption operation.

### 8.12.4.22 C\_EncryptInit()

```
CK_RV C_EncryptInit (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hObject )
```

Initializes an encryption operation using the specified mechanism and session.

### 8.12.4.23 C\_EncryptUpdate()

```
CK_RV C_EncryptUpdate (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG ulDataLen,
    CK_BYTE_PTR pEncryptedData,
    CK_ULONG_PTR pulEncryptedDataLen )
```

Continues a multiple-part encryption operation.

#### 8.12.4.24 C\_Finalize()

```
CK_RV C_Finalize (
    CK_VOID_PTR pReserved )
```

Clean up miscellaneous Cryptoki-associated resources.

#### 8.12.4.25 C\_FindObjects()

```
CK_RV C_FindObjects (
    CK_SESSION_HANDLE hSession,
    CK_OBJECT_HANDLE_PTR phObject,
    CK_ULONG ulMaxObjectCount,
    CK_ULONG_PTR pulObjectCount )
```

Continue the search for objects in the specified session.

#### 8.12.4.26 C\_FindObjectsFinal()

```
CK_RV C_FindObjectsFinal (
    CK_SESSION_HANDLE hSession )
```

Finishes an object search operation (and cleans up)

#### 8.12.4.27 C\_FindObjectsInit()

```
CK_RV C_FindObjectsInit (
    CK_SESSION_HANDLE hSession,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount )
```

Initializes an object search in the specified session using the specified attribute template as search parameters.

#### 8.12.4.28 C\_GenerateKey()

```
CK_RV C_GenerateKey (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount,
    CK_OBJECT_HANDLE_PTR phKey )
```

Generates a secret key using the specified mechanism.

### 8.12.4.29 C\_GenerateKeyPair()

```
CK_RV C_GenerateKeyPair (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_ATTRIBUTE_PTR pPublicKeyTemplate,
    CK_ULONG ulPublicKeyAttributeCount,
    CK_ATTRIBUTE_PTR pPrivateKeyTemplate,
    CK_ULONG ulPrivateKeyAttributeCount,
    CK_OBJECT_HANDLE_PTR phPublicKey,
    CK_OBJECT_HANDLE_PTR phPrivateKey )
```

Generates a public-key/private-key pair using the specified mechanism.

### 8.12.4.30 C\_GenerateRandom()

```
CK_RV C_GenerateRandom (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pRandomData,
    CK_ULONG ulRandomLen )
```

Generate the specified amount of random data.

### 8.12.4.31 C\_GetAttributeValue()

```
CK_RV C_GetAttributeValue (
    CK_SESSION_HANDLE hSession,
    CK_OBJECT_HANDLE hObject,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount )
```

Obtains an attribute value of an object.

### 8.12.4.32 C\_GetFunctionList()

```
CK_RV C_GetFunctionList (
    CK_FUNCTION_LIST_PTR_PTR ppFunctionList )
```

Obtains entry points of Cryptoki library functions.

#### 8.12.4.33 C\_GetFunctionStatus()

```
CK_RV C_GetFunctionStatus (
    CK_SESSION_HANDLE hSession )
```

Legacy function - see PKCS#11 v2.40.

#### 8.12.4.34 C\_GetInfo()

```
CK_RV C_GetInfo (
    CK_INFO_PTR pInfo )
```

Obtains general information about Cryptoki.

#### 8.12.4.35 C\_GetMechanismInfo()

```
CK_RV C_GetMechanismInfo (
    CK_SLOT_ID slotID,
    CK_MECHANISM_TYPE type,
    CK_MECHANISM_INFO_PTR pInfo )
```

Obtains information about a particular mechanism of a token (in a slot)

#### 8.12.4.36 C\_GetMechanismList()

```
CK_RV C_GetMechanismList (
    CK_SLOT_ID slotID,
    CK_MECHANISM_TYPE_PTR pMechanismList,
    CK_ULONG_PTR pulCount )
```

Obtains a list of mechanisms supported by a token (in a slot)

#### 8.12.4.37 C\_GetObjectSize()

```
CK_RV C_GetObjectSize (
    CK_SESSION_HANDLE hSession,
    CK_OBJECT_HANDLE hObject,
    CK_ULONG_PTR pulSize )
```

Obtains the size of an object in bytes.

### 8.12.4.38 C\_GetOperationState()

```
CK_RV C_GetOperationState (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pOperationState,
    CK_ULONG_PTR pulOperationStateLen )
```

Obtains the cryptographic operations state of a session.

### 8.12.4.39 C\_GetSessionInfo()

```
CK_RV C_GetSessionInfo (
    CK_SESSION_HANDLE hSession,
    CK_SESSION_INFO_PTR pInfo )
```

Retrieve information about the specified session.

### 8.12.4.40 C\_GetSlotInfo()

```
CK_RV C_GetSlotInfo (
    CK_SLOT_ID slotID,
    CK_SLOT_INFO_PTR pInfo )
```

Obtains information about a particular slot.

### 8.12.4.41 C\_GetSlotList()

```
CK_RV C_GetSlotList (
    CK_BBOOL tokenPresent,
    CK_SLOT_ID_PTR pSlotList,
    CK_ULONG_PTR pulCount )
```

Obtains a list of slots in the system.

### 8.12.4.42 C\_GetTokenInfo()

```
CK_RV C_GetTokenInfo (
    CK_SLOT_ID slotID,
    CK_TOKEN_INFO_PTR pInfo )
```

Obtains information about a particular token.

#### 8.12.4.43 C\_Initialize()

```
CK_RV C_Initialize (
    CK_VOID_PTR pInitArgs )
```

Initializes Cryptoki library NOTES: If pInitArgs is a non-NULL\_PTR is must dereference to a [CK\\_C\\_INITIALIZE\\_ARGS](#) structure.

#### 8.12.4.44 C\_InitPIN()

```
CK_RV C_InitPIN (
    CK_SESSION_HANDLE hSession,
    CK_UTF8CHAR_PTR pPin,
    CK_ULONG ulPinLen )
```

Initializes the normal user's PIN.

#### 8.12.4.45 C\_InitToken()

```
CK_RV C_InitToken (
    CK_SLOT_ID slotID,
    CK_UTF8CHAR_PTR pPin,
    CK_ULONG ulPinLen,
    CK_UTF8CHAR_PTR pLabel )
```

Initializes a token (in a slot)

#### 8.12.4.46 C\_Login()

```
CK_RV C_Login (
    CK_SESSION_HANDLE hSession,
    CK_USER_TYPE userType,
    CK_UTF8CHAR_PTR pPin,
    CK_ULONG ulPinLen )
```

Login on the token in the specified session.

#### 8.12.4.47 C\_Logout()

```
CK_RV C_Logout (
    CK_SESSION_HANDLE hSession )
```

Log out of the token in the specified session.

### 8.12.4.48 C\_OpenSession()

```
CK_RV C_OpenSession (
    CK_SLOT_ID slotID,
    CK_FLAGS flags,
    CK_VOID_PTR pApplication,
    CK_NOTIFY notify,
    CK_SESSION_HANDLE_PTR phSession )
```

Opens a connection between an application and a particular token or sets up an application callback for token insertion.

### 8.12.4.49 C\_SeedRandom()

```
CK_RV C_SeedRandom (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pSeed,
    CK_ULONG ulSeedLen )
```

Mixes in additional seed material to the random number generator.

### 8.12.4.50 C\_SetAttributeValue()

```
CK_RV C_SetAttributeValue (
    CK_SESSION_HANDLE hSession,
    CK_OBJECT_HANDLE hObject,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount )
```

Change or set the value of the specified attributes on the specified object.

### 8.12.4.51 C\_SetOperationState()

```
CK_RV C_SetOperationState (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pOperationState,
    CK_ULONG ulOperationStateLen,
    CK_OBJECT_HANDLE hEncryptionKey,
    CK_OBJECT_HANDLE hAuthenticationKey )
```

Sets the cryptographic operations state of a session.



#### 8.12.4.52 C\_SetPIN()

```
CK_RV C_SetPIN (
    CK_SESSION_HANDLE hSession,
    CK_UTF8CHAR_PTR pOldPin,
    CK_ULONG ulOldLen,
    CK_UTF8CHAR_PTR pNewPin,
    CK_ULONG ulNewLen )
```

Modifies the PIN of the current user.

#### 8.12.4.53 C\_Sign()

```
CK_RV C_Sign (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG ulDataLen,
    CK_BYTE_PTR pSignature,
    CK_ULONG_PTR pulSignatureLen )
```

Sign the data in a single pass operation.

#### 8.12.4.54 C\_SignEncryptUpdate()

```
CK_RV C_SignEncryptUpdate (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pPart,
    CK_ULONG ulPartLen,
    CK_BYTE_PTR pEncryptedPart,
    CK_ULONG_PTR pulEncryptedPartLen )
```

Continues simultaneous multiple-part signature and encryption operations.

#### 8.12.4.55 C\_SignFinal()

```
CK_RV C_SignFinal (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pSignature,
    CK_ULONG_PTR pulSignatureLen )
```

Finishes a multiple-part signature operation.

### 8.12.4.56 C\_SignInit()

```
CK_RV C_SignInit (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hKey )
```

Initialize a signing operation using the specified key and mechanism.

### 8.12.4.57 C\_SignRecover()

```
CK_RV C_SignRecover (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG ulDataLen,
    CK_BYTE_PTR pSignature,
    CK_ULONG_PTR pulSignatureLen )
```

Signs single-part data, where the data can be recovered from the signature.

### 8.12.4.58 C\_SignRecoverInit()

```
CK_RV C_SignRecoverInit (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hKey )
```

Initializes a signature operation, where the data can be recovered from the signature.

### 8.12.4.59 C\_SignUpdate()

```
CK_RV C_SignUpdate (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pPart,
    CK_ULONG ulPartLen )
```

Continues a multiple-part signature operation.

#### 8.12.4.60 C\_UnwrapKey()

```
CK_RV C_UnwrapKey (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hUnwrappingKey,
    CK_BYTE_PTR pWrappedKey,
    CK_ULONG ulWrappedKeyLen,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount,
    CK_OBJECT_HANDLE_PTR phKey )
```

Unwraps (decrypts) the specified key using the specified unwrapping key.

#### 8.12.4.61 C\_Verify()

```
CK_RV C_Verify (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG ulDataLen,
    CK_BYTE_PTR pSignature,
    CK_ULONG ulSignatureLen )
```

Verifies a signature on single-part data.

#### 8.12.4.62 C\_VerifyFinal()

```
CK_RV C_VerifyFinal (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pSignature,
    CK_ULONG ulSignatureLen )
```

Finishes a multiple-part verification operation.

#### 8.12.4.63 C\_VerifyInit()

```
CK_RV C_VerifyInit (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hKey )
```

Initializes a verification operation using the specified key and mechanism.

### 8.12.4.64 C\_VerifyRecover()

```
CK_RV C_VerifyRecover (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pSignature,
    CK_ULONG ulSignatureLen,
    CK_BYTE_PTR pData,
    CK_ULONG_PTR pulDataLen )
```

Verifies a signature on single-part data, where the data is recovered from the signature.

### 8.12.4.65 C\_VerifyRecoverInit()

```
CK_RV C_VerifyRecoverInit (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hKey )
```

Initializes a verification operation where the data is recovered from the signature.

### 8.12.4.66 C\_VerifyUpdate()

```
CK_RV C_VerifyUpdate (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pPart,
    CK_ULONG ulPartLen )
```

Continues a multiple-part verification operation.

### 8.12.4.67 C\_WaitForSlotEvent()

```
CK_RV C_WaitForSlotEvent (
    CK_FLAGS flags,
    CK_SLOT_ID_PTR pSlot,
    CK_VOID_PTR pReserved )
```

Wait for a slot event (token insertion, removal, etc) on the specified slot to occur.

**8.12.4.68 C\_WrapKey()**

```

CK_RV C_WrapKey (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hWrappingKey,
    CK_OBJECT_HANDLE hKey,
    CK_BYTE_PTR pWrappedKey,
    CK_ULONG_PTR pulWrappedKeyLen )

```

Wraps (encrypts) the specified key using the specified wrapping key and mechanism.

**8.12.4.69 pkcs11\_attrib\_empty()**

```

CK_RV pkcs11_attrib_empty (
    const CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )

```

**8.12.4.70 pkcs11\_attrib\_false()**

```

CK_RV pkcs11_attrib_false (
    const CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )

```

**8.12.4.71 pkcs11\_attrib\_fill()**

```

CK_RV pkcs11_attrib_fill (
    CK_ATTRIBUTE_PTR pAttribute,
    const CK_VOID_PTR pData,
    const CK_ULONG ulSize )

```

Perform the nessasary checks and copy data into an attribute structure.

The ulValueLen field is modified to hold the exact length of the specified attribute for the object. In the special case of an attribute whose value is an array of attributes, for example CKA\_WRAP\_TEMPLATE, where it is passed in with pValue not NULL, then if the pValue of elements within the array is NULL\_PTR then the ulValueLen of elements within the array will be set to the required length. If the pValue of elements within the array is not NULL\_PTR, then the ulValueLen element of attributes within the array MUST reflect the space that the corresponding pValue points to, and pValue is filled in if there is sufficient room. Therefore it is important to initialize the contents of a buffer before calling C\_GetAttributeValue to get such an array value. If any ulValueLen within the array isn't large enough, it will be set to CK\_UNAVAILABLE\_INFORMATION and the function will return CKR\_BUFFER\_TOO\_SMALL, as it does if an attribute in the pTemplate argument has ulValueLen too small. Note that any attribute whose value is an array of attributes is identifiable by virtue of the attribute type having the CKF\_ARRAY\_ATTRIBUTE bit set.

### 8.12.4.72 pkcs11\_attrib\_true()

```
CK_RV pkcs11_attrib_true (
    const CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

### 8.12.4.73 pkcs11\_attrib\_value()

```
CK_RV pkcs11_attrib_value (
    CK_ATTRIBUTE_PTR pAttribute,
    const CK_ULONG ulValue,
    const CK_ULONG ulSize )
```

Helper function to write a numerical value to an attribute buffer.

### 8.12.4.74 pkcs11\_cert\_get\_authority\_key\_id()

```
CK_RV pkcs11_cert_get_authority_key_id (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

### 8.12.4.75 pkcs11\_cert\_get\_encoded()

```
CK_RV pkcs11_cert_get_encoded (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

### 8.12.4.76 pkcs11\_cert\_get\_subject()

```
CK_RV pkcs11_cert_get_subject (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

### 8.12.4.77 pkcs11\_cert\_get\_subject\_key\_id()

```
CK_RV pkcs11_cert_get_subject_key_id (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

**8.12.4.78 pkcs11\_cert\_get\_trusted\_flag()**

```
CK_RV pkcs11_cert_get_trusted_flag (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

**8.12.4.79 pkcs11\_cert\_get\_type()**

```
CK_RV pkcs11_cert_get_type (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

**8.12.4.80 pkcs11\_cert\_x509\_write()**

```
CK_RV pkcs11_cert_x509_write (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

**8.12.4.81 pkcs11\_config\_cert()**

```
CK_RV pkcs11_config_cert (
    pkcs11_lib_ctx_ptr pLibCtx,
    pkcs11_slot_ctx_ptr pSlot,
    pkcs11_object_ptr pObject,
    CK_ATTRIBUTE_PTR pLabel )
```

**8.12.4.82 pkcs11\_config\_init\_cert()**

```
void pkcs11_config_init_cert (
    pkcs11_object_ptr pObject,
    char * label,
    size_t len )
```

**8.12.4.83 pkcs11\_config\_init\_private()**

```
void pkcs11_config_init_private (
    pkcs11_object_ptr pObject,
    char * label,
    size_t len )
```

### 8.12.4.84 pkcs11\_config\_init\_public()

```
void pkcs11_config_init_public (
    pkcs11_object_ptr pObject,
    char * label,
    size_t len )
```

### 8.12.4.85 pkcs11\_config\_init\_secret()

```
void pkcs11_config_init_secret (
    pkcs11_object_ptr pObject,
    char * label,
    size_t len,
    uint8_t keylen )
```

### 8.12.4.86 pkcs11\_config\_key()

```
CK_RV pkcs11_config_key (
    pkcs11_lib_ctx_ptr pLibCtx,
    pkcs11_slot_ctx_ptr pSlot,
    pkcs11_object_ptr pObject,
    CK_ATTRIBUTE_PTR pLabel )
```

### 8.12.4.87 pkcs11\_config\_load()

```
CK_RV pkcs11_config_load (
    pkcs11_slot_ctx_ptr slot_ctx )
```

### 8.12.4.88 pkcs11\_config\_load\_objects()

```
CK_RV pkcs11_config_load_objects (
    pkcs11_slot_ctx_ptr slot_ctx )
```

### 8.12.4.89 pkcs11\_config\_remove\_object()

```
CK_RV pkcs11_config_remove_object (
    pkcs11_lib_ctx_ptr pLibCtx,
    pkcs11_slot_ctx_ptr pSlot,
    pkcs11_object_ptr pObject )
```



#### 8.12.4.90 `pkcs11_config_split_string()`

```
void pkcs11_config_split_string (
    char * s,
    char splitter,
    int * argc,
    char * argv[] )
```

#### 8.12.4.91 `pkcs11_decrypt()`

```
CK_RV pkcs11_decrypt (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pEncryptedData,
    CK_ULONG ulEncryptedDataLen,
    CK_BYTE_PTR pData,
    CK_ULONG_PTR pulDataLen )
```

#### 8.12.4.92 `pkcs11_decrypt_final()`

```
CK_RV pkcs11_decrypt_final (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG_PTR pulDataLen )
```

Finishes a multiple-part decryption operation.

#### 8.12.4.93 `pkcs11_decrypt_init()`

```
CK_RV pkcs11_decrypt_init (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hObject )
```

#### 8.12.4.94 `pkcs11_decrypt_update()`

```
CK_RV pkcs11_decrypt_update (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pEncryptedData,
    CK_ULONG ulEncryptedDataLen,
    CK_BYTE_PTR pData,
    CK_ULONG_PTR pulDataLen )
```

### 8.12.4.95 pkcs11\_deinit()

```
CK_RV pkcs11_deinit (
    CK_VOID_PTR pReserved )
```

### 8.12.4.96 pkcs11\_encrypt()

```
CK_RV pkcs11_encrypt (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG ulDataLen,
    CK_BYTE_PTR pEncryptedData,
    CK_ULONG_PTR pulEncryptedDataLen )
```

### 8.12.4.97 pkcs11\_encrypt\_final()

```
CK_RV pkcs11_encrypt_final (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pEncryptedData,
    CK_ULONG_PTR pulEncryptedDataLen )
```

Finishes a multiple-part encryption operation.

### 8.12.4.98 pkcs11\_encrypt\_init()

```
CK_RV pkcs11_encrypt_init (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hObject )
```

### 8.12.4.99 pkcs11\_encrypt\_update()

```
CK_RV pkcs11_encrypt_update (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG ulDataLen,
    CK_BYTE_PTR pEncryptedData,
    CK_ULONG_PTR pulEncryptedDataLen )
```

**8.12.4.100 pkcs11\_find\_continue()**

```
CK_RV pkcs11_find_continue (
    CK_SESSION_HANDLE hSession,
    CK_OBJECT_HANDLE_PTR phObject,
    CK_ULONG ulMaxObjectCount,
    CK_ULONG_PTR pulObjectCount )
```

**8.12.4.101 pkcs11\_find\_finish()**

```
CK_RV pkcs11_find_finish (
    CK_SESSION_HANDLE hSession )
```

**8.12.4.102 pkcs11\_find\_get\_attribute()**

```
CK_RV pkcs11_find_get_attribute (
    CK_SESSION_HANDLE hSession,
    CK_OBJECT_HANDLE hObject,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount )
```

**8.12.4.103 pkcs11\_find\_init()**

```
CK_RV pkcs11_find_init (
    CK_SESSION_HANDLE hSession,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount )
```

**8.12.4.104 pkcs11\_get\_context()**

```
pkcs11_lib_ctx_ptr pkcs11_get_context (
    void )
```

Retrieve the current library context.

**8.12.4.105 pkcs11\_get\_lib\_info()**

```
CK_RV pkcs11_get_lib_info (
    CK_INFO_PTR pInfo )
```

Obtains general information about Cryptoki.

### 8.12.4.106 pkcs11\_get\_session\_context()

```
pkcs11_session_ctx_ptr pkcs11_get_session_context (
    CK_SESSION_HANDLE hSession )
```

### 8.12.4.107 pkcs11\_init()

```
CK_RV pkcs11_init (
    CK_C_INITIALIZE_ARGS_PTR pInitArgs )
```

Initializes the PKCS11 API Library for Cryptoauthlib.

### 8.12.4.108 pkcs11\_init\_check()

```
CK_RV pkcs11_init_check (
    pkcs11_lib_ctx_ptr * ppContext,
    CK_BBOOL lock )
```

Check if the library is initialized properly.

### 8.12.4.109 pkcs11\_key\_derive()

```
CK_RV pkcs11_key_derive (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hBaseKey,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount,
    CK_OBJECT_HANDLE_PTR phKey )
```

### 8.12.4.110 pkcs11\_key\_generate()

```
CK_RV pkcs11_key_generate (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount,
    CK_OBJECT_HANDLE_PTR phKey )
```

**8.12.4.111 pkcs11\_key\_generate\_pair()**

```
CK_RV pkcs11_key_generate_pair (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_ATTRIBUTE_PTR pPublicKeyTemplate,
    CK_ULONG ulPublicKeyAttributeCount,
    CK_ATTRIBUTE_PTR pPrivateKeyTemplate,
    CK_ULONG ulPrivateKeyAttributeCount,
    CK_OBJECT_HANDLE_PTR phPublicKey,
    CK_OBJECT_HANDLE_PTR phPrivateKey )
```

**8.12.4.112 pkcs11\_key\_write()**

```
CK_RV pkcs11_key_write (
    CK_VOID_PTR pSession,
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

**8.12.4.113 pkcs11\_lock\_both()**

```
CK_RV pkcs11_lock_both (
    pkcs11_lib_ctx_ptr pContext )
```

**8.12.4.114 pkcs11\_lock\_context()**

```
CK_RV pkcs11_lock_context (
    pkcs11_lib_ctx_ptr pContext )
```

**8.12.4.115 pkcs11\_lock\_device()**

```
CK_RV pkcs11_lock_device (
    pkcs11_lib_ctx_ptr pContext )
```

**8.12.4.116 pkcs11\_mech\_get\_list()**

```
CK_RV pkcs11_mech_get_list (
    CK_SLOT_ID slotID,
    CK_MECHANISM_TYPE_PTR pMechanismList,
    CK_ULONG_PTR pulCount )
```

### 8.12.4.117 pkcs11\_object\_alloc()

```
CK_RV pkcs11_object_alloc (
    CK_SLOT_ID slotId,
    pkcs11_object_ptr * ppObject )
```

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### 8.12.4.118 pkcs11\_object\_check()

```
CK_RV pkcs11_object_check (
    pkcs11_object_ptr * ppObject,
    CK_OBJECT_HANDLE hObject )
```

### 8.12.4.119 pkcs11\_object\_create()

```
CK_RV pkcs11_object_create (
    CK_SESSION_HANDLE hSession,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount,
    CK_OBJECT_HANDLE_PTR phObject )
```

Create a new object on the token in the specified session using the given attribute template.

### 8.12.4.120 pkcs11\_object\_deinit()

```
CK_RV pkcs11_object_deinit (
    pkcs11_lib_ctx_ptr pContext )
```

### 8.12.4.121 pkcs11\_object\_destroy()

```
CK_RV pkcs11_object_destroy (
    CK_SESSION_HANDLE hSession,
    CK_OBJECT_HANDLE hObject )
```

Destroy the specified object.

**8.12.4.122 pkcs11\_object\_find()**

```
CK_RV pkcs11_object_find (
    CK_SLOT_ID slotId,
    pkcs11_object_ptr * ppObject,
    CK_ATTRIBUTE_PTR pTemplate,
    CK_ULONG ulCount )
```

**8.12.4.123 pkcs11\_object\_free()**

```
CK_RV pkcs11_object_free (
    pkcs11_object_ptr pObject )
```

**8.12.4.124 pkcs11\_object\_get\_class()**

```
CK_RV pkcs11_object_get_class (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

**8.12.4.125 pkcs11\_object\_get\_destroyable()**

```
CK_RV pkcs11_object_get_destroyable (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

**8.12.4.126 pkcs11\_object\_get\_handle()**

```
CK_RV pkcs11_object_get_handle (
    pkcs11_object_ptr pObject,
    CK_OBJECT_HANDLE_PTR phObject )
```

**8.12.4.127 pkcs11\_object\_get\_name()**

```
CK_RV pkcs11_object_get_name (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

### 8.12.4.128 pkcs11\_object\_get\_owner()

```
CK_RV pkcs11_object_get_owner (
    pkcs11_object_ptr pObject,
    CK_SLOT_ID_PTR pSlotId )
```

### 8.12.4.129 pkcs11\_object\_get\_size()

```
CK_RV pkcs11_object_get_size (
    CK_SESSION_HANDLE hSession,
    CK_OBJECT_HANDLE hObject,
    CK_ULONG_PTR pulSize )
```

### 8.12.4.130 pkcs11\_object\_get\_type()

```
CK_RV pkcs11_object_get_type (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

### 8.12.4.131 pkcs11\_object\_is\_private()

```
CK_RV pkcs11_object_is_private (
    pkcs11_object_ptr pObject,
    CK_BBOOL * is_private )
```

Checks the attributes of the underlying cryptographic asset to determine if it is a private key - this changes the way the associated public key is referenced.

### 8.12.4.132 pkcs11\_object\_load\_handle\_info()

```
ATCA_STATUS pkcs11_object_load_handle_info (
    pkcs11_lib_ctx_ptr pContext )
```

### 8.12.4.133 pkcs11\_os\_create\_mutex()

```
CK_RV pkcs11_os_create_mutex (
    CK_VOID_PTR_PTR ppMutex )
```

Application callback for creating a mutex object.



## Parameters

in, out	<i>ppMutex</i>	location to receive ptr to mutex
---------	----------------	----------------------------------

**8.12.4.134 pkcs11\_os\_destroy\_mutex()**

```
CK_RV pkcs11_os_destroy_mutex (
    CK_VOID_PTR pMutex )
```

**8.12.4.135 pkcs11\_os\_lock\_mutex()**

```
CK_RV pkcs11_os_lock_mutex (
    CK_VOID_PTR pMutex )
```

**8.12.4.136 pkcs11\_os\_unlock\_mutex()**

```
CK_RV pkcs11_os_unlock_mutex (
    CK_VOID_PTR pMutex )
```

**8.12.4.137 pkcs11\_session\_check()**

```
CK_RV pkcs11_session_check (
    pkcs11_session_ctx_ptr * pSession,
    CK_SESSION_HANDLE hSession )
```

Check if the session is initialized properly.

**8.12.4.138 pkcs11\_session\_close()**

```
CK_RV pkcs11_session_close (
    CK_SESSION_HANDLE hSession )
```

### 8.12.4.139 pkcs11\_session\_closeall()

```
CK_RV pkcs11_session_closeall (
    CK_SLOT_ID slotID )
```

Close all sessions for a given slot - not actually all open sessions.

### 8.12.4.140 pkcs11\_session\_get\_info()

```
CK_RV pkcs11_session_get_info (
    CK_SESSION_HANDLE hSession,
    CK_SESSION_INFO_PTR pInfo )
```

Obtains information about a particular session.

### 8.12.4.141 pkcs11\_session\_login()

```
CK_RV pkcs11_session_login (
    CK_SESSION_HANDLE hSession,
    CK_USER_TYPE userType,
    CK_UTF8CHAR_PTR pPin,
    CK_ULONG ulPinLen )
```

### 8.12.4.142 pkcs11\_session\_logout()

```
CK_RV pkcs11_session_logout (
    CK_SESSION_HANDLE hSession )
```

### 8.12.4.143 pkcs11\_session\_open()

```
CK_RV pkcs11_session_open (
    CK_SLOT_ID slotID,
    CK_FLAGS flags,
    CK_VOID_PTR pApplication,
    CK_NOTIFY notify,
    CK_SESSION_HANDLE_PTR phSession )
```

**8.12.4.144 pkcs11\_signature\_sign()**

```
CK_RV pkcs11_signature_sign (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG ulDataLen,
    CK_BYTE_PTR pSignature,
    CK_ULONG_PTR pulSignatureLen )
```

Sign the data in a single pass operation.

**8.12.4.145 pkcs11\_signature\_sign\_continue()**

```
CK_RV pkcs11_signature_sign_continue (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pPart,
    CK_ULONG ulPartLen )
```

Continues a multiple-part signature operation.

**8.12.4.146 pkcs11\_signature\_sign\_finish()**

```
CK_RV pkcs11_signature_sign_finish (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pSignature,
    CK_ULONG_PTR pulSignatureLen )
```

Finishes a multiple-part signature operation.

**8.12.4.147 pkcs11\_signature\_sign\_init()**

```
CK_RV pkcs11_signature_sign_init (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hKey )
```

Initialize a signing operation using the specified key and mechanism.

### 8.12.4.148 pkcs11\_signature\_verify()

```
CK_RV pkcs11_signature_verify (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG ulDataLen,
    CK_BYTE_PTR pSignature,
    CK_ULONG ulSignatureLen )
```

Verifies a signature on single-part data.

### 8.12.4.149 pkcs11\_signature\_verify\_continue()

```
CK_RV pkcs11_signature_verify_continue (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pPart,
    CK_ULONG ulPartLen )
```

Continues a multiple-part verification operation.

### 8.12.4.150 pkcs11\_signature\_verify\_finish()

```
CK_RV pkcs11_signature_verify_finish (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pSignature,
    CK_ULONG ulSignatureLen )
```

Finishes a multiple-part verification operation.

### 8.12.4.151 pkcs11\_signature\_verify\_init()

```
CK_RV pkcs11_signature_verify_init (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism,
    CK_OBJECT_HANDLE hKey )
```

Initializes a verification operation using the specified key and mechanism.

### 8.12.4.152 pkcs11\_slot\_config()

```
CK_RV pkcs11_slot_config (
    CK_SLOT_ID slotID )
```

**8.12.4.153 pkcs11\_slot\_get\_context()**

```
pkcs11_slot_ctx_ptr pkcs11_slot_get_context (
    pkcs11_lib_ctx_ptr lib_ctx,
    CK_SLOT_ID slotID )
```

Retrieve the current slot context.

**8.12.4.154 pkcs11\_slot\_get\_info()**

```
CK_RV pkcs11_slot_get_info (
    CK_SLOT_ID slotID,
    CK_SLOT_INFO_PTR pInfo )
```

Obtains information about a particular slot.

**8.12.4.155 pkcs11\_slot\_get\_list()**

```
CK_RV pkcs11_slot_get_list (
    CK_BBOOL tokenPresent,
    CK_SLOT_ID_PTR pSlotList,
    CK_ULONG_PTR pulCount )
```

**8.12.4.156 pkcs11\_slot\_get\_new\_context()**

```
pkcs11_slot_ctx_ptr pkcs11_slot_get_new_context (
    pkcs11_lib_ctx_ptr lib_ctx )
```

**8.12.4.157 pkcs11\_slot\_init()**

```
CK_RV pkcs11_slot_init (
    CK_SLOT_ID slotID )
```

This is an internal function that initializes a pkcs11 slot - it must already have the locks in place before being called.

**8.12.4.158 pkcs11\_slot\_initslots()**

```
CK_VOID_PTR pkcs11_slot_initslots (
    CK_ULONG pulCount )
```

### 8.12.4.159 pkcs11\_token\_convert\_pin\_to\_key()

```
CK_RV pkcs11_token_convert_pin_to_key (
    const CK_UTF8CHAR_PTR pPin,
    const CK_ULONG ulPinLen,
    const CK_UTF8CHAR_PTR pSalt,
    const CK_ULONG ulSaltLen,
    CK_BYTE_PTR pKey,
    CK_ULONG ulKeyLen )
```

### 8.12.4.160 pkcs11\_token\_get\_access\_type()

```
CK_RV pkcs11_token_get_access_type (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

### 8.12.4.161 pkcs11\_token\_get\_info()

```
CK_RV pkcs11_token_get_info (
    CK_SLOT_ID slotID,
    CK_TOKEN_INFO_PTR pInfo )
```

Obtains information about a particular token.

### 8.12.4.162 pkcs11\_token\_get\_storage()

```
CK_RV pkcs11_token_get_storage (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

### 8.12.4.163 pkcs11\_token\_get\_writable()

```
CK_RV pkcs11_token_get_writable (
    CK_VOID_PTR pObject,
    CK_ATTRIBUTE_PTR pAttribute )
```

**8.12.4.164 pkcs11\_token\_init()**

```
CK_RV pkcs11_token_init (
    CK_SLOT_ID slotID,
    CK_UTF8CHAR_PTR pPin,
    CK_ULONG ulPinLen,
    CK_UTF8CHAR_PTR pLabel )
```

Write the configuration into the device and generate new keys

**8.12.4.165 pkcs11\_token\_random()**

```
CK_RV pkcs11_token_random (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pRandomData,
    CK_ULONG ulRandomLen )
```

Generate the specified amount of random data.

**8.12.4.166 pkcs11\_token\_set\_pin()**

```
CK_RV pkcs11_token_set_pin (
    CK_SESSION_HANDLE hSession,
    CK_UTF8CHAR_PTR pOldPin,
    CK_ULONG ulOldLen,
    CK_UTF8CHAR_PTR pNewPin,
    CK_ULONG ulNewLen )
```

**8.12.4.167 pkcs11\_unlock\_both()**

```
CK_RV pkcs11_unlock_both (
    pkcs11_lib_ctx_ptr pContext )
```

**8.12.4.168 pkcs11\_unlock\_context()**

```
CK_RV pkcs11_unlock_context (
    pkcs11_lib_ctx_ptr pContext )
```

**8.12.4.169 pkcs11\_unlock\_device()**

```
CK_RV pkcs11_unlock_device (
    pkcs11_lib_ctx_ptr pContext )
```

## 8.12 Attributes (pkcs11\_attrib\_)

---

### 8.12.4.170 pkcs11\_util\_convert\_rv()

```
CK_RV pkcs11_util_convert_rv (
    ATCA_STATUS status )
```

### 8.12.4.171 pkcs11\_util\_escape\_string()

```
void pkcs11_util_escape_string (
    CK_UTF8CHAR_PTR buf,
    CK_ULONG buf_len )
```

### 8.12.4.172 pkcs11\_util\_memset()

```
int pkcs11_util_memset (
    void * dest,
    size_t destsz,
    int ch,
    size_t count )
```

### 8.12.4.173 pkcs\_mech\_get\_info()

```
CK_RV pkcs_mech_get_info (
    CK_SLOT_ID slotID,
    CK_MECHANISM_TYPE type,
    CK_MECHANISM_INFO_PTR pInfo )
```

## 8.12.5 Variable Documentation

### 8.12.5.1 pkcs11\_cert\_wtlspublic\_attributes

```
const pkcs11_attrib_model pkcs11_cert_wtlspublic_attributes[]
```

CKO\_CERTIFICATE (Type: CKC\_WTLS) - TLS Public Key Certificate Model

### 8.12.5.2 pkcs11\_cert\_wtlspublic\_attributes\_count

```
const CK_ULONG pkcs11_cert_wtlspublic_attributes_count = sizeof( pkcs11_cert_wtlspublic_attributes
) / sizeof( pkcs11_cert_wtlspublic_attributes [0])
```



### 8.12.5.3 pkcs11\_cert\_x509\_attributes

```
const pkcs11_attrib_model pkcs11_cert_x509_attributes[ ]
```

CKO\_CERTIFICATE (Type: CKC\_X\_509\_ATTR\_CERT) - X509 Attribute Certificate Model

### 8.12.5.4 pkcs11\_cert\_x509\_attributes\_count

```
const CK_ULONG pkcs11_cert_x509_attributes_count = sizeof( pkcs11_cert_x509_attributes ) /
sizeof( pkcs11_cert_x509_attributes [0])
```

### 8.12.5.5 pkcs11\_cert\_x509public\_attributes

```
const pkcs11_attrib_model pkcs11_cert_x509public_attributes[ ]
```

CKO\_CERTIFICATE (Type: CKC\_X\_509) - X509 Public Key Certificate Model

### 8.12.5.6 pkcs11\_cert\_x509public\_attributes\_count

```
const CK_ULONG pkcs11_cert_x509public_attributes_count = sizeof( pkcs11_cert_x509public_attributes
) / sizeof( pkcs11_cert_x509public_attributes [0])
```

### 8.12.5.7 pkcs11\_key\_ec\_private\_attributes

```
const pkcs11_attrib_model pkcs11_key_ec_private_attributes[ ]
```

#### Initial value:

```
= {
    { 0x00000180UL , pkcs11_key_get_ec_params },
    { 0x00000181UL , pkcs11_key_get_ec_point  },
}
```

CKO\_PRIVATE\_KEY (Type: CKK\_EC) - EC/ECDSA Public Key Object Model

### 8.12.5.8 pkcs11\_key\_ec\_public\_attributes

```
const pkcs11_attrib_model pkcs11_key_ec_public_attributes[ ]
```

#### Initial value:

```
= {
    { 0x00000180UL , pkcs11_key_get_ec_params },
    { 0x00000181UL , pkcs11_key_get_ec_point  },
}
```

CKO\_PUBLIC\_KEY (Type: CKK\_EC) - EC/ECDSA Public Key Object Model

### 8.12.5.9 pkcs11\_key\_private\_attributes

```
const pkcs11_attrib_model pkcs11_key_private_attributes[]
```

CKO\_PRIVATE\_KEY - Private Key Object Base Model

### 8.12.5.10 pkcs11\_key\_private\_attributes\_count

```
const CK_ULONG pkcs11_key_private_attributes_count = sizeof( pkcs11_key_private_attributes ) /  
sizeof( pkcs11_key_private_attributes [0])
```

### 8.12.5.11 pkcs11\_key\_public\_attributes

```
const pkcs11_attrib_model pkcs11_key_public_attributes[]
```

CKO\_PUBLIC\_KEY - Public Key Object Model

### 8.12.5.12 pkcs11\_key\_public\_attributes\_count

```
const CK_ULONG pkcs11_key_public_attributes_count = sizeof( pkcs11_key_public_attributes ) /  
sizeof( pkcs11_key_public_attributes [0])
```

### 8.12.5.13 pkcs11\_key\_rsa\_private\_attributes

```
const pkcs11_attrib_model pkcs11_key_rsa_private_attributes[]
```

**Initial value:**

```
= {  
    { 0x000000120UL ,      0  
      },  
    { 0x000000122UL ,      0  
      },  
    { 0x000000123UL ,      0  
      },  
    { 0x000000124UL ,      0  
      },  
    { 0x000000125UL ,      0  
      },  
    { 0x000000126UL ,      0  
      },  
    { 0x000000127UL ,      0  
      },  
    { 0x000000128UL ,      0  
      },  
}
```

CKO\_PRIVATE\_KEY (Type: CKK\_RSA) - RSA Private Key Object Model

**8.12.5.14 pkcs11\_key\_secret\_attributes**

```
const pkcs11_attr_model pkcs11_key_secret_attributes[]
```

CKO\_SECRET\_KEY - Secret Key Object Base Model

**8.12.5.15 pkcs11\_key\_secret\_attributes\_count**

```
const CK_ULONG pkcs11_key_secret_attributes_count = sizeof( pkcs11_key_secret_attributes ) /
sizeof( pkcs11_key_secret_attributes [0])
```

**8.12.5.16 pkcs11\_lib\_description**

```
const char pkcs11_lib_description[] = "Cryptoauthlib PKCS11 Interface"
```

**8.12.5.17 pkcs11\_lib\_manufacturer\_id**

```
const char pkcs11_lib_manufacturer_id[] = "Microchip Technology Inc"
```

**8.12.5.18 pkcs11\_object\_cache**

```
pkcs11_object_cache_t pkcs11_object_cache[PKCS11_MAX_OBJECTS_ALLOWED]
```

**8.12.5.19 pkcs11\_object\_monotonic\_attributes**

```
const pkcs11_attr_model pkcs11_object_monotonic_attributes[]
```

**Initial value:**

```
= {
    { 0x00000000UL ,      pkcs11_object_get_class
      },
    { 0x00000300UL , pkcs11_object_get_type
      },
    { 0x00000301UL ,  pkcs11_attr_false
      },
    { 0x00000302UL ,      pkcs11_attr_false
      },
    { 0x00000011UL ,      0
      },
}
```

CKA\_CLASS == CKO\_HW\_FEATURE\_TYPE CKA\_HW\_FEATURE\_TYPE == CKH\_MONOTONIC\_COUNTER

**8.12.5.20 pkcs11\_object\_monotonic\_attributes\_count**

```
const CK_ULONG pkcs11_object_monotonic_attributes_count = sizeof( pkcs11_object_monotonic_attributes
) / sizeof( pkcs11_object_monotonic_attributes [0])
```

## 8.13 TNG API (tng\_)

These methods provide some convenience functions (mostly around certificates) for TNG devices, which currently include ATECC608A-MAHTN-T.

### 8.13.0.1 TNG Functions

This folder has a number of convenience functions for working with TNG devices (currently ATECC608A-MAHTN-T).

These devices have standard certificates that can be easily read using the functions in [tng\\_atcacert\\_client.h](#)

### Functions

- const [atcacert\\_def\\_t \\* tng\\_map\\_get\\_device\\_cert\\_def](#) (int index)  
*Helper function to iterate through all trust cert definitions.*
- [ATCA\\_STATUS tng\\_get\\_device\\_cert\\_def](#) (const [atcacert\\_def\\_t \\*\\*cert\\_def](#))  
*Get the TNG device certificate definition.*
- [ATCA\\_STATUS tng\\_get\\_device\\_pubkey](#) (uint8\_t \*public\_key)  
*Uses GenKey command to calculate the public key from the primary device public key.*
- const [atcacert\\_def\\_t g\\_tflxtls\\_cert\\_def\\_4\\_device](#)
- int [tng\\_atcacert\\_max\\_device\\_cert\\_size](#) (size\_t \*max\_cert\_size)  
*Return the maximum possible certificate size in bytes for a TNG device certificate. Certificate can be variable size, so this gives an appropriate buffer size when reading the certificate.*
- int [tng\\_atcacert\\_read\\_device\\_cert](#) (uint8\_t \*cert, size\_t \*cert\_size, const uint8\_t \*signer\_cert)  
*Reads the device certificate for a TNG device.*
- int [tng\\_atcacert\\_device\\_public\\_key](#) (uint8\_t \*public\_key, uint8\_t \*cert)  
*Reads the device public key.*
- int [tng\\_atcacert\\_max\\_signer\\_cert\\_size](#) (size\_t \*max\_cert\_size)  
*Return the maximum possible certificate size in bytes for a TNG signer certificate. Certificate can be variable size, so this gives an appropriate buffer size when reading the certificate.*
- int [tng\\_atcacert\\_read\\_signer\\_cert](#) (uint8\_t \*cert, size\_t \*cert\_size)  
*Reads the signer certificate for a TNG device.*
- int [tng\\_atcacert\\_signer\\_public\\_key](#) (uint8\_t \*public\_key, uint8\_t \*cert)  
*Reads the signer public key.*
- int [tng\\_atcacert\\_root\\_cert\\_size](#) (size\_t \*cert\_size)  
*Get the size of the TNG root cert.*
- int [tng\\_atcacert\\_root\\_cert](#) (uint8\_t \*cert, size\_t \*cert\_size)  
*Get the TNG root cert.*
- int [tng\\_atcacert\\_root\\_public\\_key](#) (uint8\_t \*public\_key)  
*Gets the root public key.*
- const uint8\_t [g\\_cryptoauth\\_root\\_ca\\_002\\_cert](#) []
- const size\_t [g\\_cryptoauth\\_root\\_ca\\_002\\_cert\\_size](#)
- #define [CRYPTOAUTH\\_ROOT\\_CA\\_002\\_PUBLIC\\_KEY\\_OFFSET](#) 266
- [ATCA\\_DLL](#) const [atcacert\\_def\\_t g\\_tnglora\\_cert\\_def\\_1\\_signer](#)

- [ATCA\\_DLL](#) const [atcacert\\_def\\_t g\\_tnglora\\_cert\\_def\\_2\\_device](#)
- [ATCA\\_DLL](#) const [atcacert\\_def\\_t g\\_tnglora\\_cert\\_def\\_4\\_device](#)
- [#define](#) [TNGLORA\\_CERT\\_TEMPLATE\\_4\\_DEVICE\\_SIZE](#) 552
- [ATCA\\_DLL](#) const [atcacert\\_def\\_t g\\_tngtls\\_cert\\_def\\_1\\_signer](#)
- [#define](#) [TNGTLS\\_CERT\\_TEMPLATE\\_1\\_SIGNER\\_SIZE](#) 520
- [ATCA\\_DLL](#) const [atcacert\\_def\\_t g\\_tngtls\\_cert\\_def\\_2\\_device](#)
- [#define](#) [TNGTLS\\_CERT\\_TEMPLATE\\_2\\_DEVICE\\_SIZE](#) 505
- [#define](#) [TNGTLS\\_CERT\\_ELEMENTS\\_2\\_DEVICE\\_COUNT](#) 2
- [ATCA\\_DLL](#) const [atcacert\\_def\\_t g\\_tngtls\\_cert\\_def\\_3\\_device](#)
- [#define](#) [TNGTLS\\_CERT\\_TEMPLATE\\_3\\_DEVICE\\_SIZE](#) 546

### 8.13.1 Detailed Description

These methods provide some convenience functions (mostly around certificates) for TNG devices, which currently include ATECC608A-MAHTN-T.

### 8.13.2 Macro Definition Documentation

#### 8.13.2.1 CRYPTOAUTH\_ROOT\_CA\_002\_PUBLIC\_KEY\_OFFSET

```
#define CRYPTOAUTH_ROOT_CA_002_PUBLIC_KEY_OFFSET 266
```

#### 8.13.2.2 TNGLORA\_CERT\_TEMPLATE\_4\_DEVICE\_SIZE

```
#define TNGLORA_CERT_TEMPLATE_4_DEVICE_SIZE 552
```

#### 8.13.2.3 TNGTLS\_CERT\_ELEMENTS\_2\_DEVICE\_COUNT

```
#define TNGTLS_CERT_ELEMENTS_2_DEVICE_COUNT 2
```

## 8.13 TNG API (tng\_)

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### 8.13.2.4 TNGTLS\_CERT\_TEMPLATE\_1\_SIGNER\_SIZE

```
#define TNGTLS_CERT_TEMPLATE_1_SIGNER_SIZE 520
```

### 8.13.2.5 TNGTLS\_CERT\_TEMPLATE\_2\_DEVICE\_SIZE

```
#define TNGTLS_CERT_TEMPLATE_2_DEVICE_SIZE 505
```

### 8.13.2.6 TNGTLS\_CERT\_TEMPLATE\_3\_DEVICE\_SIZE

```
#define TNGTLS_CERT_TEMPLATE_3_DEVICE_SIZE 546
```

## 8.13.3 Function Documentation

### 8.13.3.1 tng\_atcacert\_device\_public\_key()

```
int tng_atcacert_device_public_key (  
    uint8_t * public_key,  
    uint8_t * cert )
```

Reads the device public key.

#### Parameters

out	<i>public_key</i>	Public key will be returned here. Format will be the X and Y integers in big-endian format. 64 bytes for P256 curve.
in	<i>cert</i>	If supplied, the device public key is used from this certificate. If set to NULL, the device public key is read from the device.

#### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

### 8.13.3.2 tng\_atcacert\_max\_device\_cert\_size()

```
int tng_atcacert_max_device_cert_size (  
    size_t * max_cert_size )
```

Return the maximum possible certificate size in bytes for a TNG device certificate. Certificate can be variable size, so this gives an appropriate buffer size when reading the certificate.

**Parameters**

out	<i>max_cert_size</i>	Maximum certificate size will be returned here in bytes.
-----	----------------------	--

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.13.3.3 tng\_atcacert\_max\_signer\_cert\_size()**

```
int tng_atcacert_max_signer_cert_size (
    size_t * max_cert_size )
```

Return the maximum possible certificate size in bytes for a TNG signer certificate. Certificate can be variable size, so this gives an appropriate buffer size when reading the certificate.

**Parameters**

out	<i>max_cert_size</i>	Maximum certificate size will be returned here in bytes.
-----	----------------------	--

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.13.3.4 tng\_atcacert\_read\_device\_cert()**

```
int tng_atcacert_read_device_cert (
    uint8_t * cert,
    size_t * cert_size,
    const uint8_t * signer_cert )
```

Reads the device certificate for a TNG device.

**Parameters**

out	<i>cert</i>	Buffer to received the certificate (DER format).
in, out	<i>cert_size</i>	As input, the size of the cert buffer in bytes. As output, the size of the certificate returned in cert in bytes.
in	<i>signer_cert</i>	If supplied, the signer public key is used from this certificate. If set to NULL, the signer public key is read from the device.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

### 8.13.3.5 tng\_atcacert\_read\_signer\_cert()

```
int tng_atcacert_read_signer_cert (
    uint8_t * cert,
    size_t * cert_size )
```

Reads the signer certificate for a TNG device.

#### Parameters

out	<i>cert</i>	Buffer to received the certificate (DER format).
in, out	<i>cert_size</i>	As input, the size of the cert buffer in bytes. As output, the size of the certificate returned in cert in bytes.

#### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

### 8.13.3.6 tng\_atcacert\_root\_cert()

```
int tng_atcacert_root_cert (
    uint8_t * cert,
    size_t * cert_size )
```

Get the TNG root cert.

#### Parameters

out	<i>cert</i>	Buffer to received the certificate (DER format).
in, out	<i>cert_size</i>	As input, the size of the cert buffer in bytes. As output, the size of the certificate returned in cert in bytes.

#### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

### 8.13.3.7 tng\_atcacert\_root\_cert\_size()

```
int tng_atcacert_root_cert_size (
    size_t * cert_size )
```

Get the size of the TNG root cert.



**Parameters**

out	<i>cert_size</i>	Certificate size will be returned here in bytes.
-----	------------------	--

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.13.3.8 tng\_atcacert\_root\_public\_key()**

```
int tng_atcacert_root_public_key (
    uint8_t * public_key )
```

Gets the root public key.

**Parameters**

out	<i>public_key</i>	Public key will be returned here. Format will be the X and Y integers in big-endian format. 64 bytes for P256 curve.
-----	-------------------	--

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

**8.13.3.9 tng\_atcacert\_signer\_public\_key()**

```
int tng_atcacert_signer_public_key (
    uint8_t * public_key,
    uint8_t * cert )
```

Reads the signer public key.

**Parameters**

out	<i>public_key</i>	Public key will be returned here. Format will be the X and Y integers in big-endian format. 64 bytes for P256 curve.
in	<i>cert</i>	If supplied, the signer public key is used from this certificate. If set to NULL, the signer public key is read from the device.

**Returns**

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

## 8.13 TNG API (tng\_)

---

### 8.13.3.10 tng\_get\_device\_cert\_def()

```
ATCA_STATUS tng_get_device_cert_def (
    const atcacert_def_t ** cert_def )
```

Get the TNG device certificate definition.

#### Parameters

out	<i>cert_def</i>	TNG device certificate definition is returned here.
-----	-----------------	---

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.13.3.11 tng\_get\_device\_pubkey()

```
ATCA_STATUS tng_get_device_pubkey (
    uint8_t * public_key )
```

Uses GenKey command to calculate the public key from the primary device public key.

#### Parameters

out	<i>public_key</i>	Public key will be returned here. Format will be the X and Y integers in big-endian format. 64 bytes for P256 curve.
-----	-------------------	--

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 8.13.3.12 tng\_map\_get\_device\_cert\_def()

```
const atcacert_def_t* tng_map_get_device_cert_def (
    int index )
```

Helper function to iterate through all trust cert definitions.

#### Parameters

in	<i>index</i>	Map index
----	--------------	-----------

**Returns**

non-null value if success, otherwise NULL

**8.13.4 Variable Documentation****8.13.4.1 g\_cryptoauth\_root\_ca\_002\_cert**

```
const uint8_t g_cryptoauth_root_ca_002_cert[] [extern]
```

**8.13.4.2 g\_cryptoauth\_root\_ca\_002\_cert\_size**

```
const size_t g_cryptoauth_root_ca_002_cert_size [extern]
```

**8.13.4.3 g\_tflxtls\_cert\_def\_4\_device**

```
const atccert_def_t g_tflxtls_cert_def_4_device [extern]
```

**8.13.4.4 g\_tnglora\_cert\_def\_1\_signer**

```
ATCA_DLL const atccert_def_t g_tnglora_cert_def_1_signer
```

**8.13.4.5 g\_tnglora\_cert\_def\_2\_device**

```
ATCA_DLL const atccert_def_t g_tnglora_cert_def_2_device
```

**8.13.4.6 g\_tnglora\_cert\_def\_4\_device**

```
ATCA_DLL const atccert_def_t g_tnglora_cert_def_4_device
```

**8.13.4.7 g\_tngtls\_cert\_def\_1\_signer**

```
ATCA_DLL const atccert_def_t g_tngtls_cert_def_1_signer
```

**8.13.4.8 g\_tngtls\_cert\_def\_2\_device**

```
ATCA_DLL const atccert_def_t g_tngtls_cert_def_2_device
```

**8.13.4.9 g\_tngtls\_cert\_def\_3\_device**

```
ATCA_DLL const atccert_def_t g_tngtls_cert_def_3_device
```

## Chapter 9

# Data Structure Documentation

### 9.1 `_ascii_kit_host_context` Struct Reference

```
#include <ascii_kit_host.h>
```

#### Data Fields

- const [atca\\_hal\\_kit\\_phy\\_t](#) \* `phy`
- [uint8\\_t](#) `buffer` [(2500)]
- [ATCADevice](#) `device`
- [ATCAIfaceCfg](#) \*\* `iface`
- [size\\_t](#) `iface_count`
- [uint32\\_t](#) `flags`

#### 9.1.1 Field Documentation

##### 9.1.1.1 `buffer`

```
uint8_t buffer[(2500)]
```

##### 9.1.1.2 `device`

```
ATCADevice device
```

### 9.1.1.3 flags

```
uint32_t flags
```

### 9.1.1.4 iface

```
ATCAIfaceCfg** iface
```

### 9.1.1.5 iface\_count

```
size_t iface_count
```

### 9.1.1.6 phy

```
const atca_hal_kit_phy_t* phy
```

## 9.2 \_atecc508a\_config Struct Reference

```
#include <atca_device.h>
```

### Data Fields

- uint32\_t [SN03](#)
- uint32\_t [RevNum](#)
- uint32\_t [SN47](#)
- uint8\_t [SN8](#)
- uint8\_t [Reserved0](#)
- uint8\_t [I2C\\_Enable](#)
- uint8\_t [Reserved1](#)
- uint8\_t [I2C\\_Address](#)
- uint8\_t [Reserved2](#)
- uint8\_t [OTPmode](#)
- uint8\_t [ChipMode](#)
- uint16\_t [SlotConfig](#) [16]
- uint8\_t [Counter0](#) [8]
- uint8\_t [Counter1](#) [8]
- uint8\_t [LastKeyUse](#) [16]
- uint8\_t [UserExtra](#)
- uint8\_t [Selector](#)
- uint8\_t [LockValue](#)
- uint8\_t [LockConfig](#)
- uint16\_t [SlotLocked](#)
- uint16\_t [RFU](#)
- uint32\_t [X509format](#)
- uint16\_t [KeyConfig](#) [16]

### 9.2.1 Field Documentation

#### 9.2.1.1 ChipMode

`uint8_t ChipMode`

#### 9.2.1.2 Counter0

`uint8_t Counter0[8]`

#### 9.2.1.3 Counter1

`uint8_t Counter1[8]`

#### 9.2.1.4 I2C\_Address

`uint8_t I2C_Address`

#### 9.2.1.5 I2C\_Enable

`uint8_t I2C_Enable`

#### 9.2.1.6 KeyConfig

`uint16_t KeyConfig[16]`

#### 9.2.1.7 LastKeyUse

`uint8_t LastKeyUse[16]`

**9.2.1.8 LockConfig**

uint8\_t LockConfig

**9.2.1.9 LockValue**

uint8\_t LockValue

**9.2.1.10 OTPmode**

uint8\_t OTPmode

**9.2.1.11 Reserved0**

uint8\_t Reserved0

**9.2.1.12 Reserved1**

uint8\_t Reserved1

**9.2.1.13 Reserved2**

uint8\_t Reserved2

**9.2.1.14 RevNum**

uint32\_t RevNum

**9.2.1.15 RFU**

uint16\_t RFU

### 9.2.1.16 Selector

uint8\_t Selector

### 9.2.1.17 SlotConfig

uint16\_t SlotConfig[16]

### 9.2.1.18 SlotLocked

uint16\_t SlotLocked

### 9.2.1.19 SN03

uint32\_t SN03

### 9.2.1.20 SN47

uint32\_t SN47

### 9.2.1.21 SN8

uint8\_t SN8

### 9.2.1.22 UserExtra

uint8\_t UserExtra

### 9.2.1.23 X509format

uint32\_t X509format



## 9.3 \_atecc608\_config Struct Reference

```
#include <atca_device.h>
```

### Data Fields

- uint32\_t [SN03](#)
- uint32\_t [RevNum](#)
- uint32\_t [SN47](#)
- uint8\_t [SN8](#)
- uint8\_t [AES\\_Enable](#)
- uint8\_t [I2C\\_Enable](#)
- uint8\_t [Reserved1](#)
- uint8\_t [I2C\\_Address](#)
- uint8\_t [Reserved2](#)
- uint8\_t [CountMatch](#)
- uint8\_t [ChipMode](#)
- uint16\_t [SlotConfig](#) [16]
- uint8\_t [Counter0](#) [8]
- uint8\_t [Counter1](#) [8]
- uint8\_t [UseLock](#)
- uint8\_t [VolatileKeyPermission](#)
- uint16\_t [SecureBoot](#)
- uint8\_t [KdflvLoc](#)
- uint16\_t [KdflvStr](#)
- uint8\_t [Reserved3](#) [9]
- uint8\_t [UserExtra](#)
- uint8\_t [UserExtraAdd](#)
- uint8\_t [LockValue](#)
- uint8\_t [LockConfig](#)
- uint16\_t [SlotLocked](#)
- uint16\_t [ChipOptions](#)
- uint32\_t [X509format](#)
- uint16\_t [KeyConfig](#) [16]

### 9.3.1 Field Documentation

#### 9.3.1.1 AES\_Enable

```
uint8_t AES_Enable
```

#### 9.3.1.2 ChipMode

```
uint8_t ChipMode
```

### 9.3.1.3 ChipOptions

uint16\_t ChipOptions

### 9.3.1.4 Counter0

uint8\_t Counter0[8]

### 9.3.1.5 Counter1

uint8\_t Counter1[8]

### 9.3.1.6 CountMatch

uint8\_t CountMatch

### 9.3.1.7 I2C\_Address

uint8\_t I2C\_Address

### 9.3.1.8 I2C\_Enable

uint8\_t I2C\_Enable

### 9.3.1.9 KdfIvLoc

uint8\_t KdfIvLoc

### 9.3.1.10 KdfIvStr

uint16\_t KdfIvStr

**9.3.1.11 KeyConfig**

```
uint16_t KeyConfig[16]
```

**9.3.1.12 LockConfig**

```
uint8_t LockConfig
```

**9.3.1.13 LockValue**

```
uint8_t LockValue
```

**9.3.1.14 Reserved1**

```
uint8_t Reserved1
```

**9.3.1.15 Reserved2**

```
uint8_t Reserved2
```

**9.3.1.16 Reserved3**

```
uint8_t Reserved3[9]
```

**9.3.1.17 RevNum**

```
uint32_t RevNum
```

**9.3.1.18 SecureBoot**

```
uint16_t SecureBoot
```

### 9.3.1.19 SlotConfig

```
uint16_t SlotConfig[16]
```

### 9.3.1.20 SlotLocked

```
uint16_t SlotLocked
```

### 9.3.1.21 SN03

```
uint32_t SN03
```

### 9.3.1.22 SN47

```
uint32_t SN47
```

### 9.3.1.23 SN8

```
uint8_t SN8
```

### 9.3.1.24 UseLock

```
uint8_t UseLock
```

### 9.3.1.25 UserExtra

```
uint8_t UserExtra
```

### 9.3.1.26 UserExtraAdd

```
uint8_t UserExtraAdd
```

### 9.3.1.27 VolatileKeyPermission

```
uint8_t VolatileKeyPermission
```

### 9.3.1.28 X509format

```
uint32_t X509format
```

## 9.4 \_atsha204a\_config Struct Reference

```
#include <atca_device.h>
```

### Data Fields

- uint32\_t [SN03](#)
- uint32\_t [RevNum](#)
- uint32\_t [SN47](#)
- uint8\_t [SN8](#)
- uint8\_t [Reserved0](#)
- uint8\_t [I2C\\_Enable](#)
- uint8\_t [Reserved1](#)
- uint8\_t [I2C\\_Address](#)
- uint8\_t [Reserved2](#)
- uint8\_t [OTPmode](#)
- uint8\_t [ChipMode](#)
- uint16\_t [SlotConfig](#) [16]
- uint16\_t [Counter](#) [8]
- uint8\_t [LastKeyUse](#) [16]
- uint8\_t [UserExtra](#)
- uint8\_t [Selector](#)
- uint8\_t [LockValue](#)
- uint8\_t [LockConfig](#)

### 9.4.1 Field Documentation

#### 9.4.1.1 ChipMode

```
uint8_t ChipMode
```

### 9.4.1.2 Counter

```
uint16_t Counter[8]
```

### 9.4.1.3 I2C\_Address

```
uint8_t I2C_Address
```

### 9.4.1.4 I2C\_Enable

```
uint8_t I2C_Enable
```

### 9.4.1.5 LastKeyUse

```
uint8_t LastKeyUse[16]
```

### 9.4.1.6 LockConfig

```
uint8_t LockConfig
```

### 9.4.1.7 LockValue

```
uint8_t LockValue
```

### 9.4.1.8 OTPmode

```
uint8_t OTPmode
```

### 9.4.1.9 Reserved0

```
uint8_t Reserved0
```

**9.4.1.10 Reserved1**

uint8\_t Reserved1

**9.4.1.11 Reserved2**

uint8\_t Reserved2

**9.4.1.12 RevNum**

uint32\_t RevNum

**9.4.1.13 Selector**

uint8\_t Selector

**9.4.1.14 SlotConfig**

uint16\_t SlotConfig[16]

**9.4.1.15 SN03**

uint32\_t SN03

**9.4.1.16 SN47**

uint32\_t SN47

**9.4.1.17 SN8**

uint8\_t SN8

### 9.4.1.18 UserExtra

uint8\_t UserExtra

## 9.5 \_kit\_host\_map\_entry Struct Reference

```
#include <ascii_kit_host.h>
```

### Data Fields

- const char \* [id](#)
- [ATCA\\_STATUS](#)(\* [fp\\_command](#))([ascii\\_kit\\_host\\_context\\_t](#) \*ctx, int argc, char \*argv[], uint8\_t \*response, size\_t \*rlen)

### 9.5.1 Detailed Description

Used to create command tables for the kit host parser

### 9.5.2 Field Documentation

#### 9.5.2.1 fp\_command

```
ATCA\_STATUS(* fp\_command)(ascii\_kit\_host\_context\_t *ctx, int argc, char *argv[], uint8_t *response, size_t *rlen)
```

#### 9.5.2.2 id

```
const char* id
```

## 9.6 \_pcks11\_mech\_table\_e Struct Reference

### Data Fields

- [CK\\_MECHANISM\\_TYPE](#) type
- [CK\\_MECHANISM\\_INFO](#) info

### 9.6.1 Field Documentation



### 9.6.1.1 info

`CK_MECHANISM_INFO` info

### 9.6.1.2 type

`CK_MECHANISM_TYPE` type

## 9.7 `_pkcs11_attrib_model` Struct Reference

```
#include <pkcs11_attrib.h>
```

### Data Fields

- const `CK_ATTRIBUTE_TYPE` type
- const `attrib_f` func

### 9.7.1 Field Documentation

#### 9.7.1.1 func

const `attrib_f` func

#### 9.7.1.2 type

const `CK_ATTRIBUTE_TYPE` type

## 9.8 `_pkcs11_lib_ctx` Struct Reference

```
#include <pkcs11_init.h>
```

### Data Fields

- [CK\\_BBOOL](#) initialized
- [CK\\_CREATEMUTEX](#) [create\\_mutex](#)
- [CK\\_DESTROYMUTEX](#) [destroy\\_mutex](#)
- [CK\\_LOCKMUTEX](#) [lock\\_mutex](#)
- [CK\\_UNLOCKMUTEX](#) [unlock\\_mutex](#)
- [CK\\_VOID\\_PTR](#) [lib\\_lock](#)
- [CK\\_VOID\\_PTR](#) [dev\\_lock](#)
- [CK\\_BBOOL](#) [lib\\_locked](#)
- [CK\\_VOID\\_PTR](#) [slots](#)
- [CK\\_ULONG](#) [slot\\_cnt](#)
- [CK\\_CHAR](#) [config\\_path](#) [200]

### 9.8.1 Detailed Description

Library Context

### 9.8.2 Field Documentation

#### 9.8.2.1 config\_path

[CK\\_CHAR](#) [config\\_path](#)[200]

#### 9.8.2.2 create\_mutex

[CK\\_CREATEMUTEX](#) [create\\_mutex](#)

#### 9.8.2.3 destroy\_mutex

[CK\\_DESTROYMUTEX](#) [destroy\\_mutex](#)

#### 9.8.2.4 dev\_lock

[CK\\_VOID\\_PTR](#) [dev\\_lock](#)

#### 9.8.2.5 initialized

`CK_BBOOL` initialized

#### 9.8.2.6 lib\_lock

`CK_VOID_PTR` lib\_lock

#### 9.8.2.7 lib\_locked

`CK_BBOOL` lib\_locked

#### 9.8.2.8 lock\_mutex

`CK_LOCKMUTEX` lock\_mutex

#### 9.8.2.9 slot\_cnt

`CK_ULONG` slot\_cnt

#### 9.8.2.10 slots

`CK_VOID_PTR` slots

#### 9.8.2.11 unlock\_mutex

`CK_UNLOCKMUTEX` unlock\_mutex

### 9.9 \_pkcs11\_object Struct Reference

```
#include <pkcs11_object.h>
```

### Data Fields

- [CK\\_OBJECT\\_CLASS](#) `class_id`
- [CK\\_ULONG](#) `class_type`
- `pkcs11_attr_model` `const * attributes`
- [CK\\_ULONG](#) `count`
- [CK\\_ULONG](#) `size`
- `uint16_t` `slot`
- [CK\\_FLAGS](#) `flags`
- [CK\\_UTF8CHAR](#) `name` [`PKCS11_MAX_LABEL_SIZE+1`]
- [CK\\_VOID\\_PTR](#) `config`
- [CK\\_VOID\\_PTR](#) `data`
- `ta_element_attributes_t` `handle_info`

### 9.9.1 Field Documentation

#### 9.9.1.1 attributes

`pkcs11_attr_model` `const* attributes`

List of attribute models this object possesses

#### 9.9.1.2 class\_id

[CK\\_OBJECT\\_CLASS](#) `class_id`

The Class Identifier

#### 9.9.1.3 class\_type

[CK\\_ULONG](#) `class_type`

The Class Type

#### 9.9.1.4 config

[CK\\_VOID\\_PTR](#) `config`

#### 9.9.1.5 count

[CK\\_ULONG](#) `count`

Count of attribute models

#### 9.9.1.6 data

[CK\\_VOID\\_PTR](#) data

#### 9.9.1.7 flags

[CK\\_FLAGS](#) flags

#### 9.9.1.8 handle\_info

ta\_element\_attributes\_t handle\_info

#### 9.9.1.9 name

[CK\\_UTF8CHAR](#) name[PKCS11\_MAX\_LABEL\_SIZE+1]

#### 9.9.1.10 size

[CK\\_ULONG](#) size

#### 9.9.1.11 slot

uint16\_t slot

### 9.10 \_pkcs11\_object\_cache\_t Struct Reference

```
#include <pkcs11_object.h>
```

#### Data Fields

- [CK\\_OBJECT\\_HANDLE](#) handle
- [CK\\_SLOT\\_ID](#) slotid
- pkcs11\_object\_ptr [object](#)

### 9.10.1 Field Documentation

#### 9.10.1.1 handle

`CK_OBJECT_HANDLE` handle

Arbitrary (but unique) non-null identifier for an object

#### 9.10.1.2 object

`pkcs11_object_ptr` object

The actual object

#### 9.10.1.3 slotid

`CK_SLOT_ID` slotid

## 9.11 \_pkcs11\_session\_ctx Struct Reference

```
#include <pkcs11_session.h>
```

### Data Fields

- `CK_BBOOL` initialized
- `pkcs11_slot_ctx_ptr` slot
- `CK_SESSION_HANDLE` handle
- `CK_STATE` state
- `CK_ULONG` error
- `CK_ATTRIBUTE_PTR` attrib\_list
- `CK_ULONG` attrib\_count
- `CK_ULONG` object\_index
- `CK_ULONG` object\_count
- `CK_OBJECT_HANDLE` active\_object
- `CK_MECHANISM_TYPE` active\_mech
- `pkcs11_session_mech_ctx` active\_mech\_data

### 9.11.1 Detailed Description

Session Context

## 9.11.2 Field Documentation

### 9.11.2.1 active\_mech

`CK_MECHANISM_TYPE` active\_mech

### 9.11.2.2 active\_mech\_data

`pkcs11_session_mech_ctx` active\_mech\_data

### 9.11.2.3 active\_object

`CK_OBJECT_HANDLE` active\_object

### 9.11.2.4 attrib\_count

`CK_ULONG` attrib\_count

### 9.11.2.5 attrib\_list

`CK_ATTRIBUTE_PTR` attrib\_list

### 9.11.2.6 error

`CK_ULONG` error

### 9.11.2.7 handle

`CK_SESSION_HANDLE` handle

### 9.11.2.8 initialized

`CK_BBOOL` initialized

### 9.11.2.9 object\_count

`CK_ULONG` object\_count

### 9.11.2.10 object\_index

`CK_ULONG` object\_index

### 9.11.2.11 slot

`pkcs11_slot_ctx_ptr` slot

### 9.11.2.12 state

`CK_STATE` state

## 9.12 \_pkcs11\_session\_mech\_ctx Struct Reference

```
#include <pkcs11_session.h>
```

### Data Fields

- `atcac_hmac_sha256_ctx` hmac
- `atcac_sha2_256_ctx` sha256
- `atca_aes_cmac_ctx_t` cmac
- `atca_aes_cbc_ctx_t` cbc
- struct {
  - `uint8_t` iv [TA\_AES\_GCM\_IV\_LENGTH]
  - `uint8_t` aad [ATCA\_AES128\_BLOCK\_SIZE]
  - `CK_BYTE` aad\_len
- `gcm_single`



## 9.12.1 Field Documentation

### 9.12.1.1 aad

```
uint8_t aad[ATCA_AES128_BLOCK_SIZE]
```

### 9.12.1.2 aad\_len

```
CK_BYTE aad_len
```

### 9.12.1.3 cbc

```
atca_aes_cbc_ctx_t cbc
```

### 9.12.1.4 cmac

```
atca_aes_cmac_ctx_t cmac
```

### 9.12.1.5 gcm\_single

```
struct { ... } gcm_single
```

### 9.12.1.6 hmac

```
atcac_hmac_sha256_ctx hmac
```

### 9.12.1.7 iv

```
uint8_t iv[TA_AES_GCM_IV_LENGTH]
```

### 9.12.1.8 sha256

`atcac_sha2_256_ctx` sha256

## 9.13 \_pkcs11\_slot\_ctx Struct Reference

```
#include <pkcs11_slot.h>
```

### Data Fields

- `CK_BBOOL` initialized
- `CK_SLOT_ID` slot\_id
- `ATCADevice` device\_ctx
- `ATCAIfaceCfg` interface\_config
- `CK_SESSION_HANDLE` session
- `atecc608_config_t` cfg\_zone
- `CK_FLAGS` flags
- `uint16_t` user\_pin\_handle
- `uint16_t` so\_pin\_handle
- `CK_UTF8CHAR` label [PKCS11\_MAX\_LABEL\_SIZE+1]
- `CK_BBOOL` logged\_in
- `CK_BYTE` read\_key [32]

### 9.13.1 Detailed Description

Slot Context

### 9.13.2 Field Documentation

#### 9.13.2.1 cfg\_zone

`atecc608_config_t` cfg\_zone

#### 9.13.2.2 device\_ctx

`ATCADevice` device\_ctx

### 9.13.2.3 flags

`CK_FLAGS` flags

### 9.13.2.4 initialized

`CK_BBOOL` initialized

### 9.13.2.5 interface\_config

`ATCAIfaceCfg` interface\_config

### 9.13.2.6 label

`CK_UTF8CHAR` label[PKCS11\_MAX\_LABEL\_SIZE+1]

### 9.13.2.7 logged\_in

`CK_BBOOL` logged\_in

### 9.13.2.8 read\_key

`CK_BYTE` read\_key[32]

Accepted through C\_Login as the user pin

### 9.13.2.9 session

`CK_SESSION_HANDLE` session

### 9.13.2.10 slot\_id

`CK_SLOT_ID` slot\_id

### 9.13.2.11 so\_pin\_handle

uint16\_t so\_pin\_handle

### 9.13.2.12 user\_pin\_handle

uint16\_t user\_pin\_handle

## 9.14 atca\_check\_mac\_in\_out Struct Reference

Input/output parameters for function [atcah\\_check\\_mac\(\)](#).

```
#include <atca_host.h>
```

### Data Fields

- uint8\_t [mode](#)  
*[in] CheckMac command Mode*
- uint16\_t [key\\_id](#)  
*[in] CheckMac command KeyID*
- const uint8\_t \* [sn](#)  
*[in] Device serial number SN[0:8]. Only SN[0:1] and SN[8] are required though.*
- const uint8\_t \* [client\\_chal](#)  
*[in] ClientChal data, 32 bytes. Can be NULL if mode[0] is 1.*
- uint8\_t \* [client\\_resp](#)  
*[out] Calculated ClientResp will be returned here.*
- const uint8\_t \* [other\\_data](#)  
*[in] OtherData, 13 bytes*
- const uint8\_t \* [otp](#)  
*[in] First 8 bytes of the OTP zone data. Can be NULL is mode[5] is 0.*
- const uint8\_t \* [slot\\_key](#)
- const uint8\_t \* [target\\_key](#)
- struct [atca\\_temp\\_key](#) \* [temp\\_key](#)  
*[in,out] Current state of TempKey. Required if mode[0] or mode[1] are 1.*

### 9.14.1 Detailed Description

Input/output parameters for function [atcah\\_check\\_mac\(\)](#).

### 9.14.2 Field Documentation

#### 9.14.2.1 client\_chal

```
const uint8_t* client_chal
```

[in] ClientChal data, 32 bytes. Can be NULL if mode[0] is 1.

#### 9.14.2.2 client\_resp

```
uint8_t* client_resp
```

[out] Calculated ClientResp will be returned here.

#### 9.14.2.3 key\_id

```
uint16_t key_id
```

[in] CheckMac command KeyID

#### 9.14.2.4 mode

```
uint8_t mode
```

[in] CheckMac command Mode

#### 9.14.2.5 other\_data

```
const uint8_t* other_data
```

[in] OtherData, 13 bytes

#### 9.14.2.6 otp

```
const uint8_t* otp
```

[in] First 8 bytes of the OTP zone data. Can be NULL is mode[5] is 0.

## 9.15 atca\_decrypt\_in\_out Struct Reference

---

### 9.14.2.7 slot\_key

```
const uint8_t* slot_key
```

[in] 32 byte key value in the slot specified by slot\_id. Can be NULL if mode[1] is 1.

### 9.14.2.8 sn

```
const uint8_t* sn
```

[in] Device serial number SN[0:8]. Only SN[0:1] and SN[8] are required though.

### 9.14.2.9 target\_key

```
const uint8_t* target_key
```

[in] If this is not NULL, it assumes CheckMac copy is enabled for the specified key\_id (ReadKey=0). If key\_id is even, this should be the 32-byte key value for the slot key\_id+1, otherwise this should be set to slot\_key.

### 9.14.2.10 temp\_key

```
struct atca_temp_key* temp_key
```

[in,out] Current state of TempKey. Required if mode[0] or mode[1] are 1.

## 9.15 atca\_decrypt\_in\_out Struct Reference

Input/output parameters for function atca\_decrypt().

```
#include <atca_host.h>
```

### Data Fields

- `uint8_t * crypto_data`  
*[in,out] Pointer to 32-byte data. Input encrypted data from Read command (Contents field), output decrypted.*
- `struct atca_temp_key * temp_key`  
*[in,out] Pointer to TempKey structure.*

### 9.15.1 Detailed Description

Input/output parameters for function atca\_decrypt().

## 9.16 atca\_derive\_key\_in\_out Struct Reference

Input/output parameters for function [atcah\\_derive\\_key\(\)](#).

```
#include <atca_host.h>
```

### Data Fields

- `uint8_t mode`  
*Mode (param 1) of the derive key command.*
- `uint16_t target_key_id`  
*Key ID (param 2) of the target slot to run the command on.*
- `const uint8_t * sn`  
*Device serial number SN[0:8]. Only SN[0:1] and SN[8] are required though.*
- `const uint8_t * parent_key`  
*Parent key to be used in the derive key calculation (32 bytes).*
- `uint8_t * target_key`  
*Derived key will be returned here (32 bytes).*
- `struct atca_temp_key * temp_key`  
*Current state of TempKey.*

### 9.16.1 Detailed Description

Input/output parameters for function [atcah\\_derive\\_key\(\)](#).

### 9.16.2 Field Documentation

#### 9.16.2.1 mode

```
uint8_t mode
```

Mode (param 1) of the derive key command.

#### 9.16.2.2 parent\_key

```
const uint8_t* parent_key
```

Parent key to be used in the derive key calculation (32 bytes).

## 9.17 atca\_derive\_key\_mac\_in\_out Struct Reference

---

### 9.16.2.3 sn

```
const uint8_t* sn
```

Device serial number SN[0:8]. Only SN[0:1] and SN[8] are required though.

### 9.16.2.4 target\_key

```
uint8_t* target_key
```

Derived key will be returned here (32 bytes).

### 9.16.2.5 target\_key\_id

```
uint16_t target_key_id
```

Key ID (param 2) of the target slot to run the command on.

### 9.16.2.6 temp\_key

```
struct atca_temp_key* temp_key
```

Current state of TempKey.

## 9.17 atca\_derive\_key\_mac\_in\_out Struct Reference

Input/output parameters for function [atcah\\_derive\\_key\\_mac\(\)](#).

```
#include <atca_host.h>
```

### Data Fields

- `uint8_t mode`  
*Mode (param 1) of the derive key command.*
- `uint16_t target_key_id`  
*Key ID (param 2) of the target slot to run the command on.*
- `const uint8_t * sn`  
*Device serial number SN[0:8]. Only SN[0:1] and SN[8] are required though.*
- `const uint8_t * parent_key`  
*Parent key to be used in the derive key calculation (32 bytes).*
- `uint8_t * mac`  
*DeriveKey MAC will be returned here.*



### 9.17.1 Detailed Description

Input/output parameters for function [atcah\\_derive\\_key\\_mac\(\)](#).

### 9.17.2 Field Documentation

#### 9.17.2.1 mac

```
uint8_t* mac
```

DeriveKey MAC will be returned here.

#### 9.17.2.2 mode

```
uint8_t mode
```

Mode (param 1) of the derive key command.

#### 9.17.2.3 parent\_key

```
const uint8_t* parent_key
```

Parent key to be used in the derive key calculation (32 bytes).

#### 9.17.2.4 sn

```
const uint8_t* sn
```

Device serial number SN[0:8]. Only SN[0:1] and SN[8] are required though.

#### 9.17.2.5 target\_key\_id

```
uint16_t target_key_id
```

Key ID (param 2) of the target slot to run the command on.

## 9.18 atca\_device Struct Reference

[atca\\_device](#) is the C object backing ATCADevice. See the [atca\\_device.h](#) file for details on the ATCADevice methods

```
#include <atca_device.h>
```

### Data Fields

- [atca\\_iface\\_t](#) miface
- [uint8\\_t](#) device\_state
- [uint8\\_t](#) clock\_divider
- [uint16\\_t](#) execution\_time\_msec
- [uint8\\_t](#) session\_state
- [uint16\\_t](#) session\_counter
- [uint16\\_t](#) session\_key\_id
- [uint8\\_t](#) \* session\_key
- [uint8\\_t](#) session\_key\_len
- [uint16\\_t](#) options

### 9.18.1 Detailed Description

[atca\\_device](#) is the C object backing ATCADevice. See the [atca\\_device.h](#) file for details on the ATCADevice methods

### 9.18.2 Field Documentation

#### 9.18.2.1 clock\_divider

```
uint8_t clock_divider
```

#### 9.18.2.2 device\_state

```
uint8_t device_state
```

Device Power State

#### 9.18.2.3 execution\_time\_msec

```
uint16_t execution_time_msec
```

#### 9.18.2.4 miface

`atca_iface_t` mIface

Physical interface

#### 9.18.2.5 options

`uint16_t` options

Nested command details parameter

#### 9.18.2.6 session\_counter

`uint16_t` session\_counter

Secure Session Message Count

#### 9.18.2.7 session\_key

`uint8_t*` session\_key

Session Key

#### 9.18.2.8 session\_key\_id

`uint16_t` session\_key\_id

Key ID used for a secure session

#### 9.18.2.9 session\_key\_len

`uint8_t` session\_key\_len

Length of key used for the session in bytes

#### 9.18.2.10 session\_state

`uint8_t` session\_state

Secure Session State

### 9.19 atca\_gen\_dig\_in\_out Struct Reference

Input/output parameters for function [atcah\\_gen\\_dig\(\)](#).

```
#include <atca_host.h>
```

### Data Fields

- `uint8_t zone`  
*[in] Zone/Param1 for the GenDig command*
- `uint16_t key_id`  
*[in] KeyId/Param2 for the GenDig command*
- `uint16_t slot_conf`  
*[in] Slot config for the GenDig command*
- `uint16_t key_conf`  
*[in] Key config for the GenDig command*
- `uint8_t slot_locked`  
*[in] slot locked for the GenDig command*
- `uint32_t counter`  
*[in] counter for the GenDig command*
- `bool is_key_nomac`  
*[in] Set to true if the slot pointed to be key\_id has the SotConfig.NoMac bit set*
- `const uint8_t * sn`  
*[in] Device serial number SN[0:8]. Only SN[0:1] and SN[8] are required though.*
- `const uint8_t * stored_value`  
*[in] 32-byte slot value, config block, OTP block as specified by the Zone/KeyId parameters*
- `const uint8_t * other_data`  
*[in] 32-byte value for shared nonce zone, 4-byte value if is\_key\_nomac is true, ignored and/or NULL otherwise*
- `struct atca_temp_key * temp_key`  
*[inout] Current state of TempKey*

### 9.19.1 Detailed Description

Input/output parameters for function `atcah_gen_dig()`.

### 9.19.2 Field Documentation

#### 9.19.2.1 counter

```
uint32_t counter
```

*[in]* counter for the GenDig command

#### 9.19.2.2 is\_key\_nomac

```
bool is_key_nomac
```

*[in]* Set to true if the slot pointed to be key\_id has the SotConfig.NoMac bit set

### 9.19.2.3 key\_conf

```
uint16_t key_conf
```

[in] Key config for the GenDig command

### 9.19.2.4 key\_id

```
uint16_t key_id
```

[in] KeyId/Param2 for the GenDig command

### 9.19.2.5 other\_data

```
const uint8_t* other_data
```

[in] 32-byte value for shared nonce zone, 4-byte value if is\_key\_nomac is true, ignored and/or NULL otherwise

### 9.19.2.6 slot\_conf

```
uint16_t slot_conf
```

[in] Slot config for the GenDig command

### 9.19.2.7 slot\_locked

```
uint8_t slot_locked
```

[in] slot locked for the GenDig command

### 9.19.2.8 sn

```
const uint8_t* sn
```

[in] Device serial number SN[0:8]. Only SN[0:1] and SN[8] are required though.

## 9.20 atca\_gen\_key\_in\_out Struct Reference

---

### 9.19.2.9 stored\_value

```
const uint8_t* stored_value
```

[in] 32-byte slot value, config block, OTP block as specified by the Zone/KeyId parameters

### 9.19.2.10 temp\_key

```
struct atca_temp_key* temp_key
```

[inout] Current state of TempKey

### 9.19.2.11 zone

```
uint8_t zone
```

[in] Zone/Param1 for the GenDig command

## 9.20 atca\_gen\_key\_in\_out Struct Reference

Input/output parameters for calculating the PubKey digest put into TempKey by the GenKey command with the [atcah\\_gen\\_key\\_msg\(\)](#) function.

```
#include <atca_host.h>
```

### Data Fields

- `uint8_t mode`  
*[in] GenKey Mode*
- `uint16_t key_id`  
*[in] GenKey KeyID*
- `const uint8_t * public_key`  
*[in] Public key to be used in the PubKey digest. X and Y integers in big-endian format. 64 bytes for P256 curve.*
- `size_t public_key_size`  
*[in] Total number of bytes in the public key. 64 bytes for P256 curve.*
- `const uint8_t * other_data`  
*[in] 3 bytes required when bit 4 of the mode is set. Can be NULL otherwise.*
- `const uint8_t * sn`  
*[in] Device serial number SN[0:8] (9 bytes). Only SN[0:1] and SN[8] are required though.*
- `struct atca_temp_key * temp_key`  
*[in,out] As input the current state of TempKey. As output, the resulting PubKey digest.*

### 9.20.1 Detailed Description

Input/output parameters for calculating the PubKey digest put into TempKey by the GenKey command with the [atcah\\_gen\\_key\\_msg\(\)](#) function.

### 9.20.2 Field Documentation

#### 9.20.2.1 key\_id

```
uint16_t key_id
```

[in] GenKey KeyID

#### 9.20.2.2 mode

```
uint8_t mode
```

[in] GenKey Mode

#### 9.20.2.3 other\_data

```
const uint8_t* other_data
```

[in] 3 bytes required when bit 4 of the mode is set. Can be NULL otherwise.

#### 9.20.2.4 public\_key

```
const uint8_t* public_key
```

[in] Public key to be used in the PubKey digest. X and Y integers in big-endian format. 64 bytes for P256 curve.

#### 9.20.2.5 public\_key\_size

```
size_t public_key_size
```

[in] Total number of bytes in the public key. 64 bytes for P256 curve.

## 9.21 atca\_hal\_kit\_phy\_t Struct Reference

---

### 9.20.2.6 sn

```
const uint8_t* sn
```

[in] Device serial number SN[0:8] (9 bytes). Only SN[0:1] and SN[8] are required though.

### 9.20.2.7 temp\_key

```
struct atca_temp_key* temp_key
```

[in,output] As input the current state of TempKey. As output, the resulting PubKey digest.

## 9.21 atca\_hal\_kit\_phy\_t Struct Reference

```
#include <atca_hal.h>
```

### Data Fields

- [ATCA\\_STATUS\(\\* send\)](#)(void \*ctx, uint8\_t \*txdata, uint16\_t txlen)
- [ATCA\\_STATUS\(\\* recv\)](#)(void \*ctx, uint8\_t \*rxdata, uint16\_t rxlen)
- void \*(\* [packet\\_alloc](#))(size\_t bytes)
- void(\* [packet\\_free](#))(void \*packet)
- void \* [hal\\_data](#)

### 9.21.1 Field Documentation

#### 9.21.1.1 hal\_data

```
void* hal_data
```

Physical layer context

#### 9.21.1.2 packet\_alloc

```
void*(* packet_alloc)(size_t bytes)
```

Allocate a phy packet



### 9.21.1.3 packet\_free

```
void(* packet_free) (void *packet)
```

Free a phy packet

### 9.21.1.4 recv

```
ATCA_STATUS(* recv) (void *ctx, uint8_t *rxdata, uint16_t *rxlen)
```

Must be a blocking receive

### 9.21.1.5 send

```
ATCA_STATUS(* send) (void *ctx, uint8_t *txdata, uint16_t txlen)
```

Must be a blocking send

## 9.22 atca\_hal\_list\_entry\_t Struct Reference

Structure that holds the hal/phy mapping for different interface types.

### Data Fields

- [uint8\\_t iface\\_type](#)
- [ATCAHAL\\_t \\* hal](#)
- [ATCAHAL\\_t \\* phy](#)

### 9.22.1 Detailed Description

Structure that holds the hal/phy mapping for different interface types.

### 9.22.2 Field Documentation

#### 9.22.2.1 hal

```
ATCAHAL_t* hal
```

### 9.22.2.2 iface\_type

uint8\_t iface\_type

### 9.22.2.3 phy

ATCAHAL\_t\* phy

Physical interface for the specific HAL

## 9.23 atca\_hmac\_in\_out Struct Reference

Input/output parameters for function atca\_hmac().

```
#include <atca_host.h>
```

### Data Fields

- uint8\_t [mode](#)  
*[in] Mode parameter used in HMAC command (Param1).*
- uint16\_t [key\\_id](#)  
*[in] KeyID parameter used in HMAC command (Param2).*
- const uint8\_t \* [key](#)  
*[in] Pointer to 32-byte key used to generate HMAC digest.*
- const uint8\_t \* [otp](#)  
*[in] Pointer to 11-byte OTP, optionally included in HMAC digest, depending on mode.*
- const uint8\_t \* [sn](#)  
*[in] Pointer to 9-byte SN, optionally included in HMAC digest, depending on mode.*
- uint8\_t \* [response](#)  
*[out] Pointer to 32-byte SHA-256 HMAC digest.*
- struct [atca\\_temp\\_key](#) \* [temp\\_key](#)  
*[in,out] Pointer to TempKey structure.*

### 9.23.1 Detailed Description

Input/output parameters for function atca\_hmac().

## 9.24 atca\_i2c\_host\_s Struct Reference

### Data Fields

- char [i2c\\_file](#) [16]
- int [ref\\_ct](#)

## 9.24.1 Field Documentation

### 9.24.1.1 i2c\_file

```
char i2c_file[16]
```

### 9.24.1.2 ref\_ct

```
int ref_ct
```

## 9.25 atca\_iface Struct Reference

[atca\\_iface](#) is the context structure for a configured interface

```
#include <atca_iface.h>
```

### Data Fields

- [ATCAIfaceCfg](#) \* mifaceCFG
- [ATCAHAL\\_t](#) \* hal
- [ATCAHAL\\_t](#) \* phy
- void \* hal\_data

### 9.25.1 Detailed Description

[atca\\_iface](#) is the context structure for a configured interface

### 9.25.2 Field Documentation

#### 9.25.2.1 hal

```
ATCAHAL\_t* hal
```

The configured HAL for the interface

### 9.25.2.2 hal\_data

`void* hal_data`

Pointer to HAL specific context/data

### 9.25.2.3 mifaceCFG

`ATCAIfaceCfg* mIfaceCFG`

Points to previous defined/given Cfg object, the caller manages this

### 9.25.2.4 phy

`ATCAHAL_t* phy`

When a HAL is not a "native" hal it needs a physical layer to be associated with it

## 9.26 atca\_include\_data\_in\_out Struct Reference

Input / output parameters for function `atca_include_data()`.

```
#include <atca_host.h>
```

### Data Fields

- `uint8_t * p_temp`  
*[out] pointer to output buffer*
- `const uint8_t * otp`  
*[in] pointer to one-time-programming data*
- `const uint8_t * sn`  
*[in] pointer to serial number data*
- `uint8_t mode`

### 9.26.1 Detailed Description

Input / output parameters for function `atca_include_data()`.

### 9.26.2 Field Documentation

#### 9.26.2.1 mode

`uint8_t mode`

## 9.27 atca\_io\_decrypt\_in\_out Struct Reference

```
#include <atca_host.h>
```

### Data Fields

- `const uint8_t * io_key`  
*IO protection key (32 bytes).*
- `const uint8_t * out_nonce`  
*OutNonce returned from command (32 bytes).*
- `uint8_t * data`  
*As input, encrypted data. As output, decrypted data.*
- `size_t data_size`  
*Size of data in bytes (32 or 64).*

### 9.27.1 Field Documentation

#### 9.27.1.1 data

```
uint8_t* data
```

As input, encrypted data. As output, decrypted data.

#### 9.27.1.2 data\_size

```
size_t data_size
```

Size of data in bytes (32 or 64).

#### 9.27.1.3 io\_key

```
const uint8_t* io_key
```

IO protection key (32 bytes).

#### 9.27.1.4 out\_nonce

```
const uint8_t* out_nonce
```

OutNonce returned from command (32 bytes).

## 9.28 atca\_jwt\_t Struct Reference

Structure to hold metadata information about the jwt being built.

```
#include <atca_jwt.h>
```

### Data Fields

- char \* [buf](#)
- uint16\_t [buflen](#)
- uint16\_t [cur](#)

### 9.28.1 Detailed Description

Structure to hold metadata information about the jwt being built.

### 9.28.2 Field Documentation

#### 9.28.2.1 buf

```
char* buf
```

#### 9.28.2.2 buflen

```
uint16_t buflen
```

#### 9.28.2.3 cur

```
uint16_t cur
```

## 9.29 atca\_mac\_in\_out Struct Reference

Input/output parameters for function `atca_mac()`.

```
#include <atca_host.h>
```

## Data Fields

- `uint8_t mode`  
*[in] Mode parameter used in MAC command (Param1).*
- `uint16_t key_id`  
*[in] KeyID parameter used in MAC command (Param2).*
- `const uint8_t * challenge`  
*[in] Pointer to 32-byte Challenge data used in MAC command, depending on mode.*
- `const uint8_t * key`  
*[in] Pointer to 32-byte key used to generate MAC digest.*
- `const uint8_t * otp`  
*[in] Pointer to 11-byte OTP, optionally included in MAC digest, depending on mode.*
- `const uint8_t * sn`  
*[in] Pointer to 9-byte SN, optionally included in MAC digest, depending on mode.*
- `uint8_t * response`  
*[out] Pointer to 32-byte SHA-256 digest (MAC).*
- `struct atca_temp_key * temp_key`  
*[in,out] Pointer to TempKey structure.*

### 9.29.1 Detailed Description

Input/output parameters for function `atca_mac()`.

## 9.30 atca\_mbedtlsls\_eckey\_s Struct Reference

```
#include <atca_mbedtlsls_wrap.h>
```

## Data Fields

- `ATCADevice device`
- `uint16_t handle`

### 9.30.1 Detailed Description

Structure to hold metadata - is written into the mbedtls pk structure as the private key bignum value 'd' which otherwise would be unused. Bignums can be any arbitrary length of bytes

### 9.30.2 Field Documentation

### 9.30.2.1 device

[ATCADevice](#) device

### 9.30.2.2 handle

uint16\_t handle

## 9.31 atca\_nonce\_in\_out Struct Reference

Input/output parameters for function `atca_nonce()`.

```
#include <atca_host.h>
```

### Data Fields

- [uint8\\_t mode](#)  
*[in] Mode parameter used in Nonce command (Param1).*
- [uint16\\_t zero](#)  
*[in] Zero parameter used in Nonce command (Param2).*
- [const uint8\\_t \\* num\\_in](#)  
*[in] Pointer to 20-byte NumIn data used in Nonce command.*
- [const uint8\\_t \\* rand\\_out](#)  
*[in] Pointer to 32-byte RandOut data from Nonce command.*
- [struct atca\\_temp\\_key \\* temp\\_key](#)  
*[in,out] Pointer to TempKey structure.*

### 9.31.1 Detailed Description

Input/output parameters for function `atca_nonce()`.

## 9.32 atca\_plib\_i2c\_api Struct Reference

```
#include <atca_config.h>
```

### Data Fields

- [atca\\_i2c\\_plib\\_read](#) read
- [atca\\_i2c\\_plib\\_write](#) write
- [atca\\_i2c\\_plib\\_is\\_busy](#) is\_busy
- [atca\\_i2c\\_error\\_get](#) error\_get
- [atca\\_i2c\\_plib\\_transfer\\_setup](#) transfer\_setup



### 9.32.1 Field Documentation

#### 9.32.1.1 error\_get

`atca_i2c_error_get` error\_get

#### 9.32.1.2 is\_busy

`atca_i2c_plib_is_busy` is\_busy

#### 9.32.1.3 read

`atca_i2c_plib_read` read

#### 9.32.1.4 transfer\_setup

`atca_i2c_plib_transfer_setup` transfer\_setup

#### 9.32.1.5 write

`atca_i2c_plib_write` write

## 9.33 atca\_secureboot\_enc\_in\_out Struct Reference

```
#include <atca_host.h>
```

### Data Fields

- `const uint8_t * io_key`  
*IO protection key value (32 bytes)*
- `const struct atca_temp_key * temp_key`  
*Current value of TempKey.*
- `const uint8_t * digest`  
*Plaintext digest as input.*
- `uint8_t * hashed_key`  
*Calculated key is returned here (32 bytes)*
- `uint8_t * digest_enc`  
*Encrypted (ciphertext) digest is return here (32 bytes)*

### 9.33.1 Field Documentation

#### 9.33.1.1 digest

```
const uint8_t* digest
```

Plaintext digest as input.

#### 9.33.1.2 digest\_enc

```
uint8_t* digest_enc
```

Encrypted (ciphertext) digest is return here (32 bytes)

#### 9.33.1.3 hashed\_key

```
uint8_t* hashed_key
```

Calculated key is returned here (32 bytes)

#### 9.33.1.4 io\_key

```
const uint8_t* io_key
```

IO protection key value (32 bytes)

#### 9.33.1.5 temp\_key

```
const struct atca_temp_key* temp_key
```

Current value of TempKey.

## 9.34 atca\_secureboot\_mac\_in\_out Struct Reference

```
#include <atca_host.h>
```

## Data Fields

- uint8\_t [mode](#)  
*SecureBoot mode (param1)*
- uint16\_t [param2](#)  
*SecureBoot param2.*
- uint16\_t [secure\\_boot\\_config](#)  
*SecureBootConfig value from configuration zone.*
- const uint8\_t \* [hashed\\_key](#)  
*Hashed key. SHA256(IO Protection Key | TempKey)*
- const uint8\_t \* [digest](#)  
*Digest (unencrypted)*
- const uint8\_t \* [signature](#)  
*Signature (can be NULL if not required)*
- uint8\_t \* [mac](#)  
*MAC is returned here.*

### 9.34.1 Field Documentation

#### 9.34.1.1 digest

```
const uint8_t* digest
```

Digest (unencrypted)

#### 9.34.1.2 hashed\_key

```
const uint8_t* hashed_key
```

Hashed key. SHA256(IO Protection Key | TempKey)

#### 9.34.1.3 mac

```
uint8_t* mac
```

MAC is returned here.

## 9.35 atca\_session\_key\_in\_out Struct Reference

---

### 9.34.1.4 mode

`uint8_t mode`

SecureBoot mode (param1)

### 9.34.1.5 param2

`uint16_t param2`

SecureBoot param2.

### 9.34.1.6 secure\_boot\_config

`uint16_t secure_boot_config`

SecureBootConfig value from configuration zone.

### 9.34.1.7 signature

`const uint8_t* signature`

Signature (can be NULL if not required)

## 9.35 atca\_session\_key\_in\_out Struct Reference

Input/Output paramters for calculating the session key by the nonce command. Used with the [atcah\\_gen\\_session\\_key\(\)](#) function.

```
#include <atca_host.h>
```

### Data Fields

- `uint8_t * transport_key`
- `uint16_t transport_key_id`
- `const uint8_t * sn`
- `uint8_t * nonce`
- `uint8_t * session_key`

### 9.35.1 Detailed Description

Input/Output parameters for calculating the session key by the nonce command. Used with the [atcah\\_gen\\_session\\_key\(\)](#) function.

### 9.35.2 Field Documentation

#### 9.35.2.1 nonce

```
uint8_t* nonce
```

#### 9.35.2.2 session\_key

```
uint8_t* session_key
```

#### 9.35.2.3 sn

```
const uint8_t* sn
```

#### 9.35.2.4 transport\_key

```
uint8_t* transport_key
```

#### 9.35.2.5 transport\_key\_id

```
uint16_t transport_key_id
```

## 9.36 atca\_sha256\_ctx Struct Reference

```
#include <calib_basic.h>
```

### Data Fields

- uint32\_t [total\\_msg\\_size](#)  
*Total number of message bytes processed.*
- uint32\_t [block\\_size](#)  
*Number of bytes in current block.*
- uint8\_t [block](#) [[ATCA\\_SHA256\\_BLOCK\\_SIZE](#) \*2]  
*Unprocessed message storage.*

### 9.36.1 Field Documentation

#### 9.36.1.1 block

```
uint8_t block[ATCA_SHA256_BLOCK_SIZE *2]
```

Unprocessed message storage.

#### 9.36.1.2 block\_size

```
uint32_t block_size
```

Number of bytes in current block.

#### 9.36.1.3 total\_msg\_size

```
uint32_t total_msg_size
```

Total number of message bytes processed.

## 9.37 atca\_sign\_internal\_in\_out Struct Reference

Input/output parameters for calculating the message and digest used by the Sign(internal) command. Used with the [atcah\\_sign\\_internal\\_msg\(\)](#) function.

```
#include <atca_host.h>
```

## Data Fields

- uint8\_t [mode](#)  
*[in] Sign Mode*
- uint16\_t [key\\_id](#)  
*[in] Sign KeyID*
- uint16\_t [slot\\_config](#)  
*[in] SlotConfig[TempKeyFlags.keyId]*
- uint16\_t [key\\_config](#)  
*[in] KeyConfig[TempKeyFlags.keyId]*
- uint8\_t [use\\_flag](#)  
*[in] UseFlag[TempKeyFlags.keyId], 0x00 for slots 8 and above and for ATECC508A*
- uint8\_t [update\\_count](#)  
*[in] UpdateCount[TempKeyFlags.keyId], 0x00 for slots 8 and above and for ATECC508A*
- bool [is\\_slot\\_locked](#)  
*[in] Is TempKeyFlags.keyId slot locked.*
- bool [for\\_invalidate](#)  
*[in] Set to true if this will be used for the Verify(Invalidate) command.*
- const uint8\_t \* [sn](#)  
*[in] Device serial number SN[0:8] (9 bytes)*
- const struct [atca\\_temp\\_key](#) \* [temp\\_key](#)  
*[in] The current state of TempKey.*
- uint8\_t \* [message](#)  
*[out] Full 55 byte message the Sign(internal) command will build. Can be NULL if not required.*
- uint8\_t \* [verify\\_other\\_data](#)  
*[out] The 19 byte OtherData bytes to be used with the Verify(In/Validate) command. Can be NULL if not required.*
- uint8\_t \* [digest](#)  
*[out] SHA256 digest of the full 55 byte message. Can be NULL if not required.*

### 9.37.1 Detailed Description

Input/output parameters for calculating the message and digest used by the Sign(internal) command. Used with the [atcah\\_sign\\_internal\\_msg\(\)](#) function.

### 9.37.2 Field Documentation

#### 9.37.2.1 digest

```
uint8_t* digest
```

[out] SHA256 digest of the full 55 byte message. Can be NULL if not required.

### 9.37.2.2 for\_invalidate

bool for\_invalidate

[in] Set to true if this will be used for the Verify(Invalidate) command.

### 9.37.2.3 is\_slot\_locked

bool is\_slot\_locked

[in] Is TempKeyFlags.keyId slot locked.

### 9.37.2.4 key\_config

uint16\_t key\_config

[in] KeyConfig[TempKeyFlags.keyId]

### 9.37.2.5 key\_id

uint16\_t key\_id

[in] Sign KeyID

### 9.37.2.6 message

uint8\_t\* message

[out] Full 55 byte message the Sign(internal) command will build. Can be NULL if not required.

### 9.37.2.7 mode

uint8\_t mode

[in] Sign Mode



### 9.37.2.8 slot\_config

```
uint16_t slot_config
```

[in] SlotConfig[TempKeyFlags.keyId]

### 9.37.2.9 sn

```
const uint8_t* sn
```

[in] Device serial number SN[0:8] (9 bytes)

### 9.37.2.10 temp\_key

```
const struct atca_temp_key* temp_key
```

[in] The current state of TempKey.

### 9.37.2.11 update\_count

```
uint8_t update_count
```

[in] UpdateCount[TempKeyFlags.keyId], 0x00 for slots 8 and above and for ATECC508A

### 9.37.2.12 use\_flag

```
uint8_t use_flag
```

[in] UseFlag[TempKeyFlags.keyId], 0x00 for slots 8 and above and for ATECC508A

### 9.37.2.13 verify\_other\_data

```
uint8_t* verify_other_data
```

[out] The 19 byte OtherData bytes to be used with the Verify(In/Validate) command. Can be NULL if not required.

## 9.38 atca\_spi\_host\_s Struct Reference

### Data Fields

- char [spi\\_file](#) [20]
- int [f\\_spi](#)

### 9.38.1 Field Documentation

#### 9.38.1.1 f\_spi

```
int f_spi
```

#### 9.38.1.2 spi\_file

```
char spi_file[20]
```

## 9.39 atca\_temp\_key Struct Reference

Structure to hold TempKey fields.

```
#include <atca_host.h>
```

### Data Fields

- uint8\_t [value](#) [ATCA\_KEY\_SIZE \*2]  
*Value of TempKey (64 bytes for ATECC608 only)*
- unsigned [key\\_id](#): 4  
*If TempKey was derived from a slot or transport key (GenDig or GenKey), that key ID is saved here.*
- unsigned [source\\_flag](#): 1  
*Indicates id TempKey started from a random nonce (0) or not (1).*
- unsigned [gen\\_dig\\_data](#): 1  
*TempKey was derived from the GenDig command.*
- unsigned [gen\\_key\\_data](#): 1  
*TempKey was derived from the GenKey command (ATECC devices only).*
- unsigned [no\\_mac\\_flag](#): 1  
*TempKey was derived from a key that has the NoMac bit set preventing the use of the MAC command. Known as CheckFlag in ATSHA devices).*
- unsigned [valid](#): 1  
*TempKey is valid.*
- uint8\_t [is\\_64](#)  
*TempKey has 64 bytes of valid data.*

### 9.39.1 Detailed Description

Structure to hold TempKey fields.

### 9.39.2 Field Documentation

#### 9.39.2.1 gen\_dig\_data

`unsigned gen_dig_data`

TempKey was derived from the GenDig command.

#### 9.39.2.2 gen\_key\_data

`unsigned gen_key_data`

TempKey was derived from the GenKey command (ATECC devices only).

#### 9.39.2.3 is\_64

`uint8_t is_64`

TempKey has 64 bytes of valid data.

#### 9.39.2.4 key\_id

`unsigned key_id`

If TempKey was derived from a slot or transport key (GenDig or GenKey), that key ID is saved here.

#### 9.39.2.5 no\_mac\_flag

`unsigned no_mac_flag`

TempKey was derived from a key that has the NoMac bit set preventing the use of the MAC command. Known as CheckFlag in ATSHA devices).

## 9.40 atca\_uart\_host\_s Struct Reference

---

### 9.39.2.6 source\_flag

unsigned source\_flag

Indicates id TempKey started from a random nonce (0) or not (1).

### 9.39.2.7 valid

unsigned valid

TempKey is valid.

### 9.39.2.8 value

uint8\_t value[ATCA\_KEY\_SIZE \*2]

Value of TempKey (64 bytes for ATECC608 only)

## 9.40 atca\_uart\_host\_s Struct Reference

### Data Fields

- char [uart\\_file](#) [20]
- int [fd\\_uart](#)
- int [ref\\_ct](#)
- HANDLE [hSerial](#)

### 9.40.1 Field Documentation

#### 9.40.1.1 fd\_uart

int fd\_uart

#### 9.40.1.2 hSerial

HANDLE hSerial

#### 9.40.1.3 ref\_ct

```
int ref_ct
```

#### 9.40.1.4 uart\_file

```
char uart_file
```

### 9.41 atca\_verify\_in\_out Struct Reference

Input/output parameters for function atcah\_verify().

```
#include <atca_host.h>
```

#### Data Fields

- uint16\_t [curve\\_type](#)  
*[in]* Curve type used in Verify command (Param2).
- const uint8\_t \* [signature](#)  
*[in]* Pointer to ECDSA signature to be verified
- const uint8\_t \* [public\\_key](#)  
*[in]* Pointer to the public key to be used for verification
- struct [atca\\_temp\\_key](#) \* [temp\\_key](#)  
*[in,out]* Pointer to TempKey structure.

#### 9.41.1 Detailed Description

Input/output parameters for function atcah\_verify().

### 9.42 atca\_verify\_mac Struct Reference

```
#include <atca_host.h>
```

### Data Fields

- `uint8_t mode`  
*Mode (Param1) parameter used in Verify command.*
- `uint16_t key_id`  
*KeyID (Param2) used in Verify command.*
- `const uint8_t * signature`  
*Signature used in Verify command (64 bytes).*
- `const uint8_t * other_data`  
*OtherData used in Verify command (19 bytes).*
- `const uint8_t * msg_dig_buf`  
*Message digest buffer (64 bytes).*
- `const uint8_t * io_key`  
*IO protection key value (32 bytes).*
- `const uint8_t * sn`  
*Serial number (9 bytes).*
- `const atca_temp_key_t * temp_key`  
*TempKey.*
- `uint8_t * mac`  
*Calculated verification MAC is returned here (32 bytes).*

### 9.42.1 Field Documentation

#### 9.42.1.1 io\_key

```
const uint8_t* io_key
```

IO protection key value (32 bytes).

#### 9.42.1.2 key\_id

```
uint16_t key_id
```

KeyID (Param2) used in Verify command.

#### 9.42.1.3 mac

```
uint8_t* mac
```

Calculated verification MAC is returned here (32 bytes).

#### 9.42.1.4 mode

```
uint8_t mode
```

Mode (Param1) parameter used in Verify command.

#### 9.42.1.5 msg\_dig\_buf

```
const uint8_t* msg_dig_buf
```

Message digest buffer (64 bytes).

#### 9.42.1.6 other\_data

```
const uint8_t* other_data
```

OtherData used in Verify command (19 bytes).

#### 9.42.1.7 signature

```
const uint8_t* signature
```

Signature used in Verify command (64 bytes).

#### 9.42.1.8 sn

```
const uint8_t* sn
```

Serial number (9 bytes).

#### 9.42.1.9 temp\_key

```
const atca_temp_key_t* temp_key
```

TempKey.

## 9.43 atca\_write\_mac\_in\_out Struct Reference

Input/output parameters for function [atcah\\_write\\_auth\\_mac\(\)](#) and [atcah\\_privwrite\\_auth\\_mac\(\)](#).

```
#include <atca_host.h>
```

### Data Fields

- `uint8_t zone`  
*Zone/Param1 for the Write or PrivWrite command.*
- `uint16_t key_id`  
*KeyID/Param2 for the Write or PrivWrite command.*
- `const uint8_t * sn`  
*Device serial number SN[0:8]. Only SN[0:1] and SN[8] are required though.*
- `const uint8_t * input_data`  
*Data to be encrypted. 32 bytes for Write command, 36 bytes for PrivWrite command.*
- `uint8_t * encrypted_data`  
*Encrypted version of input\_data will be returned here. 32 bytes for Write command, 36 bytes for PrivWrite command.*
- `uint8_t * auth_mac`  
*Write MAC will be returned here. 32 bytes.*
- `struct atca_temp_key * temp_key`  
*Current state of TempKey.*

### 9.43.1 Detailed Description

Input/output parameters for function [atcah\\_write\\_auth\\_mac\(\)](#) and [atcah\\_privwrite\\_auth\\_mac\(\)](#).

### 9.43.2 Field Documentation

#### 9.43.2.1 auth\_mac

```
uint8_t* auth_mac
```

Write MAC will be returned here. 32 bytes.

#### 9.43.2.2 encrypted\_data

```
uint8_t* encrypted_data
```

Encrypted version of input\_data will be returned here. 32 bytes for Write command, 36 bytes for PrivWrite command.



#### 9.43.2.3 input\_data

```
const uint8_t* input_data
```

Data to be encrypted. 32 bytes for Write command, 36 bytes for PrivWrite command.

#### 9.43.2.4 key\_id

```
uint16_t key_id
```

KeyID/Param2 for the Write or PrivWrite command.

#### 9.43.2.5 sn

```
const uint8_t* sn
```

Device serial number SN[0:8]. Only SN[0:1] and SN[8] are required though.

#### 9.43.2.6 temp\_key

```
struct atca_temp_key* temp_key
```

Current state of TempKey.

#### 9.43.2.7 zone

```
uint8_t zone
```

Zone/Param1 for the Write or PrivWrite command.

### 9.44 atcacert\_build\_state\_s Struct Reference

```
#include <atcacert_def.h>
```

### Data Fields

- const [atccert\\_def\\_t](#) \* [cert\\_def](#)  
*Certificate definition for the certificate being rebuilt.*
- [uint8\\_t](#) \* [cert](#)  
*Buffer to contain the rebuilt certificate.*
- [size\\_t](#) \* [cert\\_size](#)  
*Current size of the certificate in bytes.*
- [size\\_t](#) [max\\_cert\\_size](#)  
*Max size of the cert buffer in bytes.*
- [uint8\\_t](#) [is\\_device\\_sn](#)  
*Indicates the structure contains the device SN.*
- [uint8\\_t](#) [device\\_sn](#) [9]  
*Storage for the device SN, when it's found.*

### 9.44.1 Detailed Description

Tracks the state of a certificate as it's being rebuilt from device information.

### 9.44.2 Field Documentation

#### 9.44.2.1 cert

```
uint8_t* cert
```

Buffer to contain the rebuilt certificate.

#### 9.44.2.2 cert\_def

```
const atccert\_def\_t* cert_def
```

Certificate definition for the certificate being rebuilt.

#### 9.44.2.3 cert\_size

```
size_t* cert_size
```

Current size of the certificate in bytes.

#### 9.44.2.4 device\_sn

```
uint8_t device_sn[9]
```

Storage for the device SN, when it's found.

#### 9.44.2.5 is\_device\_sn

```
uint8_t is_device_sn
```

Indicates the structure contains the device SN.

#### 9.44.2.6 max\_cert\_size

```
size_t max_cert_size
```

Max size of the cert buffer in bytes.

### 9.45 atcacert\_cert\_element\_s Struct Reference

```
#include <atcacert_def.h>
```

#### Data Fields

- `char id [25]`  
*ID identifying this element.*
- `atcacert_device_loc_t device_loc`  
*Location in the device for the element.*
- `atcacert_cert_loc_t cert_loc`  
*Location in the certificate template for the element.*
- `atcacert_transform_t transforms [2]`  
*List of transforms from device to cert for this element.*

#### 9.45.1 Detailed Description

Defines a generic dynamic element for a certificate including the device and template locations.

#### 9.45.2 Field Documentation

## 9.46 atcacert\_cert\_loc\_s Struct Reference

---

### 9.45.2.1 cert\_loc

`atcacert_cert_loc_t cert_loc`

Location in the certificate template for the element.

### 9.45.2.2 device\_loc

`atcacert_device_loc_t device_loc`

Location in the device for the element.

### 9.45.2.3 id

`char id[25]`

ID identifying this element.

### 9.45.2.4 transforms

`atcacert_transform_t transforms[2]`

List of transforms from device to cert for this element.

## 9.46 atcacert\_cert\_loc\_s Struct Reference

```
#include <atcacert_def.h>
```

### Data Fields

- `uint16_t offset`  
*Byte offset in the certificate template.*
- `uint16_t count`  
*Byte count. Set to 0 if it doesn't exist.*

### 9.46.1 Detailed Description

Defines a chunk of data in a certificate template.

## 9.46.2 Field Documentation

### 9.46.2.1 count

`uint16_t count`

Byte count. Set to 0 if it doesn't exist.

### 9.46.2.2 offset

`uint16_t offset`

Byte offset in the certificate template.

## 9.47 atcacert\_def\_s Struct Reference

```
#include <atcacert_def.h>
```

### Data Fields

- [atcacert\\_cert\\_type\\_t type](#)  
*Certificate type.*
- `uint8_t template_id`  
*ID for the this certificate definition (4-bit value).*
- `uint8_t chain_id`  
*ID for the certificate chain this definition is a part of (4-bit value).*
- `uint8_t private_key_slot`  
*If this is a device certificate template, this is the device slot for the device private key.*
- [atcacert\\_cert\\_sn\\_src\\_t sn\\_source](#)  
*Where the certificate serial number comes from (4-bit value).*
- [atcacert\\_device\\_loc\\_t cert\\_sn\\_dev\\_loc](#)  
*Only applies when `sn_source` is `SNSRC_STORED` or `SNSRC_STORED_DYNAMIC`. Describes where to get the certificate serial number on the device.*
- [atcacert\\_date\\_format\\_t issue\\_date\\_format](#)  
*Format of the issue date in the certificate.*
- [atcacert\\_date\\_format\\_t expire\\_date\\_format](#)  
*format of the expire date in the certificate.*
- [atcacert\\_cert\\_loc\\_t tbs\\_cert\\_loc](#)  
*Location in the certificate for the TBS (to be signed) portion.*
- `uint8_t expire_years`  
*Number of years the certificate is valid for (5-bit value). 0 means no expiration.*
- [atcacert\\_device\\_loc\\_t public\\_key\\_dev\\_loc](#)  
*Where on the device the public key can be found.*

- [atcacert\\_device\\_loc\\_t comp\\_cert\\_dev\\_loc](#)  
*Where on the device the compressed cert can be found.*
- [atcacert\\_cert\\_loc\\_t std\\_cert\\_elements \[STDCERT\\_NUM\\_ELEMENTS\]](#)  
*Where in the certificate template the standard cert elements are inserted.*
- `const atcacert\_cert\_element\_t * cert\_elements`  
*Additional certificate elements outside of the standard certificate contents.*
- `uint8_t cert\_elements\_count`  
*Number of additional certificate elements in [cert\\_elements](#).*
- `const uint8_t * cert\_template`  
*Pointer to the actual certificate template data.*
- `uint16_t cert\_template\_size`  
*Size of the certificate template in [cert\\_template](#) in bytes.*
- `const struct atcacert\_def\_s * ca\_cert\_def`  
*Certificate definition of the CA certificate.*

### 9.47.1 Detailed Description

Defines a certificate and all the pieces to work with it.

If any of the standard certificate elements ([std\\_cert\\_elements](#)) are not a part of the certificate definition, set their count to 0 to indicate their absence.

### 9.47.2 Field Documentation

#### 9.47.2.1 [ca\\_cert\\_def](#)

```
const struct atcacert\_def\_s* ca\_cert\_def
```

Certificate definition of the CA certificate.

#### 9.47.2.2 [cert\\_elements](#)

```
const atcacert\_cert\_element\_t* cert\_elements
```

Additional certificate elements outside of the standard certificate contents.

#### 9.47.2.3 [cert\\_elements\\_count](#)

```
uint8_t cert\_elements\_count
```

Number of additional certificate elements in [cert\\_elements](#).

#### 9.47.2.4 cert\_sn\_dev\_loc

`atcacert_device_loc_t cert_sn_dev_loc`

Only applies when `sn_source` is `SNSRC_STORED` or `SNSRC_STORED_DYNAMIC`. Describes where to get the certificate serial number on the device.

#### 9.47.2.5 cert\_template

`const uint8_t* cert_template`

Pointer to the actual certificate template data.

#### 9.47.2.6 cert\_template\_size

`uint16_t cert_template_size`

Size of the certificate template in `cert_template` in bytes.

#### 9.47.2.7 chain\_id

`uint8_t chain_id`

ID for the certificate chain this definition is a part of (4-bit value).

#### 9.47.2.8 comp\_cert\_dev\_loc

`atcacert_device_loc_t comp_cert_dev_loc`

Where on the device the compressed cert can be found.

#### 9.47.2.9 expire\_date\_format

`atcacert_date_format_t expire_date_format`

format of the expire date in the certificate.

### 9.47.2.10 expire\_years

`uint8_t expire_years`

Number of years the certificate is valid for (5-bit value). 0 means no expiration.

### 9.47.2.11 issue\_date\_format

`atcacert_date_format_t issue_date_format`

Format of the issue date in the certificate.

### 9.47.2.12 private\_key\_slot

`uint8_t private_key_slot`

If this is a device certificate template, this is the device slot for the device private key.

### 9.47.2.13 public\_key\_dev\_loc

`atcacert_device_loc_t public_key_dev_loc`

Where on the device the public key can be found.

### 9.47.2.14 sn\_source

`atcacert_cert_sn_src_t sn_source`

Where the certificate serial number comes from (4-bit value).

### 9.47.2.15 std\_cert\_elements

`atcacert_cert_loc_t std_cert_elements[STDCERT_NUM_ELEMENTS]`

Where in the certificate template the standard cert elements are inserted.



#### 9.47.2.16 tbs\_cert\_loc

`atcacert_cert_loc_t tbs_cert_loc`

Location in the certificate for the TBS (to be signed) portion.

#### 9.47.2.17 template\_id

`uint8_t template_id`

ID for the this certificate definition (4-bit value).

#### 9.47.2.18 type

`atcacert_cert_type_t type`

Certificate type.

### 9.48 atcacert\_device\_loc\_s Struct Reference

```
#include <atcacert_def.h>
```

#### Data Fields

- `atcacert_device_zone_t zone`  
*Zone in the device.*
- `uint8_t slot`  
*Slot within the data zone. Only applies if zone is DEVZONE\_DATA.*
- `uint8_t is_genkey`  
*If true, use GenKey command to get the contents instead of Read.*
- `uint16_t offset`  
*Byte offset in the zone.*
- `uint16_t count`  
*Byte count.*

#### 9.48.1 Detailed Description

Defines a chunk of data in an ATECC device.

#### 9.48.2 Field Documentation

### 9.48.2.1 count

`uint16_t count`

Byte count.

### 9.48.2.2 is\_genkey

`uint8_t is_genkey`

If true, use GenKey command to get the contents instead of Read.

### 9.48.2.3 offset

`uint16_t offset`

Byte offset in the zone.

### 9.48.2.4 slot

`uint8_t slot`

Slot within the data zone. Only applies if zone is DEVZONE\_DATA.

### 9.48.2.5 zone

`atcacert_device_zone_t zone`

Zone in the device.

## 9.49 atcacert\_tm\_utc\_s Struct Reference

```
#include <atcacert_date.h>
```

## Data Fields

- int [tm\\_sec](#)
- int [tm\\_min](#)
- int [tm\\_hour](#)
- int [tm\\_mday](#)
- int [tm\\_mon](#)
- int [tm\\_year](#)

### 9.49.1 Detailed Description

Holds a broken-down date in UTC. Mimics `atcacert_tm_utc_t` from `time.h`.

### 9.49.2 Field Documentation

#### 9.49.2.1 `tm_hour`

```
int tm_hour
```

#### 9.49.2.2 `tm_mday`

```
int tm_mday
```

#### 9.49.2.3 `tm_min`

```
int tm_min
```

#### 9.49.2.4 `tm_mon`

```
int tm_mon
```

#### 9.49.2.5 `tm_sec`

```
int tm_sec
```

### 9.49.2.6 tm\_year

```
int tm_year
```

## 9.50 ATCAHAL\_t Struct Reference

HAL Driver Structure.

```
#include <atca_iface.h>
```

### Data Fields

- [ATCA\\_STATUS](#)(\* [halinit](#) )([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)
- [ATCA\\_STATUS](#)(\* [halpostinit](#) )([ATCAIface](#) iface)
- [ATCA\\_STATUS](#)(\* [halsend](#) )([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)
- [ATCA\\_STATUS](#)(\* [halreceive](#) )([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxlength)
- [ATCA\\_STATUS](#)(\* [halcontrol](#) )([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)
- [ATCA\\_STATUS](#)(\* [halrelease](#) )(void \*hal\_data)

### 9.50.1 Detailed Description

HAL Driver Structure.

### 9.50.2 Field Documentation

#### 9.50.2.1 halcontrol

```
ATCA\_STATUS(* halcontrol) (ATCAIface iface, uint8_t option, void *param, size_t paramlen)
```

#### 9.50.2.2 halinit

```
ATCA\_STATUS(* halinit) (ATCAIface iface, ATCAIfaceCfg *cfg)
```

#### 9.50.2.3 halpostinit

```
ATCA\_STATUS(* halpostinit) (ATCAIface iface)
```

#### 9.50.2.4 halreceive

```
ATCA_STATUS(* halreceive) (ATCAIface iface, uint8_t word_address, uint8_t *rxdata, uint16_t *rxlength)
```

#### 9.50.2.5 halrelease

```
ATCA_STATUS(* halrelease) (void *hal_data)
```

#### 9.50.2.6 halsend

```
ATCA_STATUS(* halsend) (ATCAIface iface, uint8_t word_address, uint8_t *txdata, int txlength)
```

### 9.51 atcal2Cmaster Struct Reference

this is the hal\_data for ATCA HAL for ASF SERCOM

```
#include <hal_uc3_i2c_asf.h>
```

#### Data Fields

- int [id](#)
- i2c\_config\_t [conf](#)
- int [ref\\_ct](#)
- uint8\_t [twi\\_id](#)
- avr32\_twi\_t \* [twi\\_master\\_instance](#)
- int [bus\\_index](#)

#### 9.51.1 Detailed Description

this is the hal\_data for ATCA HAL for ASF SERCOM

#### 9.51.2 Field Documentation

##### 9.51.2.1 bus\_index

```
int bus_index
```

### 9.51.2.2 conf

i2c\_config\_t conf

### 9.51.2.3 id

int id

### 9.51.2.4 ref\_ct

int ref\_ct

### 9.51.2.5 twi\_id

uint8\_t twi\_id

### 9.51.2.6 twi\_master\_instance

avr32\_twi\_t\* twi\_master\_instance

## 9.52 ATCAIfaceCfg Struct Reference

```
#include <atca_iface.h>
```

## Data Fields

- [ATCAIfaceType](#) iface\_type
- [ATCADeviceType](#) devtype
- union {
  - struct {
    - uint8\_t [address](#)
    - uint8\_t [bus](#)
    - uint32\_t [baud](#)
  - } [atcai2c](#)
  - struct {
    - uint8\_t [address](#)
    - uint8\_t [bus](#)
  - } [atcaswi](#)
  - struct {
    - uint8\_t [bus](#)
    - uint8\_t [select\\_pin](#)
    - uint32\_t [baud](#)
  - } [atcaspi](#)
  - struct {
    - [ATCAKitType](#) dev\_interface
    - uint8\_t [dev\\_identity](#)
    - uint8\_t [port](#)
    - uint32\_t [baud](#)
    - uint8\_t [wordsize](#)
    - uint8\_t [parity](#)
    - uint8\_t [stopbits](#)
  - } [atcauart](#)
  - struct {
    - int [idx](#)
    - [ATCAKitType](#) dev\_interface
    - uint8\_t [dev\\_identity](#)
    - uint32\_t [vid](#)
    - uint32\_t [pid](#)
    - uint32\_t [packetsize](#)
  - } [atcahid](#)
  - struct {
    - [ATCAKitType](#) dev\_interface
    - uint8\_t [dev\\_identity](#)
    - uint32\_t [flags](#)
  - } [atcakit](#)
  - struct {
    - [ATCA\\_STATUS](#)(\* [halinit](#) )(void \*hal, void \*cfg)
    - [ATCA\\_STATUS](#)(\* [halpostinit](#) )(void \*iface)
    - [ATCA\\_STATUS](#)(\* [halsend](#) )(void \*iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)
    - [ATCA\\_STATUS](#)(\* [halreceive](#) )(void \*iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxlength)
    - [ATCA\\_STATUS](#)(\* [halwake](#) )(void \*iface)
    - [ATCA\\_STATUS](#)(\* [halidle](#) )(void \*iface)
    - [ATCA\\_STATUS](#)(\* [halsleep](#) )(void \*iface)
    - [ATCA\\_STATUS](#)(\* [halrelease](#) )(void \*hal\_data)
  - } [atcacustom](#)
- };
- uint16\_t [wake\\_delay](#)

- int [rx\\_retries](#)
- void \* [cfg\\_data](#)

### 9.52.1 Field Documentation

#### 9.52.1.1 "@1

```
union { ... }
```

#### 9.52.1.2 address

```
uint8_t address
```

Device address - the upper 7 bits are the I2c address bits

#### 9.52.1.3 atcacustom

```
struct { ... } atcacustom
```

#### 9.52.1.4 atcahid

```
struct { ... } atcahid
```

#### 9.52.1.5 atcai2c

```
struct { ... } atcai2c
```

#### 9.52.1.6 atcakit

```
struct { ... } atcakit
```



**9.52.1.7 atcaspi**

```
struct { ... } atcaspi
```

**9.52.1.8 atcaswi**

```
struct { ... } atcaswi
```

**9.52.1.9 atcauart**

```
struct { ... } atcauart
```

**9.52.1.10 baud**

```
uint32_t baud
```

**9.52.1.11 bus**

```
uint8_t bus
```

**9.52.1.12 cfg\_data**

```
void* cfg_data
```

**9.52.1.13 dev\_identity**

```
uint8_t dev_identity
```

**9.52.1.14 dev\_interface**

```
ATCAKitType dev_interface
```

### 9.52.1.15 devtype

`ATCADeviceType` devtype

### 9.52.1.16 flags

`uint32_t` flags

### 9.52.1.17 halidle

`ATCA_STATUS`(\* halidle) (void \*iface)

### 9.52.1.18 halinit

`ATCA_STATUS`(\* halinit) (void \*hal, void \*cfg)

### 9.52.1.19 halpostinit

`ATCA_STATUS`(\* halpostinit) (void \*iface)

### 9.52.1.20 halreceive

`ATCA_STATUS`(\* halreceive) (void \*iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxlength)

### 9.52.1.21 halrelease

`ATCA_STATUS`(\* halrelease) (void \*hal\_data)

### 9.52.1.22 halsend

`ATCA_STATUS`(\* halsend) (void \*iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)

**9.52.1.23 halsleep**

```
ATCA_STATUS(* halsleep) (void *iface)
```

**9.52.1.24 halwake**

```
ATCA_STATUS(* halwake) (void *iface)
```

**9.52.1.25 idx**

```
int idx
```

**9.52.1.26 iface\_type**

```
ATCAIfaceType iface_type
```

**9.52.1.27 packetsize**

```
uint32_t packetsize
```

**9.52.1.28 parity**

```
uint8_t parity
```

**9.52.1.29 pid**

```
uint32_t pid
```

**9.52.1.30 port**

```
uint8_t port
```

### 9.52.1.31 rx\_retries

int rx\_retries

### 9.52.1.32 select\_pin

uint8\_t select\_pin

### 9.52.1.33 stopbits

uint8\_t stopbits

### 9.52.1.34 vid

uint32\_t vid

### 9.52.1.35 wake\_delay

uint16\_t wake\_delay

### 9.52.1.36 wordsize

uint8\_t wordsize

## 9.53 ATCAPacket Struct Reference

```
#include <calib_command.h>
```

### Data Fields

- uint8\_t [\\_reserved](#)
- uint8\_t [txsize](#)
- uint8\_t [opcode](#)
- uint8\_t [param1](#)
- uint16\_t [param2](#)
- uint8\_t [data](#) [192]
- uint8\_t [execTime](#)

## 9.53.1 Field Documentation

### 9.53.1.1 `_reserved`

```
uint8_t _reserved
```

### 9.53.1.2 `data`

```
uint8_t data[192]
```

### 9.53.1.3 `execTime`

```
uint8_t execTime
```

### 9.53.1.4 `opcode`

```
uint8_t opcode
```

### 9.53.1.5 `param1`

```
uint8_t param1
```

### 9.53.1.6 `param2`

```
uint16_t param2
```

### 9.53.1.7 `txsize`

```
uint8_t txsize
```

### 9.54 atcaSWImaster Struct Reference

this is the hal\_data for ATCA HAL for ASF SERCOM

```
#include <swi_uart_samd21_asf.h>
```

#### Data Fields

- struct usart\_module [usart\\_instance](#)
- int [ref\\_ct](#)
- int [bus\\_index](#)
- struct usart\_sync\_descriptor [USART\\_SWI](#)
- uint32\_t [sercom\\_core\\_freq](#)

#### 9.54.1 Detailed Description

this is the hal\_data for ATCA HAL for ASF SERCOM

#### 9.54.2 Field Documentation

##### 9.54.2.1 bus\_index

```
int bus_index
```

##### 9.54.2.2 ref\_ct

```
int ref_ct
```

##### 9.54.2.3 sercom\_core\_freq

```
uint32_t sercom_core_freq
```

##### 9.54.2.4 usart\_instance

```
struct usart_module usart_instance
```

#### 9.54.2.5 USART\_SWI

```
struct usart_sync_descriptor USART_SWI
```

### 9.55 CK\_AES\_CBC\_ENCRYPT\_DATA\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

#### Data Fields

- [CK\\_BYTE](#) iv [16]
- [CK\\_BYTE\\_PTR](#) pData
- [CK\\_ULONG](#) length

#### 9.55.1 Field Documentation

##### 9.55.1.1 iv

```
CK\_BYTE iv[16]
```

##### 9.55.1.2 length

```
CK\_ULONG length
```

##### 9.55.1.3 pData

```
CK\_BYTE\_PTR pData
```

### 9.56 CK\_AES\_CCM\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_ULONG](#) ulDataLen
- [CK\\_BYTE\\_PTR](#) pNonce
- [CK\\_ULONG](#) ulNonceLen
- [CK\\_BYTE\\_PTR](#) pAAD
- [CK\\_ULONG](#) ulAADLen
- [CK\\_ULONG](#) ulMACLen

### 9.56.1 Field Documentation

#### 9.56.1.1 pAAD

[CK\\_BYTE\\_PTR](#) pAAD

#### 9.56.1.2 pNonce

[CK\\_BYTE\\_PTR](#) pNonce

#### 9.56.1.3 ulAADLen

[CK\\_ULONG](#) ulAADLen

#### 9.56.1.4 ulDataLen

[CK\\_ULONG](#) ulDataLen

#### 9.56.1.5 ulMACLen

[CK\\_ULONG](#) ulMACLen

#### 9.56.1.6 ulNonceLen

[CK\\_ULONG](#) ulNonceLen



## 9.57 CK\_AES\_CTR\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_ULONG](#) ulCounterBits
- [CK\\_BYTE](#) cb [16]

### 9.57.1 Field Documentation

#### 9.57.1.1 cb

[CK\\_BYTE](#) cb[16]

#### 9.57.1.2 ulCounterBits

[CK\\_ULONG](#) ulCounterBits

## 9.58 CK\_AES\_GCM\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_BYTE\\_PTR](#) pIv
- [CK\\_ULONG](#) ulIvLen
- [CK\\_ULONG](#) ulIvBits
- [CK\\_BYTE\\_PTR](#) pAAD
- [CK\\_ULONG](#) ulAADLen
- [CK\\_ULONG](#) ulTagBits

### 9.58.1 Field Documentation

### 9.58.1.1 pAAD

[CK\\_BYTE\\_PTR](#) pAAD

### 9.58.1.2 pIv

[CK\\_BYTE\\_PTR](#) pIv

### 9.58.1.3 ulAADLen

[CK\\_ULONG](#) ulAADLen

### 9.58.1.4 ulIvBits

[CK\\_ULONG](#) ulIvBits

### 9.58.1.5 ulIvLen

[CK\\_ULONG](#) ulIvLen

### 9.58.1.6 ulTagBits

[CK\\_ULONG](#) ulTagBits

## 9.59 CK\_ARIA\_CBC\_ENCRYPT\_DATA\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_BYTE](#) iv [16]
- [CK\\_BYTE\\_PTR](#) pData
- [CK\\_ULONG](#) length

### 9.59.1 Field Documentation

#### 9.59.1.1 iv

`CK_BYTE iv[16]`

#### 9.59.1.2 length

`CK_ULONG length`

#### 9.59.1.3 pData

`CK_BYTE_PTR pData`

## 9.60 CK\_ATTRIBUTE Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_ATTRIBUTE_TYPE` type
- `CK_VOID_PTR` pValue
- `CK_ULONG` ulValueLen

### 9.60.1 Field Documentation

#### 9.60.1.1 pValue

`CK_VOID_PTR pValue`

### 9.60.1.2 type

`CK_ATTRIBUTE_TYPE` type

### 9.60.1.3 ulValueLen

`CK_ULONG` ulValueLen

## 9.61 CK\_C\_INITIALIZE\_ARGS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- CK\_CREATEMUTEX [CreateMutex](#)
- CK\_DESTROYMUTEX [DestroyMutex](#)
- CK\_LOCKMUTEX [LockMutex](#)
- CK\_UNLOCKMUTEX [UnlockMutex](#)
- CK\_FLAGS [flags](#)
- CK\_VOID\_PTR [pReserved](#)

### 9.61.1 Field Documentation

#### 9.61.1.1 CreateMutex

`CK_CREATEMUTEX` [CreateMutex](#)

#### 9.61.1.2 DestroyMutex

`CK_DESTROYMUTEX` [DestroyMutex](#)

#### 9.61.1.3 flags

`CK_FLAGS` [flags](#)

#### 9.61.1.4 LockMutex

`CK_LOCKMUTEX LockMutex`

#### 9.61.1.5 pReserved

`CK_VOID_PTR pReserved`

#### 9.61.1.6 UnlockMutex

`CK_UNLOCKMUTEX UnlockMutex`

## 9.62 CK\_CAMELLIA\_CBC\_ENCRYPT\_DATA\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_BYTE iv[16]`
- `CK_BYTE_PTR pData`
- `CK_ULONG length`

### 9.62.1 Field Documentation

#### 9.62.1.1 iv

`CK_BYTE iv[16]`

#### 9.62.1.2 length

`CK_ULONG length`

### 9.62.1.3 pData

[CK\\_BYTE\\_PTR](#) pData

## 9.63 CK\_CAMELLIA\_CTR\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_ULONG](#) ulCounterBits
- [CK\\_BYTE](#) cb [16]

### 9.63.1 Field Documentation

#### 9.63.1.1 cb

[CK\\_BYTE](#) cb[16]

#### 9.63.1.2 ulCounterBits

[CK\\_ULONG](#) ulCounterBits

## 9.64 CK\_CCM\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_ULONG](#) ulDataLen
- [CK\\_BYTE\\_PTR](#) pNonce
- [CK\\_ULONG](#) ulNonceLen
- [CK\\_BYTE\\_PTR](#) pAAD
- [CK\\_ULONG](#) ulAADLen
- [CK\\_ULONG](#) ulMACLen

### 9.64.1 Field Documentation

#### 9.64.1.1 pAAD

[CK\\_BYTE\\_PTR](#) pAAD

#### 9.64.1.2 pNonce

[CK\\_BYTE\\_PTR](#) pNonce

#### 9.64.1.3 ulAADLen

[CK\\_ULONG](#) ulAADLen

#### 9.64.1.4 ulDataLen

[CK\\_ULONG](#) ulDataLen

#### 9.64.1.5 ulMACLen

[CK\\_ULONG](#) ulMACLen

#### 9.64.1.6 ulNonceLen

[CK\\_ULONG](#) ulNonceLen

### 9.65 CK\_CMS\_SIG\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

#### Data Fields

- [CK\\_OBJECT\\_HANDLE](#) certificateHandle
- [CK\\_MECHANISM\\_PTR](#) pSigningMechanism
- [CK\\_MECHANISM\\_PTR](#) pDigestMechanism
- [CK\\_UTF8CHAR\\_PTR](#) pContentType
- [CK\\_BYTE\\_PTR](#) pRequestedAttributes
- [CK\\_ULONG](#) ulRequestedAttributesLen
- [CK\\_BYTE\\_PTR](#) pRequiredAttributes
- [CK\\_ULONG](#) ulRequiredAttributesLen

### 9.65.1 Field Documentation

#### 9.65.1.1 certificateHandle

[CK\\_OBJECT\\_HANDLE](#) certificateHandle

#### 9.65.1.2 pContentType

[CK\\_UTF8CHAR\\_PTR](#) pContentType

#### 9.65.1.3 pDigestMechanism

[CK\\_MECHANISM\\_PTR](#) pDigestMechanism

#### 9.65.1.4 pRequestedAttributes

[CK\\_BYTE\\_PTR](#) pRequestedAttributes

#### 9.65.1.5 pRequiredAttributes

[CK\\_BYTE\\_PTR](#) pRequiredAttributes

#### 9.65.1.6 pSigningMechanism

[CK\\_MECHANISM\\_PTR](#) pSigningMechanism

#### 9.65.1.7 ulRequestedAttributesLen

[CK\\_ULONG](#) ulRequestedAttributesLen



### 9.65.1.8 ulRequiredAttributesLen

`CK_ULONG ulRequiredAttributesLen`

## 9.66 CK\_DATE Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_CHAR year` [4]
- `CK_CHAR month` [2]
- `CK_CHAR day` [2]

### 9.66.1 Field Documentation

#### 9.66.1.1 day

`CK_CHAR day` [2]

#### 9.66.1.2 month

`CK_CHAR month` [2]

#### 9.66.1.3 year

`CK_CHAR year` [4]

## 9.67 CK\_DES\_CBC\_ENCRYPT\_DATA\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_BYTE iv` [8]
- `CK_BYTE_PTR pData`
- `CK_ULONG length`

### 9.67.1 Field Documentation

#### 9.67.1.1 iv

`CK_BYTE iv[8]`

#### 9.67.1.2 length

`CK_ULONG length`

#### 9.67.1.3 pData

`CK_BYTE_PTR pData`

## 9.68 CK\_DSA\_PARAMETER\_GEN\_PARAM Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_MECHANISM_TYPE` hash
- `CK_BYTE_PTR` pSeed
- `CK_ULONG` ulSeedLen
- `CK_ULONG` ulIndex

### 9.68.1 Field Documentation

#### 9.68.1.1 hash

`CK_MECHANISM_TYPE` hash

### 9.68.1.2 pSeed

[CK\\_BYTE\\_PTR](#) pSeed

### 9.68.1.3 ulIndex

[CK\\_ULONG](#) ulIndex

### 9.68.1.4 ulSeedLen

[CK\\_ULONG](#) ulSeedLen

## 9.69 CK\_ECDH1\_DERIVE\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_EC\\_KDF\\_TYPE](#) kdf
- [CK\\_ULONG](#) ulSharedDataLen
- [CK\\_BYTE\\_PTR](#) pSharedData
- [CK\\_ULONG](#) ulPublicDataLen
- [CK\\_BYTE\\_PTR](#) pPublicData

### 9.69.1 Field Documentation

#### 9.69.1.1 kdf

[CK\\_EC\\_KDF\\_TYPE](#) kdf

#### 9.69.1.2 pPublicData

[CK\\_BYTE\\_PTR](#) pPublicData

### 9.69.1.3 pSharedData

[CK\\_BYTE\\_PTR](#) pSharedData

### 9.69.1.4 ulPublicDataLen

[CK\\_ULONG](#) ulPublicDataLen

### 9.69.1.5 ulSharedDataLen

[CK\\_ULONG](#) ulSharedDataLen

## 9.70 CK\_ECDH2\_DERIVE\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_EC\\_KDF\\_TYPE](#) kdf
- [CK\\_ULONG](#) ulSharedDataLen
- [CK\\_BYTE\\_PTR](#) pSharedData
- [CK\\_ULONG](#) ulPublicDataLen
- [CK\\_BYTE\\_PTR](#) pPublicData
- [CK\\_ULONG](#) ulPrivateDataLen
- [CK\\_OBJECT\\_HANDLE](#) hPrivateData
- [CK\\_ULONG](#) ulPublicDataLen2
- [CK\\_BYTE\\_PTR](#) pPublicData2

### 9.70.1 Field Documentation

#### 9.70.1.1 hPrivateData

[CK\\_OBJECT\\_HANDLE](#) hPrivateData

**9.70.1.2 kdf**

`CK_EC_KDF_TYPE` kdf

**9.70.1.3 pPublicData**

`CK_BYTE_PTR` pPublicData

**9.70.1.4 pPublicData2**

`CK_BYTE_PTR` pPublicData2

**9.70.1.5 pSharedData**

`CK_BYTE_PTR` pSharedData

**9.70.1.6 ulPrivateDataLen**

`CK_ULONG` ulPrivateDataLen

**9.70.1.7 ulPublicDataLen**

`CK_ULONG` ulPublicDataLen

**9.70.1.8 ulPublicDataLen2**

`CK_ULONG` ulPublicDataLen2

**9.70.1.9 ulSharedDataLen**

`CK_ULONG` ulSharedDataLen

## 9.71 CK\_ECDH\_AES\_KEY\_WRAP\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_ULONG](#) ulAESKeyBits
- [CK\\_EC\\_KDF\\_TYPE](#) kdf
- [CK\\_ULONG](#) ulSharedDataLen
- [CK\\_BYTE\\_PTR](#) pSharedData

### 9.71.1 Field Documentation

#### 9.71.1.1 kdf

[CK\\_EC\\_KDF\\_TYPE](#) kdf

#### 9.71.1.2 pSharedData

[CK\\_BYTE\\_PTR](#) pSharedData

#### 9.71.1.3 ulAESKeyBits

[CK\\_ULONG](#) ulAESKeyBits

#### 9.71.1.4 ulSharedDataLen

[CK\\_ULONG](#) ulSharedDataLen

## 9.72 CK\_ECMQV\_DERIVE\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

## Data Fields

- [CK\\_EC\\_KDF\\_TYPE](#) kdf
- [CK\\_ULONG](#) ulSharedDataLen
- [CK\\_BYTE\\_PTR](#) pSharedData
- [CK\\_ULONG](#) ulPublicDataLen
- [CK\\_BYTE\\_PTR](#) pPublicData
- [CK\\_ULONG](#) ulPrivateDataLen
- [CK\\_OBJECT\\_HANDLE](#) hPrivateData
- [CK\\_ULONG](#) ulPublicDataLen2
- [CK\\_BYTE\\_PTR](#) pPublicData2
- [CK\\_OBJECT\\_HANDLE](#) publicKey

### 9.72.1 Field Documentation

#### 9.72.1.1 hPrivateData

[CK\\_OBJECT\\_HANDLE](#) hPrivateData

#### 9.72.1.2 kdf

[CK\\_EC\\_KDF\\_TYPE](#) kdf

#### 9.72.1.3 pPublicData

[CK\\_BYTE\\_PTR](#) pPublicData

#### 9.72.1.4 pPublicData2

[CK\\_BYTE\\_PTR](#) pPublicData2

#### 9.72.1.5 pSharedData

[CK\\_BYTE\\_PTR](#) pSharedData

## 9.73 CK\_FUNCTION\_LIST Struct Reference

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### 9.72.1.6 publicKey

[CK\\_OBJECT\\_HANDLE](#) publicKey

### 9.72.1.7 ulPrivateDataLen

[CK\\_ULONG](#) ulPrivateDataLen

### 9.72.1.8 ulPublicDataLen

[CK\\_ULONG](#) ulPublicDataLen

### 9.72.1.9 ulPublicDataLen2

[CK\\_ULONG](#) ulPublicDataLen2

### 9.72.1.10 ulSharedDataLen

[CK\\_ULONG](#) ulSharedDataLen

## 9.73 CK\_FUNCTION\_LIST Struct Reference

```
#include <pkcs11.h>
```

### Data Fields

- [CK\\_VERSION](#) version

### 9.73.1 Field Documentation

#### 9.73.1.1 version

[CK\\_VERSION](#) version



## 9.74 CK\_GCM\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_BYTE\\_PTR](#) pIv
- [CK\\_ULONG](#) ulIvLen
- [CK\\_ULONG](#) ulIvBits
- [CK\\_BYTE\\_PTR](#) pAAD
- [CK\\_ULONG](#) ulAADLen
- [CK\\_ULONG](#) ulTagBits

### 9.74.1 Field Documentation

#### 9.74.1.1 pAAD

[CK\\_BYTE\\_PTR](#) pAAD

#### 9.74.1.2 pIv

[CK\\_BYTE\\_PTR](#) pIv

#### 9.74.1.3 ulAADLen

[CK\\_ULONG](#) ulAADLen

#### 9.74.1.4 ulIvBits

[CK\\_ULONG](#) ulIvBits

#### 9.74.1.5 ulIvLen

[CK\\_ULONG](#) ulIvLen

### 9.74.1.6 ulTagBits

`CK_ULONG` ulTagBits

## 9.75 CK\_GOSTR3410\_DERIVE\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_EC_KDF_TYPE` kdf
- `CK_BYTE_PTR` pPublicData
- `CK_ULONG` ulPublicDataLen
- `CK_BYTE_PTR` pUKM
- `CK_ULONG` ulUKMLen

### 9.75.1 Field Documentation

#### 9.75.1.1 kdf

`CK_EC_KDF_TYPE` kdf

#### 9.75.1.2 pPublicData

`CK_BYTE_PTR` pPublicData

#### 9.75.1.3 pUKM

`CK_BYTE_PTR` pUKM

#### 9.75.1.4 ulPublicDataLen

`CK_ULONG` ulPublicDataLen

### 9.75.1.5 ulUKMLen

[CK\\_ULONG](#) ulUKMLen

## 9.76 CK\_GOSTR3410\_KEY\_WRAP\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_BYTE\\_PTR](#) pWrapOID
- [CK\\_ULONG](#) ulWrapOIDLen
- [CK\\_BYTE\\_PTR](#) pUKM
- [CK\\_ULONG](#) ulUKMLen
- [CK\\_OBJECT\\_HANDLE](#) hKey

### 9.76.1 Field Documentation

#### 9.76.1.1 hKey

[CK\\_OBJECT\\_HANDLE](#) hKey

#### 9.76.1.2 pUKM

[CK\\_BYTE\\_PTR](#) pUKM

#### 9.76.1.3 pWrapOID

[CK\\_BYTE\\_PTR](#) pWrapOID

#### 9.76.1.4 ulUKMLen

[CK\\_ULONG](#) ulUKMLen

### 9.76.1.5 ulWrapOIDLen

`CK_ULONG` ulWrapOIDLen

## 9.77 CK\_INFO Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_VERSION` cryptokiVersion
- `CK_UTF8CHAR` manufacturerID [32]
- `CK_FLAGS` flags
- `CK_UTF8CHAR` libraryDescription [32]
- `CK_VERSION` libraryVersion

### 9.77.1 Field Documentation

#### 9.77.1.1 cryptokiVersion

`CK_VERSION` cryptokiVersion

#### 9.77.1.2 flags

`CK_FLAGS` flags

#### 9.77.1.3 libraryDescription

`CK_UTF8CHAR` libraryDescription[32]

#### 9.77.1.4 libraryVersion

`CK_VERSION` libraryVersion

### 9.77.1.5 manufacturerID

`CK_UTF8CHAR manufacturerID[32]`

## 9.78 CK\_KEA\_DERIVE\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_BBOOL isSender`
- `CK_ULONG ulRandomLen`
- `CK_BYTE_PTR pRandomA`
- `CK_BYTE_PTR pRandomB`
- `CK_ULONG ulPublicDataLen`
- `CK_BYTE_PTR pPublicData`

### 9.78.1 Field Documentation

#### 9.78.1.1 isSender

`CK_BBOOL isSender`

#### 9.78.1.2 pPublicData

`CK_BYTE_PTR pPublicData`

#### 9.78.1.3 pRandomA

`CK_BYTE_PTR pRandomA`

#### 9.78.1.4 pRandomB

`CK_BYTE_PTR pRandomB`

### 9.78.1.5 ulPublicDataLen

[CK\\_ULONG](#) ulPublicDataLen

### 9.78.1.6 ulRandomLen

[CK\\_ULONG](#) ulRandomLen

## 9.79 CK\_KEY\_DERIVATION\_STRING\_DATA Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_BYTE\\_PTR](#) pData
- [CK\\_ULONG](#) ulLen

### 9.79.1 Field Documentation

#### 9.79.1.1 pData

[CK\\_BYTE\\_PTR](#) pData

#### 9.79.1.2 ulLen

[CK\\_ULONG](#) ulLen

## 9.80 CK\_KEY\_WRAP\_SET\_OAEP\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_BYTE](#) bBC
- [CK\\_BYTE\\_PTR](#) pX
- [CK\\_ULONG](#) ulXLen

## 9.80.1 Field Documentation

### 9.80.1.1 bBC

[CK\\_BYTE](#) bBC

### 9.80.1.2 pX

[CK\\_BYTE\\_PTR](#) pX

### 9.80.1.3 ulXLen

[CK\\_ULONG](#) ulXLen

## 9.81 CK\_KIP\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_MECHANISM\\_PTR](#) pMechanism
- [CK\\_OBJECT\\_HANDLE](#) hKey
- [CK\\_BYTE\\_PTR](#) pSeed
- [CK\\_ULONG](#) ulSeedLen

## 9.81.1 Field Documentation

### 9.81.1.1 hKey

[CK\\_OBJECT\\_HANDLE](#) hKey

### 9.81.1.2 pMechanism

[CK\\_MECHANISM\\_PTR](#) pMechanism

### 9.81.1.3 pSeed

[CK\\_BYTE\\_PTR](#) pSeed

### 9.81.1.4 ulSeedLen

[CK\\_ULONG](#) ulSeedLen

## 9.82 CK\_MECHANISM Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_MECHANISM\\_TYPE](#) mechanism
- [CK\\_VOID\\_PTR](#) pParameter
- [CK\\_ULONG](#) ulParameterLen

### 9.82.1 Field Documentation

#### 9.82.1.1 mechanism

[CK\\_MECHANISM\\_TYPE](#) mechanism

#### 9.82.1.2 pParameter

[CK\\_VOID\\_PTR](#) pParameter



### 9.82.1.3 ulParameterLen

`CK_ULONG ulParameterLen`

## 9.83 CK\_MECHANISM\_INFO Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_ULONG ulMinKeySize`
- `CK_ULONG ulMaxKeySize`
- `CK_FLAGS flags`

### 9.83.1 Field Documentation

#### 9.83.1.1 flags

`CK_FLAGS flags`

#### 9.83.1.2 ulMaxKeySize

`CK_ULONG ulMaxKeySize`

#### 9.83.1.3 ulMinKeySize

`CK_ULONG ulMinKeySize`

## 9.84 CK\_OTP\_PARAM Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_OTP_PARAM_TYPE type`
- `CK_VOID_PTR pValue`
- `CK_ULONG ulValueLen`

### 9.84.1 Field Documentation

#### 9.84.1.1 pValue

[CK\\_VOID\\_PTR](#) pValue

#### 9.84.1.2 type

[CK\\_OTP\\_PARAM\\_TYPE](#) type

#### 9.84.1.3 ulValueLen

[CK\\_ULONG](#) ulValueLen

## 9.85 CK\_OTP\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_OTP\\_PARAM\\_PTR](#) pParams
- [CK\\_ULONG](#) ulCount

### 9.85.1 Field Documentation

#### 9.85.1.1 pParams

[CK\\_OTP\\_PARAM\\_PTR](#) pParams

#### 9.85.1.2 ulCount

[CK\\_ULONG](#) ulCount

## 9.86 CK\_OTP\_SIGNATURE\_INFO Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_OTP\\_PARAM\\_PTR](#) pParams
- [CK\\_ULONG](#) ulCount

### 9.86.1 Field Documentation

#### 9.86.1.1 pParams

[CK\\_OTP\\_PARAM\\_PTR](#) pParams

#### 9.86.1.2 ulCount

[CK\\_ULONG](#) ulCount

## 9.87 CK\_PBE\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_BYTE\\_PTR](#) pInitVector
- [CK\\_UTF8CHAR\\_PTR](#) pPassword
- [CK\\_ULONG](#) ulPasswordLen
- [CK\\_BYTE\\_PTR](#) pSalt
- [CK\\_ULONG](#) ulSaltLen
- [CK\\_ULONG](#) ulIteration

### 9.87.1 Field Documentation

### 9.87.1.1 pInitVector

`CK_BYTE_PTR` pInitVector

### 9.87.1.2 pPassword

`CK_UTF8CHAR_PTR` pPassword

### 9.87.1.3 pSalt

`CK_BYTE_PTR` pSalt

### 9.87.1.4 ulIteration

`CK_ULONG` ulIteration

### 9.87.1.5 ulPasswordLen

`CK_ULONG` ulPasswordLen

### 9.87.1.6 ulSaltLen

`CK_ULONG` ulSaltLen

## 9.88 CK\_PKCS5\_PBKD2\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_PKCS5_PBKDF2_SALT_SOURCE_TYPE` saltSource
- `CK_VOID_PTR` pSaltSourceData
- `CK_ULONG` ulSaltSourceDataLen
- `CK_ULONG` iterations
- `CK_PKCS5_PBKD2_PSEUDO_RANDOM_FUNCTION_TYPE` prf
- `CK_VOID_PTR` pPrfData
- `CK_ULONG` ulPrfDataLen
- `CK_UTF8CHAR_PTR` pPassword
- `CK_ULONG_PTR` ulPasswordLen

## 9.88.1 Field Documentation

### 9.88.1.1 iterations

`CK_ULONG` iterations

### 9.88.1.2 pPassword

`CK_UTF8CHAR_PTR` pPassword

### 9.88.1.3 pPrfData

`CK_VOID_PTR` pPrfData

### 9.88.1.4 prf

`CK_PKCS5_PBKD2_PSEUDO_RANDOM_FUNCTION_TYPE` prf

### 9.88.1.5 pSaltSourceData

`CK_VOID_PTR` pSaltSourceData

### 9.88.1.6 saltSource

`CK_PKCS5_PBKDF2_SALT_SOURCE_TYPE` saltSource

### 9.88.1.7 ulPasswordLen

`CK_ULONG_PTR` ulPasswordLen

### 9.88.1.8 ulPrfDataLen

`CK_ULONG` ulPrfDataLen

### 9.88.1.9 ulSaltSourceDataLen

`CK_ULONG` ulSaltSourceDataLen

## 9.89 CK\_PKCS5\_PBKD2\_PARAMS2 Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_PKCS5_PBKDF2_SALT_SOURCE_TYPE` saltSource
- `CK_VOID_PTR` pSaltSourceData
- `CK_ULONG` ulSaltSourceDataLen
- `CK_ULONG` iterations
- `CK_PKCS5_PBKD2_PSEUDO_RANDOM_FUNCTION_TYPE` prf
- `CK_VOID_PTR` pPrfData
- `CK_ULONG` ulPrfDataLen
- `CK_UTF8CHAR_PTR` pPassword
- `CK_ULONG` ulPasswordLen

### 9.89.1 Field Documentation

#### 9.89.1.1 iterations

`CK_ULONG` iterations

#### 9.89.1.2 pPassword

`CK_UTF8CHAR_PTR` pPassword

### 9.89.1.3 pPrfData

`CK_VOID_PTR` pPrfData

### 9.89.1.4 prf

`CK_PKCS5_PBKD2_PSEUDO_RANDOM_FUNCTION_TYPE` prf

### 9.89.1.5 pSaltSourceData

`CK_VOID_PTR` pSaltSourceData

### 9.89.1.6 saltSource

`CK_PKCS5_PBKDF2_SALT_SOURCE_TYPE` saltSource

### 9.89.1.7 ulPasswordLen

`CK_ULONG` ulPasswordLen

### 9.89.1.8 ulPrfDataLen

`CK_ULONG` ulPrfDataLen

### 9.89.1.9 ulSaltSourceDataLen

`CK_ULONG` ulSaltSourceDataLen

## 9.90 CK\_RC2\_CBC\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_ULONG](#) ulEffectiveBits
- [CK\\_BYTE](#) iv [8]

#### 9.90.1 Field Documentation

##### 9.90.1.1 iv

[CK\\_BYTE](#) iv[8]

##### 9.90.1.2 ulEffectiveBits

[CK\\_ULONG](#) ulEffectiveBits

## 9.91 CK\_RC2\_MAC\_GENERAL\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_ULONG](#) ulEffectiveBits
- [CK\\_ULONG](#) ulMacLength

#### 9.91.1 Field Documentation

##### 9.91.1.1 ulEffectiveBits

[CK\\_ULONG](#) ulEffectiveBits

##### 9.91.1.2 ulMacLength

[CK\\_ULONG](#) ulMacLength



## 9.92 CK\_RC5\_CBC\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_ULONG](#) ulWordsize
- [CK\\_ULONG](#) ulRounds
- [CK\\_BYTE\\_PTR](#) pIv
- [CK\\_ULONG](#) ulIvLen

### 9.92.1 Field Documentation

#### 9.92.1.1 pIv

[CK\\_BYTE\\_PTR](#) pIv

#### 9.92.1.2 ulIvLen

[CK\\_ULONG](#) ulIvLen

#### 9.92.1.3 ulRounds

[CK\\_ULONG](#) ulRounds

#### 9.92.1.4 ulWordsize

[CK\\_ULONG](#) ulWordsize

## 9.93 CK\_RC5\_MAC\_GENERAL\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_ULONG](#) ulWordsize
- [CK\\_ULONG](#) ulRounds
- [CK\\_ULONG](#) ulMacLength

### 9.93.1 Field Documentation

#### 9.93.1.1 ulMacLength

[CK\\_ULONG](#) ulMacLength

#### 9.93.1.2 ulRounds

[CK\\_ULONG](#) ulRounds

#### 9.93.1.3 ulWordsize

[CK\\_ULONG](#) ulWordsize

## 9.94 CK\_RC5\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_ULONG](#) ulWordsize
- [CK\\_ULONG](#) ulRounds

### 9.94.1 Field Documentation

#### 9.94.1.1 ulRounds

[CK\\_ULONG](#) ulRounds

### 9.94.1.2 ulWordsize

[CK\\_ULONG](#) ulWordsize

## 9.95 CK\_RSA\_AES\_KEY\_WRAP\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_ULONG](#) ulAESKeyBits
- [CK\\_RSA\\_PKCS\\_OAEP\\_PARAMS\\_PTR](#) pOAEPParams

### 9.95.1 Field Documentation

#### 9.95.1.1 pOAEPParams

[CK\\_RSA\\_PKCS\\_OAEP\\_PARAMS\\_PTR](#) pOAEPParams

#### 9.95.1.2 ulAESKeyBits

[CK\\_ULONG](#) ulAESKeyBits

## 9.96 CK\_RSA\_PKCS\_OAEP\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_MECHANISM\\_TYPE](#) hashAlg
- [CK\\_RSA\\_PKCS\\_MGF\\_TYPE](#) mgf
- [CK\\_RSA\\_PKCS\\_OAEP\\_SOURCE\\_TYPE](#) source
- [CK\\_VOID\\_PTR](#) pSourceData
- [CK\\_ULONG](#) ulSourceDataLen

### 9.96.1 Field Documentation

### 9.96.1.1 hashAlg

[CK\\_MECHANISM\\_TYPE](#) hashAlg

### 9.96.1.2 mgf

[CK\\_RSA\\_PKCS\\_MGF\\_TYPE](#) mgf

### 9.96.1.3 pSourceData

[CK\\_VOID\\_PTR](#) pSourceData

### 9.96.1.4 source

[CK\\_RSA\\_PKCS\\_OAEP\\_SOURCE\\_TYPE](#) source

### 9.96.1.5 ulSourceDataLen

[CK\\_ULONG](#) ulSourceDataLen

## 9.97 CK\_RSA\_PKCS\_PSS\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_MECHANISM\\_TYPE](#) hashAlg
- [CK\\_RSA\\_PKCS\\_MGF\\_TYPE](#) mgf
- [CK\\_ULONG](#) sLen

### 9.97.1 Field Documentation

### 9.97.1.1 hashAlg

`CK_MECHANISM_TYPE` hashAlg

### 9.97.1.2 mgf

`CK_RSA_PKCS_MGF_TYPE` mgf

### 9.97.1.3 sLen

`CK_ULONG` sLen

## 9.98 CK\_SEED\_CBC\_ENCRYPT\_DATA\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_BYTE` iv [16]
- `CK_BYTE_PTR` pData
- `CK_ULONG` length

### 9.98.1 Field Documentation

#### 9.98.1.1 iv

`CK_BYTE` iv[16]

#### 9.98.1.2 length

`CK_ULONG` length

### 9.98.1.3 pData

`CK_BYTE_PTR` pData

## 9.99 CK\_SESSION\_INFO Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_SLOT_ID` slotID
- `CK_STATE` state
- `CK_FLAGS` flags
- `CK_ULONG` ulDeviceError

### 9.99.1 Field Documentation

#### 9.99.1.1 flags

`CK_FLAGS` flags

#### 9.99.1.2 slotID

`CK_SLOT_ID` slotID

#### 9.99.1.3 state

`CK_STATE` state

#### 9.99.1.4 ulDeviceError

`CK_ULONG` ulDeviceError

## 9.100 CK\_SKIPJACK\_PRIVATE\_WRAP\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_ULONG](#) ulPasswordLen
- [CK\\_BYTE\\_PTR](#) pPassword
- [CK\\_ULONG](#) ulPublicDataLen
- [CK\\_BYTE\\_PTR](#) pPublicData
- [CK\\_ULONG](#) ulPAndGLen
- [CK\\_ULONG](#) ulQLen
- [CK\\_ULONG](#) ulRandomLen
- [CK\\_BYTE\\_PTR](#) pRandomA
- [CK\\_BYTE\\_PTR](#) pPrimeP
- [CK\\_BYTE\\_PTR](#) pBaseG
- [CK\\_BYTE\\_PTR](#) pSubprimeQ

### 9.100.1 Field Documentation

#### 9.100.1.1 pBaseG

[CK\\_BYTE\\_PTR](#) pBaseG

#### 9.100.1.2 pPassword

[CK\\_BYTE\\_PTR](#) pPassword

#### 9.100.1.3 pPrimeP

[CK\\_BYTE\\_PTR](#) pPrimeP

#### 9.100.1.4 pPublicData

[CK\\_BYTE\\_PTR](#) pPublicData

## 9.101 CK\_SKIPJACK\_RELAYX\_PARAMS Struct Reference

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### 9.100.1.5 pRandomA

[CK\\_BYTE\\_PTR](#) pRandomA

### 9.100.1.6 pSubprimeQ

[CK\\_BYTE\\_PTR](#) pSubprimeQ

### 9.100.1.7 ulPAndGLen

[CK\\_ULONG](#) ulPAndGLen

### 9.100.1.8 ulPasswordLen

[CK\\_ULONG](#) ulPasswordLen

### 9.100.1.9 ulPublicDataLen

[CK\\_ULONG](#) ulPublicDataLen

### 9.100.1.10 ulQLen

[CK\\_ULONG](#) ulQLen

### 9.100.1.11 ulRandomLen

[CK\\_ULONG](#) ulRandomLen

## 9.101 CK\_SKIPJACK\_RELAYX\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```



## Data Fields

- [CK\\_ULONG](#) ulOldWrappedXLen
- [CK\\_BYTE\\_PTR](#) pOldWrappedX
- [CK\\_ULONG](#) ulOldPasswordLen
- [CK\\_BYTE\\_PTR](#) pOldPassword
- [CK\\_ULONG](#) ulOldPublicDataLen
- [CK\\_BYTE\\_PTR](#) pOldPublicData
- [CK\\_ULONG](#) ulOldRandomLen
- [CK\\_BYTE\\_PTR](#) pOldRandomA
- [CK\\_ULONG](#) ulNewPasswordLen
- [CK\\_BYTE\\_PTR](#) pNewPassword
- [CK\\_ULONG](#) ulNewPublicDataLen
- [CK\\_BYTE\\_PTR](#) pNewPublicData
- [CK\\_ULONG](#) ulNewRandomLen
- [CK\\_BYTE\\_PTR](#) pNewRandomA

### 9.101.1 Field Documentation

#### 9.101.1.1 pNewPassword

[CK\\_BYTE\\_PTR](#) pNewPassword

#### 9.101.1.2 pNewPublicData

[CK\\_BYTE\\_PTR](#) pNewPublicData

#### 9.101.1.3 pNewRandomA

[CK\\_BYTE\\_PTR](#) pNewRandomA

#### 9.101.1.4 pOldPassword

[CK\\_BYTE\\_PTR](#) pOldPassword

### 9.101.1.5 pOldPublicData

`CK_BYTE_PTR` pOldPublicData

### 9.101.1.6 pOldRandomA

`CK_BYTE_PTR` pOldRandomA

### 9.101.1.7 pOldWrappedX

`CK_BYTE_PTR` pOldWrappedX

### 9.101.1.8 ulNewPasswordLen

`CK_ULONG` ulNewPasswordLen

### 9.101.1.9 ulNewPublicDataLen

`CK_ULONG` ulNewPublicDataLen

### 9.101.1.10 ulNewRandomLen

`CK_ULONG` ulNewRandomLen

### 9.101.1.11 ulOldPasswordLen

`CK_ULONG` ulOldPasswordLen

### 9.101.1.12 ulOldPublicDataLen

`CK_ULONG` ulOldPublicDataLen

#### 9.101.1.13 ulOldRandomLen

`CK_ULONG` ulOldRandomLen

#### 9.101.1.14 ulOldWrappedXLen

`CK_ULONG` ulOldWrappedXLen

### 9.102 CK\_SLOT\_INFO Struct Reference

```
#include <pkcs11t.h>
```

#### Data Fields

- `CK_UTF8CHAR` slotDescription [64]
- `CK_UTF8CHAR` manufacturerID [32]
- `CK_FLAGS` flags
- `CK_VERSION` hardwareVersion
- `CK_VERSION` firmwareVersion

#### 9.102.1 Field Documentation

##### 9.102.1.1 firmwareVersion

`CK_VERSION` firmwareVersion

##### 9.102.1.2 flags

`CK_FLAGS` flags

##### 9.102.1.3 hardwareVersion

`CK_VERSION` hardwareVersion

### 9.102.1.4 manufacturerID

`CK_UTF8CHAR manufacturerID[32]`

### 9.102.1.5 slotDescription

`CK_UTF8CHAR slotDescription[64]`

## 9.103 CK\_SSL3\_KEY\_MAT\_OUT Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_OBJECT_HANDLE hClientMacSecret`
- `CK_OBJECT_HANDLE hServerMacSecret`
- `CK_OBJECT_HANDLE hClientKey`
- `CK_OBJECT_HANDLE hServerKey`
- `CK_BYTE_PTR pIVClient`
- `CK_BYTE_PTR pIVServer`

### 9.103.1 Field Documentation

#### 9.103.1.1 hClientKey

`CK_OBJECT_HANDLE hClientKey`

#### 9.103.1.2 hClientMacSecret

`CK_OBJECT_HANDLE hClientMacSecret`

#### 9.103.1.3 hServerKey

`CK_OBJECT_HANDLE hServerKey`

#### 9.103.1.4 hServerMacSecret

[CK\\_OBJECT\\_HANDLE](#) hServerMacSecret

#### 9.103.1.5 pIVClient

[CK\\_BYTE\\_PTR](#) pIVClient

#### 9.103.1.6 pIVServer

[CK\\_BYTE\\_PTR](#) pIVServer

### 9.104 CK\_SSL3\_KEY\_MAT\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

#### Data Fields

- [CK\\_ULONG](#) ulMacSizeInBits
- [CK\\_ULONG](#) ulKeySizeInBits
- [CK\\_ULONG](#) ulIVSizeInBits
- [CK\\_BBOOL](#) blsExport
- [CK\\_SSL3\\_RANDOM\\_DATA](#) RandomInfo
- [CK\\_SSL3\\_KEY\\_MAT\\_OUT\\_PTR](#) pReturnedKeyMaterial

#### 9.104.1 Field Documentation

##### 9.104.1.1 blsExport

[CK\\_BBOOL](#) blsExport

##### 9.104.1.2 pReturnedKeyMaterial

[CK\\_SSL3\\_KEY\\_MAT\\_OUT\\_PTR](#) pReturnedKeyMaterial

### 9.104.1.3 RandomInfo

[CK\\_SSL3\\_RANDOM\\_DATA](#) RandomInfo

### 9.104.1.4 ulIVSizeInBits

[CK\\_ULONG](#) ulIVSizeInBits

### 9.104.1.5 ulKeySizeInBits

[CK\\_ULONG](#) ulKeySizeInBits

### 9.104.1.6 ulMacSizeInBits

[CK\\_ULONG](#) ulMacSizeInBits

## 9.105 CK\_SSL3\_MASTER\_KEY\_DERIVE\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_SSL3\\_RANDOM\\_DATA](#) RandomInfo
- [CK\\_VERSION\\_PTR](#) pVersion

### 9.105.1 Field Documentation

#### 9.105.1.1 pVersion

[CK\\_VERSION\\_PTR](#) pVersion

### 9.105.1.2 RandomInfo

[CK\\_SSL3\\_RANDOM\\_DATA](#) RandomInfo

## 9.106 CK\_SSL3\_RANDOM\_DATA Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_BYTE\\_PTR](#) pClientRandom
- [CK\\_ULONG](#) ulClientRandomLen
- [CK\\_BYTE\\_PTR](#) pServerRandom
- [CK\\_ULONG](#) ulServerRandomLen

### 9.106.1 Field Documentation

#### 9.106.1.1 pClientRandom

[CK\\_BYTE\\_PTR](#) pClientRandom

#### 9.106.1.2 pServerRandom

[CK\\_BYTE\\_PTR](#) pServerRandom

#### 9.106.1.3 ulClientRandomLen

[CK\\_ULONG](#) ulClientRandomLen

#### 9.106.1.4 ulServerRandomLen

[CK\\_ULONG](#) ulServerRandomLen

## 9.107 CK\_TLS12\_KEY\_MAT\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_ULONG](#) ulMacSizeInBits
- [CK\\_ULONG](#) ulKeySizeInBits
- [CK\\_ULONG](#) ulIVSizeInBits
- [CK\\_BBOOL](#) blsExport
- [CK\\_SSL3\\_RANDOM\\_DATA](#) RandomInfo
- [CK\\_SSL3\\_KEY\\_MAT\\_OUT\\_PTR](#) pReturnedKeyMaterial
- [CK\\_MECHANISM\\_TYPE](#) prfHashMechanism

### 9.107.1 Field Documentation

#### 9.107.1.1 blsExport

[CK\\_BBOOL](#) blsExport

#### 9.107.1.2 pReturnedKeyMaterial

[CK\\_SSL3\\_KEY\\_MAT\\_OUT\\_PTR](#) pReturnedKeyMaterial

#### 9.107.1.3 prfHashMechanism

[CK\\_MECHANISM\\_TYPE](#) prfHashMechanism

#### 9.107.1.4 RandomInfo

[CK\\_SSL3\\_RANDOM\\_DATA](#) RandomInfo

#### 9.107.1.5 ulIVSizeInBits

[CK\\_ULONG](#) ulIVSizeInBits



#### 9.107.1.6 ulKeySizeInBits

`CK_ULONG` ulKeySizeInBits

#### 9.107.1.7 ulMacSizeInBits

`CK_ULONG` ulMacSizeInBits

### 9.108 CK\_TLS12\_MASTER\_KEY\_DERIVE\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

#### Data Fields

- [CK\\_SSL3\\_RANDOM\\_DATA](#) RandomInfo
- [CK\\_VERSION\\_PTR](#) pVersion
- [CK\\_MECHANISM\\_TYPE](#) prfHashMechanism

#### 9.108.1 Field Documentation

##### 9.108.1.1 prfHashMechanism

`CK_MECHANISM_TYPE` prfHashMechanism

##### 9.108.1.2 pVersion

`CK_VERSION_PTR` pVersion

##### 9.108.1.3 RandomInfo

`CK_SSL3_RANDOM_DATA` RandomInfo

### 9.109 CK\_TLS\_KDF\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_MECHANISM\\_TYPE](#) prfMechanism
- [CK\\_BYTE\\_PTR](#) pLabel
- [CK\\_ULONG](#) ulLabelLength
- [CK\\_SSL3\\_RANDOM\\_DATA](#) RandomInfo
- [CK\\_BYTE\\_PTR](#) pContextData
- [CK\\_ULONG](#) ulContextDataLength

### 9.109.1 Field Documentation

#### 9.109.1.1 pContextData

[CK\\_BYTE\\_PTR](#) pContextData

#### 9.109.1.2 pLabel

[CK\\_BYTE\\_PTR](#) pLabel

#### 9.109.1.3 prfMechanism

[CK\\_MECHANISM\\_TYPE](#) prfMechanism

#### 9.109.1.4 RandomInfo

[CK\\_SSL3\\_RANDOM\\_DATA](#) RandomInfo

#### 9.109.1.5 ulContextDataLength

[CK\\_ULONG](#) ulContextDataLength

#### 9.109.1.6 ulLabelLength

[CK\\_ULONG](#) ulLabelLength

## 9.110 CK\_TLS\_MAC\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_MECHANISM\\_TYPE](#) prfHashMechanism
- [CK\\_ULONG](#) ulMacLength
- [CK\\_ULONG](#) ulServerOrClient

### 9.110.1 Field Documentation

#### 9.110.1.1 prfHashMechanism

[CK\\_MECHANISM\\_TYPE](#) prfHashMechanism

#### 9.110.1.2 ulMacLength

[CK\\_ULONG](#) ulMacLength

#### 9.110.1.3 ulServerOrClient

[CK\\_ULONG](#) ulServerOrClient

## 9.111 CK\_TLS\_PRF\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_BYTE\\_PTR](#) pSeed
- [CK\\_ULONG](#) ulSeedLen
- [CK\\_BYTE\\_PTR](#) pLabel
- [CK\\_ULONG](#) ulLabelLen
- [CK\\_BYTE\\_PTR](#) pOutput
- [CK\\_ULONG\\_PTR](#) pulOutputLen

### 9.111.1 Field Documentation

#### 9.111.1.1 pLabel

`CK_BYTE_PTR` pLabel

#### 9.111.1.2 pOutput

`CK_BYTE_PTR` pOutput

#### 9.111.1.3 pSeed

`CK_BYTE_PTR` pSeed

#### 9.111.1.4 pulOutputLen

`CK_ULONG_PTR` pulOutputLen

#### 9.111.1.5 ulLabelLen

`CK_ULONG` ulLabelLen

#### 9.111.1.6 ulSeedLen

`CK_ULONG` ulSeedLen

## 9.112 CK\_TOKEN\_INFO Struct Reference

```
#include <pkcs11t.h>
```

## Data Fields

- [CK\\_UTF8CHAR](#) label [32]
- [CK\\_UTF8CHAR](#) manufacturerID [32]
- [CK\\_UTF8CHAR](#) model [16]
- [CK\\_CHAR](#) serialNumber [16]
- [CK\\_FLAGS](#) flags
- [CK\\_ULONG](#) ulMaxSessionCount
- [CK\\_ULONG](#) ulSessionCount
- [CK\\_ULONG](#) ulMaxRwSessionCount
- [CK\\_ULONG](#) ulRwSessionCount
- [CK\\_ULONG](#) ulMaxPinLen
- [CK\\_ULONG](#) ulMinPinLen
- [CK\\_ULONG](#) ulTotalPublicMemory
- [CK\\_ULONG](#) ulFreePublicMemory
- [CK\\_ULONG](#) ulTotalPrivateMemory
- [CK\\_ULONG](#) ulFreePrivateMemory
- [CK\\_VERSION](#) hardwareVersion
- [CK\\_VERSION](#) firmwareVersion
- [CK\\_CHAR](#) utcTime [16]

### 9.112.1 Field Documentation

#### 9.112.1.1 firmwareVersion

[CK\\_VERSION](#) firmwareVersion

#### 9.112.1.2 flags

[CK\\_FLAGS](#) flags

#### 9.112.1.3 hardwareVersion

[CK\\_VERSION](#) hardwareVersion

#### 9.112.1.4 label

[CK\\_UTF8CHAR](#) label [32]

### 9.112.1.5 manufacturerID

`CK_UTF8CHAR` manufacturerID[32]

### 9.112.1.6 model

`CK_UTF8CHAR` model[16]

### 9.112.1.7 serialNumber

`CK_CHAR` serialNumber[16]

### 9.112.1.8 ulFreePrivateMemory

`CK_ULONG` ulFreePrivateMemory

### 9.112.1.9 ulFreePublicMemory

`CK_ULONG` ulFreePublicMemory

### 9.112.1.10 ulMaxPinLen

`CK_ULONG` ulMaxPinLen

### 9.112.1.11 ulMaxRwSessionCount

`CK_ULONG` ulMaxRwSessionCount

### 9.112.1.12 ulMaxSessionCount

`CK_ULONG` ulMaxSessionCount

**9.112.1.13 ulMinPinLen**

`CK_ULONG ulMinPinLen`

**9.112.1.14 ulRwSessionCount**

`CK_ULONG ulRwSessionCount`

**9.112.1.15 ulSessionCount**

`CK_ULONG ulSessionCount`

**9.112.1.16 ulTotalPrivateMemory**

`CK_ULONG ulTotalPrivateMemory`

**9.112.1.17 ulTotalPublicMemory**

`CK_ULONG ulTotalPublicMemory`

**9.112.1.18 utcTime**

`CK_CHAR utcTime[16]`

**9.113 CK\_VERSION Struct Reference**

```
#include <pkcs11t.h>
```

**Data Fields**

- `CK_BYTE major`
- `CK_BYTE minor`

### 9.113.1 Field Documentation

#### 9.113.1.1 major

`CK_BYTE` major

#### 9.113.1.2 minor

`CK_BYTE` minor

## 9.114 CK\_WTLS\_KEY\_MAT\_OUT Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_OBJECT_HANDLE` hMacSecret
- `CK_OBJECT_HANDLE` hKey
- `CK_BYTE_PTR` pIV

### 9.114.1 Field Documentation

#### 9.114.1.1 hKey

`CK_OBJECT_HANDLE` hKey

#### 9.114.1.2 hMacSecret

`CK_OBJECT_HANDLE` hMacSecret

#### 9.114.1.3 pIV

`CK_BYTE_PTR` pIV



## 9.115 CK\_WTLS\_KEY\_MAT\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_MECHANISM\\_TYPE](#) DigestMechanism
- [CK\\_ULONG](#) ulMacSizeInBits
- [CK\\_ULONG](#) ulKeySizeInBits
- [CK\\_ULONG](#) ulIVSizeInBits
- [CK\\_ULONG](#) ulSequenceNumber
- [CK\\_BBOOL](#) blsExport
- [CK\\_WTLS\\_RANDOM\\_DATA](#) RandomInfo
- [CK\\_WTLS\\_KEY\\_MAT\\_OUT\\_PTR](#) pReturnedKeyMaterial

### 9.115.1 Field Documentation

#### 9.115.1.1 blsExport

[CK\\_BBOOL](#) blsExport

#### 9.115.1.2 DigestMechanism

[CK\\_MECHANISM\\_TYPE](#) DigestMechanism

#### 9.115.1.3 pReturnedKeyMaterial

[CK\\_WTLS\\_KEY\\_MAT\\_OUT\\_PTR](#) pReturnedKeyMaterial

#### 9.115.1.4 RandomInfo

[CK\\_WTLS\\_RANDOM\\_DATA](#) RandomInfo

### 9.115.1.5 ulIVSizeInBits

`CK_ULONG` ulIVSizeInBits

### 9.115.1.6 ulKeySizeInBits

`CK_ULONG` ulKeySizeInBits

### 9.115.1.7 ulMacSizeInBits

`CK_ULONG` ulMacSizeInBits

### 9.115.1.8 ulSequenceNumber

`CK_ULONG` ulSequenceNumber

## 9.116 CK\_WTLS\_MASTER\_KEY\_DERIVE\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_MECHANISM_TYPE` DigestMechanism
- `CK_WTLS_RANDOM_DATA` RandomInfo
- `CK_BYTE_PTR` pVersion

### 9.116.1 Field Documentation

#### 9.116.1.1 DigestMechanism

`CK_MECHANISM_TYPE` DigestMechanism

### 9.116.1.2 pVersion

[CK\\_BYTE\\_PTR](#) pVersion

### 9.116.1.3 RandomInfo

[CK\\_WTLS\\_RANDOM\\_DATA](#) RandomInfo

## 9.117 CK\_WTLS\_PRF\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_MECHANISM\\_TYPE](#) DigestMechanism
- [CK\\_BYTE\\_PTR](#) pSeed
- [CK\\_ULONG](#) ulSeedLen
- [CK\\_BYTE\\_PTR](#) pLabel
- [CK\\_ULONG](#) ulLabelLen
- [CK\\_BYTE\\_PTR](#) pOutput
- [CK\\_ULONG\\_PTR](#) pulOutputLen

### 9.117.1 Field Documentation

#### 9.117.1.1 DigestMechanism

[CK\\_MECHANISM\\_TYPE](#) DigestMechanism

#### 9.117.1.2 pLabel

[CK\\_BYTE\\_PTR](#) pLabel

#### 9.117.1.3 pOutput

[CK\\_BYTE\\_PTR](#) pOutput

### 9.117.1.4 pSeed

[CK\\_BYTE\\_PTR](#) pSeed

### 9.117.1.5 pulOutputLen

[CK\\_ULONG\\_PTR](#) pulOutputLen

### 9.117.1.6 ulLabelLen

[CK\\_ULONG](#) ulLabelLen

### 9.117.1.7 ulSeedLen

[CK\\_ULONG](#) ulSeedLen

## 9.118 CK\_WTLS\_RANDOM\_DATA Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_BYTE\\_PTR](#) pClientRandom
- [CK\\_ULONG](#) ulClientRandomLen
- [CK\\_BYTE\\_PTR](#) pServerRandom
- [CK\\_ULONG](#) ulServerRandomLen

### 9.118.1 Field Documentation

#### 9.118.1.1 pClientRandom

[CK\\_BYTE\\_PTR](#) pClientRandom

### 9.118.1.2 pServerRandom

[CK\\_BYTE\\_PTR](#) pServerRandom

### 9.118.1.3 ulClientRandomLen

[CK\\_ULONG](#) ulClientRandomLen

### 9.118.1.4 ulServerRandomLen

[CK\\_ULONG](#) ulServerRandomLen

## 9.119 CK\_X9\_42\_DH1\_DERIVE\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_X9\\_42\\_DH\\_KDF\\_TYPE](#) kdf
- [CK\\_ULONG](#) ulOtherInfoLen
- [CK\\_BYTE\\_PTR](#) pOtherInfo
- [CK\\_ULONG](#) ulPublicDataLen
- [CK\\_BYTE\\_PTR](#) pPublicData

### 9.119.1 Field Documentation

#### 9.119.1.1 kdf

[CK\\_X9\\_42\\_DH\\_KDF\\_TYPE](#) kdf

#### 9.119.1.2 pOtherInfo

[CK\\_BYTE\\_PTR](#) pOtherInfo

### 9.119.1.3 pPublicData

`CK_BYTE_PTR` pPublicData

### 9.119.1.4 ulOtherInfoLen

`CK_ULONG` ulOtherInfoLen

### 9.119.1.5 ulPublicDataLen

`CK_ULONG` ulPublicDataLen

## 9.120 CK\_X9\_42\_DH2\_DERIVE\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- `CK_X9_42_DH_KDF_TYPE` kdf
- `CK_ULONG` ulOtherInfoLen
- `CK_BYTE_PTR` pOtherInfo
- `CK_ULONG` ulPublicDataLen
- `CK_BYTE_PTR` pPublicData
- `CK_ULONG` ulPrivateDataLen
- `CK_OBJECT_HANDLE` hPrivateData
- `CK_ULONG` ulPublicDataLen2
- `CK_BYTE_PTR` pPublicData2

### 9.120.1 Field Documentation

#### 9.120.1.1 hPrivateData

`CK_OBJECT_HANDLE` hPrivateData

**9.120.1.2 kdf**

`CK_X9_42_DH_KDF_TYPE` kdf

**9.120.1.3 pOtherInfo**

`CK_BYTE_PTR` pOtherInfo

**9.120.1.4 pPublicData**

`CK_BYTE_PTR` pPublicData

**9.120.1.5 pPublicData2**

`CK_BYTE_PTR` pPublicData2

**9.120.1.6 ulOtherInfoLen**

`CK_ULONG` ulOtherInfoLen

**9.120.1.7 ulPrivateDataLen**

`CK_ULONG` ulPrivateDataLen

**9.120.1.8 ulPublicDataLen**

`CK_ULONG` ulPublicDataLen

**9.120.1.9 ulPublicDataLen2**

`CK_ULONG` ulPublicDataLen2

## 9.121 CK\_X9\_42\_MQV\_DERIVE\_PARAMS Struct Reference

```
#include <pkcs11t.h>
```

### Data Fields

- [CK\\_X9\\_42\\_DH\\_KDF\\_TYPE](#) kdf
- [CK\\_ULONG](#) ulOtherInfoLen
- [CK\\_BYTE\\_PTR](#) pOtherInfo
- [CK\\_ULONG](#) ulPublicDataLen
- [CK\\_BYTE\\_PTR](#) pPublicData
- [CK\\_ULONG](#) ulPrivateDataLen
- [CK\\_OBJECT\\_HANDLE](#) hPrivateData
- [CK\\_ULONG](#) ulPublicDataLen2
- [CK\\_BYTE\\_PTR](#) pPublicData2
- [CK\\_OBJECT\\_HANDLE](#) publicKey

### 9.121.1 Field Documentation

#### 9.121.1.1 hPrivateData

[CK\\_OBJECT\\_HANDLE](#) hPrivateData

#### 9.121.1.2 kdf

[CK\\_X9\\_42\\_DH\\_KDF\\_TYPE](#) kdf

#### 9.121.1.3 pOtherInfo

[CK\\_BYTE\\_PTR](#) pOtherInfo

#### 9.121.1.4 pPublicData

[CK\\_BYTE\\_PTR](#) pPublicData



#### 9.121.1.5 pPublicData2

`CK_BYTE_PTR` pPublicData2

#### 9.121.1.6 publicKey

`CK_OBJECT_HANDLE` publicKey

#### 9.121.1.7 ulOtherInfoLen

`CK_ULONG` ulOtherInfoLen

#### 9.121.1.8 ulPrivateDataLen

`CK_ULONG` ulPrivateDataLen

#### 9.121.1.9 ulPublicDataLen

`CK_ULONG` ulPublicDataLen

#### 9.121.1.10 ulPublicDataLen2

`CK_ULONG` ulPublicDataLen2

### 9.122 CL\_HashContext Struct Reference

```
#include <sha1_routines.h>
```

#### Data Fields

- `uint32_t` `h` [20/4]
- `uint32_t` `buf` [64/4]
- `uint32_t` `byteCount`
- `uint32_t` `byteCountHi`

### 9.122.1 Field Documentation

#### 9.122.1.1 buf

```
uint32_t buf[64/4]
```

#### 9.122.1.2 byteCount

```
uint32_t byteCount
```

#### 9.122.1.3 byteCountHi

```
uint32_t byteCountHi
```

#### 9.122.1.4 h

```
uint32_t h[20/4]
```

## 9.123 device\_execution\_time\_t Struct Reference

Structure to hold the device execution time and the opcode for the corresponding command.

```
#include <calib_execution.h>
```

### Data Fields

- `uint8_t opcode`
- `uint16_t execution_time_msec`

### 9.123.1 Detailed Description

Structure to hold the device execution time and the opcode for the corresponding command.

## 9.123.2 Field Documentation

### 9.123.2.1 execution\_time\_msec

```
uint16_t execution_time_msec
```

### 9.123.2.2 opcode

```
uint8_t opcode
```

## 9.124 devtype\_names\_t Struct Reference

### Data Fields

- [ATCADeviceType](#) devtype
- const char \* [name](#)

## 9.124.1 Field Documentation

### 9.124.1.1 devtype

```
ATCADeviceType devtype
```

### 9.124.1.2 name

```
const char* name
```

## 9.125 i2c\_sam0\_instance Struct Reference

```
#include <hal_sam0_i2c_asf.h>
```

### Data Fields

- struct i2c\_master\_module \* [i2c\\_instance](#)
- [sam0\\_change\\_baudrate](#) change\_baudrate

### 9.125.1 Field Documentation

#### 9.125.1.1 change\_baudrate

[sam0\\_change\\_baudrate](#) [change\\_baudrate](#)

#### 9.125.1.2 i2c\_instance

[struct i2c\\_master\\_module\\*](#) [i2c\\_instance](#)

## 9.126 i2c\_sam\_instance Struct Reference

```
#include <hal_sam_i2c_asf.h>
```

### Data Fields

- [Twi \\*](#) [i2c\\_instance](#)
- [sam\\_change\\_baudrate](#) [change\\_baudrate](#)

### 9.126.1 Field Documentation

#### 9.126.1.1 change\_baudrate

[sam\\_change\\_baudrate](#) [change\\_baudrate](#)

#### 9.126.1.2 i2c\_instance

[Twi\\*](#) [i2c\\_instance](#)

## 9.127 i2c\_start\_instance Struct Reference

```
#include <hal_i2c_start.h>
```

## Data Fields

- struct i2c\_m\_sync\_desc \* [i2c\\_descriptor](#)
- [start\\_change\\_baudrate](#) [change\\_baudrate](#)

### 9.127.1 Field Documentation

#### 9.127.1.1 [change\\_baudrate](#)

[start\\_change\\_baudrate](#) [change\\_baudrate](#)

#### 9.127.1.2 [i2c\\_descriptor](#)

struct i2c\_m\_sync\_desc\* [i2c\\_descriptor](#)

## 9.128 [memory\\_parameters](#) Struct Reference

```
#include <secure_boot_memory.h>
```

## Data Fields

- uint32\_t [start\\_address](#)
- uint32\_t [memory\\_size](#)
- uint32\_t [version\\_info](#)
- uint8\_t [reserved](#) [52]
- uint8\_t [signature](#) [ATCA\_SIG\_SIZE]

### 9.128.1 Field Documentation

#### 9.128.1.1 [memory\\_size](#)

uint32\_t [memory\\_size](#)

## 9.129 secure\_boot\_config\_bits Struct Reference

---

### 9.128.1.2 reserved

```
uint8_t reserved[52]
```

### 9.128.1.3 signature

```
uint8_t signature[ATCA_SIG_SIZE]
```

### 9.128.1.4 start\_address

```
uint32_t start_address
```

### 9.128.1.5 version\_info

```
uint32_t version_info
```

## 9.129 secure\_boot\_config\_bits Struct Reference

```
#include <secure_boot.h>
```

### Data Fields

- uint16\_t [secure\\_boot\\_mode](#): 2
- uint16\_t [secure\\_boot\\_reserved1](#): 1
- uint16\_t [secure\\_boot\\_persistent\\_enable](#): 1
- uint16\_t [secure\\_boot\\_rand\\_nonce](#): 1
- uint16\_t [secure\\_boot\\_reserved2](#): 3
- uint16\_t [secure\\_boot\\_sig\\_dig](#): 4
- uint16\_t [secure\\_boot\\_pub\\_key](#): 4

### 9.129.1 Field Documentation

#### 9.129.1.1 secure\_boot\_mode

```
uint16_t secure_boot_mode
```

#### 9.129.1.2 `secure_boot_persistent_enable`

```
uint16_t secure_boot_persistent_enable
```

#### 9.129.1.3 `secure_boot_pub_key`

```
uint16_t secure_boot_pub_key
```

#### 9.129.1.4 `secure_boot_rand_nonce`

```
uint16_t secure_boot_rand_nonce
```

#### 9.129.1.5 `secure_boot_reserved1`

```
uint16_t secure_boot_reserved1
```

#### 9.129.1.6 `secure_boot_reserved2`

```
uint16_t secure_boot_reserved2
```

#### 9.129.1.7 `secure_boot_sig_dig`

```
uint16_t secure_boot_sig_dig
```

### 9.130 `secure_boot_parameters` Struct Reference

```
#include <secure_boot.h>
```

#### Data Fields

- [memory\\_parameters](#) `memory_params`
- `atcac_sha2_256_ctx` `s_sha_context`
- `uint8_t` `app_digest` [`ATCA_SHA_DIGEST_SIZE`]

### 9.130.1 Field Documentation

#### 9.130.1.1 app\_digest

```
uint8_t app_digest[ATCA_SHA_DIGEST_SIZE]
```

#### 9.130.1.2 memory\_params

```
memory_parameters memory_params
```

#### 9.130.1.3 s\_sha\_context

```
atcac_sha2_256_ctx s_sha_context
```

## 9.131 sw\_sha256\_ctx Struct Reference

```
#include <sha2_routines.h>
```

### Data Fields

- uint32\_t [total\\_msg\\_size](#)  
*Total number of message bytes processed.*
- uint32\_t [block\\_size](#)  
*Number of bytes in current block.*
- uint8\_t [block](#) [(64) \*2]  
*Unprocessed message storage.*
- uint32\_t [hash](#) [8]  
*Hash state.*

### 9.131.1 Field Documentation

#### 9.131.1.1 block

```
uint8_t block[(64) *2]
```

Unprocessed message storage.



### 9.131.1.2 block\_size

```
uint32_t block_size
```

Number of bytes in current block.

### 9.131.1.3 hash

```
uint32_t hash[8]
```

Hash state.

### 9.131.1.4 total\_msg\_size

```
uint32_t total_msg_size
```

Total number of message bytes processed.

## 9.132 tng\_cert\_map\_element Struct Reference

### Data Fields

- const char \* [otpcode](#)
- const [atcacert\\_def\\_t](#) \* [cert\\_def](#)

### 9.132.1 Field Documentation

#### 9.132.1.1 cert\_def

```
const atcacert\_def\_t* cert_def
```

#### 9.132.1.2 otpcode

```
const char* otpcode
```

# Chapter 10

## File Documentation

### 10.1 api\_206a.c File Reference

Provides APIs to use with ATSHA206A device.

```
#include <stdlib.h>
#include <stdio.h>
#include "cryptoauthlib.h"
#include "api_206a.h"
```

#### Functions

- [ATCA\\_STATUS sha206a\\_diversify\\_parent\\_key](#) (uint8\_t \*parent\_key, uint8\_t \*diversified\_key)  
*Computes the diversified key based on the parent key provided and device serial number.*
- [ATCA\\_STATUS sha206a\\_generate\\_derive\\_key](#) (uint8\_t \*parent\_key, uint8\_t \*derived\_key, uint8\_t param1, uint16\_t param2)  
*Generates the derived key based on the parent key and other parameters provided.*
- [ATCA\\_STATUS sha206a\\_generate\\_challenge\\_response\\_pair](#) (uint8\_t \*key, uint8\_t \*challenge, uint8\_t \*response)  
*Generates the response based on Key and Challenge provided.*
- [ATCA\\_STATUS sha206a\\_authenticate](#) (uint8\_t \*challenge, uint8\_t \*expected\_response, uint8\_t \*is\_authenticated)  
*verifies the challenge and provided response using key in device*
- [ATCA\\_STATUS sha206a\\_verify\\_device\\_consumption](#) (uint8\_t \*is\_consumed)  
*verifies the device is fully consumed or not based on Parent and Derived Key use flags.*
- [ATCA\\_STATUS sha206a\\_check\\_dk\\_useflag\\_validity](#) (uint8\_t \*is\_consumed)  
*verifies Derived Key use flags for consumption*
- [ATCA\\_STATUS sha206a\\_check\\_pk\\_useflag\\_validity](#) (uint8\_t \*is\_consumed)  
*verifies Parent Key use flags for consumption*
- [ATCA\\_STATUS sha206a\\_get\\_dk\\_useflag\\_count](#) (uint8\_t \*dk\_available\_count)  
*calculates available Derived Key use counts*
- [ATCA\\_STATUS sha206a\\_get\\_pk\\_useflag\\_count](#) (uint8\_t \*pk\_available\_count)  
*calculates available Parent Key use counts*
- [ATCA\\_STATUS sha206a\\_get\\_dk\\_update\\_count](#) (uint8\_t \*dk\_update\_count)  
*Read Derived Key slot update count. It will be wraps around 256.*

- [ATCA\\_STATUS sha206a\\_write\\_data\\_store](#) (uint8\_t slot, uint8\_t \*data, uint8\_t block, uint8\_t offset, uint8\_t len, bool lock\_after\_write)  
*Update the data store slot with user data and lock it if necessary.*
- [ATCA\\_STATUS sha206a\\_read\\_data\\_store](#) (uint8\_t slot, uint8\_t \*data, uint8\_t offset, uint8\_t len)  
*Read the data stored in Data store.*
- [ATCA\\_STATUS sha206a\\_get\\_data\\_store\\_lock\\_status](#) (uint8\_t slot, uint8\_t \*is\_locked)  
*Returns the lock status of the given data store.*

### 10.1.1 Detailed Description

Provides APIs to use with ATSHA206A device.

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### 10.1.2 Function Documentation

#### 10.1.2.1 sha206a\_authenticate()

```
ATCA_STATUS sha206a_authenticate (
    uint8_t * challenge,
    uint8_t * expected_response,
    uint8_t * is_authenticated )
```

verifies the challenge and provided response using key in device

#### Parameters

in	<i>challenge</i>	Challenge to be used in the response calculations
in	<i>expected_response</i>	Expected response from the device.
out	<i>is_authenticated</i>	result of expected of response and calcaulted response

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.1.2.2 sha206a\_check\_dk\_useflag\_validity()

```
ATCA_STATUS sha206a_check_dk_useflag_validity (
    uint8_t * is_consumed )
```

verifies Derived Key use flags for consumption

### Parameters

out	<i>is_consumed</i>	indicates if DK is available for consumption.
-----	--------------------	---

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.1.2.3 sha206a\_check\_pk\_useflag\_validity()

```
ATCA_STATUS sha206a_check_pk_useflag_validity (
    uint8_t * is_consumed )
```

verifies Parent Key use flags for consumption

### Parameters

out	<i>is_consumed</i>	indicates if PK is available for consumption
-----	--------------------	--

### Returns

ATCA\_SUCCESS on success, otherwise an error code

#### 10.1.2.4 sha206a\_diversify\_parent\_key()

```
ATCA_STATUS sha206a_diversify_parent_key (
    uint8_t * parent_key,
    uint8_t * diversified_key )
```

Computes the diversified key based on the parent key provided and device serial number.

### Parameters

in	<i>parent_key</i>	parent key to be diversified
out	<i>diversified_key</i>	diversified parent key

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.1.2.5 sha206a\_generate\_challenge\_response\_pair()

```
ATCA_STATUS sha206a_generate_challenge_response_pair (
    uint8_t * key,
    uint8_t * challenge,
    uint8_t * response )
```

Generates the response based on Key and Challenge provided.

#### Parameters

in	<i>key</i>	Input data contains device's key
in	<i>challenge</i>	Input data to be used in challenge response calculation
out	<i>response</i>	response derived from key and challenge

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.1.2.6 sha206a\_generate\_derive\_key()

```
ATCA_STATUS sha206a_generate_derive_key (
    uint8_t * parent_key,
    uint8_t * derived_key,
    uint8_t param1,
    uint16_t param2 )
```

Generates the derived key based on the parent key and other parameters provided.

#### Parameters

in	<i>parent_key</i>	Input data contains device's parent key
out	<i>derived_key</i>	Output data derived from parent key
in	<i>param1</i>	Input data to be used in derive key calculation
in	<i>param2</i>	Input data to be used in derive key calculation

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.1.2.7 sha206a\_get\_data\_store\_lock\_status()

```
ATCA_STATUS sha206a_get_data_store_lock_status (
    uint8_t slot,
    uint8_t * is_locked )
```

Returns the lock status of the given data store.

### Parameters

in	<i>slot</i>	Slot number of the data store
out	<i>is_locked</i>	lock status of the data store

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.1.2.8 sha206a\_get\_dk\_update\_count()

```
ATCA_STATUS sha206a_get_dk_update_count (
    uint8_t * dk_update_count )
```

Read Derived Key slot update count. It will be wraps around 256.

### Parameters

out	<i>dk_update_count</i>	returns number of times the slot has been updated with derived key
-----	------------------------	--

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.1.2.9 sha206a\_get\_dk\_useflag\_count()

```
ATCA_STATUS sha206a_get_dk_useflag_count (
    uint8_t * dk_available_count )
```

calculates available Derived Key use counts

### Parameters

out	<i>dk_available_count</i>	counts available bit's as 1
-----	---------------------------	-----------------------------

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.1.2.10 sha206a\_get\_pk\_useflag\_count()

```
ATCA_STATUS sha206a_get_pk_useflag_count (
    uint8_t * pk_available_count )
```

calculates available Parent Key use counts

#### Parameters

out	<i>pk_available_count</i>	counts available bit's as 1
-----	---------------------------	-----------------------------

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.1.2.11 sha206a\_read\_data\_store()

```
ATCA_STATUS sha206a_read_data_store (
    uint8_t slot,
    uint8_t * data,
    uint8_t offset,
    uint8_t len )
```

Read the data stored in Data store.

#### Parameters

in	<i>slot</i>	Slot number to read from
in	<i>data</i>	Pointer to hold slot data data
in	<i>offset</i>	Byte offset within the zone to read from.
in	<i>len</i>	data length

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.1.2.12 sha206a\_verify\_device\_consumption()

```
ATCA_STATUS sha206a_verify_device_consumption (
    uint8_t * is_consumed )
```

verifies the device is fully consumed or not based on Parent and Derived Key use flags.

#### Parameters

out	<i>is_consumed</i>	result of device consumption
-----	--------------------	------------------------------

## 10.2 api\_206a.h File Reference

---

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.1.2.13 sha206a\_write\_data\_store()

```
ATCA_STATUS sha206a_write_data_store (
    uint8_t slot,
    uint8_t * data,
    uint8_t block,
    uint8_t offset,
    uint8_t len,
    bool lock_after_write )
```

Update the data store slot with user data and lock it if necessary.

### Parameters

in	<i>slot</i>	Slot number to be written with data
in	<i>data</i>	Pointer that holds the data
in	<i>block</i>	32-byte block to write to.
in	<i>offset</i>	4-byte word within the specified block to write to. If performing a 32-byte write, this should be 0.
in	<i>len</i>	data length
in	<i>lock_after_write</i>	set 1 to lock slot after write, otherwise 0

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 10.2 api\_206a.h File Reference

Provides api interfaces to use with ATSHA206A device.

```
#include "atca_status.h"
```

### Macros

- #define ATCA\_SHA206A\_ZONE\_WRITE\_LOCK 0x20
- #define ATCA\_SHA206A\_DKEY\_CONSUMPTION\_MASK 0x01
- #define ATCA\_SHA206A\_PKEY\_CONSUMPTION\_MASK 0x02
- #define ATCA\_SHA206A\_SYMMETRIC\_KEY\_ID\_SLOT 0x07

### Enumerations

- enum { SHA206A\_DATA\_STORE0 =8, SHA206A\_DATA\_STORE1, SHA206A\_DATA\_STORE2 }



## Functions

- [ATCA\\_STATUS sha206a\\_diversify\\_parent\\_key](#) (uint8\_t \*parent\_key, uint8\_t \*diversified\_key)  
*Computes the diversified key based on the parent key provided and device serial number.*
- [ATCA\\_STATUS sha206a\\_generate\\_derive\\_key](#) (uint8\_t \*parent\_key, uint8\_t \*derived\_key, uint8\_t param1, uint16\_t param2)  
*Generates the derived key based on the parent key and other parameters provided.*
- [ATCA\\_STATUS sha206a\\_generate\\_challenge\\_response\\_pair](#) (uint8\_t \*key, uint8\_t \*challenge, uint8\_t \*response)  
*Generates the response based on Key and Challenge provided.*
- [ATCA\\_STATUS sha206a\\_authenticate](#) (uint8\_t \*challenge, uint8\_t \*expected\_response, uint8\_t \*is\_authenticated)  
*verifies the challenge and provided response using key in device*
- [ATCA\\_STATUS sha206a\\_verify\\_device\\_consumption](#) (uint8\_t \*is\_consumed)  
*verifies the device is fully consumed or not based on Parent and Derived Key use flags.*
- [ATCA\\_STATUS sha206a\\_check\\_dk\\_useflag\\_validity](#) (uint8\_t \*is\_valid)  
*verifies Derived Key use flags for consumption*
- [ATCA\\_STATUS sha206a\\_check\\_pk\\_useflag\\_validity](#) (uint8\_t \*is\_valid)  
*verifies Parent Key use flags for consumption*
- [ATCA\\_STATUS sha206a\\_get\\_dk\\_useflag\\_count](#) (uint8\_t \*dk\_available\_count)  
*calculates available Derived Key use counts*
- [ATCA\\_STATUS sha206a\\_get\\_pk\\_useflag\\_count](#) (uint8\_t \*pk\_available\_count)  
*calculates available Parent Key use counts*
- [ATCA\\_STATUS sha206a\\_get\\_dk\\_update\\_count](#) (uint8\_t \*dk\_update\_count)  
*Read Derived Key slot update count. It will be wraps around 256.*
- [ATCA\\_STATUS sha206a\\_write\\_data\\_store](#) (uint8\_t slot, uint8\_t \*data, uint8\_t block, uint8\_t offset, uint8\_t len, bool lock\_after\_write)  
*Update the data store slot with user data and lock it if necessary.*
- [ATCA\\_STATUS sha206a\\_read\\_data\\_store](#) (uint8\_t slot, uint8\_t \*data, uint8\_t offset, uint8\_t len)  
*Read the data stored in Data store.*
- [ATCA\\_STATUS sha206a\\_get\\_data\\_store\\_lock\\_status](#) (uint8\_t slot, uint8\_t \*is\_locked)  
*Returns the lock status of the given data store.*

### 10.2.1 Detailed Description

Provides api interfaces to use with ATSHA206A device.

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### 10.2.2 Macro Definition Documentation

#### 10.2.2.1 ATCA\_SHA206A\_DKEY\_CONSUMPTION\_MASK

```
#define ATCA_SHA206A_DKEY_CONSUMPTION_MASK 0x01
```

### 10.2.2.2 ATCA\_SHA206A\_PKEY\_CONSUMPTION\_MASK

```
#define ATCA_SHA206A_PKEY_CONSUMPTION_MASK 0x02
```

### 10.2.2.3 ATCA\_SHA206A\_SYMMETRIC\_KEY\_ID\_SLOT

```
#define ATCA_SHA206A_SYMMETRIC_KEY_ID_SLOT 0x07
```

### 10.2.2.4 ATCA\_SHA206A\_ZONE\_WRITE\_LOCK

```
#define ATCA_SHA206A_ZONE_WRITE_LOCK 0x20
```

## 10.2.3 Enumeration Type Documentation

### 10.2.3.1 anonymous enum

anonymous enum

#### Enumerator

SHA206A_DATA_STORE0	
SHA206A_DATA_STORE1	
SHA206A_DATA_STORE2	

## 10.2.4 Function Documentation

### 10.2.4.1 sha206a\_authenticate()

```
ATCA_STATUS sha206a_authenticate (
    uint8_t * challenge,
    uint8_t * expected_response,
    uint8_t * is_authenticated )
```

verifies the challenge and provided response using key in device

**Parameters**

in	<i>challenge</i>	Challenge to be used in the response calculations
in	<i>expected_response</i>	Expected response from the device.
out	<i>is_authenticated</i>	result of expected of response and calcaulted response

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.2.4.2 sha206a\_check\_dk\_useflag\_validity()**

```
ATCA_STATUS sha206a_check_dk_useflag_validity (
    uint8_t * is_consumed )
```

verifies Derived Key use flags for consumption

**Parameters**

out	<i>is_consumed</i>	indicates if DK is available for consumption.
-----	--------------------	---

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.2.4.3 sha206a\_check\_pk\_useflag\_validity()**

```
ATCA_STATUS sha206a_check_pk_useflag_validity (
    uint8_t * is_consumed )
```

verifies Parent Key use flags for consumption

**Parameters**

out	<i>is_consumed</i>	indicates if PK is available for consumption
-----	--------------------	--

**Returns**

ATCA\_SUCCESS on success, otherwise an error code

### 10.2.4.4 sha206a\_diversify\_parent\_key()

```
ATCA_STATUS sha206a_diversify_parent_key (
    uint8_t * parent_key,
    uint8_t * diversified_key )
```

Computes the diversified key based on the parent key provided and device serial number.

#### Parameters

in	<i>parent_key</i>	parent key to be diversified
out	<i>diversified_key</i>	diversified parent key

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.2.4.5 sha206a\_generate\_challenge\_response\_pair()

```
ATCA_STATUS sha206a_generate_challenge_response_pair (
    uint8_t * key,
    uint8_t * challenge,
    uint8_t * response )
```

Generates the response based on Key and Challenge provided.

#### Parameters

in	<i>key</i>	Input data contains device's key
in	<i>challenge</i>	Input data to be used in challenge response calculation
out	<i>response</i>	response derived from key and challenge

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.2.4.6 sha206a\_generate\_derive\_key()

```
ATCA_STATUS sha206a_generate_derive_key (
    uint8_t * parent_key,
    uint8_t * derived_key,
    uint8_t param1,
    uint16_t param2 )
```

Generates the derived key based on the parent key and other parameters provided.

**Parameters**

in	<i>parent_key</i>	Input data contains device's parent key
out	<i>derived_key</i>	Output data derived from parent key
in	<i>param1</i>	Input data to be used in derive key calculation
in	<i>param2</i>	Input data to be used in derive key calculation

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.2.4.7 sha206a\_get\_data\_store\_lock\_status()**

```
ATCA_STATUS sha206a_get_data_store_lock_status (
    uint8_t slot,
    uint8_t * is_locked )
```

Returns the lock status of the given data store.

**Parameters**

in	<i>slot</i>	Slot number of the data store
out	<i>is_locked</i>	lock status of the data store

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.2.4.8 sha206a\_get\_dk\_update\_count()**

```
ATCA_STATUS sha206a_get_dk_update_count (
    uint8_t * dk_update_count )
```

Read Derived Key slot update count. It will be wraps around 256.

**Parameters**

out	<i>dk_update_count</i>	returns number of times the slot has been updated with derived key
-----	------------------------	--

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

### 10.2.4.9 sha206a\_get\_dk\_useflag\_count()

```
ATCA_STATUS sha206a_get_dk_useflag_count (
    uint8_t * dk_available_count )
```

calculates available Derived Key use counts

#### Parameters

out	<i>dk_available_count</i>	counts available bit's as 1
-----	---------------------------	-----------------------------

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.2.4.10 sha206a\_get\_pk\_useflag\_count()

```
ATCA_STATUS sha206a_get_pk_useflag_count (
    uint8_t * pk_available_count )
```

calculates available Parent Key use counts

#### Parameters

out	<i>pk_available_count</i>	counts available bit's as 1
-----	---------------------------	-----------------------------

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.2.4.11 sha206a\_read\_data\_store()

```
ATCA_STATUS sha206a_read_data_store (
    uint8_t slot,
    uint8_t * data,
    uint8_t offset,
    uint8_t len )
```

Read the data stored in Data store.

#### Parameters

in	<i>slot</i>	Slot number to read from
in	<i>data</i>	Pointer to hold slot data data
in	<i>offset</i>	Byte offset within the zone to read from.
in	<i>len</i>	data length

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.2.4.12 sha206a\_verify\_device\_consumption()**

```
ATCA_STATUS sha206a_verify_device_consumption (
    uint8_t * is_consumed )
```

verifies the device is fully consumed or not based on Parent and Derived Key use flags.

**Parameters**

out	<i>is_consumed</i>	result of device consumption
-----	--------------------	------------------------------

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.2.4.13 sha206a\_write\_data\_store()**

```
ATCA_STATUS sha206a_write_data_store (
    uint8_t slot,
    uint8_t * data,
    uint8_t block,
    uint8_t offset,
    uint8_t len,
    bool lock_after_write )
```

Update the data store slot with user data and lock it if necessary.

**Parameters**

in	<i>slot</i>	Slot number to be written with data
in	<i>data</i>	Pointer that holds the data
in	<i>block</i>	32-byte block to write to.
in	<i>offset</i>	4-byte word within the specified block to write to. If performing a 32-byte write, this should be 0.
in	<i>len</i>	data length
in	<i>lock_after_write</i>	set 1 to lock slot after write, otherwise 0

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

## 10.3 `ascii_kit_host.c` File Reference

KIT protocol interpreter.

```
#include <ctype.h>
#include "ascii_kit_host.h"
#include "hal/kit_protocol.h"
#include "talib/talib_fce.h"
```

### Functions

- [ATCA\\_STATUS kit\\_host\\_init\\_phy](#) ([atca\\_hal\\_kit\\_phy\\_t](#) \*phy, [ATCAIface](#) iface)  
*Initializes a phy structure with a cryptoauthlib hal adapter.*
- [ATCA\\_STATUS kit\\_host\\_init](#) ([ascii\\_kit\\_host\\_context\\_t](#) \*ctx, [ATCAIfaceCfg](#) \*iface[], const [size\\_t](#) iface\_count, const [atca\\_hal\\_kit\\_phy\\_t](#) \*phy, const [uint32\\_t](#) flags)  
*Initializes the kit protocol parser context.*
- [size\\_t kit\\_host\\_format\\_response](#) ([uint8\\_t](#) \*response, [size\\_t](#) rlen, [ATCA\\_STATUS](#) status, [uint8\\_t](#) \*data, [size\\_t](#) dlen)  
*Format the status and data into the kit protocol response format.*
- [ATCA\\_STATUS kit\\_host\\_process\\_cmd](#) ([ascii\\_kit\\_host\\_context\\_t](#) \*ctx, const [kit\\_host\\_map\\_entry\\_t](#) \*cmd\_list, int argc, char \*argv[], [uint8\\_t](#) \*response, [size\\_t](#) \*rlen)  
*Iterate through a command list to match the given command and then will execute it.*
- [ATCA\\_STATUS kit\\_host\\_process\\_ta](#) ([ascii\\_kit\\_host\\_context\\_t](#) \*ctx, int argc, char \*argv[], [uint8\\_t](#) \*response, [size\\_t](#) \*rlen)
- [ATCA\\_STATUS kit\\_host\\_process\\_line](#) ([ascii\\_kit\\_host\\_context\\_t](#) \*ctx, [uint8\\_t](#) \*input\_line, [size\\_t](#) ilen, [uint8\\_t](#) \*response, [size\\_t](#) \*rlen)  
*Parse a line as a kit protocol command. The kit protocol is printable ascii and each line ends with a newline character.*
- void [kit\\_host\\_task](#) ([ascii\\_kit\\_host\\_context\\_t](#) \*ctx)  
*Non returning kit protocol runner using the configured physical interface that was provided when the context was initialized.*

### 10.3.1 Detailed Description

KIT protocol interpreter.

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### 10.3.2 Function Documentation



### 10.3.2.1 kit\_host\_format\_response()

```
size_t kit_host_format_response (
    uint8_t * response,
    size_t rlen,
    ATCA_STATUS status,
    uint8_t * data,
    size_t dlen )
```

Format the status and data into the kit protocol response format.

### 10.3.2.2 kit\_host\_init()

```
ATCA_STATUS kit_host_init (
    ascii_kit_host_context_t * ctx,
    ATCAIfaceCfg * iface[],
    const size_t iface_count,
    const atca_hal_kit_phy_t * phy,
    const uint32_t flags )
```

Initializes the kit protocol parser context.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code

#### Parameters

<i>ctx</i>	Kit protocol parser context
<i>iface</i>	List of device configurations which will be used
<i>iface_count</i>	Number of configurations provided
<i>phy</i>	Kit protocol physical adapter
<i>flags</i>	Option Flags

### 10.3.2.3 kit\_host\_init\_phy()

```
ATCA_STATUS kit_host_init_phy (
    atca_hal_kit_phy_t * phy,
    ATCAIface iface )
```

Initializes a phy structure with a cryptoauthlib hal adapter.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code

### 10.3.2.4 kit\_host\_process\_cmd()

```
ATCA_STATUS kit_host_process_cmd (
    ascii_kit_host_context_t * ctx,
    const kit_host_map_entry_t * cmd_list,
    int argc,
    char * argv[],
    uint8_t * response,
    size_t * rlen )
```

Iterate through a command list to match the given command and then will execute it.

### 10.3.2.5 kit\_host\_process\_line()

```
ATCA_STATUS kit_host_process_line (
    ascii_kit_host_context_t * ctx,
    uint8_t * input_line,
    size_t ilen,
    uint8_t * response,
    size_t * rlen )
```

Parse a line as a kit protocol command. The kit protocol is printable ascii and each line ends with a newline character.

### 10.3.2.6 kit\_host\_process\_ta()

```
ATCA_STATUS kit_host_process_ta (
    ascii_kit_host_context_t * ctx,
    int argc,
    char * argv[],
    uint8_t * response,
    size_t * rlen )
```

### 10.3.2.7 kit\_host\_task()

```
void kit_host_task (
    ascii_kit_host_context_t * ctx )
```

Non returning kit protocol runner using the configured physical interface that was provided when the context was initialized.

## 10.4 ascii\_kit\_host.h File Reference

KIT protocol interpreter.

```
#include "cryptoauthlib.h"
```

## Data Structures

- struct [\\_ascii\\_kit\\_host\\_context](#)
- struct [\\_kit\\_host\\_map\\_entry](#)

## Macros

- `#define KIT_LAYER_DELIMITER ':'`
- `#define KIT_DATA_BEGIN_DELIMITER '('`
- `#define KIT_DATA_END_DELIMITER ')'`
- `#define KIT_MESSAGE_DELIMITER '\n'`
- `#define KIT_MESSAGE_SIZE_MAX (2500)`  
*The Kit Protocol maximum message size.*
- `#define KIT_SECTION_NAME_SIZE_MAX KIT_MESSAGE_SIZE_MAX`
- `#define KIT_VERSION_SIZE_MAX (32)`
- `#define KIT_FIRMWARE_SIZE_MAX (32)`

## Typedefs

- typedef struct [\\_ascii\\_kit\\_host\\_context](#) [ascii\\_kit\\_host\\_context\\_t](#)
- typedef struct [\\_kit\\_host\\_map\\_entry](#) [kit\\_host\\_map\\_entry\\_t](#)

## Functions

- [ATCA\\_STATUS kit\\_host\\_init\\_phy](#) ([atca\\_hal\\_kit\\_phy\\_t](#) \*phy, [ATCAIface](#) iface)  
*Initializes a phy structure with a cryptoauthlib hal adapter.*
- [ATCA\\_STATUS kit\\_host\\_init](#) ([ascii\\_kit\\_host\\_context\\_t](#) \*ctx, [ATCAIfaceCfg](#) \*iface[], const size\_t iface\_count, const [atca\\_hal\\_kit\\_phy\\_t](#) \*phy, const uint32\_t flags)  
*Initializes the kit protocol parser context.*
- size\_t [kit\\_host\\_format\\_response](#) (uint8\_t \*response, size\_t rlen, [ATCA\\_STATUS](#) status, uint8\_t \*data, size\_t dlen)  
*Format the status and data into the kit protocol response format.*
- [ATCA\\_STATUS kit\\_host\\_process\\_cmd](#) ([ascii\\_kit\\_host\\_context\\_t](#) \*ctx, const [kit\\_host\\_map\\_entry\\_t](#) \*cmd\_list, int argc, char \*argv[], uint8\_t \*response, size\_t \*rlen)  
*Iterate through a command list to match the given command and then will execute it.*
- [ATCA\\_STATUS kit\\_host\\_process\\_line](#) ([ascii\\_kit\\_host\\_context\\_t](#) \*ctx, uint8\_t \*input\_line, size\_t ilen, uint8\_t \*response, size\_t \*rlen)  
*Parse a line as a kit protocol command. The kit protocol is printable ascii and each line ends with a newline character.*
- void [kit\\_host\\_task](#) ([ascii\\_kit\\_host\\_context\\_t](#) \*ctx)  
*Non returning kit protocol runner using the configured physical interface that was provided when the context was initialized.*

### 10.4.1 Detailed Description

KIT protocol interpreter.

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### 10.4.2 Macro Definition Documentation

#### 10.4.2.1 KIT\_DATA\_BEGIN\_DELIMITER

```
#define KIT_DATA_BEGIN_DELIMITER '('
```

#### 10.4.2.2 KIT\_DATA\_END\_DELIMITER

```
#define KIT_DATA_END_DELIMITER ')'
```

#### 10.4.2.3 KIT\_FIRMWARE\_SIZE\_MAX

```
#define KIT_FIRMWARE_SIZE_MAX (32)
```

#### 10.4.2.4 KIT\_LAYER\_DELIMITER

```
#define KIT_LAYER_DELIMITER ':'
```

#### 10.4.2.5 KIT\_MESSAGE\_DELIMITER

```
#define KIT_MESSAGE_DELIMITER '\n'
```

#### 10.4.2.6 KIT\_MESSAGE\_SIZE\_MAX

```
#define KIT_MESSAGE_SIZE_MAX (2500)
```

The Kit Protocol maximum message size.

#### Note

Send: <target>:<command>(optional hex bytes to send)  
Receive: <status hex byte>(optional hex bytes of response)

### 10.4.2.7 KIT\_SECTION\_NAME\_SIZE\_MAX

```
#define KIT_SECTION_NAME_SIZE_MAX KIT_MESSAGE_SIZE_MAX
```

### 10.4.2.8 KIT\_VERSION\_SIZE\_MAX

```
#define KIT_VERSION_SIZE_MAX (32)
```

## 10.4.3 Typedef Documentation

### 10.4.3.1 ascii\_kit\_host\_context\_t

```
typedef struct _ascii_kit_host_context ascii_kit_host_context_t
```

### 10.4.3.2 kit\_host\_map\_entry\_t

```
typedef struct _kit_host_map_entry kit_host_map_entry_t
```

Used to create command tables for the kit host parser

## 10.4.4 Function Documentation

### 10.4.4.1 kit\_host\_format\_response()

```
size_t kit_host_format_response (
    uint8_t * response,
    size_t rlen,
    ATCA_STATUS status,
    uint8_t * data,
    size_t dlen )
```

Format the status and data into the kit protocol response format.

### 10.4.4.2 kit\_host\_init()

```
ATCA_STATUS kit_host_init (
    ascii_kit_host_context_t * ctx,
    ATCAIfaceCfg * iface[],
    const size_t iface_count,
    const atca_hal_kit_phy_t * phy,
    const uint32_t flags )
```

Initializes the kit protocol parser context.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code

### Parameters

<i>ctx</i>	Kit protocol parser context
<i>iface</i>	List of device configurations which will be used
<i>iface_count</i>	Number of configurations provided
<i>phy</i>	Kit protocol physical adapter
<i>flags</i>	Option Flags

#### 10.4.4.3 kit\_host\_init\_phy()

```
ATCA_STATUS kit_host_init_phy (  
    atca_hal_kit_phy_t * phy,  
    ATCAIface iface )
```

Initializes a phy structure with a cryptoauthlib hal adapter.

### Returns

ATCA\_SUCCESS on success, otherwise an error code

#### 10.4.4.4 kit\_host\_process\_cmd()

```
ATCA_STATUS kit_host_process_cmd (  
    ascii_kit_host_context_t * ctx,  
    const kit_host_map_entry_t * cmd_list,  
    int argc,  
    char * argv[],  
    uint8_t * response,  
    size_t * rlen )
```

Iterate through a command list to match the given command and then will execute it.

#### 10.4.4.5 kit\_host\_process\_line()

```
ATCA_STATUS kit_host_process_line (  
    ascii_kit_host_context_t * ctx,  
    uint8_t * input_line,  
    size_t ilen,  
    uint8_t * response,  
    size_t * rlen )
```

Parse a line as a kit protocol command. The kit protocol is printable ascii and each line ends with a newline character.

#### 10.4.4.6 kit\_host\_task()

```
void kit_host_task (
    ascii_kit_host_context_t * ctx )
```

Non returning kit protocol runner using the configured physical interface that was provided when the context was initialized.

## 10.5 atca\_basic.c File Reference

CryptoAuthLib Basic API methods. These methods provide a simpler way to access the core crypto methods.

```
#include "atca_basic.h"
#include "atca_version.h"
```

### Functions

- [ATCA\\_STATUS atcab\\_version](#) (char \*ver\_str)  
*basic API methods are all prefixed with atcab\_ (CryptoAuthLib Basic) the fundamental premise of the basic API is it is based on a single interface instance and that instance is global, so all basic API commands assume that one global device is the one to operate on.*
- [ATCA\\_STATUS atcab\\_init\\_ext](#) (ATCADevice \*device, ATCAfaceCfg \*cfg)  
*Creates and initializes a ATCADevice context.*
- [ATCA\\_STATUS atcab\\_init](#) (ATCAfaceCfg \*cfg)  
*Creates a global ATCADevice object used by Basic API.*
- [ATCA\\_STATUS atcab\\_init\\_device](#) (ATCADevice ca\_device)  
*Initialize the global ATCADevice object to point to one of your choosing for use with all the atcab\_ basic API.*
- [ATCA\\_STATUS atcab\\_release\\_ext](#) (ATCADevice \*device)  
*release (free) the an ATCADevice instance.*
- [ATCA\\_STATUS atcab\\_release](#) (void)  
*release (free) the global ATCADevice instance. This must be called in order to release or free up the interface.*
- [ATCADevice atcab\\_get\\_device](#) (void)  
*Get the global device object.*
- [ATCADeviceType atcab\\_get\\_device\\_type\\_ext](#) (ATCADevice device)  
*Get the selected device type of rthe device context.*
- [ATCADeviceType atcab\\_get\\_device\\_type](#) (void)  
*Get the current device type configured for the global ATCADevice.*
- [uint8\\_t atcab\\_get\\_device\\_address](#) (ATCADevice device)  
*Get the current device address based on the configured device and interface.*
- [bool atcab\\_is\\_ca\\_device](#) (ATCADeviceType dev\_type)  
*Check whether the device is cryptoauth device.*
- [bool atcab\\_is\\_ta\\_device](#) (ATCADeviceType dev\_type)  
*Check whether the device is Trust Anchor device.*
- [ATCA\\_STATUS atcab\\_wakeup](#) (void)  
*wakeup the CryptoAuth device*
- [ATCA\\_STATUS atcab\\_idle](#) (void)  
*idle the CryptoAuth device*
- [ATCA\\_STATUS atcab\\_sleep](#) (void)

- invoke sleep on the CryptoAuth device*

  - [ATCA\\_STATUS atcab\\_get\\_zone\\_size](#) (uint8\_t zone, uint16\_t slot, size\_t \*size)  
*Gets the size of the specified zone in bytes.*
  - [ATCA\\_STATUS atcab\\_aes](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*aes\_in, uint8\_t \*aes\_out)  
*Compute the AES-128 encrypt, decrypt, or GFM calculation.*
  - [ATCA\\_STATUS atcab\\_aes\\_encrypt\\_ext](#) (ATCADevice device, uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*plaintext, uint8\_t \*ciphertext)  
*Perform an AES-128 encrypt operation with a key in the device.*
  - [ATCA\\_STATUS atcab\\_aes\\_encrypt](#) (uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*plaintext, uint8\_t \*ciphertext)  
*Perform an AES-128 encrypt operation with a key in the device.*
  - [ATCA\\_STATUS atcab\\_aes\\_decrypt\\_ext](#) (ATCADevice device, uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*ciphertext, uint8\_t \*plaintext)  
*Perform an AES-128 decrypt operation with a key in the device.*
  - [ATCA\\_STATUS atcab\\_aes\\_decrypt](#) (uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*ciphertext, uint8\_t \*plaintext)  
*Perform an AES-128 decrypt operation with a key in the device.*
  - [ATCA\\_STATUS atcab\\_aes\\_gfm](#) (const uint8\_t \*h, const uint8\_t \*input, uint8\_t \*output)  
*Perform a Galois Field Multiply (GFM) operation.*
  - [ATCA\\_STATUS atcab\\_aes\\_gcm\\_init](#) (atca\_aes\_gcm\_ctx\_t \*ctx, uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*iv, size\_t iv\_size)  
*Initialize context for AES GCM operation with an existing IV, which is common when starting a decrypt operation.*
  - [ATCA\\_STATUS atcab\\_aes\\_gcm\\_init\\_rand](#) (atca\_aes\_gcm\_ctx\_t \*ctx, uint16\_t key\_id, uint8\_t key\_block, size\_t rand\_size, const uint8\_t \*free\_field, size\_t free\_field\_size, uint8\_t \*iv)  
*Initialize context for AES GCM operation with a IV composed of a random and optional fixed(free) field, which is common when starting an encrypt operation.*
  - [ATCA\\_STATUS atcab\\_aes\\_gcm\\_aad\\_update](#) (atca\_aes\_gcm\_ctx\_t \*ctx, const uint8\_t \*aad, uint32\_t aad\_size)  
*Process Additional Authenticated Data (AAD) using GCM mode and a key within the ATECC608 device.*
  - [ATCA\\_STATUS atcab\\_aes\\_gcm\\_encrypt\\_update](#) (atca\_aes\_gcm\_ctx\_t \*ctx, const uint8\_t \*plaintext, uint32\_t plaintext\_size, uint8\_t \*ciphertext)  
*Encrypt data using GCM mode and a key within the ATECC608 device. [atcab\\_aes\\_gcm\\_init\(\)](#) or [atcab\\_aes\\_gcm\\_init\\_rand\(\)](#) should be called before the first use of this function.*
  - [ATCA\\_STATUS atcab\\_aes\\_gcm\\_encrypt\\_finish](#) (atca\_aes\_gcm\_ctx\_t \*ctx, uint8\_t \*tag, size\_t tag\_size)  
*Complete a GCM encrypt operation returning the authentication tag.*
  - [ATCA\\_STATUS atcab\\_aes\\_gcm\\_decrypt\\_update](#) (atca\_aes\_gcm\_ctx\_t \*ctx, const uint8\_t \*ciphertext, uint32\_t ciphertext\_size, uint8\_t \*plaintext)  
*Decrypt data using GCM mode and a key within the ATECC608 device. [atcab\\_aes\\_gcm\\_init\(\)](#) or [atcab\\_aes\\_gcm\\_init\\_rand\(\)](#) should be called before the first use of this function.*
  - [ATCA\\_STATUS atcab\\_aes\\_gcm\\_decrypt\\_finish](#) (atca\_aes\_gcm\_ctx\_t \*ctx, const uint8\_t \*tag, size\_t tag\_size, bool \*is\_verified)  
*Complete a GCM decrypt operation verifying the authentication tag.*
  - [ATCA\\_STATUS atcab\\_checkmac](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*challenge, const uint8\_t \*response, const uint8\_t \*other\_data)  
*Compares a MAC response with input values.*
  - [ATCA\\_STATUS atcab\\_counter](#) (uint8\_t mode, uint16\_t counter\_id, uint32\_t \*counter\_value)  
*Compute the Counter functions.*
  - [ATCA\\_STATUS atcab\\_counter\\_increment](#) (uint16\_t counter\_id, uint32\_t \*counter\_value)  
*Increments one of the device's monotonic counters.*
  - [ATCA\\_STATUS atcab\\_counter\\_read](#) (uint16\_t counter\_id, uint32\_t \*counter\_value)  
*Read one of the device's monotonic counters.*
  - [ATCA\\_STATUS atcab\\_derivekey](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*mac)  
*Executes the DeviveKey command for deriving a new key from a nonce (TempKey) and an existing key.*



- [ATCA\\_STATUS atcab\\_ecdh\\_base](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*public\_key, uint8\_t \*pms, uint8\_t \*out\_nonce)  
Base function for generating premaster secret key using ECDH.
- [ATCA\\_STATUS atcab\\_ecdh](#) (uint16\_t key\_id, const uint8\_t \*public\_key, uint8\_t \*pms)  
ECDH command with a private key in a slot and the premaster secret is returned in the clear.
- [ATCA\\_STATUS atcab\\_ecdh\\_enc](#) (uint16\_t key\_id, const uint8\_t \*public\_key, uint8\_t \*pms, const uint8\_t \*read\_key, uint16\_t read\_key\_id, const uint8\_t num\_in[(20)])  
ECDH command with a private key in a slot and the premaster secret is read from the next slot.
- [ATCA\\_STATUS atcab\\_ecdh\\_ioenc](#) (uint16\_t key\_id, const uint8\_t \*public\_key, uint8\_t \*pms, const uint8\_t \*io\_key)  
ECDH command with a private key in a slot and the premaster secret is returned encrypted using the IO protection key.
- [ATCA\\_STATUS atcab\\_ecdh\\_tempkey](#) (const uint8\_t \*public\_key, uint8\_t \*pms)  
ECDH command with a private key in TempKey and the premaster secret is returned in the clear.
- [ATCA\\_STATUS atcab\\_ecdh\\_tempkey\\_ioenc](#) (const uint8\_t \*public\_key, uint8\_t \*pms, const uint8\_t \*io\_key)  
ECDH command with a private key in TempKey and the premaster secret is returned encrypted using the IO protection key.
- [ATCA\\_STATUS atcab\\_gendig](#) (uint8\_t zone, uint16\_t key\_id, const uint8\_t \*other\_data, uint8\_t other\_data\_size)  
Issues a GenDig command, which performs a SHA256 hash on the source data indicated by zone with the contents of TempKey. See the CryptoAuth datasheet for your chip to see what the values of zone correspond to.
- [ATCA\\_STATUS atcab\\_genkey\\_base](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*other\_data, uint8\_t \*public\_key)  
Issues GenKey command, which can generate a private key, compute a public key, and/or compute a digest of a public key.
- [ATCA\\_STATUS atcab\\_genkey](#) (uint16\_t key\_id, uint8\_t \*public\_key)  
Issues GenKey command, which generates a new random private key in slot/handle and returns the public key.
- [ATCA\\_STATUS atcab\\_get\\_pubkey\\_ext](#) (ATCA\_Device device, uint16\_t key\_id, uint8\_t \*public\_key)  
Uses GenKey command to calculate the public key from an existing private key in a slot.
- [ATCA\\_STATUS atcab\\_get\\_pubkey](#) (uint16\_t key\_id, uint8\_t \*public\_key)  
Uses GenKey command to calculate the public key from an existing private key in a slot.
- [ATCA\\_STATUS atcab\\_hmac](#) (uint8\_t mode, uint16\_t key\_id, uint8\_t \*digest)  
Issues a HMAC command, which computes an HMAC/SHA-256 digest of a key stored in the device, a challenge, and other information on the device.
- [ATCA\\_STATUS atcab\\_info\\_base](#) (uint8\_t mode, uint16\_t param2, uint8\_t \*out\_data)  
Issues an Info command, which return internal device information and can control GPIO and the persistent latch.
- [ATCA\\_STATUS atcab\\_info](#) (uint8\_t \*revision)  
Use the Info command to get the device revision (DevRev).
- [ATCA\\_STATUS atcab\\_info\\_set\\_latch](#) (bool state)  
Use the Info command to set the persistent latch state for an ATECC608 device.
- [ATCA\\_STATUS atcab\\_info\\_get\\_latch](#) (bool \*state)  
Use the Info command to get the persistent latch current state for an ATECC608 device.
- [ATCA\\_STATUS atcab\\_kdf](#) (uint8\_t mode, uint16\_t key\_id, const uint32\_t details, const uint8\_t \*message, uint8\_t \*out\_data, uint8\_t \*out\_nonce)  
Executes the KDF command, which derives a new key in PRF, AES, or HKDF modes.
- [ATCA\\_STATUS atcab\\_lock](#) (uint8\_t mode, uint16\_t summary\_crc)  
The Lock command prevents future modifications of the Configuration and/or Data and OTP zones. If the device is so configured, then this command can be used to lock individual data slots. This command fails if the designated area is already locked.
- [ATCA\\_STATUS atcab\\_lock\\_config\\_zone](#) (void)  
Unconditionally (no CRC required) lock the config zone.
- [ATCA\\_STATUS atcab\\_lock\\_config\\_zone\\_crc](#) (uint16\_t summary\_crc)  
Lock the config zone with summary CRC.

- [ATCA\\_STATUS atcab\\_lock\\_data\\_zone](#) (void)  
*Unconditionally (no CRC required) lock the data zone (slots and OTP). for CryptoAuth devices and lock the setup for Trust Anchor device.*
- [ATCA\\_STATUS atcab\\_lock\\_data\\_zone\\_crc](#) (uint16\_t summary\_crc)  
*Lock the data zone (slots and OTP) with summary CRC.*
- [ATCA\\_STATUS atcab\\_lock\\_data\\_slot](#) (uint16\_t slot)  
*Lock an individual slot in the data zone on an ATECC device. Not available for ATSHA devices. Slot must be configured to be slot lockable (KeyConfig.Lockable=1) (for cryptoauth devices) or Lock an individual handle in shared data element on an Trust Anchor device (for Trust Anchor devices).*
- [ATCA\\_STATUS atcab\\_mac](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*challenge, uint8\_t \*digest)  
*Executes MAC command, which computes a SHA-256 digest of a key stored in the device, a challenge, and other information on the device.*
- [ATCA\\_STATUS atcab\\_nonce\\_base](#) (uint8\_t mode, uint16\_t zero, const uint8\_t \*num\_in, uint8\_t \*rand\_out)  
*Executes Nonce command, which loads a random or fixed nonce/data into the device for use by subsequent commands.*
- [ATCA\\_STATUS atcab\\_nonce](#) (const uint8\_t \*num\_in)  
*Execute a Nonce command in pass-through mode to initialize TempKey to a specified value.*
- [ATCA\\_STATUS atcab\\_nonce\\_load](#) (uint8\_t target, const uint8\_t \*num\_in, uint16\_t num\_in\_size)  
*Execute a Nonce command in pass-through mode to load one of the device's internal buffers with a fixed value.*
- [ATCA\\_STATUS atcab\\_nonce\\_rand](#) (const uint8\_t \*num\_in, uint8\_t \*rand\_out)  
*Execute a Nonce command to generate a random nonce combining a host nonce (num\_in) and a device random number.*
- [ATCA\\_STATUS atcab\\_challenge](#) (const uint8\_t \*num\_in)  
*Execute a Nonce command in pass-through mode to initialize TempKey to a specified value.*
- [ATCA\\_STATUS atcab\\_challenge\\_seed\\_update](#) (const uint8\_t \*num\_in, uint8\_t \*rand\_out)  
*Execute a Nonce command to generate a random challenge combining a host nonce (num\_in) and a device random number.*
- [ATCA\\_STATUS atcab\\_priv\\_write](#) (uint16\_t key\_id, const uint8\_t priv\_key[36], uint16\_t write\_key\_id, const uint8\_t write\_key[32], const uint8\_t num\_in[(20)])  
*Executes PrivWrite command, to write externally generated ECC private keys into the device.*
- [ATCA\\_STATUS atcab\\_random\\_ext](#) (ATCADevice device, uint8\_t \*rand\_out)  
*Executes Random command, which generates a 32 byte random number from the device.*
- [ATCA\\_STATUS atcab\\_random](#) (uint8\_t \*rand\_out)  
*Executes Random command, which generates a 32 byte random number from the device.*
- [ATCA\\_STATUS atcab\\_read\\_zone](#) (uint8\_t zone, uint16\_t slot, uint8\_t block, uint8\_t offset, uint8\_t \*data, uint8\_t len)  
*Executes Read command, which reads either 4 or 32 bytes of data from a given slot, configuration zone, or the OTP zone.*
- [ATCA\\_STATUS atcab\\_is\\_locked](#) (uint8\_t zone, bool \*is\_locked)  
*Executes Read command, which reads the configuration zone to see if the specified zone is locked.*
- [ATCA\\_STATUS atcab\\_is\\_config\\_locked](#) (bool \*is\_locked)  
*This function check whether configuration zone is locked or not.*
- [ATCA\\_STATUS atcab\\_is\\_data\\_locked](#) (bool \*is\_locked)  
*This function check whether data/setup zone is locked or not.*
- [ATCA\\_STATUS atcab\\_is\\_slot\\_locked](#) (uint16\_t slot, bool \*is\_locked)  
*This function check whether slot/handle is locked or not.*
- [ATCA\\_STATUS atcab\\_is\\_private\\_ext](#) (ATCADevice device, uint16\_t slot, bool \*is\_private)  
*Check to see if the key is a private key or not.*
- [ATCA\\_STATUS atcab\\_is\\_private](#) (uint16\_t slot, bool \*is\_private)
- [ATCA\\_STATUS atcab\\_read\\_bytes\\_zone\\_ext](#) (ATCADevice device, uint8\_t zone, uint16\_t slot, size\_t offset, uint8\_t \*data, size\_t length)
- [ATCA\\_STATUS atcab\\_read\\_bytes\\_zone](#) (uint8\_t zone, uint16\_t slot, size\_t offset, uint8\_t \*data, size\_t length)

- Used to read an arbitrary number of bytes from any zone configured for clear reads.*
- [ATCA\\_STATUS atcab\\_read\\_serial\\_number](#) (uint8\_t \*serial\_number)  
*This function returns serial number of the device.*
  - [ATCA\\_STATUS atcab\\_read\\_pubkey\\_ext](#) (ATCADevice device, uint16\_t slot, uint8\_t \*public\_key)  
*Executes Read command to read an ECC P256 public key from a slot configured for clear reads.*
  - [ATCA\\_STATUS atcab\\_read\\_pubkey](#) (uint16\_t slot, uint8\_t \*public\_key)  
*Executes Read command to read an ECC P256 public key from a slot configured for clear reads.*
  - [ATCA\\_STATUS atcab\\_read\\_sig](#) (uint16\_t slot, uint8\_t \*sig)  
*Executes Read command to read a 64 byte ECDSA P256 signature from a slot configured for clear reads.*
  - [ATCA\\_STATUS atcab\\_read\\_config\\_zone](#) (uint8\_t \*config\_data)  
*Executes Read command to read the complete device configuration zone.*
  - [ATCA\\_STATUS atcab\\_cmp\\_config\\_zone](#) (uint8\_t \*config\_data, bool \*same\_config)  
*Compares a specified configuration zone with the configuration zone currently on the device.*
  - [ATCA\\_STATUS atcab\\_read\\_enc](#) (uint16\_t key\_id, uint8\_t block, uint8\_t \*data, const uint8\_t \*enc\_key, const uint16\_t enc\_key\_id, const uint8\_t num\_in[(20)])  
*Executes Read command on a slot configured for encrypted reads and decrypts the data to return it as plaintext.*
  - [ATCA\\_STATUS atcab\\_secureboot](#) (uint8\_t mode, uint16\_t param2, const uint8\_t \*digest, const uint8\_t \*signature, uint8\_t \*mac)  
*Executes Secure Boot command, which provides support for secure boot of an external MCU or MPU.*
  - [ATCA\\_STATUS atcab\\_secureboot\\_mac](#) (uint8\_t mode, const uint8\_t \*digest, const uint8\_t \*signature, const uint8\_t \*num\_in, const uint8\_t \*io\_key, bool \*is\_verified)  
*Executes Secure Boot command with encrypted digest and validated MAC response using the IO protection key.*
  - [ATCA\\_STATUS atcab\\_selftest](#) (uint8\_t mode, uint16\_t param2, uint8\_t \*result)  
*Executes the SelfTest command, which performs a test of one or more of the cryptographic engines within the ATCC608 chip.*
  - [ATCA\\_STATUS atcab\\_sha\\_base](#) (uint8\_t mode, uint16\_t length, const uint8\_t \*data\_in, uint8\_t \*data\_out, uint16\_t \*data\_out\_size)  
*Executes SHA command, which computes a SHA-256 or HMAC/SHA-256 digest for general purpose use by the host system.*
  - [ATCA\\_STATUS atcab\\_sha\\_start](#) (void)  
*Executes SHA command to initialize SHA-256 calculation engine.*
  - [ATCA\\_STATUS atcab\\_sha\\_update](#) (const uint8\_t \*message)  
*Executes SHA command to add 64 bytes of message data to the current context.*
  - [ATCA\\_STATUS atcab\\_sha\\_end](#) (uint8\_t \*digest, uint16\_t length, const uint8\_t \*message)  
*Executes SHA command to complete SHA-256 or HMAC/SHA-256 operation.*
  - [ATCA\\_STATUS atcab\\_sha\\_read\\_context](#) (uint8\_t \*context, uint16\_t \*context\_size)  
*Executes SHA command to read the SHA-256 context back. Only for ATECC608 with SHA-256 contexts. HMAC not supported.*
  - [ATCA\\_STATUS atcab\\_sha\\_write\\_context](#) (const uint8\_t \*context, uint16\_t context\_size)  
*Executes SHA command to write (restore) a SHA-256 context into the device. Only supported for ATECC608 with SHA-256 contexts.*
  - [ATCA\\_STATUS atcab\\_sha](#) (uint16\_t length, const uint8\_t \*message, uint8\_t \*digest)  
*Use the SHA command to compute a SHA-256 digest.*
  - [ATCA\\_STATUS atcab\\_hw\\_sha2\\_256](#) (const uint8\_t \*data, size\_t data\_size, uint8\_t \*digest)  
*Use the SHA command to compute a SHA-256 digest.*
  - [ATCA\\_STATUS atcab\\_hw\\_sha2\\_256\\_init](#) (atca\_sha256\_ctx\_t \*ctx)  
*Initialize a SHA context for performing a hardware SHA-256 operation on a device. Note that only one SHA operation can be run at a time.*
  - [ATCA\\_STATUS atcab\\_hw\\_sha2\\_256\\_update](#) (atca\_sha256\_ctx\_t \*ctx, const uint8\_t \*data, size\_t data\_size)  
*Add message data to a SHA context for performing a hardware SHA-256 operation on a device.*
  - [ATCA\\_STATUS atcab\\_hw\\_sha2\\_256\\_finish](#) (atca\_sha256\_ctx\_t \*ctx, uint8\_t \*digest)

- Finish SHA-256 digest for a SHA context for performing a hardware SHA-256 operation on a device.*
- **ATCA\_STATUS atcab\_sha\_hmac\_init** (**atca\_hmac\_sha256\_ctx\_t** \*ctx, **uint16\_t** key\_slot)  
*Executes SHA command to start an HMAC/SHA-256 operation.*
  - **ATCA\_STATUS atcab\_sha\_hmac\_update** (**atca\_hmac\_sha256\_ctx\_t** \*ctx, **const uint8\_t** \*data, **size\_t** data\_size)  
*Executes SHA command to add an arbitrary amount of message data to a HMAC/SHA-256 operation.*
  - **ATCA\_STATUS atcab\_sha\_hmac\_finish** (**atca\_hmac\_sha256\_ctx\_t** \*ctx, **uint8\_t** \*digest, **uint8\_t** target)  
*Executes SHA command to complete a HMAC/SHA-256 operation.*
  - **ATCA\_STATUS atcab\_sha\_hmac\_ext** (**ATCADevice** device, **const uint8\_t** \*data, **size\_t** data\_size, **uint16\_t** key\_slot, **uint8\_t** \*digest, **uint8\_t** target)  
*Use the SHA command to compute an HMAC/SHA-256 operation.*
  - **ATCA\_STATUS atcab\_sha\_hmac** (**const uint8\_t** \*data, **size\_t** data\_size, **uint16\_t** key\_slot, **uint8\_t** \*digest, **uint8\_t** target)  
*Use the SHA command to compute an HMAC/SHA-256 operation.*
  - **ATCA\_STATUS atcab\_sign\_base** (**uint8\_t** mode, **uint16\_t** key\_id, **uint8\_t** \*signature)  
*Executes the Sign command, which generates a signature using the ECDSA algorithm.*
  - **ATCA\_STATUS atcab\_sign\_ext** (**ATCADevice** device, **uint16\_t** key\_id, **const uint8\_t** \*msg, **uint8\_t** \*signature)  
*Executes Sign command, to sign a 32-byte external message using the private key in the specified slot. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
  - **ATCA\_STATUS atcab\_sign** (**uint16\_t** key\_id, **const uint8\_t** \*msg, **uint8\_t** \*signature)  
*Executes Sign command, to sign a 32-byte external message using the private key in the specified slot. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
  - **ATCA\_STATUS atcab\_sign\_internal** (**uint16\_t** key\_id, **bool** is\_invalidate, **bool** is\_full\_sn, **uint8\_t** \*signature)  
*Executes Sign command to sign an internally generated message.*
  - **ATCA\_STATUS atcab\_updateextra** (**uint8\_t** mode, **uint16\_t** new\_value)  
*Executes UpdateExtra command to update the values of the two extra bytes within the Configuration zone (bytes 84 and 85).*
  - **ATCA\_STATUS atcab\_verify** (**uint8\_t** mode, **uint16\_t** key\_id, **const uint8\_t** \*signature, **const uint8\_t** \*public\_key, **const uint8\_t** \*other\_data, **uint8\_t** \*mac)  
*Executes the Verify command, which takes an ECDSA [R,S] signature and verifies that it is correctly generated from a given message and public key. In all cases, the signature is an input to the command.*
  - **ATCA\_STATUS atcab\_verify\_extern\_ext** (**ATCADevice** device, **const uint8\_t** \*message, **const uint8\_t** \*signature, **const uint8\_t** \*public\_key, **bool** \*is\_verified)  
*Executes the Verify command, which verifies a signature (ECDSA verify operation) with all components (message, signature, and public key) supplied. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
  - **ATCA\_STATUS atcab\_verify\_extern** (**const uint8\_t** \*message, **const uint8\_t** \*signature, **const uint8\_t** \*public\_key, **bool** \*is\_verified)  
*Executes the Verify command, which verifies a signature (ECDSA verify operation) with all components (message, signature, and public key) supplied. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
  - **ATCA\_STATUS atcab\_verify\_stored\_ext** (**ATCADevice** device, **const uint8\_t** \*message, **const uint8\_t** \*signature, **uint16\_t** key\_id, **bool** \*is\_verified)  
*Executes the Verify command, which verifies a signature (ECDSA verify operation) with a public key stored in the device. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
  - **ATCA\_STATUS atcab\_verify\_stored** (**const uint8\_t** \*message, **const uint8\_t** \*signature, **uint16\_t** key\_id, **bool** \*is\_verified)  
*Executes the Verify command, which verifies a signature (ECDSA verify operation) with a public key stored in the device. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
  - **ATCA\_STATUS atcab\_verify\_stored\_with\_tempkey** (**const uint8\_t** \*signature, **uint16\_t** key\_id, **bool** \*is\_verified)

Executes the Verify command, which verifies a signature (ECDSA verify operation) with a public key stored in the device. `keyConfig.reqrandom` bit should be set and the message to be signed should be already loaded into TempKey for all devices.

- [ATCA\\_STATUS atcab\\_verify\\_validate](#) (uint16\_t key\_id, const uint8\_t \*signature, const uint8\_t \*other\_data, bool \*is\_verified)

Executes the Verify command in Validate mode to validate a public key stored in a slot.

- [ATCA\\_STATUS atcab\\_verify\\_invalidate](#) (uint16\_t key\_id, const uint8\_t \*signature, const uint8\_t \*other\_data, bool \*is\_verified)

Executes the Verify command in Invalidate mode which invalidates a previously validated public key stored in a slot.

- [ATCA\\_STATUS atcab\\_write](#) (uint8\_t zone, uint16\_t address, const uint8\_t \*value, const uint8\_t \*mac)

Executes the Write command, which writes either one four byte word or a 32-byte block to one of the EEPROM zones on the device. Depending upon the value of the WriteConfig byte for this slot, the data may be required to be encrypted by the system prior to being sent to the device. This command cannot be used to write slots configured as ECC private keys.

- [ATCA\\_STATUS atcab\\_write\\_zone](#) (uint8\_t zone, uint16\_t slot, uint8\_t block, uint8\_t offset, const uint8\_t \*data, uint8\_t len)

Executes the Write command, which writes either 4 or 32 bytes of data into a device zone.

- [ATCA\\_STATUS atcab\\_write\\_bytes\\_zone\\_ext](#) (ATCADevice device, uint8\_t zone, uint16\_t slot, size\_t offset\_bytes, const uint8\_t \*data, size\_t length)

- [ATCA\\_STATUS atcab\\_write\\_bytes\\_zone](#) (uint8\_t zone, uint16\_t slot, size\_t offset\_bytes, const uint8\_t \*data, size\_t length)

Executes the Write command, which writes data into the configuration, otp, or data zones with a given byte offset and length. Offset and length must be multiples of a word (4 bytes).

- [ATCA\\_STATUS atcab\\_write\\_pubkey](#) (uint16\_t slot, const uint8\_t \*public\_key)

Uses the write command to write a public key to a slot in the proper format.

- [ATCA\\_STATUS atcab\\_write\\_config\\_zone](#) (const uint8\_t \*config\_data)

Executes the Write command, which writes the configuration zone.

- [ATCA\\_STATUS atcab\\_write\\_enc](#) (uint16\_t key\_id, uint8\_t block, const uint8\_t \*data, const uint8\_t \*enc\_key, const uint16\_t enc\_key\_id, const uint8\_t num\_in[(20)])

Executes the Write command, which performs an encrypted write of a 32 byte block into given slot.

- [ATCA\\_STATUS atcab\\_write\\_config\\_counter](#) (uint16\_t counter\_id, uint32\_t counter\_value)

Initialize one of the monotonic counters in device with a specific value.

## Variables

- const char [atca\\_version](#) [] = "20221111"
- [ATCADevice \\_gDevice](#) = NULL

### 10.5.1 Detailed Description

CryptoAuthLib Basic API methods. These methods provide a simpler way to access the core crypto methods.

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### 10.5.2 Variable Documentation

### 10.5.2.1 atca\_version

```
const char atca_version[] = "20221111"
```

## 10.6 atca\_basic.h File Reference

CryptoAuthLib Basic API methods - a simple crypto authentication API. These methods manage a global ATCA↔ Device object behind the scenes. They also manage the wake/idle state transitions so callers don't need to.

```
#include "cryptoauthlib.h"
#include "crypto/atca_crypto_sw_sha2.h"
#include "crypto/atca_crypto_hw_aes.h"
```

### Macros

- #define [atcab\\_get\\_addr\(...\)](#) [calib\\_get\\_addr\(\\_\\_VA\\_ARGS\\_\\_\)](#)
- #define [atca\\_execute\\_command\(...\)](#) [calib\\_execute\\_command\(\\_\\_VA\\_ARGS\\_\\_\)](#)
- #define [SHA\\_CONTEXT\\_MAX\\_SIZE](#) (109)

### Functions

- [ATCA\\_STATUS atcab\\_version](#) (char \*ver\_str)  
*basic API methods are all prefixed with atcab\_ (CryptoAuthLib Basic) the fundamental premise of the basic API is it is based on a single interface instance and that instance is global, so all basic API commands assume that one global device is the one to operate on.*
- [ATCA\\_STATUS atcab\\_init\\_ext](#) (ATCADevice \*device, ATCAIfaceCfg \*cfg)  
*Creates and initializes a ATCADevice context.*
- [ATCA\\_STATUS atcab\\_init](#) (ATCAIfaceCfg \*cfg)  
*Creates a global ATCADevice object used by Basic API.*
- [ATCA\\_STATUS atcab\\_init\\_device](#) (ATCADevice ca\_device)  
*Initialize the global ATCADevice object to point to one of your choosing for use with all the atcab\_ basic API.*
- [ATCA\\_STATUS atcab\\_release\\_ext](#) (ATCADevice \*device)  
*release (free) the an ATCADevice instance.*
- [ATCA\\_STATUS atcab\\_release](#) (void)  
*release (free) the global ATCADevice instance. This must be called in order to release or free up the interface.*
- [ATCADevice atcab\\_get\\_device](#) (void)  
*Get the global device object.*
- [ATCADeviceType atcab\\_get\\_device\\_type\\_ext](#) (ATCADevice device)  
*Get the selected device type of rthe device context.*
- [ATCADeviceType atcab\\_get\\_device\\_type](#) (void)  
*Get the current device type configured for the global ATCADevice.*
- [uint8\\_t atcab\\_get\\_device\\_address](#) (ATCADevice device)  
*Get the current device address based on the configured device and interface.*
- [bool atcab\\_is\\_ca\\_device](#) (ATCADeviceType dev\_type)  
*Check whether the device is cryptoauth device.*
- [bool atcab\\_is\\_ta\\_device](#) (ATCADeviceType dev\_type)  
*Check whether the device is Trust Anchor device.*



- [ATCA\\_STATUS atcab\\_pbkdf2\\_sha256\\_ext](#) (ATCADevice device, const uint32\_t iter, const uint16\_t slot, const uint8\_t \*salt, const size\_t salt\_len, uint8\_t \*result, size\_t result\_len)
- [ATCA\\_STATUS atcab\\_pbkdf2\\_sha256](#) (const uint32\_t iter, const uint16\_t slot, const uint8\_t \*salt, const size\_t salt\_len, uint8\_t \*result, size\_t result\_len)
- [ATCA\\_STATUS \\_atcab\\_exit](#) (void)
- [ATCA\\_STATUS atcab\\_wakeup](#) (void)  
*wakeup the CryptoAuth device*
- [ATCA\\_STATUS atcab\\_idle](#) (void)  
*idle the CryptoAuth device*
- [ATCA\\_STATUS atcab\\_sleep](#) (void)  
*invoke sleep on the CryptoAuth device*
- [ATCA\\_STATUS atcab\\_get\\_zone\\_size](#) (uint8\_t zone, uint16\_t slot, size\_t \*size)  
*Gets the size of the specified zone in bytes.*
- [ATCA\\_STATUS atcab\\_aes](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*aes\_in, uint8\_t \*aes\_out)  
*Compute the AES-128 encrypt, decrypt, or GFM calculation.*
- [ATCA\\_STATUS atcab\\_aes\\_encrypt](#) (uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*plaintext, uint8\_t \*ciphertext)  
*Perform an AES-128 encrypt operation with a key in the device.*
- [ATCA\\_STATUS atcab\\_aes\\_encrypt\\_ext](#) (ATCADevice device, uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*plaintext, uint8\_t \*ciphertext)  
*Perform an AES-128 encrypt operation with a key in the device.*
- [ATCA\\_STATUS atcab\\_aes\\_decrypt](#) (uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*ciphertext, uint8\_t \*plaintext)  
*Perform an AES-128 decrypt operation with a key in the device.*
- [ATCA\\_STATUS atcab\\_aes\\_decrypt\\_ext](#) (ATCADevice device, uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*ciphertext, uint8\_t \*plaintext)  
*Perform an AES-128 decrypt operation with a key in the device.*
- [ATCA\\_STATUS atcab\\_aes\\_gfm](#) (const uint8\_t \*h, const uint8\_t \*input, uint8\_t \*output)  
*Perform a Galois Field Multiply (GFM) operation.*
- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_init](#) (atca\_aes\_gcm\_ctx\_t \*ctx, uint16\_t key\_id, uint8\_t key\_block, const uint8\_t \*iv, size\_t iv\_size)  
*Initialize context for AES GCM operation with an existing IV, which is common when starting a decrypt operation.*
- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_init\\_rand](#) (atca\_aes\_gcm\_ctx\_t \*ctx, uint16\_t key\_id, uint8\_t key\_block, size\_t rand\_size, const uint8\_t \*free\_field, size\_t free\_field\_size, uint8\_t \*iv)  
*Initialize context for AES GCM operation with a IV composed of a random and optional fixed(free) field, which is common when starting an encrypt operation.*
- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_aad\\_update](#) (atca\_aes\_gcm\_ctx\_t \*ctx, const uint8\_t \*aad, uint32\_t aad\_size)  
*Process Additional Authenticated Data (AAD) using GCM mode and a key within the ATECC608 device.*
- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_encrypt\\_update](#) (atca\_aes\_gcm\_ctx\_t \*ctx, const uint8\_t \*plaintext, uint32\_t plaintext\_size, uint8\_t \*ciphertext)  
*Encrypt data using GCM mode and a key within the ATECC608 device. [atcab\\_aes\\_gcm\\_init\(\)](#) or [atcab\\_aes\\_gcm\\_init\\_rand\(\)](#) should be called before the first use of this function.*
- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_encrypt\\_finish](#) (atca\_aes\_gcm\_ctx\_t \*ctx, uint8\_t \*tag, size\_t tag\_size)  
*Complete a GCM encrypt operation returning the authentication tag.*
- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_decrypt\\_update](#) (atca\_aes\_gcm\_ctx\_t \*ctx, const uint8\_t \*ciphertext, uint32\_t ciphertext\_size, uint8\_t \*plaintext)  
*Decrypt data using GCM mode and a key within the ATECC608 device. [atcab\\_aes\\_gcm\\_init\(\)](#) or [atcab\\_aes\\_gcm\\_init\\_rand\(\)](#) should be called before the first use of this function.*
- [ATCA\\_STATUS atcab\\_aes\\_gcm\\_decrypt\\_finish](#) (atca\_aes\_gcm\_ctx\_t \*ctx, const uint8\_t \*tag, size\_t tag\_size, bool \*is\_verified)  
*Complete a GCM decrypt operation verifying the authentication tag.*

- [ATCA\\_STATUS atcab\\_checkmac](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*challenge, const uint8\_t \*response, const uint8\_t \*other\_data)  
*Compares a MAC response with input values.*
- [ATCA\\_STATUS atcab\\_counter](#) (uint8\_t mode, uint16\_t counter\_id, uint32\_t \*counter\_value)  
*Compute the Counter functions.*
- [ATCA\\_STATUS atcab\\_counter\\_increment](#) (uint16\_t counter\_id, uint32\_t \*counter\_value)  
*Increments one of the device's monotonic counters.*
- [ATCA\\_STATUS atcab\\_counter\\_read](#) (uint16\_t counter\_id, uint32\_t \*counter\_value)  
*Read one of the device's monotonic counters.*
- [ATCA\\_STATUS atcab\\_derivekey](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*mac)  
*Executes the DeviveKey command for deriving a new key from a nonce (TempKey) and an existing key.*
- [ATCA\\_STATUS atcab\\_ecdh\\_base](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*public\_key, uint8\_t \*pms, uint8\_t \*out\_nonce)  
*Base function for generating premaster secret key using ECDH.*
- [ATCA\\_STATUS atcab\\_ecdh](#) (uint16\_t key\_id, const uint8\_t \*public\_key, uint8\_t \*pms)  
*ECDH command with a private key in a slot and the premaster secret is returned in the clear.*
- [ATCA\\_STATUS atcab\\_ecdh\\_enc](#) (uint16\_t key\_id, const uint8\_t \*public\_key, uint8\_t \*pms, const uint8\_t \*read\_key, uint16\_t read\_key\_id, const uint8\_t num\_in[(20)])  
*ECDH command with a private key in a slot and the premaster secret is read from the next slot.*
- [ATCA\\_STATUS atcab\\_ecdh\\_ioenc](#) (uint16\_t key\_id, const uint8\_t \*public\_key, uint8\_t \*pms, const uint8\_t \*io\_key)  
*ECDH command with a private key in a slot and the premaster secret is returned encrypted using the IO protection key.*
- [ATCA\\_STATUS atcab\\_ecdh\\_tempkey](#) (const uint8\_t \*public\_key, uint8\_t \*pms)  
*ECDH command with a private key in TempKey and the premaster secret is returned in the clear.*
- [ATCA\\_STATUS atcab\\_ecdh\\_tempkey\\_ioenc](#) (const uint8\_t \*public\_key, uint8\_t \*pms, const uint8\_t \*io\_key)  
*ECDH command with a private key in TempKey and the premaster secret is returned encrypted using the IO protection key.*
- [ATCA\\_STATUS atcab\\_gendig](#) (uint8\_t zone, uint16\_t key\_id, const uint8\_t \*other\_data, uint8\_t other\_data\_size)  
*Issues a GenDig command, which performs a SHA256 hash on the source data indicated by zone with the contents of TempKey. See the CryptoAuth datasheet for your chip to see what the values of zone correspond to.*
- [ATCA\\_STATUS atcab\\_genkey\\_base](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*other\_data, uint8\_t \*public\_key)  
*Issues GenKey command, which can generate a private key, compute a public key, nd/or compute a digest of a public key.*
- [ATCA\\_STATUS atcab\\_genkey](#) (uint16\_t key\_id, uint8\_t \*public\_key)  
*Issues GenKey command, which generates a new random private key in slot/handle and returns the public key.*
- [ATCA\\_STATUS atcab\\_get\\_pubkey](#) (uint16\_t key\_id, uint8\_t \*public\_key)  
*Uses GenKey command to calculate the public key from an existing private key in a slot.*
- [ATCA\\_STATUS atcab\\_get\\_pubkey\\_ext](#) (ATCADevice device, uint16\_t key\_id, uint8\_t \*public\_key)  
*Uses GenKey command to calculate the public key from an existing private key in a slot.*
- [ATCA\\_STATUS atcab\\_hmac](#) (uint8\_t mode, uint16\_t key\_id, uint8\_t \*digest)  
*Issues a HMAC command, which computes an HMAC/SHA-256 digest of a key stored in the device, a challenge, and other information on the device.*
- [ATCA\\_STATUS atcab\\_info\\_base](#) (uint8\_t mode, uint16\_t param2, uint8\_t \*out\_data)  
*Issues an Info command, which return internal device information and can control GPIO and the persistent latch.*
- [ATCA\\_STATUS atcab\\_info](#) (uint8\_t \*revision)  
*Use the Info command to get the device revision (DevRev).*
- [ATCA\\_STATUS atcab\\_info\\_set\\_latch](#) (bool state)  
*Use the Info command to set the persistent latch state for an ATECC608 device.*
- [ATCA\\_STATUS atcab\\_info\\_get\\_latch](#) (bool \*state)



Use the Info command to get the persistent latch current state for an ATECC608 device.

- [ATCA\\_STATUS atcab\\_kdf](#) (uint8\_t mode, uint16\_t key\_id, const uint32\_t details, const uint8\_t \*message, uint8\_t \*out\_data, uint8\_t \*out\_nonce)  
*Executes the KDF command, which derives a new key in PRF, AES, or HKDF modes.*
- [ATCA\\_STATUS atcab\\_lock](#) (uint8\_t mode, uint16\_t summary\_crc)  
*The Lock command prevents future modifications of the Configuration and/or Data and OTP zones. If the device is so configured, then this command can be used to lock individual data slots. This command fails if the designated area is already locked.*
- [ATCA\\_STATUS atcab\\_lock\\_config\\_zone](#) (void)  
*Unconditionally (no CRC required) lock the config zone.*
- [ATCA\\_STATUS atcab\\_lock\\_config\\_zone\\_crc](#) (uint16\_t summary\_crc)  
*Lock the config zone with summary CRC.*
- [ATCA\\_STATUS atcab\\_lock\\_data\\_zone](#) (void)  
*Unconditionally (no CRC required) lock the data zone (slots and OTP). for CryptoAuth devices and lock the setup for Trust Anchor device.*
- [ATCA\\_STATUS atcab\\_lock\\_data\\_zone\\_crc](#) (uint16\_t summary\_crc)  
*Lock the data zone (slots and OTP) with summary CRC.*
- [ATCA\\_STATUS atcab\\_lock\\_data\\_slot](#) (uint16\_t slot)  
*Lock an individual slot in the data zone on an ATECC device. Not available for ATSHA devices. Slot must be configured to be slot lockable (KeyConfig.Lockable=1) (for cryptoauth devices) or Lock an individual handle in shared data element on an Trust Anchor device (for Trust Anchor devices).*
- [ATCA\\_STATUS atcab\\_mac](#) (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*challenge, uint8\_t \*digest)  
*Executes MAC command, which computes a SHA-256 digest of a key stored in the device, a challenge, and other information on the device.*
- [ATCA\\_STATUS atcab\\_nonce\\_base](#) (uint8\_t mode, uint16\_t zero, const uint8\_t \*num\_in, uint8\_t \*rand\_out)  
*Executes Nonce command, which loads a random or fixed nonce/data into the device for use by subsequent commands.*
- [ATCA\\_STATUS atcab\\_nonce](#) (const uint8\_t \*num\_in)  
*Execute a Nonce command in pass-through mode to initialize TempKey to a specified value.*
- [ATCA\\_STATUS atcab\\_nonce\\_load](#) (uint8\_t target, const uint8\_t \*num\_in, uint16\_t num\_in\_size)  
*Execute a Nonce command in pass-through mode to load one of the device's internal buffers with a fixed value.*
- [ATCA\\_STATUS atcab\\_nonce\\_rand](#) (const uint8\_t \*num\_in, uint8\_t \*rand\_out)  
*Execute a Nonce command to generate a random nonce combining a host nonce (num\_in) and a device random number.*
- [ATCA\\_STATUS atcab\\_challenge](#) (const uint8\_t \*num\_in)  
*Execute a Nonce command in pass-through mode to initialize TempKey to a specified value.*
- [ATCA\\_STATUS atcab\\_challenge\\_seed\\_update](#) (const uint8\_t \*num\_in, uint8\_t \*rand\_out)  
*Execute a Nonce command to generate a random challenge combining a host nonce (num\_in) and a device random number.*
- [ATCA\\_STATUS atcab\\_priv\\_write](#) (uint16\_t key\_id, const uint8\_t priv\_key[36], uint16\_t write\_key\_id, const uint8\_t write\_key[32], const uint8\_t num\_in[(20)])  
*Executes PrivWrite command, to write externally generated ECC private keys into the device.*
- [ATCA\\_STATUS atcab\\_random](#) (uint8\_t \*rand\_out)  
*Executes Random command, which generates a 32 byte random number from the device.*
- [ATCA\\_STATUS atcab\\_random\\_ext](#) (ATCADevice device, uint8\_t \*rand\_out)  
*Executes Random command, which generates a 32 byte random number from the device.*
- [ATCA\\_STATUS atcab\\_read\\_zone](#) (uint8\_t zone, uint16\_t slot, uint8\_t block, uint8\_t offset, uint8\_t \*data, uint8\_t len)  
*Executes Read command, which reads either 4 or 32 bytes of data from a given slot, configuration zone, or the OTP zone.*
- [ATCA\\_STATUS atcab\\_is\\_locked](#) (uint8\_t zone, bool \*is\_locked)  
*Executes Read command, which reads the configuration zone to see if the specified zone is locked.*
- [ATCA\\_STATUS atcab\\_is\\_config\\_locked](#) (bool \*is\_locked)

*This function check whether configuration zone is locked or not.*

- [ATCA\\_STATUS atcab\\_is\\_data\\_locked](#) (bool \*is\_locked)

*This function check whether data/setup zone is locked or not.*

- [ATCA\\_STATUS atcab\\_is\\_slot\\_locked](#) (uint16\_t slot, bool \*is\_locked)

*This function check whether slot/handle is locked or not.*

- [ATCA\\_STATUS atcab\\_is\\_private\\_ext](#) (ATCADevice device, uint16\_t slot, bool \*is\_private)

*Check to see if the key is a private key or not.*

- [ATCA\\_STATUS atcab\\_is\\_private](#) (uint16\_t slot, bool \*is\_private)
- [ATCA\\_STATUS atcab\\_read\\_bytes\\_zone\\_ext](#) (ATCADevice device, uint8\_t zone, uint16\_t slot, size\_t offset, uint8\_t \*data, size\_t length)
- [ATCA\\_STATUS atcab\\_read\\_bytes\\_zone](#) (uint8\_t zone, uint16\_t slot, size\_t offset, uint8\_t \*data, size\_t length)

*Used to read an arbitrary number of bytes from any zone configured for clear reads.*

- [ATCA\\_STATUS atcab\\_read\\_serial\\_number](#) (uint8\_t \*serial\_number)

*This function returns serial number of the device.*

- [ATCA\\_STATUS atcab\\_read\\_pubkey](#) (uint16\_t slot, uint8\_t \*public\_key)

*Executes Read command to read an ECC P256 public key from a slot configured for clear reads.*

- [ATCA\\_STATUS atcab\\_read\\_pubkey\\_ext](#) (ATCADevice device, uint16\_t slot, uint8\_t \*public\_key)

*Executes Read command to read an ECC P256 public key from a slot configured for clear reads.*

- [ATCA\\_STATUS atcab\\_read\\_sig](#) (uint16\_t slot, uint8\_t \*sig)

*Executes Read command to read a 64 byte ECDSA P256 signature from a slot configured for clear reads.*

- [ATCA\\_STATUS atcab\\_read\\_config\\_zone](#) (uint8\_t \*config\_data)

*Executes Read command to read the complete device configuration zone.*

- [ATCA\\_STATUS atcab\\_cmp\\_config\\_zone](#) (uint8\_t \*config\_data, bool \*same\_config)

*Compares a specified configuration zone with the configuration zone currently on the device.*

- [ATCA\\_STATUS atcab\\_read\\_enc](#) (uint16\_t key\_id, uint8\_t block, uint8\_t \*data, const uint8\_t \*enc\_key, const uint16\_t enc\_key\_id, const uint8\_t num\_in[(20)])

*Executes Read command on a slot configured for encrypted reads and decrypts the data to return it as plaintext.*

- [ATCA\\_STATUS atcab\\_secureboot](#) (uint8\_t mode, uint16\_t param2, const uint8\_t \*digest, const uint8\_t \*signature, uint8\_t \*mac)

*Executes Secure Boot command, which provides support for secure boot of an external MCU or MPU.*

- [ATCA\\_STATUS atcab\\_secureboot\\_mac](#) (uint8\_t mode, const uint8\_t \*digest, const uint8\_t \*signature, const uint8\_t \*num\_in, const uint8\_t \*io\_key, bool \*is\_verified)

*Executes Secure Boot command with encrypted digest and validated MAC response using the IO protection key.*

- [ATCA\\_STATUS atcab\\_selftest](#) (uint8\_t mode, uint16\_t param2, uint8\_t \*result)

*Executes the SelfTest command, which performs a test of one or more of the cryptographic engines within the ATCC608 chip.*

- [ATCA\\_STATUS atcab\\_sha\\_base](#) (uint8\_t mode, uint16\_t length, const uint8\_t \*data\_in, uint8\_t \*data\_out, uint16\_t \*data\_out\_size)

*Executes SHA command, which computes a SHA-256 or HMAC/SHA-256 digest for general purpose use by the host system.*

- [ATCA\\_STATUS atcab\\_sha\\_start](#) (void)

*Executes SHA command to initialize SHA-256 calculation engine.*

- [ATCA\\_STATUS atcab\\_sha\\_update](#) (const uint8\_t \*message)

*Executes SHA command to add 64 bytes of message data to the current context.*

- [ATCA\\_STATUS atcab\\_sha\\_end](#) (uint8\_t \*digest, uint16\_t length, const uint8\_t \*message)

*Executes SHA command to complete SHA-256 or HMAC/SHA-256 operation.*

- [ATCA\\_STATUS atcab\\_sha\\_read\\_context](#) (uint8\_t \*context, uint16\_t \*context\_size)

*Executes SHA command to read the SHA-256 context back. Only for ATECC608 with SHA-256 contexts. HMAC not supported.*

- [ATCA\\_STATUS atcab\\_sha\\_write\\_context](#) (const uint8\_t \*context, uint16\_t context\_size)

*Executes SHA command to write (restore) a SHA-256 context into the device. Only supported for ATECC608 with SHA-256 contexts.*

- **ATCA\_STATUS atcab\_sha** (uint16\_t length, const uint8\_t \*message, uint8\_t \*digest)  
*Use the SHA command to compute a SHA-256 digest.*
- **ATCA\_STATUS atcab\_hw\_sha2\_256** (const uint8\_t \*data, size\_t data\_size, uint8\_t \*digest)  
*Use the SHA command to compute a SHA-256 digest.*
- **ATCA\_STATUS atcab\_hw\_sha2\_256\_init** (atca\_sha256\_ctx\_t \*ctx)  
*Initialize a SHA context for performing a hardware SHA-256 operation on a device. Note that only one SHA operation can be run at a time.*
- **ATCA\_STATUS atcab\_hw\_sha2\_256\_update** (atca\_sha256\_ctx\_t \*ctx, const uint8\_t \*data, size\_t data\_size)  
*Add message data to a SHA context for performing a hardware SHA-256 operation on a device.*
- **ATCA\_STATUS atcab\_hw\_sha2\_256\_finish** (atca\_sha256\_ctx\_t \*ctx, uint8\_t \*digest)  
*Finish SHA-256 digest for a SHA context for performing a hardware SHA-256 operation on a device.*
- **ATCA\_STATUS atcab\_sha\_hmac\_init** (atca\_hmac\_sha256\_ctx\_t \*ctx, uint16\_t key\_slot)  
*Executes SHA command to start an HMAC/SHA-256 operation.*
- **ATCA\_STATUS atcab\_sha\_hmac\_update** (atca\_hmac\_sha256\_ctx\_t \*ctx, const uint8\_t \*data, size\_t data\_size)  
*Executes SHA command to add an arbitrary amount of message data to a HMAC/SHA-256 operation.*
- **ATCA\_STATUS atcab\_sha\_hmac\_finish** (atca\_hmac\_sha256\_ctx\_t \*ctx, uint8\_t \*digest, uint8\_t target)  
*Executes SHA command to complete a HMAC/SHA-256 operation.*
- **ATCA\_STATUS atcab\_sha\_hmac** (const uint8\_t \*data, size\_t data\_size, uint16\_t key\_slot, uint8\_t \*digest, uint8\_t target)  
*Use the SHA command to compute an HMAC/SHA-256 operation.*
- **ATCA\_STATUS atcab\_sha\_hmac\_ext** (ATCADevice device, const uint8\_t \*data, size\_t data\_size, uint16\_t key\_slot, uint8\_t \*digest, uint8\_t target)  
*Use the SHA command to compute an HMAC/SHA-256 operation.*
- **ATCA\_STATUS atcab\_sign\_base** (uint8\_t mode, uint16\_t key\_id, uint8\_t \*signature)  
*Executes the Sign command, which generates a signature using the ECDSA algorithm.*
- **ATCA\_STATUS atcab\_sign** (uint16\_t key\_id, const uint8\_t \*msg, uint8\_t \*signature)  
*Executes Sign command, to sign a 32-byte external message using the private key in the specified slot. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
- **ATCA\_STATUS atcab\_sign\_ext** (ATCADevice device, uint16\_t key\_id, const uint8\_t \*msg, uint8\_t \*signature)  
*Executes Sign command, to sign a 32-byte external message using the private key in the specified slot. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
- **ATCA\_STATUS atcab\_sign\_internal** (uint16\_t key\_id, bool is\_invalidate, bool is\_full\_sn, uint8\_t \*signature)  
*Executes Sign command to sign an internally generated message.*
- **ATCA\_STATUS atcab\_updateextra** (uint8\_t mode, uint16\_t new\_value)  
*Executes UpdateExtra command to update the values of the two extra bytes within the Configuration zone (bytes 84 and 85).*
- **ATCA\_STATUS atcab\_verify** (uint8\_t mode, uint16\_t key\_id, const uint8\_t \*signature, const uint8\_t \*public\_key, const uint8\_t \*other\_data, uint8\_t \*mac)  
*Executes the Verify command, which takes an ECDSA [R,S] signature and verifies that it is correctly generated from a given message and public key. In all cases, the signature is an input to the command.*
- **ATCA\_STATUS atcab\_verify\_extern** (const uint8\_t \*message, const uint8\_t \*signature, const uint8\_t \*public\_key, bool \*is\_verified)  
*Executes the Verify command, which verifies a signature (ECDSA verify operation) with all components (message, signature, and public key) supplied. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
- **ATCA\_STATUS atcab\_verify\_extern\_ext** (ATCADevice device, const uint8\_t \*message, const uint8\_t \*signature, const uint8\_t \*public\_key, bool \*is\_verified)  
*Executes the Verify command, which verifies a signature (ECDSA verify operation) with all components (message, signature, and public key) supplied. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*

- [ATCA\\_STATUS atcab\\_verify\\_extern\\_mac](#) (const uint8\_t \*message, const uint8\_t \*signature, const uint8\_t \*public\_key, const uint8\_t \*num\_in, const uint8\_t \*io\_key, bool \*is\_verified)  
*Executes the Verify command, which verifies a signature (ECDSA verify operation) with a public key stored in the device. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
- [ATCA\\_STATUS atcab\\_verify\\_stored](#) (const uint8\_t \*message, const uint8\_t \*signature, uint16\_t key\_id, bool \*is\_verified)  
*Executes the Verify command, which verifies a signature (ECDSA verify operation) with a public key stored in the device. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
- [ATCA\\_STATUS atcab\\_verify\\_stored\\_ext](#) (ATCADevice device, const uint8\_t \*message, const uint8\_t \*signature, uint16\_t key\_id, bool \*is\_verified)  
*Executes the Verify command, which verifies a signature (ECDSA verify operation) with a public key stored in the device. The message to be signed will be loaded into the Message Digest Buffer to the ATECC608 device or TempKey for other devices.*
- [ATCA\\_STATUS atcab\\_verify\\_stored\\_with\\_tempkey](#) (const uint8\_t \*signature, uint16\_t key\_id, bool \*is\_verified)  
*Executes the Verify command, which verifies a signature (ECDSA verify operation) with a public key stored in the device. keyConfig.reqrandom bit should be set and the message to be signed should be already loaded into TempKey for all devices.*
- [ATCA\\_STATUS atcab\\_verify\\_stored\\_mac](#) (const uint8\_t \*message, const uint8\_t \*signature, uint16\_t key\_id, const uint8\_t \*num\_in, const uint8\_t \*io\_key, bool \*is\_verified)
- [ATCA\\_STATUS atcab\\_verify\\_validate](#) (uint16\_t key\_id, const uint8\_t \*signature, const uint8\_t \*other\_data, bool \*is\_verified)  
*Executes the Verify command in Validate mode to validate a public key stored in a slot.*
- [ATCA\\_STATUS atcab\\_verify\\_invalidate](#) (uint16\_t key\_id, const uint8\_t \*signature, const uint8\_t \*other\_data, bool \*is\_verified)  
*Executes the Verify command in Invalidate mode which invalidates a previously validated public key stored in a slot.*
- [ATCA\\_STATUS atcab\\_write](#) (uint8\_t zone, uint16\_t address, const uint8\_t \*value, const uint8\_t \*mac)  
*Executes the Write command, which writes either one four byte word or a 32-byte block to one of the EEPROM zones on the device. Depending upon the value of the WriteConfig byte for this slot, the data may be required to be encrypted by the system prior to being sent to the device. This command cannot be used to write slots configured as ECC private keys.*
- [ATCA\\_STATUS atcab\\_write\\_zone](#) (uint8\_t zone, uint16\_t slot, uint8\_t block, uint8\_t offset, const uint8\_t \*data, uint8\_t len)  
*Executes the Write command, which writes either 4 or 32 bytes of data into a device zone.*
- [ATCA\\_STATUS atcab\\_write\\_bytes\\_zone\\_ext](#) (ATCADevice device, uint8\_t zone, uint16\_t slot, size\_t offset\_bytes, const uint8\_t \*data, size\_t length)
- [ATCA\\_STATUS atcab\\_write\\_bytes\\_zone](#) (uint8\_t zone, uint16\_t slot, size\_t offset\_bytes, const uint8\_t \*data, size\_t length)  
*Executes the Write command, which writes data into the configuration, otp, or data zones with a given byte offset and length. Offset and length must be multiples of a word (4 bytes).*
- [ATCA\\_STATUS atcab\\_write\\_pubkey](#) (uint16\_t slot, const uint8\_t \*public\_key)  
*Uses the write command to write a public key to a slot in the proper format.*
- [ATCA\\_STATUS atcab\\_write\\_config\\_zone](#) (const uint8\_t \*config\_data)  
*Executes the Write command, which writes the configuration zone.*
- [ATCA\\_STATUS atcab\\_write\\_enc](#) (uint16\_t key\_id, uint8\_t block, const uint8\_t \*data, const uint8\_t \*enc\_key, const uint16\_t enc\_key\_id, const uint8\_t num\_in[(20)])  
*Executes the Write command, which performs an encrypted write of a 32 byte block into given slot.*
- [ATCA\\_STATUS atcab\\_write\\_config\\_counter](#) (uint16\_t counter\_id, uint32\_t counter\_value)  
*Initialize one of the monotonic counters in device with a specific value.*

## Variables

- [ATCADevice\\_gDevice](#)

### 10.6.1 Detailed Description

CryptoAuthLib Basic API methods - a simple crypto authentication API. These methods manage a global ATCA↔ Device object behind the scenes. They also manage the wake/idle state transitions so callers don't need to.

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## 10.7 atca\_bool.h File Reference

bool define for systems that don't have it

```
#include <stdbool.h>
```

### 10.7.1 Detailed Description

bool define for systems that don't have it

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## 10.8 atca\_cfgs.c File Reference

a set of default configurations for various ATCA devices and interfaces

```
#include <stddef.h>
#include "cryptoauthlib.h"
#include "atca_cfgs.h"
#include "atca_iface.h"
#include "atca_device.h"
```

### 10.8.1 Detailed Description

a set of default configurations for various ATCA devices and interfaces

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## 10.9 atca\_cfgs.h File Reference

a set of default configurations for various ATCA devices and interfaces

```
#include "atca_iface.h"
```

### Variables

- [ATCAIfaceCfg cfg\\_ateccx08a\\_i2c\\_default](#)  
*default configuration for an ECCx08A device on the first logical I2C bus*
- [ATCAIfaceCfg cfg\\_ateccx08a\\_swi\\_default](#)  
*default configuration for an ECCx08A device on the logical SWI bus over UART*
- [ATCAIfaceCfg cfg\\_ateccx08a\\_kitcdc\\_default](#)  
*default configuration for Kit protocol over a CDC interface*
- [ATCAIfaceCfg cfg\\_ateccx08a\\_kithid\\_default](#)  
*default configuration for Kit protocol over a HID interface*
- [ATCAIfaceCfg cfg\\_atsha20xa\\_i2c\\_default](#)  
*default configuration for a SHA204A device on the first logical I2C bus*
- [ATCAIfaceCfg cfg\\_atsha20xa\\_swi\\_default](#)  
*default configuration for an SHA20xA device on the logical SWI bus over UART*
- [ATCAIfaceCfg cfg\\_atsha20xa\\_kitcdc\\_default](#)  
*default configuration for Kit protocol over a CDC interface*
- [ATCAIfaceCfg cfg\\_atsha20xa\\_kithid\\_default](#)  
*default configuration for Kit protocol over a HID interface for SHA204*
- [ATCAIfaceCfg cfg\\_ecc204\\_i2c\\_default](#)  
*default configuration for an ECC204 device on the first logical I2C bus*
- [ATCAIfaceCfg cfg\\_ecc204\\_swi\\_default](#)  
*default configuration for an ECC204 device on the logical SWI over GPIO*
- [ATCAIfaceCfg cfg\\_ecc204\\_kithid\\_default](#)  
*default configuration for Kit protocol over the device's async interface*

### 10.9.1 Detailed Description

a set of default configurations for various ATCA devices and interfaces

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### 10.9.2 Variable Documentation

#### 10.9.2.1 `cfg_ateccx08a_i2c_default`

`ATCAIfaceCfg` `cfg_ateccx08a_i2c_default` [extern]

default configuration for an ECCx08A device on the first logical I2C bus

#### 10.9.2.2 `cfg_ateccx08a_kitcdc_default`

`ATCAIfaceCfg` `cfg_ateccx08a_kitcdc_default` [extern]

default configuration for Kit protocol over a CDC interface

#### 10.9.2.3 `cfg_ateccx08a_kithid_default`

`ATCAIfaceCfg` `cfg_ateccx08a_kithid_default` [extern]

default configuration for Kit protocol over a HID interface

#### 10.9.2.4 `cfg_ateccx08a_swi_default`

`ATCAIfaceCfg` `cfg_ateccx08a_swi_default` [extern]

default configuration for an ECCx08A device on the logical SWI bus over UART

#### 10.9.2.5 `cfg_atsha20xa_i2c_default`

`ATCAIfaceCfg` `cfg_atsha20xa_i2c_default` [extern]

default configuration for a SHA204A device on the first logical I2C bus

#### 10.9.2.6 `cfg_atsha20xa_kitcdc_default`

`ATCAIfaceCfg` `cfg_atsha20xa_kitcdc_default` [extern]

default configuration for Kit protocol over a CDC interface

## 10.10 atca\_compiler.h File Reference

---

### 10.9.2.7 cfg\_atsha20xa\_kithid\_default

`ATCAIfaceCfg` `cfg_atsha20xa_kithid_default` [extern]

default configuration for Kit protocol over a HID interface for SHA204

### 10.9.2.8 cfg\_atsha20xa\_swi\_default

`ATCAIfaceCfg` `cfg_atsha20xa_swi_default` [extern]

default configuration for an SHA20xA device on the logical SWI bus over UART

### 10.9.2.9 cfg\_ecc204\_i2c\_default

`ATCAIfaceCfg` `cfg_ecc204_i2c_default` [extern]

default configuration for an ECC204 device on the first logical I2C bus

### 10.9.2.10 cfg\_ecc204\_kithid\_default

`ATCAIfaceCfg` `cfg_ecc204_kithid_default` [extern]

default configuration for Kit protocol over the device's async interface

### 10.9.2.11 cfg\_ecc204\_swi\_default

`ATCAIfaceCfg` `cfg_ecc204_swi_default` [extern]

default configuration for an ECC204 device on the logical SWI over GPIO

## 10.10 atca\_compiler.h File Reference

CryptoAuthLib is meant to be portable across architectures, even non-Microchip architectures and compiler environments. This file is for isolating compiler specific macros.

### Macros

- #define `SHARED_LIB_EXPORT`
- #define `ATCA_DLL` extern



### 10.10.1 Detailed Description

CryptoAuthLib is meant to be portable across architectures, even non-Microchip architectures and compiler environments. This file is for isolating compiler specific macros.

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### 10.10.2 Macro Definition Documentation

#### 10.10.2.1 ATCA\_DLL

```
#define ATCA_DLL extern
```

#### 10.10.2.2 SHARED\_LIB\_EXPORT

```
#define SHARED_LIB_EXPORT
```

## 10.11 atca\_config.h File Reference

```
#include "definitions.h"
```

### Data Structures

- struct [atca\\_plib\\_i2c\\_api](#)

## Macros

- #define [ATCA\\_HAL\\_I2C](#)
- #define [ATCA\\_ATECC608\\_SUPPORT](#)
- #define [ATCA\\_POLLING\\_INIT\\_TIME\\_MSEC](#) 1
- #define [ATCA\\_POLLING\\_FREQUENCY\\_TIME\\_MSEC](#) 2
- #define [ATCA\\_POLLING\\_MAX\\_TIME\\_MSEC](#) 2500
- #define [ATCA\\_NO\\_HEAP](#)
- #define [atca\\_delay\\_ms](#) hal\_delay\_ms
- #define [atca\\_delay\\_us](#) hal\_delay\_us
- #define [ATCA\\_POST\\_DELAY\\_MSEC](#) 25
- #define [PLIB\\_I2C\\_ERROR](#) SERCOM\_I2C\_ERROR
- #define [PLIB\\_I2C\\_ERROR\\_NONE](#) SERCOM\_I2C\_ERROR\_NONE
- #define [PLIB\\_I2C\\_TRANSFER\\_SETUP](#) SERCOM\_I2C\_TRANSFER\_SETUP
- #define [WPC\\_CHAIN\\_DIGEST\\_HANDLE\\_0](#) 0x03
- #define [WPC\\_CHAIN\\_CERT\\_DEF\\_0](#) g\_cert\_def\_2\_device
- #define [WPC\\_STRICT\\_SLOT\\_INDEX](#)
- #define [WPC\\_CERT\\_SN\\_FROM\\_HASH\\_EN](#) FEATURE\_DISABLED
- #define [WPC\\_MSG\\_PT\\_EN](#) FEATURE\_ENABLED
- #define [WPC\\_MSG\\_PR\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_AES\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_AES\\_GCM\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_COUNTER\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_DERIVEKEY\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_ECDH\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_ECDH\\_ENC\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_GENDIG\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_GENKEY\\_MAC\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_HMAC\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_INFO\\_LATCH\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_KDF\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_LOCK\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_MAC\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_PRIVWRITE\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_RANDOM\\_EN](#) WPC\_MSG\_PR\_EN
- #define [ATCAB\\_READ\\_ENC\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_SECUREBOOT\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_SECUREBOOT\\_MAC\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_SELFTEST\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_SHA\\_HMAC\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_SIGN\\_INTERNAL\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_UPDATEEXTRA\\_EN](#) FEATURE\_DISABLED
- #define [ATCAB\\_VERIFY\\_EN](#) WPC\_MSG\_PR\_EN
- #define [ATCAB\\_WRITE\\_EN](#) FEATURE\_DISABLED
- #define [ATCAC\\_SHA1\\_EN](#) FEATURE\_DISABLED
- #define [ATCAC\\_SHA256\\_EN](#) FEATURE\_DISABLED
- #define [ATCACERT\\_DATEFMT\\_UTC\\_EN](#) FEATURE\_ENABLED
- #define [ATCACERT\\_DATEFMT\\_GEN\\_EN](#) FEATURE\_ENABLED
- #define [ATCACERT\\_DATEFMT\\_ISO\\_EN](#) FEATURE\_DISABLED
- #define [ATCACERT\\_DATEFMT\\_POSIX\\_EN](#) FEATURE\_DISABLED

## Typedefs

- typedef bool(\* [atca\\_i2c\\_plib\\_read](#)) (uint16\_t, uint8\_t \*, uint32\_t)
- typedef bool(\* [atca\\_i2c\\_plib\\_write](#)) (uint16\_t, uint8\_t \*, uint32\_t)
- typedef bool(\* [atca\\_i2c\\_plib\\_is\\_busy](#)) (void)
- typedef SERCOM\_I2C\_ERROR(\* [atca\\_i2c\\_error\\_get](#)) (void)
- typedef bool(\* [atca\\_i2c\\_plib\\_transfer\\_setup](#)) (SERCOM\_I2C\_TRANSFER\_SETUP \*setup, uint32\_t srcClk↔ Freq)
- typedef struct [atca\\_plib\\_i2c\\_api](#) [atca\\_plib\\_i2c\\_api\\_t](#)

## Variables

- [atca\\_plib\\_i2c\\_api\\_t](#) [sercom2\\_plib\\_i2c\\_api](#)

## 10.11.1 Macro Definition Documentation

### 10.11.1.1 ATCA\_ATECC608\_SUPPORT

```
#define ATCA_ATECC608_SUPPORT
```

Include Device Support Options

### 10.11.1.2 atca\_delay\_ms

```
#define atca_delay_ms hal_delay_ms
```

### 10.11.1.3 atca\_delay\_us

```
#define atca_delay_us hal_delay_us
```

### 10.11.1.4 ATCA\_HAL\_I2C

```
#define ATCA_HAL_I2C
```

### 10.11.1.5 ATCA\_NO\_HEAP

```
#define ATCA_NO_HEAP
```

Define if the library is not to use malloc/free

### 10.11.1.6 ATCA\_POLLING\_FREQUENCY\_TIME\_MSEC

```
#define ATCA_POLLING_FREQUENCY_TIME_MSEC 2
```

### 10.11.1.7 ATCA\_POLLING\_INIT\_TIME\_MSEC

```
#define ATCA_POLLING_INIT_TIME_MSEC 1
```

### 10.11.1.8 ATCA\_POLLING\_MAX\_TIME\_MSEC

```
#define ATCA_POLLING_MAX_TIME_MSEC 2500
```

### 10.11.1.9 ATCA\_POST\_DELAY\_MSEC

```
#define ATCA_POST_DELAY_MSEC 25
```

### 10.11.1.10 ATCAB\_AES\_EN

```
#define ATCAB_AES_EN FEATURE_DISABLED
```

### 10.11.1.11 ATCAB\_AES\_GCM\_EN

```
#define ATCAB_AES_GCM_EN FEATURE_DISABLED
```

### 10.11.1.12 ATCAB\_COUNTER\_EN

```
#define ATCAB_COUNTER_EN FEATURE_DISABLED
```

### 10.11.1.13 ATCAB\_DERIVEKEY\_EN

```
#define ATCAB_DERIVEKEY_EN FEATURE_DISABLED
```

**10.11.1.14 ATCAB\_ECDH\_EN**

```
#define ATCAB_ECDH_EN FEATURE_DISABLED
```

**10.11.1.15 ATCAB\_ECDH\_ENC\_EN**

```
#define ATCAB_ECDH_ENC_EN FEATURE_DISABLED
```

**10.11.1.16 ATCAB\_GENDIG\_EN**

```
#define ATCAB_GENDIG_EN FEATURE_DISABLED
```

**10.11.1.17 ATCAB\_GENKEY\_MAC\_EN**

```
#define ATCAB_GENKEY_MAC_EN FEATURE_DISABLED
```

**10.11.1.18 ATCAB\_HMAC\_EN**

```
#define ATCAB_HMAC_EN FEATURE_DISABLED
```

**10.11.1.19 ATCAB\_INFO\_LATCH\_EN**

```
#define ATCAB_INFO_LATCH_EN FEATURE_DISABLED
```

**10.11.1.20 ATCAB\_KDF\_EN**

```
#define ATCAB_KDF_EN FEATURE_DISABLED
```

**10.11.1.21 ATCAB\_LOCK\_EN**

```
#define ATCAB_LOCK_EN FEATURE_DISABLED
```

### 10.11.1.22 ATCAB\_MAC\_EN

```
#define ATCAB_MAC_EN FEATURE_DISABLED
```

### 10.11.1.23 ATCAB\_PRIVWRITE\_EN

```
#define ATCAB_PRIVWRITE_EN FEATURE_DISABLED
```

### 10.11.1.24 ATCAB\_RANDOM\_EN

```
#define ATCAB_RANDOM_EN WPC_MSG_PR_EN
```

### 10.11.1.25 ATCAB\_READ\_ENC\_EN

```
#define ATCAB_READ_ENC_EN FEATURE_DISABLED
```

### 10.11.1.26 ATCAB\_SECUREBOOT\_EN

```
#define ATCAB_SECUREBOOT_EN FEATURE_DISABLED
```

### 10.11.1.27 ATCAB\_SECUREBOOT\_MAC\_EN

```
#define ATCAB_SECUREBOOT_MAC_EN FEATURE_DISABLED
```

### 10.11.1.28 ATCAB\_SELFTEST\_EN

```
#define ATCAB_SELFTEST_EN FEATURE_DISABLED
```

### 10.11.1.29 ATCAB\_SHA\_HMAC\_EN

```
#define ATCAB_SHA_HMAC_EN FEATURE_DISABLED
```

**10.11.1.30 ATCAB\_SIGN\_INTERNAL\_EN**

```
#define ATCAB_SIGN_INTERNAL_EN FEATURE_DISABLED
```

**10.11.1.31 ATCAB\_UPDATEEXTRA\_EN**

```
#define ATCAB_UPDATEEXTRA_EN FEATURE_DISABLED
```

**10.11.1.32 ATCAB\_VERIFY\_EN**

```
#define ATCAB_VERIFY_EN WPC_MSG_PR_EN
```

**10.11.1.33 ATCAB\_WRITE\_EN**

```
#define ATCAB_WRITE_EN FEATURE_DISABLED
```

**10.11.1.34 ATCAC\_SHA1\_EN**

```
#define ATCAC_SHA1_EN FEATURE_DISABLED
```

**10.11.1.35 ATCAC\_SHA256\_EN**

```
#define ATCAC_SHA256_EN FEATURE_DISABLED
```

**10.11.1.36 ATCACERT\_DATEFMT\_GEN\_EN**

```
#define ATCACERT_DATEFMT_GEN_EN FEATURE_ENABLED
```

**10.11.1.37 ATCACERT\_DATEFMT\_ISO\_EN**

```
#define ATCACERT_DATEFMT_ISO_EN FEATURE_DISABLED
```

### 10.11.1.38 ATCACERT\_DATEFMT\_POSIX\_EN

```
#define ATCACERT_DATEFMT_POSIX_EN FEATURE_DISABLED
```

### 10.11.1.39 ATCACERT\_DATEFMT\_UTC\_EN

```
#define ATCACERT_DATEFMT_UTC_EN FEATURE_ENABLED
```

### 10.11.1.40 PLIB\_I2C\_ERROR

```
#define PLIB_I2C_ERROR SERCOM_I2C_ERROR
```

### 10.11.1.41 PLIB\_I2C\_ERROR\_NONE

```
#define PLIB_I2C_ERROR_NONE SERCOM_I2C_ERROR_NONE
```

### 10.11.1.42 PLIB\_I2C\_TRANSFER\_SETUP

```
#define PLIB_I2C_TRANSFER_SETUP SERCOM_I2C_TRANSFER_SETUP
```

### 10.11.1.43 WPC\_CERT\_SN\_FROM\_HASH\_EN

```
#define WPC_CERT_SN_FROM_HASH_EN FEATURE_DISABLED
```

### 10.11.1.44 WPC\_CHAIN\_CERT\_DEF\_0

```
#define WPC_CHAIN_CERT_DEF_0 g_cert_def_2_device
```

### 10.11.1.45 WPC\_CHAIN\_DIGEST\_HANDLE\_0

```
#define WPC_CHAIN_DIGEST_HANDLE_0 0x03
```



#### 10.11.1.46 WPC\_MSG\_PR\_EN

```
#define WPC_MSG_PR_EN FEATURE_DISABLED
```

#### 10.11.1.47 WPC\_MSG\_PT\_EN

```
#define WPC_MSG_PT_EN FEATURE_ENABLED
```

#### 10.11.1.48 WPC\_STRICT\_SLOT\_INDEX

```
#define WPC_STRICT_SLOT_INDEX
```

### 10.11.2 Typedef Documentation

#### 10.11.2.1 atca\_i2c\_error\_get

```
typedef SERCOM_I2C_ERROR(* atca_i2c_error_get) (void)
```

#### 10.11.2.2 atca\_i2c\_plib\_is\_busy

```
typedef bool(* atca_i2c_plib_is_busy) (void)
```

#### 10.11.2.3 atca\_i2c\_plib\_read

```
typedef bool(* atca_i2c_plib_read) (uint16_t, uint8_t *, uint32_t)
```

#### 10.11.2.4 atca\_i2c\_plib\_transfer\_setup

```
typedef bool(* atca_i2c_plib_transfer_setup) (SERCOM_I2C_TRANSFER_SETUP *setup, uint32_t src←  
ClkFreq)
```

### 10.11.2.5 atca\_i2c\_plib\_write

```
typedef bool(* atca_i2c_plib_write) (uint16_t, uint8_t *, uint32_t)
```

### 10.11.2.6 atca\_plib\_i2c\_api\_t

```
typedef struct atca_plib_i2c_api atca_plib_i2c_api_t
```

## 10.11.3 Variable Documentation

### 10.11.3.1 sercom2\_plib\_i2c\_api

```
atca_plib_i2c_api_t sercom2_plib_i2c_api [extern]
```

## 10.12 atca\_config\_check.h File Reference

Consistency checks for configuration options.

```
#include "atca_config.h"
```

## Macros

- #define [FEATURE\\_ENABLED](#) (1)
- #define [FEATURE\\_DISABLED](#) (0)
- #define [DEFAULT\\_ENABLED](#) [FEATURE\\_ENABLED](#)
- #define [DEFAULT\\_DISABLED](#) [FEATURE\\_DISABLED](#)
- #define [ATCA\\_SHA\\_SUPPORT](#) 1
- #define [ATCA\\_ATECC608\\_SUPPORT](#)
- #define [ATCA\\_ECC\\_SUPPORT](#) [DEFAULT\\_ENABLED](#)
- #define [ATCA\\_CA\\_SUPPORT](#) [DEFAULT\\_ENABLED](#)
- #define [ATCA\\_TA\\_SUPPORT](#) [DEFAULT\\_ENABLED](#)
- #define [ATCA\\_HOSTLIB\\_EN](#) [DEFAULT\\_ENABLED](#)
- #define [ATCA\\_USE\\_ATCAB\\_FUNCTIONS](#)
- #define [ATCA\\_CHECK\\_PARAMS\\_EN](#) [DEFAULT\\_ENABLED](#)
- #define [ATCA\\_CHECK\\_INVALID\\_MSG](#)(c, s, m) if (c) return [ATCA\\_TRACE](#)(s, m)
- #define [ATCA\\_CHECK\\_VALID\\_MSG](#)(c, m) if (![ATCA\\_TRACE](#)(!(c), m))
- #define [ATCA\\_CHECK\\_INVALID](#)(c, s) [ATCA\\_CHECK\\_INVALID\\_MSG](#)(c, s, "")
- #define [ATCA\\_CHECK\\_VALID](#)(c) [ATCA\\_CHECK\\_VALID\\_MSG](#)(c, "")
- #define [ATCAB\\_AES\\_EN](#) ([DEFAULT\\_ENABLED](#))
- #define [ATCAB\\_AES\\_GFM\\_EN](#) ([DEFAULT\\_ENABLED](#))
- #define [ATCAB\\_AES\\_GCM\\_EN](#) ([DEFAULT\\_ENABLED](#))
- #define [ATCAB\\_CHECKMAC\\_EN](#) ([DEFAULT\\_ENABLED](#))

- `#define ATCAB_COUNTER_EN (DEFAULT_ENABLED)`
- `#define ATCAB_DERIVEKEY_EN (DEFAULT_ENABLED)`
- `#define ATCAB_ECDH_EN (DEFAULT_ENABLED)`
- `#define ATCAB_ECDH_ENC_EN (DEFAULT_ENABLED)`
- `#define ATCAB_GENDIG_EN (DEFAULT_ENABLED)`
- `#define ATCAB_GENKEY_EN (DEFAULT_ENABLED)`
- `#define ATCAB_GENKEY_MAC_EN ATCAB_GENKEY_EN`
- `#define ATCAB_HMAC_EN (DEFAULT_ENABLED)`
- `#define ATCAB_INFO_LATCH_EN (DEFAULT_ENABLED)`
- `#define ATCAB_KDF_EN (DEFAULT_ENABLED)`
- `#define ATCAB_LOCK_EN (DEFAULT_ENABLED)`
- `#define ATCAB_MAC_EN (DEFAULT_ENABLED)`
- `#define ATCAB_NONCE_EN (DEFAULT_ENABLED)`
- `#define ATCAB_PRIVWRITE_EN (DEFAULT_ENABLED)`
- `#define ATCAB_RANDOM_EN (DEFAULT_ENABLED)`
- `#define ATCAB_READ_EN (DEFAULT_ENABLED)`
- `#define ATCAB_READ_ENC_EN ATCAB_READ_EN`
- `#define ATCAB_SECUREBOOT_EN (DEFAULT_ENABLED)`
- `#define ATCAB_SECUREBOOT_MAC_EN ATCAB_SECUREBOOT_EN`
- `#define ATCAB_SELFTEST_EN (DEFAULT_ENABLED)`
- `#define ATCAB_SHA_EN (DEFAULT_ENABLED)`
- `#define ATCAB_SHA_HMAC_EN ATCAB_SHA_EN`
- `#define ATCAB_SHA_CONTEXT_EN ATCAB_SHA_EN`
- `#define ATCAB_SIGN_EN (DEFAULT_ENABLED)`
- `#define ATCAB_SIGN_INTERNAL_EN ATCAB_SIGN_EN`
- `#define ATCAB_UPDATEEXTRA_EN (DEFAULT_ENABLED)`
- `#define ATCAB_VERIFY_EN (DEFAULT_ENABLED)`
- `#define ATCAB_VERIFY_EXTERN_EN ATCAB_VERIFY_EN`
- `#define ATCAB_VERIFY_MAC_EN ATCAB_VERIFY_EN`
- `#define ATCAB_VERIFY_STORED_EN ATCAB_VERIFY_EN`
- `#define ATCAB_VERIFY_VALIDATE_EN ATCAB_VERIFY_EN`
- `#define ATCAB_WRITE_EN (DEFAULT_ENABLED)`
- `#define ATCAB_WRITE_ENC_EN ATCAB_WRITE_EN`
- `#define ATCAC_SHA1_EN (DEFAULT_ENABLED)`
- `#define ATCAC_SHA256_EN (DEFAULT_ENABLED)`
- `#define ATCAC_SHA256_HMAC_EN ATCAC_SHA256_EN`
- `#define ATCAC_SHA256_HMAC_CTR_EN ATCAC_SHA256_HMAC_EN`
- `#define ATCAC_RANDOM_EN ATCA_HOSTLIB_EN`
- `#define ATCAC_VERIFY_EN ATCA_HOSTLIB_EN`
- `#define ATCAC_SIGN_EN ATCA_HOSTLIB_EN`

### 10.12.1 Detailed Description

Consistency checks for configuration options.

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### 10.12.2 Macro Definition Documentation

### 10.12.2.1 ATCA\_ATECC608\_SUPPORT

```
#define ATCA_ATECC608_SUPPORT
```

### 10.12.2.2 ATCA\_CA\_SUPPORT

```
#define ATCA_CA_SUPPORT DEFAULT\_ENABLED
```

### 10.12.2.3 ATCA\_CHECK\_INVALID

```
#define ATCA_CHECK_INVALID(  
    c,  
    s ) ATCA\_CHECK\_INVALID\_MSG(c, s, "")
```

### 10.12.2.4 ATCA\_CHECK\_INVALID\_MSG

```
#define ATCA_CHECK_INVALID_MSG(  
    c,  
    s,  
    m ) if (c) return ATCA\_TRACE(s, m)
```

Emits message and returns the status code when the condition is true

### 10.12.2.5 ATCA\_CHECK\_PARAMS\_EN

```
#define ATCA_CHECK_PARAMS_EN DEFAULT\_ENABLED
```

### 10.12.2.6 ATCA\_CHECK\_VALID

```
#define ATCA_CHECK_VALID(  
    c ) ATCA\_CHECK\_VALID\_MSG(c, "")
```

### 10.12.2.7 ATCA\_CHECK\_VALID\_MSG

```
#define ATCA_CHECK_VALID_MSG(  
    c,  
    m ) if (!ATCA\_TRACE(!(c), m))
```

#### 10.12.2.8 ATCA\_ECC\_SUPPORT

```
#define ATCA_ECC_SUPPORT DEFAULT_ENABLED
```

#### 10.12.2.9 ATCA\_HOSTLIB\_EN

```
#define ATCA_HOSTLIB_EN DEFAULT_ENABLED
```

#### 10.12.2.10 ATCA\_SHA\_SUPPORT

```
#define ATCA_SHA_SUPPORT 1
```

Library Configuration File - All build attributes should be included in [atca\\_config.h](#)

#### 10.12.2.11 ATCA\_TA\_SUPPORT

```
#define ATCA_TA_SUPPORT DEFAULT_ENABLED
```

#### 10.12.2.12 ATCA\_USE\_ATCAB\_FUNCTIONS

```
#define ATCA_USE_ATCAB_FUNCTIONS
```

Does the atcab\_ API layer need to be instantiated (adds a layer of abstraction)

#### 10.12.2.13 ATCAB\_AES\_EN

```
#define ATCAB_AES_EN (DEFAULT_ENABLED)
```

#### 10.12.2.14 ATCAB\_AES\_GCM\_EN

```
#define ATCAB_AES_GCM_EN (DEFAULT_ENABLED)
```

### 10.12.2.15 ATCAB\_AES\_GFM\_EN

```
#define ATCAB_AES_GFM_EN (DEFAULT_ENABLED)
```

Enable ATCAB\_AES\_GFM\_EN to enabled Galois Field Multiply

Supported API's: atcab\_aes

### 10.12.2.16 ATCAB\_CHECKMAC\_EN

```
#define ATCAB_CHECKMAC_EN (DEFAULT_ENABLED)
```

### 10.12.2.17 ATCAB\_COUNTER\_EN

```
#define ATCAB_COUNTER_EN (DEFAULT_ENABLED)
```

### 10.12.2.18 ATCAB\_DERIVEKEY\_EN

```
#define ATCAB_DERIVEKEY_EN (DEFAULT_ENABLED)
```

### 10.12.2.19 ATCAB\_ECDH\_EN

```
#define ATCAB_ECDH_EN (DEFAULT_ENABLED)
```

### 10.12.2.20 ATCAB\_ECDH\_ENC\_EN

```
#define ATCAB_ECDH_ENC_EN (DEFAULT_ENABLED)
```

### 10.12.2.21 ATCAB\_GENDIG\_EN

```
#define ATCAB_GENDIG_EN (DEFAULT_ENABLED)
```

**10.12.2.22 ATCAB\_GENKEY\_EN**

```
#define ATCAB_GENKEY_EN (DEFAULT_ENABLED)
```

**10.12.2.23 ATCAB\_GENKEY\_MAC\_EN**

```
#define ATCAB_GENKEY_MAC_EN ATCAB_GENKEY_EN
```

Requires: ATCAB\_GENKEY\_EN

Enable ATCAB\_GENKEY\_MAC\_EN which provides for a mac with the genkey command

Supported API's: atcab\_genkey\_base

**10.12.2.24 ATCAB\_HMAC\_EN**

```
#define ATCAB_HMAC_EN (DEFAULT_ENABLED)
```

**10.12.2.25 ATCAB\_INFO\_LATCH\_EN**

```
#define ATCAB_INFO_LATCH_EN (DEFAULT_ENABLED)
```

Enable ATCAB\_INFO\_LATCH\_EN which enables control of GPIOs and the persistent latch

Supported API's: atcab\_info\_base

**10.12.2.26 ATCAB\_KDF\_EN**

```
#define ATCAB_KDF_EN (DEFAULT_ENABLED)
```

**10.12.2.27 ATCAB\_LOCK\_EN**

```
#define ATCAB_LOCK_EN (DEFAULT_ENABLED)
```

**10.12.2.28 ATCAB\_MAC\_EN**

```
#define ATCAB_MAC_EN (DEFAULT_ENABLED)
```

### 10.12.2.29 ATCAB\_NONCE\_EN

```
#define ATCAB_NONCE_EN (DEFAULT_ENABLED)
```

### 10.12.2.30 ATCAB\_PRIVWRITE\_EN

```
#define ATCAB_PRIVWRITE_EN (DEFAULT_ENABLED)
```

### 10.12.2.31 ATCAB\_RANDOM\_EN

```
#define ATCAB_RANDOM_EN (DEFAULT_ENABLED)
```

### 10.12.2.32 ATCAB\_READ\_EN

```
#define ATCAB_READ_EN (DEFAULT_ENABLED)
```

### 10.12.2.33 ATCAB\_READ\_ENC\_EN

```
#define ATCAB_READ_ENC_EN ATCAB_READ_EN
```

### 10.12.2.34 ATCAB\_SECUREBOOT\_EN

```
#define ATCAB_SECUREBOOT_EN (DEFAULT_ENABLED)
```

### 10.12.2.35 ATCAB\_SECUREBOOT\_MAC\_EN

```
#define ATCAB_SECUREBOOT_MAC_EN ATCAB_SECUREBOOT_EN
```

### 10.12.2.36 ATCAB\_SELFTEST\_EN

```
#define ATCAB_SELFTEST_EN (DEFAULT_ENABLED)
```



**10.12.2.37 ATCAB\_SHA\_CONTEXT\_EN**

```
#define ATCAB_SHA_CONTEXT_EN ATCAB_SHA_EN
```

**10.12.2.38 ATCAB\_SHA\_EN**

```
#define ATCAB_SHA_EN (DEFAULT_ENABLED)
```

**10.12.2.39 ATCAB\_SHA\_HMAC\_EN**

```
#define ATCAB_SHA_HMAC_EN ATCAB_SHA_EN
```

**10.12.2.40 ATCAB\_SIGN\_EN**

```
#define ATCAB_SIGN_EN (DEFAULT_ENABLED)
```

**10.12.2.41 ATCAB\_SIGN\_INTERNAL\_EN**

```
#define ATCAB_SIGN_INTERNAL_EN ATCAB_SIGN_EN
```

**10.12.2.42 ATCAB\_UPDATEEXTRA\_EN**

```
#define ATCAB_UPDATEEXTRA_EN (DEFAULT_ENABLED)
```

**10.12.2.43 ATCAB\_VERIFY\_EN**

```
#define ATCAB_VERIFY_EN (DEFAULT_ENABLED)
```

**10.12.2.44 ATCAB\_VERIFY\_EXTERN\_EN**

```
#define ATCAB_VERIFY_EXTERN_EN ATCAB_VERIFY_EN
```

### 10.12.2.45 ATCAB\_VERIFY\_MAC\_EN

```
#define ATCAB_VERIFY_MAC_EN ATCAB_VERIFY_EN
```

Requires: ATCAB\_VERIFY

Executes verification command with verification MAC for the External or Stored Verify modes

Supported API's: atcab\_verify\_extern\_mac, atcab\_verify\_stored\_mac

### 10.12.2.46 ATCAB\_VERIFY\_STORED\_EN

```
#define ATCAB_VERIFY_STORED_EN ATCAB_VERIFY_EN
```

### 10.12.2.47 ATCAB\_VERIFY\_VALIDATE\_EN

```
#define ATCAB_VERIFY_VALIDATE_EN ATCAB_VERIFY_EN
```

### 10.12.2.48 ATCAB\_WRITE\_EN

```
#define ATCAB_WRITE_EN (DEFAULT_ENABLED)
```

### 10.12.2.49 ATCAB\_WRITE\_ENC\_EN

```
#define ATCAB_WRITE_ENC_EN ATCAB_WRITE_EN
```

### 10.12.2.50 ATCAC\_RANDOM\_EN

```
#define ATCAC_RANDOM_EN ATCA_HOSTLIB_EN
```

Requires: ATCA\_HOSTLIB\_EN

Enable ATCAC\_RANDOM\_EN get random numbers from the host's implementation - generally assumed to come from the host's cryptographic library or peripheral driver

### 10.12.2.51 ATCAC\_SHA1\_EN

```
#define ATCAC_SHA1_EN (DEFAULT_ENABLED)
```

Enable ATCAC\_SHA1\_EN to enable sha1 host side api

Supported API's: atcab\_write

**10.12.2.52 ATCAC\_SHA256\_EN**

```
#define ATCAC_SHA256_EN (DEFAULT_ENABLED)
```

Enable ATCAC\_SHA256\_EN to enable sha256 host side api

Supported API's: atcab\_write

**10.12.2.53 ATCAC\_SHA256\_HMAC\_CTR\_EN**

```
#define ATCAC_SHA256_HMAC_CTR_EN ATCAC_SHA256_HMAC_EN
```

**10.12.2.54 ATCAC\_SHA256\_HMAC\_EN**

```
#define ATCAC_SHA256_HMAC_EN ATCAC_SHA256_EN
```

**10.12.2.55 ATCAC\_SIGN\_EN**

```
#define ATCAC_SIGN_EN ATCA_HOSTLIB_EN
```

Requires: ATCA\_HOSTLIB\_EN

Enable ATCAC\_SIGN\_EN to use the host's sign functions. Generally assumed to come from the host's cryptographic library or peripheral driver.

**10.12.2.56 ATCAC\_VERIFY\_EN**

```
#define ATCAC_VERIFY_EN ATCA_HOSTLIB_EN
```

Requires: ATCA\_HOSTLIB\_EN

Enable ATCAC\_VERIFY\_EN to use the host's verify functions. Generally assumed to come from the host's cryptographic library or peripheral driver.

**10.12.2.57 DEFAULT\_DISABLED**

```
#define DEFAULT_DISABLED FEATURE_DISABLED
```

**10.12.2.58 DEFAULT\_ENABLED**

```
#define DEFAULT_ENABLED FEATURE_ENABLED
```

## 10.13 atca\_crypto\_hw\_aes.h File Reference

---

### 10.12.2.59 FEATURE\_DISABLED

```
#define FEATURE_DISABLED (0)
```

### 10.12.2.60 FEATURE\_ENABLED

```
#define FEATURE_ENABLED (1)
```

## 10.13 atca\_crypto\_hw\_aes.h File Reference

AES CTR, CBC & CMAC structure definitions.

```
#include "cryptoauthlib.h"  
#include "crypto_config_check.h"
```

### 10.13.1 Detailed Description

AES CTR, CBC & CMAC structure definitions.

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## 10.14 atca\_crypto\_hw\_aes\_cbc.c File Reference

CryptoAuthLib Basic API methods for AES CBC mode.

```
#include "cryptoauthlib.h"  
#include "atca_crypto_hw_aes.h"
```

### 10.14.1 Detailed Description

CryptoAuthLib Basic API methods for AES CBC mode.

The AES command supports 128-bit AES encryption or decryption of small messages or data packets in ECB mode.

#### Note

List of devices that support this command - ATECC608A, ATECC608B, & TA100. Refer to device datasheet for full details.

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## 10.15 atca\_crypto\_hw\_aes\_cbcmac.c File Reference

CryptoAuthLib Basic API methods for AES CBC\_MAC mode.

```
#include "cryptoauthlib.h"
#include "crypto_config_check.h"
```

### 10.15.1 Detailed Description

CryptoAuthLib Basic API methods for AES CBC\_MAC mode.

The AES command supports 128-bit AES encryption or decryption of small messages or data packets in ECB mode. Also can perform GFM (Galois Field Multiply) calculation in support of AES-GCM.

#### Note

List of devices that support this command - ATECC608A. Refer to device datasheet for full details.

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## 10.16 atca\_crypto\_hw\_aes\_ccm.c File Reference

CryptoAuthLib Basic API methods for AES CCM mode.

```
#include "cryptoauthlib.h"
```

### 10.16.1 Detailed Description

CryptoAuthLib Basic API methods for AES CCM mode.

The AES command supports 128-bit AES encryption or decryption of small messages or data packets in ECB mode. CCM mode provides security and authenticity to the message being processed.

#### Note

List of devices that support this command - ATECC608A. Refer to device datasheet for full details.

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## 10.17 atca\_crypto\_hw\_aes\_cmac.c File Reference

CryptoAuthLib Basic API methods for AES CBC\_MAC mode.

```
#include "cryptoauthlib.h"
#include "atca_crypto_hw_aes.h"
```

### 10.17.1 Detailed Description

CryptoAuthLib Basic API methods for AES CBC\_MAC mode.

The AES command supports 128-bit AES encryption or decryption of small messages or data packets in ECB mode.

#### Note

List of devices that support this command - ATECC608A, ATECC608B, & TA100. Refer to device datasheet for full details.

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## 10.18 atca\_crypto\_hw\_aes\_ctr.c File Reference

CryptoAuthLib Basic API methods for AES CTR mode.

```
#include "cryptoauthlib.h"
#include "atca_crypto_hw_aes.h"
```

### 10.18.1 Detailed Description

CryptoAuthLib Basic API methods for AES CTR mode.

The AES command supports 128-bit AES encryption or decryption of small messages or data packets in ECB mode.

#### Note

List of devices that support this command - ATECC608A, ATECC608B, & TA100. Refer to device datasheet for full details.

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## 10.19 atca\_crypto\_pad.c File Reference

Implementation of PKCS7 Padding for block encryption.

```
#include "cryptoauthlib.h"
#include "atca_crypto_sw.h"
```

### 10.19.1 Detailed Description

Implementation of PKCS7 Padding for block encryption.

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## 10.20 atca\_crypto\_pbkdf2.c File Reference

Implementation of the PBKDF2 algorithm for use in generating password hashes.

```
#include "cryptoauthlib.h"
```

### 10.20.1 Detailed Description

Implementation of the PBKDF2 algorithm for use in generating password hashes.

#### Copyright

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## 10.21 atca\_crypto\_sw.h File Reference

Common defines for CryptoAuthLib software crypto wrappers.

```
#include <stdint.h>
#include <stdlib.h>
#include "crypto/crypto_config_check.h"
#include "atca_status.h"
#include "mbedtls/config.h"
#include <mbedtls/cipher.h>
#include <mbedtls/md.h>
#include <mbedtls/pk.h>
```

## Macros

- #define [ATCA\\_SHA1\\_DIGEST\\_SIZE](#) (20)
- #define [ATCA\\_SHA2\\_256\\_DIGEST\\_SIZE](#) (32)
- #define [ATCA\\_SHA2\\_256\\_BLOCK\\_SIZE](#) (64)
- #define [MBEDTLS\\_CMAC\\_C](#)

## Typedefs

- typedef mbedtls\_cipher\_context\_t [atcac\\_aes\\_cmac\\_ctx](#)
- typedef mbedtls\_md\_context\_t [atcac\\_hmac\\_sha256\\_ctx](#)
- typedef mbedtls\_cipher\_context\_t [atcac\\_aes\\_gcm\\_ctx](#)
- typedef mbedtls\_md\_context\_t [atcac\\_sha1\\_ctx](#)
- typedef mbedtls\_md\_context\_t [atcac\\_sha2\\_256\\_ctx](#)
- typedef mbedtls\_pk\_context [atcac\\_pk\\_ctx](#)

## Functions

- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_encrypt\\_start](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, const uint8\_t \*key, const uint8\_t key\_len, const uint8\_t \*iv, const uint8\_t iv\_len)  
*Initialize an AES-GCM context.*
- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_decrypt\\_start](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, const uint8\_t \*key, const uint8\_t key\_len, const uint8\_t \*iv, const uint8\_t iv\_len)  
*Initialize an AES-GCM context for decryption.*
- [ATCA\\_STATUS atcac\\_aes\\_cmac\\_init](#) ([atcac\\_aes\\_cmac\\_ctx](#) \*ctx, const uint8\_t \*key, const uint8\_t key\_len)  
*Initialize context for performing CMAC in software.*
- [ATCA\\_STATUS atcac\\_aes\\_cmac\\_update](#) ([atcac\\_aes\\_cmac\\_ctx](#) \*ctx, const uint8\_t \*data, const size\_t data\_size)  
*Update CMAC context with input data.*
- [ATCA\\_STATUS atcac\\_aes\\_cmac\\_finish](#) ([atcac\\_aes\\_cmac\\_ctx](#) \*ctx, uint8\_t \*cmac, size\_t \*cmac\_size)  
*Finish CMAC calculation and clear the CMAC context.*
- [ATCA\\_STATUS atcac\\_pk\\_init](#) ([atcac\\_pk\\_ctx](#) \*ctx, const uint8\_t \*buf, size\_t buflen, uint8\_t key\_type, bool pubkey)  
*Set up a public/private key structure for use in asymmetric cryptographic functions.*
- [ATCA\\_STATUS atcac\\_pk\\_init\\_pem](#) ([atcac\\_pk\\_ctx](#) \*ctx, const uint8\_t \*buf, size\_t buflen, bool pubkey)  
*Set up a public/private key structure for use in asymmetric cryptographic functions.*
- [ATCA\\_STATUS atcac\\_pk\\_free](#) ([atcac\\_pk\\_ctx](#) \*ctx)  
*Free a public/private key structure.*
- [ATCA\\_STATUS atcac\\_pk\\_public](#) ([atcac\\_pk\\_ctx](#) \*ctx, uint8\_t \*buf, size\_t \*buflen)  
*Get the public key from the context.*
- [ATCA\\_STATUS atcac\\_pk\\_sign](#) ([atcac\\_pk\\_ctx](#) \*ctx, const uint8\_t \*digest, size\_t dig\_len, uint8\_t \*signature, size\_t \*sig\_len)  
*Perform a signature with the private key in the context.*
- [ATCA\\_STATUS atcac\\_pk\\_verify](#) ([atcac\\_pk\\_ctx](#) \*ctx, const uint8\_t \*digest, size\_t dig\_len, const uint8\_t \*signature, size\_t sig\_len)  
*Perform a verify using the public key in the provided context.*
- [ATCA\\_STATUS atcac\\_pk\\_derive](#) ([atcac\\_pk\\_ctx](#) \*private\_ctx, [atcac\\_pk\\_ctx](#) \*public\_ctx, uint8\_t \*buf, size\_t \*buflen)  
*Execute the key agreement protocol for the provided keys (if they can)*
- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_aad\\_update](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, const uint8\_t \*aad, const size\_t aad\_len)



*Update the GCM context with additional authentication data (AAD)*

- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_encrypt\\_update](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, const uint8\_t \*plaintext, const size\_t pt\_len, uint8\_t \*ciphertext, size\_t \*ct\_len)

*Encrypt a data using the initialized context.*

- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_encrypt\\_finish](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, uint8\_t \*tag, size\_t tag\_len)

*Get the AES-GCM tag and free the context.*

- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_decrypt\\_update](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, const uint8\_t \*ciphertext, const size\_t ct\_len, uint8\_t \*plaintext, size\_t \*pt\_len)

*Decrypt ciphertext using the initialized context.*

- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_decrypt\\_finish](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, const uint8\_t \*tag, size\_t tag\_len, bool \*is\_verified)

*Compare the AES-GCM tag and free the context.*

- [ATCA\\_STATUS atcac\\_pbkdf2\\_sha256](#) (const uint32\_t iter, const uint8\_t \*password, const size\_t password\_len, const uint8\_t \*salt, const size\_t salt\_len, uint8\_t \*result, size\_t result\_len)
- [ATCA\\_STATUS atcac\\_pkcs7\\_pad](#) (uint8\_t \*buffer, size\_t \*buflen, const size\_t datalen, uint8\_t blocksize)
- [ATCA\\_STATUS atcac\\_pkcs7\\_unpad](#) (uint8\_t \*buffer, size\_t \*buflen, const uint8\_t blocksize)

## 10.21.1 Detailed Description

Common defines for CryptoAuthLib software crypto wrappers.

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## 10.21.2 Macro Definition Documentation

### 10.21.2.1 ATCA\_SHA1\_DIGEST\_SIZE

```
#define ATCA_SHA1_DIGEST_SIZE (20)
```

### 10.21.2.2 ATCA\_SHA2\_256\_BLOCK\_SIZE

```
#define ATCA_SHA2_256_BLOCK_SIZE (64)
```

### 10.21.2.3 ATCA\_SHA2\_256\_DIGEST\_SIZE

```
#define ATCA_SHA2_256_DIGEST_SIZE (32)
```

### 10.21.2.4 MBEDTLS\_CMAC\_C

```
#define MBEDTLS_CMAC_C
```

## 10.21.3 Typedef Documentation

### 10.21.3.1 atcac\_aes\_cmac\_ctx

```
typedef mbedtls_cipher_context_t atcac\_aes\_cmac\_ctx
```

### 10.21.3.2 atcac\_aes\_gcm\_ctx

```
typedef mbedtls_cipher_context_t atcac\_aes\_gcm\_ctx
```

### 10.21.3.3 atcac\_hmac\_sha256\_ctx

```
typedef mbedtls_md_context_t atcac\_hmac\_sha256\_ctx
```

### 10.21.3.4 atcac\_pk\_ctx

```
typedef mbedtls_pk_context atcac\_pk\_ctx
```

### 10.21.3.5 atcac\_sha1\_ctx

```
typedef mbedtls_md_context_t atcac\_sha1\_ctx
```

### 10.21.3.6 atcac\_sha2\_256\_ctx

```
typedef mbedtls_md_context_t atcac\_sha2\_256\_ctx
```

## 10.21.4 Function Documentation

### 10.21.4.1 `atcac_aes_cmac_finish()`

```
ATCA_STATUS atcac_aes_cmac_finish (
    atcac_aes_cmac_ctx * ctx,
    uint8_t * cmac,
    size_t * cmac_size )
```

Finish CMAC calculation and clear the CMAC context.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	pointer to a aes-cmac context
out	<i>cmac</i>	cmac value
in, out	<i>cmac_size</i>	length of cmac

### 10.21.4.2 `atcac_aes_cmac_init()`

```
ATCA_STATUS atcac_aes_cmac_init (
    atcac_aes_cmac_ctx * ctx,
    const uint8_t * key,
    const uint8_t key_len )
```

Initialize context for performing CMAC in software.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	pointer to a aes-cmac context
in	<i>key</i>	key value to use
in	<i>key_len</i>	length of the key

### 10.21.4.3 atcac\_aes\_cmac\_update()

```
ATCA_STATUS atcac_aes_cmac_update (
    atcac_aes_cmac_ctx * ctx,
    const uint8_t * data,
    const size_t data_size )
```

Update CMAC context with input data.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	pointer to a aes-cmac context
in	<i>data</i>	input data
in	<i>data_size</i>	length of input data

### 10.21.4.4 atcac\_aes\_gcm\_aad\_update()

```
ATCA_STATUS atcac_aes_gcm_aad_update (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * aad,
    const size_t aad_len )
```

Update the GCM context with additional authentication data (AAD)

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	AES-GCM Context
in	<i>aad</i>	Additional Authentication Data
in	<i>aad_len</i>	Length of AAD

### 10.21.4.5 atcac\_aes\_gcm\_decrypt\_finish()

```
ATCA_STATUS atcac_aes_gcm_decrypt_finish (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * tag,
    size_t tag_len,
    bool * is_verified )
```

Compare the AES-GCM tag and free the context.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>ctx</i>	AES-GCM Context
in	<i>tag</i>	GCM Tag to Verify
in	<i>tag_len</i>	Length of the GCM tag
out	<i>is_verified</i>	Tag verified as matching

**10.21.4.6 atcac\_aes\_gcm\_decrypt\_start()**

```
ATCA_STATUS atcac_aes_gcm_decrypt_start (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * key,
    const uint8_t key_len,
    const uint8_t * iv,
    const uint8_t iv_len )
```

Initialize an AES-GCM context for decryption.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>ctx</i>	AES-GCM Context
in	<i>key</i>	AES Key
in	<i>key_len</i>	Length of the AES key - should be 16 or 32
in	<i>iv</i>	Initialization vector input
in	<i>iv_len</i>	Length of the initialization vector

**10.21.4.7 atcac\_aes\_gcm\_decrypt\_update()**

```
ATCA_STATUS atcac_aes_gcm_decrypt_update (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * ciphertext,
    const size_t ct_len,
    uint8_t * plaintext,
    size_t * pt_len )
```

Decrypt ciphertext using the initialized context.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	AES-GCM Context
in	<i>ciphertext</i>	Ciphertext to decrypt
in	<i>ct_len</i>	Length of the ciphertext
out	<i>plaintext</i>	Resulting decrypted plaintext
in, out	<i>pt_len</i>	Length of the plaintext buffer

**10.21.4.8 atcac\_aes\_gcm\_encrypt\_finish()**

```
ATCA_STATUS atcac_aes_gcm_encrypt_finish (
    atcac_aes_gcm_ctx * ctx,
    uint8_t * tag,
    size_t tag_len )
```

Get the AES-GCM tag and free the context.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	AES-GCM Context
out	<i>tag</i>	GCM Tag Result
in	<i>tag_len</i>	Length of the GCM tag

**10.21.4.9 atcac\_aes\_gcm\_encrypt\_start()**

```
ATCA_STATUS atcac_aes_gcm_encrypt_start (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * key,
    const uint8_t key_len,
    const uint8_t * iv,
    const uint8_t iv_len )
```

Initialize an AES-GCM context.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	AES-GCM Context
in	<i>key</i>	AES Key
in	<i>key_len</i>	Length of the AES key - should be 16 or 32
in	<i>iv</i>	Initialization vector input
in	<i>iv_len</i>	Length of the initialization vector

#### 10.21.4.10 atcac\_aes\_gcm\_encrypt\_update()

```
ATCA_STATUS atcac_aes_gcm_encrypt_update (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * plaintext,
    const size_t pt_len,
    uint8_t * ciphertext,
    size_t * ct_len )
```

Encrypt a data using the initialized context.

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

##### Parameters

in	<i>ctx</i>	AES-GCM Context
in	<i>plaintext</i>	Input buffer to encrypt
in	<i>pt_len</i>	Length of the input
out	<i>ciphertext</i>	Output buffer
in, out	<i>ct_len</i>	Length of the ciphertext buffer

#### 10.21.4.11 atcac\_pbkdf2\_sha256()

```
ATCA_STATUS atcac_pbkdf2_sha256 (
    const uint32_t iter,
    const uint8_t * password,
    const size_t password_len,
    const uint8_t * salt,
    const size_t salt_len,
    uint8_t * result,
    size_t result_len )
```

#### 10.21.4.12 atcac\_pk\_derive()

```
ATCA_STATUS atcac_pk_derive (
    atcac_pk_ctx * private_ctx,
    atcac_pk_ctx * public_ctx,
    uint8_t * buf,
    size_t * buflen )
```

Execute the key agreement protocol for the provided keys (if they can)

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.21.4.13 atcac\_pk\_free()

```
ATCA_STATUS atcac_pk_free (
    atcac_pk_ctx * ctx )
```

Free a public/private key structure.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	pointer to a pk context
----	------------	-------------------------

### 10.21.4.14 atcac\_pk\_init()

```
ATCA_STATUS atcac_pk_init (
    atcac_pk_ctx * ctx,
    const uint8_t * buf,
    size_t buflen,
    uint8_t key_type,
    bool pubkey )
```

Set up a public/private key structure for use in asymmetric cryptographic functions.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	pointer to a pk context
in	<i>buf</i>	buffer containing a pem encoded key
in	<i>buflen</i>	length of the input buffer
in	<i>pubkey</i>	buffer is a public key

### 10.21.4.15 atcac\_pk\_init\_pem()

```
ATCA_STATUS atcac_pk_init_pem (
    atcac_pk_ctx * ctx,
    const uint8_t * buf,
    size_t buflen,
    bool pubkey )
```

Set up a public/private key structure for use in asymmetric cryptographic functions.



**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>ctx</i>	pointer to a pk context
in	<i>buf</i>	buffer containing a pem encoded key
in	<i>buflen</i>	length of the input buffer
in	<i>pubkey</i>	buffer is a public key

**10.21.4.16 atcac\_pk\_public()**

```
ATCA_STATUS atcac_pk_public (
    atcac_pk_ctx * ctx,
    uint8_t * buf,
    size_t * buflen )
```

Get the public key from the context.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.21.4.17 atcac\_pk\_sign()**

```
ATCA_STATUS atcac_pk_sign (
    atcac_pk_ctx * ctx,
    const uint8_t * digest,
    size_t dig_len,
    uint8_t * signature,
    size_t * sig_len )
```

Perform a signature with the private key in the context.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

### 10.21.4.18 atcac\_pk\_verify()

```
ATCA_STATUS atcac_pk_verify (
    atcac_pk_ctx * ctx,
    const uint8_t * digest,
    size_t dig_len,
    const uint8_t * signature,
    size_t sig_len )
```

Perform a verify using the public key in the provided context.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.21.4.19 atcac\_pkcs7\_pad()

```
ATCA_STATUS atcac_pkcs7_pad (
    uint8_t * buffer,
    size_t * buflen,
    const size_t datalen,
    uint8_t blocksize )
```

### 10.21.4.20 atcac\_pkcs7\_unpad()

```
ATCA_STATUS atcac_pkcs7_unpad (
    uint8_t * buffer,
    size_t * buflen,
    const uint8_t blocksize )
```

## 10.22 atca\_crypto\_sw\_sha1.c File Reference

Wrapper API for SHA 1 routines.

```
#include "atca_crypto_sw_sha1.h"
#include "hashes/sha1_routines.h"
#include "cryptoauthlib.h"
```

### 10.22.1 Detailed Description

Wrapper API for SHA 1 routines.

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## 10.23 atca\_crypto\_sw\_sha1.h File Reference

Wrapper API for SHA 1 routines.

```
#include "atca_crypto_sw.h"  
#include <stddef.h>  
#include <stdint.h>
```

### Functions

- int [atcac\\_sw\\_sha1\\_init](#) ([atcac\\_sha1\\_ctx](#) \*ctx)  
*Initialize context for performing SHA1 hash in software.*
- int [atcac\\_sw\\_sha1\\_update](#) ([atcac\\_sha1\\_ctx](#) \*ctx, const uint8\_t \*data, size\_t data\_size)  
*Add data to a SHA1 hash.*
- int [atcac\\_sw\\_sha1\\_finish](#) ([atcac\\_sha1\\_ctx](#) \*ctx, uint8\_t digest[(20)])
- int [atcac\\_sw\\_sha1](#) (const uint8\_t \*data, size\_t data\_size, uint8\_t digest[(20)])

### 10.23.1 Detailed Description

Wrapper API for SHA 1 routines.

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## 10.24 atca\_crypto\_sw\_sha2.c File Reference

Wrapper API for software SHA 256 routines.

```
#include "cryptoauthlib.h"  
#include "atca_crypto_sw_sha2.h"  
#include "hashes/sha2_routines.h"
```

### 10.24.1 Detailed Description

Wrapper API for software SHA 256 routines.

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## 10.25 atca\_crypto\_sw\_sha2.h File Reference

Wrapper API for software SHA 256 routines.

```
#include "atca_crypto_sw.h"
#include <stddef.h>
#include <stdint.h>
```

### Functions

- int [atcac\\_sw\\_sha2\\_256\\_init](#) ([atcac\\_sha2\\_256\\_ctx](#) \*ctx)  
*Initialize context for performing SHA256 hash in software.*
- int [atcac\\_sw\\_sha2\\_256\\_update](#) ([atcac\\_sha2\\_256\\_ctx](#) \*ctx, const uint8\_t \*data, size\_t data\_size)  
*Add data to a SHA256 hash.*
- int [atcac\\_sw\\_sha2\\_256\\_finish](#) ([atcac\\_sha2\\_256\\_ctx](#) \*ctx, uint8\_t digest[(32)])
- int [atcac\\_sw\\_sha2\\_256](#) (const uint8\_t \*data, size\_t data\_size, uint8\_t digest[(32)])
- [ATCA\\_STATUS](#) [atcac\\_sha256\\_hmac\\_init](#) ([atcac\\_hmac\\_sha256\\_ctx](#) \*ctx, const uint8\_t \*key, const uint8\_t key\_len)  
*Initialize context for performing HMAC (sha256) in software.*
- [ATCA\\_STATUS](#) [atcac\\_sha256\\_hmac\\_update](#) ([atcac\\_hmac\\_sha256\\_ctx](#) \*ctx, const uint8\_t \*data, size\_t data\_size)  
*Update HMAC context with input data.*
- [ATCA\\_STATUS](#) [atcac\\_sha256\\_hmac\\_finish](#) ([atcac\\_hmac\\_sha256\\_ctx](#) \*ctx, uint8\_t \*digest, size\_t \*digest\_len)  
*Finish CMAC calculation and clear the HMAC context.*
- [ATCA\\_STATUS](#) [atcac\\_sha256\\_hmac\\_counter](#) ([atcac\\_hmac\\_sha256\\_ctx](#) \*ctx, uint8\_t \*label, size\_t label\_len, uint8\_t \*data, size\_t data\_len, uint8\_t \*digest, size\_t diglen)

### 10.25.1 Detailed Description

Wrapper API for software SHA 256 routines.

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## 10.26 atca\_debug.c File Reference

Debug/Trace for CryptoAuthLib calls.

```
#include <cryptoauthlib.h>
```

### Functions

- void [atca\\_trace\\_config](#) (FILE \*fp)
- [ATCA\\_STATUS](#) [atca\\_trace](#) ([ATCA\\_STATUS](#) status)
- [ATCA\\_STATUS](#) [atca\\_trace\\_msg](#) ([ATCA\\_STATUS](#) status, const char \*msg)

## Variables

- FILE \* `g_trace_fp`

### 10.26.1 Detailed Description

Debug/Trace for CryptoAuthLib calls.

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### 10.26.2 Function Documentation

#### 10.26.2.1 `atca_trace()`

```
ATCA_STATUS atca_trace (
    ATCA_STATUS status )
```

#### 10.26.2.2 `atca_trace_config()`

```
void atca_trace_config (
    FILE * fp )
```

#### 10.26.2.3 `atca_trace_msg()`

```
ATCA_STATUS atca_trace_msg (
    ATCA_STATUS status,
    const char * msg )
```

### 10.26.3 Variable Documentation

#### 10.26.3.1 `g_trace_fp`

```
FILE* g_trace_fp
```

## 10.27 atca\_debug.h File Reference

```
#include "atca_status.h"
```

### Functions

- void [atca\\_trace\\_config](#) (FILE \*fp)
- [ATCA\\_STATUS](#) [atca\\_trace](#) ([ATCA\\_STATUS](#) status)
- [ATCA\\_STATUS](#) [atca\\_trace\\_msg](#) ([ATCA\\_STATUS](#) status, const char \*msg)

### 10.27.1 Function Documentation

#### 10.27.1.1 atca\_trace()

```
ATCA\_STATUS atca_trace (  
    ATCA\_STATUS status )
```

#### 10.27.1.2 atca\_trace\_config()

```
void atca_trace_config (  
    FILE * fp )
```

#### 10.27.1.3 atca\_trace\_msg()

```
ATCA\_STATUS atca_trace_msg (  
    ATCA\_STATUS status,  
    const char * msg )
```

## 10.28 atca\_device.c File Reference

Microchip CryptoAuth device object.

```
#include <cryptoauthlib.h>
```

## Functions

- [ATCADevice newATCADevice \(ATCAIfaceCfg \\*cfg\)](#)  
*constructor for a Microchip CryptoAuth device*
- void [deleteATCADevice \(ATCADevice \\*ca\\_dev\)](#)  
*destructor for a device NULLs reference after object is freed*
- [ATCA\\_STATUS initATCADevice \(ATCAIfaceCfg \\*cfg, ATCADevice ca\\_dev\)](#)  
*Initializer for an Microchip CryptoAuth device.*
- [ATCAIface atGetIFace \(ATCADevice dev\)](#)  
*returns a reference to the ATCAIface interface object for the device*
- [ATCA\\_STATUS releaseATCADevice \(ATCADevice ca\\_dev\)](#)  
*Release any resources associated with the device.*

### 10.28.1 Detailed Description

Microchip CryptoAuth device object.

#### Copyright

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## 10.29 atca\_device.h File Reference

Microchip Crypto Auth device object.

```
#include "atca_iface.h"
```

## Data Structures

- struct [\\_atsha204a\\_config](#)
- struct [\\_atecc508a\\_config](#)
- struct [\\_atecc608\\_config](#)
- struct [atca\\_device](#)

[atca\\_device](#) is the C object backing ATCADevice. See the [atca\\_device.h](#) file for details on the ATCADevice methods

## Macros

- [#define ATCA\\_PACKED](#)
- [#define ATCA\\_AES\\_ENABLE\\_EN\\_SHIFT \(0\)](#)
- [#define ATCA\\_AES\\_ENABLE\\_EN\\_MASK \(0x01u << ATCA\\_AES\\_ENABLE\\_EN\\_SHIFT\)](#)
- [#define ATCA\\_I2C\\_ENABLE\\_EN\\_SHIFT \(0\)](#)
- [#define ATCA\\_I2C\\_ENABLE\\_EN\\_MASK \(0x01u << ATCA\\_I2C\\_ENABLE\\_EN\\_SHIFT\)](#)
- [#define ATCA\\_COUNTER\\_MATCH\\_EN\\_SHIFT \(0\)](#)
- [#define ATCA\\_COUNTER\\_MATCH\\_EN\\_MASK \(0x01u << ATCA\\_COUNTER\\_MATCH\\_EN\\_SHIFT\)](#)
- [#define ATCA\\_COUNTER\\_MATCH\\_KEY\\_SHIFT \(4\)](#)
- [#define ATCA\\_COUNTER\\_MATCH\\_KEY\\_MASK \(0x0Fu << ATCA\\_COUNTER\\_MATCH\\_KEY\\_SHIFT\)](#)
- [#define ATCA\\_COUNTER\\_MATCH\\_KEY\(v\) \(ATCA\\_COUNTER\\_MATCH\\_KEY\\_MASK & \(v << ATCA\\_COUNTER\\_MATCH\\_KEY\\_SHIFT\)\)](#)

- `#define ATCA_CHIP_MODE_I2C_EXTRA_SHIFT (0)`
- `#define ATCA_CHIP_MODE_I2C_EXTRA_MASK (0x01u << ATCA_CHIP_MODE_I2C_EXTRA_SHIFT)`
- `#define ATCA_CHIP_MODE_TTL_EN_SHIFT (1)`
- `#define ATCA_CHIP_MODE_TTL_EN_MASK (0x01u << ATCA_CHIP_MODE_TTL_EN_SHIFT)`
- `#define ATCA_CHIP_MODE_WDG_LONG_SHIFT (2)`
- `#define ATCA_CHIP_MODE_WDG_LONG_MASK (0x01u << ATCA_CHIP_MODE_WDG_LONG_SHIFT)`
- `#define ATCA_CHIP_MODE_CLK_DIV_SHIFT (3)`
- `#define ATCA_CHIP_MODE_CLK_DIV_MASK (0x1Fu << ATCA_CHIP_MODE_CLK_DIV_SHIFT)`
- `#define ATCA_CHIP_MODE_CLK_DIV(v) (ATCA_CHIP_MODE_CLK_DIV_MASK & (v << ATCA_CHIP_MODE_CLK_DIV_SHIFT))`
- `#define ATCA_SLOT_CONFIG_READKEY_SHIFT (0)`
- `#define ATCA_SLOT_CONFIG_READKEY_MASK (0x0Fu << ATCA_SLOT_CONFIG_READKEY_SHIFT)`
- `#define ATCA_SLOT_CONFIG_READKEY(v) (ATCA_SLOT_CONFIG_READKEY_MASK & (v << ATCA_SLOT_CONFIG_READKEY_SHIFT))`
- `#define ATCA_SLOT_CONFIG_NOMAC_SHIFT (4)`
- `#define ATCA_SLOT_CONFIG_NOMAC_MASK (0x01u << ATCA_SLOT_CONFIG_NOMAC_SHIFT)`
- `#define ATCA_SLOT_CONFIG_LIMITED_USE_SHIFT (5)`
- `#define ATCA_SLOT_CONFIG_LIMITED_USE_MASK (0x01u << ATCA_SLOT_CONFIG_LIMITED_USE_SHIFT)`
- `#define ATCA_SLOT_CONFIG_ENCRYPTED_READ_SHIFT (6)`
- `#define ATCA_SLOT_CONFIG_ENCRYPTED_READ_MASK (0x01u << ATCA_SLOT_CONFIG_ENCRYPTED_READ_SHIFT)`
- `#define ATCA_SLOT_CONFIG_IS_SECRET_SHIFT (7)`
- `#define ATCA_SLOT_CONFIG_IS_SECRET_MASK (0x01u << ATCA_SLOT_CONFIG_IS_SECRET_SHIFT)`
- `#define ATCA_SLOT_CONFIG_WRITE_KEY_SHIFT (8)`
- `#define ATCA_SLOT_CONFIG_WRITE_KEY_MASK (0x0Fu << ATCA_SLOT_CONFIG_WRITE_KEY_SHIFT)`
- `#define ATCA_SLOT_CONFIG_WRITE_KEY(v) (ATCA_SLOT_CONFIG_WRITE_KEY_MASK & (v << ATCA_SLOT_CONFIG_WRITE_KEY_SHIFT))`
- `#define ATCA_SLOT_CONFIG_WRITE_CONFIG_SHIFT (12)`
- `#define ATCA_SLOT_CONFIG_WRITE_CONFIG_MASK (0x0Fu << ATCA_SLOT_CONFIG_WRITE_CONFIG_SHIFT)`
- `#define ATCA_SLOT_CONFIG_WRITE_CONFIG(v) (ATCA_SLOT_CONFIG_WRITE_CONFIG_MASK & (v << ATCA_SLOT_CONFIG_WRITE_CONFIG_SHIFT))`
- `#define ATCA_SLOT_CONFIG_EXT_SIG_SHIFT (0)`
- `#define ATCA_SLOT_CONFIG_EXT_SIG_MASK (0x01u << ATCA_SLOT_CONFIG_EXT_SIG_SHIFT)`
- `#define ATCA_SLOT_CONFIG_INT_SIG_SHIFT (1)`
- `#define ATCA_SLOT_CONFIG_INT_SIG_MASK (0x01u << ATCA_SLOT_CONFIG_INT_SIG_SHIFT)`
- `#define ATCA_SLOT_CONFIG_ECDH_SHIFT (2)`
- `#define ATCA_SLOT_CONFIG_ECDH_MASK (0x01u << ATCA_SLOT_CONFIG_ECDH_SHIFT)`
- `#define ATCA_SLOT_CONFIG_WRITE_ECDH_SHIFT (3)`
- `#define ATCA_SLOT_CONFIG_WRITE_ECDH_MASK (0x01u << ATCA_SLOT_CONFIG_WRITE_ECDH_SHIFT)`
- `#define ATCA_SLOT_CONFIG_GEN_KEY_SHIFT (8)`
- `#define ATCA_SLOT_CONFIG_GEN_KEY_MASK (0x01u << ATCA_SLOT_CONFIG_GEN_KEY_SHIFT)`
- `#define ATCA_SLOT_CONFIG_PRIV_WRITE_SHIFT (9)`
- `#define ATCA_SLOT_CONFIG_PRIV_WRITE_MASK (0x01u << ATCA_SLOT_CONFIG_PRIV_WRITE_SHIFT)`
- `#define ATCA_USE_LOCK_ENABLE_SHIFT (0)`
- `#define ATCA_USE_LOCK_ENABLE_MASK (0x0Fu << ATCA_USE_LOCK_ENABLE_SHIFT)`
- `#define ATCA_USE_LOCK_KEY_SHIFT (4)`
- `#define ATCA_USE_LOCK_KEY_MASK (0x0Fu << ATCA_USE_LOCK_KEY_SHIFT)`
- `#define ATCA_VOL_KEY_PERM_SLOT_SHIFT (0)`
- `#define ATCA_VOL_KEY_PERM_SLOT_MASK (0x0Fu << ATCA_VOL_KEY_PERM_SLOT_SHIFT)`
- `#define ATCA_VOL_KEY_PERM_SLOT(v) (ATCA_VOL_KEY_PERM_SLOT_MASK & (v << ATCA_VOL_KEY_PERM_SLOT_SHIFT))`
- `#define ATCA_VOL_KEY_PERM_EN_SHIFT (7)`
- `#define ATCA_VOL_KEY_PERM_EN_MASK (0x01u << ATCA_VOL_KEY_PERM_EN_SHIFT)`
- `#define ATCA_SECURE_BOOT_MODE_SHIFT (0)`
- `#define ATCA_SECURE_BOOT_MODE_MASK (0x03u << ATCA_SECURE_BOOT_MODE_SHIFT)`
- `#define ATCA_SECURE_BOOT_MODE(v) (ATCA_SECURE_BOOT_MODE_MASK & (v << ATCA_SECURE_BOOT_MODE_SHIFT))`
- `#define ATCA_SECURE_BOOT_PERSIST_EN_SHIFT (3)`
- `#define ATCA_SECURE_BOOT_PERSIST_EN_MASK (0x01u << ATCA_SECURE_BOOT_PERSIST_EN_SHIFT)`



- #define ATCA\_SECURE\_BOOT\_RAND\_NONCE\_SHIFT (4)
- #define ATCA\_SECURE\_BOOT\_RAND\_NONCE\_MASK (0x01u << ATCA\_SECURE\_BOOT\_RAND\_NONCE\_SHIFT)
- #define ATCA\_SECURE\_BOOT\_DIGEST\_SHIFT (8)
- #define ATCA\_SECURE\_BOOT\_DIGEST\_MASK (0x0Fu << ATCA\_SECURE\_BOOT\_DIGEST\_SHIFT)
- #define ATCA\_SECURE\_BOOT\_DIGEST(v) (ATCA\_SECURE\_BOOT\_DIGEST\_MASK & (v << ATCA\_SECURE\_BOOT\_DIGEST\_SHIFT))
- #define ATCA\_SECURE\_BOOT\_PUB\_KEY\_SHIFT (12)
- #define ATCA\_SECURE\_BOOT\_PUB\_KEY\_MASK (0x0Fu << ATCA\_SECURE\_BOOT\_PUB\_KEY\_SHIFT)
- #define ATCA\_SECURE\_BOOT\_PUB\_KEY(v) (ATCA\_SECURE\_BOOT\_PUB\_KEY\_MASK & (v << ATCA\_SECURE\_BOOT\_PUB\_KEY\_SHIFT))
- #define ATCA\_SLOT\_LOCKED(v) ((0x01 << v) & 0xFFFFu)
- #define ATCA\_CHIP\_OPT\_POST\_EN\_SHIFT (0)
- #define ATCA\_CHIP\_OPT\_POST\_EN\_MASK (0x01u << ATCA\_CHIP\_OPT\_POST\_EN\_SHIFT)
- #define ATCA\_CHIP\_OPT\_IO\_PROT\_EN\_SHIFT (1)
- #define ATCA\_CHIP\_OPT\_IO\_PROT\_EN\_MASK (0x01u << ATCA\_CHIP\_OPT\_IO\_PROT\_EN\_SHIFT)
- #define ATCA\_CHIP\_OPT\_KDF\_AES\_EN\_SHIFT (2)
- #define ATCA\_CHIP\_OPT\_KDF\_AES\_EN\_MASK (0x01u << ATCA\_CHIP\_OPT\_KDF\_AES\_EN\_SHIFT)
- #define ATCA\_CHIP\_OPT\_ECDH\_PROT\_SHIFT (8)
- #define ATCA\_CHIP\_OPT\_ECDH\_PROT\_MASK (0x03u << ATCA\_CHIP\_OPT\_ECDH\_PROT\_SHIFT)
- #define ATCA\_CHIP\_OPT\_ECDH\_PROT(v) (ATCA\_CHIP\_OPT\_ECDH\_PROT\_MASK & (v << ATCA\_CHIP\_OPT\_ECDH\_PROT\_SHIFT))
- #define ATCA\_CHIP\_OPT\_KDF\_PROT\_SHIFT (10)
- #define ATCA\_CHIP\_OPT\_KDF\_PROT\_MASK (0x03u << ATCA\_CHIP\_OPT\_KDF\_PROT\_SHIFT)
- #define ATCA\_CHIP\_OPT\_KDF\_PROT(v) (ATCA\_CHIP\_OPT\_KDF\_PROT\_MASK & (v << ATCA\_CHIP\_OPT\_KDF\_PROT\_SHIFT))
- #define ATCA\_CHIP\_OPT\_IO\_PROT\_KEY\_SHIFT (12)
- #define ATCA\_CHIP\_OPT\_IO\_PROT\_KEY\_MASK (0x0Fu << ATCA\_CHIP\_OPT\_IO\_PROT\_KEY\_SHIFT)
- #define ATCA\_CHIP\_OPT\_IO\_PROT\_KEY(v) (ATCA\_CHIP\_OPT\_IO\_PROT\_KEY\_MASK & (v << ATCA\_CHIP\_OPT\_IO\_PROT\_KEY\_SHIFT))
- #define ATCA\_KEY\_CONFIG\_OFFSET(x) (96UL + (x) \* 2)
- #define ATCA\_KEY\_CONFIG\_PRIVATE\_SHIFT (0)
- #define ATCA\_KEY\_CONFIG\_PRIVATE\_MASK (0x01u << ATCA\_KEY\_CONFIG\_PRIVATE\_SHIFT)
- #define ATCA\_KEY\_CONFIG\_PUB\_INFO\_SHIFT (1)
- #define ATCA\_KEY\_CONFIG\_PUB\_INFO\_MASK (0x01u << ATCA\_KEY\_CONFIG\_PUB\_INFO\_SHIFT)
- #define ATCA\_KEY\_CONFIG\_KEY\_TYPE\_SHIFT (2)
- #define ATCA\_KEY\_CONFIG\_KEY\_TYPE\_MASK (0x07u << ATCA\_KEY\_CONFIG\_KEY\_TYPE\_SHIFT)
- #define ATCA\_KEY\_CONFIG\_KEY\_TYPE(v) (ATCA\_KEY\_CONFIG\_KEY\_TYPE\_MASK & (v << ATCA\_KEY\_CONFIG\_KEY\_TYPE\_SHIFT))
- #define ATCA\_KEY\_CONFIG\_LOCKABLE\_SHIFT (5)
- #define ATCA\_KEY\_CONFIG\_LOCKABLE\_MASK (0x01u << ATCA\_KEY\_CONFIG\_LOCKABLE\_SHIFT)
- #define ATCA\_KEY\_CONFIG\_REQ\_RANDOM\_SHIFT (6)
- #define ATCA\_KEY\_CONFIG\_REQ\_RANDOM\_MASK (0x01u << ATCA\_KEY\_CONFIG\_REQ\_RANDOM\_SHIFT)
- #define ATCA\_KEY\_CONFIG\_REQ\_AUTH\_SHIFT (7)
- #define ATCA\_KEY\_CONFIG\_REQ\_AUTH\_MASK (0x01u << ATCA\_KEY\_CONFIG\_REQ\_AUTH\_SHIFT)
- #define ATCA\_KEY\_CONFIG\_AUTH\_KEY\_SHIFT (8)
- #define ATCA\_KEY\_CONFIG\_AUTH\_KEY\_MASK (0x0Fu << ATCA\_KEY\_CONFIG\_AUTH\_KEY\_SHIFT)
- #define ATCA\_KEY\_CONFIG\_AUTH\_KEY(v) (ATCA\_KEY\_CONFIG\_AUTH\_KEY\_MASK & (v << ATCA\_KEY\_CONFIG\_AUTH\_KEY\_SHIFT))
- #define ATCA\_KEY\_CONFIG\_PERSIST\_DISABLE\_SHIFT (12)
- #define ATCA\_KEY\_CONFIG\_PERSIST\_DISABLE\_MASK (0x01u << ATCA\_KEY\_CONFIG\_PERSIST\_DISABLE\_SHIFT)
- #define ATCA\_KEY\_CONFIG\_RFU\_SHIFT (13)
- #define ATCA\_KEY\_CONFIG\_RFU\_MASK (0x01u << ATCA\_KEY\_CONFIG\_RFU\_SHIFT)
- #define ATCA\_KEY\_CONFIG\_X509\_ID\_SHIFT (14)
- #define ATCA\_KEY\_CONFIG\_X509\_ID\_MASK (0x03u << ATCA\_KEY\_CONFIG\_X509\_ID\_SHIFT)
- #define ATCA\_KEY\_CONFIG\_X509\_ID(v) (ATCA\_KEY\_CONFIG\_X509\_ID\_MASK & (v << ATCA\_KEY\_CONFIG\_X509\_ID\_SHIFT))

### Typedefs

- typedef struct `_atsha204a_config` `atsha204a_config_t`
- typedef struct `_atecc508a_config` `atecc508a_config_t`
- typedef struct `_atecc608_config` `atecc608_config_t`
- typedef struct `atca_device` \* `ATCADevice`

### Enumerations

- enum `ATCADeviceState` { `ATCA_DEVICE_STATE_UNKNOWN` = 0, `ATCA_DEVICE_STATE_SLEEP`, `ATCA_DEVICE_STATE_IDLE`, `ATCA_DEVICE_STATE_ACTIVE` }

*ATCADeviceState says about device state.*

### Functions

- `ATCA_STATUS` `initATCADevice` (`ATCAIfaceCfg` \*`cfg`, `ATCADevice` `ca_dev`)  
*Initializer for an Microchip CryptoAuth device.*
- `ATCADevice` `newATCADevice` (`ATCAIfaceCfg` \*`cfg`)  
*constructor for a Microchip CryptoAuth device*
- `ATCA_STATUS` `releaseATCADevice` (`ATCADevice` `ca_dev`)  
*Release any resources associated with the device.*
- void `deleteATCADevice` (`ATCADevice` \*`ca_dev`)  
*destructor for a device NULLs reference after object is freed*
- `ATCAIface` `atGetIface` (`ATCADevice` `dev`)  
*returns a reference to the ATCAIface interface object for the device*

## 10.29.1 Detailed Description

Microchip Crypto Auth device object.

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## 10.30 atca\_devtypes.h File Reference

Microchip Crypto Auth.

### Enumerations

- enum `ATCADeviceType` {  
    `ATSHA204A` = 0, `ATECC108A` = 1, `ATECC508A` = 2, `ATECC608A` = 3,  
    `ATECC608B` = 3, `ATECC608` = 3, `ATSHA206A` = 4, `ECC204` = 5,  
    `ECC206` = 6, `TA010` = 7, `RNG90` = 8, `SHA104` = 9,  
    `SHA105` = 10, `SHA106` = 11, `TA100` = 0x10, `ATCA_DEV_UNKNOWN` = 0x20 }  
*The supported Device type in Cryptoauthlib library.*

### 10.30.1 Detailed Description

Microchip Crypto Auth.

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## 10.31 atca\_hal.c File Reference

low-level HAL - methods used to setup indirection to physical layer interface. this level does the dirty work of abstracting the higher level ATCAIFace methods from the low-level physical interfaces. Its main goal is to keep low-level details from bleeding into the logical interface implementation.

```
#include "cryptoauthlib.h"
#include "atca_hal.h"
```

### Data Structures

- struct [atca\\_hal\\_list\\_entry\\_t](#)  
*Structure that holds the hal/phy mapping for different interface types.*

### Macros

- #define [ATCA\\_MAX\\_HAL\\_CACHE](#)

### Functions

- [ATCA\\_STATUS hal\\_iface\\_register\\_hal](#) ([ATCAIFaceType](#) iface\_type, [ATCAHAL\\_t](#) \*hal, [ATCAHAL\\_t](#) \*\*old\_hal, [ATCAHAL\\_t](#) \*phy, [ATCAHAL\\_t](#) \*\*old\_phy)  
*Register/Replace a HAL with a.*
- [ATCA\\_STATUS hal\\_iface\\_init](#) ([ATCAIFaceCfg](#) \*cfg, [ATCAHAL\\_t](#) \*\*hal, [ATCAHAL\\_t](#) \*\*phy)  
*Standard HAL API for ATCA to initialize a physical interface.*
- [ATCA\\_STATUS hal\\_iface\\_release](#) ([ATCAIFaceType](#) iface\_type, void \*hal\_data)  
*releases a physical interface, HAL knows how to interpret hal\_data*
- [ATCA\\_STATUS hal\\_check\\_wake](#) (const uint8\_t \*response, int response\_size)  
*Utility function for hal\_wake to check the reply.*
- uint8\_t [hal\\_is\\_command\\_word](#) (uint8\_t word\_address)  
*Utility function for hal\_wake to check the reply.*

### 10.31.1 Detailed Description

low-level HAL - methods used to setup indirection to physical layer interface. this level does the dirty work of abstracting the higher level ATCAIFace methods from the low-level physical interfaces. Its main goal is to keep low-level details from bleeding into the logical interface implementation.

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### 10.31.2 Macro Definition Documentation

#### 10.31.2.1 ATCA\_MAX\_HAL\_CACHE

```
#define ATCA_MAX_HAL_CACHE
```

## 10.32 atca\_hal.h File Reference

low-level HAL - methods used to setup indirection to physical layer interface

```
#include <stdlib.h>
#include "atca_config.h"
#include "atca_status.h"
#include "atca_iface.h"
```

### Data Structures

- struct [atca\\_hal\\_kit\\_phy\\_t](#)

### Macros

- #define [ATCA\\_POLLING\\_INIT\\_TIME\\_MSEC](#) 1
- #define [ATCA\\_POLLING\\_FREQUENCY\\_TIME\\_MSEC](#) 2
- #define [ATCA\\_POLLING\\_MAX\\_TIME\\_MSEC](#) 2500

### Enumerations

- enum [ATCA\\_HAL\\_CONTROL](#) {  
    [ATCA\\_HAL\\_CONTROL\\_WAKE](#) = 0, [ATCA\\_HAL\\_CONTROL\\_IDLE](#) = 1, [ATCA\\_HAL\\_CONTROL\\_SLEEP](#) =  
    2, [ATCA\\_HAL\\_CONTROL\\_RESET](#) = 3,  
    [ATCA\\_HAL\\_CONTROL\\_SELECT](#) = 4, [ATCA\\_HAL\\_CONTROL\\_DESELECT](#) = 5, [ATCA\\_HAL\\_CHANGE\\_BAUD](#)  
    = 6, [ATCA\\_HAL\\_FLUSH\\_BUFFER](#) = 7,  
    [ATCA\\_HAL\\_CONTROL\\_DIRECTION](#) = 8 }

## Functions

- [ATCA\\_STATUS hal\\_iface\\_init](#) ([ATCAIfaceCfg](#) \*, [ATCAHAL\\_t](#) \*\*hal, [ATCAHAL\\_t](#) \*\*phy)  
*Standard HAL API for ATCA to initialize a physical interface.*
- [ATCA\\_STATUS hal\\_iface\\_release](#) ([ATCAIfaceType](#), void \*hal\_data)  
*releases a physical interface, HAL knows how to interpret hal\_data*
- [ATCA\\_STATUS hal\\_check\\_wake](#) (const uint8\_t \*response, int response\_size)  
*Utility function for hal\_wake to check the reply.*
- void [atca\\_delay\\_ms](#) (uint32\_t ms)  
*Timer API for legacy implementations.*
- void [atca\\_delay\\_us](#) (uint32\_t delay)  
*This function delays for a number of microseconds.*
- void [hal\\_rtos\\_delay\\_ms](#) (uint32\_t ms)  
*Timer API implemented at the HAL level.*
- void [hal\\_delay\\_ms](#) (uint32\_t delay)  
*This function delays for a number of milliseconds.*
- void [hal\\_delay\\_us](#) (uint32\_t delay)  
*This function delays for a number of microseconds.*
- [ATCA\\_STATUS hal\\_create\\_mutex](#) (void \*\*ppMutex, char \*pName)  
*Optional hal interfaces.*
- [ATCA\\_STATUS hal\\_destroy\\_mutex](#) (void \*pMutex)
- [ATCA\\_STATUS hal\\_lock\\_mutex](#) (void \*pMutex)
- [ATCA\\_STATUS hal\\_unlock\\_mutex](#) (void \*pMutex)
- [ATCA\\_STATUS hal\\_iface\\_register\\_hal](#) ([ATCAIfaceType](#) iface\_type, [ATCAHAL\\_t](#) \*hal, [ATCAHAL\\_t](#) \*\*old↵  
\_hal, [ATCAHAL\\_t](#) \*phy, [ATCAHAL\\_t](#) \*\*old\_phy)  
*Register/Replace a HAL with a.*
- uint8\_t [hal\\_is\\_command\\_word](#) (uint8\_t word\_address)  
*Utility function for hal\_wake to check the reply.*

### 10.32.1 Detailed Description

low-level HAL - methods used to setup indirection to physical layer interface

#### Copyright

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## 10.33 atca\_helpers.c File Reference

Helpers to support the CryptoAuthLib Basic API methods.

```
#include <stdlib.h>
#include <stdio.h>
#include <ctype.h>
#include <string.h>
#include "cryptoauthlib.h"
#include "atca_helpers.h"
```

## Macros

- `#define B64_IS_EQUAL (uint8_t)64`
- `#define B64_IS_INVALID (uint8_t)0xFF`

## Functions

- **ATCA\_STATUS atcab\_bin2hex** (const uint8\_t \*bin, size\_t bin\_size, char \*hex, size\_t \*hex\_size)  
*Convert a binary buffer to a hex string for easy reading.*
- **ATCA\_STATUS atcab\_reversal** (const uint8\_t \*bin, size\_t bin\_size, uint8\_t \*dest, size\_t \*dest\_size)  
*To reverse the input data.*
- **ATCA\_STATUS atcab\_bin2hex\_** (const uint8\_t \*bin, size\_t bin\_size, char \*hex, size\_t \*hex\_size, bool is\_↵  
pretty, bool is\_space, bool is\_upper)  
*Function that converts a binary buffer to a hex string suitable for easy reading.*
- **ATCA\_STATUS atcab\_hex2bin\_** (const char \*hex, size\_t hex\_size, uint8\_t \*bin, size\_t \*bin\_size, bool is\_↵  
space)  
*Function that converts a hex string to binary buffer.*
- **ATCA\_STATUS atcab\_hex2bin** (const char \*hex, size\_t hex\_size, uint8\_t \*bin, size\_t \*bin\_size)  
*Function that converts a hex string to binary buffer.*
- bool **isDigit** (char c)  
*Checks to see if a character is an ASCII representation of a digit ((c >= '0') and (c <= '9'))*
- bool **isBlankSpace** (char c)  
*Checks to see if a character is blank space.*
- bool **isAlpha** (char c)  
*Checks to see if a character is an ASCII representation of hex ((c >= 'A') and (c <= 'F')) || ((c >= 'a') and (c <= 'f'))*
- bool **isHexAlpha** (char c)  
*Checks to see if a character is an ASCII representation of hex ((c >= 'A') and (c <= 'F')) || ((c >= 'a') and (c <= 'f'))*
- bool **isHex** (char c)  
*Returns true if this character is a valid hex character or if this is blankspace (The character can be included in a valid hexstring).*
- bool **isHexDigit** (char c)  
*Returns true if this character is a valid hex character.*
- **ATCA\_STATUS packHex** (const char \*ascii\_hex, size\_t ascii\_hex\_len, char \*packed\_hex, size\_t \*packed\_↵  
\_len)  
*Remove spaces from a ASCII hex string.*
- bool **isBase64** (char c, const uint8\_t \*rules)  
*Returns true if this character is a valid base 64 character or if this is space (A character can be included in a valid base 64 string).*
- bool **isBase64Digit** (char c, const uint8\_t \*rules)  
*Returns true if this character is a valid base 64 character.*
- uint8\_t **base64Index** (char c, const uint8\_t \*rules)  
*Returns the base 64 index of the given character.*
- char **base64Char** (uint8\_t id, const uint8\_t \*rules)  
*Returns the base 64 character of the given index.*
- **ATCA\_STATUS atcab\_base64decode\_** (const char \*encoded, size\_t encoded\_size, uint8\_t \*data, size\_t \*data\_size, const uint8\_t \*rules)  
*Decode base64 string to data with ruleset option.*
- **ATCA\_STATUS atcab\_base64encode\_** (const uint8\_t \*data, size\_t data\_size, char \*encoded, size\_t\_↵  
\*encoded\_size, const uint8\_t \*rules)  
*Encode data as base64 string with ruleset option.*
- **ATCA\_STATUS atcab\_base64encode** (const uint8\_t \*byte\_array, size\_t array\_len, char \*encoded, size\_t \*encoded\_len)  
*Encode data as base64 string.*

- [ATCA\\_STATUS atcab\\_base64decode](#) (const char \*encoded, size\_t encoded\_len, uint8\_t \*byte\_array, size\_t \*array\_len)  
*Decode base64 string to data.*
- int [atcab\\_memset\\_s](#) (void \*dest, size\_t destsz, int ch, size\_t count)  
*Guaranteed to perform memory writes regardless of optimization level. Matches memset\_s signature.*
- char \* [lib\\_strcasestr](#) (const char \*haystack, const char \*needle)  
*Search for a substring in a case insensitive format.*

## Variables

- uint8\_t [atcab\\_b64rules\\_default](#) [4] = { '+', '/', '=', 64 }
- uint8\_t [atcab\\_b64rules\\_mime](#) [4] = { '+', '/', '=', 76 }
- uint8\_t [atcab\\_b64rules\\_urlsafe](#) [4] = { '-', '\_', 0, 0 }

### 10.33.1 Detailed Description

Helpers to support the CryptoAuthLib Basic API methods.

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### 10.33.2 Macro Definition Documentation

#### 10.33.2.1 B64\_IS\_EQUAL

```
#define B64_IS_EQUAL (uint8_t) 64
```

#### 10.33.2.2 B64\_IS\_INVALID

```
#define B64_IS_INVALID (uint8_t) 0xFF
```

### 10.33.3 Function Documentation

#### 10.33.3.1 atcab\_base64decode()

```
ATCA_STATUS atcab_base64decode (
    const char * encoded,
    size_t encoded_len,
    uint8_t * byte_array,
    size_t * array_len )
```

Decode base64 string to data.

## 10.33 atca\_helpers.c File Reference

---

### Parameters

in	<i>encoded</i>	Base64 string to be decoded.
in	<i>encoded_len</i>	Size of the base64 string in bytes.
out	<i>byte_array</i>	Decoded data will be returned here.
in, out	<i>array_len</i>	As input, the size of the byte_array buffer. As output, the length of the decoded data.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.33.3.2 atcab\_base64decode\_()

```
ATCA_STATUS atcab_base64decode_ (
    const char * encoded,
    size_t encoded_size,
    uint8_t * data,
    size_t * data_size,
    const uint8_t * rules )
```

Decode base64 string to data with ruleset option.

### Parameters

in	<i>encoded</i>	Base64 string to be decoded.
in	<i>encoded_size</i>	Size of the base64 string in bytes.
out	<i>data</i>	Decoded data will be returned here.
in, out	<i>data_size</i>	As input, the size of the byte_array buffer. As output, the length of the decoded data.
in	<i>rules</i>	base64 ruleset to use

### 10.33.3.3 atcab\_base64encode()

```
ATCA_STATUS atcab_base64encode (
    const uint8_t * byte_array,
    size_t array_len,
    char * encoded,
    size_t * encoded_len )
```

Encode data as base64 string.

### Parameters

in	<i>byte_array</i>	Data to be encode in base64.
in	<i>array_len</i>	Size of byte_array in bytes.
in	<i>encoded</i>	Base64 output is returned here.
in, out	<i>encoded_len</i>	As input, the size of the encoded buffer. As output, the length of the encoded base64 character string.



**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.33.3.4 atcab\_base64encode\_()**

```
ATCA_STATUS atcab_base64encode_ (
    const uint8_t * data,
    size_t data_size,
    char * encoded,
    size_t * encoded_size,
    const uint8_t * rules )
```

Encode data as base64 string with ruleset option.

**Parameters**

in	<i>data</i>	The input byte array that will be converted to base 64 encoded characters
in	<i>data_size</i>	The length of the byte array
in	<i>encoded</i>	The output converted to base 64 encoded characters.
in, out	<i>encoded_size</i>	Input: The size of the encoded buffer, Output: The length of the encoded base 64 character string
in	<i>rules</i>	ruleset to use during encoding

**10.33.3.5 atcab\_bin2hex()**

```
ATCA_STATUS atcab_bin2hex (
    const uint8_t * bin,
    size_t bin_size,
    char * hex,
    size_t * hex_size )
```

Convert a binary buffer to a hex string for easy reading.

**Parameters**

in	<i>bin</i>	Input data to convert.
in	<i>bin_size</i>	Size of data to convert.
out	<i>hex</i>	Buffer that receives hex string.
in, out	<i>hex_size</i>	As input, the size of the hex buffer. As output, the size of the output hex.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

### 10.33.3.6 atcab\_bin2hex\_()

```
ATCA_STATUS atcab_bin2hex_ (
    const uint8_t * bin,
    size_t bin_size,
    char * hex,
    size_t * hex_size,
    bool is_pretty,
    bool is_space,
    bool is_upper )
```

Function that converts a binary buffer to a hex string suitable for easy reading.

#### Parameters

in	<i>bin</i>	Input data to convert.
in	<i>bin_size</i>	Size of data to convert.
out	<i>hex</i>	Buffer that receives hex string.
in, out	<i>hex_size</i>	As input, the size of the hex buffer. As output, the size of the output hex.
in	<i>is_pretty</i>	Indicates whether new lines should be added for pretty printing.
in	<i>is_space</i>	Convert the output hex with space between it.
in	<i>is_upper</i>	Convert the output hex to upper case.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.33.3.7 atcab\_hex2bin()

```
ATCA_STATUS atcab_hex2bin (
    const char * hex,
    size_t hex_size,
    uint8_t * bin,
    size_t * bin_size )
```

Function that converts a hex string to binary buffer.

#### Parameters

in	<i>hex</i>	Input buffer to convert
in	<i>hex_size</i>	Length of buffer to convert
out	<i>bin</i>	Buffer that receives binary
in, out	<i>bin_size</i>	As input, the size of the bin buffer. As output, the size of the bin data.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

**10.33.3.8 atcab\_hex2bin\_()**

```

ATCA_STATUS atcab_hex2bin_ (
    const char * hex,
    size_t hex_size,
    uint8_t * bin,
    size_t * bin_size,
    bool is_space )

```

**10.33.3.9 atcab\_memset\_s()**

```

int atcab_memset_s (
    void * dest,
    size_t destsz,
    int ch,
    size_t count )

```

Guaranteed to perform memory writes regardless of optimization level. Matches memset\_s signature.

**10.33.3.10 atcab\_reversal()**

```

ATCA_STATUS atcab_reversal (
    const uint8_t * bin,
    size_t bin_size,
    uint8_t * dest,
    size_t * dest_size )

```

To reverse the input data.

**Parameters**

in	<i>bin</i>	Input data to reverse.
in	<i>bin_size</i>	Size of data to reverse.
out	<i>dest</i>	Buffer to store reversed binary data.
in	<i>dest_size</i>	The size of the dest buffer.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.33.3.11 base64Char()**

```

char base64Char (
    uint8_t id,
    const uint8_t * rules )

```

Returns the base 64 character of the given index.

**Parameters**

in	<i>id</i>	index to check
in	<i>rules</i>	base64 ruleset to use

**Returns**

the base 64 character of the given index

**10.33.3.12 base64Index()**

```
uint8_t base64Index (
    char c,
    const uint8_t * rules )
```

Returns the base 64 index of the given character.

**Parameters**

in	<i>c</i>	character to check
in	<i>rules</i>	base64 ruleset to use

**Returns**

the base 64 index of the given character

**10.33.3.13 isAlpha()**

```
bool isAlpha (
    char c )
```

Checks to see if a character is an ASCII representation of hex ((c >= 'A') and (c <= 'F')) || ((c >= 'a') and (c <= 'f'))

**Parameters**

in	<i>c</i>	character to check
----	----------	--------------------

**Returns**

True if the character is a hex

### 10.33.3.14 isBase64()

```
bool isBase64 (
    char c,
    const uint8_t * rules )
```

Returns true if this character is a valid base 64 character or if this is space (A character can be included in a valid base 64 string).

#### Parameters

in	<i>c</i>	character to check
in	<i>rules</i>	base64 ruleset to use

#### Returns

True if the character can be included in a valid base 64 string

### 10.33.3.15 isBase64Digit()

```
bool isBase64Digit (
    char c,
    const uint8_t * rules )
```

Returns true if this character is a valid base 64 character.

#### Parameters

in	<i>c</i>	character to check
in	<i>rules</i>	base64 ruleset to use

#### Returns

True if the character can be included in a valid base 64 string

### 10.33.3.16 isBlankSpace()

```
bool isBlankSpace (
    char c )
```

Checks to see if a character is blank space.

#### Parameters

in	<i>c</i>	character to check
----	----------	--------------------

**Returns**

True if the character is blankspace

**10.33.3.17 isDigit()**

```
bool isDigit (  
    char c )
```

Checks to see if a character is an ASCII representation of a digit ((c ge '0') and (c le '9'))

**Parameters**

in	c	character to check
----	---	--------------------

**Returns**

True if the character is a digit

**10.33.3.18 isHex()**

```
bool isHex (  
    char c )
```

Returns true if this character is a valid hex character or if this is blankspace (The character can be included in a valid hexstring).

**Parameters**

in	c	character to check
----	---	--------------------

**Returns**

True if the character can be included in a valid hexstring

**10.33.3.19 isHexAlpha()**

```
bool isHexAlpha (  
    char c )
```

Checks to see if a character is an ASCII representation of hex ((c >= 'A') and (c <= 'F')) || ((c >= 'a') and (c <= 'f'))

### Parameters

in	c	character to check
----	---	--------------------

### Returns

True if the character is a hex

### 10.33.3.20 isHexDigit()

```
bool isHexDigit (  
    char c )
```

Returns true if this character is a valid hex character.

### Parameters

in	c	character to check
----	---	--------------------

### Returns

True if the character can be included in a valid hexstring

### 10.33.3.21 lib\_strcasestr()

```
char* lib_strcasestr (  
    const char * haystack,  
    const char * needle )
```

Search for a substring in a case insensitive format.

### 10.33.3.22 packHex()

```
ATCA_STATUS packHex (  
    const char * ascii_hex,  
    size_t ascii_hex_len,  
    char * packed_hex,  
    size_t * packed_len )
```

Remove spaces from a ASCII hex string.



## Parameters

in	<i>ascii_hex</i>	Initial hex string to remove blankspace from
in	<i>ascii_hex_len</i>	Length of the initial hex string
in	<i>packed_hex</i>	Resulting hex string without blankspace
in, out	<i>packed_len</i>	In: Size to packed_hex buffer Out: Number of bytes in the packed hex string

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 10.33.4 Variable Documentation

### 10.33.4.1 atcab\_b64rules\_default

```
uint8_t atcab_b64rules_default[4] = { '+', '/', '=', 64 }
```

### 10.33.4.2 atcab\_b64rules\_mime

```
uint8_t atcab_b64rules_mime[4] = { '+', '/', '=', 76 }
```

### 10.33.4.3 atcab\_b64rules\_urllsafe

```
uint8_t atcab_b64rules_urllsafe[4] = { '-', '_', 0, 0 }
```

## 10.34 atca\_helpers.h File Reference

Helpers to support the CryptoAuthLib Basic API methods.

```
#include "cryptoauthlib.h"
```

- [uint8\\_t atcab\\_b64rules\\_default](#) [4]
- [uint8\\_t atcab\\_b64rules\\_mime](#) [4]
- [uint8\\_t atcab\\_b64rules\\_urllsafe](#) [4]
- [ATCA\\_STATUS atcab\\_printbin](#) (uint8\_t \*binary, size\_t bin\_len, bool add\_space)
- [ATCA\\_STATUS atcab\\_bin2hex](#) (const uint8\_t \*bin, size\_t bin\_size, char \*hex, size\_t \*hex\_size)  
Convert a binary buffer to a hex string for easy reading.
- [ATCA\\_STATUS atcab\\_bin2hex\\_](#) (const uint8\_t \*bin, size\_t bin\_size, char \*hex, size\_t \*hex\_size, bool is\_↵ pretty, bool is\_space, bool is\_upper)

*Function that converts a binary buffer to a hex string suitable for easy reading.*

- [ATCA\\_STATUS atcab\\_hex2bin](#) (const char \*ascii\_hex, size\_t ascii\_hex\_len, uint8\_t \*binary, size\_t \*bin\_len)

*Function that converts a hex string to binary buffer.*

- [ATCA\\_STATUS atcab\\_hex2bin\\_](#) (const char \*hex, size\_t hex\_size, uint8\_t \*bin, size\_t \*bin\_size, bool is\_↵ space)
- [ATCA\\_STATUS atcab\\_printbin\\_sp](#) (uint8\_t \*binary, size\_t bin\_len)
- [ATCA\\_STATUS atcab\\_printbin\\_label](#) (const char \*label, uint8\_t \*binary, size\_t bin\_len)
- [ATCA\\_STATUS packHex](#) (const char \*ascii\_hex, size\_t ascii\_hex\_len, char \*packed\_hex, size\_t \*packed\_↵ \_len)

*Remove spaces from a ASCII hex string.*

- bool [isDigit](#) (char c)

*Checks to see if a character is an ASCII representation of a digit ((c ge '0') and (c le '9'))*

- bool [isBlankSpace](#) (char c)

*Checks to see if a character is blank space.*

- bool [isAlpha](#) (char c)

*Checks to see if a character is an ASCII representation of hex ((c >= 'A') and (c <= 'F')) || ((c >= 'a') and (c <= 'f'))*

- bool [isHexAlpha](#) (char c)

*Checks to see if a character is an ASCII representation of hex ((c >= 'A') and (c <= 'F')) || ((c >= 'a') and (c <= 'f'))*

- bool [isHex](#) (char c)

*Returns true if this character is a valid hex character or if this is blankspace (The character can be included in a valid hexstring).*

- bool [isHexDigit](#) (char c)

*Returns true if this character is a valid hex character.*

- bool [isBase64](#) (char c, const uint8\_t \*rules)

*Returns true if this character is a valid base 64 character or if this is space (A character can be included in a valid base 64 string).*

- bool [isBase64Digit](#) (char c, const uint8\_t \*rules)

*Returns true if this character is a valid base 64 character.*

- uint8\_t [base64Index](#) (char c, const uint8\_t \*rules)

*Returns the base 64 index of the given character.*

- char [base64Char](#) (uint8\_t id, const uint8\_t \*rules)

*Returns the base 64 character of the given index.*

- [ATCA\\_STATUS atcab\\_base64decode\\_](#) (const char \*encoded, size\_t encoded\_size, uint8\_t \*data, size\_t \*data\_size, const uint8\_t \*rules)

*Decode base64 string to data with ruleset option.*

- [ATCA\\_STATUS atcab\\_base64decode](#) (const char \*encoded, size\_t encoded\_size, uint8\_t \*data, size\_↵ t \*data\_size)

*Decode base64 string to data.*

- [ATCA\\_STATUS atcab\\_base64encode\\_](#) (const uint8\_t \*data, size\_t data\_size, char \*encoded, size\_↵ t \*encoded\_size, const uint8\_t \*rules)

*Encode data as base64 string with ruleset option.*

- [ATCA\\_STATUS atcab\\_base64encode](#) (const uint8\_t \*data, size\_t data\_size, char \*encoded, size\_↵ t \*encoded\_size)

*Encode data as base64 string.*

- [ATCA\\_STATUS atcab\\_reversal](#) (const uint8\_t \*bin, size\_t bin\_size, uint8\_t \*dest, size\_t \*dest\_size)

*To reverse the input data.*

- int [atcab\\_memset\\_s](#) (void \*dest, size\_t destsz, int ch, size\_t count)

*Guaranteed to perform memory writes regardless of optimization level. Matches memset\_s signature.*

### 10.34.1 Detailed Description

Helpers to support the CryptoAuthLib Basic API methods.

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### 10.34.2 Function Documentation

#### 10.34.2.1 atcab\_base64decode()

```
ATCA_STATUS atcab_base64decode (
    const char * encoded,
    size_t encoded_len,
    uint8_t * byte_array,
    size_t * array_len )
```

Decode base64 string to data.

#### Parameters

in	<i>encoded</i>	Base64 string to be decoded.
in	<i>encoded_len</i>	Size of the base64 string in bytes.
out	<i>byte_array</i>	Decoded data will be returned here.
in, out	<i>array_len</i>	As input, the size of the byte_array buffer. As output, the length of the decoded data.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.34.2.2 atcab\_base64decode\_()

```
ATCA_STATUS atcab_base64decode_ (
    const char * encoded,
    size_t encoded_size,
    uint8_t * data,
    size_t * data_size,
    const uint8_t * rules )
```

Decode base64 string to data with ruleset option.

#### Parameters

in	<i>encoded</i>	Base64 string to be decoded.
in	<i>encoded_size</i>	Size of the base64 string in bytes.
out	<i>data</i>	Decoded data will be returned here.
in, out	<i>data_size</i>	As input, the size of the byte_array buffer. As output, the length of the decoded data.
in	<i>rules</i>	base64 ruleset to use

### 10.34.2.3 atcab\_base64encode()

```
ATCA_STATUS atcab_base64encode (
    const uint8_t * byte_array,
    size_t array_len,
    char * encoded,
    size_t * encoded_len )
```

Encode data as base64 string.

#### Parameters

in	<i>byte_array</i>	Data to be encode in base64.
in	<i>array_len</i>	Size of byte_array in bytes.
in	<i>encoded</i>	Base64 output is returned here.
in, out	<i>encoded_len</i>	As input, the size of the encoded buffer. As output, the length of the encoded base64 character string.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.34.2.4 atcab\_base64encode\_()

```
ATCA_STATUS atcab_base64encode_ (
    const uint8_t * data,
    size_t data_size,
    char * encoded,
    size_t * encoded_size,
    const uint8_t * rules )
```

Encode data as base64 string with ruleset option.

#### Parameters

in	<i>data</i>	The input byte array that will be converted to base 64 encoded characters
in	<i>data_size</i>	The length of the byte array
in	<i>encoded</i>	The output converted to base 64 encoded characters.
in, out	<i>encoded_size</i>	Input: The size of the encoded buffer, Output: The length of the encoded base 64 character string
in	<i>rules</i>	ruleset to use during encoding

### 10.34.2.5 atcab\_bin2hex()

```
ATCA_STATUS atcab_bin2hex (
    const uint8_t * bin,
    size_t bin_size,
    char * hex,
    size_t * hex_size )
```

Convert a binary buffer to a hex string for easy reading.

#### Parameters

in	<i>bin</i>	Input data to convert.
in	<i>bin_size</i>	Size of data to convert.
out	<i>hex</i>	Buffer that receives hex string.
in, out	<i>hex_size</i>	As input, the size of the hex buffer. As output, the size of the output hex.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.34.2.6 atcab\_bin2hex\_()

```
ATCA_STATUS atcab_bin2hex_ (
    const uint8_t * bin,
    size_t bin_size,
    char * hex,
    size_t * hex_size,
    bool is_pretty,
    bool is_space,
    bool is_upper )
```

Function that converts a binary buffer to a hex string suitable for easy reading.

#### Parameters

in	<i>bin</i>	Input data to convert.
in	<i>bin_size</i>	Size of data to convert.
out	<i>hex</i>	Buffer that receives hex string.
in, out	<i>hex_size</i>	As input, the size of the hex buffer. As output, the size of the output hex.
in	<i>is_pretty</i>	Indicates whether new lines should be added for pretty printing.
in	<i>is_space</i>	Convert the output hex with space between it.
in	<i>is_upper</i>	Convert the output hex to upper case.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.34.2.7 atcab\_hex2bin()

```
ATCA_STATUS atcab_hex2bin (
    const char * hex,
    size_t hex_size,
    uint8_t * bin,
    size_t * bin_size )
```

Function that converts a hex string to binary buffer.

#### Parameters

in	<i>hex</i>	Input buffer to convert
in	<i>hex_size</i>	Length of buffer to convert
out	<i>bin</i>	Buffer that receives binary
in, out	<i>bin_size</i>	As input, the size of the bin buffer. As output, the size of the bin data.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.34.2.8 atcab\_hex2bin\_()

```
ATCA_STATUS atcab_hex2bin_ (
    const char * hex,
    size_t hex_size,
    uint8_t * bin,
    size_t * bin_size,
    bool is_space )
```

### 10.34.2.9 atcab\_memset\_s()

```
int atcab_memset_s (
    void * dest,
    size_t destsz,
    int ch,
    size_t count )
```

Guaranteed to perform memory writes regardless of optimization level. Matches memset\_s signature.

### 10.34.2.10 atcab\_printbin\_label()

```
ATCA_STATUS atcab_printbin_label (
    const char * label,
    uint8_t * binary,
    size_t bin_len )
```

#### 10.34.2.11 atcab\_printbin\_sp()

```
ATCA_STATUS atcab_printbin_sp (
    uint8_t * binary,
    size_t bin_len )
```

#### 10.34.2.12 atcab\_reversal()

```
ATCA_STATUS atcab_reversal (
    const uint8_t * bin,
    size_t bin_size,
    uint8_t * dest,
    size_t * dest_size )
```

To reverse the input data.

##### Parameters

in	<i>bin</i>	Input data to reverse.
in	<i>bin_size</i>	Size of data to reverse.
out	<i>dest</i>	Buffer to store reversed binary data.
in	<i>dest_size</i>	The size of the dest buffer.

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.34.2.13 base64Char()

```
char base64Char (
    uint8_t id,
    const uint8_t * rules )
```

Returns the base 64 character of the given index.

##### Parameters

in	<i>id</i>	index to check
in	<i>rules</i>	base64 ruleset to use

##### Returns

the base 64 character of the given index

### 10.34.2.14 base64Index()

```
uint8_t base64Index (
    char c,
    const uint8_t * rules )
```

Returns the base 64 index of the given character.

#### Parameters

in	<i>c</i>	character to check
in	<i>rules</i>	base64 ruleset to use

#### Returns

the base 64 index of the given character

### 10.34.2.15 isAlpha()

```
bool isAlpha (
    char c )
```

Checks to see if a character is an ASCII representation of hex ((c >= 'A') and (c <= 'F')) || ((c >= 'a') and (c <= 'f'))

#### Parameters

in	<i>c</i>	character to check
----	----------	--------------------

#### Returns

True if the character is a hex

### 10.34.2.16 isBase64()

```
bool isBase64 (
    char c,
    const uint8_t * rules )
```

Returns true if this character is a valid base 64 character or if this is space (A character can be included in a valid base 64 string).

#### Parameters

in	<i>c</i>	character to check
in	<i>rules</i>	base64 ruleset to use



**Returns**

True if the character can be included in a valid base 64 string

**10.34.2.17 isBase64Digit()**

```
bool isBase64Digit (
    char c,
    const uint8_t * rules )
```

Returns true if this character is a valid base 64 character.

**Parameters**

in	<i>c</i>	character to check
in	<i>rules</i>	base64 ruleset to use

**Returns**

True if the character can be included in a valid base 64 string

**10.34.2.18 isBlankSpace()**

```
bool isBlankSpace (
    char c )
```

Checks to see if a character is blank space.

**Parameters**

in	<i>c</i>	character to check
----	----------	--------------------

**Returns**

True if the character is blankspace

**10.34.2.19 isDigit()**

```
bool isDigit (
    char c )
```

Checks to see if a character is an ASCII representation of a digit ((c ge '0') and (c le '9'))

### Parameters

in	c	character to check
----	---	--------------------

### Returns

True if the character is a digit

### 10.34.2.20 isHex()

```
bool isHex (
    char c )
```

Returns true if this character is a valid hex character or if this is blankspace (The character can be included in a valid hexstring).

### Parameters

in	c	character to check
----	---	--------------------

### Returns

True if the character can be included in a valid hexstring

### 10.34.2.21 isHexAlpha()

```
bool isHexAlpha (
    char c )
```

Checks to see if a character is an ASCII representation of hex ((c >= 'A') and (c <= 'F')) || ((c >= 'a') and (c <= 'f'))

### Parameters

in	c	character to check
----	---	--------------------

### Returns

True if the character is a hex

### 10.34.2.22 isHexDigit()

```
bool isHexDigit (
    char c )
```

Returns true if this character is a valid hex character.

#### Parameters

in	c	character to check
----	---	--------------------

#### Returns

True if the character can be included in a valid hexstring

### 10.34.2.23 packHex()

```
ATCA_STATUS packHex (
    const char * ascii_hex,
    size_t ascii_hex_len,
    char * packed_hex,
    size_t * packed_len )
```

Remove spaces from a ASCII hex string.

#### Parameters

in	<i>ascii_hex</i>	Initial hex string to remove blankspace from
in	<i>ascii_hex_len</i>	Length of the initial hex string
in	<i>packed_hex</i>	Resulting hex string without blankspace
in, out	<i>packed_len</i>	In: Size to packed_hex buffer Out: Number of bytes in the packed hex string

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 10.34.3 Variable Documentation

### 10.34.3.1 atcab\_b64rules\_default

```
uint8_t atcab_b64rules_default[4] [extern]
```

### 10.34.3.2 atcab\_b64rules\_mime

```
uint8_t atcab_b64rules_mime[4] [extern]
```

### 10.34.3.3 atcab\_b64rules\_urlsafe

```
uint8_t atcab_b64rules_urlsafe[4] [extern]
```

## 10.35 atca\_host.c File Reference

Host side methods to support CryptoAuth computations.

```
#include "atca_host.h"  
#include "crypto/atca_crypto_sw_sha2.h"
```

### 10.35.1 Detailed Description

Host side methods to support CryptoAuth computations.

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## 10.36 atca\_host.h File Reference

Definitions and Prototypes for ATCA Utility Functions.

```
#include <stdint.h>  
#include "cryptoauthlib.h"  
#include "calib/calib_basic.h"  
#include "atca_host_config_check.h"
```

### Data Structures

- struct [atca\\_temp\\_key](#)  
*Structure to hold TempKey fields.*
- struct [atca\\_include\\_data\\_in\\_out](#)  
*Input / output parameters for function atca\_include\_data().*
- struct [atca\\_nonce\\_in\\_out](#)  
*Input/output parameters for function atca\_nonce().*
- struct [atca\\_io\\_decrypt\\_in\\_out](#)
- struct [atca\\_verify\\_mac](#)
- struct [atca\\_secureboot\\_enc\\_in\\_out](#)
- struct [atca\\_secureboot\\_mac\\_in\\_out](#)
- struct [atca\\_mac\\_in\\_out](#)  
*Input/output parameters for function atca\_mac().*
- struct [atca\\_hmac\\_in\\_out](#)  
*Input/output parameters for function atca\_hmac().*
- struct [atca\\_gen\\_dig\\_in\\_out](#)

- Input/output parameters for function [atcah\\_gen\\_dig\(\)](#).*

  - struct [atca\\_write\\_mac\\_in\\_out](#)

*Input/output parameters for function [atcah\\_write\\_auth\\_mac\(\)](#) and [atcah\\_privwrite\\_auth\\_mac\(\)](#).*

  - struct [atca\\_derive\\_key\\_in\\_out](#)

*Input/output parameters for function [atcah\\_derive\\_key\(\)](#).*

  - struct [atca\\_derive\\_key\\_mac\\_in\\_out](#)

*Input/output parameters for function [atcah\\_derive\\_key\\_mac\(\)](#).*

  - struct [atca\\_decrypt\\_in\\_out](#)

*Input/output parameters for function [atca\\_decrypt\(\)](#).*

  - struct [atca\\_check\\_mac\\_in\\_out](#)

*Input/output parameters for function [atcah\\_check\\_mac\(\)](#).*

  - struct [atca\\_verify\\_in\\_out](#)

*Input/output parameters for function [atcah\\_verify\(\)](#).*

  - struct [atca\\_gen\\_key\\_in\\_out](#)

*Input/output parameters for calculating the PubKey digest put into TempKey by the GenKey command with the [atcah\\_gen\\_key\\_msg\(\)](#) function.*

  - struct [atca\\_sign\\_internal\\_in\\_out](#)

*Input/output parameters for calculating the message and digest used by the Sign(internal) command. Used with the [atcah\\_sign\\_internal\\_msg\(\)](#) function.*

  - struct [atca\\_session\\_key\\_in\\_out](#)

*Input/Output paramters for calculating the session key by the nonce command. Used with the [atcah\\_gen\\_session\\_key\(\)](#) function.*

## Macros

### Definitions for ATECC Message Sizes to Calculate a SHA256 Hash

"||" is the concatenation operator. The number in braces is the length of the hash input value in bytes.

- #define [ATCA\\_MSG\\_SIZE\\_NONCE](#) (55)
 

*RandOut{32} || NumIn{20} || OpCode{1} || Mode{1} || LSB of Param2{1}.*
- #define [ATCA\\_MSG\\_SIZE\\_MAC](#) (88)
 

*(Key or TempKey){32} || (Challenge or TempKey){32} || OpCode{1} || Mode{1} || Param2{2} || (OTP0\_7 or 0){8} || (OTP8\_10 or 0){3} || SN8{1} || (SN4\_7 or 0){4} || SN0\_1{2} || (SN2\_3 or 0){2}*
- #define [ATCA\\_MSG\\_SIZE\\_HMAC](#) (88)
- #define [ATCA\\_MSG\\_SIZE\\_GEN\\_DIG](#) (96)
 

*KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2} || 0{25} || TempKey{32}.*
- #define [ATCA\\_MSG\\_SIZE\\_DERIVE\\_KEY](#) (96)
 

*KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2} || 0{25} || TempKey{32}.*
- #define [ATCA\\_MSG\\_SIZE\\_DERIVE\\_KEY\\_MAC](#) (39)
 

*KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2}.*
- #define [ATCA\\_MSG\\_SIZE\\_ENCRYPT\\_MAC](#) (96)
 

*KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2} || 0{25} || TempKey{32}.*
- #define [ATCA\\_MSG\\_SIZE\\_SESSION\\_KEY](#) (96)
 

*TransportKey{32} || 0x15{1} || 0x00{1} || KeyId{2} || SN8{1} || SN0\_1{2} || 0{25} || Nonce{32}.*
- #define [ATCA\\_MSG\\_SIZE\\_PRIVWRITE\\_MAC](#) (96)
 

*KeyId{32} || OpCode{1} || Param1{1} || Param2{2} || SN8{1} || SN0\_1{2} || 0{21} || PlainText{36}.*
- #define [ATCA\\_COMMAND\\_HEADER\\_SIZE](#) ( 4)
- #define [ATCA\\_GENDIG\\_ZEROS\\_SIZE](#) (25)
- #define [ATCA\\_WRITE\\_MAC\\_ZEROS\\_SIZE](#) (25)
- #define [ATCA\\_PRIVWRITE\\_MAC\\_ZEROS\\_SIZE](#) (21)
- #define [ATCA\\_PRIVWRITE\\_PLAIN\\_TEXT\\_SIZE](#) (36)
- #define [ATCA\\_DERIVE\\_KEY\\_ZEROS\\_SIZE](#) (25)
- #define [ATCA\\_HMAC\\_BLOCK\\_SIZE](#) (64)
- #define [ENCRYPTION\\_KEY\\_SIZE](#) (64)

**Default Fixed Byte Values of Serial Number (SN[0:1] and SN[8])**

- #define [ATCA\\_SN\\_0\\_DEF](#) (0x01)
- #define [ATCA\\_SN\\_1\\_DEF](#) (0x23)
- #define [ATCA\\_SN\\_8\\_DEF](#) (0xEE)

**Definition for TempKey Mode**

- #define [MAC\\_MODE\\_USE\\_TEMPKEY\\_MASK](#) ((uint8\_t)0x03)  
*mode mask for MAC command when using TempKey*

**Typedefs**

- typedef struct [atca\\_temp\\_key](#) [atca\\_temp\\_key\\_t](#)  
*Structure to hold TempKey fields.*
- typedef struct [atca\\_nonce\\_in\\_out](#) [atca\\_nonce\\_in\\_out\\_t](#)
- typedef struct [atca\\_io\\_decrypt\\_in\\_out](#) [atca\\_io\\_decrypt\\_in\\_out\\_t](#)
- typedef struct [atca\\_verify\\_mac](#) [atca\\_verify\\_mac\\_in\\_out\\_t](#)
- typedef struct [atca\\_secureboot\\_enc\\_in\\_out](#) [atca\\_secureboot\\_enc\\_in\\_out\\_t](#)
- typedef struct [atca\\_secureboot\\_mac\\_in\\_out](#) [atca\\_secureboot\\_mac\\_in\\_out\\_t](#)
- typedef struct [atca\\_mac\\_in\\_out](#) [atca\\_mac\\_in\\_out\\_t](#)
- typedef struct [atca\\_gen\\_dig\\_in\\_out](#) [atca\\_gen\\_dig\\_in\\_out\\_t](#)  
*Input/output parameters for function [atcah\\_gen\\_dig\(\)](#).*
- typedef struct [atca\\_write\\_mac\\_in\\_out](#) [atca\\_write\\_mac\\_in\\_out\\_t](#)  
*Input/output parameters for function [atcah\\_write\\_auth\\_mac\(\)](#) and [atcah\\_privwrite\\_auth\\_mac\(\)](#).*
- typedef struct [atca\\_check\\_mac\\_in\\_out](#) [atca\\_check\\_mac\\_in\\_out\\_t](#)  
*Input/output parameters for function [atcah\\_check\\_mac\(\)](#).*
- typedef struct [atca\\_verify\\_in\\_out](#) [atca\\_verify\\_in\\_out\\_t](#)
- typedef struct [atca\\_gen\\_key\\_in\\_out](#) [atca\\_gen\\_key\\_in\\_out\\_t](#)  
*Input/output parameters for calculating the PubKey digest put into TempKey by the GenKey command with the [atcah\\_gen\\_key\\_msg\(\)](#) function.*
- typedef struct [atca\\_sign\\_internal\\_in\\_out](#) [atca\\_sign\\_internal\\_in\\_out\\_t](#)  
*Input/output parameters for calculating the message and digest used by the Sign(internal) command. Used with the [atcah\\_sign\\_internal\\_msg\(\)](#) function.*
- typedef struct [atca\\_session\\_key\\_in\\_out](#) [atca\\_session\\_key\\_in\\_out\\_t](#)  
*Input/Output paramters for calculating the session key by the nonce command. Used with the [atcah\\_gen\\_session\\_key\(\)](#) function.*

**Functions**

- [ATCA\\_STATUS atcah\\_nonce](#) (struct [atca\\_nonce\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_mac](#) (struct [atca\\_mac\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_check\\_mac](#) (struct [atca\\_check\\_mac\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_hmac](#) (struct [atca\\_hmac\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_gen\\_dig](#) (struct [atca\\_gen\\_dig\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_gen\\_mac](#) (struct [atca\\_gen\\_dig\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_write\\_auth\\_mac](#) (struct [atca\\_write\\_mac\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_privwrite\\_auth\\_mac](#) (struct [atca\\_write\\_mac\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_derive\\_key](#) (struct [atca\\_derive\\_key\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_derive\\_key\\_mac](#) (struct [atca\\_derive\\_key\\_mac\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_decrypt](#) (struct [atca\\_decrypt\\_in\\_out](#) \*param)
- [ATCA\\_STATUS atcah\\_sha256](#) (int32\_t len, const uint8\_t \*message, uint8\_t \*digest)

- `uint8_t * atcah_include_data` (struct `atca_include_data_in_out` \*param)
- `ATCA_STATUS atcah_gen_key_msg` (struct `atca_gen_key_in_out` \*param)
- `ATCA_STATUS atcah_config_to_sign_internal` (`ATCADeviceType` device\_type, struct `atca_sign_internal_in_out` \*param, const `uint8_t` \*config)
- `ATCA_STATUS atcah_sign_internal_msg` (`ATCADeviceType` device\_type, struct `atca_sign_internal_in_out` \*param)
- `ATCA_STATUS atcah_verify_mac` (`atca_verify_mac_in_out_t` \*param)
- `ATCA_STATUS atcah_secureboot_enc` (`atca_secureboot_enc_in_out_t` \*param)
- `ATCA_STATUS atcah_secureboot_mac` (`atca_secureboot_mac_in_out_t` \*param)
- `ATCA_STATUS atcah_encode_counter_match` (`uint32_t` counter, `uint8_t` \*counter\_match)
- `ATCA_STATUS atcah_io_decrypt` (struct `atca_io_decrypt_in_out` \*param)
- `ATCA_STATUS atcah_ecc204_write_auth_mac` (struct `atca_write_mac_in_out` \*param)
- `ATCA_STATUS atcah_gen_session_key` (`atca_session_key_in_out_t` \*param)

### 10.36.1 Detailed Description

Definitions and Prototypes for ATCA Utility Functions.

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## 10.37 atca\_host\_config\_check.h File Reference

Consistency checks for configuration options.

### Macros

- `#define ATCAH_INCLUDE_DATA (DEFAULT_ENABLED)`
- `#define ATCAH_NONCE (DEFAULT_ENABLED)`
- `#define ATCAH_IO_DECRYPT (DEFAULT_ENABLED)`
- `#define ATCAH_VERIFY_MAC (DEFAULT_ENABLED)`
- `#define ATCAH_SECUREBOOT_ENC (DEFAULT_ENABLED)`
- `#define ATCAH_SECUREBOOT_MAC (DEFAULT_ENABLED)`
- `#define ATCAH_MAC (DEFAULT_ENABLED)`
- `#define ATCAH_CHECK_MAC (DEFAULT_ENABLED)`
- `#define ATCAH_HMAC (DEFAULT_ENABLED)`
- `#define ATCAH_GENDIG (DEFAULT_ENABLED)`
- `#define ATCAH_GEN_MAC (DEFAULT_ENABLED)`
- `#define ATCAH_WRITE_AUTH_MAC (DEFAULT_ENABLED)`
- `#define ATCAH_PRIVWRITE_AUTH_MAC (DEFAULT_ENABLED)`
- `#define ATCAH_DERIVE_KEY (DEFAULT_ENABLED)`
- `#define ATCAH_DERIVE_KEY_MAC (DEFAULT_ENABLED)`
- `#define ATCAH_DECRYPT (DEFAULT_ENABLED)`
- `#define ATCAH_SHA256 (DEFAULT_ENABLED)`
- `#define ATCAH_GEN_KEY_MSG (DEFAULT_ENABLED)`
- `#define ATCAH_CONFIG_TO_SIGN_INTERNAL (DEFAULT_ENABLED)`
- `#define ATCAH_SIGN_INTERNAL_MSG (DEFAULT_ENABLED)`
- `#define ATCAH_ENCODE_COUNTER_MATCH (DEFAULT_ENABLED)`
- `#define ATCAH_GEN_SESSION_KEY (DEFAULT_ENABLED)`
- `#define ATCAC_SW_SHA2_256 (DEFAULT_ENABLED)`

### 10.37.1 Detailed Description

Consistency checks for configuration options.

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### 10.37.2 Macro Definition Documentation

#### 10.37.2.1 ATCAC\_SW\_SHA2\_256

```
#define ATCAC_SW_SHA2_256 (DEFAULT_ENABLED)
```

#### 10.37.2.2 ATCAH\_CHECK\_MAC

```
#define ATCAH_CHECK_MAC (DEFAULT_ENABLED)
```

Requires: ATCAH\_CHECK\_MAC ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_check\_mac

Enable ATCAH\_CHECK\_MAC to perform the checkmac operation to generate client response on the host side

#### 10.37.2.3 ATCAH\_CONFIG\_TO\_SIGN\_INTERNAL

```
#define ATCAH_CONFIG_TO_SIGN_INTERNAL (DEFAULT_ENABLED)
```

Requires: ATCAH\_CONFIG\_TO\_SIGN\_INTERNAL

Supported API's: atcah\_config\_to\_sign\_internal

Enable ATCAH\_CONFIG\_TO\_SIGN\_INTERNAL to populate the slot\_config, key\_config, and is\_slot\_locked fields in the [atca\\_sign\\_internal\\_in\\_out](#) structure from the provided config zone

#### 10.37.2.4 ATCAH\_DECRYPT

```
#define ATCAH_DECRYPT (DEFAULT_ENABLED)
```

Requires: ATCAH\_DECRYPT

Supported API's: atcah\_decrypt

Enable ATCAH\_DECRYPT to decrypt 32-byte encrypted data received with the Read command



### 10.37.2.5 ATCAH\_DERIVE\_KEY

```
#define ATCAH_DERIVE_KEY (DEFAULT_ENABLED)
```

Requires: ATCAH\_DERIVE\_KEY ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_derive\_key

Enable ATCAH\_DERIVE\_KEY to derive a key with a key and TempKey

### 10.37.2.6 ATCAH\_DERIVE\_KEY\_MAC

```
#define ATCAH_DERIVE_KEY_MAC (DEFAULT_ENABLED)
```

Requires: ATCAH\_DERIVE\_KEY\_MAC ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_derive\_key\_mac

Enable ATCAH\_DERIVE\_KEY\_MAC to calculate the input MAC for a DeriveKey command

### 10.37.2.7 ATCAH\_ENCODE\_COUNTER\_MATCH

```
#define ATCAH_ENCODE_COUNTER_MATCH (DEFAULT_ENABLED)
```

Requires: ATCAH\_ENCODE\_COUNTER\_MATCH

Supported API's: atcah\_encode\_counter\_match

Enable ATCAH\_ENCODE\_COUNTER\_MATCH to build the counter match value that needs to be stored in a slot

### 10.37.2.8 ATCAH\_GEN\_KEY\_MSG

```
#define ATCAH_GEN_KEY_MSG (DEFAULT_ENABLED)
```

Requires: ATCAH\_SHA256 ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_gen\_key\_msg

Enable ATCAH\_GEN\_KEY\_MSG to calculate the PubKey digest created by GenKey and saved to TempKey

### 10.37.2.9 ATCAH\_GEN\_MAC

```
#define ATCAH_GEN_MAC (DEFAULT_ENABLED)
```

Requires: ATCAH\_GEN\_MAC ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_gen\_mac

Enable ATCAH\_GEN\_MAC to generate mac with session key with a plain text

### 10.37.2.10 ATCAH\_GEN\_SESSION\_KEY

```
#define ATCAH_GEN_SESSION_KEY (DEFAULT_ENABLED)
```

Requires: ATCAH\_GEN\_SESSION\_KEY ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_gen\_session\_key

Enable ATCAH\_GEN\_SESSION\_KEY to calculate the session key for the ECC204

### 10.37.2.11 ATCAH\_GENDIG

```
#define ATCAH_GENDIG (DEFAULT_ENABLED)
```

Requires: ATCAH\_GENDIG ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_gen\_dig

Enable ATCAH\_GENDIG to combine the current TempKey with a stored value

### 10.37.2.12 ATCAH\_HMAC

```
#define ATCAH_HMAC (DEFAULT_ENABLED)
```

Requires: ATCAH\_HMAC ATCAC\_SW\_SHA2\_256 ATCAH\_INCLUDE\_DATA

Supported API's: atcah\_hmac

Enable ATCAH\_HMAC to generate an HMAC / SHA-256 hash of a key and other information

### 10.37.2.13 ATCAH\_INCLUDE\_DATA

```
#define ATCAH_INCLUDE_DATA (DEFAULT_ENABLED)
```

Requires: ATCAH\_INCLUDE\_DATA

Supported API's: atcah\_include\_data

Enable ATCAH\_INCLUDE\_DATA to copy otp and sn data into a command buffer

### 10.37.2.14 ATCAH\_IO\_DECRYPT

```
#define ATCAH_IO_DECRYPT (DEFAULT_ENABLED)
```

Requires: ATCAH\_IO\_DECRYPT ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_io\_decrypt

Enable ATCAH\_IO\_DECRYPT to decrypt data that's been encrypted by the IO protection key. The ECDH and KDF commands on the ATECC608 are the only ones that support this operation

#### 10.37.2.15 ATCAH\_MAC

```
#define ATCAH_MAC (DEFAULT_ENABLED)
```

Requires: ATCAH\_MAC ATCAC\_SW\_SHA2\_256 ATCAH\_INCLUDE\_DATA

Supported API's: atcah\_mac

Enable ATCAH\_MAC to generate an SHA-256 digest (MAC) of a key, challenge, and other information

#### 10.37.2.16 ATCAH\_NONCE

```
#define ATCAH_NONCE (DEFAULT_ENABLED)
```

Requires: ATCAH\_NONCE ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_nonce

Enable ATCAH\_NONCE to calculate host side nonce with the parameters passed

#### 10.37.2.17 ATCAH\_PRIVWRITE\_AUTH\_MAC

```
#define ATCAH_PRIVWRITE_AUTH_MAC (DEFAULT_ENABLED)
```

Requires: ATCAH\_PRIVWRITE\_AUTH\_MAC ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_privwrite\_auth\_mac

Enable ATCAH\_PRIVWRITE\_AUTH\_MAC to calculate the input MAC for the PrivWrite command

#### 10.37.2.18 ATCAH\_SECUREBOOT\_ENC

```
#define ATCAH_SECUREBOOT_ENC (DEFAULT_ENABLED)
```

Requires: ATCAH\_SECUREBOOT\_ENC ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_secureboot\_enc

Enable ATCAH\_SECUREBOOT\_ENC to encrypt the digest for the SecureBoot command when using the encrypted digest / validating mac option

#### 10.37.2.19 ATCAH\_SECUREBOOT\_MAC

```
#define ATCAH_SECUREBOOT_MAC (DEFAULT_ENABLED)
```

Requires: ATCAH\_SECUREBOOT\_MAC ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_secureboot\_mac

Enable ATCAH\_SECUREBOOT\_MAC to calculates the expected MAC returned from the SecureBoot command when verification is a success

### 10.37.2.20 ATCAH\_SHA256

```
#define ATCAH_SHA256 (DEFAULT_ENABLED)
```

Requires: ATCAH\_SHA256 ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_sha256

Enable ATCAH\_SHA256 to create a SHA256 digest on a little-endian system

### 10.37.2.21 ATCAH\_SIGN\_INTERNAL\_MSG

```
#define ATCAH_SIGN_INTERNAL_MSG (DEFAULT_ENABLED)
```

Requires: ATCAH\_SIGN\_INTERNAL\_MSG ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_sign\_internal\_msg

Enable ATCAH\_SIGN\_INTERNAL\_MSG to build the full message that would be signed by the Sign(Internal) command

### 10.37.2.22 ATCAH\_VERIFY\_MAC

```
#define ATCAH_VERIFY_MAC (DEFAULT_ENABLED)
```

Requires: ATCAH\_VERIFY\_MAC ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_verify\_mac

Enable ATCAH\_VERIFY\_MAC to calculate the expected MAC on the host side for the Verify command

### 10.37.2.23 ATCAH\_WRITE\_AUTH\_MAC

```
#define ATCAH_WRITE_AUTH_MAC (DEFAULT_ENABLED)
```

Requires: ATCAH\_WRITE\_AUTH\_MAC ATCAC\_SW\_SHA2\_256

Supported API's: atcah\_write\_auth\_mac ECC204 specific API's: atcah\_ecc204\_write\_auth\_mac

Enable ATCAH\_WRITE\_AUTH\_MAC to calculate the input MAC for the Write command

## 10.38 atca\_iface.c File Reference

Microchip CryptoAuthLib hardware interface object.

```
#include "cryptoauthlib.h"  
#include <ctype.h>
```

## Data Structures

- struct [devtype\\_names\\_t](#)

## Functions

- [ATCA\\_STATUS initATCAIface](#) ([ATCAIfaceCfg](#) \*cfg, [ATCAIface](#) ca\_iface)  
*Initializer for ATCAIface objects.*
- [ATCAIface newATCAIface](#) ([ATCAIfaceCfg](#) \*cfg)  
*Constructor for ATCAIface objects.*
- [ATCA\\_STATUS atinit](#) ([ATCAIface](#) ca\_iface)  
*Performs the HAL initialization by calling intermediate HAL wrapper function. If using the basic API, the [atcab\\_init\(\)](#) function should be called instead.*
- [ATCA\\_STATUS atsend](#) ([ATCAIface](#) ca\_iface, uint8\_t address, uint8\_t \*txdata, int txlength)  
*Sends the data to the device by calling intermediate HAL wrapper function.*
- [ATCA\\_STATUS atreceive](#) ([ATCAIface](#) ca\_iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*Receives data from the device by calling intermediate HAL wrapper function.*
- [ATCA\\_STATUS atcontrol](#) ([ATCAIface](#) ca\_iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations with the underlying hal driver.*
- [ATCA\\_STATUS atwake](#) ([ATCAIface](#) ca\_iface)  
*Wakes up the device by calling intermediate HAL wrapper function. The [atcab\\_wakeup\(\)](#) function should be used instead.*
- [ATCA\\_STATUS atidle](#) ([ATCAIface](#) ca\_iface)  
*Puts the device into idle state by calling intermediate HAL wrapper function. The [atcab\\_idle\(\)](#) function should be used instead.*
- [ATCA\\_STATUS atsleep](#) ([ATCAIface](#) ca\_iface)  
*Puts the device into sleep state by calling intermediate HAL wrapper function. The [atcab\\_sleep\(\)](#) function should be used instead.*
- [ATCAIfaceCfg](#) \* [atgetifacecfg](#) ([ATCAIface](#) ca\_iface)  
*Returns the logical interface configuration for the device.*
- void \* [atgetifacehaldat](#) ([ATCAIface](#) ca\_iface)  
*Returns the HAL data pointer for the device.*
- bool [iface\\_type\\_is\\_kit](#) ([ATCAIfaceType](#) iface\_type)  
*Check if the given interface is a "kit protocol" one.*
- bool [atca\\_iface\\_is\\_kit](#) ([ATCAIface](#) ca\_iface)  
*Check if the given interface is configured as a "kit protocol" one where transactions are atomic.*
- bool [atca\\_iface\\_is\\_swi](#) ([ATCAIface](#) ca\_iface)  
*Check if the given interface is configured as a SWI.*
- int [atca\\_iface\\_get\\_retries](#) ([ATCAIface](#) ca\_iface)  
*Retrieve the number of retries for a configured interface.*
- uint16\_t [atca\\_iface\\_get\\_wake\\_delay](#) ([ATCAIface](#) ca\_iface)  
*Retrieve the wake/retry delay for a configured interface/device.*
- uint8\_t [ifacecfg\\_get\\_address](#) ([ATCAIfaceCfg](#) \*cfg)  
*Retrieves the device address given an interface configuration.*
- [ATCA\\_STATUS ifacecfg\\_set\\_address](#) ([ATCAIfaceCfg](#) \*cfg, uint8\_t addr, [ATCAKitType](#) kitiface)  
*Change the address of the selected device.*
- [ATCA\\_STATUS releaseATCAIface](#) ([ATCAIface](#) ca\_iface)  
*Instruct the HAL driver to release any resources associated with this interface.*
- void [deleteATCAIface](#) ([ATCAIface](#) \*ca\_iface)  
*Instruct the HAL driver to release any resources associated with this interface, then delete the object.*
- [ATCADeviceType](#) [iface\\_get\\_device\\_type\\_by\\_name](#) (const char \*name)  
*Get the ATCADeviceType for a string that looks like a part number.*

### 10.38.1 Detailed Description

Microchip CryptoAuthLib hardware interface object.

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## 10.39 atca\_iface.h File Reference

Microchip Crypto Auth hardware interface object.

```
#include <stdint.h>
#include <stddef.h>
#include "atca_config.h"
#include "atca_devtypes.h"
#include "atca_status.h"
```

### Data Structures

- struct [ATCAIfaceCfg](#)
- struct [ATCAHAL\\_t](#)  
*HAL Driver Structure.*
- struct [atca\\_iface](#)  
*atca\_iface is the context structure for a configured interface*

### Macros

- #define [ATCA\\_IFACECFG\\_NAME\(x\)](#)
- #define [ATCA\\_IFACECFG\\_VALUE\(c, v\) c->v](#)

### Typedefs

- typedef struct [atca\\_iface](#) \* [ATCAIface](#)
- typedef struct [atca\\_iface](#) [atca\\_iface\\_t](#)  
*atca\_iface is the context structure for a configured interface*

### Enumerations

- enum [ATCAIfaceType](#) {  
    [ATCA\\_I2C\\_IFACE](#) = 0, [ATCA\\_SWI\\_IFACE](#) = 1, [ATCA\\_UART\\_IFACE](#) = 2, [ATCA\\_SPI\\_IFACE](#) = 3,  
    [ATCA\\_HID\\_IFACE](#) = 4, [ATCA\\_KIT\\_IFACE](#) = 5, [ATCA\\_CUSTOM\\_IFACE](#) = 6, [ATCA\\_I2C\\_GPIO\\_IFACE](#) = 7,  
    [ATCA\\_SWI\\_GPIO\\_IFACE](#) = 8, [ATCA\\_SPI\\_GPIO\\_IFACE](#) = 9, [ATCA\\_UNKNOWN\\_IFACE](#) = 0xFE }
- enum [ATCAKitType](#) {  
    [ATCA\\_KIT\\_AUTO\\_IFACE](#), [ATCA\\_KIT\\_I2C\\_IFACE](#), [ATCA\\_KIT\\_SWI\\_IFACE](#), [ATCA\\_KIT\\_SPI\\_IFACE](#),  
    [ATCA\\_KIT\\_UNKNOWN\\_IFACE](#) }

## Functions

- [ATCA\\_STATUS initATCAIface](#) ([ATCAIfaceCfg](#) \*cfg, [ATCAIface](#) ca\_iface)  
*Initializer for ATCAIface objects.*
- [ATCAIface newATCAIface](#) ([ATCAIfaceCfg](#) \*cfg)  
*Constructor for ATCAIface objects.*
- [ATCA\\_STATUS releaseATCAIface](#) ([ATCAIface](#) ca\_iface)  
*Instruct the HAL driver to release any resources associated with this interface.*
- void [deleteATCAIface](#) ([ATCAIface](#) \*ca\_iface)  
*Instruct the HAL driver to release any resources associated with this interface, then delete the object.*
- [ATCA\\_STATUS atinit](#) ([ATCAIface](#) ca\_iface)  
*Performs the HAL initialization by calling intermediate HAL wrapper function. If using the basic API, the [atcab\\_init\(\)](#) function should be called instead.*
- [ATCA\\_STATUS atsend](#) ([ATCAIface](#) ca\_iface, uint8\_t address, uint8\_t \*txdata, int txlength)  
*Sends the data to the device by calling intermediate HAL wrapper function.*
- [ATCA\\_STATUS atreceive](#) ([ATCAIface](#) ca\_iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*Receives data from the device by calling intermediate HAL wrapper function.*
- [ATCA\\_STATUS atcontrol](#) ([ATCAIface](#) ca\_iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations with the underlying hal driver.*
- [ATCA\\_STATUS atwake](#) ([ATCAIface](#) ca\_iface)  
*Wakes up the device by calling intermediate HAL wrapper function. The [atcab\\_wakeup\(\)](#) function should be used instead.*
- [ATCA\\_STATUS atidle](#) ([ATCAIface](#) ca\_iface)  
*Puts the device into idle state by calling intermediate HAL wrapper function. The [atcab\\_idle\(\)](#) function should be used instead.*
- [ATCA\\_STATUS atsleep](#) ([ATCAIface](#) ca\_iface)  
*Puts the device into sleep state by calling intermediate HAL wrapper function. The [atcab\\_sleep\(\)](#) function should be used instead.*
- [ATCAIfaceCfg](#) \* [atgetifacecfg](#) ([ATCAIface](#) ca\_iface)  
*Returns the logical interface configuration for the device.*
- void \* [atgetifacehaldat](#) ([ATCAIface](#) ca\_iface)  
*Returns the HAL data pointer for the device.*
- [ATCA\\_STATUS ifacecfg\\_set\\_address](#) ([ATCAIfaceCfg](#) \*cfg, uint8\_t addr, [ATCAKitType](#) kitiface)  
*Change the address of the selected device.*
- uint8\_t [ifacecfg\\_get\\_address](#) ([ATCAIfaceCfg](#) \*cfg)  
*Retrieves the device address given an interface configuration.*
- bool [ifacetype\\_is\\_kit](#) ([ATCAIfaceType](#) iface\_type)  
*Check if the given interface is a "kit protocol" one.*
- bool [atca\\_iface\\_is\\_kit](#) ([ATCAIface](#) ca\_iface)  
*Check if the given interface is configured as a "kit protocol" one where transactions are atomic.*
- bool [atca\\_iface\\_is\\_swi](#) ([ATCAIface](#) ca\_iface)  
*Check if the given interface is configured as a SWI.*
- int [atca\\_iface\\_get\\_retries](#) ([ATCAIface](#) ca\_iface)  
*Retrive the number of retries for a configured interface.*
- uint16\_t [atca\\_iface\\_get\\_wake\\_delay](#) ([ATCAIface](#) ca\_iface)  
*Retrive the wake/retry delay for a configured interface/device.*
- [ATCADeviceType](#) [iface\\_get\\_device\\_type\\_by\\_name](#) (const char \*name)  
*Get the ATCADeviceType for a string that looks like a part number.*

### 10.39.1 Detailed Description

Microchip Crypto Auth hardware interface object.

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## 10.40 atca\_jwt.c File Reference

Utilities to create and verify a JSON Web Token (JWT)

```
#include "cryptoauthlib.h"
#include "atca_helpers.h"
#include "crypto/atca_crypto_sw_sha2.h"
#include "jwt/atca_jwt.h"
#include <stdio.h>
```

### Functions

- void [atca\\_jwt\\_check\\_payload\\_start](#) ([atca\\_jwt\\_t](#) \*jwt)  
*Check the provided context to see what character needs to be added in order to append a claim.*
- [ATCA\\_STATUS](#) [atca\\_jwt\\_init](#) ([atca\\_jwt\\_t](#) \*jwt, char \*buf, uint16\_t buflen)  
*Initialize a JWT structure.*
- [ATCA\\_STATUS](#) [atca\\_jwt\\_finalize](#) ([atca\\_jwt\\_t](#) \*jwt, uint16\_t key\_id)  
*Close the claims of a token, encode them, then sign the result.*
- [ATCA\\_STATUS](#) [atca\\_jwt\\_add\\_claim\\_string](#) ([atca\\_jwt\\_t](#) \*jwt, const char \*claim, const char \*value)  
*Add a string claim to a token.*
- [ATCA\\_STATUS](#) [atca\\_jwt\\_add\\_claim\\_numeric](#) ([atca\\_jwt\\_t](#) \*jwt, const char \*claim, int32\_t value)  
*Add a numeric claim to a token.*

### 10.40.1 Detailed Description

Utilities to create and verify a JSON Web Token (JWT)

#### Copyright

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## 10.41 atca\_jwt.h File Reference

Utilities to create and verify a JSON Web Token (JWT)

```
#include "cryptoauthlib.h"
```



## Data Structures

- struct [atca\\_jwt\\_t](#)

*Structure to hold metadata information about the jwt being built.*

## Functions

- [ATCA\\_STATUS atca\\_jwt\\_init](#) ([atca\\_jwt\\_t](#) \*jwt, char \*buf, uint16\_t buflen)  
*Initialize a JWT structure.*
- [ATCA\\_STATUS atca\\_jwt\\_add\\_claim\\_string](#) ([atca\\_jwt\\_t](#) \*jwt, const char \*claim, const char \*value)  
*Add a string claim to a token.*
- [ATCA\\_STATUS atca\\_jwt\\_add\\_claim\\_numeric](#) ([atca\\_jwt\\_t](#) \*jwt, const char \*claim, int32\_t value)  
*Add a numeric claim to a token.*
- [ATCA\\_STATUS atca\\_jwt\\_finalize](#) ([atca\\_jwt\\_t](#) \*jwt, uint16\_t key\_id)  
*Close the claims of a token, encode them, then sign the result.*
- void [atca\\_jwt\\_check\\_payload\\_start](#) ([atca\\_jwt\\_t](#) \*jwt)  
*Check the provided context to see what character needs to be added in order to append a claim.*

### 10.41.1 Detailed Description

Utilities to create and verify a JSON Web Token (JWT)

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## 10.42 atca\_mbedtls\_ecdh.c File Reference

```
#include "mbedtls/config.h"
```

## 10.43 atca\_mbedtls\_ecdsa.c File Reference

```
#include "mbedtls/config.h"
```

## 10.44 atca\_mbedtls\_wrap.c File Reference

Wrapper functions to replace cryptoauthlib software crypto functions with the mbedtls equivalent.

```
#include "mbedtls/config.h"
#include <stdlib.h>
#include "mbedtls/cmac.h"
#include "mbedtls/ctr_drbg.h"
#include "mbedtls/pk.h"
#include "mbedtls/ecdh.h"
#include "mbedtls/ecp.h"
#include "mbedtls/entropy.h"
#include "mbedtls/x509_crt.h"
#include "cryptoauthlib.h"
#include "atca_mbedtls_wrap.h"
#include "atca_mbedtls_patch.h"
#include "crypto/atca_crypto_sw.h"
#include "atcacert/atcacert_client.h"
#include "atcacert/atcacert_def.h"
#include "mbedtls/pk_internal.h"
#include "atcacert/atcacert_der.h"
```

### Macros

- #define `mbedtls_calloc` `calloc`
- #define `mbedtls_free` `free`

### Functions

- int `atcac_sw_random` (uint8\_t \*data, size\_t data\_size)  
*Return Random Bytes.*
- ATCA\_STATUS `atcac_aes_gcm_aad_update` (atcac\_aes\_gcm\_ctx \*ctx, const uint8\_t \*aad, const size\_t aad\_len)  
*Update the GCM context with additional authentication data (AAD)*
- ATCA\_STATUS `atcac_aes_gcm_encrypt_start` (atcac\_aes\_gcm\_ctx \*ctx, const uint8\_t \*key, const uint8\_t key\_len, const uint8\_t \*iv, const uint8\_t iv\_len)  
*Initialize an AES-GCM context.*
- ATCA\_STATUS `atcac_aes_gcm_encrypt_update` (atcac\_aes\_gcm\_ctx \*ctx, const uint8\_t \*plaintext, const size\_t pt\_len, uint8\_t \*ciphertext, size\_t \*ct\_len)  
*Encrypt a data using the initialized context.*
- ATCA\_STATUS `atcac_aes_gcm_encrypt_finish` (atcac\_aes\_gcm\_ctx \*ctx, uint8\_t \*tag, size\_t tag\_len)  
*Get the AES-GCM tag and free the context.*
- ATCA\_STATUS `atcac_aes_gcm_decrypt_start` (atcac\_aes\_gcm\_ctx \*ctx, const uint8\_t \*key, const uint8\_t key\_len, const uint8\_t \*iv, const uint8\_t iv\_len)  
*Initialize an AES-GCM context for decryption.*
- ATCA\_STATUS `atcac_aes_gcm_decrypt_update` (atcac\_aes\_gcm\_ctx \*ctx, const uint8\_t \*ciphertext, const size\_t ct\_len, uint8\_t \*plaintext, size\_t \*pt\_len)  
*Decrypt ciphertext using the initialized context.*
- ATCA\_STATUS `atcac_aes_gcm_decrypt_finish` (atcac\_aes\_gcm\_ctx \*ctx, const uint8\_t \*tag, size\_t tag\_len, bool \*is\_verified)  
*Compare the AES-GCM tag and free the context.*

- `int atcac_sw_sha1_init (atcac_sha1_ctx *ctx)`  
*Initialize context for performing SHA1 hash in software.*
- `int atcac_sw_sha1_update (atcac_sha1_ctx *ctx, const uint8_t *data, size_t data_size)`  
*Add data to a SHA1 hash.*
- `int atcac_sw_sha1_finish (atcac_sha1_ctx *ctx, uint8_t digest[ATCA_SHA1_DIGEST_SIZE])`  
*Complete the SHA1 hash in software and return the digest.*
- `int atcac_sw_sha2_256_init (atcac_sha2_256_ctx *ctx)`  
*Initialize context for performing SHA256 hash in software.*
- `int atcac_sw_sha2_256_update (atcac_sha2_256_ctx *ctx, const uint8_t *data, size_t data_size)`  
*Add data to a SHA256 hash.*
- `int atcac_sw_sha2_256_finish (atcac_sha2_256_ctx *ctx, uint8_t digest[ATCA_SHA2_256_DIGEST_SIZE])`  
*Complete the SHA256 hash in software and return the digest.*
- `ATCA_STATUS atcac_aes_cmac_init (atcac_aes_cmac_ctx *ctx, const uint8_t *key, const uint8_t key_len)`  
*Initialize context for performing CMAC in software.*
- `ATCA_STATUS atcac_aes_cmac_update (atcac_aes_cmac_ctx *ctx, const uint8_t *data, const size_t data_size)`  
*Update CMAC context with input data.*
- `ATCA_STATUS atcac_aes_cmac_finish (atcac_aes_cmac_ctx *ctx, uint8_t *cmac, size_t *cmac_size)`  
*Finish CMAC calculation and clear the CMAC context.*
- `ATCA_STATUS atcac_sha256_hmac_init (atcac_hmac_sha256_ctx *ctx, const uint8_t *key, const uint8_t key_len)`  
*Initialize context for performing HMAC (sha256) in software.*
- `ATCA_STATUS atcac_sha256_hmac_update (atcac_hmac_sha256_ctx *ctx, const uint8_t *data, size_t data_size)`  
*Update HMAC context with input data.*
- `ATCA_STATUS atcac_sha256_hmac_finish (atcac_hmac_sha256_ctx *ctx, uint8_t *digest, size_t *digest_len)`  
*Finish CMAC calculation and clear the HMAC context.*
- `ATCA_STATUS atcac_pk_init (atcac_pk_ctx *ctx, const uint8_t *buf, size_t buflen, uint8_t key_type, bool pubkey)`  
*Set up a public/private key structure for use in asymmetric cryptographic functions.*
- `ATCA_STATUS atcac_pk_init_pem (atcac_pk_ctx *ctx, const uint8_t *buf, size_t buflen, bool pubkey)`  
*Set up a public/private key structure for use in asymmetric cryptographic functions.*
- `ATCA_STATUS atcac_pk_free (atcac_pk_ctx *ctx)`  
*Free a public/private key structure.*
- `ATCA_STATUS atcac_pk_public (atcac_pk_ctx *ctx, uint8_t *buf, size_t *buflen)`  
*Get the public key from the context.*
- `ATCA_STATUS atcac_pk_sign (atcac_pk_ctx *ctx, const uint8_t *digest, size_t dig_len, uint8_t *signature, size_t *sig_len)`  
*Perform a signature with the private key in the context.*
- `ATCA_STATUS atcac_pk_verify (atcac_pk_ctx *ctx, const uint8_t *digest, size_t dig_len, const uint8_t *signature, size_t sig_len)`  
*Perform a verify using the public key in the provided context.*
- `ATCA_STATUS atcac_pk_derive (atcac_pk_ctx *private_ctx, atcac_pk_ctx *public_ctx, uint8_t *buf, size_t *buflen)`  
*Execute the key agreement protocol for the provided keys (if they can)*
- `int atca_mbedtls_pk_init_ext (ATCADevice device, mbedtls_pk_context *pkey, const uint16_t slotid)`  
*Initializes an mbedtls pk context for use with EC operations.*
- `int atca_mbedtls_pk_init (mbedtls_pk_context *pkey, const uint16_t slotid)`  
*Initializes an mbedtls pk context for use with EC operations.*
- `int atca_mbedtls_cert_add (mbedtls_x509_crt *cert, const atcacert_def_t *cert_def)`  
*Rebuild a certificate from an atcacert\_def\_t structure, and then add it to an mbedtls cert chain.*

### Variables

- const mbedtls\_pk\_info\_t [atca\\_mbedtls\\_ekey\\_info](#)

### 10.44.1 Detailed Description

Wrapper functions to replace cryptoauthlib software crypto functions with the mbedtls equivalent.

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### 10.44.2 Macro Definition Documentation

#### 10.44.2.1 mbedtls\_calloc

```
#define mbedtls_calloc calloc
```

#### 10.44.2.2 mbedtls\_free

```
#define mbedtls_free free
```

### 10.44.3 Function Documentation

#### 10.44.3.1 atca\_mbedtls\_cert\_add()

```
int atca_mbedtls_cert_add (
    mbedtls_x509_crt * cert,
    const atcacert_def_t * cert_def )
```

Rebuild a certificate from an atcacert\_def\_t structure, and then add it to an mbedtls cert chain.

#### Parameters

in, out	<i>cert</i>	mbedtls cert chain. Must have already been initialized
in	<i>cert_def</i>	Certificate definition that will be rebuilt and added

**Returns**

0 on success, otherwise an error code.

**10.44.3.2 atcac\_aes\_cmac\_finish()**

```
ATCA_STATUS atcac_aes_cmac_finish (
    atcac_aes_cmac_ctx * ctx,
    uint8_t * cmac,
    size_t * cmac_size )
```

Finish CMAC calculation and clear the CMAC context.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>ctx</i>	pointer to a aes-cmac context
out	<i>cmac</i>	cmac value
in, out	<i>cmac_size</i>	length of cmac

**10.44.3.3 atcac\_aes\_cmac\_init()**

```
ATCA_STATUS atcac_aes_cmac_init (
    atcac_aes_cmac_ctx * ctx,
    const uint8_t * key,
    const uint8_t key_len )
```

Initialize context for performing CMAC in software.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>ctx</i>	pointer to a aes-cmac context
in	<i>key</i>	key value to use
in	<i>key_len</i>	length of the key

### 10.44.3.4 atcac\_aes\_cmac\_update()

```
ATCA_STATUS atcac_aes_cmac_update (
    atcac_aes_cmac_ctx * ctx,
    const uint8_t * data,
    const size_t data_size )
```

Update CMAC context with input data.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	pointer to a aes-cmac context
in	<i>data</i>	input data
in	<i>data_size</i>	length of input data

### 10.44.3.5 atcac\_aes\_gcm\_aad\_update()

```
ATCA_STATUS atcac_aes_gcm_aad_update (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * aad,
    const size_t aad_len )
```

Update the GCM context with additional authentication data (AAD)

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	AES-GCM Context
in	<i>aad</i>	Additional Authentication Data
in	<i>aad_len</i>	Length of AAD

### 10.44.3.6 atcac\_aes\_gcm\_decrypt\_finish()

```
ATCA_STATUS atcac_aes_gcm_decrypt_finish (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * tag,
    size_t tag_len,
    bool * is_verified )
```

Compare the AES-GCM tag and free the context.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>ctx</i>	AES-GCM Context
in	<i>tag</i>	GCM Tag to Verify
in	<i>tag_len</i>	Length of the GCM tag
out	<i>is_verified</i>	Tag verified as matching

**10.44.3.7 atcac\_aes\_gcm\_decrypt\_start()**

```
ATCA_STATUS atcac_aes_gcm_decrypt_start (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * key,
    const uint8_t key_len,
    const uint8_t * iv,
    const uint8_t iv_len )
```

Initialize an AES-GCM context for decryption.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>ctx</i>	AES-GCM Context
in	<i>key</i>	AES Key
in	<i>key_len</i>	Length of the AES key - should be 16 or 32
in	<i>iv</i>	Initialization vector input
in	<i>iv_len</i>	Length of the initialization vector

**10.44.3.8 atcac\_aes\_gcm\_decrypt\_update()**

```
ATCA_STATUS atcac_aes_gcm_decrypt_update (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * ciphertext,
    const size_t ct_len,
    uint8_t * plaintext,
    size_t * pt_len )
```

Decrypt ciphertext using the initialized context.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	AES-GCM Context
in	<i>ciphertext</i>	Ciphertext to decrypt
in	<i>ct_len</i>	Length of the ciphertext
out	<i>plaintext</i>	Resulting decrypted plaintext
in, out	<i>pt_len</i>	Length of the plaintext buffer

**10.44.3.9 atcac\_aes\_gcm\_encrypt\_finish()**

```
ATCA_STATUS atcac_aes_gcm_encrypt_finish (
    atcac_aes_gcm_ctx * ctx,
    uint8_t * tag,
    size_t tag_len )
```

Get the AES-GCM tag and free the context.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	AES-GCM Context
out	<i>tag</i>	GCM Tag Result
in	<i>tag_len</i>	Length of the GCM tag

**10.44.3.10 atcac\_aes\_gcm\_encrypt\_start()**

```
ATCA_STATUS atcac_aes_gcm_encrypt_start (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * key,
    const uint8_t key_len,
    const uint8_t * iv,
    const uint8_t iv_len )
```

Initialize an AES-GCM context.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	AES-GCM Context
in	<i>key</i>	AES Key
in	<i>key_len</i>	Length of the AES key - should be 16 or 32
in	<i>iv</i>	Initialization vector input
in	<i>iv_len</i>	Length of the initialization vector



#### 10.44.3.11 atcac\_aes\_gcm\_encrypt\_update()

```
ATCA_STATUS atcac_aes_gcm_encrypt_update (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * plaintext,
    const size_t pt_len,
    uint8_t * ciphertext,
    size_t * ct_len )
```

Encrypt a data using the initialized context.

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

##### Parameters

in	<i>ctx</i>	AES-GCM Context
in	<i>plaintext</i>	Input buffer to encrypt
in	<i>pt_len</i>	Length of the input
out	<i>ciphertext</i>	Output buffer
in, out	<i>ct_len</i>	Length of the ciphertext buffer

#### 10.44.3.12 atcac\_pk\_derive()

```
ATCA_STATUS atcac_pk_derive (
    atcac_pk_ctx * private_ctx,
    atcac_pk_ctx * public_ctx,
    uint8_t * buf,
    size_t * buflen )
```

Execute the key agreement protocol for the provided keys (if they can)

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.44.3.13 atcac\_pk\_free()

```
ATCA_STATUS atcac_pk_free (
    atcac_pk_ctx * ctx )
```

Free a public/private key structure.

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### Parameters

in	<i>ctx</i>	pointer to a pk context
----	------------	-------------------------

### 10.44.3.14 atcac\_pk\_init()

```
ATCA_STATUS atcac_pk_init (
    atcac_pk_ctx * ctx,
    const uint8_t * buf,
    size_t buflen,
    uint8_t key_type,
    bool pubkey )
```

Set up a public/private key structure for use in asymmetric cryptographic functions.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### Parameters

in	<i>ctx</i>	pointer to a pk context
in	<i>buf</i>	buffer containing a pem encoded key
in	<i>buflen</i>	length of the input buffer
in	<i>pubkey</i>	buffer is a public key

### 10.44.3.15 atcac\_pk\_init\_pem()

```
ATCA_STATUS atcac_pk_init_pem (
    atcac_pk_ctx * ctx,
    const uint8_t * buf,
    size_t buflen,
    bool pubkey )
```

Set up a public/private key structure for use in asymmetric cryptographic functions.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### Parameters

in	<i>ctx</i>	pointer to a pk context
in	<i>buf</i>	buffer containing a pem encoded key
in	<i>buflen</i>	length of the input buffer
in	<i>pubkey</i>	buffer is a public key

#### 10.44.3.16 atcac\_pk\_public()

```
ATCA_STATUS atcac_pk_public (
    atcac_pk_ctx * ctx,
    uint8_t * buf,
    size_t * buflen )
```

Get the public key from the context.

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.44.3.17 atcac\_pk\_sign()

```
ATCA_STATUS atcac_pk_sign (
    atcac_pk_ctx * ctx,
    const uint8_t * digest,
    size_t dig_len,
    uint8_t * signature,
    size_t * sig_len )
```

Perform a signature with the private key in the context.

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.44.3.18 atcac\_pk\_verify()

```
ATCA_STATUS atcac_pk_verify (
    atcac_pk_ctx * ctx,
    const uint8_t * digest,
    size_t dig_len,
    const uint8_t * signature,
    size_t sig_len )
```

Perform a verify using the public key in the provided context.

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.44.3.19 atcac\_sw\_random()

```
int atcac_sw_random (
    uint8_t * data,
    size_t data_size )
```

Return Random Bytes.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.44.3.20 atcac\_sw\_sha1\_finish()

```
int atcac_sw_sha1_finish (
    atcac_sha1_ctx * ctx,
    uint8_t digest[ATCA_SHA1_DIGEST_SIZE] )
```

Complete the SHA1 hash in software and return the digest.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	pointer to a hash context
out	<i>digest</i>	output buffer (20 bytes)

### 10.44.3.21 atcac\_sw\_sha2\_256\_finish()

```
int atcac_sw_sha2_256_finish (
    atcac_sha2_256_ctx * ctx,
    uint8_t digest[ATCA_SHA2_256_DIGEST_SIZE] )
```

Complete the SHA256 hash in software and return the digest.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	pointer to a hash context
out	<i>digest</i>	output buffer (32 bytes)

## 10.44.4 Variable Documentation

### 10.44.4.1 atca\_mbedtls\_eckey\_info

```
const mbedtls_pk_info_t atca_mbedtls_eckey_info
```

#### Initial value:

```
= {
    MBEDTLS_PK_ECKEY,
    "EC",
    atca_mbedtls_eckey_get_bitlen,
    atca_mbedtls_eckey_can_do,
    atca_mbedtls_eckey_verify,
    atca_mbedtls_eckey_sign,
    NULL,
    NULL,
    atca_mbedtls_eckey_check_pair,
    atca_mbedtls_eckey_alloc,
    atca_mbedtls_eckey_free,
    atca_mbedtls_eckey_debug,
}
```

## 10.45 atca\_mbedtls\_wrap.h File Reference

```
#include "atca_device.h"
#include "mbedtls/bignum.h"
```

### Data Structures

- struct [atca\\_mbedtls\\_eckey\\_s](#)

### Typedefs

- typedef struct [atca\\_mbedtls\\_eckey\\_s](#) [atca\\_mbedtls\\_eckey\\_t](#)

### Functions

- int [atca\\_mbedtls\\_ecdsa\\_sign](#) (const mbedtls\_mpi \*d, mbedtls\_mpi \*r, mbedtls\_mpi \*s, const unsigned char \*buf, size\_t buf\_len)
- int [atca\\_mbedtls\\_pk\\_init\\_ext](#) ([ATCADevice](#) device, struct mbedtls\_pk\_context \*pkey, const uint16\_t slotid)  
*Initializes an mbedtls pk context for use with EC operations.*
- int [atca\\_mbedtls\\_pk\\_init](#) (struct mbedtls\_pk\_context \*pkey, const uint16\_t slotid)  
*Initializes an mbedtls pk context for use with EC operations.*
- int [atca\\_mbedtls\\_cert\\_add](#) (struct mbedtls\_x509\_crt \*cert, const struct [atcacert\\_def\\_s](#) \*cert\_def)
- int [atca\\_mbedtls\\_ecdh\\_slot\\_cb](#) (void)  
*ECDH Callback to obtain the "slot" used in ECDH operations from the application.*
- int [atca\\_mbedtls\\_ecdh\\_ioprot\\_cb](#) (uint8\_t secret[32])  
*ECDH Callback to obtain the IO Protection secret from the application.*

## 10.46 atca\_openssl\_interface.c File Reference

Crypto abstraction functions for external host side cryptography.

```
#include "atca_config.h"
#include "atca_status.h"
#include "crypto/atca_crypto_sw.h"
#include <openssl/bn.h>
#include <openssl/bio.h>
#include <openssl/cmac.h>
#include <openssl/ec.h>
#include <openssl/evp.h>
#include <openssl/hmac.h>
#include <openssl/pem.h>
#include <openssl/rand.h>
```

### Functions

- int [atcac\\_sw\\_random](#) (uint8\_t \*data, size\_t data\_size)  
*Return Random Bytes.*
- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_aad\\_update](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, const uint8\_t \*aad, const size\_t aad\_len)  
*Update the GCM context with additional authentication data (AAD)*
- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_encrypt\\_start](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, const uint8\_t \*key, const uint8\_t key\_len, const uint8\_t \*iv, const uint8\_t iv\_len)  
*Initialize an AES-GCM context.*
- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_encrypt\\_update](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, const uint8\_t \*plaintext, const size\_t pt\_len, uint8\_t \*ciphertext, size\_t \*ct\_len)  
*Encrypt a data using the initialized context.*
- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_encrypt\\_finish](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, uint8\_t \*tag, size\_t tag\_len)  
*Get the AES-GCM tag and free the context.*
- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_decrypt\\_start](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, const uint8\_t \*key, const uint8\_t key\_len, const uint8\_t \*iv, const uint8\_t iv\_len)  
*Initialize an AES-GCM context for decryption.*
- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_decrypt\\_update](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, const uint8\_t \*ciphertext, const size\_t ct\_len, uint8\_t \*plaintext, size\_t \*pt\_len)  
*Decrypt ciphertext using the initialized context.*
- [ATCA\\_STATUS atcac\\_aes\\_gcm\\_decrypt\\_finish](#) ([atcac\\_aes\\_gcm\\_ctx](#) \*ctx, const uint8\_t \*tag, size\_t tag\_len, bool \*is\_verified)  
*Compare the AES-GCM tag and free the context.*
- int [atcac\\_sw\\_sha1\\_init](#) ([atcac\\_sha1\\_ctx](#) \*ctx)  
*Initialize context for performing SHA1 hash in software.*
- int [atcac\\_sw\\_sha1\\_update](#) ([atcac\\_sha1\\_ctx](#) \*ctx, const uint8\_t \*data, size\_t data\_size)  
*Add data to a SHA1 hash.*
- int [atcac\\_sw\\_sha1\\_finish](#) ([atcac\\_sha1\\_ctx](#) \*ctx, uint8\_t digest[[ATCA\\_SHA1\\_DIGEST\\_SIZE](#)])  
*Complete the SHA1 hash in software and return the digest.*
- int [atcac\\_sw\\_sha2\\_256\\_init](#) ([atcac\\_sha2\\_256\\_ctx](#) \*ctx)  
*Initialize context for performing SHA256 hash in software.*
- int [atcac\\_sw\\_sha2\\_256\\_update](#) ([atcac\\_sha2\\_256\\_ctx](#) \*ctx, const uint8\_t \*data, size\_t data\_size)  
*Add data to a SHA256 hash.*
- int [atcac\\_sw\\_sha2\\_256\\_finish](#) ([atcac\\_sha2\\_256\\_ctx](#) \*ctx, uint8\_t digest[[ATCA\\_SHA2\\_256\\_DIGEST\\_SIZE](#)])

*Complete the SHA256 hash in software and return the digest.*

- [ATCA\\_STATUS atcac\\_aes\\_cmac\\_init](#) ([atcac\\_aes\\_cmac\\_ctx](#) \*ctx, const uint8\_t \*key, const uint8\_t key\_len)

*Initialize context for performing CMAC in software.*

- [ATCA\\_STATUS atcac\\_aes\\_cmac\\_update](#) ([atcac\\_aes\\_cmac\\_ctx](#) \*ctx, const uint8\_t \*data, const size\_t data\_size)

*Update CMAC context with input data.*

- [ATCA\\_STATUS atcac\\_aes\\_cmac\\_finish](#) ([atcac\\_aes\\_cmac\\_ctx](#) \*ctx, uint8\_t \*cmac, size\_t \*cmac\_size)

*Finish CMAC calculation and clear the CMAC context.*

- [ATCA\\_STATUS atcac\\_sha256\\_hmac\\_init](#) ([atcac\\_hmac\\_sha256\\_ctx](#) \*ctx, const uint8\_t \*key, const uint8\_t key\_len)

*Initialize context for performing HMAC (sha256) in software.*

- [ATCA\\_STATUS atcac\\_sha256\\_hmac\\_update](#) ([atcac\\_hmac\\_sha256\\_ctx](#) \*ctx, const uint8\_t \*data, size\_t data\_size)

*Update HMAC context with input data.*

- [ATCA\\_STATUS atcac\\_sha256\\_hmac\\_finish](#) ([atcac\\_hmac\\_sha256\\_ctx](#) \*ctx, uint8\_t \*digest, size\_t \*digest\_len)

*Finish CMAC calculation and clear the HMAC context.*

- [ATCA\\_STATUS atcac\\_pk\\_init](#) ([atcac\\_pk\\_ctx](#) \*ctx, const uint8\_t \*buf, size\_t buflen, uint8\_t key\_type, bool pubkey)

*Set up a public/private key structure for use in asymmetric cryptographic functions.*

- [ATCA\\_STATUS atcac\\_pk\\_init\\_pem](#) ([atcac\\_pk\\_ctx](#) \*ctx, const uint8\_t \*buf, size\_t buflen, bool pubkey)

*Set up a public/private key structure for use in asymmetric cryptographic functions.*

- [ATCA\\_STATUS atcac\\_pk\\_free](#) ([atcac\\_pk\\_ctx](#) \*ctx)

*Free a public/private key structure.*

- [ATCA\\_STATUS atcac\\_pk\\_public](#) ([atcac\\_pk\\_ctx](#) \*ctx, uint8\_t \*buf, size\_t \*buflen)

*Get the public key from the context.*

- [ATCA\\_STATUS atcac\\_pk\\_sign](#) ([atcac\\_pk\\_ctx](#) \*ctx, const uint8\_t \*digest, size\_t dig\_len, uint8\_t \*signature, size\_t \*sig\_len)

*Perform a signature with the private key in the context.*

- [ATCA\\_STATUS atcac\\_pk\\_verify](#) ([atcac\\_pk\\_ctx](#) \*ctx, const uint8\_t \*digest, size\_t dig\_len, const uint8\_t \*signature, size\_t sig\_len)

*Perform a verify using the public key in the provided context.*

- [ATCA\\_STATUS atcac\\_pk\\_derive](#) ([atcac\\_pk\\_ctx](#) \*private\_ctx, [atcac\\_pk\\_ctx](#) \*public\_ctx, uint8\_t \*buf, size\_t \*buflen)

*Execute the key agreement protocol for the provided keys (if they can)*

## 10.46.1 Detailed Description

Crypto abstraction functions for external host side cryptography.

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## 10.46.2 Function Documentation

### 10.46.2.1 atcac\_aes\_cmac\_finish()

```
ATCA_STATUS atcac_aes_cmac_finish (
    atcac_aes_cmac_ctx * ctx,
    uint8_t * cmac,
    size_t * cmac_size )
```

Finish CMAC calculation and clear the CMAC context.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	pointer to a aes-cmac context
out	<i>cmac</i>	cmac value
in, out	<i>cmac_size</i>	length of cmac

### 10.46.2.2 atcac\_aes\_cmac\_init()

```
ATCA_STATUS atcac_aes_cmac_init (
    atcac_aes_cmac_ctx * ctx,
    const uint8_t * key,
    const uint8_t key_len )
```

Initialize context for performing CMAC in software.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	pointer to a aes-cmac context
in	<i>key</i>	key value to use
in	<i>key_len</i>	length of the key

### 10.46.2.3 atcac\_aes\_cmac\_update()

```
ATCA_STATUS atcac_aes_cmac_update (
    atcac_aes_cmac_ctx * ctx,
    const uint8_t * data,
    const size_t data_size )
```

Update CMAC context with input data.



**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>ctx</i>	pointer to a aes-cmac context
in	<i>data</i>	input data
in	<i>data_size</i>	length of input data

**10.46.2.4 atcac\_aes\_gcm\_aad\_update()**

```
ATCA_STATUS atcac_aes_gcm_aad_update (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * aad,
    const size_t aad_len )
```

Update the GCM context with additional authentication data (AAD)

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>ctx</i>	AES-GCM Context
in	<i>aad</i>	Additional Authentication Data
in	<i>aad_len</i>	Length of AAD

**10.46.2.5 atcac\_aes\_gcm\_decrypt\_finish()**

```
ATCA_STATUS atcac_aes_gcm_decrypt_finish (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * tag,
    size_t tag_len,
    bool * is_verified )
```

Compare the AES-GCM tag and free the context.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	AES-GCM Context
in	<i>tag</i>	GCM Tag to Verify
in	<i>tag_len</i>	Length of the GCM tag
out	<i>is_verified</i>	Tag verified as matching

**10.46.2.6 atcac\_aes\_gcm\_decrypt\_start()**

```
ATCA_STATUS atcac_aes_gcm_decrypt_start (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * key,
    const uint8_t key_len,
    const uint8_t * iv,
    const uint8_t iv_len )
```

Initialize an AES-GCM context for decryption.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	AES-GCM Context
in	<i>key</i>	AES Key
in	<i>key_len</i>	Length of the AES key - should be 16 or 32
in	<i>iv</i>	Initialization vector input
in	<i>iv_len</i>	Length of the initialization vector

**10.46.2.7 atcac\_aes\_gcm\_decrypt\_update()**

```
ATCA_STATUS atcac_aes_gcm_decrypt_update (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * ciphertext,
    const size_t ct_len,
    uint8_t * plaintext,
    size_t * pt_len )
```

Decrypt ciphertext using the initialized context.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	AES-GCM Context
in	<i>ciphertext</i>	Ciphertext to decrypt
in	<i>ct_len</i>	Length of the ciphertext
out	<i>plaintext</i>	Resulting decrypted plaintext
in, out	<i>pt_len</i>	Length of the plaintext buffer

**10.46.2.8 atcac\_aes\_gcm\_encrypt\_finish()**

```
ATCA_STATUS atcac_aes_gcm_encrypt_finish (
    atcac_aes_gcm_ctx * ctx,
    uint8_t * tag,
    size_t tag_len )
```

Get the AES-GCM tag and free the context.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	AES-GCM Context
out	<i>tag</i>	GCM Tag Result
in	<i>tag_len</i>	Length of the GCM tag

**10.46.2.9 atcac\_aes\_gcm\_encrypt\_start()**

```
ATCA_STATUS atcac_aes_gcm_encrypt_start (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * key,
    const uint8_t key_len,
    const uint8_t * iv,
    const uint8_t iv_len )
```

Initialize an AES-GCM context.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	AES-GCM Context
in	<i>key</i>	AES Key
in	<i>key_len</i>	Length of the AES key - should be 16 or 32
in	<i>iv</i>	Initialization vector input
in	<i>iv_len</i>	Length of the initialization vector

### 10.46.2.10 atcac\_aes\_gcm\_encrypt\_update()

```
ATCA_STATUS atcac_aes_gcm_encrypt_update (
    atcac_aes_gcm_ctx * ctx,
    const uint8_t * plaintext,
    const size_t pt_len,
    uint8_t * ciphertext,
    size_t * ct_len )
```

Encrypt a data using the initialized context.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

in	<i>ctx</i>	AES-GCM Context
in	<i>plaintext</i>	Input buffer to encrypt
in	<i>pt_len</i>	Length of the input
out	<i>ciphertext</i>	Output buffer
in, out	<i>ct_len</i>	Length of the ciphertext buffer

### 10.46.2.11 atcac\_pk\_derive()

```
ATCA_STATUS atcac_pk_derive (
    atcac_pk_ctx * private_ctx,
    atcac_pk_ctx * public_ctx,
    uint8_t * buf,
    size_t * buflen )
```

Execute the key agreement protocol for the provided keys (if they can)

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.46.2.12 atcac\_pk\_free()

```
ATCA_STATUS atcac_pk_free (
    atcac_pk_ctx * ctx )
```

Free a public/private key structure.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	pointer to a pk context
----	------------	-------------------------

**10.46.2.13 atcac\_pk\_init()**

```
ATCA_STATUS atcac_pk_init (
    atcac_pk_ctx * ctx,
    const uint8_t * buf,
    size_t buflen,
    uint8_t key_type,
    bool pubkey )
```

Set up a public/private key structure for use in asymmetric cryptographic functions.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	pointer to a pk context
in	<i>buf</i>	buffer containing a pem encoded key
in	<i>buflen</i>	length of the input buffer
in	<i>pubkey</i>	buffer is a public key

**10.46.2.14 atcac\_pk\_init\_pem()**

```
ATCA_STATUS atcac_pk_init_pem (
    atcac_pk_ctx * ctx,
    const uint8_t * buf,
    size_t buflen,
    bool pubkey )
```

Set up a public/private key structure for use in asymmetric cryptographic functions.

## Returns

ATCA\_SUCCESS on success, otherwise an error code.

## Parameters

in	<i>ctx</i>	pointer to a pk context
in	<i>buf</i>	buffer containing a pem encoded key
in	<i>buflen</i>	length of the input buffer
in	<i>pubkey</i>	buffer is a public key

### 10.46.2.15 atcac\_pk\_public()

```
ATCA_STATUS atcac_pk_public (
    atcac_pk_ctx * ctx,
    uint8_t * buf,
    size_t * buflen )
```

Get the public key from the context.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.46.2.16 atcac\_pk\_sign()

```
ATCA_STATUS atcac_pk_sign (
    atcac_pk_ctx * ctx,
    const uint8_t * digest,
    size_t dig_len,
    uint8_t * signature,
    size_t * sig_len )
```

Perform a signature with the private key in the context.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.46.2.17 atcac\_pk\_verify()

```
ATCA_STATUS atcac_pk_verify (
    atcac_pk_ctx * ctx,
    const uint8_t * digest,
    size_t dig_len,
    const uint8_t * signature,
    size_t sig_len )
```

Perform a verify using the public key in the provided context.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.46.2.18 atcac\_sw\_random()

```
int atcac_sw_random (
    uint8_t * data,
    size_t data_size )
```

Return Random Bytes.

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.46.2.19 atcac\_sw\_sha1\_finish()

```
int atcac_sw_sha1_finish (
    atcac_sha1_ctx * ctx,
    uint8_t digest[ATCA_SHA1_DIGEST_SIZE] )
```

Complete the SHA1 hash in software and return the digest.

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

##### Parameters

in	<i>ctx</i>	pointer to a hash context
out	<i>digest</i>	output buffer (20 bytes)

#### 10.46.2.20 atcac\_sw\_sha2\_256\_finish()

```
int atcac_sw_sha2_256_finish (
    atcac_sha2_256_ctx * ctx,
    uint8_t digest[ATCA_SHA2_256_DIGEST_SIZE] )
```

Complete the SHA256 hash in software and return the digest.

##### Returns

ATCA\_SUCCESS on success, otherwise an error code.

##### Parameters

in	<i>ctx</i>	pointer to a hash context
out	<i>digest</i>	output buffer (32 bytes)

## 10.47 atca\_platform.h File Reference

Configure the platform interfaces for cryptoauthlib.

```
#include <stddef.h>
#include <string.h>
```

### Macros

- #define [hal\\_memset\\_s](#) [atcab\\_memset\\_s](#)

### Functions

- void \* [hal\\_malloc](#) (size\_t size)
- void [hal\\_free](#) (void \*ptr)
- char \* [lib\\_strcasestr](#) (const char \*haystack, const char \*needle)  
*Search for a substring in a case insensitive format.*

#### 10.47.1 Detailed Description

Configure the platform interfaces for cryptoauthlib.

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#### 10.47.2 Macro Definition Documentation

##### 10.47.2.1 hal\_memset\_s

```
#define hal_memset_s atcab\_memset\_s
```

#### 10.47.3 Function Documentation

##### 10.47.3.1 lib\_strcasestr()

```
char* lib_strcasestr (  
    const char * haystack,  
    const char * needle )
```

Search for a substring in a case insensitive format.



## 10.48 atca\_start\_config.h File Reference

## 10.49 atca\_start\_iface.h File Reference

## 10.50 atca\_status.h File Reference

Microchip Crypto Auth status codes.

```
#include <stdint.h>
#include "atca_bool.h"
```

### Macros

- `#define ATCA_STATUS_AUTH_BIT 0x40`

### Enumerations

- `enum ATCA_STATUS {`  
`ATCA_SUCCESS = 0x00, ATCA_CONFIG_ZONE_LOCKED = 0x01, ATCA_DATA_ZONE_LOCKED = 0x02, ATCA_INVALID_POINTER,`  
`ATCA_INVALID_LENGTH, ATCA_WAKE_FAILED = 0xD0, ATCA_CHECKMAC_VERIFY_FAILED = 0xD1,`  
`ATCA_PARSE_ERROR = 0xD2,`  
`ATCA_STATUS_CRC = 0xD4, ATCA_STATUS_UNKNOWN = 0xD5, ATCA_STATUS_ECC = 0xD6,`  
`ATCA_STATUS_SELFTEST_ERROR = 0xD7,`  
`ATCA_FUNC_FAIL = 0xE0, ATCA_GEN_FAIL = 0xE1, ATCA_BAD_PARAM = 0xE2, ATCA_INVALID_ID = 0xE3,`  
`ATCA_INVALID_SIZE = 0xE4, ATCA_RX_CRC_ERROR = 0xE5, ATCA_RX_FAIL = 0xE6, ATCA_RX_NO_RESPONSE = 0xE7,`  
`ATCA_RESYNC_WITH_WAKEUP = 0xE8, ATCA_PARITY_ERROR = 0xE9, ATCA_TX_TIMEOUT = 0xEA,`  
`ATCA_RX_TIMEOUT = 0xEB,`  
`ATCA_TOO_MANY_COMM_RETRIES = 0xEC, ATCA_SMALL_BUFFER = 0xED, ATCA_COMM_FAIL = 0xF0, ATCA_TIMEOUT = 0xF1,`  
`ATCA_BAD_OPCODE = 0xF2, ATCA_WAKE_SUCCESS = 0xF3, ATCA_EXECUTION_ERROR = 0xF4,`  
`ATCA_UNIMPLEMENTED = 0xF5,`  
`ATCA_ASSERT_FAILURE = 0xF6, ATCA_TX_FAIL = 0xF7, ATCA_NOT_LOCKED = 0xF8, ATCA_NO_DEVICES = 0xF9,`  
`ATCA_HEALTH_TEST_ERROR = 0xFA, ATCA_ALLOC_FAILURE = 0xFB, ATCA_USE_FLAGS_CONSUMED = 0xFC, ATCA_NOT_INITIALIZED = 0xFD }`  
`}`

### 10.50.1 Detailed Description

Microchip Crypto Auth status codes.

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## 10.50.2 Macro Definition Documentation

### 10.50.2.1 ATCA\_STATUS\_AUTH\_BIT

```
#define ATCA_STATUS_AUTH_BIT 0x40
```

## 10.50.3 Enumeration Type Documentation

### 10.50.3.1 ATCA\_STATUS

```
enum ATCA_STATUS
```

#### Enumerator

ATCA_SUCCESS	Function succeeded.
ATCA_CONFIG_ZONE_LOCKED	
ATCA_DATA_ZONE_LOCKED	
ATCA_INVALID_POINTER	
ATCA_INVALID_LENGTH	
ATCA_WAKE_FAILED	response status byte indicates CheckMac failure (status byte = 0x01)
ATCA_CHECKMAC_VERIFY_FAILED	response status byte indicates CheckMac failure (status byte = 0x01)
ATCA_PARSE_ERROR	response status byte indicates parsing error (status byte = 0x03)
ATCA_STATUS_CRC	response status byte indicates DEVICE did not receive data properly (status byte = 0xFF)
ATCA_STATUS_UNKNOWN	response status byte is unknown
ATCA_STATUS_ECC	response status byte is ECC fault (status byte = 0x05)
ATCA_STATUS_SELFTEST_ERROR	response status byte is Self Test Error, chip in failure mode (status byte = 0x07)
ATCA_FUNC_FAIL	Function could not execute due to incorrect condition / state.
ATCA_GEN_FAIL	unspecified error
ATCA_BAD_PARAM	bad argument (out of range, null pointer, etc.)
ATCA_INVALID_ID	invalid device id, id not set
ATCA_INVALID_SIZE	Count value is out of range or greater than buffer size.
ATCA_RX_CRC_ERROR	CRC error in data received from device.
ATCA_RX_FAIL	Timed out while waiting for response. Number of bytes received is > 0.
ATCA_RX_NO_RESPONSE	Not an error while the Command layer is polling for a command response.
ATCA_RESYNC_WITH_WAKEUP	Re-synchronization succeeded, but only after generating a Wake-up.
ATCA_PARITY_ERROR	for protocols needing parity
ATCA_TX_TIMEOUT	for Microchip PHY protocol, timeout on transmission waiting for master

## Enumerator

ATCA_RX_TIMEOUT	for Microchip PHY protocol, timeout on receipt waiting for master
ATCA_TOO_MANY_COMM_RETRIES	Device did not respond too many times during a transmission. Could indicate no device present.
ATCA_SMALL_BUFFER	Supplied buffer is too small for data required.
ATCA_COMM_FAIL	Communication with device failed. Same as in hardware dependent modules.
ATCA_TIMEOUT	Timed out while waiting for response. Number of bytes received is 0.
ATCA_BAD_OPCODE	opcode is not supported by the device
ATCA_WAKE_SUCCESS	received proper wake token
ATCA_EXECUTION_ERROR	chip was in a state where it could not execute the command, response status byte indicates command execution error (status byte = 0x0F)
ATCA_UNIMPLEMENTED	Function or some element of it hasn't been implemented yet.
ATCA_ASSERT_FAILURE	Code failed run-time consistency check.
ATCA_TX_FAIL	Failed to write.
ATCA_NOT_LOCKED	required zone was not locked
ATCA_NO_DEVICES	For protocols that support device discovery (kit protocol), no devices were found.
ATCA_HEALTH_TEST_ERROR	random number generator health test error
ATCA_ALLOC_FAILURE	Couldn't allocate required memory.
ATCA_USE_FLAGS_CONSUMED	Use flags on the device indicates its consumed fully.
ATCA_NOT_INITIALIZED	The library has not been initialized so the command could not be executed.

## 10.51 atca\_utils\_sizes.c File Reference

API to Return structure sizes of cryptoauthlib structures.

```
#include "cryptoauthlib.h"
#include "atcacert/atcacert_date.h"
#include "atcacert/atcacert_def.h"
#include "host/atca_host.h"
```

### Macros

- `#define SIZE_OF_API_T(x) size_t x ## _size(void); size_t x ## _size(void) { return sizeof( x ); }`
- `#define SIZE_OF_API_S(x) size_t x ## _size(void); size_t x ## _size(void) { return sizeof(struct x ); }`

### Functions

- `size_t atcacert_tm_utc_t_size (void)`
- `size_t atcacert_date_format_t_size (void)`
- `size_t atcacert_cert_type_t_size (void)`
- `size_t atcacert_cert_sn_src_t_size (void)`
- `size_t atcacert_device_zone_t_size (void)`

- `size_t atcacert_std_cert_element_t_size` (void)
- `size_t atcacert_device_loc_t_size` (void)
- `size_t atcacert_cert_loc_t_size` (void)
- `size_t atcacert_cert_element_t_size` (void)
- `size_t atcacert_def_t_size` (void)
- `size_t atcacert_build_state_t_size` (void)
- `size_t atca_temp_key_t_size` (void)
- `size_t atca_include_data_in_out_size` (void)
- `size_t atca_nonce_in_out_t_size` (void)
- `size_t atca_io_decrypt_in_out_t_size` (void)
- `size_t atca_verify_mac_in_out_t_size` (void)
- `size_t atca_secureboot_enc_in_out_t_size` (void)
- `size_t atca_secureboot_mac_in_out_t_size` (void)
- `size_t atca_mac_in_out_t_size` (void)
- `size_t atca_hmac_in_out_size` (void)
- `size_t atca_gen_dig_in_out_t_size` (void)
- `size_t atca_write_mac_in_out_t_size` (void)
- `size_t atca_derive_key_in_out_size` (void)
- `size_t atca_derive_key_mac_in_out_size` (void)
- `size_t atca_decrypt_in_out_size` (void)
- `size_t atca_check_mac_in_out_t_size` (void)
- `size_t atca_verify_in_out_t_size` (void)
- `size_t atca_gen_key_in_out_t_size` (void)
- `size_t atca_sign_internal_in_out_t_size` (void)
- `size_t bool_size` (void)
- `size_t ATCAPacket_size` (void)
- `size_t atca_device_size` (void)
- `size_t ATCADeviceType_size` (void)
- `size_t ATCAIfaceType_size` (void)
- `size_t ATCAIfaceCfg_size` (void)
- `size_t atca_iface_size` (void)
- `size_t ATCA_STATUS_size` (void)

### 10.51.1 Detailed Description

API to Return structure sizes of cryptoauthlib structures.

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### 10.51.2 Macro Definition Documentation

#### 10.51.2.1 SIZE\_OF\_API\_S

```
#define SIZE_OF_API_S(  
    x ) size_t x ## _size(void); size_t x ## _size(void) { return sizeof(struct x );  
}
```

### 10.51.2.2 SIZE\_OF\_API\_T

```
#define SIZE_OF_API_T(  
    x ) size_t x ## _size(void); size_t x ## _size(void) { return sizeof( x ); }
```

## 10.51.3 Function Documentation

### 10.51.3.1 atca\_check\_mac\_in\_out\_t\_size()

```
size_t atca_check_mac_in_out_t_size (  
    void )
```

### 10.51.3.2 atca\_decrypt\_in\_out\_size()

```
size_t atca_decrypt_in_out_size (  
    void )
```

### 10.51.3.3 atca\_derive\_key\_in\_out\_size()

```
size_t atca_derive_key_in_out_size (  
    void )
```

### 10.51.3.4 atca\_derive\_key\_mac\_in\_out\_size()

```
size_t atca_derive_key_mac_in_out_size (  
    void )
```

### 10.51.3.5 atca\_device\_size()

```
size_t atca_device_size (  
    void )
```

### 10.51.3.6 atca\_gen\_dig\_in\_out\_t\_size()

```
size_t atca_gen_dig_in_out_t_size (  
    void )
```

### 10.51.3.7 atca\_gen\_key\_in\_out\_t\_size()

```
size_t atca_gen_key_in_out_t_size (  
    void )
```

### 10.51.3.8 atca\_hmac\_in\_out\_size()

```
size_t atca_hmac_in_out_size (  
    void )
```

### 10.51.3.9 atca\_iface\_size()

```
size_t atca_iface_size (  
    void )
```

### 10.51.3.10 atca\_include\_data\_in\_out\_size()

```
size_t atca_include_data_in_out_size (  
    void )
```

### 10.51.3.11 atca\_io\_decrypt\_in\_out\_t\_size()

```
size_t atca_io_decrypt_in_out_t_size (  
    void )
```

### 10.51.3.12 atca\_mac\_in\_out\_t\_size()

```
size_t atca_mac_in_out_t_size (  
    void )
```

**10.51.3.13 atca\_nonce\_in\_out\_t\_size()**

```
size_t atca_nonce_in_out_t_size (  
    void )
```

**10.51.3.14 atca\_secureboot\_enc\_in\_out\_t\_size()**

```
size_t atca_secureboot_enc_in_out_t_size (  
    void )
```

**10.51.3.15 atca\_secureboot\_mac\_in\_out\_t\_size()**

```
size_t atca_secureboot_mac_in_out_t_size (  
    void )
```

**10.51.3.16 atca\_sign\_internal\_in\_out\_t\_size()**

```
size_t atca_sign_internal_in_out_t_size (  
    void )
```

**10.51.3.17 ATCA\_STATUS\_size()**

```
size_t ATCA_STATUS_size (  
    void )
```

**10.51.3.18 atca\_temp\_key\_t\_size()**

```
size_t atca_temp_key_t_size (  
    void )
```

**10.51.3.19 atca\_verify\_in\_out\_t\_size()**

```
size_t atca_verify_in_out_t_size (  
    void )
```

### 10.51.3.20 atca\_verify\_mac\_in\_out\_t\_size()

```
size_t atca_verify_mac_in_out_t_size (  
    void )
```

### 10.51.3.21 atca\_write\_mac\_in\_out\_t\_size()

```
size_t atca_write_mac_in_out_t_size (  
    void )
```

### 10.51.3.22 atcacert\_build\_state\_t\_size()

```
size_t atcacert_build_state_t_size (  
    void )
```

### 10.51.3.23 atcacert\_cert\_element\_t\_size()

```
size_t atcacert_cert_element_t_size (  
    void )
```

### 10.51.3.24 atcacert\_cert\_loc\_t\_size()

```
size_t atcacert_cert_loc_t_size (  
    void )
```

### 10.51.3.25 atcacert\_cert\_sn\_src\_t\_size()

```
size_t atcacert_cert_sn_src_t_size (  
    void )
```

### 10.51.3.26 atcacert\_cert\_type\_t\_size()

```
size_t atcacert_cert_type_t_size (  
    void )
```



**10.51.3.27 atcacert\_date\_format\_t\_size()**

```
size_t atcacert_date_format_t_size (  
    void )
```

**10.51.3.28 atcacert\_def\_t\_size()**

```
size_t atcacert_def_t_size (  
    void )
```

**10.51.3.29 atcacert\_device\_loc\_t\_size()**

```
size_t atcacert_device_loc_t_size (  
    void )
```

**10.51.3.30 atcacert\_device\_zone\_t\_size()**

```
size_t atcacert_device_zone_t_size (  
    void )
```

**10.51.3.31 atcacert\_std\_cert\_element\_t\_size()**

```
size_t atcacert_std_cert_element_t_size (  
    void )
```

**10.51.3.32 atcacert\_tm\_utc\_t\_size()**

```
size_t atcacert_tm_utc_t_size (  
    void )
```

**10.51.3.33 ATCADeviceType\_size()**

```
size_t ATCADeviceType_size (  
    void )
```

### 10.51.3.34 ATCAIfaceCfg\_size()

```
size_t ATCAIfaceCfg_size (  
    void )
```

### 10.51.3.35 ATCAIfaceType\_size()

```
size_t ATCAIfaceType_size (  
    void )
```

### 10.51.3.36 ATCAPacket\_size()

```
size_t ATCAPacket_size (  
    void )
```

### 10.51.3.37 bool\_size()

```
size_t bool_size (  
    void )
```

## 10.52 atca\_version.h File Reference

Microchip CryptoAuth Library Version.

### Macros

- #define [ATCA\\_LIBRARY\\_VERSION\\_DATE](#) "20221111"
- #define [ATCA\\_LIBRARY\\_VERSION\\_MAJOR](#) 3
- #define [ATCA\\_LIBRARY\\_VERSION\\_MINOR](#) 4
- #define [ATCA\\_LIBRARY\\_VERSION\\_BUILD](#) 1

### 10.52.1 Detailed Description

Microchip CryptoAuth Library Version.

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## 10.52.2 Macro Definition Documentation

### 10.52.2.1 ATCA\_LIBRARY\_VERSION\_BUILD

```
#define ATCA_LIBRARY_VERSION_BUILD 1
```

### 10.52.2.2 ATCA\_LIBRARY\_VERSION\_DATE

```
#define ATCA_LIBRARY_VERSION_DATE "20221111"
```

### 10.52.2.3 ATCA\_LIBRARY\_VERSION\_MAJOR

```
#define ATCA_LIBRARY_VERSION_MAJOR 3
```

### 10.52.2.4 ATCA\_LIBRARY\_VERSION\_MINOR

```
#define ATCA_LIBRARY_VERSION_MINOR 4
```

## 10.53 atca\_wolfssl\_interface.c File Reference

Crypto abstraction functions for external host side cryptography.

```
#include "atca_config.h"  
#include "atca_status.h"  
#include "crypto/atca_crypto_sw.h"
```

### 10.53.1 Detailed Description

Crypto abstraction functions for external host side cryptography.

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## 10.54 atcacert.h File Reference

Declarations common to all atcacert code.

```
#include <stddef.h>
#include <stdint.h>
#include "atcacert_check_config.h"
```

### Macros

- #define **FALSE** (0)
- #define **TRUE** (1)
- #define **ATCACERT\_E\_SUCCESS** 0  
*Operation completed successfully.*
- #define **ATCACERT\_E\_ERROR** 1  
*General error.*
- #define **ATCACERT\_E\_BAD\_PARAMS** 2  
*Invalid/bad parameter passed to function.*
- #define **ATCACERT\_E\_BUFFER\_TOO\_SMALL** 3  
*Supplied buffer for output is too small to hold the result.*
- #define **ATCACERT\_E\_DECODING\_ERROR** 4  
*Data being decoded/parsed has an invalid format.*
- #define **ATCACERT\_E\_INVALID\_DATE** 5  
*Date is invalid.*
- #define **ATCACERT\_E\_UNIMPLEMENTED** 6  
*Function is unimplemented for the current configuration.*
- #define **ATCACERT\_E\_UNEXPECTED\_ELEM\_SIZE** 7  
*A certificate element size was not what was expected.*
- #define **ATCACERT\_E\_ELEM\_MISSING** 8  
*The certificate element isn't defined for the certificate definition.*
- #define **ATCACERT\_E\_ELEM\_OUT\_OF\_BOUNDS** 9  
*Certificate element is out of bounds for the given certificate.*
- #define **ATCACERT\_E\_BAD\_CERT** 10  
*Certificate structure is bad in some way.*
- #define **ATCACERT\_E\_WRONG\_CERT\_DEF** 11
- #define **ATCACERT\_E\_VERIFY\_FAILED** 12  
*Certificate or challenge/response verification failed.*
- #define **ATCACERT\_E\_INVALID\_TRANSFORM** 13  
*Invalid transform passed to function.*

### 10.54.1 Detailed Description

Declarations common to all atcacert code.

These are common definitions used by all the atcacert code.

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## 10.55 atcacert\_check\_config.h File Reference

Configuration check and defaults for the atcacert module.

```
#include "calib/calib_config_check.h"
```

### Macros

- `#define ATCACERT_HW_CHALLENGE_EN CALIB_RANDOM_EN`
- `#define ATCACERT_HW_VERIFY_EN CALIB_VERIFY_EXTERN_EN`
- `#define ATCACERT_DATEFMT_ISO_EN DEFAULT_ENABLED`
- `#define ATCACERT_DATEFMT_UTC_EN DEFAULT_ENABLED`
- `#define ATCACERT_DATEFMT_POSIX_EN DEFAULT_ENABLED`
- `#define ATCACERT_DATEFMT_GEN_EN DEFAULT_ENABLED`

### 10.55.1 Detailed Description

Configuration check and defaults for the atcacert module.

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### 10.55.2 Macro Definition Documentation

#### 10.55.2.1 ATCACERT\_DATEFMT\_GEN\_EN

```
#define ATCACERT_DATEFMT_GEN_EN DEFAULT_ENABLED
```

#### 10.55.2.2 ATCACERT\_DATEFMT\_ISO\_EN

```
#define ATCACERT_DATEFMT_ISO_EN DEFAULT_ENABLED
```

#### 10.55.2.3 ATCACERT\_DATEFMT\_POSIX\_EN

```
#define ATCACERT_DATEFMT_POSIX_EN DEFAULT_ENABLED
```

### 10.55.2.4 ATCACERT\_DATEFMT\_UTC\_EN

```
#define ATCACERT_DATEFMT_UTC_EN DEFAULT_ENABLED
```

### 10.55.2.5 ATCACERT\_HW\_CHALLENGE\_EN

```
#define ATCACERT_HW_CHALLENGE_EN CALIB_RANDOM_EN
```

### 10.55.2.6 ATCACERT\_HW\_VERIFY\_EN

```
#define ATCACERT_HW_VERIFY_EN CALIB_VERIFY_EXTERN_EN
```

## 10.56 atcacert\_client.c File Reference

Client side cert i/o methods. These declarations deal with the client-side, the node being authenticated, of the authentication process. It is assumed the client has an ECC CryptoAuthentication device (e.g. ATECC508A) and the certificates are stored on that device.

```
#include <stdlib.h>
#include "atcacert_client.h"
#include "atcacert_der.h"
#include "atcacert_pem.h"
#include "cryptoauthlib.h"
#include "calib/calib_basic.h"
```

## Functions

- int [atcacert\\_get\\_response](#) (uint8\_t device\_private\_key\_slot, const uint8\_t challenge[32], uint8\_t response[64])  
*Calculates the response to a challenge sent from the host.*
- int [atcacert\\_read\\_device\\_loc](#) (const [atcacert\\_device\\_loc\\_t](#) \*device\_loc, uint8\_t \*data)  
*Read the data from a device location.*
- int [atcacert\\_read\\_cert](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t ca\_public\_key[64], uint8\_t \*cert, size\_t \*cert\_size)  
*Reads the certificate specified by the certificate definition from the ATECC508A device.*
- int [atcacert\\_create\\_csr\\_pem](#) (const [atcacert\\_def\\_t](#) \*csr\_def, char \*csr, size\_t \*csr\_size)  
*Creates a CSR specified by the CSR definition from the ATECC508A device. This process involves reading the dynamic CSR data from the device and combining it with the template found in the CSR definition, then signing it. Return the CSR in der format.*
- int [atcacert\\_create\\_csr](#) (const [atcacert\\_def\\_t](#) \*csr\_def, uint8\_t \*csr, size\_t \*csr\_size)  
*Creates a CSR specified by the CSR definition from the ATECC508A device. This process involves reading the dynamic CSR data from the device and combining it with the template found in the CSR definition, then signing it. Return the CSR in der format.*
- int [atcacert\\_read\\_subj\\_key\\_id](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t subj\_key\_id[20])  
*Reads the subject key ID based on a certificate definition.*
- int [atcacert\\_read\\_cert\\_size](#) (const [atcacert\\_def\\_t](#) \*cert\_def, size\_t \*cert\_size)  
*Return the actual certificate size in bytes for a given cert def. Certificate can be variable size, so this gives the absolute buffer size when reading the certificates.*

## 10.56.1 Detailed Description

Client side cert i/o methods. These declarations deal with the client-side, the node being authenticated, of the authentication process. It is assumed the client has an ECC CryptoAuthentication device (e.g. ATECC508A) and the certificates are stored on that device.

### Copyright

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## 10.57 atcacert\_client.h File Reference

Client side cert i/o methods. These declarations deal with the client-side, the node being authenticated, of the authentication process. It is assumed the client has an ECC CryptoAuthentication device (e.g. ATECC508A) and the certificates are stored on that device.

```
#include <stddef.h>
#include <stdint.h>
#include "atcacert_def.h"
```

### Functions

- int [atcacert\\_read\\_device\\_loc](#) (const [atcacert\\_device\\_loc\\_t](#) \*device\_loc, uint8\_t \*data)  
*Read the data from a device location.*
- int [atcacert\\_read\\_cert](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t ca\_public\_key[64], uint8\_t \*cert, size\_t \*cert\_size)  
*Reads the certificate specified by the certificate definition from the ATECC508A device.*
- int [atcacert\\_write\\_cert](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size)  
*Take a full certificate and write it to the ATECC508A device according to the certificate definition.*
- int [atcacert\\_create\\_csr](#) (const [atcacert\\_def\\_t](#) \*csr\_def, uint8\_t \*csr, size\_t \*csr\_size)  
*Creates a CSR specified by the CSR definition from the ATECC508A device. This process involves reading the dynamic CSR data from the device and combining it with the template found in the CSR definition, then signing it. Return the CSR in der format.*
- int [atcacert\\_create\\_csr\\_pem](#) (const [atcacert\\_def\\_t](#) \*csr\_def, char \*csr, size\_t \*csr\_size)  
*Creates a CSR specified by the CSR definition from the ATECC508A device. This process involves reading the dynamic CSR data from the device and combining it with the template found in the CSR definition, then signing it. Return the CSR in der format.*
- int [atcacert\\_get\\_response](#) (uint8\_t device\_private\_key\_slot, const uint8\_t challenge[32], uint8\_t response[64])  
*Calculates the response to a challenge sent from the host.*
- int [atcacert\\_read\\_subj\\_key\\_id](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t subj\_key\_id[20])  
*Reads the subject key ID based on a certificate definition.*
- int [atcacert\\_read\\_cert\\_size](#) (const [atcacert\\_def\\_t](#) \*cert\_def, size\_t \*cert\_size)  
*Return the actual certificate size in bytes for a given cert def. Certificate can be variable size, so this gives the absolute buffer size when reading the certificates.*

## 10.57.1 Detailed Description

Client side cert i/o methods. These declarations deal with the client-side, the node being authenticated, of the authentication process. It is assumed the client has an ECC CryptoAuthentication device (e.g. ATECC508A) and the certificates are stored on that device.

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## 10.58 atcacert\_date.c File Reference

Date handling with regard to certificates.

```
#include <string.h>
#include "atcacert_date.h"
```

### Functions

- int [atcacert\\_date\\_enc](#) ([atcacert\\_date\\_format\\_t](#) format, const [atcacert\\_tm\\_utc\\_t](#) \*timestamp, uint8\_t \*formatted\_date, size\_t \*formatted\_date\_size)  
*Format a timestamp according to the format type.*
- int [atcacert\\_date\\_dec](#) ([atcacert\\_date\\_format\\_t](#) format, const uint8\_t \*formatted\_date, size\_t formatted\_date\_size, [atcacert\\_tm\\_utc\\_t](#) \*timestamp)  
*Parse a formatted timestamp according to the specified format.*
- int [atcacert\\_date\\_get\\_max\\_date](#) ([atcacert\\_date\\_format\\_t](#) format, [atcacert\\_tm\\_utc\\_t](#) \*timestamp)  
*Return the maximum date available for the given format.*
- int [atcacert\\_date\\_enc\\_compcert](#) (const [atcacert\\_tm\\_utc\\_t](#) \*issue\_date, uint8\_t expire\_years, uint8\_t enc\_dates[3])  
*Encode the issue and expire dates in the format used by the compressed certificate.*
- int [atcacert\\_date\\_dec\\_compcert](#) (const uint8\_t enc\_dates[3], [atcacert\\_date\\_format\\_t](#) expire\_date\_format, [atcacert\\_tm\\_utc\\_t](#) \*issue\_date, [atcacert\\_tm\\_utc\\_t](#) \*expire\_date)  
*Decode the issue and expire dates from the format used by the compressed certificate.*

### Variables

- const size\_t [ATCACERT\\_DATE\\_FORMAT\\_SIZES](#) [5]

## 10.58.1 Detailed Description

Date handling with regard to certificates.

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## 10.59 atcacert\_date.h File Reference

Declarations for date handling with regard to certificates.

```
#include <stddef.h>
#include "atcacert.h"
```

### Data Structures

- struct [atcacert\\_tm\\_utc\\_s](#)

### Macros

- #define [DATEFMT\\_ISO8601\\_SEP](#) 0  
*ISO8601 full date YYYY-MM-DDThh:mm:ssZ.*
- #define [DATEFMT\\_RFC5280.UTC](#) 1  
*RFC 5280 (X.509) 4.1.2.5.1 UTCTime format YYMMDDhhmmssZ.*
- #define [DATEFMT\\_POSIX\\_UINT32\\_BE](#) 2  
*POSIX (aka UNIX) date format. Seconds since Jan 1, 1970. 32 bit unsigned integer, big endian.*
- #define [DATEFMT\\_POSIX\\_UINT32\\_LE](#) 3  
*POSIX (aka UNIX) date format. Seconds since Jan 1, 1970. 32 bit unsigned integer, little endian.*
- #define [DATEFMT\\_RFC5280\\_GEN](#) 4  
*RFC 5280 (X.509) 4.1.2.5.2 GeneralizedTime format YYYYMMDDhhmmssZ.*
- #define [DATEFMT\\_ISO8601\\_SEP\\_SIZE](#) (20)
- #define [DATEFMT\\_RFC5280.UTC\\_SIZE](#) (13)
- #define [DATEFMT\\_POSIX\\_UINT32\\_BE\\_SIZE](#) (4)
- #define [DATEFMT\\_POSIX\\_UINT32\\_LE\\_SIZE](#) (4)
- #define [DATEFMT\\_RFC5280\\_GEN\\_SIZE](#) (15)
- #define [DATEFMT\\_MAX\\_SIZE](#) [DATEFMT\\_ISO8601\\_SEP\\_SIZE](#)
- #define [ATCACERT\\_DATE\\_FORMAT\\_SIZES\\_COUNT](#) 5

### Typedefs

- typedef struct [atcacert\\_tm\\_utc\\_s](#) [atcacert\\_tm\\_utc\\_t](#)
- typedef uint8\_t [atcacert\\_date\\_format\\_t](#)

### Functions

- int [atcacert\\_date\\_enc](#) ([atcacert\\_date\\_format\\_t](#) format, const [atcacert\\_tm\\_utc\\_t](#) \*timestamp, uint8\_t ↵  
t \*formatted\_date, size\_t \*formatted\_date\_size)  
*Format a timestamp according to the format type.*
- int [atcacert\\_date\\_dec](#) ([atcacert\\_date\\_format\\_t](#) format, const uint8\_t \*formatted\_date, size\_t formatted\_ ↵  
date\_size, [atcacert\\_tm\\_utc\\_t](#) \*timestamp)  
*Parse a formatted timestamp according to the specified format.*
- int [atcacert\\_date\\_enc\\_compcert](#) (const [atcacert\\_tm\\_utc\\_t](#) \*issue\_date, uint8\_t expire\_years, uint8\_t enc\_ ↵  
dates[3])  
*Encode the issue and expire dates in the format used by the compressed certificate.*

- int [atcacert\\_date\\_dec\\_compcert](#) (const uint8\_t enc\_dates[3], [atcacert\\_date\\_format\\_t](#) expire\_date\_format, [atcacert\\_tm\\_utc\\_t](#) \*issue\_date, [atcacert\\_tm\\_utc\\_t](#) \*expire\_date)

*Decode the issue and expire dates from the format used by the compressed certificate.*

- int [atcacert\\_date\\_get\\_max\\_date](#) ([atcacert\\_date\\_format\\_t](#) format, [atcacert\\_tm\\_utc\\_t](#) \*timestamp)

*Return the maximum date available for the given format.*

- int [atcacert\\_date\\_enc\\_iso8601\\_sep](#) (const [atcacert\\_tm\\_utc\\_t](#) \*timestamp, uint8\_t formatted\_date[(20)])
- int [atcacert\\_date\\_dec\\_iso8601\\_sep](#) (const uint8\_t formatted\_date[(20)], [atcacert\\_tm\\_utc\\_t](#) \*timestamp)
- int [atcacert\\_date\\_enc\\_rfc5280\\_utc](#) (const [atcacert\\_tm\\_utc\\_t](#) \*timestamp, uint8\_t formatted\_date[(13)])
- int [atcacert\\_date\\_dec\\_rfc5280\\_utc](#) (const uint8\_t formatted\_date[(13)], [atcacert\\_tm\\_utc\\_t](#) \*timestamp)
- int [atcacert\\_date\\_enc\\_rfc5280\\_gen](#) (const [atcacert\\_tm\\_utc\\_t](#) \*timestamp, uint8\_t formatted\_date[(15)])
- int [atcacert\\_date\\_dec\\_rfc5280\\_gen](#) (const uint8\_t formatted\_date[(15)], [atcacert\\_tm\\_utc\\_t](#) \*timestamp)
- int [atcacert\\_date\\_enc\\_posix\\_uint32\\_be](#) (const [atcacert\\_tm\\_utc\\_t](#) \*timestamp, uint8\_t formatted\_date[(4)])
- int [atcacert\\_date\\_dec\\_posix\\_uint32\\_be](#) (const uint8\_t formatted\_date[(4)], [atcacert\\_tm\\_utc\\_t](#) \*timestamp)
- int [atcacert\\_date\\_enc\\_posix\\_uint32\\_le](#) (const [atcacert\\_tm\\_utc\\_t](#) \*timestamp, uint8\_t formatted\_date[(4)])
- int [atcacert\\_date\\_dec\\_posix\\_uint32\\_le](#) (const uint8\_t formatted\_date[(4)], [atcacert\\_tm\\_utc\\_t](#) \*timestamp)

## Variables

- const size\_t [ATCACERT\\_DATE\\_FORMAT\\_SIZES](#) [5]

## 10.59.1 Detailed Description

Declarations for date handling with regard to certificates.

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## 10.60 atcacert\_def.c File Reference

Main certificate definition implementation.

```
#include "atcacert_def.h"
#include "crypto/atca_crypto_sw_sha1.h"
#include "crypto/atca_crypto_sw_sha2.h"
#include "atcacert_der.h"
#include "atcacert_date.h"
#include <string.h>
#include "atca_helpers.h"
```

## Macros

- #define [ATCACERT\\_MIN](#)(x, y) ((x) < (y) ? (x) : (y))
- #define [ATCACERT\\_MAX](#)(x, y) ((x) >= (y) ? (x) : (y))

## Functions

- int [atcacert\\_merge\\_device\\_loc](#) ([atcacert\\_device\\_loc\\_t](#) \*device\_locs, size\_t \*device\_locs\_count, size\_t device\_locs\_max\_count, const [atcacert\\_device\\_loc\\_t](#) \*device\_loc, size\_t block\_size)  
*Merge a new device location into a list of device locations. If the new location overlaps with an existing location, the existing one will be modified to encompass both. Otherwise the new location is appended to the end of the list.*
- int [atcacert\\_get\\_device\\_locs](#) (const [atcacert\\_def\\_t](#) \*cert\_def, [atcacert\\_device\\_loc\\_t](#) \*device\_locs, size\_t \*device\_locs\_count, size\_t device\_locs\_max\_count, size\_t block\_size)  
*Add all the device locations required to rebuild the specified certificate (cert\_def) to a device locations list.*
- int [atcacert\\_cert\\_build\\_start](#) ([atcacert\\_build\\_state\\_t](#) \*build\_state, const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t \*cert\_size, const uint8\_t ca\_public\_key[64])  
*Starts the certificate rebuilding process.*
- int [atcacert\\_cert\\_build\\_process](#) ([atcacert\\_build\\_state\\_t](#) \*build\_state, const [atcacert\\_device\\_loc\\_t](#) \*device\_loc, const uint8\_t \*device\_data)  
*Process information read from the ATECC device. If it contains information for the certificate, it will be incorporated into the certificate.*
- int [atcacert\\_cert\\_build\\_finish](#) ([atcacert\\_build\\_state\\_t](#) \*build\_state)  
*Completes any final certificate processing required after all data from the device has been incorporated.*
- int [atcacert\\_is\\_device\\_loc\\_overlap](#) (const [atcacert\\_device\\_loc\\_t](#) \*device\_loc1, const [atcacert\\_device\\_loc\\_t](#) \*device\_loc2)  
*Determines if the two device locations overlap.*
- int [atcacert\\_get\\_device\\_data](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, const [atcacert\\_device\\_loc\\_t](#) \*device\_loc, uint8\_t \*device\_data)  
*Gets the dynamic data that would be saved to the specified device location. This function is primarily used to break down a full certificate into the dynamic components to be saved to a device.*
- int [atcacert\\_set\\_subj\\_public\\_key](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const uint8\_t subj\_public\_key[64])  
*Sets the subject public key and subject key ID in a certificate.*
- int [atcacert\\_get\\_subj\\_public\\_key](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t subj\_public\_key[64])  
*Gets the subject public key from a certificate.*
- int [atcacert\\_get\\_subj\\_key\\_id](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t subj\_key\_id[20])  
*Gets the subject key ID from a certificate.*
- int [atcacert\\_set\\_signature](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t \*cert\_size, size\_t max\_cert\_size, const uint8\_t signature[64])  
*Sets the signature in a certificate. This may alter the size of the X.509 certificates.*
- int [atcacert\\_get\\_signature](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t signature[64])  
*Gets the signature from a certificate.*
- int [atcacert\\_set\\_issue\\_date](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const [atcacert\\_tm\\_utc\\_t](#) \*timestamp)  
*Sets the issue date (notBefore) in a certificate. Will be formatted according to the date format specified in the certificate definition.*
- int [atcacert\\_get\\_issue\\_date](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, [atcacert\\_tm\\_utc\\_t](#) \*timestamp)  
*Gets the issue date from a certificate. Will be parsed according to the date format specified in the certificate definition.*
- int [atcacert\\_set\\_expire\\_date](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const [atcacert\\_tm\\_utc\\_t](#) \*timestamp)  
*Sets the expire date (notAfter) in a certificate. Will be formatted according to the date format specified in the certificate definition.*
- int [atcacert\\_get\\_expire\\_date](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, [atcacert\\_tm\\_utc\\_t](#) \*timestamp)  
*Gets the expire date from a certificate. Will be parsed according to the date format specified in the certificate definition.*

- int [atcacert\\_set\\_signer\\_id](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const uint8\_t ↵  
t signer\_id[2])  
*Sets the signer ID in a certificate. Will be formatted as 4 upper-case hex digits.*
- int [atcacert\\_get\\_signer\\_id](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t ↵  
t signer\_id[2])  
*Gets the signer ID from a certificate. Will be parsed as 4 upper-case hex digits.*
- int [atcacert\\_set\\_cert\\_sn](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t \*cert\_size, size\_t max\_cert ↵  
\_size, const uint8\_t \*cert\_sn, size\_t cert\_sn\_size)  
*Sets the certificate serial number in a certificate.*
- int [atcacert\\_gen\\_cert\\_sn](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const uint8\_t ↵  
t device\_sn[9])  
*Sets the certificate serial number by generating it from other information in the certificate using the scheme specified by sn\_source in cert\_def. See the.*
- int [atcacert\\_get\\_cert\\_sn](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t \*cert ↵  
\_sn, size\_t \*cert\_sn\_size)  
*Gets the certificate serial number from a certificate.*
- int [atcacert\\_set\\_auth\\_key\\_id](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const uint8\_t ↵  
auth\_public\_key[64])  
*Sets the authority key ID in a certificate. Note that this takes the actual public key creates a key ID from it.*
- int [atcacert\\_set\\_auth\\_key\\_id\\_raw](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const ↵  
uint8\_t \*auth\_key\_id)  
*Sets the authority key ID in a certificate.*
- int [atcacert\\_get\\_auth\\_key\\_id](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t ↵  
auth\_key\_id[20])  
*Gets the authority key ID from a certificate.*
- int [atcacert\\_set\\_comp\\_cert](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t \*cert\_size, size\_t max ↵  
cert\_size, const uint8\_t comp\_cert[72])  
*Sets the signature, issue date, expire date, and signer ID found in the compressed certificate. This also checks fields common between the cert\_def and the compressed certificate to make sure they match.*
- int [atcacert\\_get\\_comp\\_cert](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t ↵  
t comp\_cert[72])  
*Generate the compressed certificate for the given certificate.*
- int [atcacert\\_get\\_tbs](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, const uint8\_t \*\*tbs, ↵  
size\_t \*tbs\_size)  
*Get a pointer to the TBS data in a certificate.*
- int [atcacert\\_get\\_tbs\\_digest](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t ↵  
t tbs\_digest[32])  
*Get the SHA256 digest of certificate's TBS data.*
- int [atcacert\\_set\\_cert\\_element](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const [atcacert\\_cert\\_loc\\_t](#) \*cert\_loc, uint8\_t ↵  
\*cert, size\_t cert\_size, const uint8\_t \*data, size\_t data\_size)  
*Sets an element in a certificate. The data\_size must match the size in cert\_loc.*
- int [atcacert\\_get\\_cert\\_element](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const [atcacert\\_cert\\_loc\\_t](#) \*cert\_loc, const ↵  
uint8\_t \*cert, size\_t cert\_size, uint8\_t \*data, size\_t data\_size)  
*Gets an element from a certificate.*
- int [atcacert\\_get\\_key\\_id](#) (const uint8\_t public\_key[64], uint8\_t key\_id[20])  
*Calculates the key ID for a given public ECC P256 key.*
- void [atcacert\\_public\\_key\\_add\\_padding](#) (const uint8\_t raw\_key[64], uint8\_t padded\_key[72])  
*Takes a raw P256 ECC public key and converts it to the padded version used by ATECC devices. Input and output buffers can point to the same location to do an in-place transform.*
- void [atcacert\\_public\\_key\\_remove\\_padding](#) (const uint8\_t padded\_key[72], uint8\_t raw\_key[64])  
*Takes a padded public key used by ATECC devices and converts it to a raw P256 ECC public key. Input and output buffers can point to the same location to do an in-place transform.*
- int [atcacert\\_transform\\_data](#) ([atcacert\\_transform\\_t](#) transform, const uint8\_t \*data, size\_t data\_size, uint8\_t ↵  
\*destination, size\_t \*destination\_size)

*Apply the specified transform to the specified data.*

- int `atcacert_max_cert_size` (const `atcacert_def_t` \*cert\_def, size\_t \*max\_cert\_size)

*Return the maximum possible certificate size in bytes for a given cert def. Certificate can be variable size, so this gives an appropriate buffer size when reading the certificates.*

## 10.60.1 Detailed Description

Main certificate definition implementation.

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## 10.60.2 Macro Definition Documentation

### 10.60.2.1 ATCACERT\_MAX

```
#define ATCACERT_MAX(  
    x,  
    y ) ((x) >= (y) ? (x) : (y))
```

### 10.60.2.2 ATCACERT\_MIN

```
#define ATCACERT_MIN(  
    x,  
    y ) ((x) < (y) ? (x) : (y))
```

## 10.61 atcacert\_def.h File Reference

Declarations for certificates related to ECC CryptoAuthentication devices. These are the definitions required to define a certificate and its various elements with regards to the CryptoAuthentication ECC devices.

```
#include <stddef.h>  
#include <stdint.h>  
#include "atca_compiler.h"  
#include "atcacert.h"  
#include "atcacert_date.h"  
#include "atca_helpers.h"
```

## Data Structures

- struct [atcacert\\_device\\_loc\\_s](#)
- struct [atcacert\\_cert\\_loc\\_s](#)
- struct [atcacert\\_cert\\_element\\_s](#)
- struct [atcacert\\_def\\_s](#)
- struct [atcacert\\_build\\_state\\_s](#)

## Macros

- #define [ATCA\\_MAX\\_TRANSFORMS](#) 2
- #define [ATCA\\_PACKED](#)

## Typedefs

- typedef enum [atcacert\\_cert\\_type\\_e](#) [atcacert\\_cert\\_type\\_t](#)
- typedef enum [atcacert\\_cert\\_sn\\_src\\_e](#) [atcacert\\_cert\\_sn\\_src\\_t](#)
- typedef enum [atcacert\\_device\\_zone\\_e](#) [atcacert\\_device\\_zone\\_t](#)
- typedef enum [atcacert\\_transform\\_e](#) [atcacert\\_transform\\_t](#)  
*How to transform the data from the device to the certificate.*
- typedef enum [atcacert\\_std\\_cert\\_element\\_e](#) [atcacert\\_std\\_cert\\_element\\_t](#)
- typedef struct [atcacert\\_device\\_loc\\_s](#) [atcacert\\_device\\_loc\\_t](#)
- typedef struct [atcacert\\_cert\\_loc\\_s](#) [atcacert\\_cert\\_loc\\_t](#)
- typedef struct [atcacert\\_cert\\_element\\_s](#) [atcacert\\_cert\\_element\\_t](#)
- typedef struct [atcacert\\_def\\_s](#) [atcacert\\_def\\_t](#)
- typedef struct [atcacert\\_build\\_state\\_s](#) [atcacert\\_build\\_state\\_t](#)

## Enumerations

- enum [atcacert\\_cert\\_type\\_e](#) { [CERTTYPE\\_X509](#), [CERTTYPE\\_CUSTOM](#) }
- enum [atcacert\\_cert\\_sn\\_src\\_e](#) {  
[SNSRC\\_STORED](#) = 0x0, [SNSRC\\_STORED\\_DYNAMIC](#) = 0x7, [SNSRC\\_DEVICE\\_SN](#) = 0x8, [SNSRC\\_SIGNER\\_ID](#) = 0x9,  
[SNSRC\\_PUB\\_KEY\\_HASH](#) = 0xA, [SNSRC\\_DEVICE\\_SN\\_HASH](#) = 0xB, [SNSRC\\_PUB\\_KEY\\_HASH\\_POS](#) = 0xC,  
[SNSRC\\_DEVICE\\_SN\\_HASH\\_POS](#) = 0xD,  
[SNSRC\\_PUB\\_KEY\\_HASH\\_RAW](#) = 0xE, [SNSRC\\_DEVICE\\_SN\\_HASH\\_RAW](#) = 0xF }
- enum [atcacert\\_device\\_zone\\_e](#) { [DEVZONE\\_CONFIG](#) = 0x00, [DEVZONE\\_OTP](#) = 0x01, [DEVZONE\\_DATA](#) = 0x02, [DEVZONE\\_NONE](#) = 0x07 }
- enum [atcacert\\_transform\\_e](#) {  
[TF\\_NONE](#), [TF\\_REVERSE](#), [TF\\_BIN2HEX\\_UC](#), [TF\\_BIN2HEX\\_LC](#),  
[TF\\_HEX2BIN\\_UC](#), [TF\\_HEX2BIN\\_LC](#), [TF\\_BIN2HEX\\_SPACE\\_UC](#), [TF\\_BIN2HEX\\_SPACE\\_LC](#),  
[TF\\_HEX2BIN\\_SPACE\\_UC](#), [TF\\_HEX2BIN\\_SPACE\\_LC](#) }
- How to transform the data from the device to the certificate.*
- enum [atcacert\\_std\\_cert\\_element\\_e](#) {  
[STDCERT\\_PUBLIC\\_KEY](#), [STDCERT\\_SIGNATURE](#), [STDCERT\\_ISSUE\\_DATE](#), [STDCERT\\_EXPIRE\\_DATE](#),  
[STDCERT\\_SIGNER\\_ID](#), [STDCERT\\_CERT\\_SN](#), [STDCERT\\_AUTH\\_KEY\\_ID](#), [STDCERT\\_SUBJ\\_KEY\\_ID](#),  
[STDCERT\\_NUM\\_ELEMENTS](#) }

## Functions

- `int atcacert_get_device_locs` (const `atcacert_def_t` \*cert\_def, `atcacert_device_loc_t` \*device\_locs, `size_t` \*device\_locs\_count, `size_t` device\_locs\_max\_count, `size_t` block\_size)  
*Add all the device locations required to rebuild the specified certificate (cert\_def) to a device locations list.*
- `int atcacert_cert_build_start` (`atcacert_build_state_t` \*build\_state, const `atcacert_def_t` \*cert\_def, `uint8_t` \*cert, `size_t` \*cert\_size, const `uint8_t` ca\_public\_key[64])  
*Starts the certificate rebuilding process.*
- `int atcacert_cert_build_process` (`atcacert_build_state_t` \*build\_state, const `atcacert_device_loc_t` \*device\_loc, const `uint8_t` \*device\_data)  
*Process information read from the ATECC device. If it contains information for the certificate, it will be incorporated into the certificate.*
- `int atcacert_cert_build_finish` (`atcacert_build_state_t` \*build\_state)  
*Completes any final certificate processing required after all data from the device has been incorporated.*
- `int atcacert_get_device_data` (const `atcacert_def_t` \*cert\_def, const `uint8_t` \*cert, `size_t` cert\_size, const `atcacert_device_loc_t` \*device\_loc, `uint8_t` \*device\_data)  
*Gets the dynamic data that would be saved to the specified device location. This function is primarily used to break down a full certificate into the dynamic components to be saved to a device.*
- `int atcacert_set_subj_public_key` (const `atcacert_def_t` \*cert\_def, `uint8_t` \*cert, `size_t` cert\_size, const `uint8_t` subj\_public\_key[64])  
*Sets the subject public key and subject key ID in a certificate.*
- `int atcacert_get_subj_public_key` (const `atcacert_def_t` \*cert\_def, const `uint8_t` \*cert, `size_t` cert\_size, `uint8_t` subj\_public\_key[64])  
*Gets the subject public key from a certificate.*
- `int atcacert_get_subj_key_id` (const `atcacert_def_t` \*cert\_def, const `uint8_t` \*cert, `size_t` cert\_size, `uint8_t` subj\_key\_id[20])  
*Gets the subject key ID from a certificate.*
- `int atcacert_set_signature` (const `atcacert_def_t` \*cert\_def, `uint8_t` \*cert, `size_t` \*cert\_size, `size_t` max\_cert\_size, const `uint8_t` signature[64])  
*Sets the signature in a certificate. This may alter the size of the X.509 certificates.*
- `int atcacert_get_signature` (const `atcacert_def_t` \*cert\_def, const `uint8_t` \*cert, `size_t` cert\_size, `uint8_t` \*signature[64])  
*Gets the signature from a certificate.*
- `int atcacert_set_issue_date` (const `atcacert_def_t` \*cert\_def, `uint8_t` \*cert, `size_t` cert\_size, const `atcacert_tm_utc_t` \*timestamp)  
*Sets the issue date (notBefore) in a certificate. Will be formatted according to the date format specified in the certificate definition.*
- `int atcacert_get_issue_date` (const `atcacert_def_t` \*cert\_def, const `uint8_t` \*cert, `size_t` cert\_size, `atcacert_tm_utc_t` \*timestamp)  
*Gets the issue date from a certificate. Will be parsed according to the date format specified in the certificate definition.*
- `int atcacert_set_expire_date` (const `atcacert_def_t` \*cert\_def, `uint8_t` \*cert, `size_t` cert\_size, const `atcacert_tm_utc_t` \*timestamp)  
*Sets the expire date (notAfter) in a certificate. Will be formatted according to the date format specified in the certificate definition.*
- `int atcacert_get_expire_date` (const `atcacert_def_t` \*cert\_def, const `uint8_t` \*cert, `size_t` cert\_size, `atcacert_tm_utc_t` \*timestamp)  
*Gets the expire date from a certificate. Will be parsed according to the date format specified in the certificate definition.*
- `int atcacert_set_signer_id` (const `atcacert_def_t` \*cert\_def, `uint8_t` \*cert, `size_t` cert\_size, const `uint8_t` signer\_id[2])  
*Sets the signer ID in a certificate. Will be formatted as 4 upper-case hex digits.*
- `int atcacert_get_signer_id` (const `atcacert_def_t` \*cert\_def, const `uint8_t` \*cert, `size_t` cert\_size, `uint8_t` \*signer\_id[2])  
*Gets the signer ID from a certificate. Will be parsed as 4 upper-case hex digits.*

- int [atcacert\\_set\\_cert\\_sn](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t \*cert\_size, size\_t max\_cert\_size, const uint8\_t \*cert\_sn, size\_t cert\_sn\_size)  
*Sets the certificate serial number in a certificate.*
- int [atcacert\\_gen\\_cert\\_sn](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const uint8\_t device\_sn[9])  
*Sets the certificate serial number by generating it from other information in the certificate using the scheme specified by sn\_source in cert\_def. See the.*
- int [atcacert\\_get\\_cert\\_sn](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t \*cert\_sn, size\_t \*cert\_sn\_size)  
*Gets the certificate serial number from a certificate.*
- int [atcacert\\_set\\_auth\\_key\\_id](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const uint8\_t auth\_public\_key[64])  
*Sets the authority key ID in a certificate. Note that this takes the actual public key creates a key ID from it.*
- int [atcacert\\_set\\_auth\\_key\\_id\\_raw](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t cert\_size, const uint8\_t \*auth\_key\_id)  
*Sets the authority key ID in a certificate.*
- int [atcacert\\_get\\_auth\\_key\\_id](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t auth\_key\_id[20])  
*Gets the authority key ID from a certificate.*
- int [atcacert\\_set\\_comp\\_cert](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t \*cert\_size, size\_t max\_cert\_size, const uint8\_t comp\_cert[72])  
*Sets the signature, issue date, expire date, and signer ID found in the compressed certificate. This also checks fields common between the cert\_def and the compressed certificate to make sure they match.*
- int [atcacert\\_get\\_comp\\_cert](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t comp\_cert[72])  
*Generate the compressed certificate for the given certificate.*
- int [atcacert\\_get\\_tbs](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, const uint8\_t \*\*tbs, size\_t \*tbs\_size)  
*Get a pointer to the TBS data in a certificate.*
- int [atcacert\\_get\\_tbs\\_digest](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, uint8\_t tbs\_digest[32])  
*Get the SHA256 digest of certificate's TBS data.*
- int [atcacert\\_set\\_cert\\_element](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const [atcacert\\_cert\\_loc\\_t](#) \*cert\_loc, uint8\_t \*cert, size\_t cert\_size, const uint8\_t \*data, size\_t data\_size)  
*Sets an element in a certificate. The data\_size must match the size in cert\_loc.*
- int [atcacert\\_get\\_cert\\_element](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const [atcacert\\_cert\\_loc\\_t](#) \*cert\_loc, const uint8\_t \*cert, size\_t cert\_size, uint8\_t \*data, size\_t data\_size)  
*Gets an element from a certificate.*
- int [atcacert\\_get\\_key\\_id](#) (const uint8\_t public\_key[64], uint8\_t key\_id[20])  
*Calculates the key ID for a given public ECC P256 key.*
- int [atcacert\\_merge\\_device\\_loc](#) ([atcacert\\_device\\_loc\\_t](#) \*device\_locs, size\_t \*device\_locs\_count, size\_t device\_locs\_max\_count, const [atcacert\\_device\\_loc\\_t](#) \*device\_loc, size\_t block\_size)  
*Merge a new device location into a list of device locations. If the new location overlaps with an existing location, the existing one will be modified to encompass both. Otherwise the new location is appended to the end of the list.*
- int [atcacert\\_is\\_device\\_loc\\_overlap](#) (const [atcacert\\_device\\_loc\\_t](#) \*device\_loc1, const [atcacert\\_device\\_loc\\_t](#) \*device\_loc2)  
*Determines if the two device locations overlap.*
- void [atcacert\\_public\\_key\\_add\\_padding](#) (const uint8\_t raw\_key[64], uint8\_t padded\_key[72])  
*Takes a raw P256 ECC public key and converts it to the padded version used by ATECC devices. Input and output buffers can point to the same location to do an in-place transform.*
- void [atcacert\\_public\\_key\\_remove\\_padding](#) (const uint8\_t padded\_key[72], uint8\_t raw\_key[64])  
*Takes a padded public key used by ATECC devices and converts it to a raw P256 ECC public key. Input and output buffers can point to the same location to do an in-place transform.*



- int `atcacert_transform_data` (`atcacert_transform_t` transform, const uint8\_t \*data, size\_t data\_size, uint8\_t \*destination, size\_t \*destination\_size)

*Apply the specified transform to the specified data.*

- int `atcacert_max_cert_size` (const `atcacert_def_t` \*cert\_def, size\_t \*max\_cert\_size)

*Return the maximum possible certificate size in bytes for a given cert def. Certificate can be variable size, so this gives an appropriate buffer size when reading the certificates.*

### 10.61.1 Detailed Description

Declarations for certificates related to ECC CryptoAuthentication devices. These are the definitions required to define a certificate and its various elements with regards to the CryptoAuthentication ECC devices.

Only the dynamic elements of a certificate (the parts of the certificate that change from device to device) are stored on the ATECC device. The definitions here describe the form of the certificate, and where the dynamic elements can be found both on the ATECC device itself and in the certificate template.

This also defines utility functions for working with the certificates and their definitions.

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### 10.61.2 Macro Definition Documentation

#### 10.61.2.1 ATCA\_MAX\_TRANSFORMS

```
#define ATCA_MAX_TRANSFORMS 2
```

## 10.62 atcacert\_der.c File Reference

functions required to work with DER encoded data related to X.509 certificates.

```
#include "cryptoauthlib.h"
#include "atcacert_der.h"
#include <string.h>
```

## Functions

- int [atcacert\\_der\\_enc\\_length](#) (uint32\_t length, uint8\_t \*der\_length, size\_t \*der\_length\_size)  
*Encode a length in DER format.*
- int [atcacert\\_der\\_dec\\_length](#) (const uint8\_t \*der\_length, size\_t \*der\_length\_size, uint32\_t \*length)  
*Decode a DER format length.*
- int [atcacert\\_der\\_adjust\\_length](#) (uint8\_t \*der\_length, size\_t \*der\_length\_size, int delta\_length, uint32\_t \*new\_length)
- int [atcacert\\_der\\_enc\\_integer](#) (const uint8\_t \*int\_data, size\_t int\_data\_size, uint8\_t is\_unsigned, uint8\_t \*der\_int, size\_t \*der\_int\_size)  
*Encode an ASN.1 integer in DER format, including tag and length fields.*
- int [atcacert\\_der\\_dec\\_integer](#) (const uint8\_t \*der\_int, size\_t \*der\_int\_size, uint8\_t \*int\_data, size\_t \*int\_data\_size)  
*Decode an ASN.1 DER encoded integer.*
- int [atcacert\\_der\\_enc\\_ecdsa\\_sig\\_value](#) (const uint8\_t raw\_sig[64], uint8\_t \*der\_sig, size\_t \*der\_sig\_size)  
*Formats a raw ECDSA P256 signature in the DER encoding found in X.509 certificates.*
- int [atcacert\\_der\\_dec\\_ecdsa\\_sig\\_value](#) (const uint8\_t \*der\_sig, size\_t \*der\_sig\_size, uint8\_t raw\_sig[64])  
*Parses an ECDSA P256 signature in the DER encoding as found in X.509 certificates.*

### 10.62.1 Detailed Description

functions required to work with DER encoded data related to X.509 certificates.

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## 10.63 atcacert\_der.h File Reference

function declarations required to work with DER encoded data related to X.509 certificates.

```
#include <stddef.h>
#include <stdint.h>
#include "atcacert.h"
```

## Functions

- int [atcacert\\_der\\_enc\\_length](#) (uint32\_t length, uint8\_t \*der\_length, size\_t \*der\_length\_size)  
*Encode a length in DER format.*
- int [atcacert\\_der\\_dec\\_length](#) (const uint8\_t \*der\_length, size\_t \*der\_length\_size, uint32\_t \*length)  
*Decode a DER format length.*
- int [atcacert\\_der\\_adjust\\_length](#) (uint8\_t \*der\_length, size\_t \*der\_length\_size, int delta\_length, uint32\_t \*new\_length)
- int [atcacert\\_der\\_enc\\_integer](#) (const uint8\_t \*int\_data, size\_t int\_data\_size, uint8\_t is\_unsigned, uint8\_t \*der\_int, size\_t \*der\_int\_size)  
*Encode an ASN.1 integer in DER format, including tag and length fields.*
- int [atcacert\\_der\\_dec\\_integer](#) (const uint8\_t \*der\_int, size\_t \*der\_int\_size, uint8\_t \*int\_data, size\_t \*int\_data\_size)  
*Decode an ASN.1 DER encoded integer.*
- int [atcacert\\_der\\_enc\\_ecdsa\\_sig\\_value](#) (const uint8\_t raw\_sig[64], uint8\_t \*der\_sig, size\_t \*der\_sig\_size)  
*Formats a raw ECDSA P256 signature in the DER encoding found in X.509 certificates.*
- int [atcacert\\_der\\_dec\\_ecdsa\\_sig\\_value](#) (const uint8\_t \*der\_sig, size\_t \*der\_sig\_size, uint8\_t raw\_sig[64])  
*Parses an ECDSA P256 signature in the DER encoding as found in X.509 certificates.*

### 10.63.1 Detailed Description

function declarations required to work with DER encoded data related to X.509 certificates.

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## 10.64 atcacert\_host\_hw.c File Reference

host side methods using CryptoAuth hardware

```
#include "atcacert_host_hw.h"
#include "atca_basic.h"
#include "crypto/atca_crypto_sw_sha2.h"
```

### 10.64.1 Detailed Description

host side methods using CryptoAuth hardware

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## 10.65 atcacert\_host\_hw.h File Reference

host side methods using CryptoAuth hardware

```
#include <stddef.h>
#include <stdint.h>
#include "atcacert_def.h"
```

## Functions

- int [atcacert\\_verify\\_cert\\_hw](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, const uint8\_t ca\_public\_key[64])  
*Verify a certificate against its certificate authority's public key using the host's ATECC device for crypto functions.*
- int [atcacert\\_gen\\_challenge\\_hw](#) (uint8\_t challenge[32])  
*Generate a random challenge to be sent to the client using the RNG on the host's ATECC device.*
- int [atcacert\\_verify\\_response\\_hw](#) (const uint8\_t device\_public\_key[64], const uint8\_t challenge[32], const uint8\_t response[64])  
*Verify a client's response to a challenge using the host's ATECC device for crypto functions.*

### 10.65.1 Detailed Description

host side methods using CryptoAuth hardware

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## 10.66 atcacert\_host\_sw.c File Reference

host side methods using software implementations

```
#include "atcacert_host_sw.h"
#include "crypto/atca_crypto_sw.h"
```

### 10.66.1 Detailed Description

host side methods using software implementations

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## 10.67 atcacert\_host\_sw.h File Reference

Host side methods using software implementations. host-side, the one authenticating a client, of the authentication process. Crypto functions are performed using a software library.

```
#include <stddef.h>
#include <stdint.h>
#include "atcacert_def.h"
```

### Functions

- int [atcacert\\_verify\\_cert\\_sw](#) (const [atcacert\\_def\\_t](#) \*cert\_def, const uint8\_t \*cert, size\_t cert\_size, const uint8\_t ca\_public\_key[64])  
*Verify a certificate against its certificate authority's public key using software crypto functions. The function is currently not implemented.*
- int [atcacert\\_gen\\_challenge\\_sw](#) (uint8\_t challenge[32])  
*Generate a random challenge to be sent to the client using a software PRNG. The function is currently not implemented.*
- int [atcacert\\_verify\\_response\\_sw](#) (const uint8\_t device\_public\_key[64], const uint8\_t challenge[32], const uint8\_t response[64])  
*Verify a client's response to a challenge using software crypto functions. The function is currently not implemented.*

### 10.67.1 Detailed Description

Host side methods using software implementations. host-side, the one authenticating a client, of the authentication process. Crypto functions are performed using a software library.

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## 10.68 atcacert\_pem.c File Reference

Functions required to work with PEM encoded data related to X.509 certificates.

```
#include <string.h>
#include "atcacert.h"
#include "atcacert_pem.h"
#include "atca_helpers.h"
```

### Functions

- int [atcacert\\_encode\\_pem](#) (const uint8\_t \*der, size\_t der\_size, char \*pem, size\_t \*pem\_size, const char \*header, const char \*footer)  
*Encode a DER data in PEM format.*
- int [atcacert\\_decode\\_pem](#) (const char \*pem, size\_t pem\_size, uint8\_t \*der, size\_t \*der\_size, const char \*header, const char \*footer)  
*Decode PEM data into DER format.*
- int [atcacert\\_encode\\_pem\\_cert](#) (const uint8\_t \*der\_cert, size\_t der\_cert\_size, char \*pem\_cert, size\_t \*pem\_cert\_size)  
*Encode a DER certificate in PEM format.*
- int [atcacert\\_encode\\_pem\\_csr](#) (const uint8\_t \*der\_csr, size\_t der\_csr\_size, char \*pem\_csr, size\_t \*pem\_csr\_size)  
*Encode a DER CSR in PEM format.*
- int [atcacert\\_decode\\_pem\\_cert](#) (const char \*pem\_cert, size\_t pem\_cert\_size, uint8\_t \*der\_cert, size\_t \*der\_cert\_size)  
*Decode a PEM certificate into DER format.*
- int [atcacert\\_decode\\_pem\\_csr](#) (const char \*pem\_csr, size\_t pem\_csr\_size, uint8\_t \*der\_csr, size\_t \*der\_csr\_size)  
*Extract the CSR certificate bytes from a PEM encoded CSR certificate.*

### 10.68.1 Detailed Description

Functions required to work with PEM encoded data related to X.509 certificates.

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## 10.68.2 Function Documentation

### 10.68.2.1 atcacert\_decode\_pem()

```
int atcacert_decode_pem (
    const char * pem,
    size_t pem_size,
    uint8_t * der,
    size_t * der_size,
    const char * header,
    const char * footer )
```

Decode PEM data into DER format.

#### Parameters

in	<i>pem</i>	PEM data to decode to DER.
in	<i>pem_size</i>	PEM data size in bytes.
out	<i>der</i>	DER data is returned here.
in, out	<i>der_size</i>	As input, the size of the der buffer. As output, the size of the DER data.
in	<i>header</i>	Header to find the beginning of the PEM data.
in	<i>footer</i>	Footer to find the end of the PEM data.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.68.2.2 atcacert\_decode\_pem\_cert()

```
int atcacert_decode_pem_cert (
    const char * pem_cert,
    size_t pem_cert_size,
    uint8_t * der_cert,
    size_t * der_cert_size )
```

Decode a PEM certificate into DER format.

#### Parameters

in	<i>pem_cert</i>	PEM certificate to decode to DER.
in	<i>pem_cert_size</i>	PEM certificate size in bytes.
out	<i>der_cert</i>	DER certificate is returned here.
in, out	<i>der_cert_size</i>	As input, the size of the der_cert buffer. As output, the size of the DER certificate.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.68.2.3 atcacert\_decode\_pem\_csr()**

```
int atcacert_decode_pem_csr (
    const char * pem_csr,
    size_t pem_csr_size,
    uint8_t * der_csr,
    size_t * der_csr_size )
```

Extract the CSR certificate bytes from a PEM encoded CSR certificate.

**Parameters**

in	<i>pem_csr</i>	PEM CSR to decode to DER.
in	<i>pem_csr_size</i>	PEM CSR size in bytes.
out	<i>der_csr</i>	DER CSR is returned here.
in, out	<i>der_csr_size</i>	As input, the size of the der_csr buffer. As output, the size of the DER CSR.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.68.2.4 atcacert\_encode\_pem()**

```
int atcacert_encode_pem (
    const uint8_t * der,
    size_t der_size,
    char * pem,
    size_t * pem_size,
    const char * header,
    const char * footer )
```

Encode a DER data in PEM format.

**Parameters**

in	<i>der</i>	DER data to be encoded as PEM.
out	<i>der_size</i>	DER data size in bytes.
out	<i>pem</i>	PEM encoded data is returned here.
in, out	<i>pem_size</i>	As input, the size of the pem buffer. As output, the size of the PEM data.
in	<i>header</i>	Header to place at the beginning of the PEM data.
in	<i>footer</i>	Footer to place at the end of the PEM data.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.68.2.5 atcacert\_encode\_pem\_cert()

```
int atcacert_encode_pem_cert (
    const uint8_t * der_cert,
    size_t der_cert_size,
    char * pem_cert,
    size_t * pem_cert_size )
```

Encode a DER certificate in PEM format.

#### Parameters

in	<i>der_cert</i>	DER certificate to be encoded as PEM.
out	<i>der_cert_size</i>	DER certificate size in bytes.
out	<i>pem_cert</i>	PEM encoded certificate is returned here.
in, out	<i>pem_cert_size</i>	As input, the size of the pem_cert buffer. As output, the size of the PEM certificate.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.68.2.6 atcacert\_encode\_pem\_csr()

```
int atcacert_encode_pem_csr (
    const uint8_t * der_csr,
    size_t der_csr_size,
    char * pem_csr,
    size_t * pem_csr_size )
```

Encode a DER CSR in PEM format.

#### Parameters

in	<i>der_csr</i>	DER CSR to be encoded as PEM.
out	<i>der_csr_size</i>	DER CSR size in bytes.
out	<i>pem_csr</i>	PEM encoded CSR is returned here.
in, out	<i>pem_csr_size</i>	As input, the size of the pem_csr buffer. As output, the size of the PEM CSR.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.



## 10.69 atcacert\_pem.h File Reference

Functions for converting between DER and PEM formats.

```
#include <stdint.h>
```

### Macros

- #define `PEM_CERT_BEGIN` "-----BEGIN CERTIFICATE-----"
- #define `PEM_CERT_END` "-----END CERTIFICATE-----"
- #define `PEM_CSR_BEGIN` "-----BEGIN CERTIFICATE REQUEST-----"
- #define `PEM_CSR_END` "-----END CERTIFICATE REQUEST-----"

### Functions

- int `atcacert_encode_pem` (const uint8\_t \*der, size\_t der\_size, char \*pem, size\_t \*pem\_size, const char \*header, const char \*footer)  
*Encode a DER data in PEM format.*
- int `atcacert_decode_pem` (const char \*pem, size\_t pem\_size, uint8\_t \*der, size\_t \*der\_size, const char \*header, const char \*footer)  
*Decode PEM data into DER format.*
- int `atcacert_encode_pem_cert` (const uint8\_t \*der\_cert, size\_t der\_cert\_size, char \*pem\_cert, size\_t \*pem\_cert\_size)  
*Encode a DER certificate in PEM format.*
- int `atcacert_decode_pem_cert` (const char \*pem\_cert, size\_t pem\_cert\_size, uint8\_t \*der\_cert, size\_t \*der\_cert\_size)  
*Decode a PEM certificate into DER format.*
- int `atcacert_encode_pem_csr` (const uint8\_t \*der\_csr, size\_t der\_csr\_size, char \*pem\_csr, size\_t \*pem\_csr\_size)  
*Encode a DER CSR in PEM format.*
- int `atcacert_decode_pem_csr` (const char \*pem\_csr, size\_t pem\_csr\_size, uint8\_t \*der\_csr, size\_t \*der\_csr\_size)  
*Extract the CSR certificate bytes from a PEM encoded CSR certificate.*

### 10.69.1 Detailed Description

Functions for converting between DER and PEM formats.

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### 10.69.2 Macro Definition Documentation

### 10.69.2.1 PEM\_CERT\_BEGIN

```
#define PEM_CERT_BEGIN "-----BEGIN CERTIFICATE-----"
```

### 10.69.2.2 PEM\_CERT\_END

```
#define PEM_CERT_END "-----END CERTIFICATE-----"
```

### 10.69.2.3 PEM\_CSR\_BEGIN

```
#define PEM_CSR_BEGIN "-----BEGIN CERTIFICATE REQUEST-----"
```

### 10.69.2.4 PEM\_CSR\_END

```
#define PEM_CSR_END "-----END CERTIFICATE REQUEST-----"
```

## 10.69.3 Function Documentation

### 10.69.3.1 atcacert\_decode\_pem()

```
int atcacert_decode_pem (  
    const char * pem,  
    size_t pem_size,  
    uint8_t * der,  
    size_t * der_size,  
    const char * header,  
    const char * footer )
```

Decode PEM data into DER format.

#### Parameters

in	<i>pem</i>	PEM data to decode to DER.
in	<i>pem_size</i>	PEM data size in bytes.
out	<i>der</i>	DER data is returned here.
in, out	<i>der_size</i>	As input, the size of the der buffer. As output, the size of the DER data.
in	<i>header</i>	Header to find the beginning of the PEM data.
in	<i>footer</i>	Footer to find the end of the PEM data.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.69.3.2 atcacert\_decode\_pem\_cert()**

```
int atcacert_decode_pem_cert (
    const char * pem_cert,
    size_t pem_cert_size,
    uint8_t * der_cert,
    size_t * der_cert_size )
```

Decode a PEM certificate into DER format.

**Parameters**

in	<i>pem_cert</i>	PEM certificate to decode to DER.
in	<i>pem_cert_size</i>	PEM certificate size in bytes.
out	<i>der_cert</i>	DER certificate is returned here.
in, out	<i>der_cert_size</i>	As input, the size of the der_cert buffer. As output, the size of the DER certificate.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.69.3.3 atcacert\_decode\_pem\_csr()**

```
int atcacert_decode_pem_csr (
    const char * pem_csr,
    size_t pem_csr_size,
    uint8_t * der_csr,
    size_t * der_csr_size )
```

Extract the CSR certificate bytes from a PEM encoded CSR certificate.

**Parameters**

in	<i>pem_csr</i>	PEM CSR to decode to DER.
in	<i>pem_csr_size</i>	PEM CSR size in bytes.
out	<i>der_csr</i>	DER CSR is returned here.
in, out	<i>der_csr_size</i>	As input, the size of the der_csr buffer. As output, the size of the DER CSR.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

### 10.69.3.4 atcacert\_encode\_pem()

```
int atcacert_encode_pem (
    const uint8_t * der,
    size_t der_size,
    char * pem,
    size_t * pem_size,
    const char * header,
    const char * footer )
```

Encode a DER data in PEM format.

#### Parameters

in	<i>der</i>	DER data to be encoded as PEM.
out	<i>der_size</i>	DER data size in bytes.
out	<i>pem</i>	PEM encoded data is returned here.
in, out	<i>pem_size</i>	As input, the size of the pem buffer. As output, the size of the PEM data.
in	<i>header</i>	Header to place at the beginning of the PEM data.
in	<i>footer</i>	Footer to place at the end of the PEM data.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.69.3.5 atcacert\_encode\_pem\_cert()

```
int atcacert_encode_pem_cert (
    const uint8_t * der_cert,
    size_t der_cert_size,
    char * pem_cert,
    size_t * pem_cert_size )
```

Encode a DER certificate in PEM format.

#### Parameters

in	<i>der_cert</i>	DER certificate to be encoded as PEM.
out	<i>der_cert_size</i>	DER certificate size in bytes.
out	<i>pem_cert</i>	PEM encoded certificate is returned here.
in, out	<i>pem_cert_size</i>	As input, the size of the pem_cert buffer. As output, the size of the PEM certificate.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.69.3.6 atcacert\_encode\_pem\_csr()

```
int atcacert_encode_pem_csr (
    const uint8_t * der_csr,
    size_t der_csr_size,
    char * pem_csr,
    size_t * pem_csr_size )
```

Encode a DER CSR in PEM format.

#### Parameters

in	<i>der_csr</i>	DER CSR to be encoded as PEM.
out	<i>der_csr_size</i>	DER CSR size in bytes.
out	<i>pem_csr</i>	PEM encoded CSR is returned here.
in, out	<i>pem_csr_size</i>	As input, the size of the pem_csr buffer. As output, the size of the PEM CSR.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 10.70 calib\_aes.c File Reference

CryptoAuthLib Basic API methods for AES command.

```
#include "cryptoauthlib.h"
```

### 10.70.1 Detailed Description

CryptoAuthLib Basic API methods for AES command.

The AES command supports 128-bit AES encryption or decryption of small messages or data packets in ECB mode. Also can perform GFM (Galois Field Multiply) calculation in support of AES-GCM.

#### Note

List of devices that support this command - ATECC608A/B. Refer to device edatasheet for full details.

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## 10.71 calib\_aes\_gcm.c File Reference

CryptoAuthLib Basic API methods for AES GCM mode.

```
#include "cryptoauthlib.h"
```

### 10.71.1 Detailed Description

CryptoAuthLib Basic API methods for AES GCM mode.

The AES command supports 128-bit AES encryption or decryption of small messages or data packets in ECB mode. Also can perform GFM (Galois Field Multiply) calculation in support of AES-GCM.

#### Note

List of devices that support this command - ATECC608A/B. Refer to device datasheet for full details.

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## 10.72 calib\_aes\_gcm.h File Reference

Unity tests for the cryptoauthlib AES GCM functions.

```
#include "calib_config_check.h"
```

### 10.72.1 Detailed Description

Unity tests for the cryptoauthlib AES GCM functions.

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## 10.73 calib\_basic.c File Reference

CryptoAuthLib Basic API methods. These methods provide a simpler way to access the core crypto methods.

```
#include "cryptoauthlib.h"
```

### Functions

- [ATCA\\_STATUS calib\\_wakeup\\_i2c](#) (ATCADevice device)  
*basic API methods are all prefixed with atcab\_ (CryptoAuthLib Basic) the fundamental premise of the basic API is it is based on a single interface instance and that instance is global, so all basic API commands assume that one global device is the one to operate on.*
- [ATCA\\_STATUS calib\\_wakeup](#) (ATCADevice device)  
*wakeup the CryptoAuth device*
- [ATCA\\_STATUS calib\\_idle](#) (ATCADevice device)  
*idle the CryptoAuth device*
- [ATCA\\_STATUS calib\\_sleep](#) (ATCADevice device)  
*invoke sleep on the CryptoAuth device*
- [ATCA\\_STATUS \\_calib\\_exit](#) (ATCADevice device)  
*common cleanup code which idles the device after any operation*
- [ATCA\\_STATUS calib\\_get\\_addr](#) (uint8\_t zone, uint16\_t slot, uint8\_t block, uint8\_t offset, uint16\_t \*addr)  
*Compute the address given the zone, slot, block, and offset.*
- [ATCA\\_STATUS calib\\_get\\_zone\\_size](#) (ATCADevice device, uint8\_t zone, uint16\_t slot, size\_t \*size)  
*Gets the size of the specified zone in bytes.*

### 10.73.1 Detailed Description

CryptoAuthLib Basic API methods. These methods provide a simpler way to access the core crypto methods.

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### 10.73.2 Function Documentation

#### 10.73.2.1 calib\_wakeup\_i2c()

```
ATCA_STATUS calib_wakeup_i2c (  
    ATCADevice device )
```

basic API methods are all prefixed with atcab\_ (CryptoAuthLib Basic) the fundamental premise of the basic API is it is based on a single interface instance and that instance is global, so all basic API commands assume that one global device is the one to operate on.

## 10.74 calib\_basic.h File Reference

```
#include "calib_config_check.h"  
#include "calib_command.h"  
#include "calib_execution.h"
```

### Data Structures

- struct [atca\\_sha256\\_ctx](#)

### Typedefs

- typedef struct [atca\\_sha256\\_ctx](#) [atca\\_sha256\\_ctx\\_t](#)
- typedef [atca\\_sha256\\_ctx\\_t](#) [atca\\_hmac\\_sha256\\_ctx\\_t](#)

## Functions

- [ATCA\\_STATUS calib\\_wakeup](#) (ATCADevice device)  
*wakeup the CryptoAuth device*
- [ATCA\\_STATUS calib\\_idle](#) (ATCADevice device)  
*idle the CryptoAuth device*
- [ATCA\\_STATUS calib\\_sleep](#) (ATCADevice device)  
*invoke sleep on the CryptoAuth device*
- [ATCA\\_STATUS \\_calib\\_exit](#) (ATCADevice device)  
*common cleanup code which idles the device after any operation*
- [ATCA\\_STATUS calib\\_get\\_addr](#) (uint8\_t zone, uint16\_t slot, uint8\_t block, uint8\_t offset, uint16\_t \*addr)  
*Compute the address given the zone, slot, block, and offset.*
- [ATCA\\_STATUS calib\\_get\\_zone\\_size](#) (ATCADevice device, uint8\_t zone, uint16\_t slot, size\_t \*size)  
*Gets the size of the specified zone in bytes.*
- [ATCA\\_STATUS calib\\_ecc204\\_get\\_addr](#) (uint8\_t zone, uint16\_t slot, uint8\_t block, uint8\_t offset, uint16\_t \*addr)
- [ATCA\\_STATUS calib\\_is\\_locked](#) (ATCADevice device, uint8\_t zone, bool \*is\_locked)
- [ATCA\\_STATUS calib\\_is\\_locked\\_ext](#) (ATCADevice device, uint8\_t zone, bool \*is\_locked)
- [ATCA\\_STATUS calib\\_is\\_slot\\_locked](#) (ATCADevice device, uint16\_t slot, bool \*is\_locked)
- [ATCA\\_STATUS calib\\_is\\_private](#) (ATCADevice device, uint16\_t slot, bool \*is\_private)  
*Executes Read command, which reads the configuration zone to see if the specified slot is locked.*
- [ATCA\\_STATUS calib\\_ecc204\\_is\\_locked](#) (ATCADevice device, uint8\_t zone, bool \*is\_locked)
- [ATCA\\_STATUS calib\\_ecc204\\_is\\_data\\_locked](#) (ATCADevice device, bool \*is\_locked)
- [ATCA\\_STATUS calib\\_ecc204\\_is\\_config\\_locked](#) (ATCADevice device, bool \*is\_locked)
- [ATCADeviceType calib\\_get\\_devicetype](#) (uint8\_t revision[4])  
*Parse the revision field to get the device type.*
- [ATCA\\_STATUS calib\\_info\\_base](#) (ATCADevice device, uint8\_t mode, uint16\_t param2, uint8\_t \*out\_data)  
*Issues an Info command, which return internal device information and can control GPIO and the persistent latch.*
- [ATCA\\_STATUS calib\\_info](#) (ATCADevice device, uint8\_t \*revision)  
*Use the Info command to get the device revision (DevRev).*
- [ATCA\\_STATUS calib\\_info\\_privkey\\_valid](#) (ATCADevice device, uint16\_t key\_id, uint8\_t \*is\_valid)  
*Use Info command to check ECC Private key stored in key slot is valid or not.*
- [ATCA\\_STATUS calib\\_info\\_lock\\_status](#) (ATCADevice device, uint16\_t param2, uint8\_t \*is\_locked)

## 10.75 calib\_checkmac.c File Reference

CryptoAuthLib Basic API methods for CheckMAC command.

```
#include "cryptoauthlib.h"
```

### 10.75.1 Detailed Description

CryptoAuthLib Basic API methods for CheckMAC command.

The CheckMac command calculates a MAC response that would have been generated on a different CryptoAuth Authentication device and then compares the result with input value.

#### Note

List of devices that support this command - ATSHA204A, ATECC108A, ATECC508A, and ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.76 calib\_command.c File Reference

Microchip CryptoAuthentication device command builder - this is the main object that builds the command byte strings for the given device. It does not execute the command. The basic flow is to call a command method to build the command you want given the parameters and then send that byte string through the device interface.

```
#include "cryptoauthlib.h"
```

### Functions

- [ATCA\\_STATUS atInfo](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)  
*ATCACommand Info method.*
- [ATCA\\_STATUS atPause](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)  
*ATCACommand Pause method.*
- void [atCRC](#) (size\_t length, const uint8\_t \*data, uint8\_t \*crc\_le)  
*Calculates CRC over the given raw data and returns the CRC in little-endian byte order.*
- void [atCalcCrc](#) ([ATCAPacket](#) \*packet)  
*This function calculates CRC and adds it to the correct offset in the packet data.*
- [ATCA\\_STATUS atCheckCrc](#) (const uint8\_t \*response)  
*This function checks the consistency of a response.*
- bool [atIsSHAFamily](#) ([ATCADeviceType](#) device\_type)  
*determines if a given device type is a SHA device or a superset of a SHA device*
- bool [atIsECCFamily](#) ([ATCADeviceType](#) device\_type)  
*determines if a given device type is an ECC device or a superset of an ECC device*
- [ATCA\\_STATUS isATCAError](#) (uint8\_t \*data)  
*checks for basic error frame in data*

### 10.76.1 Detailed Description

Microchip CryptoAuthentication device command builder - this is the main object that builds the command byte strings for the given device. It does not execute the command. The basic flow is to call a command method to build the command you want given the parameters and then send that byte string through the device interface.

The primary goal of the command builder is to wrap the given parameters with the correct packet size and CRC. The caller should first fill in the parameters required in the [ATCAPacket](#) parameter given to the command. The command builder will deal with the mechanics of creating a valid packet using the parameter information.

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### 10.76.2 Function Documentation

#### 10.76.2.1 atCalcCrc()

```
void atCalcCrc (
    ATCAPacket * packet )
```

This function calculates CRC and adds it to the correct offset in the packet data.

## Parameters

in	<i>packet</i>	Packet to calculate CRC data for
----	---------------	----------------------------------

**10.76.2.2 atCheckCrc()**

```
ATCA_STATUS atCheckCrc (  
    const uint8_t * response )
```

This function checks the consistency of a response.

## Parameters

in	<i>response</i>	pointer to response
----	-----------------	---------------------

## Returns

ATCA\_SUCCESS on success, otherwise ATCA\_RX\_CRC\_ERROR

**10.76.2.3 atCRC()**

```
void atCRC (  
    size_t length,  
    const uint8_t * data,  
    uint8_t * crc_le )
```

Calculates CRC over the given raw data and returns the CRC in little-endian byte order.

## Parameters

in	<i>length</i>	Size of data not including the CRC byte positions
in	<i>data</i>	Pointer to the data over which to compute the CRC
out	<i>crc_le</i>	Pointer to the place where the two-bytes of CRC will be returned in little-endian byte order.

**10.76.2.4 atInfo()**

```
ATCA_STATUS atInfo (  
    ATCADeviceType device_type,  
    ATCAPacket * packet )
```

ATCACommand Info method.

**Parameters**

in	<i>ca_cmd</i>	instance
in	<i>packet</i>	pointer to the packet containing the command being built

**Returns**

ATCA\_SUCCESS

**10.76.2.5 atIsECCFamily()**

```
bool atIsECCFamily (  
    ATCADeviceType device_type )
```

determines if a given device type is an ECC device or a superset of a ECC device

**Parameters**

in	<i>device_type</i>	Type of device to check for family type
----	--------------------	---

**Returns**

boolean indicating whether the given device is an ECC family device.

**10.76.2.6 atIsSHAFamily()**

```
bool atIsSHAFamily (  
    ATCADeviceType device_type )
```

determines if a given device type is a SHA device or a superset of a SHA device

**Parameters**

in	<i>device_type</i>	Type of device to check for family type
----	--------------------	---

**Returns**

boolean indicating whether the given device is a SHA family device.

### 10.76.2.7 atPause()

```
ATCA_STATUS atPause (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

ATCACommand Pause method.

#### Parameters

in	<i>ca_cmd</i>	instance
in	<i>packet</i>	pointer to the packet containing the command being built

#### Returns

ATCA\_SUCCESS

### 10.76.2.8 isATCAError()

```
ATCA_STATUS isATCAError (
    uint8_t * data )
```

checks for basic error frame in data

#### Parameters

in	<i>data</i>	pointer to received data - expected to be in the form of a CA device response frame
----	-------------	---

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 10.77 calib\_command.h File Reference

Microchip Crypto Auth device command object - this is a command builder only, it does not send the command. The result of a command method is a fully formed packet, ready to send to the ATCAIFace object to dispatch.

```
#include <stddef.h>
```

### Data Structures

- struct [ATCAPacket](#)

## Macros

- #define **ATCA\_CMD\_SIZE\_MIN** ((uint8\_t)7)  
*minimum number of bytes in command (from count byte to second CRC byte)*
- #define **ATCA\_CMD\_SIZE\_MAX** ((uint8\_t)4 \* 36 + 7)  
*maximum size of command packet (Verify)*
- #define **CMD\_STATUS\_SUCCESS** ((uint8\_t)0x00)  
*status byte for success*
- #define **CMD\_STATUS\_WAKEUP** ((uint8\_t)0x11)  
*status byte after wake-up*
- #define **CMD\_STATUS\_BYTE\_PARSE** ((uint8\_t)0x03)  
*command parse error*
- #define **CMD\_STATUS\_BYTE\_ECC** ((uint8\_t)0x05)  
*command ECC error*
- #define **CMD\_STATUS\_BYTE\_EXEC** ((uint8\_t)0x0F)  
*command execution error*
- #define **CMD\_STATUS\_BYTE\_COMM** ((uint8\_t)0xFF)  
*communication error*

## Opcodes for Crypto Authentication device commands

- #define **ATCA\_CHECKMAC** ((uint8\_t)0x28)  
*CheckMac command op-code.*
- #define **ATCA\_DERIVE\_KEY** ((uint8\_t)0x1C)  
*DeriveKey command op-code.*
- #define **ATCA\_INFO** ((uint8\_t)0x30)  
*Info command op-code.*
- #define **ATCA\_GENDIG** ((uint8\_t)0x15)  
*GenDig command op-code.*
- #define **ATCA\_GENKEY** ((uint8\_t)0x40)  
*GenKey command op-code.*
- #define **ATCA\_HMAC** ((uint8\_t)0x11)  
*HMAC command op-code.*
- #define **ATCA\_LOCK** ((uint8\_t)0x17)  
*Lock command op-code.*
- #define **ATCA\_MAC** ((uint8\_t)0x08)  
*MAC command op-code.*
- #define **ATCA\_NONCE** ((uint8\_t)0x16)  
*Nonce command op-code.*
- #define **ATCA\_PAUSE** ((uint8\_t)0x01)  
*Pause command op-code.*
- #define **ATCA\_PRIVWRITE** ((uint8\_t)0x46)  
*PrivWrite command op-code.*
- #define **ATCA\_RANDOM** ((uint8\_t)0x1B)  
*Random command op-code.*
- #define **ATCA\_READ** ((uint8\_t)0x02)  
*Read command op-code.*
- #define **ATCA\_SIGN** ((uint8\_t)0x41)  
*Sign command op-code.*
- #define **ATCA\_UPDATE\_EXTRA** ((uint8\_t)0x20)  
*UpdateExtra command op-code.*
- #define **ATCA\_VERIFY** ((uint8\_t)0x45)  
*GenKey command op-code.*
- #define **ATCA\_WRITE** ((uint8\_t)0x12)  
*Write command op-code.*
- #define **ATCA\_ECDH** ((uint8\_t)0x43)

- ECDH command op-code.*
- #define [ATCA\\_COUNTER](#) ((uint8\_t)0x24)
- Counter command op-code.*
- #define [ATCA\\_DELETE](#) ((uint8\_t)0x13)
- Delete command op-code.*
- #define [ATCA\\_SHA](#) ((uint8\_t)0x47)
- SHA command op-code.*
- #define [ATCA\\_AES](#) ((uint8\_t)0x51)
- AES command op-code.*
- #define [ATCA\\_KDF](#) ((uint8\_t)0x56)
- KDF command op-code.*
- #define [ATCA\\_SECUREBOOT](#) ((uint8\_t)0x80)
- Secure Boot command op-code.*
- #define [ATCA\\_SELFTEST](#) ((uint8\_t)0x77)
- Self test command op-code.*

### Definitions of Data and Packet Sizes

- #define [ATCA\\_BLOCK\\_SIZE](#) (32)  
*size of a block*
- #define [ATCA\\_WORD\\_SIZE](#) (4)  
*size of a word*
- #define [ATCA\\_PUB\\_KEY\\_PAD](#) (4)  
*size of the public key pad*
- #define [ATCA\\_SERIAL\\_NUM\\_SIZE](#) (9)  
*number of bytes in the device serial number*
- #define [ATCA\\_RSP\\_SIZE\\_VAL](#) ((uint8\_t)7)  
*size of response packet containing four bytes of data*
- #define [ATCA\\_KEY\\_COUNT](#) (16)  
*number of keys*
- #define [ATCA\\_ECC\\_CONFIG\\_SIZE](#) (128)  
*size of configuration zone*
- #define [ATCA\\_SHA\\_CONFIG\\_SIZE](#) (88)  
*size of configuration zone*
- #define [ATCA\\_ECC204\\_CONFIG\\_SIZE](#) (64)  
*size of ECC204 configuration zone*
- #define [ATCA\\_ECC204\\_CONFIG\\_SLOT\\_SIZE](#) (16)  
*size of ECC204 configuration slot size*
- #define [ATCA\\_OTP\\_SIZE](#) (64)  
*size of OTP zone*
- #define [ATCA\\_DATA\\_SIZE](#) (ATCA\_KEY\_COUNT \* ATCA\_KEY\_SIZE)  
*size of data zone*
- #define [ATCA\\_AES\\_GFM\\_SIZE](#) ATCA\_BLOCK\_SIZE  
*size of GFM data*
- #define [ATCA\\_CHIPMODE\\_OFFSET](#) (19)  
*ChipMode byte offset within the configuration zone.*
- #define [ATCA\\_CHIPMODE\\_I2C\\_ADDRESS\\_FLAG](#) ((uint8\_t)0x01)  
*ChipMode I2C Address in UserExtraAdd flag.*
- #define [ATCA\\_CHIPMODE\\_TTL\\_ENABLE\\_FLAG](#) ((uint8\_t)0x02)  
*ChipMode TTLEnable flag.*
- #define [ATCA\\_CHIPMODE\\_WATCHDOG\\_MASK](#) ((uint8\_t)0x04)  
*ChipMode watchdog duration mask.*
- #define [ATCA\\_CHIPMODE\\_WATCHDOG\\_SHORT](#) ((uint8\_t)0x00)  
*ChipMode short watchdog (~1.3s)*
- #define [ATCA\\_CHIPMODE\\_WATCHDOG\\_LONG](#) ((uint8\_t)0x04)  
*ChipMode long watchdog (~13s)*
- #define [ATCA\\_CHIPMODE\\_CLOCK\\_DIV\\_MASK](#) ((uint8\_t)0xF8)  
*ChipMode clock divider mask.*

- #define `ATCA_CHIPMODE_CLOCK_DIV_M0` ((uint8\_t)0x00)  
*ChipMode clock divider M0.*
- #define `ATCA_CHIPMODE_CLOCK_DIV_M1` ((uint8\_t)0x28)  
*ChipMode clock divider M1.*
- #define `ATCA_CHIPMODE_CLOCK_DIV_M2` ((uint8\_t)0x68)  
*ChipMode clock divider M2.*
- #define `ATCA_COUNT_SIZE` ((uint8\_t)1)  
*Number of bytes in the command packet Count.*
- #define `ATCA_CRC_SIZE` ((uint8\_t)2)  
*Number of bytes in the command packet CRC.*
- #define `ATCA_PACKET_OVERHEAD` (`ATCA_COUNT_SIZE` + `ATCA_CRC_SIZE`)  
*Number of bytes in the command packet.*
- #define `ATCA_PUB_KEY_SIZE` (64)  
*size of a p256 public key*
- #define `ATCA_PRIV_KEY_SIZE` (32)  
*size of a p256 private key*
- #define `ATCA_SIG_SIZE` (64)  
*size of a p256 signature*
- #define `ATCA_KEY_SIZE` (32)  
*size of a symmetric SHA key*
- #define `RSA2048_KEY_SIZE` (256)  
*size of a RSA private key*
- #define `ATCA_RSP_SIZE_MIN` ((uint8\_t)4)  
*minimum number of bytes in response*
- #define `ATCA_RSP_SIZE_4` ((uint8\_t)7)  
*size of response packet containing 4 bytes data*
- #define `ATCA_RSP_SIZE_72` ((uint8\_t)75)  
*size of response packet containing 64 bytes data*
- #define `ATCA_RSP_SIZE_64` ((uint8\_t)67)  
*size of response packet containing 64 bytes data*
- #define `ATCA_RSP_SIZE_32` ((uint8\_t)35)  
*size of response packet containing 32 bytes data*
- #define `ATCA_RSP_SIZE_16` ((uint8\_t)19)  
*size of response packet containing 16 bytes data*
- #define `ATCA_RSP_SIZE_MAX` ((uint8\_t)75)  
*maximum size of response packet (GenKey and Verify command)*
- #define `OUTNONCE_SIZE` (32)  
*Size of the OutNonce response expected from several commands.*

### Definitions for Command Parameter Ranges

- #define `ATCA_KEY_ID_MAX` ((uint8\_t)15)  
*maximum value for key id*
- #define `ATCA_OTP_BLOCK_MAX` ((uint8\_t)1)  
*maximum value for OTP block*

### Definitions for Indexes Common to All Commands

- #define `ATCA_COUNT_IDX` (0)  
*command packet index for count*
- #define `ATCA_OPCODE_IDX` (1)  
*command packet index for op-code*
- #define `ATCA_PARAM1_IDX` (2)  
*command packet index for first parameter*
- #define `ATCA_PARAM2_IDX` (3)  
*command packet index for second parameter*
- #define `ATCA_DATA_IDX` (5)  
*command packet index for data load*

- #define [ATCA\\_RSP\\_DATA\\_IDX](#) (1)  
*buffer index of data in response*

#### Definitions for Zone and Address Parameters

- #define [ATCA\\_ZONE\\_MASK](#) ((uint8\_t)0x03)  
*Zone mask.*
- #define [ATCA\\_ZONE\\_ENCRYPTED](#) ((uint8\_t)0x40)  
*Zone bit 6 set: Write is encrypted with an unlocked data zone.*
- #define [ATCA\\_ZONE\\_READWRITE\\_32](#) ((uint8\_t)0x80)  
*Zone bit 7 set: Access 32 bytes, otherwise 4 bytes.*
- #define [ATCA\\_ADDRESS\\_MASK\\_CONFIG](#) (0x001F)  
*Address bits 5 to 7 are 0 for Configuration zone.*
- #define [ATCA\\_ADDRESS\\_MASK\\_OTP](#) (0x000F)  
*Address bits 4 to 7 are 0 for OTP zone.*
- #define [ATCA\\_ADDRESS\\_MASK](#) (0x007F)  
*Address bit 7 to 15 are always 0.*
- #define [ATCA\\_TEMPKEY\\_KEYID](#) (0xFFFF)  
*KeyID when referencing TempKey.*

#### Definitions for Key types

- #define [ATCA\\_B283\\_KEY\\_TYPE](#) 0  
*B283 NIST ECC key.*
- #define [ATCA\\_K283\\_KEY\\_TYPE](#) 1  
*K283 NIST ECC key.*
- #define [ATCA\\_P256\\_KEY\\_TYPE](#) 4  
*P256 NIST ECC key.*
- #define [ATCA\\_AES\\_KEY\\_TYPE](#) 6  
*AES-128 Key.*
- #define [ATCA\\_SHA\\_KEY\\_TYPE](#) 7  
*SHA key or other data.*

#### Definitions for the AES Command

- #define [AES\\_MODE\\_IDX](#) [ATCA\\_PARAM1\\_IDX](#)  
*AES command index for mode.*
- #define [AES\\_KEYID\\_IDX](#) [ATCA\\_PARAM2\\_IDX](#)  
*AES command index for key id.*
- #define [AES\\_INPUT\\_IDX](#) [ATCA\\_DATA\\_IDX](#)  
*AES command index for input data.*
- #define [AES\\_COUNT](#) (23)  
*AES command packet size.*
- #define [AES\\_MODE\\_MASK](#) ((uint8\_t)0xC7)  
*AES mode bits 3 to 5 are 0.*
- #define [AES\\_MODE\\_KEY\\_BLOCK\\_MASK](#) ((uint8\_t)0xC0)  
*AES mode mask for key block field.*
- #define [AES\\_MODE\\_OP\\_MASK](#) ((uint8\_t)0x07)  
*AES mode operation mask.*
- #define [AES\\_MODE\\_ENCRYPT](#) ((uint8\_t)0x00)  
*AES mode: Encrypt.*
- #define [AES\\_MODE\\_DECRYPT](#) ((uint8\_t)0x01)  
*AES mode: Decrypt.*
- #define [AES\\_MODE\\_GFM](#) ((uint8\_t)0x03)  
*AES mode: GFM calculation.*
- #define [AES\\_MODE\\_KEY\\_BLOCK\\_POS](#) (6)  
*Bit shift for key block in mode.*



- #define `AES_DATA_SIZE` (16)  
*size of AES encrypt/decrypt data*
- #define `AES_RSP_SIZE ATCA_RSP_SIZE_16`  
*AES command response packet size.*

### Definitions for the CheckMac Command

- #define `CHECKMAC_MODE_IDX ATCA_PARAM1_IDX`  
*CheckMAC command index for mode.*
- #define `CHECKMAC_KEYID_IDX ATCA_PARAM2_IDX`  
*CheckMAC command index for key identifier.*
- #define `CHECKMAC_CLIENT_CHALLENGE_IDX ATCA_DATA_IDX`  
*CheckMAC command index for client challenge.*
- #define `CHECKMAC_CLIENT_RESPONSE_IDX` (37)  
*CheckMAC command index for client response.*
- #define `CHECKMAC_DATA_IDX` (69)  
*CheckMAC command index for other data.*
- #define `CHECKMAC_COUNT` (84)  
*CheckMAC command packet size.*
- #define `CHECKMAC_MODE_CHALLENGE` ((uint8\_t)0x00)  
*CheckMAC mode 0: first SHA block from key id.*
- #define `CHECKMAC_MODE_BLOCK2_TEMPKEY` ((uint8\_t)0x01)  
*CheckMAC mode bit 0: second SHA block from TempKey.*
- #define `CHECKMAC_MODE_BLOCK1_TEMPKEY` ((uint8\_t)0x02)  
*CheckMAC mode bit 1: first SHA block from TempKey.*
- #define `CHECKMAC_MODE_SOURCE_FLAG_MATCH` ((uint8\_t)0x04)  
*CheckMAC mode bit 2: match TempKey.SourceFlag.*
- #define `CHECKMAC_MODE_INCLUDE_OTP_64` ((uint8\_t)0x20)  
*CheckMAC mode bit 5: include first 64 OTP bits.*
- #define `CHECKMAC_MODE_MASK` ((uint8\_t)0x27)  
*CheckMAC mode bits 3, 4, 6, and 7 are 0.*
- #define `CHECKMAC_CLIENT_CHALLENGE_SIZE` (32)  
*CheckMAC size of client challenge.*
- #define `CHECKMAC_CLIENT_RESPONSE_SIZE` (32)  
*CheckMAC size of client response.*
- #define `CHECKMAC_OTHER_DATA_SIZE` (13)  
*CheckMAC size of "other data".*
- #define `CHECKMAC_CLIENT_COMMAND_SIZE` (4)  
*CheckMAC size of client command header size inside "other data".*
- #define `CHECKMAC_CMD_MATCH` (0)  
*CheckMAC return value when there is a match.*
- #define `CHECKMAC_CMD_MISMATCH` (1)  
*CheckMAC return value when there is a mismatch.*
- #define `CHECKMAC_RSP_SIZE ATCA_RSP_SIZE_MIN`  
*CheckMAC response packet size.*

### Definitions for the Counter command

- #define `COUNTER_COUNT ATCA_CMD_SIZE_MIN`
- #define `COUNTER_MODE_IDX ATCA_PARAM1_IDX`  
*Counter command index for mode.*
- #define `COUNTER_KEYID_IDX ATCA_PARAM2_IDX`  
*Counter command index for key id.*
- #define `COUNTER_MODE_MASK` ((uint8\_t)0x01)  
*Counter mode bits 1 to 7 are 0.*
- #define `COUNTER_MAX_VALUE` ((uint32\_t)2097151)  
*Counter maximum value of the counter.*
- #define `COUNTER_MODE_READ` ((uint8\_t)0x00)

- Counter command mode for reading.*
- #define [COUNTER\\_MODE\\_INCREMENT](#) ((uint8\_t)0x01)
- Counter command mode for incrementing.*
- #define [COUNTER\\_RSP\\_SIZE](#) [ATCA\\_RSP\\_SIZE\\_4](#)
- Counter command response packet size.*
- #define [COUNTER\\_SIZE](#) [ATCA\\_RSP\\_SIZE\\_MIN](#)
- Counter size in binary.*
- #define [ECC204\\_COUNTER\\_MAX\\_VALUE](#) ((uint16\_t)10000)
- Counter maximum value of the counter for ECC204.*

#### Definitions for the DeriveKey Command

- #define [DERIVE\\_KEY\\_RANDOM\\_IDX](#) [ATCA\\_PARAM1\\_IDX](#)
- DeriveKey command index for random bit.*
- #define [DERIVE\\_KEY\\_TARGETKEY\\_IDX](#) [ATCA\\_PARAM2\\_IDX](#)
- DeriveKey command index for target slot.*
- #define [DERIVE\\_KEY\\_MAC\\_IDX](#) [ATCA\\_DATA\\_IDX](#)
- DeriveKey command index for optional MAC.*
- #define [DERIVE\\_KEY\\_COUNT\\_SMALL](#) [ATCA\\_CMD\\_SIZE\\_MIN](#)
- DeriveKey command packet size without MAC.*
- #define [DERIVE\\_KEY\\_MODE](#) ((uint8\_t)0x04)
- DeriveKey command mode set to 4 as in datasheet.*
- #define [DERIVE\\_KEY\\_COUNT\\_LARGE](#) (39)
- DeriveKey command packet size with MAC.*
- #define [DERIVE\\_KEY\\_RANDOM\\_FLAG](#) ((uint8\_t)4)
- DeriveKey 1. parameter; has to match TempKey.SourceFlag.*
- #define [DERIVE\\_KEY\\_MAC\\_SIZE](#) (32)
- DeriveKey MAC size.*
- #define [DERIVE\\_KEY\\_RSP\\_SIZE](#) [ATCA\\_RSP\\_SIZE\\_MIN](#)
- DeriveKey response packet size.*

#### Definitions for the ECDH Command

- #define [ECDH\\_PREFIX\\_MODE](#) ((uint8\_t)0x00)
- #define [ECDH\\_COUNT](#) ([ATCA\\_CMD\\_SIZE\\_MIN](#) + [ATCA\\_PUB\\_KEY\\_SIZE](#))
- #define [ECDH\\_MODE\\_SOURCE\\_MASK](#) ((uint8\_t)0x01)
- #define [ECDH\\_MODE\\_SOURCE\\_EEPROM\\_SLOT](#) ((uint8\_t)0x00)
- #define [ECDH\\_MODE\\_SOURCE\\_TEMPKEY](#) ((uint8\_t)0x01)
- #define [ECDH\\_MODE\\_OUTPUT\\_MASK](#) ((uint8\_t)0x02)
- #define [ECDH\\_MODE\\_OUTPUT\\_CLEAR](#) ((uint8\_t)0x00)
- #define [ECDH\\_MODE\\_OUTPUT\\_ENC](#) ((uint8\_t)0x02)
- #define [ECDH\\_MODE\\_COPY\\_MASK](#) ((uint8\_t)0x0C)
- #define [ECDH\\_MODE\\_COPY\\_COMPATIBLE](#) ((uint8\_t)0x00)
- #define [ECDH\\_MODE\\_COPY\\_EEPROM\\_SLOT](#) ((uint8\_t)0x04)
- #define [ECDH\\_MODE\\_COPY\\_TEMP\\_KEY](#) ((uint8\_t)0x08)
- #define [ECDH\\_MODE\\_COPY\\_OUTPUT\\_BUFFER](#) ((uint8\_t)0x0C)
- #define [ECDH\\_KEY\\_SIZE](#) [ATCA\\_BLOCK\\_SIZE](#)
- ECDH output data size.*
- #define [ECDH\\_RSP\\_SIZE](#) [ATCA\\_RSP\\_SIZE\\_64](#)
- ECDH command packet size.*

#### Definitions for the GenDig Command

- #define [GENDIG\\_ZONE\\_IDX](#) [ATCA\\_PARAM1\\_IDX](#)
- GenDig command index for zone.*
- #define [GENDIG\\_KEYID\\_IDX](#) [ATCA\\_PARAM2\\_IDX](#)
- GenDig command index for key id.*
- #define [GENDIG\\_DATA\\_IDX](#) [ATCA\\_DATA\\_IDX](#)

- *GenDig command index for optional data.*
- #define [GENDIG\\_COUNT ATCA\\_CMD\\_SIZE\\_MIN](#)
- *GenDig command packet size without "other data".*
- #define [GENDIG\\_ZONE\\_CONFIG](#) ((uint8\_t)0)
- *GenDig zone id config. Use KeyID to specify any of the four 256-bit blocks of the Configuration zone.*
- #define [GENDIG\\_ZONE\\_OTP](#) ((uint8\_t)1)
- *GenDig zone id OTP. Use KeyID to specify either the first or second 256-bit block of the OTP zone.*
- #define [GENDIG\\_ZONE\\_DATA](#) ((uint8\_t)2)
- *GenDig zone id data. Use KeyID to specify a slot in the Data zone or a transport key in the hardware array.*
- #define [GENDIG\\_ZONE\\_SHARED\\_NONCE](#) ((uint8\_t)3)
- *GenDig zone id shared nonce. KeyID specifies the location of the input value in the message generation.*
- #define [GENDIG\\_ZONE\\_COUNTER](#) ((uint8\_t)4)
- *GenDig zone id counter. KeyID specifies the monotonic counter ID to be included in the message generation.*
- #define [GENDIG\\_ZONE\\_KEY\\_CONFIG](#) ((uint8\_t)5)
- *GenDig zone id key config. KeyID specifies the slot for which the configuration information is to be included in the message generation.*
- #define [GENDIG\\_RSP\\_SIZE ATCA\\_RSP\\_SIZE\\_MIN](#)
- *GenDig command response packet size.*

### Definitions for the GenKey Command

- #define [GENKEY\\_MODE\\_IDX ATCA\\_PARAM1\\_IDX](#)
- *GenKey command index for mode.*
- #define [GENKEY\\_KEYID\\_IDX ATCA\\_PARAM2\\_IDX](#)
- *GenKey command index for key id.*
- #define [GENKEY\\_DATA\\_IDX](#) (5)
- *GenKey command index for other data.*
- #define [GENKEY\\_COUNT ATCA\\_CMD\\_SIZE\\_MIN](#)
- *GenKey command packet size without "other data".*
- #define [GENKEY\\_COUNT\\_DATA](#) (10)
- *GenKey command packet size with "other data".*
- #define [GENKEY\\_OTHER\\_DATA\\_SIZE](#) (3)
- *GenKey size of "other data".*
- #define [GENKEY\\_MODE\\_MASK](#) ((uint8\_t)0x1C)
- *GenKey mode bits 0 to 1 and 5 to 7 are 0.*
- #define [GENKEY\\_MODE\\_PRIVATE](#) ((uint8\_t)0x04)
- *GenKey mode: private key generation.*
- #define [GENKEY\\_MODE\\_PUBLIC](#) ((uint8\_t)0x00)
- *GenKey mode: public key calculation.*
- #define [GENKEY\\_MODE\\_DIGEST](#) ((uint8\_t)0x08)
- *GenKey mode: PubKey digest will be created after the public key is calculated.*
- #define [GENKEY\\_MODE\\_PUBKEY\\_DIGEST](#) ((uint8\_t)0x10)
- *GenKey mode: Calculate PubKey digest on the public key in KeyId.*
- #define [GENKEY\\_MODE\\_MAC](#) ((uint8\_t)0x20)
- *GenKey mode: Calculate MAC of public key + session key.*
- #define [GENKEY\\_PRIVATE\\_TO\\_TEMPKEY](#) ((uint16\_t)0xFFFF)
- *GenKey Create private key and store to tempkey (608 only)*
- #define [GENKEY\\_RSP\\_SIZE\\_SHORT ATCA\\_RSP\\_SIZE\\_MIN](#)
- *GenKey response packet size in Digest mode.*
- #define [GENKEY\\_RSP\\_SIZE\\_LONG ATCA\\_RSP\\_SIZE\\_64](#)
- *GenKey response packet size when returning a public key.*

### Definitions for the HMAC Command

- #define [HMAC\\_MODE\\_IDX ATCA\\_PARAM1\\_IDX](#)
- *HMAC command index for mode.*
- #define [HMAC\\_KEYID\\_IDX ATCA\\_PARAM2\\_IDX](#)
- *HMAC command index for key id.*

- #define [HMAC\\_COUNT ATCA\\_CMD\\_SIZE\\_MIN](#)  
*HMAC command packet size.*
- #define [HMAC\\_MODE\\_FLAG\\_TK\\_RAND](#) ((uint8\_t)0x00)  
*HMAC mode bit 2: The value of this bit must match the value in TempKey.SourceFlag or the command will return an error.*
- #define [HMAC\\_MODE\\_FLAG\\_TK\\_NORAND](#) ((uint8\_t)0x04)  
*HMAC mode bit 2: The value of this bit must match the value in TempKey.SourceFlag or the command will return an error.*
- #define [HMAC\\_MODE\\_FLAG\\_OTP88](#) ((uint8\_t)0x10)  
*HMAC mode bit 4: Include the first 88 OTP bits (OTP[0] through OTP[10]) in the message.; otherwise, the corresponding message bits are set to zero. Not applicable for ATECC508A.*
- #define [HMAC\\_MODE\\_FLAG\\_OTP64](#) ((uint8\_t)0x20)  
*HMAC mode bit 5: Include the first 64 OTP bits (OTP[0] through OTP[7]) in the message.; otherwise, the corresponding message bits are set to zero. If Mode[4] is set, the value of this mode bit is ignored. Not applicable for ATECC508A.*
- #define [HMAC\\_MODE\\_FLAG\\_FULLSN](#) ((uint8\_t)0x40)  
*HMAC mode bit 6: If set, include the 48 bits SN[2:3] and SN[4:7] in the message.; otherwise, the corresponding message bits are set to zero.*
- #define [HMAC\\_MODE\\_MASK](#) ((uint8\_t)0x74)  
*HMAC mode bits 0, 1, 3, and 7 are 0.*
- #define [HMAC\\_DIGEST\\_SIZE](#) (32)  
*HMAC size of digest response.*
- #define [HMAC\\_RSP\\_SIZE ATCA\\_RSP\\_SIZE\\_32](#)  
*HMAC command response packet size.*

#### Definitions for the Info Command

- #define [INFO\\_PARAM1\\_IDX ATCA\\_PARAM1\\_IDX](#)  
*Info command index for 1. parameter.*
- #define [INFO\\_PARAM2\\_IDX ATCA\\_PARAM2\\_IDX](#)  
*Info command index for 2. parameter.*
- #define [INFO\\_COUNT ATCA\\_CMD\\_SIZE\\_MIN](#)  
*Info command packet size.*
- #define [INFO\\_MODE\\_REVISION](#) ((uint8\_t)0x00)  
*Info mode Revision.*
- #define [INFO\\_MODE\\_KEY\\_VALID](#) ((uint8\_t)0x01)  
*Info mode KeyValid.*
- #define [INFO\\_MODE\\_STATE](#) ((uint8\_t)0x02)  
*Info mode State.*
- #define [INFO\\_MODE\\_LOCK\\_STATUS](#) ((uint8\_t)0x02)  
*Info mode Lock status for ECC204 device.*
- #define [INFO\\_MODE\\_GPIO](#) ((uint8\_t)0x03)  
*Info mode GPIO.*
- #define [INFO\\_MODE\\_VOL\\_KEY\\_PERMIT](#) ((uint8\_t)0x04)  
*Info mode GPIO.*
- #define [INFO\\_MODE\\_MAX](#) ((uint8\_t)0x03)  
*Info mode maximum value.*
- #define [INFO\\_NO\\_STATE](#) ((uint8\_t)0x00)  
*Info mode is not the state mode.*
- #define [INFO\\_OUTPUT\\_STATE\\_MASK](#) ((uint8\_t)0x01)  
*Info output state mask.*
- #define [INFO\\_DRIVER\\_STATE\\_MASK](#) ((uint8\_t)0x02)  
*Info driver state mask.*
- #define [INFO\\_PARAM2\\_SET\\_LATCH\\_STATE](#) ((uint16\_t)0x0002)  
*Info param2 to set the persistent latch state.*
- #define [INFO\\_PARAM2\\_LATCH\\_SET](#) ((uint16\_t)0x0001)  
*Info param2 to set the persistent latch.*
- #define [INFO\\_PARAM2\\_LATCH\\_CLEAR](#) ((uint16\_t)0x0000)  
*Info param2 to clear the persistent latch.*

- #define `INFO_SIZE` ((uint8\_t)0x04)  
*Info return size.*
- #define `INFO_RSP_SIZE` `ATCA_RSP_SIZE_VAL`  
*Info command response packet size.*

### Definitions for the KDF Command

- #define `KDF_MODE_IDX` `ATCA_PARAM1_IDX`  
*KDF command index for mode.*
- #define `KDF_KEYID_IDX` `ATCA_PARAM2_IDX`  
*KDF command index for key id.*
- #define `KDF_DETAILS_IDX` `ATCA_DATA_IDX`  
*KDF command index for details.*
- #define `KDF_DETAILS_SIZE` 4  
*KDF details (param3) size.*
- #define `KDF_MESSAGE_IDX` (`ATCA_DATA_IDX` + `KDF_DETAILS_SIZE`)
- #define `KDF_MODE_SOURCE_MASK` ((uint8\_t)0x03)  
*KDF mode source key mask.*
- #define `KDF_MODE_SOURCE_TEMPKEY` ((uint8\_t)0x00)  
*KDF mode source key in TempKey.*
- #define `KDF_MODE_SOURCE_TEMPKEY_UP` ((uint8\_t)0x01)  
*KDF mode source key in upper TempKey.*
- #define `KDF_MODE_SOURCE_SLOT` ((uint8\_t)0x02)  
*KDF mode source key in a slot.*
- #define `KDF_MODE_SOURCE_ALTKEYBUF` ((uint8\_t)0x03)  
*KDF mode source key in alternate key buffer.*
- #define `KDF_MODE_TARGET_MASK` ((uint8\_t)0x1C)  
*KDF mode target key mask.*
- #define `KDF_MODE_TARGET_TEMPKEY` ((uint8\_t)0x00)  
*KDF mode target key in TempKey.*
- #define `KDF_MODE_TARGET_TEMPKEY_UP` ((uint8\_t)0x04)  
*KDF mode target key in upper TempKey.*
- #define `KDF_MODE_TARGET_SLOT` ((uint8\_t)0x08)  
*KDF mode target key in slot.*
- #define `KDF_MODE_TARGET_ALTKEYBUF` ((uint8\_t)0x0C)  
*KDF mode target key in alternate key buffer.*
- #define `KDF_MODE_TARGET_OUTPUT` ((uint8\_t)0x10)  
*KDF mode target key in output buffer.*
- #define `KDF_MODE_TARGET_OUTPUT_ENC` ((uint8\_t)0x14)  
*KDF mode target key encrypted in output buffer.*
- #define `KDF_MODE_ALG_MASK` ((uint8\_t)0x60)  
*KDF mode algorithm mask.*
- #define `KDF_MODE_ALG_PRF` ((uint8\_t)0x00)  
*KDF mode PRF algorithm.*
- #define `KDF_MODE_ALG_AES` ((uint8\_t)0x20)  
*KDF mode AES algorithm.*
- #define `KDF_MODE_ALG_HKDF` ((uint8\_t)0x40)  
*KDF mode HKDF algorithm.*
- #define `KDF_DETAILS_PRF_KEY_LEN_MASK` ((uint32\_t)0x00000003)  
*KDF details for PRF, source key length mask.*
- #define `KDF_DETAILS_PRF_KEY_LEN_16` ((uint32\_t)0x00000000)  
*KDF details for PRF, source key length is 16 bytes.*
- #define `KDF_DETAILS_PRF_KEY_LEN_32` ((uint32\_t)0x00000001)  
*KDF details for PRF, source key length is 32 bytes.*
- #define `KDF_DETAILS_PRF_KEY_LEN_48` ((uint32\_t)0x00000002)  
*KDF details for PRF, source key length is 48 bytes.*
- #define `KDF_DETAILS_PRF_KEY_LEN_64` ((uint32\_t)0x00000003)  
*KDF details for PRF, source key length is 64 bytes.*

- #define `KDF_DETAILS_PRF_TARGET_LEN_MASK` ((uint32\_t)0x00000100)  
*KDF details for PRF, target length mask.*
- #define `KDF_DETAILS_PRF_TARGET_LEN_32` ((uint32\_t)0x00000000)  
*KDF details for PRF, target length is 32 bytes.*
- #define `KDF_DETAILS_PRF_TARGET_LEN_64` ((uint32\_t)0x00000100)  
*KDF details for PRF, target length is 64 bytes.*
- #define `KDF_DETAILS_PRF_AEAD_MASK` ((uint32\_t)0x00000600)  
*KDF details for PRF, AEAD processing mask.*
- #define `KDF_DETAILS_PRF_AEAD_MODE0` ((uint32\_t)0x00000000)  
*KDF details for PRF, AEAD no processing.*
- #define `KDF_DETAILS_PRF_AEAD_MODE1` ((uint32\_t)0x00000200)  
*KDF details for PRF, AEAD First 32 go to target, second 32 go to output buffer.*
- #define `KDF_DETAILS_AES_KEY_LOC_MASK` ((uint32\_t)0x00000003)  
*KDF details for AES, key location mask.*
- #define `KDF_DETAILS_HKDF_MSG_LOC_MASK` ((uint32\_t)0x00000003)  
*KDF details for HKDF, message location mask.*
- #define `KDF_DETAILS_HKDF_MSG_LOC_SLOT` ((uint32\_t)0x00000000)  
*KDF details for HKDF, message location in slot.*
- #define `KDF_DETAILS_HKDF_MSG_LOC_TEMPKEY` ((uint32\_t)0x00000001)  
*KDF details for HKDF, message location in TempKey.*
- #define `KDF_DETAILS_HKDF_MSG_LOC_INPUT` ((uint32\_t)0x00000002)  
*KDF details for HKDF, message location in input parameter.*
- #define `KDF_DETAILS_HKDF_MSG_LOC_IV` ((uint32\_t)0x00000003)  
*KDF details for HKDF, message location is a special IV function.*
- #define `KDF_DETAILS_HKDF_ZERO_KEY` ((uint32\_t)0x00000004)  
*KDF details for HKDF, key is 32 bytes of zero.*

#### Definitions for the Lock Command

- #define `LOCK_ZONE_IDX ATCA_PARAM1_IDX`  
*Lock command index for zone.*
- #define `LOCK_SUMMARY_IDX ATCA_PARAM2_IDX`  
*Lock command index for summary.*
- #define `LOCK_COUNT ATCA_CMD_SIZE_MIN`  
*Lock command packet size.*
- #define `LOCK_ZONE_CONFIG` ((uint8\_t)0x00)  
*Lock zone is Config.*
- #define `LOCK_ZONE_DATA` ((uint8\_t)0x01)  
*Lock zone is OTP or Data.*
- #define `LOCK_ZONE_DATA_SLOT` ((uint8\_t)0x02)  
*Lock slot of Data.*
- #define `LOCK_ECC204_ZONE_DATA` ((uint8\_t)0x00)  
*Lock ECC204 Data zone by slot.*
- #define `LOCK_ECC204_ZONE_CONFIG` ((uint8\_t)0x01)  
*Lock ECC204 configuration zone by slot.*
- #define `LOCK_ZONE_NO_CRC` ((uint8\_t)0x80)  
*Lock command: Ignore summary.*
- #define `LOCK_ZONE_MASK` (0xBF)  
*Lock parameter 1 bits 6 are 0.*
- #define `ATCA_UNLOCKED` (0x55)  
*Value indicating an unlocked zone.*
- #define `ATCA_LOCKED` (0x00)  
*Value indicating a locked zone.*
- #define `LOCK_RSP_SIZE ATCA_RSP_SIZE_MIN`  
*Lock command response packet size.*

#### Definitions for the MAC Command

- #define `MAC_MODE_IDX ATCA_PARAM1_IDX`  
*MAC command index for mode.*
- #define `MAC_KEYID_IDX ATCA_PARAM2_IDX`  
*MAC command index for key id.*
- #define `MAC_CHALLENGE_IDX ATCA_DATA_IDX`  
*MAC command index for optional challenge.*
- #define `MAC_COUNT_SHORT ATCA_CMD_SIZE_MIN`  
*MAC command packet size without challenge.*
- #define `MAC_COUNT_LONG` (39)  
*MAC command packet size with challenge.*
- #define `MAC_MODE_CHALLENGE` ((uint8\_t)0x00)  
*MAC mode 0: first SHA block from data slot.*
- #define `MAC_MODE_BLOCK2_TEMPKEY` ((uint8\_t)0x01)  
*MAC mode bit 0: second SHA block from TempKey.*
- #define `MAC_MODE_BLOCK1_TEMPKEY` ((uint8\_t)0x02)  
*MAC mode bit 1: first SHA block from TempKey.*
- #define `MAC_MODE_SOURCE_FLAG_MATCH` ((uint8\_t)0x04)  
*MAC mode bit 2: match TempKey.SourceFlag.*
- #define `MAC_MODE_PTNONCE_TEMPKEY` ((uint8\_t)0x06)  
*MAC mode bit 0: second SHA block from TempKey.*
- #define `MAC_MODE_PASSTHROUGH` ((uint8\_t)0x07)  
*MAC mode bit 0-2: pass-through mode.*
- #define `MAC_MODE_INCLUDE_OTP_88` ((uint8\_t)0x10)  
*MAC mode bit 4: include first 88 OTP bits.*
- #define `MAC_MODE_INCLUDE_OTP_64` ((uint8\_t)0x20)  
*MAC mode bit 5: include first 64 OTP bits.*
- #define `MAC_MODE_INCLUDE_SN` ((uint8\_t)0x40)  
*MAC mode bit 6: include serial number.*
- #define `MAC_CHALLENGE_SIZE` (32)  
*MAC size of challenge.*
- #define `MAC_SIZE` (32)  
*MAC size of response.*
- #define `MAC_MODE_MASK` ((uint8\_t)0x77)  
*MAC mode bits 3 and 7 are 0.*
- #define `MAC_RSP_SIZE ATCA_RSP_SIZE_32`  
*MAC command response packet size.*

### Definitions for the Nonce Command

- #define `NONCE_MODE_IDX ATCA_PARAM1_IDX`  
*Nonce command index for mode.*
- #define `NONCE_PARAM2_IDX ATCA_PARAM2_IDX`  
*Nonce command index for 2. parameter.*
- #define `NONCE_INPUT_IDX ATCA_DATA_IDX`  
*Nonce command index for input data.*
- #define `NONCE_COUNT_SHORT` (`ATCA_CMD_SIZE_MIN` + 20)  
*Nonce command packet size for 20 bytes of NumIn.*
- #define `NONCE_COUNT_LONG` (`ATCA_CMD_SIZE_MIN` + 32)  
*Nonce command packet size for 32 bytes of NumIn.*
- #define `NONCE_COUNT_LONG_64` (`ATCA_CMD_SIZE_MIN` + 64)  
*Nonce command packet size for 64 bytes of NumIn.*
- #define `NONCE_MODE_MASK` ((uint8\_t)0x03)  
*Nonce mode bits 2 to 7 are 0.*
- #define `NONCE_MODE_SEED_UPDATE` ((uint8\_t)0x00)  
*Nonce mode: update seed.*
- #define `NONCE_MODE_NO_SEED_UPDATE` ((uint8\_t)0x01)  
*Nonce mode: do not update seed.*
- #define `NONCE_MODE_INVALID` ((uint8\_t)0x02)



- Nonce mode 2 is invalid.*
- #define `NONCE_MODE_PASSTHROUGH` ((uint8\_t)0x03)  
*Nonce mode: pass-through.*
- #define `NONCE_MODE_GEN_SESSION_KEY` ((uint8\_t)0x02)  
*Nonce mode: Generate session key in ECC204 device.*
- #define `NONCE_MODE_INPUT_LEN_MASK` ((uint8\_t)0x20)  
*Nonce mode: input size mask.*
- #define `NONCE_MODE_INPUT_LEN_32` ((uint8\_t)0x00)  
*Nonce mode: input size is 32 bytes.*
- #define `NONCE_MODE_INPUT_LEN_64` ((uint8\_t)0x20)  
*Nonce mode: input size is 64 bytes.*
- #define `NONCE_MODE_TARGET_MASK` ((uint8\_t)0xC0)  
*Nonce mode: target mask.*
- #define `NONCE_MODE_TARGET_TEMPKEY` ((uint8\_t)0x00)  
*Nonce mode: target is TempKey.*
- #define `NONCE_MODE_TARGET_MSGDIGBUF` ((uint8\_t)0x40)  
*Nonce mode: target is Message Digest Buffer.*
- #define `NONCE_MODE_TARGET_ALTKEYBUF` ((uint8\_t)0x80)  
*Nonce mode: target is Alternate Key Buffer.*
- #define `NONCE_ZERO_CALC_MASK` ((uint16\_t)0x8000)  
*Nonce zero (param2): calculation mode mask.*
- #define `NONCE_ZERO_CALC_RANDOM` ((uint16\_t)0x0000)  
*Nonce zero (param2): calculation mode random, use RNG in calculation and return RNG output.*
- #define `NONCE_ZERO_CALC_TEMPKEY` ((uint16\_t)0x8000)  
*Nonce zero (param2): calculation mode TempKey, use TempKey in calculation and return new TempKey value.*
- #define `NONCE_NUMIN_SIZE` (20)  
*Nonce NumIn size for random modes.*
- #define `NONCE_NUMIN_SIZE_PASSTHROUGH` (32)  
*Nonce NumIn size for 32-byte pass-through mode.*
- #define `NONCE_RSP_SIZE_SHORT ATCA_RSP_SIZE_MIN`  
*Nonce command response packet size with no output.*
- #define `NONCE_RSP_SIZE_LONG ATCA_RSP_SIZE_32`  
*Nonce command response packet size with output.*

#### Definitions for the Pause Command

- #define `PAUSE_SELECT_IDX ATCA_PARAM1_IDX`  
*Pause command index for Selector.*
- #define `PAUSE_PARAM2_IDX ATCA_PARAM2_IDX`  
*Pause command index for 2. parameter.*
- #define `PAUSE_COUNT ATCA_CMD_SIZE_MIN`  
*Pause command packet size.*
- #define `PAUSE_RSP_SIZE ATCA_RSP_SIZE_MIN`  
*Pause command response packet size.*

#### Definitions for the PrivWrite Command

- #define `PRIVWRITE_ZONE_IDX ATCA_PARAM1_IDX`  
*PrivWrite command index for zone.*
- #define `PRIVWRITE_KEYID_IDX ATCA_PARAM2_IDX`  
*PrivWrite command index for KeyID.*
- #define `PRIVWRITE_VALUE_IDX` ( 5)  
*PrivWrite command index for value.*
- #define `PRIVWRITE_MAC_IDX` (41)  
*PrivWrite command index for MAC.*
- #define `PRIVWRITE_COUNT` (75)  
*PrivWrite command packet size.*
- #define `PRIVWRITE_ZONE_MASK` ((uint8\_t)0x40)



- *PrivWrite zone bits 0 to 5 and 7 are 0.*
- #define PRIVWRITE\_MODE\_ENCRYPT ((uint8\_t)0x40)  
*PrivWrite mode: encrypted.*
- #define PRIVWRITE\_RSP\_SIZE ATCA\_RSP\_SIZE\_MIN  
*PrivWrite command response packet size.*

### Definitions for the Random Command

- #define RANDOM\_MODE\_IDX ATCA\_PARAM1\_IDX  
*Random command index for mode.*
- #define RANDOM\_PARAM2\_IDX ATCA\_PARAM2\_IDX  
*Random command index for 2. parameter.*
- #define RANDOM\_COUNT ATCA\_CMD\_SIZE\_MIN  
*Random command packet size.*
- #define RANDOM\_SEED\_UPDATE ((uint8\_t)0x00)  
*Random mode for automatic seed update.*
- #define RANDOM\_NO\_SEED\_UPDATE ((uint8\_t)0x01)  
*Random mode for no seed update.*
- #define RANDOM\_NUM\_SIZE ((uint8\_t)32)  
*Number of bytes in the data packet of a random command.*
- #define RANDOM\_RSP\_SIZE ATCA\_RSP\_SIZE\_32  
*Random command response packet size.*

### Definitions for the Read Command

- #define READ\_ZONE\_IDX ATCA\_PARAM1\_IDX  
*Read command index for zone.*
- #define READ\_ADDR\_IDX ATCA\_PARAM2\_IDX  
*Read command index for address.*
- #define READ\_COUNT ATCA\_CMD\_SIZE\_MIN  
*Read command packet size.*
- #define READ\_ZONE\_MASK ((uint8\_t)0x83)  
*Read zone bits 2 to 6 are 0.*
- #define READ\_4\_RSP\_SIZE ATCA\_RSP\_SIZE\_VAL  
*Read command response packet size when reading 4 bytes.*
- #define READ\_32\_RSP\_SIZE ATCA\_RSP\_SIZE\_32  
*Read command response packet size when reading 32 bytes.*

### Definitions for the SecureBoot Command

- #define SECUREBOOT\_MODE\_IDX ATCA\_PARAM1\_IDX  
*SecureBoot command index for mode.*
- #define SECUREBOOT\_DIGEST\_SIZE (32)  
*SecureBoot digest input size.*
- #define SECUREBOOT\_SIGNATURE\_SIZE (64)  
*SecureBoot signature input size.*
- #define SECUREBOOT\_COUNT\_DIG (ATCA\_CMD\_SIZE\_MIN + SECUREBOOT\_DIGEST\_SIZE)  
*SecureBoot command packet size for just a digest.*
- #define SECUREBOOT\_COUNT\_DIG\_SIG (ATCA\_CMD\_SIZE\_MIN + SECUREBOOT\_DIGEST\_SIZE + SECUREBOOT\_SIGNATURE\_SIZE)  
*SecureBoot command packet size for a digest and signature.*
- #define SECUREBOOT\_MAC\_SIZE (32)  
*SecureBoot MAC output size.*
- #define SECUREBOOT\_RSP\_SIZE\_NO\_MAC ATCA\_RSP\_SIZE\_MIN  
*SecureBoot response packet size for no MAC.*
- #define SECUREBOOT\_RSP\_SIZE\_MAC (ATCA\_PACKET\_OVERHEAD + SECUREBOOT\_MAC\_SIZE)  
*SecureBoot response packet size with MAC.*

- #define `SECUREBOOT_MODE_MASK` ((uint8\_t)0x07)  
*SecureBoot mode mask.*
- #define `SECUREBOOT_MODE_FULL` ((uint8\_t)0x05)  
*SecureBoot mode Full.*
- #define `SECUREBOOT_MODE_FULL_STORE` ((uint8\_t)0x06)  
*SecureBoot mode FullStore.*
- #define `SECUREBOOT_MODE_FULL_COPY` ((uint8\_t)0x07)  
*SecureBoot mode FullCopy.*
- #define `SECUREBOOT_MODE_PROHIBIT_FLAG` ((uint8\_t)0x40)  
*SecureBoot mode flag to prohibit SecureBoot until next power cycle.*
- #define `SECUREBOOT_MODE_ENC_MAC_FLAG` ((uint8\_t)0x80)  
*SecureBoot mode flag for encrypted digest and returning validating MAC.*
- #define `SECUREBOOTCONFIG_OFFSET` (70)  
*SecureBootConfig byte offset into the configuration zone.*
- #define `SECUREBOOTCONFIG_MODE_MASK` ((uint16\_t)0x0003)  
*Mask for SecureBootMode field in SecureBootConfig value.*
- #define `SECUREBOOTCONFIG_MODE_DISABLED` ((uint16\_t)0x0000)  
*Disabled SecureBootMode in SecureBootConfig value.*
- #define `SECUREBOOTCONFIG_MODE_FULL_BOTH` ((uint16\_t)0x0001)  
*Both digest and signature always required SecureBootMode in SecureBootConfig value.*
- #define `SECUREBOOTCONFIG_MODE_FULL_SIG` ((uint16\_t)0x0002)  
*Signature stored SecureBootMode in SecureBootConfig value.*
- #define `SECUREBOOTCONFIG_MODE_FULL_DIG` ((uint16\_t)0x0003)  
*Digest stored SecureBootMode in SecureBootConfig value.*

#### Definitions for the SelfTest Command

- #define `SELFTEST_MODE_IDX ATCA_PARAM1_IDX`  
*SelfTest command index for mode.*
- #define `SELFTEST_COUNT ATCA_CMD_SIZE_MIN`  
*SelfTest command packet size.*
- #define `SELFTEST_MODE_RNG` ((uint8\_t)0x01)  
*SelfTest mode RNG DRBG function.*
- #define `SELFTEST_MODE_ECDSA_SIGN_VERIFY` ((uint8\_t)0x02)  
*SelfTest mode ECDSA verify function.*
- #define `SELFTEST_MODE_ECDH` ((uint8\_t)0x08)  
*SelfTest mode ECDH function.*
- #define `SELFTEST_MODE_AES` ((uint8\_t)0x10)  
*SelfTest mode AES encrypt function.*
- #define `SELFTEST_MODE_SHA` ((uint8\_t)0x20)  
*SelfTest mode SHA function.*
- #define `SELFTEST_MODE_ALL` ((uint8\_t)0x3B)  
*SelfTest mode all algorithms.*
- #define `SELFTEST_RSP_SIZE ATCA_RSP_SIZE_MIN`  
*SelfTest command response packet size.*

#### Definitions for the SHA Command

- #define `SHA_COUNT_SHORT ATCA_CMD_SIZE_MIN`
- #define `SHA_COUNT_LONG ATCA_CMD_SIZE_MIN`  
*Just a starting size.*
- #define `ATCA_SHA_DIGEST_SIZE` (32)
- #define `SHA_DATA_MAX` (64)
- #define `SHA_MODE_MASK` ((uint8\_t)0x07)  
*Mask the bit 0-2.*
- #define `SHA_MODE_SHA256_START` ((uint8\_t)0x00)  
*Initialization, does not accept a message.*
- #define `SHA_MODE_SHA256_UPDATE` ((uint8\_t)0x01)

- *Add 64 bytes in the message to the SHA context.*  
• #define `SHA_MODE_SHA256_END` ((uint8\_t)0x02)
- *Complete the calculation and return the digest.*  
• #define `SHA_MODE_SHA256_PUBLIC` ((uint8\_t)0x03)
- *Add 64 byte ECC public key in the slot to the SHA context.*  
• #define `SHA_MODE_HMAC_START` ((uint8\_t)0x04)
- *Initialization, HMAC calculation.*  
• #define `SHA_MODE_ECC204_HMAC_START` ((uint8\_t)0x03)
- *Initialization, HMAC calculation for ECC204.*  
• #define `SHA_MODE_HMAC_UPDATE` ((uint8\_t)0x01)
- *Add 64 bytes in the message to the SHA context.*  
• #define `SHA_MODE_HMAC_END` ((uint8\_t)0x05)
- *Complete the HMAC computation and return digest.*  
• #define `SHA_MODE_608_HMAC_END` ((uint8\_t)0x02)
- *Complete the HMAC computation and return digest... Different command on 608.*  
• #define `SHA_MODE_ECC204_HMAC_END` ((uint8\_t)0x02)
- *Complete the HMAC computation and return digest... Different mode on ECC204.*  
• #define `SHA_MODE_READ_CONTEXT` ((uint8\_t)0x06)
- *Read current SHA-256 context out of the device.*  
• #define `SHA_MODE_WRITE_CONTEXT` ((uint8\_t)0x07)
- *Restore a SHA-256 context into the device.*  
• #define `SHA_MODE_TARGET_MASK` ((uint8\_t)0xC0)
- *Resulting digest target location mask.*  
• #define `SHA_RSP_SIZE ATCA_RSP_SIZE_32`
- *SHA command response packet size.*  
• #define `SHA_RSP_SIZE_SHORT ATCA_RSP_SIZE_MIN`
- *SHA command response packet size only status code.*  
• #define `SHA_RSP_SIZE_LONG ATCA_RSP_SIZE_32`
- *SHA command response packet size.*

### Definitions for the Sign Command

- #define `SIGN_MODE_IDX ATCA_PARAM1_IDX`  
*Sign command index for mode.*
- #define `SIGN_KEYID_IDX ATCA_PARAM2_IDX`  
*Sign command index for key id.*
- #define `SIGN_COUNT ATCA_CMD_SIZE_MIN`  
*Sign command packet size.*
- #define `SIGN_MODE_MASK` ((uint8\_t)0xE1)  
*Sign mode bits 1 to 4 are 0.*
- #define `SIGN_MODE_INTERNAL` ((uint8\_t)0x00)  
*Sign mode 0: internal.*
- #define `SIGN_MODE_INVALIDATE` ((uint8\_t)0x01)  
*Sign mode bit 1: Signature will be used for Verify(Invalid)*
- #define `SIGN_MODE_INCLUDE_SN` ((uint8\_t)0x40)  
*Sign mode bit 6: include serial number.*
- #define `SIGN_MODE_EXTERNAL` ((uint8\_t)0x80)  
*Sign mode bit 7: external.*
- #define `SIGN_MODE_SOURCE_MASK` ((uint8\_t)0x20)  
*Sign mode message source mask.*
- #define `SIGN_MODE_SOURCE_TEMPKEY` ((uint8\_t)0x00)  
*Sign mode message source is TempKey.*
- #define `SIGN_MODE_SOURCE_MSGDIGBUF` ((uint8\_t)0x20)  
*Sign mode message source is the Message Digest Buffer.*
- #define `SIGN_RSP_SIZE ATCA_RSP_SIZE_MAX`  
*Sign command response packet size.*

### Definitions for the UpdateExtra Command

- #define [UPDATE\\_MODE\\_IDX ATCA\\_PARAM1\\_IDX](#)  
*UpdateExtra command index for mode.*
- #define [UPDATE\\_VALUE\\_IDX ATCA\\_PARAM2\\_IDX](#)  
*UpdateExtra command index for new value.*
- #define [UPDATE\\_COUNT ATCA\\_CMD\\_SIZE\\_MIN](#)  
*UpdateExtra command packet size.*
- #define [UPDATE\\_MODE\\_USER\\_EXTRA](#) ((uint8\_t)0x00)  
*UpdateExtra mode update UserExtra (config byte 84)*
- #define [UPDATE\\_MODE\\_SELECTOR](#) ((uint8\_t)0x01)  
*UpdateExtra mode update Selector (config byte 85)*
- #define [UPDATE\\_MODE\\_USER\\_EXTRA\\_ADD UPDATE\\_MODE\\_SELECTOR](#)  
*UpdateExtra mode update UserExtraAdd (config byte 85)*
- #define [UPDATE\\_MODE\\_DEC\\_COUNTER](#) ((uint8\_t)0x02)  
*UpdateExtra mode: decrement counter.*
- #define [UPDATE\\_RSP\\_SIZE ATCA\\_RSP\\_SIZE\\_MIN](#)  
*UpdateExtra command response packet size.*

### Definitions for the Verify Command

- #define [VERIFY\\_MODE\\_IDX ATCA\\_PARAM1\\_IDX](#)  
*Verify command index for mode.*
- #define [VERIFY\\_KEYID\\_IDX ATCA\\_PARAM2\\_IDX](#)  
*Verify command index for key id.*
- #define [VERIFY\\_DATA\\_IDX](#) ( 5)  
*Verify command index for data.*
- #define [VERIFY\\_256\\_STORED\\_COUNT](#) ( 71)  
*Verify command packet size for 256-bit key in stored mode.*
- #define [VERIFY\\_283\\_STORED\\_COUNT](#) ( 79)  
*Verify command packet size for 283-bit key in stored mode.*
- #define [VERIFY\\_256\\_VALIDATE\\_COUNT](#) ( 90)  
*Verify command packet size for 256-bit key in validate mode.*
- #define [VERIFY\\_283\\_VALIDATE\\_COUNT](#) ( 98)  
*Verify command packet size for 283-bit key in validate mode.*
- #define [VERIFY\\_256\\_EXTERNAL\\_COUNT](#) (135)  
*Verify command packet size for 256-bit key in external mode.*
- #define [VERIFY\\_283\\_EXTERNAL\\_COUNT](#) (151)  
*Verify command packet size for 283-bit key in external mode.*
- #define [VERIFY\\_256\\_KEY\\_SIZE](#) ( 64)  
*Verify key size for 256-bit key.*
- #define [VERIFY\\_283\\_KEY\\_SIZE](#) ( 72)  
*Verify key size for 283-bit key.*
- #define [VERIFY\\_256\\_SIGNATURE\\_SIZE](#) ( 64)  
*Verify signature size for 256-bit key.*
- #define [VERIFY\\_283\\_SIGNATURE\\_SIZE](#) ( 72)  
*Verify signature size for 283-bit key.*
- #define [VERIFY\\_OTHER\\_DATA\\_SIZE](#) ( 19)  
*Verify size of "other data".*
- #define [VERIFY\\_MODE\\_MASK](#) ((uint8\_t)0x07)  
*Verify mode bits 3 to 7 are 0.*
- #define [VERIFY\\_MODE\\_STORED](#) ((uint8\_t)0x00)  
*Verify mode: stored.*
- #define [VERIFY\\_MODE\\_VALIDATE\\_EXTERNAL](#) ((uint8\_t)0x01)  
*Verify mode: validate external.*
- #define [VERIFY\\_MODE\\_EXTERNAL](#) ((uint8\_t)0x02)  
*Verify mode: external.*
- #define [VERIFY\\_MODE\\_VALIDATE](#) ((uint8\_t)0x03)  
*Verify mode: validate.*
- #define [VERIFY\\_MODE\\_INVALIDATE](#) ((uint8\_t)0x07)

- *Verify mode: invalidate.*
- #define `VERIFY_MODE_SOURCE_MASK` ((uint8\_t)0x20)  
*Verify mode message source mask.*
- #define `VERIFY_MODE_SOURCE_TEMPKEY` ((uint8\_t)0x00)  
*Verify mode message source is TempKey.*
- #define `VERIFY_MODE_SOURCE_MSGDIGBUF` ((uint8\_t)0x20)  
*Verify mode message source is the Message Digest Buffer.*
- #define `VERIFY_MODE_MAC_FLAG` ((uint8\_t)0x80)  
*Verify mode: MAC.*
- #define `VERIFY_KEY_B283` ((uint16\_t)0x0000)  
*Verify key type: B283.*
- #define `VERIFY_KEY_K283` ((uint16\_t)0x0001)  
*Verify key type: K283.*
- #define `VERIFY_KEY_P256` ((uint16\_t)0x0004)  
*Verify key type: P256.*
- #define `VERIFY_RSP_SIZE ATCA_RSP_SIZE_MIN`  
*Verify command response packet size.*
- #define `VERIFY_RSP_SIZE_MAC ATCA_RSP_SIZE_32`  
*Verify command response packet size with validating MAC.*

### Definitions for the Write Command

- #define `WRITE_ZONE_IDX ATCA_PARAM1_IDX`  
*Write command index for zone.*
- #define `WRITE_ADDR_IDX ATCA_PARAM2_IDX`  
*Write command index for address.*
- #define `WRITE_VALUE_IDX ATCA_DATA_IDX`  
*Write command index for data.*
- #define `WRITE_MAC_VS_IDX` ( 9)  
*Write command index for MAC following short data.*
- #define `WRITE_MAC_VL_IDX` (37)  
*Write command index for MAC following long data.*
- #define `WRITE_MAC_SIZE` (32)  
*Write MAC size.*
- #define `WRITE_ZONE_MASK` ((uint8\_t)0xC3)  
*Write zone bits 2 to 5 are 0.*
- #define `WRITE_ZONE_WITH_MAC` ((uint8\_t)0x40)  
*Write zone bit 6: write encrypted with MAC.*
- #define `WRITE_ZONE_OTP` ((uint8\_t)1)  
*Write zone id OTP.*
- #define `WRITE_ZONE_DATA` ((uint8\_t)2)  
*Write zone id data.*
- #define `WRITE_RSP_SIZE ATCA_RSP_SIZE_MIN`  
*Write command response packet size.*

### Functions

- `ATCA_STATUS atCheckMAC` (ATCADeviceType device\_type, ATCAPacket \*packet)
- `ATCA_STATUS atCounter` (ATCADeviceType device\_type, ATCAPacket \*packet)
- `ATCA_STATUS atDeriveKey` (ATCADeviceType device\_type, ATCAPacket \*packet, bool has\_mac)
- `ATCA_STATUS atECDH` (ATCADeviceType device\_type, ATCAPacket \*packet)
- `ATCA_STATUS atGenDig` (ATCADeviceType device\_type, ATCAPacket \*packet, bool is\_no\_mac\_key)
- `ATCA_STATUS atGenKey` (ATCADeviceType device\_type, ATCAPacket \*packet)
- `ATCA_STATUS atHMAC` (ATCADeviceType device\_type, ATCAPacket \*packet)
- `ATCA_STATUS atInfo` (ATCADeviceType device\_type, ATCAPacket \*packet)  
*ATCACommand Info method.*

- [ATCA\\_STATUS atLock](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)
- [ATCA\\_STATUS atMAC](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)
- [ATCA\\_STATUS atNonce](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)
- [ATCA\\_STATUS atPause](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)  
*ATCACommand Pause method.*
- [ATCA\\_STATUS atPrivWrite](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)
- [ATCA\\_STATUS atRandom](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)
- [ATCA\\_STATUS atRead](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)
- [ATCA\\_STATUS atSecureBoot](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)
- [ATCA\\_STATUS atSHA](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet, uint16\_t write\_context\_size)
- [ATCA\\_STATUS atSign](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)
- [ATCA\\_STATUS atUpdateExtra](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)
- [ATCA\\_STATUS atVerify](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)
- [ATCA\\_STATUS atWrite](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet, bool has\_mac)
- [ATCA\\_STATUS atAES](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)
- [ATCA\\_STATUS atSelfTest](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)
- [ATCA\\_STATUS atKDF](#) ([ATCADeviceType](#) device\_type, [ATCAPacket](#) \*packet)
- bool [atIsSHAFamily](#) ([ATCADeviceType](#) device\_type)  
*determines if a given device type is a SHA device or a superset of a SHA device*
- bool [atIsECCFamily](#) ([ATCADeviceType](#) device\_type)  
*determines if a given device type is an ECC device or a superset of a ECC device*
- [ATCA\\_STATUS isATCAError](#) (uint8\_t \*data)  
*checks for basic error frame in data*
- void [atCRC](#) (size\_t length, const uint8\_t \*data, uint8\_t \*crc\_le)  
*Calculates CRC over the given raw data and returns the CRC in little-endian byte order.*
- void [atCalcCrc](#) ([ATCAPacket](#) \*pkt)  
*This function calculates CRC and adds it to the correct offset in the packet data.*
- [ATCA\\_STATUS atCheckCrc](#) (const uint8\_t \*response)  
*This function checks the consistency of a response.*

### 10.77.1 Detailed Description

Microchip Crypto Auth device command object - this is a command builder only, it does not send the command. The result of a command method is a fully formed packet, ready to send to the ATCAIFace object to dispatch.

This command object supports the ATSHA and ATECC device family. The command list is a superset of all device commands for this family. The command object differentiates the packet contents based on specific device type within the family.

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### 10.77.2 Macro Definition Documentation

### 10.77.2.1 AES\_COUNT

```
#define AES_COUNT (23)
```

AES command packet size.

### 10.77.2.2 AES\_DATA\_SIZE

```
#define AES_DATA_SIZE (16)
```

size of AES encrypt/decrypt data

### 10.77.2.3 AES\_INPUT\_IDX

```
#define AES_INPUT_IDX ATCA_DATA_IDX
```

AES command index for input data.

### 10.77.2.4 AES\_KEYID\_IDX

```
#define AES_KEYID_IDX ATCA_PARAM2_IDX
```

AES command index for key id.

### 10.77.2.5 AES\_MODE\_DECRYPT

```
#define AES_MODE_DECRYPT ((uint8_t)0x01)
```

AES mode: Decrypt.

### 10.77.2.6 AES\_MODE\_ENCRYPT

```
#define AES_MODE_ENCRYPT ((uint8_t)0x00)
```

AES mode: Encrypt.

### 10.77.2.7 AES\_MODE\_GFM

```
#define AES_MODE_GFM ((uint8_t)0x03)
```

AES mode: GFM calculation.

### 10.77.2.8 AES\_MODE\_IDX

```
#define AES_MODE_IDX ATCA_PARAM1_IDX
```

AES command index for mode.

### 10.77.2.9 AES\_MODE\_KEY\_BLOCK\_MASK

```
#define AES_MODE_KEY_BLOCK_MASK ((uint8_t)0xC0)
```

AES mode mask for key block field.

### 10.77.2.10 AES\_MODE\_KEY\_BLOCK\_POS

```
#define AES_MODE_KEY_BLOCK_POS (6)
```

Bit shift for key block in mode.

### 10.77.2.11 AES\_MODE\_MASK

```
#define AES_MODE_MASK ((uint8_t)0xC7)
```

AES mode bits 3 to 5 are 0.

### 10.77.2.12 AES\_MODE\_OP\_MASK

```
#define AES_MODE_OP_MASK ((uint8_t)0x07)
```

AES mode operation mask.



**10.77.2.13 AES\_RSP\_SIZE**

```
#define AES_RSP_SIZE ATCA_RSP_SIZE_16
```

AES command response packet size.

**10.77.2.14 ATCA\_ADDRESS\_MASK**

```
#define ATCA_ADDRESS_MASK (0x007F)
```

Address bit 7 to 15 are always 0.

**10.77.2.15 ATCA\_ADDRESS\_MASK\_CONFIG**

```
#define ATCA_ADDRESS_MASK_CONFIG (0x001F)
```

Address bits 5 to 7 are 0 for Configuration zone.

**10.77.2.16 ATCA\_ADDRESS\_MASK\_OTP**

```
#define ATCA_ADDRESS_MASK_OTP (0x000F)
```

Address bits 4 to 7 are 0 for OTP zone.

**10.77.2.17 ATCA\_AES**

```
#define ATCA_AES ((uint8_t)0x51)
```

AES command op-code.

**10.77.2.18 ATCA\_AES\_GFM\_SIZE**

```
#define ATCA_AES_GFM_SIZE ATCA_BLOCK_SIZE
```

size of GFM data

### 10.77.2.19 ATCA\_AES\_KEY\_TYPE

```
#define ATCA_AES_KEY_TYPE 6
```

AES-128 Key.

### 10.77.2.20 ATCA\_B283\_KEY\_TYPE

```
#define ATCA_B283_KEY_TYPE 0
```

B283 NIST ECC key.

### 10.77.2.21 ATCA\_BLOCK\_SIZE

```
#define ATCA_BLOCK_SIZE (32)
```

size of a block

### 10.77.2.22 ATCA\_CHECKMAC

```
#define ATCA_CHECKMAC ((uint8_t)0x28)
```

CheckMac command op-code.

### 10.77.2.23 ATCA\_CHIPMODE\_CLOCK\_DIV\_M0

```
#define ATCA_CHIPMODE_CLOCK_DIV_M0 ((uint8_t)0x00)
```

ChipMode clock divider M0.

### 10.77.2.24 ATCA\_CHIPMODE\_CLOCK\_DIV\_M1

```
#define ATCA_CHIPMODE_CLOCK_DIV_M1 ((uint8_t)0x28)
```

ChipMode clock divider M1.

**10.77.2.25 ATCA\_CHIPMODE\_CLOCK\_DIV\_M2**

```
#define ATCA_CHIPMODE_CLOCK_DIV_M2 ((uint8_t)0x68)
```

ChipMode clock divider M2.

**10.77.2.26 ATCA\_CHIPMODE\_CLOCK\_DIV\_MASK**

```
#define ATCA_CHIPMODE_CLOCK_DIV_MASK ((uint8_t)0xF8)
```

ChipMode clock divider mask.

**10.77.2.27 ATCA\_CHIPMODE\_I2C\_ADDRESS\_FLAG**

```
#define ATCA_CHIPMODE_I2C_ADDRESS_FLAG ((uint8_t)0x01)
```

ChipMode I2C Address in UserExtraAdd flag.

**10.77.2.28 ATCA\_CHIPMODE\_OFFSET**

```
#define ATCA_CHIPMODE_OFFSET (19)
```

ChipMode byte offset within the configuration zone.

**10.77.2.29 ATCA\_CHIPMODE\_TTL\_ENABLE\_FLAG**

```
#define ATCA_CHIPMODE_TTL_ENABLE_FLAG ((uint8_t)0x02)
```

ChipMode TTLenable flag.

**10.77.2.30 ATCA\_CHIPMODE\_WATCHDOG\_LONG**

```
#define ATCA_CHIPMODE_WATCHDOG_LONG ((uint8_t)0x04)
```

ChipMode long watchdog (~13s)

### 10.77.2.31 ATCA\_CHIPMODE\_WATCHDOG\_MASK

```
#define ATCA_CHIPMODE_WATCHDOG_MASK ((uint8_t)0x04)
```

ChipMode watchdog duration mask.

### 10.77.2.32 ATCA\_CHIPMODE\_WATCHDOG\_SHORT

```
#define ATCA_CHIPMODE_WATCHDOG_SHORT ((uint8_t)0x00)
```

ChipMode short watchdog (~1.3s)

### 10.77.2.33 ATCA\_CMD\_SIZE\_MAX

```
#define ATCA_CMD_SIZE_MAX ((uint8_t)4 * 36 + 7)
```

maximum size of command packet (Verify)

### 10.77.2.34 ATCA\_CMD\_SIZE\_MIN

```
#define ATCA_CMD_SIZE_MIN ((uint8_t)7)
```

minimum number of bytes in command (from count byte to second CRC byte)

### 10.77.2.35 ATCA\_COUNT\_IDX

```
#define ATCA_COUNT_IDX (0)
```

command packet index for count

### 10.77.2.36 ATCA\_COUNT\_SIZE

```
#define ATCA_COUNT_SIZE ((uint8_t)1)
```

Number of bytes in the command packet Count.

**10.77.2.37 ATCA\_COUNTER**

```
#define ATCA_COUNTER ((uint8_t)0x24)
```

Counter command op-code.

**10.77.2.38 ATCA\_CRC\_SIZE**

```
#define ATCA_CRC_SIZE ((uint8_t)2)
```

Number of bytes in the command packet CRC.

**10.77.2.39 ATCA\_DATA\_IDX**

```
#define ATCA_DATA_IDX (5)
```

command packet index for data load

**10.77.2.40 ATCA\_DATA\_SIZE**

```
#define ATCA_DATA_SIZE (ATCA_KEY_COUNT * ATCA_KEY_SIZE)
```

size of data zone

**10.77.2.41 ATCA\_DELETE**

```
#define ATCA_DELETE ((uint8_t)0x13)
```

Delete command op-code.

**10.77.2.42 ATCA\_DERIVE\_KEY**

```
#define ATCA_DERIVE_KEY ((uint8_t)0x1C)
```

DeriveKey command op-code.

### 10.77.2.43 ATCA\_ECC204\_CONFIG\_SIZE

```
#define ATCA_ECC204_CONFIG_SIZE (64)
```

size of ECC204 configuration zone

### 10.77.2.44 ATCA\_ECC204\_CONFIG\_SLOT\_SIZE

```
#define ATCA_ECC204_CONFIG_SLOT_SIZE (16)
```

size of ECC204 configuration slot size

### 10.77.2.45 ATCA\_ECC\_CONFIG\_SIZE

```
#define ATCA_ECC_CONFIG_SIZE (128)
```

size of configuration zone

### 10.77.2.46 ATCA\_ECDH

```
#define ATCA_ECDH ((uint8_t)0x43)
```

ECDH command op-code.

### 10.77.2.47 ATCA\_GENDIG

```
#define ATCA_GENDIG ((uint8_t)0x15)
```

GenDig command op-code.

### 10.77.2.48 ATCA\_GENKEY

```
#define ATCA_GENKEY ((uint8_t)0x40)
```

GenKey command op-code.

**10.77.2.49 ATCA\_HMAC**

```
#define ATCA_HMAC ((uint8_t)0x11)
```

HMAC command op-code.

**10.77.2.50 ATCA\_INFO**

```
#define ATCA_INFO ((uint8_t)0x30)
```

Info command op-code.

**10.77.2.51 ATCA\_K283\_KEY\_TYPE**

```
#define ATCA_K283_KEY_TYPE 1
```

K283 NIST ECC key.

**10.77.2.52 ATCA\_KDF**

```
#define ATCA_KDF ((uint8_t)0x56)
```

KDF command op-code.

**10.77.2.53 ATCA\_KEY\_COUNT**

```
#define ATCA_KEY_COUNT (16)
```

number of keys

**10.77.2.54 ATCA\_KEY\_ID\_MAX**

```
#define ATCA_KEY_ID_MAX ((uint8_t)15)
```

maximum value for key id

### 10.77.2.55 ATCA\_KEY\_SIZE

```
#define ATCA_KEY_SIZE (32)
```

size of a symmetric SHA key

### 10.77.2.56 ATCA\_LOCK

```
#define ATCA_LOCK ((uint8_t)0x17)
```

Lock command op-code.

### 10.77.2.57 ATCA\_LOCKED

```
#define ATCA_LOCKED (0x00)
```

Value indicating a locked zone.

### 10.77.2.58 ATCA\_MAC

```
#define ATCA_MAC ((uint8_t)0x08)
```

MAC command op-code.

### 10.77.2.59 ATCA\_NONCE

```
#define ATCA_NONCE ((uint8_t)0x16)
```

Nonce command op-code.

### 10.77.2.60 ATCA\_OPCODE\_IDX

```
#define ATCA_OPCODE_IDX (1)
```

command packet index for op-code



**10.77.2.61 ATCA\_OTP\_BLOCK\_MAX**

```
#define ATCA_OTP_BLOCK_MAX ((uint8_t)1)
```

maximum value for OTP block

**10.77.2.62 ATCA\_OTP\_SIZE**

```
#define ATCA_OTP_SIZE (64)
```

size of OTP zone

**10.77.2.63 ATCA\_P256\_KEY\_TYPE**

```
#define ATCA_P256_KEY_TYPE 4
```

P256 NIST ECC key.

**10.77.2.64 ATCA\_PACKET\_OVERHEAD**

```
#define ATCA_PACKET_OVERHEAD (ATCA_COUNT_SIZE + ATCA_CRC_SIZE)
```

Number of bytes in the command packet.

**10.77.2.65 ATCA\_PARAM1\_IDX**

```
#define ATCA_PARAM1_IDX (2)
```

command packet index for first parameter

**10.77.2.66 ATCA\_PARAM2\_IDX**

```
#define ATCA_PARAM2_IDX (3)
```

command packet index for second parameter

### 10.77.2.67 ATCA\_PAUSE

```
#define ATCA_PAUSE ((uint8_t)0x01)
```

Pause command op-code.

### 10.77.2.68 ATCA\_PRIV\_KEY\_SIZE

```
#define ATCA_PRIV_KEY_SIZE (32)
```

size of a p256 private key

### 10.77.2.69 ATCA\_PRIVWRITE

```
#define ATCA_PRIVWRITE ((uint8_t)0x46)
```

PrivWrite command op-code.

### 10.77.2.70 ATCA\_PUB\_KEY\_PAD

```
#define ATCA_PUB_KEY_PAD (4)
```

size of the public key pad

### 10.77.2.71 ATCA\_PUB\_KEY\_SIZE

```
#define ATCA_PUB_KEY_SIZE (64)
```

size of a p256 public key

### 10.77.2.72 ATCA\_RANDOM

```
#define ATCA_RANDOM ((uint8_t)0x1B)
```

Random command op-code.

**10.77.2.73 ATCA\_READ**

```
#define ATCA_READ ((uint8_t)0x02)
```

Read command op-code.

**10.77.2.74 ATCA\_RSP\_DATA\_IDX**

```
#define ATCA_RSP_DATA_IDX (1)
```

buffer index of data in response

**10.77.2.75 ATCA\_RSP\_SIZE\_16**

```
#define ATCA_RSP_SIZE_16 ((uint8_t)19)
```

size of response packet containing 16 bytes data

**10.77.2.76 ATCA\_RSP\_SIZE\_32**

```
#define ATCA_RSP_SIZE_32 ((uint8_t)35)
```

size of response packet containing 32 bytes data

**10.77.2.77 ATCA\_RSP\_SIZE\_4**

```
#define ATCA_RSP_SIZE_4 ((uint8_t)7)
```

size of response packet containing 4 bytes data

**10.77.2.78 ATCA\_RSP\_SIZE\_64**

```
#define ATCA_RSP_SIZE_64 ((uint8_t)67)
```

size of response packet containing 64 bytes data

### 10.77.2.79 ATCA\_RSP\_SIZE\_72

```
#define ATCA_RSP_SIZE_72 ((uint8_t)75)
```

size of response packet containing 64 bytes data

### 10.77.2.80 ATCA\_RSP\_SIZE\_MAX

```
#define ATCA_RSP_SIZE_MAX ((uint8_t)75)
```

maximum size of response packet (GenKey and Verify command)

### 10.77.2.81 ATCA\_RSP\_SIZE\_MIN

```
#define ATCA_RSP_SIZE_MIN ((uint8_t)4)
```

minimum number of bytes in response

### 10.77.2.82 ATCA\_RSP\_SIZE\_VAL

```
#define ATCA_RSP_SIZE_VAL ((uint8_t)7)
```

size of response packet containing four bytes of data

### 10.77.2.83 ATCA\_SECUREBOOT

```
#define ATCA_SECUREBOOT ((uint8_t)0x80)
```

Secure Boot command op-code.

### 10.77.2.84 ATCA\_SELFTEST

```
#define ATCA_SELFTEST ((uint8_t)0x77)
```

Self test command op-code.

**10.77.2.85 ATCA\_SERIAL\_NUM\_SIZE**

```
#define ATCA_SERIAL_NUM_SIZE (9)
```

number of bytes in the device serial number

**10.77.2.86 ATCA\_SHA**

```
#define ATCA_SHA ((uint8_t)0x47)
```

SHA command op-code.

**10.77.2.87 ATCA\_SHA\_CONFIG\_SIZE**

```
#define ATCA_SHA_CONFIG_SIZE (88)
```

size of configuration zone

**10.77.2.88 ATCA\_SHA\_DIGEST\_SIZE**

```
#define ATCA_SHA_DIGEST_SIZE (32)
```

**10.77.2.89 ATCA\_SHA\_KEY\_TYPE**

```
#define ATCA_SHA_KEY_TYPE 7
```

SHA key or other data.

**10.77.2.90 ATCA\_SIG\_SIZE**

```
#define ATCA_SIG_SIZE (64)
```

size of a p256 signature

### 10.77.2.91 ATCA\_SIGN

```
#define ATCA_SIGN ((uint8_t)0x41)
```

Sign command op-code.

### 10.77.2.92 ATCA\_TEMPKEY\_KEYID

```
#define ATCA_TEMPKEY_KEYID (0xFFFF)
```

KeyID when referencing TempKey.

### 10.77.2.93 ATCA\_UNLOCKED

```
#define ATCA_UNLOCKED (0x55)
```

Value indicating an unlocked zone.

### 10.77.2.94 ATCA\_UPDATE\_EXTRA

```
#define ATCA_UPDATE_EXTRA ((uint8_t)0x20)
```

UpdateExtra command op-code.

### 10.77.2.95 ATCA\_VERIFY

```
#define ATCA_VERIFY ((uint8_t)0x45)
```

GenKey command op-code.

### 10.77.2.96 ATCA\_WORD\_SIZE

```
#define ATCA_WORD_SIZE (4)
```

size of a word

**10.77.2.97 ATCA\_WRITE**

```
#define ATCA_WRITE ((uint8_t)0x12)
```

Write command op-code.

**10.77.2.98 ATCA\_ZONE\_ENCRYPTED**

```
#define ATCA_ZONE_ENCRYPTED ((uint8_t)0x40)
```

Zone bit 6 set: Write is encrypted with an unlocked data zone.

**10.77.2.99 ATCA\_ZONE\_MASK**

```
#define ATCA_ZONE_MASK ((uint8_t)0x03)
```

Zone mask.

**10.77.2.100 ATCA\_ZONE\_READWRITE\_32**

```
#define ATCA_ZONE_READWRITE_32 ((uint8_t)0x80)
```

Zone bit 7 set: Access 32 bytes, otherwise 4 bytes.

**10.77.2.101 CHECKMAC\_CLIENT\_CHALLENGE\_IDX**

```
#define CHECKMAC_CLIENT_CHALLENGE_IDX ATCA\_DATA\_IDX
```

CheckMAC command index for client challenge.

**10.77.2.102 CHECKMAC\_CLIENT\_CHALLENGE\_SIZE**

```
#define CHECKMAC_CLIENT_CHALLENGE_SIZE (32)
```

CheckMAC size of client challenge.

### 10.77.2.103 CHECKMAC\_CLIENT\_COMMAND\_SIZE

```
#define CHECKMAC_CLIENT_COMMAND_SIZE (4)
```

CheckMAC size of client command header size inside "other data".

### 10.77.2.104 CHECKMAC\_CLIENT\_RESPONSE\_IDX

```
#define CHECKMAC_CLIENT_RESPONSE_IDX (37)
```

CheckMAC command index for client response.

### 10.77.2.105 CHECKMAC\_CLIENT\_RESPONSE\_SIZE

```
#define CHECKMAC_CLIENT_RESPONSE_SIZE (32)
```

CheckMAC size of client response.

### 10.77.2.106 CHECKMAC\_CMD\_MATCH

```
#define CHECKMAC_CMD_MATCH (0)
```

CheckMAC return value when there is a match.

### 10.77.2.107 CHECKMAC\_CMD\_MISMATCH

```
#define CHECKMAC_CMD_MISMATCH (1)
```

CheckMAC return value when there is a mismatch.

### 10.77.2.108 CHECKMAC\_COUNT

```
#define CHECKMAC_COUNT (84)
```

CheckMAC command packet size.



**10.77.2.109 CHECKMAC\_DATA\_IDX**

```
#define CHECKMAC_DATA_IDX (69)
```

CheckMAC command index for other data.

**10.77.2.110 CHECKMAC\_KEYID\_IDX**

```
#define CHECKMAC_KEYID_IDX ATCA_PARAM2_IDX
```

CheckMAC command index for key identifier.

**10.77.2.111 CHECKMAC\_MODE\_BLOCK1\_TEMPKEY**

```
#define CHECKMAC_MODE_BLOCK1_TEMPKEY ((uint8_t)0x02)
```

CheckMAC mode bit 1: first SHA block from TempKey.

**10.77.2.112 CHECKMAC\_MODE\_BLOCK2\_TEMPKEY**

```
#define CHECKMAC_MODE_BLOCK2_TEMPKEY ((uint8_t)0x01)
```

CheckMAC mode bit 0: second SHA block from TempKey.

**10.77.2.113 CHECKMAC\_MODE\_CHALLENGE**

```
#define CHECKMAC_MODE_CHALLENGE ((uint8_t)0x00)
```

CheckMAC mode 0: first SHA block from key id.

**10.77.2.114 CHECKMAC\_MODE\_IDX**

```
#define CHECKMAC_MODE_IDX ATCA_PARAM1_IDX
```

CheckMAC command index for mode.

### 10.77.2.115 CHECKMAC\_MODE\_INCLUDE\_OTP\_64

```
#define CHECKMAC_MODE_INCLUDE_OTP_64 ((uint8_t)0x20)
```

CheckMAC mode bit 5: include first 64 OTP bits.

### 10.77.2.116 CHECKMAC\_MODE\_MASK

```
#define CHECKMAC_MODE_MASK ((uint8_t)0x27)
```

CheckMAC mode bits 3, 4, 6, and 7 are 0.

### 10.77.2.117 CHECKMAC\_MODE\_SOURCE\_FLAG\_MATCH

```
#define CHECKMAC_MODE_SOURCE_FLAG_MATCH ((uint8_t)0x04)
```

CheckMAC mode bit 2: match TempKey.SourceFlag.

### 10.77.2.118 CHECKMAC\_OTHER\_DATA\_SIZE

```
#define CHECKMAC_OTHER_DATA_SIZE (13)
```

CheckMAC size of "other data".

### 10.77.2.119 CHECKMAC\_RSP\_SIZE

```
#define CHECKMAC_RSP_SIZE ATCA_RSP_SIZE_MIN
```

CheckMAC response packet size.

### 10.77.2.120 CMD\_STATUS\_BYTE\_COMM

```
#define CMD_STATUS_BYTE_COMM ((uint8_t)0xFF)
```

communication error

**10.77.2.121 CMD\_STATUS\_BYTE\_ECC**

```
#define CMD_STATUS_BYTE_ECC ((uint8_t)0x05)
```

command ECC error

**10.77.2.122 CMD\_STATUS\_BYTE\_EXEC**

```
#define CMD_STATUS_BYTE_EXEC ((uint8_t)0x0F)
```

command execution error

**10.77.2.123 CMD\_STATUS\_BYTE\_PARSE**

```
#define CMD_STATUS_BYTE_PARSE ((uint8_t)0x03)
```

command parse error

**10.77.2.124 CMD\_STATUS\_SUCCESS**

```
#define CMD_STATUS_SUCCESS ((uint8_t)0x00)
```

status byte for success

**10.77.2.125 CMD\_STATUS\_WAKEUP**

```
#define CMD_STATUS_WAKEUP ((uint8_t)0x11)
```

status byte after wake-up

**10.77.2.126 COUNTER\_COUNT**

```
#define COUNTER_COUNT ATCA_CMD_SIZE_MIN
```

### 10.77.2.127 COUNTER\_KEYID\_IDX

```
#define COUNTER_KEYID_IDX ATCA_PARAM2_IDX
```

Counter command index for key id.

### 10.77.2.128 COUNTER\_MAX\_VALUE

```
#define COUNTER_MAX_VALUE ((uint32_t)2097151)
```

Counter maximum value of the counter.

### 10.77.2.129 COUNTER\_MODE\_IDX

```
#define COUNTER_MODE_IDX ATCA_PARAM1_IDX
```

Counter command index for mode.

### 10.77.2.130 COUNTER\_MODE\_INCREMENT

```
#define COUNTER_MODE_INCREMENT ((uint8_t)0x01)
```

Counter command mode for incrementing.

### 10.77.2.131 COUNTER\_MODE\_MASK

```
#define COUNTER_MODE_MASK ((uint8_t)0x01)
```

Counter mode bits 1 to 7 are 0.

### 10.77.2.132 COUNTER\_MODE\_READ

```
#define COUNTER_MODE_READ ((uint8_t)0x00)
```

Counter command mode for reading.

**10.77.2.133 COUNTER\_RSP\_SIZE**

```
#define COUNTER_RSP_SIZE ATCA_RSP_SIZE_4
```

Counter command response packet size.

**10.77.2.134 COUNTER\_SIZE**

```
#define COUNTER_SIZE ATCA_RSP_SIZE_MIN
```

Counter size in binary.

**10.77.2.135 DERIVE\_KEY\_COUNT\_LARGE**

```
#define DERIVE_KEY_COUNT_LARGE (39)
```

DeriveKey command packet size with MAC.

**10.77.2.136 DERIVE\_KEY\_COUNT\_SMALL**

```
#define DERIVE_KEY_COUNT_SMALL ATCA_CMD_SIZE_MIN
```

DeriveKey command packet size without MAC.

**10.77.2.137 DERIVE\_KEY\_MAC\_IDX**

```
#define DERIVE_KEY_MAC_IDX ATCA_DATA_IDX
```

DeriveKey command index for optional MAC.

**10.77.2.138 DERIVE\_KEY\_MAC\_SIZE**

```
#define DERIVE_KEY_MAC_SIZE (32)
```

DeriveKey MAC size.

### 10.77.2.139 DERIVE\_KEY\_MODE

```
#define DERIVE_KEY_MODE ((uint8_t)0x04)
```

DeriveKey command mode set to 4 as in datasheet.

### 10.77.2.140 DERIVE\_KEY\_RANDOM\_FLAG

```
#define DERIVE_KEY_RANDOM_FLAG ((uint8_t)4)
```

DeriveKey 1. parameter; has to match TempKey.SourceFlag.

### 10.77.2.141 DERIVE\_KEY\_RANDOM\_IDX

```
#define DERIVE_KEY_RANDOM_IDX ATCA_PARAM1_IDX
```

DeriveKey command index for random bit.

### 10.77.2.142 DERIVE\_KEY\_RSP\_SIZE

```
#define DERIVE_KEY_RSP_SIZE ATCA_RSP_SIZE_MIN
```

DeriveKey response packet size.

### 10.77.2.143 DERIVE\_KEY\_TARGETKEY\_IDX

```
#define DERIVE_KEY_TARGETKEY_IDX ATCA_PARAM2_IDX
```

DeriveKey command index for target slot.

### 10.77.2.144 ECC204\_COUNTER\_MAX\_VALUE

```
#define ECC204_COUNTER_MAX_VALUE ((uint16_t)10000)
```

Counter maximum value of the counter for ECC204.

**10.77.2.145 ECDH\_COUNT**

```
#define ECDH_COUNT (ATCA_CMD_SIZE_MIN + ATCA_PUB_KEY_SIZE)
```

**10.77.2.146 ECDH\_KEY\_SIZE**

```
#define ECDH_KEY_SIZE ATCA_BLOCK_SIZE
```

ECDH output data size.

**10.77.2.147 ECDH\_MODE\_COPY\_COMPATIBLE**

```
#define ECDH_MODE_COPY_COMPATIBLE ((uint8_t)0x00)
```

**10.77.2.148 ECDH\_MODE\_COPY\_EEPROM\_SLOT**

```
#define ECDH_MODE_COPY_EEPROM_SLOT ((uint8_t)0x04)
```

**10.77.2.149 ECDH\_MODE\_COPY\_MASK**

```
#define ECDH_MODE_COPY_MASK ((uint8_t)0x0C)
```

**10.77.2.150 ECDH\_MODE\_COPY\_OUTPUT\_BUFFER**

```
#define ECDH_MODE_COPY_OUTPUT_BUFFER ((uint8_t)0x0C)
```

**10.77.2.151 ECDH\_MODE\_COPY\_TEMP\_KEY**

```
#define ECDH_MODE_COPY_TEMP_KEY ((uint8_t)0x08)
```

### 10.77.2.152 ECDH\_MODE\_OUTPUT\_CLEAR

```
#define ECDH_MODE_OUTPUT_CLEAR ((uint8_t)0x00)
```

### 10.77.2.153 ECDH\_MODE\_OUTPUT\_ENC

```
#define ECDH_MODE_OUTPUT_ENC ((uint8_t)0x02)
```

### 10.77.2.154 ECDH\_MODE\_OUTPUT\_MASK

```
#define ECDH_MODE_OUTPUT_MASK ((uint8_t)0x02)
```

### 10.77.2.155 ECDH\_MODE\_SOURCE\_EEPROM\_SLOT

```
#define ECDH_MODE_SOURCE_EEPROM_SLOT ((uint8_t)0x00)
```

### 10.77.2.156 ECDH\_MODE\_SOURCE\_MASK

```
#define ECDH_MODE_SOURCE_MASK ((uint8_t)0x01)
```

### 10.77.2.157 ECDH\_MODE\_SOURCE\_TEMPKEY

```
#define ECDH_MODE_SOURCE_TEMPKEY ((uint8_t)0x01)
```

### 10.77.2.158 ECDH\_PREFIX\_MODE

```
#define ECDH_PREFIX_MODE ((uint8_t)0x00)
```



**10.77.2.159 ECDH\_RSP\_SIZE**

```
#define ECDH_RSP_SIZE ATCA_RSP_SIZE_64
```

ECDH command packet size.

**10.77.2.160 GENDIG\_COUNT**

```
#define GENDIG_COUNT ATCA_CMD_SIZE_MIN
```

GenDig command packet size without "other data".

**10.77.2.161 GENDIG\_DATA\_IDX**

```
#define GENDIG_DATA_IDX ATCA_DATA_IDX
```

GenDig command index for optional data.

**10.77.2.162 GENDIG\_KEYID\_IDX**

```
#define GENDIG_KEYID_IDX ATCA_PARAM2_IDX
```

GenDig command index for key id.

**10.77.2.163 GENDIG\_RSP\_SIZE**

```
#define GENDIG_RSP_SIZE ATCA_RSP_SIZE_MIN
```

GenDig command response packet size.

**10.77.2.164 GENDIG\_ZONE\_CONFIG**

```
#define GENDIG_ZONE_CONFIG ((uint8_t)0)
```

GenDig zone id config. Use KeyID to specify any of the four 256-bit blocks of the Configuration zone.

### 10.77.2.165 GENDIG\_ZONE\_COUNTER

```
#define GENDIG_ZONE_COUNTER ((uint8_t)4)
```

GenDig zone id counter. KeyID specifies the monotonic counter ID to be included in the message generation.

### 10.77.2.166 GENDIG\_ZONE\_DATA

```
#define GENDIG_ZONE_DATA ((uint8_t)2)
```

GenDig zone id data. Use KeyID to specify a slot in the Data zone or a transport key in the hardware array.

### 10.77.2.167 GENDIG\_ZONE\_IDX

```
#define GENDIG_ZONE_IDX ATCA_PARAM1_IDX
```

GenDig command index for zone.

### 10.77.2.168 GENDIG\_ZONE\_KEY\_CONFIG

```
#define GENDIG_ZONE_KEY_CONFIG ((uint8_t)5)
```

GenDig zone id key config. KeyID specifies the slot for which the configuration information is to be included in the message generation.

### 10.77.2.169 GENDIG\_ZONE\_OTP

```
#define GENDIG_ZONE_OTP ((uint8_t)1)
```

GenDig zone id OTP. Use KeyID to specify either the first or second 256-bit block of the OTP zone.

### 10.77.2.170 GENDIG\_ZONE\_SHARED\_NONCE

```
#define GENDIG_ZONE_SHARED_NONCE ((uint8_t)3)
```

GenDig zone id shared nonce. KeyID specifies the location of the input value in the message generation.

**10.77.2.171 GENKEY\_COUNT**

```
#define GENKEY_COUNT ATCA_CMD_SIZE_MIN
```

GenKey command packet size without "other data".

**10.77.2.172 GENKEY\_COUNT\_DATA**

```
#define GENKEY_COUNT_DATA (10)
```

GenKey command packet size with "other data".

**10.77.2.173 GENKEY\_DATA\_IDX**

```
#define GENKEY_DATA_IDX (5)
```

GenKey command index for other data.

**10.77.2.174 GENKEY\_KEYID\_IDX**

```
#define GENKEY_KEYID_IDX ATCA_PARAM2_IDX
```

GenKey command index for key id.

**10.77.2.175 GENKEY\_MODE\_DIGEST**

```
#define GENKEY_MODE_DIGEST ((uint8_t)0x08)
```

GenKey mode: PubKey digest will be created after the public key is calculated.

**10.77.2.176 GENKEY\_MODE\_IDX**

```
#define GENKEY_MODE_IDX ATCA_PARAM1_IDX
```

GenKey command index for mode.

### 10.77.2.177 GENKEY\_MODE\_MAC

```
#define GENKEY_MODE_MAC ((uint8_t)0x20)
```

Genkey mode: Calculate MAC of public key + session key.

### 10.77.2.178 GENKEY\_MODE\_MASK

```
#define GENKEY_MODE_MASK ((uint8_t)0x1C)
```

GenKey mode bits 0 to 1 and 5 to 7 are 0.

### 10.77.2.179 GENKEY\_MODE\_PRIVATE

```
#define GENKEY_MODE_PRIVATE ((uint8_t)0x04)
```

GenKey mode: private key generation.

### 10.77.2.180 GENKEY\_MODE\_PUBKEY\_DIGEST

```
#define GENKEY_MODE_PUBKEY_DIGEST ((uint8_t)0x10)
```

GenKey mode: Calculate PubKey digest on the public key in KeyId.

### 10.77.2.181 GENKEY\_MODE\_PUBLIC

```
#define GENKEY_MODE_PUBLIC ((uint8_t)0x00)
```

GenKey mode: public key calculation.

### 10.77.2.182 GENKEY\_OTHER\_DATA\_SIZE

```
#define GENKEY_OTHER_DATA_SIZE (3)
```

GenKey size of "other data".

**10.77.2.183 GENKEY\_PRIVATE\_TO\_TEMPKEY**

```
#define GENKEY_PRIVATE_TO_TEMPKEY ((uint16_t)0xFFFF)
```

GenKey Create private key and store to tempkey (608 only)

**10.77.2.184 GENKEY\_RSP\_SIZE\_LONG**

```
#define GENKEY_RSP_SIZE_LONG ATCA_RSP_SIZE_64
```

GenKey response packet size when returning a public key.

**10.77.2.185 GENKEY\_RSP\_SIZE\_SHORT**

```
#define GENKEY_RSP_SIZE_SHORT ATCA_RSP_SIZE_MIN
```

GenKey response packet size in Digest mode.

**10.77.2.186 HMAC\_COUNT**

```
#define HMAC_COUNT ATCA_CMD_SIZE_MIN
```

HMAC command packet size.

**10.77.2.187 HMAC\_DIGEST\_SIZE**

```
#define HMAC_DIGEST_SIZE (32)
```

HMAC size of digest response.

**10.77.2.188 HMAC\_KEYID\_IDX**

```
#define HMAC_KEYID_IDX ATCA_PARAM2_IDX
```

HMAC command index for key id.

### 10.77.2.189 HMAC\_MODE\_FLAG\_FULLSN

```
#define HMAC_MODE_FLAG_FULLSN ((uint8_t)0x40)
```

HMAC mode bit 6: If set, include the 48 bits SN[2:3] and SN[4:7] in the message.; otherwise, the corresponding message bits are set to zero.

### 10.77.2.190 HMAC\_MODE\_FLAG\_OTP64

```
#define HMAC_MODE_FLAG_OTP64 ((uint8_t)0x20)
```

HMAC mode bit 5: Include the first 64 OTP bits (OTP[0] through OTP[7]) in the message.; otherwise, the corresponding message bits are set to zero. If Mode[4] is set, the value of this mode bit is ignored. Not applicable for ATECC508A.

### 10.77.2.191 HMAC\_MODE\_FLAG\_OTP88

```
#define HMAC_MODE_FLAG_OTP88 ((uint8_t)0x10)
```

HMAC mode bit 4: Include the first 88 OTP bits (OTP[0] through OTP[10]) in the message.; otherwise, the corresponding message bits are set to zero. Not applicable for ATECC508A.

### 10.77.2.192 HMAC\_MODE\_FLAG\_TK\_NORAND

```
#define HMAC_MODE_FLAG_TK_NORAND ((uint8_t)0x04)
```

HMAC mode bit 2: The value of this bit must match the value in TempKey.SourceFlag or the command will return an error.

### 10.77.2.193 HMAC\_MODE\_FLAG\_TK\_RAND

```
#define HMAC_MODE_FLAG_TK_RAND ((uint8_t)0x00)
```

HMAC mode bit 2: The value of this bit must match the value in TempKey.SourceFlag or the command will return an error.

**10.77.2.194 HMAC\_MODE\_IDX**

```
#define HMAC_MODE_IDX ATCA_PARAM1_IDX
```

HMAC command index for mode.

**10.77.2.195 HMAC\_MODE\_MASK**

```
#define HMAC_MODE_MASK ((uint8_t)0x74)
```

HMAC mode bits 0, 1, 3, and 7 are 0.

**10.77.2.196 HMAC\_RSP\_SIZE**

```
#define HMAC_RSP_SIZE ATCA_RSP_SIZE_32
```

HMAC command response packet size.

**10.77.2.197 INFO\_COUNT**

```
#define INFO_COUNT ATCA_CMD_SIZE_MIN
```

Info command packet size.

**10.77.2.198 INFO\_DRIVER\_STATE\_MASK**

```
#define INFO_DRIVER_STATE_MASK ((uint8_t)0x02)
```

Info driver state mask.

**10.77.2.199 INFO\_MODE\_GPIO**

```
#define INFO_MODE_GPIO ((uint8_t)0x03)
```

Info mode GPIO.

### 10.77.2.200 INFO\_MODE\_KEY\_VALID

```
#define INFO_MODE_KEY_VALID ((uint8_t)0x01)
```

Info mode KeyValid.

### 10.77.2.201 INFO\_MODE\_LOCK\_STATUS

```
#define INFO_MODE_LOCK_STATUS ((uint8_t)0x02)
```

Info mode Lock status for ECC204 device.

### 10.77.2.202 INFO\_MODE\_MAX

```
#define INFO_MODE_MAX ((uint8_t)0x03)
```

Info mode maximum value.

### 10.77.2.203 INFO\_MODE\_REVISION

```
#define INFO_MODE_REVISION ((uint8_t)0x00)
```

Info mode Revision.

### 10.77.2.204 INFO\_MODE\_STATE

```
#define INFO_MODE_STATE ((uint8_t)0x02)
```

Info mode State.

### 10.77.2.205 INFO\_MODE\_VOL\_KEY\_PERMIT

```
#define INFO_MODE_VOL_KEY_PERMIT ((uint8_t)0x04)
```

Info mode GPIO.



**10.77.2.206 INFO\_NO\_STATE**

```
#define INFO_NO_STATE ((uint8_t)0x00)
```

Info mode is not the state mode.

**10.77.2.207 INFO\_OUTPUT\_STATE\_MASK**

```
#define INFO_OUTPUT_STATE_MASK ((uint8_t)0x01)
```

Info output state mask.

**10.77.2.208 INFO\_PARAM1\_IDX**

```
#define INFO_PARAM1_IDX ATCA_PARAM1_IDX
```

Info command index for 1. parameter.

**10.77.2.209 INFO\_PARAM2\_IDX**

```
#define INFO_PARAM2_IDX ATCA_PARAM2_IDX
```

Info command index for 2. parameter.

**10.77.2.210 INFO\_PARAM2\_LATCH\_CLEAR**

```
#define INFO_PARAM2_LATCH_CLEAR ((uint16_t)0x0000)
```

Info param2 to clear the persistent latch.

**10.77.2.211 INFO\_PARAM2\_LATCH\_SET**

```
#define INFO_PARAM2_LATCH_SET ((uint16_t)0x0001)
```

Info param2 to set the persistent latch.

### 10.77.2.212 INFO\_PARAM2\_SET\_LATCH\_STATE

```
#define INFO_PARAM2_SET_LATCH_STATE ((uint16_t)0x0002)
```

Info param2 to set the persistent latch state.

### 10.77.2.213 INFO\_RSP\_SIZE

```
#define INFO_RSP_SIZE ATCA_RSP_SIZE_VAL
```

Info command response packet size.

### 10.77.2.214 INFO\_SIZE

```
#define INFO_SIZE ((uint8_t)0x04)
```

Info return size.

### 10.77.2.215 KDF\_DETAILS\_AES\_KEY\_LOC\_MASK

```
#define KDF_DETAILS_AES_KEY_LOC_MASK ((uint32_t)0x00000003)
```

KDF details for AES, key location mask.

### 10.77.2.216 KDF\_DETAILS\_HKDF\_MSG\_LOC\_INPUT

```
#define KDF_DETAILS_HKDF_MSG_LOC_INPUT ((uint32_t)0x00000002)
```

KDF details for HKDF, message location in input parameter.

### 10.77.2.217 KDF\_DETAILS\_HKDF\_MSG\_LOC\_IV

```
#define KDF_DETAILS_HKDF_MSG_LOC_IV ((uint32_t)0x00000003)
```

KDF details for HKDF, message location is a special IV function.

**10.77.2.218 KDF\_DETAILS\_HKDF\_MSG\_LOC\_MASK**

```
#define KDF_DETAILS_HKDF_MSG_LOC_MASK ((uint32_t)0x00000003)
```

KDF details for HKDF, message location mask.

**10.77.2.219 KDF\_DETAILS\_HKDF\_MSG\_LOC\_SLOT**

```
#define KDF_DETAILS_HKDF_MSG_LOC_SLOT ((uint32_t)0x00000000)
```

KDF details for HKDF, message location in slot.

**10.77.2.220 KDF\_DETAILS\_HKDF\_MSG\_LOC\_TEMPKEY**

```
#define KDF_DETAILS_HKDF_MSG_LOC_TEMPKEY ((uint32_t)0x00000001)
```

KDF details for HKDF, message location in TempKey.

**10.77.2.221 KDF\_DETAILS\_HKDF\_ZERO\_KEY**

```
#define KDF_DETAILS_HKDF_ZERO_KEY ((uint32_t)0x00000004)
```

KDF details for HKDF, key is 32 bytes of zero.

**10.77.2.222 KDF\_DETAILS\_IDX**

```
#define KDF_DETAILS_IDX ATCA\_DATA\_IDX
```

KDF command index for details.

**10.77.2.223 KDF\_DETAILS\_PRF\_AEAD\_MASK**

```
#define KDF_DETAILS_PRF_AEAD_MASK ((uint32_t)0x00000600)
```

KDF details for PRF, AEAD processing mask.

### 10.77.2.224 KDF\_DETAILS\_PRF\_AEAD\_MODE0

```
#define KDF_DETAILS_PRF_AEAD_MODE0 ((uint32_t)0x00000000)
```

KDF details for PRF, AEAD no processing.

### 10.77.2.225 KDF\_DETAILS\_PRF\_AEAD\_MODE1

```
#define KDF_DETAILS_PRF_AEAD_MODE1 ((uint32_t)0x00000200)
```

KDF details for PRF, AEAD First 32 go to target, second 32 go to output buffer.

### 10.77.2.226 KDF\_DETAILS\_PRF\_KEY\_LEN\_16

```
#define KDF_DETAILS_PRF_KEY_LEN_16 ((uint32_t)0x00000000)
```

KDF details for PRF, source key length is 16 bytes.

### 10.77.2.227 KDF\_DETAILS\_PRF\_KEY\_LEN\_32

```
#define KDF_DETAILS_PRF_KEY_LEN_32 ((uint32_t)0x00000001)
```

KDF details for PRF, source key length is 32 bytes.

### 10.77.2.228 KDF\_DETAILS\_PRF\_KEY\_LEN\_48

```
#define KDF_DETAILS_PRF_KEY_LEN_48 ((uint32_t)0x00000002)
```

KDF details for PRF, source key length is 48 bytes.

### 10.77.2.229 KDF\_DETAILS\_PRF\_KEY\_LEN\_64

```
#define KDF_DETAILS_PRF_KEY_LEN_64 ((uint32_t)0x00000003)
```

KDF details for PRF, source key length is 64 bytes.

**10.77.2.230 KDF\_DETAILS\_PRF\_KEY\_LEN\_MASK**

```
#define KDF_DETAILS_PRF_KEY_LEN_MASK ((uint32_t)0x00000003)
```

KDF details for PRF, source key length mask.

**10.77.2.231 KDF\_DETAILS\_PRF\_TARGET\_LEN\_32**

```
#define KDF_DETAILS_PRF_TARGET_LEN_32 ((uint32_t)0x00000000)
```

KDF details for PRF, target length is 32 bytes.

**10.77.2.232 KDF\_DETAILS\_PRF\_TARGET\_LEN\_64**

```
#define KDF_DETAILS_PRF_TARGET_LEN_64 ((uint32_t)0x00000100)
```

KDF details for PRF, target length is 64 bytes.

**10.77.2.233 KDF\_DETAILS\_PRF\_TARGET\_LEN\_MASK**

```
#define KDF_DETAILS_PRF_TARGET_LEN_MASK ((uint32_t)0x00000100)
```

KDF details for PRF, target length mask.

**10.77.2.234 KDF\_DETAILS\_SIZE**

```
#define KDF_DETAILS_SIZE 4
```

KDF details (param3) size.

**10.77.2.235 KDF\_KEYID\_IDX**

```
#define KDF_KEYID_IDX ATCA_PARAM2_IDX
```

KDF command index for key id.

### 10.77.2.236 KDF\_MESSAGE\_IDX

```
#define KDF_MESSAGE_IDX (ATCA_DATA_IDX + KDF_DETAILS_SIZE)
```

### 10.77.2.237 KDF\_MODE\_ALG\_AES

```
#define KDF_MODE_ALG_AES ((uint8_t)0x20)
```

KDF mode AES algorithm.

### 10.77.2.238 KDF\_MODE\_ALG\_HKDF

```
#define KDF_MODE_ALG_HKDF ((uint8_t)0x40)
```

KDF mode HKDF algorithm.

### 10.77.2.239 KDF\_MODE\_ALG\_MASK

```
#define KDF_MODE_ALG_MASK ((uint8_t)0x60)
```

KDF mode algorithm mask.

### 10.77.2.240 KDF\_MODE\_ALG\_PRF

```
#define KDF_MODE_ALG_PRF ((uint8_t)0x00)
```

KDF mode PRF algorithm.

### 10.77.2.241 KDF\_MODE\_IDX

```
#define KDF_MODE_IDX ATCA_PARAM1_IDX
```

KDF command index for mode.

**10.77.2.242 KDF\_MODE\_SOURCE\_ALTKEYBUF**

```
#define KDF_MODE_SOURCE_ALTKEYBUF ((uint8_t)0x03)
```

KDF mode source key in alternate key buffer.

**10.77.2.243 KDF\_MODE\_SOURCE\_MASK**

```
#define KDF_MODE_SOURCE_MASK ((uint8_t)0x03)
```

KDF mode source key mask.

**10.77.2.244 KDF\_MODE\_SOURCE\_SLOT**

```
#define KDF_MODE_SOURCE_SLOT ((uint8_t)0x02)
```

KDF mode source key in a slot.

**10.77.2.245 KDF\_MODE\_SOURCE\_TEMPKEY**

```
#define KDF_MODE_SOURCE_TEMPKEY ((uint8_t)0x00)
```

KDF mode source key in TempKey.

**10.77.2.246 KDF\_MODE\_SOURCE\_TEMPKEY\_UP**

```
#define KDF_MODE_SOURCE_TEMPKEY_UP ((uint8_t)0x01)
```

KDF mode source key in upper TempKey.

**10.77.2.247 KDF\_MODE\_TARGET\_ALTKEYBUF**

```
#define KDF_MODE_TARGET_ALTKEYBUF ((uint8_t)0x0C)
```

KDF mode target key in alternate key buffer.

### 10.77.2.248 KDF\_MODE\_TARGET\_MASK

```
#define KDF_MODE_TARGET_MASK ((uint8_t)0x1C)
```

KDF mode target key mask.

### 10.77.2.249 KDF\_MODE\_TARGET\_OUTPUT

```
#define KDF_MODE_TARGET_OUTPUT ((uint8_t)0x10)
```

KDF mode target key in output buffer.

### 10.77.2.250 KDF\_MODE\_TARGET\_OUTPUT\_ENC

```
#define KDF_MODE_TARGET_OUTPUT_ENC ((uint8_t)0x14)
```

KDF mode target key encrypted in output buffer.

### 10.77.2.251 KDF\_MODE\_TARGET\_SLOT

```
#define KDF_MODE_TARGET_SLOT ((uint8_t)0x08)
```

KDF mode target key in slot.

### 10.77.2.252 KDF\_MODE\_TARGET\_TEMPKEY

```
#define KDF_MODE_TARGET_TEMPKEY ((uint8_t)0x00)
```

KDF mode target key in TempKey.

### 10.77.2.253 KDF\_MODE\_TARGET\_TEMPKEY\_UP

```
#define KDF_MODE_TARGET_TEMPKEY_UP ((uint8_t)0x04)
```

KDF mode target key in upper TempKey.



**10.77.2.254 LOCK\_COUNT**

```
#define LOCK_COUNT ATCA_CMD_SIZE_MIN
```

Lock command packet size.

**10.77.2.255 LOCK\_ECC204\_ZONE\_CONFIG**

```
#define LOCK_ECC204_ZONE_CONFIG ((uint8_t)0x01)
```

Lock ECC204 configuration zone by slot.

**10.77.2.256 LOCK\_ECC204\_ZONE\_DATA**

```
#define LOCK_ECC204_ZONE_DATA ((uint8_t)0x00)
```

Lock ECC204 Data zone by slot.

**10.77.2.257 LOCK\_RSP\_SIZE**

```
#define LOCK_RSP_SIZE ATCA_RSP_SIZE_MIN
```

Lock command response packet size.

**10.77.2.258 LOCK\_SUMMARY\_IDX**

```
#define LOCK_SUMMARY_IDX ATCA_PARAM2_IDX
```

Lock command index for summary.

**10.77.2.259 LOCK\_ZONE\_CONFIG**

```
#define LOCK_ZONE_CONFIG ((uint8_t)0x00)
```

Lock zone is Config.

### 10.77.2.260 LOCK\_ZONE\_DATA

```
#define LOCK_ZONE_DATA ((uint8_t)0x01)
```

Lock zone is OTP or Data.

### 10.77.2.261 LOCK\_ZONE\_DATA\_SLOT

```
#define LOCK_ZONE_DATA_SLOT ((uint8_t)0x02)
```

Lock slot of Data.

### 10.77.2.262 LOCK\_ZONE\_IDX

```
#define LOCK_ZONE_IDX ATCA_PARAM1_IDX
```

Lock command index for zone.

### 10.77.2.263 LOCK\_ZONE\_MASK

```
#define LOCK_ZONE_MASK (0xBF)
```

Lock parameter 1 bits 6 are 0.

### 10.77.2.264 LOCK\_ZONE\_NO\_CRC

```
#define LOCK_ZONE_NO_CRC ((uint8_t)0x80)
```

Lock command: Ignore summary.

### 10.77.2.265 MAC\_CHALLENGE\_IDX

```
#define MAC_CHALLENGE_IDX ATCA_DATA_IDX
```

MAC command index for optional challenge.

**10.77.2.266 MAC\_CHALLENGE\_SIZE**

```
#define MAC_CHALLENGE_SIZE (32)
```

MAC size of challenge.

**10.77.2.267 MAC\_COUNT\_LONG**

```
#define MAC_COUNT_LONG (39)
```

MAC command packet size with challenge.

**10.77.2.268 MAC\_COUNT\_SHORT**

```
#define MAC_COUNT_SHORT ATCA_CMD_SIZE_MIN
```

MAC command packet size without challenge.

**10.77.2.269 MAC\_KEYID\_IDX**

```
#define MAC_KEYID_IDX ATCA_PARAM2_IDX
```

MAC command index for key id.

**10.77.2.270 MAC\_MODE\_BLOCK1\_TEMPKEY**

```
#define MAC_MODE_BLOCK1_TEMPKEY ((uint8_t)0x02)
```

MAC mode bit 1: first SHA block from TempKey.

**10.77.2.271 MAC\_MODE\_BLOCK2\_TEMPKEY**

```
#define MAC_MODE_BLOCK2_TEMPKEY ((uint8_t)0x01)
```

MAC mode bit 0: second SHA block from TempKey.

### 10.77.2.272 MAC\_MODE\_CHALLENGE

```
#define MAC_MODE_CHALLENGE ((uint8_t)0x00)
```

MAC mode 0: first SHA block from data slot.

### 10.77.2.273 MAC\_MODE\_IDX

```
#define MAC_MODE_IDX ATCA_PARAM1_IDX
```

MAC command index for mode.

### 10.77.2.274 MAC\_MODE\_INCLUDE\_OTP\_64

```
#define MAC_MODE_INCLUDE_OTP_64 ((uint8_t)0x20)
```

MAC mode bit 5: include first 64 OTP bits.

### 10.77.2.275 MAC\_MODE\_INCLUDE\_OTP\_88

```
#define MAC_MODE_INCLUDE_OTP_88 ((uint8_t)0x10)
```

MAC mode bit 4: include first 88 OTP bits.

### 10.77.2.276 MAC\_MODE\_INCLUDE\_SN

```
#define MAC_MODE_INCLUDE_SN ((uint8_t)0x40)
```

MAC mode bit 6: include serial number.

### 10.77.2.277 MAC\_MODE\_MASK

```
#define MAC_MODE_MASK ((uint8_t)0x77)
```

MAC mode bits 3 and 7 are 0.

**10.77.2.278 MAC\_MODE\_PASSTHROUGH**

```
#define MAC_MODE_PASSTHROUGH ((uint8_t)0x07)
```

MAC mode bit 0-2: pass-through mode.

**10.77.2.279 MAC\_MODE\_PTNONCE\_TEMPKEY**

```
#define MAC_MODE_PTNONCE_TEMPKEY ((uint8_t)0x06)
```

MAC mode bit 0: second SHA block from TempKey.

**10.77.2.280 MAC\_MODE\_SOURCE\_FLAG\_MATCH**

```
#define MAC_MODE_SOURCE_FLAG_MATCH ((uint8_t)0x04)
```

MAC mode bit 2: match TempKey.SourceFlag.

**10.77.2.281 MAC\_RSP\_SIZE**

```
#define MAC_RSP_SIZE ATCA_RSP_SIZE_32
```

MAC command response packet size.

**10.77.2.282 MAC\_SIZE**

```
#define MAC_SIZE (32)
```

MAC size of response.

**10.77.2.283 NONCE\_COUNT\_LONG**

```
#define NONCE_COUNT_LONG (ATCA_CMD_SIZE_MIN + 32)
```

Nonce command packet size for 32 bytes of NumIn.

### 10.77.2.284 NONCE\_COUNT\_LONG\_64

```
#define NONCE_COUNT_LONG_64 (ATCA_CMD_SIZE_MIN + 64)
```

Nonce command packet size for 64 bytes of NumIn.

### 10.77.2.285 NONCE\_COUNT\_SHORT

```
#define NONCE_COUNT_SHORT (ATCA_CMD_SIZE_MIN + 20)
```

Nonce command packet size for 20 bytes of NumIn.

### 10.77.2.286 NONCE\_INPUT\_IDX

```
#define NONCE_INPUT_IDX ATCA_DATA_IDX
```

Nonce command index for input data.

### 10.77.2.287 NONCE\_MODE\_GEN\_SESSION\_KEY

```
#define NONCE_MODE_GEN_SESSION_KEY ((uint8_t)0x02)
```

Nonce mode: Generate session key in ECC204 device.

### 10.77.2.288 NONCE\_MODE\_IDX

```
#define NONCE_MODE_IDX ATCA_PARAM1_IDX
```

Nonce command index for mode.

### 10.77.2.289 NONCE\_MODE\_INPUT\_LEN\_32

```
#define NONCE_MODE_INPUT_LEN_32 ((uint8_t)0x00)
```

Nonce mode: input size is 32 bytes.

**10.77.2.290 NONCE\_MODE\_INPUT\_LEN\_64**

```
#define NONCE_MODE_INPUT_LEN_64 ((uint8_t)0x20)
```

Nonce mode: input size is 64 bytes.

**10.77.2.291 NONCE\_MODE\_INPUT\_LEN\_MASK**

```
#define NONCE_MODE_INPUT_LEN_MASK ((uint8_t)0x20)
```

Nonce mode: input size mask.

**10.77.2.292 NONCE\_MODE\_INVALID**

```
#define NONCE_MODE_INVALID ((uint8_t)0x02)
```

Nonce mode 2 is invalid.

**10.77.2.293 NONCE\_MODE\_MASK**

```
#define NONCE_MODE_MASK ((uint8_t)0x03)
```

Nonce mode bits 2 to 7 are 0.

**10.77.2.294 NONCE\_MODE\_NO\_SEED\_UPDATE**

```
#define NONCE_MODE_NO_SEED_UPDATE ((uint8_t)0x01)
```

Nonce mode: do not update seed.

**10.77.2.295 NONCE\_MODE\_PASSTHROUGH**

```
#define NONCE_MODE_PASSTHROUGH ((uint8_t)0x03)
```

Nonce mode: pass-through.

### 10.77.2.296 NONCE\_MODE\_SEED\_UPDATE

```
#define NONCE_MODE_SEED_UPDATE ((uint8_t)0x00)
```

Nonce mode: update seed.

### 10.77.2.297 NONCE\_MODE\_TARGET\_ALTKEYBUF

```
#define NONCE_MODE_TARGET_ALTKEYBUF ((uint8_t)0x80)
```

Nonce mode: target is Alternate Key Buffer.

### 10.77.2.298 NONCE\_MODE\_TARGET\_MASK

```
#define NONCE_MODE_TARGET_MASK ((uint8_t)0xC0)
```

Nonce mode: target mask.

### 10.77.2.299 NONCE\_MODE\_TARGET\_MSGDIGBUF

```
#define NONCE_MODE_TARGET_MSGDIGBUF ((uint8_t)0x40)
```

Nonce mode: target is Message Digest Buffer.

### 10.77.2.300 NONCE\_MODE\_TARGET\_TEMPKEY

```
#define NONCE_MODE_TARGET_TEMPKEY ((uint8_t)0x00)
```

Nonce mode: target is TempKey.

### 10.77.2.301 NONCE\_NUMIN\_SIZE

```
#define NONCE_NUMIN_SIZE (20)
```

Nonce NumIn size for random modes.



**10.77.2.302 NONCE\_NUMIN\_SIZE\_PASSTHROUGH**

```
#define NONCE_NUMIN_SIZE_PASSTHROUGH (32)
```

Nonce NumIn size for 32-byte pass-through mode.

**10.77.2.303 NONCE\_PARAM2\_IDX**

```
#define NONCE_PARAM2_IDX ATCA_PARAM2_IDX
```

Nonce command index for 2. parameter.

**10.77.2.304 NONCE\_RSP\_SIZE\_LONG**

```
#define NONCE_RSP_SIZE_LONG ATCA_RSP_SIZE_32
```

Nonce command response packet size with output.

**10.77.2.305 NONCE\_RSP\_SIZE\_SHORT**

```
#define NONCE_RSP_SIZE_SHORT ATCA_RSP_SIZE_MIN
```

Nonce command response packet size with no output.

**10.77.2.306 NONCE\_ZERO\_CALC\_MASK**

```
#define NONCE_ZERO_CALC_MASK ((uint16_t)0x8000)
```

Nonce zero (param2): calculation mode mask.

**10.77.2.307 NONCE\_ZERO\_CALC\_RANDOM**

```
#define NONCE_ZERO_CALC_RANDOM ((uint16_t)0x0000)
```

Nonce zero (param2): calculation mode random, use RNG in calculation and return RNG output.

### 10.77.2.308 NONCE\_ZERO\_CALC\_TEMPKEY

```
#define NONCE_ZERO_CALC_TEMPKEY ((uint16_t)0x8000)
```

Nonce zero (param2): calculation mode TempKey, use TempKey in calculation and return new TempKey value.

### 10.77.2.309 OUTNONCE\_SIZE

```
#define OUTNONCE_SIZE (32)
```

Size of the OutNonce response expected from several commands.

### 10.77.2.310 PAUSE\_COUNT

```
#define PAUSE_COUNT ATCA_CMD_SIZE_MIN
```

Pause command packet size.

### 10.77.2.311 PAUSE\_PARAM2\_IDX

```
#define PAUSE_PARAM2_IDX ATCA_PARAM2_IDX
```

Pause command index for 2. parameter.

### 10.77.2.312 PAUSE\_RSP\_SIZE

```
#define PAUSE_RSP_SIZE ATCA_RSP_SIZE_MIN
```

Pause command response packet size.

### 10.77.2.313 PAUSE\_SELECT\_IDX

```
#define PAUSE_SELECT_IDX ATCA_PARAM1_IDX
```

Pause command index for Selector.

**10.77.2.314 PRIVWRITE\_COUNT**

```
#define PRIVWRITE_COUNT (75)
```

PrivWrite command packet size.

**10.77.2.315 PRIVWRITE\_KEYID\_IDX**

```
#define PRIVWRITE_KEYID_IDX ATCA_PARAM2_IDX
```

PrivWrite command index for KeyID.

**10.77.2.316 PRIVWRITE\_MAC\_IDX**

```
#define PRIVWRITE_MAC_IDX (41)
```

PrivWrite command index for MAC.

**10.77.2.317 PRIVWRITE\_MODE\_ENCRYPT**

```
#define PRIVWRITE_MODE_ENCRYPT ((uint8_t)0x40)
```

PrivWrite mode: encrypted.

**10.77.2.318 PRIVWRITE\_RSP\_SIZE**

```
#define PRIVWRITE_RSP_SIZE ATCA_RSP_SIZE_MIN
```

PrivWrite command response packet size.

**10.77.2.319 PRIVWRITE\_VALUE\_IDX**

```
#define PRIVWRITE_VALUE_IDX ( 5)
```

PrivWrite command index for value.

### 10.77.2.320 PRIVWRITE\_ZONE\_IDX

```
#define PRIVWRITE_ZONE_IDX ATCA_PARAM1_IDX
```

PrivWrite command index for zone.

### 10.77.2.321 PRIVWRITE\_ZONE\_MASK

```
#define PRIVWRITE_ZONE_MASK ((uint8_t)0x40)
```

PrivWrite zone bits 0 to 5 and 7 are 0.

### 10.77.2.322 RANDOM\_COUNT

```
#define RANDOM_COUNT ATCA_CMD_SIZE_MIN
```

Random command packet size.

### 10.77.2.323 RANDOM\_MODE\_IDX

```
#define RANDOM_MODE_IDX ATCA_PARAM1_IDX
```

Random command index for mode.

### 10.77.2.324 RANDOM\_NO\_SEED\_UPDATE

```
#define RANDOM_NO_SEED_UPDATE ((uint8_t)0x01)
```

Random mode for no seed update.

### 10.77.2.325 RANDOM\_NUM\_SIZE

```
#define RANDOM_NUM_SIZE ((uint8_t)32)
```

Number of bytes in the data packet of a random command.

**10.77.2.326 RANDOM\_PARAM2\_IDX**

```
#define RANDOM_PARAM2_IDX ATCA_PARAM2_IDX
```

Random command index for 2. parameter.

**10.77.2.327 RANDOM\_RSP\_SIZE**

```
#define RANDOM_RSP_SIZE ATCA_RSP_SIZE_32
```

Random command response packet size.

**10.77.2.328 RANDOM\_SEED\_UPDATE**

```
#define RANDOM_SEED_UPDATE ((uint8_t)0x00)
```

Random mode for automatic seed update.

**10.77.2.329 READ\_32\_RSP\_SIZE**

```
#define READ_32_RSP_SIZE ATCA_RSP_SIZE_32
```

Read command response packet size when reading 32 bytes.

**10.77.2.330 READ\_4\_RSP\_SIZE**

```
#define READ_4_RSP_SIZE ATCA_RSP_SIZE_VAL
```

Read command response packet size when reading 4 bytes.

**10.77.2.331 READ\_ADDR\_IDX**

```
#define READ_ADDR_IDX ATCA_PARAM2_IDX
```

Read command index for address.

### 10.77.2.332 READ\_COUNT

```
#define READ_COUNT ATCA_CMD_SIZE_MIN
```

Read command packet size.

### 10.77.2.333 READ\_ZONE\_IDX

```
#define READ_ZONE_IDX ATCA_PARAM1_IDX
```

Read command index for zone.

### 10.77.2.334 READ\_ZONE\_MASK

```
#define READ_ZONE_MASK ((uint8_t)0x83)
```

Read zone bits 2 to 6 are 0.

### 10.77.2.335 RSA2048\_KEY\_SIZE

```
#define RSA2048_KEY_SIZE (256)
```

size of a RSA private key

### 10.77.2.336 SECUREBOOT\_COUNT\_DIG

```
#define SECUREBOOT_COUNT_DIG (ATCA_CMD_SIZE_MIN + SECUREBOOT_DIGEST_SIZE)
```

SecureBoot command packet size for just a digest.

### 10.77.2.337 SECUREBOOT\_COUNT\_DIG\_SIG

```
#define SECUREBOOT_COUNT_DIG_SIG (ATCA_CMD_SIZE_MIN + SECUREBOOT_DIGEST_SIZE + SECUREBOOT_SIGNATURE_SIZE)
```

SecureBoot command packet size for a digest and signature.

**10.77.2.338 SECUREBOOT\_DIGEST\_SIZE**

```
#define SECUREBOOT_DIGEST_SIZE (32)
```

SecureBoot digest input size.

**10.77.2.339 SECUREBOOT\_MAC\_SIZE**

```
#define SECUREBOOT_MAC_SIZE (32)
```

SecureBoot MAC output size.

**10.77.2.340 SECUREBOOT\_MODE\_ENC\_MAC\_FLAG**

```
#define SECUREBOOT_MODE_ENC_MAC_FLAG ((uint8_t)0x80)
```

SecureBoot mode flag for encrypted digest and returning validating MAC.

**10.77.2.341 SECUREBOOT\_MODE\_FULL**

```
#define SECUREBOOT_MODE_FULL ((uint8_t)0x05)
```

SecureBoot mode Full.

**10.77.2.342 SECUREBOOT\_MODE\_FULL\_COPY**

```
#define SECUREBOOT_MODE_FULL_COPY ((uint8_t)0x07)
```

SecureBoot mode FullCopy.

**10.77.2.343 SECUREBOOT\_MODE\_FULL\_STORE**

```
#define SECUREBOOT_MODE_FULL_STORE ((uint8_t)0x06)
```

SecureBoot mode FullStore.

### 10.77.2.344 SECUREBOOT\_MODE\_IDX

```
#define SECUREBOOT_MODE_IDX ATCA_PARAM1_IDX
```

SecureBoot command index for mode.

### 10.77.2.345 SECUREBOOT\_MODE\_MASK

```
#define SECUREBOOT_MODE_MASK ((uint8_t)0x07)
```

SecureBoot mode mask.

### 10.77.2.346 SECUREBOOT\_MODE\_PROHIBIT\_FLAG

```
#define SECUREBOOT_MODE_PROHIBIT_FLAG ((uint8_t)0x40)
```

SecureBoot mode flag to prohibit SecureBoot until next power cycle.

### 10.77.2.347 SECUREBOOT\_RSP\_SIZE\_MAC

```
#define SECUREBOOT_RSP_SIZE_MAC (ATCA_PACKET_OVERHEAD + SECUREBOOT_MAC_SIZE)
```

SecureBoot response packet size with MAC.

### 10.77.2.348 SECUREBOOT\_RSP\_SIZE\_NO\_MAC

```
#define SECUREBOOT_RSP_SIZE_NO_MAC ATCA_RSP_SIZE_MIN
```

SecureBoot response packet size for no MAC.

### 10.77.2.349 SECUREBOOT\_SIGNATURE\_SIZE

```
#define SECUREBOOT_SIGNATURE_SIZE (64)
```

SecureBoot signature input size.



**10.77.2.350 SECUREBOOTCONFIG\_MODE\_DISABLED**

```
#define SECUREBOOTCONFIG_MODE_DISABLED ((uint16_t)0x0000)
```

Disabled SecureBootMode in SecureBootConfig value.

**10.77.2.351 SECUREBOOTCONFIG\_MODE\_FULL\_BOTH**

```
#define SECUREBOOTCONFIG_MODE_FULL_BOTH ((uint16_t)0x0001)
```

Both digest and signature always required SecureBootMode in SecureBootConfig value.

**10.77.2.352 SECUREBOOTCONFIG\_MODE\_FULL\_DIG**

```
#define SECUREBOOTCONFIG_MODE_FULL_DIG ((uint16_t)0x0003)
```

Digest stored SecureBootMode in SecureBootConfig value.

**10.77.2.353 SECUREBOOTCONFIG\_MODE\_FULL\_SIG**

```
#define SECUREBOOTCONFIG_MODE_FULL_SIG ((uint16_t)0x0002)
```

Signature stored SecureBootMode in SecureBootConfig value.

**10.77.2.354 SECUREBOOTCONFIG\_MODE\_MASK**

```
#define SECUREBOOTCONFIG_MODE_MASK ((uint16_t)0x0003)
```

Mask for SecureBootMode field in SecureBootConfig value.

**10.77.2.355 SECUREBOOTCONFIG\_OFFSET**

```
#define SECUREBOOTCONFIG_OFFSET (70)
```

SecureBootConfig byte offset into the configuration zone.

### 10.77.2.356 SELFTEST\_COUNT

```
#define SELFTEST_COUNT ATCA_CMD_SIZE_MIN
```

SelfTest command packet size.

### 10.77.2.357 SELFTEST\_MODE\_AES

```
#define SELFTEST_MODE_AES ((uint8_t)0x10)
```

SelfTest mode AES encrypt function.

### 10.77.2.358 SELFTEST\_MODE\_ALL

```
#define SELFTEST_MODE_ALL ((uint8_t)0x3B)
```

SelfTest mode all algorithms.

### 10.77.2.359 SELFTEST\_MODE\_ECDH

```
#define SELFTEST_MODE_ECDH ((uint8_t)0x08)
```

SelfTest mode ECDH function.

### 10.77.2.360 SELFTEST\_MODE\_ECDSA\_SIGN\_VERIFY

```
#define SELFTEST_MODE_ECDSA_SIGN_VERIFY ((uint8_t)0x02)
```

SelfTest mode ECDSA verify function.

### 10.77.2.361 SELFTEST\_MODE\_IDX

```
#define SELFTEST_MODE_IDX ATCA_PARAM1_IDX
```

SelfTest command index for mode.

**10.77.2.362 SELFTEST\_MODE\_RNG**

```
#define SELFTEST_MODE_RNG ((uint8_t)0x01)
```

SelfTest mode RNG DRBG function.

**10.77.2.363 SELFTEST\_MODE\_SHA**

```
#define SELFTEST_MODE_SHA ((uint8_t)0x20)
```

SelfTest mode SHA function.

**10.77.2.364 SELFTEST\_RSP\_SIZE**

```
#define SELFTEST_RSP_SIZE ATCA_RSP_SIZE_MIN
```

SelfTest command response packet size.

**10.77.2.365 SHA\_COUNT\_LONG**

```
#define SHA_COUNT_LONG ATCA_CMD_SIZE_MIN
```

Just a starting size.

**10.77.2.366 SHA\_COUNT\_SHORT**

```
#define SHA_COUNT_SHORT ATCA_CMD_SIZE_MIN
```

**10.77.2.367 SHA\_DATA\_MAX**

```
#define SHA_DATA_MAX (64)
```

### 10.77.2.368 SHA\_MODE\_608\_HMAC\_END

```
#define SHA_MODE_608_HMAC_END ((uint8_t)0x02)
```

Complete the HMAC computation and return digest... Different command on 608.

### 10.77.2.369 SHA\_MODE\_ECC204\_HMAC\_END

```
#define SHA_MODE_ECC204_HMAC_END ((uint8_t)0x02)
```

Complete the HMAC computation and return digest... Different mode on ECC204.

### 10.77.2.370 SHA\_MODE\_ECC204\_HMAC\_START

```
#define SHA_MODE_ECC204_HMAC_START ((uint8_t)0x03)
```

Initialization, HMAC calculation for ECC204.

### 10.77.2.371 SHA\_MODE\_HMAC\_END

```
#define SHA_MODE_HMAC_END ((uint8_t)0x05)
```

Complete the HMAC computation and return digest.

### 10.77.2.372 SHA\_MODE\_HMAC\_START

```
#define SHA_MODE_HMAC_START ((uint8_t)0x04)
```

Initialization, HMAC calculation.

### 10.77.2.373 SHA\_MODE\_HMAC\_UPDATE

```
#define SHA_MODE_HMAC_UPDATE ((uint8_t)0x01)
```

Add 64 bytes in the meesage to the SHA context.

**10.77.2.374 SHA\_MODE\_MASK**

```
#define SHA_MODE_MASK ((uint8_t)0x07)
```

Mask the bit 0-2.

**10.77.2.375 SHA\_MODE\_READ\_CONTEXT**

```
#define SHA_MODE_READ_CONTEXT ((uint8_t)0x06)
```

Read current SHA-256 context out of the device.

**10.77.2.376 SHA\_MODE\_SHA256\_END**

```
#define SHA_MODE_SHA256_END ((uint8_t)0x02)
```

Complete the calculation and return the digest.

**10.77.2.377 SHA\_MODE\_SHA256\_PUBLIC**

```
#define SHA_MODE_SHA256_PUBLIC ((uint8_t)0x03)
```

Add 64 byte ECC public key in the slot to the SHA context.

**10.77.2.378 SHA\_MODE\_SHA256\_START**

```
#define SHA_MODE_SHA256_START ((uint8_t)0x00)
```

Initialization, does not accept a message.

**10.77.2.379 SHA\_MODE\_SHA256\_UPDATE**

```
#define SHA_MODE_SHA256_UPDATE ((uint8_t)0x01)
```

Add 64 bytes in the message to the SHA context.

### 10.77.2.380 SHA\_MODE\_TARGET\_MASK

```
#define SHA_MODE_TARGET_MASK ((uint8_t)0xC0)
```

Resulting digest target location mask.

### 10.77.2.381 SHA\_MODE\_WRITE\_CONTEXT

```
#define SHA_MODE_WRITE_CONTEXT ((uint8_t)0x07)
```

Restore a SHA-256 context into the device.

### 10.77.2.382 SHA\_RSP\_SIZE

```
#define SHA_RSP_SIZE ATCA_RSP_SIZE_32
```

SHA command response packet size.

### 10.77.2.383 SHA\_RSP\_SIZE\_LONG

```
#define SHA_RSP_SIZE_LONG ATCA_RSP_SIZE_32
```

SHA command response packet size.

### 10.77.2.384 SHA\_RSP\_SIZE\_SHORT

```
#define SHA_RSP_SIZE_SHORT ATCA_RSP_SIZE_MIN
```

SHA command response packet size only status code.

### 10.77.2.385 SIGN\_COUNT

```
#define SIGN_COUNT ATCA_CMD_SIZE_MIN
```

Sign command packet size.

**10.77.2.386 SIGN\_KEYID\_IDX**

```
#define SIGN_KEYID_IDX ATCA_PARAM2_IDX
```

Sign command index for key id.

**10.77.2.387 SIGN\_MODE\_EXTERNAL**

```
#define SIGN_MODE_EXTERNAL ((uint8_t)0x80)
```

Sign mode bit 7: external.

**10.77.2.388 SIGN\_MODE\_IDX**

```
#define SIGN_MODE_IDX ATCA_PARAM1_IDX
```

Sign command index for mode.

**10.77.2.389 SIGN\_MODE\_INCLUDE\_SN**

```
#define SIGN_MODE_INCLUDE_SN ((uint8_t)0x40)
```

Sign mode bit 6: include serial number.

**10.77.2.390 SIGN\_MODE\_INTERNAL**

```
#define SIGN_MODE_INTERNAL ((uint8_t)0x00)
```

Sign mode 0: internal.

**10.77.2.391 SIGN\_MODE\_INVALIDATE**

```
#define SIGN_MODE_INVALIDATE ((uint8_t)0x01)
```

Sign mode bit 1: Signature will be used for Verify(Invalidate)

### 10.77.2.392 SIGN\_MODE\_MASK

```
#define SIGN_MODE_MASK ((uint8_t)0xE1)
```

Sign mode bits 1 to 4 are 0.

### 10.77.2.393 SIGN\_MODE\_SOURCE\_MASK

```
#define SIGN_MODE_SOURCE_MASK ((uint8_t)0x20)
```

Sign mode message source mask.

### 10.77.2.394 SIGN\_MODE\_SOURCE\_MSGDIGBUF

```
#define SIGN_MODE_SOURCE_MSGDIGBUF ((uint8_t)0x20)
```

Sign mode message source is the Message Digest Buffer.

### 10.77.2.395 SIGN\_MODE\_SOURCE\_TEMPKEY

```
#define SIGN_MODE_SOURCE_TEMPKEY ((uint8_t)0x00)
```

Sign mode message source is TempKey.

### 10.77.2.396 SIGN\_RSP\_SIZE

```
#define SIGN_RSP_SIZE ATCA_RSP_SIZE_MAX
```

Sign command response packet size.

### 10.77.2.397 UPDATE\_COUNT

```
#define UPDATE_COUNT ATCA_CMD_SIZE_MIN
```

UpdateExtra command packet size.



**10.77.2.398 UPDATE\_MODE\_DEC\_COUNTER**

```
#define UPDATE_MODE_DEC_COUNTER ((uint8_t)0x02)
```

UpdateExtra mode: decrement counter.

**10.77.2.399 UPDATE\_MODE\_IDX**

```
#define UPDATE_MODE_IDX ATCA_PARAM1_IDX
```

UpdateExtra command index for mode.

**10.77.2.400 UPDATE\_MODE\_SELECTOR**

```
#define UPDATE_MODE_SELECTOR ((uint8_t)0x01)
```

UpdateExtra mode update Selector (config byte 85)

**10.77.2.401 UPDATE\_MODE\_USER\_EXTRA**

```
#define UPDATE_MODE_USER_EXTRA ((uint8_t)0x00)
```

UpdateExtra mode update UserExtra (config byte 84)

**10.77.2.402 UPDATE\_MODE\_USER\_EXTRA\_ADD**

```
#define UPDATE_MODE_USER_EXTRA_ADD UPDATE_MODE_SELECTOR
```

UpdateExtra mode update UserExtraAdd (config byte 85)

**10.77.2.403 UPDATE\_RSP\_SIZE**

```
#define UPDATE_RSP_SIZE ATCA_RSP_SIZE_MIN
```

UpdateExtra command response packet size.

### 10.77.2.404 UPDATE\_VALUE\_IDX

```
#define UPDATE_VALUE_IDX ATCA_PARAM2_IDX
```

UpdateExtra command index for new value.

### 10.77.2.405 VERIFY\_256\_EXTERNAL\_COUNT

```
#define VERIFY_256_EXTERNAL_COUNT (135)
```

Verify command packet size for 256-bit key in external mode.

### 10.77.2.406 VERIFY\_256\_KEY\_SIZE

```
#define VERIFY_256_KEY_SIZE ( 64)
```

Verify key size for 256-bit key.

### 10.77.2.407 VERIFY\_256\_SIGNATURE\_SIZE

```
#define VERIFY_256_SIGNATURE_SIZE ( 64)
```

Verify signature size for 256-bit key.

### 10.77.2.408 VERIFY\_256\_STORED\_COUNT

```
#define VERIFY_256_STORED_COUNT ( 71)
```

Verify command packet size for 256-bit key in stored mode.

### 10.77.2.409 VERIFY\_256\_VALIDATE\_COUNT

```
#define VERIFY_256_VALIDATE_COUNT ( 90)
```

Verify command packet size for 256-bit key in validate mode.

**10.77.2.410 VERIFY\_283\_EXTERNAL\_COUNT**

```
#define VERIFY_283_EXTERNAL_COUNT (151)
```

Verify command packet size for 283-bit key in external mode.

**10.77.2.411 VERIFY\_283\_KEY\_SIZE**

```
#define VERIFY_283_KEY_SIZE ( 72)
```

Verify key size for 283-bit key.

**10.77.2.412 VERIFY\_283\_SIGNATURE\_SIZE**

```
#define VERIFY_283_SIGNATURE_SIZE ( 72)
```

Verify signature size for 283-bit key.

**10.77.2.413 VERIFY\_283\_STORED\_COUNT**

```
#define VERIFY_283_STORED_COUNT ( 79)
```

Verify command packet size for 283-bit key in stored mode.

**10.77.2.414 VERIFY\_283\_VALIDATE\_COUNT**

```
#define VERIFY_283_VALIDATE_COUNT ( 98)
```

Verify command packet size for 283-bit key in validate mode.

**10.77.2.415 VERIFY\_DATA\_IDX**

```
#define VERIFY_DATA_IDX ( 5)
```

Verify command index for data.

### 10.77.2.416 VERIFY\_KEY\_B283

```
#define VERIFY_KEY_B283 ((uint16_t)0x0000)
```

Verify key type: B283.

### 10.77.2.417 VERIFY\_KEY\_K283

```
#define VERIFY_KEY_K283 ((uint16_t)0x0001)
```

Verify key type: K283.

### 10.77.2.418 VERIFY\_KEY\_P256

```
#define VERIFY_KEY_P256 ((uint16_t)0x0004)
```

Verify key type: P256.

### 10.77.2.419 VERIFY\_KEYID\_IDX

```
#define VERIFY_KEYID_IDX ATCA_PARAM2_IDX
```

Verify command index for key id.

### 10.77.2.420 VERIFY\_MODE\_EXTERNAL

```
#define VERIFY_MODE_EXTERNAL ((uint8_t)0x02)
```

Verify mode: external.

### 10.77.2.421 VERIFY\_MODE\_IDX

```
#define VERIFY_MODE_IDX ATCA_PARAM1_IDX
```

Verify command index for mode.

**10.77.2.422 VERIFY\_MODE\_INVALIDATE**

```
#define VERIFY_MODE_INVALIDATE ((uint8_t)0x07)
```

Verify mode: invalidate.

**10.77.2.423 VERIFY\_MODE\_MAC\_FLAG**

```
#define VERIFY_MODE_MAC_FLAG ((uint8_t)0x80)
```

Verify mode: MAC.

**10.77.2.424 VERIFY\_MODE\_MASK**

```
#define VERIFY_MODE_MASK ((uint8_t)0x07)
```

Verify mode bits 3 to 7 are 0.

**10.77.2.425 VERIFY\_MODE\_SOURCE\_MASK**

```
#define VERIFY_MODE_SOURCE_MASK ((uint8_t)0x20)
```

Verify mode message source mask.

**10.77.2.426 VERIFY\_MODE\_SOURCE\_MSGDIGBUF**

```
#define VERIFY_MODE_SOURCE_MSGDIGBUF ((uint8_t)0x20)
```

Verify mode message source is the Message Digest Buffer.

**10.77.2.427 VERIFY\_MODE\_SOURCE\_TEMPKEY**

```
#define VERIFY_MODE_SOURCE_TEMPKEY ((uint8_t)0x00)
```

Verify mode message source is TempKey.

### 10.77.2.428 VERIFY\_MODE\_STORED

```
#define VERIFY_MODE_STORED ((uint8_t)0x00)
```

Verify mode: stored.

### 10.77.2.429 VERIFY\_MODE\_VALIDATE

```
#define VERIFY_MODE_VALIDATE ((uint8_t)0x03)
```

Verify mode: validate.

### 10.77.2.430 VERIFY\_MODE\_VALIDATE\_EXTERNAL

```
#define VERIFY_MODE_VALIDATE_EXTERNAL ((uint8_t)0x01)
```

Verify mode: validate external.

### 10.77.2.431 VERIFY\_OTHER\_DATA\_SIZE

```
#define VERIFY_OTHER_DATA_SIZE ( 19)
```

Verify size of "other data".

### 10.77.2.432 VERIFY\_RSP\_SIZE

```
#define VERIFY_RSP_SIZE ATCA_RSP_SIZE_MIN
```

Verify command response packet size.

### 10.77.2.433 VERIFY\_RSP\_SIZE\_MAC

```
#define VERIFY_RSP_SIZE_MAC ATCA_RSP_SIZE_32
```

Verify command response packet size with validating MAC.

**10.77.2.434 WRITE\_ADDR\_IDX**

```
#define WRITE_ADDR_IDX ATCA_PARAM2_IDX
```

Write command index for address.

**10.77.2.435 WRITE\_MAC\_SIZE**

```
#define WRITE_MAC_SIZE (32)
```

Write MAC size.

**10.77.2.436 WRITE\_MAC\_VL\_IDX**

```
#define WRITE_MAC_VL_IDX (37)
```

Write command index for MAC following long data.

**10.77.2.437 WRITE\_MAC\_VS\_IDX**

```
#define WRITE_MAC_VS_IDX ( 9)
```

Write command index for MAC following short data.

**10.77.2.438 WRITE\_RSP\_SIZE**

```
#define WRITE_RSP_SIZE ATCA_RSP_SIZE_MIN
```

Write command response packet size.

**10.77.2.439 WRITE\_VALUE\_IDX**

```
#define WRITE_VALUE_IDX ATCA_DATA_IDX
```

Write command index for data.

### 10.77.2.440 WRITE\_ZONE\_DATA

```
#define WRITE_ZONE_DATA ((uint8_t)2)
```

Write zone id data.

### 10.77.2.441 WRITE\_ZONE\_IDX

```
#define WRITE_ZONE_IDX ATCA_PARAM1_IDX
```

Write command index for zone.

### 10.77.2.442 WRITE\_ZONE\_MASK

```
#define WRITE_ZONE_MASK ((uint8_t)0xC3)
```

Write zone bits 2 to 5 are 0.

### 10.77.2.443 WRITE\_ZONE\_OTP

```
#define WRITE_ZONE_OTP ((uint8_t)1)
```

Write zone id OTP.

### 10.77.2.444 WRITE\_ZONE\_WITH\_MAC

```
#define WRITE_ZONE_WITH_MAC ((uint8_t)0x40)
```

Write zone bit 6: write encrypted with MAC.

## 10.77.3 Function Documentation

### 10.77.3.1 atAES()

```
ATCA_STATUS atAES (  
    ATCADeviceType device_type,  
    ATCAPacket * packet )
```

### 10.77.3.2 atCalcCrc()

```
void atCalcCrc (  
    ATCAPacket * packet )
```

This function calculates CRC and adds it to the correct offset in the packet data.



## Parameters

in	<i>packet</i>	Packet to calculate CRC data for
----	---------------	----------------------------------

**10.77.3.3 atCheckCrc()**

```
ATCA_STATUS atCheckCrc (  
    const uint8_t * response )
```

This function checks the consistency of a response.

## Parameters

in	<i>response</i>	pointer to response
----	-----------------	---------------------

## Returns

ATCA\_SUCCESS on success, otherwise ATCA\_RX\_CRC\_ERROR

**10.77.3.4 atCheckMAC()**

```
ATCA_STATUS atCheckMAC (  
    ATCADeviceType device_type,  
    ATCAPacket * packet )
```

**10.77.3.5 atCounter()**

```
ATCA_STATUS atCounter (  
    ATCADeviceType device_type,  
    ATCAPacket * packet )
```

**10.77.3.6 atCRC()**

```
void atCRC (  
    size_t length,  
    const uint8_t * data,  
    uint8_t * crc_le )
```

Calculates CRC over the given raw data and returns the CRC in little-endian byte order.

## Parameters

in	<i>length</i>	Size of data not including the CRC byte positions
in	<i>data</i>	Pointer to the data over which to compute the CRC
out	<i>crc↔_le</i>	Pointer to the place where the two-bytes of CRC will be returned in little-endian byte order.

**10.77.3.7 atDeriveKey()**

```
ATCA_STATUS atDeriveKey (
    ATCADeviceType device_type,
    ATCAPacket * packet,
    bool has_mac )
```

**10.77.3.8 atECDH()**

```
ATCA_STATUS atECDH (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

**10.77.3.9 atGenDig()**

```
ATCA_STATUS atGenDig (
    ATCADeviceType device_type,
    ATCAPacket * packet,
    bool is_no_mac_key )
```

**10.77.3.10 atGenKey()**

```
ATCA_STATUS atGenKey (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

**10.77.3.11 atHMAC()**

```
ATCA_STATUS atHMAC (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

**10.77.3.12 atInfo()**

```
ATCA_STATUS atInfo (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

ATCACommand Info method.

**Parameters**

in	<i>ca_cmd</i>	instance
in	<i>packet</i>	pointer to the packet containing the command being built

**Returns**

ATCA\_SUCCESS

**10.77.3.13 atIsECCFamily()**

```
bool atIsECCFamily (
    ATCADeviceType device_type )
```

determines if a given device type is an ECC device or a superset of a ECC device

**Parameters**

in	<i>device_type</i>	Type of device to check for family type
----	--------------------	---

**Returns**

boolean indicating whether the given device is an ECC family device.

**10.77.3.14 atIsSHAFamily()**

```
bool atIsSHAFamily (
    ATCADeviceType device_type )
```

determines if a given device type is a SHA device or a superset of a SHA device

**Parameters**

in	<i>device_type</i>	Type of device to check for family type
----	--------------------	---

**Returns**

boolean indicating whether the given device is a SHA family device.

**10.77.3.15 atKDF()**

```
ATCA_STATUS atKDF (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

**10.77.3.16 atLock()**

```
ATCA_STATUS atLock (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

**10.77.3.17 atMAC()**

```
ATCA_STATUS atMAC (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

**10.77.3.18 atNonce()**

```
ATCA_STATUS atNonce (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

**10.77.3.19 atPause()**

```
ATCA_STATUS atPause (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

ATCACommand Pause method.

**Parameters**

in	<i>ca_cmd</i>	instance
in	<i>packet</i>	pointer to the packet containing the command being built

**Returns**

ATCA\_SUCCESS

**10.77.3.20 atPrivWrite()**

```
ATCA_STATUS atPrivWrite (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

**10.77.3.21 atRandom()**

```
ATCA_STATUS atRandom (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

**10.77.3.22 atRead()**

```
ATCA_STATUS atRead (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

**10.77.3.23 atSecureBoot()**

```
ATCA_STATUS atSecureBoot (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

**10.77.3.24 atSelfTest()**

```
ATCA_STATUS atSelfTest (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

**10.77.3.25 atSHA()**

```
ATCA_STATUS atSHA (
    ATCADeviceType device_type,
    ATCAPacket * packet,
    uint16_t write_context_size )
```

### 10.77.3.26 atSign()

```
ATCA_STATUS atSign (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

### 10.77.3.27 atUpdateExtra()

```
ATCA_STATUS atUpdateExtra (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

### 10.77.3.28 atVerify()

```
ATCA_STATUS atVerify (
    ATCADeviceType device_type,
    ATCAPacket * packet )
```

### 10.77.3.29 atWrite()

```
ATCA_STATUS atWrite (
    ATCADeviceType device_type,
    ATCAPacket * packet,
    bool has_mac )
```

### 10.77.3.30 isATCAError()

```
ATCA_STATUS isATCAError (
    uint8_t * data )
```

checks for basic error frame in data

#### Parameters

in	data	pointer to received data - expected to be in the form of a CA device response frame
----	------	---

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 10.78 calib\_config\_check.h File Reference

Consistency checks for configuration options.

```
#include "atca_config_check.h"
```

### Macros

- `#define CALIB_SHA204_EN DEFAULT_ENABLED`
- `#define CALIB_SHA206_EN DEFAULT_ENABLED`
- `#define CALIB_ECC508_EN DEFAULT_ENABLED`
- `#define CALIB_FULL_FEATURE (CALIB_SHA204_EN || CALIB_ECC108_EN || CALIB_ECC508_EN || CALIB_ECC608_EN)`
- `#define CALIB_ECC_SUPPORT (CALIB_ECC108_EN || CALIB_ECC508_EN || CALIB_ECC608_EN || CALIB_ECC204_EN)`
- `#define CALIB_ECC204_ONLY (CALIB_ECC204_EN && !(CALIB_FULL_FEATURE || CALIB_SHA206_EN))`
- `#define CALIB_SHA206_ONLY (CALIB_SHA206_EN && !(CALIB_FULL_FEATURE || CALIB_ECC204_EN))`
- `#define CALIB_AES_EN (ATCAB_AES_EN && CALIB_ECC608_EN)`
- `#define CALIB_AES_GCM_EN (ATCAB_AES_GCM_EN && CALIB_AES_EN && CALIB_ECC608_EN)`
- `#define CALIB_CHECKMAC_EN (ATCAB_CHECKMAC_EN && CALIB_FULL_FEATURE)`
- `#define CALIB_COUNTER_EN (ATCAB_COUNTER_EN && CALIB_ECC_SUPPORT)`
- `#define CALIB_DERIVEKEY_EN (ATCAB_DERIVEKEY_EN && (CALIB_FULL_FEATURE || CALIB_SHA206_EN))`
- `#define CALIB_ECDH_EN (ATCAB_ECDH_EN && (CALIB_ECC508_EN || CALIB_ECC608_EN))`
- `#define CALIB_ECDH_ENC_EN (ATCAB_ECDH_ENC_EN && (CALIB_ECC508_EN || CALIB_ECC608_EN))`
- `#define CALIB_GENDIG_EN (ATCAB_GENDIG_EN && CALIB_FULL_FEATURE)`
- `#define CALIB_GENKEY_EN (ATCAB_GENKEY_EN && CALIB_ECC_SUPPORT)`
- `#define CALIB_GENKEY_MAC_EN (ATCAB_GENKEY_MAC_EN && CALIB_ECC_SUPPORT)`
- `#define CALIB_HMAC_EN (ATCAB_HMAC_EN && (CALIB_SHA204_EN || CALIB_ECC108_EN || CALIB_ECC508_EN))`
- `#define CALIB_INFO_LATCH_EN ATCAB_INFO_LATCH_EN`
- `#define CALIB_KDF_EN (ATCAB_KDF_EN && CALIB_ECC608_EN)`
- `#define CALIB_LOCK_EN (ATCAB_LOCK_EN && CALIB_FULL_FEATURE)`
- `#define CALIB_LOCK_ECC204_EN (ATCAB_LOCK_EN && CALIB_ECC204_EN)`
- `#define CALIB_MAC_EN (ATCAB_MAC_EN && (CALIB_FULL_FEATURE || CALIB_SHA206_EN))`
- `#define CALIB_NONCE_EN (ATCAB_NONCE_EN && (CALIB_FULL_FEATURE || CALIB_ECC204_EN))`
- `#define CALIB_PRIVWRITE_EN (ATCAB_PRIVWRITE_EN && (CALIB_ECC108_EN || CALIB_ECC508_EN || CALIB_ECC608_EN))`
- `#define CALIB_RANDOM_EN (ATCAB_RANDOM_EN && CALIB_FULL_FEATURE)`
- `#define CALIB_READ_EN (ATCAB_READ_EN && (CALIB_FULL_FEATURE || CALIB_SHA206_EN))`
- `#define CALIB_READ_ECC204_EN (ATCAB_READ_EN && CALIB_ECC204_EN)`
- `#define CALIB_READ_ENC_EN (ATCAB_READ_ENC_EN && CALIB_FULL_FEATURE)`
- `#define CALIB_SECUREBOOT_EN (ATCAB_SECUREBOOT_EN && CALIB_ECC608_EN)`
- `#define CALIB_SECUREBOOT_MAC_EN (ATCAB_SECUREBOOT_MAC_EN && CALIB_ECC608_EN)`
- `#define CALIB_SELFTEST_EN (ATCAB_SELFTEST_EN && (CALIB_ECC608_EN || CALIB_ECC204_EN))`
- `#define CALIB_SHA_EN (ATCAB_SHA_EN && (CALIB_FULL_FEATURE || CALIB_ECC204_EN))`
- `#define CALIB_SHA_HMAC_EN (ATCAB_SHA_HMAC_EN && CALIB_ECC_SUPPORT)`
- `#define CALIB_SHA_CONTEXT_EN (ATCAB_SHA_CONTEXT_EN && CALIB_ECC608_EN)`
- `#define CALIB_SIGN_EN (ATCAB_SIGN_EN && (CALIB_ECC108_EN || CALIB_ECC508_EN || CALIB_ECC608_EN))`
- `#define CALIB_SIGN_ECC204_EN (ATCAB_SIGN_EN && CALIB_ECC204_EN)`
- `#define CALIB_SIGN_INTERNAL_EN (ATCAB_SIGN_INTERNAL_EN && CALIB_SIGN_EN)`

- `#define CALIB_UPDATEEXTRA_EN (ATCAB_UPDATEEXTRA_EN && CALIB_FULL_FEATURE)`
- `#define CALIB_VERIFY_EN (ATCAB_VERIFY_EN && (CALIB_ECC108_EN || CALIB_ECC508_EN || CALIB_ECC608_EN))`
- `#define CALIB_VERIFY_MAC_EN (ATCAB_VERIFY_EXTERN_STORED_MAC_EN && CALIB_ECC608_EN)`
- `#define CALIB_VERIFY_EXTERN_EN (ATCAB_VERIFY_EXTERN_EN && CALIB_VERIFY_EN)`
- `#define CALIB_VERIFY_STORED_EN (ATCAB_VERIFY_STORED_EN && CALIB_VERIFY_EN)`
- `#define CALIB_VERIFY_VALIDATE_EN (ATCAB_VERIFY_VALIDATE_EN && CALIB_VERIFY_EN)`
- `#define CALIB_WRITE_EN (ATCAB_WRITE_EN && (CALIB_FULL_FEATURE || CALIB_SHA206_EN))`
- `#define CALIB_WRITE_ENC_EN (ATCAB_WRITE_ENC_EN && CALIB_FULL_FEATURE)`
- `#define CALIB_WRITE_ECC204_EN (ATCAB_WRITE_EN && CALIB_ECC204_EN)`
- `#define CALIB_WRITE_ENC_ECC204_EN (ATCAB_WRITE_ENC_EN && CALIB_WRITE_ECC204_EN && CALIB_NONCE_EN)`

### 10.78.1 Detailed Description

Consistency checks for configuration options.

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### 10.78.2 Macro Definition Documentation

#### 10.78.2.1 CALIB\_AES\_EN

```
#define CALIB_AES_EN (ATCAB_AES_EN && CALIB_ECC608_EN)
```

#### 10.78.2.2 CALIB\_AES\_GCM\_EN

```
#define CALIB_AES_GCM_EN (ATCAB_AES_GCM_EN && CALIB_AES_EN && CALIB_ECC608_EN)
```

#### 10.78.2.3 CALIB\_CHECKMAC\_EN

```
#define CALIB_CHECKMAC_EN (ATCAB_CHECKMAC_EN && CALIB_FULL_FEATURE)
```



#### 10.78.2.4 CALIB\_COUNTER\_EN

```
#define CALIB_COUNTER_EN (ATCAB_COUNTER_EN && CALIB_ECC_SUPPORT)
```

#### 10.78.2.5 CALIB\_DERIVEKEY\_EN

```
#define CALIB_DERIVEKEY_EN (ATCAB_DERIVEKEY_EN && (CALIB_FULL_FEATURE || CALIB_SHA206_EN))
```

#### 10.78.2.6 CALIB\_ECC204\_ONLY

```
#define CALIB_ECC204_ONLY (CALIB_ECC204_EN && !(CALIB_FULL_FEATURE || CALIB_SHA206_EN))
```

#### 10.78.2.7 CALIB\_ECC508\_EN

```
#define CALIB_ECC508_EN DEFAULT_ENABLED
```

#### 10.78.2.8 CALIB\_ECC\_SUPPORT

```
#define CALIB_ECC_SUPPORT (CALIB_ECC108_EN || CALIB_ECC508_EN || CALIB_ECC608_EN || CALIB_ECC204↵_EN)
```

#### 10.78.2.9 CALIB\_ECDH\_EN

```
#define CALIB_ECDH_EN (ATCAB_ECDH_EN && (CALIB_ECC508_EN || CALIB_ECC608_EN))
```

#### 10.78.2.10 CALIB\_ECDH\_ENC\_EN

```
#define CALIB_ECDH_ENC_EN (ATCAB_ECDH_ENC_EN && (CALIB_ECC508_EN || CALIB_ECC608_EN))
```

### 10.78.2.11 CALIB\_FULL\_FEATURE

```
#define CALIB_FULL_FEATURE (CALIB_SHA204_EN || CALIB_ECC108_EN || CALIB_ECC508_EN || CALIB_ECC608_EN)
```

### 10.78.2.12 CALIB\_GENDIG\_EN

```
#define CALIB_GENDIG_EN (ATCAB_GENDIG_EN && CALIB_FULL_FEATURE)
```

### 10.78.2.13 CALIB\_GENKEY\_EN

```
#define CALIB_GENKEY_EN (ATCAB_GENKEY_EN && CALIB_ECC_SUPPORT)
```

### 10.78.2.14 CALIB\_GENKEY\_MAC\_EN

```
#define CALIB_GENKEY_MAC_EN (ATCAB_GENKEY_MAC_EN && CALIB_ECC_SUPPORT)
```

### 10.78.2.15 CALIB\_HMAC\_EN

```
#define CALIB_HMAC_EN (ATCAB_HMAC_EN && (CALIB_SHA204_EN || CALIB_ECC108_EN || CALIB_ECC508))
```

### 10.78.2.16 CALIB\_INFO\_LATCH\_EN

```
#define CALIB_INFO_LATCH_EN ATCAB_INFO_LATCH_EN
```

Supported API's: calib\_info\_get\_latch calib\_info\_set\_latch

ECC204 specific api: calib\_info\_lock\_status

### 10.78.2.17 CALIB\_KDF\_EN

```
#define CALIB_KDF_EN (ATCAB_KDF_EN && CALIB_ECC608_EN)
```

#### 10.78.2.18 CALIB\_LOCK\_ECC204\_EN

```
#define CALIB_LOCK_ECC204_EN (ATCAB_LOCK_EN && CALIB_ECC204_EN)
```

Enable CALIB\_LOCK\_ECC204\_EN which enables the lock command for the ecc204 device

Supported API's: calib\_lock

#### 10.78.2.19 CALIB\_LOCK\_EN

```
#define CALIB_LOCK_EN (ATCAB_LOCK_EN && CALIB_FULL_FEATURE)
```

Enable CALIB\_LOCK\_EN to enable the lock commands for the classic cryptoauth parts

Supported API's: calib\_lock

#### 10.78.2.20 CALIB\_MAC\_EN

```
#define CALIB_MAC_EN (ATCAB_MAC_EN && (CALIB_FULL_FEATURE || CALIB_SHA206_EN))
```

#### 10.78.2.21 CALIB\_NONCE\_EN

```
#define CALIB_NONCE_EN (ATCAB_NONCE_EN && (CALIB_FULL_FEATURE || CALIB_ECC204_EN))
```

#### 10.78.2.22 CALIB\_PRIVWRITE\_EN

```
#define CALIB_PRIVWRITE_EN (ATCAB_PRIVWRITE_EN && (CALIB_ECC108_EN || CALIB_ECC508_EN || CALIB_ECC608_EN))
```

#### 10.78.2.23 CALIB\_RANDOM\_EN

```
#define CALIB_RANDOM_EN (ATCAB_RANDOM_EN && CALIB_FULL_FEATURE)
```

#### 10.78.2.24 CALIB\_READ\_ECC204\_EN

```
#define CALIB_READ_ECC204_EN (ATCAB_READ_EN && CALIB_ECC204_EN)
```

### 10.78.2.25 CALIB\_READ\_EN

```
#define CALIB_READ_EN (ATCAB_READ_EN && (CALIB_FULL_FEATURE || CALIB_SHA206_EN))
```

Enable CALIB\_READ\_EN which enables the read commands

Supported API's: calib\_read\_zone

### 10.78.2.26 CALIB\_READ\_ENC\_EN

```
#define CALIB_READ_ENC_EN (ATCAB_READ_ENC_EN && CALIB_FULL_FEATURE)
```

### 10.78.2.27 CALIB\_SECUREBOOT\_EN

```
#define CALIB_SECUREBOOT_EN (ATCAB_SECUREBOOT_EN && CALIB_ECC608_EN)
```

### 10.78.2.28 CALIB\_SECUREBOOT\_MAC\_EN

```
#define CALIB_SECUREBOOT_MAC_EN (ATCAB_SECUREBOOT_MAC_EN && CALIB_ECC608_EN)
```

### 10.78.2.29 CALIB\_SELFTEST\_EN

```
#define CALIB_SELFTEST_EN (ATCAB_SELFTEST_EN && (CALIB_ECC608_EN || CALIB_ECC204_EN))
```

### 10.78.2.30 CALIB\_SHA204\_EN

```
#define CALIB_SHA204_EN DEFAULT_ENABLED
```

### 10.78.2.31 CALIB\_SHA206\_EN

```
#define CALIB_SHA206_EN DEFAULT_ENABLED
```

### 10.78.2.32 CALIB\_SHA206\_ONLY

```
#define CALIB_SHA206_ONLY (CALIB_SHA206_EN && !(CALIB_FULL_FEATURE || CALIB_ECC204_EN))
```

### 10.78.2.33 CALIB\_SHA\_CONTEXT\_EN

```
#define CALIB_SHA_CONTEXT_EN (ATCAB_SHA_CONTEXT_EN && CALIB_ECC608_EN)
```

Requires: CALIB\_SHA\_BASE

Use the SHA command to compute an HMAC/SHA-256 operation

Supported API's: calib\_sha\_read\_context

### 10.78.2.34 CALIB\_SHA\_EN

```
#define CALIB_SHA_EN (ATCAB_SHA_EN && (CALIB_FULL_FEATURE || CALIB_ECC204_EN))
```

Enable CALIB\_SHA\_EN to compute a SHA-256 or HMAC/SHA-256 digest for general purpose use by the host system

Supported API's: calib\_sha\_base

### 10.78.2.35 CALIB\_SHA\_HMAC\_EN

```
#define CALIB_SHA_HMAC_EN (ATCAB_SHA_HMAC_EN && CALIB_ECC_SUPPORT)
```

Requires: CALIB\_SHA\_HMAC CALIB\_SHA\_BASE

Use the SHA command to compute an HMAC/SHA-256 operation

Supported API's: calib\_sha\_hmac, calib\_sha\_hmac\_init, calib\_sha\_hmac\_update, calib\_sha\_hmac\_finish

### 10.78.2.36 CALIB\_SIGN\_ECC204\_EN

```
#define CALIB_SIGN_ECC204_EN (ATCAB_SIGN_EN && CALIB_ECC204_EN)
```

Enable CALIB\_SIGN\_ECC204\_EN to generate a signature using the ECDSA algorithm

Supported API's: calib\_sign\_base

### 10.78.2.37 CALIB\_SIGN\_EN

```
#define CALIB_SIGN_EN (ATCAB_SIGN_EN && (CALIB_ECC108_EN || CALIB_ECC508_EN || CALIB_ECC608_EN))
```

Enable CALIB\_SIGN\_EN to generate a signature using the ECDSA algorithm

Supported API's: calib\_sign

### 10.78.2.38 CALIB\_SIGN\_INTERNAL\_EN

```
#define CALIB_SIGN_INTERNAL_EN (ATCAB_SIGN_INTERNAL_EN && CALIB_SIGN_EN)
```

### 10.78.2.39 CALIB\_UPDATEEXTRA\_EN

```
#define CALIB_UPDATEEXTRA_EN (ATCAB_UPDATEEXTRA_EN && CALIB_FULL_FEATURE)
```

Enable CALIB\_UPDATEEXTRA\_EN to update the values of the two extra bytes within the configuration zone (bytes 84 and 85)

Supported API's: calib\_updateextra

### 10.78.2.40 CALIB\_VERIFY\_EN

```
#define CALIB_VERIFY_EN (ATCAB_VERIFY_EN && (CALIB_ECC108_EN || CALIB_ECC508_EN || CALIB_ECC608_↵  
_EN))
```

Enable CALIB\_VERIFY\_EN which takes an ECDSA [R,S] signature and verifies that it is correctly generated from a given message and public key. In all cases, the signature is an input to the command

Supported API's: calib\_verify

### 10.78.2.41 CALIB\_VERIFY\_EXTERN\_EN

```
#define CALIB_VERIFY_EXTERN_EN (ATCAB_VERIFY_EXTERN_EN && CALIB_VERIFY_EN)
```

### 10.78.2.42 CALIB\_VERIFY\_MAC\_EN

```
#define CALIB_VERIFY_MAC_EN (ATCAB_VERIFY_EXTERN_STORED_MAC_EN && CALIB_ECC608_EN)
```

Requires: CALIB\_NONCE\_MODE\_ENCODING CALIB\_NONCE\_BASE ATCAH\_VERIFY\_MAC ATCAC\_SW\_S↵  
HA2\_256 CALIB\_VERIFY

Executes verification command with verification MAC for the External or Stored Verify modes

Supported API's: calib\_verify\_extern\_stored\_mac, calib\_verify\_extern\_mac, calib\_verify\_stored\_mac

### 10.78.2.43 CALIB\_VERIFY\_STORED\_EN

```
#define CALIB_VERIFY_STORED_EN (ATCAB_VERIFY_STORED_EN && CALIB_VERIFY_EN)
```

Requires: CALIB\_NONCE\_MODE\_ENCODING CALIB\_NONCE\_BASE CALIB\_VERIFY

Verifies a signature (ECDSA verify operation) with a public key stored in the device

Supported API's: calib\_verify\_stored

**10.78.2.44 CALIB\_VERIFY\_VALIDATE\_EN**

```
#define CALIB_VERIFY_VALIDATE_EN (ATCAB_VERIFY_VALIDATE_EN && CALIB_VERIFY_EN)
```

**10.78.2.45 CALIB\_WRITE\_ECC204\_EN**

```
#define CALIB_WRITE_ECC204_EN (ATCAB_WRITE_EN && CALIB_ECC204_EN)
```

**10.78.2.46 CALIB\_WRITE\_EN**

```
#define CALIB_WRITE_EN (ATCAB_WRITE_EN && (CALIB_FULL_FEATURE || CALIB_SHA206_EN))
```

**10.78.2.47 CALIB\_WRITE\_ENC\_ECC204\_EN**

```
#define CALIB_WRITE_ENC_ECC204_EN (ATCAB_WRITE_ENC_EN && CALIB_WRITE_ECC204_EN && CALIB_NONCE_EN)
```

**10.78.2.48 CALIB\_WRITE\_ENC\_EN**

```
#define CALIB_WRITE_ENC_EN (ATCAB_WRITE_ENC_EN && CALIB_FULL_FEATURE)
```

Requires: CALIB\_NONCE\_MODE\_ENCODING CALIB\_NONCE\_BASE CALIB\_READ\_ZONE CALIB\_GENDIG ATCAH\_GENDIG ATCAH\_WRITE\_AUTH\_MAC ATCAH\_NONCE ATCAC\_SW\_SHA2\_256 CALIB\_WRITE ATCAH\_GEN\_SESSION\_KEY

Performs an encrypted write of a 32 byte block into given slot

Supported API's: calib\_write\_enc

Supported ECC204 specific API's: calib\_ecc204\_write\_enc

**10.79 calib\_counter.c File Reference**

CryptoAuthLib Basic API methods for Counter command.

```
#include "cryptoauthlib.h"
```

### 10.79.1 Detailed Description

CryptoAuthLib Basic API methods for Counter command.

The Counter command reads or increments the binary count value for one of the two monotonic counters

#### Note

List of devices that support this command - ATECC508A and ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.80 calib\_derivekey.c File Reference

CryptoAuthLib Basic API methods for DeriveKey command.

```
#include "cryptoauthlib.h"
```

### 10.80.1 Detailed Description

CryptoAuthLib Basic API methods for DeriveKey command.

The DeriveKey command combines the current value of a key with the nonce stored in TempKey using SHA-256 and derives a new key.

#### Note

List of devices that support this command - ATSHA204A, ATECC108A, ATECC508A, and ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.81 calib\_ecdh.c File Reference

CryptoAuthLib Basic API methods for ECDH command.

```
#include "cryptoauthlib.h"  
#include "host/atca_host.h"
```



### 10.81.1 Detailed Description

CryptoAuthLib Basic API methods for ECDH command.

The ECDH command implements the Elliptic Curve Diffie-Hellman algorithm to combine an internal private key with an external public key to calculate a shared secret.

#### Note

List of devices that support this command - ATECC508A, ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.82 calib\_execution.c File Reference

Implements an execution handler that executes a given command on a device and returns the results.

```
#include "cryptoauthlib.h"
```

### Functions

- [ATCA\\_STATUS calib\\_get\\_execution\\_time](#) (uint8\_t opcode, [ATCADevice](#) device)  
*return the typical execution time for the given command*
- [ATCA\\_STATUS calib\\_execute\\_send](#) ([ATCADevice](#) device, uint8\_t device\_address, uint8\_t \*txdata, uint16\_t txlength)
- [ATCA\\_STATUS calib\\_execute\\_receive](#) ([ATCADevice](#) device, uint8\_t device\_address, uint8\_t \*rxdata, uint16\_t rxlength)
- [ATCA\\_STATUS calib\\_execute\\_command](#) ([ATCAPacket](#) \*packet, [ATCADevice](#) device)  
*Wakes up device, sends the packet, waits for command completion, receives response, and puts the device into the idle state.*

### 10.82.1 Detailed Description

Implements an execution handler that executes a given command on a device and returns the results.

This implementation wraps Polling and No polling (simple wait) schemes into a single method and use it across the library. Polling is used by default, however, by defining the ATCA\_NO\_POLL symbol the code will instead wait an estimated max execution time before requesting the result.

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## 10.82.2 Function Documentation

### 10.82.2.1 calib\_execute\_command()

```
ATCA_STATUS calib_execute_command (
    ATCAPacket * packet,
    ATCADevice device )
```

Wakes up device, sends the packet, waits for command completion, receives response, and puts the device into the idle state.

## 10.82 calib\_execution.c File Reference

---

### Parameters

in, out	<i>packet</i>	As input, the packet to be sent. As output, the data buffer in the packet structure will contain the response.
in	<i>device</i>	CryptoAuthentication device to send the command to.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.82.2.2 calib\_execute\_receive()

```
ATCA_STATUS calib_execute_receive (
    ATCADevice device,
    uint8_t device_address,
    uint8_t * rxdata,
    uint16_t * rxlength )
```

#### 10.82.2.3 calib\_execute\_send()

```
ATCA_STATUS calib_execute_send (
    ATCADevice device,
    uint8_t device_address,
    uint8_t * txdata,
    uint16_t txlength )
```

#### 10.82.2.4 calib\_get\_execution\_time()

```
ATCA_STATUS calib_get_execution_time (
    uint8_t opcode,
    ATCADevice device )
```

return the typical execution time for the given command

### Parameters

in	<i>opcode</i>	Opcode value of the command
in	<i>ca_cmd</i>	Command object for which the execution times are associated

### Returns

ATCA\_SUCCESS

## 10.83 calib\_execution.h File Reference

Defines an execution handler that executes a given command on a device and returns the results.

```
#include "atca_status.h"
#include "calib_command.h"
#include "atca_device.h"
#include "atca_config.h"
```

### Data Structures

- struct [device\\_execution\\_time\\_t](#)  
*Structure to hold the device execution time and the opcode for the corresponding command.*

### Macros

- #define [ATCA\\_UNSUPPORTED\\_CMD](#) ((uint16\_t)0xFFFF)
- #define [CALIB\\_SWI\\_FLAG\\_WAKE](#) 0x00  
*flag preceding a command*
- #define [CALIB\\_SWI\\_FLAG\\_CMD](#) 0x77  
*flag preceding a command*
- #define [CALIB\\_SWI\\_FLAG\\_TX](#) 0x88  
*flag requesting a response*
- #define [CALIB\\_SWI\\_FLAG\\_IDLE](#) 0xBB  
*flag requesting to go into Idle mode*
- #define [CALIB\\_SWI\\_FLAG\\_SLEEP](#) 0xCC  
*flag requesting to go into Sleep mode*

### Functions

- [ATCA\\_STATUS calib\\_get\\_execution\\_time](#) (uint8\_t opcode, [ATCADevice](#) device)  
*return the typical execution time for the given command*
- [ATCA\\_STATUS calib\\_execute\\_receive](#) ([ATCADevice](#) device, uint8\_t device\_address, uint8\_t \*rxdata, uint16\_t \*rxlength)
- [ATCA\\_STATUS calib\\_execute\\_command](#) ([ATCAPacket](#) \*packet, [ATCADevice](#) device)  
*Wakes up device, sends the packet, waits for command completion, receives response, and puts the device into the idle state.*

#### 10.83.1 Detailed Description

Defines an execution handler that executes a given command on a device and returns the results.

The basic flow is to wake the device, send the command, wait/poll for completion, and finally receives the response from the device and does basic checks before returning to caller.

This handler supports the ATSHA and ATECC device family.

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### 10.83.2 Macro Definition Documentation

#### 10.83.2.1 ATCA\_UNSUPPORTED\_CMD

```
#define ATCA_UNSUPPORTED_CMD ((uint16_t)0xFFFF)
```

#### 10.83.2.2 CALIB\_SWI\_FLAG\_CMD

```
#define CALIB_SWI_FLAG_CMD 0x77
```

flag preceding a command

#### 10.83.2.3 CALIB\_SWI\_FLAG\_IDLE

```
#define CALIB_SWI_FLAG_IDLE 0xBB
```

flag requesting to go into Idle mode

#### 10.83.2.4 CALIB\_SWI\_FLAG\_SLEEP

```
#define CALIB_SWI_FLAG_SLEEP 0xCC
```

flag requesting to go into Sleep mode

#### 10.83.2.5 CALIB\_SWI\_FLAG\_TX

```
#define CALIB_SWI_FLAG_TX 0x88
```

flag requesting a response

#### 10.83.2.6 CALIB\_SWI\_FLAG\_WAKE

```
#define CALIB_SWI_FLAG_WAKE 0x00
```

flag preceding a command

### 10.83.3 Function Documentation

#### 10.83.3.1 calib\_execute\_command()

```
ATCA_STATUS calib_execute_command (  
    ATCAPacket * packet,  
    ATCADevice device )
```

Wakes up device, sends the packet, waits for command completion, receives response, and puts the device into the idle state.

**Parameters**

<i>in, out</i>	<i>packet</i>	As input, the packet to be sent. As output, the data buffer in the packet structure will contain the response.
<i>in</i>	<i>device</i>	CryptoAuthentication device to send the command to.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.83.3.2 calib\_execute\_receive()**

```
ATCA_STATUS calib_execute_receive (
    ATCADevice device,
    uint8_t device_address,
    uint8_t * rxdata,
    uint16_t * rxlength )
```

**10.83.3.3 calib\_get\_execution\_time()**

```
ATCA_STATUS calib_get_execution_time (
    uint8_t opcode,
    ATCADevice device )
```

return the typical execution time for the given command

**Parameters**

<i>in</i>	<i>opcode</i>	Opcode value of the command
<i>in</i>	<i>ca_cmd</i>	Command object for which the execution times are associated

**Returns**

ATCA\_SUCCESS

**10.84 calib\_gendig.c File Reference**

CryptoAuthLib Basic API methods for GenDig command.

```
#include "cryptoauthlib.h"
```

### 10.84.1 Detailed Description

CryptoAuthLib Basic API methods for GenDig command.

The GenDig command uses SHA-256 to combine a stored value with the contents of TempKey, which must have been valid prior to the execution of this command.

#### Note

List of devices that support this command - ATSHA204A, ATECC108A, ATECC508A, and ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.85 calib\_genkey.c File Reference

CryptoAuthLib Basic API methods for GenKey command.

```
#include "cryptoauthlib.h"
```

### 10.85.1 Detailed Description

CryptoAuthLib Basic API methods for GenKey command.

The GenKey command is used for creating ECC private keys, generating ECC public keys, and for digest calculations involving public keys.

#### Note

List of devices that support this command - ATECC108A, ATECC508A, ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.86 calib\_helpers.c File Reference

CryptoAuthLib Basic API - Helper Functions to.

```
#include "cryptoauthlib.h"
```

## Functions

- [ATCA\\_STATUS calib\\_is\\_private](#) ([ATCADevice](#) device, uint16\_t slot, bool \*is\_private)  
*Executes Read command, which reads the configuration zone to see if the specified slot is locked.*
- [ATCADeviceType calib\\_get\\_devicetype](#) (uint8\_t revision[4])  
*Parse the revision field to get the device type.*

### 10.86.1 Detailed Description

CryptoAuthLib Basic API - Helper Functions to.

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## 10.87 calib\_hmac.c File Reference

CryptoAuthLib Basic API methods for HMAC command.

```
#include "cryptoauthlib.h"
```

### 10.87.1 Detailed Description

CryptoAuthLib Basic API methods for HMAC command.

The HMAC command computes an HMAC/SHA-256 digest using a key stored in the device over a challenge stored in the TempKey register, and/or other information stored within the device.

#### Note

List of devices that support this command - ATSHA204A, ATECC108A, and ATECC508A . There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.88 calib\_info.c File Reference

CryptoAuthLib Basic API methods for Info command.

```
#include "cryptoauthlib.h"
```

### Functions

- [ATCA\\_STATUS calib\\_info\\_base](#) ([ATCADevice](#) device, uint8\_t mode, uint16\_t param2, uint8\_t \*out\_data)  
*Issues an Info command, which return internal device information and can control GPIO and the persistent latch.*
- [ATCA\\_STATUS calib\\_info](#) ([ATCADevice](#) device, uint8\_t \*revision)  
*Use the Info command to get the device revision (DevRev).*
- [ATCA\\_STATUS calib\\_info\\_privkey\\_valid](#) ([ATCADevice](#) device, uint16\_t key\_id, uint8\_t \*is\_valid)  
*Use Info command to check ECC Private key stored in key slot is valid or not.*

### 10.88.1 Detailed Description

CryptoAuthLib Basic API methods for Info command.

Info command returns a variety of static and dynamic information about the device and its state. Also is used to control the GPIO pin and the persistent latch.

#### Note

The ATSHA204A refers to this command as DevRev instead of Info, however, the OpCode and operation is the same.

List of devices that support this command - ATSHA204A, ATECC108A, ATECC508A & ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.89 calib\_kdf.c File Reference

CryptoAuthLib Basic API methods for KDF command.

```
#include "cryptoauthlib.h"
```

### 10.89.1 Detailed Description

CryptoAuthLib Basic API methods for KDF command.

The KDF command implements one of a number of Key Derivation Functions (KDF). Generally this function combines a source key with an input string and creates a result key/digest/array. Three algorithms are currently supported: PRF, HKDF and AES.

#### Note

List of devices that support this command - ATECC608A/B. Refer to device datasheet for full details.

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## 10.90 calib\_lock.c File Reference

CryptoAuthLib Basic API methods for Lock command.

```
#include "cryptoauthlib.h"
```

### 10.90.1 Detailed Description

CryptoAuthLib Basic API methods for Lock command.

The Lock command prevents future modifications of the Configuration zone, enables configured policies for Data and OTP zones, and can render individual slots read-only regardless of configuration.

#### Note

List of devices that support this command - ATSHA204A, ATECC108A, ATECC508A, ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.91 calib\_mac.c File Reference

CryptoAuthLib Basic API methods for MAC command.

```
#include "cryptoauthlib.h"
```

### 10.91.1 Detailed Description

CryptoAuthLib Basic API methods for MAC command.

The MAC command computes a SHA-256 digest of a key stored in the device, a challenge, and other information on the device. The output of this command is the digest of this message.

#### Note

List of devices that support this command - ATSHA204A, ATECC108A, ATECC508A, and ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.92 calib\_nonce.c File Reference

CryptoAuthLib Basic API methods for Nonce command.

```
#include "cryptoauthlib.h"
```

### 10.92.1 Detailed Description

CryptoAuthLib Basic API methods for Nonce command.

The Nonce command generates a nonce for use by a subsequent commands of the device by combining an internally generated random number with an input value from the system.

#### Note

List of devices that support this command - ATSHA204A, ATECC108A, ATECC508A, and ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.93 calib\_privwrite.c File Reference

CryptoAuthLib Basic API methods for PrivWrite command.

```
#include "cryptoauthlib.h"
```

### 10.93.1 Detailed Description

CryptoAuthLib Basic API methods for PrivWrite command.

The PrivWrite command is used to write externally generated ECC private keys into the device.

#### Note

List of devices that support this command - ATECC108A, ATECC508A, and ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.94 calib\_random.c File Reference

CryptoAuthLib Basic API methods for Random command.

```
#include "cryptoauthlib.h"
```

### 10.94.1 Detailed Description

CryptoAuthLib Basic API methods for Random command.

The Random command generates a random number for use by the system.

#### Note

List of devices that support this command - ATSHA204A, ATECC108A, ATECC508A, ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.95 calib\_read.c File Reference

CryptoAuthLib Basic API methods for Read command.

```
#include "cryptoauthlib.h"
```

### 10.95.1 Detailed Description

CryptoAuthLib Basic API methods for Read command.

The Read command reads words either 4-byte words or 32-byte blocks from one of the memory zones of the device. The data may optionally be encrypted before being returned to the system.

#### Note

List of devices that support this command - ATSHA204A, ATECC108A, ATECC508A, ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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### 10.96 calib\_secureboot.c File Reference

CryptoAuthLib Basic API methods for SecureBoot command.

```
#include "cryptoauthlib.h"
```

#### 10.96.1 Detailed Description

CryptoAuthLib Basic API methods for SecureBoot command.

The SecureBoot command provides support for secure boot of an external MCU or MPU.

##### Note

List of devices that support this command - ATECC608A/B. Refer to device datasheet for full details.

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### 10.97 calib\_selftest.c File Reference

CryptoAuthLib Basic API methods for SelfTest command.

```
#include "cryptoauthlib.h"
```

#### 10.97.1 Detailed Description

CryptoAuthLib Basic API methods for SelfTest command.

The SelfTest command performs a test of one or more of the cryptographic engines within the device.

##### Note

List of devices that support this command - ATECC608A/B. Refer to device datasheet for full details.

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### 10.98 calib\_sha.c File Reference

CryptoAuthLib Basic API methods for SHA command.

```
#include "cryptoauthlib.h"
```

### 10.98.1 Detailed Description

CryptoAuthLib Basic API methods for SHA command.

The SHA command Computes a SHA-256 or HMAC/SHA digest for general purpose use by the host system.

#### Note

List of devices that support this command - ATSHA204A, ATECC108A, ATECC508A, and ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.99 calib\_sign.c File Reference

CryptoAuthLib Basic API methods for Sign command.

```
#include "cryptoauthlib.h"
```

### 10.99.1 Detailed Description

CryptoAuthLib Basic API methods for Sign command.

The Sign command generates a signature using the private key in slot with ECDSA algorithm.

#### Note

List of devices that support this command - ATECC108A, ATECC508A, and ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.100 calib\_updateextra.c File Reference

CryptoAuthLib Basic API methods for UpdateExtra command.

```
#include "cryptoauthlib.h"
```

### 10.100.1 Detailed Description

CryptoAuthLib Basic API methods for UpdateExtra command.

The UpdateExtra command is used to update the values of the two extra bytes within the Configuration zone after the Configuration zone has been locked.

#### Note

List of devices that support this command - ATSHA204A, ATECC108A, ATECC508A, and ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.101 calib\_verify.c File Reference

CryptoAuthLib Basic API methods for Verify command.

```
#include "cryptoauthlib.h"
#include "host/atca_host.h"
```

### 10.101.1 Detailed Description

CryptoAuthLib Basic API methods for Verify command.

The Verify command takes an ECDSA [R,S] signature and verifies that it is correctly generated given an input message digest and public key.

#### Note

List of devices that support this command - ATECC108A, ATECC508A, and ATECC608A/B. There are differences in the modes that they support. Refer to device datasheet for full details.

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## 10.102 calib\_write.c File Reference

CryptoAuthLib Basic API methods for Write command.

```
#include "cryptoauthlib.h"
#include "host/atca_host.h"
```

### 10.102.1 Detailed Description

CryptoAuthLib Basic API methods for Write command.

The Write command writes either one 4-byte word or a 32-byte block to one of the EEPROM zones on the device. Depending upon the value of the WriteConfig byte for a slot, the data may be required to be encrypted by the system prior to being sent to the device

#### Note

List of devices that support this command - ATSHA204A, ATECC108A, ATECC508A, and ATECC608A/B. There are differences in the modes that they support. Refer to device datasheets for full details.

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## 10.103 crypto\_config\_check.h File Reference

Consistency checks for configuration options.

```
#include "atca_config_check.h"
#include "calib/calib_config_check.h"
#include "talib/talib_config_check.h"
```

### Macros

- #define ATCAB\_AES\_EXTRAS\_EN (CALIB\_AES\_EN || TALIB\_AES\_EN)
- #define ATCAB\_AES\_RANDOM\_IV\_EN (ATCA\_HOSTLIB\_EN || CALIB\_RANDOM\_EN || TALIB\_RANDOM\_EN)
- #define ATCAB\_AES\_UPDATE\_EN ATCAB\_AES\_EXTRAS\_EN
- #define ATCAB\_AES\_CBC\_ENCRYPT\_EN ATCAB\_AES\_EXTRAS\_EN
- #define ATCAB\_AES\_CBC\_DECRYPT\_EN ATCAB\_AES\_EXTRAS\_EN
- #define ATCAB\_AES\_CBC\_UPDATE\_EN ATCAB\_AES\_UPDATE\_EN
- #define ATCAB\_AES\_CBCMAC\_EN ATCAB\_AES\_CBC\_ENCRYPT\_EN
- #define ATCAB\_AES\_CTR\_EN ATCAB\_AES\_EXTRAS\_EN
- #define ATCAB\_AES\_CTR\_RAND\_IV\_EN (ATCAB\_AES\_CTR\_EN && ATCAB\_AES\_RANDOM\_IV\_EN)
- #define ATCAB\_AES\_CCM\_EN (ATCAB\_AES\_CBCMAC\_EN && ATCAB\_AES\_CTR\_EN)
- #define ATCAB\_AES\_CCM\_INIT\_IV\_EN (ATCAB\_AES\_CCM\_EN && ATCAB\_AES\_RANDOM\_IV\_EN)
- #define ATCAB\_AES\_CMAC\_EN ATCAB\_AES\_CBC\_ENCRYPT\_EN
- #define ATCA\_CRYPTO\_SHA1\_EN (ATCAC\_SHA1\_EN && !ATCA\_HOSTLIB\_EN)
- #define ATCA\_CRYPTO\_SHA2\_EN (ATCAC\_SHA256\_EN && !ATCA\_HOSTLIB\_EN)
- #define ATCA\_CRYPTO\_SHA2\_HMAC\_EN (ATCAC\_SHA256\_HMAC\_EN && !ATCA\_HOSTLIB\_EN)
- #define ATCA\_CRYPTO\_SHA2\_HMAC\_CTR\_EN ATCAC\_SHA256\_HMAC\_CTR\_EN
- #define ATCAC\_PBKDF2\_SHA256\_EN ATCAC\_SHA256\_HMAC\_EN
- #define ATCAB\_PBKDF2\_SHA256\_EN (CALIB\_SHA\_HMAC\_EN || TALIB\_SHA\_HMAC\_EN)
- #define ATCAC\_PKCS7\_PAD\_EN ATCAB\_AES\_EXTRAS\_EN

### 10.103.1 Detailed Description

Consistency checks for configuration options.

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### 10.103.2 Macro Definition Documentation

#### 10.103.2.1 ATCA\_CRYPT0\_SHA1\_EN

```
#define ATCA_CRYPT0_SHA1_EN (ATCAC_SHA1_EN && !ATCA_HOSTLIB_EN)
```

Enable ATCAC\_SHA1\_EN to enable sha1 host side api

Supported API's: atcab\_write

#### 10.103.2.2 ATCA\_CRYPT0\_SHA2\_EN

```
#define ATCA_CRYPT0_SHA2_EN (ATCAC_SHA256_EN && !ATCA_HOSTLIB_EN)
```

#### 10.103.2.3 ATCA\_CRYPT0\_SHA2\_HMAC\_CTR\_EN

```
#define ATCA_CRYPT0_SHA2_HMAC_CTR_EN ATCAC_SHA256_HMAC_CTR_EN
```

Requires: ATCAC\_SHA256\_HMAC\_EN

Enable ATCAC\_SHA256\_HMAC\_COUNTER to implement SHA256 HMAC-Counter per NIST SP 800-108 used for KDF like operations

Supported API's: atcac\_sha256\_hmac\_counter

#### 10.103.2.4 ATCA\_CRYPT0\_SHA2\_HMAC\_EN

```
#define ATCA_CRYPT0_SHA2_HMAC_EN (ATCAC_SHA256_HMAC_EN && !ATCA_HOSTLIB_EN)
```

Requires: ATCAC\_SHA256\_EN

Enable ATCAC\_SHA256\_HMAC to initialize context for performing HMAC (sha256) in software

Supported API's: atcac\_sha256\_hmac\_init, atcac\_sha256\_hmac\_update, atcac\_sha256\_hmac\_finish



**10.103.2.5 ATCAB\_AES\_CBC\_DECRYPT\_EN**

```
#define ATCAB_AES_CBC_DECRYPT_EN ATCAB_AES_EXTRAS_EN
```

Requires: ATCAB\_AES\_EN

Enable ATCAB\_AES\_CBC\_DECRYPT to decrypt a block of data using CBC mode and a key within the device. atcab\_aes\_cbc\_init() should be called before the first use of this function

Supported API's: atcab\_aes\_cbc\_decrypt\_block, atcab\_aes\_cbc\_init\_ext, atcab\_aes\_cbc\_init

**10.103.2.6 ATCAB\_AES\_CBC\_ENCRYPT\_EN**

```
#define ATCAB_AES_CBC_ENCRYPT_EN ATCAB_AES_EXTRAS_EN
```

Requires: ATCAB\_AES\_EN

Enable ATCAB\_AES\_CBC\_ENCRYPT\_EN to encrypt a block of data using CBC mode and a key within the device. atcab\_aes\_cbc\_init() should be called before the first use of this function

Supported API's: atcab\_aes\_cbc\_encrypt\_block , atcab\_aes\_cbc\_init\_ext, atcab\_aes\_cbc\_init

**10.103.2.7 ATCAB\_AES\_CBC\_UPDATE\_EN**

```
#define ATCAB_AES_CBC_UPDATE_EN ATCAB_AES_UPDATE_EN
```

**10.103.2.8 ATCAB\_AES\_CBCMAC\_EN**

```
#define ATCAB_AES_CBCMAC_EN ATCAB_AES_CBC_ENCRYPT_EN
```

Requires: ATCAB\_AES\_CBCMAC ATCAB\_AES\_CBC\_ENCRYPT ATCAB\_AES\_MODE\_ENCODING CALIB\_AES\_MODE\_ENCODING CALIB\_AES

Enable ATCAB\_AES\_CBCMAC to initialize context for AES CBC-MAC operation Enable ATCAB\_AES\_CBCMAC to calculate AES CBC-MAC with key stored within ECC608 device Enable ATCAB\_AES\_CBCMAC to finish a CBC-MAC operation returning the CBC-MAC value

Supported API's: atcab\_aes\_cbcmac\_init\_ext atcab\_aes\_cbcmac\_init, atcab\_aes\_cbcmac\_init\_update, atcab\_aes\_cbcmac\_finish

**10.103.2.9 ATCAB\_AES\_CCM\_EN**

```
#define ATCAB_AES_CCM_EN (ATCAB_AES_CBCMAC_EN && ATCAB_AES_CTR_EN)
```

Requires: ATCAB\_AES\_EN ATCAB\_AES\_CTR\_EN

Enable ATCAB\_AES\_CCM\_EN to enable AES CCM operation

### 10.103.2.10 ATCAB\_AES\_CCM\_INIT\_IV\_EN

```
#define ATCAB_AES_CCM_INIT_IV_EN (ATCAB_AES_CCM_EN && ATCAB_AES_RANDOM_IV_EN)
```

### 10.103.2.11 ATCAB\_AES\_CMAC\_EN

```
#define ATCAB_AES_CMAC_EN ATCAB_AES_CBC_ENCRYPT_EN
```

### 10.103.2.12 ATCAB\_AES\_CTR\_EN

```
#define ATCAB_AES_CTR_EN ATCAB_AES_EXTRAS_EN
```

Requires: ATCAB\_AES\_EN

Enable ATCAB\_AES\_CTR\_EN to support AES-CTR mode

### 10.103.2.13 ATCAB\_AES\_CTR\_RAND\_IV\_EN

```
#define ATCAB_AES_CTR_RAND_IV_EN (ATCAB_AES_CTR_EN && ATCAB_AES_RANDOM_IV_EN)
```

Requires: ATCAB\_AES\_CTR\_EN ATCAB\_RANDOM\_EN

Enable ATCAB\_AES\_CTR\_RAND\_IV\_EN to initialize context for AES CTR operation with a random nonce and counter set to 0 as the IV, which is common when starting an encrypt operation

Supported API's: atcab\_aes\_ctr\_init\_rand\_ext, atcab\_aes\_ctr\_init\_rand

### 10.103.2.14 ATCAB\_AES\_EXTRAS\_EN

```
#define ATCAB_AES_EXTRAS_EN (CALIB_AES_EN || TALIB_AES_EN)
```

Automatically set base on other configuration options but can be overridden to disable all CBC, CBCMAC, CTR, & CCM modes at once rather than individually

### 10.103.2.15 ATCAB\_AES\_RANDOM\_IV\_EN

```
#define ATCAB_AES_RANDOM_IV_EN (ATCA_HOSTLIB_EN || CALIB_RANDOM_EN || TALIB_RANDOM_EN)
```

**10.103.2.16 ATCAB\_AES\_UPDATE\_EN**

```
#define ATCAB_AES_UPDATE_EN ATCAB_AES_EXTRAS_EN
```

Enable update/finalize APIs for block ciphers

**10.103.2.17 ATCAB\_PBKDF2\_SHA256\_EN**

```
#define ATCAB_PBKDF2_SHA256_EN (CALIB_SHA_HMAC_EN || TALIB_SHA_HMAC_EN)
```

Requires: CALIB\_SHA\_HMAC\_EN

Enable ATCAB\_PBKDF2\_SHA256\_EN to calculate a PBKDF2 password hash using a stored key inside a device. The key length is determined by the device being used. ECCx08: 32 bytes, TA100: 16-64 bytes

Supported API's: atcab\_pbkdf2\_256, atcab\_pbkdf2\_256\_ext

**10.103.2.18 ATCAC\_PBKDF2\_SHA256\_EN**

```
#define ATCAC_PBKDF2_SHA256_EN ATCAC_SHA256_HMAC_EN
```

Requires: ATCAC\_SHA256\_EN ATCAC\_SHA256\_HMAC\_EN

Enable ATCAC\_PBKDF2\_SHA256\_EN to calculate a PBKDF2 hash of a given password and salt

Supported API's: atcac\_pbkdf2\_256

**10.103.2.19 ATCAC\_PKCS7\_PAD\_EN**

```
#define ATCAC_PKCS7_PAD_EN ATCAB_AES_EXTRAS_EN
```

**10.104 cryptoauthlib.h File Reference**

Single aggregation point for all CryptoAuthLib header files.

```
#include <stdio.h>
#include <stdint.h>
#include <stddef.h>
#include <stdlib.h>
#include <string.h>
#include <stdarg.h>
#include "atca_config_check.h"
#include "atca_compiler.h"
#include "atca_version.h"
#include "atca_platform.h"
#include "atca_status.h"
#include "atca_debug.h"
#include "atca_iface.h"
```

```
#include "atca_helpers.h"
#include "hal/atca_hal.h"
#include "atca_cfgs.h"
#include "atca_device.h"
#include "calib/calib_basic.h"
#include "calib/calib_command.h"
#include "calib/calib_aes_gcm.h"
#include "talib/talib_status.h"
#include "talib/talib_basic.h"
#include "atca_basic.h"
```

### Macros

- #define [ATCA\\_SHA256\\_BLOCK\\_SIZE](#) (64)
- #define [ATCA\\_SHA256\\_DIGEST\\_SIZE](#) (32)
- #define [ATCA\\_AES128\\_BLOCK\\_SIZE](#) (16)
- #define [ATCA\\_AES128\\_KEY\\_SIZE](#) (16)
- #define [ATCA\\_ECCP256\\_KEY\\_SIZE](#) (32)
- #define [ATCA\\_ECCP256\\_PUBKEY\\_SIZE](#) (64)
- #define [ATCA\\_ECCP256\\_SIG\\_SIZE](#) (64)
- #define [ATCA\\_ZONE\\_CONFIG](#) ((uint8\_t)0x00)
- #define [ATCA\\_ZONE\\_OTP](#) ((uint8\_t)0x01)
- #define [ATCA\\_ZONE\\_DATA](#) ((uint8\_t)0x02)
- #define [SHA\\_MODE\\_TARGET\\_TEMPKEY](#) ((uint8\_t)0x00)
- #define [SHA\\_MODE\\_TARGET\\_MSGDIGBUF](#) ((uint8\_t)0x40)
- #define [SHA\\_MODE\\_TARGET\\_OUT\\_ONLY](#) ((uint8\_t)0xC0)
- #define [ATCA\\_STRINGIFY](#)(x) #x
- #define [ATCA\\_TOSTRING](#)(x) [ATCA\\_STRINGIFY](#)(x)
- #define [ATCA\\_TRACE](#)(s, m) [atca\\_trace](#)(s)

### 10.104.1 Detailed Description

Single aggregation point for all CryptoAuthLib header files.

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### 10.104.2 Macro Definition Documentation

#### 10.104.2.1 ATCA\_AES128\_BLOCK\_SIZE

```
#define ATCA_AES128_BLOCK_SIZE (16)
```

**10.104.2.2 ATCA\_AES128\_KEY\_SIZE**

```
#define ATCA_AES128_KEY_SIZE (16)
```

**10.104.2.3 ATCA\_ECCP256\_KEY\_SIZE**

```
#define ATCA_ECCP256_KEY_SIZE (32)
```

**10.104.2.4 ATCA\_ECCP256\_PUBKEY\_SIZE**

```
#define ATCA_ECCP256_PUBKEY_SIZE (64)
```

**10.104.2.5 ATCA\_ECCP256\_SIG\_SIZE**

```
#define ATCA_ECCP256_SIG_SIZE (64)
```

**10.104.2.6 ATCA\_SHA256\_BLOCK\_SIZE**

```
#define ATCA_SHA256_BLOCK_SIZE (64)
```

Library Configuration File - All build attributes should be included in [atca\\_config.h](#)

**10.104.2.7 ATCA\_SHA256\_DIGEST\_SIZE**

```
#define ATCA_SHA256_DIGEST_SIZE (32)
```

**10.104.2.8 ATCA\_STRINGIFY**

```
#define ATCA_STRINGIFY(  
    x ) #x
```

### 10.104.2.9 ATCA\_TOSTRING

```
#define ATCA_TOSTRING(  
    x ) ATCA_STRINGIFY(x)
```

### 10.104.2.10 ATCA\_TRACE

```
#define ATCA_TRACE(  
    s,  
    m ) atca_trace(s)
```

### 10.104.2.11 ATCA\_ZONE\_CONFIG

```
#define ATCA_ZONE_CONFIG ((uint8_t)0x00)
```

### 10.104.2.12 ATCA\_ZONE\_DATA

```
#define ATCA_ZONE_DATA ((uint8_t)0x02)
```

### 10.104.2.13 ATCA\_ZONE\_OTP

```
#define ATCA_ZONE_OTP ((uint8_t)0x01)
```

### 10.104.2.14 SHA\_MODE\_TARGET\_MSGDIGBUF

```
#define SHA_MODE_TARGET_MSGDIGBUF ((uint8_t)0x40)
```

Place resulting digest both in Output buffer and Message Digest Buffer

### 10.104.2.15 SHA\_MODE\_TARGET\_OUT\_ONLY

```
#define SHA_MODE_TARGET_OUT_ONLY ((uint8_t)0xC0)
```

Place resulting digest both in Output buffer ONLY

#### 10.104.2.16 SHA\_MODE\_TARGET\_TEMPKEY

```
#define SHA_MODE_TARGET_TEMPKEY ((uint8_t)0x00)
```

Place resulting digest both in Output buffer and TempKey

### 10.105 cryptoki.h File Reference

```
#include "pkcs11.h"
```

#### Macros

- `#define PKCS11_HELPER_DLL_IMPORT`
- `#define PKCS11_HELPER_DLL_EXPORT`
- `#define PKCS11_HELPER_DLL_LOCAL`
- `#define PKCS11_API`
- `#define PKCS11_LOCAL PKCS11_HELPER_DLL_LOCAL`
- `#define CK_PTR *`
- `#define CK_DECLARE_FUNCTION(returnType, name) returnType PKCS11_API name`
- `#define CK_DECLARE_FUNCTION_POINTER(returnType, name) returnType PKCS11_API(*name)`
- `#define CK_CALLBACK_FUNCTION(returnType, name) returnType(*name)`
- `#define NULL_PTR 0`

#### 10.105.1 Macro Definition Documentation

##### 10.105.1.1 CK\_CALLBACK\_FUNCTION

```
#define CK_CALLBACK_FUNCTION(  
    returnType,  
    name ) returnType(*name)
```

##### 10.105.1.2 CK\_DECLARE\_FUNCTION

```
#define CK_DECLARE_FUNCTION(  
    returnType,  
    name ) returnType PKCS11_API name
```

### 10.105.1.3 CK\_DECLARE\_FUNCTION\_POINTER

```
#define CK_DECLARE_FUNCTION_POINTER(  
    returnType,  
    name ) returnType PKCS11_API (*name)
```

### 10.105.1.4 CK\_PTR

```
#define CK_PTR *
```

### 10.105.1.5 NULL\_PTR

```
#define NULL_PTR 0
```

### 10.105.1.6 PKCS11\_API

```
#define PKCS11_API
```

### 10.105.1.7 PKCS11\_HELPER\_DLL\_EXPORT

```
#define PKCS11_HELPER_DLL_EXPORT
```

### 10.105.1.8 PKCS11\_HELPER\_DLL\_IMPORT

```
#define PKCS11_HELPER_DLL_IMPORT
```

### 10.105.1.9 PKCS11\_HELPER\_DLL\_LOCAL

```
#define PKCS11_HELPER_DLL_LOCAL
```



### 10.105.1.10 PKCS11\_LOCAL

```
#define PKCS11_LOCAL PKCS11_HELPER_DLL_LOCAL
```

## 10.106 example\_cert\_chain.c File Reference

```
#include "atcacert/atcacert_def.h"  
#include "example_cert_chain.h"
```

### Variables

- const `atcacert_def_t g_cert_def_0_root`
- const `atcacert_cert_element_t g_cert_elements_1_signer []`
- const `uint8_t g_cert_template_1_signer []`
- const `atcacert_def_t g_cert_def_1_signer`
- const `uint8_t g_cert_template_2_device []`
- const `atcacert_def_t g_cert_def_2_device`

### 10.106.1 Variable Documentation

#### 10.106.1.1 g\_cert\_def\_0\_root

```
const atcacert_def_t g_cert_def_0_root
```

##### Initial value:

```
= {  
    .type           = CERTTYPE_X509,  
    .template_id    = 0,  
    .public_key_dev_loc = {  
        .zone       = DEVZONE_DATA,  
        .slot       = 15,  
        .is_genkey   = 0,  
        .offset      = 0,  
        .count       = 72  
    }  
}
```

#### 10.106.1.2 g\_cert\_def\_1\_signer

```
const atcacert_def_t g_cert_def_1_signer
```

## 10.107 example\_cert\_chain.h File Reference

---

### 10.106.1.3 g\_cert\_def\_2\_device

```
const atcacert_def_t g_cert_def_2_device
```

### 10.106.1.4 g\_cert\_elements\_1\_signer

```
const atcacert_cert_element_t g_cert_elements_1_signer[]
```

### 10.106.1.5 g\_cert\_template\_1\_signer

```
const uint8_t g_cert_template_1_signer[]
```

### 10.106.1.6 g\_cert\_template\_2\_device

```
const uint8_t g_cert_template_2_device[]
```

#### Initial value:

```
= {
    0x30, 0x82, 0x01, 0xa6, 0x30, 0x82, 0x01, 0x4b, 0xa0, 0x03, 0x02, 0x01, 0x02, 0x02, 0x10, 0x41,
    0xa6, 0x8b, 0xe4, 0x36, 0xdd, 0xc3, 0xd8, 0x39, 0xfa, 0xbd, 0xd7, 0x27, 0xd9, 0x74, 0xe7, 0x30,
    0x0a, 0x06, 0x08, 0x2a, 0x86, 0x48, 0xce, 0x3d, 0x04, 0x03, 0x02, 0x30, 0x34, 0x31, 0x14, 0x30,
    0x12, 0x06, 0x03, 0x55, 0x04, 0x0a, 0x0c, 0x0b, 0x45, 0x78, 0x61, 0x6d, 0x70, 0x6c, 0x65, 0x20,
    0x49, 0x6e, 0x63, 0x31, 0x1c, 0x30, 0x1a, 0x06, 0x03, 0x55, 0x04, 0x03, 0x0c, 0x13, 0x45, 0x78,
    0x61, 0x6d, 0x70, 0x6c, 0x65, 0x20, 0x53, 0x69, 0x67, 0x6e, 0x65, 0x72, 0x20, 0x46, 0x46, 0x46,
    0x46, 0x30, 0x20, 0x17, 0x0d, 0x31, 0x37, 0x30, 0x37, 0x31, 0x30, 0x32, 0x30, 0x30, 0x30, 0x30,
    0x30, 0x5a, 0x18, 0x0f, 0x33, 0x30, 0x30, 0x30, 0x31, 0x32, 0x33, 0x31, 0x32, 0x33, 0x35, 0x39,
    0x35, 0x39, 0x5a, 0x30, 0x2f, 0x31, 0x14, 0x30, 0x12, 0x06, 0x03, 0x55, 0x04, 0x0a, 0x0c, 0x0b,
    0x45, 0x78, 0x61, 0x6d, 0x70, 0x6c, 0x65, 0x20, 0x49, 0x6e, 0x63, 0x31, 0x17, 0x30, 0x15, 0x06,
    0x03, 0x55, 0x04, 0x03, 0x0c, 0x0e, 0x45, 0x78, 0x61, 0x6d, 0x70, 0x6c, 0x65, 0x20, 0x44, 0x65,
    0x76, 0x69, 0x63, 0x65, 0x30, 0x59, 0x30, 0x13, 0x06, 0x07, 0x2a, 0x86, 0x48, 0xce, 0x3d, 0x02,
    0x01, 0x06, 0x08, 0x2a, 0x86, 0x48, 0xce, 0x3d, 0x03, 0x01, 0x07, 0x03, 0x42, 0x00, 0x04, 0x96,
    0x27, 0xf1, 0x3e, 0x80, 0xac, 0xf9, 0xd4, 0x12, 0xce, 0x3b, 0x0d, 0x68, 0xf7, 0x4e, 0xb2, 0xc6,
    0x07, 0x35, 0x00, 0xb7, 0x78, 0x5b, 0xac, 0xe6, 0x50, 0x30, 0x54, 0x77, 0x7f, 0xc8, 0x62, 0x21,
    0xce, 0xf2, 0x5a, 0x9a, 0x9e, 0x86, 0x40, 0xc2, 0x29, 0xd6, 0x4a, 0x32, 0x1e, 0xb9, 0x4a, 0x1b,
    0x1c, 0x94, 0xf5, 0x39, 0x88, 0xae, 0xfe, 0x49, 0xcc, 0xfd, 0xbf, 0x8a, 0x0d, 0x34, 0xb8, 0xa3,
    0x42, 0x30, 0x40, 0x30, 0x1d, 0x06, 0x03, 0x55, 0x1d, 0x0e, 0x04, 0x16, 0x04, 0x14, 0x2d, 0xda,
    0x6c, 0x36, 0xd5, 0xa5, 0x5a, 0xce, 0x97, 0x10, 0x3d, 0xb0, 0xaf, 0x9c, 0x66, 0x2a, 0xcd, 0x3e,
    0xe6, 0xcf, 0x30, 0x1f, 0x06, 0x03, 0x55, 0x1d, 0x23, 0x04, 0x18, 0x30, 0x16, 0x80, 0x14, 0xc6,
    0x70, 0xe0, 0x5e, 0x8a, 0x45, 0x0d, 0xb8, 0x2c, 0x00, 0x2a, 0x40, 0x06, 0x39, 0x4c, 0x19, 0x58,
    0x04, 0x35, 0x76, 0x30, 0x0a, 0x06, 0x08, 0x2a, 0x86, 0x48, 0xce, 0x3d, 0x04, 0x03, 0x02, 0x03,
    0x49, 0x00, 0x30, 0x46, 0x02, 0x21, 0x00, 0xe1, 0xfc, 0x00, 0x23, 0xc1, 0x3d, 0x01, 0x3f, 0x22,
    0x31, 0x0b, 0xf0, 0xb8, 0xf4, 0xf4, 0x22, 0xfc, 0x95, 0x96, 0x33, 0x9c, 0xb9, 0x62, 0xb1, 0xfc,
    0x8a, 0x2d, 0xa8, 0x5c, 0xee, 0x67, 0x72, 0x02, 0x21, 0x00, 0xa1, 0x0d, 0x47, 0xe4, 0xfd, 0x0d,
    0x15, 0xd8, 0xde, 0xa1, 0xb5, 0x96, 0x28, 0x4e, 0x7a, 0x0b, 0xbe, 0xcc, 0xec, 0xe8, 0x8e, 0xcc,
    0x7a, 0x31, 0xb3, 0x00, 0x8b, 0xc0, 0x2e, 0x4f, 0x99, 0xc5
}
```

## 10.107 example\_cert\_chain.h File Reference

```
#include "atcacert/atcacert_def.h"
```

## Variables

- const [atcacert\\_def\\_t g\\_cert\\_def\\_1\\_signer](#)
- const [atcacert\\_def\\_t g\\_cert\\_def\\_2\\_device](#)

### 10.107.1 Variable Documentation

#### 10.107.1.1 g\_cert\_def\_1\_signer

```
const atcacert\_def\_t g_cert_def_1_signer [extern]
```

#### 10.107.1.2 g\_cert\_def\_2\_device

```
const atcacert\_def\_t g_cert_def_2_device [extern]
```

## 10.108 example\_pkcs11\_config.c File Reference

```
#include "cryptoauthlib.h"
#include "pkcs11_config.h"
#include "pkcs11/pkcs11_object.h"
#include "pkcs11/pkcs11_slot.h"
#include "example_cert_chain.h"
```

## Macros

- #define [pkcs11configLABEL\\_DEVICE\\_CERTIFICATE\\_FOR\\_TLS](#) "device"
- #define [pkcs11configLABEL\\_JITP\\_CERTIFICATE](#) "signer"
- #define [pkcs11configLABEL\\_DEVICE\\_PRIVATE\\_KEY\\_FOR\\_TLS](#) "device private"
- #define [pkcs11configLABEL\\_DEVICE\\_PUBLIC\\_KEY\\_FOR\\_TLS](#) "device public"

## Functions

- [CK\\_RV pkcs11\\_config\\_cert](#) (pkcs11\_lib\_ctx\_ptr pLibCtx, pkcs11\_slot\_ctx\_ptr pSlot, pkcs11\_object\_ptr p↵Object, [CK\\_ATTRIBUTE\\_PTR](#) pLabel)
- [CK\\_RV pkcs11\\_config\\_key](#) (pkcs11\_lib\_ctx\_ptr pLibCtx, pkcs11\_slot\_ctx\_ptr pSlot, pkcs11\_object\_ptr p↵Object, [CK\\_ATTRIBUTE\\_PTR](#) pLabel)
- [CK\\_RV pkcs11\\_config\\_load\\_objects](#) (pkcs11\_slot\_ctx\_ptr pSlot)

## Variables

- const uint8\_t [atecc608\\_config](#) []

### 10.108.1 Macro Definition Documentation

#### 10.108.1.1 pkcs11configLABEL\_DEVICE\_CERTIFICATE\_FOR\_TLS

```
#define pkcs11configLABEL_DEVICE_CERTIFICATE_FOR_TLS "device"
```

#### 10.108.1.2 pkcs11configLABEL\_DEVICE\_PRIVATE\_KEY\_FOR\_TLS

```
#define pkcs11configLABEL_DEVICE_PRIVATE_KEY_FOR_TLS "device private"
```

#### 10.108.1.3 pkcs11configLABEL\_DEVICE\_PUBLIC\_KEY\_FOR\_TLS

```
#define pkcs11configLABEL_DEVICE_PUBLIC_KEY_FOR_TLS "device public"
```

#### 10.108.1.4 pkcs11configLABEL\_JITP\_CERTIFICATE

```
#define pkcs11configLABEL_JITP_CERTIFICATE "signer"
```

### 10.108.2 Function Documentation

#### 10.108.2.1 pkcs11\_config\_cert()

```
CK_RV pkcs11_config_cert (
    pkcs11_lib_ctx_ptr pLibCtx,
    pkcs11_slot_ctx_ptr pSlot,
    pkcs11_object_ptr pObject,
    CK_ATTRIBUTE_PTR pLabel )
```

#### 10.108.2.2 pkcs11\_config\_key()

```
CK_RV pkcs11_config_key (
    pkcs11_lib_ctx_ptr pLibCtx,
    pkcs11_slot_ctx_ptr pSlot,
    pkcs11_object_ptr pObject,
    CK_ATTRIBUTE_PTR pLabel )
```

### 10.108.2.3 pkcs11\_config\_load\_objects()

```
CK_RV pkcs11_config_load_objects (
    pkcs11_slot_ctx_ptr pSlot )
```

## 10.108.3 Variable Documentation

### 10.108.3.1 atecc608\_config

```
const uint8_t atecc608_config[]
```

Initial value:

```
= {
    0x01, 0x23, 0x00, 0x00, 0x00, 0x00, 0x60, 0x01, 0x00, 0x00, 0x00, 0x00, 0xEE, 0x01, 0x01, 0x00,
    0xC0, 0x00, 0x00, 0x01, 0x8F, 0x20, 0xC4, 0x44, 0x87, 0x20, 0x87, 0x20, 0x8F, 0x0F, 0xC4, 0x36,
    0x9F, 0x0F, 0x82, 0x20, 0x0F, 0x0F, 0xC4, 0x44, 0x0F, 0x0F, 0x0F, 0x0F, 0x0F, 0x0F, 0x0F, 0x0F,
    0x0F, 0x0F, 0x0F, 0x0F, 0xFF, 0xFF, 0xFF, 0xFF, 0x00, 0x00, 0x00, 0x00, 0xFF, 0xFF, 0xFF, 0xFF,
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xFF, 0xFF, 0xFF, 0xFF, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
    0x33, 0x00, 0x1C, 0x00, 0x13, 0x00, 0x13, 0x00, 0x7C, 0x00, 0x1C, 0x00, 0x3C, 0x00, 0x33, 0x00,
    0x3C, 0x00, 0x3C, 0x00, 0x3C, 0x00, 0x30, 0x00, 0x3C, 0x00, 0x3C, 0x00, 0x3C, 0x00, 0x30, 0x00,
}
```

Standard Configuration Structure for ATECC608 devices

## 10.109 hal\_all\_platforms\_kit\_hidapi.c File Reference

HAL for kit protocol over HID for any platform.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include "hidapi.h"
#include "atca_hal.h"
#include "hal/kit_protocol.h"
```

### Functions

- [ATCA\\_STATUS hal\\_kit\\_hid\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*HAL implementation of Kit USB HID init.*
- [ATCA\\_STATUS hal\\_kit\\_hid\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of Kit HID post init.*
- [ATCA\\_STATUS hal\\_kit\\_hid\\_send](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)  
*HAL implementation of kit protocol send over USB HID.*
- [ATCA\\_STATUS hal\\_kit\\_hid\\_receive](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxsize)  
*HAL implementation of send over USB HID.*
- [ATCA\\_STATUS hal\\_kit\\_hid\\_control](#) ([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations for the kit protocol.*
- [ATCA\\_STATUS hal\\_kit\\_hid\\_release](#) (void \*hal\_data)  
*Close the physical port for HID.*

### 10.109.1 Detailed Description

HAL for kit protocol over HID for any platform.

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## 10.110 hal\_esp32\_i2c.c File Reference

```
#include <stdio.h>
#include <string.h>
#include <driver/i2c.h>
#include "esp_err.h"
#include "esp_log.h"
#include "cryptoauthlib.h"
```

### Data Structures

- struct [atcal2Cmaster](#)

*this is the hal\_data for ATCA HAL for ASF SERCOM*

### Macros

- #define [I2C0\\_SDA\\_PIN](#) 16
- #define [I2C0\\_SCL\\_PIN](#) 17
- #define [I2C1\\_SDA\\_PIN](#) 21
- #define [I2C1\\_SCL\\_PIN](#) 22
- #define [ACK\\_CHECK\\_EN](#) 0x1
- #define [ACK\\_CHECK\\_DIS](#) 0x0
- #define [ACK\\_VAL](#) 0x0
- #define [NACK\\_VAL](#) 0x1
- #define [LOG\\_LOCAL\\_LEVEL](#) ESP\_LOG\_INFO
- #define [MAX\\_I2C\\_BUSES](#) 2

### Typedefs

- typedef struct [atcal2Cmaster](#) [ATCAI2CMaster\\_t](#)

## Functions

- [ATCA\\_STATUS hal\\_i2c\\_change\\_baud](#) ([ATCAIface](#) iface, [uint32\\_t](#) speed)  
*method to change the bus speed of I2C*
- [ATCA\\_STATUS hal\\_i2c\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*hal\_i2c\_init manages requests to initialize a physical interface. it manages use counts so when an interface has released the physical layer, it will disable the interface for some other use. You can have multiple ATCAIface instances using the same bus, and you can have multiple ATCAIface instances on multiple i2c buses, so hal\_i2c\_init manages these things and ATCAIface is abstracted from the physical details.*
- [ATCA\\_STATUS hal\\_i2c\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of I2C post init.*
- [ATCA\\_STATUS hal\\_i2c\\_send](#) ([ATCAIface](#) iface, [uint8\\_t](#) address, [uint8\\_t](#) \*txdata, [int](#) txlength)  
*HAL implementation of I2C send.*
- [ATCA\\_STATUS hal\\_i2c\\_receive](#) ([ATCAIface](#) iface, [uint8\\_t](#) address, [uint8\\_t](#) \*rxdata, [uint16\\_t](#) \*rxlength)  
*HAL implementation of I2C receive function.*
- [ATCA\\_STATUS hal\\_i2c\\_release](#) ([void](#) \*hal\_data)  
*manages reference count on given bus and releases resource if no more refences exist*
- [ATCA\\_STATUS hal\\_i2c\\_control](#) ([ATCAIface](#) iface, [uint8\\_t](#) option, [void](#) \*param, [size\\_t](#) paramlen)  
*Perform control operations for the kit protocol.*

## Variables

- [ATCAI2CMaster\\_t i2c\\_hal\\_data](#) [2]
- [const char \\*](#) [TAG](#) = "HAL\_I2C"
- [ATCA\\_STATUS](#) [status](#)

### 10.110.1 Macro Definition Documentation

#### 10.110.1.1 ACK\_CHECK\_DIS

```
#define ACK_CHECK_DIS 0x0
```

I2C master will not check ack from slave

#### 10.110.1.2 ACK\_CHECK\_EN

```
#define ACK_CHECK_EN 0x1
```

I2C master will check ack from slave

#### 10.110.1.3 ACK\_VAL

```
#define ACK_VAL 0x0
```

I2C ack value

### 10.110.1.4 I2C0\_SCL\_PIN

```
#define I2C0_SCL_PIN 17
```

### 10.110.1.5 I2C0\_SDA\_PIN

```
#define I2C0_SDA_PIN 16
```

### 10.110.1.6 I2C1\_SCL\_PIN

```
#define I2C1_SCL_PIN 22
```

### 10.110.1.7 I2C1\_SDA\_PIN

```
#define I2C1_SDA_PIN 21
```

### 10.110.1.8 LOG\_LOCAL\_LEVEL

```
#define LOG_LOCAL_LEVEL ESP_LOG_INFO
```

### 10.110.1.9 MAX\_I2C\_BUSES

```
#define MAX_I2C_BUSES 2
```

### 10.110.1.10 NACK\_VAL

```
#define NACK_VAL 0x1
```

I2C nack value

## 10.110.2 Typedef Documentation



### 10.110.2.1 ATCAI2CMaster\_t

```
typedef struct atcaI2Cmaster ATCAI2CMaster_t
```

## 10.110.3 Function Documentation

### 10.110.3.1 hal\_i2c\_change\_baud()

```
ATCA_STATUS hal_i2c_change_baud (
    ATCAIface iface,
    uint32_t speed )
```

method to change the bus speed of I2C

#### Parameters

in	<i>iface</i>	interface on which to change bus speed
in	<i>speed</i>	baud rate (typically 100000 or 400000)

### 10.110.3.2 hal\_i2c\_control()

```
ATCA_STATUS hal_i2c_control (
    ATCAIface iface,
    uint8_t option,
    void * param,
    size_t paramlen )
```

Perform control operations for the kit protocol.

#### Parameters

in	<i>iface</i>	Interface to interact with.
in	<i>option</i>	Control parameter identifier
in	<i>param</i>	Optional pointer to parameter value
in	<i>paramlen</i>	Length of the parameter

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.110.3.3 hal\_i2c\_init()

```
ATCA_STATUS hal_i2c_init (
    ATCAIFace iface,
    ATCAIFaceCfg * cfg )
```

hal\_i2c\_init manages requests to initialize a physical interface. it manages use counts so when an interface has released the physical layer, it will disable the interface for some other use. You can have multiple ATCAIFace instances using the same bus, and you can have multiple ATCAIFace instances on multiple i2c buses, so hal\_i2c\_init manages these things and ATCAIFace is abstracted from the physical details.

HAL implementation of I2C init.

- this HAL implementation assumes you've included the START Twi libraries in your project, otherwise, the HAL layer will not compile because the START TWI drivers are a dependency \*

initialize an I2C interface using given config

#### Parameters

in	<i>hal</i>	- opaque ptr to HAL data
in	<i>cfg</i>	- interface configuration

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

this implementation assumes I2C peripheral has been enabled by user. It only initialize an I2C interface using given config.

#### Parameters

in	<i>hal</i>	pointer to HAL specific data that is maintained by this HAL
in	<i>cfg</i>	pointer to HAL specific configuration data that is used to initialize this HAL

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.110.3.4 hal\_i2c\_post\_init()

```
ATCA_STATUS hal_i2c_post_init (
    ATCAIFace iface )
```

HAL implementation of I2C post init.

**Parameters**

in	<i>iface</i>	instance
----	--------------	----------

**Returns**

ATCA\_SUCCESS

**Parameters**

in	<i>iface</i>	instance
----	--------------	----------

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.110.3.5 hal\_i2c\_receive()**

```
ATCA_STATUS hal_i2c_receive (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * rxdata,
    uint16_t * rxlength )
```

HAL implementation of I2C receive function.

HAL implementation of I2C receive function for ASF I2C.

HAL implementation of I2C receive function for START I2C.

**Parameters**

in	<i>iface</i>	Device to interact with.
in	<i>address</i>	Device address
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>iface</i>	Device to interact with.
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>iface</i>	Device to interact with.
in	<i>address</i>	device address
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>iface</i>	Device to interact with.
in	<i>word_address</i>	device word address
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

< I2C master will check ack from slave

< I2C ack value

< I2C nack value

**10.110.3.6 hal\_i2c\_release()**

```
ATCA_STATUS hal_i2c_release (  
    void * hal_data )
```

manages reference count on given bus and releases resource if no more refences exist

manages reference count on given bus and releases resource if no more refernces exist

**Parameters**

in	<i>hal_data</i>	- opaque pointer to hal data structure - known only to the HAL implementation
----	-----------------	---

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>hal_data</i>	- opaque pointer to hal data structure - known only to the HAL implementation return ATCA_SUCCESS
in	<i>hal_data</i>	- opaque pointer to hal data structure - known only to the HAL implementation

**Returns**

ATCA\_SUCCESS

**10.110.3.7 hal\_i2c\_send()**

```
ATCA_STATUS hal_i2c_send (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * txdata,
    int txlength )
```

HAL implementation of I2C send.

HAL implementation of I2C send over ASF.

HAL implementation of I2C send over START.

**Parameters**

in	<i>iface</i>	instance
in	<i>word_address</i>	device transaction type
in	<i>txdata</i>	pointer to space to bytes to send
in	<i>txlength</i>	number of bytes to send

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**Parameters**

in	<i>iface</i>	instance
in	<i>txdata</i>	pointer to space to bytes to send
in	<i>txlength</i>	number of bytes to send

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

Parameters

in	<i>iface</i>	instance
in	<i>word_address</i>	device word address
in	<i>txdata</i>	pointer to space to bytes to send
in	<i>txlength</i>	number of bytes to send

Returns

ATCA\_SUCCESS on success, otherwise an error code.

< I2C master will check ack from slave

< I2C master will check ack from slave

10.110.4 Variable Documentation

10.110.4.1 i2c\_hal\_data

ATCAI2CMaster\_t i2c\_hal\_data[2]

10.110.4.2 status

ATCA\_STATUS status

10.110.4.3 TAG

const char\* TAG = "HAL\_I2C"

10.111 hal\_esp32\_timer.c File Reference

```
#include "atca_hal.h"
#include "freertos/FreeRTOS.h"
#include "freertos/task.h"
```

## Functions

- void [ets\\_delay\\_us](#) (uint32\_t)
- void [hal\\_delay\\_us](#) (uint32\_t delay)
- void [hal\\_delay\\_ms](#) (uint32\_t msec)

### 10.111.1 Function Documentation

#### 10.111.1.1 [ets\\_delay\\_us\(\)](#)

```
void ets_delay_us (
    uint32_t )
```

#### 10.111.1.2 [hal\\_delay\\_ms\(\)](#)

```
void hal_delay_ms (
    uint32_t msec )
```

#### 10.111.1.3 [hal\\_delay\\_us\(\)](#)

```
void hal_delay_us (
    uint32_t delay )
```

## 10.112 [hal\\_freertos.c](#) File Reference

FreeRTOS Hardware/OS Abstraction Layer.

```
#include "atca_hal.h"
#include "FreeRTOS.h"
#include "semphr.h"
#include "task.h"
```

## Macros

- #define [ATCA\\_MUTEX\\_TIMEOUT](#) portMAX\_DELAY

### Functions

- void \* [hal\\_malloc](#) (size\_t size)
- void [hal\\_free](#) (void \*ptr)
- void [hal\\_rtos\\_delay\\_ms](#) (uint32\_t ms)  
*Timer API implemented at the HAL level.*
- [ATCA\\_STATUS hal\\_create\\_mutex](#) (void \*\*ppMutex, char \*pName)  
*Optional hal interfaces.*
- [ATCA\\_STATUS hal\\_destroy\\_mutex](#) (void \*pMutex)
- [ATCA\\_STATUS hal\\_lock\\_mutex](#) (void \*pMutex)
- [ATCA\\_STATUS hal\\_unlock\\_mutex](#) (void \*pMutex)

### 10.112.1 Detailed Description

FreeRTOS Hardware/OS Abstraction Layer.

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### 10.112.2 Macro Definition Documentation

#### 10.112.2.1 ATCA\_MUTEX\_TIMEOUT

```
#define ATCA_MUTEX_TIMEOUT portMAX_DELAY
```

## 10.113 hal\_gpio\_harmony.c File Reference

ATCA Hardware abstraction layer for GPIO.

```
#include "atca_hal.h"
```

### Functions

- [ATCA\\_STATUS hal\\_gpio\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*Initialize a gpio interface using given config.*
- [ATCA\\_STATUS hal\\_gpio\\_post\\_init](#) ([ATCAIface](#) iface)  
*Post Init for gpio hal.*
- [ATCA\\_STATUS hal\\_gpio\\_send](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*pin\_state, int unused\_↵ param)  
*Set the state of the pin.*
- [ATCA\\_STATUS hal\\_gpio\\_receive](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*pin\_state, uint16\_↵ t \*unused\_param)  
*Read the state of the pin.*
- [ATCA\\_STATUS hal\\_gpio\\_control](#) ([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)
- [ATCA\\_STATUS hal\\_gpio\\_release](#) (void \*hal\_data)  
*Release and clean up the HAL.*



### 10.113.1 Detailed Description

ATCA Hardware abstraction layer for GPIO.

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### 10.113.2 Function Documentation

#### 10.113.2.1 hal\_gpio\_control()

```
ATCA_STATUS hal_gpio_control (
    ATCAIface iface,
    uint8_t option,
    void * param,
    size_t paramlen )
```

#### 10.113.2.2 hal\_gpio\_init()

```
ATCA_STATUS hal_gpio_init (
    ATCAIface iface,
    ATCAIfaceCfg * cfg )
```

Initialize a gpio interface using given config.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.113.2.3 hal\_gpio\_post\_init()

```
ATCA_STATUS hal_gpio_post_init (
    ATCAIface iface )
```

Post Init for gpio hal.

#### Returns

ATCA\_SUCCESS

### 10.113.2.4 hal\_gpio\_receive()

```
ATCA_STATUS hal_gpio_receive (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * pin_state,
    uint16_t * unused_param )
```

Read the state of the pin.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### Parameters

<i>iface</i>	Interface context
<i>word_address</i>	Unused parameter
<i>pin_state</i>	Pin state to output
<i>unused_param</i>	Unused parameter

### 10.113.2.5 hal\_gpio\_release()

```
ATCA_STATUS hal_gpio_release (
    void * hal_data )
```

Release and clean up the HAL.

#### Parameters

in	<i>hal_data</i>	opaque pointer to hal data structure - known only to the HAL implementation
----	-----------------	---

#### Returns

ATCA\_SUCCESS

### 10.113.2.6 hal\_gpio\_send()

```
ATCA_STATUS hal_gpio_send (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * pin_state,
    int unused_param )
```

Set the state of the pin.

#### Returns

ATCA\_SUCCESS

## Parameters

<i>iface</i>	Interface context
<i>word_address</i>	Unused parameter
<i>pin_state</i>	Pin state to output
<i>unused_param</i>	Unused parameter

## 10.114 hal\_i2c\_harmony.c File Reference

ATCA Hardware abstraction layer for SAMD21 I2C over Harmony PLIB.

```
#include <string.h>
#include <stdio.h>
#include "cryptoauthlib.h"
```

### Functions

- [ATCA\\_STATUS hal\\_i2c\\_discover\\_buses](#) (int i2c\_buses[], int max\_buses)  
*discover i2c buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-prior knowledge*
- [ATCA\\_STATUS hal\\_i2c\\_discover\\_devices](#) (int bus\_num, [ATCAIfaceCfg](#) cfg[], int \*found)  
*discover any CryptoAuth devices on a given logical bus number*
- [ATCA\\_STATUS hal\\_i2c\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*hal\_i2c\_init manages requests to initialize a physical interface. it manages use counts so when an interface has released the physical layer, it will disable the interface for some other use. You can have multiple ATCAIFace instances using the same bus, and you can have multiple ATCAIFace instances on multiple i2c buses, so hal\_i2c\_init manages these things and ATCAIFace is abstracted from the physical details.*
- [ATCA\\_STATUS hal\\_i2c\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of I2C post init.*
- [ATCA\\_STATUS hal\\_i2c\\_send](#) ([ATCAIface](#) iface, uint8\_t address, uint8\_t \*txdata, int txlength)  
*HAL implementation of I2C send over START.*
- [ATCA\\_STATUS hal\\_i2c\\_receive](#) ([ATCAIface](#) iface, uint8\_t address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*HAL implementation of I2C receive function for START I2C.*
- [ATCA\\_STATUS change\\_i2c\\_speed](#) ([ATCAIface](#) iface, uint32\_t speed)  
*method to change the bus speec of I2C*
- [ATCA\\_STATUS hal\\_i2c\\_control](#) ([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations for the kit protocol.*
- [ATCA\\_STATUS hal\\_i2c\\_release](#) (void \*hal\_data)  
*manages reference count on given bus and releases resource if no more refences exist*

### 10.114.1 Detailed Description

ATCA Hardware abstraction layer for SAMD21 I2C over Harmony PLIB.

This code is structured in two parts. Part 1 is the connection of the ATCA HAL API to the physical I2C implementation. Part 2 is the Harmony I2C primitives to set up the interface.

Prerequisite: add SERCOM I2C Master Polled support to application in Atmel Studio

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## 10.115 hal\_i2c\_start.c File Reference

ATCA Hardware abstraction layer for SAMD21 I2C over START drivers.

```
#include <string.h>
#include <stdio.h>
#include <atmel_start.h>
#include <hal_gpio.h>
#include <hal_delay.h>
#include "hal_i2c_start.h"
#include "atca_start_config.h"
#include "atca_start_iface.h"
#include "cryptoauthlib.h"
```

### Functions

- [ATCA\\_STATUS hal\\_i2c\\_discover\\_buses](#) (int i2c\_buses[], int max\_buses)  
*discover i2c buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-prior knowledge*
- [ATCA\\_STATUS hal\\_i2c\\_discover\\_devices](#) (int bus\_num, [ATCAIfaceCfg](#) cfg[], int \*found)  
*discover any CryptoAuth devices on a given logical bus number*
- [ATCA\\_STATUS hal\\_i2c\\_init](#) (void \*hal, [ATCAIfaceCfg](#) \*cfg)  
*hal\_i2c\_init manages requests to initialize a physical interface. it manages use counts so when an interface has released the physical layer, it will disable the interface for some other use. You can have multiple ATCAIface instances using the same bus, and you can have multiple ATCAIface instances on multiple i2c buses, so hal\_i2c\_init manages these things and ATCAIface is abstracted from the physical details.*
- [ATCA\\_STATUS hal\\_i2c\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of I2C post init.*
- [ATCA\\_STATUS hal\\_i2c\\_send](#) ([ATCAIface](#) iface, uint8\_t address, uint8\_t \*txdata, int txlength)  
*HAL implementation of I2C send over START.*
- [ATCA\\_STATUS hal\\_i2c\\_receive](#) ([ATCAIface](#) iface, uint8\_t address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*HAL implementation of I2C receive function for START I2C.*
- [ATCA\\_STATUS hal\\_i2c\\_wake](#) ([ATCAIface](#) iface)  
*wake up CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_idle](#) ([ATCAIface](#) iface)  
*idle CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_sleep](#) ([ATCAIface](#) iface)  
*sleep CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_release](#) (void \*hal\_data)  
*manages reference count on given bus and releases resource if no more references exist*

### 10.115.1 Detailed Description

ATCA Hardware abstraction layer for SAMD21 I2C over START drivers.

This code is structured in two parts. Part 1 is the connection of the ATCA HAL API to the physical I2C implementation. Part 2 is the START I2C primitives to set up the interface.

Prerequisite: add SERCOM I2C Master Polled support to application in Atmel Studio

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## 10.116 hal\_i2c\_start.h File Reference

ATCA Hardware abstraction layer for SAMD21 I2C over START drivers.

```
#include "atmel_start.h"
#include <stdlib.h>
#include "cryptoauthlib.h"
```

### Data Structures

- struct [i2c\\_start\\_instance](#)

### Typedefs

- typedef void(\* [start\\_change\\_baudrate](#)) ([ATCAIface](#) iface, uint32\_t speed)
- typedef struct [i2c\\_start\\_instance](#) [i2c\\_start\\_instance\\_t](#)

### 10.116.1 Detailed Description

ATCA Hardware abstraction layer for SAMD21 I2C over START drivers.

Prerequisite: add SERCOM I2C Master Polled support to application in Atmel Studio

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## 10.117 hal\_kit\_bridge.c File Reference

Kit Bridging HAL for cryptoauthlib. This is not intended to be a zero copy driver. It should work with any interface that confirms to a few basic requirements: a) will accept an arbitrary number of bytes and packetize it if necessary for transmission, b) will block for the duration of the transmit.

```
#include "cryptoauthlib.h"
#include "atca_hal.h"
#include "hal_kit_bridge.h"
```

### Functions

- [ATCA\\_STATUS hal\\_kit\\_attach\\_phy](#) ([ATCAIfaceCfg](#) \*cfg, [atca\\_hal\\_kit\\_phy\\_t](#) \*phy)  
*Helper function that connects a physical layer context structure that will be used by the kit protocol bridge.*
- [ATCA\\_STATUS hal\\_kit\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*HAL implementation of Kit USB HID init.*
- [ATCA\\_STATUS hal\\_kit\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of Kit HID post init.*
- [ATCA\\_STATUS hal\\_kit\\_send](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)  
*HAL implementation of kit protocol send over USB HID.*
- [ATCA\\_STATUS hal\\_kit\\_receive](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxsize)  
*HAL implementation of send over USB HID.*
- [ATCA\\_STATUS hal\\_kit\\_control](#) ([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)  
*Kit Protocol Control.*
- [ATCA\\_STATUS hal\\_kit\\_release](#) (void \*hal\_data)  
*Close the physical port for HID.*

### 10.117.1 Detailed Description

Kit Bridging HAL for cryptoauthlib. This is not intended to be a zero copy driver. It should work with any interface that confirms to a few basic requirements: a) will accept an arbitrary number of bytes and packetize it if necessary for transmission, b) will block for the duration of the transmit.

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## 10.118 hal\_kit\_bridge.h File Reference

Kit Bridging HAL for cryptoauthlib. This is not intended to be a zero copy driver. It should work with any interface that confirms to a few basic requirements: a) will accept an arbitrary number of bytes and packetize it if necessary for transmission, b) will block for the duration of the transmit.

### Macros

- `#define BRIDGE_PROTOCOL_VERSION` (2)
- `#define HAL_KIT_COMMAND_SEND` 0x01
- `#define HAL_KIT_COMMAND_RECV` 0x02
- `#define HAL_KIT_COMMAND_WAKE` 0x03
- `#define HAL_KIT_COMMAND_IDLE` 0x04
- `#define HAL_KIT_COMMAND_SLEEP` 0x05
- `#define HAL_KIT_HEADER_LEN` (3)

### Functions

- `ATCA_STATUS hal_kit_attach_phy` (ATCAIfaceCfg \*cfg, atca\_hal\_kit\_phy\_t \*phy)

*Helper function that connects a physical layer context structure that will be used by the kit protocol bridge.*

### 10.118.1 Detailed Description

Kit Bridging HAL for cryptoauthlib. This is not intended to be a zero copy driver. It should work with any interface that confirms to a few basic requirements: a) will accept an arbitrary number of bytes and packetize it if necessary for transmission, b) will block for the duration of the transmit.

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### 10.118.2 Macro Definition Documentation

#### 10.118.2.1 BRIDGE\_PROTOCOL\_VERSION

```
#define BRIDGE_PROTOCOL_VERSION (2)
```

#### 10.118.2.2 HAL\_KIT\_COMMAND\_IDLE

```
#define HAL_KIT_COMMAND_IDLE 0x04
```

#### 10.118.2.3 HAL\_KIT\_COMMAND\_RECV

```
#define HAL_KIT_COMMAND_RECV 0x02
```

#### 10.118.2.4 HAL\_KIT\_COMMAND\_SEND

```
#define HAL_KIT_COMMAND_SEND 0x01
```

#### 10.118.2.5 HAL\_KIT\_COMMAND\_SLEEP

```
#define HAL_KIT_COMMAND_SLEEP 0x05
```

#### 10.118.2.6 HAL\_KIT\_COMMAND\_WAKE

```
#define HAL_KIT_COMMAND_WAKE 0x03
```

#### 10.118.2.7 HAL\_KIT\_HEADER\_LEN

```
#define HAL_KIT_HEADER_LEN (3)
```

## 10.119 hal\_linux.c File Reference

Timer Utility Functions for Linux.

```
#include <stdlib.h>
#include <stdint.h>
#include <unistd.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <sys/mman.h>
#include <fcntl.h>
#include <pthread.h>
#include <errno.h>
#include "atca_hal.h"
#include <semaphore.h>
```

### Functions

- void [hal\\_delay\\_us](#) (uint32\_t delay)  
*This function delays for a number of microseconds.*
- void [hal\\_delay\\_10us](#) (uint32\_t delay)  
*This function delays for a number of tens of microseconds.*
- void [hal\\_delay\\_ms](#) (uint32\_t delay)  
*This function delays for a number of milliseconds.*
- [ATCA\\_STATUS hal\\_create\\_mutex](#) (void \*\*ppMutex, char \*pName)  
*Optional hal interfaces.*
- [ATCA\\_STATUS hal\\_destroy\\_mutex](#) (void \*pMutex)
- [ATCA\\_STATUS hal\\_lock\\_mutex](#) (void \*pMutex)
- [ATCA\\_STATUS hal\\_unlock\\_mutex](#) (void \*pMutex)

### 10.119.1 Detailed Description

Timer Utility Functions for Linux.

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## 10.120 hal\_linux\_i2c\_userspace.c File Reference

ATCA Hardware abstraction layer for Linux using I2C.

```
#include <cryptoauthlib.h>
#include <linux/i2c-dev.h>
#include <unistd.h>
#include <sys/ioctl.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <fcntl.h>
#include <errno.h>
#include <string.h>
#include <stdint.h>
#include <stdio.h>
#include <stdlib.h>
#include "atca_hal.h"
```



## Data Structures

- struct [atca\\_i2c\\_host\\_s](#)

## Typedefs

- typedef struct [atca\\_i2c\\_host\\_s](#) [atca\\_i2c\\_host\\_t](#)

## Functions

- [ATCA\\_STATUS hal\\_i2c\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*hal\_i2c\_init manages requests to initialize a physical interface. it manages use counts so when an interface has released the physical layer, it will disable the interface for some other use. You can have multiple ATCAIface instances using the same bus, and you can have multiple ATCAIface instances on multiple i2c buses, so hal\_i2c\_init manages these things and ATCAIface is abstracted from the physical details.*
- [ATCA\\_STATUS hal\\_i2c\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of I2C post init.*
- [ATCA\\_STATUS hal\\_i2c\\_send](#) ([ATCAIface](#) iface, [uint8\\_t](#) address, [uint8\\_t](#) \*txdata, [int](#) txlength)  
*HAL implementation of I2C send over START.*
- [ATCA\\_STATUS hal\\_i2c\\_receive](#) ([ATCAIface](#) iface, [uint8\\_t](#) address, [uint8\\_t](#) \*rxdata, [uint16\\_t](#) \*rxlength)  
*HAL implementation of I2C receive function for START I2C.*
- [ATCA\\_STATUS hal\\_i2c\\_control](#) ([ATCAIface](#) iface, [uint8\\_t](#) option, [void](#) \*param, [size\\_t](#) paramlen)  
*Perform control operations for the kit protocol.*
- [ATCA\\_STATUS hal\\_i2c\\_release](#) ([void](#) \*hal\_data)  
*manages reference count on given bus and releases resource if no more references exist*

### 10.120.1 Detailed Description

ATCA Hardware abstraction layer for Linux using I2C.

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## 10.121 hal\_linux\_spi\_userspace.c File Reference

```
#include "cryptoauthlib.h"
#include "atca_hal.h"
#include <unistd.h>
#include <fcntl.h>
#include <sys/ioctl.h>
#include <linux/spi/spidev.h>
```

## Data Structures

- struct [atca\\_spi\\_host\\_s](#)

## Typedefs

- typedef struct [atca\\_spi\\_host\\_s](#) [atca\\_spi\\_host\\_t](#)

## Functions

- [ATCA\\_STATUS](#) [hal\\_spi\\_open\\_file](#) (const char \*dev\_name, uint32\_t speed, int \*fd)  
*Open and configure the SPI device.*
- [ATCA\\_STATUS](#) [hal\\_spi\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*HAL implementation of SPI init.*
- [ATCA\\_STATUS](#) [hal\\_spi\\_post\\_init](#) ([ATCAIface](#) iface)
- [ATCA\\_STATUS](#) [hal\\_spi\\_select](#) ([ATCAIface](#) iface)  
*HAL implementation to assert the device chip select.*
- [ATCA\\_STATUS](#) [hal\\_spi\\_deselect](#) ([ATCAIface](#) iface)  
*HAL implementation to deassert the device chip select.*
- [ATCA\\_STATUS](#) [hal\\_spi\\_receive](#) ([ATCAIface](#) iface, uint8\_t flags, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*HAL implementation of SPI receive function.*
- [ATCA\\_STATUS](#) [hal\\_spi\\_send](#) ([ATCAIface](#) iface, uint8\_t flags, uint8\_t \*txdata, int txlen)  
*HAL implementation of SPI send.*
- [ATCA\\_STATUS](#) [hal\\_spi\\_control](#) ([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations for the kit protocol.*
- [ATCA\\_STATUS](#) [hal\\_spi\\_release](#) (void \*hal\_data)  
*manages reference count on given bus and releases resource if no more references exist*

### 10.121.1 Typedef Documentation

#### 10.121.1.1 [atca\\_spi\\_host\\_t](#)

```
typedef struct atca\_spi\_host\_s atca\_spi\_host\_t
```

### 10.121.2 Function Documentation

#### 10.121.2.1 [hal\\_spi\\_control\(\)](#)

```
ATCA\_STATUS hal\_spi\_control (  
    ATCAIface iface,  
    uint8_t option,  
    void * param,  
    size_t paramlen )
```

Perform control operations for the kit protocol.

**Parameters**

in	<i>iface</i>	Interface to interact with.
in	<i>option</i>	Control parameter identifier
in	<i>param</i>	Optional pointer to parameter value
in	<i>paramlen</i>	Length of the parameter

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.121.2.2 hal\_spi\_deselect()**

```
ATCA_STATUS hal_spi_deselect (
    ATCAIface iface )
```

HAL implementation to deassert the device chip select.

**Parameters**

in	<i>iface</i>	Device to interact with.
----	--------------	--------------------------

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.121.2.3 hal\_spi\_init()**

```
ATCA_STATUS hal_spi_init (
    ATCAIface iface,
    ATCAIfaceCfg * cfg )
```

HAL implementation of SPI init.

this implementation assumes SPI peripheral has been enabled by user . It only initialize an SPI interface using given config.

**Parameters**

in	<i>hal</i>	pointer to HAL specific data that is maintained by this HAL
in	<i>cfg</i>	pointer to HAL specific configuration data that is used to initialize this HAL

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.121.2.4 hal\_spi\_open\_file()

```
ATCA_STATUS hal_spi_open_file (
    const char * dev_name,
    uint32_t speed,
    int * fd )
```

Open and configure the SPI device.

### Parameters

in	<i>dev_name</i>	File name in the form /dev/spidevX.Y
in	<i>speed</i>	Clock speed in Hz
out	<i>fd</i>	resulting file descriptor

#### 10.121.2.5 hal\_spi\_post\_init()

```
ATCA_STATUS hal_spi_post_init (
    ATCAIface iface )
```

#### 10.121.2.6 hal\_spi\_receive()

```
ATCA_STATUS hal_spi_receive (
    ATCAIface iface,
    uint8_t flags,
    uint8_t * rxdata,
    uint16_t * rxlength )
```

HAL implementation of SPI receive function.

### Parameters

in	<i>iface</i>	Device to interact with.
in	<i>word_address</i>	device transaction type
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>len</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.121.2.7 hal\_spi\_release()**

```
ATCA_STATUS hal_spi_release (
    void * hal_data )
```

manages reference count on given bus and releases resource if no more references exist

**Parameters**

in	<i>hal_data</i>	- opaque pointer to hal data structure - known only to the HAL implementation
----	-----------------	---

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.121.2.8 hal\_spi\_select()**

```
ATCA_STATUS hal_spi_select (
    ATCAIface iface )
```

HAL implementation to assert the device chip select.

**Parameters**

in	<i>iface</i>	Device to interact with.
----	--------------	--------------------------

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.121.2.9 hal\_spi\_send()**

```
ATCA_STATUS hal_spi_send (
    ATCAIface iface,
    uint8_t flags,
    uint8_t * txdata,
    int txlen )
```

HAL implementation of SPI send.

**Parameters**

in	<i>iface</i>	instance
in	<i>word_address</i>	transaction type
in	<i>txdata</i>	data to be send to device
in	<i>txdata</i>	pointer to space to bytes to send
in	<i>len</i>	number of bytes to send

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

## 10.122 hal\_linux\_uart\_userspace.c File Reference

ATCA Hardware abstraction layer for Linux using UART.

```
#include "cryptoauthlib.h"
#include "atca_hal.h"
#include <unistd.h>
#include <fcntl.h>
#include <sys/ioctl.h>
#include <termios.h>
```

**Data Structures**

- struct [atca\\_uart\\_host\\_s](#)

**Typedefs**

- typedef struct [atca\\_uart\\_host\\_s](#) [atca\\_uart\\_host\\_t](#)

**Functions**

- [ATCA\\_STATUS hal\\_uart\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*HAL implementation of UART init.*
- [ATCA\\_STATUS hal\\_uart\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of UART post init.*
- [ATCA\\_STATUS hal\\_uart\\_send](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)  
*HAL implementation of UART send.*
- [ATCA\\_STATUS hal\\_uart\\_receive](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*HAL implementation of UART receive function.*
- [ATCA\\_STATUS hal\\_uart\\_control](#) ([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations for the UART.*
- [ATCA\\_STATUS hal\\_uart\\_release](#) (void \*hal\_data)  
*manages reference count on given bus and releases resource if no more refences exist*

### 10.122.1 Detailed Description

ATCA Hardware abstraction layer for Linux using UART.

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### 10.122.2 Typedef Documentation

#### 10.122.2.1 atca\_uart\_host\_t

```
typedef struct atca_uart_host_s atca_uart_host_t
```

### 10.122.3 Function Documentation

#### 10.122.3.1 hal\_uart\_control()

```
ATCA_STATUS hal_uart_control (
    ATCAIface iface,
    uint8_t option,
    void * param,
    size_t paramlen )
```

Perform control operations for the UART.

#### Parameters

in	<i>iface</i>	Interface to interact with.
in	<i>option</i>	Control parameter identifier
in	<i>param</i>	Optional pointer to parameter value
in	<i>paramlen</i>	Length of the parameter

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.122.3.2 hal\_uart\_init()

```
ATCA_STATUS hal_uart_init (
    ATCAIface iface,
    ATCAIfaceCfg * cfg )
```

HAL implementation of UART init.

this implementation assumes UART SERIAL PORT peripheral has been enabled by user . It only initialize an UART interface using given config.

#### Parameters

in	<i>hal</i>	pointer to HAL specific data that is maintained by this HAL
in	<i>cfg</i>	pointer to HAL specific configuration data that is used to initialize this HAL

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.122.3.3 hal\_uart\_post\_init()

```
ATCA_STATUS hal_uart_post_init (  
    ATCAIface iface )
```

HAL implementation of UART post init.

#### Parameters

in	<i>iface</i>	instance
----	--------------	----------

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.122.3.4 hal\_uart\_receive()

```
ATCA_STATUS hal_uart_receive (  
    ATCAIface iface,  
    uint8_t word_address,  
    uint8_t * rxdata,  
    uint16_t * rxlength )
```

HAL implementation of UART receive function.

#### Parameters

in	<i>iface</i>	Device to interact with.
in	<i>word_address</i>	device transaction type
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.



**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.122.3.5 hal\_uart\_release()**

```
ATCA_STATUS hal_uart_release (
    void * hal_data )
```

manages reference count on given bus and releases resource if no more references exist

**Parameters**

in	<i>hal_data</i>	- opaque pointer to hal data structure - known only to the HAL implementation
----	-----------------	---

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.122.3.6 hal\_uart\_send()**

```
ATCA_STATUS hal_uart_send (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * txdata,
    int txlength )
```

HAL implementation of UART send.

**Parameters**

in	<i>iface</i>	instance
in	<i>word_address</i>	transaction type
in	<i>txdata</i>	data to be send to device
in	<i>txdata</i>	pointer to space to bytes to send

**Returns**

ATCA\_SUCCESS on success, otherwise an error code.

**10.123 hal\_sam0\_i2c\_asf.c File Reference**

ATCA Hardware abstraction layer for SAMD21 I2C over ASF drivers.

```
#include <asf.h>
#include <string.h>
#include <stdio.h>
#include "hal_sam0_i2c_asf.h"
#include "cryptoauthlib.h"
```

### Functions

- [ATCA\\_STATUS hal\\_i2c\\_discover\\_buses](#) (int i2c\_buses[], int max\_buses)  
*discover i2c buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-prior knowledge*
- [ATCA\\_STATUS hal\\_i2c\\_discover\\_devices](#) (int bus\_num, [ATCAIfaceCfg](#) cfg[], int \*found)  
*discover any CryptoAuth devices on a given logical bus number*
- [ATCA\\_STATUS hal\\_i2c\\_init](#) (void \*hal, [ATCAIfaceCfg](#) \*cfg)  
*hal\_i2c\_init manages requests to initialize a physical interface. it manages use counts so when an interface has released the physical layer, it will disable the interface for some other use. You can have multiple ATCAIface instances using the same bus, and you can have multiple ATCAIface instances on multiple i2c buses, so hal\_i2c\_init manages these things and ATCAIface is abstracted from the physical details.*
- [ATCA\\_STATUS hal\\_i2c\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of I2C post init.*
- [ATCA\\_STATUS hal\\_i2c\\_send](#) ([ATCAIface](#) iface, uint8\_t address, uint8\_t \*txdata, int txlength)  
*HAL implementation of I2C send over START.*
- [ATCA\\_STATUS hal\\_i2c\\_receive](#) ([ATCAIface](#) iface, uint8\_t address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*HAL implementation of I2C receive function for START I2C.*
- [ATCA\\_STATUS hal\\_i2c\\_wake](#) ([ATCAIface](#) iface)  
*wake up CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_idle](#) ([ATCAIface](#) iface)  
*idle CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_sleep](#) ([ATCAIface](#) iface)  
*sleep CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_release](#) (void \*hal\_data)  
*manages reference count on given bus and releases resource if no more references exist*

### 10.123.1 Detailed Description

ATCA Hardware abstraction layer for SAMD21 I2C over ASF drivers.

This code is structured in two parts. Part 1 is the connection of the ATCA HAL API to the physical I2C implementation. Part 2 is the ASF I2C primitives to set up the interface.

Prerequisite: add SERCOM I2C Master Polled support to application in Atmel Studio

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## 10.124 hal\_sam0\_i2c\_asf.h File Reference

ATCA Hardware abstraction layer for SAMD21 I2C over ASF drivers.

```
#include <asf.h>
#include "cryptoauthlib.h"
```

## Data Structures

- struct [i2c\\_sam0\\_instance](#)

## Typedefs

- typedef void(\* [sam0\\_change\\_baudrate](#)) ([ATCAIface](#) iface, uint32\_t speed)
- typedef struct [i2c\\_sam0\\_instance](#) [i2c\\_sam0\\_instance\\_t](#)

### 10.124.1 Detailed Description

ATCA Hardware abstraction layer for SAMD21 I2C over ASF drivers.

Prerequisite: add SERCOM I2C Master Polled support to application in Atmel Studio

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### 10.124.2 Typedef Documentation

#### 10.124.2.1 [i2c\\_sam0\\_instance\\_t](#)

```
typedef struct i2c\_sam0\_instance i2c\_sam0\_instance\_t
```

#### 10.124.2.2 [sam0\\_change\\_baudrate](#)

```
typedef void(* sam0\_change\_baudrate) (ATCAIface iface, uint32_t speed)
```

## 10.125 [hal\\_sam\\_i2c\\_asf.c](#) File Reference

ATCA Hardware abstraction layer for SAM flexcom & twi I2C over ASF drivers.

```
#include <asf.h>
#include <string.h>
#include <stdio.h>
#include "cryptoauthlib.h"
#include "hal_sam_i2c_asf.h"
```

## Functions

- [ATCA\\_STATUS hal\\_i2c\\_discover\\_buses](#) (int i2c\_buses[], int max\_buses)  
*discover i2c buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-prior knowledge*
- [ATCA\\_STATUS hal\\_i2c\\_discover\\_devices](#) (int bus\_num, [ATCAIfaceCfg](#) cfg[], int \*found)  
*discover any CryptoAuth devices on a given logical bus number*
- [ATCA\\_STATUS hal\\_i2c\\_init](#) (void \*hal, [ATCAIfaceCfg](#) \*cfg)  
*hal\_i2c\_init manages requests to initialize a physical interface. it manages use counts so when an interface has released the physical layer, it will disable the interface for some other use. You can have multiple ATCAIface instances using the same bus, and you can have multiple ATCAIface instances on multiple i2c buses, so hal\_i2c\_init manages these things and ATCAIface is abstracted from the physical details.*
- [ATCA\\_STATUS hal\\_i2c\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of I2C post init.*
- [ATCA\\_STATUS hal\\_i2c\\_send](#) ([ATCAIface](#) iface, uint8\_t address, uint8\_t \*txdata, int txlength)  
*HAL implementation of I2C send over START.*
- [ATCA\\_STATUS hal\\_i2c\\_receive](#) ([ATCAIface](#) iface, uint8\_t address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*HAL implementation of I2C receive function for START I2C.*
- [ATCA\\_STATUS hal\\_i2c\\_wake](#) ([ATCAIface](#) iface)  
*wake up CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_idle](#) ([ATCAIface](#) iface)  
*idle CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_sleep](#) ([ATCAIface](#) iface)  
*sleep CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_release](#) (void \*hal\_data)  
*manages reference count on given bus and releases resource if no more references exist*

### 10.125.1 Detailed Description

ATCA Hardware abstraction layer for SAM flexcom & twi I2C over ASF drivers.

This code is structured in two parts. Part 1 is the connection of the ATCA HAL API to the physical I2C implementation. Part 2 is the ASF I2C primitives to set up the interface.

Prerequisite: add "TWI - Two-Wire Interface (Common API) (service)" module to application in Atmel Studio

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## 10.126 hal\_sam\_i2c\_asf.h File Reference

ATCA Hardware abstraction layer for SAMG55 I2C over ASF drivers.

```
#include <asf.h>
#include "cryptoauthlib.h"
```

## Data Structures

- struct [i2c\\_sam\\_instance](#)

## Typedefs

- typedef void(\* [sam\\_change\\_baudrate](#)) ([ATCAIface](#) iface, uint32\_t speed)
- typedef struct [i2c\\_sam\\_instance](#) [i2c\\_sam\\_instance\\_t](#)

### 10.126.1 Detailed Description

ATCA Hardware abstraction layer for SAMG55 I2C over ASF drivers.

Prerequisite: add "TWI - Two-Wire Interface (Common API) (service)" module to application in Atmel Studio

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## 10.127 hal\_sam\_timer\_asf.c File Reference

ATCA Hardware abstraction layer for SAMD21 timer/delay over ASF drivers.

```
#include <asf.h>
#include <delay.h>
#include "atca_hal.h"
```

## Functions

- void [atca\\_delay\\_10us](#) (uint32\_t delay)  
*This function delays for a number of tens of microseconds.*
- void [atca\\_delay\\_us](#) (uint32\_t delay)  
*This function delays for a number of microseconds.*
- void [atca\\_delay\\_ms](#) (uint32\_t ms)  
*Timer API for legacy implementations.*

### 10.127.1 Detailed Description

ATCA Hardware abstraction layer for SAMD21 timer/delay over ASF drivers.

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## 10.128 hal\_spi\_harmony.c File Reference

ATCA Hardware abstraction layer for SPI over Harmony PLIB.

```
#include <string.h>
#include <stdio.h>
#include "atca_config.h"
#include "cryptoauthlib.h"
#include "atca_hal.h"
#include "atca_device.h"
#include "definitions.h"
#include "talib/talib_defines.h"
#include "talib/talib_fce.h"
```

### Functions

- [ATCA\\_STATUS hal\\_spi\\_discover\\_buses](#) (int spi\_buses[], int max\_buses)  
*discover spi buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-priori knowledge*
- [ATCA\\_STATUS hal\\_spi\\_discover\\_devices](#) (int bus\_num, [ATCAfaceCfg](#) cfg[], int \*found)  
*discover any TA100 devices on a given logical bus number*
- [ATCA\\_STATUS hal\\_spi\\_init](#) ([ATCAface](#) iface, [ATCAfaceCfg](#) \*cfg)  
*initialize an SPI interface using given config*
- [ATCA\\_STATUS hal\\_spi\\_post\\_init](#) ([ATCAface](#) iface)  
*HAL implementation of SPI post init.*
- [ATCA\\_STATUS hal\\_spi\\_select](#) ([ATCAface](#) iface)  
*HAL implementation to assert the device chip select.*
- [ATCA\\_STATUS hal\\_spi\\_deselect](#) ([ATCAface](#) iface)  
*HAL implementation to deassert the device chip select.*
- [ATCA\\_STATUS hal\\_spi\\_send](#) ([ATCAface](#) iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)  
*HAL implementation of SPI send over Harmony.*
- [ATCA\\_STATUS hal\\_spi\\_receive](#) ([ATCAface](#) iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*HAL implementation of SPI receive function for HARMONY SPI.*
- [ATCA\\_STATUS hal\\_spi\\_control](#) ([ATCAface](#) iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations for the kit protocol.*
- [ATCA\\_STATUS hal\\_spi\\_release](#) (void \*hal\_data)  
*manages reference count on given bus and releases resource if no more references exist*

### 10.128.1 Detailed Description

ATCA Hardware abstraction layer for SPI over Harmony PLIB.

This code is structured in two parts. Part 1 is the connection of the ATCA HAL API to the physical SPI implementation. Part 2 is the Harmony SPI primitives to set up the interface.

Prerequisite: add SERCOM SPI Master Interrupt support to application in Mplab Harmony 3

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## 10.129 hal\_swi\_gpio.c File Reference

ATCA Hardware abstraction layer for 1WIRE or SWI over GPIO.

```
#include "cryptoauthlib.h"
#include "hal_swi_gpio.h"
```

### Functions

- [ATCA\\_STATUS hal\\_swi\\_gpio\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*initialize an GPIO interface using given config*
- [ATCA\\_STATUS hal\\_swi\\_gpio\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of GPIO post init.*
- [ATCA\\_STATUS hal\\_swi\\_gpio\\_send](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)  
*HAL implementation of bit banging send over Harmony.*
- [ATCA\\_STATUS hal\\_swi\\_gpio\\_receive](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t rxlength)  
*HAL implementation of bit banging receive from HARMONY.*
- [ATCA\\_STATUS hal\\_swi\\_gpio\\_control](#) ([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations.*
- [ATCA\\_STATUS hal\\_swi\\_gpio\\_release](#) (void \*hal\_data)  
*releases resource if no more communication*

### 10.129.1 Detailed Description

ATCA Hardware abstraction layer for 1WIRE or SWI over GPIO.

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### 10.129.2 Function Documentation

#### 10.129.2.1 hal\_swi\_gpio\_control()

```
ATCA_STATUS hal_swi_gpio_control (
    ATCAIface iface,
    uint8_t option,
    void * param,
    size_t paramlen )
```

Perform control operations.

### Parameters

in	<i>iface</i>	Interface to interact with.
in	<i>option</i>	Control parameter identifier
in	<i>param</i>	Optional pointer to parameter value
in	<i>paramlen</i>	Length of the parameter

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.129.2.2 hal\_swi\_gpio\_init()

```
ATCA_STATUS hal_swi_gpio_init (
    ATCAIface iface,
    ATCAIfaceCfg * cfg )
```

initialize an GPIO interface using given config

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.129.2.3 hal\_swi\_gpio\_post\_init()

```
ATCA_STATUS hal_swi_gpio_post_init (
    ATCAIface iface )
```

HAL implementation of GPIO post init.

### Parameters

in	<i>iface</i>	ATCAIface instance
----	--------------	--------------------

### Returns

ATCA\_SUCCESS

#### 10.129.2.4 hal\_swi\_gpio\_receive()

```
ATCA_STATUS hal_swi_gpio_receive (
    ATCAIface iface,
```



```
uint8_t word_address,
uint8_t * rxdata,
uint16_t * rxlength )
```

HAL implementation of bit banging receive from HARMONY.

#### Parameters

in	<i>iface</i>	Device to interact with.
in	<i>word_address</i>	device transaction type
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.129.2.5 hal\_swi\_gpio\_release()

```
ATCA_STATUS hal_swi_gpio_release (
    void * hal_data )
```

releases resource if no more communication

#### Parameters

in	<i>hal_data</i>	- opaque pointer to hal data structure - known only to the HAL implementation
----	-----------------	---

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.129.2.6 hal\_swi\_gpio\_send()

```
ATCA_STATUS hal_swi_gpio_send (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * txdata,
    int txlength )
```

HAL implementation of bit banging send over Harmony.

#### Parameters

in	<i>iface</i>	instance
in	<i>word_address</i>	device transaction type
in	<i>txdata</i>	pointer to space to bytes to send
in	<i>txlength</i>	number of bytes to send

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 10.130 hal\_swi\_gpio.h File Reference

ATCA Hardware abstraction layer for SWI over GPIO drivers.

```
#include <stdlib.h>
#include "cryptoauthlib.h"
#include "atca_status.h"
#include "atca_hal.h"
#include "atca_config.h"
```

### Macros

#### Macros for Bit-Banged 1WIRE Timing

*Times to drive bits at 230.4 kbps.*

- #define **tPUP** 0
- #define **tDSCHG** 150
- #define **tRESET** 96
- #define **tRRT** 1
- #define **tDRR** 1
- #define **tMSDR** 2
- #define **tHTSS** 150
- #define **tDACK** 2
- #define **tDACK\_DLY** atca\_delay\_us(tDACK)
- #define **tRRT\_DLY** atca\_delay\_ms(tRRT)
- #define **tDRR\_DLY** atca\_delay\_us(tDRR)
- #define **tMSDR\_DLY** atca\_delay\_us(tMSDR)
- #define **tDSCHG\_DLY** atca\_delay\_us(tDSCHG)
- #define **tRESET\_DLY** atca\_delay\_us(tRESET)
- #define **tHTSS\_DLY** atca\_delay\_us(tHTSS)
- #define **tLOW0\_MIN** 6
- #define **tLOW0\_MAX** 16
- #define **tLOW1\_MIN** 1
- #define **tLOW1\_MAX** 2
- #define **tRCV\_MIN** 4
- #define **tRCV\_MAX** 6
- #define **tBIT\_MIN** (tLOW0\_MIN + tPUP + tRCV\_MIN)
- #define **tBIT\_MAX** 75
- #define **tWAKEUP** 1
- #define **tLOW0\_TYPICAL** (tLOW0\_MIN + ((tLOW0\_MAX - tLOW0\_MIN) / 2))
- #define **tLOW1\_TYPICAL** (tLOW1\_MIN + ((tLOW1\_MAX - tLOW1\_MIN) / 2))
- #define **tBIT\_TYPICAL** (tBIT\_MIN + ((tBIT\_MAX - tBIT\_MIN) / 2))
- #define **tLOW0\_HDLY** atca\_delay\_us(11)
- #define **tRD\_HDLY** atca\_delay\_us(1)
- #define **tLOW1\_HDLY** atca\_delay\_us(1)
- #define **tRCV0\_HDLY** atca\_delay\_us(11)
- #define **tRCV1\_HDLY** atca\_delay\_us(14)
- #define **tRD\_DLY** atca\_delay\_us(1)
- #define **tHIGH\_SPEED\_DLY** atca\_delay\_us(1)
- #define **tSWIN\_DLY** atca\_delay\_us(1)
- #define **tLOW0\_DLY** atca\_delay\_us(tLOW0\_TYPICAL)
- #define **tLOW1\_DLY** atca\_delay\_us(tLOW1\_TYPICAL)
- #define **tBIT\_DLY** atca\_delay\_us(tBIT\_TYPICAL)
- #define **tRCV0\_DLY** atca\_delay\_us(tBIT\_TYPICAL - tLOW0\_TYPICAL)

- #define `trcv1_dly_atca_delay_us(tBIT_TYPICAL - tLOW1_TYPICAL)`
- #define `send_logic0_1wire(...)` `send_logic_bit(__VA_ARGS__, ATCA_GPIO_LOGIC_BIT0)`
- #define `send_logic1_1wire(...)` `send_logic_bit(__VA_ARGS__, ATCA_GPIO_LOGIC_BIT1)`
- #define `send_ACK_1wire(...)` `send_logic0_1wire(__VA_ARGS__)`
- #define `send_NACK_1wire(...)` `send_logic1_1wire(__VA_ARGS__)`
- #define `ATCA_1WIRE_RESET_WORD_ADDR` `0x00`
- #define `ATCA_1WIRE_SLEEP_WORD_ADDR` `0x01`
- #define `ATCA_1WIRE_SLEEP_WORD_ADDR_ALTERNATE` `0x02`
- #define `ATCA_1WIRE_COMMAND_WORD_ADDR` `0x03`
- #define `ATCA_1WIRE_RESPONSE_LENGTH_SIZE` `0x01`
- #define `ATCA_1WIRE_BIT_MASK` `0x80`
- #define `ATCA_GPIO_WRITE` `0`
- #define `ATCA_GPIO_READ` `1`
- #define `ATCA_GPIO_INPUT_DIR` `0`
- #define `ATCA_GPIO_OUTPUT_DIR` `1`
- #define `ATCA_GPIO_LOGIC_BIT0` `0`
- #define `ATCA_GPIO_LOGIC_BIT1` `1`
- #define `ATCA_GPIO_ACK` `ATCA_GPIO_LOGIC_BIT0`
- #define `ATCA_GPIO_CLEAR` `0`
- #define `ATCA_GPIO_SET` `1`
- #define `ATCA_MIN_RESPONSE_LENGTH` `4`
- #define `PIN_INPUT_DIR(pin)` `PORT_GroupInputEnable(GET_PORT_GROUP(pin), GET_PIN_MA↵SK(pin))`
- #define `PIN_OUTPUT_DIR(pin)` `PORT_GroupOutputEnable(GET_PORT_GROUP(pin), GET_PIN_MA↵SK(pin))`

## Macros for Bit-Banged SWI Timing

Times to drive bits at 230.4 kbps.

- #define `BIT_DELAY_1L atca_delay_us(4)`
- #define `BIT_DELAY_1H atca_delay_us(4)`  
*should be 4.34 us, is 4.05us*
- #define `BIT_DELAY_5 atca_delay_us(26)`
- #define `BIT_DELAY_7 atca_delay_us(34)`
- #define `RX_TX_DELAY atca_delay_us(65)`
- #define `ATCA_SWI_WAKE_WORD_ADDR` `((uint8_t)0x00)`
- #define `ATCA_SWI_CMD_WORD_ADDR` `((uint8_t)0x77)`
- #define `ATCA_SWI_TX_WORD_ADDR` `((uint8_t)0x88)`
- #define `ATCA_SWI_IDLE_WORD_ADDR` `((uint8_t)0xBB)`
- #define `ATCA_SWI_SLEEP_WORD_ADDR` `((uint8_t)0xCC)`
- #define `ATCA_SWI_BIT_MASK` `0x01`
- enum `protocol_type` { `ATCA_PROTOCOL_1WIRE`, `ATCA_PROTOCOL_SWI`, `NO_OF_PROTOCOL` }
- enum `delay_type` {  
`LOGIC0_1`, `LOGIC0_2`, `LOGIC0_3`, `LOGIC0_4`,  
`LOGIC1_1`, `LOGIC1_2`, `NO_OF_DELAYS` }

### 10.130.1 Detailed Description

ATCA Hardware abstraction layer for SWI over GPIO drivers.

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### 10.130.2 Macro Definition Documentation

#### 10.130.2.1 ATCA\_1WIRE\_BIT\_MASK

```
#define ATCA_1WIRE_BIT_MASK 0x80
```

#### 10.130.2.2 ATCA\_1WIRE\_COMMAND\_WORD\_ADDR

```
#define ATCA_1WIRE_COMMAND_WORD_ADDR 0x03
```

#### 10.130.2.3 ATCA\_1WIRE\_RESET\_WORD\_ADDR

```
#define ATCA_1WIRE_RESET_WORD_ADDR 0x00
```

#### 10.130.2.4 ATCA\_1WIRE\_RESPONSE\_LENGTH\_SIZE

```
#define ATCA_1WIRE_RESPONSE_LENGTH_SIZE 0x01
```

#### 10.130.2.5 ATCA\_1WIRE\_SLEEP\_WORD\_ADDR

```
#define ATCA_1WIRE_SLEEP_WORD_ADDR 0x01
```

#### 10.130.2.6 ATCA\_1WIRE\_SLEEP\_WORD\_ADDR\_ALTERNATE

```
#define ATCA_1WIRE_SLEEP_WORD_ADDR_ALTERNATE 0x02
```

#### 10.130.2.7 ATCA\_GPIO\_ACK

```
#define ATCA_GPIO_ACK ATCA_GPIO_LOGIC_BIT0
```

**10.130.2.8 ATCA\_GPIO\_CLEAR**

```
#define ATCA_GPIO_CLEAR 0
```

**10.130.2.9 ATCA\_GPIO\_INPUT\_DIR**

```
#define ATCA_GPIO_INPUT_DIR 0
```

**10.130.2.10 ATCA\_GPIO\_LOGIC\_BIT0**

```
#define ATCA_GPIO_LOGIC_BIT0 0
```

**10.130.2.11 ATCA\_GPIO\_LOGIC\_BIT1**

```
#define ATCA_GPIO_LOGIC_BIT1 1
```

**10.130.2.12 ATCA\_GPIO\_OUTPUT\_DIR**

```
#define ATCA_GPIO_OUTPUT_DIR 1
```

**10.130.2.13 ATCA\_GPIO\_READ**

```
#define ATCA_GPIO_READ 1
```

**10.130.2.14 ATCA\_GPIO\_SET**

```
#define ATCA_GPIO_SET 1
```

**10.130.2.15 ATCA\_GPIO\_WRITE**

```
#define ATCA_GPIO_WRITE 0
```

### 10.130.2.16 ATCA\_MIN\_RESPONSE\_LENGTH

```
#define ATCA_MIN_RESPONSE_LENGTH 4
```

### 10.130.2.17 ATCA\_SWI\_BIT\_MASK

```
#define ATCA_SWI_BIT_MASK 0x01
```

### 10.130.2.18 ATCA\_SWI\_CMD\_WORD\_ADDR

```
#define ATCA_SWI_CMD_WORD_ADDR ((uint8_t)0x77)
```

### 10.130.2.19 ATCA\_SWI\_IDLE\_WORD\_ADDR

```
#define ATCA_SWI_IDLE_WORD_ADDR ((uint8_t)0xBB)
```

### 10.130.2.20 ATCA\_SWI\_SLEEP\_WORD\_ADDR

```
#define ATCA_SWI_SLEEP_WORD_ADDR ((uint8_t)0xCC)
```

### 10.130.2.21 ATCA\_SWI\_TX\_WORD\_ADDR

```
#define ATCA_SWI_TX_WORD_ADDR ((uint8_t)0x88)
```

### 10.130.2.22 ATCA\_SWI\_WAKE\_WORD\_ADDR

```
#define ATCA_SWI_WAKE_WORD_ADDR ((uint8_t)0x00)
```

SWI WORD Address

#### 10.130.2.23 BIT\_DELAY\_1H

```
#define BIT_DELAY_1H atca_delay_us(4)
```

should be 4.34 us, is 4.05us

#### 10.130.2.24 BIT\_DELAY\_1L

```
#define BIT_DELAY_1L atca_delay_us(4)
```

delay macro for width of one pulse (start pulse or zero pulse) should be 4.34 us, is 4.05 us

#### 10.130.2.25 BIT\_DELAY\_5

```
#define BIT_DELAY_5 atca_delay_us(26)
```

time to keep pin high for five pulses plus stop bit (used to bit-bang CryptoAuth 'zero' bit) should be 26.04 us, is 26.92 us

#### 10.130.2.26 BIT\_DELAY\_7

```
#define BIT_DELAY_7 atca_delay_us(34)
```

time to keep pin high for seven bits plus stop bit (used to bit-bang CryptoAuth 'one' bit) should be 34.72 us, is 35.13 us

#### 10.130.2.27 PIN\_INPUT\_DIR

```
#define PIN_INPUT_DIR(  
    pin ) PORT_GroupInputEnable(GET_PORT_GROUP(pin), GET_PIN_MASK(pin))
```

#### 10.130.2.28 PIN\_OUTPUT\_DIR

```
#define PIN_OUTPUT_DIR(  
    pin ) PORT_GroupOutputEnable(GET_PORT_GROUP(pin), GET_PIN_MASK(pin))
```

#### 10.130.2.29 RX\_TX\_DELAY

```
#define RX_TX_DELAY atca_delay_us(65)
```

turn around time when switching from receive to transmit should be 93 us (Setting little less value as there would be other process before these steps)

### 10.130.2.30 send\_ACK\_1wire

```
#define send_ACK_1wire(  
    ... ) send_logic0_1wire(__VA_ARGS__)
```

### 10.130.2.31 send\_logic0\_1wire

```
#define send_logic0_1wire(  
    ... ) send_logic_bit(__VA_ARGS__, ATCA_GPIO_LOGIC_BIT0)
```

### 10.130.2.32 send\_logic1\_1wire

```
#define send_logic1_1wire(  
    ... ) send_logic_bit(__VA_ARGS__, ATCA_GPIO_LOGIC_BIT1)
```

### 10.130.2.33 send\_NACK\_1wire

```
#define send_NACK_1wire(  
    ... ) send_logic1_1wire(__VA_ARGS__)
```

### 10.130.2.34 tBIT\_DLY

```
#define tBIT_DLY atca_delay_us(tBIT_TYPICAL)
```

### 10.130.2.35 tBIT\_MAX

```
#define tBIT_MAX 75
```

### 10.130.2.36 tBIT\_MIN

```
#define tBIT_MIN (tLOW0_MIN + tPUP + tRCV_MIN)
```



**10.130.2.37 tBIT\_TYPICAL**

```
#define tBIT_TYPICAL (tBIT_MIN + ((tBIT_MAX - tBIT_MIN) / 2 ))
```

**10.130.2.38 tDACK**

```
#define tDACK 2
```

**10.130.2.39 tDACK\_DLY**

```
#define tDACK_DLY atca_delay_us(tDACK)
```

**10.130.2.40 tDRR**

```
#define tDRR 1
```

**10.130.2.41 tDRR\_DLY**

```
#define tDRR_DLY atca_delay_us(tDRR)
```

**10.130.2.42 tDSCHG**

```
#define tDSCHG 150
```

**10.130.2.43 tDSCHG\_DLY**

```
#define tDSCHG_DLY atca_delay_us(tDSCHG)
```

**10.130.2.44 tHIGH\_SPEED\_DLY**

```
#define tHIGH_SPEED_DLY atca_delay_us(1)
```

### 10.130.2.45 tHTSS

```
#define tHTSS 150
```

### 10.130.2.46 tHTSS\_DLY

```
#define tHTSS_DLY atca_delay_us(tHTSS)
```

### 10.130.2.47 tLOW0\_DLY

```
#define tLOW0_DLY atca_delay_us(tLOW0_TYPICAL)
```

### 10.130.2.48 tLOW0\_HDLY

```
#define tLOW0_HDLY atca_delay_us(11)
```

### 10.130.2.49 tLOW0\_MAX

```
#define tLOW0_MAX 16
```

### 10.130.2.50 tLOW0\_MIN

```
#define tLOW0_MIN 6
```

### 10.130.2.51 tLOW0\_TYPICAL

```
#define tLOW0_TYPICAL (tLOW0_MIN + ((tLOW0_MAX - tLOW0_MIN) / 2))
```

### 10.130.2.52 tLOW1\_DLY

```
#define tLOW1_DLY atca_delay_us(tLOW1_TYPICAL)
```

**10.130.2.53 tLOW1\_HDLY**

```
#define tLOW1_HDLY atca_delay_us(1)
```

**10.130.2.54 tLOW1\_MAX**

```
#define tLOW1_MAX 2
```

**10.130.2.55 tLOW1\_MIN**

```
#define tLOW1_MIN 1
```

**10.130.2.56 tLOW1\_TYPICAL**

```
#define tLOW1_TYPICAL (tLOW1_MIN + ((tLOW1_MAX - tLOW1_MIN) / 2))
```

**10.130.2.57 tMSDR**

```
#define tMSDR 2
```

**10.130.2.58 tMSDR\_DLY**

```
#define tMSDR_DLY atca_delay_us(tMSDR)
```

**10.130.2.59 tPUP**

```
#define tPUP 0
```

**10.130.2.60 tRCV0\_DLY**

```
#define tRCV0_DLY atca_delay_us(tBIT_TYPICAL - tLOW0_TYPICAL)
```

### 10.130.2.61 tRCV0\_HDLY

```
#define tRCV0_HDLY atca_delay_us(11)
```

### 10.130.2.62 tRCV1\_DLY

```
#define tRCV1_DLY atca_delay_us(tBIT_TYPICAL - tLOW1_TYPICAL)
```

### 10.130.2.63 tRCV1\_HDLY

```
#define tRCV1_HDLY atca_delay_us(14)
```

### 10.130.2.64 tRCV\_MAX

```
#define tRCV_MAX 6
```

### 10.130.2.65 tRCV\_MIN

```
#define tRCV_MIN 4
```

### 10.130.2.66 tRD\_DLY

```
#define tRD_DLY atca_delay_us(1)
```

### 10.130.2.67 tRD\_HDLY

```
#define tRD_HDLY atca_delay_us(1)
```

### 10.130.2.68 tRESET

```
#define tRESET 96
```

#### 10.130.2.69 tRESET\_DLY

```
#define tRESET_DLY atca_delay_us(tRESET)
```

#### 10.130.2.70 tRRT

```
#define tRRT 1
```

#### 10.130.2.71 tRRT\_DLY

```
#define tRRT_DLY atca_delay_ms(tRRT)
```

#### 10.130.2.72 tSWIN\_DLY

```
#define tSWIN_DLY atca_delay_us(1)
```

#### 10.130.2.73 tWAKEUP

```
#define tWAKEUP 1
```

### 10.130.3 Enumeration Type Documentation

#### 10.130.3.1 delay\_type

```
enum delay_type
```

##### Enumerator

LOGIC0_1	
LOGIC0_2	
LOGIC0_3	
LOGIC0_4	
LOGIC1_1	
LOGIC1_2	
NO_OF_DELAYS	

### 10.130.3.2 protocol\_type

enum [protocol\\_type](#)

Enumerator

ATCA_PROTOCOL_1WIRE	
ATCA_PROTOCOL_SWI	
NO_OF_PROTOCOL	

## 10.131 hal\_swi\_uart.c File Reference

ATCA Hardware abstraction layer for SWI over UART drivers.

```
#include "cryptoauthlib.h"
```

### Functions

- [ATCA\\_STATUS hal\\_swi\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*initialize an SWI interface using given config*
- [ATCA\\_STATUS hal\\_swi\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of SWI post init.*
- [ATCA\\_STATUS hal\\_swi\\_send](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)  
*HAL implementation of SWI send command over UART.*
- [ATCA\\_STATUS hal\\_swi\\_receive](#) ([ATCAIface](#) iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*HAL implementation of SWI receive function over UART.*
- [ATCA\\_STATUS hal\\_swi\\_wake](#) ([ATCAIface](#) iface)  
*Send Wake flag via SWI.*
- [ATCA\\_STATUS hal\\_swi\\_sleep](#) ([ATCAIface](#) iface)  
*Send Sleep flag via SWI.*
- [ATCA\\_STATUS hal\\_swi\\_idle](#) ([ATCAIface](#) iface)  
*Send Idle flag via SWI.*
- [ATCA\\_STATUS hal\\_swi\\_control](#) ([ATCAIface](#) iface, uint8\_t option, void \*param, size\_t paramlen)  
*Perform control operations for the kit protocol.*
- [ATCA\\_STATUS hal\\_swi\\_release](#) (void \*hal\_data)  
*manages reference count on given bus and releases resource if no more references exist*

### 10.131.1 Detailed Description

ATCA Hardware abstraction layer for SWI over UART drivers.

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## 10.132 hal\_timer\_start.c File Reference

ATCA Hardware abstraction layer for SAMD21 I2C over START drivers.

```
#include <hal_delay.h>
#include "atca_hal.h"
```

### Functions

- void [atca\\_delay\\_us](#) (uint32\_t delay)  
*This function delays for a number of microseconds.*
- void [atca\\_delay\\_10us](#) (uint32\_t delay)  
*This function delays for a number of tens of microseconds.*
- void [atca\\_delay\\_ms](#) (uint32\_t ms)  
*Timer API for legacy implementations.*

### 10.132.1 Detailed Description

ATCA Hardware abstraction layer for SAMD21 I2C over START drivers.

Prerequisite: add SERCOM I2C Master Polled support to application in Atmel Studio

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## 10.133 hal\_uart\_harmony.c File Reference

ATCA Hardware abstraction layer for SWI uart over Harmony PLIB.

```
#include "atca_config.h"
#include "cryptoauthlib.h"
```

### Functions

- [ATCA\\_STATUS hal\\_uart\\_init](#) (ATCAIface iface, ATCAIfaceCfg \*cfg)  
*Initialize an uart interface using given config.*
- [ATCA\\_STATUS hal\\_uart\\_post\\_init](#) (ATCAIface iface)  
*HAL implementation of SWI post init.*
- [ATCA\\_STATUS hal\\_uart\\_send](#) (ATCAIface iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)  
*Send byte(s) via SWI.*
- [ATCA\\_STATUS hal\\_uart\\_receive](#) (ATCAIface iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*Receive byte(s) via SWI.*
- [ATCA\\_STATUS hal\\_uart\\_control](#) (ATCAIface iface, uint8\_t option, void \*param, size\_t paramlen)
- [ATCA\\_STATUS hal\\_uart\\_release](#) (void \*hal\_data)  
*Manages reference count on given bus and releases resource if no more reference(s) exist.*

## Variables

- PLIB\_SWI\_SERIAL\_SETUP [serial\\_setup](#)

### 10.133.1 Detailed Description

ATCA Hardware abstraction layer for SWI uart over Harmony PLIB.

This code is structured in two parts. Part 1 is the connection of the ATCA HAL API to the physical I2C implementation. Part 2 is the Harmony UART (ring buffer mode) primitives to set up the interface.

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### 10.133.2 Function Documentation

#### 10.133.2.1 hal\_uart\_control()

```
ATCA_STATUS hal_uart_control (
    ATCAIface iface,
    uint8_t option,
    void * param,
    size_t paramlen )
```

#### 10.133.2.2 hal\_uart\_init()

```
ATCA_STATUS hal_uart_init (
    ATCAIface iface,
    ATCAIfaceCfg * cfg )
```

Initialize an uart interface using given config.

#### Parameters

in	<i>hal</i>	opaque pointer to HAL data
in	<i>cfg</i>	interface configuration

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.



### 10.133.2.3 hal\_uart\_post\_init()

```
ATCA_STATUS hal_uart_post_init (
    ATCAIface iface )
```

HAL implementation of SWI post init.

#### Parameters

in	<i>iface</i>	ATCAIface instance
----	--------------	--------------------

#### Returns

ATCA\_SUCCESS

### 10.133.2.4 hal\_uart\_receive()

```
ATCA_STATUS hal_uart_receive (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * rxdata,
    uint16_t * rxlength )
```

Receive byte(s) via SWI.

#### Parameters

in	<i>iface</i>	Device to interact with.
in	<i>word_address</i>	device transaction type
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.133.2.5 hal\_uart\_release()

```
ATCA_STATUS hal_uart_release (
    void * hal_data )
```

Manages reference count on given bus and releases resource if no more reference(s) exist.

### Parameters

in	<i>hal_data</i>	opaque pointer to hal data structure - known only to the HAL implementation
----	-----------------	---

### Returns

ATCA\_SUCCESS

### 10.133.2.6 hal\_uart\_send()

```
ATCA_STATUS hal_uart_send (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * txdata,
    int txlength )
```

Send byte(s) via SWI.

### Parameters

in	<i>iface</i>	interface of the logical device to send data to
in	<i>word_address</i>	device transaction type
in	<i>txdata</i>	pointer to bytes to send
in	<i>txlength</i>	number of bytes to send

### Returns

ATCA\_SUCCESS

## 10.133.3 Variable Documentation

### 10.133.3.1 serial\_setup

```
PLIB_SWI_SERIAL_SETUP serial_setup
```

#### Initial value:

```
= {
    .parity      = PLIB_SWI_PARITY_NONE,
    .dataWidth  = PLIB_SWI_DATA_WIDTH,
    .stopBits   = PLIB_SWI_STOP_BIT
}
```

## 10.134 hal\_uc3\_i2c\_asf.c File Reference

ATCA Hardware abstraction layer for SAMV71 I2C over ASF drivers.

```
#include <asf.h>
#include <string.h>
#include <stdio.h>
#include "cryptoauthlib.h"
#include "hal_uc3_i2c_asf.h"
```

### Functions

- [ATCA\\_STATUS hal\\_i2c\\_discover\\_buses](#) (int i2c\_buses[], int max\_buses)  
*discover i2c buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-prior knowledge*
- [ATCA\\_STATUS hal\\_i2c\\_discover\\_devices](#) (int bus\_num, ATCAIfaceCfg cfg[], int \*found)  
*discover any CryptoAuth devices on a given logical bus number*
- [ATCA\\_STATUS hal\\_i2c\\_init](#) (void \*hal, ATCAIfaceCfg \*cfg)  
*hal\_i2c\_init manages requests to initialize a physical interface. it manages use counts so when an interface has released the physical layer, it will disable the interface for some other use. You can have multiple ATCAIface instances using the same bus, and you can have multiple ATCAIface instances on multiple i2c buses, so hal\_i2c\_init manages these things and ATCAIface is abstracted from the physical details.*
- [ATCA\\_STATUS hal\\_i2c\\_post\\_init](#) (ATCAIface iface)  
*HAL implementation of I2C post init.*
- [ATCA\\_STATUS hal\\_i2c\\_send](#) (ATCAIface iface, uint8\_t address, uint8\_t \*txdata, int txlength)  
*HAL implementation of I2C send over START.*
- [ATCA\\_STATUS hal\\_i2c\\_receive](#) (ATCAIface iface, uint8\_t address, uint8\_t \*rxdata, uint16\_t \*rxlength)  
*HAL implementation of I2C receive function for START I2C.*
- [ATCA\\_STATUS change\\_i2c\\_speed](#) (ATCAIface iface, uint32\_t speed)  
*method to change the bus speed of I2C*
- [ATCA\\_STATUS hal\\_i2c\\_wake](#) (ATCAIface iface)  
*wake up CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_idle](#) (ATCAIface iface)  
*idle CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_sleep](#) (ATCAIface iface)  
*sleep CryptoAuth device using I2C bus*
- [ATCA\\_STATUS hal\\_i2c\\_release](#) (void \*hal\_data)  
*manages reference count on given bus and releases resource if no more references exist*

### 10.134.1 Detailed Description

ATCA Hardware abstraction layer for SAMV71 I2C over ASF drivers.

This code is structured in two parts. Part 1 is the connection of the ATCA HAL API to the physical I2C implementation. Part 2 is the ASF I2C primitives to set up the interface.

Prerequisite: add SERCOM I2C Master Polled support to application in Atmel Studio

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### 10.135 hal\_uc3\_i2c\_asf.h File Reference

ATCA Hardware abstraction layer for SAMV71 I2C over ASF drivers.

```
#include <asf.h>
#include "twi.h"
```

#### Data Structures

- struct [atcal2Cmaster](#)  
*this is the hal\_data for ATCA HAL for ASF SERCOM*

#### Macros

- #define [MAX\\_I2C\\_BUSES](#) 3

#### Typedefs

- typedef struct [atcal2Cmaster](#) [ATCAI2CMaster\\_t](#)  
*this is the hal\_data for ATCA HAL for ASF SERCOM*

#### Functions

- [ATCA\\_STATUS change\\_i2c\\_speed](#) ([ATCAIface](#) iface, uint32\_t speed)  
*method to change the bus spec of I2C*

#### 10.135.1 Detailed Description

ATCA Hardware abstraction layer for SAMV71 I2C over ASF drivers.

Prerequisite: add SERCOM I2C Master Polled support to application in Atmel Studio

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### 10.136 hal\_uc3\_timer\_asf.c File Reference

ATCA Hardware abstraction layer for SAM4S I2C over ASF drivers.

```
#include <asf.h>
#include <delay.h>
#include "atca_hal.h"
```

## Functions

- void [atca\\_delay\\_us](#) (uint32\_t delay)  
*This function delays for a number of microseconds.*
- void [atca\\_delay\\_10us](#) (uint32\_t delay)  
*This function delays for a number of tens of microseconds.*
- void [atca\\_delay\\_ms](#) (uint32\_t ms)  
*Timer API for legacy implementations.*

### 10.136.1 Detailed Description

ATCA Hardware abstraction layer for SAM4S I2C over ASF drivers.

Prerequisite: add "Delay routines (service)" module to application in Atmel Studio

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## 10.137 hal\_windows.c File Reference

ATCA Hardware abstraction layer for windows timer functions.

```
#include "atca_hal.h"
#include <windows.h>
#include <math.h>
```

## Functions

- void [hal\\_delay\\_us](#) (uint32\_t delay)  
*This function delays for a number of microseconds.*
- void [hal\\_delay\\_10us](#) (uint32\_t delay)  
*This function delays for a number of tens of microseconds.*
- void [hal\\_delay\\_ms](#) (uint32\_t delay)  
*This function delays for a number of milliseconds.*
- [ATCA\\_STATUS hal\\_create\\_mutex](#) (void \*\*ppMutex, char \*pName)  
*Optional hal interfaces.*
- [ATCA\\_STATUS hal\\_destroy\\_mutex](#) (void \*pMutex)
- [ATCA\\_STATUS hal\\_lock\\_mutex](#) (void \*pMutex)
- [ATCA\\_STATUS hal\\_unlock\\_mutex](#) (void \*pMutex)

### 10.137.1 Detailed Description

ATCA Hardware abstraction layer for windows timer functions.

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## 10.138 hal\_windows\_kit\_uart.c File Reference

ATCA Hardware abstraction layer for Windows using UART.

```
#include "cryptoauthlib.h"
#include "atca_hal.h"
#include <windows.h>
#include <stdio.h>
#include <conio.h>
#include <math.h>
#include <string.h>
```

### Data Structures

- struct [atca\\_uart\\_host\\_s](#)

### Typedefs

- typedef struct [atca\\_uart\\_host\\_s](#) [atca\\_uart\\_host\\_t](#)

### Functions

- [ATCA\\_STATUS hal\\_uart\\_init](#) ([ATCAIface](#) iface, [ATCAIfaceCfg](#) \*cfg)  
*HAL implementation of UART init.*
- [ATCA\\_STATUS hal\\_uart\\_post\\_init](#) ([ATCAIface](#) iface)  
*HAL implementation of UART post init.*
- [ATCA\\_STATUS hal\\_uart\\_send](#) ([ATCAIface](#) iface, [uint8\\_t](#) word\_address, [uint8\\_t](#) \*txdata, [int](#) txlength)  
*HAL implementation of UART send.*
- [ATCA\\_STATUS hal\\_uart\\_receive](#) ([ATCAIface](#) iface, [uint8\\_t](#) word\_address, [uint8\\_t](#) \*rxdata, [uint16\\_t](#) \*rxlength)  
*HAL implementation of UART receive function.*
- [ATCA\\_STATUS hal\\_uart\\_control](#) ([ATCAIface](#) iface, [uint8\\_t](#) option, [void](#) \*param, [size\\_t](#) paramlen)  
*Perform control operations for the UART.*
- [ATCA\\_STATUS hal\\_uart\\_release](#) ([void](#) \*hal\_data)  
*manages reference count on given bus and releases resource if no more references exist*

#### 10.138.1 Detailed Description

ATCA Hardware abstraction layer for Windows using UART.

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#### 10.138.2 Typedef Documentation

### 10.138.2.1 atca\_uart\_host\_t

```
typedef struct atca_uart_host_s atca_uart_host_t
```

## 10.138.3 Function Documentation

### 10.138.3.1 hal\_uart\_control()

```
ATCA_STATUS hal_uart_control (
    ATCAIface iface,
    uint8_t option,
    void * param,
    size_t paramlen )
```

Perform control operations for the UART.

#### Parameters

in	<i>iface</i>	Interface to interact with.
in	<i>option</i>	Control parameter identifier
in	<i>param</i>	Optional pointer to parameter value
in	<i>paramlen</i>	Length of the parameter

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.138.3.2 hal\_uart\_init()

```
ATCA_STATUS hal_uart_init (
    ATCAIface iface,
    ATCAIfaceCfg * cfg )
```

HAL implementation of UART init.

this implementation assumes UART SERIAL PORT peripheral has been enabled by user . It only initialize an UART interface using given config.

#### Parameters

in	<i>hal</i>	pointer to HAL specific data that is maintained by this HAL
in	<i>cfg</i>	pointer to HAL specific configuration data that is used to initialize this HAL

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.138.3.3 hal\_uart\_post\_init()

```
ATCA_STATUS hal_uart_post_init (  
    ATCAIface iface )
```

HAL implementation of UART post init.

### Parameters

in	<i>iface</i>	instance
----	--------------	----------

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.138.3.4 hal\_uart\_receive()

```
ATCA_STATUS hal_uart_receive (  
    ATCAIface iface,  
    uint8_t word_address,  
    uint8_t * rxdata,  
    uint16_t * rxlength )
```

HAL implementation of UART receive function.

### Parameters

in	<i>iface</i>	Device to interact with.
in	<i>word_address</i>	device transaction type
out	<i>rxdata</i>	Data received will be returned here.
in, out	<i>rxlength</i>	As input, the size of the rxdata buffer. As output, the number of bytes received.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.138.3.5 hal\_uart\_release()

```
ATCA_STATUS hal_uart_release (  
    void * hal_data )
```



manages reference count on given bus and releases resource if no more refences exist

## 10.139 io\_protection\_key.h File Reference

---

### Parameters

in	<i>hal_data</i>	- opaque pointer to hal data structure - known only to the HAL implementation
----	-----------------	---

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.138.3.6 hal\_uart\_send()

```
ATCA_STATUS hal_uart_send (
    ATCAIface iface,
    uint8_t word_address,
    uint8_t * txdata,
    int txlength )
```

HAL implementation of UART send.

### Parameters

in	<i>iface</i>	instance
in	<i>word_address</i>	transaction type
in	<i>txdata</i>	data to be send to device
in	<i>txdata</i>	pointer to space to bytes to send
in	<i>len</i>	number of bytes to send

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 10.139 io\_protection\_key.h File Reference

Provides required interface to access IO protection key.

```
#include "atca_status.h"
```

### Functions

- [ATCA\\_STATUS io\\_protection\\_get\\_key](#) (uint8\_t \*io\_key)
- [ATCA\\_STATUS io\\_protection\\_set\\_key](#) (uint8\_t \*io\_key)

### 10.139.1 Detailed Description

Provides required interface to access IO protection key.

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## 10.139.2 Function Documentation

### 10.139.2.1 io\_protection\_get\_key()

```
ATCA_STATUS io_protection_get_key (
    uint8_t * io_key )
```

### 10.139.2.2 io\_protection\_set\_key()

```
ATCA_STATUS io_protection_set_key (
    uint8_t * io_key )
```

## 10.140 kit\_protocol.c File Reference

Microchip Crypto Auth hardware interface object.

```
#include <stdlib.h>
#include <stdio.h>
#include "atca_compiler.h"
#include "kit_protocol.h"
#include "atca_helpers.h"
```

### Macros

- #define [KIT\\_MAX\\_SCAN\\_COUNT](#) 8
- #define [KIT\\_MAX\\_TX\\_BUF](#) 32

### Functions

- char \* [strnchr](#) (const char \*s, size\_t count, int c)
- const char \* [kit\\_id\\_from\\_devtype](#) ([ATCADeviceType](#) devtype)
- const char \* [kit\\_interface\\_from\\_kittype](#) ([ATCAKitType](#) kittype)
- const char \* [kit\\_interface](#) ([ATCAKitType](#) kittype)

### 10.140.1 Detailed Description

Microchip Crypto Auth hardware interface object.

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## 10.141 kit\_protocol.h File Reference

```
#include "cryptoauthlib.h"
```

### Macros

- `#define KIT_TX_WRAP_SIZE` (10)
- `#define KIT_MSG_SIZE` (32)
- `#define KIT_RX_WRAP_SIZE` (KIT\_MSG\_SIZE + 6)

### Functions

- `ATCA_STATUS kit_init` (ATCAIface iface, ATCAIfaceCfg \*cfg)
- `ATCA_STATUS kit_post_init` (ATCAIface iface)
- `ATCA_STATUS kit_send` (ATCAIface iface, uint8\_t word\_address, uint8\_t \*txdata, int txlength)
- `ATCA_STATUS kit_receive` (ATCAIface iface, uint8\_t word\_address, uint8\_t \*rxdata, uint16\_t \*rxsize)
- `ATCA_STATUS kit_control` (ATCAIface iface, uint8\_t option, void \*param, size\_t paramlen)
- `ATCA_STATUS kit_release` (void \*hal\_data)
- `ATCA_STATUS kit_wrap_cmd` (const uint8\_t \*txdata, int txlength, char \*pkitbuf, int \*nkitbuf, const char \*target)
- `ATCA_STATUS kit_parse_rsp` (const char \*pkitbuf, int nkitbuf, uint8\_t \*kitstatus, uint8\_t \*rxdata, int \*nrxddata)
- `ATCA_STATUS kit_wake` (ATCAIface iface)
- `ATCA_STATUS kit_idle` (ATCAIface iface)
- `ATCA_STATUS kit_sleep` (ATCAIface iface)
- `const char * kit_id_from_devtype` (ATCADeviceType devtype)
- `const char * kit_interface_from_kittype` (ATCAKitType kittype)
- `const char * kit_interface` (ATCAKitType kittype)

### 10.141.1 Detailed Description

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## 10.143 pkcs11.h File Reference

```
#include "pkcs11t.h"
#include "pkcs11f.h"
```

### Data Structures

- struct [CK\\_FUNCTION\\_LIST](#)

## Macros

- #define `__PASTE(x, y) x ## y`
- #define `CK_NEED_ARG_LIST 1`
- #define `CK_PKCS11_FUNCTION_INFO(name) extern CK_DECLARE_FUNCTION(CK_RV, name)`
- #define `CK_NEED_ARG_LIST 1`
- #define `CK_PKCS11_FUNCTION_INFO(name) typedef CK_DECLARE_FUNCTION_POINTER (CK_RV, __PASTE (CK_, name))`
- #define `CK_PKCS11_FUNCTION_INFO(name) __PASTE(CK_, name) name;`

### 10.143.1 Macro Definition Documentation

#### 10.143.1.1 `__PASTE`

```
#define __PASTE(  
    x,  
    y ) x ## y
```

#### 10.143.1.2 `CK_NEED_ARG_LIST` [1/2]

```
#define CK_NEED_ARG_LIST 1
```

#### 10.143.1.3 `CK_NEED_ARG_LIST` [2/2]

```
#define CK_NEED_ARG_LIST 1
```

#### 10.143.1.4 `CK_PKCS11_FUNCTION_INFO` [1/3]

```
#define CK_PKCS11_FUNCTION_INFO(  
    name ) extern CK_DECLARE_FUNCTION(CK_RV, name)
```

#### 10.143.1.5 `CK_PKCS11_FUNCTION_INFO` [2/3]

```
#define CK_PKCS11_FUNCTION_INFO(  
    name ) typedef CK_DECLARE_FUNCTION_POINTER (CK_RV, __PASTE (CK_, name))
```

### 10.143.1.6 CK\_PKCS11\_FUNCTION\_INFO [3/3]

```
#define CK_PKCS11_FUNCTION_INFO(  
    name )    __PASTE(CK_, name) name;
```

## 10.144 pkcs11\_attrib.c File Reference

PKCS11 Library Object Attributes Handling.

```
#include "pkcs11_config.h"  
#include "pkcs11_attrib.h"  
#include "cryptoauthlib.h"
```

### Functions

- [CK\\_RV pkcs11\\_attrib\\_fill](#) ([CK\\_ATTRIBUTE\\_PTR](#) pAttribute, const [CK\\_VOID\\_PTR](#) pData, const [CK\\_ULONG](#) ulSize)  
*Perform the nessasary checks and copy data into an attribute structure.*
- [CK\\_RV pkcs11\\_attrib\\_value](#) ([CK\\_ATTRIBUTE\\_PTR](#) pAttribute, const [CK\\_ULONG](#) ulValue, const [CK\\_ULONG](#) ulSize)  
*Helper function to write a numerical value to an attribute buffer.*
- [CK\\_RV pkcs11\\_attrib\\_false](#) (const [CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV pkcs11\\_attrib\\_true](#) (const [CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV pkcs11\\_attrib\\_empty](#) (const [CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)

### 10.144.1 Detailed Description

PKCS11 Library Object Attributes Handling.

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## 10.145 pkcs11\_attrib.h File Reference

PKCS11 Library Object Attribute Handling.

```
#include "cryptoki.h"
```

### Data Structures

- [struct \\_pkcs11\\_attrib\\_model](#)

## Typedefs

- typedef [CK\\_RV](#)(\* [attrib\\_f](#)) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- typedef struct [\\_pkcs11\\_attrib\\_model](#) [pkcs11\\_attrib\\_model](#)
- typedef struct [\\_pkcs11\\_attrib\\_model](#) \* [pkcs11\\_attrib\\_model\\_ptr](#)

## Functions

- [CK\\_RV](#) [pkcs11\\_attrib\\_fill](#) ([CK\\_ATTRIBUTE\\_PTR](#) pAttribute, const [CK\\_VOID\\_PTR](#) pData, const [CK\\_ULONG](#) ulSize)  
*Perform the nessasary checks and copy data into an attribute structure.*
- [CK\\_RV](#) [pkcs11\\_attrib\\_value](#) ([CK\\_ATTRIBUTE\\_PTR](#) pAttribute, const [CK\\_ULONG](#) ulValue, const [CK\\_ULONG](#) ulSize)  
*Helper function to write a numerical value to an attribute buffer.*
- [CK\\_RV](#) [pkcs11\\_attrib\\_false](#) (const [CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV](#) [pkcs11\\_attrib\\_true](#) (const [CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV](#) [pkcs11\\_attrib\\_empty](#) (const [CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)

### 10.145.1 Detailed Description

PKCS11 Library Object Attribute Handling.

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### 10.145.2 Typedef Documentation

#### 10.145.2.1 [attrib\\_f](#)

```
typedef CK\_RV(* attrib\_f) (CK\_VOID\_PTR pObject, CK\_ATTRIBUTE\_PTR pAttribute)
```

Populate an attribute based on the "object"

#### 10.145.2.2 [pkcs11\\_attrib\\_model](#)

```
typedef struct \_pkcs11\_attrib\_model pkcs11\_attrib\_model
```

#### 10.145.2.3 [pkcs11\\_attrib\\_model\\_ptr](#)

```
typedef struct \_pkcs11\_attrib\_model * pkcs11\_attrib\_model\_ptr
```

## 10.146 pkcs11\_cert.c File Reference

PKCS11 Library Certificate Handling.

```
#include "cryptoauthlib.h"
#include "atcacert/atcacert_def.h"
#include "atcacert/atcacert_client.h"
#include "pkcs11_config.h"
#include "pkcs11_debug.h"
#include "pkcs11_token.h"
#include "pkcs11_cert.h"
#include "pkcs11_os.h"
#include "pkcs11_util.h"
```

### Functions

- [CK\\_RV pkcs11\\_cert\\_get\\_encoded \(CK\\_VOID\\_PTR pObject, CK\\_ATTRIBUTE\\_PTR pAttribute\)](#)
- [CK\\_RV pkcs11\\_cert\\_get\\_type \(CK\\_VOID\\_PTR pObject, CK\\_ATTRIBUTE\\_PTR pAttribute\)](#)
- [CK\\_RV pkcs11\\_cert\\_get\\_subject \(CK\\_VOID\\_PTR pObject, CK\\_ATTRIBUTE\\_PTR pAttribute\)](#)
- [CK\\_RV pkcs11\\_cert\\_get\\_subject\\_key\\_id \(CK\\_VOID\\_PTR pObject, CK\\_ATTRIBUTE\\_PTR pAttribute\)](#)
- [CK\\_RV pkcs11\\_cert\\_get\\_authority\\_key\\_id \(CK\\_VOID\\_PTR pObject, CK\\_ATTRIBUTE\\_PTR pAttribute\)](#)
- [CK\\_RV pkcs11\\_cert\\_get\\_trusted\\_flag \(CK\\_VOID\\_PTR pObject, CK\\_ATTRIBUTE\\_PTR pAttribute\)](#)
- [CK\\_RV pkcs11\\_cert\\_x509\\_write \(CK\\_VOID\\_PTR pObject, CK\\_ATTRIBUTE\\_PTR pAttribute\)](#)

### Variables

- const [pkcs11\\_attr\\_model pkcs11\\_cert\\_x509public\\_attributes \[\]](#)
- const [CK\\_ULONG pkcs11\\_cert\\_x509public\\_attributes\\_count](#) = sizeof( [pkcs11\\_cert\\_x509public\\_attributes](#) ) / sizeof( [pkcs11\\_cert\\_x509public\\_attributes](#) [0])
- const [pkcs11\\_attr\\_model pkcs11\\_cert\\_wtlspublic\\_attributes \[\]](#)
- const [CK\\_ULONG pkcs11\\_cert\\_wtlspublic\\_attributes\\_count](#) = sizeof( [pkcs11\\_cert\\_wtlspublic\\_attributes](#) ) / sizeof( [pkcs11\\_cert\\_wtlspublic\\_attributes](#) [0])
- const [pkcs11\\_attr\\_model pkcs11\\_cert\\_x509\\_attributes \[\]](#)
- const [CK\\_ULONG pkcs11\\_cert\\_x509\\_attributes\\_count](#) = sizeof( [pkcs11\\_cert\\_x509\\_attributes](#) ) / sizeof( [pkcs11\\_cert\\_x509\\_attributes](#) [0])

### 10.146.1 Detailed Description

PKCS11 Library Certificate Handling.

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## 10.147 pkcs11\_cert.h File Reference

PKCS11 Library Certificate Handling.

```
#include "pkcs11_object.h"
```

## Functions

- [CK\\_RV pkcs11\\_cert\\_x509\\_write](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)

## Variables

- const [pkcs11\\_attr\\_model pkcs11\\_cert\\_x509public\\_attributes](#) []
- const [CK\\_ULONG pkcs11\\_cert\\_x509public\\_attributes\\_count](#)
- const [pkcs11\\_attr\\_model pkcs11\\_cert\\_wtlspublic\\_attributes](#) []
- const [CK\\_ULONG pkcs11\\_cert\\_wtlspublic\\_attributes\\_count](#)
- const [pkcs11\\_attr\\_model pkcs11\\_cert\\_x509\\_attributes](#) []
- const [CK\\_ULONG pkcs11\\_cert\\_x509\\_attributes\\_count](#)

### 10.147.1 Detailed Description

PKCS11 Library Certificate Handling.

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## 10.148 pkcs11\_config.c File Reference

PKCS11 Library Configuration.

```
#include "cryptoauthlib.h"
#include "pkcs11_config.h"
#include "pkcs11_debug.h"
#include "pkcs11_slot.h"
#include "pkcs11_object.h"
#include "pkcs11_key.h"
#include "pkcs11_cert.h"
#include "pkcs11_os.h"
#include "pkcs11_util.h"
#include <dirent.h>
#include <stdio.h>
#include <ctype.h>
#include <stdlib.h>
```

## Functions

- void [pkcs11\\_config\\_init\\_private](#) (pkcs11\_object\_ptr pObject, char \*label, size\_t len)
- void [pkcs11\\_config\\_init\\_public](#) (pkcs11\_object\_ptr pObject, char \*label, size\_t len)
- void [pkcs11\\_config\\_init\\_secret](#) (pkcs11\_object\_ptr pObject, char \*label, size\_t len, uint8\_t keylen)
- void [pkcs11\\_config\\_init\\_cert](#) (pkcs11\_object\_ptr pObject, char \*label, size\_t len)
- void [pkcs11\\_config\\_split\\_string](#) (char \*s, char splitter, int \*argc, char \*argv[])
- [CK\\_RV pkcs11\\_config\\_cert](#) (pkcs11\_lib\_ctx\_ptr pLibCtx, pkcs11\_slot\_ctx\_ptr pSlot, pkcs11\_object\_ptr pObject, [CK\\_ATTRIBUTE\\_PTR](#) pLabel)
- [CK\\_RV pkcs11\\_config\\_key](#) (pkcs11\_lib\_ctx\_ptr pLibCtx, pkcs11\_slot\_ctx\_ptr pSlot, pkcs11\_object\_ptr pObject, [CK\\_ATTRIBUTE\\_PTR](#) pLabel)
- [CK\\_RV pkcs11\\_config\\_remove\\_object](#) (pkcs11\_lib\_ctx\_ptr pLibCtx, pkcs11\_slot\_ctx\_ptr pSlot, pkcs11\_object\_ptr pObject)
- [CK\\_RV pkcs11\\_config\\_load\\_objects](#) (pkcs11\_slot\_ctx\_ptr slot\_ctx)
- [CK\\_RV pkcs11\\_config\\_load](#) (pkcs11\_slot\_ctx\_ptr slot\_ctx)

### 10.148.1 Detailed Description

PKCS11 Library Configuration.

#### Copyright

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## 10.149 pkcs11\_debug.c File Reference

PKCS11 Library Debugging.

```
#include "pkcs11_config.h"
#include "pkcs11_debug.h"
#include "pkcs11_os.h"
#include "atca_helpers.h"
```

### 10.149.1 Detailed Description

PKCS11 Library Debugging.

#### Copyright

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## 10.150 pkcs11\_debug.h File Reference

PKCS11 Library Debugging.

```
#include "pkcs11_config.h"
```

### Macros

- `#define PKCS11_DEBUG_NOFILE(...)`
- `#define PKCS11_DEBUG(...)`
- `#define PKCS11_DEBUG_RETURN(x) { return x; }`
- `#define pkcs11_debug_attributes(x, y)`

### 10.150.1 Detailed Description

PKCS11 Library Debugging.

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### 10.150.2 Macro Definition Documentation

#### 10.150.2.1 PKCS11\_DEBUG

```
#define PKCS11_DEBUG(  
    ... )
```

#### 10.150.2.2 pkcs11\_debug\_attributes

```
#define pkcs11_debug_attributes(  
    x,  
    y )
```

#### 10.150.2.3 PKCS11\_DEBUG\_NOFILE

```
#define PKCS11_DEBUG_NOFILE(  
    ... )
```

#### 10.150.2.4 PKCS11\_DEBUG\_RETURN

```
#define PKCS11_DEBUG_RETURN(  
    x ) { return x; }
```

## 10.151 pkcs11\_digest.c File Reference

```
#include "cryptoauthlib.h"  
#include "pkcs11_init.h"  
#include "pkcs11_digest.h"  
#include "pkcs11_mech.h"  
#include "pkcs11_object.h"  
#include "pkcs11_session.h"  
#include "pkcs11_util.h"
```



## Functions

- `CK_RV pkcs11_digest_init` (`CK_SESSION_HANDLE` hSession, `CK_MECHANISM_PTR` pMechanism)  
*Initializes a message-digesting operation using the specified mechanism in the specified session.*
- `CK_RV pkcs11_digest` (`CK_SESSION_HANDLE` hSession, `CK_BYTE_PTR` pData, `CK_ULONG` ulDataLen, `CK_BYTE_PTR` pDigest, `CK_ULONG_PTR` pulDigestLen)  
*Digest the specified data in a one-pass operation and return the resulting digest.*
- `CK_RV pkcs11_digest_update` (`CK_SESSION_HANDLE` hSession, `CK_BYTE_PTR` pPart, `CK_ULONG` ulPartLen)  
*Continues a multiple-part digesting operation.*
- `CK_RV pkcs11_digest_final` (`CK_SESSION_HANDLE` hSession, `CK_BYTE_PTR` pDigest, `CK_ULONG_PTR` pulDigestLen)  
*Finishes a multiple-part digesting operation.*

### 10.151.1 Function Documentation

#### 10.151.1.1 `pkcs11_digest()`

```
CK_RV pkcs11_digest (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG ulDataLen,
    CK_BYTE_PTR pDigest,
    CK_ULONG_PTR pulDigestLen )
```

Digest the specified data in a one-pass operation and return the resulting digest.

#### 10.151.1.2 `pkcs11_digest_final()`

```
CK_RV pkcs11_digest_final (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pDigest,
    CK_ULONG_PTR pulDigestLen )
```

Finishes a multiple-part digesting operation.

#### 10.151.1.3 `pkcs11_digest_init()`

```
CK_RV pkcs11_digest_init (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism )
```

Initializes a message-digesting operation using the specified mechanism in the specified session.

### 10.151.1.4 pkcs11\_digest\_update()

```
CK_RV pkcs11_digest_update (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pPart,
    CK_ULONG ulPartLen )
```

Continues a multiple-part digesting operation.

## 10.152 pkcs11\_digest.h File Reference

PKCS11 Library Digest (SHA256) Handling.

```
#include "cryptoki.h"
```

### Functions

- `CK_RV pkcs11_digest_init (CK_SESSION_HANDLE hSession, CK_MECHANISM_PTR pMechanism)`  
*Initializes a message-digesting operation using the specified mechanism in the specified session.*
- `CK_RV pkcs11_digest (CK_SESSION_HANDLE hSession, CK_BYTE_PTR pData, CK_ULONG ulDataLen, CK_BYTE_PTR pDigest, CK_ULONG_PTR pulDigestLen)`  
*Digest the specified data in a one-pass operation and return the resulting digest.*
- `CK_RV pkcs11_digest_update (CK_SESSION_HANDLE hSession, CK_BYTE_PTR pPart, CK_ULONG ulPartLen)`  
*Continues a multiple-part digesting operation.*
- `CK_RV pkcs11_digest_final (CK_SESSION_HANDLE hSession, CK_BYTE_PTR pDigest, CK_ULONG_PTR pulDigestLen)`  
*Finishes a multiple-part digesting operation.*

### 10.152.1 Detailed Description

PKCS11 Library Digest (SHA256) Handling.

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### 10.152.2 Function Documentation

#### 10.152.2.1 `pkcs11_digest()`

```
CK_RV pkcs11_digest (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pData,
    CK_ULONG ulDataLen,
    CK_BYTE_PTR pDigest,
    CK_ULONG_PTR pulDigestLen )
```

Digest the specified data in a one-pass operation and return the resulting digest.

#### 10.152.2.2 `pkcs11_digest_final()`

```
CK_RV pkcs11_digest_final (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pDigest,
    CK_ULONG_PTR pulDigestLen )
```

Finishes a multiple-part digesting operation.

#### 10.152.2.3 `pkcs11_digest_init()`

```
CK_RV pkcs11_digest_init (
    CK_SESSION_HANDLE hSession,
    CK_MECHANISM_PTR pMechanism )
```

Initializes a message-digesting operation using the specified mechanism in the specified session.

#### 10.152.2.4 `pkcs11_digest_update()`

```
CK_RV pkcs11_digest_update (
    CK_SESSION_HANDLE hSession,
    CK_BYTE_PTR pPart,
    CK_ULONG ulPartLen )
```

Continues a multiple-part digesting operation.

### 10.153 `pkcs11_encrypt.c` File Reference

PKCS11 Library Encrypt Support.

```
#include "cryptoauthlib.h"
#include "pkcs11_config.h"
#include "pkcs11_encrypt.h"
#include "pkcs11_debug.h"
#include "pkcs11_init.h"
#include "pkcs11_object.h"
#include "pkcs11_session.h"
#include "pkcs11_util.h"
```

## Functions

- [CK\\_RV pkcs11\\_encrypt\\_init](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hObject)
- [CK\\_RV pkcs11\\_encrypt](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG](#) ulDataLen, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG\\_PTR](#) pulEncryptedDataLen)
- [CK\\_RV pkcs11\\_encrypt\\_update](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG](#) ulDataLen, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG\\_PTR](#) pulEncryptedDataLen)
- [CK\\_RV pkcs11\\_encrypt\\_final](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG\\_PTR](#) pulEncryptedDataLen)

*Finishes a multiple-part encryption operation.*

- [CK\\_RV pkcs11\\_decrypt\\_init](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hObject)
- [CK\\_RV pkcs11\\_decrypt](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG](#) ulEncryptedDataLen, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG\\_PTR](#) pulDataLen)
- [CK\\_RV pkcs11\\_decrypt\\_update](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG](#) ulEncryptedDataLen, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG\\_PTR](#) pulDataLen)
- [CK\\_RV pkcs11\\_decrypt\\_final](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG\\_PTR](#) pulDataLen)

*Finishes a multiple-part decryption operation.*

### 10.153.1 Detailed Description

PKCS11 Library Encrypt Support.

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## 10.154 pkcs11\_encrypt.h File Reference

PKCS11 Library AES Support.

```
#include "pkcs11.h"
```

## Functions

- [CK\\_RV pkcs11\\_encrypt\\_init](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hObject)
- [CK\\_RV pkcs11\\_encrypt](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG](#) ulDataLen, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG\\_PTR](#) pulEncryptedDataLen)
- [CK\\_RV pkcs11\\_encrypt\\_update](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG](#) ulDataLen, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG\\_PTR](#) pulEncryptedDataLen)
- [CK\\_RV pkcs11\\_encrypt\\_final](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG\\_PTR](#) pulEncryptedDataLen)

*Finishes a multiple-part encryption operation.*

- [CK\\_RV pkcs11\\_decrypt\\_init](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hObject)
- [CK\\_RV pkcs11\\_decrypt](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG](#) ulEncryptedDataLen, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG\\_PTR](#) pulDataLen)
- [CK\\_RV pkcs11\\_decrypt\\_update](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG](#) ulEncryptedDataLen, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG\\_PTR](#) pulDataLen)
- [CK\\_RV pkcs11\\_decrypt\\_final](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG\\_PTR](#) pulDataLen)

*Finishes a multiple-part decryption operation.*

### 10.154.1 Detailed Description

PKCS11 Library AES Support.

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## 10.155 pkcs11\_find.c File Reference

PKCS11 Library Object Find/Searching.

```
#include "cryptoauthlib.h"
#include "pkcs11_config.h"
#include "pkcs11_debug.h"
#include "pkcs11_init.h"
#include "pkcs11_os.h"
#include "pkcs11_slot.h"
#include "pkcs11_session.h"
#include "pkcs11_find.h"
#include "pkcs11_util.h"
```

### Functions

- [CK\\_RV pkcs11\\_find\\_init](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount)
- [CK\\_RV pkcs11\\_find\\_continue](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phObject, [CK\\_ULONG](#) ulMaxObjectCount, [CK\\_ULONG\\_PTR](#) pulObjectCount)
- [CK\\_RV pkcs11\\_find\\_finish](#) ([CK\\_SESSION\\_HANDLE](#) hSession)
- [CK\\_RV pkcs11\\_find\\_get\\_attribute](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE](#) hObject, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount)

### 10.155.1 Detailed Description

PKCS11 Library Object Find/Searching.

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## 10.156 pkcs11\_find.h File Reference

PKCS11 Library Object Find/Searching.

```
#include "cryptoki.h"
#include "pkcs11_object.h"
```

### Functions

- [CK\\_RV pkcs11\\_find\\_init](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount)
- [CK\\_RV pkcs11\\_find\\_continue](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phObject, [CK\\_ULONG](#) ulMaxObjectCount, [CK\\_ULONG\\_PTR](#) pulObjectCount)
- [CK\\_RV pkcs11\\_find\\_finish](#) ([CK\\_SESSION\\_HANDLE](#) hSession)
- [CK\\_RV pkcs11\\_find\\_get\\_attribute](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE](#) hObject, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount)

### 10.156.1 Detailed Description

PKCS11 Library Object Find/Searching.

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## 10.157 pkcs11\_info.c File Reference

PKCS11 Library Information Functions.

```
#include "cryptoauthlib.h"
#include "pkcs11_config.h"
#include "pkcs11_init.h"
#include "pkcs11_slot.h"
#include "pkcs11_session.h"
#include "pkcs11_util.h"
#include <stdio.h>
```

### Functions

- [CK\\_RV pkcs11\\_get\\_lib\\_info](#) ([CK\\_INFO\\_PTR](#) pInfo)  
*Obtains general information about Cryptoki.*

### Variables

- const char [pkcs11\\_lib\\_manufacturer\\_id](#) [] = "Microchip Technology Inc"
- const char [pkcs11\\_lib\\_description](#) [] = "Cryptoauthlib PKCS11 Interface"

### 10.157.1 Detailed Description

PKCS11 Library Information Functions.

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## 10.158 pkcs11\_info.h File Reference

PKCS11 Library Information Functions.

```
#include "cryptoki.h"
```

### Functions

- [CK\\_RV pkcs11\\_get\\_lib\\_info](#) ([CK\\_INFO\\_PTR](#) pInfo)  
*Obtains general information about Cryptoki.*

### Variables

- const char [pkcs11\\_lib\\_manufacturer\\_id](#) []
- const char [pkcs11\\_lib\\_description](#) []

### 10.158.1 Detailed Description

PKCS11 Library Information Functions.

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## 10.159 pkcs11\_init.c File Reference

PKCS11 Library Init/Deinit.

```
#include "pkcs11_config.h"
#include "pkcs11_debug.h"
#include "pkcs11_init.h"
#include "pkcs11_os.h"
#include "pkcs11_slot.h"
#include "pkcs11_object.h"
#include "pkcs11_session.h"
#include "cryptoauthlib.h"
```

### Functions

- [pkcs11\\_lib\\_ctx\\_ptr pkcs11\\_get\\_context](#) (void)  
*Retrieve the current library context.*
- [CK\\_RV pkcs11\\_lock\\_context](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_unlock\\_context](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_lock\\_device](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_unlock\\_device](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_lock\\_both](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_unlock\\_both](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_init\\_check](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) \*ppContext, [CK\\_BBOOL](#) lock)  
*Check if the library is initialized properly.*
- [CK\\_RV pkcs11\\_init](#) ([CK\\_C\\_INITIALIZE\\_ARGS\\_PTR](#) pInitArgs)  
*Initializes the PKCS11 API Library for Cryptoauthlib.*
- [CK\\_RV pkcs11\\_deinit](#) ([CK\\_VOID\\_PTR](#) pReserved)

### 10.159.1 Detailed Description

PKCS11 Library Init/Deinit.

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## 10.160 pkcs11\_init.h File Reference

PKCS11 Library Initialization & Context.

```
#include "cryptoki.h"
#include "pkcs11_config.h"
```

### Data Structures

- struct [\\_pkcs11\\_lib\\_ctx](#)

### Typedefs

- typedef struct [\\_pkcs11\\_lib\\_ctx](#) [pkcs11\\_lib\\_ctx](#)

### Functions

- [CK\\_RV pkcs11\\_init](#) ([CK\\_C\\_INITIALIZE\\_ARGS\\_PTR](#) pInitArgs)  
*Initializes the PKCS11 API Library for Cryptoauthlib.*
- [CK\\_RV pkcs11\\_deinit](#) ([CK\\_VOID\\_PTR](#) pReserved)
- [CK\\_RV pkcs11\\_init\\_check](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) \*ppContext, [CK\\_BBOOL](#) lock)  
*Check if the library is initialized properly.*
- [pkcs11\\_lib\\_ctx\\_ptr](#) [pkcs11\\_get\\_context](#) (void)  
*Retrieve the current library context.*
- [CK\\_RV pkcs11\\_lock\\_context](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_unlock\\_context](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_lock\\_device](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_unlock\\_device](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_lock\\_both](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_unlock\\_both](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)

### 10.160.1 Detailed Description

PKCS11 Library Initialization & Context.

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## 10.160.2 Typedef Documentation

### 10.160.2.1 pkcs11\_lib\_ctx

```
typedef struct _pkcs11_lib_ctx pkcs11_lib_ctx
```

Library Context

## 10.161 pkcs11\_key.c File Reference

PKCS11 Library Key Object Handling.

```
#include "cryptoauthlib.h"
#include "crypto/atca_crypto_sw_sha1.h"
#include "pkcs11_config.h"
#include "pkcs11_debug.h"
#include "pkcs11_token.h"
#include "pkcs11_attrib.h"
#include "pkcs11_key.h"
#include "pkcs11_session.h"
#include "pkcs11_slot.h"
#include "pkcs11_util.h"
#include "pkcs11_os.h"
```

### Functions

- [CK\\_RV pkcs11\\_key\\_write](#) ([CK\\_VOID\\_PTR](#) pSession, [CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV pkcs11\\_key\\_generate](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phKey)
- [CK\\_RV pkcs11\\_key\\_generate\\_pair](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_ATTRIBUTE\\_PTR](#) pPublicKeyTemplate, [CK\\_ULONG](#) ulPublicKeyAttributeCount, [CK\\_ATTRIBUTE\\_PTR](#) pPrivateKeyTemplate, [CK\\_ULONG](#) ulPrivateKeyAttributeCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phPublicKey, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phPrivateKey)
- [CK\\_RV pkcs11\\_key\\_derive](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hBaseKey, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phKey)

### Variables

- const [pkcs11\\_attrib\\_model](#) pkcs11\_key\_public\_attributes []
- const [CK\\_ULONG](#) pkcs11\_key\_public\_attributes\_count = sizeof( [pkcs11\\_key\\_public\\_attributes](#) ) / sizeof( [pkcs11\\_key\\_public\\_attributes](#) [0])
- const [pkcs11\\_attrib\\_model](#) pkcs11\_key\_ec\_public\_attributes []
- const [pkcs11\\_attrib\\_model](#) pkcs11\_key\_private\_attributes []
- const [CK\\_ULONG](#) pkcs11\_key\_private\_attributes\_count = sizeof( [pkcs11\\_key\\_private\\_attributes](#) ) / sizeof( [pkcs11\\_key\\_private\\_attributes](#) [0])
- const [pkcs11\\_attrib\\_model](#) pkcs11\_key\_rsa\_private\_attributes []
- const [pkcs11\\_attrib\\_model](#) pkcs11\_key\_ec\_private\_attributes []
- const [pkcs11\\_attrib\\_model](#) pkcs11\_key\_secret\_attributes []
- const [CK\\_ULONG](#) pkcs11\_key\_secret\_attributes\_count = sizeof( [pkcs11\\_key\\_secret\\_attributes](#) ) / sizeof( [pkcs11\\_key\\_secret\\_attributes](#) [0])

### 10.161.1 Detailed Description

PKCS11 Library Key Object Handling.

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## 10.162 pkcs11\_key.h File Reference

PKCS11 Library Object Handling.

```
#include "pkcs11_object.h"
```

### Functions

- [CK\\_RV pkcs11\\_key\\_write](#) ([CK\\_VOID\\_PTR](#) pSession, [CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV pkcs11\\_key\\_generate](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phKey)
- [CK\\_RV pkcs11\\_key\\_generate\\_pair](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_ATTRIBUTE\\_PTR](#) pPublicKeyTemplate, [CK\\_ULONG](#) ulPublicKeyAttributeCount, [CK\\_ATTRIBUTE\\_PTR](#) pPrivateKeyTemplate, [CK\\_ULONG](#) ulPrivateKeyAttributeCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phPublicKey, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phPrivateKey)
- [CK\\_RV pkcs11\\_key\\_derive](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hBaseKey, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phKey)

### Variables

- const [pkcs11\\_attr\\_model](#) pkcs11\_key\_public\_attributes []
- const [CK\\_ULONG](#) pkcs11\_key\_public\_attributes\_count
- const [pkcs11\\_attr\\_model](#) pkcs11\_key\_private\_attributes []
- const [CK\\_ULONG](#) pkcs11\_key\_private\_attributes\_count
- const [pkcs11\\_attr\\_model](#) pkcs11\_key\_secret\_attributes []
- const [CK\\_ULONG](#) pkcs11\_key\_secret\_attributes\_count

### 10.162.1 Detailed Description

PKCS11 Library Object Handling.

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## 10.163 pkcs11\_main.c File Reference

PKCS11 Basic library redirects based on the 2.40 specification <http://docs.oasis-open.org/pkcs11/pkcs11-base/v2.40/os/pkcs11-base-v2.40-os.html>.

```
#include "cryptoki.h"
#include "pkcs11_config.h"
#include "pkcs11_debug.h"
#include "pkcs11_encrypt.h"
#include "pkcs11_init.h"
#include "pkcs11_info.h"
#include "pkcs11_slot.h"
#include "pkcs11_mech.h"
#include "pkcs11_session.h"
#include "pkcs11_token.h"
#include "pkcs11_find.h"
#include "pkcs11_object.h"
#include "pkcs11_signature.h"
#include "pkcs11_digest.h"
#include "pkcs11_key.h"
```

### Functions

- [CK\\_RV C\\_Initialize](#) ([CK\\_VOID\\_PTR](#) pInitArgs)  
*Initializes Cryptoki library NOTES: If pInitArgs is a non-NULL\_PTR is must dereference to a [CK\\_C\\_INITIALIZE\\_ARGS](#) structure.*
- [CK\\_RV C\\_Finalize](#) ([CK\\_VOID\\_PTR](#) pReserved)  
*Clean up miscellaneous Cryptoki-associated resources.*
- [CK\\_RV C\\_GetInfo](#) ([CK\\_INFO\\_PTR](#) pInfo)  
*Obtains general information about Cryptoki.*
- [CK\\_RV C\\_GetFunctionList](#) ([CK\\_FUNCTION\\_LIST\\_PTR\\_PTR](#) ppFunctionList)  
*Obtains entry points of Cryptoki library functions.*
- [CK\\_RV C\\_GetSlotList](#) ([CK\\_BBOOL](#) tokenPresent, [CK\\_SLOT\\_ID\\_PTR](#) pSlotList, [CK\\_ULONG\\_PTR](#) pulCount)  
*Obtains a list of slots in the system.*
- [CK\\_RV C\\_GetSlotInfo](#) ([CK\\_SLOT\\_ID](#) slotID, [CK\\_SLOT\\_INFO\\_PTR](#) pInfo)  
*Obtains information about a particular slot.*
- [CK\\_RV C\\_GetTokenInfo](#) ([CK\\_SLOT\\_ID](#) slotID, [CK\\_TOKEN\\_INFO\\_PTR](#) pInfo)  
*Obtains information about a particular token.*
- [CK\\_RV C\\_GetMechanismList](#) ([CK\\_SLOT\\_ID](#) slotID, [CK\\_MECHANISM\\_TYPE\\_PTR](#) pMechanismList, [CK\\_ULONG\\_PTR](#) pulCount)  
*Obtains a list of mechanisms supported by a token (in a slot)*
- [CK\\_RV C\\_GetMechanismInfo](#) ([CK\\_SLOT\\_ID](#) slotID, [CK\\_MECHANISM\\_TYPE](#) type, [CK\\_MECHANISM\\_INFO\\_PTR](#) pInfo)  
*Obtains information about a particular mechanism of a token (in a slot)*
- [CK\\_RV C\\_InitToken](#) ([CK\\_SLOT\\_ID](#) slotID, [CK\\_UTF8CHAR\\_PTR](#) pPin, [CK\\_ULONG](#) ulPinLen, [CK\\_UTF8CHAR\\_PTR](#) pLabel)  
*Initializes a token (in a slot)*
- [CK\\_RV C\\_InitPIN](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_UTF8CHAR\\_PTR](#) pPin, [CK\\_ULONG](#) ulPinLen)  
*Initializes the normal user's PIN.*
- [CK\\_RV C\\_SetPIN](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_UTF8CHAR\\_PTR](#) pOldPin, [CK\\_ULONG](#) ulOldLen, [CK\\_UTF8CHAR\\_PTR](#) pNewPin, [CK\\_ULONG](#) ulNewLen)

*Modifies the PIN of the current user.*

- [CK\\_RV C\\_OpenSession](#) ([CK\\_SLOT\\_ID](#) slotID, [CK\\_FLAGS](#) flags, [CK\\_VOID\\_PTR](#) pApplication, [CK\\_NOTIFY](#) notify, [CK\\_SESSION\\_HANDLE\\_PTR](#) phSession)

*Opens a connection between an application and a particular token or sets up an application callback for token insertion.*

- [CK\\_RV C\\_CloseSession](#) ([CK\\_SESSION\\_HANDLE](#) hSession)

*Close the given session.*

- [CK\\_RV C\\_CloseAllSessions](#) ([CK\\_SLOT\\_ID](#) slotID)

*Close all open sessions.*

- [CK\\_RV C\\_GetSessionInfo](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_SESSION\\_INFO\\_PTR](#) pInfo)

*Retrieve information about the specified session.*

- [CK\\_RV C\\_GetOperationState](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pOperationState, [CK\\_ULONG\\_PTR](#) pulOperationStateLen)

*Obtains the cryptographic operations state of a session.*

- [CK\\_RV C\\_SetOperationState](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pOperationState, [CK\\_ULONG](#) ulOperationStateLen, [CK\\_OBJECT\\_HANDLE](#) hEncryptionKey, [CK\\_OBJECT\\_HANDLE](#) hAuthenticationKey)

*Sets the cryptographic operations state of a session.*

- [CK\\_RV C\\_Login](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_USER\\_TYPE](#) userType, [CK\\_UTF8CHAR\\_PTR](#) pPin, [CK\\_ULONG](#) ulPinLen)

*Login on the token in the specified session.*

- [CK\\_RV C\\_Logout](#) ([CK\\_SESSION\\_HANDLE](#) hSession)

*Log out of the token in the specified session.*

- [CK\\_RV C\\_CreateObject](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phObject)

*Create a new object on the token in the specified session using the given attribute template.*

- [CK\\_RV C\\_CopyObject](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE](#) hObject, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phNewObject)

*Create a copy of the object with the specified handle.*

- [CK\\_RV C\\_DestroyObject](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE](#) hObject)

*Destroy the specified object.*

- [CK\\_RV C\\_GetObjectSize](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE](#) hObject, [CK\\_ULONG\\_PTR](#) pulSize)

*Obtains the size of an object in bytes.*

- [CK\\_RV C\\_GetAttributeValue](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE](#) hObject, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount)

*Obtains an attribute value of an object.*

- [CK\\_RV C\\_SetAttributeValue](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE](#) hObject, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount)

*Change or set the value of the specified attributes on the specified object.*

- [CK\\_RV C\\_FindObjectsInit](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount)

*Initializes an object search in the specified session using the specified attribute template as search parameters.*

- [CK\\_RV C\\_FindObjects](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phObject, [CK\\_ULONG](#) ulMaxObjectCount, [CK\\_ULONG\\_PTR](#) pulObjectCount)

*Continue the search for objects in the specified session.*

- [CK\\_RV C\\_FindObjectsFinal](#) ([CK\\_SESSION\\_HANDLE](#) hSession)

*Finishes an object search operation (and cleans up)*

- [CK\\_RV C\\_EncryptInit](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hObject)

*Initializes an encryption operation using the specified mechanism and session.*

- [CK\\_RV C\\_Encrypt](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG](#) ulDataLen, [CK\\_BYTE\\_PTR](#) pEncryptedData, [CK\\_ULONG\\_PTR](#) pulEncryptedDataLen)

*Perform a single operation encryption operation in the specified session.*

- **CK\_RV C\_EncryptUpdate** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pData, **CK\_ULONG** ulDataLen, **CK\_BYTE\_PTR** pEncryptedData, **CK\_ULONG\_PTR** pulEncryptedDataLen)

*Continues a multiple-part encryption operation.*

- **CK\_RV C\_EncryptFinal** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pEncryptedData, **CK\_ULONG\_PTR** pulEncryptedDataLen)

*Finishes a multiple-part encryption operation.*

- **CK\_RV C\_DecryptInit** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_OBJECT\_HANDLE** hObject)

*Initialize decryption using the specified object.*

- **CK\_RV C\_Decrypt** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pEncryptedData, **CK\_ULONG** ulEncryptedDataLen, **CK\_BYTE\_PTR** pData, **CK\_ULONG\_PTR** pulDataLen)

*Perform a single operation decryption in the given session.*

- **CK\_RV C\_DecryptUpdate** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pEncryptedData, **CK\_ULONG** ulEncryptedDataLen, **CK\_BYTE\_PTR** pData, **CK\_ULONG\_PTR** pulDataLen)

*Continues a multiple-part decryption operation.*

- **CK\_RV C\_DecryptFinal** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pData, **CK\_ULONG\_PTR** pulDataLen)

*Finishes a multiple-part decryption operation.*

- **CK\_RV C\_DigestInit** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism)

*Initializes a message-digesting operation using the specified mechanism in the specified session.*

- **CK\_RV C\_Digest** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pData, **CK\_ULONG** ulDataLen, **CK\_BYTE\_PTR** pDigest, **CK\_ULONG\_PTR** pulDigestLen)

*Digest the specified data in a one-pass operation and return the resulting digest.*

- **CK\_RV C\_DigestUpdate** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pPart, **CK\_ULONG** ulPartLen)

*Continues a multiple-part digesting operation.*

- **CK\_RV C\_DigestKey** (**CK\_SESSION\_HANDLE** hSession, **CK\_OBJECT\_HANDLE** hObject)

*Update a running digest operation by digesting a secret key with the specified handle.*

- **CK\_RV C\_DigestFinal** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pDigest, **CK\_ULONG\_PTR** pulDigestLen)

*Finishes a multiple-part digesting operation.*

- **CK\_RV C\_SignInit** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_OBJECT\_HANDLE** hObject)

*Initialize a signing operation using the specified key and mechanism.*

- **CK\_RV C\_Sign** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pData, **CK\_ULONG** ulDataLen, **CK\_BYTE\_PTR** pSignature, **CK\_ULONG\_PTR** pulSignatureLen)

*Sign the data in a single pass operation.*

- **CK\_RV C\_SignUpdate** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pPart, **CK\_ULONG** ulPartLen)

*Continues a multiple-part signature operation.*

- **CK\_RV C\_SignFinal** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pSignature, **CK\_ULONG\_PTR** pulSignatureLen)

*Finishes a multiple-part signature operation.*

- **CK\_RV C\_SignRecoverInit** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_OBJECT\_HANDLE** hObject)

*Initializes a signature operation, where the data can be recovered from the signature.*

- **CK\_RV C\_SignRecover** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pData, **CK\_ULONG** ulDataLen, **CK\_BYTE\_PTR** pSignature, **CK\_ULONG\_PTR** pulSignatureLen)

*Signs single-part data, where the data can be recovered from the signature.*

- **CK\_RV C\_VerifyInit** (**CK\_SESSION\_HANDLE** hSession, **CK\_MECHANISM\_PTR** pMechanism, **CK\_OBJECT\_HANDLE** hObject)

*Initializes a verification operation using the specified key and mechanism.*

- **CK\_RV C\_Verify** (**CK\_SESSION\_HANDLE** hSession, **CK\_BYTE\_PTR** pData, **CK\_ULONG** ulDataLen, **CK\_BYTE\_PTR** pSignature, **CK\_ULONG** ulSignatureLen)

- Verifies a signature on single-part data.*

  - [CK\\_RV C\\_VerifyUpdate](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pPart, [CK\\_ULONG](#) ulPartLen)

*Continues a multiple-part verification operation.*

  - [CK\\_RV C\\_VerifyFinal](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pSignature, [CK\\_ULONG](#) ulSignatureLen)

*Finishes a multiple-part verification operation.*

  - [CK\\_RV C\\_VerifyRecoverInit](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hKey)

*Initializes a verification operation where the data is recovered from the signature.*

  - [CK\\_RV C\\_VerifyRecover](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pSignature, [CK\\_ULONG](#) ulSignatureLen, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG\\_PTR](#) pulDataLen)

*Verifies a signature on single-part data, where the data is recovered from the signature.*

  - [CK\\_RV C\\_DigestEncryptUpdate](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pPart, [CK\\_ULONG](#) ulPartLen, [CK\\_BYTE\\_PTR](#) pEncryptedPart, [CK\\_ULONG\\_PTR](#) pulEncryptedPartLen)

*Continues simultaneous multiple-part digesting and encryption operations.*

  - [CK\\_RV C\\_DecryptDigestUpdate](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pPart, [CK\\_ULONG](#) ulPartLen, [CK\\_BYTE\\_PTR](#) pDecryptedPart, [CK\\_ULONG\\_PTR](#) pulDecryptedPartLen)

*Continues simultaneous multiple-part decryption and digesting operations.*

  - [CK\\_RV C\\_SignEncryptUpdate](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pPart, [CK\\_ULONG](#) ulPartLen, [CK\\_BYTE\\_PTR](#) pEncryptedPart, [CK\\_ULONG\\_PTR](#) pulEncryptedPartLen)

*Continues simultaneous multiple-part signature and encryption operations.*

  - [CK\\_RV C\\_DecryptVerifyUpdate](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pEncryptedPart, [CK\\_ULONG](#) ulEncryptedPartLen, [CK\\_BYTE\\_PTR](#) pPart, [CK\\_ULONG\\_PTR](#) pulPartLen)

*Continues simultaneous multiple-part decryption and verification operations.*

  - [CK\\_RV C\\_GenerateKey](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phKey)

*Generates a secret key using the specified mechanism.*

  - [CK\\_RV C\\_GenerateKeyPair](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_ATTRIBUTE\\_PTR](#) pPublicKeyTemplate, [CK\\_ULONG](#) ulPublicKeyAttributeCount, [CK\\_ATTRIBUTE\\_PTR](#) pPrivateKeyTemplate, [CK\\_ULONG](#) ulPrivateKeyAttributeCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phPublicKey, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phPrivateKey)

*Generates a public-key/private-key pair using the specified mechanism.*

  - [CK\\_RV C\\_WrapKey](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hWrappingKey, [CK\\_OBJECT\\_HANDLE](#) hKey, [CK\\_BYTE\\_PTR](#) pWrappedKey, [CK\\_ULONG\\_PTR](#) pulWrappedKeyLen)

*Wraps (encrypts) the specified key using the specified wrapping key and mechanism.*

  - [CK\\_RV C\\_UnwrapKey](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hUnwrappingKey, [CK\\_BYTE\\_PTR](#) pWrappedKey, [CK\\_ULONG](#) ulWrappedKeyLen, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phKey)

*Unwraps (decrypts) the specified key using the specified unwrapping key.*

  - [CK\\_RV C\\_DeriveKey](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hBaseKey, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phKey)

*Derive a key from the specified base key.*

  - [CK\\_RV C\\_SeedRandom](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pSeed, [CK\\_ULONG](#) ulSeedLen)

*Mixes in additional seed material to the random number generator.*

  - [CK\\_RV C\\_GenerateRandom](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pRandomData, [CK\\_ULONG](#) ulRandomLen)

*Generate the specified amount of random data.*

  - [CK\\_RV C\\_GetFunctionStatus](#) ([CK\\_SESSION\\_HANDLE](#) hSession)

*Legacy function - see PKCS#11 v2.40.*

  - [CK\\_RV C\\_CancelFunction](#) ([CK\\_SESSION\\_HANDLE](#) hSession)

*Legacy function.*

  - [CK\\_RV C\\_WaitForSlotEvent](#) ([CK\\_FLAGS](#) flags, [CK\\_SLOT\\_ID\\_PTR](#) pSlot, [CK\\_VOID\\_PTR](#) pReserved)

*Wait for a slot event (token insertion, removal, etc) on the specified slot to occur.*

### 10.163.1 Detailed Description

PKCS11 Basic library redirects based on the 2.40 specification <http://docs.oasis-open.org/pkcs11/pkcs11-base/v2.40/os/pkcs11-base-v2.40-os.html>.

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## 10.164 pkcs11\_mech.c File Reference

PKCS11 Library Mechanism Handling.

```
#include "pkcs11_config.h"
#include "pkcs11_debug.h"
#include "pkcs11_init.h"
#include "pkcs11_mech.h"
#include "pkcs11_slot.h"
#include "cryptoauthlib.h"
```

### Data Structures

- struct [\\_pcks11\\_mech\\_table\\_e](#)

### Macros

- #define [PKCS11\\_MECH\\_ECC508\\_EC\\_CAPABILITY](#) ([CKF\\_EC\\_F\\_P](#) | [CKF\\_EC\\_NAMEDCURVE](#) | [CKF\\_EC\\_UNCOMPRESS](#))
- #define [TABLE\\_SIZE\(x\)](#) sizeof(x) / sizeof(x[0])

### Typedefs

- typedef struct [\\_pcks11\\_mech\\_table\\_e](#) [pcks11\\_mech\\_table\\_e](#)
- typedef struct [\\_pcks11\\_mech\\_table\\_e](#) \* [pcks11\\_mech\\_table\\_ptr](#)

### Functions

- [CK\\_RV](#) [pkcs11\\_mech\\_get\\_list](#) ([CK\\_SLOT\\_ID](#) slotID, [CK\\_MECHANISM\\_TYPE\\_PTR](#) pMechanismList, [CK\\_ULONG\\_PTR](#) pulCount)
- [CK\\_RV](#) [pkcs\\_mech\\_get\\_info](#) ([CK\\_SLOT\\_ID](#) slotID, [CK\\_MECHANISM\\_TYPE](#) type, [CK\\_MECHANISM\\_INFO\\_PTR](#) pInfo)

### 10.164.1 Detailed Description

PKCS11 Library Mechanism Handling.

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## 10.165 pkcs11\_mech.h File Reference

PKCS11 Library Mechanism Handling.

```
#include "cryptoki.h"
```

### Functions

- [CK\\_RV pkcs11\\_mech\\_get\\_list](#) ([CK\\_SLOT\\_ID](#) slotID, [CK\\_MECHANISM\\_TYPE\\_PTR](#) pMechanismList, [CK\\_ULONG\\_PTR](#) pulCount)
- [CK\\_RV pkcs\\_mech\\_get\\_info](#) ([CK\\_SLOT\\_ID](#) slotID, [CK\\_MECHANISM\\_TYPE](#) type, [CK\\_MECHANISM\\_INFO\\_PTR](#) pInfo)

### 10.165.1 Detailed Description

PKCS11 Library Mechanism Handling.

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## 10.166 pkcs11\_object.c File Reference

PKCS11 Library Object Handling Base.

```
#include "cryptoauthlib.h"
#include "cryptoki.h"
#include "pkcs11_config.h"
#include "pkcs11_debug.h"
#include "pkcs11_init.h"
#include "pkcs11_slot.h"
#include "pkcs11_session.h"
#include "pkcs11_util.h"
#include "pkcs11_object.h"
#include "pkcs11_os.h"
#include "pkcs11_find.h"
#include "pkcs11_key.h"
#include "pkcs11_cert.h"
```



## Functions

- [CK\\_RV pkcs11\\_object\\_alloc](#) ([CK\\_SLOT\\_ID](#) slotId, [pkcs11\\_object\\_ptr](#) \*ppObject)
  - [\\*\\*](#)
  - [CK\\_RV pkcs11\\_object\\_free](#) ([pkcs11\\_object\\_ptr](#) pObject)
  - [CK\\_RV pkcs11\\_object\\_check](#) ([pkcs11\\_object\\_ptr](#) \*ppObject, [CK\\_OBJECT\\_HANDLE](#) hObject)
  - [CK\\_RV pkcs11\\_object\\_get\\_handle](#) ([pkcs11\\_object\\_ptr](#) pObject, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phObject)
  - [CK\\_RV pkcs11\\_object\\_get\\_owner](#) ([pkcs11\\_object\\_ptr](#) pObject, [CK\\_SLOT\\_ID\\_PTR](#) pSlotId)
  - [CK\\_RV pkcs11\\_object\\_get\\_name](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
  - [CK\\_RV pkcs11\\_object\\_get\\_class](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
  - [CK\\_RV pkcs11\\_object\\_get\\_type](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
  - [CK\\_RV pkcs11\\_object\\_get\\_destroyable](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
  - [CK\\_RV pkcs11\\_object\\_get\\_size](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE](#) hObject, [CK\\_ULONG\\_PTR](#) pulSize)
  - [CK\\_RV pkcs11\\_object\\_find](#) ([CK\\_SLOT\\_ID](#) slotId, [pkcs11\\_object\\_ptr](#) \*ppObject, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount)
  - [CK\\_RV pkcs11\\_object\\_create](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phObject)
  - [CK\\_RV pkcs11\\_object\\_destroy](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE](#) hObject)
  - [CK\\_RV pkcs11\\_object\\_deinit](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
  - [ATCA\\_STATUS pkcs11\\_object\\_load\\_handle\\_info](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
  - [CK\\_RV pkcs11\\_object\\_is\\_private](#) ([pkcs11\\_object\\_ptr](#) pObject, [CK\\_BBOOL](#) \*is\_private)
  - [CK\\_RV pkcs11\\_object\\_is\\_public](#) ([pkcs11\\_object\\_ptr](#) pObject, [CK\\_BBOOL](#) \*is\_public)
- Create a new object on the token in the specified session using the given attribute template.*
- Destroy the specified object.*
- Checks the attributes of the underlying cryptographic asset to determine if it is a private key - this changes the way the associated public key is referenced.*

## Variables

- [pkcs11\\_object\\_cache\\_t](#) [pkcs11\\_object\\_cache](#) [[PKCS11\\_MAX\\_OBJECTS\\_ALLOWED](#)]
- const [pkcs11\\_attrib\\_model](#) [pkcs11\\_object\\_monotonic\\_attributes](#) []
- const [CK\\_ULONG](#) [pkcs11\\_object\\_monotonic\\_attributes\\_count](#) = sizeof([pkcs11\\_object\\_monotonic\\_attributes](#)) / sizeof([pkcs11\\_object\\_monotonic\\_attributes](#) [0])

### 10.166.1 Detailed Description

PKCS11 Library Object Handling Base.

#### Copyright

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## 10.167 pkcs11\_object.h File Reference

PKCS11 Library Object Handling.

```
#include "cryptoauthlib.h"
#include "cryptoki.h"
#include "pkcs11_config.h"
#include "pkcs11_attrib.h"
```

## Data Structures

- struct [\\_pkcs11\\_object](#)
- struct [\\_pkcs11\\_object\\_cache\\_t](#)

## Macros

- `#define` [PKCS11\\_OBJECT\\_FLAG\\_DESTROYABLE](#) 0x01
- `#define` [PKCS11\\_OBJECT\\_FLAG\\_MODIFIABLE](#) 0x02
- `#define` [PKCS11\\_OBJECT\\_FLAG\\_DYNAMIC](#) 0x04
- `#define` [PKCS11\\_OBJECT\\_FLAG\\_SENSITIVE](#) 0x08
- `#define` [PKCS11\\_OBJECT\\_FLAG\\_TA\\_TYPE](#) 0x10
- `#define` [PKCS11\\_OBJECT\\_FLAG\\_TRUST\\_TYPE](#) 0x20

## Typedefs

- typedef struct [\\_pkcs11\\_object](#) [pkcs11\\_object](#)
- typedef struct [\\_pkcs11\\_object\\_cache\\_t](#) [pkcs11\\_object\\_cache\\_t](#)

## Functions

- [CK\\_RV pkcs11\\_object\\_alloc](#) ([CK\\_SLOT\\_ID](#) slotId, [pkcs11\\_object\\_ptr](#) \*ppObject)
- \*\*
- [CK\\_RV pkcs11\\_object\\_free](#) ([pkcs11\\_object\\_ptr](#) pObject)
- [CK\\_RV pkcs11\\_object\\_check](#) ([pkcs11\\_object\\_ptr](#) \*ppObject, [CK\\_OBJECT\\_HANDLE](#) handle)
- [CK\\_RV pkcs11\\_object\\_find](#) ([CK\\_SLOT\\_ID](#) slotId, [pkcs11\\_object\\_ptr](#) \*ppObject, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount)
- [CK\\_RV pkcs11\\_object\\_is\\_private](#) ([pkcs11\\_object\\_ptr](#) pObject, [CK\\_BBOOL](#) \*is\_private)  
*Checks the attributes of the underlying cryptographic asset to determine if it is a private key - this changes the way the associated public key is referenced.*
- [CK\\_RV pkcs11\\_object\\_deinit](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_object\\_get\\_owner](#) ([pkcs11\\_object\\_ptr](#) pObject, [CK\\_SLOT\\_ID\\_PTR](#) pSlotId)
- [ATCA\\_STATUS pkcs11\\_object\\_load\\_handle\\_info](#) ([pkcs11\\_lib\\_ctx\\_ptr](#) pContext)
- [CK\\_RV pkcs11\\_object\\_get\\_class](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV pkcs11\\_object\\_get\\_name](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV pkcs11\\_object\\_get\\_type](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV pkcs11\\_object\\_get\\_destroyable](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV pkcs11\\_object\\_get\\_size](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE](#) hObject, [CK\\_ULONG\\_PTR](#) pulSize)
- [CK\\_RV pkcs11\\_object\\_get\\_handle](#) ([pkcs11\\_object\\_ptr](#) pObject, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phObject)
- [CK\\_RV pkcs11\\_object\\_create](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_ATTRIBUTE\\_PTR](#) pTemplate, [CK\\_ULONG](#) ulCount, [CK\\_OBJECT\\_HANDLE\\_PTR](#) phObject)  
*Create a new object on the token in the specified session using the given attribute template.*
- [CK\\_RV pkcs11\\_object\\_destroy](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_OBJECT\\_HANDLE](#) hObject)  
*Destroy the specified object.*

## Variables

- [pkcs11\\_object\\_cache\\_t](#) [pkcs11\\_object\\_cache](#) []
- const [pkcs11\\_attrib\\_model](#) [pkcs11\\_object\\_monotonic\\_attributes](#) []
- const [CK\\_ULONG](#) [pkcs11\\_object\\_monotonic\\_attributes\\_count](#)

## 10.167.1 Detailed Description

PKCS11 Library Object Handling.

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## 10.167.2 Macro Definition Documentation

### 10.167.2.1 PKCS11\_OBJECT\_FLAG\_DESTROYABLE

```
#define PKCS11_OBJECT_FLAG_DESTROYABLE 0x01
```

### 10.167.2.2 PKCS11\_OBJECT\_FLAG\_DYNAMIC

```
#define PKCS11_OBJECT_FLAG_DYNAMIC 0x04
```

### 10.167.2.3 PKCS11\_OBJECT\_FLAG\_MODIFIABLE

```
#define PKCS11_OBJECT_FLAG_MODIFIABLE 0x02
```

### 10.167.2.4 PKCS11\_OBJECT\_FLAG\_SENSITIVE

```
#define PKCS11_OBJECT_FLAG_SENSITIVE 0x08
```

### 10.167.2.5 PKCS11\_OBJECT\_FLAG\_TA\_TYPE

```
#define PKCS11_OBJECT_FLAG_TA_TYPE 0x10
```

### 10.167.2.6 PKCS11\_OBJECT\_FLAG\_TRUST\_TYPE

```
#define PKCS11_OBJECT_FLAG_TRUST_TYPE 0x20
```

### 10.167.3 Typedef Documentation

#### 10.167.3.1 pkcs11\_object

```
typedef struct _pkcs11_object pkcs11_object
```

#### 10.167.3.2 pkcs11\_object\_cache\_t

```
typedef struct _pkcs11_object_cache_t pkcs11_object_cache_t
```

## 10.168 pkcs11\_os.c File Reference

PKCS11 Library Operating System Abstraction Functions.

```
#include "pkcs11_os.h"  
#include "pkcs11_util.h"
```

### Functions

- [CK\\_RV pkcs11\\_os\\_create\\_mutex \(CK\\_VOID\\_PTR\\_PTR ppMutex\)](#)  
*Application callback for creating a mutex object.*
- [CK\\_RV pkcs11\\_os\\_destroy\\_mutex \(CK\\_VOID\\_PTR pMutex\)](#)
- [CK\\_RV pkcs11\\_os\\_lock\\_mutex \(CK\\_VOID\\_PTR pMutex\)](#)
- [CK\\_RV pkcs11\\_os\\_unlock\\_mutex \(CK\\_VOID\\_PTR pMutex\)](#)

### 10.168.1 Detailed Description

PKCS11 Library Operating System Abstraction Functions.

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## 10.169 pkcs11\_os.h File Reference

PKCS11 Library Operating System Abstraction.

```
#include "cryptoki.h"  
#include "cryptoauthlib.h"
```

## Macros

- `#define pkcs11_os_malloc hal_malloc`
- `#define pkcs11_os_free hal_free`

## Functions

- `CK_RV pkcs11_os_create_mutex (CK_VOID_PTR_PTR ppMutex)`  
*Application callback for creating a mutex object.*
- `CK_RV pkcs11_os_destroy_mutex (CK_VOID_PTR pMutex)`
- `CK_RV pkcs11_os_lock_mutex (CK_VOID_PTR pMutex)`
- `CK_RV pkcs11_os_unlock_mutex (CK_VOID_PTR pMutex)`

### 10.169.1 Detailed Description

PKCS11 Library Operating System Abstraction.

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### 10.169.2 Macro Definition Documentation

#### 10.169.2.1 pkcs11\_os\_free

```
#define pkcs11_os_free hal_free
```

#### 10.169.2.2 pkcs11\_os\_malloc

```
#define pkcs11_os_malloc hal_malloc
```

## 10.170 pkcs11\_session.c File Reference

PKCS11 Library Session Handling.

```
#include "cryptoauthlib.h"
#include "host/atca_host.h"
#include "pkcs11_config.h"
#include "pkcs11_debug.h"
#include "pkcs11_session.h"
#include "pkcs11_token.h"
#include "pkcs11_init.h"
#include "pkcs11_slot.h"
#include "pkcs11_object.h"
#include "pkcs11_os.h"
#include "pkcs11_util.h"
```

### Functions

- [pkcs11\\_session\\_ctx\\_ptr pkcs11\\_get\\_session\\_context \(CK\\_SESSION\\_HANDLE hSession\)](#)
- [CK\\_RV pkcs11\\_session\\_check \(pkcs11\\_session\\_ctx\\_ptr \\*pSession, CK\\_SESSION\\_HANDLE hSession\)](#)  
*Check if the session is initialized properly.*
- [CK\\_RV pkcs11\\_session\\_open \(CK\\_SLOT\\_ID slotID, CK\\_FLAGS flags, CK\\_VOID\\_PTR pApplication, CK\\_NOTIFY notify, CK\\_SESSION\\_HANDLE\\_PTR phSession\)](#)
- [CK\\_RV pkcs11\\_session\\_close \(CK\\_SESSION\\_HANDLE hSession\)](#)
- [CK\\_RV pkcs11\\_session\\_closeall \(CK\\_SLOT\\_ID slotID\)](#)  
*Close all sessions for a given slot - not actually all open sessions.*
- [CK\\_RV pkcs11\\_session\\_get\\_info \(CK\\_SESSION\\_HANDLE hSession, CK\\_SESSION\\_INFO\\_PTR pInfo\)](#)  
*Obtains information about a particular session.*
- [CK\\_RV pkcs11\\_session\\_login \(CK\\_SESSION\\_HANDLE hSession, CK\\_USER\\_TYPE userType, CK\\_UTF8CHAR\\_PTR pPin, CK\\_ULONG ulPinLen\)](#)
- [CK\\_RV pkcs11\\_session\\_logout \(CK\\_SESSION\\_HANDLE hSession\)](#)

### 10.170.1 Detailed Description

PKCS11 Library Session Handling.

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## 10.171 pkcs11\_session.h File Reference

PKCS11 Library Session Management & Context.

```
#include "cryptoki.h"
#include "pkcs11_config.h"
```

### Data Structures

- [struct \\_pkcs11\\_session\\_mech\\_ctx](#)
- [struct \\_pkcs11\\_session\\_ctx](#)

### Typedefs

- [typedef struct \\_pkcs11\\_session\\_mech\\_ctx pkcs11\\_session\\_mech\\_ctx](#)
- [typedef struct \\_pkcs11\\_session\\_mech\\_ctx \\* pkcs11\\_session\\_mech\\_ctx\\_ptr](#)
- [typedef struct \\_pkcs11\\_session\\_ctx pkcs11\\_session\\_ctx](#)
- [typedef struct \\_pkcs11\\_session\\_ctx \\* pkcs11\\_session\\_ctx\\_ptr](#)

## Functions

- `CK_RV pkcs11_session_check (pkcs11_session_ctx_ptr *pSession, CK_SESSION_HANDLE hSession)`  
*Check if the session is initialized properly.*
- `CK_RV pkcs11_session_get_info (CK_SESSION_HANDLE hSession, CK_SESSION_INFO_PTR pInfo)`  
*Obtains information about a particular session.*
- `CK_RV pkcs11_session_open (CK_SLOT_ID slotID, CK_FLAGS flags, CK_VOID_PTR pApplication, CK_NOTIFY notify, CK_SESSION_HANDLE_PTR phSession)`
- `CK_RV pkcs11_session_close (CK_SESSION_HANDLE hSession)`
- `CK_RV pkcs11_session_closeall (CK_SLOT_ID slotID)`  
*Close all sessions for a given slot - not actually all open sessions.*
- `CK_RV pkcs11_session_login (CK_SESSION_HANDLE hSession, CK_USER_TYPE userType, CK_UTF8CHAR_PTR pPin, CK_ULONG ulPinLen)`
- `CK_RV pkcs11_session_logout (CK_SESSION_HANDLE hSession)`
- `CK_RV pkcs11_session_authorize (pkcs11_session_ctx_ptr pSession, CK_VOID_PTR pObject)`

### 10.171.1 Detailed Description

PKCS11 Library Session Management & Context.

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### 10.171.2 Typedef Documentation

#### 10.171.2.1 pkcs11\_session\_ctx

```
typedef struct _pkcs11_session_ctx pkcs11_session_ctx
```

Session Context

#### 10.171.2.2 pkcs11\_session\_ctx\_ptr

```
typedef struct _pkcs11_session_ctx * pkcs11_session_ctx_ptr
```

#### 10.171.2.3 pkcs11\_session\_mech\_ctx

```
typedef struct _pkcs11_session_mech_ctx pkcs11_session_mech_ctx
```

### 10.171.2.4 pkcs11\_session\_mech\_ctx\_ptr

```
typedef struct _pkcs11_session_mech_ctx * pkcs11_session_mech_ctx_ptr
```

## 10.171.3 Function Documentation

### 10.171.3.1 pkcs11\_session\_authorize()

```
CK_RV pkcs11_session_authorize (
    pkcs11_session_ctx_ptr pSession,
    CK_VOID_PTR pObject )
```

## 10.172 pkcs11\_signature.c File Reference

PKCS11 Library Sign/Verify Handling.

```
#include "pkcs11_config.h"
#include "pkcs11_debug.h"
#include "pkcs11_init.h"
#include "pkcs11_signature.h"
#include "pkcs11_object.h"
#include "pkcs11_session.h"
#include "pkcs11_util.h"
#include "cryptoauthlib.h"
#include "atcacert/atcacert_der.h"
```

## Functions

- **CK\_RV pkcs11\_signature\_sign\_init** (CK\_SESSION\_HANDLE hSession, CK\_MECHANISM\_PTR pMechanism, CK\_OBJECT\_HANDLE hKey)  
*Initialize a signing operation using the specified key and mechanism.*
- **CK\_RV pkcs11\_signature\_sign** (CK\_SESSION\_HANDLE hSession, CK\_BYTE\_PTR pData, CK\_ULONG ulDataLen, CK\_BYTE\_PTR pSignature, CK\_ULONG\_PTR pulSignatureLen)  
*Sign the data in a single pass operation.*
- **CK\_RV pkcs11\_signature\_sign\_continue** (CK\_SESSION\_HANDLE hSession, CK\_BYTE\_PTR pPart, CK\_ULONG ulPartLen)  
*Continues a multiple-part signature operation.*
- **CK\_RV pkcs11\_signature\_sign\_finish** (CK\_SESSION\_HANDLE hSession, CK\_BYTE\_PTR pSignature, CK\_ULONG\_PTR pulSignatureLen)  
*Finishes a multiple-part signature operation.*
- **CK\_RV pkcs11\_signature\_verify\_init** (CK\_SESSION\_HANDLE hSession, CK\_MECHANISM\_PTR pMechanism, CK\_OBJECT\_HANDLE hKey)  
*Initializes a verification operation using the specified key and mechanism.*
- **CK\_RV pkcs11\_signature\_verify** (CK\_SESSION\_HANDLE hSession, CK\_BYTE\_PTR pData, CK\_ULONG ulDataLen, CK\_BYTE\_PTR pSignature, CK\_ULONG ulSignatureLen)  
*Verifies a signature on single-part data.*
- **CK\_RV pkcs11\_signature\_verify\_continue** (CK\_SESSION\_HANDLE hSession, CK\_BYTE\_PTR pPart, CK\_ULONG ulPartLen)  
*Continues a multiple-part verification operation.*
- **CK\_RV pkcs11\_signature\_verify\_finish** (CK\_SESSION\_HANDLE hSession, CK\_BYTE\_PTR pSignature, CK\_ULONG ulSignatureLen)  
*Finishes a multiple-part verification operation.*



### 10.172.1 Detailed Description

PKCS11 Library Sign/Verify Handling.

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## 10.173 pkcs11\_signature.h File Reference

PKCS11 Library Sign/Verify Handling.

```
#include "cryptoki.h"
```

### Functions

- [CK\\_RV pkcs11\\_signature\\_sign\\_init](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hKey)  
*Initialize a signing operation using the specified key and mechanism.*
- [CK\\_RV pkcs11\\_signature\\_sign](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG](#) ulDataLen, [CK\\_BYTE\\_PTR](#) pSignature, [CK\\_ULONG\\_PTR](#) pulSignatureLen)  
*Sign the data in a single pass operation.*
- [CK\\_RV pkcs11\\_signature\\_sign\\_continue](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pPart, [CK\\_ULONG](#) ulPartLen)  
*Continues a multiple-part signature operation.*
- [CK\\_RV pkcs11\\_signature\\_sign\\_finish](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pSignature, [CK\\_ULONG\\_PTR](#) pulSignatureLen)  
*Finishes a multiple-part signature operation.*
- [CK\\_RV pkcs11\\_signature\\_verify\\_init](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_MECHANISM\\_PTR](#) pMechanism, [CK\\_OBJECT\\_HANDLE](#) hKey)  
*Initializes a verification operation using the specified key and mechanism.*
- [CK\\_RV pkcs11\\_signature\\_verify](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pData, [CK\\_ULONG](#) ulDataLen, [CK\\_BYTE\\_PTR](#) pSignature, [CK\\_ULONG](#) ulSignatureLen)  
*Verifies a signature on single-part data.*
- [CK\\_RV pkcs11\\_signature\\_verify\\_continue](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pPart, [CK\\_ULONG](#) ulPartLen)  
*Continues a multiple-part verification operation.*
- [CK\\_RV pkcs11\\_signature\\_verify\\_finish](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pSignature, [CK\\_ULONG](#) ulSignatureLen)  
*Finishes a multiple-part verification operation.*

### 10.173.1 Detailed Description

PKCS11 Library Sign/Verify Handling.

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## 10.174 pkcs11\_slot.c File Reference

PKCS11 Library Slot Handling.

```
#include "cryptoauthlib.h"
#include "pkcs11_config.h"
#include "pkcs11_debug.h"
#include "pkcs11_init.h"
#include "pkcs11_slot.h"
#include "pkcs11_info.h"
#include "pkcs11_util.h"
#include "pkcs11_object.h"
#include "pkcs11_os.h"
#include <stdio.h>
```

### Functions

- `pkcs11_slot_ctx_ptr pkcs11_slot_get_context` (`pkcs11_lib_ctx_ptr lib_ctx`, `CK_SLOT_ID slotID`)  
*Retrieve the current slot context.*
- `pkcs11_slot_ctx_ptr pkcs11_slot_get_new_context` (`pkcs11_lib_ctx_ptr lib_ctx`)
- `CK_VOID_PTR pkcs11_slot_initslots` (`CK_ULONG pulCount`)
- `CK_RV pkcs11_slot_config` (`CK_SLOT_ID slotID`)
- `CK_RV pkcs11_slot_init` (`CK_SLOT_ID slotID`)  
*This is an internal function that initializes a pkcs11 slot - it must already have the locks in place before being called.*
- `CK_RV pkcs11_slot_get_list` (`CK_BBOOL tokenPresent`, `CK_SLOT_ID_PTR pSlotList`, `CK_ULONG_PTR pulCount`)
- `CK_RV pkcs11_slot_get_info` (`CK_SLOT_ID slotID`, `CK_SLOT_INFO_PTR pInfo`)  
*Obtains information about a particular slot.*

### 10.174.1 Detailed Description

PKCS11 Library Slot Handling.

The nomenclature here can lead to some confusion - the pkcs11 slot is not the same as a device slot. So for example each slot defined here is a specific device (most systems would have only one). The "slots" as defined by the device specification would be enumerated separately as related to specific supported mechanisms as cryptographic "objects".

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## 10.175 pkcs11\_slot.h File Reference

PKCS11 Library Slot Handling & Context.

```
#include "pkcs11_init.h"
#include "cryptoauthlib.h"
```

## Data Structures

- struct `_pkcs11_slot_ctx`

## Typedefs

- typedef struct `_pkcs11_slot_ctx` `pkcs11_slot_ctx`

## Functions

- `CK_RV` `pkcs11_slot_init` (`CK_SLOT_ID` slotID)  
*This is an internal function that initializes a pkcs11 slot - it must already have the locks in place before being called.*
- `CK_RV` `pkcs11_slot_config` (`CK_SLOT_ID` slotID)
- `CK_VOID_PTR` `pkcs11_slot_initslots` (`CK_ULONG` pulCount)
- `pkcs11_slot_ctx_ptr` `pkcs11_slot_get_context` (`pkcs11_lib_ctx_ptr` lib\_ctx, `CK_SLOT_ID` slotID)  
*Retrieve the current slot context.*
- `pkcs11_slot_ctx_ptr` `pkcs11_slot_get_new_context` (`pkcs11_lib_ctx_ptr` lib\_ctx)
- `CK_RV` `pkcs11_slot_get_list` (`CK_BBOOL` tokenPresent, `CK_SLOT_ID_PTR` pSlotList, `CK_ULONG_PTR` pulCount)
- `CK_RV` `pkcs11_slot_get_info` (`CK_SLOT_ID` slotID, `CK_SLOT_INFO_PTR` pInfo)  
*Obtains information about a particular slot.*

### 10.175.1 Detailed Description

PKCS11 Library Slot Handling & Context.

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### 10.175.2 Typedef Documentation

#### 10.175.2.1 `pkcs11_slot_ctx`

```
typedef struct _pkcs11_slot_ctx pkcs11_slot_ctx
```

Slot Context

## 10.176 pkcs11\_token.c File Reference

PKCS11 Library Token Handling.

```
#include "cryptoauthlib.h"
#include "pkcs11_config.h"
#include "pkcs11_debug.h"
#include "pkcs11_token.h"
#include "pkcs11_slot.h"
#include "pkcs11_info.h"
#include "pkcs11_util.h"
#include "pkcs11_object.h"
#include "pkcs11_key.h"
#include "pkcs11_cert.h"
#include "pkcs11_session.h"
```

### Macros

- `#define ATCA_SERIAL_NUM_SIZE (9)`

### Functions

- `CK_RV pkcs11_token_init (CK_SLOT_ID slotID, CK_UTF8CHAR_PTR pPin, CK_ULONG ulPinLen, CK_UTF8CHAR_PTR pLabel)`
- `CK_RV pkcs11_token_get_access_type (CK_VOID_PTR pObject, CK_ATTRIBUTE_PTR pAttribute)`
- `CK_RV pkcs11_token_get_writable (CK_VOID_PTR pObject, CK_ATTRIBUTE_PTR pAttribute)`
- `CK_RV pkcs11_token_get_storage (CK_VOID_PTR pObject, CK_ATTRIBUTE_PTR pAttribute)`
- `CK_RV pkcs11_token_get_info (CK_SLOT_ID slotID, CK_TOKEN_INFO_PTR pInfo)`  
*Obtains information about a particular token.*
- `CK_RV pkcs11_token_random (CK_SESSION_HANDLE hSession, CK_BYTE_PTR pRandomData, CK_ULONG ulRandomLen)`  
*Generate the specified amount of random data.*
- `CK_RV pkcs11_token_convert_pin_to_key (const CK_UTF8CHAR_PTR pPin, const CK_ULONG ulPinLen, const CK_UTF8CHAR_PTR pSalt, const CK_ULONG ulSaltLen, CK_BYTE_PTR pKey, CK_ULONG ulKeyLen)`
- `CK_RV pkcs11_token_set_pin (CK_SESSION_HANDLE hSession, CK_UTF8CHAR_PTR pOldPin, CK_ULONG ulOldLen, CK_UTF8CHAR_PTR pNewPin, CK_ULONG ulNewLen)`

### 10.176.1 Detailed Description

PKCS11 Library Token Handling.

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### 10.176.2 Macro Definition Documentation

### 10.176.2.1 ATCA\_SERIAL\_NUM\_SIZE

```
#define ATCA_SERIAL_NUM_SIZE (9)
```

## 10.177 pkcs11\_token.h File Reference

PKCS11 Library Token Management & Context.

```
#include "pkcs11_init.h"
```

### Functions

- [CK\\_RV pkcs11\\_token\\_init](#) ([CK\\_SLOT\\_ID](#) slotID, [CK\\_UTF8CHAR\\_PTR](#) pPin, [CK\\_ULONG](#) ulPinLen, [CK\\_UTF8CHAR\\_PTR](#) pLabel)
- [CK\\_RV pkcs11\\_token\\_get\\_access\\_type](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV pkcs11\\_token\\_get\\_writable](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV pkcs11\\_token\\_get\\_storage](#) ([CK\\_VOID\\_PTR](#) pObject, [CK\\_ATTRIBUTE\\_PTR](#) pAttribute)
- [CK\\_RV pkcs11\\_token\\_get\\_info](#) ([CK\\_SLOT\\_ID](#) slotID, [CK\\_TOKEN\\_INFO\\_PTR](#) pInfo)  
*Obtains information about a particular token.*
- [CK\\_RV pkcs11\\_token\\_convert\\_pin\\_to\\_key](#) (const [CK\\_UTF8CHAR\\_PTR](#) pPin, const [CK\\_ULONG](#) ulPinLen, const [CK\\_UTF8CHAR\\_PTR](#) pSalt, const [CK\\_ULONG](#) ulSaltLen, [CK\\_BYTE\\_PTR](#) pKey, [CK\\_ULONG](#) ulKeyLen)
- [CK\\_RV pkcs11\\_token\\_random](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_BYTE\\_PTR](#) pRandomData, [CK\\_ULONG](#) ulRandomLen)  
*Generate the specified amount of random data.*
- [CK\\_RV pkcs11\\_token\\_set\\_pin](#) ([CK\\_SESSION\\_HANDLE](#) hSession, [CK\\_UTF8CHAR\\_PTR](#) pOldPin, [CK\\_ULONG](#) ulOldLen, [CK\\_UTF8CHAR\\_PTR](#) pNewPin, [CK\\_ULONG](#) ulNewLen)

### 10.177.1 Detailed Description

PKCS11 Library Token Management & Context.

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## 10.178 pkcs11\_util.c File Reference

PKCS11 Library Utility Functions.

```
#include "pkcs11_util.h"
```

### Functions

- void [pkcs11\\_util\\_escape\\_string](#) ([CK\\_UTF8CHAR\\_PTR](#) buf, [CK\\_ULONG](#) buf\_len)
- [CK\\_RV](#) [pkcs11\\_util\\_convert\\_rv](#) ([ATCA\\_STATUS](#) status)
- int [pkcs11\\_util\\_memset](#) (void \*dest, size\_t destsz, int ch, size\_t count)

### 10.178.1 Detailed Description

PKCS11 Library Utility Functions.

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## 10.179 pkcs11\_util.h File Reference

PKCS11 Library Utilities.

```
#include "pkcs11_config.h"
#include "cryptoki.h"
#include "cryptoauthlib.h"
```

### Macros

- #define [PKCS11\\_UTIL\\_ARRAY\\_SIZE](#)(x) sizeof(x) / sizeof(x[0])

### Functions

- void [pkcs11\\_util\\_escape\\_string](#) ([CK\\_UTF8CHAR\\_PTR](#) buf, [CK\\_ULONG](#) buf\_len)
- [CK\\_RV](#) [pkcs11\\_util\\_convert\\_rv](#) ([ATCA\\_STATUS](#) status)
- int [pkcs11\\_util\\_memset](#) (void \*dest, size\_t destsz, int ch, size\_t count)

### 10.179.1 Detailed Description

PKCS11 Library Utilities.

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### 10.179.2 Macro Definition Documentation

### 10.179.2.1 PKCS11\_UTIL\_ARRAY\_SIZE

```
#define PKCS11_UTIL_ARRAY_SIZE(  
    x ) sizeof(x) / sizeof(x[0])
```

## 10.180 pkcs11f.h File Reference

## 10.181 pkcs11t.h File Reference

### Data Structures

- struct [CK\\_VERSION](#)
- struct [CK\\_INFO](#)
- struct [CK\\_SLOT\\_INFO](#)
- struct [CK\\_TOKEN\\_INFO](#)
- struct [CK\\_SESSION\\_INFO](#)
- struct [CK\\_ATTRIBUTE](#)
- struct [CK\\_DATE](#)
- struct [CK\\_MECHANISM](#)
- struct [CK\\_MECHANISM\\_INFO](#)
- struct [CK\\_C\\_INITIALIZE\\_ARGS](#)
- struct [CK\\_RSA\\_PKCS\\_OAEP\\_PARAMS](#)
- struct [CK\\_RSA\\_PKCS\\_PSS\\_PARAMS](#)
- struct [CK\\_ECDH1\\_DERIVE\\_PARAMS](#)
- struct [CK\\_ECDH2\\_DERIVE\\_PARAMS](#)
- struct [CK\\_ECMQV\\_DERIVE\\_PARAMS](#)
- struct [CK\\_X9\\_42\\_DH1\\_DERIVE\\_PARAMS](#)
- struct [CK\\_X9\\_42\\_DH2\\_DERIVE\\_PARAMS](#)
- struct [CK\\_X9\\_42\\_MQV\\_DERIVE\\_PARAMS](#)
- struct [CK\\_KEY\\_DERIVE\\_PARAMS](#)
- struct [CK\\_RC2\\_CBC\\_PARAMS](#)
- struct [CK\\_RC2\\_MAC\\_GENERAL\\_PARAMS](#)
- struct [CK\\_RC5\\_PARAMS](#)
- struct [CK\\_RC5\\_CBC\\_PARAMS](#)
- struct [CK\\_RC5\\_MAC\\_GENERAL\\_PARAMS](#)
- struct [CK\\_DES\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS](#)
- struct [CK\\_AES\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS](#)
- struct [CK\\_SKIPJACK\\_PRIVATE\\_WRAP\\_PARAMS](#)
- struct [CK\\_SKIPJACK\\_RELAYX\\_PARAMS](#)
- struct [CK\\_PBE\\_PARAMS](#)
- struct [CK\\_KEY\\_WRAP\\_SET\\_OAEP\\_PARAMS](#)
- struct [CK\\_SSL3\\_RANDOM\\_DATA](#)
- struct [CK\\_SSL3\\_MASTER\\_KEY\\_DERIVE\\_PARAMS](#)
- struct [CK\\_SSL3\\_KEY\\_MAT\\_OUT](#)
- struct [CK\\_SSL3\\_KEY\\_MAT\\_PARAMS](#)
- struct [CK\\_TLS\\_PRF\\_PARAMS](#)
- struct [CK\\_WTLS\\_RANDOM\\_DATA](#)
- struct [CK\\_WTLS\\_MASTER\\_KEY\\_DERIVE\\_PARAMS](#)
- struct [CK\\_WTLS\\_PRF\\_PARAMS](#)
- struct [CK\\_WTLS\\_KEY\\_MAT\\_OUT](#)
- struct [CK\\_WTLS\\_KEY\\_MAT\\_PARAMS](#)

- struct [CK\\_CMS\\_SIG\\_PARAMS](#)
- struct [CK\\_KEY\\_DERIVATION\\_STRING\\_DATA](#)
- struct [CK\\_PKCS5\\_PBKD2\\_PARAMS](#)
- struct [CK\\_PKCS5\\_PBKD2\\_PARAMS2](#)
- struct [CK\\_OTP\\_PARAM](#)
- struct [CK\\_OTP\\_PARAMS](#)
- struct [CK\\_OTP\\_SIGNATURE\\_INFO](#)
- struct [CK\\_KIP\\_PARAMS](#)
- struct [CK\\_AES\\_CTR\\_PARAMS](#)
- struct [CK\\_GCM\\_PARAMS](#)
- struct [CK\\_CCM\\_PARAMS](#)
- struct [CK\\_AES\\_GCM\\_PARAMS](#)
- struct [CK\\_AES\\_CCM\\_PARAMS](#)
- struct [CK\\_CAMELLIA\\_CTR\\_PARAMS](#)
- struct [CK\\_CAMELLIA\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS](#)
- struct [CK\\_ARIA\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS](#)
- struct [CK\\_DSA\\_PARAMETER\\_GEN\\_PARAM](#)
- struct [CK\\_ECDH\\_AES\\_KEY\\_WRAP\\_PARAMS](#)
- struct [CK\\_RSA\\_AES\\_KEY\\_WRAP\\_PARAMS](#)
- struct [CK\\_TLS12\\_MASTER\\_KEY\\_DERIVE\\_PARAMS](#)
- struct [CK\\_TLS12\\_KEY\\_MAT\\_PARAMS](#)
- struct [CK\\_TLS\\_KDF\\_PARAMS](#)
- struct [CK\\_TLS\\_MAC\\_PARAMS](#)
- struct [CK\\_GOSTR3410\\_DERIVE\\_PARAMS](#)
- struct [CK\\_GOSTR3410\\_KEY\\_WRAP\\_PARAMS](#)
- struct [CK\\_SEED\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS](#)

## Macros

- #define [CRYPTOKI\\_VERSION\\_MAJOR](#) 2
- #define [CRYPTOKI\\_VERSION\\_MINOR](#) 40
- #define [CRYPTOKI\\_VERSION\\_AMENDMENT](#) 0
- #define [CK\\_TRUE](#) 1
- #define [CK\\_FALSE](#) 0
- #define [FALSE](#) [CK\\_FALSE](#)
- #define [TRUE](#) [CK\\_TRUE](#)
- #define [CK\\_UNAVAILABLE\\_INFORMATION](#) (~0UL)
- #define [CK\\_EFFECTIVELY\\_INFINITE](#) 0UL
- #define [CK\\_INVALID\\_HANDLE](#) 0UL
- #define [CKN\\_SURRENDER](#) 0UL
- #define [CKN\\_OTP\\_CHANGED](#) 1UL
- #define [CKF\\_TOKEN\\_PRESENT](#) 0x00000001UL /\* a token is there \*/
- #define [CKF\\_REMOVABLE\\_DEVICE](#) 0x00000002UL /\* removable devices\*/
- #define [CKF\\_HW\\_SLOT](#) 0x00000004UL /\* hardware slot \*/
- #define [CKF\\_RNG](#) 0x00000001UL /\* has random # generator \*/
- #define [CKF\\_WRITE\\_PROTECTED](#) 0x00000002UL /\* token is write-protected \*/
- #define [CKF\\_LOGIN\\_REQUIRED](#) 0x00000004UL /\* user must login \*/
- #define [CKF\\_USER\\_PIN\\_INITIALIZED](#) 0x00000008UL /\* normal user's PIN is set \*/
- #define [CKF\\_RESTORE\\_KEY\\_NOT\\_NEEDED](#) 0x00000020UL
- #define [CKF\\_CLOCK\\_ON\\_TOKEN](#) 0x00000040UL
- #define [CKF\\_PROTECTED\\_AUTHENTICATION\\_PATH](#) 0x00000100UL
- #define [CKF\\_DUAL\\_CRYPTO\\_OPERATIONS](#) 0x00000200UL
- #define [CKF\\_TOKEN\\_INITIALIZED](#) 0x00000400UL
- #define [CKF\\_SECONDARY\\_AUTHENTICATION](#) 0x00000800UL



- #define CKF\_USER\_PIN\_COUNT\_LOW 0x00010000UL
- #define CKF\_USER\_PIN\_FINAL\_TRY 0x00020000UL
- #define CKF\_USER\_PIN\_LOCKED 0x00040000UL
- #define CKF\_USER\_PIN\_TO\_BE\_CHANGED 0x00080000UL
- #define CKF\_SO\_PIN\_COUNT\_LOW 0x00100000UL
- #define CKF\_SO\_PIN\_FINAL\_TRY 0x00200000UL
- #define CKF\_SO\_PIN\_LOCKED 0x00400000UL
- #define CKF\_SO\_PIN\_TO\_BE\_CHANGED 0x00800000UL
- #define CKF\_ERROR\_STATE 0x01000000UL
- #define CKU\_SO 0UL
- #define CKU\_USER 1UL
- #define CKU\_CONTEXT\_SPECIFIC 2UL
- #define CKS\_RO\_PUBLIC\_SESSION 0UL
- #define CKS\_RO\_USER\_FUNCTIONS 1UL
- #define CKS\_RW\_PUBLIC\_SESSION 2UL
- #define CKS\_RW\_USER\_FUNCTIONS 3UL
- #define CKS\_RW\_SO\_FUNCTIONS 4UL
- #define CKF\_RW\_SESSION 0x00000002UL /\* session is r/w \*/
- #define CKF\_SERIAL\_SESSION 0x00000004UL /\* no parallel \*/
- #define CKO\_DATA 0x00000000UL
- #define CKO\_CERTIFICATE 0x00000001UL
- #define CKO\_PUBLIC\_KEY 0x00000002UL
- #define CKO\_PRIVATE\_KEY 0x00000003UL
- #define CKO\_SECRET\_KEY 0x00000004UL
- #define CKO\_HW\_FEATURE 0x00000005UL
- #define CKO\_DOMAIN\_PARAMETERS 0x00000006UL
- #define CKO\_MECHANISM 0x00000007UL
- #define CKO\_OTP\_KEY 0x00000008UL
- #define CKO\_VENDOR\_DEFINED 0x80000000UL
- #define CKH\_MONOTONIC\_COUNTER 0x00000001UL
- #define CKH\_CLOCK 0x00000002UL
- #define CKH\_USER\_INTERFACE 0x00000003UL
- #define CKH\_VENDOR\_DEFINED 0x80000000UL
- #define CKK\_RSA 0x00000000UL
- #define CKK\_DSA 0x00000001UL
- #define CKK\_DH 0x00000002UL
- #define CKK\_ECDSA 0x00000003UL /\* Deprecated \*/
- #define CKK\_EC 0x00000003UL
- #define CKK\_X9\_42\_DH 0x00000004UL
- #define CKK\_KEA 0x00000005UL
- #define CKK\_GENERIC\_SECRET 0x00000010UL
- #define CKK\_RC2 0x00000011UL
- #define CKK\_RC4 0x00000012UL
- #define CKK\_DES 0x00000013UL
- #define CKK\_DES2 0x00000014UL
- #define CKK\_DES3 0x00000015UL
- #define CKK\_CAST 0x00000016UL
- #define CKK\_CAST3 0x00000017UL
- #define CKK\_CAST5 0x00000018UL /\* Deprecated \*/
- #define CKK\_CAST128 0x00000018UL
- #define CKK\_RC5 0x00000019UL
- #define CKK\_IDEA 0x0000001AUL
- #define CKK\_SKIPJACK 0x0000001BUL
- #define CKK\_BATON 0x0000001CUL
- #define CKK\_JUNIPER 0x0000001DUL

- #define [CKK\\_CDMF](#) 0x0000001EUL
- #define [CKK\\_AES](#) 0x0000001FUL
- #define [CKK\\_BLOWFISH](#) 0x00000020UL
- #define [CKK\\_TWOFISH](#) 0x00000021UL
- #define [CKK\\_SECURID](#) 0x00000022UL
- #define [CKK\\_HOTP](#) 0x00000023UL
- #define [CKK\\_ACTI](#) 0x00000024UL
- #define [CKK\\_CAMELLIA](#) 0x00000025UL
- #define [CKK\\_ARIA](#) 0x00000026UL
- #define [CKK\\_MD5\\_HMAC](#) 0x00000027UL
- #define [CKK\\_SHA\\_1\\_HMAC](#) 0x00000028UL
- #define [CKK\\_RIPEMD128\\_HMAC](#) 0x00000029UL
- #define [CKK\\_RIPEMD160\\_HMAC](#) 0x0000002AUL
- #define [CKK\\_SHA256\\_HMAC](#) 0x0000002BUL
- #define [CKK\\_SHA384\\_HMAC](#) 0x0000002CUL
- #define [CKK\\_SHA512\\_HMAC](#) 0x0000002DUL
- #define [CKK\\_SHA224\\_HMAC](#) 0x0000002EUL
- #define [CKK\\_SEED](#) 0x0000002FUL
- #define [CKK\\_GOSTR3410](#) 0x00000030UL
- #define [CKK\\_GOSTR3411](#) 0x00000031UL
- #define [CKK\\_GOST28147](#) 0x00000032UL
- #define [CKK\\_VENDOR\\_DEFINED](#) 0x80000000UL
- #define [CK\\_CERTIFICATE\\_CATEGORY\\_UNSPECIFIED](#) 0UL
- #define [CK\\_CERTIFICATE\\_CATEGORY\\_TOKEN\\_USER](#) 1UL
- #define [CK\\_CERTIFICATE\\_CATEGORY\\_AUTHORITY](#) 2UL
- #define [CK\\_CERTIFICATE\\_CATEGORY\\_OTHER\\_ENTITY](#) 3UL
- #define [CK\\_SECURITY\\_DOMAIN\\_UNSPECIFIED](#) 0UL
- #define [CK\\_SECURITY\\_DOMAIN\\_MANUFACTURER](#) 1UL
- #define [CK\\_SECURITY\\_DOMAIN\\_OPERATOR](#) 2UL
- #define [CK\\_SECURITY\\_DOMAIN\\_THIRD\\_PARTY](#) 3UL
- #define [CKC\\_X\\_509](#) 0x00000000UL
- #define [CKC\\_X\\_509\\_ATTR\\_CERT](#) 0x00000001UL
- #define [CKC\\_WTLS](#) 0x00000002UL
- #define [CKC\\_VENDOR\\_DEFINED](#) 0x80000000UL
- #define [CKC\\_OPENPGP](#) ([CKC\\_VENDOR\\_DEFINED](#) | 0x00504750)
- #define [CKF\\_ARRAY\\_ATTRIBUTE](#) 0x40000000UL
- #define [CK\\_OTP\\_FORMAT\\_DECIMAL](#) 0UL
- #define [CK\\_OTP\\_FORMAT\\_HEXADECIMAL](#) 1UL
- #define [CK\\_OTP\\_FORMAT\\_ALPHANUMERIC](#) 2UL
- #define [CK\\_OTP\\_FORMAT\\_BINARY](#) 3UL
- #define [CK\\_OTP\\_PARAM\\_IGNORED](#) 0UL
- #define [CK\\_OTP\\_PARAM\\_OPTIONAL](#) 1UL
- #define [CK\\_OTP\\_PARAM\\_MANDATORY](#) 2UL
- #define [CKA\\_CLASS](#) 0x00000000UL
- #define [CKA\\_TOKEN](#) 0x00000001UL
- #define [CKA\\_PRIVATE](#) 0x00000002UL
- #define [CKA\\_LABEL](#) 0x00000003UL
- #define [CKA\\_APPLICATION](#) 0x00000010UL
- #define [CKA\\_VALUE](#) 0x00000011UL
- #define [CKA\\_OBJECT\\_ID](#) 0x00000012UL
- #define [CKA\\_CERTIFICATE\\_TYPE](#) 0x00000080UL
- #define [CKA\\_ISSUER](#) 0x00000081UL
- #define [CKA\\_SERIAL\\_NUMBER](#) 0x00000082UL
- #define [CKA\\_AC\\_ISSUER](#) 0x00000083UL
- #define [CKA\\_OWNER](#) 0x00000084UL

- #define CKA\_ATTR\_TYPES 0x00000085UL
- #define CKA\_TRUSTED 0x00000086UL
- #define CKA\_CERTIFICATE\_CATEGORY 0x00000087UL
- #define CKA\_JAVA\_MIDP\_SECURITY\_DOMAIN 0x00000088UL
- #define CKA\_URL 0x00000089UL
- #define CKA\_HASH\_OF\_SUBJECT\_PUBLIC\_KEY 0x0000008AUL
- #define CKA\_HASH\_OF\_ISSUER\_PUBLIC\_KEY 0x0000008BUL
- #define CKA\_NAME\_HASH\_ALGORITHM 0x0000008CUL
- #define CKA\_CHECK\_VALUE 0x00000090UL
- #define CKA\_KEY\_TYPE 0x00000100UL
- #define CKA\_SUBJECT 0x00000101UL
- #define CKA\_ID 0x00000102UL
- #define CKA\_SENSITIVE 0x00000103UL
- #define CKA\_ENCRYPT 0x00000104UL
- #define CKA\_DECRYPT 0x00000105UL
- #define CKA\_WRAP 0x00000106UL
- #define CKA\_UNWRAP 0x00000107UL
- #define CKA\_SIGN 0x00000108UL
- #define CKA\_SIGN\_RECOVER 0x00000109UL
- #define CKA\_VERIFY 0x0000010AUL
- #define CKA\_VERIFY\_RECOVER 0x0000010BUL
- #define CKA\_DERIVE 0x0000010CUL
- #define CKA\_START\_DATE 0x00000110UL
- #define CKA\_END\_DATE 0x00000111UL
- #define CKA\_MODULUS 0x00000120UL
- #define CKA\_MODULUS\_BITS 0x00000121UL
- #define CKA\_PUBLIC\_EXPONENT 0x00000122UL
- #define CKA\_PRIVATE\_EXPONENT 0x00000123UL
- #define CKA\_PRIME\_1 0x00000124UL
- #define CKA\_PRIME\_2 0x00000125UL
- #define CKA\_EXPONENT\_1 0x00000126UL
- #define CKA\_EXPONENT\_2 0x00000127UL
- #define CKA\_COEFFICIENT 0x00000128UL
- #define CKA\_PUBLIC\_KEY\_INFO 0x00000129UL
- #define CKA\_PRIME 0x00000130UL
- #define CKA\_SUBPRIME 0x00000131UL
- #define CKA\_BASE 0x00000132UL
- #define CKA\_PRIME\_BITS 0x00000133UL
- #define CKA\_SUBPRIME\_BITS 0x00000134UL
- #define CKA\_SUB\_PRIME\_BITS CKA\_SUBPRIME\_BITS
- #define CKA\_VALUE\_BITS 0x00000160UL
- #define CKA\_VALUE\_LEN 0x00000161UL
- #define CKA\_EXTRACTABLE 0x00000162UL
- #define CKA\_LOCAL 0x00000163UL
- #define CKA\_NEVER\_EXTRACTABLE 0x00000164UL
- #define CKA\_ALWAYS\_SENSITIVE 0x00000165UL
- #define CKA\_KEY\_GEN\_MECHANISM 0x00000166UL
- #define CKA\_MODIFIABLE 0x00000170UL
- #define CKA\_COPYABLE 0x00000171UL
- #define CKA\_DESTROYABLE 0x00000172UL
- #define CKA\_ECDSA\_PARAMS 0x00000180UL /\* Deprecated \*/
- #define CKA\_EC\_PARAMS 0x00000180UL
- #define CKA\_EC\_POINT 0x00000181UL
- #define CKA\_SECONDARY\_AUTH 0x00000200UL /\* Deprecated \*/
- #define CKA\_AUTH\_PIN\_FLAGS 0x00000201UL /\* Deprecated \*/

- #define CKA\_ALWAYS\_AUTHENTICATE 0x00000202UL
- #define CKA\_WRAP\_WITH\_TRUSTED 0x00000210UL
- #define CKA\_WRAP\_TEMPLATE (CKF\_ARRAY\_ATTRIBUTE | 0x00000211UL)
- #define CKA\_UNWRAP\_TEMPLATE (CKF\_ARRAY\_ATTRIBUTE | 0x00000212UL)
- #define CKA\_DERIVE\_TEMPLATE (CKF\_ARRAY\_ATTRIBUTE | 0x00000213UL)
- #define CKA\_OTP\_FORMAT 0x00000220UL
- #define CKA\_OTP\_LENGTH 0x00000221UL
- #define CKA\_OTP\_TIME\_INTERVAL 0x00000222UL
- #define CKA\_OTP\_USER\_FRIENDLY\_MODE 0x00000223UL
- #define CKA\_OTP\_CHALLENGE\_REQUIREMENT 0x00000224UL
- #define CKA\_OTP\_TIME\_REQUIREMENT 0x00000225UL
- #define CKA\_OTP\_COUNTER\_REQUIREMENT 0x00000226UL
- #define CKA\_OTP\_PIN\_REQUIREMENT 0x00000227UL
- #define CKA\_OTP\_COUNTER 0x0000022EUL
- #define CKA\_OTP\_TIME 0x0000022FUL
- #define CKA\_OTP\_USER\_IDENTIFIER 0x0000022AUL
- #define CKA\_OTP\_SERVICE\_IDENTIFIER 0x0000022BUL
- #define CKA\_OTP\_SERVICE\_LOGO 0x0000022CUL
- #define CKA\_OTP\_SERVICE\_LOGO\_TYPE 0x0000022DUL
- #define CKA\_GOSTR3410\_PARAMS 0x00000250UL
- #define CKA\_GOSTR3411\_PARAMS 0x00000251UL
- #define CKA\_GOST28147\_PARAMS 0x00000252UL
- #define CKA\_HW\_FEATURE\_TYPE 0x00000300UL
- #define CKA\_RESET\_ON\_INIT 0x00000301UL
- #define CKA\_HAS\_RESET 0x00000302UL
- #define CKA\_PIXEL\_X 0x00000400UL
- #define CKA\_PIXEL\_Y 0x00000401UL
- #define CKA\_RESOLUTION 0x00000402UL
- #define CKA\_CHAR\_ROWS 0x00000403UL
- #define CKA\_CHAR\_COLUMNS 0x00000404UL
- #define CKA\_COLOR 0x00000405UL
- #define CKA\_BITS\_PER\_PIXEL 0x00000406UL
- #define CKA\_CHAR\_SETS 0x00000480UL
- #define CKA\_ENCODING\_METHODS 0x00000481UL
- #define CKA\_MIME\_TYPES 0x00000482UL
- #define CKA\_MECHANISM\_TYPE 0x00000500UL
- #define CKA\_REQUIRED\_CMS\_ATTRIBUTES 0x00000501UL
- #define CKA\_DEFAULT\_CMS\_ATTRIBUTES 0x00000502UL
- #define CKA\_SUPPORTED\_CMS\_ATTRIBUTES 0x00000503UL
- #define CKA\_ALLOWED\_MECHANISMS (CKF\_ARRAY\_ATTRIBUTE | 0x00000600UL)
- #define CKA\_VENDOR\_DEFINED 0x80000000UL
- #define CKM\_RSA\_PKCS\_KEY\_PAIR\_GEN 0x00000000UL
- #define CKM\_RSA\_PKCS 0x00000001UL
- #define CKM\_RSA\_9796 0x00000002UL
- #define CKM\_RSA\_X\_509 0x00000003UL
- #define CKM\_MD2\_RSA\_PKCS 0x00000004UL
- #define CKM\_MD5\_RSA\_PKCS 0x00000005UL
- #define CKM\_SHA1\_RSA\_PKCS 0x00000006UL
- #define CKM\_RIPEMD128\_RSA\_PKCS 0x00000007UL
- #define CKM\_RIPEMD160\_RSA\_PKCS 0x00000008UL
- #define CKM\_RSA\_PKCS\_OAEP 0x00000009UL
- #define CKM\_RSA\_X9\_31\_KEY\_PAIR\_GEN 0x0000000AUL
- #define CKM\_RSA\_X9\_31 0x0000000BUL
- #define CKM\_SHA1\_RSA\_X9\_31 0x0000000CUL
- #define CKM\_RSA\_PKCS\_PSS 0x0000000DUL

- #define CKM\_SHA1\_RSA\_PKCS\_PSS 0x0000000EUL
- #define CKM\_DSA\_KEY\_PAIR\_GEN 0x00000010UL
- #define CKM\_DSA 0x00000011UL
- #define CKM\_DSA\_SHA1 0x00000012UL
- #define CKM\_DSA\_SHA224 0x00000013UL
- #define CKM\_DSA\_SHA256 0x00000014UL
- #define CKM\_DSA\_SHA384 0x00000015UL
- #define CKM\_DSA\_SHA512 0x00000016UL
- #define CKM\_DH\_PKCS\_KEY\_PAIR\_GEN 0x00000020UL
- #define CKM\_DH\_PKCS\_DERIVE 0x00000021UL
- #define CKM\_X9\_42\_DH\_KEY\_PAIR\_GEN 0x00000030UL
- #define CKM\_X9\_42\_DH\_DERIVE 0x00000031UL
- #define CKM\_X9\_42\_DH\_HYBRID\_DERIVE 0x00000032UL
- #define CKM\_X9\_42\_MQV\_DERIVE 0x00000033UL
- #define CKM\_SHA256\_RSA\_PKCS 0x00000040UL
- #define CKM\_SHA384\_RSA\_PKCS 0x00000041UL
- #define CKM\_SHA512\_RSA\_PKCS 0x00000042UL
- #define CKM\_SHA256\_RSA\_PKCS\_PSS 0x00000043UL
- #define CKM\_SHA384\_RSA\_PKCS\_PSS 0x00000044UL
- #define CKM\_SHA512\_RSA\_PKCS\_PSS 0x00000045UL
- #define CKM\_SHA224\_RSA\_PKCS 0x00000046UL
- #define CKM\_SHA224\_RSA\_PKCS\_PSS 0x00000047UL
- #define CKM\_SHA512\_224 0x00000048UL
- #define CKM\_SHA512\_224\_HMAC 0x00000049UL
- #define CKM\_SHA512\_224\_HMAC\_GENERAL 0x0000004AUL
- #define CKM\_SHA512\_224\_KEY\_DERIVATION 0x0000004BUL
- #define CKM\_SHA512\_256 0x0000004CUL
- #define CKM\_SHA512\_256\_HMAC 0x0000004DUL
- #define CKM\_SHA512\_256\_HMAC\_GENERAL 0x0000004EUL
- #define CKM\_SHA512\_256\_KEY\_DERIVATION 0x0000004FUL
- #define CKM\_SHA512\_T 0x00000050UL
- #define CKM\_SHA512\_T\_HMAC 0x00000051UL
- #define CKM\_SHA512\_T\_HMAC\_GENERAL 0x00000052UL
- #define CKM\_SHA512\_T\_KEY\_DERIVATION 0x00000053UL
- #define CKM\_RC2\_KEY\_GEN 0x00000100UL
- #define CKM\_RC2\_ECB 0x00000101UL
- #define CKM\_RC2\_CBC 0x00000102UL
- #define CKM\_RC2\_MAC 0x00000103UL
- #define CKM\_RC2\_MAC\_GENERAL 0x00000104UL
- #define CKM\_RC2\_CBC\_PAD 0x00000105UL
- #define CKM\_RC4\_KEY\_GEN 0x00000110UL
- #define CKM\_RC4 0x00000111UL
- #define CKM\_DES\_KEY\_GEN 0x00000120UL
- #define CKM\_DES\_ECB 0x00000121UL
- #define CKM\_DES\_CBC 0x00000122UL
- #define CKM\_DES\_MAC 0x00000123UL
- #define CKM\_DES\_MAC\_GENERAL 0x00000124UL
- #define CKM\_DES\_CBC\_PAD 0x00000125UL
- #define CKM\_DES2\_KEY\_GEN 0x00000130UL
- #define CKM\_DES3\_KEY\_GEN 0x00000131UL
- #define CKM\_DES3\_ECB 0x00000132UL
- #define CKM\_DES3\_CBC 0x00000133UL
- #define CKM\_DES3\_MAC 0x00000134UL
- #define CKM\_DES3\_MAC\_GENERAL 0x00000135UL
- #define CKM\_DES3\_CBC\_PAD 0x00000136UL

- #define CKM\_DES3\_CMAC\_GENERAL 0x00000137UL
- #define CKM\_DES3\_CMAC 0x00000138UL
- #define CKM\_CDMF\_KEY\_GEN 0x00000140UL
- #define CKM\_CDMF\_ECB 0x00000141UL
- #define CKM\_CDMF\_CBC 0x00000142UL
- #define CKM\_CDMF\_MAC 0x00000143UL
- #define CKM\_CDMF\_MAC\_GENERAL 0x00000144UL
- #define CKM\_CDMF\_CBC\_PAD 0x00000145UL
- #define CKM\_DES\_OFB64 0x00000150UL
- #define CKM\_DES\_OFB8 0x00000151UL
- #define CKM\_DES\_CFB64 0x00000152UL
- #define CKM\_DES\_CFB8 0x00000153UL
- #define CKM\_MD2 0x00000200UL
- #define CKM\_MD2\_HMAC 0x00000201UL
- #define CKM\_MD2\_HMAC\_GENERAL 0x00000202UL
- #define CKM\_MD5 0x00000210UL
- #define CKM\_MD5\_HMAC 0x00000211UL
- #define CKM\_MD5\_HMAC\_GENERAL 0x00000212UL
- #define CKM\_SHA\_1 0x00000220UL
- #define CKM\_SHA\_1\_HMAC 0x00000221UL
- #define CKM\_SHA\_1\_HMAC\_GENERAL 0x00000222UL
- #define CKM\_RIPEMD128 0x00000230UL
- #define CKM\_RIPEMD128\_HMAC 0x00000231UL
- #define CKM\_RIPEMD128\_HMAC\_GENERAL 0x00000232UL
- #define CKM\_RIPEMD160 0x00000240UL
- #define CKM\_RIPEMD160\_HMAC 0x00000241UL
- #define CKM\_RIPEMD160\_HMAC\_GENERAL 0x00000242UL
- #define CKM\_SHA256 0x00000250UL
- #define CKM\_SHA256\_HMAC 0x00000251UL
- #define CKM\_SHA256\_HMAC\_GENERAL 0x00000252UL
- #define CKM\_SHA224 0x00000255UL
- #define CKM\_SHA224\_HMAC 0x00000256UL
- #define CKM\_SHA224\_HMAC\_GENERAL 0x00000257UL
- #define CKM\_SHA384 0x00000260UL
- #define CKM\_SHA384\_HMAC 0x00000261UL
- #define CKM\_SHA384\_HMAC\_GENERAL 0x00000262UL
- #define CKM\_SHA512 0x00000270UL
- #define CKM\_SHA512\_HMAC 0x00000271UL
- #define CKM\_SHA512\_HMAC\_GENERAL 0x00000272UL
- #define CKM\_SECURID\_KEY\_GEN 0x00000280UL
- #define CKM\_SECURID 0x00000282UL
- #define CKM\_HOTP\_KEY\_GEN 0x00000290UL
- #define CKM\_HOTP 0x00000291UL
- #define CKM\_ACTI 0x000002A0UL
- #define CKM\_ACTI\_KEY\_GEN 0x000002A1UL
- #define CKM\_CAST\_KEY\_GEN 0x00000300UL
- #define CKM\_CAST\_ECB 0x00000301UL
- #define CKM\_CAST\_CBC 0x00000302UL
- #define CKM\_CAST\_MAC 0x00000303UL
- #define CKM\_CAST\_MAC\_GENERAL 0x00000304UL
- #define CKM\_CAST\_CBC\_PAD 0x00000305UL
- #define CKM\_CAST3\_KEY\_GEN 0x00000310UL
- #define CKM\_CAST3\_ECB 0x00000311UL
- #define CKM\_CAST3\_CBC 0x00000312UL
- #define CKM\_CAST3\_MAC 0x00000313UL

- #define CKM\_CAST3\_MAC\_GENERAL 0x00000314UL
- #define CKM\_CAST3\_CBC\_PAD 0x00000315UL
- #define CKM\_CAST5\_KEY\_GEN 0x00000320UL
- #define CKM\_CAST128\_KEY\_GEN 0x00000320UL
- #define CKM\_CAST5\_ECB 0x00000321UL
- #define CKM\_CAST128\_ECB 0x00000321UL
- #define CKM\_CAST5\_CBC 0x00000322UL /\* Deprecated \*/
- #define CKM\_CAST128\_CBC 0x00000322UL
- #define CKM\_CAST5\_MAC 0x00000323UL /\* Deprecated \*/
- #define CKM\_CAST128\_MAC 0x00000323UL
- #define CKM\_CAST5\_MAC\_GENERAL 0x00000324UL /\* Deprecated \*/
- #define CKM\_CAST128\_MAC\_GENERAL 0x00000324UL
- #define CKM\_CAST5\_CBC\_PAD 0x00000325UL /\* Deprecated \*/
- #define CKM\_CAST128\_CBC\_PAD 0x00000325UL
- #define CKM\_RC5\_KEY\_GEN 0x00000330UL
- #define CKM\_RC5\_ECB 0x00000331UL
- #define CKM\_RC5\_CBC 0x00000332UL
- #define CKM\_RC5\_MAC 0x00000333UL
- #define CKM\_RC5\_MAC\_GENERAL 0x00000334UL
- #define CKM\_RC5\_CBC\_PAD 0x00000335UL
- #define CKM\_IDEA\_KEY\_GEN 0x00000340UL
- #define CKM\_IDEA\_ECB 0x00000341UL
- #define CKM\_IDEA\_CBC 0x00000342UL
- #define CKM\_IDEA\_MAC 0x00000343UL
- #define CKM\_IDEA\_MAC\_GENERAL 0x00000344UL
- #define CKM\_IDEA\_CBC\_PAD 0x00000345UL
- #define CKM\_GENERIC\_SECRET\_KEY\_GEN 0x00000350UL
- #define CKM\_CONCATENATE\_BASE\_AND\_KEY 0x00000360UL
- #define CKM\_CONCATENATE\_BASE\_AND\_DATA 0x00000362UL
- #define CKM\_CONCATENATE\_DATA\_AND\_BASE 0x00000363UL
- #define CKM\_XOR\_BASE\_AND\_DATA 0x00000364UL
- #define CKM\_EXTRACT\_KEY\_FROM\_KEY 0x00000365UL
- #define CKM\_SSL3\_PRE\_MASTER\_KEY\_GEN 0x00000370UL
- #define CKM\_SSL3\_MASTER\_KEY\_DERIVE 0x00000371UL
- #define CKM\_SSL3\_KEY\_AND\_MAC\_DERIVE 0x00000372UL
- #define CKM\_SSL3\_MASTER\_KEY\_DERIVE\_DH 0x00000373UL
- #define CKM\_TLS\_PRE\_MASTER\_KEY\_GEN 0x00000374UL
- #define CKM\_TLS\_MASTER\_KEY\_DERIVE 0x00000375UL
- #define CKM\_TLS\_KEY\_AND\_MAC\_DERIVE 0x00000376UL
- #define CKM\_TLS\_MASTER\_KEY\_DERIVE\_DH 0x00000377UL
- #define CKM\_TLS\_PRF 0x00000378UL
- #define CKM\_SSL3\_MD5\_MAC 0x00000380UL
- #define CKM\_SSL3\_SHA1\_MAC 0x00000381UL
- #define CKM\_MD5\_KEY\_DERIVATION 0x00000390UL
- #define CKM\_MD2\_KEY\_DERIVATION 0x00000391UL
- #define CKM\_SHA1\_KEY\_DERIVATION 0x00000392UL
- #define CKM\_SHA256\_KEY\_DERIVATION 0x00000393UL
- #define CKM\_SHA384\_KEY\_DERIVATION 0x00000394UL
- #define CKM\_SHA512\_KEY\_DERIVATION 0x00000395UL
- #define CKM\_SHA224\_KEY\_DERIVATION 0x00000396UL
- #define CKM\_PBE\_MD2\_DES\_CBC 0x000003A0UL
- #define CKM\_PBE\_MD5\_DES\_CBC 0x000003A1UL
- #define CKM\_PBE\_MD5\_CAST\_CBC 0x000003A2UL
- #define CKM\_PBE\_MD5\_CAST3\_CBC 0x000003A3UL
- #define CKM\_PBE\_MD5\_CAST5\_CBC 0x000003A4UL /\* Deprecated \*/



- #define CKM\_PBE\_MD5\_CAST128\_CBC 0x000003A4UL
- #define CKM\_PBE\_SHA1\_CAST5\_CBC 0x000003A5UL /\* Deprecated \*/
- #define CKM\_PBE\_SHA1\_CAST128\_CBC 0x000003A5UL
- #define CKM\_PBE\_SHA1\_RC4\_128 0x000003A6UL
- #define CKM\_PBE\_SHA1\_RC4\_40 0x000003A7UL
- #define CKM\_PBE\_SHA1\_DES3\_EDE\_CBC 0x000003A8UL
- #define CKM\_PBE\_SHA1\_DES2\_EDE\_CBC 0x000003A9UL
- #define CKM\_PBE\_SHA1\_RC2\_128\_CBC 0x000003AAUL
- #define CKM\_PBE\_SHA1\_RC2\_40\_CBC 0x000003ABUL
- #define CKM\_PKCS5\_PBKD2 0x000003B0UL
- #define CKM\_PBA\_SHA1\_WITH\_SHA1\_HMAC 0x000003C0UL
- #define CKM\_WTLS\_PRE\_MASTER\_KEY\_GEN 0x000003D0UL
- #define CKM\_WTLS\_MASTER\_KEY\_DERIVE 0x000003D1UL
- #define CKM\_WTLS\_MASTER\_KEY\_DERIVE\_DH\_ECC 0x000003D2UL
- #define CKM\_WTLS\_PRF 0x000003D3UL
- #define CKM\_WTLS\_SERVER\_KEY\_AND\_MAC\_DERIVE 0x000003D4UL
- #define CKM\_WTLS\_CLIENT\_KEY\_AND\_MAC\_DERIVE 0x000003D5UL
- #define CKM\_TLS10\_MAC\_SERVER 0x000003D6UL
- #define CKM\_TLS10\_MAC\_CLIENT 0x000003D7UL
- #define CKM\_TLS12\_MAC 0x000003D8UL
- #define CKM\_TLS12\_KDF 0x000003D9UL
- #define CKM\_TLS12\_MASTER\_KEY\_DERIVE 0x000003E0UL
- #define CKM\_TLS12\_KEY\_AND\_MAC\_DERIVE 0x000003E1UL
- #define CKM\_TLS12\_MASTER\_KEY\_DERIVE\_DH 0x000003E2UL
- #define CKM\_TLS12\_KEY\_SAFE\_DERIVE 0x000003E3UL
- #define CKM\_TLS\_MAC 0x000003E4UL
- #define CKM\_TLS\_KDF 0x000003E5UL
- #define CKM\_KEY\_WRAP\_LYNKS 0x00000400UL
- #define CKM\_KEY\_WRAP\_SET\_OAEP 0x00000401UL
- #define CKM\_CMS\_SIG 0x00000500UL
- #define CKM\_KIP\_DERIVE 0x00000510UL
- #define CKM\_KIP\_WRAP 0x00000511UL
- #define CKM\_KIP\_MAC 0x00000512UL
- #define CKM\_CAMELLIA\_KEY\_GEN 0x00000550UL
- #define CKM\_CAMELLIA\_ECB 0x00000551UL
- #define CKM\_CAMELLIA\_CBC 0x00000552UL
- #define CKM\_CAMELLIA\_MAC 0x00000553UL
- #define CKM\_CAMELLIA\_MAC\_GENERAL 0x00000554UL
- #define CKM\_CAMELLIA\_CBC\_PAD 0x00000555UL
- #define CKM\_CAMELLIA\_ECB\_ENCRYPT\_DATA 0x00000556UL
- #define CKM\_CAMELLIA\_CBC\_ENCRYPT\_DATA 0x00000557UL
- #define CKM\_CAMELLIA\_CTR 0x00000558UL
- #define CKM\_ARIA\_KEY\_GEN 0x00000560UL
- #define CKM\_ARIA\_ECB 0x00000561UL
- #define CKM\_ARIA\_CBC 0x00000562UL
- #define CKM\_ARIA\_MAC 0x00000563UL
- #define CKM\_ARIA\_MAC\_GENERAL 0x00000564UL
- #define CKM\_ARIA\_CBC\_PAD 0x00000565UL
- #define CKM\_ARIA\_ECB\_ENCRYPT\_DATA 0x00000566UL
- #define CKM\_ARIA\_CBC\_ENCRYPT\_DATA 0x00000567UL
- #define CKM\_SEED\_KEY\_GEN 0x00000650UL
- #define CKM\_SEED\_ECB 0x00000651UL
- #define CKM\_SEED\_CBC 0x00000652UL
- #define CKM\_SEED\_MAC 0x00000653UL
- #define CKM\_SEED\_MAC\_GENERAL 0x00000654UL



- #define CKM\_SEED\_CBC\_PAD 0x00000655UL
- #define CKM\_SEED\_ECB\_ENCRYPT\_DATA 0x00000656UL
- #define CKM\_SEED\_CBC\_ENCRYPT\_DATA 0x00000657UL
- #define CKM\_SKIPJACK\_KEY\_GEN 0x00001000UL
- #define CKM\_SKIPJACK\_ECB64 0x00001001UL
- #define CKM\_SKIPJACK\_CBC64 0x00001002UL
- #define CKM\_SKIPJACK\_OFB64 0x00001003UL
- #define CKM\_SKIPJACK\_CFB64 0x00001004UL
- #define CKM\_SKIPJACK\_CFB32 0x00001005UL
- #define CKM\_SKIPJACK\_CFB16 0x00001006UL
- #define CKM\_SKIPJACK\_CFB8 0x00001007UL
- #define CKM\_SKIPJACK\_WRAP 0x00001008UL
- #define CKM\_SKIPJACK\_PRIVATE\_WRAP 0x00001009UL
- #define CKM\_SKIPJACK\_RELAYX 0x0000100aUL
- #define CKM\_KEA\_KEY\_PAIR\_GEN 0x00001010UL
- #define CKM\_KEA\_KEY\_DERIVE 0x00001011UL
- #define CKM\_KEA\_DERIVE 0x00001012UL
- #define CKM\_FORTEZZA\_TIMESTAMP 0x00001020UL
- #define CKM\_BATON\_KEY\_GEN 0x00001030UL
- #define CKM\_BATON\_ECB128 0x00001031UL
- #define CKM\_BATON\_ECB96 0x00001032UL
- #define CKM\_BATON\_CBC128 0x00001033UL
- #define CKM\_BATON\_COUNTER 0x00001034UL
- #define CKM\_BATON\_SHUFFLE 0x00001035UL
- #define CKM\_BATON\_WRAP 0x00001036UL
- #define CKM\_ECDSA\_KEY\_PAIR\_GEN 0x00001040UL /\* Deprecated \*/
- #define CKM\_EC\_KEY\_PAIR\_GEN 0x00001040UL
- #define CKM\_ECDSA 0x00001041UL
- #define CKM\_ECDSA\_SHA1 0x00001042UL
- #define CKM\_ECDSA\_SHA224 0x00001043UL
- #define CKM\_ECDSA\_SHA256 0x00001044UL
- #define CKM\_ECDSA\_SHA384 0x00001045UL
- #define CKM\_ECDSA\_SHA512 0x00001046UL
- #define CKM\_ECDH1\_DERIVE 0x00001050UL
- #define CKM\_ECDH1\_COFACTOR\_DERIVE 0x00001051UL
- #define CKM\_ECMQV\_DERIVE 0x00001052UL
- #define CKM\_ECDH\_AES\_KEY\_WRAP 0x00001053UL
- #define CKM\_RSA\_AES\_KEY\_WRAP 0x00001054UL
- #define CKM\_JUNIPER\_KEY\_GEN 0x00001060UL
- #define CKM\_JUNIPER\_ECB128 0x00001061UL
- #define CKM\_JUNIPER\_CBC128 0x00001062UL
- #define CKM\_JUNIPER\_COUNTER 0x00001063UL
- #define CKM\_JUNIPER\_SHUFFLE 0x00001064UL
- #define CKM\_JUNIPER\_WRAP 0x00001065UL
- #define CKM\_FASTHASH 0x00001070UL
- #define CKM\_AES\_KEY\_GEN 0x00001080UL
- #define CKM\_AES\_ECB 0x00001081UL
- #define CKM\_AES\_CBC 0x00001082UL
- #define CKM\_AES\_MAC 0x00001083UL
- #define CKM\_AES\_MAC\_GENERAL 0x00001084UL
- #define CKM\_AES\_CBC\_PAD 0x00001085UL
- #define CKM\_AES\_CTR 0x00001086UL
- #define CKM\_AES\_GCM 0x00001087UL
- #define CKM\_AES\_CCM 0x00001088UL
- #define CKM\_AES\_CTS 0x00001089UL

- #define CKM\_AES\_CMAL 0x0000108AUL
- #define CKM\_AES\_CMAL\_GENERAL 0x0000108BUL
- #define CKM\_AES\_XCBC\_MAC 0x0000108CUL
- #define CKM\_AES\_XCBC\_MAC\_96 0x0000108DUL
- #define CKM\_AES\_GMAC 0x0000108EUL
- #define CKM\_BLOWFISH\_KEY\_GEN 0x00001090UL
- #define CKM\_BLOWFISH\_CBC 0x00001091UL
- #define CKM\_TWOFISH\_KEY\_GEN 0x00001092UL
- #define CKM\_TWOFISH\_CBC 0x00001093UL
- #define CKM\_BLOWFISH\_CBC\_PAD 0x00001094UL
- #define CKM\_TWOFISH\_CBC\_PAD 0x00001095UL
- #define CKM\_DES\_ECB\_ENCRYPT\_DATA 0x00001100UL
- #define CKM\_DES\_CBC\_ENCRYPT\_DATA 0x00001101UL
- #define CKM\_DES3\_ECB\_ENCRYPT\_DATA 0x00001102UL
- #define CKM\_DES3\_CBC\_ENCRYPT\_DATA 0x00001103UL
- #define CKM\_AES\_ECB\_ENCRYPT\_DATA 0x00001104UL
- #define CKM\_AES\_CBC\_ENCRYPT\_DATA 0x00001105UL
- #define CKM\_GOSTR3410\_KEY\_PAIR\_GEN 0x00001200UL
- #define CKM\_GOSTR3410 0x00001201UL
- #define CKM\_GOSTR3410\_WITH\_GOSTR3411 0x00001202UL
- #define CKM\_GOSTR3410\_KEY\_WRAP 0x00001203UL
- #define CKM\_GOSTR3410\_DERIVE 0x00001204UL
- #define CKM\_GOSTR3411 0x00001210UL
- #define CKM\_GOSTR3411\_HMAC 0x00001211UL
- #define CKM\_GOST28147\_KEY\_GEN 0x00001220UL
- #define CKM\_GOST28147\_ECB 0x00001221UL
- #define CKM\_GOST28147 0x00001222UL
- #define CKM\_GOST28147\_MAC 0x00001223UL
- #define CKM\_GOST28147\_KEY\_WRAP 0x00001224UL
- #define CKM\_DSA\_PARAMETER\_GEN 0x00002000UL
- #define CKM\_DH\_PKCS\_PARAMETER\_GEN 0x00002001UL
- #define CKM\_X9\_42\_DH\_PARAMETER\_GEN 0x00002002UL
- #define CKM\_DSA\_PROBABLISTIC\_PARAMETER\_GEN 0x00002003UL
- #define CKM\_DSA\_SHAW\_TAYLOR\_PARAMETER\_GEN 0x00002004UL
- #define CKM\_AES\_OFB 0x00002104UL
- #define CKM\_AES\_CFB64 0x00002105UL
- #define CKM\_AES\_CFB8 0x00002106UL
- #define CKM\_AES\_CFB128 0x00002107UL
- #define CKM\_AES\_CFB1 0x00002108UL
- #define CKM\_AES\_KEY\_WRAP 0x00002109UL /\* WAS: 0x00001090 \*/
- #define CKM\_AES\_KEY\_WRAP\_PAD 0x0000210AUL /\* WAS: 0x00001091 \*/
- #define CKM\_RSA\_PKCS\_TPM\_1\_1 0x00004001UL
- #define CKM\_RSA\_PKCS\_OAEP\_TPM\_1\_1 0x00004002UL
- #define CKM\_VENDOR\_DEFINED 0x80000000UL
- #define CKF\_HW 0x00000001UL /\* performed by HW \*/
- #define CKF\_ENCRYPT 0x00000100UL
- #define CKF\_DECRYPT 0x00000200UL
- #define CKF\_DIGEST 0x00000400UL
- #define CKF\_SIGN 0x00000800UL
- #define CKF\_SIGN\_RECOVER 0x00001000UL
- #define CKF\_VERIFY 0x00002000UL
- #define CKF\_VERIFY\_RECOVER 0x00004000UL
- #define CKF\_GENERATE 0x00008000UL
- #define CKF\_GENERATE\_KEY\_PAIR 0x00010000UL
- #define CKF\_WRAP 0x00020000UL

- #define CKF\_UNWRAP 0x00040000UL
- #define CKF\_DERIVE 0x00080000UL
- #define CKF\_EC\_F\_P 0x00100000UL
- #define CKF\_EC\_F\_2M 0x00200000UL
- #define CKF\_EC\_ECPARAMETERS 0x00400000UL
- #define CKF\_EC\_NAMEDCURVE 0x00800000UL
- #define CKF\_EC\_UNCOMPRESS 0x01000000UL
- #define CKF\_EC\_COMPRESS 0x02000000UL
- #define CKF\_EXTENSION 0x80000000UL
- #define CKR\_OK 0x00000000UL
- #define CKR\_CANCEL 0x00000001UL
- #define CKR\_HOST\_MEMORY 0x00000002UL
- #define CKR\_SLOT\_ID\_INVALID 0x00000003UL
- #define CKR\_GENERAL\_ERROR 0x00000005UL
- #define CKR\_FUNCTION\_FAILED 0x00000006UL
- #define CKR\_ARGUMENTS\_BAD 0x00000007UL
- #define CKR\_NO\_EVENT 0x00000008UL
- #define CKR\_NEED\_TO\_CREATE\_THREADS 0x00000009UL
- #define CKR\_CANT\_LOCK 0x0000000AUL
- #define CKR\_ATTRIBUTE\_READ\_ONLY 0x00000010UL
- #define CKR\_ATTRIBUTE\_SENSITIVE 0x00000011UL
- #define CKR\_ATTRIBUTE\_TYPE\_INVALID 0x00000012UL
- #define CKR\_ATTRIBUTE\_VALUE\_INVALID 0x00000013UL
- #define CKR\_ACTION\_PROHIBITED 0x0000001BUL
- #define CKR\_DATA\_INVALID 0x00000020UL
- #define CKR\_DATA\_LEN\_RANGE 0x00000021UL
- #define CKR\_DEVICE\_ERROR 0x00000030UL
- #define CKR\_DEVICE\_MEMORY 0x00000031UL
- #define CKR\_DEVICE\_REMOVED 0x00000032UL
- #define CKR\_ENCRYPTED\_DATA\_INVALID 0x00000040UL
- #define CKR\_ENCRYPTED\_DATA\_LEN\_RANGE 0x00000041UL
- #define CKR\_FUNCTION\_CANCELED 0x00000050UL
- #define CKR\_FUNCTION\_NOT\_PARALLEL 0x00000051UL
- #define CKR\_FUNCTION\_NOT\_SUPPORTED 0x00000054UL
- #define CKR\_KEY\_HANDLE\_INVALID 0x00000060UL
- #define CKR\_KEY\_SIZE\_RANGE 0x00000062UL
- #define CKR\_KEY\_TYPE\_INCONSISTENT 0x00000063UL
- #define CKR\_KEY\_NOT\_NEEDED 0x00000064UL
- #define CKR\_KEY\_CHANGED 0x00000065UL
- #define CKR\_KEY\_NEEDED 0x00000066UL
- #define CKR\_KEY\_INDIGESTIBLE 0x00000067UL
- #define CKR\_KEY\_FUNCTION\_NOT\_PERMITTED 0x00000068UL
- #define CKR\_KEY\_NOT\_WRAPPABLE 0x00000069UL
- #define CKR\_KEY\_UNEXTRACTABLE 0x0000006AUL
- #define CKR\_MECHANISM\_INVALID 0x00000070UL
- #define CKR\_MECHANISM\_PARAM\_INVALID 0x00000071UL
- #define CKR\_OBJECT\_HANDLE\_INVALID 0x00000082UL
- #define CKR\_OPERATION\_ACTIVE 0x00000090UL
- #define CKR\_OPERATION\_NOT\_INITIALIZED 0x00000091UL
- #define CKR\_PIN\_INCORRECT 0x000000A0UL
- #define CKR\_PIN\_INVALID 0x000000A1UL
- #define CKR\_PIN\_LEN\_RANGE 0x000000A2UL
- #define CKR\_PIN\_EXPIRED 0x000000A3UL
- #define CKR\_PIN\_LOCKED 0x000000A4UL
- #define CKR\_SESSION\_CLOSED 0x000000B0UL

- #define CKR\_SESSION\_COUNT 0x000000B1UL
- #define CKR\_SESSION\_HANDLE\_INVALID 0x000000B3UL
- #define CKR\_SESSION\_PARALLEL\_NOT\_SUPPORTED 0x000000B4UL
- #define CKR\_SESSION\_READ\_ONLY 0x000000B5UL
- #define CKR\_SESSION\_EXISTS 0x000000B6UL
- #define CKR\_SESSION\_READ\_ONLY\_EXISTS 0x000000B7UL
- #define CKR\_SESSION\_READ\_WRITE\_SO\_EXISTS 0x000000B8UL
- #define CKR\_SIGNATURE\_INVALID 0x000000C0UL
- #define CKR\_SIGNATURE\_LEN\_RANGE 0x000000C1UL
- #define CKR\_TEMPLATE\_INCOMPLETE 0x000000D0UL
- #define CKR\_TEMPLATE\_INCONSISTENT 0x000000D1UL
- #define CKR\_TOKEN\_NOT\_PRESENT 0x000000E0UL
- #define CKR\_TOKEN\_NOT\_RECOGNIZED 0x000000E1UL
- #define CKR\_TOKEN\_WRITE\_PROTECTED 0x000000E2UL
- #define CKR\_UNWRAPPING\_KEY\_HANDLE\_INVALID 0x000000F0UL
- #define CKR\_UNWRAPPING\_KEY\_SIZE\_RANGE 0x000000F1UL
- #define CKR\_UNWRAPPING\_KEY\_TYPE\_INCONSISTENT 0x000000F2UL
- #define CKR\_USER\_ALREADY\_LOGGED\_IN 0x00000100UL
- #define CKR\_USER\_NOT\_LOGGED\_IN 0x00000101UL
- #define CKR\_USER\_PIN\_NOT\_INITIALIZED 0x00000102UL
- #define CKR\_USER\_TYPE\_INVALID 0x00000103UL
- #define CKR\_USER\_ANOTHER\_ALREADY\_LOGGED\_IN 0x00000104UL
- #define CKR\_USER\_TOO\_MANY\_TYPES 0x00000105UL
- #define CKR\_WRAPPED\_KEY\_INVALID 0x00000110UL
- #define CKR\_WRAPPED\_KEY\_LEN\_RANGE 0x00000112UL
- #define CKR\_WRAPPING\_KEY\_HANDLE\_INVALID 0x00000113UL
- #define CKR\_WRAPPING\_KEY\_SIZE\_RANGE 0x00000114UL
- #define CKR\_WRAPPING\_KEY\_TYPE\_INCONSISTENT 0x00000115UL
- #define CKR\_RANDOM\_SEED\_NOT\_SUPPORTED 0x00000120UL
- #define CKR\_RANDOM\_NO\_RNG 0x00000121UL
- #define CKR\_DOMAIN\_PARAMS\_INVALID 0x00000130UL
- #define CKR\_CURVE\_NOT\_SUPPORTED 0x00000140UL
- #define CKR\_BUFFER\_TOO\_SMALL 0x00000150UL
- #define CKR\_SAVED\_STATE\_INVALID 0x00000160UL
- #define CKR\_INFORMATION\_SENSITIVE 0x00000170UL
- #define CKR\_STATE\_UNSAVEABLE 0x00000180UL
- #define CKR\_CRYPTOKI\_NOT\_INITIALIZED 0x00000190UL
- #define CKR\_CRYPTOKI\_ALREADY\_INITIALIZED 0x00000191UL
- #define CKR\_MUTEX\_BAD 0x000001A0UL
- #define CKR\_MUTEX\_NOT\_LOCKED 0x000001A1UL
- #define CKR\_NEW\_PIN\_MODE 0x000001B0UL
- #define CKR\_NEXT\_OTP 0x000001B1UL
- #define CKR\_EXCEEDED\_MAX\_ITERATIONS 0x000001B5UL
- #define CKR\_FIPS\_SELF\_TEST\_FAILED 0x000001B6UL
- #define CKR\_LIBRARY\_LOAD\_FAILED 0x000001B7UL
- #define CKR\_PIN\_TOO\_WEAK 0x000001B8UL
- #define CKR\_PUBLIC\_KEY\_INVALID 0x000001B9UL
- #define CKR\_FUNCTION\_REJECTED 0x00000200UL
- #define CKR\_VENDOR\_DEFINED 0x80000000UL
- #define CKF\_LIBRARY\_CANT\_CREATE\_OS\_THREADS 0x00000001UL
- #define CKF\_OS\_LOCKING\_OK 0x00000002UL
- #define CKF\_DONT\_BLOCK 1
- #define CKG\_MGF1\_SHA1 0x00000001UL
- #define CKG\_MGF1\_SHA256 0x00000002UL
- #define CKG\_MGF1\_SHA384 0x00000003UL

- #define CKG\_MGF1\_SHA512 0x00000004UL
- #define CKG\_MGF1\_SHA224 0x00000005UL
- #define CKZ\_DATA\_SPECIFIED 0x00000001UL
- #define CKD\_NULL 0x00000001UL
- #define CKD\_SHA1\_KDF 0x00000002UL
- #define CKD\_SHA1\_KDF\_ASN1 0x00000003UL
- #define CKD\_SHA1\_KDF\_CONCATENATE 0x00000004UL
- #define CKD\_SHA224\_KDF 0x00000005UL
- #define CKD\_SHA256\_KDF 0x00000006UL
- #define CKD\_SHA384\_KDF 0x00000007UL
- #define CKD\_SHA512\_KDF 0x00000008UL
- #define CKD\_CPDIVERSIFY\_KDF 0x00000009UL
- #define CKP\_PKCS5\_PBKD2\_HMAC\_SHA1 0x00000001UL
- #define CKP\_PKCS5\_PBKD2\_HMAC\_GOSTR3411 0x00000002UL
- #define CKP\_PKCS5\_PBKD2\_HMAC\_SHA224 0x00000003UL
- #define CKP\_PKCS5\_PBKD2\_HMAC\_SHA256 0x00000004UL
- #define CKP\_PKCS5\_PBKD2\_HMAC\_SHA384 0x00000005UL
- #define CKP\_PKCS5\_PBKD2\_HMAC\_SHA512 0x00000006UL
- #define CKP\_PKCS5\_PBKD2\_HMAC\_SHA512\_224 0x00000007UL
- #define CKP\_PKCS5\_PBKD2\_HMAC\_SHA512\_256 0x00000008UL
- #define CKZ\_SALT\_SPECIFIED 0x00000001UL
- #define CK\_OTP\_VALUE 0UL
- #define CK\_OTP\_PIN 1UL
- #define CK\_OTP\_CHALLENGE 2UL
- #define CK\_OTP\_TIME 3UL
- #define CK\_OTP\_COUNTER 4UL
- #define CK\_OTP\_FLAGS 5UL
- #define CK\_OTP\_OUTPUT\_LENGTH 6UL
- #define CK\_OTP\_OUTPUT\_FORMAT 7UL
- #define CKF\_NEXT\_OTP 0x00000001UL
- #define CKF\_EXCLUDE\_TIME 0x00000002UL
- #define CKF\_EXCLUDE\_COUNTER 0x00000004UL
- #define CKF\_EXCLUDE\_CHALLENGE 0x00000008UL
- #define CKF\_EXCLUDE\_PIN 0x00000010UL
- #define CKF\_USER\_FRIENDLY\_OTP 0x00000020UL

## Typedefs

- typedef unsigned char CK\_BYTE
- typedef CK\_BYTE CK\_CHAR
- typedef CK\_BYTE CK\_UTF8CHAR
- typedef CK\_BYTE CK\_BBOOL
- typedef unsigned long int CK\_ULONG
- typedef long int CK\_LONG
- typedef CK\_ULONG CK\_FLAGS
- typedef CK\_BYTE CK\_PTR CK\_BYTE\_PTR
- typedef CK\_CHAR CK\_PTR CK\_CHAR\_PTR
- typedef CK\_UTF8CHAR CK\_PTR CK\_UTF8CHAR\_PTR
- typedef CK\_ULONG CK\_PTR CK\_ULONG\_PTR
- typedef void CK\_PTR CK\_VOID\_PTR
- typedef CK\_VOID\_PTR CK\_PTR CK\_VOID\_PTR\_PTR
- typedef struct CK\_VERSION CK\_VERSION
- typedef CK\_VERSION CK\_PTR CK\_VERSION\_PTR
- typedef struct CK\_INFO CK\_INFO

- typedef CK\_INFO CK\_PTR CK\_INFO\_PTR
- typedef CK\_ULONG CK\_NOTIFICATION
- typedef CK\_ULONG CK\_SLOT\_ID
- typedef CK\_SLOT\_ID CK\_PTR CK\_SLOT\_ID\_PTR
- typedef struct CK\_SLOT\_INFO CK\_SLOT\_INFO
- typedef CK\_SLOT\_INFO CK\_PTR CK\_SLOT\_INFO\_PTR
- typedef struct CK\_TOKEN\_INFO CK\_TOKEN\_INFO
- typedef CK\_TOKEN\_INFO CK\_PTR CK\_TOKEN\_INFO\_PTR
- typedef CK\_ULONG CK\_SESSION\_HANDLE
- typedef CK\_SESSION\_HANDLE CK\_PTR CK\_SESSION\_HANDLE\_PTR
- typedef CK\_ULONG CK\_USER\_TYPE
- typedef CK\_ULONG CK\_STATE
- typedef struct CK\_SESSION\_INFO CK\_SESSION\_INFO
- typedef CK\_SESSION\_INFO CK\_PTR CK\_SESSION\_INFO\_PTR
- typedef CK\_ULONG CK\_OBJECT\_HANDLE
- typedef CK\_OBJECT\_HANDLE CK\_PTR CK\_OBJECT\_HANDLE\_PTR
- typedef CK\_ULONG CK\_OBJECT\_CLASS
- typedef CK\_OBJECT\_CLASS CK\_PTR CK\_OBJECT\_CLASS\_PTR
- typedef CK\_ULONG CK\_HW\_FEATURE\_TYPE
- typedef CK\_ULONG CK\_KEY\_TYPE
- typedef CK\_ULONG CK\_CERTIFICATE\_TYPE
- typedef CK\_ULONG CK\_ATTRIBUTE\_TYPE
- typedef struct CK\_ATTRIBUTE CK\_ATTRIBUTE
- typedef CK\_ATTRIBUTE CK\_PTR CK\_ATTRIBUTE\_PTR
- typedef struct CK\_DATE CK\_DATE
- typedef CK\_ULONG CK\_MECHANISM\_TYPE
- typedef CK\_MECHANISM\_TYPE CK\_PTR CK\_MECHANISM\_TYPE\_PTR
- typedef struct CK\_MECHANISM CK\_MECHANISM
- typedef CK\_MECHANISM CK\_PTR CK\_MECHANISM\_PTR
- typedef struct CK\_MECHANISM\_INFO CK\_MECHANISM\_INFO
- typedef CK\_MECHANISM\_INFO CK\_PTR CK\_MECHANISM\_INFO\_PTR
- typedef CK\_ULONG CK\_RV
- typedef CK\_NOTIFICATION event
- typedef CK\_NOTIFICATION CK\_VOID\_PTR pApplication
- typedef struct CK\_FUNCTION\_LIST CK\_FUNCTION\_LIST
- typedef CK\_FUNCTION\_LIST CK\_PTR CK\_FUNCTION\_LIST\_PTR
- typedef CK\_FUNCTION\_LIST\_PTR CK\_PTR CK\_FUNCTION\_LIST\_PTR\_PTR
- typedef struct CK\_C\_INITIALIZE\_ARGS CK\_C\_INITIALIZE\_ARGS
- typedef CK\_C\_INITIALIZE\_ARGS CK\_PTR CK\_C\_INITIALIZE\_ARGS\_PTR
- typedef CK\_ULONG CK\_RSA\_PKCS\_MGF\_TYPE
- typedef CK\_RSA\_PKCS\_MGF\_TYPE CK\_PTR CK\_RSA\_PKCS\_MGF\_TYPE\_PTR
- typedef CK\_ULONG CK\_RSA\_PKCS\_OAEP\_SOURCE\_TYPE
- typedef CK\_RSA\_PKCS\_OAEP\_SOURCE\_TYPE CK\_PTR CK\_RSA\_PKCS\_OAEP\_SOURCE\_TYPE\_PTR
- typedef struct CK\_RSA\_PKCS\_OAEP\_PARAMS CK\_RSA\_PKCS\_OAEP\_PARAMS
- typedef CK\_RSA\_PKCS\_OAEP\_PARAMS CK\_PTR CK\_RSA\_PKCS\_OAEP\_PARAMS\_PTR
- typedef struct CK\_RSA\_PKCS\_PSS\_PARAMS CK\_RSA\_PKCS\_PSS\_PARAMS
- typedef CK\_RSA\_PKCS\_PSS\_PARAMS CK\_PTR CK\_RSA\_PKCS\_PSS\_PARAMS\_PTR
- typedef CK\_ULONG CK\_EC\_KDF\_TYPE
- typedef struct CK\_ECDH1\_DERIVE\_PARAMS CK\_ECDH1\_DERIVE\_PARAMS
- typedef CK\_ECDH1\_DERIVE\_PARAMS CK\_PTR CK\_ECDH1\_DERIVE\_PARAMS\_PTR
- typedef struct CK\_ECDH2\_DERIVE\_PARAMS CK\_ECDH2\_DERIVE\_PARAMS
- typedef CK\_ECDH2\_DERIVE\_PARAMS CK\_PTR CK\_ECDH2\_DERIVE\_PARAMS\_PTR
- typedef struct CK\_ECMQV\_DERIVE\_PARAMS CK\_ECMQV\_DERIVE\_PARAMS
- typedef CK\_ECMQV\_DERIVE\_PARAMS CK\_PTR CK\_ECMQV\_DERIVE\_PARAMS\_PTR
- typedef CK\_ULONG CK\_X9\_42\_DH\_KDF\_TYPE

- typedef CK\_X9\_42\_DH\_KDF\_TYPE CK\_PTR CK\_X9\_42\_DH\_KDF\_TYPE\_PTR
- typedef struct CK\_X9\_42\_DH1\_DERIVE\_PARAMS CK\_X9\_42\_DH1\_DERIVE\_PARAMS
- typedef struct CK\_X9\_42\_DH1\_DERIVE\_PARAMS CK\_PTR CK\_X9\_42\_DH1\_DERIVE\_PARAMS\_PTR
- typedef struct CK\_X9\_42\_DH2\_DERIVE\_PARAMS CK\_X9\_42\_DH2\_DERIVE\_PARAMS
- typedef CK\_X9\_42\_DH2\_DERIVE\_PARAMS CK\_PTR CK\_X9\_42\_DH2\_DERIVE\_PARAMS\_PTR
- typedef struct CK\_X9\_42\_MQV\_DERIVE\_PARAMS CK\_X9\_42\_MQV\_DERIVE\_PARAMS
- typedef CK\_X9\_42\_MQV\_DERIVE\_PARAMS CK\_PTR CK\_X9\_42\_MQV\_DERIVE\_PARAMS\_PTR
- typedef struct CK\_KEA\_DERIVE\_PARAMS CK\_KEA\_DERIVE\_PARAMS
- typedef CK\_KEA\_DERIVE\_PARAMS CK\_PTR CK\_KEA\_DERIVE\_PARAMS\_PTR
- typedef CK\_ULONG CK\_RC2\_PARAMS
- typedef CK\_RC2\_PARAMS CK\_PTR CK\_RC2\_PARAMS\_PTR
- typedef struct CK\_RC2\_CBC\_PARAMS CK\_RC2\_CBC\_PARAMS
- typedef CK\_RC2\_CBC\_PARAMS CK\_PTR CK\_RC2\_CBC\_PARAMS\_PTR
- typedef struct CK\_RC2\_MAC\_GENERAL\_PARAMS CK\_RC2\_MAC\_GENERAL\_PARAMS
- typedef CK\_RC2\_MAC\_GENERAL\_PARAMS CK\_PTR CK\_RC2\_MAC\_GENERAL\_PARAMS\_PTR
- typedef struct CK\_RC5\_PARAMS CK\_RC5\_PARAMS
- typedef CK\_RC5\_PARAMS CK\_PTR CK\_RC5\_PARAMS\_PTR
- typedef struct CK\_RC5\_CBC\_PARAMS CK\_RC5\_CBC\_PARAMS
- typedef CK\_RC5\_CBC\_PARAMS CK\_PTR CK\_RC5\_CBC\_PARAMS\_PTR
- typedef struct CK\_RC5\_MAC\_GENERAL\_PARAMS CK\_RC5\_MAC\_GENERAL\_PARAMS
- typedef CK\_RC5\_MAC\_GENERAL\_PARAMS CK\_PTR CK\_RC5\_MAC\_GENERAL\_PARAMS\_PTR
- typedef CK\_ULONG CK\_MAC\_GENERAL\_PARAMS
- typedef CK\_MAC\_GENERAL\_PARAMS CK\_PTR CK\_MAC\_GENERAL\_PARAMS\_PTR
- typedef struct CK\_DES\_CBC\_ENCRYPT\_DATA\_PARAMS CK\_DES\_CBC\_ENCRYPT\_DATA\_PARAMS
- typedef CK\_DES\_CBC\_ENCRYPT\_DATA\_PARAMS CK\_PTR CK\_DES\_CBC\_ENCRYPT\_DATA\_PARAMS\_PTR
- typedef struct CK\_AES\_CBC\_ENCRYPT\_DATA\_PARAMS CK\_AES\_CBC\_ENCRYPT\_DATA\_PARAMS
- typedef CK\_AES\_CBC\_ENCRYPT\_DATA\_PARAMS CK\_PTR CK\_AES\_CBC\_ENCRYPT\_DATA\_PARAMS\_PTR
- typedef struct CK\_SKIPJACK\_PRIVATE\_WRAP\_PARAMS CK\_SKIPJACK\_PRIVATE\_WRAP\_PARAMS
- typedef CK\_SKIPJACK\_PRIVATE\_WRAP\_PARAMS CK\_PTR CK\_SKIPJACK\_PRIVATE\_WRAP\_PARAMS\_PTR
- typedef struct CK\_SKIPJACK\_RELAYX\_PARAMS CK\_SKIPJACK\_RELAYX\_PARAMS
- typedef CK\_SKIPJACK\_RELAYX\_PARAMS CK\_PTR CK\_SKIPJACK\_RELAYX\_PARAMS\_PTR
- typedef struct CK\_PBE\_PARAMS CK\_PBE\_PARAMS
- typedef CK\_PBE\_PARAMS CK\_PTR CK\_PBE\_PARAMS\_PTR
- typedef struct CK\_KEY\_WRAP\_SET\_OAEP\_PARAMS CK\_KEY\_WRAP\_SET\_OAEP\_PARAMS
- typedef CK\_KEY\_WRAP\_SET\_OAEP\_PARAMS CK\_PTR CK\_KEY\_WRAP\_SET\_OAEP\_PARAMS\_PTR
- typedef struct CK\_SSL3\_RANDOM\_DATA CK\_SSL3\_RANDOM\_DATA
- typedef struct CK\_SSL3\_MASTER\_KEY\_DERIVE\_PARAMS CK\_SSL3\_MASTER\_KEY\_DERIVE\_PARAMS
- typedef struct CK\_SSL3\_MASTER\_KEY\_DERIVE\_PARAMS CK\_PTR CK\_SSL3\_MASTER\_KEY\_DERIVE\_PARAMS\_PTR
- typedef struct CK\_SSL3\_KEY\_MAT\_OUT CK\_SSL3\_KEY\_MAT\_OUT
- typedef CK\_SSL3\_KEY\_MAT\_OUT CK\_PTR CK\_SSL3\_KEY\_MAT\_OUT\_PTR
- typedef struct CK\_SSL3\_KEY\_MAT\_PARAMS CK\_SSL3\_KEY\_MAT\_PARAMS
- typedef CK\_SSL3\_KEY\_MAT\_PARAMS CK\_PTR CK\_SSL3\_KEY\_MAT\_PARAMS\_PTR
- typedef struct CK\_TLS\_PRF\_PARAMS CK\_TLS\_PRF\_PARAMS
- typedef CK\_TLS\_PRF\_PARAMS CK\_PTR CK\_TLS\_PRF\_PARAMS\_PTR
- typedef struct CK\_WTLS\_RANDOM\_DATA CK\_WTLS\_RANDOM\_DATA
- typedef CK\_WTLS\_RANDOM\_DATA CK\_PTR CK\_WTLS\_RANDOM\_DATA\_PTR
- typedef struct CK\_WTLS\_MASTER\_KEY\_DERIVE\_PARAMS CK\_WTLS\_MASTER\_KEY\_DERIVE\_PARAMS
- typedef CK\_WTLS\_MASTER\_KEY\_DERIVE\_PARAMS CK\_PTR CK\_WTLS\_MASTER\_KEY\_DERIVE\_PARAMS\_PTR
- typedef struct CK\_WTLS\_PRF\_PARAMS CK\_WTLS\_PRF\_PARAMS
- typedef CK\_WTLS\_PRF\_PARAMS CK\_PTR CK\_WTLS\_PRF\_PARAMS\_PTR
- typedef struct CK\_WTLS\_KEY\_MAT\_OUT CK\_WTLS\_KEY\_MAT\_OUT
- typedef CK\_WTLS\_KEY\_MAT\_OUT CK\_PTR CK\_WTLS\_KEY\_MAT\_OUT\_PTR
- typedef struct CK\_WTLS\_KEY\_MAT\_PARAMS CK\_WTLS\_KEY\_MAT\_PARAMS
- typedef CK\_WTLS\_KEY\_MAT\_PARAMS CK\_PTR CK\_WTLS\_KEY\_MAT\_PARAMS\_PTR
- typedef struct CK\_CMS\_SIG\_PARAMS CK\_CMS\_SIG\_PARAMS



- typedef [CK\\_CMS\\_SIG\\_PARAMS CK\\_PTR CK\\_CMS\\_SIG\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_KEY\\_DERIVATION\\_STRING\\_DATA CK\\_KEY\\_DERIVATION\\_STRING\\_DATA](#)
- typedef [CK\\_KEY\\_DERIVATION\\_STRING\\_DATA CK\\_PTR CK\\_KEY\\_DERIVATION\\_STRING\\_DATA\\_PTR](#)
- typedef [CK\\_ULONG CK\\_EXTRACT\\_PARAMS](#)
- typedef [CK\\_EXTRACT\\_PARAMS CK\\_PTR CK\\_EXTRACT\\_PARAMS\\_PTR](#)
- typedef [CK\\_ULONG CK\\_PKCS5\\_PBKD2\\_PSEUDO\\_RANDOM\\_FUNCTION\\_TYPE](#)
- typedef [CK\\_PKCS5\\_PBKD2\\_PSEUDO\\_RANDOM\\_FUNCTION\\_TYPE CK\\_PTR CK\\_PKCS5\\_PBKD2\\_PSEUDO\\_RANDOM\\_FUNCTION\\_TYPE\\_PTR](#)
- typedef [CK\\_ULONG CK\\_PKCS5\\_PBKDF2\\_SALT\\_SOURCE\\_TYPE](#)
- typedef [CK\\_PKCS5\\_PBKDF2\\_SALT\\_SOURCE\\_TYPE CK\\_PTR CK\\_PKCS5\\_PBKDF2\\_SALT\\_SOURCE\\_TYPE\\_PTR](#)
- typedef struct [CK\\_PKCS5\\_PBKD2\\_PARAMS CK\\_PKCS5\\_PBKD2\\_PARAMS](#)
- typedef [CK\\_PKCS5\\_PBKD2\\_PARAMS CK\\_PTR CK\\_PKCS5\\_PBKD2\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_PKCS5\\_PBKD2\\_PARAMS2 CK\\_PKCS5\\_PBKD2\\_PARAMS2](#)
- typedef [CK\\_PKCS5\\_PBKD2\\_PARAMS2 CK\\_PTR CK\\_PKCS5\\_PBKD2\\_PARAMS2\\_PTR](#)
- typedef [CK\\_ULONG CK\\_OTP\\_PARAM\\_TYPE](#)
- typedef [CK\\_OTP\\_PARAM\\_TYPE CK\\_PARAM\\_TYPE](#)
- typedef struct [CK\\_OTP\\_PARAM CK\\_OTP\\_PARAM](#)
- typedef [CK\\_OTP\\_PARAM CK\\_PTR CK\\_OTP\\_PARAM\\_PTR](#)
- typedef struct [CK\\_OTP\\_PARAMS CK\\_OTP\\_PARAMS](#)
- typedef [CK\\_OTP\\_PARAMS CK\\_PTR CK\\_OTP\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_OTP\\_SIGNATURE\\_INFO CK\\_OTP\\_SIGNATURE\\_INFO](#)
- typedef [CK\\_OTP\\_SIGNATURE\\_INFO CK\\_PTR CK\\_OTP\\_SIGNATURE\\_INFO\\_PTR](#)
- typedef struct [CK\\_KIP\\_PARAMS CK\\_KIP\\_PARAMS](#)
- typedef [CK\\_KIP\\_PARAMS CK\\_PTR CK\\_KIP\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_AES\\_CTR\\_PARAMS CK\\_AES\\_CTR\\_PARAMS](#)
- typedef [CK\\_AES\\_CTR\\_PARAMS CK\\_PTR CK\\_AES\\_CTR\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_GCM\\_PARAMS CK\\_GCM\\_PARAMS](#)
- typedef [CK\\_GCM\\_PARAMS CK\\_PTR CK\\_GCM\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_CCM\\_PARAMS CK\\_CCM\\_PARAMS](#)
- typedef [CK\\_CCM\\_PARAMS CK\\_PTR CK\\_CCM\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_AES\\_GCM\\_PARAMS CK\\_AES\\_GCM\\_PARAMS](#)
- typedef [CK\\_AES\\_GCM\\_PARAMS CK\\_PTR CK\\_AES\\_GCM\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_AES\\_CCM\\_PARAMS CK\\_AES\\_CCM\\_PARAMS](#)
- typedef [CK\\_AES\\_CCM\\_PARAMS CK\\_PTR CK\\_AES\\_CCM\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_CAMELLIA\\_CTR\\_PARAMS CK\\_CAMELLIA\\_CTR\\_PARAMS](#)
- typedef [CK\\_CAMELLIA\\_CTR\\_PARAMS CK\\_PTR CK\\_CAMELLIA\\_CTR\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_CAMELLIA\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS CK\\_CAMELLIA\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS](#)
- typedef [CK\\_CAMELLIA\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS CK\\_PTR CK\\_CAMELLIA\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_ARIA\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS CK\\_ARIA\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS](#)
- typedef [CK\\_ARIA\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS CK\\_PTR CK\\_ARIA\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_DSA\\_PARAMETER\\_GEN\\_PARAM CK\\_DSA\\_PARAMETER\\_GEN\\_PARAM](#)
- typedef [CK\\_DSA\\_PARAMETER\\_GEN\\_PARAM CK\\_PTR CK\\_DSA\\_PARAMETER\\_GEN\\_PARAM\\_PTR](#)
- typedef struct [CK\\_ECDH\\_AES\\_KEY\\_WRAP\\_PARAMS CK\\_ECDH\\_AES\\_KEY\\_WRAP\\_PARAMS](#)
- typedef [CK\\_ECDH\\_AES\\_KEY\\_WRAP\\_PARAMS CK\\_PTR CK\\_ECDH\\_AES\\_KEY\\_WRAP\\_PARAMS\\_PTR](#)
- typedef [CK\\_ULONG CK\\_JAVA\\_MIDP\\_SECURITY\\_DOMAIN](#)
- typedef [CK\\_ULONG CK\\_CERTIFICATE\\_CATEGORY](#)
- typedef struct [CK\\_RSA\\_AES\\_KEY\\_WRAP\\_PARAMS CK\\_RSA\\_AES\\_KEY\\_WRAP\\_PARAMS](#)
- typedef [CK\\_RSA\\_AES\\_KEY\\_WRAP\\_PARAMS CK\\_PTR CK\\_RSA\\_AES\\_KEY\\_WRAP\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_TLS12\\_MASTER\\_KEY\\_DERIVE\\_PARAMS CK\\_TLS12\\_MASTER\\_KEY\\_DERIVE\\_PARAMS](#)
- typedef [CK\\_TLS12\\_MASTER\\_KEY\\_DERIVE\\_PARAMS CK\\_PTR CK\\_TLS12\\_MASTER\\_KEY\\_DERIVE\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_TLS12\\_KEY\\_MAT\\_PARAMS CK\\_TLS12\\_KEY\\_MAT\\_PARAMS](#)
- typedef [CK\\_TLS12\\_KEY\\_MAT\\_PARAMS CK\\_PTR CK\\_TLS12\\_KEY\\_MAT\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_TLS\\_KDF\\_PARAMS CK\\_TLS\\_KDF\\_PARAMS](#)
- typedef [CK\\_TLS\\_KDF\\_PARAMS CK\\_PTR CK\\_TLS\\_KDF\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_TLS\\_MAC\\_PARAMS CK\\_TLS\\_MAC\\_PARAMS](#)
- typedef [CK\\_TLS\\_MAC\\_PARAMS CK\\_PTR CK\\_TLS\\_MAC\\_PARAMS\\_PTR](#)



- typedef struct [CK\\_GOSTR3410\\_DERIVE\\_PARAMS](#) [CK\\_GOSTR3410\\_DERIVE\\_PARAMS](#)
- typedef [CK\\_GOSTR3410\\_DERIVE\\_PARAMS](#) [CK\\_PTR](#) [CK\\_GOSTR3410\\_DERIVE\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_GOSTR3410\\_KEY\\_WRAP\\_PARAMS](#) [CK\\_GOSTR3410\\_KEY\\_WRAP\\_PARAMS](#)
- typedef [CK\\_GOSTR3410\\_KEY\\_WRAP\\_PARAMS](#) [CK\\_PTR](#) [CK\\_GOSTR3410\\_KEY\\_WRAP\\_PARAMS\\_PTR](#)
- typedef struct [CK\\_SEED\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS](#) [CK\\_SEED\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS](#)
- typedef [CK\\_SEED\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS](#) [CK\\_PTR](#) [CK\\_SEED\\_CBC\\_ENCRYPT\\_DATA\\_PARAMS\\_PTR](#)

## Functions

- typedef [CK\\_CALLBACK\\_FUNCTION](#) ([CK\\_RV](#), [CK\\_NOTIFY](#))([CK\\_SESSION\\_HANDLE](#) hSession
- typedef [CK\\_CALLBACK\\_FUNCTION](#) ([CK\\_RV](#), [CK\\_CREATEMUTEX](#))([CK\\_VOID\\_PTR\\_PTR](#) ppMutex)
- typedef [CK\\_CALLBACK\\_FUNCTION](#) ([CK\\_RV](#), [CK\\_DESTROYMUTEX](#))([CK\\_VOID\\_PTR](#) pMutex)
- typedef [CK\\_CALLBACK\\_FUNCTION](#) ([CK\\_RV](#), [CK\\_LOCKMUTEX](#))([CK\\_VOID\\_PTR](#) pMutex)
- typedef [CK\\_CALLBACK\\_FUNCTION](#) ([CK\\_RV](#), [CK\\_UNLOCKMUTEX](#))([CK\\_VOID\\_PTR](#) pMutex)

## 10.181.1 Macro Definition Documentation

### 10.181.1.1 CK\_CERTIFICATE\_CATEGORY\_AUTHORITY

```
#define CK_CERTIFICATE_CATEGORY_AUTHORITY 2UL
```

### 10.181.1.2 CK\_CERTIFICATE\_CATEGORY\_OTHER\_ENTITY

```
#define CK_CERTIFICATE_CATEGORY_OTHER_ENTITY 3UL
```

### 10.181.1.3 CK\_CERTIFICATE\_CATEGORY\_TOKEN\_USER

```
#define CK_CERTIFICATE_CATEGORY_TOKEN_USER 1UL
```

### 10.181.1.4 CK\_CERTIFICATE\_CATEGORY\_UNSPECIFIED

```
#define CK_CERTIFICATE_CATEGORY_UNSPECIFIED 0UL
```

### 10.181.1.5 CK\_EFFECTIVELY\_INFINITE

```
#define CK_EFFECTIVELY_INFINITE 0UL
```

### 10.181.1.6 CK\_FALSE

```
#define CK_FALSE 0
```

### 10.181.1.7 CK\_INVALID\_HANDLE

```
#define CK_INVALID_HANDLE 0UL
```

### 10.181.1.8 CK\_OTP\_CHALLENGE

```
#define CK_OTP_CHALLENGE 2UL
```

### 10.181.1.9 CK\_OTP\_COUNTER

```
#define CK_OTP_COUNTER 4UL
```

### 10.181.1.10 CK\_OTP\_FLAGS

```
#define CK_OTP_FLAGS 5UL
```

### 10.181.1.11 CK\_OTP\_FORMAT\_ALPHANUMERIC

```
#define CK_OTP_FORMAT_ALPHANUMERIC 2UL
```

### 10.181.1.12 CK\_OTP\_FORMAT\_BINARY

```
#define CK_OTP_FORMAT_BINARY 3UL
```

**10.181.1.13 CK\_OTP\_FORMAT\_DECIMAL**

```
#define CK_OTP_FORMAT_DECIMAL 0UL
```

**10.181.1.14 CK\_OTP\_FORMAT\_HEXADECIMAL**

```
#define CK_OTP_FORMAT_HEXADECIMAL 1UL
```

**10.181.1.15 CK\_OTP\_OUTPUT\_FORMAT**

```
#define CK_OTP_OUTPUT_FORMAT 7UL
```

**10.181.1.16 CK\_OTP\_OUTPUT\_LENGTH**

```
#define CK_OTP_OUTPUT_LENGTH 6UL
```

**10.181.1.17 CK\_OTP\_PARAM\_IGNORED**

```
#define CK_OTP_PARAM_IGNORED 0UL
```

**10.181.1.18 CK\_OTP\_PARAM\_MANDATORY**

```
#define CK_OTP_PARAM_MANDATORY 2UL
```

**10.181.1.19 CK\_OTP\_PARAM\_OPTIONAL**

```
#define CK_OTP_PARAM_OPTIONAL 1UL
```

**10.181.1.20 CK\_OTP\_PIN**

```
#define CK_OTP_PIN 1UL
```

### 10.181.1.21 CK\_OTP\_TIME

```
#define CK_OTP_TIME 3UL
```

### 10.181.1.22 CK\_OTP\_VALUE

```
#define CK_OTP_VALUE 0UL
```

### 10.181.1.23 CK\_SECURITY\_DOMAIN\_MANUFACTURER

```
#define CK_SECURITY_DOMAIN_MANUFACTURER 1UL
```

### 10.181.1.24 CK\_SECURITY\_DOMAIN\_OPERATOR

```
#define CK_SECURITY_DOMAIN_OPERATOR 2UL
```

### 10.181.1.25 CK\_SECURITY\_DOMAIN\_THIRD\_PARTY

```
#define CK_SECURITY_DOMAIN_THIRD_PARTY 3UL
```

### 10.181.1.26 CK\_SECURITY\_DOMAIN\_UNSPECIFIED

```
#define CK_SECURITY_DOMAIN_UNSPECIFIED 0UL
```

### 10.181.1.27 CK\_TRUE

```
#define CK_TRUE 1
```

### 10.181.1.28 CK\_UNAVAILABLE\_INFORMATION

```
#define CK_UNAVAILABLE_INFORMATION (~0UL)
```

**10.181.1.29 CKA\_AC\_ISSUER**

```
#define CKA_AC_ISSUER 0x00000083UL
```

**10.181.1.30 CKA\_ALLOWED\_MECHANISMS**

```
#define CKA_ALLOWED_MECHANISMS (CKF_ARRAY_ATTRIBUTE | 0x00000600UL)
```

**10.181.1.31 CKA\_ALWAYS\_AUTHENTICATE**

```
#define CKA_ALWAYS_AUTHENTICATE 0x00000202UL
```

**10.181.1.32 CKA\_ALWAYS\_SENSITIVE**

```
#define CKA_ALWAYS_SENSITIVE 0x00000165UL
```

**10.181.1.33 CKA\_APPLICATION**

```
#define CKA_APPLICATION 0x00000010UL
```

**10.181.1.34 CKA\_ATTR\_TYPES**

```
#define CKA_ATTR_TYPES 0x00000085UL
```

**10.181.1.35 CKA\_AUTH\_PIN\_FLAGS**

```
#define CKA_AUTH_PIN_FLAGS 0x00000201UL /* Deprecated */
```

**10.181.1.36 CKA\_BASE**

```
#define CKA_BASE 0x00000132UL
```

### 10.181.1.37 CKA\_BITS\_PER\_PIXEL

```
#define CKA_BITS_PER_PIXEL 0x00000406UL
```

### 10.181.1.38 CKA\_CERTIFICATE\_CATEGORY

```
#define CKA_CERTIFICATE_CATEGORY 0x00000087UL
```

### 10.181.1.39 CKA\_CERTIFICATE\_TYPE

```
#define CKA_CERTIFICATE_TYPE 0x00000080UL
```

### 10.181.1.40 CKA\_CHAR\_COLUMNS

```
#define CKA_CHAR_COLUMNS 0x00000404UL
```

### 10.181.1.41 CKA\_CHAR\_ROWS

```
#define CKA_CHAR_ROWS 0x00000403UL
```

### 10.181.1.42 CKA\_CHAR\_SETS

```
#define CKA_CHAR_SETS 0x00000480UL
```

### 10.181.1.43 CKA\_CHECK\_VALUE

```
#define CKA_CHECK_VALUE 0x00000090UL
```

### 10.181.1.44 CKA\_CLASS

```
#define CKA_CLASS 0x00000000UL
```

**10.181.1.45 CKA\_COEFFICIENT**

```
#define CKA_COEFFICIENT 0x00000128UL
```

**10.181.1.46 CKA\_COLOR**

```
#define CKA_COLOR 0x00000405UL
```

**10.181.1.47 CKA\_COPYABLE**

```
#define CKA_COPYABLE 0x00000171UL
```

**10.181.1.48 CKA\_DECRYPT**

```
#define CKA_DECRYPT 0x00000105UL
```

**10.181.1.49 CKA\_DEFAULT\_CMS\_ATTRIBUTES**

```
#define CKA_DEFAULT_CMS_ATTRIBUTES 0x00000502UL
```

**10.181.1.50 CKA\_DERIVE**

```
#define CKA_DERIVE 0x0000010CUL
```

**10.181.1.51 CKA\_DERIVE\_TEMPLATE**

```
#define CKA_DERIVE_TEMPLATE (CKF_ARRAY_ATTRIBUTE | 0x00000213UL)
```

**10.181.1.52 CKA\_DESTROYABLE**

```
#define CKA_DESTROYABLE 0x00000172UL
```

### 10.181.1.53 CKA\_EC\_PARAMS

```
#define CKA_EC_PARAMS 0x00000180UL
```

### 10.181.1.54 CKA\_EC\_POINT

```
#define CKA_EC_POINT 0x00000181UL
```

### 10.181.1.55 CKA\_ECDSA\_PARAMS

```
#define CKA_ECDSA_PARAMS 0x00000180UL /* Deprecated */
```

### 10.181.1.56 CKA\_ENCODING\_METHODS

```
#define CKA_ENCODING_METHODS 0x00000481UL
```

### 10.181.1.57 CKA\_ENCRYPT

```
#define CKA_ENCRYPT 0x00000104UL
```

### 10.181.1.58 CKA\_END\_DATE

```
#define CKA_END_DATE 0x00000111UL
```

### 10.181.1.59 CKA\_EXPONENT\_1

```
#define CKA_EXPONENT_1 0x00000126UL
```

### 10.181.1.60 CKA\_EXPONENT\_2

```
#define CKA_EXPONENT_2 0x00000127UL
```



**10.181.1.61 CKA\_EXTRACTABLE**

```
#define CKA_EXTRACTABLE 0x00000162UL
```

**10.181.1.62 CKA\_GOST28147\_PARAMS**

```
#define CKA_GOST28147_PARAMS 0x00000252UL
```

**10.181.1.63 CKA\_GOSTR3410\_PARAMS**

```
#define CKA_GOSTR3410_PARAMS 0x00000250UL
```

**10.181.1.64 CKA\_GOSTR3411\_PARAMS**

```
#define CKA_GOSTR3411_PARAMS 0x00000251UL
```

**10.181.1.65 CKA\_HAS\_RESET**

```
#define CKA_HAS_RESET 0x00000302UL
```

**10.181.1.66 CKA\_HASH\_OF\_ISSUER\_PUBLIC\_KEY**

```
#define CKA_HASH_OF_ISSUER_PUBLIC_KEY 0x0000008BUL
```

**10.181.1.67 CKA\_HASH\_OF\_SUBJECT\_PUBLIC\_KEY**

```
#define CKA_HASH_OF_SUBJECT_PUBLIC_KEY 0x0000008AUL
```

**10.181.1.68 CKA\_HW\_FEATURE\_TYPE**

```
#define CKA_HW_FEATURE_TYPE 0x00000300UL
```

### 10.181.1.69 CKA\_ID

```
#define CKA_ID 0x00000102UL
```

### 10.181.1.70 CKA\_ISSUER

```
#define CKA_ISSUER 0x00000081UL
```

### 10.181.1.71 CKA\_JAVA\_MIDP\_SECURITY\_DOMAIN

```
#define CKA_JAVA_MIDP_SECURITY_DOMAIN 0x00000088UL
```

### 10.181.1.72 CKA\_KEY\_GEN\_MECHANISM

```
#define CKA_KEY_GEN_MECHANISM 0x00000166UL
```

### 10.181.1.73 CKA\_KEY\_TYPE

```
#define CKA_KEY_TYPE 0x00000100UL
```

### 10.181.1.74 CKA\_LABEL

```
#define CKA_LABEL 0x00000003UL
```

### 10.181.1.75 CKA\_LOCAL

```
#define CKA_LOCAL 0x00000163UL
```

### 10.181.1.76 CKA\_MECHANISM\_TYPE

```
#define CKA_MECHANISM_TYPE 0x00000500UL
```

**10.181.1.77 CKA\_MIME\_TYPES**

```
#define CKA_MIME_TYPES 0x00000482UL
```

**10.181.1.78 CKA\_MODIFIABLE**

```
#define CKA_MODIFIABLE 0x00000170UL
```

**10.181.1.79 CKA\_MODULUS**

```
#define CKA_MODULUS 0x00000120UL
```

**10.181.1.80 CKA\_MODULUS\_BITS**

```
#define CKA_MODULUS_BITS 0x00000121UL
```

**10.181.1.81 CKA\_NAME\_HASH\_ALGORITHM**

```
#define CKA_NAME_HASH_ALGORITHM 0x0000008CUL
```

**10.181.1.82 CKA\_NEVER\_EXTRACTABLE**

```
#define CKA_NEVER_EXTRACTABLE 0x00000164UL
```

**10.181.1.83 CKA\_OBJECT\_ID**

```
#define CKA_OBJECT_ID 0x00000012UL
```

**10.181.1.84 CKA\_OTP\_CHALLENGE\_REQUIREMENT**

```
#define CKA_OTP_CHALLENGE_REQUIREMENT 0x00000224UL
```

### 10.181.1.85 CKA\_OTP\_COUNTER

```
#define CKA_OTP_COUNTER 0x0000022EUL
```

### 10.181.1.86 CKA\_OTP\_COUNTER\_REQUIREMENT

```
#define CKA_OTP_COUNTER_REQUIREMENT 0x00000226UL
```

### 10.181.1.87 CKA\_OTP\_FORMAT

```
#define CKA_OTP_FORMAT 0x00000220UL
```

### 10.181.1.88 CKA\_OTP\_LENGTH

```
#define CKA_OTP_LENGTH 0x00000221UL
```

### 10.181.1.89 CKA\_OTP\_PIN\_REQUIREMENT

```
#define CKA_OTP_PIN_REQUIREMENT 0x00000227UL
```

### 10.181.1.90 CKA\_OTP\_SERVICE\_IDENTIFIER

```
#define CKA_OTP_SERVICE_IDENTIFIER 0x0000022BUL
```

### 10.181.1.91 CKA\_OTP\_SERVICE\_LOGO

```
#define CKA_OTP_SERVICE_LOGO 0x0000022CUL
```

### 10.181.1.92 CKA\_OTP\_SERVICE\_LOGO\_TYPE

```
#define CKA_OTP_SERVICE_LOGO_TYPE 0x0000022DUL
```

**10.181.1.93 CKA\_OTP\_TIME**

```
#define CKA_OTP_TIME 0x0000022FUL
```

**10.181.1.94 CKA\_OTP\_TIME\_INTERVAL**

```
#define CKA_OTP_TIME_INTERVAL 0x00000222UL
```

**10.181.1.95 CKA\_OTP\_TIME\_REQUIREMENT**

```
#define CKA_OTP_TIME_REQUIREMENT 0x00000225UL
```

**10.181.1.96 CKA\_OTP\_USER\_FRIENDLY\_MODE**

```
#define CKA_OTP_USER_FRIENDLY_MODE 0x00000223UL
```

**10.181.1.97 CKA\_OTP\_USER\_IDENTIFIER**

```
#define CKA_OTP_USER_IDENTIFIER 0x0000022AUL
```

**10.181.1.98 CKA\_OWNER**

```
#define CKA_OWNER 0x00000084UL
```

**10.181.1.99 CKA\_PIXEL\_X**

```
#define CKA_PIXEL_X 0x00000400UL
```

**10.181.1.100 CKA\_PIXEL\_Y**

```
#define CKA_PIXEL_Y 0x00000401UL
```

### 10.181.1.101 CKA\_PRIME

```
#define CKA_PRIME 0x00000130UL
```

### 10.181.1.102 CKA\_PRIME\_1

```
#define CKA_PRIME_1 0x00000124UL
```

### 10.181.1.103 CKA\_PRIME\_2

```
#define CKA_PRIME_2 0x00000125UL
```

### 10.181.1.104 CKA\_PRIME\_BITS

```
#define CKA_PRIME_BITS 0x00000133UL
```

### 10.181.1.105 CKA\_PRIVATE

```
#define CKA_PRIVATE 0x00000002UL
```

### 10.181.1.106 CKA\_PRIVATE\_EXPONENT

```
#define CKA_PRIVATE_EXPONENT 0x00000123UL
```

### 10.181.1.107 CKA\_PUBLIC\_EXPONENT

```
#define CKA_PUBLIC_EXPONENT 0x00000122UL
```

### 10.181.1.108 CKA\_PUBLIC\_KEY\_INFO

```
#define CKA_PUBLIC_KEY_INFO 0x00000129UL
```

**10.181.1.109 CKA\_REQUIRED\_CMS\_ATTRIBUTES**

```
#define CKA_REQUIRED_CMS_ATTRIBUTES 0x00000501UL
```

**10.181.1.110 CKA\_RESET\_ON\_INIT**

```
#define CKA_RESET_ON_INIT 0x00000301UL
```

**10.181.1.111 CKA\_RESOLUTION**

```
#define CKA_RESOLUTION 0x00000402UL
```

**10.181.1.112 CKA\_SECONDARY\_AUTH**

```
#define CKA_SECONDARY_AUTH 0x00000200UL /* Deprecated */
```

**10.181.1.113 CKA\_SENSITIVE**

```
#define CKA_SENSITIVE 0x00000103UL
```

**10.181.1.114 CKA\_SERIAL\_NUMBER**

```
#define CKA_SERIAL_NUMBER 0x00000082UL
```

**10.181.1.115 CKA\_SIGN**

```
#define CKA_SIGN 0x00000108UL
```

**10.181.1.116 CKA\_SIGN\_RECOVER**

```
#define CKA_SIGN_RECOVER 0x00000109UL
```

### 10.181.1.117 CKA\_START\_DATE

```
#define CKA_START_DATE 0x00000110UL
```

### 10.181.1.118 CKA\_SUB\_PRIME\_BITS

```
#define CKA_SUB_PRIME_BITS CKA_SUBPRIME_BITS
```

### 10.181.1.119 CKA\_SUBJECT

```
#define CKA_SUBJECT 0x00000101UL
```

### 10.181.1.120 CKA\_SUBPRIME

```
#define CKA_SUBPRIME 0x00000131UL
```

### 10.181.1.121 CKA\_SUBPRIME\_BITS

```
#define CKA_SUBPRIME_BITS 0x00000134UL
```

### 10.181.1.122 CKA\_SUPPORTED\_CMS\_ATTRIBUTES

```
#define CKA_SUPPORTED_CMS_ATTRIBUTES 0x00000503UL
```

### 10.181.1.123 CKA\_TOKEN

```
#define CKA_TOKEN 0x00000001UL
```

### 10.181.1.124 CKA\_TRUSTED

```
#define CKA_TRUSTED 0x00000086UL
```



**10.181.1.125 CKA\_UNWRAP**

```
#define CKA_UNWRAP 0x00000107UL
```

**10.181.1.126 CKA\_UNWRAP\_TEMPLATE**

```
#define CKA_UNWRAP_TEMPLATE (CKF_ARRAY_ATTRIBUTE | 0x00000212UL)
```

**10.181.1.127 CKA\_URL**

```
#define CKA_URL 0x00000089UL
```

**10.181.1.128 CKA\_VALUE**

```
#define CKA_VALUE 0x00000011UL
```

**10.181.1.129 CKA\_VALUE\_BITS**

```
#define CKA_VALUE_BITS 0x00000160UL
```

**10.181.1.130 CKA\_VALUE\_LEN**

```
#define CKA_VALUE_LEN 0x00000161UL
```

**10.181.1.131 CKA\_VENDOR\_DEFINED**

```
#define CKA_VENDOR_DEFINED 0x80000000UL
```

**10.181.1.132 CKA\_VERIFY**

```
#define CKA_VERIFY 0x0000010AUL
```

### 10.181.1.133 CKA\_VERIFY\_RECOVER

```
#define CKA_VERIFY_RECOVER 0x0000010BUL
```

### 10.181.1.134 CKA\_WRAP

```
#define CKA_WRAP 0x00000106UL
```

### 10.181.1.135 CKA\_WRAP\_TEMPLATE

```
#define CKA_WRAP_TEMPLATE (CKF_ARRAY_ATTRIBUTE | 0x00000211UL)
```

### 10.181.1.136 CKA\_WRAP\_WITH\_TRUSTED

```
#define CKA_WRAP_WITH_TRUSTED 0x00000210UL
```

### 10.181.1.137 CKC\_OPENPGP

```
#define CKC_OPENPGP (CKC_VENDOR_DEFINED | 0x00504750)
```

### 10.181.1.138 CKC\_VENDOR\_DEFINED

```
#define CKC_VENDOR_DEFINED 0x80000000UL
```

### 10.181.1.139 CKC\_WTLS

```
#define CKC_WTLS 0x00000002UL
```

### 10.181.1.140 CKC\_X\_509

```
#define CKC_X_509 0x00000000UL
```

**10.181.1.141 CKC\_X\_509\_ATTR\_CERT**

```
#define CKC_X_509_ATTR_CERT 0x00000001UL
```

**10.181.1.142 CKD\_CP Diversify\_KDF**

```
#define CKD_CP Diversify_KDF 0x00000009UL
```

**10.181.1.143 CKD\_NULL**

```
#define CKD_NULL 0x00000001UL
```

**10.181.1.144 CKD\_SHA1\_KDF**

```
#define CKD_SHA1_KDF 0x00000002UL
```

**10.181.1.145 CKD\_SHA1\_KDF\_ASN1**

```
#define CKD_SHA1_KDF_ASN1 0x00000003UL
```

**10.181.1.146 CKD\_SHA1\_KDF\_CONCATENATE**

```
#define CKD_SHA1_KDF_CONCATENATE 0x00000004UL
```

**10.181.1.147 CKD\_SHA224\_KDF**

```
#define CKD_SHA224_KDF 0x00000005UL
```

**10.181.1.148 CKD\_SHA256\_KDF**

```
#define CKD_SHA256_KDF 0x00000006UL
```

### 10.181.1.149 CKD\_SHA384\_KDF

```
#define CKD_SHA384_KDF 0x00000007UL
```

### 10.181.1.150 CKD\_SHA512\_KDF

```
#define CKD_SHA512_KDF 0x00000008UL
```

### 10.181.1.151 CKF\_ARRAY\_ATTRIBUTE

```
#define CKF_ARRAY_ATTRIBUTE 0x40000000UL
```

### 10.181.1.152 CKF\_CLOCK\_ON\_TOKEN

```
#define CKF_CLOCK_ON_TOKEN 0x00000040UL
```

### 10.181.1.153 CKF\_DECRYPT

```
#define CKF_DECRYPT 0x00000200UL
```

### 10.181.1.154 CKF\_DERIVE

```
#define CKF_DERIVE 0x00080000UL
```

### 10.181.1.155 CKF\_DIGEST

```
#define CKF_DIGEST 0x00000400UL
```

### 10.181.1.156 CKF\_DONT\_BLOCK

```
#define CKF_DONT_BLOCK 1
```

**10.181.1.157 CKF\_DUAL\_CRYPTO\_OPERATIONS**

```
#define CKF_DUAL_CRYPTO_OPERATIONS 0x00000200UL
```

**10.181.1.158 CKF\_EC\_COMPRESS**

```
#define CKF_EC_COMPRESS 0x02000000UL
```

**10.181.1.159 CKF\_EC\_ECPARAMETERS**

```
#define CKF_EC_ECPARAMETERS 0x00400000UL
```

**10.181.1.160 CKF\_EC\_F\_2M**

```
#define CKF_EC_F_2M 0x00200000UL
```

**10.181.1.161 CKF\_EC\_F\_P**

```
#define CKF_EC_F_P 0x00100000UL
```

**10.181.1.162 CKF\_EC\_NAMEDCURVE**

```
#define CKF_EC_NAMEDCURVE 0x00800000UL
```

**10.181.1.163 CKF\_EC\_UNCOMPRESS**

```
#define CKF_EC_UNCOMPRESS 0x01000000UL
```

**10.181.1.164 CKF\_ENCRYPT**

```
#define CKF_ENCRYPT 0x00000100UL
```

### 10.181.1.165 CKF\_ERROR\_STATE

```
#define CKF_ERROR_STATE 0x01000000UL
```

### 10.181.1.166 CKF\_EXCLUDE\_CHALLENGE

```
#define CKF_EXCLUDE_CHALLENGE 0x00000008UL
```

### 10.181.1.167 CKF\_EXCLUDE\_COUNTER

```
#define CKF_EXCLUDE_COUNTER 0x00000004UL
```

### 10.181.1.168 CKF\_EXCLUDE\_PIN

```
#define CKF_EXCLUDE_PIN 0x00000010UL
```

### 10.181.1.169 CKF\_EXCLUDE\_TIME

```
#define CKF_EXCLUDE_TIME 0x00000002UL
```

### 10.181.1.170 CKF\_EXTENSION

```
#define CKF_EXTENSION 0x80000000UL
```

### 10.181.1.171 CKF\_GENERATE

```
#define CKF_GENERATE 0x00008000UL
```

### 10.181.1.172 CKF\_GENERATE\_KEY\_PAIR

```
#define CKF_GENERATE_KEY_PAIR 0x00010000UL
```

**10.181.1.173 CKF\_HW**

```
#define CKF_HW 0x00000001UL /* performed by HW */
```

**10.181.1.174 CKF\_HW\_SLOT**

```
#define CKF_HW_SLOT 0x00000004UL /* hardware slot */
```

**10.181.1.175 CKF\_LIBRARY\_CANT\_CREATE\_OS\_THREADS**

```
#define CKF_LIBRARY_CANT_CREATE_OS_THREADS 0x00000001UL
```

**10.181.1.176 CKF\_LOGIN\_REQUIRED**

```
#define CKF_LOGIN_REQUIRED 0x00000004UL /* user must login */
```

**10.181.1.177 CKF\_NEXT\_OTP**

```
#define CKF_NEXT_OTP 0x00000001UL
```

**10.181.1.178 CKF\_OS\_LOCKING\_OK**

```
#define CKF_OS_LOCKING_OK 0x00000002UL
```

**10.181.1.179 CKF\_PROTECTED\_AUTHENTICATION\_PATH**

```
#define CKF_PROTECTED_AUTHENTICATION_PATH 0x00000100UL
```

**10.181.1.180 CKF\_REMOVABLE\_DEVICE**

```
#define CKF_REMOVABLE_DEVICE 0x00000002UL /* removable devices*/
```

### 10.181.1.181 CKF\_RESTORE\_KEY\_NOT\_NEEDED

```
#define CKF_RESTORE_KEY_NOT_NEEDED 0x00000020UL
```

### 10.181.1.182 CKF\_RNG

```
#define CKF_RNG 0x00000001UL /* has random # generator */
```

### 10.181.1.183 CKF\_RW\_SESSION

```
#define CKF_RW_SESSION 0x00000002UL /* session is r/w */
```

### 10.181.1.184 CKF\_SECONDARY\_AUTHENTICATION

```
#define CKF_SECONDARY_AUTHENTICATION 0x00000800UL
```

### 10.181.1.185 CKF\_SERIAL\_SESSION

```
#define CKF_SERIAL_SESSION 0x00000004UL /* no parallel */
```

### 10.181.1.186 CKF\_SIGN

```
#define CKF_SIGN 0x00000800UL
```

### 10.181.1.187 CKF\_SIGN\_RECOVER

```
#define CKF_SIGN_RECOVER 0x00001000UL
```

### 10.181.1.188 CKF\_SO\_PIN\_COUNT\_LOW

```
#define CKF_SO_PIN_COUNT_LOW 0x00100000UL
```



**10.181.1.189 CKF\_SO\_PIN\_FINAL\_TRY**

```
#define CKF_SO_PIN_FINAL_TRY 0x00200000UL
```

**10.181.1.190 CKF\_SO\_PIN\_LOCKED**

```
#define CKF_SO_PIN_LOCKED 0x00400000UL
```

**10.181.1.191 CKF\_SO\_PIN\_TO\_BE\_CHANGED**

```
#define CKF_SO_PIN_TO_BE_CHANGED 0x00800000UL
```

**10.181.1.192 CKF\_TOKEN\_INITIALIZED**

```
#define CKF_TOKEN_INITIALIZED 0x00000400UL
```

**10.181.1.193 CKF\_TOKEN\_PRESENT**

```
#define CKF_TOKEN_PRESENT 0x00000001UL /* a token is there */
```

**10.181.1.194 CKF\_UNWRAP**

```
#define CKF_UNWRAP 0x00040000UL
```

**10.181.1.195 CKF\_USER\_FRIENDLY\_OTP**

```
#define CKF_USER_FRIENDLY_OTP 0x00000020UL
```

**10.181.1.196 CKF\_USER\_PIN\_COUNT\_LOW**

```
#define CKF_USER_PIN_COUNT_LOW 0x00010000UL
```

### 10.181.1.197 CKF\_USER\_PIN\_FINAL\_TRY

```
#define CKF_USER_PIN_FINAL_TRY 0x00020000UL
```

### 10.181.1.198 CKF\_USER\_PIN\_INITIALIZED

```
#define CKF_USER_PIN_INITIALIZED 0x00000008UL /* normal user's PIN is set */
```

### 10.181.1.199 CKF\_USER\_PIN\_LOCKED

```
#define CKF_USER_PIN_LOCKED 0x00040000UL
```

### 10.181.1.200 CKF\_USER\_PIN\_TO\_BE\_CHANGED

```
#define CKF_USER_PIN_TO_BE_CHANGED 0x00080000UL
```

### 10.181.1.201 CKF\_VERIFY

```
#define CKF_VERIFY 0x00002000UL
```

### 10.181.1.202 CKF\_VERIFY\_RECOVER

```
#define CKF_VERIFY_RECOVER 0x00004000UL
```

### 10.181.1.203 CKF\_WRAP

```
#define CKF_WRAP 0x00020000UL
```

### 10.181.1.204 CKF\_WRITE\_PROTECTED

```
#define CKF_WRITE_PROTECTED 0x00000002UL /* token is write-protected */
```

**10.181.1.205 CKG\_MGF1\_SHA1**

```
#define CKG_MGF1_SHA1 0x00000001UL
```

**10.181.1.206 CKG\_MGF1\_SHA224**

```
#define CKG_MGF1_SHA224 0x00000005UL
```

**10.181.1.207 CKG\_MGF1\_SHA256**

```
#define CKG_MGF1_SHA256 0x00000002UL
```

**10.181.1.208 CKG\_MGF1\_SHA384**

```
#define CKG_MGF1_SHA384 0x00000003UL
```

**10.181.1.209 CKG\_MGF1\_SHA512**

```
#define CKG_MGF1_SHA512 0x00000004UL
```

**10.181.1.210 CKH\_CLOCK**

```
#define CKH_CLOCK 0x00000002UL
```

**10.181.1.211 CKH\_MONOTONIC\_COUNTER**

```
#define CKH_MONOTONIC_COUNTER 0x00000001UL
```

**10.181.1.212 CKH\_USER\_INTERFACE**

```
#define CKH_USER_INTERFACE 0x00000003UL
```

### 10.181.1.213 CKH\_VENDOR\_DEFINED

```
#define CKH_VENDOR_DEFINED 0x80000000UL
```

### 10.181.1.214 CKK\_ACTI

```
#define CKK_ACTI 0x00000024UL
```

### 10.181.1.215 CKK\_AES

```
#define CKK_AES 0x0000001FUL
```

### 10.181.1.216 CKK\_ARIA

```
#define CKK_ARIA 0x00000026UL
```

### 10.181.1.217 CKK\_BATON

```
#define CKK_BATON 0x0000001CUL
```

### 10.181.1.218 CKK\_BLOWFISH

```
#define CKK_BLOWFISH 0x00000020UL
```

### 10.181.1.219 CKK\_CAMELLIA

```
#define CKK_CAMELLIA 0x00000025UL
```

### 10.181.1.220 CKK\_CAST

```
#define CKK_CAST 0x00000016UL
```

**10.181.1.221 CKK\_CAST128**

```
#define CKK_CAST128 0x00000018UL
```

**10.181.1.222 CKK\_CAST3**

```
#define CKK_CAST3 0x00000017UL
```

**10.181.1.223 CKK\_CAST5**

```
#define CKK_CAST5 0x00000018UL /* Deprecated */
```

**10.181.1.224 CKK\_CDMF**

```
#define CKK_CDMF 0x0000001EUL
```

**10.181.1.225 CKK\_DES**

```
#define CKK_DES 0x00000013UL
```

**10.181.1.226 CKK\_DES2**

```
#define CKK_DES2 0x00000014UL
```

**10.181.1.227 CKK\_DES3**

```
#define CKK_DES3 0x00000015UL
```

**10.181.1.228 CKK\_DH**

```
#define CKK_DH 0x00000002UL
```

### 10.181.1.229 CKK\_DSA

```
#define CKK_DSA 0x00000001UL
```

### 10.181.1.230 CKK\_EC

```
#define CKK_EC 0x00000003UL
```

### 10.181.1.231 CKK\_ECDSA

```
#define CKK_ECDSA 0x00000003UL /* Deprecated */
```

### 10.181.1.232 CKK\_GENERIC\_SECRET

```
#define CKK_GENERIC_SECRET 0x00000010UL
```

### 10.181.1.233 CKK\_GOST28147

```
#define CKK_GOST28147 0x00000032UL
```

### 10.181.1.234 CKK\_GOSTR3410

```
#define CKK_GOSTR3410 0x00000030UL
```

### 10.181.1.235 CKK\_GOSTR3411

```
#define CKK_GOSTR3411 0x00000031UL
```

### 10.181.1.236 CKK\_HOTP

```
#define CKK_HOTP 0x00000023UL
```

**10.181.1.237 CKK\_IDEA**

```
#define CKK_IDEA 0x0000001AUL
```

**10.181.1.238 CKK\_JUNIPER**

```
#define CKK_JUNIPER 0x0000001DUL
```

**10.181.1.239 CKK\_KEA**

```
#define CKK_KEA 0x00000005UL
```

**10.181.1.240 CKK\_MD5\_HMAC**

```
#define CKK_MD5_HMAC 0x00000027UL
```

**10.181.1.241 CKK\_RC2**

```
#define CKK_RC2 0x00000011UL
```

**10.181.1.242 CKK\_RC4**

```
#define CKK_RC4 0x00000012UL
```

**10.181.1.243 CKK\_RC5**

```
#define CKK_RC5 0x00000019UL
```

**10.181.1.244 CKK\_RIPEMD128\_HMAC**

```
#define CKK_RIPEMD128_HMAC 0x00000029UL
```

### 10.181.1.245 CKK\_RIPEMD160\_HMAC

```
#define CKK_RIPEMD160_HMAC 0x0000002AUL
```

### 10.181.1.246 CKK\_RSA

```
#define CKK_RSA 0x00000000UL
```

### 10.181.1.247 CKK\_SECURID

```
#define CKK_SECURID 0x00000022UL
```

### 10.181.1.248 CKK\_SEED

```
#define CKK_SEED 0x0000002FUL
```

### 10.181.1.249 CKK\_SHA224\_HMAC

```
#define CKK_SHA224_HMAC 0x0000002EUL
```

### 10.181.1.250 CKK\_SHA256\_HMAC

```
#define CKK_SHA256_HMAC 0x0000002BUL
```

### 10.181.1.251 CKK\_SHA384\_HMAC

```
#define CKK_SHA384_HMAC 0x0000002CUL
```

### 10.181.1.252 CKK\_SHA512\_HMAC

```
#define CKK_SHA512_HMAC 0x0000002DUL
```



**10.181.1.253 CKK\_SHA\_1\_HMAC**

```
#define CKK_SHA_1_HMAC 0x00000028UL
```

**10.181.1.254 CKK\_SKIPJACK**

```
#define CKK_SKIPJACK 0x0000001BUL
```

**10.181.1.255 CKK\_TWOFISH**

```
#define CKK_TWOFISH 0x00000021UL
```

**10.181.1.256 CKK\_VENDOR\_DEFINED**

```
#define CKK_VENDOR_DEFINED 0x80000000UL
```

**10.181.1.257 CKK\_X9\_42\_DH**

```
#define CKK_X9_42_DH 0x00000004UL
```

**10.181.1.258 CKM\_ACTI**

```
#define CKM_ACTI 0x000002A0UL
```

**10.181.1.259 CKM\_ACTI\_KEY\_GEN**

```
#define CKM_ACTI_KEY_GEN 0x000002A1UL
```

**10.181.1.260 CKM\_AES\_CBC**

```
#define CKM_AES_CBC 0x00001082UL
```

### 10.181.1.261 CKM\_AES\_CBC\_ENCRYPT\_DATA

```
#define CKM_AES_CBC_ENCRYPT_DATA 0x00001105UL
```

### 10.181.1.262 CKM\_AES\_CBC\_PAD

```
#define CKM_AES_CBC_PAD 0x00001085UL
```

### 10.181.1.263 CKM\_AES\_CCM

```
#define CKM_AES_CCM 0x00001088UL
```

### 10.181.1.264 CKM\_AES\_CFB1

```
#define CKM_AES_CFB1 0x00002108UL
```

### 10.181.1.265 CKM\_AES\_CFB128

```
#define CKM_AES_CFB128 0x00002107UL
```

### 10.181.1.266 CKM\_AES\_CFB64

```
#define CKM_AES_CFB64 0x00002105UL
```

### 10.181.1.267 CKM\_AES\_CFB8

```
#define CKM_AES_CFB8 0x00002106UL
```

### 10.181.1.268 CKM\_AES\_CMAC

```
#define CKM_AES_CMAC 0x0000108AUL
```

**10.181.1.269 CKM\_AES\_CMAC\_GENERAL**

```
#define CKM_AES_CMAC_GENERAL 0x0000108BUL
```

**10.181.1.270 CKM\_AES\_CTR**

```
#define CKM_AES_CTR 0x00001086UL
```

**10.181.1.271 CKM\_AES\_CTS**

```
#define CKM_AES_CTS 0x00001089UL
```

**10.181.1.272 CKM\_AES\_ECB**

```
#define CKM_AES_ECB 0x00001081UL
```

**10.181.1.273 CKM\_AES\_ECB\_ENCRYPT\_DATA**

```
#define CKM_AES_ECB_ENCRYPT_DATA 0x00001104UL
```

**10.181.1.274 CKM\_AES\_GCM**

```
#define CKM_AES_GCM 0x00001087UL
```

**10.181.1.275 CKM\_AES\_GMAC**

```
#define CKM_AES_GMAC 0x0000108EUL
```

**10.181.1.276 CKM\_AES\_KEY\_GEN**

```
#define CKM_AES_KEY_GEN 0x00001080UL
```

### 10.181.1.277 CKM\_AES\_KEY\_WRAP

```
#define CKM_AES_KEY_WRAP 0x00002109UL /* WAS: 0x00001090 */
```

### 10.181.1.278 CKM\_AES\_KEY\_WRAP\_PAD

```
#define CKM_AES_KEY_WRAP_PAD 0x0000210AUL /* WAS: 0x00001091 */
```

### 10.181.1.279 CKM\_AES\_MAC

```
#define CKM_AES_MAC 0x00001083UL
```

### 10.181.1.280 CKM\_AES\_MAC\_GENERAL

```
#define CKM_AES_MAC_GENERAL 0x00001084UL
```

### 10.181.1.281 CKM\_AES\_OFB

```
#define CKM_AES_OFB 0x00002104UL
```

### 10.181.1.282 CKM\_AES\_XCBC\_MAC

```
#define CKM_AES_XCBC_MAC 0x0000108CUL
```

### 10.181.1.283 CKM\_AES\_XCBC\_MAC\_96

```
#define CKM_AES_XCBC_MAC_96 0x0000108DUL
```

### 10.181.1.284 CKM\_ARIA\_CBC

```
#define CKM_ARIA_CBC 0x00000562UL
```

**10.181.1.285 CKM\_ARIA\_CBC\_ENCRYPT\_DATA**

```
#define CKM_ARIA_CBC_ENCRYPT_DATA 0x00000567UL
```

**10.181.1.286 CKM\_ARIA\_CBC\_PAD**

```
#define CKM_ARIA_CBC_PAD 0x00000565UL
```

**10.181.1.287 CKM\_ARIA\_ECB**

```
#define CKM_ARIA_ECB 0x00000561UL
```

**10.181.1.288 CKM\_ARIA\_ECB\_ENCRYPT\_DATA**

```
#define CKM_ARIA_ECB_ENCRYPT_DATA 0x00000566UL
```

**10.181.1.289 CKM\_ARIA\_KEY\_GEN**

```
#define CKM_ARIA_KEY_GEN 0x00000560UL
```

**10.181.1.290 CKM\_ARIA\_MAC**

```
#define CKM_ARIA_MAC 0x00000563UL
```

**10.181.1.291 CKM\_ARIA\_MAC\_GENERAL**

```
#define CKM_ARIA_MAC_GENERAL 0x00000564UL
```

**10.181.1.292 CKM\_BATON\_CBC128**

```
#define CKM_BATON_CBC128 0x00001033UL
```

### 10.181.1.293 CKM\_BATON\_COUNTER

```
#define CKM_BATON_COUNTER 0x00001034UL
```

### 10.181.1.294 CKM\_BATON\_ECB128

```
#define CKM_BATON_ECB128 0x00001031UL
```

### 10.181.1.295 CKM\_BATON\_ECB96

```
#define CKM_BATON_ECB96 0x00001032UL
```

### 10.181.1.296 CKM\_BATON\_KEY\_GEN

```
#define CKM_BATON_KEY_GEN 0x00001030UL
```

### 10.181.1.297 CKM\_BATON\_SHUFFLE

```
#define CKM_BATON_SHUFFLE 0x00001035UL
```

### 10.181.1.298 CKM\_BATON\_WRAP

```
#define CKM_BATON_WRAP 0x00001036UL
```

### 10.181.1.299 CKM\_BLOWFISH\_CBC

```
#define CKM_BLOWFISH_CBC 0x00001091UL
```

### 10.181.1.300 CKM\_BLOWFISH\_CBC\_PAD

```
#define CKM_BLOWFISH_CBC_PAD 0x00001094UL
```

**10.181.1.301 CKM\_BLOWFISH\_KEY\_GEN**

```
#define CKM_BLOWFISH_KEY_GEN 0x00001090UL
```

**10.181.1.302 CKM\_CAMELLIA\_CBC**

```
#define CKM_CAMELLIA_CBC 0x00000552UL
```

**10.181.1.303 CKM\_CAMELLIA\_CBC\_ENCRYPT\_DATA**

```
#define CKM_CAMELLIA_CBC_ENCRYPT_DATA 0x00000557UL
```

**10.181.1.304 CKM\_CAMELLIA\_CBC\_PAD**

```
#define CKM_CAMELLIA_CBC_PAD 0x00000555UL
```

**10.181.1.305 CKM\_CAMELLIA\_CTR**

```
#define CKM_CAMELLIA_CTR 0x00000558UL
```

**10.181.1.306 CKM\_CAMELLIA\_ECB**

```
#define CKM_CAMELLIA_ECB 0x00000551UL
```

**10.181.1.307 CKM\_CAMELLIA\_ECB\_ENCRYPT\_DATA**

```
#define CKM_CAMELLIA_ECB_ENCRYPT_DATA 0x00000556UL
```

**10.181.1.308 CKM\_CAMELLIA\_KEY\_GEN**

```
#define CKM_CAMELLIA_KEY_GEN 0x00000550UL
```

### 10.181.1.309 CKM\_CAMELLIA\_MAC

```
#define CKM_CAMELLIA_MAC 0x00000553UL
```

### 10.181.1.310 CKM\_CAMELLIA\_MAC\_GENERAL

```
#define CKM_CAMELLIA_MAC_GENERAL 0x00000554UL
```

### 10.181.1.311 CKM\_CAST128\_CBC

```
#define CKM_CAST128_CBC 0x00000322UL
```

### 10.181.1.312 CKM\_CAST128\_CBC\_PAD

```
#define CKM_CAST128_CBC_PAD 0x00000325UL
```

### 10.181.1.313 CKM\_CAST128\_ECB

```
#define CKM_CAST128_ECB 0x00000321UL
```

### 10.181.1.314 CKM\_CAST128\_KEY\_GEN

```
#define CKM_CAST128_KEY_GEN 0x00000320UL
```

### 10.181.1.315 CKM\_CAST128\_MAC

```
#define CKM_CAST128_MAC 0x00000323UL
```

### 10.181.1.316 CKM\_CAST128\_MAC\_GENERAL

```
#define CKM_CAST128_MAC_GENERAL 0x00000324UL
```



**10.181.1.317 CKM\_CAST3\_CBC**

```
#define CKM_CAST3_CBC 0x00000312UL
```

**10.181.1.318 CKM\_CAST3\_CBC\_PAD**

```
#define CKM_CAST3_CBC_PAD 0x00000315UL
```

**10.181.1.319 CKM\_CAST3\_ECB**

```
#define CKM_CAST3_ECB 0x00000311UL
```

**10.181.1.320 CKM\_CAST3\_KEY\_GEN**

```
#define CKM_CAST3_KEY_GEN 0x00000310UL
```

**10.181.1.321 CKM\_CAST3\_MAC**

```
#define CKM_CAST3_MAC 0x00000313UL
```

**10.181.1.322 CKM\_CAST3\_MAC\_GENERAL**

```
#define CKM_CAST3_MAC_GENERAL 0x00000314UL
```

**10.181.1.323 CKM\_CAST5\_CBC**

```
#define CKM_CAST5_CBC 0x00000322UL /* Deprecated */
```

**10.181.1.324 CKM\_CAST5\_CBC\_PAD**

```
#define CKM_CAST5_CBC_PAD 0x00000325UL /* Deprecated */
```

### 10.181.1.325 CKM\_CAST5\_ECB

```
#define CKM_CAST5_ECB 0x00000321UL
```

### 10.181.1.326 CKM\_CAST5\_KEY\_GEN

```
#define CKM_CAST5_KEY_GEN 0x00000320UL
```

### 10.181.1.327 CKM\_CAST5\_MAC

```
#define CKM_CAST5_MAC 0x00000323UL /* Deprecated */
```

### 10.181.1.328 CKM\_CAST5\_MAC\_GENERAL

```
#define CKM_CAST5_MAC_GENERAL 0x00000324UL /* Deprecated */
```

### 10.181.1.329 CKM\_CAST\_CBC

```
#define CKM_CAST_CBC 0x00000302UL
```

### 10.181.1.330 CKM\_CAST\_CBC\_PAD

```
#define CKM_CAST_CBC_PAD 0x00000305UL
```

### 10.181.1.331 CKM\_CAST\_ECB

```
#define CKM_CAST_ECB 0x00000301UL
```

### 10.181.1.332 CKM\_CAST\_KEY\_GEN

```
#define CKM_CAST_KEY_GEN 0x00000300UL
```

**10.181.1.333 CKM\_CAST\_MAC**

```
#define CKM_CAST_MAC 0x00000303UL
```

**10.181.1.334 CKM\_CAST\_MAC\_GENERAL**

```
#define CKM_CAST_MAC_GENERAL 0x00000304UL
```

**10.181.1.335 CKM\_CDMF\_CBC**

```
#define CKM_CDMF_CBC 0x00000142UL
```

**10.181.1.336 CKM\_CDMF\_CBC\_PAD**

```
#define CKM_CDMF_CBC_PAD 0x00000145UL
```

**10.181.1.337 CKM\_CDMF\_ECB**

```
#define CKM_CDMF_ECB 0x00000141UL
```

**10.181.1.338 CKM\_CDMF\_KEY\_GEN**

```
#define CKM_CDMF_KEY_GEN 0x00000140UL
```

**10.181.1.339 CKM\_CDMF\_MAC**

```
#define CKM_CDMF_MAC 0x00000143UL
```

**10.181.1.340 CKM\_CDMF\_MAC\_GENERAL**

```
#define CKM_CDMF_MAC_GENERAL 0x00000144UL
```

### 10.181.1.341 CKM\_CMS\_SIG

```
#define CKM_CMS_SIG 0x00000500UL
```

### 10.181.1.342 CKM\_CONCATENATE\_BASE\_AND\_DATA

```
#define CKM_CONCATENATE_BASE_AND_DATA 0x00000362UL
```

### 10.181.1.343 CKM\_CONCATENATE\_BASE\_AND\_KEY

```
#define CKM_CONCATENATE_BASE_AND_KEY 0x00000360UL
```

### 10.181.1.344 CKM\_CONCATENATE\_DATA\_AND\_BASE

```
#define CKM_CONCATENATE_DATA_AND_BASE 0x00000363UL
```

### 10.181.1.345 CKM\_DES2\_KEY\_GEN

```
#define CKM_DES2_KEY_GEN 0x00000130UL
```

### 10.181.1.346 CKM\_DES3\_CBC

```
#define CKM_DES3_CBC 0x00000133UL
```

### 10.181.1.347 CKM\_DES3\_CBC\_ENCRYPT\_DATA

```
#define CKM_DES3_CBC_ENCRYPT_DATA 0x00001103UL
```

### 10.181.1.348 CKM\_DES3\_CBC\_PAD

```
#define CKM_DES3_CBC_PAD 0x00000136UL
```

**10.181.1.349 CKM\_DES3\_CMAC**

```
#define CKM_DES3_CMAC 0x00000138UL
```

**10.181.1.350 CKM\_DES3\_CMAC\_GENERAL**

```
#define CKM_DES3_CMAC_GENERAL 0x00000137UL
```

**10.181.1.351 CKM\_DES3\_ECB**

```
#define CKM_DES3_ECB 0x00000132UL
```

**10.181.1.352 CKM\_DES3\_ECB\_ENCRYPT\_DATA**

```
#define CKM_DES3_ECB_ENCRYPT_DATA 0x00001102UL
```

**10.181.1.353 CKM\_DES3\_KEY\_GEN**

```
#define CKM_DES3_KEY_GEN 0x00000131UL
```

**10.181.1.354 CKM\_DES3\_MAC**

```
#define CKM_DES3_MAC 0x00000134UL
```

**10.181.1.355 CKM\_DES3\_MAC\_GENERAL**

```
#define CKM_DES3_MAC_GENERAL 0x00000135UL
```

**10.181.1.356 CKM\_DES\_CBC**

```
#define CKM_DES_CBC 0x00000122UL
```

### 10.181.1.357 CKM\_DES\_CBC\_ENCRYPT\_DATA

```
#define CKM_DES_CBC_ENCRYPT_DATA 0x00001101UL
```

### 10.181.1.358 CKM\_DES\_CBC\_PAD

```
#define CKM_DES_CBC_PAD 0x00000125UL
```

### 10.181.1.359 CKM\_DES\_CFB64

```
#define CKM_DES_CFB64 0x00000152UL
```

### 10.181.1.360 CKM\_DES\_CFB8

```
#define CKM_DES_CFB8 0x00000153UL
```

### 10.181.1.361 CKM\_DES\_ECB

```
#define CKM_DES_ECB 0x00000121UL
```

### 10.181.1.362 CKM\_DES\_ECB\_ENCRYPT\_DATA

```
#define CKM_DES_ECB_ENCRYPT_DATA 0x00001100UL
```

### 10.181.1.363 CKM\_DES\_KEY\_GEN

```
#define CKM_DES_KEY_GEN 0x00000120UL
```

### 10.181.1.364 CKM\_DES\_MAC

```
#define CKM_DES_MAC 0x00000123UL
```

**10.181.1.365 CKM\_DES\_MAC\_GENERAL**

```
#define CKM_DES_MAC_GENERAL 0x00000124UL
```

**10.181.1.366 CKM\_DES\_OFB64**

```
#define CKM_DES_OFB64 0x00000150UL
```

**10.181.1.367 CKM\_DES\_OFB8**

```
#define CKM_DES_OFB8 0x00000151UL
```

**10.181.1.368 CKM\_DH\_PKCS\_DERIVE**

```
#define CKM_DH_PKCS_DERIVE 0x00000021UL
```

**10.181.1.369 CKM\_DH\_PKCS\_KEY\_PAIR\_GEN**

```
#define CKM_DH_PKCS_KEY_PAIR_GEN 0x00000020UL
```

**10.181.1.370 CKM\_DH\_PKCS\_PARAMETER\_GEN**

```
#define CKM_DH_PKCS_PARAMETER_GEN 0x00002001UL
```

**10.181.1.371 CKM\_DSA**

```
#define CKM_DSA 0x00000011UL
```

**10.181.1.372 CKM\_DSA\_KEY\_PAIR\_GEN**

```
#define CKM_DSA_KEY_PAIR_GEN 0x00000010UL
```

### 10.181.1.373 CKM\_DSA\_PARAMETER\_GEN

```
#define CKM_DSA_PARAMETER_GEN 0x00002000UL
```

### 10.181.1.374 CKM\_DSA\_PROBABLISTIC\_PARAMETER\_GEN

```
#define CKM_DSA_PROBABLISTIC_PARAMETER_GEN 0x00002003UL
```

### 10.181.1.375 CKM\_DSA\_SHA1

```
#define CKM_DSA_SHA1 0x00000012UL
```

### 10.181.1.376 CKM\_DSA\_SHA224

```
#define CKM_DSA_SHA224 0x00000013UL
```

### 10.181.1.377 CKM\_DSA\_SHA256

```
#define CKM_DSA_SHA256 0x00000014UL
```

### 10.181.1.378 CKM\_DSA\_SHA384

```
#define CKM_DSA_SHA384 0x00000015UL
```

### 10.181.1.379 CKM\_DSA\_SHA512

```
#define CKM_DSA_SHA512 0x00000016UL
```

### 10.181.1.380 CKM\_DSA\_SHAWEE\_TAYLOR\_PARAMETER\_GEN

```
#define CKM_DSA_SHAWEE_TAYLOR_PARAMETER_GEN 0x00002004UL
```



**10.181.1.381 CKM\_EC\_KEY\_PAIR\_GEN**

```
#define CKM_EC_KEY_PAIR_GEN 0x00001040UL
```

**10.181.1.382 CKM\_ECDH1\_COFACTOR\_DERIVE**

```
#define CKM_ECDH1_COFACTOR_DERIVE 0x00001051UL
```

**10.181.1.383 CKM\_ECDH1\_DERIVE**

```
#define CKM_ECDH1_DERIVE 0x00001050UL
```

**10.181.1.384 CKM\_ECDH\_AES\_KEY\_WRAP**

```
#define CKM_ECDH_AES_KEY_WRAP 0x00001053UL
```

**10.181.1.385 CKM\_ECDSA**

```
#define CKM_ECDSA 0x00001041UL
```

**10.181.1.386 CKM\_ECDSA\_KEY\_PAIR\_GEN**

```
#define CKM_ECDSA_KEY_PAIR_GEN 0x00001040UL /* Deprecated */
```

**10.181.1.387 CKM\_ECDSA\_SHA1**

```
#define CKM_ECDSA_SHA1 0x00001042UL
```

**10.181.1.388 CKM\_ECDSA\_SHA224**

```
#define CKM_ECDSA_SHA224 0x00001043UL
```

### 10.181.1.389 CKM\_ECDSA\_SHA256

```
#define CKM_ECDSA_SHA256 0x00001044UL
```

### 10.181.1.390 CKM\_ECDSA\_SHA384

```
#define CKM_ECDSA_SHA384 0x00001045UL
```

### 10.181.1.391 CKM\_ECDSA\_SHA512

```
#define CKM_ECDSA_SHA512 0x00001046UL
```

### 10.181.1.392 CKM\_ECMQV\_DERIVE

```
#define CKM_ECMQV_DERIVE 0x00001052UL
```

### 10.181.1.393 CKM\_EXTRACT\_KEY\_FROM\_KEY

```
#define CKM_EXTRACT_KEY_FROM_KEY 0x00000365UL
```

### 10.181.1.394 CKM\_FASTHASH

```
#define CKM_FASTHASH 0x00001070UL
```

### 10.181.1.395 CKM\_FORTEZZA\_TIMESTAMP

```
#define CKM_FORTEZZA_TIMESTAMP 0x00001020UL
```

### 10.181.1.396 CKM\_GENERIC\_SECRET\_KEY\_GEN

```
#define CKM_GENERIC_SECRET_KEY_GEN 0x00000350UL
```

**10.181.1.397 CKM\_GOST28147**

```
#define CKM_GOST28147 0x00001222UL
```

**10.181.1.398 CKM\_GOST28147\_ECB**

```
#define CKM_GOST28147_ECB 0x00001221UL
```

**10.181.1.399 CKM\_GOST28147\_KEY\_GEN**

```
#define CKM_GOST28147_KEY_GEN 0x00001220UL
```

**10.181.1.400 CKM\_GOST28147\_KEY\_WRAP**

```
#define CKM_GOST28147_KEY_WRAP 0x00001224UL
```

**10.181.1.401 CKM\_GOST28147\_MAC**

```
#define CKM_GOST28147_MAC 0x00001223UL
```

**10.181.1.402 CKM\_GOSTR3410**

```
#define CKM_GOSTR3410 0x00001201UL
```

**10.181.1.403 CKM\_GOSTR3410\_DERIVE**

```
#define CKM_GOSTR3410_DERIVE 0x00001204UL
```

**10.181.1.404 CKM\_GOSTR3410\_KEY\_PAIR\_GEN**

```
#define CKM_GOSTR3410_KEY_PAIR_GEN 0x00001200UL
```

### 10.181.1.405 CKM\_GOSTR3410\_KEY\_WRAP

```
#define CKM_GOSTR3410_KEY_WRAP 0x00001203UL
```

### 10.181.1.406 CKM\_GOSTR3410\_WITH\_GOSTR3411

```
#define CKM_GOSTR3410_WITH_GOSTR3411 0x00001202UL
```

### 10.181.1.407 CKM\_GOSTR3411

```
#define CKM_GOSTR3411 0x00001210UL
```

### 10.181.1.408 CKM\_GOSTR3411\_HMAC

```
#define CKM_GOSTR3411_HMAC 0x00001211UL
```

### 10.181.1.409 CKM\_HOTP

```
#define CKM_HOTP 0x00000291UL
```

### 10.181.1.410 CKM\_HOTP\_KEY\_GEN

```
#define CKM_HOTP_KEY_GEN 0x00000290UL
```

### 10.181.1.411 CKM\_IDEA\_CBC

```
#define CKM_IDEA_CBC 0x00000342UL
```

### 10.181.1.412 CKM\_IDEA\_CBC\_PAD

```
#define CKM_IDEA_CBC_PAD 0x00000345UL
```

**10.181.1.413 CKM\_IDEA\_ECB**

```
#define CKM_IDEA_ECB 0x00000341UL
```

**10.181.1.414 CKM\_IDEA\_KEY\_GEN**

```
#define CKM_IDEA_KEY_GEN 0x00000340UL
```

**10.181.1.415 CKM\_IDEA\_MAC**

```
#define CKM_IDEA_MAC 0x00000343UL
```

**10.181.1.416 CKM\_IDEA\_MAC\_GENERAL**

```
#define CKM_IDEA_MAC_GENERAL 0x00000344UL
```

**10.181.1.417 CKM\_JUNIPER\_CBC128**

```
#define CKM_JUNIPER_CBC128 0x00001062UL
```

**10.181.1.418 CKM\_JUNIPER\_COUNTER**

```
#define CKM_JUNIPER_COUNTER 0x00001063UL
```

**10.181.1.419 CKM\_JUNIPER\_ECB128**

```
#define CKM_JUNIPER_ECB128 0x00001061UL
```

**10.181.1.420 CKM\_JUNIPER\_KEY\_GEN**

```
#define CKM_JUNIPER_KEY_GEN 0x00001060UL
```

### 10.181.1.421 CKM\_JUNIPER\_SHUFFLE

```
#define CKM_JUNIPER_SHUFFLE 0x00001064UL
```

### 10.181.1.422 CKM\_JUNIPER\_WRAP

```
#define CKM_JUNIPER_WRAP 0x00001065UL
```

### 10.181.1.423 CKM\_KEA\_DERIVE

```
#define CKM_KEA_DERIVE 0x00001012UL
```

### 10.181.1.424 CKM\_KEA\_KEY\_DERIVE

```
#define CKM_KEA_KEY_DERIVE 0x00001011UL
```

### 10.181.1.425 CKM\_KEA\_KEY\_PAIR\_GEN

```
#define CKM_KEA_KEY_PAIR_GEN 0x00001010UL
```

### 10.181.1.426 CKM\_KEY\_WRAP\_LYNKS

```
#define CKM_KEY_WRAP_LYNKS 0x00000400UL
```

### 10.181.1.427 CKM\_KEY\_WRAP\_SET\_OAEP

```
#define CKM_KEY_WRAP_SET_OAEP 0x00000401UL
```

### 10.181.1.428 CKM\_KIP\_DERIVE

```
#define CKM_KIP_DERIVE 0x00000510UL
```

**10.181.1.429 CKM\_KIP\_MAC**

```
#define CKM_KIP_MAC 0x00000512UL
```

**10.181.1.430 CKM\_KIP\_WRAP**

```
#define CKM_KIP_WRAP 0x00000511UL
```

**10.181.1.431 CKM\_MD2**

```
#define CKM_MD2 0x00000200UL
```

**10.181.1.432 CKM\_MD2\_HMAC**

```
#define CKM_MD2_HMAC 0x00000201UL
```

**10.181.1.433 CKM\_MD2\_HMAC\_GENERAL**

```
#define CKM_MD2_HMAC_GENERAL 0x00000202UL
```

**10.181.1.434 CKM\_MD2\_KEY\_DERIVATION**

```
#define CKM_MD2_KEY_DERIVATION 0x00000391UL
```

**10.181.1.435 CKM\_MD2\_RSA\_PKCS**

```
#define CKM_MD2_RSA_PKCS 0x00000004UL
```

**10.181.1.436 CKM\_MD5**

```
#define CKM_MD5 0x00000210UL
```

### 10.181.1.437 CKM\_MD5\_HMAC

```
#define CKM_MD5_HMAC 0x00000211UL
```

### 10.181.1.438 CKM\_MD5\_HMAC\_GENERAL

```
#define CKM_MD5_HMAC_GENERAL 0x00000212UL
```

### 10.181.1.439 CKM\_MD5\_KEY\_DERIVATION

```
#define CKM_MD5_KEY_DERIVATION 0x00000390UL
```

### 10.181.1.440 CKM\_MD5\_RSA\_PKCS

```
#define CKM_MD5_RSA_PKCS 0x00000005UL
```

### 10.181.1.441 CKM\_PBA\_SHA1\_WITH\_SHA1\_HMAC

```
#define CKM_PBA_SHA1_WITH_SHA1_HMAC 0x000003C0UL
```

### 10.181.1.442 CKM\_PBE\_MD2\_DES\_CBC

```
#define CKM_PBE_MD2_DES_CBC 0x000003A0UL
```

### 10.181.1.443 CKM\_PBE\_MD5\_CAST128\_CBC

```
#define CKM_PBE_MD5_CAST128_CBC 0x000003A4UL
```

### 10.181.1.444 CKM\_PBE\_MD5\_CAST3\_CBC

```
#define CKM_PBE_MD5_CAST3_CBC 0x000003A3UL
```



**10.181.1.445 CKM\_PBE\_MD5\_CAST5\_CBC**

```
#define CKM_PBE_MD5_CAST5_CBC 0x000003A4UL /* Deprecated */
```

**10.181.1.446 CKM\_PBE\_MD5\_CAST\_CBC**

```
#define CKM_PBE_MD5_CAST_CBC 0x000003A2UL
```

**10.181.1.447 CKM\_PBE\_MD5\_DES\_CBC**

```
#define CKM_PBE_MD5_DES_CBC 0x000003A1UL
```

**10.181.1.448 CKM\_PBE\_SHA1\_CAST128\_CBC**

```
#define CKM_PBE_SHA1_CAST128_CBC 0x000003A5UL
```

**10.181.1.449 CKM\_PBE\_SHA1\_CAST5\_CBC**

```
#define CKM_PBE_SHA1_CAST5_CBC 0x000003A5UL /* Deprecated */
```

**10.181.1.450 CKM\_PBE\_SHA1\_DES2\_EDE\_CBC**

```
#define CKM_PBE_SHA1_DES2_EDE_CBC 0x000003A9UL
```

**10.181.1.451 CKM\_PBE\_SHA1\_DES3\_EDE\_CBC**

```
#define CKM_PBE_SHA1_DES3_EDE_CBC 0x000003A8UL
```

**10.181.1.452 CKM\_PBE\_SHA1\_RC2\_128\_CBC**

```
#define CKM_PBE_SHA1_RC2_128_CBC 0x000003AAUL
```

### 10.181.1.453 CKM\_PBE\_SHA1\_RC2\_40\_CBC

```
#define CKM_PBE_SHA1_RC2_40_CBC 0x000003ABUL
```

### 10.181.1.454 CKM\_PBE\_SHA1\_RC4\_128

```
#define CKM_PBE_SHA1_RC4_128 0x000003A6UL
```

### 10.181.1.455 CKM\_PBE\_SHA1\_RC4\_40

```
#define CKM_PBE_SHA1_RC4_40 0x000003A7UL
```

### 10.181.1.456 CKM\_PKCS5\_PBKD2

```
#define CKM_PKCS5_PBKD2 0x000003B0UL
```

### 10.181.1.457 CKM\_RC2\_CBC

```
#define CKM_RC2_CBC 0x00000102UL
```

### 10.181.1.458 CKM\_RC2\_CBC\_PAD

```
#define CKM_RC2_CBC_PAD 0x00000105UL
```

### 10.181.1.459 CKM\_RC2\_ECB

```
#define CKM_RC2_ECB 0x00000101UL
```

### 10.181.1.460 CKM\_RC2\_KEY\_GEN

```
#define CKM_RC2_KEY_GEN 0x00000100UL
```

**10.181.1.461 CKM\_RC2\_MAC**

```
#define CKM_RC2_MAC 0x00000103UL
```

**10.181.1.462 CKM\_RC2\_MAC\_GENERAL**

```
#define CKM_RC2_MAC_GENERAL 0x00000104UL
```

**10.181.1.463 CKM\_RC4**

```
#define CKM_RC4 0x00000111UL
```

**10.181.1.464 CKM\_RC4\_KEY\_GEN**

```
#define CKM_RC4_KEY_GEN 0x00000110UL
```

**10.181.1.465 CKM\_RC5\_CBC**

```
#define CKM_RC5_CBC 0x00000332UL
```

**10.181.1.466 CKM\_RC5\_CBC\_PAD**

```
#define CKM_RC5_CBC_PAD 0x00000335UL
```

**10.181.1.467 CKM\_RC5\_ECB**

```
#define CKM_RC5_ECB 0x00000331UL
```

**10.181.1.468 CKM\_RC5\_KEY\_GEN**

```
#define CKM_RC5_KEY_GEN 0x00000330UL
```

### 10.181.1.469 CKM\_RC5\_MAC

```
#define CKM_RC5_MAC 0x00000333UL
```

### 10.181.1.470 CKM\_RC5\_MAC\_GENERAL

```
#define CKM_RC5_MAC_GENERAL 0x00000334UL
```

### 10.181.1.471 CKM\_RIPEMD128

```
#define CKM_RIPEMD128 0x00000230UL
```

### 10.181.1.472 CKM\_RIPEMD128\_HMAC

```
#define CKM_RIPEMD128_HMAC 0x00000231UL
```

### 10.181.1.473 CKM\_RIPEMD128\_HMAC\_GENERAL

```
#define CKM_RIPEMD128_HMAC_GENERAL 0x00000232UL
```

### 10.181.1.474 CKM\_RIPEMD128\_RSA\_PKCS

```
#define CKM_RIPEMD128_RSA_PKCS 0x00000007UL
```

### 10.181.1.475 CKM\_RIPEMD160

```
#define CKM_RIPEMD160 0x00000240UL
```

### 10.181.1.476 CKM\_RIPEMD160\_HMAC

```
#define CKM_RIPEMD160_HMAC 0x00000241UL
```

**10.181.1.477 CKM\_RIPEMD160\_HMAC\_GENERAL**

```
#define CKM_RIPEMD160_HMAC_GENERAL 0x00000242UL
```

**10.181.1.478 CKM\_RIPEMD160\_RSA\_PKCS**

```
#define CKM_RIPEMD160_RSA_PKCS 0x00000008UL
```

**10.181.1.479 CKM\_RSA\_9796**

```
#define CKM_RSA_9796 0x00000002UL
```

**10.181.1.480 CKM\_RSA\_AES\_KEY\_WRAP**

```
#define CKM_RSA_AES_KEY_WRAP 0x00001054UL
```

**10.181.1.481 CKM\_RSA\_PKCS**

```
#define CKM_RSA_PKCS 0x00000001UL
```

**10.181.1.482 CKM\_RSA\_PKCS\_KEY\_PAIR\_GEN**

```
#define CKM_RSA_PKCS_KEY_PAIR_GEN 0x00000000UL
```

**10.181.1.483 CKM\_RSA\_PKCS\_OAEP**

```
#define CKM_RSA_PKCS_OAEP 0x00000009UL
```

**10.181.1.484 CKM\_RSA\_PKCS\_OAEP\_TPM\_1\_1**

```
#define CKM_RSA_PKCS_OAEP_TPM_1_1 0x00004002UL
```

### 10.181.1.485 CKM\_RSA\_PKCS\_PSS

```
#define CKM_RSA_PKCS_PSS 0x0000000DUL
```

### 10.181.1.486 CKM\_RSA\_PKCS\_TPM\_1\_1

```
#define CKM_RSA_PKCS_TPM_1_1 0x00004001UL
```

### 10.181.1.487 CKM\_RSA\_X9\_31

```
#define CKM_RSA_X9_31 0x0000000BUL
```

### 10.181.1.488 CKM\_RSA\_X9\_31\_KEY\_PAIR\_GEN

```
#define CKM_RSA_X9_31_KEY_PAIR_GEN 0x0000000AUL
```

### 10.181.1.489 CKM\_RSA\_X\_509

```
#define CKM_RSA_X_509 0x00000003UL
```

### 10.181.1.490 CKM\_SECURID

```
#define CKM_SECURID 0x00000282UL
```

### 10.181.1.491 CKM\_SECURID\_KEY\_GEN

```
#define CKM_SECURID_KEY_GEN 0x00000280UL
```

### 10.181.1.492 CKM\_SEED\_CBC

```
#define CKM_SEED_CBC 0x00000652UL
```

**10.181.1.493 CKM\_SEED\_CBC\_ENCRYPT\_DATA**

```
#define CKM_SEED_CBC_ENCRYPT_DATA 0x00000657UL
```

**10.181.1.494 CKM\_SEED\_CBC\_PAD**

```
#define CKM_SEED_CBC_PAD 0x00000655UL
```

**10.181.1.495 CKM\_SEED\_ECB**

```
#define CKM_SEED_ECB 0x00000651UL
```

**10.181.1.496 CKM\_SEED\_ECB\_ENCRYPT\_DATA**

```
#define CKM_SEED_ECB_ENCRYPT_DATA 0x00000656UL
```

**10.181.1.497 CKM\_SEED\_KEY\_GEN**

```
#define CKM_SEED_KEY_GEN 0x00000650UL
```

**10.181.1.498 CKM\_SEED\_MAC**

```
#define CKM_SEED_MAC 0x00000653UL
```

**10.181.1.499 CKM\_SEED\_MAC\_GENERAL**

```
#define CKM_SEED_MAC_GENERAL 0x00000654UL
```

**10.181.1.500 CKM\_SHA1\_KEY\_DERIVATION**

```
#define CKM_SHA1_KEY_DERIVATION 0x00000392UL
```

### 10.181.1.501 CKM\_SHA1\_RSA\_PKCS

```
#define CKM_SHA1_RSA_PKCS 0x00000006UL
```

### 10.181.1.502 CKM\_SHA1\_RSA\_PKCS\_PSS

```
#define CKM_SHA1_RSA_PKCS_PSS 0x0000000EUL
```

### 10.181.1.503 CKM\_SHA1\_RSA\_X9\_31

```
#define CKM_SHA1_RSA_X9_31 0x0000000CUL
```

### 10.181.1.504 CKM\_SHA224

```
#define CKM_SHA224 0x00000255UL
```

### 10.181.1.505 CKM\_SHA224\_HMAC

```
#define CKM_SHA224_HMAC 0x00000256UL
```

### 10.181.1.506 CKM\_SHA224\_HMAC\_GENERAL

```
#define CKM_SHA224_HMAC_GENERAL 0x00000257UL
```

### 10.181.1.507 CKM\_SHA224\_KEY\_DERIVATION

```
#define CKM_SHA224_KEY_DERIVATION 0x00000396UL
```

### 10.181.1.508 CKM\_SHA224\_RSA\_PKCS

```
#define CKM_SHA224_RSA_PKCS 0x00000046UL
```



**10.181.1.509 CKM\_SHA224\_RSA\_PKCS\_PSS**

```
#define CKM_SHA224_RSA_PKCS_PSS 0x00000047UL
```

**10.181.1.510 CKM\_SHA256**

```
#define CKM_SHA256 0x00000250UL
```

**10.181.1.511 CKM\_SHA256\_HMAC**

```
#define CKM_SHA256_HMAC 0x00000251UL
```

**10.181.1.512 CKM\_SHA256\_HMAC\_GENERAL**

```
#define CKM_SHA256_HMAC_GENERAL 0x00000252UL
```

**10.181.1.513 CKM\_SHA256\_KEY\_DERIVATION**

```
#define CKM_SHA256_KEY_DERIVATION 0x00000393UL
```

**10.181.1.514 CKM\_SHA256\_RSA\_PKCS**

```
#define CKM_SHA256_RSA_PKCS 0x00000040UL
```

**10.181.1.515 CKM\_SHA256\_RSA\_PKCS\_PSS**

```
#define CKM_SHA256_RSA_PKCS_PSS 0x00000043UL
```

**10.181.1.516 CKM\_SHA384**

```
#define CKM_SHA384 0x00000260UL
```

### 10.181.1.517 CKM\_SHA384\_HMAC

```
#define CKM_SHA384_HMAC 0x00000261UL
```

### 10.181.1.518 CKM\_SHA384\_HMAC\_GENERAL

```
#define CKM_SHA384_HMAC_GENERAL 0x00000262UL
```

### 10.181.1.519 CKM\_SHA384\_KEY\_DERIVATION

```
#define CKM_SHA384_KEY_DERIVATION 0x00000394UL
```

### 10.181.1.520 CKM\_SHA384\_RSA\_PKCS

```
#define CKM_SHA384_RSA_PKCS 0x00000041UL
```

### 10.181.1.521 CKM\_SHA384\_RSA\_PKCS\_PSS

```
#define CKM_SHA384_RSA_PKCS_PSS 0x00000044UL
```

### 10.181.1.522 CKM\_SHA512

```
#define CKM_SHA512 0x00000270UL
```

### 10.181.1.523 CKM\_SHA512\_224

```
#define CKM_SHA512_224 0x00000048UL
```

### 10.181.1.524 CKM\_SHA512\_224\_HMAC

```
#define CKM_SHA512_224_HMAC 0x00000049UL
```

**10.181.1.525 CKM\_SHA512\_224\_HMAC\_GENERAL**

```
#define CKM_SHA512_224_HMAC_GENERAL 0x0000004AUL
```

**10.181.1.526 CKM\_SHA512\_224\_KEY\_DERIVATION**

```
#define CKM_SHA512_224_KEY_DERIVATION 0x0000004BUL
```

**10.181.1.527 CKM\_SHA512\_256**

```
#define CKM_SHA512_256 0x0000004CUL
```

**10.181.1.528 CKM\_SHA512\_256\_HMAC**

```
#define CKM_SHA512_256_HMAC 0x0000004DUL
```

**10.181.1.529 CKM\_SHA512\_256\_HMAC\_GENERAL**

```
#define CKM_SHA512_256_HMAC_GENERAL 0x0000004EUL
```

**10.181.1.530 CKM\_SHA512\_256\_KEY\_DERIVATION**

```
#define CKM_SHA512_256_KEY_DERIVATION 0x0000004FUL
```

**10.181.1.531 CKM\_SHA512\_HMAC**

```
#define CKM_SHA512_HMAC 0x00000271UL
```

**10.181.1.532 CKM\_SHA512\_HMAC\_GENERAL**

```
#define CKM_SHA512_HMAC_GENERAL 0x00000272UL
```

### 10.181.1.533 CKM\_SHA512\_KEY\_DERIVATION

```
#define CKM_SHA512_KEY_DERIVATION 0x00000395UL
```

### 10.181.1.534 CKM\_SHA512\_RSA\_PKCS

```
#define CKM_SHA512_RSA_PKCS 0x00000042UL
```

### 10.181.1.535 CKM\_SHA512\_RSA\_PKCS\_PSS

```
#define CKM_SHA512_RSA_PKCS_PSS 0x00000045UL
```

### 10.181.1.536 CKM\_SHA512\_T

```
#define CKM_SHA512_T 0x00000050UL
```

### 10.181.1.537 CKM\_SHA512\_T\_HMAC

```
#define CKM_SHA512_T_HMAC 0x00000051UL
```

### 10.181.1.538 CKM\_SHA512\_T\_HMAC\_GENERAL

```
#define CKM_SHA512_T_HMAC_GENERAL 0x00000052UL
```

### 10.181.1.539 CKM\_SHA512\_T\_KEY\_DERIVATION

```
#define CKM_SHA512_T_KEY_DERIVATION 0x00000053UL
```

### 10.181.1.540 CKM\_SHA\_1

```
#define CKM_SHA_1 0x000000220UL
```

**10.181.1.541 CKM\_SHA\_1\_HMAC**

```
#define CKM_SHA_1_HMAC 0x00000221UL
```

**10.181.1.542 CKM\_SHA\_1\_HMAC\_GENERAL**

```
#define CKM_SHA_1_HMAC_GENERAL 0x00000222UL
```

**10.181.1.543 CKM\_SKIPJACK\_CBC64**

```
#define CKM_SKIPJACK_CBC64 0x00001002UL
```

**10.181.1.544 CKM\_SKIPJACK\_CFB16**

```
#define CKM_SKIPJACK_CFB16 0x00001006UL
```

**10.181.1.545 CKM\_SKIPJACK\_CFB32**

```
#define CKM_SKIPJACK_CFB32 0x00001005UL
```

**10.181.1.546 CKM\_SKIPJACK\_CFB64**

```
#define CKM_SKIPJACK_CFB64 0x00001004UL
```

**10.181.1.547 CKM\_SKIPJACK\_CFB8**

```
#define CKM_SKIPJACK_CFB8 0x00001007UL
```

**10.181.1.548 CKM\_SKIPJACK\_ECB64**

```
#define CKM_SKIPJACK_ECB64 0x00001001UL
```

### 10.181.1.549 CKM\_SKIPJACK\_KEY\_GEN

```
#define CKM_SKIPJACK_KEY_GEN 0x00001000UL
```

### 10.181.1.550 CKM\_SKIPJACK\_OFB64

```
#define CKM_SKIPJACK_OFB64 0x00001003UL
```

### 10.181.1.551 CKM\_SKIPJACK\_PRIVATE\_WRAP

```
#define CKM_SKIPJACK_PRIVATE_WRAP 0x00001009UL
```

### 10.181.1.552 CKM\_SKIPJACK\_RELAYX

```
#define CKM_SKIPJACK_RELAYX 0x0000100aUL
```

### 10.181.1.553 CKM\_SKIPJACK\_WRAP

```
#define CKM_SKIPJACK_WRAP 0x00001008UL
```

### 10.181.1.554 CKM\_SSL3\_KEY\_AND\_MAC\_DERIVE

```
#define CKM_SSL3_KEY_AND_MAC_DERIVE 0x00000372UL
```

### 10.181.1.555 CKM\_SSL3\_MASTER\_KEY\_DERIVE

```
#define CKM_SSL3_MASTER_KEY_DERIVE 0x00000371UL
```

### 10.181.1.556 CKM\_SSL3\_MASTER\_KEY\_DERIVE\_DH

```
#define CKM_SSL3_MASTER_KEY_DERIVE_DH 0x00000373UL
```

**10.181.1.557 CKM\_SSL3\_MD5\_MAC**

```
#define CKM_SSL3_MD5_MAC 0x00000380UL
```

**10.181.1.558 CKM\_SSL3\_PRE\_MASTER\_KEY\_GEN**

```
#define CKM_SSL3_PRE_MASTER_KEY_GEN 0x00000370UL
```

**10.181.1.559 CKM\_SSL3\_SHA1\_MAC**

```
#define CKM_SSL3_SHA1_MAC 0x00000381UL
```

**10.181.1.560 CKM\_TLS10\_MAC\_CLIENT**

```
#define CKM_TLS10_MAC_CLIENT 0x000003D7UL
```

**10.181.1.561 CKM\_TLS10\_MAC\_SERVER**

```
#define CKM_TLS10_MAC_SERVER 0x000003D6UL
```

**10.181.1.562 CKM\_TLS12\_KDF**

```
#define CKM_TLS12_KDF 0x000003D9UL
```

**10.181.1.563 CKM\_TLS12\_KEY\_AND\_MAC\_DERIVE**

```
#define CKM_TLS12_KEY_AND_MAC_DERIVE 0x000003E1UL
```

**10.181.1.564 CKM\_TLS12\_KEY\_SAFE\_DERIVE**

```
#define CKM_TLS12_KEY_SAFE_DERIVE 0x000003E3UL
```

### 10.181.1.565 CKM\_TLS12\_MAC

```
#define CKM_TLS12_MAC 0x000003D8UL
```

### 10.181.1.566 CKM\_TLS12\_MASTER\_KEY\_DERIVE

```
#define CKM_TLS12_MASTER_KEY_DERIVE 0x000003E0UL
```

### 10.181.1.567 CKM\_TLS12\_MASTER\_KEY\_DERIVE\_DH

```
#define CKM_TLS12_MASTER_KEY_DERIVE_DH 0x000003E2UL
```

### 10.181.1.568 CKM\_TLS\_KDF

```
#define CKM_TLS_KDF 0x000003E5UL
```

### 10.181.1.569 CKM\_TLS\_KEY\_AND\_MAC\_DERIVE

```
#define CKM_TLS_KEY_AND_MAC_DERIVE 0x00000376UL
```

### 10.181.1.570 CKM\_TLS\_MAC

```
#define CKM_TLS_MAC 0x000003E4UL
```

### 10.181.1.571 CKM\_TLS\_MASTER\_KEY\_DERIVE

```
#define CKM_TLS_MASTER_KEY_DERIVE 0x00000375UL
```

### 10.181.1.572 CKM\_TLS\_MASTER\_KEY\_DERIVE\_DH

```
#define CKM_TLS_MASTER_KEY_DERIVE_DH 0x00000377UL
```



**10.181.1.573 CKM\_TLS\_PRE\_MASTER\_KEY\_GEN**

```
#define CKM_TLS_PRE_MASTER_KEY_GEN 0x00000374UL
```

**10.181.1.574 CKM\_TLS\_PRF**

```
#define CKM_TLS_PRF 0x00000378UL
```

**10.181.1.575 CKM\_TWOFISH\_CBC**

```
#define CKM_TWOFISH_CBC 0x00001093UL
```

**10.181.1.576 CKM\_TWOFISH\_CBC\_PAD**

```
#define CKM_TWOFISH_CBC_PAD 0x00001095UL
```

**10.181.1.577 CKM\_TWOFISH\_KEY\_GEN**

```
#define CKM_TWOFISH_KEY_GEN 0x00001092UL
```

**10.181.1.578 CKM\_VENDOR\_DEFINED**

```
#define CKM_VENDOR_DEFINED 0x80000000UL
```

**10.181.1.579 CKM\_WTLS\_CLIENT\_KEY\_AND\_MAC\_DERIVE**

```
#define CKM_WTLS_CLIENT_KEY_AND_MAC_DERIVE 0x000003D5UL
```

**10.181.1.580 CKM\_WTLS\_MASTER\_KEY\_DERIVE**

```
#define CKM_WTLS_MASTER_KEY_DERIVE 0x000003D1UL
```

### 10.181.1.581 CKM\_WTLS\_MASTER\_KEY\_DERIVE\_DH\_ECC

```
#define CKM_WTLS_MASTER_KEY_DERIVE_DH_ECC 0x000003D2UL
```

### 10.181.1.582 CKM\_WTLS\_PRE\_MASTER\_KEY\_GEN

```
#define CKM_WTLS_PRE_MASTER_KEY_GEN 0x000003D0UL
```

### 10.181.1.583 CKM\_WTLS\_PRF

```
#define CKM_WTLS_PRF 0x000003D3UL
```

### 10.181.1.584 CKM\_WTLS\_SERVER\_KEY\_AND\_MAC\_DERIVE

```
#define CKM_WTLS_SERVER_KEY_AND_MAC_DERIVE 0x000003D4UL
```

### 10.181.1.585 CKM\_X9\_42\_DH\_DERIVE

```
#define CKM_X9_42_DH_DERIVE 0x00000031UL
```

### 10.181.1.586 CKM\_X9\_42\_DH\_HYBRID\_DERIVE

```
#define CKM_X9_42_DH_HYBRID_DERIVE 0x00000032UL
```

### 10.181.1.587 CKM\_X9\_42\_DH\_KEY\_PAIR\_GEN

```
#define CKM_X9_42_DH_KEY_PAIR_GEN 0x00000030UL
```

### 10.181.1.588 CKM\_X9\_42\_DH\_PARAMETER\_GEN

```
#define CKM_X9_42_DH_PARAMETER_GEN 0x00002002UL
```

**10.181.1.589 CKM\_X9\_42\_MQV\_DERIVE**

```
#define CKM_X9_42_MQV_DERIVE 0x00000033UL
```

**10.181.1.590 CKM\_XOR\_BASE\_AND\_DATA**

```
#define CKM_XOR_BASE_AND_DATA 0x00000364UL
```

**10.181.1.591 CKN\_OTP\_CHANGED**

```
#define CKN_OTP_CHANGED 1UL
```

**10.181.1.592 CKN\_SURRENDER**

```
#define CKN_SURRENDER 0UL
```

**10.181.1.593 CKO\_CERTIFICATE**

```
#define CKO_CERTIFICATE 0x00000001UL
```

**10.181.1.594 CKO\_DATA**

```
#define CKO_DATA 0x00000000UL
```

**10.181.1.595 CKO\_DOMAIN\_PARAMETERS**

```
#define CKO_DOMAIN_PARAMETERS 0x00000006UL
```

**10.181.1.596 CKO\_HW\_FEATURE**

```
#define CKO_HW_FEATURE 0x00000005UL
```

### 10.181.1.597 CKO\_MECHANISM

```
#define CKO_MECHANISM 0x00000007UL
```

### 10.181.1.598 CKO\_OTP\_KEY

```
#define CKO_OTP_KEY 0x00000008UL
```

### 10.181.1.599 CKO\_PRIVATE\_KEY

```
#define CKO_PRIVATE_KEY 0x00000003UL
```

### 10.181.1.600 CKO\_PUBLIC\_KEY

```
#define CKO_PUBLIC_KEY 0x00000002UL
```

### 10.181.1.601 CKO\_SECRET\_KEY

```
#define CKO_SECRET_KEY 0x00000004UL
```

### 10.181.1.602 CKO\_VENDOR\_DEFINED

```
#define CKO_VENDOR_DEFINED 0x80000000UL
```

### 10.181.1.603 CKP\_PKCS5\_PBKD2\_HMAC\_GOSTR3411

```
#define CKP_PKCS5_PBKD2_HMAC_GOSTR3411 0x00000002UL
```

### 10.181.1.604 CKP\_PKCS5\_PBKD2\_HMAC\_SHA1

```
#define CKP_PKCS5_PBKD2_HMAC_SHA1 0x00000001UL
```

**10.181.1.605 CKP\_PKCS5\_PBKD2\_HMAC\_SHA224**

```
#define CKP_PKCS5_PBKD2_HMAC_SHA224 0x00000003UL
```

**10.181.1.606 CKP\_PKCS5\_PBKD2\_HMAC\_SHA256**

```
#define CKP_PKCS5_PBKD2_HMAC_SHA256 0x00000004UL
```

**10.181.1.607 CKP\_PKCS5\_PBKD2\_HMAC\_SHA384**

```
#define CKP_PKCS5_PBKD2_HMAC_SHA384 0x00000005UL
```

**10.181.1.608 CKP\_PKCS5\_PBKD2\_HMAC\_SHA512**

```
#define CKP_PKCS5_PBKD2_HMAC_SHA512 0x00000006UL
```

**10.181.1.609 CKP\_PKCS5\_PBKD2\_HMAC\_SHA512\_224**

```
#define CKP_PKCS5_PBKD2_HMAC_SHA512_224 0x00000007UL
```

**10.181.1.610 CKP\_PKCS5\_PBKD2\_HMAC\_SHA512\_256**

```
#define CKP_PKCS5_PBKD2_HMAC_SHA512_256 0x00000008UL
```

**10.181.1.611 CKR\_ACTION\_PROHIBITED**

```
#define CKR_ACTION_PROHIBITED 0x0000001BUL
```

**10.181.1.612 CKR\_ARGUMENTS\_BAD**

```
#define CKR_ARGUMENTS_BAD 0x00000007UL
```

### 10.181.1.613 CKR\_ATTRIBUTE\_READ\_ONLY

```
#define CKR_ATTRIBUTE_READ_ONLY 0x00000010UL
```

### 10.181.1.614 CKR\_ATTRIBUTE\_SENSITIVE

```
#define CKR_ATTRIBUTE_SENSITIVE 0x00000011UL
```

### 10.181.1.615 CKR\_ATTRIBUTE\_TYPE\_INVALID

```
#define CKR_ATTRIBUTE_TYPE_INVALID 0x00000012UL
```

### 10.181.1.616 CKR\_ATTRIBUTE\_VALUE\_INVALID

```
#define CKR_ATTRIBUTE_VALUE_INVALID 0x00000013UL
```

### 10.181.1.617 CKR\_BUFFER\_TOO\_SMALL

```
#define CKR_BUFFER_TOO_SMALL 0x00000150UL
```

### 10.181.1.618 CKR\_CANCEL

```
#define CKR_CANCEL 0x00000001UL
```

### 10.181.1.619 CKR\_CANT\_LOCK

```
#define CKR_CANT_LOCK 0x0000000AUL
```

### 10.181.1.620 CKR\_CRYPTOKI\_ALREADY\_INITIALIZED

```
#define CKR_CRYPTOKI_ALREADY_INITIALIZED 0x00000191UL
```

**10.181.1.621 CKR\_CRYPTOKI\_NOT\_INITIALIZED**

```
#define CKR_CRYPTOKI_NOT_INITIALIZED 0x00000190UL
```

**10.181.1.622 CKR\_CURVE\_NOT\_SUPPORTED**

```
#define CKR_CURVE_NOT_SUPPORTED 0x00000140UL
```

**10.181.1.623 CKR\_DATA\_INVALID**

```
#define CKR_DATA_INVALID 0x00000020UL
```

**10.181.1.624 CKR\_DATA\_LEN\_RANGE**

```
#define CKR_DATA_LEN_RANGE 0x00000021UL
```

**10.181.1.625 CKR\_DEVICE\_ERROR**

```
#define CKR_DEVICE_ERROR 0x00000030UL
```

**10.181.1.626 CKR\_DEVICE\_MEMORY**

```
#define CKR_DEVICE_MEMORY 0x00000031UL
```

**10.181.1.627 CKR\_DEVICE\_REMOVED**

```
#define CKR_DEVICE_REMOVED 0x00000032UL
```

**10.181.1.628 CKR\_DOMAIN\_PARAMS\_INVALID**

```
#define CKR_DOMAIN_PARAMS_INVALID 0x00000130UL
```

### 10.181.1.629 CKR\_ENCRYPTED\_DATA\_INVALID

```
#define CKR_ENCRYPTED_DATA_INVALID 0x00000040UL
```

### 10.181.1.630 CKR\_ENCRYPTED\_DATA\_LEN\_RANGE

```
#define CKR_ENCRYPTED_DATA_LEN_RANGE 0x00000041UL
```

### 10.181.1.631 CKR\_EXCEEDED\_MAX\_ITERATIONS

```
#define CKR_EXCEEDED_MAX_ITERATIONS 0x000001B5UL
```

### 10.181.1.632 CKR\_FIPS\_SELF\_TEST\_FAILED

```
#define CKR_FIPS_SELF_TEST_FAILED 0x000001B6UL
```

### 10.181.1.633 CKR\_FUNCTION\_CANCELED

```
#define CKR_FUNCTION_CANCELED 0x00000050UL
```

### 10.181.1.634 CKR\_FUNCTION\_FAILED

```
#define CKR_FUNCTION_FAILED 0x00000006UL
```

### 10.181.1.635 CKR\_FUNCTION\_NOT\_PARALLEL

```
#define CKR_FUNCTION_NOT_PARALLEL 0x00000051UL
```

### 10.181.1.636 CKR\_FUNCTION\_NOT\_SUPPORTED

```
#define CKR_FUNCTION_NOT_SUPPORTED 0x00000054UL
```



**10.181.1.637 CKR\_FUNCTION\_REJECTED**

```
#define CKR_FUNCTION_REJECTED 0x00000200UL
```

**10.181.1.638 CKR\_GENERAL\_ERROR**

```
#define CKR_GENERAL_ERROR 0x00000005UL
```

**10.181.1.639 CKR\_HOST\_MEMORY**

```
#define CKR_HOST_MEMORY 0x00000002UL
```

**10.181.1.640 CKR\_INFORMATION\_SENSITIVE**

```
#define CKR_INFORMATION_SENSITIVE 0x00000170UL
```

**10.181.1.641 CKR\_KEY\_CHANGED**

```
#define CKR_KEY_CHANGED 0x00000065UL
```

**10.181.1.642 CKR\_KEY\_FUNCTION\_NOT\_PERMITTED**

```
#define CKR_KEY_FUNCTION_NOT_PERMITTED 0x00000068UL
```

**10.181.1.643 CKR\_KEY\_HANDLE\_INVALID**

```
#define CKR_KEY_HANDLE_INVALID 0x00000060UL
```

**10.181.1.644 CKR\_KEY\_INDIGESTIBLE**

```
#define CKR_KEY_INDIGESTIBLE 0x00000067UL
```

### 10.181.1.645 CKR\_KEY\_NEEDED

```
#define CKR_KEY_NEEDED 0x00000066UL
```

### 10.181.1.646 CKR\_KEY\_NOT\_NEEDED

```
#define CKR_KEY_NOT_NEEDED 0x00000064UL
```

### 10.181.1.647 CKR\_KEY\_NOT\_WRAPPABLE

```
#define CKR_KEY_NOT_WRAPPABLE 0x00000069UL
```

### 10.181.1.648 CKR\_KEY\_SIZE\_RANGE

```
#define CKR_KEY_SIZE_RANGE 0x00000062UL
```

### 10.181.1.649 CKR\_KEY\_TYPE\_INCONSISTENT

```
#define CKR_KEY_TYPE_INCONSISTENT 0x00000063UL
```

### 10.181.1.650 CKR\_KEY\_UNEXTRACTABLE

```
#define CKR_KEY_UNEXTRACTABLE 0x0000006AUL
```

### 10.181.1.651 CKR\_LIBRARY\_LOAD\_FAILED

```
#define CKR_LIBRARY_LOAD_FAILED 0x000001B7UL
```

### 10.181.1.652 CKR\_MECHANISM\_INVALID

```
#define CKR_MECHANISM_INVALID 0x00000070UL
```

**10.181.1.653 CKR\_MECHANISM\_PARAM\_INVALID**

```
#define CKR_MECHANISM_PARAM_INVALID 0x00000071UL
```

**10.181.1.654 CKR\_MUTEX\_BAD**

```
#define CKR_MUTEX_BAD 0x000001A0UL
```

**10.181.1.655 CKR\_MUTEX\_NOT\_LOCKED**

```
#define CKR_MUTEX_NOT_LOCKED 0x000001A1UL
```

**10.181.1.656 CKR\_NEED\_TO\_CREATE\_THREADS**

```
#define CKR_NEED_TO_CREATE_THREADS 0x00000009UL
```

**10.181.1.657 CKR\_NEW\_PIN\_MODE**

```
#define CKR_NEW_PIN_MODE 0x000001B0UL
```

**10.181.1.658 CKR\_NEXT\_OTP**

```
#define CKR_NEXT_OTP 0x000001B1UL
```

**10.181.1.659 CKR\_NO\_EVENT**

```
#define CKR_NO_EVENT 0x00000008UL
```

**10.181.1.660 CKR\_OBJECT\_HANDLE\_INVALID**

```
#define CKR_OBJECT_HANDLE_INVALID 0x00000082UL
```

### 10.181.1.661 CKR\_OK

```
#define CKR_OK 0x00000000UL
```

### 10.181.1.662 CKR\_OPERATION\_ACTIVE

```
#define CKR_OPERATION_ACTIVE 0x00000090UL
```

### 10.181.1.663 CKR\_OPERATION\_NOT\_INITIALIZED

```
#define CKR_OPERATION_NOT_INITIALIZED 0x00000091UL
```

### 10.181.1.664 CKR\_PIN\_EXPIRED

```
#define CKR_PIN_EXPIRED 0x000000A3UL
```

### 10.181.1.665 CKR\_PIN\_INCORRECT

```
#define CKR_PIN_INCORRECT 0x000000A0UL
```

### 10.181.1.666 CKR\_PIN\_INVALID

```
#define CKR_PIN_INVALID 0x000000A1UL
```

### 10.181.1.667 CKR\_PIN\_LEN\_RANGE

```
#define CKR_PIN_LEN_RANGE 0x000000A2UL
```

### 10.181.1.668 CKR\_PIN\_LOCKED

```
#define CKR_PIN_LOCKED 0x000000A4UL
```

**10.181.1.669 CKR\_PIN\_TOO\_WEAK**

```
#define CKR_PIN_TOO_WEAK 0x000001B8UL
```

**10.181.1.670 CKR\_PUBLIC\_KEY\_INVALID**

```
#define CKR_PUBLIC_KEY_INVALID 0x000001B9UL
```

**10.181.1.671 CKR\_RANDOM\_NO\_RNG**

```
#define CKR_RANDOM_NO_RNG 0x00000121UL
```

**10.181.1.672 CKR\_RANDOM\_SEED\_NOT\_SUPPORTED**

```
#define CKR_RANDOM_SEED_NOT_SUPPORTED 0x00000120UL
```

**10.181.1.673 CKR\_SAVED\_STATE\_INVALID**

```
#define CKR_SAVED_STATE_INVALID 0x00000160UL
```

**10.181.1.674 CKR\_SESSION\_CLOSED**

```
#define CKR_SESSION_CLOSED 0x000000B0UL
```

**10.181.1.675 CKR\_SESSION\_COUNT**

```
#define CKR_SESSION_COUNT 0x000000B1UL
```

**10.181.1.676 CKR\_SESSION\_EXISTS**

```
#define CKR_SESSION_EXISTS 0x000000B6UL
```

### 10.181.1.677 CKR\_SESSION\_HANDLE\_INVALID

```
#define CKR_SESSION_HANDLE_INVALID 0x000000B3UL
```

### 10.181.1.678 CKR\_SESSION\_PARALLEL\_NOT\_SUPPORTED

```
#define CKR_SESSION_PARALLEL_NOT_SUPPORTED 0x000000B4UL
```

### 10.181.1.679 CKR\_SESSION\_READ\_ONLY

```
#define CKR_SESSION_READ_ONLY 0x000000B5UL
```

### 10.181.1.680 CKR\_SESSION\_READ\_ONLY\_EXISTS

```
#define CKR_SESSION_READ_ONLY_EXISTS 0x000000B7UL
```

### 10.181.1.681 CKR\_SESSION\_READ\_WRITE\_SO\_EXISTS

```
#define CKR_SESSION_READ_WRITE_SO_EXISTS 0x000000B8UL
```

### 10.181.1.682 CKR\_SIGNATURE\_INVALID

```
#define CKR_SIGNATURE_INVALID 0x000000C0UL
```

### 10.181.1.683 CKR\_SIGNATURE\_LEN\_RANGE

```
#define CKR_SIGNATURE_LEN_RANGE 0x000000C1UL
```

### 10.181.1.684 CKR\_SLOT\_ID\_INVALID

```
#define CKR_SLOT_ID_INVALID 0x00000003UL
```

**10.181.1.685 CKR\_STATE\_UNSAVEABLE**

```
#define CKR_STATE_UNSAVEABLE 0x00000180UL
```

**10.181.1.686 CKR\_TEMPLATE\_INCOMPLETE**

```
#define CKR_TEMPLATE_INCOMPLETE 0x000000D0UL
```

**10.181.1.687 CKR\_TEMPLATE\_INCONSISTENT**

```
#define CKR_TEMPLATE_INCONSISTENT 0x000000D1UL
```

**10.181.1.688 CKR\_TOKEN\_NOT\_PRESENT**

```
#define CKR_TOKEN_NOT_PRESENT 0x000000E0UL
```

**10.181.1.689 CKR\_TOKEN\_NOT\_RECOGNIZED**

```
#define CKR_TOKEN_NOT_RECOGNIZED 0x000000E1UL
```

**10.181.1.690 CKR\_TOKEN\_WRITE\_PROTECTED**

```
#define CKR_TOKEN_WRITE_PROTECTED 0x000000E2UL
```

**10.181.1.691 CKR\_UNWRAPPING\_KEY\_HANDLE\_INVALID**

```
#define CKR_UNWRAPPING_KEY_HANDLE_INVALID 0x000000F0UL
```

**10.181.1.692 CKR\_UNWRAPPING\_KEY\_SIZE\_RANGE**

```
#define CKR_UNWRAPPING_KEY_SIZE_RANGE 0x000000F1UL
```

### 10.181.1.693 CKR\_UNWRAPPING\_KEY\_TYPE\_INCONSISTENT

```
#define CKR_UNWRAPPING_KEY_TYPE_INCONSISTENT 0x000000F2UL
```

### 10.181.1.694 CKR\_USER\_ALREADY\_LOGGED\_IN

```
#define CKR_USER_ALREADY_LOGGED_IN 0x00000100UL
```

### 10.181.1.695 CKR\_USER\_ANOTHER\_ALREADY\_LOGGED\_IN

```
#define CKR_USER_ANOTHER_ALREADY_LOGGED_IN 0x00000104UL
```

### 10.181.1.696 CKR\_USER\_NOT\_LOGGED\_IN

```
#define CKR_USER_NOT_LOGGED_IN 0x00000101UL
```

### 10.181.1.697 CKR\_USER\_PIN\_NOT\_INITIALIZED

```
#define CKR_USER_PIN_NOT_INITIALIZED 0x00000102UL
```

### 10.181.1.698 CKR\_USER\_TOO\_MANY\_TYPES

```
#define CKR_USER_TOO_MANY_TYPES 0x00000105UL
```

### 10.181.1.699 CKR\_USER\_TYPE\_INVALID

```
#define CKR_USER_TYPE_INVALID 0x00000103UL
```

### 10.181.1.700 CKR\_VENDOR\_DEFINED

```
#define CKR_VENDOR_DEFINED 0x80000000UL
```



**10.181.1.701 CKR\_WRAPPED\_KEY\_INVALID**

```
#define CKR_WRAPPED_KEY_INVALID 0x00000110UL
```

**10.181.1.702 CKR\_WRAPPED\_KEY\_LEN\_RANGE**

```
#define CKR_WRAPPED_KEY_LEN_RANGE 0x00000112UL
```

**10.181.1.703 CKR\_WRAPPING\_KEY\_HANDLE\_INVALID**

```
#define CKR_WRAPPING_KEY_HANDLE_INVALID 0x00000113UL
```

**10.181.1.704 CKR\_WRAPPING\_KEY\_SIZE\_RANGE**

```
#define CKR_WRAPPING_KEY_SIZE_RANGE 0x00000114UL
```

**10.181.1.705 CKR\_WRAPPING\_KEY\_TYPE\_INCONSISTENT**

```
#define CKR_WRAPPING_KEY_TYPE_INCONSISTENT 0x00000115UL
```

**10.181.1.706 CKS\_RO\_PUBLIC\_SESSION**

```
#define CKS_RO_PUBLIC_SESSION 0UL
```

**10.181.1.707 CKS\_RO\_USER\_FUNCTIONS**

```
#define CKS_RO_USER_FUNCTIONS 1UL
```

**10.181.1.708 CKS\_RW\_PUBLIC\_SESSION**

```
#define CKS_RW_PUBLIC_SESSION 2UL
```

### 10.181.1.709 CKS\_RW\_SO\_FUNCTIONS

```
#define CKS_RW_SO_FUNCTIONS 4UL
```

### 10.181.1.710 CKS\_RW\_USER\_FUNCTIONS

```
#define CKS_RW_USER_FUNCTIONS 3UL
```

### 10.181.1.711 CKU\_CONTEXT\_SPECIFIC

```
#define CKU_CONTEXT_SPECIFIC 2UL
```

### 10.181.1.712 CKU\_SO

```
#define CKU_SO 0UL
```

### 10.181.1.713 CKU\_USER

```
#define CKU_USER 1UL
```

### 10.181.1.714 CKZ\_DATA\_SPECIFIED

```
#define CKZ_DATA_SPECIFIED 0x00000001UL
```

### 10.181.1.715 CKZ\_SALT\_SPECIFIED

```
#define CKZ_SALT_SPECIFIED 0x00000001UL
```

### 10.181.1.716 CRYPTOKI\_VERSION\_AMENDMENT

```
#define CRYPTOKI_VERSION_AMENDMENT 0
```

**10.181.1.717 CRYPTOKI\_VERSION\_MAJOR**

```
#define CRYPTOKI_VERSION_MAJOR 2
```

**10.181.1.718 CRYPTOKI\_VERSION\_MINOR**

```
#define CRYPTOKI_VERSION_MINOR 40
```

**10.181.1.719 FALSE**

```
#define FALSE CK_FALSE
```

**10.181.1.720 TRUE**

```
#define TRUE CK_TRUE
```

**10.181.2 Typedef Documentation****10.181.2.1 CK\_AES\_CBC\_ENCRYPT\_DATA\_PARAMS**

```
typedef struct CK_AES_CBC_ENCRYPT_DATA_PARAMS CK_AES_CBC_ENCRYPT_DATA_PARAMS
```

**10.181.2.2 CK\_AES\_CBC\_ENCRYPT\_DATA\_PARAMS\_PTR**

```
typedef CK_AES_CBC_ENCRYPT_DATA_PARAMS CK_PTR CK_AES_CBC_ENCRYPT_DATA_PARAMS_PTR
```

**10.181.2.3 CK\_AES\_CCM\_PARAMS**

```
typedef struct CK_AES_CCM_PARAMS CK_AES_CCM_PARAMS
```

### 10.181.2.4 CK\_AES\_CCM\_PARAMS\_PTR

```
typedef CK_AES_CCM_PARAMS CK_PTR CK_AES_CCM_PARAMS_PTR
```

### 10.181.2.5 CK\_AES\_CTR\_PARAMS

```
typedef struct CK_AES_CTR_PARAMS CK_AES_CTR_PARAMS
```

### 10.181.2.6 CK\_AES\_CTR\_PARAMS\_PTR

```
typedef CK_AES_CTR_PARAMS CK_PTR CK_AES_CTR_PARAMS_PTR
```

### 10.181.2.7 CK\_AES\_GCM\_PARAMS

```
typedef struct CK_AES_GCM_PARAMS CK_AES_GCM_PARAMS
```

### 10.181.2.8 CK\_AES\_GCM\_PARAMS\_PTR

```
typedef CK_AES_GCM_PARAMS CK_PTR CK_AES_GCM_PARAMS_PTR
```

### 10.181.2.9 CK\_ARIA\_CBC\_ENCRYPT\_DATA\_PARAMS

```
typedef struct CK_ARIA_CBC_ENCRYPT_DATA_PARAMS CK_ARIA_CBC_ENCRYPT_DATA_PARAMS
```

### 10.181.2.10 CK\_ARIA\_CBC\_ENCRYPT\_DATA\_PARAMS\_PTR

```
typedef CK_ARIA_CBC_ENCRYPT_DATA_PARAMS CK_PTR CK_ARIA_CBC_ENCRYPT_DATA_PARAMS_PTR
```

### 10.181.2.11 CK\_ATTRIBUTE

```
typedef struct CK_ATTRIBUTE CK_ATTRIBUTE
```

**10.181.2.12 CK\_ATTRIBUTE\_PTR**

```
typedef CK_ATTRIBUTE CK_PTR CK_ATTRIBUTE_PTR
```

**10.181.2.13 CK\_ATTRIBUTE\_TYPE**

```
typedef CK_ULONG CK_ATTRIBUTE_TYPE
```

**10.181.2.14 CK\_BBOOL**

```
typedef CK_BYTE CK_BBOOL
```

**10.181.2.15 CK\_BYTE**

```
typedef unsigned char CK_BYTE
```

**10.181.2.16 CK\_BYTE\_PTR**

```
typedef CK_BYTE CK_PTR CK_BYTE_PTR
```

**10.181.2.17 CK\_C\_INITIALIZE\_ARGS**

```
typedef struct CK_C_INITIALIZE_ARGS CK_C_INITIALIZE_ARGS
```

**10.181.2.18 CK\_C\_INITIALIZE\_ARGS\_PTR**

```
typedef CK_C_INITIALIZE_ARGS CK_PTR CK_C_INITIALIZE_ARGS_PTR
```

**10.181.2.19 CK\_CAMELLIA\_CBC\_ENCRYPT\_DATA\_PARAMS**

```
typedef struct CK_CAMELLIA_CBC_ENCRYPT_DATA_PARAMS CK_CAMELLIA_CBC_ENCRYPT_DATA_PARAMS
```

### 10.181.2.20 CK\_CAMELLIA\_CBC\_ENCRYPT\_DATA\_PARAMS\_PTR

```
typedef CK_CAMELLIA_CBC_ENCRYPT_DATA_PARAMS CK_PTR CK_CAMELLIA_CBC_ENCRYPT_DATA_PARAMS_PTR
```

### 10.181.2.21 CK\_CAMELLIA\_CTR\_PARAMS

```
typedef struct CK_CAMELLIA_CTR_PARAMS CK_CAMELLIA_CTR_PARAMS
```

### 10.181.2.22 CK\_CAMELLIA\_CTR\_PARAMS\_PTR

```
typedef CK_CAMELLIA_CTR_PARAMS CK_PTR CK_CAMELLIA_CTR_PARAMS_PTR
```

### 10.181.2.23 CK\_CCM\_PARAMS

```
typedef struct CK_CCM_PARAMS CK_CCM_PARAMS
```

### 10.181.2.24 CK\_CCM\_PARAMS\_PTR

```
typedef CK_CCM_PARAMS CK_PTR CK_CCM_PARAMS_PTR
```

### 10.181.2.25 CK\_CERTIFICATE\_CATEGORY

```
typedef CK_ULONG CK_CERTIFICATE_CATEGORY
```

### 10.181.2.26 CK\_CERTIFICATE\_TYPE

```
typedef CK_ULONG CK_CERTIFICATE_TYPE
```

### 10.181.2.27 CK\_CHAR

```
typedef CK_BYTE CK_CHAR
```

**10.181.2.28 CK\_CHAR\_PTR**

```
typedef CK_CHAR CK_PTR CK_CHAR_PTR
```

**10.181.2.29 CK\_CMS\_SIG\_PARAMS**

```
typedef struct CK_CMS_SIG_PARAMS CK_CMS_SIG_PARAMS
```

**10.181.2.30 CK\_CMS\_SIG\_PARAMS\_PTR**

```
typedef CK_CMS_SIG_PARAMS CK_PTR CK_CMS_SIG_PARAMS_PTR
```

**10.181.2.31 CK\_DATE**

```
typedef struct CK_DATE CK_DATE
```

**10.181.2.32 CK\_DES\_CBC\_ENCRYPT\_DATA\_PARAMS**

```
typedef struct CK_DES_CBC_ENCRYPT_DATA_PARAMS CK_DES_CBC_ENCRYPT_DATA_PARAMS
```

**10.181.2.33 CK\_DES\_CBC\_ENCRYPT\_DATA\_PARAMS\_PTR**

```
typedef CK_DES_CBC_ENCRYPT_DATA_PARAMS CK_PTR CK_DES_CBC_ENCRYPT_DATA_PARAMS_PTR
```

**10.181.2.34 CK\_DSA\_PARAMETER\_GEN\_PARAM**

```
typedef struct CK_DSA_PARAMETER_GEN_PARAM CK_DSA_PARAMETER_GEN_PARAM
```

**10.181.2.35 CK\_DSA\_PARAMETER\_GEN\_PARAM\_PTR**

```
typedef CK_DSA_PARAMETER_GEN_PARAM CK_PTR CK_DSA_PARAMETER_GEN_PARAM_PTR
```

### 10.181.2.36 CK\_EC\_KDF\_TYPE

```
typedef CK_ULONG CK_EC_KDF_TYPE
```

### 10.181.2.37 CK\_ECDH1\_DERIVE\_PARAMS

```
typedef struct CK_ECDH1_DERIVE_PARAMS CK_ECDH1_DERIVE_PARAMS
```

### 10.181.2.38 CK\_ECDH1\_DERIVE\_PARAMS\_PTR

```
typedef CK_ECDH1_DERIVE_PARAMS CK_PTR CK_ECDH1_DERIVE_PARAMS_PTR
```

### 10.181.2.39 CK\_ECDH2\_DERIVE\_PARAMS

```
typedef struct CK_ECDH2_DERIVE_PARAMS CK_ECDH2_DERIVE_PARAMS
```

### 10.181.2.40 CK\_ECDH2\_DERIVE\_PARAMS\_PTR

```
typedef CK_ECDH2_DERIVE_PARAMS CK_PTR CK_ECDH2_DERIVE_PARAMS_PTR
```

### 10.181.2.41 CK\_ECDH\_AES\_KEY\_WRAP\_PARAMS

```
typedef struct CK_ECDH_AES_KEY_WRAP_PARAMS CK_ECDH_AES_KEY_WRAP_PARAMS
```

### 10.181.2.42 CK\_ECDH\_AES\_KEY\_WRAP\_PARAMS\_PTR

```
typedef CK_ECDH_AES_KEY_WRAP_PARAMS CK_PTR CK_ECDH_AES_KEY_WRAP_PARAMS_PTR
```

### 10.181.2.43 CK\_ECMQV\_DERIVE\_PARAMS

```
typedef struct CK_ECMQV_DERIVE_PARAMS CK_ECMQV_DERIVE_PARAMS
```



**10.181.2.44 CK\_ECMQV\_DERIVE\_PARAMS\_PTR**

```
typedef CK_ECMQV_DERIVE_PARAMS CK_PTR CK_ECMQV_DERIVE_PARAMS_PTR
```

**10.181.2.45 CK\_EXTRACT\_PARAMS**

```
typedef CK_ULONG CK_EXTRACT_PARAMS
```

**10.181.2.46 CK\_EXTRACT\_PARAMS\_PTR**

```
typedef CK_EXTRACT_PARAMS CK_PTR CK_EXTRACT_PARAMS_PTR
```

**10.181.2.47 CK\_FLAGS**

```
typedef CK_ULONG CK_FLAGS
```

**10.181.2.48 CK\_FUNCTION\_LIST**

```
typedef struct CK_FUNCTION_LIST CK_FUNCTION_LIST
```

**10.181.2.49 CK\_FUNCTION\_LIST\_PTR**

```
typedef CK_FUNCTION_LIST CK_PTR CK_FUNCTION_LIST_PTR
```

**10.181.2.50 CK\_FUNCTION\_LIST\_PTR\_PTR**

```
typedef CK_FUNCTION_LIST_PTR CK_PTR CK_FUNCTION_LIST_PTR_PTR
```

**10.181.2.51 CK\_GCM\_PARAMS**

```
typedef struct CK_GCM_PARAMS CK_GCM_PARAMS
```

### 10.181.2.52 CK\_GCM\_PARAMS\_PTR

```
typedef CK_GCM_PARAMS CK_PTR CK_GCM_PARAMS_PTR
```

### 10.181.2.53 CK\_GOSTR3410\_DERIVE\_PARAMS

```
typedef struct CK_GOSTR3410_DERIVE_PARAMS CK_GOSTR3410_DERIVE_PARAMS
```

### 10.181.2.54 CK\_GOSTR3410\_DERIVE\_PARAMS\_PTR

```
typedef CK_GOSTR3410_DERIVE_PARAMS CK_PTR CK_GOSTR3410_DERIVE_PARAMS_PTR
```

### 10.181.2.55 CK\_GOSTR3410\_KEY\_WRAP\_PARAMS

```
typedef struct CK_GOSTR3410_KEY_WRAP_PARAMS CK_GOSTR3410_KEY_WRAP_PARAMS
```

### 10.181.2.56 CK\_GOSTR3410\_KEY\_WRAP\_PARAMS\_PTR

```
typedef CK_GOSTR3410_KEY_WRAP_PARAMS CK_PTR CK_GOSTR3410_KEY_WRAP_PARAMS_PTR
```

### 10.181.2.57 CK\_HW\_FEATURE\_TYPE

```
typedef CK_ULONG CK_HW_FEATURE_TYPE
```

### 10.181.2.58 CK\_INFO

```
typedef struct CK_INFO CK_INFO
```

### 10.181.2.59 CK\_INFO\_PTR

```
typedef CK_INFO CK_PTR CK_INFO_PTR
```

**10.181.2.60 CK\_JAVA\_MIDP\_SECURITY\_DOMAIN**

```
typedef CK_ULONG CK_JAVA_MIDP_SECURITY_DOMAIN
```

**10.181.2.61 CK\_KEA\_DERIVE\_PARAMS**

```
typedef struct CK_KEA_DERIVE_PARAMS CK_KEA_DERIVE_PARAMS
```

**10.181.2.62 CK\_KEA\_DERIVE\_PARAMS\_PTR**

```
typedef CK_KEA_DERIVE_PARAMS CK_PTR CK_KEA_DERIVE_PARAMS_PTR
```

**10.181.2.63 CK\_KEY\_DERIVATION\_STRING\_DATA**

```
typedef struct CK_KEY_DERIVATION_STRING_DATA CK_KEY_DERIVATION_STRING_DATA
```

**10.181.2.64 CK\_KEY\_DERIVATION\_STRING\_DATA\_PTR**

```
typedef CK_KEY_DERIVATION_STRING_DATA CK_PTR CK_KEY_DERIVATION_STRING_DATA_PTR
```

**10.181.2.65 CK\_KEY\_TYPE**

```
typedef CK_ULONG CK_KEY_TYPE
```

**10.181.2.66 CK\_KEY\_WRAP\_SET\_OAEP\_PARAMS**

```
typedef struct CK_KEY_WRAP_SET_OAEP_PARAMS CK_KEY_WRAP_SET_OAEP_PARAMS
```

**10.181.2.67 CK\_KEY\_WRAP\_SET\_OAEP\_PARAMS\_PTR**

```
typedef CK_KEY_WRAP_SET_OAEP_PARAMS CK_PTR CK_KEY_WRAP_SET_OAEP_PARAMS_PTR
```

### 10.181.2.68 CK\_KIP\_PARAMS

```
typedef struct CK_KIP_PARAMS CK_KIP_PARAMS
```

### 10.181.2.69 CK\_KIP\_PARAMS\_PTR

```
typedef CK_KIP_PARAMS CK_PTR CK_KIP_PARAMS_PTR
```

### 10.181.2.70 CK\_LONG

```
typedef long int CK_LONG
```

### 10.181.2.71 CK\_MAC\_GENERAL\_PARAMS

```
typedef CK_ULONG CK_MAC_GENERAL_PARAMS
```

### 10.181.2.72 CK\_MAC\_GENERAL\_PARAMS\_PTR

```
typedef CK_MAC_GENERAL_PARAMS CK_PTR CK_MAC_GENERAL_PARAMS_PTR
```

### 10.181.2.73 CK\_MECHANISM

```
typedef struct CK_MECHANISM CK_MECHANISM
```

### 10.181.2.74 CK\_MECHANISM\_INFO

```
typedef struct CK_MECHANISM_INFO CK_MECHANISM_INFO
```

### 10.181.2.75 CK\_MECHANISM\_INFO\_PTR

```
typedef CK_MECHANISM_INFO CK_PTR CK_MECHANISM_INFO_PTR
```

**10.181.2.76 CK\_MECHANISM\_PTR**

```
typedef CK_MECHANISM CK_PTR CK_MECHANISM_PTR
```

**10.181.2.77 CK\_MECHANISM\_TYPE**

```
typedef CK_ULONG CK_MECHANISM_TYPE
```

**10.181.2.78 CK\_MECHANISM\_TYPE\_PTR**

```
typedef CK_MECHANISM_TYPE CK_PTR CK_MECHANISM_TYPE_PTR
```

**10.181.2.79 CK\_NOTIFICATION**

```
typedef CK_ULONG CK_NOTIFICATION
```

**10.181.2.80 CK\_OBJECT\_CLASS**

```
typedef CK_ULONG CK_OBJECT_CLASS
```

**10.181.2.81 CK\_OBJECT\_CLASS\_PTR**

```
typedef CK_OBJECT_CLASS CK_PTR CK_OBJECT_CLASS_PTR
```

**10.181.2.82 CK\_OBJECT\_HANDLE**

```
typedef CK_ULONG CK_OBJECT_HANDLE
```

**10.181.2.83 CK\_OBJECT\_HANDLE\_PTR**

```
typedef CK_OBJECT_HANDLE CK_PTR CK_OBJECT_HANDLE_PTR
```

### 10.181.2.84 CK\_OTP\_PARAM

```
typedef struct CK_OTP_PARAM CK_OTP_PARAM
```

### 10.181.2.85 CK\_OTP\_PARAM\_PTR

```
typedef CK_OTP_PARAM CK_PTR CK_OTP_PARAM_PTR
```

### 10.181.2.86 CK\_OTP\_PARAM\_TYPE

```
typedef CK_ULONG CK_OTP_PARAM_TYPE
```

### 10.181.2.87 CK\_OTP\_PARAMS

```
typedef struct CK_OTP_PARAMS CK_OTP_PARAMS
```

### 10.181.2.88 CK\_OTP\_PARAMS\_PTR

```
typedef CK_OTP_PARAMS CK_PTR CK_OTP_PARAMS_PTR
```

### 10.181.2.89 CK\_OTP\_SIGNATURE\_INFO

```
typedef struct CK_OTP_SIGNATURE_INFO CK_OTP_SIGNATURE_INFO
```

### 10.181.2.90 CK\_OTP\_SIGNATURE\_INFO\_PTR

```
typedef CK_OTP_SIGNATURE_INFO CK_PTR CK_OTP_SIGNATURE_INFO_PTR
```

### 10.181.2.91 CK\_PARAM\_TYPE

```
typedef CK_OTP_PARAM_TYPE CK_PARAM_TYPE
```

**10.181.2.92 CK\_PBE\_PARAMS**

```
typedef struct CK_PBE_PARAMS CK_PBE_PARAMS
```

**10.181.2.93 CK\_PBE\_PARAMS\_PTR**

```
typedef CK_PBE_PARAMS CK_PTR CK_PBE_PARAMS_PTR
```

**10.181.2.94 CK\_PKCS5\_PBKD2\_PARAMS**

```
typedef struct CK_PKCS5_PBKD2_PARAMS CK_PKCS5_PBKD2_PARAMS
```

**10.181.2.95 CK\_PKCS5\_PBKD2\_PARAMS2**

```
typedef struct CK_PKCS5_PBKD2_PARAMS2 CK_PKCS5_PBKD2_PARAMS2
```

**10.181.2.96 CK\_PKCS5\_PBKD2\_PARAMS2\_PTR**

```
typedef CK_PKCS5_PBKD2_PARAMS2 CK_PTR CK_PKCS5_PBKD2_PARAMS2_PTR
```

**10.181.2.97 CK\_PKCS5\_PBKD2\_PARAMS\_PTR**

```
typedef CK_PKCS5_PBKD2_PARAMS CK_PTR CK_PKCS5_PBKD2_PARAMS_PTR
```

**10.181.2.98 CK\_PKCS5\_PBKD2\_PSEUDO\_RANDOM\_FUNCTION\_TYPE**

```
typedef CK_ULONG CK_PKCS5_PBKD2_PSEUDO_RANDOM_FUNCTION_TYPE
```

**10.181.2.99 CK\_PKCS5\_PBKD2\_PSEUDO\_RANDOM\_FUNCTION\_TYPE\_PTR**

```
typedef CK_PKCS5_PBKD2_PSEUDO_RANDOM_FUNCTION_TYPE CK_PTR CK_PKCS5_PBKD2_PSEUDO_RANDOM_FUNCTION_TYPE_PTR
```

### 10.181.2.100 CK\_PKCS5\_PBKDF2\_SALT\_SOURCE\_TYPE

typedef [CK\\_ULONG](#) [CK\\_PKCS5\\_PBKDF2\\_SALT\\_SOURCE\\_TYPE](#)

### 10.181.2.101 CK\_PKCS5\_PBKDF2\_SALT\_SOURCE\_TYPE\_PTR

typedef [CK\\_PKCS5\\_PBKDF2\\_SALT\\_SOURCE\\_TYPE](#) [CK\\_PTR](#) [CK\\_PKCS5\\_PBKDF2\\_SALT\\_SOURCE\\_TYPE\\_PTR](#)

### 10.181.2.102 CK\_RC2\_CBC\_PARAMS

typedef struct [CK\\_RC2\\_CBC\\_PARAMS](#) [CK\\_RC2\\_CBC\\_PARAMS](#)

### 10.181.2.103 CK\_RC2\_CBC\_PARAMS\_PTR

typedef [CK\\_RC2\\_CBC\\_PARAMS](#) [CK\\_PTR](#) [CK\\_RC2\\_CBC\\_PARAMS\\_PTR](#)

### 10.181.2.104 CK\_RC2\_MAC\_GENERAL\_PARAMS

typedef struct [CK\\_RC2\\_MAC\\_GENERAL\\_PARAMS](#) [CK\\_RC2\\_MAC\\_GENERAL\\_PARAMS](#)

### 10.181.2.105 CK\_RC2\_MAC\_GENERAL\_PARAMS\_PTR

typedef [CK\\_RC2\\_MAC\\_GENERAL\\_PARAMS](#) [CK\\_PTR](#) [CK\\_RC2\\_MAC\\_GENERAL\\_PARAMS\\_PTR](#)

### 10.181.2.106 CK\_RC2\_PARAMS

typedef [CK\\_ULONG](#) [CK\\_RC2\\_PARAMS](#)

### 10.181.2.107 CK\_RC2\_PARAMS\_PTR

typedef [CK\\_RC2\\_PARAMS](#) [CK\\_PTR](#) [CK\\_RC2\\_PARAMS\\_PTR](#)



**10.181.2.108 CK\_RC5\_CBC\_PARAMS**

```
typedef struct CK_RC5_CBC_PARAMS CK_RC5_CBC_PARAMS
```

**10.181.2.109 CK\_RC5\_CBC\_PARAMS\_PTR**

```
typedef CK_RC5_CBC_PARAMS CK_PTR CK_RC5_CBC_PARAMS_PTR
```

**10.181.2.110 CK\_RC5\_MAC\_GENERAL\_PARAMS**

```
typedef struct CK_RC5_MAC_GENERAL_PARAMS CK_RC5_MAC_GENERAL_PARAMS
```

**10.181.2.111 CK\_RC5\_MAC\_GENERAL\_PARAMS\_PTR**

```
typedef CK_RC5_MAC_GENERAL_PARAMS CK_PTR CK_RC5_MAC_GENERAL_PARAMS_PTR
```

**10.181.2.112 CK\_RC5\_PARAMS**

```
typedef struct CK_RC5_PARAMS CK_RC5_PARAMS
```

**10.181.2.113 CK\_RC5\_PARAMS\_PTR**

```
typedef CK_RC5_PARAMS CK_PTR CK_RC5_PARAMS_PTR
```

**10.181.2.114 CK\_RSA\_AES\_KEY\_WRAP\_PARAMS**

```
typedef struct CK_RSA_AES_KEY_WRAP_PARAMS CK_RSA_AES_KEY_WRAP_PARAMS
```

**10.181.2.115 CK\_RSA\_AES\_KEY\_WRAP\_PARAMS\_PTR**

```
typedef CK_RSA_AES_KEY_WRAP_PARAMS CK_PTR CK_RSA_AES_KEY_WRAP_PARAMS_PTR
```

### 10.181.2.116 CK\_RSA\_PKCS\_MGF\_TYPE

```
typedef CK_ULONG CK_RSA_PKCS_MGF_TYPE
```

### 10.181.2.117 CK\_RSA\_PKCS\_MGF\_TYPE\_PTR

```
typedef CK_RSA_PKCS_MGF_TYPE CK_PTR CK_RSA_PKCS_MGF_TYPE_PTR
```

### 10.181.2.118 CK\_RSA\_PKCS\_OAEP\_PARAMS

```
typedef struct CK_RSA_PKCS_OAEP_PARAMS CK_RSA_PKCS_OAEP_PARAMS
```

### 10.181.2.119 CK\_RSA\_PKCS\_OAEP\_PARAMS\_PTR

```
typedef CK_RSA_PKCS_OAEP_PARAMS CK_PTR CK_RSA_PKCS_OAEP_PARAMS_PTR
```

### 10.181.2.120 CK\_RSA\_PKCS\_OAEP\_SOURCE\_TYPE

```
typedef CK_ULONG CK_RSA_PKCS_OAEP_SOURCE_TYPE
```

### 10.181.2.121 CK\_RSA\_PKCS\_OAEP\_SOURCE\_TYPE\_PTR

```
typedef CK_RSA_PKCS_OAEP_SOURCE_TYPE CK_PTR CK_RSA_PKCS_OAEP_SOURCE_TYPE_PTR
```

### 10.181.2.122 CK\_RSA\_PKCS\_PSS\_PARAMS

```
typedef struct CK_RSA_PKCS_PSS_PARAMS CK_RSA_PKCS_PSS_PARAMS
```

### 10.181.2.123 CK\_RSA\_PKCS\_PSS\_PARAMS\_PTR

```
typedef CK_RSA_PKCS_PSS_PARAMS CK_PTR CK_RSA_PKCS_PSS_PARAMS_PTR
```

**10.181.2.124 CK\_RV**

```
typedef CK_ULONG CK_RV
```

**10.181.2.125 CK\_SEED\_CBC\_ENCRYPT\_DATA\_PARAMS**

```
typedef struct CK_SEED_CBC_ENCRYPT_DATA_PARAMS CK_SEED_CBC_ENCRYPT_DATA_PARAMS
```

**10.181.2.126 CK\_SEED\_CBC\_ENCRYPT\_DATA\_PARAMS\_PTR**

```
typedef CK_SEED_CBC_ENCRYPT_DATA_PARAMS CK_PTR CK_SEED_CBC_ENCRYPT_DATA_PARAMS_PTR
```

**10.181.2.127 CK\_SESSION\_HANDLE**

```
typedef CK_ULONG CK_SESSION_HANDLE
```

**10.181.2.128 CK\_SESSION\_HANDLE\_PTR**

```
typedef CK_SESSION_HANDLE CK_PTR CK_SESSION_HANDLE_PTR
```

**10.181.2.129 CK\_SESSION\_INFO**

```
typedef struct CK_SESSION_INFO CK_SESSION_INFO
```

**10.181.2.130 CK\_SESSION\_INFO\_PTR**

```
typedef CK_SESSION_INFO CK_PTR CK_SESSION_INFO_PTR
```

**10.181.2.131 CK\_SKIPJACK\_PRIVATE\_WRAP\_PARAMS**

```
typedef struct CK_SKIPJACK_PRIVATE_WRAP_PARAMS CK_SKIPJACK_PRIVATE_WRAP_PARAMS
```

### 10.181.2.132 CK\_SKIPJACK\_PRIVATE\_WRAP\_PARAMS\_PTR

```
typedef CK_SKIPJACK_PRIVATE_WRAP_PARAMS CK_PTR CK_SKIPJACK_PRIVATE_WRAP_PARAMS_PTR
```

### 10.181.2.133 CK\_SKIPJACK\_RELAYX\_PARAMS

```
typedef struct CK_SKIPJACK_RELAYX_PARAMS CK_SKIPJACK_RELAYX_PARAMS
```

### 10.181.2.134 CK\_SKIPJACK\_RELAYX\_PARAMS\_PTR

```
typedef CK_SKIPJACK_RELAYX_PARAMS CK_PTR CK_SKIPJACK_RELAYX_PARAMS_PTR
```

### 10.181.2.135 CK\_SLOT\_ID

```
typedef CK_ULONG CK_SLOT_ID
```

### 10.181.2.136 CK\_SLOT\_ID\_PTR

```
typedef CK_SLOT_ID CK_PTR CK_SLOT_ID_PTR
```

### 10.181.2.137 CK\_SLOT\_INFO

```
typedef struct CK_SLOT_INFO CK_SLOT_INFO
```

### 10.181.2.138 CK\_SLOT\_INFO\_PTR

```
typedef CK_SLOT_INFO CK_PTR CK_SLOT_INFO_PTR
```

### 10.181.2.139 CK\_SSL3\_KEY\_MAT\_OUT

```
typedef struct CK_SSL3_KEY_MAT_OUT CK_SSL3_KEY_MAT_OUT
```

**10.181.2.140 CK\_SSL3\_KEY\_MAT\_OUT\_PTR**

```
typedef CK_SSL3_KEY_MAT_OUT CK_PTR CK_SSL3_KEY_MAT_OUT_PTR
```

**10.181.2.141 CK\_SSL3\_KEY\_MAT\_PARAMS**

```
typedef struct CK_SSL3_KEY_MAT_PARAMS CK_SSL3_KEY_MAT_PARAMS
```

**10.181.2.142 CK\_SSL3\_KEY\_MAT\_PARAMS\_PTR**

```
typedef CK_SSL3_KEY_MAT_PARAMS CK_PTR CK_SSL3_KEY_MAT_PARAMS_PTR
```

**10.181.2.143 CK\_SSL3\_MASTER\_KEY\_DERIVE\_PARAMS**

```
typedef struct CK_SSL3_MASTER_KEY_DERIVE_PARAMS CK_SSL3_MASTER_KEY_DERIVE_PARAMS
```

**10.181.2.144 CK\_SSL3\_MASTER\_KEY\_DERIVE\_PARAMS\_PTR**

```
typedef struct CK_SSL3_MASTER_KEY_DERIVE_PARAMS CK_PTR CK_SSL3_MASTER_KEY_DERIVE_PARAMS_PTR
```

**10.181.2.145 CK\_SSL3\_RANDOM\_DATA**

```
typedef struct CK_SSL3_RANDOM_DATA CK_SSL3_RANDOM_DATA
```

**10.181.2.146 CK\_STATE**

```
typedef CK_ULONG CK_STATE
```

**10.181.2.147 CK\_TLS12\_KEY\_MAT\_PARAMS**

```
typedef struct CK_TLS12_KEY_MAT_PARAMS CK_TLS12_KEY_MAT_PARAMS
```

### 10.181.2.148 CK\_TLS12\_KEY\_MAT\_PARAMS\_PTR

```
typedef CK_TLS12_KEY_MAT_PARAMS CK_PTR CK_TLS12_KEY_MAT_PARAMS_PTR
```

### 10.181.2.149 CK\_TLS12\_MASTER\_KEY\_DERIVE\_PARAMS

```
typedef struct CK_TLS12_MASTER_KEY_DERIVE_PARAMS CK_TLS12_MASTER_KEY_DERIVE_PARAMS
```

### 10.181.2.150 CK\_TLS12\_MASTER\_KEY\_DERIVE\_PARAMS\_PTR

```
typedef CK_TLS12_MASTER_KEY_DERIVE_PARAMS CK_PTR CK_TLS12_MASTER_KEY_DERIVE_PARAMS_PTR
```

### 10.181.2.151 CK\_TLS\_KDF\_PARAMS

```
typedef struct CK_TLS_KDF_PARAMS CK_TLS_KDF_PARAMS
```

### 10.181.2.152 CK\_TLS\_KDF\_PARAMS\_PTR

```
typedef CK_TLS_KDF_PARAMS CK_PTR CK_TLS_KDF_PARAMS_PTR
```

### 10.181.2.153 CK\_TLS\_MAC\_PARAMS

```
typedef struct CK_TLS_MAC_PARAMS CK_TLS_MAC_PARAMS
```

### 10.181.2.154 CK\_TLS\_MAC\_PARAMS\_PTR

```
typedef CK_TLS_MAC_PARAMS CK_PTR CK_TLS_MAC_PARAMS_PTR
```

### 10.181.2.155 CK\_TLS\_PRF\_PARAMS

```
typedef struct CK_TLS_PRF_PARAMS CK_TLS_PRF_PARAMS
```

**10.181.2.156 CK\_TLS\_PRF\_PARAMS\_PTR**

```
typedef CK_TLS_PRF_PARAMS CK_PTR CK_TLS_PRF_PARAMS_PTR
```

**10.181.2.157 CK\_TOKEN\_INFO**

```
typedef struct CK_TOKEN_INFO CK_TOKEN_INFO
```

**10.181.2.158 CK\_TOKEN\_INFO\_PTR**

```
typedef CK_TOKEN_INFO CK_PTR CK_TOKEN_INFO_PTR
```

**10.181.2.159 CK\_ULONG**

```
typedef unsigned long int CK_ULONG
```

**10.181.2.160 CK\_ULONG\_PTR**

```
typedef CK_ULONG CK_PTR CK_ULONG_PTR
```

**10.181.2.161 CK\_USER\_TYPE**

```
typedef CK_ULONG CK_USER_TYPE
```

**10.181.2.162 CK\_UTF8CHAR**

```
typedef CK_BYTE CK_UTF8CHAR
```

**10.181.2.163 CK\_UTF8CHAR\_PTR**

```
typedef CK_UTF8CHAR CK_PTR CK_UTF8CHAR_PTR
```

### 10.181.2.164 CK\_VERSION

```
typedef struct CK_VERSION CK_VERSION
```

### 10.181.2.165 CK\_VERSION\_PTR

```
typedef CK_VERSION CK_PTR CK_VERSION_PTR
```

### 10.181.2.166 CK\_VOID\_PTR

```
typedef void CK_PTR CK_VOID_PTR
```

### 10.181.2.167 CK\_VOID\_PTR\_PTR

```
typedef CK_VOID_PTR CK_PTR CK_VOID_PTR_PTR
```

### 10.181.2.168 CK\_WTLS\_KEY\_MAT\_OUT

```
typedef struct CK_WTLS_KEY_MAT_OUT CK_WTLS_KEY_MAT_OUT
```

### 10.181.2.169 CK\_WTLS\_KEY\_MAT\_OUT\_PTR

```
typedef CK_WTLS_KEY_MAT_OUT CK_PTR CK_WTLS_KEY_MAT_OUT_PTR
```

### 10.181.2.170 CK\_WTLS\_KEY\_MAT\_PARAMS

```
typedef struct CK_WTLS_KEY_MAT_PARAMS CK_WTLS_KEY_MAT_PARAMS
```

### 10.181.2.171 CK\_WTLS\_KEY\_MAT\_PARAMS\_PTR

```
typedef CK_WTLS_KEY_MAT_PARAMS CK_PTR CK_WTLS_KEY_MAT_PARAMS_PTR
```



**10.181.2.172 CK\_WTLS\_MASTER\_KEY\_DERIVE\_PARAMS**

```
typedef struct CK_WTLS_MASTER_KEY_DERIVE_PARAMS CK_WTLS_MASTER_KEY_DERIVE_PARAMS
```

**10.181.2.173 CK\_WTLS\_MASTER\_KEY\_DERIVE\_PARAMS\_PTR**

```
typedef CK_WTLS_MASTER_KEY_DERIVE_PARAMS CK_PTR CK_WTLS_MASTER_KEY_DERIVE_PARAMS_PTR
```

**10.181.2.174 CK\_WTLS\_PRF\_PARAMS**

```
typedef struct CK_WTLS_PRF_PARAMS CK_WTLS_PRF_PARAMS
```

**10.181.2.175 CK\_WTLS\_PRF\_PARAMS\_PTR**

```
typedef CK_WTLS_PRF_PARAMS CK_PTR CK_WTLS_PRF_PARAMS_PTR
```

**10.181.2.176 CK\_WTLS\_RANDOM\_DATA**

```
typedef struct CK_WTLS_RANDOM_DATA CK_WTLS_RANDOM_DATA
```

**10.181.2.177 CK\_WTLS\_RANDOM\_DATA\_PTR**

```
typedef CK_WTLS_RANDOM_DATA CK_PTR CK_WTLS_RANDOM_DATA_PTR
```

**10.181.2.178 CK\_X9\_42\_DH1\_DERIVE\_PARAMS**

```
typedef struct CK_X9_42_DH1_DERIVE_PARAMS CK_X9_42_DH1_DERIVE_PARAMS
```

**10.181.2.179 CK\_X9\_42\_DH1\_DERIVE\_PARAMS\_PTR**

```
typedef struct CK_X9_42_DH1_DERIVE_PARAMS CK_PTR CK_X9_42_DH1_DERIVE_PARAMS_PTR
```

### 10.181.2.180 CK\_X9\_42\_DH2\_DERIVE\_PARAMS

```
typedef struct CK_X9_42_DH2_DERIVE_PARAMS CK_X9_42_DH2_DERIVE_PARAMS
```

### 10.181.2.181 CK\_X9\_42\_DH2\_DERIVE\_PARAMS\_PTR

```
typedef CK_X9_42_DH2_DERIVE_PARAMS CK_PTR CK_X9_42_DH2_DERIVE_PARAMS_PTR
```

### 10.181.2.182 CK\_X9\_42\_DH\_KDF\_TYPE

```
typedef CK_ULONG CK_X9_42_DH_KDF_TYPE
```

### 10.181.2.183 CK\_X9\_42\_DH\_KDF\_TYPE\_PTR

```
typedef CK_X9_42_DH_KDF_TYPE CK_PTR CK_X9_42_DH_KDF_TYPE_PTR
```

### 10.181.2.184 CK\_X9\_42\_MQV\_DERIVE\_PARAMS

```
typedef struct CK_X9_42_MQV_DERIVE_PARAMS CK_X9_42_MQV_DERIVE_PARAMS
```

### 10.181.2.185 CK\_X9\_42\_MQV\_DERIVE\_PARAMS\_PTR

```
typedef CK_X9_42_MQV_DERIVE_PARAMS CK_PTR CK_X9_42_MQV_DERIVE_PARAMS_PTR
```

### 10.181.2.186 event

```
typedef CK_NOTIFICATION event
```

### 10.181.2.187 pApplication

```
typedef CK_NOTIFICATION CK_VOID_PTR pApplication
```

### 10.181.3 Function Documentation

#### 10.181.3.1 CK\_CALLBACK\_FUNCTION() [1/5]

```
typedef CK_CALLBACK_FUNCTION (
    CK_RV ,
    CK_CREATEMUTEX )
```

#### 10.181.3.2 CK\_CALLBACK\_FUNCTION() [2/5]

```
typedef CK_CALLBACK_FUNCTION (
    CK_RV ,
    CK_DESTROYMUTEX )
```

#### 10.181.3.3 CK\_CALLBACK\_FUNCTION() [3/5]

```
typedef CK_CALLBACK_FUNCTION (
    CK_RV ,
    CK_LOCKMUTEX )
```

#### 10.181.3.4 CK\_CALLBACK\_FUNCTION() [4/5]

```
typedef CK_CALLBACK_FUNCTION (
    CK_RV ,
    CK_NOTIFY )
```

#### 10.181.3.5 CK\_CALLBACK\_FUNCTION() [5/5]

```
typedef CK_CALLBACK_FUNCTION (
    CK_RV ,
    CK_UNLOCKMUTEX )
```

**10.182 README.md File Reference****10.183 README.md File Reference****10.184 README.md File Reference****10.185 README.md File Reference****10.186 README.md File Reference****10.187 README.md File Reference****10.188 README.md File Reference****10.189 README.md File Reference****10.190 README.md File Reference****10.191 README.md File Reference****10.192 readme.md File Reference****10.193 secure\_boot.c File Reference**

Provides required APIs to manage secure boot under various scenarios.

```
#include <string.h>
#include "secure_boot.h"
#include "io_protection_key.h"
#include "basic/atca_basic.h"
```

**Functions**

- [ATCA\\_STATUS secure\\_boot\\_process](#) (void)  
*Handles secure boot functionality through initialization, execution, and de-initialization.*
- [ATCA\\_STATUS bind\\_host\\_and\\_secure\\_element\\_with\\_io\\_protection](#) (uint16\_t slot)  
*Binds host MCU and Secure element with IO protection key.*

### 10.193.1 Detailed Description

Provides required APIs to manage secure boot under various scenarios.

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### 10.193.2 Function Documentation

#### 10.193.2.1 `bind_host_and_secure_element_with_io_protection()`

```
ATCA_STATUS bind_host_and_secure_element_with_io_protection (
    uint16_t slot )
```

Binds host MCU and Secure element with IO protection key.

#### Parameters

<code>in</code>	<code>slot</code>	The slot number of IO protection Key.
-----------------	-------------------	---------------------------------------

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

#### 10.193.2.2 `secure_boot_process()`

```
ATCA_STATUS secure_boot_process (
    void )
```

Handles secure boot functionality through initialization, execution, and de-initialization.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 10.194 `secure_boot.h` File Reference

Provides required APIs to manage secure boot under various scenarios.

```
#include "atca_status.h"
#include "secure_boot_memory.h"
#include "atca_command.h"
#include "crypto/atca_crypto_sw_sha2.h"
```

### Data Structures

- struct [secure\\_boot\\_config\\_bits](#)
- struct [secure\\_boot\\_parameters](#)

### Macros

- `#define SECURE_BOOT_CONFIG_DISABLE 0`
- `#define SECURE_BOOT_CONFIG_FULL_BOTH 1`
- `#define SECURE_BOOT_CONFIG_FULL_SIGN 2`
- `#define SECURE_BOOT_CONFIG_FULL_DIG 3`
- `#define SECURE_BOOT_CONFIGURATION SECURE_BOOT_CONFIG_FULL_DIG`
- `#define SECURE_BOOT_DIGEST_ENCRYPT_ENABLED true`
- `#define SECURE_BOOT_UPGRADE_SUPPORT true`

### Functions

- [ATCA\\_STATUS secure\\_boot\\_process](#) (void)  
*Handles secure boot functionality through initialization, execution, and de-initialization.*
- [ATCA\\_STATUS bind\\_host\\_and\\_secure\\_element\\_with\\_io\\_protection](#) (uint16\_t slot)  
*Binds host MCU and Secure element with IO protection key.*
- [ATCA\\_STATUS host\\_generate\\_random\\_number](#) (uint8\_t \*rand)

### 10.194.1 Detailed Description

Provides required APIs to manage secure boot under various scenarios.

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### 10.194.2 Macro Definition Documentation

#### 10.194.2.1 SECURE\_BOOT\_CONFIG\_DISABLE

```
#define SECURE_BOOT_CONFIG_DISABLE 0
```

#### 10.194.2.2 SECURE\_BOOT\_CONFIG\_FULL\_BOTH

```
#define SECURE_BOOT_CONFIG_FULL_BOTH 1
```

### 10.194.2.3 SECURE\_BOOT\_CONFIG\_FULL\_DIG

```
#define SECURE_BOOT_CONFIG_FULL_DIG 3
```

### 10.194.2.4 SECURE\_BOOT\_CONFIG\_FULL\_SIGN

```
#define SECURE_BOOT_CONFIG_FULL_SIGN 2
```

### 10.194.2.5 SECURE\_BOOT\_CONFIGURATION

```
#define SECURE_BOOT_CONFIGURATION SECURE_BOOT_CONFIG_FULL_DIG
```

### 10.194.2.6 SECURE\_BOOT\_DIGEST\_ENCRYPT\_ENABLED

```
#define SECURE_BOOT_DIGEST_ENCRYPT_ENABLED true
```

### 10.194.2.7 SECURE\_BOOT\_UPGRADE\_SUPPORT

```
#define SECURE_BOOT_UPGRADE_SUPPORT true
```

## 10.194.3 Function Documentation

### 10.194.3.1 bind\_host\_and\_secure\_element\_with\_io\_protection()

```
ATCA_STATUS bind_host_and_secure_element_with_io_protection (
    uint16_t slot )
```

Binds host MCU and Secure element with IO protection key.

#### Parameters

in	slot	The slot number of IO protection Key.
----	------	---------------------------------------

## 10.195 secure\_boot\_memory.h File Reference

---

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.194.3.2 host\_generate\_random\_number()

```
ATCA_STATUS host_generate_random_number (
    uint8_t * rand )
```

### 10.194.3.3 secure\_boot\_process()

```
ATCA_STATUS secure_boot_process (
    void )
```

Handles secure boot functionality through initialization, execution, and de-initialization.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

## 10.195 secure\_boot\_memory.h File Reference

Provides interface to memory component for the secure boot.

```
#include "atca_status.h"
#include "atca_command.h"
```

### Data Structures

- struct [memory\\_parameters](#)

### Functions

- [ATCA\\_STATUS secure\\_boot\\_init\\_memory](#) ([memory\\_parameters](#) \*memory\_params)
- [ATCA\\_STATUS secure\\_boot\\_read\\_memory](#) (uint8\_t \*pu8\_data, uint32\_t \*pu32\_target\_length)
- [ATCA\\_STATUS secure\\_boot\\_write\\_memory](#) (uint8\_t \*pu8\_data, uint32\_t \*pu32\_target\_length)
- void [secure\\_boot\\_deinit\\_memory](#) ([memory\\_parameters](#) \*memory\_params)
- [ATCA\\_STATUS secure\\_boot\\_mark\\_full\\_copy\\_completion](#) (void)
- bool [secure\\_boot\\_check\\_full\\_copy\\_completion](#) (void)



### 10.195.1 Detailed Description

Provides interface to memory component for the secure boot.

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### 10.195.2 Function Documentation

#### 10.195.2.1 `secure_boot_check_full_copy_completion()`

```
bool secure_boot_check_full_copy_completion (
    void )
```

#### 10.195.2.2 `secure_boot_deinit_memory()`

```
void secure_boot_deinit_memory (
    memory_parameters * memory_params )
```

#### 10.195.2.3 `secure_boot_init_memory()`

```
ATCA_STATUS secure_boot_init_memory (
    memory_parameters * memory_params )
```

#### 10.195.2.4 `secure_boot_mark_full_copy_completion()`

```
ATCA_STATUS secure_boot_mark_full_copy_completion (
    void )
```

#### 10.195.2.5 `secure_boot_read_memory()`

```
ATCA_STATUS secure_boot_read_memory (
    uint8_t * pu8_data,
    uint32_t * pu32_target_length )
```

### 10.195.2.6 secure\_boot\_write\_memory()

```
ATCA_STATUS secure_boot_write_memory (
    uint8_t * pu8_data,
    uint32_t * pu32_target_length )
```

## 10.196 sha1\_routines.c File Reference

Software implementation of the SHA1 algorithm.

```
#include "sha1_routines.h"
#include <string.h>
#include "atca_compiler.h"
#include "cryptoauthlib.h"
```

### 10.196.1 Detailed Description

Software implementation of the SHA1 algorithm.

#### Copyright

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## 10.197 sha1\_routines.h File Reference

Software implementation of the SHA1 algorithm.

```
#include <stdio.h>
#include <stdlib.h>
#include <stddef.h>
#include <stdint.h>
```

### Data Structures

- struct [CL\\_HashContext](#)

### Macros

- #define [U8](#) uint8\_t
- #define [U16](#) uint16\_t
- #define [U32](#) uint32\_t
- #define [memcpy\\_P](#) memmove
- #define [strcpy\\_P](#) strcpy
- #define [\\_WDRESET](#)()
- #define [\\_NOP](#)()
- #define [leftRotate](#)(x, n) (x) = (((x) << (n)) | ((x) >> (32 - (n))))

## Functions

- void [shaEngine](#) (uint32\_t \*buf, uint32\_t \*h)
- void [CL\\_hashInit](#) ([CL\\_HashContext](#) \*ctx)
- void [CL\\_hashUpdate](#) ([CL\\_HashContext](#) \*ctx, const uint8\_t \*src, int nbytes)
- void [CL\\_hashFinal](#) ([CL\\_HashContext](#) \*ctx, uint8\_t \*dest)
- void [CL\\_hash](#) (uint8\_t \*msg, int msgBytes, uint8\_t \*dest)

### 10.197.1 Detailed Description

Software implementation of the SHA1 algorithm.

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### 10.197.2 Macro Definition Documentation

#### 10.197.2.1 \_NOP

```
#define _NOP( )
```

#### 10.197.2.2 \_WDRESET

```
#define _WDRESET( )
```

#### 10.197.2.3 leftRotate

```
#define leftRotate(  
    x,  
    n ) (x) = (((x) << (n)) | ((x) >> (32 - (n))))
```

#### 10.197.2.4 memcpy\_P

```
#define memcpy_P memmove
```

### 10.197.2.5 strcpy\_P

```
#define strcpy_P strcpy
```

### 10.197.2.6 U16

```
#define U16 uint16_t
```

### 10.197.2.7 U32

```
#define U32 uint32_t
```

### 10.197.2.8 U8

```
#define U8 uint8_t
```

## 10.197.3 Function Documentation

### 10.197.3.1 CL\_hash()

```
void CL_hash (
    uint8_t * msg,
    int msgBytes,
    uint8_t * dest )
```

### 10.197.3.2 CL\_hashFinal()

```
void CL_hashFinal (
    CL_HashContext * ctx,
    uint8_t * dest )
```

### 10.197.3.3 CL\_hashInit()

```
void CL_hashInit (
    CL_HashContext * ctx )
```

### 10.197.3.4 CL\_hashUpdate()

```
void CL_hashUpdate (
    CL_HashContext * ctx,
    const uint8_t * src,
    int nbytes )
```

### 10.197.3.5 shaEngine()

```
void shaEngine (
    uint32_t * buf,
    uint32_t * h )
```

## 10.198 sha2\_routines.c File Reference

Software implementation of the SHA256 algorithm.

```
#include "cryptoauthlib.h"
#include "sha2_routines.h"
```

### Macros

- #define `rotate_right`(value, places) ((value >> places) | (value << (32 - places)))

### 10.198.1 Detailed Description

Software implementation of the SHA256 algorithm.

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### 10.198.2 Macro Definition Documentation

### 10.198.2.1 rotate\_right

```
#define rotate_right(  
    value,  
    places ) ((value >> places) | (value << (32 - places)))
```

## 10.199 sha2\_routines.h File Reference

Software implementation of the SHA256 algorithm.

```
#include <stdint.h>
```

### Data Structures

- struct [sw\\_sha256\\_ctx](#)

### Macros

- #define [SHA256\\_DIGEST\\_SIZE](#) (32)
- #define [SHA256\\_BLOCK\\_SIZE](#) (64)

### Functions

- void [sw\\_sha256\\_init](#) ([sw\\_sha256\\_ctx](#) \*ctx)
- void [sw\\_sha256\\_update](#) ([sw\\_sha256\\_ctx](#) \*ctx, const uint8\_t \*message, uint32\_t len)
- void [sw\\_sha256\\_final](#) ([sw\\_sha256\\_ctx](#) \*ctx, uint8\_t digest[(32)])
- void [sw\\_sha256](#) (const uint8\_t \*message, unsigned int len, uint8\_t digest[(32)])

### 10.199.1 Detailed Description

Software implementation of the SHA256 algorithm.

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### 10.199.2 Macro Definition Documentation

#### 10.199.2.1 SHA256\_BLOCK\_SIZE

```
#define SHA256_BLOCK_SIZE (64)
```

### 10.199.2.2 SHA256\_DIGEST\_SIZE

```
#define SHA256_DIGEST_SIZE (32)
```

## 10.199.3 Function Documentation

### 10.199.3.1 sw\_sha256()

```
void sw_sha256 (
    const uint8_t * message,
    unsigned int len,
    uint8_t digest[(32)] )
```

### 10.199.3.2 sw\_sha256\_final()

```
void sw_sha256_final (
    sw_sha256_ctx * ctx,
    uint8_t digest[(32)] )
```

### 10.199.3.3 sw\_sha256\_init()

```
void sw_sha256_init (
    sw_sha256_ctx * ctx )
```

### 10.199.3.4 sw\_sha256\_update()

```
void sw_sha256_update (
    sw_sha256_ctx * ctx,
    const uint8_t * message,
    uint32_t len )
```

## 10.200 swi\_uart\_samd21\_asf.c File Reference

ATXMEGA's ATCA Hardware abstraction layer for SWI interface over UART drivers.

```
#include <stdlib.h>
#include <stdio.h>
#include "swi_uart_samd21_asf.h"
#include "atca_helpers.h"
```

### Functions

- [ATCA\\_STATUS swi\\_uart\\_init](#) ([ATCASWIMaster\\_t](#) \*instance)  
*Implementation of SWI UART init.*
- [ATCA\\_STATUS swi\\_uart\\_deinit](#) ([ATCASWIMaster\\_t](#) \*instance)  
*Implementation of SWI UART deinit.*
- void [swi\\_uart\\_setbaud](#) ([ATCASWIMaster\\_t](#) \*instance, uint32\_t baudrate)  
*implementation of SWI UART change baudrate.*
- void [swi\\_uart\\_mode](#) ([ATCASWIMaster\\_t](#) \*instance, uint8\_t mode)  
*implementation of SWI UART change mode.*
- void [swi\\_uart\\_discover\\_buses](#) (int swi\_uart\_buses[], int max\_buses)  
*discover UART buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-priori knowledge*
- [ATCA\\_STATUS swi\\_uart\\_send\\_byte](#) ([ATCASWIMaster\\_t](#) \*instance, uint8\_t data)  
*HAL implementation of SWI UART send byte over ASF. This function send one byte over UART.*
- [ATCA\\_STATUS swi\\_uart\\_receive\\_byte](#) ([ATCASWIMaster\\_t](#) \*instance, uint8\_t \*data)  
*HAL implementation of SWI UART receive bytes over ASF. This function receive one byte over UART.*

### Variables

- struct port\_config [pin\\_conf](#)

### 10.200.1 Detailed Description

ATXMEGA's ATCA Hardware abstraction layer for SWI interface over UART drivers.

Prerequisite: add UART Polled support to application in Atmel Studio

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## 10.201 swi\_uart\_samd21\_asf.h File Reference

ATXMEGA's ATCA Hardware abstraction layer for SWI interface over UART drivers.

```
#include <asf.h>
#include "cryptoauthlib.h"
```

### Data Structures

- struct [atcaSWImaster](#)  
*this is the hal\_data for ATCA HAL for ASF SERCOM*



## Macros

- #define `MAX_SWI_BUSES` 6
- #define `RECEIVE_MODE` 0
- #define `TRANSMIT_MODE` 1
- #define `RX_DELAY` 10
- #define `TX_DELAY` 90
- #define `DEBUG_PIN_1` EXT2\_PIN\_5
- #define `DEBUG_PIN_2` EXT2\_PIN\_6

## Typedefs

- typedef struct `atcaSWImaster ATCASWIMaster_t`  
*this is the hal\_data for ATCA HAL for ASF SERCOM*

## Functions

- `ATCA_STATUS swi_uart_init (ATCASWIMaster_t *instance)`  
*Implementation of SWI UART init.*
- `ATCA_STATUS swi_uart_deinit (ATCASWIMaster_t *instance)`  
*Implementation of SWI UART deinit.*
- void `swi_uart_setbaud (ATCASWIMaster_t *instance, uint32_t baudrate)`  
*implementation of SWI UART change baudrate.*
- void `swi_uart_mode (ATCASWIMaster_t *instance, uint8_t mode)`  
*implementation of SWI UART change mode.*
- void `swi_uart_discover_buses (int swi_uart_buses[], int max_buses)`  
*discover UART buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-priori knowledge*
- `ATCA_STATUS swi_uart_send_byte (ATCASWIMaster_t *instance, uint8_t data)`  
*HAL implementation of SWI UART send byte over ASF. This function send one byte over UART.*
- `ATCA_STATUS swi_uart_receive_byte (ATCASWIMaster_t *instance, uint8_t *data)`  
*HAL implementation of SWI UART receive bytes over ASF. This function receive one byte over UART.*

### 10.201.1 Detailed Description

ATXMEGA's ATCA Hardware abstraction layer for SWI interface over UART drivers.

Prerequisite: add UART Polled support to application in Atmel Studio

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## 10.202 swi\_uart\_start.c File Reference

```
#include <stdlib.h>
#include <stdio.h>
#include <peripheral_clk_config.h>
#include "swi_uart_start.h"
#include "atca_helpers.h"
```

### Macros

- #define [USART\\_BAUD\\_RATE](#)(baud, sercom\_freq) (65536 - ((65536 \* 16.0F \* baud) / sercom\_freq))

### Functions

- [ATCA\\_STATUS swi\\_uart\\_init](#) (ATCASWIMaster\_t \*instance)  
*Implementation of SWI UART init.*
- [ATCA\\_STATUS swi\\_uart\\_deinit](#) (ATCASWIMaster\_t \*instance)  
*Implementation of SWI UART deinit.*
- void [swi\\_uart\\_setbaud](#) (ATCASWIMaster\_t \*instance, uint32\_t baudrate)  
*implementation of SWI UART change baudrate.*
- void [swi\\_uart\\_mode](#) (ATCASWIMaster\_t \*instance, uint8\_t mode)  
*implementation of SWI UART change mode.*
- void [swi\\_uart\\_discover\\_buses](#) (int swi\_uart\_buses[], int max\_buses)  
*discover UART buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-priori knowledge*
- [ATCA\\_STATUS swi\\_uart\\_send\\_byte](#) (ATCASWIMaster\_t \*instance, uint8\_t data)  
*HAL implementation of SWI UART send byte over ASF. This function send one byte over UART.*
- [ATCA\\_STATUS swi\\_uart\\_receive\\_byte](#) (ATCASWIMaster\_t \*instance, uint8\_t \*data)  
*HAL implementation of SWI UART receive bytes over ASF. This function receive one byte over UART.*

### 10.202.1 Detailed Description

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### 10.202.2 Macro Definition Documentation

#### 10.202.2.1 USART\_BAUD\_RATE

```
#define USART_BAUD_RATE(  
    baud,  
    sercom_freq ) (65536 - ((65536 * 16.0F * baud) / sercom_freq))
```

## 10.203 swi\_uart\_start.h File Reference

```
#include <stdlib.h>  
#include "atmel_start.h"  
#include "cryptoauthlib.h"
```

## Data Structures

- struct [atcaSWImaster](#)  
*this is the hal\_data for ATCA HAL for ASF SERCOM*

## Macros

- #define [MAX\\_SWI\\_BUSES](#) 6
- #define [RECEIVE\\_MODE](#) 0
- #define [TRANSMIT\\_MODE](#) 1
- #define [RX\\_DELAY](#) 10
- #define [TX\\_DELAY](#) 93

## Typedefs

- typedef struct [atcaSWImaster](#) [ATCASWIMaster\\_t](#)  
*this is the hal\_data for ATCA HAL for ASF SERCOM*

## Functions

- [ATCA\\_STATUS swi\\_uart\\_init](#) ([ATCASWIMaster\\_t](#) \*instance)  
*Implementation of SWI UART init.*
- [ATCA\\_STATUS swi\\_uart\\_deinit](#) ([ATCASWIMaster\\_t](#) \*instance)  
*Implementation of SWI UART deinit.*
- void [swi\\_uart\\_setbaud](#) ([ATCASWIMaster\\_t](#) \*instance, uint32\_t baudrate)  
*implementation of SWI UART change baudrate.*
- void [swi\\_uart\\_mode](#) ([ATCASWIMaster\\_t](#) \*instance, uint8\_t mode)  
*implementation of SWI UART change mode.*
- void [swi\\_uart\\_discover\\_buses](#) (int swi\_uart\_buses[], int max\_buses)  
*discover UART buses available for this hardware this maintains a list of logical to physical bus mappings freeing the application of the a-priori knowledge*
- [ATCA\\_STATUS swi\\_uart\\_send\\_byte](#) ([ATCASWIMaster\\_t](#) \*instance, uint8\_t data)  
*HAL implementation of SWI UART send byte over ASF. This function send one byte over UART.*
- [ATCA\\_STATUS swi\\_uart\\_receive\\_byte](#) ([ATCASWIMaster\\_t](#) \*instance, uint8\_t \*data)  
*HAL implementation of SWI UART receive bytes over ASF. This function receive one byte over UART.*

### 10.203.1 Detailed Description

#### Copyright

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## 10.204 symmetric\_authentication.c File Reference

Contains API for performing the symmetric Authentication between the Host and the device.

```
#include "cryptoauthlib.h"
#include "host/atca_host.h"
#include "symmetric_authentication.h"
```

### Functions

- [ATCA\\_STATUS symmetric\\_authenticate](#) (uint8\_t slot, const uint8\_t \*master\_key, const uint8\_t \*rand\_↔ number)

*Function which does the authentication between the host and device.*

### 10.204.1 Detailed Description

Contains API for performing the symmetric Authentication between the Host and the device.

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### 10.204.2 Function Documentation

#### 10.204.2.1 symmetric\_authenticate()

```
ATCA_STATUS symmetric_authenticate (
    uint8_t slot,
    const uint8_t * master_key,
    const uint8_t * rand_number )
```

Function which does the authentication between the host and device.

#### Parameters

in	<i>slot</i>	The slot number used for the symmetric authentication.
in	<i>master_key</i>	The master key used for the calculating the symmetric key.
in	<i>rand_number</i>	The 20 byte rand_number from the host.

#### Returns

ATCA\_SUCCESS on successful authentication, otherwise an error code.

## 10.205 symmetric\_authentication.h File Reference

Contains API for performing the symmetric Authentication between the Host and the device.

```
#include "cryptoauthlib.h"
```

### Functions

- [ATCA\\_STATUS symmetric\\_authenticate](#) (uint8\_t slot, const uint8\_t \*master\_key, const uint8\_t \*rand\_↔ number)

*Function which does the authentication between the host and device.*

### 10.205.1 Detailed Description

Contains API for performing the symmetric Authentication between the Host and the device.

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### 10.205.2 Function Documentation

#### 10.205.2.1 symmetric\_authenticate()

```
ATCA_STATUS symmetric_authenticate (
    uint8_t slot,
    const uint8_t * master_key,
    const uint8_t * rand_number )
```

Function which does the authentication between the host and device.

#### Parameters

in	<i>slot</i>	The slot number used for the symmetric authentication.
in	<i>master_key</i>	The master key used for the calculating the symmetric key.
in	<i>rand_number</i>	The 20 byte rand_number from the host.

#### Returns

ATCA\_SUCCESS on successful authentication, otherwise an error code.

## 10.206 tflxtls\_cert\_def\_4\_device.c File Reference

TNG TLS device certificate definition.

```
#include "atcacert/atcacert_def.h"
#include "tngtls_cert_def_1_signer.h"
```

#### Variables

- const uint8\_t [g\\_tflxtls\\_cert\\_template\\_4\\_device](#) [500]
- const [atcacert\\_cert\\_element\\_t](#) [g\\_tflxtls\\_cert\\_elements\\_4\\_device](#) []
- const [atcacert\\_def\\_t](#) [g\\_tflxtls\\_cert\\_def\\_4\\_device](#)

### 10.206.1 Detailed Description

TNG TLS device certificate definition.

#### Copyright

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### 10.206.2 Variable Documentation

#### 10.206.2.1 g\_tflxtls\_cert\_elements\_4\_device

```
const atccert_cert_element_t g_tflxtls_cert_elements_4_device[ ]
```

#### 10.206.2.2 g\_tflxtls\_cert\_template\_4\_device

```
const uint8_t g_tflxtls_cert_template_4_device[500]
```

## 10.207 tflxtls\_cert\_def\_4\_device.h File Reference

TNG TLS device certificate definition.

```
#include "atccert/atccert_def.h"
```

### Variables

- const [atccert\\_def\\_t g\\_tflxtls\\_cert\\_def\\_4\\_device](#)

### 10.207.1 Detailed Description

TNG TLS device certificate definition.

#### Copyright

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## 10.208 tng\_atca.c File Reference

TNG Helper Functions.

```
#include <string.h>
#include "cryptoauthlib.h"
#include "tng_atca.h"
#include "tnglora_cert_def_2_device.h"
#include "tnglora_cert_def_4_device.h"
#include "tngtls_cert_def_2_device.h"
#include "tngtls_cert_def_3_device.h"
#include "tflxtls_cert_def_4_device.h"
#include "atcacert/atcacert_def.h"
```

### Data Structures

- struct [tng\\_cert\\_map\\_element](#)

### Functions

- const [atcacert\\_def\\_t](#) \* [tng\\_map\\_get\\_device\\_cert\\_def](#) (int index)  
*Helper function to iterate through all trust cert definitions.*
- [ATCA\\_STATUS](#) [tng\\_get\\_device\\_cert\\_def](#) (const [atcacert\\_def\\_t](#) \*\*cert\_def)  
*Get the TNG device certificate definition.*
- [ATCA\\_STATUS](#) [tng\\_get\\_device\\_pubkey](#) (uint8\_t \*public\_key)  
*Uses GenKey command to calculate the public key from the primary device public key.*

### 10.208.1 Detailed Description

TNG Helper Functions.

#### Copyright

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## 10.209 tng\_atca.h File Reference

TNG Helper Functions.

```
#include "atca_basic.h"
#include "atcacert/atcacert_def.h"
```

### Functions

- const [atcacert\\_def\\_t](#) \* [tng\\_map\\_get\\_device\\_cert\\_def](#) (int index)  
*Helper function to iterate through all trust cert definitions.*
- [ATCA\\_STATUS](#) [tng\\_get\\_device\\_cert\\_def](#) (const [atcacert\\_def\\_t](#) \*\*cert\_def)  
*Get the TNG device certificate definition.*
- [ATCA\\_STATUS](#) [tng\\_get\\_device\\_pubkey](#) (uint8\_t \*public\_key)  
*Uses GenKey command to calculate the public key from the primary device public key.*

### 10.209.1 Detailed Description

TNG Helper Functions.

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## 10.210 tng\_atcacert\_client.c File Reference

Client side certificate I/O functions for TNG devices.

```
#include "tng_atca.h"
#include "atcacert/atcacert_client.h"
#include "tng_atcacert_client.h"
#include "tngtls_cert_def_l_signer.h"
#include "tng_root_cert.h"
```

### Functions

- int [tng\\_atcacert\\_max\\_device\\_cert\\_size](#) (size\_t \*max\_cert\_size)  
*Return the maximum possible certificate size in bytes for a TNG device certificate. Certificate can be variable size, so this gives an appropriate buffer size when reading the certificate.*
- int [tng\\_atcacert\\_read\\_device\\_cert](#) (uint8\_t \*cert, size\_t \*cert\_size, const uint8\_t \*signer\_cert)  
*Reads the device certificate for a TNG device.*
- int [tng\\_atcacert\\_device\\_public\\_key](#) (uint8\_t \*public\_key, uint8\_t \*cert)  
*Reads the device public key.*
- int [tng\\_atcacert\\_max\\_signer\\_cert\\_size](#) (size\_t \*max\_cert\_size)  
*Return the maximum possible certificate size in bytes for a TNG signer certificate. Certificate can be variable size, so this gives an appropriate buffer size when reading the certificate.*
- int [tng\\_atcacert\\_read\\_signer\\_cert](#) (uint8\_t \*cert, size\_t \*cert\_size)  
*Reads the signer certificate for a TNG device.*
- int [tng\\_atcacert\\_signer\\_public\\_key](#) (uint8\_t \*public\_key, uint8\_t \*cert)  
*Reads the signer public key.*
- int [tng\\_atcacert\\_root\\_cert\\_size](#) (size\_t \*cert\_size)  
*Get the size of the TNG root cert.*
- int [tng\\_atcacert\\_root\\_cert](#) (uint8\_t \*cert, size\_t \*cert\_size)  
*Get the TNG root cert.*
- int [tng\\_atcacert\\_root\\_public\\_key](#) (uint8\_t \*public\_key)  
*Gets the root public key.*



### 10.210.1 Detailed Description

Client side certificate I/O functions for TNG devices.

#### Copyright

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### 10.210.2 Function Documentation

#### 10.210.2.1 tng\_atcacert\_device\_public\_key()

```
int tng_atcacert_device_public_key (
    uint8_t * public_key,
    uint8_t * cert )
```

Reads the device public key.

#### Parameters

out	<i>public_key</i>	Public key will be returned here. Format will be the X and Y integers in big-endian format. 64 bytes for P256 curve.
in	<i>cert</i>	If supplied, the device public key is used from this certificate. If set to NULL, the device public key is read from the device.

#### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 10.210.2.2 tng\_atcacert\_max\_signer\_cert\_size()

```
int tng_atcacert_max_signer_cert_size (
    size_t * max_cert_size )
```

Return the maximum possible certificate size in bytes for a TNG signer certificate. Certificate can be variable size, so this gives an appropriate buffer size when reading the certificate.

#### Parameters

out	<i>max_cert_size</i>	Maximum certificate size will be returned here in bytes.
-----	----------------------	--

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

### 10.210.2.3 tng\_atcacert\_read\_device\_cert()

```
int tng_atcacert_read_device_cert (
    uint8_t * cert,
    size_t * cert_size,
    const uint8_t * signer_cert )
```

Reads the device certificate for a TNG device.

#### Parameters

out	<i>cert</i>	Buffer to received the certificate (DER format).
in, out	<i>cert_size</i>	As input, the size of the cert buffer in bytes. As output, the size of the certificate returned in cert in bytes.
in	<i>signer_cert</i>	If supplied, the signer public key is used from this certificate. If set to NULL, the signer public key is read from the device.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

### 10.210.2.4 tng\_atcacert\_read\_signer\_cert()

```
int tng_atcacert_read_signer_cert (
    uint8_t * cert,
    size_t * cert_size )
```

Reads the signer certificate for a TNG device.

#### Parameters

out	<i>cert</i>	Buffer to received the certificate (DER format).
in, out	<i>cert_size</i>	As input, the size of the cert buffer in bytes. As output, the size of the certificate returned in cert in bytes.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 10.210.2.5 tng\_atcacert\_root\_cert()

```
int tng_atcacert_root_cert (
    uint8_t * cert,
    size_t * cert_size )
```

Get the TNG root cert.

##### Parameters

out	<i>cert</i>	Buffer to received the certificate (DER format).
in, out	<i>cert_size</i>	As input, the size of the cert buffer in bytes. As output, the size of the certificate returned in cert in bytes.

##### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 10.210.2.6 tng\_atcacert\_root\_cert\_size()

```
int tng_atcacert_root_cert_size (
    size_t * cert_size )
```

Get the size of the TNG root cert.

##### Parameters

out	<i>cert_size</i>	Certificate size will be returned here in bytes.
-----	------------------	--

##### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

#### 10.210.2.7 tng\_atcacert\_root\_public\_key()

```
int tng_atcacert_root_public_key (
    uint8_t * public_key )
```

Gets the root public key.

##### Parameters

out	<i>public_key</i>	Public key will be returned here. Format will be the X and Y integers in big-endian format. 64 bytes for P256 curve.
-----	-------------------	--

## 10.211 tng\_atcacert\_client.h File Reference

---

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

### 10.210.2.8 tng\_atcacert\_signer\_public\_key()

```
int tng_atcacert_signer_public_key (
    uint8_t * public_key,
    uint8_t * cert )
```

Reads the signer public key.

### Parameters

out	<i>public_key</i>	Public key will be returned here. Format will be the X and Y integers in big-endian format. 64 bytes for P256 curve.
in	<i>cert</i>	If supplied, the signer public key is used from this certificate. If set to NULL, the signer public key is read from the device.

### Returns

ATCACERT\_E\_SUCCESS on success, otherwise an error code.

## 10.211 tng\_atcacert\_client.h File Reference

Client side certificate I/O functions for TNG devices.

```
#include <stdint.h>
#include "atcacert/atcacert.h"
```

## Functions

- int [tng\\_atcacert\\_max\\_device\\_cert\\_size](#) (size\_t \*max\_cert\_size)  
*Return the maximum possible certificate size in bytes for a TNG device certificate. Certificate can be variable size, so this gives an appropriate buffer size when reading the certificate.*
- int [tng\\_atcacert\\_read\\_device\\_cert](#) (uint8\_t \*cert, size\_t \*cert\_size, const uint8\_t \*signer\_cert)  
*Reads the device certificate for a TNG device.*
- int [tng\\_atcacert\\_device\\_public\\_key](#) (uint8\_t \*public\_key, uint8\_t \*cert)  
*Reads the device public key.*
- int [tng\\_atcacert\\_max\\_signer\\_cert\\_size](#) (size\_t \*max\_cert\_size)  
*Return the maximum possible certificate size in bytes for a TNG signer certificate. Certificate can be variable size, so this gives an appropriate buffer size when reading the certificate.*
- int [tng\\_atcacert\\_read\\_signer\\_cert](#) (uint8\_t \*cert, size\_t \*cert\_size)

*Reads the signer certificate for a TNG device.*

- int [tng\\_atcacert\\_signer\\_public\\_key](#) (uint8\_t \*public\_key, uint8\_t \*cert)

*Reads the signer public key.*

- int [tng\\_atcacert\\_root\\_cert\\_size](#) (size\_t \*cert\_size)

*Get the size of the TNG root cert.*

- int [tng\\_atcacert\\_root\\_cert](#) (uint8\_t \*cert, size\_t \*cert\_size)

*Get the TNG root cert.*

- int [tng\\_atcacert\\_root\\_public\\_key](#) (uint8\_t \*public\_key)

*Gets the root public key.*

### 10.211.1 Detailed Description

Client side certificate I/O functions for TNG devices.

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## 10.212 tng\_root\_cert.c File Reference

TNG root certificate (DER)

```
#include <stdint.h>
#include <stddef.h>
```

### Variables

- const uint8\_t [g\\_cryptoauth\\_root\\_ca\\_002\\_cert](#) [501]
- const size\_t [g\\_cryptoauth\\_root\\_ca\\_002\\_cert\\_size](#) = sizeof([g\\_cryptoauth\\_root\\_ca\\_002\\_cert](#))

### 10.212.1 Detailed Description

TNG root certificate (DER)

#### Copyright

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### 10.212.2 Variable Documentation

## 10.213 tng\_root\_cert.h File Reference

---

### 10.212.2.1 g\_cryptoauth\_root\_ca\_002\_cert

```
const uint8_t g_cryptoauth_root_ca_002_cert[501]
```

### 10.212.2.2 g\_cryptoauth\_root\_ca\_002\_cert\_size

```
const size_t g_cryptoauth_root_ca_002_cert_size = sizeof(g_cryptoauth_root_ca_002_cert)
```

## 10.213 tng\_root\_cert.h File Reference

TNG root certificate (DER)

```
#include <stdint.h>
```

- #define [CRYPTOAUTH\\_ROOT\\_CA\\_002\\_PUBLIC\\_KEY\\_OFFSET](#) 266
- const uint8\_t [g\\_cryptoauth\\_root\\_ca\\_002\\_cert](#) []
- const size\_t [g\\_cryptoauth\\_root\\_ca\\_002\\_cert\\_size](#)

### 10.213.1 Detailed Description

TNG root certificate (DER)

#### Copyright

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## 10.214 tnglora\_cert\_def\_1\_signer.c File Reference

TNG LORA signer certificate definition.

```
#include "atcacert/atcacert_def.h"  
#include "tngtls_cert_def_1_signer.h"
```

### Variables

- const uint8\_t [g\\_tngtls\\_cert\\_template\\_1\\_signer](#) []
- const [atcacert\\_cert\\_element\\_t](#) [g\\_tngtls\\_cert\\_elements\\_1\\_signer](#) []
- [SHARED\\_LIB\\_EXPORT](#) const [atcacert\\_def\\_t](#) [g\\_tnglora\\_cert\\_def\\_1\\_signer](#)

### 10.214.1 Detailed Description

TNG LORA signer certificate definition.

#### Copyright

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### 10.214.2 Variable Documentation

#### 10.214.2.1 g\_tnglora\_cert\_def\_1\_signer

```
SHARED_LIB_EXPORT const atcacert_def_t g_tnglora_cert_def_1_signer
```

#### 10.214.2.2 g\_tngtls\_cert\_elements\_1\_signer

```
const atcacert_cert_element_t g_tngtls_cert_elements_1_signer[] [extern]
```

#### 10.214.2.3 g\_tngtls\_cert\_template\_1\_signer

```
const uint8_t g_tngtls_cert_template_1_signer[] [extern]
```

## 10.215 tnglora\_cert\_def\_1\_signer.h File Reference

TNG LORA signer certificate definition.

```
#include "atcacert/atcacert_def.h"
```

### Variables

- [ATCA\\_DLL](#) const [atcacert\\_def\\_t](#) [g\\_tnglora\\_cert\\_def\\_1\\_signer](#)

### 10.215.1 Detailed Description

TNG LORA signer certificate definition.

#### Copyright

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## 10.216 tnglora\_cert\_def\_2\_device.c File Reference

TNG LORA device certificate definition.

```
#include "atcacert/atcacert_def.h"
#include "tngtls_cert_def_2_device.h"
#include "tngtls_cert_def_1_signer.h"
#include "tnglora_cert_def_1_signer.h"
```

### Variables

- `const uint8_t g_tngtls_cert_template_2_device []`
- `const atcacert_cert_element_t g_tngtls_cert_elements_2_device []`
- `SHARED_LIB_EXPORT const atcacert_def_t g_tnglora_cert_def_2_device`

### 10.216.1 Detailed Description

TNG LORA device certificate definition.

#### Copyright

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### 10.216.2 Variable Documentation

#### 10.216.2.1 g\_tnglora\_cert\_def\_2\_device

```
SHARED_LIB_EXPORT const atcacert_def_t g_tnglora_cert_def_2_device
```

#### 10.216.2.2 g\_tngtls\_cert\_elements\_2\_device

```
const atcacert_cert_element_t g_tngtls_cert_elements_2_device[] [extern]
```



### 10.216.2.3 g\_tngtls\_cert\_template\_2\_device

```
const uint8_t g_tngtls_cert_template_2_device[] [extern]
```

## 10.217 tnglora\_cert\_def\_2\_device.h File Reference

TNG LORA device certificate definition.

```
#include "atcacert/atcacert_def.h"
```

### Variables

- [ATCA\\_DLL](#) const [atcacert\\_def\\_t g\\_tnglora\\_cert\\_def\\_2\\_device](#)

### 10.217.1 Detailed Description

TNG LORA device certificate definition.

#### Copyright

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## 10.218 tnglora\_cert\_def\_4\_device.c File Reference

TNG LORA device certificate definition.

```
#include "atcacert/atcacert_def.h"  
#include "tnglora_cert_def_4_device.h"  
#include "tnglora_cert_def_1_signer.h"
```

### Variables

- [SHARED\\_LIB\\_EXPORT](#) const uint8\_t [g\\_tnglora\\_cert\\_template\\_4\\_device](#) [552]
- [SHARED\\_LIB\\_EXPORT](#) const [atcacert\\_cert\\_element\\_t g\\_tnglora\\_cert\\_elements\\_4\\_device](#) []
- [SHARED\\_LIB\\_EXPORT](#) const [atcacert\\_def\\_t g\\_tnglora\\_cert\\_def\\_4\\_device](#)

### 10.218.1 Detailed Description

TNG LORA device certificate definition.

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### 10.218.2 Variable Documentation

#### 10.218.2.1 g\_tnglora\_cert\_def\_4\_device

```
SHARED_LIB_EXPORT const atcacert_def_t g_tnglora_cert_def_4_device
```

#### 10.218.2.2 g\_tnglora\_cert\_elements\_4\_device

```
SHARED_LIB_EXPORT const atcacert_cert_element_t g_tnglora_cert_elements_4_device[]
```

#### 10.218.2.3 g\_tnglora\_cert\_template\_4\_device

```
SHARED_LIB_EXPORT const uint8_t g_tnglora_cert_template_4_device[552]
```

## 10.219 tnglora\_cert\_def\_4\_device.h File Reference

TNG LORA device certificate definition.

```
#include "atcacert/atcacert_def.h"
```

- #define `TNGLORA_CERT_TEMPLATE_4_DEVICE_SIZE` 552
- `ATCA_DLL` const `atcacert_def_t` `g_tnglora_cert_def_4_device`

### 10.219.1 Detailed Description

TNG LORA device certificate definition.

#### Copyright

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## 10.220 tngtls\_cert\_def\_1\_signer.c File Reference

TNG TLS signer certificate definition.

```
#include "atcacert/atcacert_def.h"  
#include "tngtls_cert_def_1_signer.h"
```

## Variables

- [SHARED\\_LIB\\_EXPORT](#) const uint8\_t [g\\_tngtls\\_cert\\_template\\_1\\_signer](#) [520]
- [SHARED\\_LIB\\_EXPORT](#) const [atcacert\\_cert\\_element\\_t](#) [g\\_tngtls\\_cert\\_elements\\_1\\_signer](#) []
- [SHARED\\_LIB\\_EXPORT](#) const [atcacert\\_def\\_t](#) [g\\_tngtls\\_cert\\_def\\_1\\_signer](#)

### 10.220.1 Detailed Description

TNG TLS signer certificate definition.

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### 10.220.2 Variable Documentation

#### 10.220.2.1 [g\\_tngtls\\_cert\\_def\\_1\\_signer](#)

```
SHARED_LIB_EXPORT const atcacert_def_t g_tngtls_cert_def_1_signer
```

#### 10.220.2.2 [g\\_tngtls\\_cert\\_elements\\_1\\_signer](#)

```
SHARED_LIB_EXPORT const atcacert_cert_element_t g_tngtls_cert_elements_1_signer[]
```

##### Initial value:

```
= {
    {
        .id = "subject",
        .device_loc = {
            .zone = DEVZONE_NONE,
        },
        .cert_loc = {
            .offset = 158,
            .count = 81
        }
    }
}
```

#### 10.220.2.3 [g\\_tngtls\\_cert\\_template\\_1\\_signer](#)

```
SHARED_LIB_EXPORT const uint8_t g_tngtls_cert_template_1_signer[520]
```

## 10.221 tngtls\_cert\_def\_1\_signer.h File Reference

TNG TLS signer certificate definition.

```
#include "atcacert/atcacert_def.h"
```

- `#define TNGTLS_CERT_TEMPLATE_1_SIGNER_SIZE 520`
- `ATCA_DLL const atcacert_def_t g_tngtls_cert_def_1_signer`

### 10.221.1 Detailed Description

TNG TLS signer certificate definition.

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## 10.222 tngtls\_cert\_def\_2\_device.c File Reference

TNG TLS device certificate definition.

```
#include "atcacert/atcacert_def.h"  
#include "tngtls_cert_def_2_device.h"  
#include "tngtls_cert_def_1_signer.h"
```

### Variables

- `SHARED_LIB_EXPORT const uint8_t g_tngtls_cert_template_2_device [505]`
- `SHARED_LIB_EXPORT const atcacert_cert_element_t g_tngtls_cert_elements_2_device [2]`
- `SHARED_LIB_EXPORT const atcacert_def_t g_tngtls_cert_def_2_device`

### 10.222.1 Detailed Description

TNG TLS device certificate definition.

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### 10.222.2 Variable Documentation

#### 10.222.2.1 g\_tngtls\_cert\_def\_2\_device

```
SHARED_LIB_EXPORT const atcacert_def_t g_tngtls_cert_def_2_device
```

#### 10.222.2.2 g\_tngtls\_cert\_elements\_2\_device

```
SHARED_LIB_EXPORT const atcacert_cert_element_t g_tngtls_cert_elements_2_device[2]
```

#### 10.222.2.3 g\_tngtls\_cert\_template\_2\_device

```
SHARED_LIB_EXPORT const uint8_t g_tngtls_cert_template_2_device[505]
```

### 10.223 tngtls\_cert\_def\_2\_device.h File Reference

TNG TLS device certificate definition.

```
#include "atcacert/atcacert_def.h"
```

- #define TNGTLS\_CERT\_TEMPLATE\_2\_DEVICE\_SIZE 505
- #define TNGTLS\_CERT\_ELEMENTS\_2\_DEVICE\_COUNT 2
- ATCA\_DLL const atcacert\_def\_t g\_tngtls\_cert\_def\_2\_device

#### 10.223.1 Detailed Description

TNG TLS device certificate definition.

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### 10.224 tngtls\_cert\_def\_3\_device.c File Reference

TNG TLS device certificate definition.

```
#include "atcacert/atcacert_def.h"  
#include "tngtls_cert_def_3_device.h"  
#include "tngtls_cert_def_1_signer.h"
```

### Variables

- [SHARED\\_LIB\\_EXPORT](#) const uint8\_t [g\\_tngtls\\_cert\\_template\\_3\\_device](#) [546]
- [SHARED\\_LIB\\_EXPORT](#) const [atcacert\\_cert\\_element\\_t](#) [g\\_tngtls\\_cert\\_elements\\_3\\_device](#) []
- [SHARED\\_LIB\\_EXPORT](#) const [atcacert\\_def\\_t](#) [g\\_tngtls\\_cert\\_def\\_3\\_device](#)

### 10.224.1 Detailed Description

TNG TLS device certificate definition.

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### 10.224.2 Variable Documentation

#### 10.224.2.1 g\_tngtls\_cert\_def\_3\_device

```
SHARED_LIB_EXPORT const atcacert_def_t g_tngtls_cert_def_3_device
```

#### 10.224.2.2 g\_tngtls\_cert\_elements\_3\_device

```
SHARED_LIB_EXPORT const atcacert_cert_element_t g_tngtls_cert_elements_3_device[]
```

#### 10.224.2.3 g\_tngtls\_cert\_template\_3\_device

```
SHARED_LIB_EXPORT const uint8_t g_tngtls_cert_template_3_device[546]
```

## 10.225 tngtls\_cert\_def\_3\_device.h File Reference

TNG TLS device certificate definition.

```
#include "atcacert/atcacert_def.h"
```

- `#define` [TNGTLS\\_CERT\\_TEMPLATE\\_3\\_DEVICE\\_SIZE](#) 546
- [ATCA\\_DLL](#) const [atcacert\\_def\\_t](#) [g\\_tngtls\\_cert\\_def\\_3\\_device](#)

### 10.225.1 Detailed Description

TNG TLS device certificate definition.

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## 10.226 trust\_pkcs11\_config.c File Reference

PKCS11 Trust Platform Configuration.

```
#include "cryptoauthlib.h"
#include "pkcs11_config.h"
#include "pkcs11/pkcs11_object.h"
#include "pkcs11/pkcs11_slot.h"
```

### 10.226.1 Detailed Description

PKCS11 Trust Platform Configuration.

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## 10.227 wpc\_apis.c File Reference

Provides api interfaces for WPC authentication.

```
#include "cryptoauthlib.h"
#include "wpc_apis.h"
#include "wpccert_client.h"
#include "atcacert/atcacert_client.h"
```

### 10.227.1 Detailed Description

Provides api interfaces for WPC authentication.

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## 10.228 wpc\_apis.h File Reference

Provides api interfaces for WPC authentication.

```
#include "wpc_check_config.h"
```

### Macros

- `#define WPC_PROTOCOL_VERSION 0x01`
- `#define WPC_PROTOCOL_MAX_VERSION 0x01`
- `#define WPC_TBS_AUTH_PREFIX 0x41`
- `#define WPC_CONST_N_RH ATCA_SHA256_DIGEST_SIZE`
- `#define WPC_CONST_OS_MC (2 + WPC_CONST_N_RH)`
- `#define WPC_HEADER(x) ((WPC_PROTOCOL_VERSION << 4) | x)`
- `#define WPC_GET_DIGESTS_TYPE 0x09`
- `#define WPC_GET_DIGESTS_HEADER WPC_HEADER(WPC_GET_DIGESTS_TYPE)`
- `#define WPC_GET_DIGESTS_LENGTH (2)`
- `#define WPC_GET_CERTIFICATE_TYPE 0x0A`
- `#define WPC_GET_CERTIFICATE_HEADER WPC_HEADER(WPC_GET_CERTIFICATE_TYPE)`
- `#define WPC_GET_CERTIFICATE_LENGTH (4)`
- `#define WPC_CHALLENGE_TYPE 0x0B`
- `#define WPC_CHALLENGE_HEADER WPC_HEADER(WPC_CHALLENGE_TYPE)`
- `#define WPC_CHALLENGE_NONCE_LENGTH (16)`
- `#define WPC_CHALLENGE_LENGTH (2 + WPC_CHALLENGE_NONCE_LENGTH)`
- `#define WPC_DIGESTS_TYPE 0x01`
- `#define WPC_DIGESTS_HEADER WPC_HEADER(WPC_DIGESTS_TYPE)`
- `#define WPC_DIGESTS_LENGTH(x) (2 + (ATCA_SHA256_DIGEST_SIZE * x))`
- `#define WPC_CERTIFICATE_TYPE 0x02`
- `#define WPC_CERTIFICATE_HEADER WPC_HEADER(WPC_CERTIFICATE_TYPE)`
- `#define WPC_CERTIFICATE_LENGTH(x) (1 + x)`
- `#define WPC_CHALLENGE_AUTH_TYPE 0x03`
- `#define WPC_CHALLENGE_AUTH_HEADER WPC_HEADER(WPC_CHALLENGE_AUTH_TYPE)`
- `#define WPC_CHALLENGE_AUTH_LENGTH (67)`
- `#define WPC_ERROR_TYPE 0x07`
- `#define WPC_ERROR_HEADER WPC_HEADER(WPC_ERROR_TYPE)`
- `#define WPC_ERROR_LENGTH (3)`
- `#define WPC_ERROR_INVALID_REQUEST (0x01)`
- `#define WPC_ERROR_UNSUPPORTED_PROTOCOL (0x02)`
- `#define WPC_ERROR_BUSY (0x03)`
- `#define WPC_ERROR_UNSPECIFIED (0x04)`

### Variables

- `const uint8_t g_root_ca_digest []`

#### 10.228.1 Detailed Description

Provides api interfaces for WPC authentication.

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## 10.228.2 Macro Definition Documentation

### 10.228.2.1 WPC\_CERTIFICATE\_HEADER

```
#define WPC_CERTIFICATE_HEADER WPC_HEADER(WPC_CERTIFICATE_TYPE)
```

### 10.228.2.2 WPC\_CERTIFICATE\_LENGTH

```
#define WPC_CERTIFICATE_LENGTH(  
    x ) (1 + x)
```

### 10.228.2.3 WPC\_CERTIFICATE\_TYPE

```
#define WPC_CERTIFICATE_TYPE 0x02
```

### 10.228.2.4 WPC\_CHALLENGE\_AUTH\_HEADER

```
#define WPC_CHALLENGE_AUTH_HEADER WPC_HEADER(WPC_CHALLENGE_AUTH_TYPE)
```

### 10.228.2.5 WPC\_CHALLENGE\_AUTH\_LENGTH

```
#define WPC_CHALLENGE_AUTH_LENGTH (67)
```

### 10.228.2.6 WPC\_CHALLENGE\_AUTH\_TYPE

```
#define WPC_CHALLENGE_AUTH_TYPE 0x03
```

### 10.228.2.7 WPC\_CHALLENGE\_HEADER

```
#define WPC_CHALLENGE_HEADER WPC_HEADER(WPC_CHALLENGE_TYPE)
```

### 10.228.2.8 WPC\_CHALLENGE\_LENGTH

```
#define WPC_CHALLENGE_LENGTH (2 + WPC_CHALLENGE_NONCE_LENGTH)
```

### 10.228.2.9 WPC\_CHALLENGE\_NONCE\_LENGTH

```
#define WPC_CHALLENGE_NONCE_LENGTH (16)
```

### 10.228.2.10 WPC\_CHALLENGE\_TYPE

```
#define WPC_CHALLENGE_TYPE 0x0B
```

### 10.228.2.11 WPC\_CONST\_N\_RH

```
#define WPC_CONST_N_RH ATCA_SHA256_DIGEST_SIZE
```

### 10.228.2.12 WPC\_CONST\_OS\_MC

```
#define WPC_CONST_OS_MC (2 + WPC_CONST_N_RH)
```

### 10.228.2.13 WPC\_DIGESTS\_HEADER

```
#define WPC_DIGESTS_HEADER WPC_HEADER(WPC_DIGESTS_TYPE)
```

### 10.228.2.14 WPC\_DIGESTS\_LENGTH

```
#define WPC_DIGESTS_LENGTH(  
    x ) (2 + (ATCA_SHA256_DIGEST_SIZE * x))
```

**10.228.2.15 WPC\_DIGESTS\_TYPE**

```
#define WPC_DIGESTS_TYPE 0x01
```

**10.228.2.16 WPC\_ERROR\_BUSY**

```
#define WPC_ERROR_BUSY (0x03)
```

**10.228.2.17 WPC\_ERROR\_HEADER**

```
#define WPC_ERROR_HEADER WPC_HEADER(WPC_ERROR_TYPE)
```

**10.228.2.18 WPC\_ERROR\_INVALID\_REQUEST**

```
#define WPC_ERROR_INVALID_REQUEST (0x01)
```

**10.228.2.19 WPC\_ERROR\_LENGTH**

```
#define WPC_ERROR_LENGTH (3)
```

**10.228.2.20 WPC\_ERROR\_TYPE**

```
#define WPC_ERROR_TYPE 0x07
```

**10.228.2.21 WPC\_ERROR\_UNSPECIFIED**

```
#define WPC_ERROR_UNSPECIFIED (0x04)
```

**10.228.2.22 WPC\_ERROR\_UNSUPPORTED\_PROTOCOL**

```
#define WPC_ERROR_UNSUPPORTED_PROTOCOL (0x02)
```

### 10.228.2.23 WPC\_GET\_CERTIFICATE\_HEADER

```
#define WPC_GET_CERTIFICATE_HEADER WPC_HEADER(WPC_GET_CERTIFICATE_TYPE)
```

### 10.228.2.24 WPC\_GET\_CERTIFICATE\_LENGTH

```
#define WPC_GET_CERTIFICATE_LENGTH (4)
```

### 10.228.2.25 WPC\_GET\_CERTIFICATE\_TYPE

```
#define WPC_GET_CERTIFICATE_TYPE 0x0A
```

### 10.228.2.26 WPC\_GET\_DIGESTS\_HEADER

```
#define WPC_GET_DIGESTS_HEADER WPC_HEADER(WPC_GET_DIGESTS_TYPE)
```

### 10.228.2.27 WPC\_GET\_DIGESTS\_LENGTH

```
#define WPC_GET_DIGESTS_LENGTH (2)
```

### 10.228.2.28 WPC\_GET\_DIGESTS\_TYPE

```
#define WPC_GET_DIGESTS_TYPE 0x09
```

### 10.228.2.29 WPC\_HEADER

```
#define WPC_HEADER(  
    x ) ((WPC_PROTOCOL_VERSION << 4) | x)
```

### 10.228.2.30 WPC\_PROTOCOL\_MAX\_VERSION

```
#define WPC_PROTOCOL_MAX_VERSION 0x01
```

### 10.228.2.31 WPC\_PROTOCOL\_VERSION

```
#define WPC_PROTOCOL_VERSION 0x01
```

### 10.228.2.32 WPC\_TBS\_AUTH\_PREFIX

```
#define WPC_TBS_AUTH_PREFIX 0x41
```

## 10.228.3 Variable Documentation

### 10.228.3.1 g\_root\_ca\_digest

```
const uint8_t g_root_ca_digest[] [extern]
```

## 10.229 wpc\_check\_config.h File Reference

```
#include "cryptoauthlib.h"
```

### Macros

- `#define WPC_MSG_PT_EN DEFAULT_ENABLED`
- `#define WPC_MSG_PR_EN DEFAULT_ENABLED`
- `#define WPC_STRICT_SLOT_INDEX_EN DEFAULT_DISABLED`
- `#define WPC_CERT_SN_FROM_HASH_EN DEFAULT_DISABLED`

### 10.229.1 Macro Definition Documentation

## 10.230 wpccert\_client.c File Reference

---

### 10.229.1.1 WPC\_CERT\_SN\_FROM\_HASH\_EN

```
#define WPC_CERT_SN_FROM_HASH_EN DEFAULT\_DISABLED
```

### 10.229.1.2 WPC\_MSG\_PR\_EN

```
#define WPC_MSG_PR_EN DEFAULT\_ENABLED
```

### 10.229.1.3 WPC\_MSG\_PT\_EN

```
#define WPC_MSG_PT_EN DEFAULT\_ENABLED
```

### 10.229.1.4 WPC\_STRICT\_SLOT\_INDEX\_EN

```
#define WPC_STRICT_SLOT_INDEX_EN DEFAULT\_DISABLED
```

Use the option WPC\_STRICT\_SLOT\_INDEX to configure simple mapping of slot to certificate

## 10.230 wpccert\_client.c File Reference

Provides api interfaces for accessing WPC certificates from device.

```
#include "wpc_check_config.h"  
#include "wpccert_client.h"  
#include "atcacert/atcacert_def.h"  
#include "atcacert/atcacert_der.h"  
#include "atcacert/atcacert_client.h"  
#include "atca_basic.h"
```

## Functions

- [ATCA\\_STATUS wpccert\\_read\\_cert](#) ([ATCADevice](#) device, const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*cert, size\_t \*cert\_size)  
*WPC API -.*
- [ATCA\\_STATUS wpccert\\_read\\_pdu\\_cert](#) ([ATCADevice](#) device, uint8\_t \*cert, size\_t \*cert\_size, uint8\_t slot)
- [ATCA\\_STATUS wpccert\\_read\\_mfg\\_cert](#) ([ATCADevice](#) device, uint8\_t \*cert, size\_t \*cert\_size, uint8\_t slot)
- [ATCA\\_STATUS wpccert\\_public\\_key](#) (const [atcacert\\_def\\_t](#) \*cert\_def, uint8\_t \*public\_key, uint8\_t \*cert)

## 10.230.1 Detailed Description

Provides api interfaces for accessing WPC certificates from device.

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## 10.230.2 Function Documentation

### 10.230.2.1 wpccert\_public\_key()

```
ATCA_STATUS wpccert_public_key (
    const atcacert_def_t * cert_def,
    uint8_t * public_key,
    uint8_t * cert )
```

### 10.230.2.2 wpccert\_read\_cert()

```
ATCA_STATUS wpccert_read_cert (
    ATCADevice device,
    const atcacert_def_t * cert_def,
    uint8_t * cert,
    size_t * cert_size )
```

WPC API -.

### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.230.2.3 wpccert\_read\_mfg\_cert()

```
ATCA_STATUS wpccert_read_mfg_cert (
    ATCADevice device,
    uint8_t * cert,
    size_t * cert_size,
    uint8_t slot )
```

### 10.230.2.4 wpccert\_read\_pdu\_cert()

```
ATCA_STATUS wpccert_read_pdu_cert (
    ATCADevice device,
    uint8_t * cert,
    size_t * cert_size,
    uint8_t slot )
```

## 10.231 wpccert\_client.h File Reference

Provides api interfaces for accessing WPC certificates from device.

```
#include "cryptoauthlib.h"
#include "atcacert/atcacert_def.h"
```

### Functions

- `uint8_t wpccert_get_slots_populated` (void)
- `uint8_t wpccert_get_slot_count` (void)
- `ATCA_STATUS wpccert_get_slot_info` (uint16\_t \*dig\_handle, const `atcacert_def_t` \*\*def, uint8\_t slot)
- `ATCA_STATUS wpccert_read_cert` (`ATCADevice` device, const `atcacert_def_t` \*cert\_def, uint8\_t \*cert, size\_t \*cert\_size)
- *WPC API -.*
- `ATCA_STATUS wpccert_write_cert` (`ATCADevice` device, const `atcacert_def_t` \*cert\_def, const uint8\_t \*cert, size\_t cert\_size)
- `ATCA_STATUS wpccert_read_pdu_cert` (`ATCADevice` device, uint8\_t \*cert, size\_t \*cert\_size, uint8\_t slot)
- `ATCA_STATUS wpccert_read_mfg_cert` (`ATCADevice` device, uint8\_t \*cert, size\_t \*cert\_size, uint8\_t slot)
- `ATCA_STATUS wpccert_public_key` (const `atcacert_def_t` \*cert\_def, uint8\_t \*public\_key, uint8\_t \*cert)

### 10.231.1 Detailed Description

Provides api interfaces for accessing WPC certificates from device.

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### 10.231.2 Function Documentation

#### 10.231.2.1 wpccert\_get\_slot\_count()

```
uint8_t wpccert_get_slot_count (
    void )
```



### 10.231.2.2 wpccert\_get\_slot\_info()

```
ATCA_STATUS wpccert_get_slot_info (
    uint16_t * dig_handle,
    const atcacert_def_t ** def,
    uint8_t slot )
```

### 10.231.2.3 wpccert\_get\_slots\_populated()

```
uint8_t wpccert_get_slots_populated (
    void )
```

### 10.231.2.4 wpccert\_public\_key()

```
ATCA_STATUS wpccert_public_key (
    const atcacert_def_t * cert_def,
    uint8_t * public_key,
    uint8_t * cert )
```

### 10.231.2.5 wpccert\_read\_cert()

```
ATCA_STATUS wpccert_read_cert (
    ATCADevice device,
    const atcacert_def_t * cert_def,
    uint8_t * cert,
    size_t * cert_size )
```

WPC API -.

#### Returns

ATCA\_SUCCESS on success, otherwise an error code.

### 10.231.2.6 wpccert\_read\_mfg\_cert()

```
ATCA_STATUS wpccert_read_mfg_cert (
    ATCADevice device,
    uint8_t * cert,
    size_t * cert_size,
    uint8_t slot )
```

### 10.231.2.7 wpccert\_read\_pdu\_cert()

```
ATCA_STATUS wpccert_read_pdu_cert (
    ATCADevice device,
    uint8_t * cert,
    size_t * cert_size,
    uint8_t slot )
```

### 10.231.2.8 wpccert\_write\_cert()

```
ATCA_STATUS wpccert_write_cert (
    ATCADevice device,
    const atcacert_def_t * cert_def,
    const uint8_t * cert,
    size_t cert_size )
```

## 10.232 zcust\_def\_1\_signer.c File Reference

```
#include "atcacert/atcacert_def.h"
```

### Variables

- const uint8\_t [g\\_root\\_ca\\_digest](#) [32]
- const uint8\_t [g\\_template\\_1\\_signer](#) [327]
- const uint8\_t [g\\_cert\\_ca\\_public\\_key\\_1\\_signer](#) [64]
- const [atcacert\\_cert\\_element\\_t](#) [g\\_cert\\_elements\\_1\\_signer](#) [3]
- const [atcacert\\_def\\_t](#) [g\\_cert\\_def\\_1\\_signer](#)

### 10.232.1 Variable Documentation

#### 10.232.1.1 g\_cert\_ca\_public\_key\_1\_signer

```
const uint8_t g_cert_ca_public_key_1_signer[64]
```

##### Initial value:

```
= {
    0x51, 0x1d, 0xe1, 0xff, 0x26, 0x4d, 0x5b, 0x19, 0x02, 0xdc, 0x03, 0xdd, 0x74, 0x6e, 0xfc, 0xd5,
    0x20, 0x59, 0x35, 0x95, 0xa4, 0xe9, 0x2a, 0xe2, 0x7f, 0x80, 0xdc, 0x42, 0x87, 0x00, 0xba, 0x9a,
    0x67, 0xdc, 0xe1, 0xdd, 0x03, 0x08, 0x50, 0xb7, 0x02, 0x3c, 0x96, 0xf5, 0x6e, 0xf3, 0x67, 0x61,
    0xa1, 0xe1, 0xee, 0x44, 0x95, 0x23, 0x2b, 0xf4, 0xe9, 0x9a, 0xe5, 0x94, 0xed, 0xe5, 0xa2, 0x99,
}
```

### 10.232.1.2 g\_cert\_def\_1\_signer

```
const atcacert_def_t g_cert_def_1_signer
```

### 10.232.1.3 g\_cert\_elements\_1\_signer

```
const atcacert_cert_element_t g_cert_elements_1_signer[3]
```

### 10.232.1.4 g\_root\_ca\_digest

```
const uint8_t g_root_ca_digest[32]
```

#### Initial value:

```
= {
    0x41, 0x78, 0x1d, 0x15, 0xa1, 0x52, 0x23, 0x44, 0xf3, 0x85, 0x39, 0x06, 0x5c, 0x6d, 0xea, 0x24,
    0xee, 0xfe, 0xdd, 0x39, 0xc3, 0xb7, 0x67, 0x0a, 0x00, 0x0a, 0x70, 0xb6, 0x70, 0xc7, 0xf7, 0xbd,
}
```

### 10.232.1.5 g\_template\_1\_signer

```
const uint8_t g_template_1_signer[327]
```

#### Initial value:

```
= {
    0x30, 0x82, 0x01, 0x43, 0x30, 0x81, 0xeb, 0xa0, 0x03, 0x02, 0x01, 0x02, 0x02, 0x08, 0x6b, 0x04,
    0xbe, 0x1b, 0x02, 0x97, 0xe9, 0x56, 0x30, 0x0a, 0x06, 0x08, 0x2a, 0x86, 0x48, 0xce, 0x3d, 0x04,
    0x03, 0x02, 0x30, 0x11, 0x31, 0x0f, 0x30, 0x0d, 0x06, 0x03, 0x55, 0x04, 0x03, 0x0c, 0x06, 0x57,
    0x50, 0x43, 0x43, 0x41, 0x31, 0x30, 0x20, 0x17, 0x0d, 0x32, 0x31, 0x31, 0x32, 0x32, 0x34, 0x30,
    0x36, 0x31, 0x38, 0x31, 0x35, 0x5a, 0x18, 0x0f, 0x39, 0x39, 0x39, 0x39, 0x31, 0x32, 0x33, 0x31,
    0x32, 0x33, 0x35, 0x39, 0x35, 0x39, 0x5a, 0x30, 0x12, 0x31, 0x10, 0x30, 0x0e, 0x06, 0x03, 0x55,
    0x04, 0x03, 0x0c, 0x07, 0x30, 0x30, 0x34, 0x45, 0x2d, 0x31, 0x41, 0x30, 0x59, 0x30, 0x13, 0x06,
    0x07, 0x2a, 0x86, 0x48, 0xce, 0x3d, 0x02, 0x01, 0x06, 0x08, 0x2a, 0x86, 0x48, 0xce, 0x3d, 0x03,
    0x01, 0x07, 0x03, 0x42, 0x00, 0x04, 0x62, 0x84, 0xd0, 0x99, 0x2d, 0x48, 0x27, 0x89, 0xff, 0xab,
    0x7f, 0x58, 0x11, 0x46, 0x66, 0x71, 0x7c, 0x0c, 0x77, 0x0c, 0x7d, 0xf0, 0x28, 0x6f, 0x16, 0xc8,
    0x55, 0xff, 0xdd, 0xd3, 0x46, 0xae, 0x9d, 0x34, 0xc6, 0x3a, 0xc0, 0x8f, 0x6b, 0x19, 0x30, 0x0c,
    0xca, 0xd0, 0xe0, 0xcc, 0x0a, 0x38, 0x78, 0x6e, 0xb0, 0x31, 0x6c, 0xfe, 0x52, 0x2c, 0x63, 0x76,
    0x17, 0xdc, 0xd8, 0xf1, 0xa0, 0x9b, 0xa3, 0x2a, 0x30, 0x28, 0x30, 0x12, 0x06, 0x03, 0x55, 0x1d,
    0x13, 0x01, 0x01, 0xff, 0x04, 0x08, 0x30, 0x06, 0x01, 0x01, 0xff, 0x02, 0x01, 0x00, 0x30, 0x12,
    0x06, 0x05, 0x67, 0x81, 0x14, 0x01, 0x01, 0x01, 0x01, 0xff, 0x04, 0x06, 0x04, 0x04, 0x00, 0x00,
    0x00, 0x01, 0x30, 0x0a, 0x06, 0x08, 0x2a, 0x86, 0x48, 0xce, 0x3d, 0x04, 0x03, 0x02, 0x03, 0x47,
    0x00, 0x30, 0x44, 0x02, 0x20, 0x3f, 0x59, 0x32, 0x78, 0xb5, 0x21, 0x36, 0xef, 0x11, 0xae, 0xeb,
    0xeb, 0x64, 0x70, 0x88, 0x77, 0x0c, 0x7f, 0xe2, 0xa2, 0x52, 0xe2, 0xcc, 0x1f, 0x32, 0xad, 0xd2,
    0x0b, 0x5b, 0xfa, 0x1a, 0x0a, 0x02, 0x20, 0x37, 0x85, 0xb9, 0x66, 0x23, 0x24, 0x89, 0x47, 0x11,
    0x68, 0xa6, 0x79, 0xac, 0xe1, 0x67, 0x74, 0xec, 0x6d, 0x40, 0x0e, 0x18, 0x95, 0x54, 0xbb, 0x2e,
    0x41, 0xec, 0x9a, 0x97, 0xb6, 0x28, 0xdc,
}
```

## 10.233 zcust\_def\_1\_signer.h File Reference

```
#include "atcacert/atcacert_def.h"
```

### Variables

- const [atcacert\\_def\\_t g\\_cert\\_def\\_1\\_signer](#)
- const [uint8\\_t g\\_cert\\_ca\\_public\\_key\\_1\\_signer](#) []
- const [uint8\\_t g\\_root\\_ca\\_digest](#) []

### 10.233.1 Variable Documentation

#### 10.233.1.1 g\_cert\_ca\_public\_key\_1\_signer

```
const uint8_t g_cert_ca_public_key_1_signer[] [extern]
```

#### 10.233.1.2 g\_cert\_def\_1\_signer

```
const atcacert\_def\_t g_cert_def_1_signer [extern]
```

#### 10.233.1.3 g\_root\_ca\_digest

```
const uint8_t g_root_ca_digest[] [extern]
```

## 10.234 zcust\_def\_2\_device.c File Reference

```
#include "atcacert/atcacert_def.h"  
#include "zcust_def_1_signer.h"
```

### Variables

- const [uint8\\_t g\\_template\\_2\\_device](#) [316]
- const [atcacert\\_cert\\_element\\_t g\\_cert\\_elements\\_2\\_device](#) [2]
- const [atcacert\\_def\\_t g\\_cert\\_def\\_2\\_device](#)

### 10.234.1 Variable Documentation

### 10.234.1.1 g\_cert\_def\_2\_device

```
const atcacert_def_t g_cert_def_2_device
```

### 10.234.1.2 g\_cert\_elements\_2\_device

```
const atcacert_cert_element_t g_cert_elements_2_device[2]
```

### 10.234.1.3 g\_template\_2\_device

```
const uint8_t g_template_2_device[316]
```

#### Initial value:

```
= {
    0x30, 0x82, 0x01, 0x38, 0x30, 0x81, 0xde, 0xa0, 0x03, 0x02, 0x01, 0x02, 0x02, 0x08, 0x55, 0x3a,
    0x49, 0x4e, 0x6c, 0x8c, 0x47, 0xc6, 0x30, 0x0a, 0x06, 0x08, 0x2a, 0x86, 0x48, 0xce, 0x3d, 0x04,
    0x03, 0x02, 0x30, 0x12, 0x31, 0x10, 0x30, 0x0e, 0x06, 0x03, 0x55, 0x04, 0x03, 0x0c, 0x07, 0x30,
    0x30, 0x34, 0x45, 0x2d, 0x31, 0x41, 0x30, 0x22, 0x18, 0x0f, 0x32, 0x30, 0x32, 0x31, 0x31, 0x32,
    0x32, 0x34, 0x30, 0x36, 0x30, 0x30, 0x30, 0x30, 0x5a, 0x18, 0x0f, 0x39, 0x39, 0x39, 0x39, 0x31,
    0x32, 0x33, 0x31, 0x32, 0x33, 0x35, 0x39, 0x35, 0x39, 0x5a, 0x30, 0x11, 0x31, 0x0f, 0x30, 0x0d,
    0x06, 0x03, 0x55, 0x04, 0x03, 0x0c, 0x06, 0x30, 0x31, 0x31, 0x34, 0x33, 0x30, 0x30, 0x59, 0x30,
    0x13, 0x06, 0x07, 0x2a, 0x86, 0x48, 0xce, 0x3d, 0x02, 0x01, 0x06, 0x08, 0x2a, 0x86, 0x48, 0xce,
    0x3d, 0x03, 0x01, 0x07, 0x03, 0x42, 0x00, 0x04, 0x63, 0x91, 0xf3, 0x5a, 0x89, 0x09, 0x8c, 0x21,
    0x0b, 0x4a, 0x5f, 0xee, 0xa8, 0x0f, 0x78, 0xff, 0xd4, 0x4c, 0x24, 0x14, 0x08, 0x86, 0xe4, 0x91,
    0xa6, 0xcd, 0xe9, 0xf0, 0x11, 0x55, 0xab, 0x11, 0x76, 0xaf, 0xa5, 0xba, 0x0f, 0x99, 0x88, 0xd7,
    0x4b, 0x81, 0x2d, 0x6f, 0x03, 0xce, 0xb6, 0x40, 0xba, 0x51, 0x68, 0xff, 0xdc, 0x05, 0x8b, 0xd2,
    0x60, 0x67, 0x00, 0xce, 0xb0, 0x03, 0xaa, 0x69, 0xa3, 0x1b, 0x30, 0x19, 0x30, 0x17, 0x06, 0x05,
    0x67, 0x81, 0x14, 0x01, 0x02, 0x01, 0x01, 0xff, 0x04, 0x0b, 0x04, 0x09, 0x00, 0x00, 0x00, 0x00,
    0x04, 0x30, 0x30, 0x30, 0x30, 0x30, 0x0a, 0x06, 0x08, 0x2a, 0x86, 0x48, 0xce, 0x3d, 0x04, 0x03,
    0x02, 0x03, 0x49, 0x00, 0x30, 0x46, 0x02, 0x21, 0x00, 0xb7, 0xa3, 0xab, 0x33, 0x5d, 0x4d, 0x70,
    0xd4, 0x79, 0x5d, 0x03, 0x48, 0x73, 0xda, 0x5d, 0x7f, 0x45, 0x35, 0x19, 0x18, 0xf1, 0xd6, 0x1f,
    0x6d, 0xae, 0xd8, 0xc4, 0x36, 0x63, 0x38, 0xd7, 0xef, 0x02, 0x21, 0x00, 0x9d, 0x10, 0xf3, 0xf8,
    0x99, 0x67, 0xc8, 0x3d, 0xd2, 0x7e, 0x99, 0xc7, 0x60, 0x0f, 0xa9, 0xbe, 0x84, 0xcf, 0x9a, 0x15,
    0xa4, 0xdc, 0x5d, 0xc6, 0x2c, 0x1c, 0x5e, 0x6b, 0xbb, 0xd8, 0x14, 0x70,
}
```

## 10.235 zcust\_def\_2\_device.h File Reference

```
#include "atcacert/atcacert_def.h"
```

### Variables

- const [atcacert\\_def\\_t g\\_cert\\_def\\_2\\_device](#)

## 10.235.1 Variable Documentation

### 10.235.1.1 g\_cert\_def\_2\_device

```
const atcacert_def_t g_cert_def_2_device [extern]
```

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