

# Supporting Document

## Mandatory Technical Document



PP-Module for Authentication Servers

Version: 1.0

2022-08-12

**National Information Assurance Partnership**

## Foreword

This is a Supporting Document (SD), intended to complement the Common Criteria version 3 and the associated Common Evaluation Methodology for Information Technology Security Evaluation.

SDs may be “Guidance Documents”, that highlight specific approaches and application of the standard to areas where no mutual recognition of its application is required, and as such, are not of normative nature, or “Mandatory Technical Documents”, whose application is mandatory for evaluations whose scope is covered by that of the SD. The usage of the latter class is not only mandatory, but certificates issued as a result of their application are recognized under the CCRA.

### Technical Editor:

National Information Assurance Partnership (NIAP)

### Document history:

Version	Date	Comment
1.0	2022-08-12	Initial Release

### General Purpose:

The purpose of this SD is to define evaluation methods for the functional behavior of Authentication Server products.

### Acknowledgments:

This SD was developed with support from NIAP Authentication Servers Technical Community members, with representatives from industry, government agencies, Common Criteria Test Laboratories, and members of academia.

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# 1 Introduction

## 1.1 Technology Area and Scope of Supporting Document

The scope of the PP-Module for Authentication Servers is to describe the security functionality of Authentication Servers products in terms of [CC] and to define functional and assurance requirements for them. The PP-Module is intended for use with the following Base-PP:

- [Network Device, version 2.2e](#)

This SD is mandatory for evaluations of TOEs that claim conformance to a PP-Configuration that includes the PP-Module for :

- Authentication Servers, Version 1.0

As such it defines Evaluation Activities for the functionality described in the PP-Module as well as any impacts to the Evaluation Activities to the Base-PP(s) it modifies.

Although Evaluation Activities are defined mainly for the evaluators to follow, in general they also help developers to prepare for evaluation by identifying specific requirements for their TOE. The specific requirements in Evaluation Activities may in some cases clarify the meaning of Security Functional Requirements (SFR), and may identify particular requirements for the content of Security Targets (ST) (especially the TOE Summary Specification), user guidance documentation, and possibly supplementary information (e.g. for entropy analysis or cryptographic key management architecture).

## 1.2 Structure of the Document

Evaluation Activities can be defined for both SFRs and Security Assurance Requirements (SAR), which are themselves defined in separate sections of the SD.

If any Evaluation Activity cannot be successfully completed in an evaluation, then the overall verdict for the evaluation is a 'fail'. In rare cases there may be acceptable reasons why an Evaluation Activity may be modified or deemed not applicable for a particular TOE, but this must be approved by the Certification Body for the evaluation.

In general, if all Evaluation Activities (for both SFRs and SARs) are successfully completed in an evaluation then it would be expected that the overall verdict for the evaluation is a 'pass'. To reach a 'fail' verdict when the Evaluation Activities have been successfully completed would require a specific justification from the evaluator as to why the Evaluation Activities were not sufficient for that TOE.

Similarly, at the more granular level of assurance components, if the Evaluation Activities for an assurance component and all of its related SFR Evaluation Activities are successfully completed in an evaluation then it would be expected that the verdict for the assurance component is a 'pass'. To reach a 'fail' verdict for the assurance component when these Evaluation Activities have been successfully completed would require a specific justification from the evaluator as to why the Evaluation Activities were not sufficient for that TOE.

## 1.3 Terms

The following sections list Common Criteria and technology terms used in this document.

### 1.3.1 Common Criteria Terms

Assurance                Grounds for confidence that a TOE meets the SFRs [\[CC\]](#).

Base  
Protection  
Profile (Base-  
PP)                        Protection Profile used as a basis to build a PP-Configuration.

Collaborative Protection Profile (cPP)	A Protection Profile developed by international technical communities and approved by multiple schemes.
Common Criteria (CC)	Common Criteria for Information Technology Security Evaluation (International Standard ISO/IEC 15408).
Common Criteria Testing Laboratory	Within the context of the Common Criteria Evaluation and Validation Scheme (CCEVS), an IT security evaluation facility accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) and approved by the NIAP Validation Body to conduct Common Criteria-based evaluations.
Common Evaluation Methodology (CEM)	Common Evaluation Methodology for Information Technology Security Evaluation.
Distributed TOE	A TOE composed of multiple components operating as a logical whole.
Operational Environment (OE)	Hardware and software that are outside the TOE boundary that support the TOE functionality and security policy.
Protection Profile (PP)	An implementation-independent set of security requirements for a category of products.
Protection Profile Configuration (PP-Configuration)	A comprehensive set of security requirements for a product type that consists of at least one Base-PP and at least one PP-Module.
Protection Profile Module (PP-Module)	An implementation-independent statement of security needs for a TOE type complementary to one or more Base-PPs.
Security Assurance Requirement (SAR)	A requirement to assure the security of the TOE.
Security Functional Requirement (SFR)	A requirement for security enforcement by the TOE.
Security Target (ST)	A set of implementation-dependent security requirements for a specific product.
Target of Evaluation (TOE)	The product under evaluation.
TOE Security Functionality (TSF)	The security functionality of the product under evaluation.
TOE Summary Specification (TSS)	A description of how a TOE satisfies the SFRs in an ST.

### 1.3.2 Technical Terms

Assertion	A statement from the TOE to an RP that contains information about a subscriber. Assertions may also contain verified attributes. For the purposes of this PP-Module, assertions containing authentication status and identity attributes are made by EAP response messages in accordance with EAP-TLS or EAP-TTLS.
Authentication Policy	A policy that specifies which authenticator types are required for a particular entity. The policy may be implicit for all entities, or configurable.
Authenticator	Something the claimant possesses and controls (typically a cryptographic module or password) that is used to authenticate the claimant's identity.
	The output value generated by an authenticator. The ability to generate valid authenticator

Authenticator Output	outputs on demand proves that the claimant possesses and controls the authenticator. Protocol messages sent to the verifier are dependent upon the authenticator output, but they may or may not explicitly contain it.
Claimant	A subject whose identity is to be verified using one or more authentication protocols.
Credential	An object or data structure that authoritatively binds an identity via an identifier or identifiers and (optionally) additional attributes, to at least one authenticator possessed and controlled by a subscriber.
Federation Protocol	A protocol to establish a trusted relationship with a relying party, and for the purposes of this PP module, to communicate authentication status for entities requesting access to resources managed by the relying party. In this PP-module, Federation Protocols include RADIUS, DIAMETER, and other standard protocols used in direct communication between the relying party and the TOE. Federation protocols that only support bearer assertions are out of scope for this PP-Module.
Relying Party (RP)	An entity that relies upon the subscriber's authenticators and credentials or a verifier's assertion of a claimant's identity, typically to process a transaction or grant access to information or a system.

## 2 Evaluation Activities for SFRs

The EAs presented in this section capture the actions the evaluator performs to address technology specific aspects covering specific SARs (e.g. ASE\_TSS.1, ADV\_FSP.1, AGD\_OPE.1, and ATE\_IND.1) – this is in addition to the CEM workunits that are performed in [Section 3 Evaluation Activities for SARs](#).

Regarding design descriptions (designated by the subsections labeled TSS, as well as any required supplementary material that may be treated as proprietary), the evaluator must ensure there is specific information that satisfies the EA. For findings regarding the TSS section, the evaluator's verdicts will be associated with the CEM workunit ASE\_TSS.1-1. Evaluator verdicts associated with the supplementary evidence will also be associated with ASE\_TSS.1-1, since the requirement to provide such evidence is specified in ASE in the PP.

For ensuring the guidance documentation provides sufficient information for the administrators/users as it pertains to SFRs, the evaluator's verdicts will be associated with CEM workunits ADV\_FSP.1-7, AGD\_OPE.1-4, and AGD\_OPE.1-5.

Finally, the subsection labeled Tests is where the authors have determined that testing of the product in the context of the associated SFR is necessary. While the evaluator is expected to develop tests, there may be instances where it is more practical for the developer to construct tests, or where the developer may have existing tests. Therefore, it is acceptable for the evaluator to witness developer-generated tests in lieu of executing the tests. In this case, the evaluator must ensure the developer's tests are executing both in the manner declared by the developer and as mandated by the EA. The CEM workunits that are associated with the EAs specified in this section are: ATE\_IND.1-3, ATE\_IND.1-4, ATE\_IND.1-5, ATE\_IND.1-6, and ATE\_IND.1-7.

### 2.1 Collaborative Protection Profile for Network Devices

The EAs defined in this section are only applicable in cases where the TOE claims conformance to a PP-Configuration that includes the NDcPP.

#### 2.1.1 Modified SFRs

##### 2.1.1.1 Identification and Authentication (FIA)

###### FIA\_X509\_EXT.1/Rev X.509 Certificate Validation

FIA\_X509\_EXT.1/Rev

###### **TSS**

There are no additional TSS evaluation activities for this component beyond what the NDcPP requires.

###### **Guidance**

There are no additional guidance evaluation activities for this component beyond what the NDcPP requires.

###### **Tests**

There are no additional test evaluation activities for this component beyond what the NDcPP requires.

###### FIA\_X509\_EXT.2 X.509 Certificate Authentication

FIA\_X509\_EXT.2

###### **TSS**

There are no additional TSS evaluation activities for this component beyond what the NDcPP requires.

#### **Guidance**

There are no additional guidance evaluation activities for this component beyond what the NDcPP requires.

#### **Tests**

There are no additional test evaluation activities for this component beyond what the NDcPP requires.

### **FIA\_X509\_EXT.3 X.509 Certificate Requests**

FIA\_X509\_EXT.3

#### **TSS**

There are no additional TSS evaluation activities for this component beyond what the NDcPP requires.

#### **Guidance**

There are no additional guidance evaluation activities for this component beyond what the NDcPP requires.

#### **Tests**

There are no additional test evaluation activities for this component beyond what the NDcPP requires.

## **2.2 TOE SFR Evaluation Activities**

### **2.2.1 Security Audit (FAU)**

#### **FAU\_GEN.1/AuthSvr Audit Data Generation**

FAU\_GEN.1/AuthSvr

#### **TSS**

There are no TSS evaluation activities for this SFR.

#### **Guidance**

The evaluator shall ensure that the operational guidance identifies the auditable events and includes representative examples of each event so that the presentation of each event can be identified.

#### **Tests**

The evaluator shall test the TOE's ability to correctly generate audit records by having the TOE generate audit records in accordance with the evaluation activities associated with the functional requirements in this PP-Module. When verifying the test results, the evaluator will ensure the audit records generated during testing match the format specified in the administrative guide and that the fields in each audit record have the proper entries.

Note that the testing here can be accomplished in conjunction with the testing of the security mechanisms directly.

### **2.2.2 Communications (FCO)**

#### **FCO\_NRO.1 Selective Proof of Origin**

FCO\_NRO.1

#### **TSS**

The evaluator shall ensure that the ST includes a description of authentication assertions, security associations or sensitive data associated with a claimant that is provided to a relying party, and a description of each protocol that carries such data.

The evaluator shall ensure that the ST includes a description of support for pass-through methods and the method it uses to mutually authenticate to, external authentication servers.

The evaluator shall verify that the descriptions indicate how the TSF authenticates itself to the external entities via those protocols, and that no data is passed via an unauthenticated protocol.

The evaluator shall verify that the ST describes how the TSF handles session interruptions and resumptions to ensure the relying party is able to associate data associated with a claimant to the authentication request by the relying party and the authenticator provided by the claimant.

#### **Guidance**

The evaluator shall ensure that any instructions for configuring the TSF to meet the requirements are provided.

#### **Tests**

The evaluator shall perform the following tests:

- **Test 1:**

- Step 1: The evaluator shall establish a connection with the TSF from two trusted relying parties RP1 and RP2 and verify that each of RP1 and RP2 are able to authenticate the TOE.
- Step 2: The evaluator shall initiate an authentication request for a claimant C1 via RP1, providing valid authentication data, and verify that RP1 receives an authentication assertion via the authenticated channel indicating C1 is authenticated.
- Step 3: The evaluator shall initiate an authentication request for a claimant C2 via RP2, providing invalid authentication data and confirm that the TOE does not provide an authentication assertion indicating C2 is authenticated via the authenticated channel.
- Step 4: The evaluator shall send correct authentication data associated with claimant C2 via RP1 without sending a new authentication request and observe that the TOE ignores the request.
- **Test 2:** [conditional on support for pass-through] The intent of this test is to demonstrate the TSF is able to authenticate to external entities for registered users over a pass-through method, and ignores requests for non-registered users.
  - Step 1: The evaluator shall follow operational guidance to configure the TOE to connect to an external authentication server using pass-through functionality, and initiate a request from a trusted relying party that results in the TSF exercising pass-through functionality to authenticate a registered claimant.
  - Step 2: The evaluator shall observe that the TSF authenticates to the external authentication server prior to sending any authentication requests.
  - Step 3: The evaluator shall then follow operational guidance to de-register the claimant at the TOE, and ensure the claimant is still registered at the external authentication server. The evaluator shall repeat initiation of the authentication request for the claimant, and observe that the TSF associates the identifier of the request by dropping the request without forwarding.

## **FCO\_NRR.1 Selective Proof of Receipt**

FCO\_NRR.1

### **TSS**

The evaluator shall ensure that the ST includes a description of each messaging protocol and the specific messages provided to a relying party in response to authentication requests, to include any affirmative and negative responses, and requests for additional information.

The evaluator shall verify that the descriptions specify how the TSF indicates the identity of the claimant associated with any responses to a request.

The evaluator shall verify that the ST describes how the TSF handles session interruptions and resumptions to ensure the relying party is able to associate data associated with a claimant to the authentication request by the relying party and the authenticator provided by the claimant.

### **Guidance**

The evaluator shall ensure that any instructions for configuring the TSF to meet the requirements are provided.

### **Tests**

For each messaging protocol supported, the evaluator shall perform the following test:

- **Test 1:** The evaluator shall establish a connection between a trusted relying party and the TOE and send an authentication request for a registered claimant, in accordance with the messaging protocol standard. The evaluator shall confirm the TOE responds to each message sent by the relying party with a message that appropriately identifies the claimant and confirms receipt of the request.

## **2.2.3 Cryptographic Support (FCS)**

### **FCS\_CKM.3 Cryptographic Key Access**

FCS\_CKM.3

### **TSS**

The evaluator shall verify the ST includes a description of all persistent secret and private keys used by the TSF to perform functions in this PP-Module. The evaluator shall verify the ST describes mechanisms used to prevent unauthorized exposure of keys.

### **Guidance**

The evaluator shall verify that any configuration required to meet the requirements are described.

### **Tests**

The intent of these tests is to ensure keys are not accessible using common interfaces and functionality of the TSF. It is not intended for the evaluator to attempt to cause a system crash in order to read keys and critical security parameters directly from memory or to modify functionality of the TSF.

The evaluator shall perform the following tests:

- **Test 1:** The evaluator shall attempt to export each key and critical security parameter using available interfaces and verify the mechanism is effective at preventing exposure of the key in plaintext.
- **Test 2:** The evaluator shall assume each of the privileged user roles and attempt to gain read access to

each of the keys and critical security parameters via available interfaces.

## **FCS\_EAPTLS\_EXT.1 EAP-TLS Protocol**

### **FCS\_EAPTLS\_EXT.1**

#### **TSS**

The evaluator shall examine the ST to ensure the EAP protocol is described in accordance with the claimed RFC. For each supported mode, the evaluator shall ensure the ST describes the following:

- The mechanism to authenticate a claimant uses (D)TLS with client certificate authentication in combination with any other supported authenticator outputs, and any configurable features.
- The source of randomness meets FCS\_RBG\_EXT.1 for use in key and nonce generation for the underlying (D)TLS channel and supported authentication methods.

The evaluator shall also verify that the ST contains a description of the user access policy, including which authenticator outputs are required under the default configuration and which features of the user access policy are configurable.

#### **Guidance**

The evaluator shall ensure that the operational guidance includes any instructions for configuring the TOE to support the claimed functions.

If any features of the access control policy are configurable (e.g., the supported authentication mechanism), the evaluator shall confirm that the operational guidance describes how to configure these features.

#### **Tests**

The evaluator shall perform the following tests:

- **Test 1:** TLS/DTLS testing is performed as part of FCS\_TLSS\_EXT.1 and .2 or FCS\_DTLSS\_EXT.1 and .2. When TLS/DTLS cannot be invoked directly using available TOE interfaces, the test procedures are modified in the following manner:
  - When required to send a client handshake to the TOE, the evaluator shall establish a connection with the test relying party and send the specified TLS client handshake messages in response to requests from the test relying party.
  - The evaluator ensures the test relying party encapsulates the TLS handshake messages received from the test client and forwards the EAP messages to the TOE. Alternatively the evaluator may use a test relying party to modify client handshake messages as specified. When required to observe TLS server responses produced by the TOE, the evaluator shall ensure the test relying party properly extracts the TLS messages from the EAP messages, and shall observe the response received at the test TLS client to verify that the TOE responds as indicated in test procedures. Alternatively, the evaluator may extract and reconstruct TLS responses received within the EAP messages received from the TOE at the test relying party.
- **Test 2:** EAP testing: For each EAP mode supported, the evaluator shall perform any configuration of the TOE necessary to select the desired mode according to the operational guidance and perform the following tests:
  - **Test 2a:** The evaluator shall determine the user access policy enforced by the TOE (if the TOE has a configurable user access policy, the evaluator may configure the TOE according to operational guidance to require claimant authentication using only a certificate to simplify subsequent test procedures). The evaluator shall initiate an authentication request from a test relying party to the TOE for a valid claimant registered with the TOE. The evaluator shall observe that once the EAP identity is established, the TOE sends an EAP request indicating the expected EAP mode (EAP-TLS or EAP-TTLS) and having the start-bit set.

The evaluator shall ensure a TLS client hello message from the valid claimant at a test client is EAP-encapsulated by the test relying party and provided to the TOE. The evaluator shall observe that the TOE responds with an EAP-encapsulated hello message to include a certificate request message.

The evaluator shall ensure the test client successfully completes the TLS handshake, and the test relying party properly encapsulates the TLS messages, to include the client finished message, and observes that the TOE responds in a manner indicating the TLS channel was successfully established. Note – if the user access policy is to only require certificate verification, then the expected response is an EAP-Success message. If the user access policy requires additional factors to be supported under EAP-TTLS, additional EAP-TTLS messages must be sent to the test relying party to request those additional factors from the test client. These are encrypted under the TLS tunnel established between the claimant and the TOE. In this case, the evaluator observes these requests at the test client to confirm the certificate verification was successful.

- **Test 2b:** The evaluator shall initiate an authentication request from the test relying party for a valid claimant registered with the TOE, different than the claimant used for Test 2a if performed. The evaluator shall send appropriate encapsulated TLS handshake messages to the TOE, to include a valid certificate response, but send an EAP-encapsulation of a modified client finished message to the TOE. The evaluator shall observe that the TOE does not send an EAP-Success message; the TOE is allowed either to send an EAP-request message to initiate a new TLS handshake or an EAP-Failure message.
- **Test 2c [conditional on support for additional authentication factors under EAP-TTLS]:** For each combination of authentication factors supported by the TOE's user authentication policy, the evaluator shall follow the operational guidance to configure the TOE's user access policy to require

the desired combination. The evaluator shall initiate an authentication request from a test client with a registered claimant having valid credentials for all factors. The evaluator shall observe that the TOE responds to the authentication request with an exchange of EAP-requests to successfully establish a mutually authenticated TLS/DTLS tunnel and that on completion, the TOE provides additional EAP-requests that when decrypted at the test client, results in prompts for additional factors.

For each additional factor in the combination, the evaluator shall input an incorrect value for requested authentication factors and observe that the TOE responds with an EAP-request that prompts the claimant to re-enter the value. The evaluator shall then input the correct value and observe that the TOE responds with an EAP-request resulting in a prompt for the next factor. The evaluator shall continue, in turn entering first, invalid, and then valid entries until all factors have been successfully provided. The evaluator shall confirm that on successful submission of valid factors, the TOE sends an EAP-Success message to the test relying party.

## **FCS\_RADIUS\_EXT.1 Authentication Protocol**

FCS\_RADIUS\_EXT.1

### **TSS**

The evaluator shall review the ST to ensure the supported protocols are described and that the description includes the following:

- Types of claimant-held keys that can be used by the relying party for key-holder verification in accordance with the supported EAP mode claimed in FCS\_EAPTLS\_EXT.1.
- How information provided by the TOE to the relying party allows the relying party to perform key-holder verification using the key.
- How key related information provided by the TOE is protected in transit to the relying party.

### **Guidance**

The evaluator shall verify that all configurable features of the TSF are described, and that instructions are provided to meet the requirements.

### **Tests**

The evaluator shall perform the following test in conjunction with testing for FCS\_EAP-TLS\_EXT.1 after successful authentication:

- **Test 1:** For each type of claimant held key supported, the evaluator shall confirm that communication between the test client and the test relying party encrypted using the indicated key is successful.

## **FCS\_STG\_EXT.1 Cryptographic Key Storage**

FCS\_STG\_EXT.1

### **TSS**

The evaluator shall verify the TSS includes a description of protected key storage.

### **Guidance**

The evaluator shall verify that the operational guidance includes any information needed to configure the TOE to meet this requirement.

### **Tests**

There are no test EAs for this component.

## **2.2.4 Identification and Authentication (FIA)**

### **FIA\_AFL.1/AuthSvr Authentication Failure Handling (Claimant)**

FIA\_AFL.1/AuthSvr

### **TSS**

The evaluator shall examine the TSS to verify that it contains a description of how successive unsuccessful authentication attempts by claimants are detected and tracked. The evaluator shall verify that the TSS describes the method by which the offending claimant is prevented from successfully being authenticated by the TOE, and the actions necessary to restore this ability.

### **Guidance**

The evaluator shall examine the operational guidance to verify that it describes how to configure the threshold for unsuccessful claimant authentication attempts and how to perform any actions that affect claimants that are limited in this manner (e.g., instructions for configuring the lockout period or for manually unlocking the offending claimant).

### **Tests**

The evaluator shall perform the following tests in conjunction with testing for FCS\_EAPTLS\_EXT.1 test 2a, and if applicable, test 2c for each claimant authentication method:

- **Test 1:** The evaluator shall follow the operational guidance to configure a number of failed attempts that



will cause lockout behavior to be enforced against a claimant. The evaluator shall establish a registered user and provide invalid input for the authentication method repeatedly to reach the configured limit. The evaluator shall then observe the configured penalty is imposed.

- **Test 2:** If the administrator action selection is claimed in FIA\_AFL.1.2/AuthSvr, the evaluator shall ensure that following the operational guidance for restoring access to a locked-out claimant will subsequently allow that claimant to be authenticated.

If the time period selection is claimed in FIA\_AFL.1.2/AuthSvr, the evaluator shall follow the operational guidance to configure a certain lockout time for claimants that are locked out due to excessive authentication failures. The evaluator shall cause a claimant to be locked out in this manner, wait for a time period that is just less than the configured value, and verify that an authentication attempt using valid credentials still does not result in successful access. The evaluator shall then repeat this behavior but wait for just after the configured time period has elapsed to show that an authentication attempt using valid credentials results in successful access.

## **FIA\_UAU.6 Re-Authenticating**

FIA\_UAU.6

### **TSS**

There are no TSS evaluation activities for this component.

### **Guidance**

The evaluator shall ensure that the operational guidance includes instructions on how an administrator of the TOE can change their own password.

### **Tests**

The evaluator will access the TOE using a particular administrative account and then attempt to change the password of that account as directed by the operational guidance. While making this attempt, the evaluator will verify that re-authentication is required.

If other re-authentication conditions are specified, the evaluator shall cause those conditions to occur and verify that the TSF re-authenticates the authenticated user.

## **FIA\_X509\_EXT.1/AuthSvr X.509 Certificate Validation (Claimant)**

FIA\_X509\_EXT.1/AuthSvr

### **TSS**

The evaluator shall ensure the TSS describes where the check of validity of the certificates takes place. The evaluator ensures the TSS also provides a description of the certificate path validation algorithm.

### **Guidance**

The evaluator shall ensure that instructions for any configurable features of the validation process are included. If the ST includes provisions for exception processing of certificate revocation status information, the evaluator shall ensure the operational guidance contains instructions on how the indicated options are configured.

If the TOE supports processing of the policy constraints extension and the TOE requires configuration to validate the policy of a claimant certificate, the evaluator shall verify that the operational guidance includes instructions for configuring this behavior.

### **Tests**

The evaluator shall perform the following tests. The tests for the extendedKeyUsage rules, name constraints and policy constraints, if supported, are performed in conjunction with the uses that require those rules.

- **Test 1:** The evaluator shall demonstrate that validating a certificate without a valid certification path results in the function failing, for each of the following reasons, in turn:
  - by establishing a certificate path in which one of the issuing certificates is not a CA certificate
  - by omitting the basicConstraints field in one of the issuing certificates
  - by setting the basicConstraints field in an issuing certificate to have CA=False
  - by omitting the CA signing bit of the key usage field in an issuing certificate
  - by setting the path length field of a valid CA field to a value strictly less than the certificate path

The evaluator shall then establish a valid certificate path consisting of valid CA certificates and demonstrate that the function succeeds. The evaluator shall then remove trust in one of the CA certificates and show that the function fails.

- **Test 2:** The evaluator shall demonstrate that validating an expired certificate results in the function failing.
- **Test 3:** The evaluator shall test that the TOE can properly handle revoked certificates – conditional on the revocation method that is selected; if multiple methods are selected, then the test is repeated for each method. The evaluator tests revocation for each certificate in the trust chain which advertises certificate status information. The evaluator shall ensure that a valid certificate is used, and that the validation function succeeds. The evaluator shall then attempt the test with a certificate that will be revoked (for each method chosen in the selection) and verify that the validation function fails.
- **Test 4:** [conditional] If any OCSP option is selected, the evaluator shall present a delegated OCSP certificate that does not have the OCSP signing purpose and verify that validation of the OCSP response fails. If CRL is selected, the evaluator shall configure the CA to sign a CRL with a certificate that does

not have the cRLsign key usage bit set and verify that validation of the CRL fails.

- **Test 5:** [conditional] If the TOE supports EC certificates, then the evaluator shall establish a valid, trusted certificate chain consisting of an EC leaf certificate, an EC Intermediate CA certificate not designated as a trust anchor, and an EC certificate designated as a trusted anchor, where the elliptic curve parameters are specified as a named curve. The evaluator shall confirm that the TOE validates the certificate chain.
- **Test 6:** [conditional] If the TOE supports EC certificates, then the evaluator shall replace the intermediate certificate in the certificate chain for Test 5 with a modified certificate. This certificate is modified to have the public key information field where the EC parameters use an explicit format version of the Elliptic Curve parameters in the corresponding field of intermediate CA certificate from Test 5. This certificate is also modified to be signed by the trusted EC root CA, but with no other changes. The evaluator shall confirm the TOE treats the certificate as invalid.
- **Test 7:** The evaluator shall test the following name constraints:
  - Test 7a: For each name type supported, the evaluator shall establish a valid certificate for a registered entity. The evaluator shall ensure the certificate has a valid path length of at least three, consisting of a trusted root, an issuing CA that is not a trust anchor, and the leaf certificate representing the entity. The evaluator shall ensure that the leaf certificate includes a single name of the supported name type and no other DN or SAN entries. The evaluator shall initiate an application requiring authentication of that entity using the certificate and verify the TSF successfully authenticates the entity.
  - Test 7b: For each leaf certificate used in test 7a, the evaluator shall establish a new leaf certificate that includes the same name and name type, but which is issued by a different subordinate CA asserting an allowed-list that does not include the name for the name-type. The evaluator shall ensure the subordinate CA is included in a valid chain to the same trusted root. The evaluator shall initiate the same application attempt as in test 7a for the new certificate and observe that the TSF indicates the certificate is invalid.
  - Test 7c: For each leaf certificate used in test 7a, the evaluator shall establish a new leaf certificate that includes the same name and name type, but which is issued by a different subordinate CA asserting a denylist matching the name for the name type. The evaluator shall ensure the subordinate CA is included in a valid certificate path to the same trusted root. The evaluator shall initiate the same application attempt as in test 7a using the new certificate and observe that the TSF indicates the certificate is invalid.
- **Test 8:** [conditional] If the TOE supports processing of the policy constraints extension, then for each distinct purpose and within the constraints indicated in the ST (claimant authentication and any other supported subject types), the evaluator shall follow the operational guidance as necessary to configure the TOE to require the subject's certificate to assert a specific certificate policy. The evaluator shall perform the following sub-tests:
  - Test 8a: The evaluator shall establish a certificate for the subject asserting the certificate policy OID required, issued by a Certification Authority also specifying the required certificate policy. The evaluator shall present the established certificate for authentication and verify that the TSF successfully validates the certificate.
  - Test 8b: [conditional] If the ST selects 'Inhibit anyPolicy extension...', the evaluator shall repeat test 8a using a certificate asserting the required policy but issued by a Certification Authority only asserting the 'anyPolicy' OID (value {2 5 29 32 0}) in its policy constraints extension. The evaluator shall observe that the TSF successfully validates the certificate.
  - Test 8c: [conditional] If the ST indicates support for the policy mapping extension, the evaluator shall repeat test 8a using a certificate asserting a new policy OID that does not match the required policy OID. This certificate is issued by a CA asserting the new policy OID in the policy constraints extension, and the CA certificate is issued by a second CA. This second CA asserts the required OID in its certificate constraints extension and contains a policy mapping extension including the mapping of the asserted policy to the required policy. The evaluator shall observe that the TSF successfully validates the certificate.

Note that installing a root CA trusted by the TOE with the required policy constraints and policy mapping extensions may be required if the TSF limits the path length of certificate chains.

- Test 8d: [conditional] If the ST indicates support for both policy mapping and policy constraints extensions and also supports certificate chains of length four or more, the evaluator shall establish a certificate for the subject asserting a new policy OID that does not match the required policy OID. This certificate is issued by a CA asserting the new policy OID, which in turn is issued by a second CA which includes the policy mapping extension that maps the required policy OID to the new policy OID. The second CA is in turn issued by a third CA that has the extension policy constraints with the inhibitPolicyMapping field having value 0. The evaluator shall present the certificate to the TSF for authentication and observe that the TSF indicates the certificate is invalid.
- Test 8e: [conditional] If the ST indicates support for both policy mapping and policy constraints extensions, the evaluator shall select a policy OID not required for authentication in the TOE's current configuration. The evaluator shall establish a certificate for the subject that does not assert the non-required policy, which is issued by a CA also asserting the new policy OID, which in turn, is issued by a CA asserting the 'anyPolicy' OID and having a critical policy constraints extension with the explicitPolicy field with value 0. The evaluator shall present the certificate to the TSF for authentication and observe that the TSF indicates the certificate is invalid.
- Test 8f: The evaluator shall establish a certificate for the subject asserting the required policy but issued by a Certification Authority that does not include any certificate policy related extensions. The evaluator shall present the certificate for authentication and observe that the TSF indicates the certificate is invalid.
- Test 8g: The evaluator shall establish a certificate for the subject asserting the required certificate

policy issued by a Certification Authority that only asserts a single, non-matching policy OID in its policy related extensions (i.e., the CA certificate does not include the matching OID, 'anyPolicy' assertions or assert an OID that is mapped to the required OID via policy matching extensions by previous Certification Authorities in the certificate chain, if supported). The evaluator shall present the certificate to the TSF for authentication and observe the TSF indicates the certificate is invalid.

- Test 8h: [conditional] If the ST indicates the inhibitAnyPolicy extension is supported, the evaluator shall establish a certificate for the subject asserting the required policy issued by a CA asserting the 'anyPolicy' OID, which is in turn issued by a CA with an inhibitAny extension with value 0. The evaluator shall present the certificate to the TSF for authentication and observe the TSF indicates the certificate is invalid.

Note that installing a root CA trusted by the TOE with the inhibitAny extension may be required if the TSF limits the path length of certificate chains.

## 2.2.5 Security Management (FMT)

### FMT\_SMF.1/AuthSvr Specification of Management Functions (Authentication Server)

FMT\_SMF.1/AuthSvr

#### **TSS**

The evaluator shall verify that the TSS identifies all of the security-relevant management functions that apply to the security functions the TOE claims from this PP-Module.

#### **Guidance**

For each claimed management function, the evaluator shall ensure that the operational guidance contains instructions for how to configure the function.

#### **Tests**

For each claimed management function, the evaluator shall follow the operational guidance to configure the behavior of that function and ensure that applying the configuration settings have the intended effect. Note that some or all of these functions may be tested in the course of performing the test activities for other claimed SFRs.

## 2.2.6 TOE Access (FTA)

### FTA\_TSE.1 TOE Session Establishment

FTA\_TSE.1

#### **TSS**

The evaluator shall examine the TSS to determine that all of the attributes on which a claimant session can be denied are specifically defined.

#### **Guidance**

The evaluator shall examine the operational guidance to verify that it contains instructions for configuring each of the attributes identified in the TSS.

#### **Tests**

The evaluator shall successfully have a claimant be authenticated by the TOE. For each attribute claimed in the SFR, the evaluator shall configure the TOE to deny user access based on a specific value of that attribute. The evaluator shall then attempt to establish a new session in contravention to the attribute setting while still providing valid authentication data. The evaluator shall observe that the access attempt fails.

## 2.2.7 Trusted Path/Channels (FTP)

### FTP\_ITC.1/NAS Inter-TSF Trusted Channel (Relying Party Communications)

FTP\_ITC.1/NAS

#### **TSS**

The evaluator shall examine the TSS to determine that, for all communications with authorized IT entities identified in the requirement, each communications mechanism is identified in terms of the allowed protocols for that IT entity. The evaluator shall also confirm that all protocols listed in the TSS are specified and included in the requirements in the ST.

#### **Guidance**

The evaluator shall confirm that the guidance documentation contains instructions for establishing and reestablishing the allowed protocols with each authorized IT entity.

#### **Tests**

For each claimed trusted channel mechanism, the evaluator shall configure the TOE to interact with a relying party using that channel and verify using packet captures that the claimed mechanism is used.

## 2.3 Evaluation Activities for Optional SFRs

The PP-Module does not define any optional requirements.

## 2.4 Evaluation Activities for Selection-Based SFRs

### 2.4.1 Cryptographic Support (FCS)

#### FCS\_RADSEC\_EXT.1 RadSec

FCS\_RADSEC\_EXT.1

**TSS**

TBD

**Guidance**

TBD

**Tests**

TBD

### 2.4.2 Identification and Authentication (FIA)

#### FIA\_HOTP\_EXT.1 HMAC-Based One-Time Password Pre-Shared Keys

FIA\_HOTP\_EXT.1

**TSS**

The evaluator shall confirm the TSS describes how the TOE complies with the RFC.

The evaluator shall confirm the TSS describes how the HOTP seed is generated and ensure it aligns with FCS\_RBG\_EXT.1.

The evaluator shall confirm the TSS describes how the HOTP seed is protected and ensure it aligns with the key storage requirements in FCS\_STG\_EXT.1.

The evaluator shall confirm that the TSS describes HOTP seed keys and HOTP security parameters and indicates controlled access in accordance with FCS\_CKM.3, and that it includes a description of encrypted export for seed keys that require transfer to claimant devices.

The evaluator shall confirm the TSS describes how a new HOTP seed is assigned for each claimant and how each claimant is uniquely identified.

The evaluator shall confirm the TSS describes how the HOTP seed is conditioned into a HOTP hash and verify it matches the selection in FIA\_HOTP\_EXT.1.4.

The evaluator shall confirm the TSS describes how the HOTP hash is truncated and verify it matches the selection in FIA\_HOTP\_EXT.1.5.

The evaluator shall confirm the TSS describes how the TOE handles multiple incoming invalid requests and verify it provides an anti-hammer mechanism that matches the selections made in FIA\_HOTP\_EXT.1.6.

The evaluator shall confirm the TSS describes how the TOE handles resynchronization and how it rejects values outside of the look-ahead window selected in FIA\_TOTP\_EXT.1.7 for claimant authentication.

**Guidance**

The evaluator shall verify the operational guidance contains all configuration guidance for setting any administrative value that is configurable in the FIA\_HOTP\_EXT.1 requirements.

**Tests**

The following tests may be performed in conjunction with those in FCS\_EAPTLS\_EXT.1. The evaluator shall follow any instructions in the operational guidance to establish a HOTP seed key for a registered claimant, initialize a claimant HOTP token, synchronize the counter between the token and the TSF if necessary, and perform the tests listed below.

Note that response of the TSF for an invalid HOTP value may be a request for the claimant to submit a new value, an indication that resynchronization is required, or an indication that the claimant's authentication request is rejected. Any of these responses is acceptable; a response that the authentication request is successful in Test 2 or Test 3 represents a failed test.

- **Test 1:** The evaluator shall attempt to authenticate the claimant using a valid HOTP token and confirm that the TSF determines the value to be valid.
- **Test 2:** The evaluator shall advance a registered claimant's HOTP token counter beyond the look-ahead window and attempt to validate the claimant using the next HOTP token value. The evaluator shall observe that the TSF does not indicate the claimant is authenticated.
- **Test 3:** The evaluator shall replay a previous HOTP value from a registered claimant (e.g., the value used in Test 1) and confirm that the TSF does not indicate the claimant is authenticated.
- **Test 4:** [conditional on support for resynchronization] The evaluator shall repeat Test 2 and then follow the operational guidance to resynchronize the counter. The evaluator shall observe that after resynchronization, the TSF does not indicate successful authentication, but instead requests an

additional HOTP value from the claimant.

## **FIA\_PSK\_EXT.1 Pre-Shared Key Usage**

FIA\_PSK\_EXT.1

### **FIA\_PSK\_EXT.1/AuthSvr Pre-Shared Key Usage (Claimant Authentication)**

FIA\_PSK\_EXT.1/AuthSvr

#### **TSS**

The evaluator shall examine the TSS to ensure that it identifies all protocols that allow pre-shared keys. For each protocol identified by the requirement, the evaluator shall confirm that the TSS states which pre-shared key selections are supported.

#### **Guidance**

The evaluator shall examine the operational guidance to determine that it provides guidance to administrators on how to configure all selected pre-shared key options if any configuration is required.

#### **Tests**

The evaluator shall also perform the following tests for each protocol (or instantiation of a protocol, if performed by a different implementation on the TOE).

- **Test 1:** For each mechanism selected in FIA\_PSK\_EXT.1.2/AuthSvr, the evaluator shall attempt to establish a connection and confirm that the connection requires the selected factors in the PSK to establish the connection.

## **FIA\_PSK\_EXT.2 Generated Pre-Shared Keys**

FIA\_PSK\_EXT.2

#### **TSS**

If "generate" is selected, the evaluator shall confirm that this process uses the RBG specified in FCS\_RBG\_EXT.1 and the output matches the size selected in FIA\_PSK\_EXT.2.1.

#### **Guidance**

The evaluator shall confirm the operational guidance contains instructions for generating or entering pre-shared keys (based on the selection made in FIA\_PSK\_EXT.2.1) for each protocol identified in the FIA\_PSK\_EXT.1.1/AuthSvr.

#### **Tests**

- **Test 1:** For each selection made in FIA\_PSK\_EXT.2.1, the evaluator shall input and register the PSK (whether this involves generating the key or inputting it). The evaluator shall attempt to use the PSK (e.g., by making a claimant authentication attempt using the registered key) and confirm that the TSF indicates the PSK matches.

## **FIA\_PSK\_EXT.3 Password-Based Pre-Shared Keys**

FIA\_PSK\_EXT.3

#### **TSS**

The evaluator shall examine the TSS to ensure it describes the process by which the bit-based pre-shared keys are used.

Support for length: The evaluator shall check to ensure that the TSS describes the allowable ranges for PSK lengths, and that at least 64 characters or a length defined by the platform may be specified by the user.

Support for character set: The evaluator shall check to ensure that the TSS describes the allowable character set and that it contains the characters listed in the SFR.

Support for PBKDF: The evaluator shall examine the TSS to ensure that the use of PBKDF2 is described and that the key sizes match that described by the ST author.

The evaluator shall check that the TSS describes the method by which the PSK is first encoded and then fed to the hash algorithm. The settings for the algorithm (padding, blocking, etc.) shall be described, and the evaluator shall verify that these are supported by the selections in this component as well as the selections concerning the hash function itself.

For the NIST SP 800-132-based conditioning of the PSK, the required evaluation activities will be performed when doing the evaluation activities for the appropriate requirements (FCS\_COP.1/KeyedHash).

The evaluator shall confirm that the minimum length is described.

The ST author shall provide a description in the TSS regarding the salt generation. The evaluator shall confirm that the salt is generated using an RBG described in FCS\_RBG\_EXT.1.

[conditional] If password strength meter or password denylist is selected, the evaluator shall examine the TSS

to ensure any password checking functionality provided by the TSF is described and contains details on how the function operates.

### **Guidance**

The evaluator shall examine the operational guidance to determine that it provides guidance to administrators on the composition of strong text-based pre-shared keys and (if the selection indicates keys of various lengths can be entered) that it provides information on the range of lengths supported. The guidance must specify the allowable characters for pre-shared keys in accordance with FIA\_PSK\_EXT.3.2.

### **Tests**

If the TSF supports a configurable password policy, the evaluator shall follow the operational guidance to configure the password policy based on the selections made in FIA\_PSK\_EXT.3.4. If the password policy is not configurable, the evaluator will determine the password policy used by the TSF.

The evaluator shall perform the following tests:

- **Test 1:** The evaluator shall compose a representative set of PSK meeting the TSF's password policy, to include one having the maximum length, one having the minimum length, and which, in aggregate, contain each of the supported special characters and each type of character supported. For each of the PSK, the evaluator shall demonstrate successful registration and use of the PSK.
- **Test 2:** For each of the password policy constraints indicated in FCS\_PSK\_EXT.3.4, the evaluator shall compose a password violating the constraint and demonstrate that the TSF rejects the PSK.
- **Test 3:** [conditional] If a password strength meter is supported, when performing Tests 1 and 2, the evaluator shall confirm that the TSF reflects the indicated strength of the PSK.
- **Test 4:** [conditional] If the TOE supports a password denylist, the evaluator shall enter a denylisted password and verify that the password is rejected or flagged as such.

## **FIA\_TOTP\_EXT.1 Time-Based One-Time Password Pre-Shared Keys**

FIA\_TOTP\_EXT.1

### **TSS**

The evaluator shall confirm the TSS describes how the TOE complies with the RFC.

The evaluator shall confirm the TSS describes how the TOTP seed is generated and ensure it aligns with FCS\_RBG\_EXT.1.

The evaluator shall confirm the TSS describes how the TOTP seed is protected and ensure it aligns with FCS\_STG\_EXT.1.

The evaluator shall confirm that the TSS describes TOTP seed keys and TOTP security parameters and indicates controlled access in accordance with FCS\_CKM.3, and that it includes a description of encrypted export for seed keys that require transfer to claimant devices.

The evaluator shall confirm the TSS describes how a new TOTP seed is assigned for each claimant and how each claimant is uniquely identified.

The evaluator shall confirm the TSS describes how the TOTP seed is conditioned into a TOTP hash and verify that it matches the selection in FIA\_TOTP\_EXT.1.4.

The evaluator shall confirm the TSS describes how the TOTP hash is truncated and verify that it matches the selection in FIA\_TOTP\_EXT.1.5.

The evaluator shall confirm the TSS describes how the TOE handles multiple incoming invalid requests and verify it provides an anti-hammer mechanism that matches the selections in FIA\_TOTP\_EXT.1.6.

The evaluator shall confirm the TSS describes how the TOE handles resynchronization and how it rejects values outside of the look-ahead window selected in FIA\_TOTP\_EXT.1.7 for claimant authentication.

### **Guidance**

The evaluator shall verify the operational guidance contains all configuration guidance for setting any administrative value that is configurable in the FIA\_TOTP\_EXT.1 requirements.

### **Tests**

The following tests may be performed in conjunction with those in FCS\_EAPTLS\_EXT.1. The evaluator shall follow any instructions in the operational guidance to establish a TOTP seed key for a registered claimant, initialize a claimant TOTP token, synchronize time between the token and the TSF if necessary, and perform the tests listed below.

Note that the response of the TSF for an invalid TOTP value may be a request for the claimant to submit a new value, or an indication that the claimant's authentication request is rejected. Any of these responses is acceptable; a response that the authentication request is successful in Test 2 or Test 3 represents a failed test.

- **Test 1:** The evaluator shall attempt to authenticate the claimant using the TOTP token and confirm that the TSF determines the value to be valid.
- **Test 2:** The evaluator shall advance a registered claimant's TOTP token time beyond the allowed time

drift and attempt to validate the claimant using the TOTP token value. The evaluator shall observe that the TSF does not indicate the claimant is authenticated.

- **Test 3:** The evaluator shall replay a previous TOTP value from a registered claimant (e.g., the value used in Test 1) after a delay equal to one time step and confirm that the TSF does not indicate the claimant is authenticated.

## 2.5 Evaluation Activities for Objective SFRs

The PP-Module does not define any objective requirements.

## 3 Evaluation Activities for SARs

The PP-Module does not define any SARs beyond those defined within the base NDcPP to which it must claim conformance. It is important to note that a TOE that is evaluated against the PP-Module is inherently evaluated against this Base-PP as well. The NDcPP includes a number of Evaluation Activities associated with both SFRs and SARs. Additionally, the PP-Module includes a number of SFR-based Evaluation Activities that similarly refine the SARs of the Base-PPs. The evaluation laboratory will evaluate the TOE against the Base-PP and supplement that evaluation with the necessary SFRs that are taken from the PP-Module.

## 4 Required Supplementary Information

This Supporting Document has no required supplementary information beyond the ST, operational guidance, and testing.

## Appendix A - References

Identifier	Title
	Common Criteria for Information Technology Security Evaluation -
[CC]	<ul style="list-style-type: none"><li>• <a href="#">Part 1: Introduction and General Model</a>, CCMB-2017-04-001, Version 3.1 Revision 5, April 2017.</li><li>• <a href="#">Part 2: Security Functional Components</a>, CCMB-2017-04-002, Version 3.1 Revision 5, April 2017.</li><li>• <a href="#">Part 3: Security Assurance Components</a>, CCMB-2017-04-003, Version 3.1 Revision 5, April 2017.</li></ul>
[NDcPP]	<a href="#">collaborative Protection Profile for Network Devices</a> , Version 2.2e, March 23, 2020
[NDcPP SD]	<a href="#">Supporting Document - Evaluation Activities for Network Device cPP</a> , Version 2.2, December 2019