helix_c99

0.0.2.0

Generated by Doxygen 1.8.5

Fri Oct 2 2020 15:33:42

Contents

Chapter 1

Summary of Helix SDK

Helix is a library designed to provide cryptographic services to other software packages. This implementation of Helix is written in C language, compliant with C99 standard.

Helix offers multiple layers of protection of data, such as:

- single-use keys (similar to taking a private cab, instead of sharing a public bus or train)
- each user-defined data payload is encrypted with 5 symmetric algorithms, and wrapped with 2 layers using different asymmetric algorithms
- licensed end-user keys are continuously generated, with public parts published to Helix key-server (this does not compromise cryptographic strength - those are shareable parts by design)
- etc.

Helix library abstracts many cryptographic operations away from external developers in order to facilitate simple and easy to use API for a generalist developer, at any skill level. Helix exposes only necessary API for licensing, recipient identification, data input and output. Internally, Helix uses sophisticated processes to handle management of multitude of cryptographic keys.

Helix design allows to simplify integration and use of cryptographic module with superior strength without compromising the security of cryptographic functions (through mistakes or bad confutation), or on-boarding specialized developers and resources to complete the specialized work.

Helix is a universal solution, agnostic to:

- data transfer modes (we operate above network and protocol layers in the network stack)
- nature and type of data (text, binary, document, picture, video, etc. - all formats are supported, including streaming)
- operating platform configuration (register size, endian mode, CPU type, or vendor type)

Integration Pattern

Below are examples of minimal Helix API calls, along with most-likely integration places, needed to complete logical operations of interest. Provided API calls are minimalistic non-production examples (no error code checking, etc.) to demonstrate the ease of core API use.

Initialization and Shutdown

Helix gives ability to choose when its module should be loaded/activated to the integration team. This allows integration teams to keep start-up unaffected, differentiate use of Helix by licensing or other considerations. These

actions are performed once per life-cycle of Helix module. They are frequently integrated into startup and shutdown sequences of applications.

To load Helix module, execute function:

```
blakfx_helix_apiStartup
```

To shutdown Helix module, execute function:

```
blakfx_helix_apiShutdown
```

Communication and Authentication with Helix Key-Server

Helix uses numerous number of keys to secure data at various stages of data life-cycle. Parts of many keys must be published to Helix key-server in order to facilitate discovery of communication partners (directory of known users). Helix key-server is a logical design concept that could be materialized in a number of configurations, from on-prem to managed solution, to cloud-first subscription model. There are also choices for federation in order to facilitate communication across disjoint organizations and/or groups. These actions are performed once per connection to key-server life-cycle. These actions are frequently integrated into login and logout sequences of applications.

To establish connection to Helix key-server, execute function:

```
blakfx_helix_serverConnect
```

To authenticate into Helix key-server, execute function:

```
blakfx_helix_accountLogin
```

To sever connection to Helix key-server, execute function:

```
blakfx_helix_serverDisconnect
```

Discovery of Communication Partners (Recipeints)

Through the use of key-server, Helix provides directory services where customers may discover necessary information (not necessarily identify, only public-keys) for intended recipients. This actions are performed once per recipient identification. This actions are frequently integrated into contact search sequence of applications.

To discover keys of intended recipient, execute function:

```
blakfx_helix_simpleSearchForRecipientByName
```

Cryptographic Operations

Helix takes on itself a lot of sophisticated processing, security-driven steps and key management. An integration team has a high-level steps it should execute, in order to secure any data.

To encrypt unsecured data (before transmission), you may execute functions:

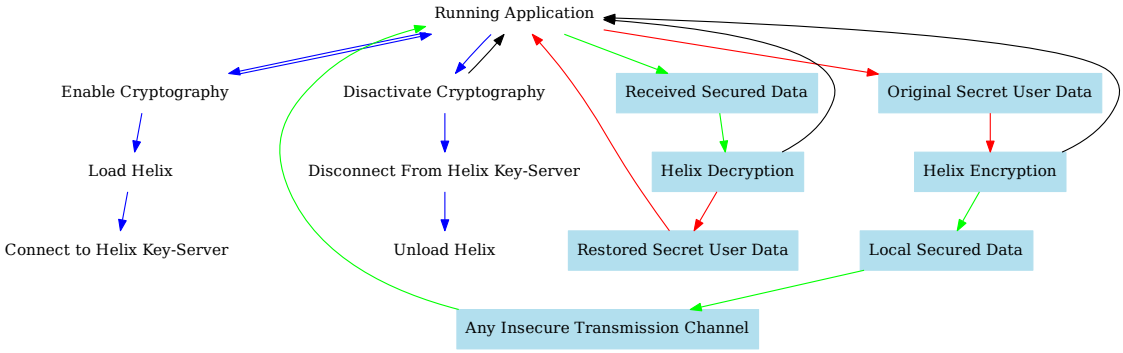
```
blakfx_helix_encryptStart
```

```
blakfx_helix_encryptPayloadGetSerialized
```

To decrypt secured data (upon receipt), execute functions:

```
blakfx_helix_decryptStart
```

```
blakfx_helix_decryptPayloadSerializedRelease
```


Running Application
Enable Cryptography
Disactivate Cryptography
Received Secured Data
Original Secret User Data
Load Helix
Disconnect From Helix Key-Server
Helix Decryption
Helix Encryption
Connect to Helix Key-Server
Unload Helix
Restored Secret User Data
Local Secured Data
Any Insecure Transmission Channel

Chapter 2

File Index

2.1 File List

Here is a list of all files with brief descriptions:

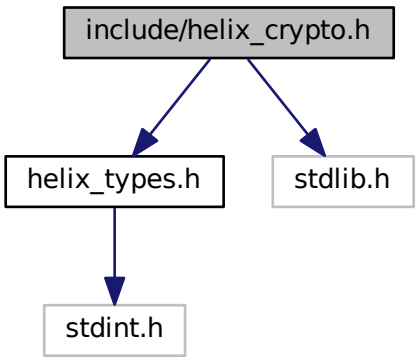
Chapter 3

File Documentation

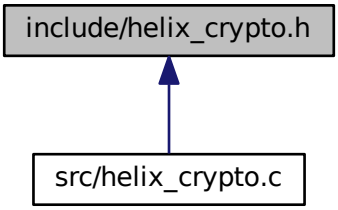
3.1 include/helix_crypto.h File Reference

```
#include "helix_types.h"
#include <stdlib.h>
```

Include dependency graph for helix_crypto.h:



This graph shows which files directly or indirectly include this file:



Typedefs

- typedef int64_t(∗ blakfx_helix_event_handler_t)(PROMISE_ID promise_ID, promiseStatusAndFlags_t status)

Functions

- invokeStatus_t blakfx_helix_accountCreate (const char ∗userName)

  Creates a new account with a given username. All previously generated keys for the account in local key storage will be deleted.
- invokeStatus_t blakfx_helix_accountDelete (const char ∗userName)

  Deletes a local account with a given username.
- invokeStatus_t blakfx_helix_accountLogin (const char ∗userName)

  Login to an existing account with a given username.
- void blakfx_helix_apiShutdown (void)

  Shut down/cleanup of Helix API module Helix module does a great deal of background work: key-generation, communication with key-server, in addition to asynchronous encryption and decryption processes. It is imperative to allow Helix module to step through orderly shutdown process in order to prevent unlikely but possible local-data corruption.
- invokeStatus_t blakfx_helix_apiStartup (const char ∗serverIP, uint16_t port, int64_t flags)

  Starts the Helix API module Helix module is composed of various components that will be loaded/activated on demand by the caller. This allows clients of Helix to minimize the start-time, optimize resource utilization, and segment Helix usage by various differentiating factors.
- invokeStatus_t blakfx_helix_apiStartup_Advanced (const char ∗serverIP, uint16_t port, const char ∗customDUID, int64_t flags, void ∗reserved)

  Starts the Helix API module, with more options available.
- promiseStatusAndFlags_t blakfx_helix_cPromiseManager_getStatus (PROMISE_ID promise_ID)

  Get the status of a specific promise.
- invokeStatus_t blakfx_helix_decryptGetOutputData (DECRYPT_ID decrypt_id, uint8_t ∗∗data, size_t ∗length)

  Get the result of a given decryption task.
- invokeStatus_t blakfx_helix_decryptIsValid (DECRYPT_ID decrypt_id)

  Check whether a given decryption task is valid.
- invokeStatus_t blakfx_helix_decryptPayloadSerializedRelease (DECRYPT_ID decrypt_id)

  Release the serialized payload of a given decryption task.
- DECRYPT_ID blakfx_helix_decryptStart (uint8_t ∗cipherData, size_t cipherMessageSize, const char ∗password, option_t anInvocationOptions)

  Start decrypting some encrypted blob.

- invokeStatus_t blakfx_helix_encryptConclude (ENCRYPT_ID encrypt_id)

  Conclude/wrap up a given encryption task.
- invokeStatus_t blakfx_helix_encryptGetOutputData (ENCRYPT_ID encrypt_id, uint8_t **serializedOut, size_t *length, option_t anInvocationOptions)

  Get the result of a given encryption task.
- invokeStatus_t blakfx_helix_encryptOutputExists (ENCRYPT_ID encrypt_id)

  Check whether encrypt output exists.
- uint8_t * blakfx_helix_encryptPayloadGetSerialized (ENCRYPT_ID encrypt_id, size_t *length)

  Get the serialized payload of a given encryption task.
- invokeStatus_t blakfx_helix_encryptPayloadSerializedRelease (ENCRYPT_ID encrypt_id, uint8_t *serialized)

  Release the serialized payload of a given encryption task.
- ENCRYPT_ID blakfx_helix_encryptStart (USER_ID user_id, const void *data, size_t dataSize, const char *password, const char *fileName, option_t anInvocationOptions)

  Start encrypting some content intended for a given target user.
- void * blakfx_helix_getUserData (PROMISE_ID promise_ID, uint64_t user_data_id, size_t *length)

  Get the data for a given user.
- invokeStatus_t blakfx_helix_serverConnect (void)

  Connect to previously specified (see blakfx_helix_apiStartup) Helix key-server. Helix module publishes and exchanges public cryptographic keys with its key-server, in order to facilitate cryptographically secure End-to-End communication.
- invokeStatus_t blakfx_helix_serverDisconnect (void)

  Sever active connection to Helix key-server Helix operates numerous background tasks allowing clients to complete complex cryptographic operations seamlessly. To prevent unlikely but possible corruption, it is crucial for Helix users to allow Helix module to complete orderly disconnect from its key-server.
- invokeStatus_t blakfx_helix_serverIsConnected (void)

  Checks whether connection to previously defined key-server is alive (in valid state and responsive). This method is added for posterity, however avoid overusing it or placing it in your execution critical path - it's execution is network-bound. Under normal circumstances, it safe to assume the connection is active, and check for error conditions of Helix API calls in the critical-path. This method is appropriate for use as connectivity test after long period is inactivity. In all other situations - use of this API is superfluous and suboptimal.
- PROMISE_ID blakfx_helix_simpleSearchForRecipientByEmail (const char *lookup, int64_t waitInMillis)

  Search for an account with a given email on the current Helix Key Server.
- PROMISE_ID blakfx_helix_simpleSearchForRecipientByName (const char *lookup, int64_t waitInMillis)

  Search for an account with a given username on the current Helix Key Server.
- USER_ID blakfx_helix_userFindByEmail (const char *emailAddress, invokeStatus_t *result, blakfx_helix_event_handler_t crypto_notification_function)

  Search for an user with a given email on the current Helix Key Server.
- PROMISE_ID blakfx_helix_userFindByEmailAsPromise (const char *emailAddress, invokeStatus_t *result, blakfx_helix_event_handler_t promise_notification_function)

  Search for an account with a given email on the current Helix Key Server.
- USER_ID blakfx_helix_userFindByName (const char *userName, invokeStatus_t *result, blakfx_helix_event_handler_t crypto_notification_function)

  Search for an user with a given username on the current Helix Key Server.
- PROMISE_ID blakfx_helix_userFindByNameAsPromise (const char *userName, invokeStatus_t *result, blakfx_helix_event_handler_t promise_notification_function)

  Search for an account with a given username on the current Helix Key Server.
- invokeStatus_t blakfx_helix_userRelease (USER_ID user_id)

  Release an user.
- invokeStatus_t blakfx_helix_userValidate (USER_ID user_id)

  Ensure that an user is valid.
- invokeStatus_t blakfx_helix_waitEvent (PROMISE_ID crypto_ID, int64_t time_in_ms)

  Waits for an event for a specific time.
- promiseStatusAndFlags_t blakfx_helix_waitEventStatus (PROMISE_ID aPromise_id)

  Retrieve status of the promise (referencing a promise to complete some operation) by its unique id.

3.1.1 Typedef Documentation

3.1.1.1 typedef int64_t(* blakfx_helix_event_handler_t)(PROMISE_ID promise_ID, promiseStatusAndFlags_t status)

Declaration of callback function Helix would accept to register it as event handler to execute at completion of select events

3.1.2 Function Documentation

3.1.2.1 invokeStatus_t blakfx_helix_accountCreate (const char * *userName*)

Creates a new account with a given username. All previously generated keys for the account in local key storage will be deleted.

Parameters

in	*userName*	the username for the account

Returns

result code of the creation operation

3.1.2.2 invokeStatus_t blakfx_helix_accountDelete (const char * *userName*)

Deletes a local account with a given username.

Parameters

in	*userName*	the username for the account

Returns

result code of the deletion operation

3.1.2.3 invokeStatus_t blakfx_helix_accountLogin (const char * *userName*)

Login to an existing account with a given username.

Parameters

in	*userName*	the username for the account

Returns

result code of the login operation

3.1.2.4 void blakfx_helix_apiShutdown (void)

Shut down/cleanup of Helix API module Helix module does a great deal of background work: key-generation, communication with key-server, in addition to asynchronous encryption and decryption processes. It is imperative to allow Helix module to step through orderly shutdown process in order to prevent unlikely but possible local-data corruption.

3.1.2.5 invokeStatus_t blakfx_helix_apiStartup (const char * *serverIP,* uint16_t *port,* int64_t *flags*)

Starts the Helix API module Helix module is composed of various components that will be loaded/activated on demand by the caller. This allows clients of Helix to minimize the start-time, optimize resource utilization, and segment Helix usage by various differentiating factors.

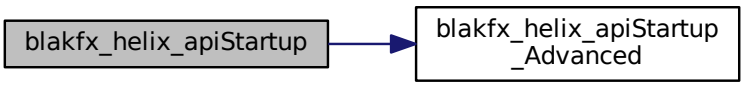
Parameters

in	*serverIP*	the IP/hostname of the Helix Key Server to connect to
in	*port*	the port of the Helix Key Server to connect to
in	*flags*	additional flags

Returns

result of startup operation

Here is the call graph for this function:



3.1.2.6 invokeStatus_t blakfx_helix_apiStartup_Advanced (const char * *serverIP*, uint16_t *port*, const char * *customDUID*, int64_t *flags*, void * *reserved*)

Starts the Helix API module, with more options available.

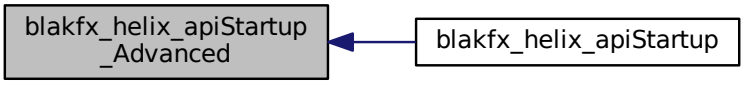
Parameters

in	*serverIP*	the IP/hostname of the Helix Key Server to connect to
in	*port*	the port of the Helix Key Server to connect to
in	*customDUID*	a fake custom device UID
in	*flags*	additional flags
in	*reserved*	unused

Returns

result of startup operation

Here is the caller graph for this function:



3.1.2.7 promiseStatusAndFlags_t blakfx_helix_cPromiseManager_getStatus (PROMISE_ID *promise_ID*)

Get the status of a specific promise.

Parameters

in	*promise_ID*	the ID of the promise to get the status of

Returns

status of the promise

3.1.2.8 invokeStatus_t blakfx_helix_decryptGetOutputData (DECRYPT_ID *decrypt_id,* uint8_t ** *data,* size_t * *length*)

Get the result of a given decryption task.

Parameters

in	*decrypt_id*	the ID of the decryption to get the result of
out	*data*	buffer to place the result of the decryption
out	*length*	the length of the decrypted data

Returns

result of get operation

3.1.2.9 invokeStatus_t blakfx_helix_decryptIsValid (DECRYPT_ID *decrypt_id*)

Check whether a given decryption task is valid.

Parameters

in	*encrypt_id*	the ID of the decryption to verify

Returns

whether the decryption is valid or not

3.1.2.10 invokeStatus_t blakfx_helix_decryptPayloadSerializedRelease (DECRYPT_ID *decrypt_id*)

Release the serialized payload of a given decryption task.

Parameters

in	*decrypt_id*	the ID of the encryption to release the serialized payload of

Returns

whether the data was released successfully

3.1.2.11 DECRYPT_ID blakfx_helix_decryptStart (uint8_t * *cipherData,* size_t *cipherMessageSize,* const char * *password,* option_t *anInvocationOptions*)

Start decrypting some encrypted blob.

Parameters

in	*cipherData*	the encrypted blob
in	*cipherMessage-Size*	the size of the encrypted blob
in	*password*	optional password to decrypt with
in	*anInvocation-Options*	additional options to specify

Returns

decryption ID for the ongoing decryption

3.1.2.12 invokeStatus_t blakfx_helix_encryptConclude (ENCRYPT_ID *encrypt_id*)

Conclude/wrap up a given encryption task.

Parameters

in	*encrypt_id*	the ID of the encryption to conclude

Returns

whether the task was concluded successfully or not

3.1.2.13 invokeStatus_t blakfx_helix_encryptGetOutputData (ENCRYPT_ID *encrypt_id,* uint8_t ∗∗ *serializedOut,* size_t ∗ *length,* option_t *anInvocationOptions*)

Get the result of a given encryption task.

Parameters

in	*encrypt_id*	the ID of the encryption to get the result of
out	*serializedOut*	buffer to place the result of the encryption
out	*length*	the length of the encrypted data
in	*anInvocation-Options*	additional options to specify

Returns

result of get operation

3.1.2.14 invokeStatus_t blakfx_helix_encryptOutputExists (ENCRYPT_ID *encrypt_id*)

Check whether encrypt output exists.

Parameters

in	*encrypt_id*	the ID of the encryption to check

Returns

whether the encryption has any output or not

3.1.2.15 uint8_t∗ blakfx_helix_encryptPayloadGetSerialized (ENCRYPT_ID *encrypt_id,* size_t ∗ *length*)

Get the serialized payload of a given encryption task.

Parameters

in	*encrypt_id*	the ID of the encryption to get the result of
out	*length*	the length of the encrypted data

Returns

the serialized payload data

3.1.2.16 invokeStatus_t blakfx_helix_encryptPayloadSerializedRelease (ENCRYPT_ID *encrypt_id,* uint8_t * *serialized*)

Release the serialized payload of a given encryption task.

Parameters

in	*encrypt_id*	the ID of the encryption to release the serialized payload of
in	*serialized*	the serialized payload data

Returns

whether the data was released successfully

3.1.2.17 ENCRYPT_ID blakfx_helix_encryptStart (USER_ID *user_id,* const void * *data,* size_t *dataSize,* const char * *password,* const char * *fileName,* option_t *anInvocationOptions*)

Start encrypting some content intended for a given target user.

Parameters

in	*user_id*	the ID of the target user
in	*data*	the content to encrypt
in	*dataSize*	the size of the content to encrypt
in	*password*	optional password to encrypt with
in	*fileName*	optional name/path for file with content to encrypt
in	*anInvocation-Options*	additional options

Returns

encryption ID for the ongoing encryption

3.1.2.18 void* blakfx_helix_getUserData (PROMISE_ID *promise_ID,* uint64_t *user_data_id,* size_t * *length*)

Get the data for a given user.

Parameters

in	*promiseID*	the promiseID to find the data for
in	*user_data_id*	the user's data ID
out	*length*	the length of the user's data

Returns

data as a void *

3.1.2.19 invokeStatus_t blakfx_helix_serverConnect (void)

Connect to previously specified (see blakfx_helix_apiStartup) Helix key-server. Helix module publishes and exchanges public cryptographic keys with its key-server, in order to facilitate cryptographically secure End-to-End communication.

Returns

Status of attempt to establish connection with key-server

3.1.2.20 invokeStatus_t blakfx_helix_serverDisconnect (void)

Sever active connection to Helix key-server Helix operates numerous background tasks allowing clients to complete complex cryptographic operations seamlessly. To prevent unlikely but possible corruption, it is crucial for Helix users to allow Helix module to complete orderly disconnect from its key-server.

Returns

Status of severing the connection to the key-server (normal or with errors)

3.1.2.21 invokeStatus_t blakfx_helix_serverIsConnected (void)

Checks whether connection to previously defined key-server is alive (in valid state and responsive). This method is added for posterity, however avoid overusing it or placing it in your execution critical path - it's execution is network-bound. Under normal circumstances, it safe to assume the connection is active, and check for error conditions of Helix API calls in the critical-path. This method is appropriate for use as connectivity test after long period is inactivity. In all other situations - use of this API is superfluous and suboptimal.

Returns

Status of connection to previously defined key-server

3.1.2.22 PROMISE_ID blakfx_helix_simpleSearchForRecipientByEmail (const char * *lookup*, int64_t *waitInMillis*)

Search for an account with a given email on the current Helix Key Server.

Parameters

in	*lookup*	the email address of the target
in	*waitInMillis*	the time in ms to attempt the search in

Returns

result of the search operation

3.1.2.23 PROMISE_ID blakfx_helix_simpleSearchForRecipientByName (const char * *lookup*, int64_t *waitInMillis*)

Search for an account with a given username on the current Helix Key Server.

Parameters

in	*lookup*	the username for the target account
in	*waitInMillis*	the time in ms to attempt the search in

Returns

result of the search operation

3.1.2.24 USER_ID blakfx_helix_userFindByEmail (const char * *emailAddress*, invokeStatus_t * *result*, blakfx_helix_event_handler_t *crypto_notification_function*)

Search for an user with a given email on the current Helix Key Server.

!

Parameters

in	*emailAddress*	the email address of the target
out	*result*	the result of the search operation
in	*blakfx_helix_event_handler_t*	register custom function to be executed as registered event handler with promise status notification

Returns

user ID of the found/not found user

3.1.2.25 PROMISE_ID blakfx_helix_userFindByEmailAsPromise (const char * *emailAddress*, invokeStatus_t * *result*, blakfx_helix_event_handler_t *promise_notification_function*)

Search for an account with a given email on the current Helix Key Server.

!

Parameters

in	*emailAddress*	the email address of the target
out	*result*	the result of the search operation
in	*blakfx_helix_event_handler_t*	register custom function to be executed as registered event handler with promise status notification

Returns

promise of found/not found user

3.1.2.26 USER_ID blakfx_helix_userFindByName (const char * *userName*, invokeStatus_t * *result*, blakfx_helix_event_handler_t *crypto_notification_function*)

Search for an user with a given username on the current Helix Key Server.

!

Parameters

in	*userName*	the name of the target

out	*result*	the result of the search operation
in	*blakfx_helix_-event_handler_t*	register custom function to be executed as registered event handler with promise status notification

Returns

user ID of the found/not found user

3.1.2.27 PROMISE_ID blakfx_helix_userFindByNameAsPromise (const char * *userName,* invokeStatus_t * *result,* blakfx_helix_event_handler_t *promise_notification_function*)

Search for an account with a given username on the current Helix Key Server.

!

Parameters

in	*userName*	the username for the target account
out	*result*	the result of the search operation
in	*blakfx_helix_-event_handler_t*	register custom function to be executed as registered event handler with promise status notification

Returns

promise of found/not found user

3.1.2.28 invokeStatus_t blakfx_helix_userRelease (USER_ID *user_id*)

Release an user.

Parameters

in	*user_id*	the ID of the user to release

Returns

result of release

3.1.2.29 invokeStatus_t blakfx_helix_userValidate (USER_ID *user_id*)

Ensure that an user is valid.

Parameters

in	*user_id*	the ID of the user to validate

Returns

result of validation

3.1.2.30 invokeStatus_t blakfx_helix_waitEvent (PROMISE_ID *crypto_ID,* int64_t *time_in_ms*)

Waits for an event for a specific time.

Parameters

in	*crypto_ID*	the ID of the event to wait for
in	*time_in_ms*	the time in ms to wait for

Returns

result of the wait operation

3.1.2.31 promiseStatusAndFlags_t blakfx_helix_waitEventStatus (PROMISE_ID *aPromise_id*)

Retrieve status of the promise (referencing a promise to complete some operation) by its unique id.

Parameters

in	*aPromise_id*	the unique id of the promise whose status to retrieve

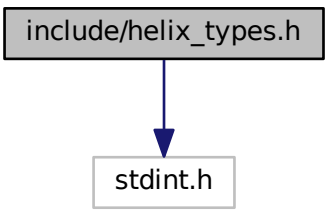
Returns

status code indicating the state of the promised work

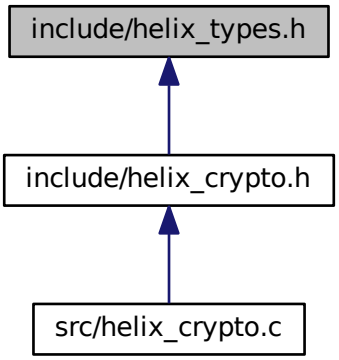
3.2 include/helix_types.h File Reference

```
#include <stdint.h>
```

Include dependency graph for helix_types.h:



This graph shows which files directly or indirectly include this file:



Typedefs

- typedef PROMISE_ID DECRYPT_ID
- typedef PROMISE_ID ENCRYPT_ID
- typedef enum __invokeStatus_t invokeStatus_t
- typedef PROMISE_ID KEY_ID
- typedef enum __logLevel_t logLevel_t
- typedef enum __option_t option_t
- typedef uint64_t PROMISE_ID
- typedef enum __promiseStatusAndFlags_t promiseStatusAndFlags_t
- typedef enum __serverResponseCode_t serverResponseCode_t
- typedef PROMISE_ID USER_ID

Enumerations

- enum __invokeStatus_t { INVOKE_STATUS_NOT_INITIALIZED = -255, INVOKE_IN_INVALID_STATE = -254, INVOKE_INVALID_INSIDE_CALLBACK = -253, INVOKE_STATUS_BAD_PROMISE_ID = -252, INVOKE_STATUS_TIMEOUT = -2, INVOKE_STATUS_FALSE = -1, INVOKE_STATUS_TRUE = 0 }
- enum __logLevel_t { NO_LOG = 0x00, ERROR_LEVEL = 0x01, INFO_LEVEL = 0x02, WARN_LEVEL = 0x04, DEBUG_LEVEL = 0x06, ALL_LEVEL = 0xffff }
- enum __option_t { USER_OWNS_MEMORY = 0x0000, HELIX_OWNS_MEMORY = 0x0001 }
- enum __promiseStatusAndFlags_t { PROMISE_INVALID = -254, PROMISE_INFINITE = -1, PROMISE_COMPLETE = 0x0001, PROMISE_DESTROY = 0x0002, PROMISE_DATA_AVAILABLE = 0x0004, PROMISE_EVENT = 0x0008, PROMISE_USER_EVENT = 0x0010, PROMISE_RESULT_ERROR = 0x0020, PROMISE_MEMORY_ALLOCATED = 0x0040, PROMISE_MEMORY_RELEASING = 0x0080, PROMISE_MEMORY_POST_RELEASED_ID = 0x0100, PROMISE_ALLOW_RECURSIVE_EVENTS = 0x1000, PROMISE_NO_STATUS = 0x2000, PROMISE_WAIT_STATUS = 0x4000, PROMISE_ERROR_UNDEFINED = 0x8000 }
- enum __serverResponseCode_t { SERVER_SUCCESS = 0, SERVER_FAIL = -1 }

3.2.1 Typedef Documentation

3.2.1.1 typedef PROMISE_ID DECRYPT_ID

3.2.1.2 typedef PROMISE_ID ENCRYPT_ID

3.2.1.3 typedef enum __invokeStatus_t invokeStatus_t

Collection of codes indicating possible conditions as result of function invocation.

3.2.1.4 typedef PROMISE_ID KEY_ID

3.2.1.5 typedef enum __logLevel_t logLevel_t

Collection of log-level modes Helix module has.

3.2.1.6 typedef enum __option_t option_t

Collection of codes indicating memory ownership model Helix caller will be using.

3.2.1.7 typedef uint64_t PROMISE_ID

3.2.1.8 typedef enum __promiseStatusAndFlags_t promiseStatusAndFlags_t

Collection of codes indicating state of a promise (result of computation to be completed in the future).

3.2.1.9 typedef enum __serverResponseCode_t serverResponseCode_t

Collection of code values key-server could respond with after various requests.

3.2.1.10 typedef PROMISE_ID USER_ID

3.2.2 Enumeration Type Documentation

3.2.2.1 enum __invokeStatus_t

Collection of codes indicating possible conditions as result of function invocation.

Enumerator

INVOKE_STATUS_NOT_INITIALIZED Status code indicating invoked module is not initialized.

INVOKE_IN_INVALID_STATE Status code indicating invoked module is not ready – not initialized or shutting down.

INVOKE_INVALID_INSIDE_CALLBACK Status code indicating provided callback is invalid.

INVOKE_STATUS_BAD_PROMISE_ID Status code indicating provided promise id is not valid.

INVOKE_STATUS_TIMEOUT Status code indicating invocation has timeout.

INVOKE_STATUS_FALSE Status code indicating invocation has failed.

INVOKE_STATUS_TRUE Status code indicating invocation completed successfully.

3.2.2.2 enum __logLevel_t

Collection of log-level modes Helix module has.

Enumerator

NO_LOG Disable all logging inside Helix module.

ERROR_LEVEL Enable logging of serious error conditions.

INFO_LEVEL Enable logging of information-level messages.

WARN_LEVEL Enable logging of warning messages.

DEBUG_LEVEL Enable logging of debug-level messages.

ALL_LEVEL Enable logging of all possible messages.

3.2.2.3 enum __option_t

Collection of codes indicating memory ownership model Helix caller will be using.

Enumerator

USER_OWNS_MEMORY Helix should not take copy of the supplied (decryption) buffer and use exclusively user supplied one. User takes on responsibility for ensuring the memory remains valid and accessible for the duration of all Helix operations to complete its work involving that memory location. In case of encryption, caller is responsible to deallocate returned memory buffer with encrypted data.

HELIX_OWNS_MEMORY Helix should take a copy of the supplied (decryption) buffer and will manage its life-cycle internally. Caller is free to destroy original (decryption) inputs at any time. In case of encryption, Helix will own memory used to return (encrypted) outputs - user is responsible to signal to Helix when the contents are eligible for destruction by calling ConcludeEncryption with promise-id corresponding to original encryption request.

3.2.2.4 enum __promiseStatusAndFlags_t

Collection of codes indicating state of a promise (result of computation to be completed in the future).

Enumerator

PROMISE_INVALID Promise state is invalid (either corrupted, or one of internal operations exited with code invokeStatus_t::INVOKE_IN_INVALID_STATE.

PROMISE_INFINITE Promised work has no timeout for its completion - promise will remain active until task signals completion (ex: daemon services)

PROMISE_COMPLETE Indicated promised computation has been completed.

PROMISE_DESTROY Request destruction of the specified promise (release of resources once promise is complete)

PROMISE_DATA_AVAILABLE There is data available for extraction as result of completion of promised work.

PROMISE_EVENT N/A.

PROMISE_USER_EVENT N/A.

PROMISE_RESULT_ERROR Promised work completed with an error.

PROMISE_MEMORY_ALLOCATED N/A.

PROMISE_MEMORY_RELEASING N/A.

PROMISE_MEMORY_POST_RELEASED_ID N/A.

PROMISE_ALLOW_RECURSIVE_EVENTS N/A.

PROMISE_NO_STATUS Status of promised work is unknown (most likely work is in progress)

PROMISE_WAIT_STATUS Promised work is in wait status (most likely task is waiting for completion is another sub-task)

PROMISE_ERROR_UNDEFINED Unknown error condition has been detected.

3.2.2.5 enum __serverResponseCode_t

Collection of code values key-server could respond with after various requests.

Enumerator

SERVER_SUCCESS Server successfully completed requested action by the client.

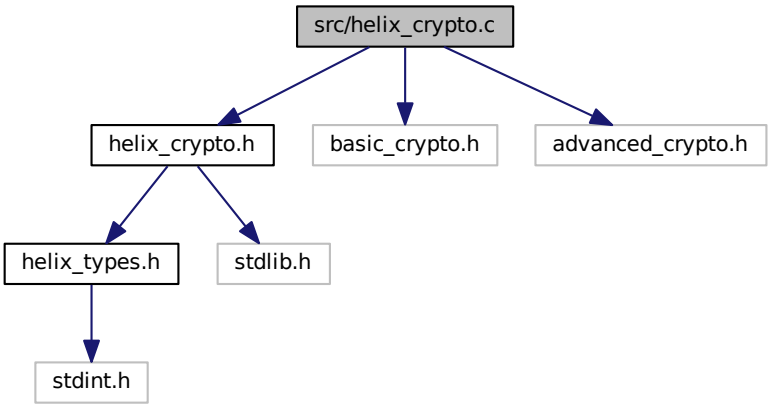
SERVER_FAIL Server failed to complete requested action by the client.

3.3 mainpage.md File Reference

3.4 src/helix_crypto.c File Reference

```
#include "helix_crypto.h"
#include "basic_crypto.h"
#include "advanced_crypto.h"
```

Include dependency graph for helix_crypto.c:



Functions

- invokeStatus_t blakfx_helix_accountCreate (const char ∗userName)

  Creates a new account with a given username. All previously generated keys for the account in local key storage will be deleted.
- invokeStatus_t blakfx_helix_accountDelete (const char ∗userName)

  Deletes a local account with a given username.
- invokeStatus_t blakfx_helix_accountLogin (const char ∗userName)

  Login to an existing account with a given username.
- invokeStatus_t blakfx_helix_apiCreateUID (uint8_t ∗inputBuffer16Bytes, size_t inputBufferSize)
- void blakfx_helix_apiShutdown (void)

  Shut down/cleanup of Helix API module Helix module does a great deal of background work: key-generation, communication with key-server, in addition to asynchronous encryption and decryption processes. It is imperative to allow Helix module to step through orderly shutdown process in order to prevent unlikely but possible local-data corruption.
- invokeStatus_t blakfx_helix_apiStartup (const char ∗serverIP, uint16_t port, int64_t flags)

Starts the Helix API module Helix module is composed of various components that will be loaded/activated on demand by the caller. This allows clients of Helix to minimize the start-time, optimize resource utilization, and segment Helix usage by various differentiating factors.

- invokeStatus_t blakfx_helix_apiStartup_Advanced (const char *serverIP, uint16_t port, const char *customDUID, int64_t flags, void *reserved)

  Starts the Helix API module, with more options available.
- promiseStatusAndFlags_t blakfx_helix_cPromiseManager_getStatus (PROMISE_ID promise_ID)

  Get the status of a specific promise.
- invokeStatus_t blakfx_helix_decryptGetOutputData (DECRYPT_ID decrypt_id, uint8_t **data, size_t *length)

  Get the result of a given decryption task.
- DECRYPT_ID blakfx_helix_decryptStart (uint8_t *cipherData, size_t cipherMessageSize, const char *password, option_t anInvocationOptions)

  Start decrypting some encrypted blob.
- invokeStatus_t blakfx_helix_encryptConclude (ENCRYPT_ID encrypt_id)

  Conclude/wrap up a given encryption task.
- invokeStatus_t blakfx_helix_encryptGetOutputData (ENCRYPT_ID encrypt_id, uint8_t **serializedOut, size_t *length, option_t anInvocationOptions)

  Get the result of a given encryption task.
- invokeStatus_t blakfx_helix_encryptOutputExists (ENCRYPT_ID encrypt_id)

  Check whether encrypt output exists.
- uint8_t * blakfx_helix_encryptPayloadGetSerialized (ENCRYPT_ID encrypt_id, size_t *length)

  Get the serialized payload of a given encryption task.
- invokeStatus_t blakfx_helix_encryptPayloadSerializedRelease (ENCRYPT_ID encrypt_id, uint8_t *serialized)

  Release the serialized payload of a given encryption task.
- ENCRYPT_ID blakfx_helix_encryptStart (USER_ID user_id, const void *data, size_t dataSize, const char *password, const char *fileName, option_t anInvocationOptions)

  Start encrypting some content intended for a given target user.
- void * blakfx_helix_getUserData (PROMISE_ID promise_ID, uint64_t user_data_id, size_t *length)

  Get the data for a given user.
- invokeStatus_t blakfx_helix_serverConnect (void)

  Connect to previously specified (see blakfx_helix_apiStartup) Helix key-server. Helix module publishes and exchanges public cryptographic keys with its key-server, in order to facilitate cryptographically secure End-to-End communication.
- invokeStatus_t blakfx_helix_serverDisconnect (void)

  Sever active connection to Helix key-server Helix operates numerous background tasks allowing clients to complete complex cryptographic operations seamlessly. To prevent unlikely but possible corruption, it is crucial for Helix users to allow Helix module to complete orderly disconnect from its key-server.
- invokeStatus_t blakfx_helix_serverIsConnected (void)

  Checks whether connection to previously defined key-server is alive (in valid state and responsive). This method is added for posterity, however avoid overusing it or placing it in your execution critical path - it's execution is network-bound. Under normal circumstances, it safe to assume the connection is active, and check for error conditions of Helix API calls in the critical-path. This method is appropriate for use as connectivity test after long period is inactivity. In all other situations - use of this API is superfluous and suboptimal.
- PROMISE_ID blakfx_helix_simpleSearchForRecipientByEmail (const char *lookup, int64_t waitInMillis)

  Search for an account with a given email on the current Helix Key Server.
- PROMISE_ID blakfx_helix_simpleSearchForRecipientByName (const char *lookup, int64_t waitInMillis)

  Search for an account with a given username on the current Helix Key Server.
- USER_ID blakfx_helix_userFindByEmail (const char *emailAddress, invokeStatus_t *result, blakfx_helix_event_handler_t crypto_notification_function)

  Search for an user with a given email on the current Helix Key Server.
- PROMISE_ID blakfx_helix_userFindByEmailAsPromise (const char *emailAddress, invokeStatus_t *result, blakfx_helix_event_handler_t promise_notification_function)

  Search for an account with a given email on the current Helix Key Server.

- USER_ID blakfx_helix_userFindByName (const char *userName, invokeStatus_t *result, blakfx_helix_event_handler_t crypto_notification_function)

  Search for an user with a given username on the current Helix Key Server.
- PROMISE_ID blakfx_helix_userFindByNameAsPromise (const char *userName, invokeStatus_t *result, blakfx_helix_event_handler_t promise_notification_function)

  Search for an account with a given username on the current Helix Key Server.
- invokeStatus_t blakfx_helix_userRelease (USER_ID user_id)

  Release an user.
- invokeStatus_t blakfx_helix_userValidate (USER_ID user_id)

  Ensure that an user is valid.
- invokeStatus_t blakfx_helix_waitEvent (PROMISE_ID crypto_ID, int64_t time_in_ms)

  Waits for an event for a specific time.
- promiseStatusAndFlags_t blakfx_helix_waitEventStatus (PROMISE_ID crypto_ID)

  Retrieve status of the promise (referencing a promise to complete some operation) by its unique id.

3.4.1 Function Documentation

3.4.1.1 invokeStatus_t blakfx_helix_accountCreate (const char * *userName*)

Creates a new account with a given username. All previously generated keys for the account in local key storage will be deleted.

Parameters

in	*userName*	the username for the account

Returns

result code of the creation operation

3.4.1.2 invokeStatus_t blakfx_helix_accountDelete (const char * *userName*)

Deletes a local account with a given username.

Parameters

in	*userName*	the username for the account

Returns

result code of the deletion operation

3.4.1.3 invokeStatus_t blakfx_helix_accountLogin (const char * *userName*)

Login to an existing account with a given username.

Parameters

in	*userName*	the username for the account

Returns

result code of the login operation

3.4.1.4 invokeStatus_t blakfx_helix_apiCreateUID (uint8_t * *inputBuffer16Bytes,* size_t *inputBufferSize*)

3.4.1.5 void blakfx_helix_apiShutdown (void)

Shut down/cleanup of Helix API module Helix module does a great deal of background work: key-generation, communication with key-server, in addition to asynchronous encryption and decryption processes. It is imperative to allow Helix module to step through orderly shutdown process in order to prevent unlikely but possible local-data corruption.

3.4.1.6 invokeStatus_t blakfx_helix_apiStartup (const char * *serverIP,* uint16_t *port,* int64_t *flags*)

Starts the Helix API module Helix module is composed of various components that will be loaded/activated on demand by the caller. This allows clients of Helix to minimize the start-time, optimize resource utilization, and segment Helix usage by various differentiating factors.

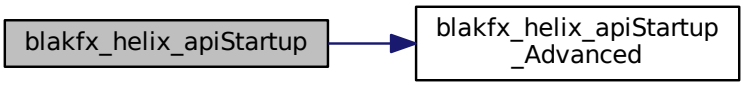
Parameters

in	*serverIP*	the IP/hostname of the Helix Key Server to connect to
in	*port*	the port of the Helix Key Server to connect to
in	*flags*	additional flags

Returns

result of startup operation

Here is the call graph for this function:



3.4.1.7 invokeStatus_t blakfx_helix_apiStartup_Advanced (const char * *serverIP,* uint16_t *port,* const char * *customDUID,* int64_t *flags,* void * *reserved*)

Starts the Helix API module, with more options available.

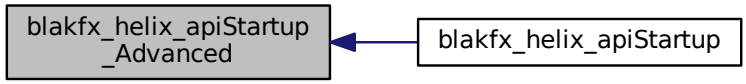
Parameters

in	*serverIP*	the IP/hostname of the Helix Key Server to connect to
in	*port*	the port of the Helix Key Server to connect to
in	*customDUID*	a fake custom device UID
in	*flags*	additional flags
in	*reserved*	unused

Returns

result of startup operation

Here is the caller graph for this function:



3.4.1.8 promiseStatusAndFlags_t blakfx_helix_cPromiseManager_getStatus (PROMISE_ID *promise_ID*)

Get the status of a specific promise.

Parameters

in	*promise_ID*	the ID of the promise to get the status of

Returns

status of the promise

3.4.1.9 invokeStatus_t blakfx_helix_decryptGetOutputData (DECRYPT_ID *decrypt_id,* uint8_t ∗∗ *data,* size_t ∗ *length*)

Get the result of a given decryption task.

Parameters

in	*decrypt_id*	the ID of the decryption to get the result of
out	*data*	buffer to place the result of the decryption
out	*length*	the length of the decrypted data

Returns

result of get operation

3.4.1.10 DECRYPT_ID blakfx_helix_decryptStart (uint8_t ∗ *cipherData,* size_t *cipherMessageSize,* const char ∗ *password,* option_t *anInvocationOptions*)

Start decrypting some encrypted blob.

Parameters

in	*cipherData*	the encrypted blob
in	*cipherMessage-Size*	the size of the encrypted blob

in	*password*	optional password to decrypt with
in	*anInvocation-Options*	additional options to specify

Returns

decryption ID for the ongoing decryption

3.4.1.11 invokeStatus_t blakfx_helix_encryptConclude (ENCRYPT_ID *encrypt_id*)

Conclude/wrap up a given encryption task.

Parameters

in	*encrypt_id*	the ID of the encryption to conclude

Returns

whether the task was concluded successfully or not

3.4.1.12 invokeStatus_t blakfx_helix_encryptGetOutputData (ENCRYPT_ID *encrypt_id,* uint8_t ∗∗ *serializedOut,* size_t ∗ *length,* option_t *anInvocationOptions*)

Get the result of a given encryption task.

Parameters

in	*encrypt_id*	the ID of the encryption to get the result of
out	*serializedOut*	buffer to place the result of the encryption
out	*length*	the length of the encrypted data
in	*anInvocation-Options*	additional options to specify

Returns

result of get operation

3.4.1.13 invokeStatus_t blakfx_helix_encryptOutputExists (ENCRYPT_ID *encrypt_id*)

Check whether encrypt output exists.

Parameters

in	*encrypt_id*	the ID of the encryption to check

Returns

whether the encryption has any output or not

3.4.1.14 uint8_t∗ blakfx_helix_encryptPayloadGetSerialized (ENCRYPT_ID *encrypt_id,* size_t ∗ *length*)

Get the serialized payload of a given encryption task.

Parameters

in	*encrypt_id*	the ID of the encryption to get the result of
out	*length*	the length of the encrypted data

Returns

the serialized payload data

3.4.1.15 invokeStatus_t blakfx_helix_encryptPayloadSerializedRelease (ENCRYPT_ID *encrypt_id,* uint8_t * *serialized*)

Release the serialized payload of a given encryption task.

Parameters

in	*encrypt_id*	the ID of the encryption to release the serialized payload of
in	*serialized*	the serialized payload data

Returns

whether the data was released successfully

3.4.1.16 ENCRYPT_ID blakfx_helix_encryptStart (USER_ID *user_id,* const void * *data,* size_t *dataSize,* const char * *password,* const char * *fileName,* option_t *anInvocationOptions*)

Start encrypting some content intended for a given target user.

Parameters

in	*user_id*	the ID of the target user
in	*data*	the content to encrypt
in	*dataSize*	the size of the content to encrypt
in	*password*	optional password to encrypt with
in	*fileName*	optional name/path for file with content to encrypt
in	*anInvocation-Options*	additional options

Returns

encryption ID for the ongoing encryption

3.4.1.17 void* blakfx_helix_getUserData (PROMISE_ID *promise_ID,* uint64_t *user_data_id,* size_t * *length*)

Get the data for a given user.

Parameters

in	*promiseID*	the promiseID to find the data for
in	*user_data_id*	the user's data ID
out	*length*	the length of the user's data

Returns

data as a void *

3.4.1.18 invokeStatus_t blakfx_helix_serverConnect (void)

Connect to previously specified (see blakfx_helix_apiStartup) Helix key-server. Helix module publishes and exchanges public cryptographic keys with its key-server, in order to facilitate cryptographically secure End-to-End communication.

Returns

Status of attempt to establish connection with key-server

3.4.1.19 invokeStatus_t blakfx_helix_serverDisconnect (void)

Sever active connection to Helix key-server Helix operates numerous background tasks allowing clients to complete complex cryptographic operations seamlessly. To prevent unlikely but possible corruption, it is crucial for Helix users to allow Helix module to complete orderly disconnect from its key-server.

Returns

Status of severing the connection to the key-server (normal or with errors)

3.4.1.20 invokeStatus_t blakfx_helix_serverIsConnected (void)

Checks whether connection to previously defined key-server is alive (in valid state and responsive). This method is added for posterity, however avoid overusing it or placing it in your execution critical path - it's execution is network-bound. Under normal circumstances, it safe to assume the connection is active, and check for error conditions of Helix API calls in the critical-path. This method is appropriate for use as connectivity test after long period is inactivity. In all other situations - use of this API is superfluous and suboptimal.

Returns

Status of connection to previously defined key-server

3.4.1.21 PROMISE_ID blakfx_helix_simpleSearchForRecipientByEmail (const char * *lookup*, int64_t *waitInMillis*)

Search for an account with a given email on the current Helix Key Server.

Parameters

in	*lookup*	the email address of the target
in	*waitInMillis*	the time in ms to attempt the search in

Returns

result of the search operation

3.4.1.22 PROMISE_ID blakfx_helix_simpleSearchForRecipientByName (const char * *lookup*, int64_t *waitInMillis*)

Search for an account with a given username on the current Helix Key Server.

Parameters

in	*lookup*	the username for the target account
in	*waitInMillis*	the time in ms to attempt the search in

Returns

result of the search operation

3.4.1.23 USER_ID blakfx_helix_userFindByEmail (const char * *emailAddress*, invokeStatus_t * *result*, blakfx_helix_event_handler_t *crypto_notification_function*)

Search for an user with a given email on the current Helix Key Server.

!

Parameters

in	*emailAddress*	the email address of the target
out	*result*	the result of the search operation
in	*blakfx_helix_event_handler_t*	register custom function to be executed as registered event handler with promise status notification

Returns

user ID of the found/not found user

3.4.1.24 PROMISE_ID blakfx_helix_userFindByEmailAsPromise (const char * *emailAddress*, invokeStatus_t * *result*, blakfx_helix_event_handler_t *promise_notification_function*)

Search for an account with a given email on the current Helix Key Server.

!

Parameters

in	*emailAddress*	the email address of the target
out	*result*	the result of the search operation
in	*blakfx_helix_event_handler_t*	register custom function to be executed as registered event handler with promise status notification

Returns

promise of found/not found user

3.4.1.25 USER_ID blakfx_helix_userFindByName (const char * *userName*, invokeStatus_t * *result*, blakfx_helix_event_handler_t *crypto_notification_function*)

Search for an user with a given username on the current Helix Key Server.

!

Parameters

in	*userName*	the name of the target

out	*result*	the result of the search operation
in	*blakfx_helix_-event_handler_t*	register custom function to be executed as registered event handler with promise status notification

Returns

user ID of the found/not found user

3.4.1.26 PROMISE_ID blakfx_helix_userFindByNameAsPromise (const char * *userName,* invokeStatus_t * *result,* blakfx_helix_event_handler_t *promise_notification_function*)

Search for an account with a given username on the current Helix Key Server.

!

Parameters

in	*userName*	the username for the target account
out	*result*	the result of the search operation
in	*blakfx_helix_-event_handler_t*	register custom function to be executed as registered event handler with promise status notification

Returns

promise of found/not found user

3.4.1.27 invokeStatus_t blakfx_helix_userRelease (USER_ID *user_id*)

Release an user.

Parameters

in	*user_id*	the ID of the user to release

Returns

result of release

3.4.1.28 invokeStatus_t blakfx_helix_userValidate (USER_ID *user_id*)

Ensure that an user is valid.

Parameters

in	*user_id*	the ID of the user to validate

Returns

result of validation

3.4.1.29 invokeStatus_t blakfx_helix_waitEvent (PROMISE_ID *crypto_ID,* int64_t *time_in_ms*)

Waits for an event for a specific time.

Parameters

in	*crypto_ID*	the ID of the event to wait for
in	*time_in_ms*	the time in ms to wait for

Returns

result of the wait operation

3.4.1.30 promiseStatusAndFlags_t blakfx_helix_waitEventStatus (PROMISE_ID *aPromise_id*)

Retrieve status of the promise (referencing a promise to complete some operation) by its unique id.

Parameters

in	*aPromise_id*	the unique id of the promise whose status to retrieve

Returns

status code indicating the state of the promised work

3.5 test/helix_crypto_test.c File Reference

Functions

- int main ()

3.5.1 Function Documentation

3.5.1.1 int main ( )

Index