IAS Router Security Target

15-3348-R-0004

Version: 1.0

12/21/2015

Prepared For:

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Notices:

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1 Security Target (ST) Introduction

- The ST introduction shall contain an ST reference, a TOE reference, a TOE overview and a TOE description.
- The ST reference shall uniquely identify the ST.
- The TOE reference shall identify the TOE.

The structure of this document is defined by CC v3.1r3 Part 1 Annex A.2, “Mandatory contents of an ST”:

- Section 1 contains the ST Introduction, including the ST reference, Target of Evaluation (TOE) reference, TOE overview, and TOE description.
- Section 2 contains conformance claims to the Common Criteria (CC) version, Protection Profile (PP) and package claims, as well as rationale for these conformance claims.
- Section 3 contains the security problem definition, which includes threats, Organizational Security Policies (OSP), and assumptions that must be countered, enforced, and upheld by the TOE and its operational environment.
- Section 4 contains statements of security objectives for the TOE, and the TOE operational environment as well as rationale for these security objectives.
- Section 5 contains definitions of any extended security requirements claimed in the ST.
- Section 6 contains the security function requirements (SFR), the security assurance requirements (SAR), as well as the rationale for the claimed SFR and SAR.
- Section 7 contains the TOE summary specification, which includes the detailed specification of the IT security functions

1.1 Security Target Reference

The Security Target reference shall uniquely identify the Security Target.

ST Title:	IAS Router Security Target
ST Version Number:	Version 1.0
ST Author(s):	Kenji Yoshino
ST Publication Date:	12/21/2015
Keywords:	Network Device, VPN Gateway, IPsec

1.2 Target of Evaluation Reference

The Target of Evaluation reference shall identify the Target of Evaluation.

TOE Developer	Information Assurance Specialists, Inc. P.O. Box 8944 Turnersville, NJ 08012
TOE Name:	IAS Router
TOE Version:	IAS STEW Rev. 1.0, IAS KG-RU Rev. 1.0, and IAS Router Micro Rev. 1.0; with IASRouter-2015-11-24_50e8756_Release-x86-fips_cc.firmware

IAS STEW Rev. 1.0, IAS KG-RU Rev. 1.0, or and IAS Router Micro Rev. 1.0 are three distinct hardware platforms that run the IASRouter-2015-11-24_50e8756_Release-x86-fips_cc.firmware. These three platforms are collectively referred to as the IAS Routers or TOE throughout this document.

1.3 Target of Evaluation Overview

1.3.1 TOE Product Type

The TOE is a VPN Gateway Network Device.

1.3.2 TOE Usage

The IAS Routers are a family of ultra-portable routers that offer advanced routing capabilities and diverse WAN technology options (e.g. Ethernet, Wi-Fi, Cellular). The IAS Routers act as mobile VPN gateways which enable users to establish VPN connections between the IAS Router and a secure LAN. The IAS Routers uses FIPS Approved algorithms to secure VPN and remote management traffic.

1.3.3 TOE Major Security Features Summary

- Audit
- Cryptography
- User Data Protection
- Identification and Authentication
- Security Management
- Packet Filtering
- Protection of the TSF
- TOE Access
- Trusted Path/Channels

1.3.4 TOE IT Environment Hardware/Software/Firmware Requirements

The TOE requires the following support from the IT environment to operate in the evaluated configuration.

An RFC 5424 compliant syslog server must be present to support storage and review of audit logs. The TOE must be able to establish an IPsec tunnel to the LAN hosting the syslog server or directly to the syslog server. The syslog server must conform to RFC 5424. The IPsec implementation must conform to the VPN Peer requirements below.

The TOE requires a VPN Peer supporting:

- IPsec/IKEv1 (RFCs 2407, 2408, 2409, 4109) & IKEv2 (RFC 5996)
    - Main Mode
    - Authentication with X.509 using:
        - ECDSA (P-256 or P-384)
        - Pre-Shared Key
    - Symmetric ciphers (at least one of):
        - AES-CBC-128
        - AES-CBC-256
    - Integrity Algorithms (at least one of):
        - HMAC-SHA-256
        - HMAC-SHA-384

        - HMAC-SHA-512
    - Key Agreement (at least one of):
        - Diffie-Hellman Group 14 (2048 modp)
        - Diffie-Hellman Group 19 (P-256)
        - Diffie-Hellman Group 20 (P-384)
        - Diffie-Hellman Group 21 (P-521)
- IPsec/ESP (RFCs 4301, 4303, 4106, 3602)
    - Tunnel Mode
    - Symmetric ciphers (at least one of):
        - AES-GCM-128
        - AES-GCM-256
        - AES-CBC-128
        - AES-CBC-256
    - Integrity (only with AES-CBC, at least one of):
        - HMAC-SHA-256
        - HMAC-SHA-384
        - HMAC-SHA-512

The TOE supports syncing time with an NTP Server:

- NTPv4 (RFC 5905)

The TOE requires a Local Console:

- RS-232 connection

The TOE is known to be compatible with IE 11, Chrome 46, Firefox 22, and Safari 6. The TOE requires a Web Browser (Remote Console) supporting:

- Protocol versions (at least one of):
    - HTTPs/TLSv1.0 (RFCs 2818 & 2246)
    - HTTPs/TLSv1.1 (RFC 2818 & 3246)
    - HTTPs/TLSv1.2 (RFCs 2818 & 5246)
- Ciphersuites (at least one of):
    - TLS_RSA_WITH_AES_128_CBC_SHA
    - TLS_RSA_WITH_AES_256_CBC_SHA
    - TLS_DHE_RSA_WITH_AES_128_CBC_SHA
    - TLS_DHE_RSA_WITH_AES_256_CBC_SHA
    - TLS_RSA_WITH_AES_128_CBC_SHA256
    - TLS_RSA_WITH_AES_256_CBC_ SHA256
    - TLS_DHE_RSA_WITH_AES_128_CBC_ SHA256
    - TLS_DHE_RSA_WITH_AES_256_CBC_ SHA256
    - TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256
    - TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384
    - TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
    - TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384

1.4 Target of Evaluation Description

1.4.1 Target of Evaluation Physical Boundaries

The TOE consists of the following hardware:

- IAS STEW Rev. 1.0
- IAS KG-RU Rev. 1.0
- IAS Router Micro Rev. 1.0

running:

- IASRouter-2015-11-24_50e8756_Release-x86-fips_cc.firmware

The guidance documentation that is part of the TOE is listed in Section 9, "References," within Table 12: TOE Guidance Documentation.

1.4.1.1 Excluded Components

The IAS STEW and IAS KG-RU 2015 include a Cisco ESR 5915 within the physical enclosure. The IAS Router is an independently configured, evaluated, and tested component that does not have any security dependencies on the Cisco ESR; therefore, the Cisco ESR 5915 is excluded from the TOE and the security requirements described in this Security Target.

1.4.2 Target of Evaluation Logical Boundary

The logical boundary of the TOE includes those security functions implemented exclusively by the TOE. These security functions were summarized in Section 1.3.3 above and are further described in the following subsections. A more detailed description of the implementation of these security functions is provided in Section 7, "TOE Summary Specification."

The IAS STEW and IAS KG-RU 2015 include the VPN GW functionality of a Cisco ESR 5915 within their physical enclosure; however, the IAS Router is an independently configured, evaluated, and tested component that independently implements the security functions described in this section.

1.4.2.1 Audit

The TOE generates audit records for security relevant events. The TOE maintains a local audit log as well as sending the audit records to a remote Syslog server. Audit records sent to the remote server are protected by an IPsec tunnel. Each audit record includes identity (username, IP address, or process), date and time of the event, type of event, and the outcome of the event. The TOE prevents modification to the local audit log.

1.4.2.2 Cryptographic Operations

The TOE implements CAVP validated cryptographic algorithms for random bit generation, encryption/decryption, authentication, and integrity protection/verification. These algorithms are used to provide security for the TLS and IPsec (IKEv1, IKEv2, and ESP) protocols.

The TOE zeroizes all plaintext secret and private cryptographic keys and CSPs once they are no longer required.

1.4.2.3 User Data Protection

The TOE ensures that previous content of network packets is not reused in subsequent network packets. The TOE zeroizes packet buffers when each buffer is allocated.

1.4.2.4 Identification and Authentication

The TOE authenticates administrative users using a username/password combination. The TSF does not allow access to any administrative functions prior to successful authentication. The TOE has the capability to lock a remote user’s account if that user exceeds the configured number of failed authentication attempts.

1.4.2.5 Security Management

The TOE implements a restrictive HTTPs based interface that allows authorized administrative users to manage the TOE. This interface does not allow the execution of arbitrary commands. The TOE also implements a local command line interface (CLI) to allow authorized administrators to reset the TOE to factory defaults and view logs. These interfaces restrict the administrator to executing well-defined commands that are required to configure and administer the TOE.

1.4.2.6 Packet Filtering

The TOE filters packets received on the physical interfaces and virtual interfaces (IPsec tunnels). The TOE reads each packet’s header and can be configured to allow or deny the packet based on IP source address, IP destination address, Transport Layer Protocol (if specified in the IP header), TCP or UDP source port, and/or TCP or UDP destination port.

1.4.2.7 Protection of the TSF

The TOE protects itself through a number of features. The administrative interfaces do not allow the administrator to execute arbitrary binaries or provide commands for the administrator to display secret and private keys. The TOE ensures timestamps and timeouts are accurate by maintaining a real-time clock for measuring time as well as polling an NTP server to mitigate drift.

The TOE implements self-tests to verify its correct operation prior to enabling networking. If the power-on self-tests fail or a fatal conditional self-test fails, the TOE enters an error state, disables network services, and disables all cryptographic operations.

The TOE automatically verifies the authenticity and integrity of updates by requiring the updates to be digitally signed. The TOE verifies that every update is digitally signed prior to installing the update.

1.4.2.8 TOE Access

The TOE can be configured to display a warning and consent banner when an administrator attempts to establish an interactive session over the local CLI or remote HTTPs interface. The TOE also enforces a configurable inactivity timeout for remote administrative and IPsec sessions.

The TOE can be configured to deny establishment of a VPN client session based on the time, day, and/or remote client’s IP address.

1.4.2.9 Trusted Path/Channels

The TOE uses IPsec to provide a trusted communication channel between itself and VPN peers. The trusted channels utilize X.509 certificates or pre-shared keys to perform mutual authentication. The TOE initiates the IPsec trusted channel with a remote peer to protect user data and protect communication with the syslog server.

The TOE uses TLS/HTTPs to provide a trusted path between itself and remote administrative users. The TOE does not implement any additional methods of remote administration. The administrator can configure the remote administration to be tunneled through IPsec in addition to using TLS/HTTPs.

1.4.2.10 Exclusions

The TOE implements the following functionality that is excluded from the evaluated configuration and may not be used:

- Standard Mode (non-allowed algorithms and password lengths)
- FIPS Mode (non-allowed algorithms and password lengths)
- Operation as an NTP server

1.5 Notation, Formatting, and Conventions

The notation, formatting, and conventions used in this security target are defined below; these styles and clarifying information conventions were developed to aid the reader.

Where necessary, the ST author has added application notes to provide the reader with additional details to aid understanding; they are italicized and usually appear following the element needing clarification. Those notes specific to the TOE are marked “TOE Application Note;” those taken from the ND Protection Profile are marked “PP Application Note.”

The notation conventions that refer to iterations, assignments, selections, and refinements made in this Security Target are in reference to SARs and SFRs taken directly from CC Part 2 and Part 3 as well as any SFRs and SARs taken from a protection profile.

The notation used in those PP to indicate iterations, assignments, selections, and refinements of SARs and SFRs taken from CC Part 2 and Part 3 is not carried forward into this document. Additionally, obvious errors in the PP are corrected and noted as such.

The CC permits four component operations (assignment, iteration, refinement, and selection) to be performed on requirement components. These operations are defined in Common Criteria, Part 1; paragraph 6.4.1.3.2, “Permitted operations on components” as:

- Iteration: allows a component to be used more than once with varying operations;
- Assignment: allows the specification of parameters;
- Selection: allows the specification of one or more items from a list; and
- Refinement: allows the addition of details.

Iterations are indicated by a number in parenthesis following the requirement number, e.g., FIA_UAU.1.1(1); the iterated requirement titles are similarly indicated, e.g., FIA_UAU.1(1).

Assignments made by the ST author are identified with **bold text.**

Selections are identified with <u>underlined text</u>**.**

Refinements that add text use ***bold and italicized text*** to identified the added text***.*** Refinements that performs a deletion, identifies the deleted text with ~~***strikeout, bold, and italicized text***~~.

2 Conformance Claims

2.1 Common Criteria Conformance Claims

This Security Target is conformant to the Common Criteria Version 3.1r3, CC Part 2 extended [2], and CC Part 3 extended [3].

2.2 Conformance to Protection Profiles

This Security Target claims exact compliance to the Protection Profile for Network Devices, Version 1.1, dated June 8, 2012 [6], including the Security Requirements for Network Devices Errata #3 [7]. This Protection Profile and Errata will be referred to as NDPP or PP for convenience throughout this Security Target.

The Security Target incorporates all NIAP Technical Decisions for the NDPP published as of April 16, 2015.

2.3 Conformance to Security Packages

This Security Target extends the NDPP security claims with the Network Device Protection Profile (NDPP) Extended Package VPN Gateway, Version 1.1, dated April 12, 2013 [8]. This Extended Package will be referred to as VPNEP or EP throughout this Security Target. This Security Target claims exact compliance to the VPNEP in addition to the NDPP.

The Security Target incorporates all NIAP Technical Decisions for the VPNEP published as of April 16, 2015.

2.4 Conformance Claims Rationale

To demonstrate that exact conformance is met, this rationale shows all threats are addressed, all OSP are satisfied, no additional assumptions are made, all objectives have been addressed, and all SFRs and SARs have been instantiated.

The following address the completeness of the threats, OSP, and objectives, limitations on the assumptions, and instantiation of the SFRs and SARs:

- Threats
    - All threats defined in the NDPP and EP are carried forward to this ST;
    - No additional threats have been defined in this ST.
- Organizational Security Policies
    - All OSP defined in the NDPP and EP are carried forward to this ST;
    - No additional OSPs have been defined in this ST.
- Assumptions
    - All assumptions defined in the NDPP and EP are carried forward to this ST;
    - No additional assumptions for the operational environment have been defined in this ST.
- Objectives

  - All objectives defined in the NDPP and EP are carried forward to this ST.
- All SFRs and SARs defined in the NDPP and EP are carried forward to this Security Target.

Rationale presented in the body of this ST shows all assumptions on the operational environment have been upheld, all the OSP are enforced, all defined objectives have been met and these objectives counter the defined threats.

Additionally, all SFRs and SARs defined in the NDPP and EP have been properly instantiated in this Security Target; therefore, this ST shows exact compliance to the NDPP and EP.

3 Security Problem Definition

3.1 Threats

The following table defines the security threats for the TOE, characterized by a threat agent, an asset, and an adverse action of that threat agent on that asset. These threats are taken directly from the PP and EP unchanged.

Table 1: Threats

Threat	Description
T.ADMIN_ERROR	An administrator may unintentionally install or configure the TOE incorrectly, resulting in ineffective security mechanisms.
T.TSF_FAILURE	Security mechanisms of the TOE may fail, leading to a compromise of the TSF.
T.UNDETECTED_ACTIONS	Malicious remote users or external IT entities may take actions that adversely affect the security of the TOE. These actions may remain undetected and thus their effects cannot be effectively mitigated.
T.UNAUTHORIZED_ACCESS	A user may gain unauthorized access to the TOE data and TOE executable code. A malicious user, process, or external IT entity may masquerade as an authorized entity in order to gain unauthorized access to data or TOE resources. A malicious user, process, or external IT entity may misrepresent itself as the TOE to obtain identification and authentication data.
T.UNAUTHORIZED_UPDATE	A malicious party attempts to supply the end user with an update to the product that may compromise the security features of the TOE.
T.USER_DATA_REUSE	User data may be inadvertently sent to a destination not intended by the original sender.
T.NETWORK_DISCLOSURE	Sensitive information on a protected network might be disclosed resulting from ingress- or egress-based actions.
T.NETWORK_ACCESS	Unauthorized access may be achieved to services on a protected network from outside that network, or alternately services outside a protected network from inside the protected network
T.NETWORK_MISUSE	Access to services made available by a protected network might be used counter to Operational Environment policies.
T.REPLAY_ATTACK	If malicious or external IT entities are able to gain access to the network, they may have the ability to capture information traversing throughout the network and send them on to the intended receiver.
T.DATA_INTEGRITY	A malicious party attempts to change the data being sent – resulting in loss of integrity.

3.2 Organizational Security Policies

The following table defines the organizational security policies which are a set of rules, practices, and procedures imposed by an organization to address its security needs. These threats are taken directly from the PP and EP unchanged.

Table 2: Organizational Security Policies

OSP	Description
P.ACCESS_BANNER	The TOE shall display an initial banner describing restrictions of use, legal agreements, or any other appropriate information to which users consent by accessing the TOE.

3.3 Assumptions

This section describes the assumptions on the operational environment in which the TOE is intended to be used. It includes information about the physical, personnel, and connectivity aspects of the environment. The operational environment must be managed in accordance with the provided guidance documentation. The following table defines specific conditions that are assumed to exist in an environment where the TOE is deployed. These assumptions are taken directly from the PP and EP unchanged.

Table 3: Assumptions

Assumption	Description
A.NO_GENERAL_PURPOSE	It is assumed that there are no general-purpose computing capabilities (e.g., compilers or user applications) available to the TOE, other than those services necessary for the operation, administration and support of the TOE.
A.PHYSICAL	Physical security, commensurate with the value of the TOE and the data it contains, is assumed to be provided by the environment.
A.TRUSTED_ADMIN	TOE Administrators are trusted to follow and apply all administrator guidance in a trusted manner.
A.CONNECTIONS	It is assumed that the TOE is connected to distinct networks in a manner that ensures that the TOE security policies will be enforced on all applicable network traffic flowing among the attached networks.

4 Security Objectives

4.1 Security Objectives for the TOE

Table 4: Security Objectives for the TOE

TOE Objective	Description
O.PROTECTED_COMMUNICATIONS	The TOE will provide protected communication channels for administrators, other parts of a distributed TOE, and authorized IT entities.
O.VERIFIABLE_UPDATES	The TOE will provide the capability to help ensure that any updates to the TOE can be verified by the administrator to be unaltered and (optionally) from a trusted source.
O.SYSTEM_MONITORING	The TOE will provide the capability to generate audit data and send those data to an external IT entity.
O.DISPLAY_BANNER	The TOE will display an advisory warning regarding use of the TOE.
O.TOE_ADMINISTRATION	The TOE will provide mechanisms to ensure that only administrators are able to log in and configure the TOE, and provide protections for logged-in administrators.
O.RESIDUAL_INFORMATION_CLEARING	The TOE will ensure that any data contained in a protected resource is not available when the resource is reallocated.
O.SESSION_LOCK	The TOE shall provide mechanisms that mitigate the risk of unattended sessions being hijacked.
O.TSF_SELF_TEST	The TOE will provide the capability to test some subset of its security functionality to ensure it is operating properly.
O.ADDRESS_FILTERING	The TOE will provide the means to filter and log network packets based on source and destination addresses.
O.AUTHENTICATION	The TOE will provide a means to authenticate the user to ensure they are communicating with an authorized external IT entity.
O.CRYPTOGRAPHIC_FUNCTIONS	The TOE will provide means to encrypt and decrypt data as a means to maintain confidentiality and allow for detection and modification of TSF data that is transmitted outside of the TOE.
O.FAIL_SECURE	Upon a self-test failure, the TOE will shutdown to ensure data cannot be passed while not adhering to the security policies configured by the administrator.
O.PORT_FILTERING	The TOE will provide the means to filter and log network packets based on source and destination transport layer ports.

4.2 Security Objectives for the Operational Environment

Table 5: Security Objectives for the Operational Environment

Objective	Description
OE.NO_GENERAL_PURPOSE	There are no general-purpose computing capabilities (e.g., compilers or user applications) available to the TOE, other than those services necessary for the operation, administration and support of the TOE.
OE.PHYSICAL	Physical security, commensurate with the value of the TOE and the data it contains, is provided by the environment.
OE.TRUSTED_ADMIN	TOE Administrators are trusted to follow and apply all administrator guidance in a trusted manner.
OE.CONNECTIONS	TOE administrators will ensure that the TOE is installed in a manner that will

Table 5: Security Objectives for the Operational Environment	
Objective	Description
	allow the TOE to effectively enforce its policies on network traffic flowing among attached networks.

5 Extended Components Definition

This section provides definition of the extended security functional and assurance requirements; the components that are CC Part 2 extended, and CC Part 3 extended, i.e., NIAP interpreted requirements, and extended requirements.

5.1 Extended Security Functional Requirements Definitions

There are no extended Security Functional Requirements defined in this Security Target. All extended SFRs were taken from the PP or EP.

5.2 Extended Security Assurance Requirement Definitions

There are no extended Security Assurance Requirements defined in this Security Target. All extended SARs were taken from the PP or EP.

6 Security Requirements

This section describes the security functional and assurance requirements for the TOE; those that are CC Part 2 conformant, CC Part 2 extended, CC Part 3 conformant, and CC Part 3 extended.

6.1 Security Function Requirements

This section describes the functional requirements for the TOE. The security functional requirement components in this security target are CC Part 2 conformant or CC Part 2 extended as defined in Section 2, Conformance Claims. Operations that were performed in the NDPP are not signified in this section. Operations performed by the ST are denoted according to the formatting conventions in Section 1.5.

Table 6: Security Functional Requirements

#	SFR	Description
1	FAU_GEN.1	Audit Data Generation
2	FAU_GEN.2	User Audit Association
3	FAU_STG_EXT.1	External Audit Trail Storage
4	FCS_CKM.1(1)	Cryptographic Key Generation (Asymmetric Keys)
5	FCS_CKM.1(2)	Cryptographic Key Generation (for asymmetric keys)
6	FCS_CKM_EXT.4	Cryptographic Key Zeroization
7	FCS_COP.1(1)	Cryptographic Operation (Data Encryption/Decryption)
8	FCS_COP.1(2)	Cryptographic Operation (Cryptographic Signature)
9	FCS_COP.1(3)	Cryptographic Operation (Cryptographic Hashing)
10	FCS_COP.1(4)	Cryptographic Operation (Keyed-Hash Message Authentication)
11	FCS_IPSEC_EXT.1	Extended: Internet Protocol Security (IPsec) Communications
12	FCS_TLS_EXT.1	Transport Layer Security
13	FCS_HTTPS_EXT.1	HTTP Security
14	FCS_RBG_EXT.1	Extended: Cryptographic Operation: Random Bit Generation
15	FDP_RIP.2	Full Resident Information Protection
16	FIA_AFL.1	Authentication Failure Handling
17	FIA_PMG_EXT.1	Password Management
18	FIA_PSK_EXT.1	Extended: Pre-Shared Key Composition
19	FIA_UIA_EXT.1	User Identification and Authentication
20	FIA_UAU_EXT.2	Extended: Password-based Authentication Mechanisms
21	FIA_UAU.7	Protected Authentication Feedback
22	FIA_X509_EXT.1	Extended: X.509 Certificates
23	FMT_MOF.1	Management of Security Functions Behavior
24	FMT_MTD.1	Management of TSF Data (General TSF Data)
25	FMT_SMF.1	Specification of management functions
26	FMT_SMR.2	Security Management Roles

Table 6: Security Functional Requirements

#	SFR	Description
27	FPF_RUL_EXT.1	Packet Filtering
28	FPT_SKP_EXT.1	Protection of TSF Data (for reading of all symmetric keys)
29	FPT_APW_EXT.1	Protection of Administrator Passwords
30	FPT_FLS.1	Fail Secure
31	FPT_STM.1	Reliable Time Stamp
32	FPT_TUD_EXT.1	Extended: Trusted Update
33	FPT_TST_EXT.1	Extended: TSF Testing
34	FTA_SSL_EXT.1	TSF-initiated session locking
35	FTA_SSL.3	TSF-initiated termination
36	FTA_SSL.4	User-initiated termination
37	FTA_TAB.1	Default TOE Access Banners
38	FTP_ITC.1	Inter-TSF trusted channel
39	FTP_TRP.1	Trusted Path

6.1.1 Class FAU: Security Audit

6.1.1.1 FAU_GEN.1 Audit Data Generation

FAU_GEN.1.1

The TSF shall be able to generate an audit record for the following auditable events:

a) Start-up and shut-down of the audit functions;
b) All auditable events for the not specified level of audit; and
c) All administrative actions;
d) Specifically defined auditable events listed in Table 7.

Table 7: Auditable Events

#	SFR	Auditable Events	Additional Audit Record Contents
1	FAU_GEN.1	None.	
2	FAU_GEN.2	None.	
3	FAU_STG_EXT.1	None.	
4	FCS_CKM.1(1)	None.	
5	FCS_CKM.1(2)	None.	
6	FCS_CKM_EXT.4	None.	
7	FCS_COP.1(1)	None.	
8	FCS_COP.1(2)	None.	
9	FCS_COP.1(3)	None.	
10	FCS_COP.1(4)	None.	

Table 7: Auditable Events			
#	SFR	Auditable Events	Additional Audit Record Contents
11	FCS_IPSEC_EXT.1	Failure to establish an IPsec SA. Establishment/Termination of an IPsec SA.	Reason for failure. Non-TOE endpoint of connection (IP address) for both success and failures.
		Session Establishment with peer[1]	Source and destination addresses Source and destination ports TOE interface
12	FCS_TLS_EXT.1	Failure to establish a TLS Session. Establishment/Termination of a TLS session.	Reason for failure. Non-TOE endpoint of connection (IP address) for both successes and failures.
13	FCS_HTTPS_EXT.1	Failure to establish a HTTPS Session. Establishment/Termination of a HTTPS session.	Reason for failure. Non-TOE endpoint of connection (IP address) for both successes and failures.
14	FCS_RBG_EXT.1	None.	
15	FDP_RIP.2	None.	
16	FIA_AFL.1	None.	
17	FIA_PMG_EXT.1	None.	
18	FIA_PSK_EXT.1	None.	
19	FIA_UIA_EXT.1	All use of the identification and authentication mechanism.	Provided user identity, origin of the attempt (e.g., IP address).
20	FIA_UAU_EXT.2	All use of the authentication mechanism.	Origin of the attempt (e.g., IP address).
21	FIA_UAU.7	None.	
22	FIA_X509_EXT.1	Establishing a session with CA	Source and destination addresses Source and destination ports TOE interface
23	FMT_MOF.1	None.	
24	FMT_MTD.1	None.	
25	FMT_SMF.1	None.	
26	FMT_SMR.2	None.	
27	FPF_RUL_EXT.1	Application of rules configured with the 'log' operation	Source and destination addresses Source and destination ports Transport Layer Protocol TOE interface
		Indication of packets dropped due to too much network traffic	TOE interface that is unable to process packets
28	FPT_SKP_EXT.1	None.	

[1] EP Application Note: For session establishment, the expectation is that the TOE is capable of auditing all of the packets associated with the establishment of a session; this would include the IKE phase 1 and phase 2 negotiations. The TOE must be able to log all of the packets in a successful session establishment, and also have the ability to log any packets that were dropped or discarded.

Table 7: Auditable Events			
#	SFR	Auditable Events	Additional Audit Record Contents
29	FPT_APW_EXT.1	None.	
31	FPT_STM.1	Changes to the time.	The old and new values for the time. Origin of the attempt (e.g., IP address).
32	FPT_TUD_EXT.1	Initiation of update.	No additional information.
33	FPT_TST_EXT.1	None.	
34	FTA_SSL_EXT.1	Any attempts at unlocking of an interactive session.	No additional information.
35	FTA_SSL.3	The termination of a remote session by the session locking mechanism.	No additional information.
36	FTA_SSL.4	The termination of an interactive session.	No additional information.
37	FTA_TAB.1	None.	
38	FTP_ITC.1	Initiation of the trusted channel. Termination of the trusted channel. Failure of the trusted channel functions.	Identification of the initiator and target of failed trusted channels establishment attempt.
39	FTP_TRP.1	Initiation of the trusted channel. Termination of the trusted channel. Failure of the trusted channel functions.	Identification of the claimed user identity.

PP Application Note:

The ST author can include other auditable events directly in the table; they are not limited to the list presented.

Many auditable aspects of the SFRs included in this document deal with administrative actions. Item c above requires all administrative actions to be auditable, so no additional specification of the auditability of these actions is specified in Table 7.

Assurance Activity:

The evaluator shall check the administrative guide and ensure that it lists all of the auditable events and provides a format for audit records. Each audit record format type must be covered, along with a brief description of each field. The evaluator shall check to make sure that every audit event type mandated by the PP is described and that the description of the fields contains the information required in FAU_GEN.1.2, and the additional information specified in Table 7.

The evaluator shall also make a determination of the administrative actions that are relevant in the context of the NDPP. The evaluator shall examine the administrative guide and make a determination of which administrative commands, including subcommands, scripts, and configuration files, are related to the configuration (including enabling or disabling) of the mechanisms implemented in the TOE that are necessary to enforce the requirements specified in the PP. The evaluator shall document the methodology or approach taken while determining which actions in the administrative guide are security relevant with respect to the NDPP. The evaluator may perform this activity as part of the activities associated with ensuring the AGD_OPE guidance satisfies the requirements.

The evaluator shall test the TOE's ability to correctly generate audit records by having the TOE generate audit records for the events listed in Table 7 and administrative actions. This should include all instances of an event--for instance, if there are several different I&A mechanisms for a system, the FIA_UIA_EXT.1 events must be generated for each mechanism. The evaluator shall test that audit records are generated for the establishment and termination of a channel for each of the cryptographic protocols contained in the ST. If HTTPS is implemented, the test demonstrating the establishment and termination of a TLS session can be combined with the test for an HTTPS session. For administrative actions, the evaluator shall test that each action determined by the evaluator above to be security relevant in the context of the NDPP is auditable. When verifying the test results, the evaluator shall 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. For example, testing performed to ensure that the administrative guidance provided is correct verifies that AGD_OPE.1 is satisfied and should address the invocation of the administrative actions that are needed to verify the audit records are generated as expected.

EP Assurance Activity:

TSS:

The evaluator shall verify that the TSS describes how the Packet filter firewall rules can be configured to log network traffic associated with applicable rules. Note that this activity should have been addressed with a combination of the TSS assurance activities for FPF_RUL_EXT.1.

The evaluator shall verify that the TSS describes how the TOE behaves when one of its interfaces is overwhelmed by network traffic. It is acceptable for the TOE to drop packets that it cannot process, but under no circumstances is the TOE allowed to pass packets that do not satisfy a rule that allows the permit operation or belong to an allowed established session. It may not always be possible for the TOE to audit dropped packets due to implementation limitations. These limitations and circumstances in which the event of dropped packets is not audited shall be described in the TSS.

Guidance:

The evaluator shall verify that the operational guidance describes how to configure the Packet filter firewall rules to result in applicable network traffic logging. Note that this activity should have been addressed with a combination of the guidance assurance activities for FPF_RUL_EXT.1.

Test:

The following test is expected to execute outside the context of the other requirements. While testing the TOE's compliance against the SFRs, either specific tests are developed and run in the context of this SFR, or as is typically done, the audit capability is turned on while testing the TOE's behavior in complying to the other SFRs in the EP.

- Test 1: The evaluator shall attempt to flood the TOE with network packets such that the TOE will be unable to process all the packets. This may require the evaluator to configure the TOE to limit the bandwidth the TOE is capable to handling (e.g., use of a 10 MB interface).

FAU_GEN.1.2

The TSF shall record within each audit record at least the following information:

- Date and time of the event, type of event, subject identity, and the outcome (success or failure) of the event; and
- For each audit event type, based on the auditable event definitions of the functional components included in the PP/ST, information specified in column three of Table 7.

PP Application Note:

As with the previous component, the ST author should update Table 7 above with any additional information generated. "Subject identity" in the context of this requirement could either be the administrator's user id or the affected network interface, for example.

Assurance Activity:

This activity should be accomplished in conjunction with the testing of FAU_GEN.1.1.

6.1.1.2 FAU_GEN.2 User Identity Association

FAU_GEN.2.1

For audit events resulting from actions of identified users, the TSF shall be able to associate each auditable event with the identity of the user that caused the event.

Assurance Activity:

This activity should be accomplished in conjunction with the testing of FAU_GEN.1.1.

6.1.1.3 FAU_STG_EXT.1 External Audit Trail Storage

FAU_STG_EXT.1.1

The TSF shall be able to perform transmit the generated audit data to an external IT entity using a trusted channel implementing the IPsec protocol.

PP Application Note:

For applications of the NDPP to TOEs that do not act as audit servers, the TOE relies on a non-TOE audit server for storage and review of audit records. Although the TOE generates audit records, the storage of these audit records and the ability to allow the administrator to review these audit records is provided by the operational environment. The ST author chooses the first clause of the first selection in these cases. The NDPP can also be used to specify requirements for an audit server; in this case, the second clause of the first selection is used.

In the second selection, the ST author chooses the means by which this connection is protected. The ST author also ensures that the supporting protocol requirement matching the selection is included in the ST.

Assurance Activity:

For both types of TOEs (those that act as an audit server and those that send data to an external audit server), there is some amount of local storage. The evaluator shall examine the TSS to ensure it describes the amount of audit data that are stored locally; what happens when the local audit data store is full; and how these records are protected against unauthorized access. The evaluator shall also examine the operational guidance to determine that it describes the relationship between the local audit data and the audit data that are sent to the audit log server (for TOEs that are not acting as an audit log server). For example, when an audit event is generated, is it simultaneously sent to the external server and the local store, or is the local store periodically by sending the data to the audit server.

TOE acts as audit server:

The evaluator shall examine the TSS to ensure it describes the connection supported from non-TOE entities to send the audit data to the TOE, and how the trusted channel is provided. Testing of the trusted channel mechanism will be performed as specified in the associated assurance activities for the particular trusted channel mechanism. The evaluator shall also examine the operational guidance to ensure it describes how to establish the trusted channel with the TOE, as well as describe any requirements for other IT entities to connect and send audit data to the TOE (particular audit server protocol, version of the protocol required, etc.), as well as configuration of the TOE needed to communicate with other IT entities. The evaluator shall perform the following test for this requirement:

- Test 1: The evaluator shall establish a session between an external IT entity and the TOE according to the configuration guidance provided. The evaluator shall then examine the traffic that passes between the IT entity and the TOE during several activities of the TOE. The evaluator shall observe that these data are not able to be viewed in the clear during this transfer, and that they are successfully received by the TOE. The evaluator shall perform this test for each protocol selected in the second selection.

TOE is not an audit server:

The evaluator shall examine the TSS to ensure it describes the means by which the audit data are transferred to the external audit server, and how the trusted channel is provided. Testing of the trusted channel mechanism will be performed as specified in the associated assurance activities for the particular trusted channel mechanism. The evaluator shall also examine the operational guidance to ensure it describes how to establish the trusted channel to the audit server, as well as describe any requirements on the audit server (particular audit server protocol, version of the protocol required, etc.), as well as configuration of the TOE needed to communicate with the audit server. The evaluator shall perform the following test for this requirement:

- Test 1: The evaluator shall establish a session between the TOE and the audit server according to the configuration guidance provided. The evaluator shall then examine the traffic that passes between the audit server and the TOE during several activities of the evaluator's choice designed to generate audit data to be transferred to the audit server. The evaluator shall observe that these data are not able to be viewed in the clear during this transfer, and that they are successfully received by the audit server. The evaluator shall record the particular software (name, version) used on the audit server during testing.

6.1.2 Cryptographic Support (FCS)

6.1.2.1 FCS_CKM.1(1) Cryptographic Key Generation (for asymmetric keys)

FCS_CKM.1.1(1)

The TSF shall generate asymmetric cryptographic keys used for key establishment in accordance with

- NIST Special Publication 800-56A, "Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography" for elliptic curve-based key establishment schemes and implementing "NIST curves" P-256, P-384 and P-521 (as defined in FIPS PUB 186-3, "Digital Signature Standard");

- NIST Special Publication 800-56A. “Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography” for finite field-based key establishment schemes;
- NIST Special Publication 800-56B, “Recommendation for Pair-Wise Key Establishment Schemes Using Integer Factorization Cryptography” for RSA-based key establishment schemes

and specified cryptographic key sizes equivalent to, or greater than, a symmetric key strength of 112 bits.

EP Application Note:

The EP requires specific algorithms to be used in key establishment, and this instantiation of the requirement from the NDPP ensures the right selections are made.

PP Application Note:

This component requires that the TOE be able to generate the public/private key pairs that are used for key establishment purposes for the various cryptographic protocols used by the TOE (e.g., IPsec). If multiple schemes are supported, then the ST author should iterate this requirement to capture this capability. The scheme used will be chosen by the ST author from the selection.

Since the domain parameters to be used are specified by the requirements of the protocol in the NDPP, it is not expected that the TOE will generate domain parameters, and therefore there is no additional domain parameter validation needed when the TOE complies to the protocols specified in the NDPP.

SP 800-56B references (but does not mandate) key generation according to FIPS 186-3. For purposes of compliance in this version of the NDPP, RSA key pair generation according to FIPS 186-2 or FIPS 186-3 is allowed in order for the TOE to claim conformance to SP 800-56B.

The generated key strength of 2048-bit DSA and rDSA keys need to be equivalent to, or greater than, a symmetric key strength of 112 bits. See NIST Special Publication 800-57, “Recommendation for Key Management” for information about equivalent key strengths.

EP Assurance Activity:

TSS:

In order to show that the TSF complies with 800-56A and 800-56B (as selected) depending on the selections made, the evaluator shall ensure that the TSS contains the following information:

- The TSS shall list all sections of the appropriate 800-56 standard(s) to which the TOE complies.
- For each applicable section listed in the TSS, for all statements that are not "shall" (that is, "shall not", "should", and "should not"), if the TOE implements such options it shall be described in the TSS. If the included functionality is indicated as "shall not" or "should not" in the standard, the TSS shall provide a rationale for why this will not adversely affect the security policy implemented by the TOE;
- For each applicable section of 800-56A and 800-56B (as selected), any omission of functionality related to "shall" or “should” statements shall be described;

Any TOE-specific extensions, processing that is not included in the documents, or alternative implementations allowed by the documents that may impact the security requirements the TOE is to enforce shall be described.

Guidance:

The evaluator shall check that the operational guidance describes how the key generation functionality is invoked, and describes the inputs and outputs associated with the process for each signature scheme supported. The evaluator shall also check that guidance is provided regarding the format and location of the output of the key generation process.

Test:

The evaluator shall use the key pair generation portions of "The FIPS 186-3 Digital Signature Algorithm Validation System (DSA2VS)", "The FIPS 186-3 Elliptic Curve Digital Signature Algorithm Validation System (ECDSA2VS)", and "The RSA Validation System (RSA2VS)" as a guide in testing the requirement above, depending on the selection performed by the ST author. This will require that the evaluator have a trusted reference implementation of the algorithms that can produce test vectors that are verifiable during the test.

PP Assurance Activity:

The evaluator shall use the key pair generation portions of "The FIPS 186-3 Digital Signature Algorithm Validation System (DSA2VS)", "The FIPS 186-3 Elliptic Curve Digital Signature Algorithm Validation System (ECDSA2VS)", and either "The RSA Validation System (RSAVS)" (for FIPS 186-2) or “The 186-3 RSA Validation System (RSA2VS)” (for FIPS 186-3) as a guide in testing the requirement above, depending on the selection performed by the ST author. This will require that the evaluator have a trusted reference implementation of the algorithms that can produce test vectors that are verifiable during the test.

The evaluator shall ensure that the TSS contains a description of how the TSF complies with 800-56A and/or 800-56B, depending on the selections made. This description shall indicate the sections in 800-56A and/or 800-56B that are implemented by the TSF, and the evaluator shall ensure that key establishment is among those sections that the TSF claims to implement.

Any TOE-specific extensions, processing that is not included in the documents, or alternative implementations allowed by the documents that may impact the security requirements the TOE is to enforce shall be described.

6.1.2.2 FCS_CKM.1(2) Cryptographic Key Generation (for asymmetric keys)

FCS_CKM.1.2

The TSF shall generate asymmetric cryptographic keys used for IKE peer authentication in accordance with a:

- FIPS PUB 186-3, “Digital Signature Standard (DSS)”, Appendix B.4 for ECDSA schemes and implementing “NIST curves” P-256, P-384 and no other curves;

and specified cryptographic key sizes equivalent to, or greater than, a symmetric key strength of 112 bits.

EP Application Note:

The ANSI X9.31-1998 option will be removed from the selection in a future publication of the EP. Presently, the selection is not exclusively limited to the FIPS PUB 186-3 options in order to allow industry some further time to complete the transition to the modern FIPS PUB 186-3 standard.

The keys that are required to be generated by the TOE through this requirement are intended to be used for the authentication of the VPN peers during the IKE (either v1 or v2) key exchange. While it is required that the public key be associated with an identity in an X509v3 certificate, this association is not required *to be performed by the TOE, and instead is expected to be performed by a Certificate Authority in the Operational Environment.*

As indicated in FCS_IPSEC_EXT.1, the TOE is required to implement support RSA or ECDSA (or both) for peer authentication.

The generated key strength of 2048-bit RSA keys need to be equivalent to, or greater than, a symmetric key strength of 112 bits. See NIST Special Publication 800-57, "Recommendation for Key Management" for information about equivalent key strengths.

EP Assurance Activity:

TSS:

The evaluator shall check to ensure that the TSS describes how the key-pairs are generated. In order to show that the TSF implementation complies with FIPS PUB 186-3, the evaluator shall ensure that the TSS contains the following information:

- The TSS shall list all sections of Appendix B to which the TOE complies.
- For each applicable section listed in the TSS, for all statements that are not "shall" (that is, "shall not", "should", and "should not"), if the TOE implements such options it shall be described in the TSS. If the included functionality is indicated as "shall not" or "should not" in the standard, the TSS shall provide a rationale for why this will not adversely affect the security policy implemented by the TOE;
- For each applicable section of Appendix B, any omission of functionality related to "shall" or "should" statements shall be described;

Any TOE-specific extensions, processing that is not included in the Appendices, or alternative implementations allowed by the Appendices that may impact the security requirements the TOE is to enforce shall be described.

Guidance:

The evaluator shall check that the operational guidance describes how the key generation functionality is invoked, and describes the inputs and outputs associated with the process for each signature scheme supported. The evaluator shall also check that guidance is provided regarding the format and location of the output of the key generation process.

Test:

The evaluator shall use the key pair generation portions of "The FIPS 186-3 Elliptic Curve Digital Signature Algorithm Validation System (ECDSA2VS)" and "The RSA Validation System (RSA2VS)" as a guide in testing the requirement above, depending on the selection performed by the ST author. This will require that the evaluator have a trusted reference implementation of the algorithms that can produce test vectors that are verifiable during the test.

6.1.2.3 FCS_CKM_EXT.4 Cryptographic Key Zeroization

FCS_CKM_EXT.4.1

The TSF shall zeroize all plaintext secret and private cryptographic keys and CSPs when no longer required.

PP Application Note:

"Cryptographic Critical Security Parameters" are defined in FIPS 140-2 as "security-related information (e.g., secret and private cryptographic keys, and authentication data such as passwords and PINs) whose disclosure or modification can compromise the security of a cryptographic module."

The zeroization indicated above applies to each intermediate storage area for plaintext key/cryptographic critical security parameter (i.e., any storage, such as memory buffers, that is included in the path of such data) upon the transfer of the key/cryptographic critical security parameter to another location.

Assurance Activity

The evaluator shall check to ensure the TSS describes each of the secret keys (keys used for symmetric encryption), private keys, and CSPs used to generate key; when they are zeroized (for example, immediately after use, on system shutdown, etc.); and the type of zeroization procedure that is performed (overwrite with zeros, overwrite three times with random pattern, etc.). If different types of memory are used to store the materials to be protected, the evaluator shall check to ensure that the TSS describes the zeroization procedure in terms of the memory in which the data are stored (for example, "secret keys stored on flash are zeroized by overwriting once with zeros, while secret keys stored on the internal hard drive are zeroized by overwriting three times with a random pattern that is changed before each write").

6.1.2.4 FCS_COP.1(1) Cryptographic Operation (for data encryption/decryption)

FCS_COP.1.1(1)

The TSF shall perform encryption and decryption in accordance with a specified cryptographic algorithm AES operating in GCM, CBC, **no other modes** and cryptographic key sizes 128-bits, 256-bits, and <u>no other key sizes</u> that meets the following:

- FIPS PUB 197, "Advanced Encryption Standard (AES)"
- NIST SP 800-38D, NIST SP 800-38A, <u>no other standards</u>

EP Application Note:

The EP requires the modes GCM and CBC to be used in the IPsec and IKE protocols (FCS_IPSEC_EXT.1.4, FCS_IPSEC_EXT.1.6). Therefore, the FCS_COP.1.1(1) element in the NDPP has been specified here to ensure the ST Author includes these two modes to be consistent with the IPsec requirements.

PP Application Note:

For the first selection, the ST author should choose the mode or modes in which AES operates to support the cryptographic protocols chosen for FTP_ITC and FTP_TRP. If any other modes are used to support requirements in the ST, those should be filled in through the assignment. For the second selection, the ST author should choose the standards that describe the modes specified in the first selection and the assignment.

Assurance Activity:

The evaluator shall use tests appropriate to the modes selected in the above requirement from "The Advanced Encryption Standard Algorithm Validation Suite (AESAVS)", "The XTS-AES Validation System (XTSVS)", The CMAC Validation System (CMACVS)", "The Counter with Cipher Block Chaining-Message Authentication Code (CCM) Validation System (CCMVS)", and "The Galois/Counter Mode (GCM) and GMAC Validation System (GCMVS)" (these documents are available from http://csrc.nist.gov/groups/STM/cavp/index.html) as a guide in testing the requirement above. This will require that the evaluator have a reference implementation of the algorithms known to be good that can produce test vectors that are verifiable during the test.

6.1.2.5 FCS_COP.1(2) Cryptographic Operations (for cryptographic signature)

FCS_COP.1.1(2)

The TSF shall perform cryptographic signature services in accordance with a

- RSA Digital Signature Algorithm (RSA) with a key size (modulus) of 2048 bits or greater that meets FIPS PUB 186-2 or FIPS PUB 186-3, "Digital Signature Standard",
- Elliptic Curve Digital Signature Algorithm (ECDSA) with a key size of 256 bits or greater that meets FIPS PUB 186-3, "Digital Signature Standard" with "NIST curves" P-256, P-384 and no other curves (as defined in FIPS PUB 186-3, "Digital Signature Standard").

PP Application Note:

As the preferred approach for cryptographic signature, elliptic curves will be required in future publications of the NDPP.

PP Application Note:

The ST Author should choose the algorithm implemented to perform digital signatures; if more than one algorithm is available, this requirement (and the corresponding FCS_CKM.1 requirement) should be iterated to specify the functionality. For the algorithm chosen, the ST author should make the appropriate assignments/selections to specify the parameters that are implemented for that algorithm.

For elliptic curve-based schemes, the key size refers to the $\log_2$ of the order of the base point. As the preferred approach for digital signatures, ECDSA will be required in future publications of the NDPP.

Assurance Activity

The evaluator shall use the signature generation and signature verification portions of "The Digital Signature Algorithm Validation System" (DSA2VS), "The Elliptic Curve Digital Signature Algorithm Validation System" (ECDSA2VS), and "The RSA Validation System" (RSAVS (for 186-2) or RSA2VS (for 186-3)) as a guide in testing the requirement above. The Validation System used shall comply with the conformance standard identified in the ST (i.e., FIPS PUB 186-2 or FIPS PUB 186-3). This will require that the evaluator have a reference implementation of the algorithms known to be good that can produce test vectors that are verifiable during the test.

6.1.2.6 FCS_COP.1(3) Cryptographic Operation (for cryptographic hashing)

FCS_COP.1.1(3)

The TSF shall perform cryptographic hashing services in accordance with a specified cryptographic algorithm SHA-1, SHA-256, SHA-384, SHA-512 and message digest sizes 160, 256, 384, 512 bits that meet the following: FIPS Pub 180-3, "Secure Hash Standard."

PP Application Note:

The selection of the hashing algorithm must correspond to the selection of the message digest size; for example, if SHA-1 is chosen, then the only valid message digest size selection would be 160 bits.

In subsequent publications of the NDPP, it is likely that SHA-1 will no longer be an approved algorithm for cryptographic hashing.

Assurance Activity:

The evaluator shall use "The Secure Hash Algorithm Validation System (SHAVS)" as a guide in testing the requirement above. This will require that the evaluator have a reference implementation of the algorithms known to be good that can produce test vectors that are verifiable during the test.

6.1.2.7 FCS_COP.1(4) Cryptographic Operation (for keyed hash message authentication)

FCS_COP.1.1(4)

The TSF shall perform keyed-hash message authentication in accordance with a specified cryptographic algorithm HMAC-SHA-1, SHA-256, SHA-384, SHA-512 key size **160, 256, 384, 512** and message digest sizes 160, 256, 384, 512 bits that meet the following: FIPS Pub 198-1, "The Keyed-Hash Message Authentication Code, and FIPS Pub 180-3, "Secure Hash Standard."

PP Application Note:

In future version of the NDPP, SHA-1 may be removed as a valid hash algorithm. Developers are encouraged to transition to the other listed hash algorithms.

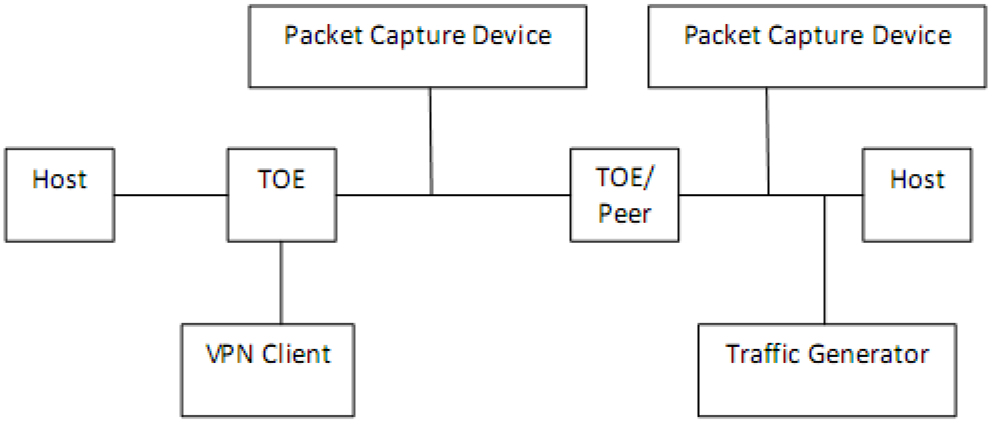
Assurance Activity:

The evaluator shall use "The Keyed-Hash Message Authentication Code (HMAC) Validation System (HMACVS)" as a guide in testing the requirement above. This will require that the evaluator have a reference implementation of the algorithms known to be good that can produce test vectors that are verifiable during the test.

6.1.2.8 FCS_IPSEC_EXT.1 IPsec

Assurance Activity:

In order to show that the TSF implements the RFCs correctly, the evaluator shall perform the assurance activities listed below. In future versions of the EP, assurance activities may be augmented, or new ones introduced that cover more aspects of RFC compliance than is currently described in the EP.



The evaluators shall minimally create a test environment equivalent to the test environment illustrated above. Two instantiations of the TOE will more than likely make it easier to conduct testing and if there is a failure of a test it should be more easily traced to the TOE, however, the evaluator is free to construct a testbed where one instance of a TOE exists and there is a device that provides the necessary functions to interact with the TOE to satisfy the testing activities. If the ST author includes the requirements for a VPN Headend, it is expected that a VPN client be used to demonstrate the TOE can act as a remote access VPN headend as well as the requirements specified for VPN client management. It is expected that the traffic generator is used to construct network packets and will provide the evaluator with the ability manipulate fields in the ICMP, IPv4, IPv6, UDP, and TCP packet headers. The evaluators must provide justification for any differences in the test environment. One such justification may be that the host can implement a traffic generator. It would be more difficult to make the same argument for the packet capture device, since it is expected the evaluator will have access to packets that are actually on the wire.

FCS_IPSEC_EXT.1.1

The TSF shall implement the IPsec architecture as specified in RFC 4301.

Assurance Activity:

TSS:

Nothing is done in addition to determining that the TOE's implementation is conformant to RFC 4301 as described above.

Guidance:

The evaluator shall examine the operational guidance to verify it instructs the Administrator how to construct entries into the SPD that specify a rule for DISCARD, BYPASS and PROTECT.

Test:

The evaluator uses the operational guidance to configure the TOE and platform to carry out the following tests:

- Test 1: The evaluator shall configure the TOE's SPD such that there is a rule for DISCARD, BYPASS, PROTECT. The selectors used in the construction of the rule shall be different such that the evaluator can send in three network packets with the appropriate fields in the packet header that each packet will match one of the three rules. The evaluator observes via the audit trail, and packet captures that the TOE exhibited the expected behavior: appropriate packet was dropped, allowed through without modification, was encrypted by the IPsec implementation.
- Test 2: The evaluator shall devise two equal SPD entries with alternate operations – BYPASS and PROTECT. The entries should then be deployed in two distinct orders and in each case the evaluator shall ensure that the first entry is enforced in both cases by generating applicable packets and using packet capture and logs for confirmation.
- Test 3: The evaluator shall repeat the procedure above, except that the two entries should be devised where one is a subset of the other (e.g., a specific address vs. a network segment). Again, the evaluator should test both orders to ensure that the first is enforced regardless of the specificity of the rule.

FCS_IPSEC_EXT.1.2

The TSF shall implement tunnel mode.

EP Application Note:

Future versions of the EP will require that the TSF implement both tunnel mode and transport mode.

Assurance Activity:

TSS:

The evaluator checks the TSS to ensure it states that the VPN can be established to operate in tunnel mode and/or transport mode (as selected).

Guidance:

The evaluator shall confirm that the operational guidance instructs the Administrator how the TOE is configured in each mode selected.

Test:

- Test 1 (conditional): If tunnel mode is selected, the evaluator uses the operational guidance to configure the TOE in tunnel mode, and a TOE peer in tunnel mode. The evaluator configures the two peer TOEs to use any of the allowable cryptographic algorithms, authentication methods, etc. to ensure an allowable SA can be negotiated. The evaluator shall then initiate a session between the peers. The evaluator observes in the audit trail and the captured packets that a successful connection was established using the tunnel mode.
- Test 2 (conditional): If transport mode is selected, the evaluator uses the operational guidance to configure the TOE to operate in transport mode when it receives packets from the VPN client. The evaluator configures the TOE and VPN client to use any of the allowed cryptographic algorithms, authentication methods, etc. to ensure an allowable SA can be negotiated. The evaluator then initiates a connection with the TOE using the VPN client. The evaluator observes in the audit trail and the captured packets that a successful connection was established using the transport mode.

FCS_IPSEC_EXT.1.3

The TSF shall have a nominal, final entry in the SPD that matches anything that is otherwise unmatched, and discards it.

Assurance Activity:

TSS:

The evaluator shall examine the TSS to verify that the TSS provides a description of how a packet is processed against the SPD and that if no “rules” are found to match, that a final rule exists, either implicitly or explicitly, that causes the network packet to be discarded.

Guidance:

The evaluator checks that the operational guidance provides instructions on how to construct the SPD and uses the guidance to configure the TOE for the following tests.

Test:

- Test 1: The evaluator shall configure the TOE’s SPD, such that it has entries that contain operations that DISCARD, BYPASS, and PROTECT network packets. The evaluator also configures the TOE so that all auditable events with respect to FCS_IPSEC_EXT.1 are enabled. The evaluator may use the SPD that was created for verification of FCS_IPSEC_EXT.1.1. The evaluator shall construct a network packet that matches a BYPASS entry and send that packet to the TOE. The evaluator should observe that the network packet is passed to the proper destination interface with no modification. The evaluator shall then modify a field in the packet header; such that it no longer matches the evaluator created entries (there may be a “TOE created” final entry that discards packets that do not match any previous entries). The evaluator sends the packet to the TOE, and observes that the packet was not permitted to flow to any of the TOE's interfaces. The evaluator shall verify that an audit record is generated that specifies that the packet was discarded as expected.

FCS_IPSEC_EXT.1.4

The TSF shall implement the IPsec protocol ESP as defined by RFC 4303 using the cryptographic algorithms AES-GCM-128, AES-GCM-256 as specified in RFC 4106, AES-CBC-128, AES-CBC-256 (both specified by RFC 3602) together with a Secure Hash Algorithm (SHA)-based HMAC.

EP Application Note:

If an AES-CBC selection is made, the SHA-based HMAC must be consistent with what is specified in the NDPP FCS_COP.1(4) Cryptographic Operation (for keyed-hash message authentication) requirement.

Assurance Activity:

TSS:

The evaluator shall examine the TSS to verify that the algorithms AES-GCM-128 and AES-GCM-256 are implemented. If the ST author has selected either AES-CBC-128 or AES-CBC-256 in this requirement, then the evaluator verifies the TSS describes these as well. In addition, the evaluator ensures that the SHA-based HMAC algorithm conforms to the algorithms specified in FCS_COP.1(4) Cryptographic Operations (for keyed-hash message authentication).

Guidance:

The evaluator checks the operational guidance to ensure it provides instructions on how to configure the TOE to use the AES-GCM-128, and AES-GCM-256 algorithms, and if either AES-CBC-128 or AES-CBC-256 have been selected the guidance instructs how to use these as well.

Test:

- Test 1: The evaluator shall configure the TOE as indicated in the operational guidance configuring the TOE to using each of the AES-GCM-128, and AES-GCM-256 algorithms, and attempt to establish a connection using ESP in confidentiality and integrity mode. If the ST Author has selected either AES-CBC-128 or AES-CBC-256, the TOE is configured to use those algorithms and the evaluator attempts to establish a connection using ESP in confidentiality and integrity mode for those algorithms selected.

FCS_IPSEC_EXT.1.5

The TSF shall implement the protocol: IKEv1 as defined in RFCs 2407, 2408, 2409, RFC 4109, no other RFCs for extended sequence numbers and RFC 4868 for hash functions; IKEv2 as defined in RFCs 5996 (with mandatory support for NAT traversal as specified in section 2.23) and RFC 4868 for hash functions.

PP Application Note:

Either IKEv1 or IKEv2 support must be provided, although conformant TOEs can provide both; the first selection is used to make this choice. For IKEv1, the requirement is to be interpreted as requiring the IKE implementation conforming to RFC 2409 with the additions/modifications as described in RFC 4109. RFC 4304 identifies support for extended sequence numbers, which compliant TOEs can specify using the second selection. RFC 4868 identifies additional hash functions for use with both IKEv1 and IKEv2; if these functions are implemented, the third (for IKEv1) and fourth (for IKEv2) selection can be used.

Assurance Activity:

TSS:

The evaluator shall examine the TSS to verify that IKEv1 and/or IKEv2 are implemented.

Guidance:

The evaluator checks the operational guidance to ensure it instructs the administrator how to configure the TOE to use IKEv1 and/or IKEv2 (as selected), and uses the guidance to configure the TOE to perform NAT traversal for the following test.

Test:

- Test 1: The evaluator shall configure the TOE so that it will perform NAT traversal processing as described in the TSS and RFC 5996, section 2.23. The evaluator shall initiate an IPsec connection and determine that the NAT is successfully traversed.

FCS_IPSEC_EXT.1.6

The TSF shall ensure the encrypted payload in the IKEv1, IKEv2 protocol uses the cryptographic algorithms AES-CBC-128, AES-CBC-256 as specified in RFC 6379 and no other algorithm.

Assurance Activity:

TSS:

The evaluator shall ensure the TSS identifies the algorithms used for encrypting the IKEv1 and/or IKEv2 payload, and that the algorithms AES-CBC-128, AES-CBC-256 are specified, and if others are chosen in the selection of the requirement, those are included in the TSS discussion.

Guidance:

The evaluator ensures that the operational guidance describes how the TOE can be configured to use the mandated algorithms, as well as any additional algorithms selected in the requirement. The guidance is then used to configure the TOE to perform the following test.

Test:

- Test 1: The evaluator shall configure the TOE to use AES-CBC-128 to encrypt the IKEv1 and/or IKEv2 payload and establish a connection with a peer device, which is configured to only accept the payload encrypted using AES-CBC-128. The evaluator will consult the audit trail to confirm the algorithm was that used in the negotiation.

FCS_IPSEC_EXT.1.7

The TSF shall ensure that IKEv1 Phase 1 exchanges use only main mode.

EP Application Note:

Element 1.7 is only applicable if IKEv1 is selected.

Assurance Activity:

TSS:

The evaluator shall examine the TSS to ensure that, in the description of the IPsec protocol supported by the TOE, it states that aggressive mode is not used for IKEv1 Phase 1 exchanges, and that only main mode is used. It may be that this is a configurable option.

Guidance:

If the mode requires configuration of the TOE prior to its operation, the evaluator shall check the operational guidance to ensure that instructions for this configuration are contained within that guidance.

Test:

- Test 1 (conditional): The evaluator shall configure the TOE as indicated in the operational guidance, and attempt to establish a connection using an IKEv1 Phase 1 connection in aggressive mode. This attempt should fail. The evaluator should then show that main mode exchanges are supported. This test is not applicable if IKEv1 is not selected above in the FCS_IPSEC_EXT.1.5 protocol selection.

FCS_IPSEC_EXT.1.8

The TSF shall ensure that <u>IKEv2 SA lifetimes can be configured by an Administrator based on number of packets or length of time, where the time values can be limited to: 24 hours for Phase 1 SAs and 8 hours for Phase 2 SAs, IKEv1 SA lifetimes can be configured by an Administrator based on number of packets or length of time, where the time values can be limited to: 24 hours for Phase 1 SAs and 8 hours for Phase 2 SAs</u>.

EP Application Note:

It is appropriate to refine the requirement in terms of number of MB/KB instead of number of packets, as long as the TOE is capable of setting a limit on the amount of traffic that is protected by the same key (the total volume of all IPsec traffic protected by that key).

PP Application Note:

The ST Author is afforded a selection based on the version of IKE in their implementation. If the lifetime limitations are configurable, then the evaluator verifies that the appropriate instructions for configuring these values are included in the operational guidance.

As far as SA lifetimes are concerned, the TOE can limit the lifetime based on the number of bytes transmitted, or the number of packets transmitted. Either packet-based or volume-based SA lifetimes are acceptable; the ST author makes the appropriate selection to indicate which type of lifetime limits are supported.

Assurance Activity:

TSS:

How the lifetimes are established and enforced is described in the RFCs and the evaluator examines the TSS as stated at the beginning of this section.

Guidance:

The evaluator verifies that the values for SA lifetimes can be configured and that the instructions for doing so are located in the operational guidance. The evaluator ensures that the Administrator is able to configurable Phase 1 SAs values for 24 hours and 8 hours for Phase 2 SAs. Currently there are no values mandated for the number of packets, the evaluator just ensures that this can be configured. The TOE may limit the lifetime on the number of bytes that have been transmitted and this would be acceptable.

Test:

When testing this, the evaluator needs to ensure that both sides are configured appropriately. From the RFC “A difference between IKEv1 and IKEv2 is that in IKEv1 SA lifetimes were negotiated. In IKEv2, each end of the SA is responsible for enforcing its own lifetime policy on the SA and rekeying the SA when necessary. If the two ends have different lifetime policies, the end with the shorter lifetime will end up always being the one to request the rekeying. If the two ends have the same lifetime policies, it is possible that both will initiate a rekeying at the same time (which will result in redundant SAs). To reduce the probability of this happening, the timing of rekeying requests SHOULD be jittered."

Each of the following tests shall be performed for each version of IKE selected in the FCS_IPSEC_EXT.1.5 protocol selection:

- Test 1: The evaluator shall configure a maximum lifetime in terms of the # of packets (or bytes) allowed following the operational guidance. The evaluator shall establish an SA and determine that once the allowed # of packets (or bytes) through this SA is exceeded, the connection is closed.
- Test 2: The evaluator shall construct a test where a Phase 1 SA is established and attempted to be maintained for more than 24 hours before it is renegotiated. The evaluator shall observe that this SA is closed or renegotiated in 24 hours or less. If such an action requires that the TOE be configured in a specific way, the evaluator shall implement tests demonstrating that the configuration capability of the TOE works as documented in the operational guidance.
- Test 3: The evaluator shall perform a test similar to Test 1 for Phase 2 SAs, except that the lifetime will be 8 hours instead of 24.

FCS_IPSEC_EXT.1.9

The TSF shall generate the secret value x used in the IKE Diffie-Hellman key exchange ("x" in g^x mod p) using the random bit generator specified in FCS_RBG_EXT.1, and having a length of at least **2047** bits.

FCS_IPSEC_EXT.1.10

The TSF shall generate nonces used in IKE exchanges in a manner such that the probability that a specific nonce value will be repeated during the life a specific IPsec SA is less than 1 in 2^**112, 2^128, 2^192, 2^256**.

Assurance Activity:

The evaluator shall check to ensure that, for each DH group supported by the TSF, the TSS describes the process for generating "x" (as defined in FCS_IPSEC_EXT.1.9) and each nonce. The evaluator shall verify that the TSS indicates that the random number generated that meets the requirements in this PP is used, and that the length of "x" and the nonces meet the stipulations in the requirement.

FCS_IPSEC_EXT.1.11

The TSF shall ensure that all IKE protocols implement DH Groups 14 (2048-bit MODP), 19 (256-bit Random ECP), and <u>20 (384-bit Random ECP), **21 (521-bit Random ECP)**</u>.

PP Application Note:

The above requires that the TOE support DH Group 14. If other groups are supported, then those should be selected (for groups 24, 19, 20, and 5) or specified in the assignment above; otherwise "no other DH groups" should be selected. This applies to IKEv1/IKEv2 exchanges.

In future publications of the NDPP DH Groups 19 (256-bit Random ECP) and 20 (384-bit Random ECP) will be required.

Assurance Activity:

The evaluator shall check to ensure that the DH groups specified in the requirement are listed as being supported in the TSS. If there is more than one DH group supported, the evaluator checks to ensure the TSS describes how a particular DH group is specified/negotiated with a peer. The evaluator shall also perform the following test:

- Test 1: For each supported DH group, the evaluator shall test to ensure that all IKE protocols can be successfully completed using that particular DH group.

FCS_IPSEC_EXT.1.12

The TSF shall ensure that all IKE protocols perform peer authentication using a ECDSA that use X.509v3 certificates that conform to RFC 4945 and Pre-shared Keys.

PP Application Note:

The selected algorithm should correspond to an appropriate selection for FCS_COP.1(2). *If IPsec is included in the TOE, the ST author also includes FIA_PSK_EXT from Appendix C.*

Assurance Activity:

TSS:

The evaluator ensures that the TSS identifies RSA and/or ECDSA as being used to perform peer authentication. The description must be consistent with the algorithms specified in FCS_COP.1(2) Cryptographic Operations (for cryptographic signature).

Guidance:

The evaluator ensures the operational guidance describes how to set up the TOE to use the cryptographic algorithms RSA and/or ECDSA.

In order to construct the environment and configure the TOE for the following tests, the evaluator will ensure that the operation guidance also describes how to configure the TOE to connect to a trusted CA, and ensure a valid certificate for that CA is loaded into the TOE and marked “trusted”.

Test:

For efficiency sake, the testing that is performed here has been combined with aspects of the testing for FIA_X509_EXT.1 Extended: X.509 Certificates, specifically FIA_X509_EXT.1.4, and FIA_X509_EXT.1.5.

The following five tests shall be repeated for each peer authentication protocol selected in the FCS_IPSEC_EXT.1.12 selection above:

- Test 1: The evaluator shall have the TOE generate a public-private key pair, and submit a CSR (Certificate Signing Request) to a CA (trusted by both the TOE and the peer VPN used to establish a connection) for its signature. The values for the DN (Common Name, Organization, Organizational Unit, and Country) will also be passed in the request.
- Test 2: The evaluator shall use a certificate signed using the RSA or ECDSA algorithm to authenticate the remote peer during the IKE exchange. This test ensures the remote peer has the certificate for the trusted CA that signed the TOE’s certificate and it will do a bit-wise comparison on the DN. This bit-wise comparison of the DN ensures that not only does the peer have a certificate signed by the trusted CA, but the certificate is from the DN that is expected. The evaluator will configure the TOE to associate a certificate (e.g., a certificate map in some implementations) with a VPN connection. This is what the DN is checked against.

- Test 3: The evaluator shall test that the TOE can properly handle revoked certificates – conditional on whether CRL or OCSP is selected; if both are selected, and then a test is performed for each method. For this draft of the EP, the evaluator has to only test one up in the trust chain (future drafts may require to ensure the validation is done up the entire chain). The evaluator shall ensure that a valid certificate is used, and that the SA is established. The evaluator then attempts the test with a certificate that will be revoked (for each method chosen in the selection) to ensure when the certificate is no longer valid that the TOE will not establish an SA.
- Test 4: The evaluator shall construct a certificate path, such that the certificate of the CA issuing the TOE's certificate does not contain the basicConstraints extension. The validation of the certificate path fails.
- Test 5: The evaluator shall construct a certificate path, such that the certificate of the CA issuing the TOE's certificate has the cA flag in the basicConstraints extension not set. The validation of the certificate path fails.
- Test 6: The evaluator shall construct a certificate path, such that the certificate of the CA issuing the TOE's certificate has the cA flag in the basicConstraints extension set to TRUE. The validation of the certificate path succeeds.
- Test 7: The evaluator shall test that given a signed certificate from a trusted CA, that when the DN does not match – any of the four fields can be modified such that they do not match the expected value, that an SA does not get established.
- Test 8: The evaluator shall ensure that the TOE is configurable to either establish an SA, or not establish an SA if a connection to the certificate validation entity cannot be reached. For each method selected for certificate validation, the evaluator attempts to validate the certificate – for the purposes of this test, it does not matter if the certificate is revoked or not. For the "mode" where an SA is allowed to be established, the connection is made. Where the SA is not to be established, the connection is refused.

FCS_IPSEC_EXT.1.13

The TSF shall be able to ensure by default that the strength of the symmetric algorithm (in terms of the number of bits in the key) negotiated to protect the IKEv1 Phase 1, IKEv2 IKE_SA connection is greater than or equal to the strength of the symmetric algorithm (in terms of the number of bits in the key) negotiated to protect the IKEv1 Phase 2, IKEv2 CHILD_SA connection.

Assurance Activity:

TSS:

The evaluator shall check that the TSS describes the potential strengths (in terms of the number of bits in the symmetric key) of the algorithms that are allowed for the IKE and ESP exchanges. The TSS shall also describe the checks that are done when negotiating IKEv1 Phase 2 and/or IKEv2 CHILD_SA suites to ensure that the strength (in terms of the number of bits of key in the symmetric algorithm) of the negotiated algorithm is less than or equal to that of the IKE SA this is protecting the negotiation.

Guidance:

The evaluator simply follows the guidance to configure the TOE to perform the following tests.

Test:

- Test 1: This test shall be performed for each version of IKE supported by the TOE. The evaluator shall successfully negotiate an IPsec connection using each of the supported algorithms and hash functions identified in the requirements.
- Test 2: This test shall be performed for each version of IKE supported by the TOE. The evaluator shall attempt to establish an SA for ESP that selects an encryption algorithm with more strength than that being used for the IKE SA (i.e., symmetric algorithm with a key size larger than that being used for the IKE SA). Such attempts should fail.
- Test 3: This test shall be performed for each version of IKE supported by the TOE. The evaluator shall attempt to establish an IKE SA using an algorithm that is not one of the supported algorithms and hash functions identified in the requirements. Such an attempt should fail.
- Test 4: This test shall be performed for each version of IKE supported by the TOE. The evaluator shall attempt to establish an SA for ESP (assumes the proper parameters where used to establish the IKE SA) that selects an encryption algorithm that is not identified in FCS_IPSEC_EXT.1.4. Such an attempt should fail.

6.1.2.9 FCS_TLS_EXT.1 TLS

FCS_TLS_EXT.1.1

The TSF shall implement one or more of the following protocols TLS 1.0 (RFC 2246), TLS 1.1 (RFC 4346), TLS 1.2 (RFC 5246) supporting the following ciphersuites:

Mandatory Ciphersuites:

- TLS_RSA_WITH_AES_128_CBC_SHA

Optional Ciphersuites:

- TLS_RSA_WITH_AES_256_CBC_SHA
- TLS_DHE_RSA_WITH_AES_128_CBC_SHA
- TLS_DHE_RSA_WITH_AES_256_CBC_SHA
- TLS_RSA_WITH_AES_128_CBC_SHA256
- TLS_RSA_WITH_AES_256_CBC_ SHA256
- TLS_DHE_RSA_WITH_AES_128_CBC_ SHA256
- TLS_DHE_RSA_WITH_AES_256_CBC_ SHA256
- TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256
- TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384
- TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384

PP Application Note:

The ST author must make the appropriate selections and assignments to reflect the TLS implementation.

The ciphersuites to be tested in the evaluated configuration are limited by this requirement. The ST author should select the optional ciphersuites that are supported; if there are no ciphersuites supported other than the mandatory suites, then "None" should be selected. If administrative steps need to be taken so that the suites negotiated by the implementation are limited to those in this requirement, the appropriate instructions need to be contained in the guidance called for by AGD_OPE.

The Suite B algorithms (RFC 5430) listed above are the preferred algorithms for implementation. The TLS requirement will be changed in the next version of the NDPP to comply with CNSSP 15 and NIST SP 800-131A.

Assurance Activity:

The evaluator shall check the description of the implementation of this protocol in the TSS to ensure that the ciphersuites supported are specified. The evaluator shall check the TSS to ensure that the ciphersuites specified are identical to those listed for this component. The evaluator shall also check the operational guidance to ensure that it contains instructions on configuring the TOE so that TLS conforms to the description in the TSS (for instance, the set of ciphersuites advertised by the TOE may have to be restricted to meet the requirements). The evaluator shall also perform the following test:

- Test 1: The evaluator shall establish a TLS connection using each of the ciphersuites specified by the requirement. This connection may be established as part of the establishment of a higher-level protocol, e.g., as part of a HTTPS session. It is sufficient to observe the successful negotiation of a ciphersuite to satisfy the intent of the test; it is not necessary to examine the characteristics of the encrypted traffic in an attempt to discern the ciphersuite being used (for example, that the cryptographic algorithm is 128-bit AES and not 256-bit AES).
- ~~Test 2: The evaluator shall setup a man-in-the-middle tool between the TOE and the TLS Peer and shall perform the following modifications to the traffic:~~
  - ~~[Conditional: TOE is a server] Modify at least one byte in the server's nonce in the Server Hello handshake message, and verify that the server denies the client's Finished handshake message.~~
  - ~~[Conditional: TOE is a client] Modify the server's selected ciphersuite in the Server Hello handshake message to be a ciphersuite not presented in the Client Hello handshake message. The evaluator shall verify that the client rejects the connection after receiving the Server Hello.~~
  - ~~[Conditional: TOE is a client] If a DHE or ECDHE ciphersuite is supported, modify the signature block in the Server's KeyExchange handshake message, and verify that the client rejects the connection after receiving the Server KeyExchange.~~
  - ~~[Conditional: TOE is a client] Modify a byte in the Server Finished handshake message, and verify that the client sends a fatal alert upon receipt and does not send any application data.~~[2]

6.1.2.10 FCS_HTTPS_EXT.1 HTTPS

FCS_HTTPS_EXT.1.1

The TSF shall implement the HTTPS protocol that complies with RFC 2818.

PP Application Note:

The ST author must provide enough detail to determine how the implementation is complying with the standard(s) identified; this can be done either by adding elements to this component, or by additional detail in the TSS.

[2] Man in the middle attacks removed according to CCEVS TD0004.

FCS_HTTPS_EXT.1.2

The TSF shall implement HTTPS using TLS as specified in FCS_TLS_EXT.1.

Assurance Activity:

The evaluator shall check the TSS to ensure that it is clear on how HTTPS uses TLS to establish an administrative session, focusing on any client authentication required by the TLS protocol vs. security administrator authentication which may be done at a different level of the processing stack. Testing for this activity is done as part of the TLS testing; this may result in additional testing if the TLS tests are done at the TLS protocol level.

6.1.2.11 FCS_RBG_EXT.1 Extended: Cryptographic Operation (Random Bit Generation)

FCS_RBG_EXT.1.1

The TSF shall perform all random bit generation (RBG) services in accordance with NIST Special Publication 800-90 using CTR_DRBG (AES) seeded by an entropy source that accumulates entropy from a TSF-hardware based noise source, and no other noise source.

FCS_RBG_EXT.1.2

The deterministic RBG shall be seeded with a minimum of 256 bits of entropy at least equal to the greatest security strength of the keys and hashes that it will generate.

EP Application Note:

The NDPP allows the ST Author to choose whether the noise source is software based or hardware based. For compliance with this EP, there must be at least one hardware based noise source.

A hardware noise source is a component that produces data that cannot be explained by a deterministic rule, due to its physical nature. In other words, a hardware based noise source generates sequences of random numbers from a physical process that cannot be predicted. For example, a sampled ring oscillator consists of an odd number of inverter gates chained into a loop, with an electrical pulse traveling from inverter to inverter around the loop. The inverters are not clocked, so the precise time required for a complete circuit around the loop varies slightly as various physical effects modify the small delay time at each inverter on the line to the next inverter. This variance results in an approximate natural frequency that contains drift and jitter over time. The output of the ring oscillator consists of the oscillating binary value sampled at a constant rate from one of the inverters – a rate that is significantly slower than the oscillator’s natural frequency.

Any hardware component behaving in similarly variable ways that cannot be explained by a precise and predictable rule can serve as a hardware-based noise source. It is also possible to use multiple independent noise sources to increase entropy production and reduce attack potential (by requiring attackers to exploit multiple random bit streams) as long as at least one of the sources is hardware based. It should be noted that timing of interrupts caused by mechanical I/O devices and system counters are not considered hardware-based noise sources for the purposes of this requirement.

See Appendix D of the NDPP for further explanation regarding entropy.

PP Application Note:

NIST Special Pub 800-90B describes the minimum entropy measurement that will probably be required future versions of FIPS-140. If possible this should be used immediately and will be required in future versions of the NDPP.

For the first selection in FCS_RBG_EXT.1.1, the ST author should select the standard to which the RBG services comply (either 800-90B or 140-2 Annex C).

SP 800-90B contains four different methods of generating random numbers; each of these, in turn, depends on underlying cryptographic primitives (hash functions/ciphers). The ST author will select the function used (if 800-90B is selected), and include the specific underlying cryptographic primitives used in the requirement or in the TSS. While any of the identified hash functions (SHA-1, SHA-224,SHA-256, SHA-384, SHA-512) are allowed for Hash_DRBG or HMAC_DRBG, only AES-based implementations for CTR_DRBG are allowed. While any of the curves defined in 800-90B are allowed for Dual_EC_DRBG, the ST author not only must include the curve chosen, but also the hash algorithm used.

For the second selection in FCS_RBG_EXT.1.1, the ST author indicates whether the sources of entropy are software-based, hardware-based, or both. If there are multiple sources of entropy, the ST will elaborate each entropy sources and whether it is hardware- or software-based. Hardware-based noise sources are preferred.

Note that for FIPS Pub 140-2 Annex C, currently only the method described in NIST-Recommended Random Number Generator Based on ANSI X9.31 Appendix A.2.4 Using the 3-Key Triple DES and AES Algorithms, Section 3 is valid. If the key length for the AES implementation used here is different than that used to encrypt the user data, then FCS_COP.1 may have to be adjusted or iterated to reflect the different key length. For the selection in FCS_RBG_EXT.1.2, the ST author selects the minimum number of bits of entropy that is used to seed the RBG.

The ST author also ensures that any underlying functions are included in the baseline requirements for the TOE.

For the selection in FCS_RBG_EXT.1.2, the ST author selects the appropriate number of bits of entropy that corresponds to the greatest security strength of the algorithms included in the ST. Security strength is defined in Tables 2 and 3 of NIST SP 800-57A. For example, if the implementation includes 2048-bit RSA (security strength of 112 bits), AES 128 (security strength 128 bits), and HMAC-512 (security strength 256 bits), then the ST author would select 256 bits.

Assurance Activity:

Documentation shall be produced – and the evaluator shall perform the activities – in accordance with Annex D, Entropy Documentation and Assessment.

The evaluator shall also perform the following tests, depending on the standard to which the RBG conforms.

Implementations Conforming to FIPS 140-2, Annex C

The reference for the tests contained in this section is The Random Number Generator Validation System (RNGVS) [RNGVS]. The evaluator shall conduct the following two tests. Note that the "expected values" are produced by a reference implementation of the algorithm that is known to be correct. Proof of correctness is left to each Scheme.

The evaluator shall perform a Variable Seed Test. The evaluator shall provide a set of 128 (Seed, DT) pairs to the TSF RBG function, each 128 bits. The evaluator shall also provide a key (of the length appropriate to the AES algorithm) that is constant for all 128 (Seed, DT) pairs. The DT value is incremented by 1 for each set. The seed values shall have no repeats within the set. The evaluator ensures that the values returned by the TSF match the expected values.

The evaluator shall perform a Monte Carlo Test. For this test, they supply an initial Seed and DT value to the TSF RBG function; each of these is 128 bits. The evaluator shall also provide a key (of the length appropriate to the AES algorithm) that is constant throughout the test. The evaluator then invokes the TSF RBG 10,000 times, with the DT value being incremented by 1 on each iteration, and the new seed for the subsequent iteration produced as specified in NIST-Recommended Random Number Generator Based on ANSI X9.31 Appendix A.2.4 Using the 3-Key Triple DES and AES Algorithms, Section 3. The evaluator ensures that the 10,000th value produced matches the expected value.

Implementations Conforming to NIST Special Publication 800-90

The evaluator shall perform 15 trials for the RBG implementation. If the RBG is configurable, the evaluator shall perform 15 trials for each configuration. The evaluator shall also confirm that the operational guidance contains appropriate instructions for configuring the RBG functionality.

If the RBG has prediction resistance enabled, each trial consists of (1) instantiate drbg, (2) generate the first block of random bits (3) generate a second block of random bits (4) uninstantiate. The evaluator verifies that the second block of random bits is the expected value. The evaluator shall generate eight input values for each trial. The first is a count (0 - 14). The next three are entropy input, nonce, and personalization string for the instantiate operation. The next two are additional input and entropy input for the first call to generate. The final two are additional input and entropy input for the second call to generate. These values are randomly generated. “generate one block of random bits” means to generate random bits with number of returned bits equal to the Output Block Length (as defined in NIST SP 800-90).

If the RBG does not have prediction resistance, each trial consists of (1) instantiate drbg, (2) generate the first block of random bits (3) reseed, (4) generate a second block of random bits (5) uninstantiate. The evaluator verifies that the second block of random bits is the expected value. The evaluator shall generate eight input values for each trial. The first is a count (0 - 14). The next three are entropy input, nonce, and personalization string for the instantiate operation. The fifth value is additional input to the first call to generate. The sixth and seventh are additional input and entropy input to the call to reseed. The final value is additional input to the second generate call.

The following paragraphs contain more information on some of the input values to be generated/selected by the evaluator.

- Entropy input: the length of the entropy input value must equal the seed length.
- Nonce: If a nonce is supported (CTR_DRBG with no df does not use a nonce), the nonce bit length is one-half the seed length.
- Personalization string: The length of the personalization string must be <= seed length. If the implementation only supports one personalization string length, then the same length can be used for both values. If more than one string length is supported, the evaluator shall use personalization strings of two different lengths. If the implementation does not use a personalization string, no value needs to be supplied.
- Additional input: the additional input bit lengths have the same defaults and restrictions as the personalization string lengths.

6.1.3 User Data Protection (FDP)

6.1.3.1 FDP_RIP.2 Full Residual Information Protection

FDP_RIP.2.1

The TSF shall ensure that any previous information content of a resource is made unavailable upon the allocation of the resource to all objects.

Assurance Activity:

"Resources" in the context of this requirement are network packets being sent through (as opposed to "to", as is the case when a security administrator connects to the TOE) the TOE. The concern is that once a network packet is sent, the buffer or memory area used by the packet still contains data from that packet, and that if that buffer is re-used, those data might remain and make their way into a new packet. The evaluator shall check to ensure that the TSS describes packet processing to the extent that they can determine that no data will be reused when processing network packets. The evaluator shall ensure that this description at a minimum describes how the previous data are zeroized/overwritten, and at what point in the buffer processing this occurs.

6.1.4 Identification and Authentication (FIA)

6.1.4.1 FIA_AFL.1 Authentication Failure Handling

FIA_AFL.1.1

The TSF shall detect when an Administrator configurable positive integer of successive unsuccessful authentication attempts occur related to administrators attempting to authenticate remotely.

FIA_AFL.1.2

When the defined number of unsuccessful authentication attempts has been met, the TSF shall prevent the offending remote administrator from successfully authenticating until an Administrator defined time period has elapsed.

EP Application Note:

This requirement does not apply to an administrator at the local console, since it does not make sense to lock a local administrator's account in this fashion. This could be addressed by (for example) requiring a separate account for local administrators or having the authentication mechanism implementation distinguish local and remote login attempts. The "action" taken by a local administrator is implementation specific and would be defined in the administrator 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.

Assurance Activity:

TSS:

The evaluator shall examine the TSS to determine that it contains a description, for each supported method for remote administrative actions, of how successive unsuccessful authentication attempts are detected and tracked. The TSS shall also describe the method by which the remote administrator is prevented from successfully logging on to the TOE, and the actions necessary to restore this ability.

Guidance:

The evaluator shall also examine the operational guidance to ensure that instructions for configuring the number of successive unsuccessful authentication attempts (1.1) and time period (1.2, if implemented) are provided, and that the process of allowing the remote administrator to once again successfully log on is described for each "action" specified (if that option is chosen). If different actions or mechanisms are implemented depending on the secure protocol employed (e.g., TLS vs. SSH), all must be described.

Test:

The evaluator shall perform the following tests for IPsec, and for each other method by which remote administrators access the TOE (e.g., TLS, SSH):

- Test 1: The evaluator shall use the operational guidance to configure the number of successive unsuccessful authentication attempts allowed by the TOE. The evaluator shall test that once the limit is reached, attempts with valid credentials are not successful. For each action specified by the requirement, the evaluator shall show that following the operational guidance and performing each action to allow the remote administrator access are successful.
- Test 2: The evaluator shall use the operational guidance to configure the number of successive unsuccessful authentication attempts allowed by the TOE and a time period after which valid logins will be allowed for a remote administrator. After exceeding the specified number of invalid login attempts and showing that valid login is not possible, the evaluator shall show that waiting for the interval defined by the time period before another access attempt will result in the ability for the remote administrator to successfully log on using valid credentials.

6.1.4.2 FIA_PMG_EXT.1 Password Management

FIA_PMG_EXT.1.1

The TSF shall provide the following password management capabilities for administrative passwords:

1. Passwords shall be able to be composed of any combination of upper and lower case letters, numbers, and the following special characters: “!”, “@”, “#”, “$”, “%”, “^”, “&”, “*”, “(“, “)”;
2. Minimum password length shall settable by the Security Administrator, and support passwords of 15 characters or greater;

PP Application Note:

The ST author selects the special characters that are supported by TOE; they may optionally list additional special characters supported using the assignment. "Administrative passwords" refers to passwords used by administrators at the local console or over protocols that support passwords, such as SSH and HTTPS.

Assurance Activity:

The evaluator shall examine the operational guidance to determine that it provides guidance to security administrators on the composition of strong passwords, and that it provides instructions on setting the minimum password length. The evaluator shall also perform the following tests. Note that one or more of these tests can be performed with a single test case.

- Test 1: The evaluator shall compose passwords that either meet the requirements, or fail to meet the requirements, in some way. For each password, the evaluator shall verify that the TOE supports the password. While the evaluator is not required (nor is it feasible) to test all possible compositions of passwords, the evaluator shall ensure that all characters, rule characteristics, and a minimum length listed in the requirement are supported, and justify the subset of those characters chosen for testing.

6.1.4.3 FIA_PSK_EXT.1 Extended: Pre-Shared Key Composition

PP Application Note:

The TOE must support pre-shared keys for use in the IPsec protocol. There are two types of pre-shared keys--text-based (which are required) and bit-based (which are optional)--supported by the TOE, as specified in the requirements below. The first type is referred to as "text-based pre-shared keys", which refer to pre-shared keys that are entered by users as a string of characters from a standard character set, similar to a password. Such pre-shared keys must be conditioned so that the string of characters is transformed into a string of bits, which is then used as the key.

The second type is referred to as "bit-based pre-shared keys" (for lack of a standard term); this refers to keys that are either generated by the TSF on a command from the administrator, or input in "direct form" by an administrator. "Direct form" means that the input is used directly as the key, with no "conditioning" as was the case for text-based pre-shared keys. An example would be a string of hex digits that represent the bits that comprise the key.

The requirements below mandate that the TOE must support text-based pre-shared keys and optionally support bit-based pre-shared keys, although generation of the bit-based pre-shared keys may be done either by the TOE or in the operational environment.

EP Application Note:

The TOE may support pre-shared keys for use in the IPsec protocol, and may use pre-shared keys in other protocols as well. There are two types of pre-shared keys that may be supported by the TOE, as specified in the requirements below. The first type is referred to as "text-based pre-shared keys", which refer to pre-shared keys that are entered by users as a string of characters from a standard character set, similar to a password. Such pre-shared keys must be conditioned so that the string of characters is transformed into a string of bits, which is then used as the key.

The second type is referred to as "bit-based pre-shared keys" (for lack of a standard term); this refers to keys that are either generated by the TSF on a command from the administrator, or input in "direct form" by an administrator. "Direct form" means that the input is used directly as the key, with no "conditioning" as was the case for text-based pre-shared keys. An example would be a string of hex digits that represent the bits that comprise the key.

The requirements below mandate that the TOE must support both text-based and bit-based pre-shared keys, although generation of the bit-based pre-shared keys may be done either by the TOE or in the operational environment.

The requirements below allow the ST Author to include these requirements in the ST, if they select pre-shared keys in the FCS_IPSEC_EXT.1.12 element in the body of the EP.

FIA_PSK_EXT.1.1

The TSF shall be able to use pre-shared keys for IPsec and no other protocols.

FIA_PSK_EXT.1.2

The TSF shall be able to accept text-based pre-shared keys that:

- are 22 characters and **administrator configurable minimum lengths from 15 to 22 characters and no maximum length**;
- composed of any combination of upper and lower case letters, numbers, and special characters (that include: "!", "@", "#", "$", "%", "^", "&", "*", "(", and ")").

FIA_PSK_EXT.1.3

The TSF shall condition the text-based pre-shared keys by using SHA-1, SHA-256, SHA-512, **SHA-384**.

FIA_PSK_EXT.1.4

The TSF shall be able to accept bit-based pre-shared keys.

PP Application Note:

For the length of the text-based pre-shared keys, a common length (22 characters) is required to help promote interoperability. If other lengths are supported they should be listed in the assignment; this assignment can also specify a range of values (e.g., "lengths from 5 to 55 characters") as well.

In the second selection for FIA_PSK_EXT.1.3, the ST author fills in the method by which the text string entered by the administrator is "conditioned" into the bit string used as the key. This can be done by using one of the specified hash functions, or some other method through the assignment statement. If "bit-based pre-shared keys" is selected, the ST author specifies whether the TSF merely accepts bit-based pre-shared keys, or is capable of generating them. If it generates them, the requirement specified that they must be generated using the RBG specified by the requirements. If the use of bit-based pre-shared keys is not supported, the ST author chooses "use no other pre-shared keys".

Assurance Activity:

The evaluator shall examine the operational guidance to determine that it provides guidance 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 merits of shorter or longer pre-shared keys. The guidance must specify the allowable characters for pre-shared keys, and that list must be a super-set of the list contained in FIA_PSK_EXT.1.2.

The evaluator shall examine the TSS to ensure that it states that text-based pre-shared keys of 22 characters are supported, and that the TSS states the conditioning that takes place to transform the text-based pre-shared key from the key sequence entered by the user (e.g., ASCII representation) to the bit string used by IPsec, and that this conditioning is consistent with the first selection in the FIA_PSK_EXT.1.3 requirement. If the assignment is used to specify conditioning, the evaluator will confirm that the TSS describes this conditioning.

If "bit-based pre-shared keys" is selected, the evaluator shall confirm the operational guidance contains instructions for either entering bit-based pre-shared keys for each protocol identified in the requirement, or generating a bit-based pre-shared key (or both). The evaluator shall also examine the TSS to ensure it describes the process by which the bit-based pre-shared keys are generated (if the TOE supports this functionality), and confirm that this process uses the RBG specified in FCS_RBG_EXT.1.

The evaluator shall also perform the following tests:

- Test 1: The evaluator shall compose at least 15 pre-shared keys of 22 characters that cover all allowed characters in various combinations that conform to the operational guidance, and demonstrates that a successful protocol negotiation can be performed with each key.
- Test 2 [conditional]: If the TOE supports pre-shared keys of multiple lengths, the evaluator shall repeat Test 1 using the minimum length; the maximum length; and an invalid length. The minimum and maximum length tests should be successful, and the invalid length must be rejected by the TOE.
- Test 3 [conditional]: If the TOE supports bit-based pre-shared keys but does not generate such keys, the evaluator shall obtain a bit-based pre-shared key of the appropriate length and enter it according to the instructions in the operational guidance. The evaluator shall then demonstrate that a successful protocol negotiation can be performed with the key.

- Test 4 [conditional]: If the TOE supports bit-based pre-shared keys and does generate such keys, the evaluator shall generate a bit-based pre-shared key of the appropriate length and use it according to the instructions in the operational guidance. The evaluator shall then demonstrate that a successful protocol negotiation can be performed with the key.

6.1.4.4 FIA_UIA_EXT.1 User Identification and Authentication

FIA_UIA_EXT.1.1

The TSF shall allow the following actions prior to requiring the non-TOE entity to initiate the identification and authentication process:

- Display the warning banner in accordance with FTA_TAB.1;
- **ICMP Echo (ping)**
- **DHCP**
- **ARP**
- **DNS**

FIA_UIA_EXT.1.2

The TSF shall require each administrative user to be successfully identified and authenticated before allowing any other TSF-mediated actions on behalf of that administrative user.

PP Application Note:

This requirement applies to users (administrators and external IT entities) of services available from the TOE directly, and not services available by connecting through the TOE. While it should be the case that few or no services are available to external entities prior to identification and authentication, if there are some available (perhaps ICMP echo) these should be listed in the assignment statement; otherwise "no other actions" should be selected.

Authentication can be password-based through the local console or through a protocol that supports passwords (such as SSH), or be certificate based (SSH, TLS).

For communications with external IT entities (e.g., an audit server or NTP server, for instance), such connections must be performed in accordance with FTP_ITC.1, whose protocols perform identification and authentication. This means that such communications (e.g., establishing the IPsec connection to the authentication server) would not have to be specified in the assignment, since establishing the connection "counts" as initiating the identification and authentication process.

Assurance Activity:

The evaluator shall examine the TSS to determine that it describes the logon process for each logon method (local, remote (HTTPS, SSH, etc.)) supported for the product. This description shall contain information pertaining to the credentials allowed/used, any protocol transactions that take place, and what constitutes a "successful logon". The evaluator shall examine the operational guidance to determine that any necessary preparatory steps (e.g., establishing credential material such as pre-shared keys, tunnels, certificates, etc.) to logging in are described. For each supported the login method, the evaluator shall ensure the operational guidance provides clear instructions for successfully logging on. If configuration is necessary to ensure the services provided before login are limited, the evaluator shall determine that the operational guidance provides sufficient instruction on limiting the allowed services.

The evaluator shall perform the following tests for each method by which administrators access the TOE (local and remote), as well as for each type of credential supported by the login method:

- Test 1: The evaluator shall use the operational guidance to configure the appropriate credential supported for the login method. For that credential/login method, the evaluator shall show that providing correct I&A information results in the ability to access the system, while providing incorrect information results in denial of access.
- Test 2: The evaluator shall configure the services allowed (if any) according to the operational guidance, and then determine the services available to an external remote entity. The evaluator shall determine that the list of services available is limited to those specified in the requirement.
- Test 3: For local access, the evaluator shall determine what services are available to a local administrator prior to logging in, and make sure this list is consistent with the requirement.

6.1.4.5 FIA_UAU_EXT.2 Password-based Authentication Mechanism

FIA_UAU_EXT.2.1

The TSF shall provide a local password-based authentication mechanism, none to perform administrative user authentication.

Assurance Activity:

Assurance activities for this requirement are covered under those for FIA_UIA_EXT.1. If other authentication mechanisms are specified, the evaluator shall include those methods in the activities for FIA_UIA_EXT.1.

6.1.4.6 FIA_UAU.7 Protected Authentication Feedback

FIA_UAU.7.1

The TSF shall provide only obscured feedback to the administrative user while the authentication is in progress at the local console.

PP Application Note:

"Obscured feedback" implies the TSF does not produce a visible display of any authentication data entered by a user (such as the echoing of a password), although an obscured indication of progress may be provided (such as an asterisk for each character). It also implies that the TSF does not return any information during the authentication process to the user that may provide any indication of the authentication data.

Assurance Activity:

The evaluator shall perform the following test for each method of local login allowed:

- Test 1: The evaluator shall locally authenticate to the TOE. While making this attempt, the evaluator shall verify that at most obscured feedback is provided while entering the authentication information.

6.1.4.7 FIA_X509_EXT.1 Extended: X.509 Certificates

FIA_X509_EXT.1.1

The TSF shall use X.509v3 certificates as defined by RFC 5280 to support authentication for IPsec and no other protocols connections.

FIA_X509_EXT.1.2

The TSF shall store and protect certificate(s) from unauthorized deletion and modification.

FIA_X509_EXT.1.3

The TSF shall provide the capability for authenticated Administrators to load X.509v3 certificates into the TOE for use by the security functions specified in this ***ST*** ~~***PP***~~.

FIA_X509_EXT.1.4

The TSF shall generate a Certificate Request Message as specified in RFC 2986 and be able to provide the following information in the request: public key, Common Name, Organization, Organizational Unit, and Country.

EP Application Note:

The public key referenced in FIA_X509_EXT.1.4 is the public key portion of the public-private key pair generated by the TOE as specified in FCS_CKM.1(2).

FIA_X509_EXT.1.5

The TSF shall validate the certificate using the Online Certificate Status Protocol (OCSP) as specified in RFC 2560, a Certificate Revocation List (CRL) as specified in RFC 5759.

EP Application Note:

While the choice of revocation method employed is left to the ST author, future versions of the EP will mandate both methods be available to the TOE's Administrator.

FIA_X509_EXT.1.6

The TSF shall validate a certificate path by ensuring the presence of the basicConstraints extension is present and the cA flag is set to TRUE for all CA certificates.

FIA_X509_EXT.1.7

The TSF shall not treat a certificate as a CA certificate if the basicConstraints extension is not present or the cA flag is not set to TRUE.

FIA_X509_EXT.1.8

The TSF shall not establish an SA if a certificate or certificate path is deemed invalid.

FIA_X509_EXT.1.9

The TSF shall not establish an SA if the distinguished name (DN) contained in a certificate does not match the expected DN for the entity attempting to establish a connection.

FIA_X509_EXT.1.10[3]

When the TSF cannot establish a connection to determine the validity of a certificate, the TSF shall allow the administrator to choose whether to accept the certificate in these cases.

EP Application Note:

[3] Updated according to CCEVS TD0041.

*The intent of FIA_X509_EXT.1.**10**~~8~~ is that the TOE is configurable to allow or disallow session establishment if the TOE cannot connect to an entity responsible for providing certificate validation information. For instance, if a CRL cannot be obtained because a machine is down, or the network path is broken, the administrator may elect to configure the TOE to allow sessions to continue to be established, rather than terminate the TOE's ability to establish any new SAs because it cannot reach the CA.*

Assurance Activity:

TSS:

The TSS shall describe all certificate stores implemented that contain certificates used to meet the requirements of this EP. This description shall contain information pertaining to how certificates are loaded into the store, and how the store is protected from unauthorized access. The TSS description will also include a discussion as to how the TOE forms a certification path as specified in the standard and how certificates are validated (CRL and/or OCSP are included in the discussion, as well as the certificate path validation algorithm).

Guidance:

The evaluator shall verify that the operational guidance describes how to the administrator loads certificates into the certificate store. If the level of protection can managed by the administrator, the guidance provides a description of how to manage the protection mechanism. The guidance instructs the administrator how to generate a key pair and how to generate a Certificate Request Message to the CA.

The guidance documentation provides instructions how to select the method used for checking, as well as how to setup a protected communication path with the entity providing the information pertaining to certificate validity.

How the administrator can configure the TOE to either allow or disallow the establishment of an SA is also described in the operational guidance.

Test:

The tests associated with this component are bundled with the FCS_IPSEC_EXT.1.12 requirements.

6.1.5 Security Management (FMT)

6.1.5.1 FMT_MOF.1 Management of Security Functions Behavior

FMT_MOF.1.1

The TSF shall restrict the ability to enable, disable, determine and modify the behavior of all of the security functions of the TOE identified in this EP to an authenticated Administrator.

6.1.5.2 FMT_MTD.1 Management of TSF Data (for general TSF data)

FMT_MTD.1.1

The TSF shall restrict the ability to manage the TSF data to the Security Administrators.

PP Application Note:

The word "manage" includes but is not limited to create, initialize, view, change default, modify, delete, clear, and append. This requirement is intended to be the "default" requirement for management of TSF data; other iterations of FMT_MTD should place different restrictions or operations available on the *specifically-identified TSF data. TSF data includes cryptographic information as well; managing these data would include the association of a cryptographic protocol with an interface, for instance.*

Assurance Activity:

The evaluator shall review the operational guidance to determine that each of the TSF-data-manipulating functions implemented in response to the requirements of the NDPP is identified, and that configuration information is provided to ensure that only administrators have access to the functions. The evaluator shall examine the TSS to determine that, for each administrative function identified in the operational guidance, those that are accessible through an interface prior to administrator log-in are identified. For each of these functions, the evaluator shall also confirm that the TSS details how the ability to manipulate the TSF data through these interfaces is disallowed for non-administrative users.

6.1.5.3 FMT_SMF.1 Specification of Management Functions

FMT_SMF.1.1

The TSF shall be capable of performing the following management functions:

- Ability to configure the cryptographic functionality,
- Ability to configure the IPsec functionality,
- Ability to enable, disable, determine and modify the behavior of all the security functions of the TOE identified in this ***~~EP~~ ST*** to the Administrator,
- Ability to configure all security management functions identified in other sections of this ***~~EP~~ ST***.

PP Application Note:

The TOE must provide functionality for both local and remote administration, as well as the capability for the administrator to verify that updates received came from a trusted source. They must be capable of performing this action using digital signatures, and optionally a published hash. The ST author chooses whether the published hash verification option is available using the first selection, which must match the corresponding selection in FPT_TUD_EXT.1.3. If the TOE offers the ability for the administrator to configure the services available prior to identification or authentication, or if any of the cryptographic functionality on the TOE can be configured, then the ST author makes the appropriate choice or choices in the second selection, otherwise select "no other capabilities."

EP Assurance Activity:

TSS:

The evaluator shall verify that the TSS describes how the Packet filter firewall rules can be configured. Note that this activity should have been addressed with the TSS assurance activities for FPF_RUL_EXT.1.

Guidance:

The evaluator shall verify that the operational guidance describes how to configure the Packet filter firewall rules, including how to set any configurable defaults and how to configure each of the applicable rule attributes, actions, and associated interfaces. The evaluator must ensure that the operational guidance also provides instruction that would allow an administrator to ensure that configured rules are properly ordered. Note that this activity should have been addressed with the Guidance assurance activities for FPF_RUL_EXT.1.

Test:

- Test 1: The evaluator shall devise tests that demonstrate that the functions used to configure the Packet filter firewall rules yield expected changes in the rules that they are correctly enforced. A number of rule combination and ordering scenarios need to be configured and tested by attempting to pass both valid and invalid network traffic through the TOE. Note that this activity should have been addressed with a combination of the Test assurance activities for FPF_RUL_EXT.1.

Assurance Activity:

The security management functions for FMT_SMF.1 are distributed throughout the PP and are included as part of the requirements in FMT_MTD, FPT_TST_EXT, and any cryptographic management functions specified in the reference standards. Compliance to these requirements satisfies compliance with FMT_SMF.1.

6.1.5.4 FMT_SMR.2 Restrictions on Security Roles

FMT_SMR.2.1

The TSF shall maintain the roles:

- Authorized Administrator

FMT_SMR.2.2

The TSF shall be able to associate users with roles.

FMT_SMR.2.3

The TSF shall ensure that the conditions

- Authorized Administrator role shall be able to administer the TOE locally;
- Authorized Administrator role shall be able to administer the TOE remotely;

are satisfied.

PP Application Note:

FMT_SMR.2.2 requires that user accounts be associated with only one role. However, note that multiple users may have the same role, and the TOE is not required to restrict roles to a single person.

FMT_SMR.2.3 requires that an authorized administrator be able to administer the TOE through the local console and through a remote mechanism (IPsec, SSH, TLS, TLS/HTTPS). For multiple component TOEs, only the TOE components providing the management control and configuration of the other TOE components require a local administration interface.

Assurance Activity:

The evaluator shall review the operational guidance to ensure that it contains instructions for administering the TOE both locally and remotely, including any configuration that needs to be performed on the client for remote administration. In the course of performing the testing activities for the evaluation, the evaluator shall use all supported interfaces, although it is not necessary to repeat each test involving an administrative action with each interface. The evaluator shall ensure, however, that each supported method of administering the TOE that conforms to the requirements of the NDPP be tested; for instance, if the TOE can be administered through a local hardware interface; SSH; and TLS/HTTPS; then all three methods of administration must be exercised during the evaluation team's test activities.

6.1.6 Packet Filtering (FPF)

6.1.6.1 FPF_RUL_EXT.1 Packet Filtering

FPF_RUL_EXT.1.1

The TSF shall perform Packet Filtering on network packets processed by the TOE.

Assurance Activity:

TSS:

The evaluator shall verify that the TSS provide a description of the TOE's initialization/startup process, which clearly indicates where processing of network packets begins to take place, and provides a discussion that supports the assertion that packets cannot flow during this process.

The evaluator shall verify that the TSS also includes a narrative that identifies the components (e.g., active entity such as a process or task) involved in processing the network packets and describes the safeguards that would prevent packets flowing through the TOE without applying the ruleset in the event of a component failure. This could include the failure of a component, such as a process being terminated, or a failure within a component, such as memory buffers full and cannot process packets.

Guidance:

The operational guidance associated with this requirement is assessed in the subsequent test assurance activities.

Tests:

- Test 1: The evaluator shall attempt to get network traffic to flow through the TOE while the TOE is being initialized. A steady flow of network packets that would otherwise be denied by the ruleset should be directed at the TOE's interfaces, with packet sniffers listening to see if any network traffic is allowed through.

Note: The remaining testing associated with application of the ruleset is addressed in the subsequent test assurance activities.

FPF_RUL_EXT.1.2

The TSF shall process the following network traffic protocols:

- Internet Protocol (IPv4)
- ~~***Internet Protocol version 6 (IPv6)***~~
- Transmission Control Protocol (TCP)
- User Datagram Protocol (UDP)

and be capable of inspecting network packet header fields defined by the following RFCs to the extent mandated in the other elements of this SFR

- RFC 791 (IPv4)
- ~~***RFC 2460 (IPv6)***~~
- RFC 793 (TCP)
- RFC 768 (UDP).

EP Application Note:

This element identifies the protocols and references the protocol definitions that serve to define to what extent the network traffic can be interpreted by the TOE when importing (receiving network traffic or ingress) and exporting (sending – or forming to be sent - network traffic or egress).

While the protocol formatting specified in the RFCs is still used, many RFCs define behaviors which are no longer considered safe to follow. For example, RFC792 defined the "Redirect" ICMP type, which is not considered safe to honor when it might come from an adversary; the "source quench" message, which is insecure because its source cannot be validated.

Assurance Activity:

TSS:

The evaluator shall verify that the TSS indicates that the following protocols are supported:

- RFC 791 (IPv4)
- ~~***RFC 2460 (IPv6)***~~
- RFC 793 (TCP)
- RFC 768 (UDP)

The evaluator shall verify that the TSS describes how conformance with the identified RFCs has been determined by the TOE developer (e.g., third party interoperability testing, protocol compliance testing).

Guidance:

The evaluator shall verify that the operational guidance indicates that the following protocols are supported:

- RFC 791 (IPv4)
- ~~***RFC 2460 (IPv6)***~~
- RFC 793 (TCP)
- RFC 768 (UDP)

The guidance will describe the other protocols contained within the ST (e.g., IPsec, IKE, potentially HTTPS, SSH, and TLS) that are processed by the TOE. The evaluator ensures it is made clear what protocols were not considered as part of the TOE evaluation.

Tests:

The testing associated with this requirement is addressed in the subsequent test assurance activities.

FPF_RUL_EXT.1.3

The TSF shall allow the definition of Packet Filtering rules using the following network protocol fields:

- IPv4
    - Source address
    - Destination Address
    - Protocol
- ~~***IPv6***~~

    - ~~***Source address***~~
    - ~~***Destination Address***~~
    - ~~***Next Header (Protocol)***~~
- TCP
    - Source Port
    - Destination Port
- UDP
    - Source Port
    - Destination Port

and distinct interface.

EP Application Note:

This element identifies the various attributes that are applicable when constructing rules to be enforced by this requirement – the applicable interface is a property of the TOE and the rest of the identified attributes are defined in the associated RFCs. Note that the Protocol is the IPv4 field (in IPv6 this field is called the "next header" that identifies the applicable protocol, such as TCP, UDP, ICMP, etc.. Also, 'Interface' identified above is the external port where the applicable network traffic was received or alternately will be sent.

FPF_RUL_EXT.1.4

The TSF shall allow the following operations to be associated with Packet Traffic Filtering rules: permit, deny, and log.

EP Application Note:

This element defines the operations that can be associated with rules used to match network traffic. Note that the data to be logged is identified in the Security Audit requirements, see Section 6.1.1.

FPF_RUL_EXT.1.5

The TSF shall allow the Packet Traffic Filtering rules to be assigned to each distinct network interface.

EP Application Note:

This element identifies where rules can be assigned. Specifically, a conforming TOE must be able to assign filtering rules specific to each of its available and identifiable distinct network interfaces that handle layer 3 and 4 network traffic. Identifiable means the interface is unique and identifiable within the TOE, and does not necessarily require the interface to be visible from the network perspective (e.g., does not need to have an IP address assigned to it). A distinct network interface is one or more physical connections that share a common logical path into the TOE. For example, the TOE might have a small form-factor pluggable (SFP) port supporting SFP modules that expose a number of physical network ports, but since a common driver is used for all external ports they can be treated as a single distinct network interface.

Note that there could be a separate ruleset for each interface or alternately a shared ruleset that somehow associates rules with specific interfaces.

Assurance Activity:

TSS:

The evaluator shall verify that the TSS describes a Packet Filtering policy and the following attributes are:

- IPv4
    - Source address
    - Destination Address
    - Protocol
- ~~***IPv6***~~
    - ~~***Source address***~~
    - ~~***Destination Address***~~
    - ~~***Next Header (Protocol)***~~
- TCP
    - Source Port
    - Destination Port
- UDP
    - Source Port
    - Destination Port

The evaluator shall verify that each rule can identify the following actions: permit, deny, and log.

The evaluator shall verify that the TSS identifies all interface types subject to the Packet Filtering policy and explains how rules are associated with distinct network interfaces. Where interfaces can be grouped into a common interface type (e.g., where the same internal logical path is used, perhaps where a common device driver is used) they can be treated collectively as a distinct network interface.

Guidance:

The evaluators shall verify that the operational guidance identifies the following attributes as being configurable within Packet filtering rules for the associated protocols:

- IPv4
    - Source address
    - Destination Address
    - Protocol
- ~~***IPv6***~~
    - ~~***Source address***~~
    - ~~***Destination Address***~~
    - ~~***Next Header (Protocol)***~~
- TCP

  - Source Port
  - Destination Port
- UDP
  - Source Port
  - Destination Port

The evaluator shall verify that the operational guidance indicates that each rule can identify the following actions: permit, deny, and log.

The evaluator shall verify that the operational guidance explains how rules are associated with distinct network interfaces.

The evaluator shall verify that the operational guidance explains how to determine the interface type of a distinct network interface (e.g., how to determine the device driver for a distinct network interface).

Tests:

- Test 1: The evaluator shall use the instructions in the operational guidance to test that packet filter rules can be created that permit, deny, and log packets for each of the following attributes:
  - IPv4
    - Source address
    - Destination Address
    - Protocol
  - ~~***IPv6***~~
    - ~~***Source address***~~
    - ~~***Destination Address***~~
    - ~~***Next Header (Protocol)***~~
  - TCP
    - Source Port
    - Destination Port
  - UDP
    - Source Port
    - Destination Port
- Test 2: Repeat the test assurance activity above to ensure that Packet filtering rules can be defined for each distinct network interface type supported by the TOE.

Note that these test activities should be performed in conjunction with those of FPF_RUL_EXT.1.7 where the effectiveness of the rules is tested; here the evaluator is just ensuring the guidance is sufficient and the TOE supports the administrator creating a ruleset based on the above attributes. The test activities for FPF_RUL_EXT.1.7 define the protocol/attribute combinations required to be tested. If those combinations are configured manually, that will fulfill the objective of these test activities, but if those combinations are configured otherwise (e.g., using automation), these test activities may be necessary in order to ensure the guidance is correct and the full range of configurations can be achieved by a TOE administrator.

FPF_RUL_EXT.1.6

The TSF shall process the applicable Packet Filtering rules (as determined in accordance with FPF_RUL_EXT.1.5) in the following order: Administrator-defined.

EP Application Note:

This element requires that an administrator is able to define the order in which configured filtering rules are processed for matches.

Assurance Activity:

TSS:

The evaluator shall verify that the TSS describes the algorithm applied to incoming packets, including the processing of default rules, determination of whether a packet is part of an established session, and application of administrator defined and ordered ruleset.

Guidance:

The evaluator shall verify that the operational guidance describes how the order of Packet filtering rules is determined and provides the necessary instructions so that an administrator can configure the order of rule processing.

Tests:

- Test 1: The evaluator shall devise two equal Packet filtering rules with alternate operations – permit and deny. The rules should then be deployed in two distinct orders and in each case the evaluator shall ensure that the first rule is enforced in both cases by generating applicable packets and using packet capture and logs for confirmation.
- Test 2: The evaluator shall repeat the procedure above, except that the two rules should be devised where one is a subset of the other (e.g., a specific address vs. a network segment). Again, the evaluator should test both orders to ensure that the first is enforced regardless of the specificity of the rule.

FPF_RUL_EXT.1.7

The TSF shall deny packet flow if a matching rule is not identified.

EP Application Note:

This element requires that the behavior is always to deny network traffic when no rules apply.

Assurance Activity:

TSS:

The evaluator shall verify that the TSS describes the process for applying Packet filtering rules and also that the behavior (either by default, or as configured by the administrator) is to deny packets when there is no rule match unless another required conditions allows the network traffic (i.e., FPF_RUL_EXT.1.6 or FPF_RUL_EXT.1.7).

Guidance:

The evaluator shall verify that the operational guidance describes the behavior if no rules or special conditions apply to the network traffic. If the behavior is configurable, the evaluator shall verify that the operational guidance provides the appropriate instructions to configure the behavior to deny packets with no matching rules.

Tests:

- Test 1: The evaluator shall configure the TOE to permit and log each defined IPv4 Transport Layer Protocol (see table 9-1 Defined Protocol-specific Values) in conjunction with a specific source address and specific destination address, specific source address and wildcard destination address, wildcard source address and specific destination address, and wildcard source address and wildcard destination address. The evaluator shall generate packets matching each defined IPv4 Transport Layer Protocol and within the configured source and destination addresses in order to ensure that they are permitted (i.e., by capturing the packets after passing through the TOE) and logged.
- Test 2: The evaluator shall configure the TOE to permit all traffic except to deny and log each defined IPv4 Transport Layer Protocol (see table 9-1 Defined Protocol-specific Values) in conjunction with a specific source address and specific destination address, specific source address and wildcard destination address, wildcard source address and specific destination address, and wildcard source address and wildcard destination address. The evaluator shall generate packets matching each defined IPv4 Transport Layer Protocol and within the configured source and destination addresses in order to ensure that they are denied (i.e., by capturing no applicable packets passing through the TOE) and logged.
- Test 3: The evaluator shall configure the TOE to permit and log each defined IPv4 Transport Layer Protocol (see table 9-1 Defined Protocol-specific Values) in conjunction with a specific source address and specific destination address, specific source address and wildcard destination address, wildcard source address and specific destination address, and wildcard source address and wildcard destination address. Additionally, the evaluator shall configure the TOE to deny and log each defined IPv4 Transport Layer Protocol (see table 9-1 Defined Protocol-specific Values) in conjunction with different (than those permitted above) combinations of a specific source address and specific destination address, specific source address and wildcard destination address, wildcard source address and specific destination address, and wildcard source address and wildcard destination address. The evaluator shall generate packets matching each defined IPv4 Transport Layer Protocol and outside the scope of all source and destination addresses configured above in order to ensure that they are denied (i.e., by capturing no applicable packets passing through the TOE).
- Test 4: The evaluator shall configure the TOE to permit and log each defined IPv6 Transport Layer Protocol (see table 9-1 Defined Protocol-specific Values) in conjunction with a specific source address and specific destination address, specific source address and wildcard destination address, wildcard source address and specific destination address, and wildcard source address and wildcard destination address. The evaluator shall generate packets matching each defined IPv6 Transport Layer Protocol and within the configured source and destination addresses in order to ensure that they are permitted (i.e., by capturing the packets after passing through the TOE) and logged.
- Test 5: The evaluator shall configure the TOE to permit all traffic except to deny and log each defined IPv6 Transport Layer Protocol (see table 9-1 Defined Protocol-specific Values) in conjunction with a specific source address and specific destination address, specific source

address and wildcard destination address, wildcard source address and specific destination address, and wildcard source address and wildcard destination address. The evaluator shall generate packets matching each defined IPv6 Transport Layer Protocol and within the configured source and destination addresses in order to ensure that they are denied (i.e., by capturing no applicable packets passing through the TOE) and logged.

- Test 6: The evaluator shall configure the TOE to permit and log each defined IPv6 Transport Layer Protocol (see table 9-1 Defined Protocol-specific Values) in conjunction with a specific source address and specific destination address, specific source address and wildcard destination address, wildcard source address and specific destination address, and wildcard source address and wildcard destination address. Additionally, the evaluator shall configure the TOE to deny and log each defined IPv6 Transport Layer Protocol (see table 9-1 Defined Protocol-specific Values) in conjunction with different (than those permitted above) combinations of a specific source address and specific destination address, specific source address and wildcard destination address, wildcard source address and specific destination address, and wildcard source address and wildcard destination address. The evaluator shall generate packets matching each defined IPv6 Transport Layer Protocol and outside the scope of all source and destination addresses configured above in order to ensure that they are denied (i.e., by capturing no applicable packets passing through the TOE).
- Test 7: The evaluator shall configure the TOE to permit and log protocol 6 (TCP) using a selected source port, a selected destination port, and a selected source and destination port combination. The evaluator shall generate packets matching the configured source and destination TCP ports in order to ensure that they are permitted (i.e., by capturing the packets after passing through the TOE) and logged.
- Test 8: The evaluator shall configure the TOE to deny and log protocol 6 (TCP) using a selected source port, a selected destination port, and a selected source and destination port combination. The evaluator shall generate packets matching the configured source and destination TCP ports in order to ensure that they are denied (i.e., by capturing no applicable packets passing through the TOE) and logged.
- Test 9: The evaluator shall configure the TOE to permit and log protocol 17 (UDP) using a selected source port, a selected destination port, and a selected source and destination port combination. The evaluator shall generate packets matching the configured source and destination UDP ports in order to ensure that they are permitted (i.e., by capturing the packets after passing through the TOE) and logged. Here the evaluator ensures that the UDP port 500 (IKE) is included in the set of tests.
- Test 10: The evaluator shall configure the TOE to deny and log protocol 17 (UDP) using a selected source port, a selected destination port, and a selected source and destination port combination. The evaluator shall generate packets matching the configured source and destination UDP ports in order to ensure that they are denied (i.e., by capturing no applicable packets passing through the TOE) and logged. Again, the evaluator ensures that UDP port 500 is included in the set of tests.

6.1.7 Protection of the TSF (FPT)

6.1.7.1 FPT_SKP_EXT.1 Protection of TSF Data (for reading of all symmetric keys)

FPT_SKP_EXT.1.1

The TSF shall prevent reading of all pre-shared keys, symmetric keys, and private keys.

PP Application Note:

The intent of the requirement is that an administrator is unable to read or view the identified keys (stored or ephemeral) through "normal" interfaces. While it is understood that the administrator could directly read memory to view these keys, do so is not a trivial task and may require substantial work on the part of an administrator. Since the administrator is considered a trusted agent, it is assumed they would not endeavour in such an activity.

Assurance Activity:

The evaluator shall examine the TSS to determine that it details how any pre-shared keys, symmetric keys, and private keys are stored and that they are unable to be viewed through an interface designed specifically for that purpose, as outlined in the application note. If these values are not stored in plaintext, the TSS shall describe how they are protected/obscured.

6.1.7.2 FPT_APW_EXT.1 Protection of Administrator Passwords

FPT_APW_EXT.1.1

The TSF shall store passwords in non-plaintext form.

FPT_APW_EXT.1.2

The TSF shall prevent the reading of plaintext passwords.

PP Application Note:

The intent of the requirement is that raw password authentication data are not stored in the clear, and that no user or administrator is able to read the plaintext password through "normal" interfaces. An all-powerful administrator of course could directly read memory to capture a password but is trusted not to do so.

In this version of the PP there are no requirements on the method used to store the passwords in non-plaintext form, but cryptographic methods based on the requirements in FCS_COP are preferred. In future versions of the NDPP, FCS_COP-based cryptographic methods that conform to the Level 2 Credential Storage requirements from NIST SP 800-63 will be required.

Assurance Activity:

The evaluator shall examine the TSS to determine that it details all authentication data that are subject to this requirement, and the method used to obscure the plaintext password data when stored. The TSS shall also detail passwords are stored in such a way that they are unable to be viewed through an interface designed specifically for that purpose, as outlined in the application note.

6.1.7.3 FPT_FLS.1 Fail Secure

FPT_FLS.1.1

The TSF shall shutdown when the following types of failures occur: failure of the power-on self-tests, failure of integrity check of the TSF executable image, failure of noise source health tests.

EP Application Note:

The failures relevant to this requirement are the FPT_TST_EXT.1.1 requirement in the NDPP, and the FPT_TST_EXT.1.2 requirement specified in the EP.

Assurance Activity:

TSS:

The evaluator shall ensure the TSS describes how the TOE ensures a shutdown upon a self-test failure, a failed integrity check of the TSF executable image, or a failed health test of the noise source. If there are instances when a shut-down does not occur, e.g., a failure is deemed non-security relevant, those cases are identified and a rationale supporting the classification and justification why the TOE's ability to enforce its security policies is not affected.

6.1.7.4 FPT_STM.1 Reliable Time Stamps

FPT_STM.1.1

The TSF shall be able to provide reliable time stamps for its own use.

Assurance Activity:

The evaluator shall examine the TSS to ensure that it lists each security function that makes use of time. The TSS provides a description of how the time is maintained and considered reliable in the context of each of the time related functions.

The evaluator examines the operational guidance to ensure it instructs the administrator how to set the time. If the TOE supports the use of an NTP server, the operational guidance instructs how a communication path is established between the TOE and the NTP server, and any configuration of the NTP client on the TOE to support this communication.

- Test 1: The evaluator uses the operational guide to set the time. The evaluator shall then use an available interface to observe that the time was set correctly.
- Test2: [conditional] If the TOE supports the use of an NTP server; the evaluator shall use the operational guidance to configure the NTP client on the TOE, and set up a communication path with the NTP server. The evaluator will observe that the NTP server has set the time to what is expected. If the TOE supports multiple protocols for establishing a connection with the NTP server, the evaluator shall perform this test using each supported protocol claimed in the operational guidance.

6.1.7.5 FPT_TUD_EXT.1 Trusted Update

FPT_TUD_EXT.1.1

The TSF shall provide security administrators the ability to query the current version of the TOE firmware/software.

FPT_TUD_EXT.1.2

The TSF shall provide security administrators the ability to initiate updates to TOE firmware/software.

FPT_TUD_EXT.1.3

The TSF shall provide a means to verify firmware/software updates to the TOE using a digital signature mechanism and no other functions prior to installing those updates.

EP Application Note:

The NDPP provides an option of which method of verification the ST Author wishes to specify. For compliance with the EP, a digital signature mechanism (one of those specified in FCS_COP.1(2) must be employed.

PP Application Note:

The digital signature mechanism referenced in the third element is the one specified in FCS_COP.1(2). The published hash referenced is generated by one of the functions specified in FCS_COP.1(3). The ST author should choose the mechanism implemented by the TOE; it is acceptable to implement both mechanisms.

Assurance Activity:

Updates to the TOE either have a hash associated with them, or are signed by an authorized source. If digital signatures are used, the definition of an authorized source is contained in the TSS, along with a description of how the certificates used by the update verification mechanism are contained on the device. The evaluator ensures this information is contained in the TSS. The evaluator also ensures that the TSS (or the operational guidance) describes how the candidate updates are obtained; the processing associated with verifying the digital signature or calculating the hash of the updates; and the actions that take place for successful (hash or signature was verified) and unsuccessful (hash or signature could not be verified) cases. The evaluator shall perform the following tests:

- Test 1: The evaluator performs the version verification activity to determine the current version of the product. The evaluator obtains a legitimate update using procedures described in the operational guidance and verifies that it is successfully installed on the TOE. Then, the evaluator performs a subset of other assurance activity tests to demonstrate that the update functions as expected. After the update, the evaluator performs the version verification activity again to verify the version correctly corresponds to that of the update.
- Test 2: The evaluator performs the version verification activity to determine the current version of the product. The evaluator obtains or produces an illegitimate update, and attempts to install it on the TOE. ~~***The evaluator verifies that the TOE rejects the update.***~~ ***The evaluator verifies that the TOE either rejects the update without intervention or detects that the update is illegitimate and allows the administrator to reject the update (as specified in the operational guidance)***[4]***.***

6.1.7.6 FPT_TST_EXT.1 TSF Testing

FPT_TST_EXT.1.1

The TSF shall run a suite of self tests during initial start-up (on power on) to demonstrate the correct operation of the TSF.

FPT_TST_EXT.1.2

The TSF shall provide the capability to verify the integrity of stored TSF executable code when it is loaded for execution through the use of the TSF-provided cryptographic service specified in FCS_COP.1(2).

EP Application Note:

The NDPP contains one element for this component, which simply requires a suite of self-tests to demonstrate correct operation of the TSF. This element is added to that component to comply with the EP.

Assurance Activity:

[4] Updated according to CCEVS TD0026.

The evaluator shall examine the TSS to ensure that it details the self tests that are run by the TSF on start-up; this description should include an outline of what the tests are actually doing (e.g., rather than saying "memory is tested", a description similar to "memory is tested by writing a value to each memory location and reading it back to ensure it is identical to what was written" shall be used). The evaluator shall ensure that the TSS makes an argument that the tests are sufficient to demonstrate that the TSF is operating correctly.

The evaluator shall also ensure that the operational guidance describes the possible errors that may result from such tests, and actions the administrator should take in response; these possible errors shall correspond to those described in the TSS.

6.1.8 TOE Access (FTA)

6.1.8.1 FTA_SSL_EXT.1 TSF-initiated Session Locking

FTA_SSL_EXT.1.1

The TSF shall, for local interactive sessions,

- <u>terminate the session</u>

after a Security Administrator-specified time period of inactivity.

Assurance Activity:

The evaluator shall perform the following test:

- Test 1: The evaluator follows the operational guidance to configure several different values for the inactivity time period referenced in the component. For each period configured, the evaluator establishes a local interactive session with the TOE. The evaluator then observes that the session is either locked or terminated after the configured time period. If locking was selected from the component, the evaluator then ensures that re-authentication is needed when trying to unlock the session.

6.1.8.2 FTA_SSL.3 TSF-initiated Termination

FTA_SSL.3.1

The TSF shall terminate a remote interactive session after a Security Administrator-configurable time interval of session inactivity.

Assurance Activity:

The evaluator shall perform the following test:

- Test 1: The evaluator follows the operational guidance to configure several different values for the inactivity time period referenced in the component. For each period configured, the evaluator establishes a remote interactive session with the TOE. The evaluator then observes that the session is terminated after the configured time period.

6.1.8.3 FTA_SSL.4 User-initiated Termination

FTA_SSL.4.1

The TSF shall allow Administrator-initiated termination of the Administrator’s own interactive session.

Assurance Activity:

The evaluator shall perform the following test:

- Test 1: The evaluator initiates an interactive local session with the TOE. The evaluator then follows the operational guidance to exit or log off the session and observes that the session has been terminated.
- Test 2: The evaluator initiates an interactive remote session with the TOE. The evaluator then follows the operational guidance to exit or log off the session and observes that the session has been terminated.

6.1.8.4 FTA_TAB.1 Default TOE Access Banners

FTA_TAB.1.1

Before establishing an administrative user session the TSF shall display a Security Administrator-specified advisory notice and consent warning message regarding use of the TOE.

PP Application Note:

This requirement is intended to apply to interactive sessions between a human user and a TOE. IT entities establishing connections or programmatic connections (e.g., remote procedure calls over a network) are not required to be covered by this requirement.

Assurance Activity:

The evaluator shall check the TSS to ensure that it details each method of access (local and remote) available to the administrator (e.g., serial port, SSH, HTTPS). The evaluator shall also perform the following test:

- Test 1: The evaluator follows the operational guidance to configure a notice and consent warning message. The evaluator shall then, for each method of access specified in the TSS, establish a session with the TOE. The evaluator shall verify that the notice and consent warning message is displayed in each instance.

6.1.9 Trusted Path/Channels (FTP)

6.1.9.1 FTP_ITC.1 Inter-TSF-trusted channel

FTP_ITC.1.1[5]

The TSF shall use <u>IPsec</u> to provide a trusted communication channel between itself and authorized IT entities supporting the following capabilities: audit server, **<u>user data protection</u>** that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from disclosure and detection of modification of the channel data.

FTP_ITC.1.2

The TSF shall permit the TSF, or the authorized IT entities to initiate communication via the trusted channel.

FTP_ ITC.1.3

The TSF shall initiate communication via the trusted channel for **audit server, user data protection**.

[5] Taken from NDPP Errata #3 instead of the VPNEP according to CCEVS TD0035.

EP Application Note:

The NDPP allows trusted channels other than IPsec to be available for communication with external IT entities. To be compliant with the EP, the selection is made such that the TOE must provide the IPsec protocol as a configurable option to the administrator.

PP Application Note:

The intent of the above requirement is to use a cryptographic protocol to protect external communications with authorized IT entities that the TOE interacts with to perform its functions. This is not, however, to be used to specify VPN Gateway functionality; a separate VPN Protection Profile should be used in these instances. Protection (by one of the listed protocols) is required at least for communications with the server that collects the audit information. If it communicates with an authentication server (e.g., RADIUS), then the ST author chooses "authentication server" in FTP_ITC.1.1 and this connection must be protected by one of the listed protocols. If other authorized IT entities (e.g., NTP server) are protected, the ST author makes the appropriate assignments (for those entities) and selections (for the protocols that are used to protect those connections). After the ST author has made the selections, they are to select the detailed requirements in Annex C corresponding to their protocol selection to put in the ST. To summarize, the connection to an external audit collection server is required to be protected by one of the listed protocols. If an external authentication server is supported, then it is required to protect that connection with one of the listed protocols. For any other external server, external communications are not required to be protected, but if protection is claimed, then it must be protected with one of the identified protocols.

While there are no requirements on the party initiating the communication, the ST author lists in the assignment for FTP_ITC.1.3 the services for which the TOE can initiate the communication with the authorized IT entity.

The requirement implies that not only are communications protected when they are initially established, but also on resumption after an outage. It may be the case that some part of the TOE setup involves manually setting up tunnels to protect other communication, and if after an outage the TOE attempts to re-establish the communication automatically with (the necessary) manual intervention, there may be a window created where an attacker might be able to gain critical information or compromise a connection.

Assurance Activity:

The evaluator shall examine the TSS to determine that, for all communications with authorized IT entities identified in the requirement, each communications mechanism is identified in terms of the allowed protocols for that IT entity. The evaluator shall also confirm that all protocols listed in the TSS are specified and included in the requirements in the ST. The evaluator shall confirm that the operational guidance contains instructions for establishing the allowed protocols with each authorized IT entity, and that it contains recovery instructions should a connection be unintentionally broken. The evaluator shall also perform the following tests:

- Test 1: The evaluators shall ensure that communications using each protocol with each authorized IT entity is tested during the course of the evaluation, setting up the connections as described in the operational guidance and ensuring that communication is successful.
- Test 2: For each protocol that the TOE can initiate as defined in the requirement, the evaluator shall follow the operational guidance to ensure that in fact the communication channel can be initiated from the TOE.

- Test 3: The evaluator shall ensure, for each communication channel with an authorized IT entity, the channel data is not sent in plaintext.
- Test 4: The evaluators shall, for each protocol associated with each authorized IT entity tested during test 1, the connection is physically interrupted. The evaluator shall ensure that when physical connectivity is restored, communications are appropriately protected.

Further assurance activities are associated with the specific protocols.

6.1.9.2 FTP_TRP.1 Trusted Path

FTP_TRP.1.1

The TSF shall use IPsec, TLS/HTTPS provide a trusted communication path between itself and remote administrators that is logically distinct from other communication paths and provides assured identification of its end points and protection of the communicated data from disclosure and detection of modification of the communicated data.

FTP_TRP.1.2

The TSF shall permit remote administrators to initiate communication via the trusted path.

FTP_TRP.1.3

The TSF shall require the use of the trusted path for initial administrator authentication and all remote administration actions.

PP Application Note:

This requirement ensures that authorized remote administrators initiate all communication with the TOE via a trusted path, and that all communications with the TOE by remote administrators is performed over this path. The data passed in this trusted communication channel are encrypted as defined the protocol chosen in the first selection. The ST author chooses the mechanism or mechanisms supported by the TOE, and then ensures the detailed requirements in Annex C corresponding to their selection are copied to the ST if not already present.

Assurance Activity:

The evaluator shall examine the TSS to determine that the methods of remote TOE administration are indicated, along with how those communications are protected. The evaluator shall also confirm that all protocols listed in the TSS in support of TOE administration are consistent with those specified in the requirement, and are included in the requirements in the ST. The evaluator shall confirm that the operational guidance contains instructions for establishing the remote administrative sessions for each supported method. The evaluator shall also perform the following tests:

- Test 1: The evaluators shall ensure that communications using each specified (in the operational guidance) remote administration method is tested during the course of the evaluation, setting up the connections as described in the operational guidance and ensuring that communication is successful.
- Test 2: For each method of remote administration supported, the evaluator shall follow the operational guidance to ensure that there is no available interface that can be used by a remote user to establish a remote administrative sessions without invoking the trusted path.
- Test 3: The evaluator shall ensure, for each method of remote administration, the channel data are not sent in plaintext.

Further assurance activities are associated with the specific protocols.

6.2 Security Assurance Requirements

This Security Target is conformant with the assurance requirements specified in the NDPP. The CC Part 3 conformant security assurance requirements are listed in Table 8. The CC Part 3 extended assurance requirements are listed in Section 6.1 as "Assurance Activity" and Section 6.2.1.

Table 8: Assurance Requirements

Assurance Class	Assurance Component	Assurance Components Description
Development	ADV_FSP.1	Basic Functional Specification
Guidance Documents	AGD_OPE.1	Operational user guidance
	AGD_PRE.1	Preparative User guidance
Life-cycle Support	ALC_CMC.1	Labeling of the TOE
	ALC_CMS.1	TOE CM coverage
Tests	ATE_IND.1	Independent testing - conformance
Vulnerability Assessment	AVA_VAN.1	Vulnerability analysis

6.2.1 Extended Security Assurance Requirements

These requirements are taken directly from the NDPP and augment or modify the existing SARs taken from CC Part 3.

6.2.1.1 ADV_FSP.1 Basic Functional Specification

There are no specific assurance activities associated with these SARs. The functional specification documentation is provided to support the evaluation activities described in Section 6.1, and other activities described for AGD, ATE, and AVA SARs. The requirements on the content of the functional specification information is implicitly assessed by virtue of the other assurance activities being performed; if the evaluator is unable to perform an activity because the there is insufficient interface information, then an adequate functional specification has not been provided.

6.2.1.2 AGD_OPE.1 Operational User Guidance

Some of the contents of the operational guidance will be verified by the assurance activities in Section 6.1 and evaluation of the TOE according to the CEM. The following additional information is also required.

The operational guidance shall at a minimum list the processes running (or that could run) on the TOE in its evaluated configuration during its operation that are capable of processing data received on the network interfaces (there are likely more than one of these, and this is not limited to the process that "listens" on the network interface). It is acceptable to list all processes running (or that could run) on the TOE in its evaluated configuration instead of attempting to determine just those that process the network data. For each process listed, the administrative guidance will contain a short (e.g., one- or two-line) description of the process' function, and the privilege with which the service runs. "Privilege" includes the hardware privilege level (e.g., ring 0, ring 1), any software privileges specifically associated with the process, and the privileges associated with the user role the process runs as or under.

The operational guidance shall contain instructions for configuring the cryptographic engine associated with the evaluated configuration of the TOE. It shall provide a warning to the administrator that use of other cryptographic engines was not evaluated nor tested during the CC evaluation of the TOE.

The documentation must describe the process for verifying updates to the TOE, either by checking the hash or by verifying a digital signature. The evaluator shall verify that this process includes the following steps:

1. For hashes, a description of where the hash for a given update can be obtained. For digital signatures, instructions for obtaining the certificate that will be used by the FCS_COP.1(2) mechanism to ensure that a signed update has been received from the certificate owner. This may be supplied with the product initially, or may be obtained by some other means.
2. Instructions for obtaining the update itself. This should include instructions for making the update accessible to the TOE (e.g., placement in a specific directory).
3. Instructions for initiating the update process, as well as discerning whether the process was successful or unsuccessful. This includes generation of the hash/digital signature.

The TOE will likely contain security functionality that does not fall in the scope of evaluation under the NDPP. The operational guidance shall make it clear to an administrator which security functionality is covered by the evaluation activities.

6.2.1.3 AGD_PRE.1 Preparative Procedures

As indicated in the introduction above, there are significant expectations with respect to the documentation-especially when configuring the operational environment to support TOE functional requirements. The evaluator shall check to ensure that the guidance provided for the TOE adequately addresses all platforms claimed for the TOE in the ST.

6.2.1.4 ALC_CMC.1 Labeling of the TOE

The evaluator shall check the ST to ensure that it contains an identifier (such as a product name/version number) that specifically identifies the version that meets the requirements of the ST. The evaluator shall ensure that this identifier is sufficient for an acquisition entity to use in procuring the TOE (including the appropriate administrative guidance) as specified in the ST. Further, the evaluator shall check the AGD guidance and TOE samples received for testing to ensure that the version number is consistent with that in the ST. If the vendor maintains a web site advertising the TOE, the evaluator shall examine the information on the web site to ensure that the information in the ST is sufficient to distinguish the product.

6.2.1.5 ATE_IND.1 Independent Testing - Conformance

The evaluator shall prepare a test plan and report documenting the testing aspects of the system. The test plan covers all of the testing actions contained in the CEM and the body of the NDPP's Assurance Activities. While it is not necessary to have one test case per test listed in an Assurance Activity, the evaluator must document in the test plan that each applicable testing requirement in the ST is covered.

The test plan identifies the platforms to be tested, and for those platforms not included in the test plan but included in the ST, the test plan provides a justification for not testing the platforms. This justification must address the differences between the tested platforms and the untested platforms, and make an argument that the differences do not affect the testing to be performed. It is not sufficient to merely assert that the differences have no affect; rationale must be provided. If all platforms claimed in the ST are tested, then no rationale is necessary.

The test plan describes the composition of each platform to be tested, and any setup that is necessary beyond what is contained in the AGD documentation. It should be noted that the evaluator is expected to follow the AGD documentation for installation and setup of each platform either as part of a test or as a standard pre-test condition. This may include special test drivers or tools. For each driver or tool, an argument (not just an assertion) should be provided that the driver or tool will not adversely affect the performance of the functionality by the TOE and its platform. This also includes the configuration of the cryptographic engine to be used. The cryptographic algorithms implemented by this engine are those specified by the NDPP and used by the cryptographic protocols being evaluated (IPsec, TLS/HTTPS, SSH).

The test plan identifies high-level test objectives as well as the test procedures to be followed to achieve those objectives. These procedures include expected results. The test report (which could just be an annotated version of the test plan) details the activities that took place when the test procedures were executed, and includes the actual results of the tests. This shall be a cumulative account, so if there was a test run that resulted in a failure; a fix installed; and then a successful re-run of the tests, the report would show a “fail” and “pass” result (and the supporting details), and not just the “pass” result.

6.2.1.6 AVA_VAN.1 Vulnerability Assessment

As with ATE_IND, the evaluator shall generate a report to document their findings with respect to this requirement. This report could physically be part of the overall test report mentioned in ATE_IND, or a separate document. The evaluator performs a search of public information to determine the vulnerabilities that have been found in network infrastructure devices and the implemented communication protocols in general, as well as those that pertain to the particular TOE. The evaluator documents the sources consulted and the vulnerabilities found in the report. For each vulnerability found, the evaluator either provides a rationale with respect to its non-applicability, or the evaluator formulates a test (using the guidelines provided in ATE_IND) to confirm the vulnerability, if suitable. Suitability is determined by assessing the attack vector needed to take advantage of the vulnerability. For example, if the vulnerability can be detected by pressing a key combination on boot-up, a test would be suitable at the assurance level of the NDPP. If exploiting the vulnerability requires expert skills and an electron microscope, for instance, then a test would not be suitable and an appropriate justification would be formulated.

~~The evaluator shall generate network packets that cycle through all of the values for attributes, Type, Code, and Transport Layer Protocol, that are undefined by the RFC for each of the protocols, ICMPv4, ICMPv6, IPv4, and IPv6. For example, ICMPv4 has an eight-byte field for Type and an eight-byte field for the Code. Only 21 Types are defined in the RFC (see table 4-2), but there are 256 possible value. Each Type has a Code associated with it, the number of RFC defined Codes varies based on the Type. The evaluator is required to construct packets that exercise each possible value not defined in the RFC (the defined values are already tested in FPF_RUL_EXT.1.10) of Type and Code (including all possible combinations) and target each distinct interface type to determine that the TOE handles these packets appropriately. Since none of these packets will match a rule, or belong to an allowed session the packets should be dropped. Since there are no requirements that the firewall audit a packet being dropped under these circumstances, the evaluator shall ensure the firewall does not allow these packets to flow through the TOE.~~

The evaluator shall generate network packets that cycle through all of the values for the Transport Layer Protocol attribute that are undefined by the RFCs for IPv4 and IPv6. For example, IPv4 has an eight-bit field for Transport Layer Protocol. Only 100 Transport Layer Protocol values are defined in the RFC for IPv4 (see Table 9-1 in Appendix E), but there are 256 possible values. The evaluator is required to construct packets that exercise each possible value not defined in the RFC (the defined values are already tested in FPF_RUL_EXT.1.7) of Transport Layer Protocol (including all possible combinations) and target each distinct interface type to determine that the TOE handles these packets appropriately. Since none of these packets will match a rule, or belong to an allowed session the packets should be dropped.

Since there are no requirements that the VPN Gateway audit a packet being dropped under these circumstances, the evaluator shall ensure the VPN Gateway does not allow these packets to flow through the TOE. Note that for IPv6, protocol numbers 0 (Hop-by-Hop options), 60 (Destination options), 44 (Fragment), 51 (AH), and 50 (ESP) are extension header numbers rather than transport layer protocol numbers and should be excluded from testing.[6]

In addition to the undefined attribute testing required above, the evaluator shall perform intelligent fuzz testing of the remaining fields in the required protocol headers (excluding FTP). The intent of intelligent fuzzing is that a packet that is otherwise correctly constructed, such that it will be denied when the ruleset is applied, has random values inserted into each of the protocol header fields. The evaluator ensures a statistically significant sample size, which will vary depending on the protocol field length, is used and is justified in their report.

The evaluator should consult whatever diagnostics (e.g., logging, process status, interface errors) the TOE offers to determine if the TOE was adversely impacted by the processing of such packets.

6.3 Security Requirements Rationale

6.3.1 Security Function Requirement to Security Objective Rationale

The following sections present the rationale that demonstrate that the SFRs meet all security objectives for the TOE.

6.3.1.1 Protected Communications

O.PROTECTED_COMMUNICATIONS

To address the issues concerning transmitting sensitive data to and from the TOE described in Section 3.1, Table 1, row “T.UNAUTHORIZED_ACCESS”, compliant TOEs will provide encryption for these communication paths between themselves and the endpoint. These channels are implemented using one (or more) of three standard protocols: IPsec, TLS/HTTPS, and SSH. These protocols are specified by RFCs that offer a variety of implementation choices. Requirements have been imposed on some of these choices (particularly those for cryptographic primitives) to provide interoperability and resistance to cryptographic attack. While compliant TOEs must support all of the choices specified in the ST, they may support additional algorithms and protocols. If such additional mechanisms are not evaluated, guidance must be given to the administrator to make clear the fact that they are not evaluated.

In addition to providing protection from disclosure (and detection of modification) for the communications, each of the protocols described in this document (IPsec, SSH, and TLS/HTTPS) offer two-way authentication of each endpoint in a cryptographically secure manner, meaning that even if there was a malicious attacker between the two endpoints, any attempt to represent themselves to either endpoint of the communications path as the other communicating party would be detected. The requirements on each protocol, in addition to the structure of the protocols themselves, provide protection against replay attacks such as those described in Section 3.1, Table 1, row “T.UNAUTHORIZED_ACCESS”, usually by including a unique value in each communication so that replay of that communication can be detected.

[6] Updated according to CCEVS TD0013

(FCS_CKM.1, FCS_CKM_EXT.4, FCS_COP.1(1), FCS_COP.1(2), FCS_COP.1(3), FCS_COP.1(4), FCS_IPSEC_EXT.1, FCS_TLS_EXT.1, FCS_HTTPS_EXT.1 , FCS_RBG_EXT.1, FPT_SKP_EXT.1, FTP_ITC.1, FTP_TRP.1)

6.3.1.2 Verifiable Updates

O.VERIFIABLE_UPDATES

As outlined in Section 3.1, Table 1, row "T.UNAUTHORIZED_UPDATE", failure by the Security Administrator to verify that updates to the system can be trusted may lead to compromise of the entire system. A first step in establishing trust in the update is to publish a hash of the update that can be verified by the System Administrator prior to installing the update. In this way, the Security Administrator can download the update, compute the hash, and compare it to the published hash. While this establishes that the update downloaded is the one associated with the published hash, it does not indicate if the source of the update/hash combination has been compromised or can't be trusted. So, there remains a threat to the system. To establish trust in the source of the updates, the system can provide cryptographic mechanisms and procedures to procure the update, check the update cryptographically through the TOE-provided digital signature mechanism, and install the update on the system. While there is no requirement that this process be completely automated, administrative guidance documentation will detail any procedures that must be performed manually, as well as the manner in which the administrator ensures that the signature on the update is valid.

(FPT_TUD_EXT.1, FCS_COP.1(2), FCS_COP.1(3))

6.3.1.3 System Monitoring

O.SYSTEM_MONITORING

In order to assure that information exists that allows Security Administrators to discover intentional and unintentional issues with the configuration and/or operation of the system as discussed in Section 3.1; Table 1; rows "T.ADMIN_ERROR", "T_UNDETECTED_ACTIONS", and "T.UNAUTHROIZED_ACCESS"; compliant TOEs have the capability of generating audit data targeted at detecting such activity. Auditing of administrative activities provides information that may hasten corrective action should the system be configured incorrectly. Audit of select system events can provide an indication of failure of critical portions of the TOE (e.g., a cryptographic provider process not running) or anomalous activity (e.g., establishment of an administrative session at a suspicious time, repeated failures to establish sessions or authenticate to the system) of a suspicious nature.

In some instances there may be a large amount of audit information produced that could overwhelm the TOE or administrators in charge of reviewing the audit information. The TOE must be capable of sending audit information to an external trusted entity, which mitigates the possibility that the generated audit data will cause some kind of denial of service situation on the TOE. This information must carry reliable timestamps, which will help order the information when sent to the external device.

Loss of communication with the audit server is problematic. While there are several potential mitigations to this threat, the NDPP does not mandate that a specific action takes place; the degree to which this action preserves the audit information and still allows the TOE to meet its functionality responsibilities should drive decisions on the suitability of the TOE in a particular environment.

(FAU_GEN.1, FAU_GEN.2, FAU_STG_EXT.1, FPT_STM.1)

O.SYSTEM_MONITORING

EP Application Note: To address the issues of administrators being able to monitor the operations of the VPN gateway, this security objective, which originated in the NDPP, is extended as follows.

Compliant TOEs will implement the ability to log the flow of network traffic. Specifically, the TOE will provide the means for administrators to configure packet filtering rules to 'log' when network traffic is found to match the configured rule. As a result, matching a rule configured to 'log' will result in informative event logs whenever a match occurs. In addition, the establishment of security associations (SAs) is auditable, not only between peer VPN gateways, but also with certification authorities (CAs).

(FAU_GEN.1, FPF_RUL_EXT.1)

6.3.1.4 TOE Administration

O.TOE_ADMINISTRATION, O.SESSION_LOCK

In order to provide a trusted means for administrators to interact with the TOE, the TOE provides a password-based logon mechanism. The administrator must have the capability to compose a strong password, and have mechanisms in place so that the password must be changed regularly. To avoid attacks where an attacker might observe a password being typed by an administrator, passwords must be obscured during logon. Session locking or termination must also be implemented to mitigate the risk of an account being used illegitimately. Passwords must be stored in an obscured form, and there must be no interface provided for specifically reading the password or password file such that the passwords are displayed in plain text.

(FIA_UIA_EXT.1, FIA_PMG_EXT.1, FIA_UAU.7, FMT_MTD.1, FMT_SMF.1, FMT_SMR.2, FPT_APW_EXT.1, FTA_SSL_EXT.1, FTA_SSL.3)

O.TOE_ADMINISTRATION

EP Application Note: To address the issues involved with a trusted means of administration of the VPN gateway, this security objective, which originated in the NDPP, is extended as follows. Note that it is assumed that use of the functions indicated below is protected in accordance with the requirements in the NDPP.

Compliant TOEs will provide the functions necessary for an administrator to configure the packet filtering rules, as well as the cryptographic aspects of the IPsec protocol that are enforced by the TOE.

(FMT_SMF.1, FIA_AFL.1)

O.DISPLAY_BANNER

In order to satisfy the policy requiring users to view and consent to an initial access banner prior to accessing the TOE, the TSF displays an Administrator specified advisory notice and consent warning message prior to the establishment of an administrative user session.

FTA_TAB.1

6.3.1.5 Residual Information Clearing

O.RESIDUAL_INFORMATION_CLEARING

In order to counter the threat that user data is inadvertently included in network traffic not intended by the original sender, the TSF ensures that network packets sent from the TOE do not include data "left over" from the processing of previous network information.

(FDP_RIP.2)

6.3.1.6 TSF Self Test

O.TSF_SELF_TEST

In order to detect some number of failures of underlying security mechanisms used by the TSF, the TSF will perform self-tests. The extent of this self testing is left to the product developer, but a more comprehensive set of self tests should result in a more trustworthy platform on which to develop enterprise architecture.

(FPT_TST_EXT.1)

6.3.1.7 Data Encryption and Decryption

O.CRYPTOGRAPHIC_FUNCTIONS

To address the issues associated with unauthorized disclosure of information, inappropriate access to services, misuse of services, disruption of services, and network-based reconnaissance, compliant TOE's will implement a cryptographic capabilities. These capabilities are intended to maintain confidentiality and allow for detection and modification of data that is transmitted outside of the TOE.

(FCS_COP.1(1), FCS_COP.1(2), FCS_COP.1(3), FCS_COP.1(4), FCS_RBG_EXT.1, FCS_IPSEC_EXT.1)

6.3.1.8 Authentication

O. AUTHENTICATION

To further address the issues associated with unauthorized disclosure of information, a compliant TOE's authentication ability (IPSec) will allow a VPN peer to establish VPN connectivity with another VPN peer. VPN endpoints authenticate each other to ensure they are communicating with an authorized external IT entity.

(FTP_ITC.1, FCS_IPSEC_EXT.1)

6.3.1.9 Address-Based Filtering

O.ADDRESS_FILTERING

To address the issues associated with unauthorized disclosure of information, inappropriate access to services, misuse of services, disruption or denial of services, and network-based reconnaissance, compliant TOE's will implement Packet Filtering capability. That capability will restrict the flow of network traffic between protected networks and other attached networks based on network addresses of the network nodes originating (source) and/or receiving (destination) applicable network traffic as well as on established connection information.

(FPF_RUL_EXT.1)

6.3.1.10 Insecure Operations

O. FAIL_SECURE

There may be instances where the TOE's hardware malfunctions or the integrity of the TOE's software is compromised, the latter being due to malicious or non-malicious intent. To address the concern of the TOE operating outside of its hardware or software specification, the TOE will shut down upon discovery of a problem reported via the self-test mechanism.

(FPT_FLS.1)

6.3.1.11 Port Based Filtering

O. PORT_FILTERING

To further address the issues associated with unauthorized disclosure of information, etc., a compliant TOE's port filtering capability will restrict the flow of network traffic between protected networks and other attached networks based on the originating (source) and/or receiving (destination) port (or service) identified in the network traffic as well as on established connection information.

(FPF_RUL_EXT.1)

6.3.2 Security Functional Requirement Dependency Rationale

Table 6: Security Functional Requirements maps the dependencies that exist for each SFR. If the column labeled "Dependency Satisfied" shows a dependency that has not been resolved, the rationale is provided in the following section, why this dependency does not apply for the TOE.

6.3.2.1 Rationale for Unsatisfied Dependencies

The FCS_COP.1(1) dependency on FDP_ITC.1, FDP_ITC.2, or FCS_CKM.1; because the NDPP does not specify an SFR to satisfy this dependency. FCS_RBG_EXT.1 provides the TOE with a method of generating symmetric cryptographic keys for FCS_COP.1(1).

The FCS_COP.1(3) dependency on FDP_ITC.1, FDP_ITC.2, or FCS_CKM.1; because cryptographic hash algorithms do not need cryptographic keys to operate.

The FCS_COP.1(4) dependency on FDP_ITC.1, FDP_ITC.2, or FCS_CKM.1; because the NDPP does not specify an SFR to satisfy this dependency.

6.3.3 Security Assurance Requirements Rationale

This ST contains the assurance requirements from the NDPP. The assurance requirements are listed in the "Component" column of Table 9: SAR Component Dependency Mapping. These assurance requirements are specified in CC Part 3.

6.3.3.1.1 Security requirement dependency analysis

Table 9: SAR Component Dependency Mapping, maps the dependencies that exist for each SAR to demonstrate all SAR dependencies are satisfied.

Table 9: SAR Component Dependency Mapping

Component	Dependencies	Satisfied
ADV_FSP.1	None	
AGD_OPE.1	ADV_FSP.1	Yes - ADV_FSP.1
AGD_PRE.1	None	
ASE_CCL.1	ASE_INT.1 ASE_ECD.1 ASE_REQ.1	Yes - ASE_INT.1 Yes - ASE_ECD.1 Yes - ASE_REQ.1
ASE_ECD.1	None	
ASE_INT.1	None	
ASE_OBJ.1	None	
ASE_REQ.1	ASE_ECD.1	Yes - ASE_ECD.1
ASE_TSS.1	ASE_INT.1 ASE_REQ.1 ADV_FSP.1	Yes - ASE_INT.1 Yes - ASE_REQ.1 Yes - ADV_FSP.1

Table 9: SAR Component Dependency Mapping		
ALC_CMC.1	ALC_CMS.1	Yes – ALC_CMS.1
ALC_CMS.1	None	
ATE_IND.1	ADV_FSP.1 AGD_OPE.1 AGD_PRE.1	Yes – ADV_FSP.1 Yes – AGD_OPE.1 Yes – AGD_PRE.1
AVA_VAN.2	ADV_FSP.1 AGD_OPE.1 AGD_PRE.1	Yes - ADV_FSP.1 Yes – AGD_OPE.1 Yes - AGD_PRE.1

7 TOE Summary Specification

This section provides evaluators and potential consumers of the TOE with a high-level description of each SFR, thereby enabling them to gain a general understanding of how the TOE is implemented. These descriptions are intentionally not overly detailed, thereby disclosing no proprietary information. These sections refer to SFRs defined in Section 6, Security Requirements.

The TOE consists of the following Security Functions:

- Security Audit
- Cryptographic Operations
- User Data Protection
- Security Management
- Protection of the TSF
- Packet Filtering
- TOE Access
- Trusted Path/Channels

7.1 Security Audit

7.1.1 Audit Generation

The TSF generates and formats audit records according to the Syslog Protocol (RFC 5424). These records include time stamp, hostname or IP address, process name, user identifier, action, and target. The timestamp field has the granularity of one second and specifies the date/time that the audit log was generated. For administrative actions, the TSF logs the administrator's username as the user identifier. For network actions, the user identifier is the IP address or interface that triggered the event. The action and target fields specify the event details and outcome.

The TSF audit process automatically generates an audit record when it starts. The audit process also generates an audit record when it receives a signal to shutdown; however, the audit logs are not expected to contain shutdown audit records, because the TSF is expected to be shutdown by removing power. The TSF also generates audit records for the administrative actions described in Section 7.5, and the events listed in Table 7.

The TSF generates audit records for the following cryptographic protocol failures:

- IPsec
  - Failure to negotiate algorithms during the handshake
  - Session timeout
  - Session dropped (remote client stops responding)
  - Invalid HMAC or GCM tag received
- TLS/HTTPS
  - Failure to negotiate a ciphersuite during the handshake
  - Session timeout
  - Session dropped (remote client stops responding)
  - Invalid HMAC or GCM tag received

The TSF generates the audit records for each packet filter firewall LOG rule that is configured. These audit records include the network interface, source IP address, destination IP address, transport layer protocol, source port, destination port, and the action taken (if ACCEPT or DROP was performed in the same rule). If a network interface of the TSF receives network traffic faster than it can process it, it drops traffic packets and maintains a counter of dropped packets. The TSF logs the number of dropped packets on an interface every 60 seconds if the count has changed since the last check.

FAU_GEN.1

7.1.2 Audit Storage

The TSF functions as an Originator and transmits audit logs to a Collector (syslog server) using the Syslog protocol as specified in RFC 5424. The TSF encapsulates all Syslog traffic using IPsec as specified in Section 7.2.4. If the IPsec tunnel has not been established, the TSF does not transmit audit logs. The TSF maintains 1 GB of local audit log files in a RAM disk, so all local audit logs are lost if power is lost. The TSF checks the size of the active log file once per hour. The TSF performs log rotation if the current log file is greater than 1 MB. Log rotation involves compressing the current log file and archiving it. The TSF then adds all future audit events to a new log file. The TSF deletes the oldest log archive when there are more than four archives or if local storage is exhausted.

The TSF management interface, described in Section 7.5, does not provide the administrative user a method to delete or modify audit logs. This interface requires all users to be authenticated prior to viewing any locally stored logs.

FAU_STG_EXT.1

7.2 Cryptographic Operations

The TSF implements the following CAVP validated algorithms:

- AES (Cert #3430)
- RSA (Cert #1756)
- DSA (Cert #948)
- ECDSA (Cert #663)
- SHA (Cert #2830)
- HMAC (Cert #2182)
- DRBG (Cert #782)

These algorithms are implemented in the IAS-Router-FIPS crypto library version 7a55571 – 2015-05-07. This library is part of IASRouter-2015-11-24_50e8756_Release-x86-fips_cc.firmware.

FCS_CKM.1(1), FCS_CKM.1(2), FCS_COP.1(1), FCS_COP.1(2), FCS_COP.1(3), FCS_COP.1(4)

7.2.1 Cryptographic Key Generation

The TSF generates ephemeral Diffie-Hellman (FFC) keys for TLS and IKE key exchange according to the following sections of NIST SP 800-56A:

- 5.5.3: Domain Parameter Management
- 5.6.1.1: FFC Key Pair Generation
- 5.6.2.1: Owner Assurances of Static Public Key Validity
- 6.1.2.1: dhEphem, C(2, 0, FFC DH)

The TSF generates Elliptic Curve Diffie-Hellman (ECDH) keys for TLS and IKE key exchange according to the following sections of NIST SP 800-56A:

- 5.5.2: Assurances of Domain Parameter Validity
    - Domain parameters are validated according to option 3
- 5.5.3: Domain Parameter Management
- 5.6.1.2: ECC Key Pair Generation
- 6.1.2.2: Ephemeral Unified Model, C(2, 0, ECC CDH)

The TSF generates RSA keys for TLS key establishment in according to the following sections of NIST SP 800-56B:

- 6.3.1: RSAKPG1 Family: RSA Key Pair Generation with a Fixed Public Exponent
    - This section has been modified to support a security strength of 128 bits and RSA keys greater than or equal to 3072-bits

The TSF implements all "shall" and "should" statements in the referenced sections and does not implement any "shall not" or "should not" in the referenced sections. With the exception of the security strength/RSA key length modifications, the TSF does not implement any additional or different functionality.

FCS_CKM.1(1)

The TSF generates ECDSA keys used for IKE peer authentication according to FIPS 186-4 Appendix B.4.3.

The TSF implements all "shall" and "should" statements in the referenced sections and does not implement any "shall not" or "should not" in the referenced sections. The TSF does not implement any TOE specific extensions.

FCS_CKM.1(2)

7.2.2 Zeroization

The TSF maintains the following persistent secret and private keys in the file system (Flash/SSD):

- IPsec ECDSA and/or RSA private key
- IPsec pre-shared key
- TLS ECDSA and/or RSA private key

The TSF zeroizes persistent CSPs whenever a file containing CSPs is modified or deleted by overwriting the specified file three times with a pseudo random pattern.

The TSF maintains the following secret and private keys in volatile memory (RAM):

- IKE DH or ECDH Private Key
- IKE Session Keys
- ESP Session Keys
- TLS DH or ECDH Private Key
- TLS pre-master secret & TLS master secret
- TLS Session Keys

The TSF zeroizes volatile secret and private keys when power is removed[7].

[7] This method of zeroization meets the NSA CSS Storage Device Declassification Manual for the zeroization of DRAM and SRAM.

When the user invokes a "Reset to factory defaults," the TSF performs a zeroization of all persistent CSPs, followed by a system reboot to zeroize all volatile CSPs.

FCS_CKM_EXT.4

7.2.3 Random Bit Generation

The TSF implements an SP 800-90A CTR_DRBG (AES 256) for generating random bits. The correct operation of the DRBG has been validated by the Cryptographic Algorithm Validation Program (DRBG Cert #782). The TSF seeds the DRBG with 32768bytes of seed data from the RDRAND instruction to ensure that the DRBG is seeded with at least 256-bits of entropy. The Intel Bay Trail processor, a third party entropy source, provides the RDRAND instruction.

FCS_RBG_EXT.1

7.2.4 IPsec

The TSF implements IPsec as specified in RFCs 4301, 4303, 4106, and 3602. The TSF supports IPsec connections operating in tunnel mode.

The TSF uses SPD policies to specify which packets should be forwarded, dropped, or encrypted. Packets not processed by any policy are dropped by a final policy.

The TSF can be configured to use the AES-GCM-128, AES-GCM-256, AES-CBC-128 with an HMAC, and/or AES-CBC-256 with an HMAC as the encryption and message authentication algorithms for IPsec ESP. When AES-CBC is negotiated as the symmetric cipher, the TOE supports HMAC-SHA-256, HMAC-SHA-384, and HMAC-SHA-512.

The TSF implements IKEv1 as specified in RFCs 2407, 2408, 2409, and 4109 and IKEv2 as specified in RFC 6379. The TSF uses AES-CBC-128 or AES-CBC-256 to encrypt the IKE payloads. The TSF disables Aggressive Mode in IKEv1.

The TSF can be configured to use the following SHA-based HMAC algorithms in IKEv1 or IKEv2:

- SHA-256
- SHA-384
- SHA-512

The TSF supports IKEv2 IKE_SA and IKEv1 Phase 1 SA lifetime configuration based on a number of packets or a length of time (default of 24 hours). By default, if no packets are processed (excluding SA) by the SA within the configured SA lifetime, the SA is closed. In this mode, the IKE SA lifetime acts as an idle timeout value. If any packets were processed through the SA, the tunnel is re-keyed instead. The administrator can also configure the SA to always rekey rather than drop the tunnel when no packets are processed. The TSF also supports IKEv2 CHILD_SA and IKEv1 Phase 2 SA lifetime configuration based on number of packets or length of time (default of 8 hours).

The TSF supports DH groups 14, 19, 20 and 21 for use in IKE. One or more of these groups may be selected. The TSF administrator can configure the preferred order of the DH groups when multiple groups are enabled. The TSF uses the CTR_DRBG to generate a 521, 384, 256, or 2047-bit ephemeral private key used in Diffie-Hellman.

The TSF generates nonces with the CTR_DRBG that are 256 bits long. The nonces are used in the IKE key exchange for all cipher suites.

The TSF supports ECDSA x.509 certificates and Pre-Shared Keys to perform IKE peer authentication as described in Section 7.4. The ECDSA certificates must use “NIST curves” P-256 or P-384.

The TSF negotiates the allowed groups with the client in the IKEv2 exchange. The TSF will not allow the client to use any group not selected in the configuration. For example, if the client has selected group 5, the TSF will refuse to connect because the symmetric strength would be less than 112 bits.

The security management interface, described in Section 7.5, ensures that the symmetric cipher key size(s) configurable for a Phase 2/CHILD_SA are less than or equal to the symmetric cipher key size(s) configured for the Phase 1/IKEv2 SA. If a client attempts to negotiate a Phase 2/CHILD_SA with a key size that has not been configured on the TSF, the connection will fail with a cipher-suite mismatch.

When authenticating VPN users, the TSF can be configured to prevent access based on remote IP address, time of day, and/or day of week.

FCS_IPSEC_EXT.1

7.2.5 TLS

The TSF implements the server side of TLSv1.0, TLSv1.1, and TLSv1.2 according to RFCs 2246, 4346, and 5246 respectively. The TSF also implements the extension specified in RFCs 3286, 4301, and 5289.

The TSF supports the following TLS cipher suites:

- TLS_RSA_WITH_AES_128_CBC_SHA
- TLS_RSA_WITH_AES_256_CBC_SHA
- TLS_DHE_RSA_WITH_AES_128_CBC_SHA
- TLS_DHE_RSA_WITH_AES_256_CBC_SHA
- TLS_RSA_WITH_AES_128_CBC_SHA256
- TLS_RSA_WITH_AES_256_CBC_ SHA256
- TLS_DHE_RSA_WITH_AES_128_CBC_ SHA256
- TLS_DHE_RSA_WITH_AES_256_CBC_ SHA256
- TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256
- TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384
- TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384

The TSF only supports the AES GCM cipher suites when TLSv1.2 is negotiated.

FCS_TLS_EXT.1

7.2.6 HTTPs

The TSF implements the server side of the HTTPs protocol according to RFC 2818 by using a TLS connection in place of a TCP connection. The TSF listens on port 443 for HTTPs connections. The TSF uses HTML over HTTPs to present the administrative users with a secure management interface described in Section 7.5. The TSF uses TLS to provide a secure connection between the TSF and the administrator; however, HTTP is used to maintain the administrator’s session. The management interface performs administrator authentication.

FCS_HTTPS_EXT.1

7.3 User Data Protection

The TSF ensures that data will not be reused when processing network packets by overwriting previous buffer contents upon allocation of a new buffer. The TSF accomplishes this by allocating the exact buffer size for each write/addition to each buffer. This ensures that the previous contents are immediately overwritten. The TSF continues to enlarge the buffer by the exact size of each additional write to progressively "grows" the buffer as necessary.

FDP_RIP.2

7.4 Identification and Authentication

The TSF provides local console and the HTTPs web GUI to administer the TSF.

When a user connects to the console interface, the TSF prompts the user for a username and password. The TSF does not echo any characters back to the local console while the user is entering their password. If the username/password match an authorized administrator's credentials, the user is granted access to the command line interface described in Section 7.5.

When a user connects to the HTTPS interface, the TSF prompts the user for a username and password. The TSF presents the user's browser with an HTML Password field to indicate that the characters should not be echoed back; however, displaying or hiding the password is outside of the control of the TSF. If the username/password match an authorized administrator's credentials, the user is granted access to the HTTPs interface described in Section 7.5.

The TSF requires passwords to be 15 characters or greater. The TSF supports passwords containing lowercase, uppercase, and numeric ASCII characters. The TSF also allows the following special characters to be used in passwords: !@#$%^&*()

FIA_UIA_EXT.1, FIA_PMG_EXT.1, FIA_UAU_EXT.2, FIA_UAU.7

The TSF supports text-based pre-shared keys for authentication of IKE authentication. The TSF allows the entry of text-based pre-shared keys that are at least 15 characters in length. The TSF uses the IKE negotiated HMAC function to condition pre-shared keys.

The TSF also supports the entry of bit-based pre-shared keys. Bit-based pre-shared keys must be entered hex or base64 encoded. The minimum length of a decoded bit-based pre-shared key is 112-bits. The administrative interface enforces the minimum key length.

FIA_PSK_EXT.1

The TSF maintains a counter of failed remote authentication attempts in volatile memory. The TSF increments this counter each time an incorrect username/password combination is submitted over HTTPs. When the counter reaches a configured value (default 5), the TSF blocks all remote authentication attempts for a configurable period of time (default 10 minutes).

FIA_AFL.1

The administrative interfaces, described in Section 7.5, do not implement commands to allow unauthorized users to the certificate store. The certificate store is a portion of the file system with restricted access. The TSF also zeroizes certificates according to the persistent zeroization described in Section 7.2.2. The TSF allows the administrator to load certificates with a specific command over HTTPs. When certificates are loaded into the certificate store, the TSF verifies that the certificate is syntactically correct.

When a certificate is used (to identify the TSF or identify an external entity to the TSF), the TSF verifies certificates by checking the following:

- The current date between the “Valid from” and “Valid to” dates
- The certificate is not listed on the CRL or reported revoked by OCSP
- The certificate chain is valid:
    - Each certificate in the certificate chain passes the above two checks.
    - Each certificate in the certificate chain has the Subject Type=CA flag set.
    - Each certificate is signed by:
        - a certificate in the certificate chain, or
        - a trusted root CA that has been installed in the TSF.

The TSF verifies the validity of a certificate when an administrator loads a certificate into the TSF and when IKE receives a peer certificate. If the administrator attempts to load a certificate with a Subject Type=CA, the TSF does not validate the certificate path.

FIA_X509_EXT.1

7.5 Security Management

The TSF implements two security management interfaces, a limited local console and a HTML based GUI. Regardless of interface, the TSF does not allow any administrative actions to be performed prior to authentication of the administrative user.

The local console is a restricted CLI. It limits the administrative user to the configuring the following functions:

- Reset to defaults (zeroize)
- View logs

The GUI provides the administrator with additional administrative functions; however, the functions are limited to those explicitly presented by the GUI to prevent the user from running arbitrary commands. The GUI presents the security administrator with the following options:

- Manage trusted CAs
- Configure Packet filtering rules (as described in Section 7.6)
- Configure IKE SA lifetimes
- Configure IKE algorithms
- Mange IKE Session Establishment restrictions
- Configure IPsec ESP algorithms (restricted to algorithms equal or weaker than those configured for IKE)
- Configure IP address assignment to VPN clients
- Generate CSR (and ECDSA or RSA keypair)
- Load a X.509 Certificate
- Load a private key (associated with an X.509 certificate)
- Manage administrator accounts
- Manage minimum password length
- Configure the remote administrator inactivity timeout
- Manage the failed authentication counter
- Configure Syslog server connectivity
- Configure NTP server connectivity

- Initiate an update to the software
- Set the time

FMT_MOF.1, FMT_MTD.1, FMT_SMF.1, FMT_SMR.2

7.6 Packet Filtering

The TSF has the following zones:

- WAN: 1xRJ45 or internal connector to the Cisco ESR
- VPN: Internal Virtual Interface
- LAN: 5xRJ45

While the TSF is powering up, the TSF starts security functions in the following order: audit, POST, packet filtering, networking, HTTPs administration, VPN. This ensures that the TSF has passed its self-tests and enabled packet filtering before any network interfaces are enabled. If the POST fails or the packet filtering rules fail to start, the TSF automatically reboots without initializing networking. This ensures that the TSF is operating properly and that the packet filtering rules have been initialized before the TSF processes any network data.

The TSF implements three different rule chains that can be applied to a zone. Each chain is applied to a different traffic type; traffic to be processed by the zone of the TOE (INPUT), traffic sent by the zone of the TOE (OUTPUT), and traffic passing through the zone TOE without modification (FORWARD). The rules are applied in the order they appear. Each rule can be ACCEPT, REJECT, or LOG. Traffic can be filtered by zone, IP protocol, source/destination port (TCP port, UDP port) and source/destination IP address range (IPv4). FORWARD rules are applied to VPN traffic.

The TSF ensures that the rules are not bypassed in the event of a component failure by utilizing the three zones. The FORWARD rules specify a zone instead of a hardware interface, so failure of the VPN results in iptables being unable to send data to the VPN zone (from the WAN or LAN zones). iptables is the only process that passes traffic between the difference zones, so a failure of iptables results in the inability to pass any traffic.

The TSF performs stateful packet inspection to determine if a packet is part of an established TCP stream. The TSF performs this inspection by checking the source address, destination address, source port, destination port, sequence number against, and flags against established streams. If the TSF determines that the packet is part of an established stream, it forwards or accepts the packet without applying all of the rules. If a packet is not part of an established TCP session, the TSF applies the rules sequentially. If a packet matches a rule, the action configured in the rule is applied. If the packet does not match the rule or the action was only LOG, the TSF passes the packet to the next rule in the chain. The TSF implements a hard-coded rule at the end of each chain that cannot be modified:

- REJECT and LOG any packets that do not match any user created rule.

Each zone is configured with the following default rules:

- WAN:
    - INPUT: REJECT with the following exceptions:
        - DHCP (UDP port 68): ACCEPT
        - ICMP (IP protocol 1): ACCEPT
        - IKE (UDP port 500): ACCEPT
        - IKE 4500 (UDP port 4500): ACCEPT
        - ESP (IP protocol 50): ACCEPT

  - OUTPUT: ACCEPT
  - FORWARD: REJECT
- VPN:
  - INPUT: ACCEPT
  - OUTPUT: ACCEPT
  - FORWARD: REJECT
- LAN:
  - INPUT: ACCEPT
  - OUTPUT: ACCEPT
  - FORWARD: ACCEPT

The default WAN rules only allow this zone to accept traffic that is for basic network management (i.e. DHCP and ICMP) and traffic that is for VPN tunnels. The default VPN rules prevent the passing of plaintext traffic between the LAN and WAN zones by blocking forwarding of packets. The VPN zone rules default to accepting input and output traffic; because the WAN zone has already filtered non-VPN (IKE or ESP) packets, and the devices on the LAN are expected to be trusted. The default LAN rules allow input, output, and forwarding of network traffic; because any traffic from the LAN or traffic that has been decrypted from a VPN tunnel is assumed to be trusted.

The IPv4, TCP, and UDP protocols implemented by the TSF have been verified to conform with RFCs 791, 793, and 768 respectively. Conformance with these RFCs has been tested by interoperability testing with the Windows 7, MacOS X 10.8, CentOS 6, and Cisco IOS 15 network stacks.

FPF_RUL_EXT.1

7.7 Protection of the TSF

The restrictive management interfaces described in Section 7.5 does not provide the user with commands to view pre-shared keys, symmetric keys, and private keys. The pre-shared and private keys are stored as plaintext on the file system. The symmetric keys are stored in RAM.

FPT_SKP_EXT.1

The TSF appends a 32-byte salt and hashes all administrator passwords with SHA-256 to obscure the plaintext passwords prior to storing them. Additionally, the restrictive management interfaces described in Section 7.5 do not provide the user with commands to view passwords or password hashes.

FPT_APW_EXT.1

The following TSF security functions utilize the time:

- Audit timestamps
- IPsec SA timeout
- HTTPs session timeout
- Console session timeout
- Certificate Expiration/Validity Checking

The TSF contains a real-time clock to maintain the time between updates from the NTP server and provide time to other TSF security functions. The real-time clock is considered reliable, because the TSF security functions that utilize the time only utilize an accuracy of one second.

FPT_STM.1

The TSF performs an ECDSA P-256 with SHA-256 signature verification of any candidate update image. The TSF verifies that the image is signed by the IAS Certificate. This certificate is hard coded in the TSF. If the signature check fails, the TSF will not install the update.

FPT_TUD_EXT.1

Upon power-up, the TSF performs an ECDSA P-256 signature verification of the kernel, all executables, and all interpreted files. The TSF also performs a known answer test on each cryptographic algorithm. The TSF then begins normal operation, if all of the executables are unchanged and the cryptographic algorithms are operating correctly.

FPT_TST_EXT.1

While the TSF is powering up and performing its power-up self-tests, it does not pass any network traffic. The TSF does not start operation (see Section 7.6 for more detail) if any of the power-up self-tests fail. Once the TSF is operational, the only conditional self-test that may indicate a failure is that of the NDRNG. In this case, the TSF will continue trying to read entropy. This may result in a key generation or session establishment hanging, but will not allow the TSF to inadvertently release sensitive information or pass traffic that does not meet its security policies.

A failure of the bypass test, pair-wise consistency test, or trusted update test do not affect the TSF's ability to enforce its security policies. If the bypass test fails, the TSF disables bypass; resulting in a fail-secure configuration. The pair-wise consistency test and trusted update test simply discard the key or update that fails the test.

FPT_FLS.1

7.8 TOE Access

The administrator can access the TSF via the local console (serial) or remotely via HTTPs. The TSF displays a configurable advisory and consent message when an administrator accesses the local console or HTTPs interface. The administrator can terminate a console or HTTPs session by logging out. When an administrator logs out of the local console, the TSF sets the state to unauthenticated and presents a login prompt. When an administrator logs out of the HTTPs session, the TSF sets a flag in the HTTPs session to unauthenticated. All HTTPs sessions are cleared when the TSF is shutdown or restarted. The TSF terminates local console and HTTPs sessions after a configurable period of inactivity. The TSF immediately terminates local sessions if the period of inactivity expires. The TSF computes the time from the last activity to the current request upon receipt of each HTTPs request. If the time difference exceeds the inactivity timer, the TSF does not process the request and terminates the session.

FTA_TAB.1, FTA_SSL.3, FTA_SSL.4, FTA_SSL_EXT.1

7.9 Trusted Path/Channels

The TSF communicates with the following trusted IT entities:

- VPN Peer(s) – IPsec
- Syslog Server – IPsec

The TSF implements the IPsec according to Section 7.2.4.

FTP_ITC.1

The TSF implements HTTPs/TLS to provide a trusted path for remote administration of the TSF. The TSF can be configured to require HTTPS to be tunneled through IPsec to provide additional security of the channel.

The TSF implements these protocols as described in Sections 7.2.4, 7.2.5, and 7.2.6.

FTP_TRP.1

8 Terms and Definitions

Table 10: TOE Abbreviations and Acronyms

Abbreviations/ Acronyms	Description
ESR	Embedded Services Router

Table 11: CC Abbreviations and Acronyms

Abbreviations/ Acronyms	Description
CAC	Common Access Card
CAP	Composed Assurance Package
CC	Common Criteria
CCRA	Arrangement on the Recognition of Common Criteria Certificates in the field of IT Security
DAC	Discretionary Access Control
DOD	Department of Defense
EAL	Evaluation Assurance Level
IT	Information Technology
OSP	Organizational Security Policy
PP	Protection Profile
SAR	Security Assurance Requirement
SFR	Security Functional Requirement
SFP	Security Function Policy
SPD	Security Policy Database
ST	Security Target
TOE	Target of Evaluation
TSF	TOE Security Functionality
TSFI	TSF Interface

9 References

Table 12: TOE Guidance Documentation

Reference	Description	Version	Date
[1]	IAS Router Common Criteria Operator Guidance	1.0.6	November 24, 2015

Table 13: Common Criteria v3.1 References

Reference	Description	Version	Date
[2]	Common Criteria for Information Technology Security Evaluation Part 1: Introduction and general model CCMB-2009-07-001	V3.1 R3	July 2009
[3]	Common Criteria for Information Technology Security Evaluation Part 2: Security functional components CCMB-2009-07-002	V3.1 R3	July 2009
[4]	Common Criteria for Information Technology Security Evaluation Part 3: Security assurance components CCMB-2009-07-003	V3.1 R3	July 2009
[5]	Common Criteria for Information Technology Security Evaluation Evaluation Methodology CCMB-2009-07-004	V3.1 R3	July 2009

Table 14: Supporting Documentation

Reference	Description	Version	Date
[6]	Protection Profile for Network Devices	1.1	June 8, 2012
[7]	Security Requirements for Network Devices Errata #3		November 3, 2014
[8]	Network Device Protection Profile (NDPP) Extended Package VPN Gateway	1.1	April 12, 2013