

# PP-Module for Authentication Servers



Version: 2.0  
2026-03-10

**National Information Assurance Partnership**

## Revision History

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Version	Date	Comment
1.0	2023-01-25	Initial Release
2.0	2026-03-10	Incorporate NIAP Technical Decisions, Update to CC:2022

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# 1 Introduction

## 1.1 Overview

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An authentication server provides assertions to a relying party that a particular request for access is from an authentic digital identity associated with various identity attributes, such as a registered account within an information system, or a certified identity as validated by a trusted certification authority or both. The digital identities can represent people, devices, or processes. Authentication servers validate various authenticators controlled by the entities represented by the presented digital identity. When the entity is a person, authenticators can provide indications of what the entity knows (e.g., a password, pin, or passphrase), what the entity has (e.g., a registered device in the control of the user), or what the entity is (a biometric). NIST SP 800-63-3 Part B provides recommendations about how these authenticators can be leveraged individually or in combinations to provide assurance that the entity is authentic and describes requirements for validation of the authenticators to various assurance levels.

A relying party may delegate verification of authenticators to an authentication server; such delegation creates a relationship between the relying party and the authentication server that is referred to as an identity federation. Assertions to a federated relying party can be via bearer assertions or via direct communication with the relying party. The latter mechanism is modeled after that used by Authentication, Access, and Accounting (AAA) servers, which used the RADIUS protocol. RADIUS has been largely replaced by DIAMETER, a protocol that addresses many of the security issues with RADIUS. These provide direct, back-end assertions protected by an authenticated and encrypted channel to a Network Access Server (NAS) that further governs accesses to resources on a network.

This PP-module describes the security functionality of authentication servers supporting RADIUS or DIAMETER and other messaging protocols intended for direct communications with relying parties via authenticated, real-time protected channels.

The scope of this PP-Module is to describe the security functionality of an authentication server in terms of [CC] and to define functional and assurance requirements for such products. This PP-Module is intended for use with the following Base-PP:

- Network Device collaborative Protection Profile Version 4.0

This Base-PP is valid because an authentication server can be deployed as a dedicated network appliance. The use case of deploying the authentication server as an application on a general-purpose computer is outside the scope of this PP-Module. Authentication server products allow enterprises to provide a centralized and standardized method of evaluating user authentication requests made throughout the enterprise. This enables a centralized definition for user identity and credential data and allows for uniform application of authentication policies that define what credentials and user attributes are necessary to gain access to various systems and applications in the enterprise environment.

Note that the NDcPP defines an optional architecture for a “distributed TOE” that allows for security functionality to be spread across multiple distinct components. This PP-Module does not require or prohibit the TOE from being a distributed system when the TOE conforms to the NDcPP; the TOE may be standalone or distributed in this case.

## 1.2 Terms

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

### 1.2.1 Common Criteria Terms

Assurance	Grounds for confidence that a TOE meets the SFRs <a href="#">[CC]</a> .
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.
Direct Rationale	A type of Protection Profile, PP-Module, or Security Target in which the security problem definition (SPD) elements are mapped directly to the SFRs and possibly to the security objectives for the operational environment. There are no security objectives for the TOE.
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.

## 1.2.2 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.
Authenticator Output	The output value generated by an authenticator. The ability to generate valid authenticator 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.

## 1.3 Compliant Targets of Evaluation

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This PP-Module specifically addresses a dedicated network device that performs entity (device or user) authentication via direct, back-end connections with a relying party. The entity to be authenticated is referred to as the claimant, though different terms have been used for specific protocols (e.g., peer for RADIUS or DIAMETER). The relying party can manage a single resource or provide access control for resources within a network. For example, a Wireless Local Area Network (WLAN) Access System may use the services of a dedicated authentication server during tunnel establishment. In this use case, an authentication server must support IEEE 802.1X Port-Based Network Access Control and must fulfill the IEEE 802.11 authentication server role using Extensible Authentication Protocol (EAP) messaging.

Similarly, the authentication server may be used during Virtual Private Network (VPN) tunnel establishment. The relying party in this case is a VPN Gateway acting as a Network Access Server using pass-through between the VPN client and authentication server (the TOE), also using EAP messaging.

In general, any relying party using a direct authentication federation protocol that supports EAP-TLS or EAP-TTLS messaging is addressed by this PP-Module.

The combination of the NDcPP and this PP-Module is a network device that provides authentication server functionality in addition to all of the security functionality expected of a network device as mandated by the NDcPP.

This PP-Module describes the functional requirements and threats specific to authentication servers. A TOE that conforms to this PP-Module must also conform to the Base-PP.

## 1.4 TOE Boundary

This document specifies SFRs for an authentication server. An authentication server is designed to authenticate a claimant that attempts to access a relying party – an access gateway to a protected network, or individual resources and services – and provide assertions to one or more relying parties about the authentication state of the claimant. A claimant forwards one or more authenticator outputs to the authentication server; the authentication server verifies the authenticator outputs and may also provide additional identity attributes to allow the relying party to determine whether the claimant meets its authentication policy.

The authentication server defined by this PP-Module is one or more dedicated network appliances; the TOE is not intended to run as an application on a general-purpose computer. The authentication server can be co-located with an access management or privilege management system, or it may be separate from such services. Regardless of the deployment, access control functions and management of non-identity attributes are outside the scope of this PP-Module.

An authentication server may be part of a larger system that also provides authorization information, either as part of an AAA server, an authorization server, or a domain controller. This PP-Module specifies the functional requirements for authentication services only; as in the case where the TOE may be co-located with the relying party, the TOE's logical boundary only includes the authentication server functionality. However, the TOE boundary includes the ability to generate audit events that are specific to the authentication functionality but may be used to support other functions (e.g., AAA servers).

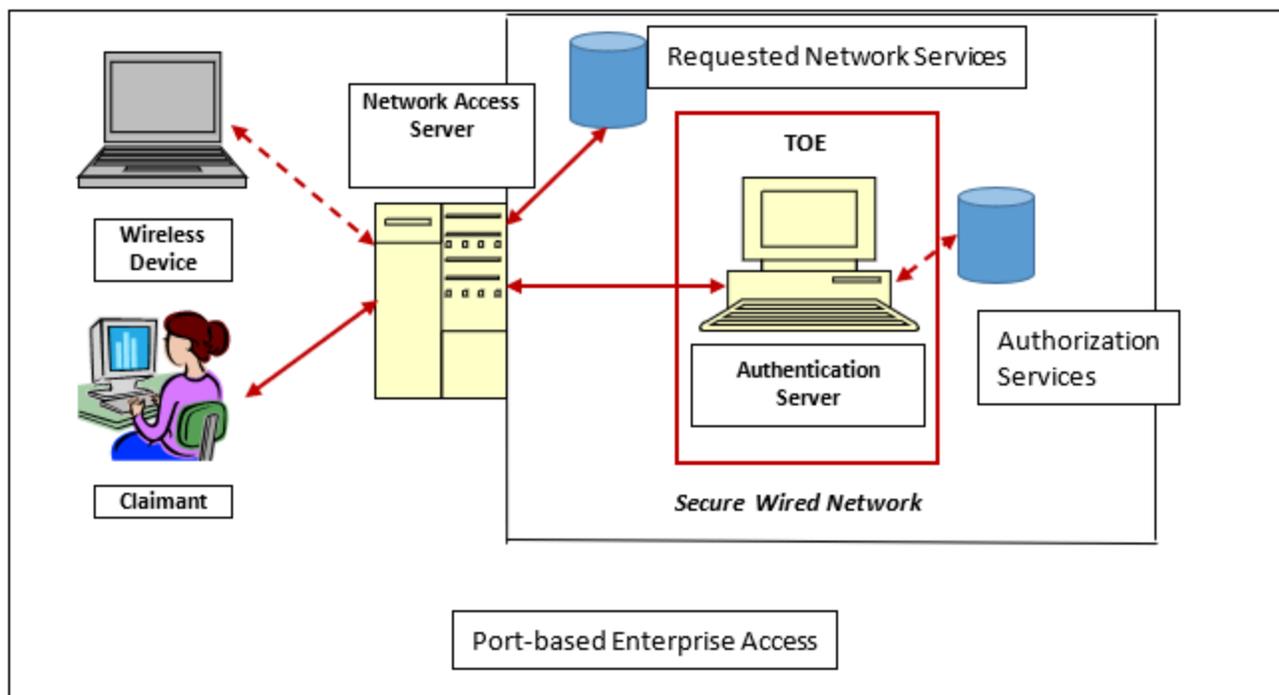
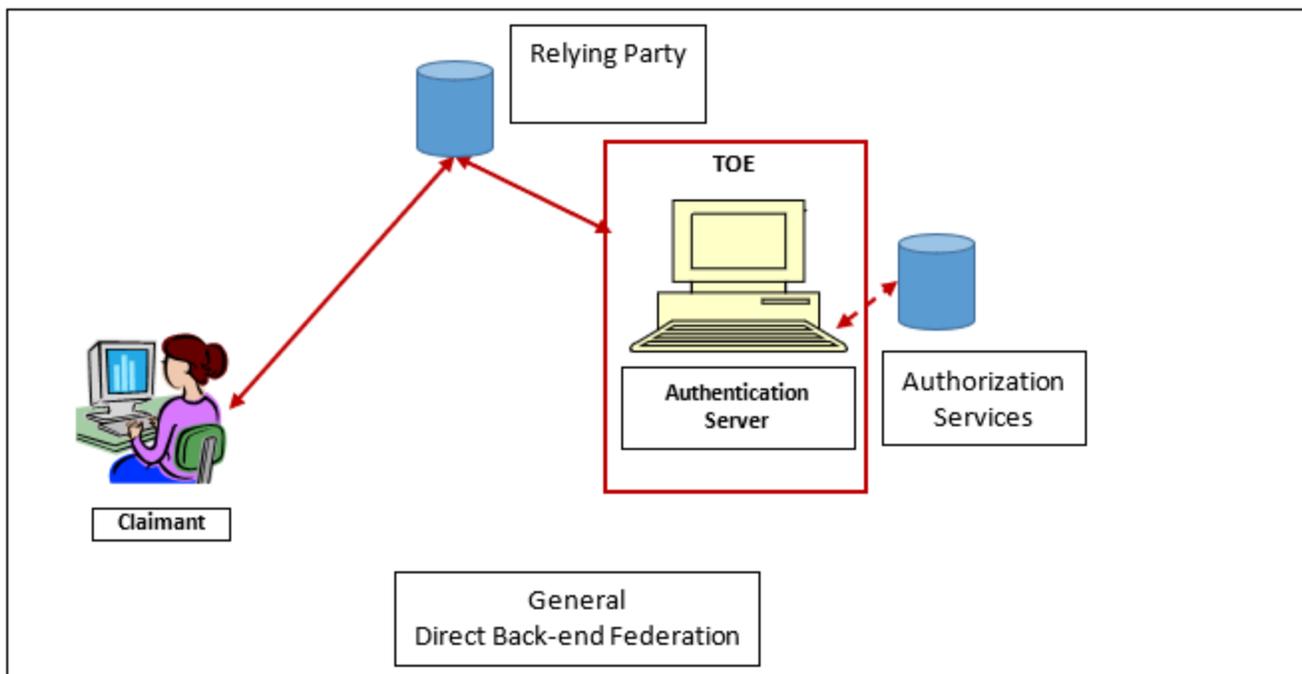


Figure 1: NAS with an Authentication Server



**Figure 2: Generic Authentication Server User Case**

## 1.5 Use Cases

This PP-Module defines the potential use cases below for the authentication server TOE. Use Case 1 defines the physical embodiment of the TOE, while Use Cases 2-4 define its role in a network infrastructure.

### [USE CASE 1] Dedicated Appliance

The authentication server is integrated on a standalone network appliance. In this use case, conformance to the NDcPP and this PP-Module is sufficient to ensure security. This PP-Module does not cover the use case where the authentication server is an application that is installed on a general-purpose computer.

### [USE CASE 2] Standalone Server

The system on which the authentication server is deployed is solely responsible for acting as an authenticator. In this deployment, the authentication server's only network infrastructure role is to communicate with the relying party for receiving challenges and issuing responses.

### [USE CASE 3] Relying Party Co-Location

The system on which the authentication server is deployed acts as both the relying party or its proxy and the authentication server. In this deployment, the authentication server's interactions with the relying party are internal-only. Regardless of whether the relying party is a standalone component or the authentication server executable code also provides relying party functionality, the TOE's logical boundary still only includes the authentication server component. Additionally, if the authentication server is a software application that can be deployed independent of the relying party, the required external trusted communications must still be supported; an authentication server cannot use the fact that it can be deployed on the same physical server as the relying party as a way to exempt itself from implementation of IPsec, RadSec, or mutually authenticated (D)TLS with an external relying party.

### [USE CASE 4] Integrated as an Authorization Server Component

The system on which the authentication server is deployed also acts as an authorization server (e.g., as part of an AAA server) that provides authorization services in addition to the authentication server. Assertions made via the direct connection can also include authorization information, and an unauthorized, but authenticated user may result in a negative response to the relying party. Regardless of whether these are all standalone components or the authentication server executable code also provides authorization functionality, the TOE's logical boundary still only includes the authentication server component. As in the case where the

authentication server is co-located with the relying party, this deployment does not exempt the **TOE** from being able to implement all the functionality that this **PP-Module** requires.

## 1.6 Package Usage

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This section contains selections and assignments that are required when the listed Functional Packages are claimed by this **PP-Module**.

Package Usage guidance defined in the **TOE's** relevant **Base-PP** applies to the usage of the packages for this module, unless explicitly stated otherwise in this section.

### Functional Package for X.509, Version 1.0

#### No CA Claims Permitted

The **TOE** will not be a certificate authority because neither the **Base-PP** nor the **PP-Module** provides for the operation of an authentication server as a CA. Thus, the **ST** author shall select the option to request a certificate from an external CA in FIA\_XCU\_EXT.2.1 and shall not select any options elsewhere in the package that involve claiming the ability to be a CA.

#### Certificate Verification and Assertion Required in FIA\_XCU\_EXT.1.1

The **ST** author shall select the options to verify and assert certificate identities in FIA\_XCU\_EXT.1.1.

#### Limitations on Signature Algorithms in FIA\_X509\_EXT.1.1

The **TOE** must utilize appropriate cryptographic algorithms that conform to CNSA standards. Thus, the **TOE** shall utilize no other algorithms outside of those specified in RFC 8603 for certificate or **CRL** signatures. Additionally, the **TOE** shall not use ECDSA with SHA-512 signatures for **OCSP** responses, and shall utilize no other algorithms for **OCSP** responses.

#### Required Extension Processing in FIA\_X509\_EXT.1.2

The **ST** author shall select the option to process the basicConstraints and extendedKeyUsage extensions in FIA\_X509\_EXT.1.2. If the **TOE** supports the use of certificate names of types other than a Directory Name, the **ST** author shall select the option to process the subjectAlternateName extension and the relevant options within the subjectAlternateName extension that correspond to the supported identifier types. If the **TOE** supports the use of UPN names, the **ST** author shall utilize the assignment for other name types within the selection for extendedKeyUsage support to specify the use of the UPN name type.

The **ST** author shall utilize the assignment for other extensions within the list of selectable certificate extensions to specify supported policy-related extensions, including certificate policy, policy mapping, policy constraints, and inhibit anyPolicy.

In addition, the **ST** author shall perform the following tests as appropriate:

- *Test FIA\_X509\_EXT.1:AuthSvr:1: The evaluator shall test the following name constraints:*
  - *Test FIA\_X509\_EXT.1:AuthSvr:1.1: 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 **TSE** successfully authenticates the entity.*
  - *Test FIA\_X509\_EXT.1:AuthSvr:1.2: For each leaf certificate used in Test FIA\_X509\_EXT.1:AuthSvr:1, 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 FIA\_X509\_EXT.1:AuthSvr:1 for the new certificate and observe that the T<sub>SF</sub> indicates the certificate is invalid.

- Test FIA\_X509\_EXT.1:AuthSvr:1.3: For each leaf certificate used in Test FIA\_X509\_EXT.1:AuthSvr:1, 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 FIA\_X509\_EXT.1:AuthSvr:1 using the new certificate and observe that the T<sub>SF</sub> indicates the certificate is invalid.
- Test FIA\_X509\_EXT.1:AuthSvr:2: [conditional] If the T<sub>OE</sub> supports processing of the policy constraints extension, then for each distinct purpose and within the constraints indicated in the S<sub>T</sub> (claimant authentication and any other supported subject types), the evaluator shall follow the operational guidance as necessary to configure the T<sub>OE</sub> to require the subject's certificate to assert a specific certificate policy. The evaluator shall perform the following sub-tests:
  - Test FIA\_X509\_EXT.1:AuthSvr:2.1: 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 T<sub>SF</sub> successfully validates the certificate.
  - Test FIA\_X509\_EXT.1:AuthSvr:2.2: [conditional] If the S<sub>T</sub> selects 'Inhibit anyPolicy extension...', the evaluator shall repeat Test FIA\_X509\_EXT.1:AuthSvr:2.1 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 T<sub>SF</sub> successfully validates the certificate.
  - Test FIA\_X509\_EXT.1:AuthSvr:2.3: [conditional] If the S<sub>T</sub> indicates support for the policy mapping extension, the evaluator shall repeat Test FIA\_X509\_EXT.1:AuthSvr:2.1 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 T<sub>SF</sub> successfully validates the certificate.

Note that installing a root CA trusted by the T<sub>OE</sub> with the required policy constraints and policy mapping extensions may be required if the T<sub>SF</sub> limits the path length of certificate chains.

- Test FIA\_X509\_EXT.1:AuthSvr:2.4: [conditional] If the S<sub>T</sub> 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 T<sub>SF</sub> for authentication and observe that the T<sub>SF</sub> indicates the certificate is invalid.
- Test FIA\_X509\_EXT.1:AuthSvr:2.5: [conditional] If the S<sub>T</sub> indicates support for both policy mapping and policy constraints extensions, the evaluator shall select a policy OID not required for authentication in the T<sub>OE</sub>'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 T<sub>SF</sub> for authentication and observe that the T<sub>SF</sub> indicates the certificate is invalid.
- Test FIA\_X509\_EXT.1:AuthSvr:2.6: 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 *TSE* indicates the certificate is invalid.

- Test FIA\_X509\_EXT.1:AuthSvr:2.7: 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 *TSE* for authentication and observe the *TSE* indicates the certificate is invalid.
- Test FIA\_X509\_EXT.1:AuthSvr:2.8: [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 *TSE* for authentication and observe the *TSE* indicates the certificate is invalid.

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

### **CRL or OCSP-based Revocation Required for FIA\_X509\_EXT.1.3**

The *TOE* must support revocation that only involves CRL or OCSP. Accordingly, the *ST* author shall select only from options involving CRL or OCSP in FIA\_X509\_EXT.1.3 (e.g., the selection to treat all certificates older than a given short timeframe is not an acceptable substitute or alternative for supporting CRL or OCSP).

### **Connections to CRL or OCSP Servers Required for FIA\_X509\_EXT.1.4**

Because the *TOE* is required to support CRL or OCSP, the *TSE* shall support an appropriate mechanism for obtaining revocation status information. In the case of CRL, the *ST* author shall claim that revocation status information is obtained via network connection to a CRL distribution point. In the case of OCSP, the *ST* author shall claim that revocation status information is obtained via network connection to an OCSP responder, via OCSP stapling, or via OCSP multi-stapling.

### **Restrictions on Acceptable Key Usage Values for FIA\_X509\_EXT.1.5**

The *TOE* will always support the use of extendedKeyUsage values to verify that X.509 certificates are used in accordance with their intended purpose. Accordingly, the *ST* author shall claim that the *TOE* supports the processing of extendedKeyUsage fields in the leaf certificate (as opposed to application of trust store context rules or passing the certification path or other supported context information to an external function) and shall select all values that are relevant to the claimed uses of X.509 in the *ST*. In particular, since neither the Base-PP nor the PP-Module does not define any functions that require the use of S/MIME, the *ST* author shall not select this as an extendedKeyUsage value to be validated.

### **Required Function Claims in FIA\_X509\_EXT.2.1**

The *ST* author shall ensure that the selections and assignments within FIA\_X509\_EXT.2.1 reflect the usage of X.509 for EAP-TLS. Other selections and assignments may be made as appropriate for other *TOE* functionality.

## **Functional Package for Transport Layer Security (TLS), Version 2.1**

### **TLS or DTLS Client Functionality Required in FCS\_TLS\_EXT.1.1**

The *ST* author shall select the option to support client functionality for TLS or DTLS in FCS\_TLS\_EXT.1.1. The selection shall correspond with other protocol selections made in [FCS\\_EAPTLS\\_EXT.1](#).

### **Mutual Authentication Required in FCS\_TLSC\_EXT.1.1 or FCS\_DTLSC\_EXT.1.1**

The *ST* author shall select the option to support mutual authentication for TLS or DTLS, according with the protocol support selected in FCS\_TLS\_EXT.1.1.

# 2 Conformance Claims

## Conformance Statement

An ST must claim exact conformance to this PP-Module.

The evaluation methods used for evaluating the TOE are a combination of the workunits defined in [\[CEM\]](#) as well as the Evaluation Activities for ensuring that individual SFRs and SARs have a sufficient level of supporting evidence in the Security Target and guidance documentation and have been sufficiently tested by the laboratory as part of completing ATE\_IND.1. Any functional packages this PP claims similarly contain their own Evaluation Activities that are used in this same manner.

## CC Conformance Claims

This PP-Module is conformant to Part 2 (extended) and Part 3 (conformant) of Common Criteria CC:2022, Revision 1.

## PP Claim

This PP-Module does not claim conformance to any Protection Profile.

The following PPs and PP-Modules are allowed to be specified in a PP-Configuration with this PP-Module:

- Network Device collaborative Protection Profile Version 4.0

## Package Claim

- This PP-Module is Functional Package for TLS, version 2.1 conformant.
- This PP-Module is Functional Package for X.509, version 1.0 conformant.
- This PP-Module does not conform to any assurance packages.

The functional packages to which the PP conforms may include SFRs that are not mandatory to claim for the sake of conformance. An ST that claims one or more of these functional packages may include any non-mandatory SFRs that are appropriate to claim based on the capabilities of the TSE and on any triggers for their inclusion based inherently on the SFR selections made.

# 3 Security Problem Definition

The security problem is described in terms of the threats that the **.TOE** is expected to address, assumptions about its Operational Environment, and any organizational security policies that the **.TOE** is expected to enforce.

## 3.1 Threats

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The following threats that are defined in this **PP-Module** extend the threats that are defined by the **Base-PP**.

### **T.FALSE\_ENDPOINTS**

A malicious actor may falsely impersonate the **.TOE** or a federated relying party in order to cause the **.TOE** to operate in an insecure manner or to extract security-relevant, or sensitive user data from the **.TOE** or its Operational Environment.

### **T.INVALID\_USERS**

A malicious user may supply incorrect or insufficient credential data or an otherwise invalid authentication request that is approved or ignored by the **.TSF** such that protected resources are subject to unauthenticated access.

### **T.UNAUTHORIZED\_ADMINISTRATOR\_ACCESS (from NDcPP)**

This threat from the above Base **PP** also applies to the functionality defined in this **PP-Module**.

### **T.UNDETECTED\_ACTIVITY (from NDcPP)**

This threat from the above Base **PP** also applies to the functionality defined in this **PP-Module**.

## 3.2 Assumptions

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These assumptions are made on the Operational Environment (**OE**) in order to be able to ensure that the security functionality specified in the **PP-Module** can be provided by the **.TOE**. If the **.TOE** is placed in an **OE** that does not meet these assumptions, the **.TOE** may no longer be able to provide all of its security functionality.

All assumptions for the **OE** of the **Base-PP** also apply to this **PP-Module**.

### **A.RP\_FEDERATION**

It is assumed that the **.TOE** is federated with one or more relying parties that transmit authentication requests to it.

## 3.3 Organizational Security Policies

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### **P.AUTH\_POLICY**

The organization defines, for each protected resource, an authentication policy that specifies the authenticators that must be provided to access a given resource.

# 4 Security Objectives

## 4.1 Security Objectives for the Operational Environment

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All objectives for the OE of the Base-PP also apply to this PP-Module.

### OE.RP\_FEDERATION

The TTOE will be deployed in such a manner that it is federated with one or more relying parties that transmit authentication requests to it.

### OE.REQUIRE\_AUTH

The operational environment will protect assets in a manner that requires authentication commensurate with the sensitivity of the assets.

## 4.2 Security Objectives Rationale

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This section describes how the assumptions and organizational security policies map to operational environment security objectives.

**Table 1: Security Objectives Rationale**

Assumption or OSP	Security Objectives	Rationale
<a href="#">A.RP_FEDERATION</a>	<a href="#">OE.RP_FEDERATION</a>	The <u>OE</u> objective <a href="#">OE.RP_FEDERATION</a> is realized through <a href="#">A.RP_FEDERATION</a> .
<a href="#">P.AUTH_POLICY</a>	<a href="#">OE.REQUIRE_AUTH</a>	Definition of an authentication policy, which can be enforced through deployment of a conformant <u>TTOE</u> , can be used to ensure that organizational assets are protected by enforcing appropriate requirements for authentication.

# 5 Security Requirements

This chapter describes the security requirements which have to be fulfilled by the product under evaluation. Those requirements comprise functional components from Part 2 and assurance components from Part 3 of [CC]. The following conventions are used for the completion of operations:

- **Refinement** operation (denoted by **bold text** or ~~strikethrough text~~): Is used to add details to a requirement or to remove part of the requirement that is made irrelevant through the completion of another operation, and thus further restricts a requirement.
- **Selection** (denoted by *italicized text*): Is used to select one or more options provided by the [CC] in stating a requirement.
- **Assignment** operation (denoted by *italicized text*): Is used to assign a specific value to an unspecified parameter, such as the length of a password. Showing the value in square brackets indicates assignment.
- **Iteration** operation: Is indicated by appending the SFR name with a slash and unique identifier suggesting the purpose of the operation, e.g. "/EXAMPLE1."

## 5.1 Collaborative Protection Profile for Network Device Security Functional Requirements Direction

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In a PP-Configuration that includes the NDcPP, the TOE is expected to rely on some of the security functions implemented by the Network Device as a whole and evaluated against the NDcPP. The following sections describe any modifications that the ST author must make to the SFRs defined in the NDcPP in addition to what is mandated by Section 5.2 TOE Security Functional Requirements.

### 5.1.1 Modified SFRs

This PP-Module does not modify any SFRs defined by the NDcPP.

## 5.2 TOE Security Functional Requirements

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The following section describes the SFRs that must be satisfied by any TOE that claims conformance to this PP-Module. These SFRs must be claimed regardless of which PP-Configuration is used to define the TOE.

### 5.2.1 Auditable Events for Mandatory SFRs

Table 2: Auditable Events for Mandatory Requirements

Requirement	Auditable Events	Additional Audit Record Contents
FAU_GEN.1/AuthSvr	No events specified	N/A
FCO_NRO.1	Claimant request for which the TOE does not have credential verification data.	Identity of the claimant.
FCO_NRR.1	No events specified	N/A

FCS_CKM.3	<b>[selection:</b> <i>Attempt to export plaintext key or CSP via defined interface., None</i> ]	If attempt is detected, record process identifier, authorized user's identifier (if any).
FCS_EAPTLS_EXT.1	Successful and failed authentication of claimant.	Identifier of claimant.
	Protocol failures.	If failure occurs, record a descriptive reason for the failure.
FCS_RADIUS_EXT.1	Protocol failures.	If failure occurs, record a descriptive reason for the failure.
	Success/failure of authentication.	No additional information
FCS_STG_EXT.1	No events specified	N/A
FIA_AFL.1/AuthSvr	The reaching of the threshold for the unsuccessful authentication attempts.	The claimed identity of the entity attempting to authenticate or the IP where the attempts originated.
	Disabling an account due to the threshold being reached.	No additional information
FIA_UAU.6	All use of the authentication mechanism.	Origin of the attempt (e.g., IP address).
FMT_SMF.1/AuthSvr	All management actions.	Identifier of initiator.
FTA_TSE.1	Denial of session establishment due to the session establishment mechanism.	Reason for denial, origin of establishment attempt.
FTP_ITC.1/NAS	Initiation of the trusted channel.	Identification of the initiator.
	Termination of the trusted channel.	Identification of the initiator.
	Failure of the trusted channel functions.	Target of failed trusted channels establishment attempt.

## 5.2.2 Security Audit (FAU)

### FAU\_GEN.1/AuthSvr Audit Data Generation (Authentication Server)

#### FAU\_GEN.1.1/AuthSvr

The TSS shall be able to generate audit data of the following auditable events:

- a. Start-up and shutdown of the audit functions;
- b. All auditable events for the [not specified] level of audit; and
- c. [Auditable events listed in the Auditable Events for Mandatory SFRs table (Table 2)]
- d. [selection: Auditable events listed in the Auditable Events for Selection-Based SFRs table (Table 7), no other events]

].

**Application Note:** The auditable events defined in the audit tables are for the SFRs that are explicitly defined in this PP-Module and are intended to extend FAU\_GEN.1 in the Base-PP. The events in the Auditable Events table should be combined with those of the NDcPP in the context of a conforming Security Target.

If the ST includes any selection-based SFRs, the selection for "Auditable events listed in the Auditable Events for Selection-Based SFRs table" must be made. If no selection-based SFRs are included, "no other events" should be selected. The auditing of selection-based SFRs is only required if that SFR is included in the ST.

Per FAU\_STG.1 in the Base-PP, the TOE must support transfer of the audit data to an external IT entity using a trusted channel.

For FCS\_CKM.3, if no defined interfaces have access to persistent keys or CSP, select 'none'.

FAU\_GEN.1.2/AuthSvr

The TSSF shall record within the audit data at least the following information:

- a. Date and time of the event, type of event, subject identity (if applicable), and the outcome (success or failure) of the event;
- b. For each audit event type, based on the auditable event definitions of the functional components included in the PP, PP-Module, functional package or ST, [information specified in column three of the Auditable Events table in which the event was defined].

## Evaluation Activities

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**

- Test FAU\_GEN.1/AuthSvr:1:

*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.*

## 5.2.3 Communications (FCO)

FCO\_NRO.1 Selective Proof of Origin

## FCO\_NRO.1.1

The TSE shall be able to generate evidence of origin for transmitted [*identity authentication assertions, [selection: authentication requests, IKE authentication phase security associations, [assignment: claimant identity attributes], no other data*]] at the request of the [*relying party, [selection: external authentication servers in support of pass-through, no other entities*]].

**Application Note:** The intent of this requirement is for the TOE to provide the source of origin (non-repudiation) for assertions and sensitive data associated to claimants it provides to relying parties. The ST author will claim ‘authentication requests’ and ‘external authentication servers...’ if the TSE supports pass-through communication with external authentication servers. The ST author claims additional information provided to a relying party via an authenticated channel as appropriate.

## FCO\_NRO.1.2

The TSE shall be able to relate the [*authenticator*] of the originator of the information, and the [*authentication request*] of the information to which the evidence applies.

**Application Note:** The intent of this requirement is for the TOE to be able to associate authentication assertions it makes to requests made to it by a relying party. For pass-through functionality, the TOE relates requests and response messages it forwards between external entities via identity information asserted in the EAP headers.

## FCO\_NRO.1.3

The TSE shall provide a capability to verify the evidence of origin of information to [*recipient*] given [*an authenticated channel is established with a trusted relying party*].

## Evaluation Activities

### 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.*

*If pass-through is supported, the evaluator shall ensure that the ST includes a description of the claimant authentication methods allowed and the method used to mutually authenticate to external authentication servers.*

*The evaluator shall verify that the descriptions indicate how the TSE 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 TSE 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 TSE to meet the requirements are provided.*

## Tests

The evaluator shall perform the following tests:

- Test FCO\_NRO.1:1:
  - **Step 1:** The evaluator shall establish a connection with the TSSF 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 reinitialize the EAP session for C1 on RP1, but send correct authentication data associated with claimant C2 via RP1 without resetting the EAP session and observe that the TOE does not indicate a successful authentication.
- Test FCO\_NRO.1:2: [conditional on support for pass-through] The intent of this test is to demonstrate the TSSF 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 TSSF exercising pass-through functionality to authenticate a registered claimant.
  - **Step 2:** The evaluator shall observe that the TSSF 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 TSSF associates the identifier of the request by dropping the request without forwarding.

## FCO\_NRR.1 Selective Proof of Receipt

### FCO\_NRR.1.1

The TSSF shall be able to generate evidence of receipt for received [authentication requests, **[selection: authentication responses and queries, none]**] at the request of the [originator].

**Application Note:** The intent of this requirement is for the TOE to be able to return a valid response to the relying party upon receipt of an Access-Request. If the TSSF supports pass-through functionality, the ST author claims 'authentication responses and queries' in the selection for authentication in communications with external authentication servers.

### FCO\_NRR.1.2

The TSSF shall be able to relate the [claimant identifier and claimant authenticators] of the recipient of the information, and the [identity assertion, information requests, and error responses] of the information to which the evidence applies.

**Application Note:** The intent of this requirement is for the ST author to list the information supplied by the TOE in response to an authentication request that

confirms receipt of the request, and identifies:

- the authentication request that is being responded to;
- the mutually authenticated channel between the trusted relying party and the **TOE**.

FCO\_NRR.1.3

The **TSE** shall provide a capability to verify the evidence of receipt of information to [originator] given [establishment of a mutually authenticated channel with a trusted relying party].

## Evaluation Activities

### **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 **TSE** indicates the identity of the claimant associated with any responses to a request.

The evaluator shall verify that the **ST** describes how the **TSE** 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 **TSE** to meet the requirements are provided.

#### **Tests**

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

- **Test FCO\_NRR.1:1:** 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.

## 5.2.4 Cryptographic Support (FCS)

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

FCS\_CKM.3.1

The **TSE** shall perform [access control for persistent private and secret keys and critical security parameters required by this **PP-Module**] in accordance with a specified cryptographic key access method [ensuring only authorized security functionality can access plaintext keys or critical security parameters] that meets the following: [keys and critical security parameters are not exportable in plaintext and keys and critical security parameters are not viewable in plaintext].

**Application Note:** Exposure of keys used for assertion signatures, including private keys associated to certificates used to establish a protected channel to relying parties and claimants, one-time-password seed keys, and plaintext passwords can undermine or bypass the protections required for TQE functionality. The ST author describes the specific methods used to prevent unauthorized or unnecessary access to these keys and critical security parameters. This requirement is not intended to cover unanticipated exploits; it is only required that plaintext keys and critical security parameters not be exportable or viewable by defined interfaces. OTP seed key values are shared using out-of-band methods with the associated entities. This requirement implies that the method to export these values uses encrypted key transport methods.

## Evaluation Activities

### 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 FCS\_CKM.3:1: 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 FCS\_CKM.3:2: 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.1.1

The TSF shall implement [**selection:** EAP-TLS as specified in RFC 5216, EAP-TTLS as specified in RFC 5881] as updated by RFC 8996 with [**selection:** TLS, DTLS] implemented using mutual authentication in accordance with [**selection:** FCS\_TLSS\_EXT.1 and FCS\_TLSS\_EXT.2 as defined in the **Functional Package for Transport Layer Security (TLS), version 2.1**, FCS\_DTLSS\_EXT.1 and FCS\_DTLSS\_EXT.2 as defined in the **Functional Package for Transport Layer Security (TLS), version 2.1**].

### FCS\_EAPTLS\_EXT.1.2

The **T.SF** shall generate random values used in the [**selection:** *EAP-TLS, EAP-TTLS*] exchange using the **RBG** specified in FCS\_RBG.1.

#### FCS\_EAPTLS\_EXT.1.3

The **T.SF** shall support claimant authentication using certificates and [**selection:** *static PSK, HOTP, TOTP, other authentication-verification methods via pass-through, no other methods*].

#### FCS\_EAPTLS\_EXT.1.4

The **T.SF** shall not forward an EAP-Success response to the relying party if the client certificate is not valid according to FIA\_X509\_EXT.1 as defined in **Functional Package for X.509, version 1.0**, if the [**selection:** *TLS, DTLS*] session is not established, or if any of [**selection:** *PSK, HOTP value, TOTP value, no other authenticator*] required by the authentication policy are not provided or if any of the required authenticators presented in the authentication request is not valid.

**Application Note:** The **S.T** author should indicate support for EAP-TLS or EAP-TTLS in FCS\_EAPTLS\_EXT.1.1. In the third selection, 'FCS\_TLSS\_EXT.1 and FCS\_TLSS\_EXT.2' or 'FCS\_DTLSS\_EXT.1 and FCS\_DTLSS\_EXT.2' is selected according to the **TLS** or **DTLS** support indicated in the second selection, with the expectation that the corresponding **SFRs** from the **Functional Package for Transport Layer Security (TLS), version 2.1** are claimed.

FCS\_TLSS\_EXT.1, FCS\_TLSS\_EXT.2, FCS\_DTLSS\_EXT.1, and FCS\_DTLSS\_EXT.2 are defined in the **Functional Package for Transport Layer Security (TLS), version 2.1**. The selection in FCS\_EAPTLS\_EXT.1.2 matches the first selection in FCS\_EAPTLS\_EXT.1.1.

The selections made in FCS\_EAPTLS\_EXT.1.3 may trigger the inclusion of selection-based **SFRs**, as follows:

- Any of "static PSK," "HOTP," or "TOTP" requires inclusion of [FIA\\_PSK\\_EXT.1/AuthSvr](#).
- "HOTP" requires inclusion of [FIA\\_HOTP\\_EXT.1](#).
- "TOTP" requires inclusion of [FIA\\_TOTP\\_EXT.1](#)

The **S.T** author claims any additional supported authentication-verification methods in FCS\_EAPTLS\_EXT.1.3. Each supported method is claimed independently, even if combinations of the methods are required for individual claimant authentication. For any authentication methods that are only supported by pass-through functionality, the **S.T** author should claim 'other authentication-verification methods via pass-through' without claiming the corresponding method in the same selection. Pass-through functionality can typically support any authentication method, including ones not specified in the **SFR**. However, it is preferred that the **T.SF** not use pass-through functionality for EAP methods that do not align to standardized methods utilizing certificate-based authentication of the claimant.

## Evaluation Activities

### [FCS\\_EAPTLS\\_EXT.1](#)

#### **TSS**

The evaluator shall examine the **S.T** to ensure the EAP protocol is described in accordance with the claimed RFC. For each supported mode, the evaluator shall ensure the **S.T** 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.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 FCS\_EAPTLS\_EXT.1:1: TLS/DTLS testing is performed as part of FCS\_TLSS\_EXT.1 and .2 or FCS\_DTLSS\_EXT.1 and .2 in the [Functional Package for Transport Layer Security \(TLS\), version 2.1](#). 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 FCS\_EAPTLS\_EXT.1:2: 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 FCS\_EAPTLS\_EXT.1:2.1: 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 FCS\_EAPTLS\_EXT.1:2.2: 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 FCS\\_EAPTLS\\_EXT.1:2.1](#). 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 FCS\_EAPTLS\_EXT.1:2.3:  
[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.

If combinations are supported, the TSF may request each factor individually, or request all factors in a particular order in a single request. If multiple factors are included in a request, the evaluator shall test each component, observing that the TSF will reject the entry until all components are correct.

## FCS\_RADIUS\_EXT.1 Authentication Protocol

### FCS\_RADIUS\_EXT.1.1

The TSF shall implement the [**selection:** RADIUS protocol as specified in RFC 2865, DIAMETER protocol as specified in RFC 6733, [**assignment:** other direct identity federation protocol]] for communication of identity and authentication information with a relying party.

### FCS\_RADIUS\_EXT.1.2

The TSF shall implement encapsulated EAP in accordance with [FCS\\_EAPTLS\\_EXT.1](#).

### FCS\_RADIUS\_EXT.1.3

The **T.SF** shall provide [**selection**: a key indicator, an encrypted parameter, an encrypted value] for a key held by the successfully authenticated claimant derived from the supported **EAP** mode and provided to the relying party in accordance with the protocol indicated in [FCS\\_RADIUS\\_EXT.1.1](#).

**Application Note:** The **ST** author describes how the **T.SF** communicates with a relying party at the application layer to receive authentication requests and provide identity assertions. **RADIUS** and **DIAMETER** protocols are used with **AAA** servers when the relying party is a **NAS**. However, other direct access identity federation protocols that support [FCS\\_EAPTLS\\_EXT.1](#) and identify a key held by the authenticated claimant that can be confirmed by the relying party are acceptable. If other protocols are claimed, the **ST** author includes the **RFCs** and indicates the messages used for authentication requests and assertions.

The **ST** author indicates which keys held by the authenticated claimant are available to the relying party for key-holder verification. For **RADIUS** and **DIAMETER**, the **EAP-TLS/EAP-TTLS** master key established during the **TLS** handshake with the claimant is shared with the relying party, encrypted under the protected channel between the **T.SF** and the relying party. Both the relying party and claimant derive the **AUTH MSK**/security association for an **IPsec** session from this master key. More generally, a key indicator can be a reference identifier for a shared secret key, or a public key, certificate, or other identifier associated with a private asymmetric key controlled by the authenticated claimant.

## Evaluation Activities

### [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 **T.SF** 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 *FCS\_RADIUS\_EXT.1:1*: 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.

*NOTE: This test, while not directly involving the TQE, is intended to confirm that the key provided by the TQE to the test client (via EAP-TLS negotiation) and to the test relying party (via RadSec or other encrypted messaging protocol) to enable communication between the client and relying party is valid.*

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

### FCS\_STG\_EXT.1.1

Persistent private and secret keys shall be stored within the TSE [selection:

- *encrypted with a hardware protected key*
- *in a hardware cryptographic module*
- *within an isolated execution environment protected by a hardware key*

].

## Evaluation Activities ▼

### [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 TQE to meet this requirement.*

#### **Tests**

*There are no test EAs for this component.*

## 5.2.5 Identification and Authentication (FIA)

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

#### FIA\_AFL.1.1/AuthSvr

The TSE shall detect when [an administrator configurable positive integer of **successive**] unsuccessful authentication attempts occur related to [claimants attempting to authenticate].

#### FIA\_AFL.1.2/AuthSvr

When the defined number of unsuccessful authentication attempts has been [met], the TSE shall [selection, choose one of:

- *prevent the offending remote entity from successfully authenticating until [assignment: action] is taken by a local Administrator*

- prevent the offending claimant from successfully authenticating until an administrator-defined time period has elapsed

].

**Application Note:** This requirement applies to claimant authentication attempts in support of an authentication service provided for a federated relying party. This requirement does not apply to login to the TOE by privileged users for administrative accesses; these cases are addressed by the Base-PP iteration of this SFR. Responses to authentication queries to aid the claimant in providing acceptable authenticators is not considered a preventative action and are allowed prior to reaching the lockout threshold. The “action” taken by a local administrator is implementation specific and is defined in the operational guidance (for example, lockout reset or password reset). The ST author chooses one of the selections for handling of authentication failures depending on how the TOE has implemented this handler.

## Evaluation Activities

[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, what the acceptable range of values for that threshold is, 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 FCS\\_EAPTLS\\_EXT.1:2.1](#), and if applicable, [Test FCS\\_EAPTLS\\_EXT.1:2.3](#) for each claimant authentication method:

- Test FIA\_AFL.1/AuthSvr: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 FIA\_AFL.1/AuthSvr: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.6.1**

The TSSF shall re-authenticate the **administrative** user under the conditions [*when the user changes their password, [selection: following TSSF-initiated session locking, assignment: other conditions], no other conditions*].

## **Evaluation Activities** ▼

### ***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***

- *Test FIA\_UAU.6:1: 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 TSSF re-authenticates the authenticated user.*

## **5.2.6 Security Management (FMT)**

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

#### **FMT\_SMF.1.1/AuthSvr**

The TSSF shall be capable of performing the following management functions: [

- *Ability to configure claimant verification data*
- *Ability to manage trust store data*
- *Ability to configure administrator authentication credential*
- *Ability to configure trusted channel to relying party*
- ***[selection:***
  - *Ability to configure IPsec functionality*
  - *Ability to configure DTLS functionality*
  - *Ability to configure TLS functionality*
  - *Ability to manage claimant authentication policy*
  - *Ability to manage supported authentication-verification methods*
  - *Ability to manage supported authentication-verification methods supported via pass-through functionality*

- Ability to configure RADIUS shared secret
- Ability to define authorized relying parties
- Ability to configure cryptographic key storage
- Ability to configure lockout policy for failed claimant authentication
- Ability to unlock a claimant account
- Ability to configure certificate validation checking mechanisms
- Ability to define conditions in which claimant authentication attempts are rejected
- Ability to associate pre-shared keys with claimants or external entities
- Ability to configure restrictions on the composition of pre-shared keys
- Ability to configure restrictions on the validation of pre-shared keys
- Ability to generate pre-shared keys
- Ability to accept pre-shared keys
- Ability to manage HOTP verification function
- Ability to manage TOTP verification function
- No other functions

].

**Application Note:** This SFR defines additional management functions for the TOE beyond what is defined in the Base-PP as FMT\_SMF.1.

## Evaluation Activities

### 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**

- Test FMT\_SMF.1/AuthSvr:1: 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.

## 5.2.7 TOE Access (FTA)

### FTA\_TSE.1 TOE Session Establishment

#### FTA\_TSE.1.1

The TSF shall be able to deny **claimant** session establishment based on [invalid certificate, [**selection**: [**assignment**: other identity attributes], no other attributes]].

**Application Note:** The intent of this SFR is to describe any circumstances that would cause a claimant's authentication request to be rejected. All compliant TOEs will reject authentication requests based on invalid credentials. A compliant TOE may also impose additional limitations such as suspended accounts or time of day restrictions, depending on the capabilities of the TSE's authentication mechanism.

## Evaluation Activities

### 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**

- Test FTA\_TSE.1:1: 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.

## 5.2.8 Trusted Path/Channels (FTP)

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

#### FTP\_ITC.1.1/NAS

The TSE shall provide [**selection: an IPsec, a RadSec, a mutually authenticated TLS, a mutually authenticated DTLS**] communication channel between itself and a **relying party** that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from modification or disclosure.

**Application Note:** If “an IPsec” is selected, the Base-PP SFR FCS\_IPSEC\_EXT.1 must be claimed.

If “a RadSec” is selected, the selection-based SFR FCS\_RADSEC\_EXT.1 must be claimed.

If “a mutually authenticated TLS” is selected, the [Functional Package for Transport Layer Security \(TLS\), version 2.1 SFRs](#) FCS\_TLSS\_EXT.1 and FCS\_TLSS\_EXT.2 must be claimed.

If “a mutually authenticated DTLS” is selected, the [Functional Package for Transport Layer Security \(TLS\), version 2.1 SFRs](#) FCS\_DTLSS\_EXT.1 and FCS\_DTLSS\_EXT.2 must be claimed.

#### FTP\_ITC.1.2/NAS

The T.SF shall permit [*the T.SF or the relying party*] to initiate communication via the trusted channel.

FTP\_ITC.1.3/NAS

The T.SF shall initiate communication via the trusted channel for [*responses to authentication request messages received from the relying party*].

## Evaluation Activities

### FTP\_ITC.1/NAS

#### T.SS

The evaluator shall examine the T.SS 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 T.SS are specified and included in the requirements in the S.T.

#### **Guidance**

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

#### **Tests**

- Test FTP\_ITC.1/NAS:1: 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.

## 5.3 TOE Security Functional Requirements Rationale

The following rationale provides justification for each S.FR for the TOE, showing that the S.FRs are suitable to address the specified threats:

**Table 3: S.FR Rationale**

Threat	Addressed by	Rationale
<u>T.FALSE_ENDPOINTS</u>	FIA_X509_EXT.1 (from <u>Functional Package for X.509, version 1.0</u> )	Mitigates the threat by authenticating relying parties via X.509 certificates.
	FIA_X509_EXT.2 (from <u>Functional Package for X.509, version 1.0</u> )	Mitigates the threat by authenticating relying parties via X.509 certificates.
	FIA_X509_EXT.3 (from <u>Functional Package for X.509, version 1.0</u> )	Mitigates the threat by implementing a method for the <u>TOE</u> to obtain its own certificate for mutually-authenticated <u>TLS</u> or <u>DTLS</u> .
	<u>FCS_EAPTLS_EXT.1</u>	Mitigates the threat by utilizing either <u>EAP-TLS</u> or <u>EAP-TTLS</u> with mutual

		authentication to authenticate itself to a relying party.
	<a href="#">FTP_ITC.1/NAS</a>	Mitigates the threat by utilizing a cryptographically secure trusted channel with a relying party that allows mutual authentication with the relying party.
	<a href="#">FCS_RADSEC_EXT.1</a> (selection-based)	Mitigates the threat by utilizing RadSec to establish a trusted channel with the relying party.
	<a href="#">FIA_PSK_EXT.1/AuthSvr</a> (selection-based)	Mitigates the threat by using a pre-shared key as the mechanism by which it authenticates itself to the relying party.
<a href="#">T.INVALID_USERS</a>	<a href="#">FCO_NRO.1</a>	Mitigates the threat by providing a non-repudiation function to assert the source of origin of its communications with the relying party.
	<a href="#">FCO_NRR.1</a>	Mitigates the threat by providing a proof of receipt function to assert to a relying party that communications with it are successful.
	<a href="#">FCS_EAPTLS_EXT.1</a>	Mitigates the threat by utilizing either <a href="#">EAP-TLS</a> or <a href="#">EAP-TTLS</a> as a mechanism to assert the success or failure of claimant authentication requests to the relying party.
	<a href="#">FCS_RADIUS_EXT.1</a>	Mitigates the threat by implementing <a href="#">RADIUS</a> , <a href="#">DIAMETER</a> , or some other direct identity federation protocol to communicate the success or failure of claimant authentication requests.
	<a href="#">FIA_AFL.1/AuthSvr</a>	Mitigates the threat by implementing a mechanism to prevent claimant authentication attempts if an excessive number of failed attempts have been made.
	<a href="#">FTA_TSE.1</a>	Mitigates the threat by implementing a mechanism to assert the failure of a claimant authentication attempt based on attributes of the claimant or of the attempt.
	<a href="#">FIA_HOTP_EXT.1</a> (selection-based)	Mitigates the threat by utilizing <a href="#">HOTP</a> as a form of claimant authenticator and implementing mechanisms to determine the validity of a <a href="#">HOTP</a> credential if supported.
	<a href="#">FIA_PSK_EXT.1/AuthSvr</a> (selection-based)	Mitigates the threat by supporting PSKs in various forms as a form of claimant authenticator (password-based, <a href="#">HOTP</a> , or <a href="#">TOTP</a> ).

	FIA_PSK_EXT.2 (selection-based)	Mitigates the threat by utilizing randomly generated PSKs as a form of claimant authenticator.
	FIA_PSK_EXT.3 (selection-based)	Mitigates the threat by utilizing password-based PSKs as a form of claimant authenticator and implementing mechanisms to determine the validity of a password-based PSK credential if supported.
	FIA_TOTP_EXT.1 (selection-based)	Mitigates the threat by utilizing TOTP as a form of claimant authenticator and implementing mechanisms to determine the validity of a TOTP credential if supported.
T.UNAUTHORIZED_ADMINISTRATOR_ACCESS (from NDcPP)	FAU_GEN.1/AuthSvr	Mitigates the threat by implementing an audit mechanism to detect potential misuse of the TOE.
	FCS_CKM.3	Mitigates the threat by implementing a cryptographic key access control mechanism to prevent compromise of the data in transit confidentiality mechanisms.
	FCS_STG_EXT.1	Mitigates the threat by implementing a secure cryptographic key storage mechanism to prevent compromise of the data in transit confidentiality mechanisms.
	FIA_UAU.6	Mitigates the threat by implementing a re-authentication mechanism to prevent compromise of an administrator account due to an unattended session.
	FMT_SMF.1/AuthSvr	Mitigates the threat by defining management functions as a legitimate mechanism to control the behavior of the TSE.
T.UNDETECTED_ACTIVITY (from NDcPP)	FAU_GEN.1/AuthSvr	Mitigates the threat by implementing an audit mechanism to detect potential misuse of the TOE.
	FCS_CKM.3	Mitigates the threat by implementing a cryptographic key access control mechanism to prevent compromise of the data in transit confidentiality mechanisms.
	FCS_STG_EXT.1	Mitigates the threat by implementing a secure cryptographic key storage mechanism to prevent compromise of the data in transit confidentiality mechanisms.
	FIA_UAU.6	Mitigates the threat by implementing a re-authentication mechanism to prevent

compromise of an administrator account due to an unattended session.

[FMT\\_SMF.1/AuthSvr](#)

Mitigates the threat by defining management functions as a legitimate mechanism to control the behavior of the TSE.

## 5.4 TOE Security Assurance Requirements

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This PP-Module does not define any Security Assurance requirements. The SARs from the Base-PP must be satisfied.

# 6 Consistency Rationale

## 6.1 Collaborative Protection Profile for Network Device

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### 6.1.1 Consistency of TOE Type

When this PP-Module is used to extend the NDcPP, the TOE type for the overall TOE is still a network device. The TOE boundary is simply extended to include authentication server functionality that is provided by the network device.

### 6.1.2 Consistency of Security Problem Definition

Table 4: Consistency of Security Problem Definition (NDcPP base)

PP-Module Threat, Assumption, OSP	Consistency Rationale
T.FALSE_ENDPOINTS	This threat is similar to the T.WEAK_AUTHENTICATION_ENDPOINTS threat in the NDcPP but it applies specifically to the NAS, which is an environmental component that is defined specifically in this PP-Module.
T.INVALID_USERS	This threat is similar to the T.UNAUTHORIZED_ADMINISTRATOR_ACCESS threat in the NDcPP but it applies to user authentication brokered by the TSE rather than to administrator authentication to the TOE itself. It is also similar to the T.UNTRUSTED_COMMUNICATION_CHANNELS threat in the NDcPP except that it applies specifically to the RADIUS communications and the protocols used to secure those, which is an interface that is defined specifically in this PP-Module.
A.RP_FEDERATION	The NDcPP does not define any assumptions for the intended network architecture that the TOE is deployed into. Therefore, an assumption that the network can be set up in such a way that the TOE will have direct connectivity with one or more relying parties does not violate any assumptions of the NDcPP.
P.AUTH_POLICY	This OSP relates to behavior that is not part of the Base-PP and so the Base-PP is not contradicted by guidance on its implementation.

### 6.1.3 Consistency of OE Objectives

Table 5: Consistency of OE Objectives (NDcPP base)

PP-Module OE Objective	Consistency Rationale
OE.RP_FEDERATION	The Base-PP does not define where in a particular network architecture a network device must be deployed since it is designed to be generic to various types of network devices. This PP-Module defines the expected architectural deployment specifically for a network device that acts as an authentication server.
OE.REQUIRE_AUTH	The Base-PP does not define a particular use for a network device, so there is no consistency issue with the PP-Module defining expectations for the use of a specific

type of device.

#### 6.1.4 Consistency of Requirements

This PP-Module identifies several SFRs from the NDcPP that are needed to support Authentication Server functionality. This is considered to be consistent because the functionality provided by the NDcPP is being used for its intended purpose. The rationale for why this does not conflict with the claims defined by the NDcPP are as follows:

**Table 6: Consistency of Requirements (NDcPP base)**

PP-Module Requirement	Consistency Rationale
<b>Modified SFRs</b>	
This PP-Module does not modify any requirements when the NDcPP is the base.	
<b>Additional SFRs</b>	
This PP-Module does not add any requirements when the NDcPP is the base.	
<b>Mandatory SFRs</b>	
FAU_GEN.1/AuthSvr	This SFR iterates the FAU_GEN.1 SFR defined in the Base-PP to define auditable events for the functionality that is specific to this PP-Module.
FCO_NRO.1	This SFR applies to the implementation of the supported authentication protocol, which is beyond the original scope of the Base-PP.
FCO_NRR.1	This SFR applies to the implementation of the supported authentication protocol, which is beyond the original scope of the Base-PP.
FCS_CKM.3	The Base-PP requires confidentiality of cryptographic key data in FPT_SKP_EXT.1. This SFR defines more specific detail on how that function should be enforced.
FCS_EAPTLS_EXT.1	This SFR applies to the implementation of EAP-TLS; the Base-PP defines implementation requirements for (D)TLS, but EAP-TLS is beyond the original scope of the Base-PP.
FCS_RADIUS_EXT.1	This SFR applies to the implementation of authentication protocols, which is beyond the original scope of the Base-PP.
FCS_STG_EXT.1	This SFR is consistent with the FPT_SKP_EXT.1 requirement of the Base-PP but requires the TSF to implement a specific method of protecting key data rather than a general statement that such data is not stored in plaintext.
FIA_AFL.1/AuthSvr	This SFR defines functional behavior enforced on external users being authenticated by the TOE, which is functionality that is not covered by the Base-PP.
FIA_UAU.6	This SFR defines support for re-authentication of administrators, which expands on the authentication functionality defined in the Base-PP.
FMT_SMF.1/AuthSvr	This SFR defines additional management functionality that is specific to the PP-Module's product type and would therefore not be expected to be present in the Base-PP.

[FTA\\_TSE.1](#) This SFR relates to the handling of claimants being authenticated by the TOE, which is functionality that is beyond the original scope of the Base-PP.

[FTP\\_ITC.1/NAS](#) This SFR iterates the FTP\_ITC.1 SFR defined in the Base-PP to define trusted communication channels for the functionality that is specific to this PP-Module.

### **Optional SFRs**

This PP-Module does not define any Optional requirements.

### **Objective SFRs**

This PP-Module does not define any Objective requirements.

### **Implementation-dependent SFRs**

This PP-Module does not define any Implementation-dependent requirements.

### **Selection-based SFRs**

[FCS\\_RADSEC\\_EXT.1](#) This SFR defines the implementation of RadSec and the peer authentication method that it uses. This relies on the TLS requirements defined by the Base-PP and may also use the X.509v3 certificate validation methods specified in the Base-PP, depending on the selected peer authentication method.

[FIA\\_HOTP\\_EXT.1](#) This SFR extends the functionality of the Base-PP by defining the use of pre-shared keys as an authenticator.

[FIA\\_PSK\\_EXT.1/AuthSvr](#) This SFR extends the functionality of the Base-PP by defining the use of pre-shared keys as an authenticator.

[FIA\\_PSK\\_EXT.2](#) This SFR extends the functionality of the Base-PP by defining the use of pre-shared keys as an authenticator.

[FIA\\_PSK\\_EXT.3](#) This SFR extends the functionality of the Base-PP by defining the use of pre-shared keys as an authenticator.

[FIA\\_TOTP\\_EXT.1](#) This SFR extends the functionality of the Base-PP by defining the use of pre-shared keys as an authenticator.

# Appendix A - Optional SFRs

## A.1 Strictly Optional Requirements

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This PP-Module does not define any Strictly Optional SFRs or SARs.

## A.2 Objective Requirements

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This PP-Module does not define any Objective SFRs.

## A.3 Implementation-dependent Requirements

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This PP-Module does not define any Implementation-dependent SFRs.

# Appendix B - Selection-based Requirements

## B.1 Auditable Events for Selection-Based SFRs

Table 7: Auditable Events for Selection-based Requirements

Requirement	Auditable Events	Additional Audit Record Contents
<a href="#">FCS_RADSEC_EXT.1</a>	No events specified	N/A
<a href="#">FIA_HOTP_EXT.1</a>	Generation of a <b>HOTP</b> seed key.	Entity identifier.
	Entity <b>HOTP</b> value comparison.	Result of comparison - success or failure.
<a href="#">FIA_PSK_EXT.1/AuthSvr</a>	No events specified	N/A
<a href="#">FIA_PSK_EXT.2</a>	No events specified	N/A
<a href="#">FIA_PSK_EXT.3</a>	No events specified	N/A
<a href="#">FIA_TOTP_EXT.1</a>	Generation of a <b>TOTP</b> seed key.	Entity identifier.
	Entity <b>TOTP</b> value comparison.	Result of comparison - success or failure.

## B.2 Cryptographic Support (FCS)

### FCS\_RADSEC\_EXT.1 RadSec

*The inclusion of this selection-based component depends upon selection in [FTP\\_ITC.1.1/NAS](#).*

#### FCS\_RADSEC\_EXT.1.1

The **TSPF** shall implement RadSec as specified in [**selection:** *RFC 6614, RFC 7360*] as updated by RFC 8996 to communicate securely with a relying party.

#### FCS\_RADSEC\_EXT.1.2

The **TSPF** shall perform relying party authentication using X.509v3 certificates in accordance with [FIA\\_X509\\_EXT.1](#) as defined in the **Functional Package for X.509, version 1.0** and [**selection:** *pre-shared keys, no other methods*].

**Application Note:** It is recommended that both X.509v3 certificates and pre-shared keys be supported for resiliency purposes.

#### FCS\_RADSEC\_EXT.1.3

The **TSPF** shall implement RadSec using [**selection:** *TLS* in accordance with [FCS\\_TLSS\\_EXT.1](#) and [FCS\\_TLSS\\_EXT.2](#) from the **Functional Package for Transport Layer Security (TLS), version 2.1**, *DTLS* in accordance with

*FCS\_DTLSS\_EXT.1 and FCS\_DTLSS\_EXT.2 from the **Functional Package for Transport Layer Security (TLS), version 2.1***] with mutual authentication.

**Application Note:** This SFR is claimed if "a RadSec" is selected in [FTP\\_ITC.1.1/NAS](#).

If "RFC 6614" is claimed in the selection for [FCS\\_RADSEC\\_EXT.1.1](#), "TLS in accordance with FCS\_TLSS\_EXT.1 and FCS\_TLSS\_EXT.2 from the **Functional Package for Transport Layer Security (TLS), version 2.1**" is claimed in [FCS\\_RADSEC\\_EXT.1.3](#).

If "RFC 7360" is claimed in the selection for [FCS\\_RADSEC\\_EXT.1.1](#), "DTLS in accordance with FCS\_DTLSS\_EXT.1 and FCS\_DTLSS\_EXT.2 from the **Functional Package for Transport Layer Security (TLS), version 2.1**" is claimed in [FCS\\_RADSEC\\_EXT.1.3](#). Note that RFC 7360 is not directly updated by RFC 8996, but its references to DTLS 1.2 (RFC 6347) are.

It is the intent that TLS 1.0, TLS 1.1, and DTLS 1.0 (to include via downgrade as allowed in the original RFCs) are not allowed here.

If "pre-shared keys" is selected in [FCS\\_RADSEC\\_EXT.1.2](#), the selection-based SFR [FIA\\_PSK\\_EXT.1/AuthSvr](#) must be claimed.

## Evaluation Activities

### [FCS\\_RADSEC\\_EXT.1](#)

#### **TSS**

*The evaluator shall review the ST and verify that the RadSec protocol is described and that the description of the RadSec protocol includes a description of the support for relying party authentication in accordance with the requirement.*

#### **Guidance**

*If the ST indicates multiple options for relying party authentication, the evaluator shall review the operational guidance to ensure it includes instructions for configuring the options.*

#### **Tests**

*There are no test EAs for this component.*

## B.3 Identification and Authentication (FIA)

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

*The inclusion of this selection-based component depends upon selection in [FCS\\_EAPTLS\\_EXT.1.3](#), [FIA\\_PSK\\_EXT.1.2/AuthSvr](#).*

#### FIA\_HOTP\_EXT.1.1

The TSF shall support HMAC-Based One-Time Password authentication (HOTP) in accordance with RFC 4226.

#### FIA\_HOTP\_EXT.1.2

The ~~T.SF~~ shall generate a ~~HOTP~~ seed key according to FCS\_RBG.1 of 256 bits.

#### FIA\_HOTP\_EXT.1.3

The ~~T.SF~~ shall generate a new ~~HOTP~~ seed key for each claimant to be authenticated.

#### FIA\_HOTP\_EXT.1.4

The ~~T.SF~~ shall use [**selection:** *SHA-384, SHA-512*] with key sizes [**assignment:** *key size (in bits) used in HMAC*] and message digest sizes [**selection:** *384, 512*] to derive a ~~HOTP~~ hash from the ~~HOTP~~ seed and counter.

#### FIA\_HOTP\_EXT.1.5

The ~~T.SF~~ shall truncate the ~~HOTP~~ hash per [FIA\\_HOTP\\_EXT.1.4](#) to create a ~~HOTP~~ of [**selection:**

- *administrator configurable character length of at least 6*
- *preset character length of [**selection:** 6, 7, 8, 9, 10]*

].

#### FIA\_HOTP\_EXT.1.6

The ~~T.SF~~ shall [**selection:**

- *throttle invalid requests to [**selection:***
  - *administrator configurable value*
  - [**assignment:** *value less than 10*]*] per minute*
- *lock the associated account after [**selection:** *administrator configurable value, [assignment: value less than 10]*] failed attempts until [**selection:** *an administrator unlocks the account, a configurable time period has elapsed*]*

].

#### FIA\_HOTP\_EXT.1.7

The ~~T.SF~~ shall not verify ~~HOTP~~ attempts outside of the counter look-ahead window of [**assignment:** *a value less than or equal to three*] [**selection:**

- *except for resynchronization*
- *where a look-ahead window of [**selection:** *a configurable value, [assignment: fixed value]*] is used to reset the counter but which is not considered a valid ~~HOTP~~ value*
- *with no exception*

].

#### FIA\_HOTP\_EXT.1.8

The ~~T.SF~~ shall increment the counter after each successful authentication.

**Application Note:** This ~~SFR~~ is claimed if "~~HOTP~~" is selected in [FCS\\_EAPTLS\\_EXT.1.3](#) or if "HMAC-based one-time password" is selected in [FIA\\_PSK\\_EXT.1.2/AuthSvr](#).

The selection in [FIA\\_HOTP\\_EXT.1.4](#) must be consistent with the key size specified for the size of the keys used in conjunction with the keyed-hash message authentication.

In [FIA\\_HOTP\\_EXT.1.5](#), the ~~ST~~ author may either provide a configurable character length of at least 6 or a preset size between 6 and 10.

In [FIA\\_HOTP\\_EXT.1.6](#), the ~~ST~~ may select throttle requests, account lockout, or

both.

The selections in [FIA\\_HOTP\\_EXT.1.7](#) indicate an optional resynchronization process that allows an arbitrary look-ahead to determine a new counter value by the verifier. This can be used for out-of-sync claimants or for initial use of a ~~HOTP~~ mechanism. The ~~HOTP~~ value presented for resynchronization does not serve to authenticate a user. A second verification using a small look-ahead window (at most three) is required after resynchronization to ensure the claimant and the ~~TOE~~ counter values are indeed synchronized so that arbitrary values are not considered valid. If such a resynchronization function is not supported, 'with no exception' is claimed.

The ~~HOTP~~ seed and all derived values are considered secret keys for purposes of protection.

## Evaluation Activities

### [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.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 ~~TSS~~ if necessary, and perform the tests listed below.*

Note that response of the TSSF 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 FIA\\_HOTP\\_EXT.1:2](#) or [Test FIA\\_HOTP\\_EXT.1:3](#) represents a failed test.

- [Test FIA\\_HOTP\\_EXT.1:1](#): The evaluator shall attempt to authenticate the claimant using a valid HOTP token and confirm that the TSSF determines the value to be valid.
- [Test FIA\\_HOTP\\_EXT.1:2](#): 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 TSSF does not indicate the claimant is authenticated.
- [Test FIA\\_HOTP\\_EXT.1:3](#): The evaluator shall replay a previous HOTP value from a registered claimant (e.g., the value used in [Test FIA\\_HOTP\\_EXT.1:1](#)) and confirm that the TSSF does not indicate the claimant is authenticated.
- [Test FIA\\_HOTP\\_EXT.1:4](#): [conditional on support for resynchronization] The evaluator shall repeat [Test FIA\\_HOTP\\_EXT.1:2](#) and then follow the operational guidance to resynchronize the counter. The evaluator shall observe that after resynchronization, the TSSF does not indicate successful authentication, but instead requests an additional HOTP value from the claimant.

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

**The inclusion of this selection-based component depends upon selection in [FCS\\_EAPTLS\\_EXT.1.3](#), [FCS\\_RADSEC\\_EXT.1.2](#).**

### FIA\_PSK\_EXT.1.1/AuthSvr

The TSSF shall be able to use pre-shared keys for [selection: [IPsec](#), [RadSec](#), [EAP-TTLS](#), [RADIUS](#), [HOTP](#), [TOTP](#)].

### FIA\_PSK\_EXT.1.2/AuthSvr

The TSSF shall be able to accept the following as pre-shared keys: [selection: *generated bit-based, password-based, HMAC-based one-time password, time-based one-time password*].

**Application Note:** This SFR is claimed if any other TOE functions require the use of pre-shared keys. Within the scope of this PP-Module, this includes the following:

- Any of "static PSK," "HOTP," or "TOTP" is selected in [FCS\\_EAPTLS\\_EXT.1.3](#).
- "pre-shared keys" is selected in [FCS\\_RADSEC\\_EXT.1.2](#).
- "pre-shared keys" is selected in [FCS\\_IPSEC\\_EXT.1.13](#) (from the Base-PP).

[IPsec](#) is claimed in [FIA\\_PSK\\_EXT.1.1/AuthSvr](#), if [IPsec](#) is claimed in [FTP\\_ITC.1/NAS](#) and the selection for [FCS\\_IPSEC\\_EXT.1.13](#) in the Base-PP includes 'pre-shared keys.' PSK in [IPsec](#) may use any supported type of PSK – those supported are claimed in [FIA\\_PSK\\_EXT.1.2/AuthSvr](#). Use of certificates in [IPsec](#) is preferred.

[RadSec](#) is claimed in [FIA\\_PSK\\_EXT.1.1/AuthSvr](#), if [RadSec](#) is selected in [FTP\\_ITC.1/NAS](#) and the (D)TLS implementation in [RadSec](#) allows server-only authentication or supports a PSK ciphersuite. [RadSec](#) can use any type of PSK – those supported should be claimed in [FIA\\_PSK\\_EXT.1.2/AuthSvr](#). Use of a

mutually authenticated (D)TLS channel using certificate-based authentication is preferred.

If a pre-shared key is used in RADIUS to authenticate the relying party, RADIUS is claimed. It should not be claimed when RADIUS is used exclusively with RadSec since in that case, the legacy PSK used in RADIUS is replaced with a fixed value not used in authenticating the relying party. Use of a mutually authenticated channel using certificates to authenticate the relying party is preferred.

EAP-TTLS is claimed in FIA\_PSK\_EXT.1.1/AuthSvr if it is claimed in FCS\_EAP\_TLS\_EXT.1.1 and support for static PSK (alone or in combination) is indicated in FCS\_EAP\_TLS\_EXT.1.3. When EAP-TTLS is claimed in FIA\_PSK\_EXT.1.1/AuthSvr, at least one of 'password-based,' 'HMAC-based one-time password,' or 'time-based one-time password' is claimed in FIA\_PSK\_EXT.1.2/AuthSvr. Multiple password types are claimed if the TSF supports validation of combinations of password types, even if presented in a single payload.

Note that even if presented by a claimant, PSK are ignored in EAP-TLS implementations.

HOTP or TOTP, respectively, are claimed if the respective entry is claimed in FCS\_EAP\_TLS\_EXT.1.3 and the TSF validates the HOTP or TOTP values presented in an authentication request. If claimed, the PSK represents the seed key value generated by the TOE and shared via out-of-band mechanisms with the claimant as well as the HOTP or TOTP values presented by a claimant to be validated; the 'generated as bit-based PSK' as well as the respective HOTP or TOTP entries are claimed in FIA\_PSK\_EXT.1.2/AuthSvr. The selection-based SFRs FIA\_HOTP\_EXT.1 and FIA\_TOTP\_EXT.1 must also be claimed if HOTP or TOTP are claimed, respectively.

Note that if HOTP or TOTP mechanisms are supported, but the values are only validated by an external entity, the HOTP or TOTP entries are not claimed in FIA\_PSK\_EXT.1/AuthSvr.

If "generated bit-based" is selected in FIA\_PSK\_EXT.1.2/AuthSvr, FIA\_PSK\_EXT.2 must be claimed.

If "password-based" is selected in FIA\_PSK\_EXT.1.2/AuthSvr, FIA\_PSK\_EXT.3 must be claimed.

## Evaluation Activities

### [FIA\\_PSK\\_EXT.1/AuthSvr](#)

#### **TS**

*The evaluator shall examine the TS 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 TS 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 **TQE**).

- Test **FIA\_PSK\_EXT.1/AuthSvr: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

*The inclusion of this selection-based component depends upon selection in **FIA\_PSK\_EXT.1.2/AuthSvr**.*

### FIA\_PSK\_EXT.2.1

The **TSE** shall be able to [**selection**: accept externally generated pre-shared keys, generate 256 bit-based pre-shared keys via **FCS\_RBG.1** ].

**Application Note:** This **SFR** is claimed if "generated bit-based" is selected in **FIA\_PSK\_EXT.1.2/AuthSvr**.

Generated PSKs are expected to be shared between components via an out-of-band mechanism.

## Evaluation Activities

### **FIA\_PSK\_EXT.2**

#### **TSS**

If "generate" is selected, the evaluator shall confirm that this process uses the **RBG** specified in **FCS\_RBG.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 **FIA\_PSK\_EXT.2:1**: 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 **TSE** indicates the **PSK** matches.

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

*The inclusion of this selection-based component depends upon selection in **FIA\_PSK\_EXT.1.2/AuthSvr**.*

#### FIA\_PSK\_EXT.3.1

The **T.SF** shall support a **PSK** of up to [**assignment**: *positive integer of 64 or more*] characters.

#### FIA\_PSK\_EXT.3.2

The **T.SF** shall allow PSKs to be composed of any combination of uppercase characters, lowercase characters, numbers, the following special characters: "!", "@", "#", "\$", "%", "^", "&", "\*", "(", and ")", and [**selection**: [**assignment**: *other supported special characters*], *no other characters*].

#### FIA\_PSK\_EXT.3.3

The **T.SF** shall perform Password-based Key Derivation Functions in accordance with a specified cryptographic algorithm [*HMAC*-[**selection**: *SHA-384, SHA-512*]], with [**assignment**: *positive integer of 4096 or more*] iterations, and output cryptographic key sizes [256] bits that meet the following: [*NIST SP 800-132*].

#### FIA\_PSK\_EXT.3.4

The **T.SF** shall not accept PSKs failing to meet [**selection**: *an administrator-defined, a fixed*] password policy indicating the maximum **PSK** length consistent with [FIA\\_PSK\\_EXT.3.1](#) and [**selection**: [**assignment**: *password policy indicating minimum length and types of characters required*], *no additional password constraints*].

#### FIA\_PSK\_EXT.3.5

The **T.SF** shall generate all salts using an **RBG** that meets [FCS\\_RBG.1](#) and with entropy corresponding to the key size selected for **PBKDF** in [FIA\\_PSK\\_EXT.3.3](#).

#### FIA\_PSK\_EXT.3.6

The **T.SF** shall require the **PSK** to be entered in accordance with the [**selection**: *user authentication policy, protocol authentication requirement*].

#### FIA\_PSK\_EXT.3.7

The **T.SF** shall [**selection**: *provide a password strength meter, check the password against a denylist, perform no action to assist the user in choosing a strong password*].

**Application Note:** This **SFR** is claimed if "password-based" is selected in [FIA\\_PSK\\_EXT.1.2/AuthSvr](#).

For [FIA\\_PSK\\_EXT.3.1](#), the **ST** author assigns the maximum size of the **PSK** it supports; it must support at least 64 characters.

For [FIA\\_PSK\\_EXT.3.2](#), the **ST** author assigns any other supported characters; if there are no other supported characters, they should select "no other characters."

For [FIA\\_PSK\\_EXT.3.3](#), the **ST** author selects the parameters based on the **PBKDF** used by the **T.SF**.

For [FIA\\_PSK\\_EXT.3.4](#), if the minimum length is settable, then the **ST** author chooses "a value settable by the administrator." If the minimum length is not settable, the **ST** author fills in the assignment with the minimum length the **PSK** must be. This requirement is to ensure bounds work properly.

For [FIA\\_PSK\\_EXT.3.7](#), the **ST** author may select one, both, or neither of the functions in alignment with NIST SP 800-63B.

### [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.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 FIA\_PSK\_EXT.3:1: 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 FIA\_PSK\_EXT.3:2: 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 FIA\_PSK\_EXT.3:3: [conditional] If a password strength meter is supported, when performing Tests 1 and 2, the evaluator shall confirm that the T<sub>TSF</sub> reflects the indicated strength of the P<sub>SK</sub>.
- Test FIA\_PSK\_EXT.3:4: [conditional] If the T<sub>QF</sub> 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

*The inclusion of this selection-based component depends upon selection in FCS\_EAPTLS\_EXT.1.3, FIA\_PSK\_EXT.1.2/AuthSvr.*

### FIA\_TOTP\_EXT.1.1

The T<sub>TSF</sub> shall support Time-Based One-Time Password (T<sub>TOTP</sub>) authentication in accordance with RFC 6238.

### FIA\_TOTP\_EXT.1.2

The T<sub>TSF</sub> shall generate a T<sub>TOTP</sub> seed according to FCS\_RBG.1 of 256 bits.

### FIA\_TOTP\_EXT.1.3

The T<sub>TSF</sub> shall generate a new T<sub>TOTP</sub> seed for each claimant.

### FIA\_TOTP\_EXT.1.4

The T<sub>TSF</sub> shall use [**selection:** SHA-384, SHA-512] with key sizes [**assignment:** key size (in bits) used in HMAC] and message digest sizes [**selection:** 384, 512] bits to derive a T<sub>TOTP</sub> hash from the T<sub>TOTP</sub> seed and current time provided by NTP.

### FIA\_TOTP\_EXT.1.5

The T<sub>TSF</sub> shall truncate the T<sub>TOTP</sub> hash per FIA\_TOTP\_EXT.1.4 to create a T<sub>TOTP</sub> of [**selection:**

- administrator configurable character length of at least 6
- preset character length of [**selection:** 6, 7, 8, 9, 10]

].

### FIA\_TOTP\_EXT.1.6

The T<sub>TSF</sub> shall [**selection:**

- throttle invalid requests to [**selection:** administrator configurable value, [**assignment:** value less than 10]] per minute
- lock the associated account after [**selection:** administrator configurable value, [**assignment:** value less than 10]] failed attempts until [**selection:** an administrator unlocks the account, a configurable time period has elapsed]

].

### FIA\_TOTP\_EXT.1.7

The T<sub>TSF</sub> shall set a time-step size of [**selection, choose one of:** a configurable number of, [**assignment:** a value less than or equal to 30]] seconds.

### FIA\_TOTP\_EXT.1.8

The T<sub>TSF</sub> shall not validate a T<sub>TOTP</sub> value calculated using a time drift of more than [**selection, choose one of:** a configurable value, [**assignment:** a value less than or equal to 3]] time-steps.

## FIA\_TOTP\_EXT.1.9

The TSS shall [selection, choose one of: allow resynchronization by recording time drift within the limit of FIA\_TOTP\_EXT.1.8, not permit resynchronization].

**Application Note:** This SFR is claimed if "TOTP" is selected in FCS\_EAPTLS\_EXT.1.3 or if "time-based one-time password" is selected in FIA\_PSK\_EXT.1.2/AuthSvr.

The selection FIA\_TOTP\_EXT.1.4 must be consistent with the key size specified for the size of the keys used in conjunction with the keyed-hash message authentication.

In FIA\_TOTP\_EXT.1.5, the ST author may either provide a configurable character length of at least 6 or a preset size between 6 and 10.

In FIA\_TOTP\_EXT.1.6, the ST author may select throttle requests, account lockout, or both.

The TOTP seed and all derived values are considered secret keys for purposes of protection.

## Evaluation Activities ▼

### [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.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 FIA\\_TOTP\\_EXT.1:2](#) or [Test FIA\\_TOTP\\_EXT.1:3](#) represents a failed test.

- [Test FIA\\_TOTP\\_EXT.1:1](#): The evaluator shall attempt to authenticate the claimant using the [TOTP](#) token and confirm that the [TSF](#) determines the value to be valid.
- [Test FIA\\_TOTP\\_EXT.1:2](#): 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 FIA\\_TOTP\\_EXT.1:3](#): The evaluator shall replay a previous [TOTP](#) value from a registered claimant (e.g., the value used in [Test FIA\\_TOTP\\_EXT.1:1](#)) after a delay equal to one time step and confirm that the [TSF](#) does not indicate the claimant is authenticated.

# Appendix C - Extended Component Definitions

This appendix contains the definitions for all extended requirements specified in the `PP::Module`.

## C.1 Extended Components Table

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All extended components specified in the `PP::Module` are listed in this table:

**Table 8: Extended Component Definitions**

Functional Class	Functional Components
Cryptographic Support (FCS)	FCS_EAPTLS_EXT EAP-TLS Protocol FCS_RADIUS_EXT Authentication Protocol FCS_RADSEC_EXT RadSec FCS_STG_EXT Cryptographic Key Storage
Identification and Authentication (FIA)	FIA_HOTP_EXT HMAC-Based One-Time Password Pre-Shared Keys FIA_PSK_EXT Pre-Shared Keys FIA_TOTP_EXT Time-Based One-Time Password Pre-Shared Keys

## C.2 Extended Component Definitions

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### C.2.1 Cryptographic Support (FCS)

This `PP::Module` defines the following extended components as part of the FCS class originally defined by `CC` Part 2:

#### C.2.1.1 FCS\_EAPTLS\_EXT EAP-TLS Protocol

##### Family Behavior

This family defines requirements for how the `TSSF` implements the Extensible Authentication Protocol (`EAP`) and EAP-Transport Layer Security.

##### Component Leveling

`FCS_EAPTLS_EXT` ———— 1

[FCS\\_EAPTLS\\_EXT.1](#), EAP-TLS Protocol, requires the `TSSF` to implement `EAP` and EAP-TLS according to appropriate standards.

##### Management: FCS\_EAPTLS\_EXT.1

The following actions could be considered for the management functions in FMT:

- Configuration of claimant verification data

- Configuration of claimant authentication policy

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

The following actions should be auditable if FAU\_GEN Security audit data generation is included in the PP/ST:

- Protocol failures
- Successful and failed authentication of claimant

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

Hierarchical to: No other components.

Dependencies to: FCS\_RBG.1 Random Bit Generation

[FCS\_TLSS\_EXT.1 TLS Server Protocol Without Mutual Authentication, or  
FCS\_DTLSS\_EXT.1 DTLS Server Protocol Without Mutual Authentication]

[FCS\_TLSS\_EXT.2 TLS Server Support for Mutual Authentication, or  
FCS\_DTLSS\_EXT.2 DTLS Server Support for Mutual Authentication]

FIA\_X509\_EXT.1 X.509 Certificate Validation

#### **FCS\_EAPTLS\_EXT.1.1**

The TSF shall implement [**selection:** *EAP-TLS as specified in RFC 5216, EAP-TTLS as specified in RFC 5881*] as updated by RFC 8996 with [**selection:** *TLS, DTLS*] implemented using mutual authentication in accordance with [**selection:** *FCS\_TLSS\_EXT.1 and FCS\_TLSS\_EXT.2, FCS\_DTLSS\_EXT.1 and FCS\_DTLSS\_EXT.2*].

#### **FCS\_EAPTLS\_EXT.1.2**

The TSF shall generate random values used in the [**selection:** *EAP-TLS, EAP-TTLS*] exchange using the RBG specified in FCS\_RBG.1.

#### **FCS\_EAPTLS\_EXT.1.3**

The TSF shall support claimant authentication using certificates and [**selection:** *static PSK, HOTP, TOTP, other authentication-verification methods via pass-through, no other methods*].

#### **FCS\_EAPTLS\_EXT.1.4**

The TSF shall not forward an EAP-Success response to the relying party if the client certificate is not valid according to FIA\_X509\_EXT.1, if the [**selection:** *TLS, DTLS*] session is not established, or if any of [**selection:** *PSK, HOTP value, TOTP value, no other authenticator*] required by the authentication policy are not provided or if any of the required authenticators presented in the authentication request is not valid.

## **C.2.1.2 FCS\_RADIUS\_EXT Authentication Protocol**

### **Family Behavior**

Components in this family define requirements for implementation of authentication protocols.

### **Component Leveling**

[FCS\\_RADIUS\\_EXT.1](#), Authentication Protocol, requires the TSSF to implement the specified authentication protocols.

### Management: FCS\_RADIUS\_EXT.1

The following actions could be considered for the management functions in FMT:

- Ability to configure RADIUS shared secret
- Ability to define authorized NAS

### Audit: FCS\_RADIUS\_EXT.1

The following actions should be auditable if FAU\_GEN Security audit data generation is included in the PP/ST:

- Protocol failures
- Success/failure of authentication

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

Hierarchical to: No other components.

Dependencies to: FCS\_EAPTLS\_EXT.1 EAP-TLS Protocol

#### FCS\_RADIUS\_EXT.1.1

The TSSF shall implement the [**selection:** *RADIUS protocol as specified in RFC 2865, DIAMETER protocol as specified in RFC 6733, [assignment: other direct identity federation protocol]*] for communication of identity and authentication information with a relying party.

#### FCS\_RADIUS\_EXT.1.2

The TSSF shall implement encapsulated EAP in accordance with [FCS\\_EAPTLS\\_EXT.1](#).

#### FCS\_RADIUS\_EXT.1.3

The TSSF shall provide [**selection:** *a key indicator, an encrypted parameter, an encrypted value*] for a key held by the successfully authenticated claimant derived from the supported EAP mode and provided to the relying party in accordance with the protocol indicated in [FCS\\_RADIUS\\_EXT.1.1](#).

## C.2.1.3 FCS\_STG\_EXT Cryptographic Key Storage

### Family Behavior

Components in this family define requirements for secure storage of cryptographic keys.

### Component Leveling

[FCS\\_STG\\_EXT.1](#), Cryptographic Key Storage, requires the TSSF to identify a mechanism used to securely store cryptographic keys.

### Management: FCS\_STG\_EXT.1

The following actions could be considered for the management functions in FMT:

- Configuration of cryptographic key storage

#### **Audit: FCS\_STG\_EXT.1**

There are no auditable events foreseen.

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

Hierarchical to: No other components.

Dependencies to: [FCS\\_CKM.3](#) Cryptographic Key Access

##### **FCS\_STG\_EXT.1.1**

Persistent private and secret keys shall be stored within the T.S.F [selection:

- *encrypted with a hardware protected key*
- *in a hardware cryptographic module*
- *within an isolated execution environment protected by a hardware key*

].

#### **C.2.1.4 FCS\_RADSEC\_EXT RadSec**

##### **Family Behavior**

Components in this family define requirements for the T.S.F to use RadSec to secure RADIUS data in transit.

##### **Component Leveling**



[FCS\\_RADSEC\\_EXT.1](#), RadSec, defines implementation requirements for RadSec.

##### **Management: FCS\_RADSEC\_EXT.1**

The following actions could be considered for the management functions in FMT:

- Configuration of trusted channel to relying party

#### **Audit: FCS\_RADSEC\_EXT.1**

There are no auditable events foreseen.

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

Hierarchical to: No other components.

Dependencies to: [FCS\\_RADIUS\\_EXT.1](#) Authentication Protocol  
[FCS\\_RBG.1](#) Random Bit Generation  
[[FIA\\_PSK\\_EXT.1](#) Pre-Shared Key Composition, or  
[FIA\\_X509\\_EXT.1](#) X.509 Certificate Validation]

[FCS\_TLSS\_EXT.1 ~~TL~~S Server Protocol Without Mutual Authentication, or  
FCS\_DTLSS\_EXT.1 ~~DTL~~S Server Protocol Without Mutual Authentication]  
[FCS\_TLSS\_EXT.2 ~~TL~~S Server Support for Mutual Authentication, or  
FCS\_DTLSS\_EXT.2 ~~DTL~~S Server Support for Mutual Authentication]

### **FCS\_RADSEC\_EXT.1.1**

The TSP shall implement RadSec as specified in [**selection:** *RFC 6614, RFC 7360*] as updated by RFC 8996 to communicate securely with a relying party.

### **FCS\_RADSEC\_EXT.1.2**

The TSP shall perform relying party authentication using X.509v3 certificates in accordance with FIA\_X509\_EXT.1 and [**selection:** *pre-shared keys, no other methods*].

### **FCS\_RADSEC\_EXT.1.3**

The TSP shall implement RadSec using [**selection:** *TL*S in accordance with FCS\_TLSS\_EXT.1 and FCS\_TLSS\_EXT.2, *DTL*S in accordance with FCS\_DTLSS\_EXT.1 and FCS\_DTLSS\_EXT.2] with mutual authentication.

## **C.2.2 Identification and Authentication (FIA)**

This PP-Module defines the following extended components as part of the FIA class originally defined by CC Part 2:

### **C.2.2.1 FIA\_HOTP\_EXT HMAC-Based One-Time Password Pre-Shared Keys**

#### **Family Behavior**

Components in this family define requirements for the use of HMAC-based One-Time Password authentication, including generation methods and usage restrictions.

#### **Component Leveling**



[FIA\\_HOTP\\_EXT.1](#), HMAC-Based One-Time Password Pre-Shared Keys, defines the implementation of ~~HOTP~~.

#### **Management: FIA\_HOTP\_EXT.1**

The following actions could be considered for the management functions in FMT:

- Ability to configure restrictions on the composition of pre-shared keys
- Ability to configure restrictions on the validation of pre-shared keys

#### **Audit: FIA\_HOTP\_EXT.1**

The following actions should be auditable if FAU\_GEN Security audit data generation is included in the PP/ST:

- Generation of a ~~HOTP~~ seed key
- Entity ~~HOTP~~ value comparison

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

Hierarchical to: No other components.

Dependencies to: FCS\_COP.1 Cryptographic Operation  
FCS\_RBG.1 Random Bit Generation

### **FIA\_HOTP\_EXT.1.1**

The TTSF shall support HMAC-Based One-Time Password authentication (HOTP) in accordance with RFC 4226.

### **FIA\_HOTP\_EXT.1.2**

The TTSF shall generate a HOTP seed key according to FCS\_RBG.1 of 256 bits.

### **FIA\_HOTP\_EXT.1.3**

The TTSF shall generate a new HOTP seed key for each claimant to be authenticated.

### **FIA\_HOTP\_EXT.1.4**

The TTSF shall use [**selection:** SHA-384, SHA-512] with key sizes [**assignment:** key size (in bits) used in HMAC] and message digest sizes [**selection:** 384, 512] to derive a HOTP hash from the HOTP seed and counter.

### **FIA\_HOTP\_EXT.1.5**

The TTSF shall truncate the HOTP hash per [FIA\\_HOTP\\_EXT.1.4](#) to create a HOTP of [**selection:**

- administrator configurable character length of at least 6
- preset character length of [**selection:** 6, 7, 8, 9, 10]

].

### **FIA\_HOTP\_EXT.1.6**

The TTSF shall [**selection:**

- throttle invalid requests to [**selection:**
  - administrator configurable value
  - [**assignment:** value less than 10]]  
] per minute
- lock the associated account after [**selection:** administrator configurable value, [**assignment:** value less than 10]] failed attempts until [**selection:** an administrator unlocks the account, a configurable time period has elapsed]

].

### **FIA\_HOTP\_EXT.1.7**

The TTSF shall not verify HOTP attempts outside of the counter look-ahead window of [**assignment:** a value less than or equal to three] [**selection:**

- except for resynchronization
- where a look-ahead window of [**selection:** a configurable value, [**assignment:** fixed value]] is used to reset the counter but which is not considered a valid HOTP value
- with no exception

].

### FIA\_HOTP\_EXT.1.8

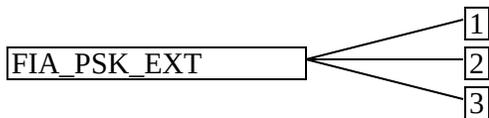
The TSSF shall increment the counter after each successful authentication.

## C.2.2.2 FIA\_PSK\_EXT Pre-Shared Keys

### Family Behavior

Components in this family describe the requirements for pre-shared keys used for authentication.

### Component Leveling



FIA\_PSK\_EXT.1, Pre-Shared Key Usage, defines the use and composition of pre-shared keys used for authentication.

[FIA\\_PSK\\_EXT.2](#), Generated Pre-Shared Keys, defines the use and composition of generated pre-shared keys used for authentication.

[FIA\\_PSK\\_EXT.3](#), Password-Based Pre-Shared Keys, defines the use and composition of password-based pre-shared keys used for authentication.

### Management: FIA\_PSK\_EXT.1

The following actions could be considered for the management functions in FMT:

- Ability to associate pre-shared keys with claimants or external entities

### Audit: FIA\_PSK\_EXT.1

There are no auditable events foreseen.

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

Hierarchical to: No other components.

Dependencies to: [FCS\_EAPTLS\_EXT.1 EAP-TLS Protocol, or  
FCS\_IPSEC\_EXT.1 IPsec]

### FIA\_PSK\_EXT.1.1

The TSSF shall be able to use pre-shared keys for [**assignment:** *protocols or authentication schemes that use pre-shared keys*].

### FIA\_PSK\_EXT.1.2

The TSSF shall be able to accept the following as pre-shared keys: [**assignment:** *types of supported pre-shared keys (e.g., randomly generated, password-based, OTP)*].

### Management: FIA\_PSK\_EXT.2

The following actions could be considered for the management functions in FMT:

- Ability to generate pre-shared keys
- Ability to accept pre-shared keys

### **Audit: FIA\_PSK\_EXT.2**

There are no auditable events foreseen.

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

Hierarchical to: No other components.

Dependencies to: FIA\_PSK\_EXT.1 Pre-Shared Key Usage

#### **FIA\_PSK\_EXT.2.1**

The TTSF shall be able to [**selection:** *accept externally generated pre-shared keys, generate 256 bit-based pre-shared keys via FCS\_RBG.1.* ].

### **Management: FIA\_PSK\_EXT.3**

The following actions could be considered for the management functions in FMT:

- Ability to configure restrictions on the composition of pre-shared keys
- Ability to configure restrictions on the validation of pre-shared keys

### **Audit: FIA\_PSK\_EXT.3**

No auditable events are foreseen.

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

Hierarchical to: No other components.

Dependencies to: FCS\_COP.1 Cryptographic Operation

FCS\_RBG.1 Random Bit Generation

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

#### **FIA\_PSK\_EXT.3.1**

The TTSF shall support a PSK of up to [**assignment:** *positive integer of 64 or more*] characters.

#### **FIA\_PSK\_EXT.3.2**

The TTSF shall allow PSKs to be composed of any combination of uppercase characters, lowercase characters, numbers, the following special characters: "!", "@", "#", "\$", "%", "^", "&", "\*", "(", and ")", and [**selection:** *[assignment: other supported special characters], no other characters*].

#### **FIA\_PSK\_EXT.3.3**

The TTSF shall perform Password-based Key Derivation Functions in accordance with a specified cryptographic algorithm [**assignment:** *key derivation algorithm*], with [**assignment:** *number or range of*

acceptable iterations] iterations, and output cryptographic key sizes [**assignment:** number of bits] bits that meet the following: [**assignment:** applicable standard].

#### FIA\_PSK\_EXT.3.4

The TSP shall not accept PSKs failing to meet [**selection:** an administrator-defined, a fixed] password policy indicating the maximum PSK length consistent with FIA\_PSK\_EXT.3.1 and [**selection:** [assignment: password policy indicating minimum length and types of characters required], no additional password constraints].

#### FIA\_PSK\_EXT.3.5

The TSP shall generate all salts using an RBG that meets FCS\_RBG.1 and with entropy corresponding to the key size selected for PBKDF in FIA\_PSK\_EXT.3.3.

#### FIA\_PSK\_EXT.3.6

The TSP shall require the PSK to be entered in accordance with the [**selection:** user authentication policy, protocol authentication requirement].

#### FIA\_PSK\_EXT.3.7

The TSP shall [**selection:** provide a password strength meter, check the password against a denylist, perform no action to assist the user in choosing a strong password].

### C.2.2.3 FIA\_TOTP\_EXT Time-Based One-Time Password Pre-Shared Keys

#### Family Behavior

Components in this family define requirements for the use of Time-Based One-Time password authentication, including generation methods and usage restrictions.

#### Component Leveling



FIA\_TOTP\_EXT.1, Time-Based One-Time Password Pre-Shared Keys, defines the implementation of TOTP.

#### Management: FIA\_TOTP\_EXT.1

The following actions could be considered for the management functions in FMT:

- Ability to configure restrictions on the composition of pre-shared keys
- Ability to configure restrictions on the validation of pre-shared keys

#### Audit: FIA\_TOTP\_EXT.1

The following actions should be auditable if FAU\_GEN Security audit data generation is included in the PP/ST:

- Generation of a TOTP seed key
- Entity TOTP value comparison

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

Hierarchical to: No other components.

Dependencies to: FCS\_COP.1 Cryptographic Operation  
FCS\_NTP\_EXT.1 NTP Protocol  
FCS\_RBG.1 Random Bit Generation

### **FIA\_TOTP\_EXT.1.1**

The TSSF shall support Time-Based One-Time Password (TOTP) authentication in accordance with RFC 6238.

### **FIA\_TOTP\_EXT.1.2**

The TSSF shall generate a TOTP seed according to FCS\_RBG.1 of 256 bits.

### **FIA\_TOTP\_EXT.1.3**

The TSSF shall generate a new TOTP seed for each claimant.

### **FIA\_TOTP\_EXT.1.4**

The TSSF shall use [**selection:** *SHA-384, SHA-512*] with key sizes [**assignment:** *key size (in bits) used in HMAC*] and message digest sizes [**selection:** *384, 512*] bits to derive a TOTP hash from the TOTP seed and current time provided by NTP.

### **FIA\_TOTP\_EXT.1.5**

The TSSF shall truncate the TOTP hash per [FIA\\_TOTP\\_EXT.1.4](#) to create a TOTP of [**selection:**

- *administrator configurable character length of at least 6*
- *preset character length of [**selection:** *6, 7, 8, 9, 10*]*

].

### **FIA\_TOTP\_EXT.1.6**

The TSSF shall [**selection:**

- *throttle invalid requests to [**selection:** *administrator configurable value, [**assignment:** *value less than 10*]] per minute**
- *lock the associated account after [**selection:** *administrator configurable value, [**assignment:** *value less than 10*]] failed attempts until [**selection:** *an administrator unlocks the account, a configurable time period has elapsed*]**

].

### **FIA\_TOTP\_EXT.1.7**

The TSSF shall set a time-step size of [**selection, choose one of:** *a configurable number of, [**assignment:** *a value less than or equal to 30*]] seconds.*

### **FIA\_TOTP\_EXT.1.8**

The TSSF shall not validate a TOTP value calculated using a time drift of more than [**selection, choose one of:** *a configurable value, [**assignment:** *a value less than or equal to 3*]] time-steps.*

### **FIA\_TOTP\_EXT.1.9**

The TSE shall [**selection, choose one of:** *allow resynchronization by recording time drift within the limit of [FIA\\_TOTP\\_EXT.1.8](#), not permit resynchronization*].

# Appendix D - Implicitly Satisfied Requirements

This appendix lists requirements that should be considered satisfied by products successfully evaluated against this ~~PP-Module~~. These requirements are not featured explicitly as ~~SFRs~~ and should not be included in the ~~ST~~. They are not included as standalone ~~SFRs~~ because it would increase the time, cost, and complexity of evaluation. This approach is permitted by [\[CC\]](#) Part 1, 8.3 Dependencies between components.

This information benefits systems engineering activities which call for inclusion of particular security controls. Evaluation against the ~~PP-Module~~ provides evidence that these controls are present and have been evaluated.

This ~~PP-Module~~ has no implicitly satisfied requirements. All ~~SFR~~ dependencies are explicitly met either through ~~SFRs~~ defined by the ~~PP-Module~~ or inherited from the ~~Base-PP~~.

# Appendix E - Allocation of Requirements in Distributed TOEs

For a distributed TOE, the SFRs in this PP-Module need to be met by the TOE as a whole, but not all SFRs will necessarily be implemented by all components. The following categories are defined in order to specify when each SFR must be implemented by a component:

- **All Components ("All"):** All components that comprise the distributed TOE must independently satisfy the requirement.
- **At least one Component ("One"):** This requirement must be fulfilled by at least one component within the distributed TOE.
- **Feature Dependent ("Feature Dependent"):** These requirements will only be fulfilled where the feature is implemented by the distributed TOE component (note that the requirement to meet the PP-Module as a whole requires that at least one component implements these requirements if they are claimed by the TOE).

The table below specifies how each of the SFRs in this PP-Module must be met, using the categories above.

Requirement	Description	Distributed TOE SFR Allocation
<a href="#">FAU_GEN.1/AuthSvr</a>	Audit Data Generation (Authentication Server)	All
<a href="#">FCO_NRO.1</a>	Selective Proof of Origin	Feature Dependent
<a href="#">FCO_NRR.1</a>	Selective Proof of Receipt	Feature Dependent
<a href="#">FCS_CKM.3</a>	Cryptographic Key Access	All
<a href="#">FCS_EAPTLS_EXT.1</a>	EAP-TLS Protocol	Feature Dependent
<a href="#">FCS_RADIUS_EXT.1</a>	Authentication Protocol	Feature Dependent
<a href="#">FCS_STG_EXT.1</a>	Cryptographic Key Storage	All
<a href="#">FIA_AFL.1/AuthSvr</a>	Authentication Failure Handling (Claimant)	Feature Dependent
<a href="#">FIA_X509_EXT.1</a> (as defined in <a href="#">Functional Package for X.509, version 1.0</a> )	X.509 Certificate Validation	Feature Dependent
<a href="#">FIA_UAU.6</a>	Re-Authenticating	Feature Dependent
<a href="#">FMT_SMF.1/AuthSvr</a>	Specification of Management Functions (Authentication Server)	All
<a href="#">FTA_TSE.1</a>	TOE Session Establishment	Feature Dependent

<a href="#">FTP_ITC.1/NAS</a>	Inter-TSF Trusted Channel (Relying Party Communications)	Feature Dependent
<a href="#">FCS_RADSEC_EXT.1</a> (selection-based)	RadSec	Feature Dependent
<a href="#">FIA_HOTP_EXT.1</a> (selection-based)	HMAC-Based One-Time Password Pre-Shared Keys	Feature Dependent
<a href="#">FIA_PSK_EXT.1/AuthSvr</a> (selection-based)	Pre-Shared Key Usage	Feature Dependent
<a href="#">FIA_PSK_EXT.2</a> (selection-based)	Generated Pre-Shared Keys	Feature Dependent
<a href="#">FIA_PSK_EXT.3</a> (selection-based)	Password-Based Pre-Shared Keys	Feature Dependent
<a href="#">FIA_TOTP_EXT.1</a> (selection-based)	Time-Based One-Time Password Pre-Shared Keys	Feature Dependent

# Appendix F - Entropy Documentation and Assessment

The TOE does not require any additional supplementary information to describe its entropy sources beyond the requirements outlined in the Base-PP.

# Appendix G - Acronyms

**Table 9: Acronyms**

<b>Acronym</b>	<b>Meaning</b>
AAA	Authentication, Authorization, and Accounting
Base-PP	Base Protection Profile
CC	Common Criteria
CEM	Common Evaluation Methodology
cPP	Collaborative Protection Profile
CRL	Certificate Revocation List
CSP	Critical Security Parameters
DTLS	Datagram Transport Layer Security
EAP	Extensible Authentication Protocol
HOTP	Hash-Based One-Time Password
IPsec	Internet Protocol Security
MSK	Master Session Key
OCSP	Online Certificate Status Protocol
OE	Operational Environment
PBKDF	Password-Based Key Derivation Function
PP	Protection Profile
PP-Configuration	Protection Profile Configuration
PP-Module	Protection Profile Module
PSK	Pre-Shared Key
RADIUS	Remote Authentication Dial In User Service
RBG	Random Bit Generator
RP	Relying Party
SAR	Security Assurance Requirement

**SFR** Security Functional Requirement

**SSH** Secure Shell

**ST** Security Target

**TLS** Transport Layer Security

**TOE** Target of Evaluation

**TOTP** Time-Based One-Time Password

**TSE** ~~TOE~~ Security Functionality

**TSEI** ~~TSE~~ Interface

**TSS** ~~TOE~~ Summary Specification

**WLAN** Wireless Local Area Network

# Appendix H - Bibliography

Table 10: Bibliography

Identifier	Title
[CC]	Common Criteria for Information Technology Security Evaluation - <ul style="list-style-type: none"><li>• <a href="#">Part 1: Introduction and general model</a>, CCMB-2022-11-001, CC:2022, Revision 1, November 2022.</li><li>• <a href="#">Part 2: Security functional requirements</a>, CCMB-2022-11-002, CC:2022, Revision 1, November 2022.</li><li>• <a href="#">Part 3: Security assurance requirements</a>, CCMB-2022-11-003, CC:2022, Revision 1, November 2022.</li><li>• <a href="#">Part 4: Framework for the specification of evaluation methods and activities</a>, CCMB-2022-11-004, CC:2022, Revision 1, November 2022.</li><li>• <a href="#">Part 5: Pre-defined packages of security requirements</a>, CCMB-2022-11-005, CC:2022, Revision 1, November 2022.</li></ul>
[GEM]	Common Methodology for Information Technology Security Evaluation - <ul style="list-style-type: none"><li>• <a href="#">Evaluation methodology</a>, CCMB-2022-11-006, CC:2022, Revision 1, November 2022.</li></ul>
[NDcPP]	<a href="#">collaborative Protection Profile for Network Devices, Version 4.0, December 22, 2025</a>