Cisco Catalyst 9200CX/9500X/9600X Series Switches 17.15

Security Target

Version: 1.0
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Document Introduction

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This document provides the basis for an evaluation of a specific Target of Evaluation (TOE), Cisco Catalyst 9200CX/9500X/9600X Series Switches 17.15. This Security Target (ST) defines a set of assumptions about the aspects of the environment, a list of threats that the product intends to counter, a set of security objectives, a set of security requirements, and the IT security functions provided by the TOE which meet the set of requirements. Administrators of the TOE will be referred to as administrators, Authorized Administrators, TOE administrators, semi-privileged, privileged administrators, and security administrators in this document.

Revision History

Version	Date	Change
0.1	October 11, 2024	Initial Version
0.2	June 10, 2025	Updates from testing
0.3	June 27, 2025	Updates for Check-Out Package
0.4	July 14, 2025	Additional Updates for Check-Out Package
0.5	July 31, 2025	Updates to address NIAP comments
1.0	August 4, 2025	Final Updates

1. Security Target Introduction

This Security Target contains the following sections:

- Security Target Introduction
- Conformance Claims
- Security Problem Definition
- Security Objectives
- Security Requirements
- TOE Summary Specification
- References

The structure and content of this ST comply with the requirements specified in the Common Criteria (CC), Part 1, Annex A, and Part 2.

1.1. ST and TOE Reference

This section provides information needed to identify and control this ST and its TOE.

Table 1. ST and TOE Identification

Name	Description
ST Title	Cisco Catalyst 9200CX/9500X/9600X Series Switches 17.15 Security Target
ST Version	1.0
Publication Date	August 4, 2025
Vendor and ST Author	Cisco Systems, Inc.
TOE Reference	Cisco Catalyst 9200CX/9500X/9600X Series Switches 17.15
TOE Hardware Models	Catalyst 9200CX/9500X/9600X Series Switches
TOE Software Version	IOS-XE 17.15.01
Keywords	Audit, Authentication, Encryption, Network Device, Secure Administration

1.2. TOE Overview

The Cisco Catalyst 9200CX/9500X/9600X Series Switches 17.15 TOE is an enterprise access-layer and core/distribution switch for branch, enterprise, and campus deployments.

Switches are used to connect multiple devices, such as computers, wireless access points, printers, and servers; on the same network within a building or campus. A switch enables connected devices to share information and talk to each other and are key building blocks for any network.

1.3. TOE Product Type

The Cisco Catalyst 9200CX/9500X/9600X Series Switches 17.15 TOE is a layer 2 and 3 network device comprised of both hardware and software. The hardware is the Catalyst 9200CX, Catalyst 9500X, and Catalyst 9600X switches as described below in Table 3 of section 1.7.

1.4. Required non-TOE Hardware/Software/Firmware

The TOE requires the following hardware/software/firmware in the IT environment when the TOE is configured in its evaluated configuration.

Table 2. Required IT Environment Components

Component	Usage/Purpose/Description
Syslog Server	This includes any syslog server to which the TOE would transmit syslog messages over IPsec.
Certificate Authority	The Certification Authority is used to provide the TOE with valid certificates. The CA also provides the TOE with a method to check the peer certificate revocation status of devices the TOE communicates with.
Management Workstation	This includes any IT Environment Management workstation with a SSH client installed that is used by the Security Administrator for remote administration over SSH trusted paths.
Local Console	This includes any IT Environment Console that is directly connected to the TOE component via the console port and is used by the Security Administrator for local TOE administration.

1.5. TOE Description

The Cisco Catalyst 9200CX/9500X/9600X Series Switches 17.15 Target of Evaluation (TOE) is a purpose-built, switching and routing platform enabling connected devices to communicate over a network at layer 2 or 3. The TOE provides Administrative control and management of the network. The TOE also provides Layer 3 capabilities, including OSPF, EIGRP, ISIS, RIP, and routed access.

Hardware models only vary in component characteristics. These characteristics affect non-security relevant functions, such as throughput and amount of storage. Since there is no security relevant impact due to differing components, equivalence between all switch models is claimed.

Primary features of the Cisco Catalyst 9200CX/9500X/9600X Series Switches include the following:

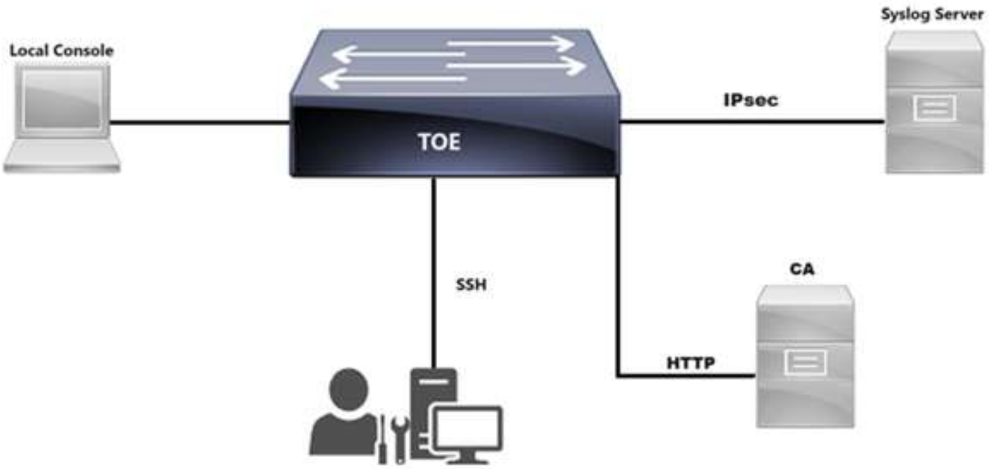
- Central processor that supports all system operations
- Dynamic memory, used by the central processor for all system operations
- Central Processing Unit (CPU) complex with 8-GigaBytes (GB) memory, 16-GB of flash, and an external Universal Serial Bus (USB) 3.0 Solid State Drive (SSD) pluggable storage slot (delivering 120-GB of storage with an optional SSD drive)
- Serial Advanced Technology Attachment (SATA) SSD local storage
- Flash memory Electrically Erasable Programmable Read-Only Memory (EEPROM), used to store the Cisco IOS-XE image (binary program)
- Non-volatile Read Only Memory (ROM) is used to store the bootstrap program and power-on diagnostic programs
- Non-volatile Random Access Memory (NVRAM) is used to store switch configuration parameters that are used to initialize the system at start-up.
- Physical network interfaces (minimally two) (e.g., Registered Jack (RJ-45) serial and standard 10/100/1000 Ethernet ports). The number of network interface ports varies by model
- Dedicated management port on the switch, RJ-45 console port, and a USB mini-Type B console connection
- Resiliency with Field Replaceable Units (FRU) and redundant power supply, fans, and modular uplinks

1.6. TOE Evaluated Configuration

Deployment of the TOE in its evaluated configuration consists of at least one TOE switch model following the Cisco Catalyst 9200CX/9500X/9600X Series Switches 17.15 CC Configuration Guide (AGD). The TOE has two or more network interfaces and is connected to at least one internal and one external network. The Cisco IOS-XE configuration determines how packets are handled to and from the TOE's network interfaces. The switch configuration will determine how traffic flows received on an interface will be handled. Typically, packet flows are passed through the internet working device and forwarded to their configured destination.

A typical deployment with a single instance of the TOE is depicted in in figure 1 below.

Figure 1. TOE and Environment



The TOE can be administered interactively using a CLI over a local console connection or remotely over SSH.

The operational environment of the TOE will include an audit (syslog) server and a Management Workstation. The syslog server is used to store audit records, where the TOE uses IPsec to secure the transmission of the records. The environment will include a CA to provide the TOE with valid certificates and a method to check the peer certificate revocation status.

1.7. Physical Scope of the TOE

The Cisco Catalyst 9200CX/9500X/9600X Series Switches 17.15 TOE is composed of hardware and software with the following specifications:

Table 3. Hardware Models and Specifications

Type	Hardware Model and Picture	Specifications
Fixed	**C9200CX-12T-2X2G** 	**ASIC**: Cisco UADP 2.0 **Processor**: Xilinx ZU3EG (ARM Cortex-A53) **Ports**: 12-port 1G, 2x10G and 3x1G, data **Management Ports:** ■ Ethernet management port: RJ-45 connectors, 4-pair Cat 5 UTP cabling ■ Management console port: RJ-45-to-DB9 cable for PC connections, USB-C adaptor, USB adaptor
Fixed	**C9200CX-12P-2X2G** 	**ASIC**: Cisco UADP 2.0 **Processor**: Xilinx ZU3EG (ARM Cortex-A53) **Ports**: 12-port 1G, 2x10G and 2x1G, PoE+ **Management Ports:** ■ Ethernet management port: RJ-45 connectors, 4-pair Cat 5 UTP cabling ■ Management console port: RJ-45-to-DB9 cable for PC connections, USB-C adaptor, USB adaptor

Type	Hardware Model and Picture	Specifications
Fixed	**C9200CX-8P-2X2G** 	**ASIC**: Cisco UADP 2.0 **Processor**: Xilinx ZU3EG (ARM Cortex-A53) **Ports**: 8-port 1G, 2x10G and 2x1G, PoE+ **Management Ports:** ■ Ethernet management port: RJ-45 connectors, 4-pair Cat 5 UTP cabling ■ Management console port: RJ-45-to-DB9 cable for PC connections, USB-C adaptor, USB adaptor
Fixed	**C9200CX-8UXG-2X** 	**ASIC**: Cisco UADP 2.0 **Processor**: Xilinx ZU3EG (ARM Cortex-A53) **Ports**: 8 ports UPOE (4 mGig ports up to 10G, 4 ports up to 1G) **Management Ports:** ■ Ethernet management port: RJ-45 connectors, 4-pair Cat 5 UTP cabling ■ Management console port: RJ-45-to-DB9 cable for PC connections, USB-C adaptor, USB adaptor
Fixed	**C9500X-28C8D** 	**ASIC**: Cisco Silicon One Q200 **Processor**: Intel Xeon D-1564N (Broadwell) **Ports**: 28x100G + 8x400G Gigabit Ethernet **Management Ports:** ■ Ethernet management port: RJ-45 connectors, 4-pair Cat 5 UTP cabling ■ Management console port: RJ-45-to-DB9 cable for PC connections, USB mini-Type B console port, USB-C console port
Fixed	**C9500X-60L4D** 	**ASIC**: Cisco Silicon One Q200 **Processor**: Intel Xeon D-1564N (Broadwell) **Ports**: 60x 10/25/50G + 4x 40/100/200/400G Gigabit Ethernet **Management Ports:** ■ Ethernet management port: RJ-45 connectors, 4-pair Cat 5 UTP cabling ■ Management console port: RJ-45-to-DB9 cable for PC connections, USB mini-Type B console port, USB-C console port

Type	Hardware Model and Picture	Specifications
Modular Chassis	**C9606R** 	**Slots**: ■ Line-card slots: 4 ■ Supervisor engine slots: 2 ■ Dedicated supervisor engine slot numbers: 3 and 4 **Power supply bays:** 4 **Fan-tray bays**: 1
Supervisor Engine	**C9600X-SUP-2** 	**ASIC**: Cisco Silicon One Q200 **Processor**: Intel Xeon D-1573N (Broadwell) **Ports:** ■ Up to 8 non-blocking 400/200 Gigabit Ethernet QSFP-DD ports ■ Up to 128 non-blocking 100 Gigabit Ethernet QSPF28 ports ■ Up to 128 non-blocking 40 Gigabit Ethernet QSPF+ ports ■ Up to 256 non-blocking 50G/25G/10G Gigabit Ethernet QSPF56 ports ■ Up to 192 non-blocking 10 Gigabit Ethernet RJ45 copper port
Line Cards	**C9600-LC-40YL4CD** 	**Ports** ■ 40 ports 50/25/10GE SFP56 ■ 2 ports 200/100/40QSFP56 uplinks ■ 2 ports 400/200/100GE QSFP-DD uplink
	C9600X-LC-32CD 	**Ports** ■ 30 ports 100/40G QSFP28 ■ 2 ports 400/200/100G QSFP-DD
	C9600X-LC-56YL4C 	**Ports** ■ 56 ports 50/25/10GE SFP56 ■ 4-port 40/100GE QSFP28

The TOE includes the *cat9k_lite_iosxe.V1715_3_CSCWO73590_3.SPA.bin* or *cat9k_iosxe.V1715_3_CSCWO73590_3.SPA.bin* software image available by contacting the Technical Assistance Center (TAC) at www.cisco.com/go/offices or by navigating to Cisco Software Central at https://software.cisco.com/. Customers can use their Cisco Care Online (CCO) or SMART account to download the software in a binary image format.

1.8. Logical Scope of the TOE

The TOE is comprised of several security features including:

- Security Audit
- Cryptographic Support
- Identification and Authentication
- Security Management
- Protection of the TSF
- TOE Access
- Trusted Path/Channels

These features are described in more detail in the following subsections.

Security Audit

Auditing allows Security Administrators to discover intentional and unintentional issues with the TOE's configuration and/or operation. Auditing of administrative activities provides information that may be used to hasten corrective action should the system be configured incorrectly. Security audit data can also provide an indication of failure of critical portions of the TOE (e.g. a communication channel failure or anomalous activity (e.g. establishment of an administrative session at a suspicious time, repeated failures to establish sessions or authenticate to the TOE) of a suspicious nature.

The TOE provides extensive capabilities to generate audit data targeted at detecting such activity. The TOE generates an audit record for each auditable event. Each security relevant audit event has the date, timestamp, event description, and subject identity. The TOE stores audit messages in a circular audit trail configurable by the Security Administrator. All audit logs are transmitted to an external audit server over a trusted channel protected with IPsec. The TOE allows authorized administrators the ability to view locally stored audit records.

Cryptographic Support

The TOE provides cryptographic functions to implement SSH and IPsec protocols. The cryptographic algorithm implementation has been validated for CAVP conformance. This includes key generation and random bit generation, key establishment methods, key destruction, and the various types of cryptographic operations to provide AES encryption/decryption, signature verification, hash generation, and keyed hash generation.

SSH and IPsec protocols are implemented using the IOS Common Cryptographic Module (IC2M) version Rel5a. Refer to Table 19 for identification of the relevant CAVP certificates.

Identification and Authentication

The TOE implements four types of authentication to provide a trusted means for Security Administrators and remote servers/endpoints to securely communicate: X.509v3 certificate-based authentication for remote syslog audit servers and local and remote authentication for Security Administrators using local password, SSH password, and SSH public key.

Security Administrators have the ability to compose strong passwords which are stored using a SHA-2 hash. Additionally, the TOE detects and tracks successive unsuccessful remote authentication attempts and will prevent the offending account from making further attempts until a Security Administrator time period has elapsed or until the Administrator manually unblocks the account.

Security Management

The TOE provides secure remote administrative interface and local interface to perform security management functions. This includes ability to configure cryptographic functionality; an access banner containing an advisory notice and consent warning message; a session inactivity timer before session termination as well as an ability to update TOE software.

The TOE provides a Security Administrator role and only the Security Administrator can perform the above security management functions.

Protection of the TSF

The TOE protects critical security data including keys and passwords against tampering by untrusted subjects. The TOE provides reliable timestamps to support monitoring local and remote interactive administrative sessions for inactivity, validating X.509 certificates (to determine if a certificate has expired), and to support accurate audit records.

The TOE provides self-tests to ensure it is operating correctly, including the ability to detect software integrity failures. Additionally, the TOE provides an ability to perform software updates and to verify those software updates are from Cisco Systems, Inc.

TOE Access

The TOE monitors both local and remote admin sessions for inactivity and terminates when a threshold time period is reached. Once a session has been terminated the TOE requires the user to re-authenticate.

The TOE also displays a Security Administrator specified advisory notice and consent warning message prior to initiating identification and authentication for each administrative user.

Trusted Path/Channels

The TOE provides encryption (protection from disclosure and detection of modification) for communication paths and channels between itself and remote endpoints.

In addition, the TOE provides 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.

1.9. Excluded Functionality

The functionality listed below is not included in the evaluated configuration.

Table 4. Excluded Functionality and Rationale

Function Excluded	Rationale
Non-FIPS 140-2 mode of operation	The TOE includes FIPS mode of operation. The FIPS modes allows the TOE to use only approved cryptography. FIPS mode of operation must be enabled in order for the TOE to be operating in its evaluated configuration.
HTTP/HTTPS Web GUI	Remote Management is performed using SSH
SNMP	Remote Management is performed using SSH
MACsec	MACsec must not be enabled in the evaluated configuration

These services can be disabled by using the configuration settings as described in section 4.2.18 of the Cisco Catalyst 9200CX/9500X/9600X Series Switches 17.15 CC Configuration Guide (AGD).

Additionally, the TOE includes a number of functions where there are no Security Functional Requirements that apply from the collaborative Protection Profile for Network Devices v3.0e. The excluded functionality does not affect the TOE's conformance to the claimed Protection Profiles. This includes various layer 3 capabilities, including OSPF, EIGRP, ISIS, RIP, and routed access.

2. Conformance Claims

2.1.Common Criteria Conformance Claim

The TOE and ST are compliant with the Common Criteria (CC) Version 3.1, Revision 5, dated: April 2017. The TOE and ST are CC Part 2 extended and CC Part 3 conformant.

2.2.PP Conformance Claim

The TOE and ST are conformant with the PP identified in Table 5.

Table 5. PP Conformance

Protection Profile	Version	Date
collaborative Protection Profile for Network Devices [CPP_ND_V3.0E]	3.0e	December 6, 2023

The TOE and ST are also conformant with the Functional Package for Secure Shell (SSH), Version 1.0, May 13, 2021 [PKG_SSH_v1.0].

This ST applies the following NIAP Technical Decisions:

Table 6. NIAP Technical Decisions

Number	Title	PP	Applicable	Exclusion Rational
TD0923	NIT Technical Decision: Auditable event for FAU_STG_EXT.1 in FAU_GEN.1.2	[CPP_ND_V3.0E]	Yes	
TD0921	NIT Technical Decision: Addition of FIPS PUB 186-5 and Correction of Assignment	[CPP_ND_V3.0E]	Yes	
TD0900	Clarification to Local Administrator Access in FIA_UIA_EXT.1.3	[CPP_ND_V3.0E]	Yes	
TD0899	NIT Technical Decision: Correction of Renegotiation Test for TLS 1.2	[CPP_ND_V3.0E]	No	TLS 1.2 not claimed
TD0886	Clarification to FAU_STG_EXT.1 Test 6	[CPP_ND_V3.0E]	Yes	
TD0880	NIT Decision: Removal of Duplicate Selection in FMT_SMF.1.1	[CPP_ND_V3.0E]	Yes	
TD0879	NIT Decision: Correction of Chapter Headings in CPP_ND_V3.0E	[CPP_ND_V3.0E]	Yes	
TD0868	NIT Technical Decision: Clarification of time frames in FCS_IPSEC_EXT.1.7 and FCS_IPSEC_EXT.1.8	[CPP_ND_V3.0E]	Yes	

Number	Title	PP	Applicable	Exclusion Rational
TD0836	NIT Technical Decision: Redundant Requirements in FPT_TST_EXT.1	[CPP_ND_V3.0E]	Yes	
TD909	Updates to FCS_SSH_EXT.1.1 App Note in SSH FP 1.0	[PKG_SSH_v1.0]	Yes	
TD0777	Clarification to Selections for Auditable Events for FCS_SSH_EXT.1	[PKG_SSH_v1.0]	Yes	
TD0732	FCS_SSHS_EXT.1.3 Test 2 Update	[PKG_SSH_v1.0]	Yes	
TD0695	Choice of 128 or 256 bit size in AES-CTR in SSH Functional Package.	[PKG_SSH_v1.0]	Yes	
TD0682	Addressing Ambiguity in FCS_SSHS_EXT.1 Tests	[PKG_SSH_v1.0]	Yes	

2.3. Protection Profile Conformance Claim Rationale

2.3.1. TOE Appropriateness

The TOE provides all of the functionality at a level of security commensurate with that identified in the U.S. Government Protection Profiles.

2.3.2. TOE Security Problem Definition Consistency

The Assumptions, Threats, and Organization Security Policies included in the Security Target represent the Assumptions, Threats, and Organization Security Policies specified in [NDcPP] and [PKG_SSH_v1.0] for which conformance is claimed verbatim. All concepts covered in the Protection Profile Security Problem Definition are included in the Security Target Statement of Security Objectives Consistency.

The Security Objectives included in the Security Target represent the Security Objectives specified in [NDcPP] and [PKG_SSH_v1.0] for which conformance is claimed verbatim. All concepts covered in the Protection Profile's Statement of Security Objectives are included in the Security Target.

2.3.3. Statement of Security Requirements Consistency

The Security Functional Requirements included in the Security Target represent the Security Functional Requirements specified in [NDcPP] [PKG_SSH_v1.0] for which conformance is claimed verbatim. All concepts covered the Protection Profile's Statement of Security Requirements are included in the Security Target. Additionally, the Security Assurance Requirements included in the Security Target are identical to the Security Assurance Requirements included in the claimed Protection Profiles.

3. Security Problem Definition

This section identifies the following:

- Assumptions about the TOE's operational environment. These assumptions include both practical realities in the development of the TOE security requirements and the essential environmental conditions on the use of the TOE.
- Threats addressed by the TOE and the IT Environment.
- Organizational Security Policies imposed by an organization on the TOE to address its security needs.

The security problem definition below has been drawn verbatim from [NDcPP] and [PKG_SSH_v1.0].

3.1. Assumptions

Table 7. TOE Assumptions

Assumption	Assumption Definition
A.PHYSICAL_PROTECTION	The Network Device is assumed to be physically protected in its operational environment and not subject to physical attacks that compromise the security or interfere with the device's physical interconnections and correct operation. This protection is assumed to be sufficient to protect the device and the data it contains. As a result, the cPP does not include any requirements on physical tamper protection or other physical attack mitigations. The cPP does not expect the product to defend against physical access to the device that allows unauthorized entities to extract data, bypass other controls, or otherwise manipulate the device. For vNDs, this assumption applies to the physical platform on which the VM runs.
A.LIMITED_FUNCTIONALITY	The device is assumed to provide networking functionality as its core function and not provide functionality/ services that could be deemed as general purpose computing. For example the device should not provide computing platform for general purpose applications (unrelated to networking functionality). If a virtual TOE evaluated as a pND, following Case 2 vNDs as specified in Section 1.2, the VS is considered part of the TOE with only one vND instance for each physical hardware platform. The exception being where components of a distributed TOE run inside more than one virtual machine (VM) on a single VS. In Case 2 vND, no non-TOE guest VMs are allowed on the platform.
A.NO_THRU_TRAFFIC_PROTECTION	A standard/generic Network Device does not provide any assurance regarding the protection of traffic that traverses it. The intent is for the Network Device to protect data that originates on or is destined to the device itself, to include administrative data and audit data. Traffic that is traversing the Network Device, destined for another network entity, is not covered by the ND cPP. It is assumed that this protection will be covered by cPPs for particular types of Network Devices (e.g., firewall).
A.TRUSTED_ADMINISTRATOR	The Security Administrator(s) for the Network Device are assumed to be trusted and to act in the best interest of security for the organization. This includes appropriately trained, following policy, and adhering to guidance documentation. Administrators are trusted to ensure passwords/credentials have sufficient strength and entropy and to lack malicious intent when administering the device. The Network Device is not expected to be capable of defending against a malicious Administrator that actively works to bypass or compromise the security of the device. For TOEs supporting X.509v3 certificate-based authentication, the Security Administrator(s) are expected to fully validate (e.g. offline verification) any CA certificate (root CA certificate or intermediate CA certificate) loaded into the TOE's trust store (aka 'root store', ' trusted CA Key Store', or similar) as a trust anchor prior to use (e.g. offline verification).

A.REGULAR_UPDATES	The Network Device firmware and software is assumed to be updated by an Administrator on a regular basis in response to the release of product updates due to known vulnerabilities.
A.ADMIN_CREDENTIALS_SECURE	The Administrator's credentials (private key) used to access the Network Device are protected by the platform on which they reside.
A.COMPONENTS_RUNNING (applies to distributed TOEs only)	For distributed TOEs it is assumed that the availability of all TOE components is checked as appropriate to reduce the risk of an undetected attack on (or failure of) one or more TOE components. It is also assumed that in addition to the availability of all components it is also checked as appropriate that the audit functionality is running properly on all TOE components.
A.RESIDUAL_INFORMATION	The Administrator must ensure that there is no unauthorized access possible for sensitive residual information (e.g. cryptographic keys, keying material, PINs, passwords etc.) on networking equipment when the equipment is discarded or removed from its operational environment.
A.VS_TRUSTED_ADMINISTRATOR (applies to vNDs only)	The Security Administrators for the VS are assumed to be trusted and to act in the best interest of security for the organization. This includes not interfering with the correct operation of the device. The Network Device is not expected to be capable of defending against a malicious VS Administrator that actively works to bypass or compromise the security of the device.
A.VS_REGULAR_UPDATES (applies to vNDs only)	The VS software is assumed to be updated by the VS Administrator on a regular basis in response to the release of product updates due to known vulnerabilities.
A.VS_ISOLATON (applies to vNDs only)	For vNDs, it is assumed that the VS provides, and is configured to provide sufficient isolation between software running in VMs on the same physical platform. Furthermore, it is assumed that the VS adequately protects itself from software running inside VMs on the same physical platform.
A.VS_CORRECT_CONFIGURATION (applies to vNDs only)	For vNDs, it is assumed that the VS and VMs are correctly configured to support ND functionality implemented in VMs.

3.2. Threats

Table 8. Threats

Threat	Threat Definition
T.UNAUTHORIZED_ADMINISTRATOR_ACCESS	Threat agents may attempt to gain Administrator access to the Network Device by nefarious means such as masquerading as an Administrator to the device, masquerading as the device to an Administrator, replaying an administrative session (in its entirety, or selected portions), or performing man-in-the-middle attacks, which would provide access to the administrative session, or sessions between Network Devices. Successfully gaining administrator access allows malicious actions that compromise the security functionality of the device and the network on which it resides.
T.WEAK_CRYPTOGRAPHY	Threat agents may exploit weak cryptographic algorithms or perform a cryptographic exhaust against the key space. Poorly chosen encryption algorithms, modes, and key sizes will allow attackers to compromise the algorithms, or brute force exhaust the key space and give them unauthorized access allowing them to read, manipulate and/or control the traffic with minimal effort.

Threat	Threat Definition
T.UNTRUSTED_COMMUNICATION_CHANNELS	Threat agents may attempt to target Network Devices that do not use standardized secure tunneling protocols to protect the critical network traffic. Attackers may take advantage of poorly designed protocols or poor key management to successfully perform man-in-the middle attacks, replay attacks, etc. Successful attacks will result in loss of confidentiality and integrity of the critical network traffic, and potentially could lead to a compromise of the Network Device itself.
T.WEAK_AUTHENTICATION_ENDPOINTS	Threat agents may take advantage of secure protocols that use weak methods to authenticate the endpoints – e.g., shared password that is guessable or transported as plaintext. The consequences are the same as a poorly designed protocol, the attacker could masquerade as the Administrator or another device, and the attacker could insert themselves into the network stream and perform a man-in-the-middle attack. The result is the critical network traffic is exposed and there could be a loss of confidentiality and integrity, and potentially the Network Device itself could be compromised.
T.UPDATE_COMPROMISE	Threat agents may attempt to provide a compromised update of the software or firmware which undermines the security functionality of the device. Non-validated updates or updates validated using non-secure or weak cryptography leave the update firmware vulnerable to surreptitious alteration.
T.UNDETECTED_ACTIVITY	Threat agents may attempt to access, change, and/or modify the security functionality of the Network Device without Administrator awareness. This could result in the attacker finding an avenue (e.g., misconfiguration, flaw in the product) to compromise the device and the Administrator would have no knowledge that the device has been compromised.
T.SECURITY_FUNCTIONALITY_COMPROMISE	Threat agents may compromise credentials and device data enabling continued access to the Network Device and its critical data. The compromise of credentials include replacing existing credentials with an attacker's credentials, modifying existing credentials, or obtaining the Administrator or device credentials for use by the attacker. Threat agents may also be able to take advantage of weak administrative passwords to gain privileged access to the device.
T.SECURITY_FUNCTIONALITY_FAILURE	An external, unauthorized entity could make use of failed or compromised security functionality and might therefore subsequently use or abuse security functions without prior authentication to access, change or modify device data, critical network traffic or security functionality of the device.

3.3. Organizational Security Policies

Table 9. Organizational Security Policies

Policy Name	Policy Definition
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.

4. Security Objectives

This section identifies the security objectives of the IT Environment. The security objectives identify the responsibilities of the TOE and the TOE's IT environment in meeting the security needs.

4.1. Security Objectives for the TOE

[NDcPP] does not define any security objectives that apply to the TOE.

4.2. Security Objectives for the Environment

The following table identifies the Security Objectives for the Environment. These security objectives reflect the stated intent to counter identified threats and/or comply with any security policies. The security objectives below have been drawn verbatim from [NDcPP].

Table 10. Security Objectives for the Environment

Environment Security Objective	IT Environment Security Objective Definition
OE.PHYSICAL	Physical security, commensurate with the value of the TOE and the data it contains, is provided by the environment.
OE.NO_GENERAL_PURPOSE	There are no general-purpose computing capabilities (e.g., compilers or user applications) available on the TOE, other than those services necessary for the operation, administration and support of the TOE. Note: For vNDs the TOE includes only the contents of the its own VM, and does not include other VMs or the VS.
OE.NO_THRU_TRAFFIC_PROTECTION	The TOE does not provide any protection of traffic that traverses it. It is assumed that protection of this traffic will be covered by other security and assurance measures in the operational environment.
OE.TRUSTED_ADMIN	Security Administrators are trusted to follow and apply all guidance in a trusted manner. For vNDs, this includes the VS Administrator responsible for configuring the VMs that implement ND functionality. For TOEs supporting X.509v3 certificate-based authentication, the Security Administrator(s) are assumed to monitor the revocation status of all certificates in the TOE's trust store and to remove any certificate from the TOE's trust store in case such certificate can no longer be trusted.
OE.UPDATES	The TOE firmware and software is updated by an Administrator on a regular basis in response to the release of product updates due to known vulnerabilities.
OE.ADMIN_CREDENTIALS_SECURE	The Administrator's credentials (private key) used to access the TOE must be protected on any other platform on which they reside.
OE.COMPONENTS_RUNNING applies to distributed TOEs only)	For distributed TOEs the Security Administrator ensures that the availability of every TOE component is checked as appropriate to reduce the risk of an undetected attack on (or failure of) one or more TOE components. The Security Administrator also ensures that it is checked as appropriate for every TOE component that the audit functionality is running properly.
OE.RESIDUAL_INFORMATION	The Security Administrator ensures that there is no unauthorized access possible for sensitive residual information (e.g. cryptographic keys, keying material, PINs, passwords etc.) on networking equipment when the equipment is discarded or removed from its operational environment. For vNDs, this applies when the physical platform on which the VM runs is removed from its operational environment.

OE.VM_CONFIGURATION (applies to vNDs only)	For vNDs, the Security Administrator ensures that the VS and VMs are configured to ■ reduce the attack surface of VMs as much as possible while supporting ND functionality (e.g., remove unnecessary virtual hardware, turn off unused inter-VM communications mechanisms), and ■ correctly implement ND functionality (e.g., ensure virtual networking is properly configured to support network traffic, management channels, and audit reporting). The VS should be operated in a manner that reduces the likelihood that vND operations are adversely affected by virtualization features such as cloning, save/restore, suspend/resume, and live migration. If possible, the VS should be configured to make use of features that leverage the VS's privileged position to provide additional security functionality. Such features could include malware detection through VM introspection, measured VM boot, or VM snapshot for forensic analysis.

5. Security Requirements

This section identifies the Security Functional Requirements for the TOE. The Security Functional Requirements in this section are drawn from [CC_PART2], [NDcPP] [PKG_SSH_v1.0], and NIAP Technical Decisions.

5.1. Conventions

[CC_PART1] defines operations on Security Functional Requirements. This document uses the following conventions to identify the operations permitted by [NDcPP] [PKG_SSH_v1.0], and NIAP Technical Decisions.

Table 11. Security Requirement Conventions

Convention	Indication
Assignment	Indicated with *italicized* text
Refinement	Indicated with **bold** text and ~~strikethroughs~~
Selection	Indicated with underlined text
Assignment within a Selection	Indicated with *italicized and underlined* text
Iteration	indicated by adding a string starting with '/' (e.g. 'FCS_COP.1/Hash')

Where operations were completed in the [NDcPP] itself, the formatting used in the [NDcPP] has been retained. Formatting used in [NDcPP] and [PKG_SSH_v1.0] that is inconsistent with the listed conventions has not been retained in the ST.

The TOE Security Functional Requirements are identified in the following table and are described in more detail in the following subsections.

Table 12. Security Functional Requirements

Class Name	Component Identification	Component Name	Drawn From
FAU: Security Audit	FAU_GEN.1	Audit data generation	[NDcPP]
	FAU_GEN.2	User Identity Association	[NDcPP]
	FAU_STG_EXT.1	Protected Audit Event Storage	[NDcPP]
FCS: Cryptographic Support	FCS_CKM.1	Cryptographic Key Generation (Refinement)	[NDcPP]
	FCS_CKM.2	Cryptographic Key Establishment	[NDcPP]
	FCS_CKM.4	Cryptographic Key Destruction	[NDcPP]
	FCS_COP.1/DataEncryption	Cryptographic Operation (AES Data Encryption/Decryption)	[NDcPP]
	FCS_COP.1/SigGen	Cryptographic Operation (Signature Generation and Verification)	[NDcPP]
	FCS_COP.1/Hash	Cryptographic Operation (Hash Algorithm)	[NDcPP]
	FCS_COP.1/KeyedHash	Cryptographic Operation (Keyed Hash Algorithm)	[NDcPP]
	FCS_IPSEC_EXT.1	IPsec Protocol	[NDcPP]
	FCS_RBG_EXT.1	Random Bit Generation	[NDcPP]
	FCS_SSH_EXT.1	SSH Protocol	[PKG_SSH_v1.0]
	FCS_SSHS_EXT.1	SSH Server Protocol	[PKG_SSH_v1.0]
FIA: Identification and authentication	FIA_AFL.1	Authentication Failure Handling	[NDcPP]
	FIA_PMG_EXT.1	Password Management	[NDcPP]
	FIA_UIA_EXT.1	User Identification and Authentication	[NDcPP]
	FIA_UAU.7	Protected Authentication Feedback	[NDcPP]
	FIA_X509_EXT.1/Rev	X.509 Certificate Validation	[NDcPP]
	FIA_X509_EXT.2	X.509 Certificate Authentication	[NDcPP]
	FIA_X509_EXT.3	X.509 Certificate Requests	[NDcPP]
FMT: Security Management	FMT_MOF.1/ManualUpdate	Management of security functions behaviour	[NDcPP]
	FMT_MTD.1/CoreData	Management of TSF Data	[NDcPP]
	FMT_MTD.1/CryptoKeys	Management of TSF Data	[NDcPP]
	FMT_SMF.1	Specification of Management Functions	[NDcPP]
	FMT_SMR.2	Restrictions on Security Roles	[NDcPP]
	FPT_APW_EXT.1	Extended: Protection of Administrator Passwords	[NDcPP]
	FPT_SKP_EXT.1	Extended: Protection of TSF Data (for reading of all pre-shared, symmetric and private keys)	[NDcPP]
	FPT_STM_EXT.1	Reliable Time Stamps	[NDcPP]
	FPT_TST_EXT.1	TSF Testing (Extended)	[NDcPP]
	FPT_TUD_EXT.1	Trusted update	[NDcPP]

FTA: TOE Access	FTA_SSL_EXT.1	TSF-initiated Session Locking	[NDcPP]
	FTA_SSL.3	TSF-initiated Termination	[NDcPP]
	FTA_SSL.4	User-initiated Termination	[NDcPP]
	FTA_TAB.1	Default TOE Access Banners	[NDcPP]
FTP: Trusted path/channels	FTP_ITC.1	Inter-TSF trusted channel	[NDcPP]
	FTP_TRP.1/Admin	Trusted Path	[NDcPP]

5.2. Class: Security Audit (FAU)

5.2.1. FAU_GEN.1 – Audit Data Generation

FAU_GEN.1.1 The TSF shall be able to generate an audit record of the following auditable events:

a) Start-up and shutdown of the audit functions;

b) All auditable events for the not specified level of audit; and

c) *All administrator actions comprising:*

- *Administrative login and logout (name of Administrator account shall be logged if individual accounts are required for Administrators).*
- *Changes to TSF data related to configuration changes (in addition to the information that a change occurred it shall be logged what has been changed).*
- *Generating/import of, changing, or deleting of cryptographic keys (in addition to the action itself a unique key name or key reference shall be logged).*
- *[Resetting passwords (name of related Administrator account shall be logged];*

d) *Specifically defined auditable events listed in Table 13.*

FAU_GEN.1.2 The TSF shall record within each audit record at least the following information:

a) Date and time of the event, type of event, subject identity, and the outcome (success or failure) of the event; and

b) For each audit event type, based on the auditable event definitions of the functional components included in the cPP/ST, *information specified in column three of Table 13.*

Table 13. Auditable Events

SFR	Auditable Event	Additional Audit Record Contents
FAU_GEN.1	None.	None.
FAU_GEN.2	None.	None.
FAU_STG_EXT.1	Configuration of local audit settings.	Identity of account making changes to the audit configuration.
FCS_CKM.1	None.	None.
FCS_CKM.2	None.	None.
FCS_CKM.4	None.	None.
FCS_COP.1/DataEncryption	None.	None.

SFR	Auditable Event	Additional Audit Record Contents
FCS_COP.1/SigGen	None.	None.
FCS_COP.1/Hash	None.	None.
FCS_COP.1/KeyedHash	None.	None.
FCS_IPSEC_EXT.1	Failure to establish an IPsec SA.	Reason for failure.
FCS_RBG_EXT.1	None.	None.
FCS_SSH_EXT.1	[Failure to establish SSH connection]	[Reason for failure and Non-TOE endpoint of connection (IP Address)]
FCS_SSH_EXT.1	[Establishment of SSH connection]	[Non-TOE endpoint of connection (IP Address)]
FCS_SSH_EXT.1	[Termination of SSH connection session]	[Non-TOE endpoint of connection (IP Address)]
FCS_SSH_EXT.1	[None]	[None]
FCS_SSHS_EXT.1	No events specified	
FIA_AFL.1	Unsuccessful login attempts limit is met or exceeded.	Origin of the attempt (e.g., IP address).
FIA_PMG_EXT.1	None.	None.
FIA_UIA_EXT.1	All use of the identification and authentication mechanism.	Origin of the attempt (e.g., IP address).
FIA_UAU.7	None.	None.
FIA_X509_EXT.1/Rev	Unsuccessful attempt to validate a certificate Any addition, replacement or removal of trust anchors in the TOE's trust store.	Reason for failure of certificate validation Identification of certificates added, replaced or removed as trust anchor in the TOE's trust store.
FIA_X509_EXT.2	None.	None.
FIA_X509_EXT.3	None.	None.
FMT_MOF.1/ManualUpdate	Any attempt to initiate a manual update	None.
FMT_MTD.1/CoreData	None.	None.
FMT_MTD.1/CryptoKeys	None.	None.
FMT_SMF.1	All management activities of TSF data.	None.
FMT_SMR.2	None.	None.
FPT_APW_EXT.1	None.	None.
FPT_SKP_EXT.1	None.	None.
FPT_STM_EXT.1	Discontinuous changes to time - either Administrator actuated or changed via an automated process.	For discontinuous changes to time: The old and new values for the time. Origin of the attempt to change time for success and failure (e.g., IP address).
FPT_TST_EXT.1	None.	None.
FPT_TUD_EXT.1	Initiation of update. result of the update attempt (success or failure)	None.

SFR	Auditable Event	Additional Audit Record Contents
FTA_SSL_EXT.1	The termination of a local session by the session locking mechanism.	None.
FTA_SSL.3	The termination of a remote session by the session locking mechanism.	None.
FTA_SSL.4	The termination of an interactive session.	None.
FTA_TAB.1	None.	None.
FTP_ITC.1	• Initiation of the trusted channel. • Termination of the trusted channel. • Failure of the trusted channel functions.	• None • None • Reason for failure
FTP_TRP.1/Admin	• Initiation of the trusted path. • Termination of the trusted path. • Failures of the trusted path functions.	• None • None • Reason for failure

5.2.2. 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.

5.2.3. FAU_STG_EXT.1 – Protected Audit Event Storage

FAU_STG_EXT.1.1 The TSF shall be able to transmit the generated audit data to an external IT entity using a trusted channel according to FTP_ITC.1.

FAU_STG_EXT.1.2 The TSF shall be able to store generated audit data on the TOE itself. In addition [

- The TOE shall consist of a single standalone component that stores audit data locally].

FAU_STG_EXT.1.3 The TSF shall maintain a [buffer] of audit records in the event that an interruption of communication with the remote audit server occurs.

FAU_STG_EXT.1.4 The TSF shall be able to store [nonpersistent] audit records locally with a minimum storage size of [*150000000 bytes*].

FAU_STG_EXT.1.5 The TSF shall [*overwrite previous audit records according to the following rule:* [*oldest audit records are overwritten*]] when the local storage space for audit data is full.

FAU_STG_EXT.1.6 The TSF shall provide the following mechanisms for administrative access to locally stored audit records [ability to view locally].

5.3. Class: Cryptographic Support (FCS)

5.3.1. FCS_CKM.1 – Cryptographic Key Generation (Refinement)

FCS_CKM.1.1 The TSF shall generate **asymmetric** cryptographic keys in accordance with a specified cryptographic key generation algorithm: [

- RSA schemes using cryptographic key sizes of [3072-bit] that meet the following: FIPS PUB 186-4, “Digital Signature Standard (DSS)”, Appendix B.3 or FIPS PUB 186-5, "Digital Signature Standard (DSS)", A.1;

- ECC schemes using ‘NIST curves’ [P-384] that meet the following: FIPS PUB 186-4, 'Digital Signature Standard (DSS)', Appendix B.4, or FIPS PUB 186-5, “Digital Signature Standard (DSS)”, Appendix A.2, or ISO/IEC 14888-3, “IT Security techniques - Digital signatures with appendix - Part 3: Discrete logarithm based mechanisms”, Section 6.6.

] ~~and specified cryptographic key sizes [assignment: *cryptographic key sizes]* that meet the following: [assignment: *list of standards*~~].

5.3.2. FCS_CKM.2 – Cryptographic Key Establishment (Refinement)

FCS_CKM.2.1 The TSF shall **perform** cryptographic **key establishment** in accordance with a specified cryptographic key **establishment** method: [

- Elliptic curve-based key establishment schemes that meet the following: NIST Special Publication 800-56A Revision 3, “Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography”.

] ~~that meets the following: [assignment: *list of standards*~~].

5.3.3. FCS_CKM.4 – Cryptographic Key Destruction

FCS_CKM.4.1 The TSF shall destroy cryptographic keys in accordance with a specified cryptographic key destruction method

- *For plaintext keys in volatile storage, the destruction shall be executed by a* [single overwrite consisting of [zeroes, a new value of the key]]*;*
- *For plaintext keys in non-volatile storage, the destruction shall be executed by the invocation of an interface provided by a part of the TSF that* [
    - logically addresses the storage location of the key and performs a [single-pass]overwrite consisting of [zeroes, a new value of the key]]*;*

  that meets the following: *No Standard.*

5.3.4. FCS_COP.1/DataEncryption – Cryptographic Operation (AES Data Encryption/Decryption)

FCS_COP.1.1/DataEncryption The TSF shall perform *encryption/decryption* in accordance with a specified cryptographic algorithm *AES used in* [CBC, GCM] *mode* and cryptographic key sizes [256 bits] that meet the following: *AES as specified in ISO 18033-3,* **[**CBC as specified in ISO 10116, GCM as specified in ISO 19772].

5.3.5. FCS_COP.1/SigGen – Cryptographic Operation (Signature Generation and Verification)

FCS_COP.1.1/SigGen The TSF shall perform *cryptographic signature services (generation and verification*) in accordance with a specified cryptographic algorithm

[

- RSA Digital Signature Algorithm,
- Elliptic Curve Digital Signature Algorithm

]

and cryptographic key sizes [

- For RSA: [*3072 bits*],
- For ECDSA: *[384 bits*]

]

that meet the following:

[

- For RSA schemes: FIPS PUB 186-4, “Digital Signature Standard (DSS)”, Section 5.5, using PKCS #1 v2.1 Signature Schemes RSASSA-PSS and/or RSASSA-PKCS1v1_5; ISO/IEC 9796-2, Digital signature scheme 2 or Digital Signature scheme 3,
- For ECDSA schemes implementing [P-384] curves that meet the following: FIPS PUB 186-4, 'Digital Signature Standard (DSS)', Section 6 and Appendix D, Implementing 'NIST Recommended' curves; or FIPS PUB 186-5, 'Digital Signature Standard (DSS)', Section 6 and NIST SP 800-186 Section 3.2.1, Implementing Weierstrass curves; or ISO/IEC 14888-3, 'IT Security techniques - Digital signatures with appendix - Part 3: Discrete logarithm based mechanisms', Section 6.6

].

5.3.6. FCS_COP.1/Hash – Cryptographic Operation (Hash Algorithm)

FCS_COP.1.1/Hash The TSF shall perform *cryptographic hashing services* in accordance with a specified cryptographic algorithm [SHA-256, SHA-512] ~~and cryptographic key sizes [*assignment: cryptographic key sizes*~~] and **message digest sizes** [**256, 512**] **bits** that meet the following: *ISO/IEC 10118-3:2004.*

5.3.7. FCS_COP.1/KeyedHash – Cryptographic Operation (Keyed Hash Algorithm)

FCS_COP.1.1/KeyedHash The TSF shall perform *keyed-hash message authentication* in accordance with a specified cryptographic algorithm [*HMAC-SHA-256, implicit*] and cryptographic key sizes [*256*] **and message digest sizes** [**256**] **bits** that meet the following: *ISO/IEC 9797-2:2011, Section 7 “MAC Algorithm 2”*.

5.3.8. FCS_IPSEC_EXT.1 IPsec Protocol

FCS_IPSEC_EXT.1.1 The TSF shall implement the IPsec architecture as specified in RFC 4301.

FCS_IPSEC_EXT.1.2 The TSF shall have a nominal, final entry in the SPD that matches anything that is otherwise unmatched and discards it.

FCS_IPSEC_EXT.1.3 The TSF shall implement [tunnel mode, transport mode].

FCS_IPSEC_EXT.1.4 The TSF shall implement the IPsec protocol ESP[1] as defined by RFC 4303 using the cryptographic algorithms [AES-GCM-256 (RFC 4106)] together with a Secure Hash Algorithm (SHA)-based HMAC [no HMAC algorithm].

FCS_IPSEC_EXT.1.5 The TSF shall implement the protocol: [

- IKEv2 as defined in RFC 7296 and [with no support for NAT traversal], and [RFC 4868 for hash functions]

].

FCS_IPSEC_EXT.1.6 The TSF shall ensure the encrypted payload in the [IKEv2] protocol uses the cryptographic algorithms [AES-GCM-256 (specified in RFC 5282)].

FCS_IPSEC_EXT.1.7 The TSF shall ensure that [

- IKEv2 SA lifetimes can be configured by a Security Administrator based on
[
    - length of time, where the time values can be configured between [*2 minutes*] and [*24 hours*];

[1] ESP – Encapsulating Security Protocol

]

].

FCS_IPSEC_EXT.1.8 The TSF shall ensure that [

- IKEv2 Child SA lifetimes can be configured by a Security Administrator based on

[

  - number of bytes
  - length of time, where the time values can be configured between [*2 minutes*] and [*720 hours*];

]

].

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 [*384 (for DH Group 20)*] bits.

FCS_IPSEC_EXT.1.10 The TSF shall generate nonces used in [IKEv2] exchanges of length [

- at least 128 bits in size and at least half the output size of the negotiated pseudorandom function (PRF) hash

].

FCS_IPSEC_EXT.1.11 The TSF shall ensure that IKE protocols implement DH Group(s) [[20 (384-bit Random ECP)] according to RFC 5114.

].

FCS_IPSEC_EXT.1.12 The TSF shall be able to ensure that the strength of the symmetric algorithm (in terms of the number of bits in the key) negotiated to protect the [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 [IKEv2 CHILD_SA] connection.

FCS_IPSEC_EXT.1.13 The TSF shall ensure that all IKE protocols perform peer authentication using [RSA] that use X.509v3 certificates that conform to RFC 4945 and [no other method].

FCS_IPSEC_EXT.1.14 The TSF shall only establish a trusted channel if the presented identifier in the received certificate matches the configured reference identifier, where the presented and reference identifiers are of the following fields and types: [SAN: IP address, SAN: Fully Qualified Domain Name (FQDN)] and [no other reference identifier types].

***Application Note**: Per the [NDcPP] a SHA-based HMAC is not required in FCS_IPSEC_EXT.1.4 for AES-GCM since AES-GCM satisfies both confidentiality and integrity functions. The selection of "no HMAC algorithm" applies to AES-GCM-256.*

5.3.9. FCS_RBG_EXT.1 – Random Bit Generation

FCS_RBG_EXT.1.1 The TSF shall perform all deterministic random bit generation services in accordance with ISO/IEC 18031:2011 using [CTR_DRBG (AES)].

FCS_RBG_EXT.1.2 The deterministic RBG shall be seeded by at least one entropy source that accumulates entropy from [[*1*] software-based noise source] with a minimum of [*256 bits*] of entropy at least equal to the greatest security strength, according to ISO/IEC 18031:2011 Table C.1 "Security Strength Table for Hash Functions", of the keys and hashes that it will generate.

5.3.10. FCS_SSH_EXT.1 – SSH Protocol

FCS_SSH_EXT.1.1 The TOE shall implement SSH acting as a [*server*] in accordance with that complies with RFCs 4251, 4252, 4253, 4254, [*5647, 5656, 6668*] and [no other standard].

FCS_SSH_EXT.1.2 The TSF shall ensure that the SSH protocol implementation supports the following authentication methods: [

- *"password" (RFC 4252),*
- *"publickey" (RFC 4252): [*
  - *ecdsa-sha2-nistp384 (RFC 5656),*

  ]

] and no other methods.

FCS_SSH_EXT.1.3 The TSF shall ensure that, as described in RFC 4253, packets greater than [*65,806 bytes*] in an SSH transport connection are dropped.

FCS_SSH_EXT.1.4 The TSF shall protect data in transit from unauthorised disclosure using the following mechanisms: [

- aes256-cbc (RFC 4253),
- aes256-gcm@openssh.com (RFC 5647)

] and no other mechanisms.

FCS_SSH_EXT.1.5 The TSF shall protect data in transit from modification, deletion, and insertion using: [

- hmac-sha2-256 (RFC 6668),
- implicit

] and no other mechanisms.

FCS_SSH_EXT.1.6 The TSF shall establish a shared secret with its peer using: [

- ecdh-sha2-nistp384 (RFC 5656),

] and no other mechanisms.

FCS_SSH_EXT.1.7 The TSF shall use SSH KDF as defined in [

- RFC 5656 (Section 4)

] to derive the following cryptographic keys from a shared secret: session keys.

FCS_SSH_EXT.1.8 The TSF shall ensure that [

- a rekey of the session keys,

] occurs when any of the following thresholds are met:

- one hour connection time
- no more than one gigabyte of transmitted data, or
- no more than one gigabyte of received data.

5.3.11. FCS_SSHS_EXT.1 – SSH Server Protocol

FCS_SSHS_EXT.1.1 The TSF shall authenticate itself to its peer (SSH Client) using: [

- *ecdsa-sha2-nistp384 (RFC 5656)*,

].

5.4. Class: Identification and Authentication (FIA)

5.4.1. FIA_AFL.1 – Authentication Failure Handling (Refinement)

FIA_AFL.1.1 The TSF shall detect when an Administrator configurable positive integer within [*1-25*] unsuccessful authentication attempts occur related to *Administrators attempting to authenticate remotely using a password*.

FIA_AFL.1.2 When the defined number of unsuccessful authentication attempts has been met, the TSF shall [prevent the offending Administrator from successfully establishing remote session using any authentication method that involves a password until [*unblocking action*] is taken by an Administrator; prevent the offending Administrator from successfully establishing remote session using any authentication method that involves a password until an Administrator defined time period has elapsed].

5.4.2. 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: [“!”, “@”, “#”, “$”, “%”, “^”, “&”, “*”, “(“, “)” [*Additional Special Characters listed in Table 14*]];

Table 14. Additional Password Special Characters

Special Character	Name
	Space
;	Semicolon
:	Colon
"	Double Quote
‘	Single Quote
|	Vertical Bar
+	Plus
-	Minus
=	Equal Sign
.	Period
,	Comma
/	Slash
\	Backslash
<	Less Than
>	Greater Than
_	Underscore

`	Grave accent (backtick)
~	Tilde
{	Left Brace
}	Right Brace

2. Minimum password length shall be configurable to between [1] and [*127*] characters.

5.4.3. 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;
- [no other actions]

FIA_UIA_EXT.1.2 The TSF shall require each administrative user to be successfully identified and authenticated before allowing any other TSF-mediated action on behalf of that administrative user.

FIA_UIA_EXT.1.3 The TSF shall provide the following remote authentication mechanisms [SSH password, SSH public key] and [no other mechanism]. The TSF shall provide the following local authentication mechanisms [password-based].

FIA_UIA_EXT.1.4 The TSF shall authenticate any administrative user's claimed identity according to each authentication mechanism specified in FIA_UIA_EXT.1.3.

5.4.4. 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**.

5.4.5. FIA_X509_EXT.1/Rev – X.509 Certificate Validation

FIA_X509_EXT.1.1/Rev The TSF shall validate certificates in accordance with the following rules:

- RFC 5280 certificate validation and certificate path validation **supporting a minimum path length of three certificates.**
- The certificate path must terminate with a trusted CA certificate designated as a trust anchor.
- The TSF shall validate a certification path by ensuring that all CA certificates in the certification path contain the basicConstraints extension with the CA flag set to TRUE.
- The TSF shall validate the revocation status of the certificate using [a Certificate Revocation List (CRL) as specified in RFC 5759 Section 5].
- The TSF shall validate the extendedKeyUsage field according to the following rules:
    - Certificates used for trusted updates and executable code integrity verification shall have the Code Signing purpose (id-kp 3 with OID 1.3.6.1.5.5.7.3.3) in the extendedKeyUsage field.
    - Server certificates presented for TLS shall have the Server Authentication purpose (id-kp 1 with OID 1.3.6.1.5.5.7.3.1) in the extendedKeyUsage field.
    - Client certificates presented for TLS shall have the Client Authentication purpose (id-kp 2 with OID 1.3.6.1.5.5.7.3.2) in the extendedKeyUsage field.

- OCSP certificates presented for OCSP responses shall have the OCSP Signing purpose (id-kp 9 with OID 1.3.6.1.5.5.7.3.9) in the extendedKeyUsage field.

FIA_X509_EXT.1.2/Rev The TSF shall only treat a certificate as a CA certificate if the basicConstraints extension is present and the CA flag is set to TRUE.

5.4.6. FIA_X509_EXT.2 – X.509 Certificate Authentication

FIA_X509_EXT.2.1 The TSF shall use X.509v3 certificates as defined by RFC 5280 to support authentication for [IPsec], and [no additional uses].

FIA_X509_EXT.2.2 When the TSF cannot establish a connection to determine the validity of a certificate, the TSF shall [not accept the certificate].

5.4.7. FIA_X509_EXT.3 – X.509 Certificate Requests

FIA_X509_EXT.3.1 The TSF shall generate a Certificate Request as specified by RFC 2986 and be able to provide the following information in the request: public key and [Common Name, Organization, Organizational Unit, Country].

FIA_X509_EXT.3.2 The TSF shall validate the chain of certificates from the Root CA upon receiving the CA Certificate Response.

5.5. Class: Security Management (FMT)

5.5.1. FMT_MOF.1/ManualUpdate – Management of Security Functions Behavior

FMT_MOF.1.1/ManualUpdate The TSF shall restrict the ability to enable the functions *to perform manual update* to *Security Administrators*.

5.5.2. FMT_MTD.1/CoreData – Management of TSF Data

FMT_MTD.1.1/CoreData The TSF shall restrict the ability to *manage* the *TSF data* to *Security Administrators*.

5.5.3. FMT_MTD.1/CryptoKeys – Management of TSF Data

FMT_MTD.1.1/CryptoKeys The TSF shall restrict the ability to *manage* the *cryptographic keys to Security Administrators*.

5.5.4. FMT_SMF.1 – Specification of Management Functions

FMT_SMF.1.1 The TSF shall be capable of performing the following management functions:

- *Ability to administer the TOE remotely;*
- *Ability to configure the access banner;*
- *Ability to configure the remote session inactivity time before session termination;*
- *Ability to update the TOE, and to verify the updates using [digital signature] capability prior to installing those updates;*

  [

  - *Ability to configure local audit behaviour (e.g. changes to storage locations for audit; changes to behaviour when local audit storage space is full, changes to local audit storage size);*
  - *Ability to manage the cryptographic keys;*
  - *Ability to configure the cryptographic functionality;*

- *Ability to configure thresholds for SSH rekeying*;
- *Ability to configure the lifetime for IPsec SAs*;
- *Ability to re-enable an Administrator account*;
- *Ability to set the time which is used for time-stamps*;
- *Ability to configure the reference identifier for the peer*;
- *Ability to manage the TOE's trust store and designate X509.v3 certificates as trust anchors*;
- *Ability to import X.509v3 certificates to the TOE's trust store;*
- *Ability to generate Certificate Signing Request (CSR) and process CA certificate response*;
- *Ability to administer the TOE locally;*
- *Ability to configure the local session inactivity time before session termination or locking;*
- *Ability to configure the authentication failure parameters for FIA_AFL.1*;
- *Ability to manage the trusted public keys database*

]

5.5.5. FMT_SMR.2 – Restrictions on Security Roles

FMT_SMR.2.1 The TSF shall maintain the roles:

- *Security 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

- *The Security Administrator role shall be able to administer the TOE remotely*

are satisfied.

Class: Protection of the TSF (FPT)

5.5.6. FPT_APW_EXT.1 – Protection of Administrator Passwords

FPT_APW_EXT.1.1 The TSF shall store administrative passwords in non-plaintext form.

FPT_APW_EXT.1.2 The TSF shall prevent the reading of plaintext administrative passwords.

5.5.7. FPT_SKP_EXT.1 – Protection of TSF Data (for reading of all pre-shared, symmetric and private keys)

FPT_SKP_EXT.1.1 The TSF shall prevent reading of all pre-shared keys, symmetric keys, and private keys.

5.5.8. FPT_STM_EXT.1 – Reliable Time Stamps

FPT_STM_EXT.1.1 The TSF shall be able to provide reliable time stamps for its own use.

FPT_STM_EXT.1.2 The TSF shall [allow the Security Administrator to set the time].

5.5.9. FPT_TST_EXT.1 – TSF Testing

FPT_TST_EXT.1.1 The TSF shall run a suite of the following self-tests:

- During initial start-up (on power on) to verify the integrity of the TOE firmware and software;
- Prior to providing any cryptographic services and [on-demand] to verify correct operation of cryptographic implementation necessary to fulfil the TSF;
- [no other] self tests [none]

to demonstrate the correct operation of the TSF.

FPT_TST_EXT.1.2 The TSF shall respond to all failures by [rebooting].

5.5.10. FPT_TUD_EXT.1 – Trusted Update

FPT_TUD_EXT.1.1 The TSF shall provide *Security Administrators* the ability to query the currently executing version of the TOE firmware/software and [the most recently installed version of the TOE firmware/software].

FPT_TUD_EXT.1.2 The TSF shall provide *Security Administrators* the ability to manually initiate updates to TOE firmware/software and [no other update mechanism].

FPT_TUD_EXT.1.3 The TSF shall provide means to authenticate firmware/software updates to the TOE using a [digital signature] prior to installing those updates.

5.6. Class: TOE Access (FTA)

5.6.1. FTA_SSL_EXT.1 – TSF-initiated Session Locking

FTA_SSL_EXT.1.1 The TSF shall, for local interactive sessions, [terminate the session] after a Security Administrator-specified time period of inactivity.

5.6.2. 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*.

5.6.3. FTA_SSL.4 – User-initiated Termination

FTA_SSL.4.1 The TSF shall allow ~~user~~ **Administrator**-initiated termination of the ~~user's~~ **Administrator**'s own interactive session.

5.6.4. FTA_TAB.1 – Default TOE Access Banners

FTA_TAB.1.1 Before establishing ~~a~~ **an administrative** user session the TSF shall display **a Security Administrator-specified** advisory **notice and consent** warning message regarding ~~unauthorised~~ use of the TOE.

5.7. Class: Trusted Path/Channels (FTP)

5.7.1. FTP_ITC.1 – Inter-TSF Trusted Channel

FTP_ITC.1.1 The TSF shall **be capable of using** [IPsec] **to** provide a **trusted** communication channel between itself and ~~another trusted IT product~~ **authorized IT entities supporting the following capabilities: audit server,** [***no other capabilities***] that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from ~~modification or~~ disclosure **and detection of modification of the channel data**.

FTP_ITC.1.2 The TSF shall permit [*the TSF*] to initiate communication via the trusted channel.

FTP_ITC.1.3 The TSF shall initiate communication via the trusted channel for [

- *Syslog server over IPsec*

]

5.7.2. FTP_TRP.1/Admin – Trusted Path

FTP_TRP.1.1/Admin The TSF shall **be capable of using** [SSH] **to** provide a communication path between itself and **authorized** remote **Administrators** ~~users~~ 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 provides detection of modification of the channel data**.

FTP_TRP.1.2/Admin The TSF shall permit remote **Administrators** ~~users~~ to initiate communication via the trusted path.

FTP_TRP.1.3/Admin The TSF shall require the use of the trusted path for *initial Administrator authentication and all remote administration actions*.

5.8. TOE SFR Dependencies Rationale

The Security Functional Requirements included in the ST represent all mandatory, optional, and selection-based SFRs specified in [NDcPP] and [PKG_SSH_v1.0] against which exact compliance is claimed.

All dependency rationale in the ST are considered to be identical to those that are defined in the claimed PP.

5.9. TOE SFR Dependencies Rationale

The TOE assurance requirements for this ST are taken directly from the NDcPP which are derived from [CC_PART3]. The assurance requirements are summarized in the table below.

Table 15. Assurance Requirements

Assurance Class	Components	Description
Security Target (ASE)	ASE_CCL.1	Conformance claims
	ASE_ECD.1	Extended components definition
	ASE_INT.1	ST introduction
	ASE_OBJ.1	Security objectives for the operational environment
	ASE_REQ.1	Stated security requirements
	ASE_SPD.1	Security Problem Definition
	ASE_TSS.1	TOE summary specification
Development (ADV)	ADV_FSP.1	Basic functional specification
Guidance Documents (AGD)	AGD_OPE.1	Operational user guidance
	AGD_PRE.1	Preparative procedures
Life Cycle Support (ALC)	ALC_CMC.1	Labeling of the TOE
	ALC_CMS.1	TOE CM coverage

	ALC_FLR.2	Flaw Reporting Procedures
Tests (ATE)	ATE_IND.1	Independent testing – conformance
Vulnerability Assessment (AVA)	AVA_VAN.1	Vulnerability survey

5.10. TOE SFR Dependencies Rationale

[NDcPP] contains all the requirements claimed in this Security Target. As such the dependencies are not applicable since the PPs themselves have been approved.

5.11. Security Assurance Requirements Rationale

The Security Assurance Requirements (SARs) in this Security Target represent the SARs identified in the [NDcPP] and [PKG_SSH_v1.0]. As such, the [NDcPP] and [PKG_SSH_v1.0] SAR rationale is deemed acceptable since the PPs themselves have been approved.

5.12. Assurance Measures

The TOE satisfies the identified assurance requirements. The table below identifies the Assurance Measures applied by Cisco to satisfy the assurance requirements.

Table 16. Assurance Measures

Assurance Component	Rationale
ASE_INT.1 ASE_CCL.1 ASE_OBJ.1 ASE_ECD.1 ASE_REQ.1 ASE_SPD.1 ASE_TSS.1	Cisco provided this Security Target document.
ADV_FSP.1	No additional “functional specification” documentation was provided by Cisco to satisfy the Evaluation Activities.
AGD_OPE.1 AGD_PRE.1	Cisco will provide the guidance documents with the ST.
ALC_CMC.1 ALC_CMS.1	Cisco will identify the TOE such that it can be distinguished from other products or versions from the Cisco and can be easily specified when being procured by an end user.
ALC_FLR.2	Cisco will provide the flaw remediation and reporting procedures to document how TOE users can submit security flaw reports to the developer and how the security flaw reports will be appropriately acted upon.
ATE_IND.1	Cisco will provide the TOE for testing.
AVA_VAN.1	Cisco will provide the TOE for Vulnerability Analysis.

6. TOE Summary Specification

The table below identifies and describes how the Security Functional Requirements identified above are met by the TOE.

Table 17. TSS Rationale

<table>
<tr><th>TOE SFRs</th><th>How the SFR is Met</th></tr>
<tr><td>FAU_GEN.1</td><td>The TOE generates an audit record whenever an audited event occurs. The types of events that cause audit records to be generated include start-up and shut-down of the audit mechanism cryptography related events, identification and authentication related events, and administrative events (the specific events and the contents of each audit record are listed in Table 13 above.
Each of the events is specified in the audit record is in enough detail to identify the user for which the event is associated, when the event occurred, where the event occurred, the outcome of the event, and the type of event that occurred such as generating keys, including the key identifier. Additionally, the start-up and shut-down of the audit functionality is audited.
The audit trail consists of the individual audit records; one audit record for each event that occurred. The audit record can contain up to 80 characters and a percent sign (%), which follows the time-stamp information. As noted above, the information includes at least all the required information. Additional information can be configured.</td></tr>
<tr><td>FAU_GEN.2</td><td>The TOE shall ensure that each auditable event is associated with the user that triggered the event and as a result, they are traceable to a specific user. For example, a human user, user identity or related session ID would be included in the audit record. For an IT entity or device, the IP address, MAC address, host name, or other configured identification is presented.</td></tr>
<tr><td>FAU_STG_EXT.1</td><td>The TOE is a standalone device configured to export syslog records to a specified, external syslog server in real-time. The TOE protects communications with an external syslog server using IPsec. If the IPsec connection fails, the TOE will store audit records on the TOE when it discovers it can no longer communicate with its configured syslog server. When the connection is restored, the TOE will transmit the buffer contents to the syslog server.
For audit records stored internally to the TOE the audit records are stored in a non-persistent circular log file where the TOE overwrites the oldest audit records when the audit trail becomes full. The size of the logging files on the TOE is configurable by the Administrator with the minimum value being 4096 (default) to 2,147,483,647 bytes of available disk space. Refer to the Common Criteria Operational User Guidance and Preparative Procedures for command description and usage information.
Only Authorized Administrators can clear the local logs, and local audit records are stored in a directory that does not allow Administrators to modify the contents.</td></tr>
<tr><td>FCS_CKM.1</td><td rowspan="2">The following table describes the key generation algorithms the TOE implements to generate asymmetric keys used for <b>device authentication</b>:
<table>
<tr><th>Scheme</th><th>Standard</th><th>Key Size/
NIST Curve</th><th>SFR</th><th>Service</th></tr>
<tr><td>ECDSA</td><td>FIPS PUB 186-4</td><td>384</td><td>FCS_SSHS_EXT.1</td><td>SSH Remote Administration</td></tr>
<tr><td>RSA</td><td>FIPS PUB 186-4</td><td>3072</td><td>FCS_IPSEC_EXT.1</td><td>Transmit generated audit data to an external IT entity</td></tr>
</table>
With the exception to SSH, the keys are used to generate certificate signing requests (CSRs) in which the public key is associated with an X.509 certificate.
The following table shows the key generation algorithms the TOE implements to generate asymmetric keys used for <b>key establishment</b>:
<table>
<tr><th>Scheme</th><th>Standard</th><th>Key Size/
NIST Curve</th><th>SFR</th><th>Service</th></tr>
<tr><td>ECC</td><td>FIPS PUB 186-4</td><td>DH Group 20 (P-384)</td><td>FCS_IPSEC_EXT.1</td><td>Transmit generated audit data to an external IT entity</td></tr>
</table>
</td></tr>
<tr><td>FCS_CKM.2</td></tr>
</table>

<table>
<tr><th>TOE SFRs</th><th>How the SFR is Met</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td></td><td>P-384</td><td>FCS_SSHS_EXT.1</td><td>SSH Remote Administration</td></tr>
</table>
The following table shows the methods the TOE implements for <b>key establishment</b>:
<table>
<tr><th>Scheme</th><th>Standard</th><th>SFR</th><th>Service</th></tr>
<tr><td>EC-DH</td><td>NIST SP 800-56A Revision 3</td><td>FCS_IPSEC_EXT.1</td><td>Transmit generated audit data to an external IT entity</td></tr>
<tr><td></td><td></td><td>FCS_SSHS_EXT.1</td><td>SSH Remote Administration</td></tr>
</table>
</td></tr>
<tr><td>FCS_CKM.4</td><td>The TOE meets all requirements specified in FIPS 140-2 for destruction of keys and Critical Security Parameters (CSPs) when no longer required for use. See section 6.1 for additional details on key zeroization.</td></tr>
<tr><td>FCS_COP.1/DataEncryption</td><td>The TOE provides symmetric encryption and decryption capabilities using AES in CBC mode and GCM mode using 256 bit keys as described in ISO/IEC 18033-3, ISO/IEC 10116, and ISO/IEC 19772. AES is implemented in the SSH and IPsec protocols. Refer to Table 19 for the FIPS validated algorithm certificate numbers.</td></tr>
<tr><td>FCS_COP.1/SigGen</td><td>The TOE provides cryptographic signature services using a RSA Digital Signature Algorithm with key size of 3072 and ECDSA Digital Signature algorithm with curve P-384 as specified in FIPS PUB 186-4. Refer to Table 19 for the FIPS validated algorithm certificate numbers.</td></tr>
<tr><td>FCS_COP.1/Hash
FCS_COP.1/KeyedHash</td><td>The TOE provides cryptographic hashing services using SHA-256 and SHA-512 as specified in ISO/IEC 10118-3:2004 (with key sizes and message digest sizes of 256 and 512 bits respectively).
The TOE provides keyed-hashing message authentication services using HMAC-SHA-256 that operates on 512-bit blocks of data, with key size and message digest size of 256 bits as specified in ISO/IEC 9797-2:2011, Section 7 “MAC Algorithm 2”.
SHA-512 hashing is used for verification of software image integrity.
Refer to Table 19 for the FIPS validated algorithm certificate numbers.</td></tr>
<tr><td>FCS_IPSEC_EXT.1</td><td>The TSF implements IPsec to provide authentication and encryption services to prevent unauthorized viewing or modification of syslog authentication data as it travels over the external network. The TSF’s implementation of the IPsec standard (in accordance with the RFCs noted in the SFR) uses the Internet Key Exchange version 2 (IKEv2) protocol and the Encapsulating Security Payload (ESP) protocol to provide authentication and encryption supporting the following algorithms:
■ AES-GCM-256
The TOE supports both transport and tunnel mode for IPsec communications between the TOE and an external audit server.
The administrator defines the traffic that needs to be protected between two IPsec peers by configuring access lists and applying these access lists to interfaces using crypto map sets. A crypto map set can contain multiple entries, each with a different access list. The crypto map entries are searched in a sequence--the router attempts to match the packet to the access list specified in that entry.
When a packet matches a permit entry in a particular access list, and the corresponding crypto map entry is tagged connections are established, if necessary. If the crypto map entry is tagged as ipsec-isakmp, IPsec is triggered. If there is no SA that the IPsec can use to protect this traffic to the peer, IPsec uses IKE to negotiate with the remote peer to set up the necessary IPsec SAs on behalf of the data flow. The negotiation uses information specified in the crypto map entry as well as the data flow information from the specific access list entry.
Once established, the set of SAs (outbound to the peer) is then applied to the triggering packet and to subsequent applicable packets as those packets exit the Switch. "Applicable" packets are packets that</td></tr>
</table>

TOE SFRs	How the SFR is Met
	match the same access list criteria that the original packet matched. For example, all applicable packets could be encrypted be-fore being forwarded to the remote peer. The corresponding inbound SAs are used when processing the incoming traffic from that peer. Access lists associated with IPsec crypto map entries also represent the traffic that the Switch needs protected by IPsec. Inbound traffic is processed against crypto map entries. if an unprotected packet matches a permit entry in a particular access list associated with an IPsec crypto map entry, that packet is dropped because it was not sent as an IPsec-protected packet. The traffic matching the permit ACLs would then flow through the IPsec tunnel and be classified as “PROTECTED”. Traffic that does not match a permit ACL in the crypto map, but that is not disallowed by other ACLs on the interface is allowed to BYPASS the tunnel. Traffic that does not match a permit ACL and is also blocked by other non-crypto ACLs on the interface would be DISCARDED. Rules applied to an access control list can be applied to either inbound or outbound traffic. IPsec Internet Key Exchange, also called ISAKMP, is the negotiation protocol that lets two peers agree on how to build an IPsec Security Association (SA). The strength of the symmetric algorithm negotiated to protect the IKEv2 IKE_SA connection is greater than or equal to the strength of the symmetric algorithm negotiated to protect the IKEv2 CHILD_SA connection. The IKE protocols implement Peer Authentication using RSA X.509v3 certificates. IKE separates negotiation into two phases: IKEv2 SA and IKEv2 Child SA. The IKEv2 SA creates the first tunnel, which protects later ISAKMP negotiation messages. The key negotiated during the IKEv2 SA enables IKE peers to negotiate IKE v2 Child SA and establishes the IPsec SA to communicate securely. IKE maintains a trusted channel, referred to as a Security Association (SA), between IPsec peers that is also used to manage IPsec connections, including: ■ The negotiation of mutually acceptable IPsec options between peers (including signature based authentication parameters), ■ The establishment of additional Security Associations to protect packets flows using Encapsulating Security Payload (ESP), and ■ The agreement of secure bulk data encryption AES keys for use with ESP. The resulting potential strength of the symmetric key will be 256 bits of security. As part of this negotiation, the TOE verifies that the negotiated IKE Child SA symmetric algorithm key strength is at most as large as the negotiated IKE SA key strength as configured on the TOE and peer via an explicit check. Each IKE negotiation begins by agreement of both peers on a common (shared) IKE policy. This policy states which security parameters will be used to protect subsequent IKE negotiations and mandates how the peers are authenticated. The Security Administrator can configure multiple, prioritized policies on each peer, each with a different combination of parameter values. However, at least one of these policies must contain exactly the same encryption, hash, authentication, and Diffie-Hellman parameter values as one of the policies on the remote peer. For each policy created, the Security Administrator assign's a unique priority (1 through 10,000, with 1 being the highest priority). When the IKE negotiation begins, IKE searches for an IKE policy that is the same on both peers. The peer that initiates the negotiation will send all its policies to the remote peer, and the remote peer will try to find a match. The remote peer looks for a match by comparing its own highest priority policy against the policies received from the other peer. The remote peer checks each of its policies in order of its priority (highest priority first) until a match is found. After the two peers agree upon a policy, the security parameters of the policy are identified by an SA established at each peer, and these IKE SAs apply to all subsequent IKE traffic during the negotiation. When a packet is processed by the TOE and it determines it requires IPsec, it uses active SA settings or creates new SAs for initial connections with the IPsec peer.

TOE SFRs	How the SFR is Met
	The TOE supports IKEv2 session establishment. The TOE supports configuration of session lifetimes for both IKEv2 SAs and IKEv2 Child SAs using the command "lifetime." The time values for IKEv2 SAs can be configured between 2 minutes and 24 hours. The time values for IKEv2 Child SAs can be configured between 2 minutes and 720 hours. The IKEv2 Child SA lifetimes can also be configured by an Administrator based on number of bytes. The TOE supports Diffie-Hellman Group 20. The TSF generates the secret value 'x' used in the IKEv2 Diffie-Hellman key exchange ('x' in g^x mod p) using the NIST approved DRBG specified in FCS_RBG_EXT.1 and having possible lengths of 384 bits. The TOE generates nonces used in IKEv2 exchanges, of at least 128 bits in size and at least half the output size of the negotiated pseudorandom function (PRF) hash. When a random number is needed for a nonce, the probability that a specific nonce value will be repeated during the life a specific IPsec SA is less than 1 in 2^{128}. The nonce is likewise generated using the CTR-DRBG. The TOE supports authentication of IPsec peers using RSA X.509 certificates. The TOE validates the presented identifier provided supporting the following fields and types: SAN: IP address, SAN: Fully Qualified Domain Name (FQDN). Certificate maps provide the ability for a certificate to be matched with a given set of criteria. The Administrator is instructed in the CC Configuration Guide to specify one or more certificate fields together with their matching criteria and the value to match. In the evaluated configuration, the field name must specify the SAN (alt-subject-name) field. Match criteria should be "eq" for equal. SAN example: alt-subject-name eq <peer.cisco.com> The TOE will reject the IKE connection in any of these situations: 1) If the data ID Payload for any of those ID Types does not match the peer's certificate exactly; 2) If an ID Payload is not provided by the peer; 3) If multiple ID Types are provided in the ID Payload.
FCS_RBG_EXT.1	The TOE implements a NIST-approved CTR-DRBG, as specified in ISO/IEC 18031:2011 seeded by an entropy source that accumulates entropy from a software-based noise source. The DRBG is seeded with a minimum of 256 bits of entropy, which is at least equal to the greatest security strength of the keys and hashes that it will generate.
FCS_SSH_EXT.1 FCS_SSHS_EXT.1	The TSF implements SSHv2 conformant to RFCs 4251, 4252, 4253, 4254, 5647, 5656, and 6668 to provide a secure command line interface for remote administration. SSHv2 connections will be dropped if the TOE receives a packet larger than 65,806 bytes. Large packets are detected by the SSHv2 implementation and dropped internal to the SSH process. The TSF's SSH transport implementation supports the following encryption algorithms: ■ aes256-cbc ■ aes256-gcm@openssh.com When aes256-gcm@openssh.com is used as the encryption algorithm the MAC algorithm is implicit. All connection attempts from remote SSH clients requesting any other encryption algorithm is denied. The TSF's SSH transport implementation supports the following MAC algorithms: ■ hmac-sha2-256 All connection attempts from remote SSH clients requesting any other MAC algorithm is denied. The TSF's SSH transport implementation supports the following public-key algorithms for Hostkey (peer) authentication and client authentication: ■ ecdsa-sha2-nistp384 The public-key algorithm is consistent with the ECDSA digital signature algorithm in FCS_COP.1/SigGen.

TOE SFRs	How the SFR is Met
	When the SSH client presents a public key, the TSF verifies it matches the one configured for the Administrator account. If the presented public key does not match the one configured for the Administrator account, access is denied. Password based authentication is also supported. The TSF’s SSH key exchange implementation supports the following key exchange algorithm: ■ ecdh-sha2-nistp384 The TOE derives cryptographic session keys via shared secret using SSH KDF as defined in RFC 5656 (Section 4). The TSF's SSH implementation will perform a rekey after no longer than one hour or more than one gigabyte of data has been transmitted with the same session key. Both thresholds are checked. Rekeying is performed upon reaching whichever threshold is met first. The Administrator can configure lower rekey values if desired. The minimum time value is 10 minutes. The minimum volume value is 100 kilobytes.
FIA_AFL.1	To block password-based brute force attacks, the TOE uses an internal AAA function to detect and track failed login attempts. When an account attempting to log into an administrative interface reaches the set maximum number of failed authentication attempts, the account will not be granted access until the time period has elapsed or until the Administrator manually unblocks the account. The TOE provides the Administrator the ability to specify the maximum number of unsuccessful authentication attempts before an offending account will be blocked. The TOE also provides the ability to specify the time period to block offending accounts. To avoid a potential situation where password failures made by Administrators leads to no Administrator access until the defined blocking time period has elapsed, the CC Configuration Guide instructs the Administrator to configure the TOE for SSH public key authentication which is not subjected to password-based brute force attacks. During the block out period, the TOE provides the ability for the Administrator account to login remotely using SSH public key authentication.
FIA_PMG_EXT.1	The TOE supports the local definition of users with corresponding passwords. The passwords can be composed of any combination of upper and lower case letters, numbers, and special characters that include: “!”, “@”, “#”, “$”, “%”, “^”, “&”, “*”, “(“, “)” and other special characters listed in Table 14. Minimum password length is settable by the Authorized Administrator, and can be configured for minimum password lengths of 1 and maximum of 127 characters. A minimum password length of 8 is recommended.
FIA_UIA_EXT.1	The TOE requires all users to be successfully identified and authenticated before allowing any TSF mediated actions to be performed. Prior to being granted access, a login warning banner is displayed. Administrative access to the TOE is facilitated through a local password-based authentication mechanism and remote SSH password and public key authentication mechanisms on the TOE through which all Administrator actions are mediated. Once a potential (unauthenticated) administrative user attempts to access the TOE through an interactive administrative interface, the TOE prompts the user for a user name and password or SSH public key authentication. The TOE then either grants administrative access (if credentials are valid, and the account has not been locked) or indicates the login attempt was unsuccessful. The TOE does not provide a reason for failure in the cases of a login failure. A successful login is indicated by a hash sign (“#”) next to the device hostname. No access is allowed to the administrative functionality of the TOE until the administrator is successfully identified and authenticated.
FIA_UAU.7	When a user enters their password at the local console, the TOE does not echo any characters as the password is entered. For remote session authentication, the TOE does not echo any characters as they are entered.
FIA_X509_EXT.1/Rev	The TOE uses X.509v3 certificates to support authentication for IPsec connections. The TSF determines the validity of certificates at the time of authentication by ensuring that the certificate and the certificate path are valid in accordance with RFC 5280. The certificate path is validated by ensuring that all the CA certificates have the basicConstraints extension and the CA flag is set to TRUE and the certificate path must terminate with a trusted CA certificate.

TOE SFRs	How the SFR is Met
	CRL revocation checking is supported by the TOE. Revocation checking is performed on the leaf and intermediate certificate(s) when authenticating a certificate chain provided by the remote peer. There are no functional differences if a full certificate chain or only a leaf certificate is presented.
FIA_X509_EXT.2	The TOE determines which certificate to use based upon the trustpoint configured. The instructions for configuring trustpoints is provided in CC Configuration Guide. In the event that a network connection cannot be established to verify the revocation status of certificate for an external peer, the certificate will be rejected and the connection will not be established.
FIA_X509_EXT.3	A Certificate Request Message can be generated as specified by RFC 2986 and provide the following information in the request – Common Name(CN), Organization(O), Organizational Unit(OU), and Country(C). The TOE will validate the chain of certificates from the Root CA when the CA Certificate Response is received.
FMT_MOF.1/ManualUpdate FMT_MTD.1/CoreData FMT_MTD.1/CryptoKeys	The TOE provides the ability for Security Administrators to access TOE data, such as audit data, configuration data, security attributes, routing tables, and session thresholds and to perform manual updates to the TOE. Only Security Administrators can access the TOE's trust store. Each of the predefined and administratively configured roles has create (set), query, modify, or delete access to the TOE data, though with some privilege levels, the access is limited. The TOE performs role-based authorization, using TOE platform authorization mechanisms, to grant access to the privileged and semi-privileged roles. For the purposes of this evaluation, the privileged level is equivalent to full administrative access to the CLI, which is the default access for IOS-XE privilege level 15; and the semi-privileged level equates to any privilege level that has a subset of the privileges assigned to level 15. Privilege levels 0 and 1 are defined by default and are customizable, while levels 2-14 are undefined by default and customizable. The term "Authorized Administrator" is used in this ST to refer to any user that has been assigned to a privilege level that is permitted to perform the relevant action; therefore, has the appropriate privileges to perform the requested functions. The semi-privileged Administrators with only a subset of privileges may also manage and modify TOE data based on the privileges assigned. The TOE provides the ability for Authorized Administrators to access TOE data, such as audit data, configuration data, security attributes, session thresholds, cryptographic keys, and updates. Each of the predefined and administratively configured privilege levels has a set of permissions that will grant access to the TOE data, though with some privilege levels, the access is limited. The TOE does not provide automatic updates to the software version running on the TOE. The Authorized Administrator can query the software version running on the TOE and can initiate updates to (replacements of) software images. When software updates are made available by Cisco, the Authorized Administrators can obtain, verify the integrity of, and install those updates. The Authorized Administrator generates RSA key pairs to be used in the IPsec protocol and ECC key pairs to be used in the SSH protocol. Zeroization of these keys is provided in Table 18 below. Prior to authentication the TOE may be configured by the Administrator to display a customized login banner, which describes restrictions of use, legal agreements, or any other appropriate information to which users consent by accessing the TOE. No administrative functionality is available prior to administrative login. TOE Administrators can control (generate/delete) the following keys, RSA Key Pairs and SSH ECC Key Pairs by following the instruction in the AGD.
FMT_SMF.1	The TOE provides all capabilities necessary to securely manage the TOE and the services provided by the TOE. The management functionality of the TOE is provided through the TOE CLI. The Authorized Administrator can perform all management functions by accessing the TOE directly via connected console cable or remote administration via SSHv2 secure connection. The specific management capabilities available from the TOE include: • Ability to administer the TOE remotely; • Ability to configure the access banner; • Ability to configure the remote session inactivity time before session termination;

TOE SFRs	How the SFR is Met
	• Ability to update the TOE, and to verify the updates using a digital signature capability prior to installing those updates; • Ability to configure local audit behaviour (e.g. changes to storage locations for audit; changes to behaviour when local audit storage space is full, changes to local audit storage size); • Ability to manage the cryptographic keys; • Ability to configure the cryptographic functionality; • Ability to configure thresholds for SSH rekeying; • Ability to configure the lifetime for IPsec SAs; • Ability to re-enable an Administrator account; • Ability to set the time which is used for time-stamps; • Ability to configure the reference identifier for the peer; • Ability to manage the TOE's trust store and designate X509.v3 certificates as trust anchors; • Ability to import X.509v3 certificates to the TOE's trust store; • Ability to generate Certificate Signing Request (CSR) and process CA certificate response; • Ability to administer the TOE locally; • Ability to configure the local session inactivity time before session termination or locking; • Ability to configure the authentication failure parameters for FIA_AFL.1; • Ability to manage the trusted public keys database
FMT_SMR.2	The TOE maintains privileged and semi-privileged Administrator roles. The TOE performs role-based authorization, using TOE platform authorization mechanisms, to grant access to TOE functions. For the purposes of this evaluation, the privileged role is equivalent to full administrative access to the CLI, which is the default access for IOS-XE privilege level (PL) 15. Semi-privileged roles are assigned a PL of 0 – 14. PL 0 and 1 are defined by default and are customizable, while PL 2-14 are undefined by default and are also customizable. Note: Levels 0 – 14 are a subset of PL 15 and the levels are not hierarchical. The term “Authorized Administrator” is used in this ST to refer to any user which has been assigned to a privilege level that is permitted to perform the relevant action; therefore, has the appropriate privileges to perform the requested functions. The privilege level determines the functions the user can perform, hence the Authorized Administrator with the appropriate privileges. The TOE can and shall be configured to authenticate all access to the command line interface using a username and password. The TOE supports both local administration via a directly connected console cable and remote administration via SSHv2 secure connection.
FPT_APW_EXT.1	The TOE is designed specifically to not disclose any passwords stored in the TOE. All passwords are stored using a SHA-2 hash. ‘Show’ commands display only the hashed password. The CC Configuration Guide instructs the Administrator to use the algorithm-type scrypt sub-command when passwords are created or updated. The scrypt is password type 9 and uses a SHA-2 hash.
FPT_SKP_EXT.1	The TOE is designed specifically to not disclose any keys stored in the TOE. The TOE stores all private keys in a secure directory that cannot be viewed or accessed, even by the Administrator. The TOE stores symmetric keys only in volatile memory.
FPT_STM_EXT.1	The TSF implements a clock function to provide a source of date and time. The clock function is reliant on the system clock provided by the underlying hardware. All Switch models have a real-time clock (RTC) with battery to maintain time across reboots and power loss. The TOE relies upon date and time information for the following security functions: ■ To monitor local and remote interactive administrative sessions for inactivity (FTA_SSL_EXT.1, FTA_SSL.3); ■ Validating X.509 certificates to determine if a certificate has expired (FIA_X509_EXT.1/Rev); ■ To determine when IKEv2 SA lifetimes have expired and to initiate a rekey (FCS_IPSEC_EXT.1);

TOE SFRs	How the SFR is Met
	■ To determine when IPsec Child SA lifetimes have expired and to initiate a rekey (FCS_IPSEC_EXT.1); ■ To determine when SSH session keys have expired and to initiate a rekey (FCS_SSHS_EXT.1); ■ To provide accurate timestamps in audit records (FAU_GEN.1.2).
FPT_TUD_EXT.1	An Authorized Administrator can query the software version running on the TOE and can initiate updates to (replacements of) software images. The current active version can be verified by executing the “show version” command from the TOE’s CLI. When software updates are made available by Cisco, an Administrator can obtain, verify the integrity of, and install the updates. The updates can be downloaded from https://software.cisco.com/. Trusted updates can be installed on the TOE in a single stage or as a multi-stage process with a delayed activation. The inactive version will become active when the Administrator responds ‘y’ at the re-boot prompt. The updates can be downloaded from software.cisco.com. The TOE will authenticate the image using a digital signature verification check to ensure it has not been modified since distribution using the following process: Prior to being made publicly available, the software image is hashed using a SHA512 algorithm and then digitally signed. The digital signature is embedded to the image (hence the image is signed). The TOE uses a Cisco public key to validate the digital signature to obtain the SHA512 hash. The TOE then computes its own hash of the image using the same SHA512 algorithm and verifies the computed hash against the embedded hash. If they match the image has not been modified or tampered since distributed from Cisco meaning the software is authenticated and the image is ready to be activated automatically in the single stage upgrade or by the administrator in the multistage upgrade. If they do not match the image will not install.
FPT_TST_EXT.1	The TOE runs a suite of self-tests during initial start-up to verify correct operation of the cryptographic module. All ports are blocked from moving to forwarding state during the POST. If all components of all modules pass the POST, the system is placed in FIPS PASS state and ports are allowed to forward data traffic. If any of the tests fail, the system halts and a message is displayed to the local console. These tests include: ***AES Known Answer Test***: For the encrypt test, a known key is used to encrypt a known plain text value resulting in an encrypted value. This encrypted value is compared to a known encrypted value. If the encrypted texts match, the test passes; otherwise, the test fails. The decrypt test is just the opposite. In this test a known key is used to decrypt a known encrypted value. The resulting plaintext value is compared to a known plaintext value. If the decrypted texts match, the test passes; otherwise, the test fails. ***RSA Signature Known Answer Test (both signature/verification)***: This test takes a known plaintext value and Private/Public key pair and used the public key to encrypt the data. This value is compared to a known encrypted value. If the encrypted values, the test passes; otherwise, the test fails. The encrypted data is then decrypted using the private key. This value is compared to the original plaintext value. If the decrypted values match, the test passes; otherwise, the test fails. ***RNG/DRBG Known Answer Test:*** For this test, known seed values are provided to the DRBG implementation. The DRBG uses these values to generate random bits. These random bits are compared to known random bits. If the random bits match, the test passes; otherwise, the test fails. ***HMAC Known Answer Test:*** For each of the hash values listed, the HMAC implementation is fed known plaintext data and a known key. These values are used to generate a MAC. This MAC is compared to a known MAC. If the MAC values match, the test passes; otherwise, the test fails. ***Software Integrity Test:*** The Software Integrity Test uses HMAC-SHA256 verification to confirm the cryptographic module has maintained its integrity. The Software Integrity Test is run automatically when the module is loaded. ***SHA-256/384/512 Known Answer Test:*** For each of the values listed, the SHA implementation is fed known data and a key. These values are used to generate a hash. This hash is compared to a known value. If the hash values match, the test passes; otherwise, the test fails.

<table>
<tr><th>TOE SFRs</th><th>How the SFR is Met</th></tr>
<tr><td></td><td>If any component reports failure for the POST, the system crashes. Appropriate information is displayed on the screen and saved in the crashinfo file.
All ports are blocked during the POST. If all components pass the POST, the system is placed in FIPS PASS state and ports can forward data traffic.
If an error occurs during the self-test, a SELF_TEST_FAILURE system log is generated.
Example Error Message:
%CRYPTO-0-SELF_TEST_FAILURE: Crypto algorithms self-test failed (SHA hashing)
These tests are sufficient to verify that the correct version of the TOE software is running as well as that the cryptographic operations are all performing as expected because any deviation in the TSF behaviour will be identified by the failure of a self-test.
At the request of the authorized administrator, the self-tests can be executed on-demand. Refer to the AGD for related instructions.</td></tr>
<tr><td>FTA_SSL_EXT.1
FTA_SSL.3</td><td>An Authorized Administrator can configure maximum inactivity times individually for both local and remote administrative sessions using the “exec-timeout” command applied to the console and virtual terminal (vty) lines. The allowable inactivity timeout range is from is <0-35791> minutes. A value of 0 means there is no inactivity timeout enforced and therefore a value of 0 must not be used in the evaluated configuration.
The configuration of the vty lines sets the configuration for the remote console access.
The line console settings are not immediately activated for the current session. The current line console session must be exited. When the user logs back in, the inactivity timer will be activated for the new session. The local interactive session terminates and does not lock. If a local user session is inactive for a configured period, the session will be terminated and will require re-identification and authentication to login. If a remote user session is inactive for a configured period, the session will be terminated and will require re-identification and authentication to establish a new session.</td></tr>
<tr><td>FTA_SSL.4</td><td>An Authorized Administrator can exit out of both local and remote administrative sessions by issuing the ‘exit’ or ’logout’ command.</td></tr>
<tr><td>FTA_TAB.1</td><td>The Administrator can configure an access banner that describes restrictions of use, legal agreements, or any other appropriate information to which users consent by accessing the TOE. The banner will display on the local console port and SSH interfaces prior to allowing any administrative access.</td></tr>
<tr><td>FTP_ITC.1</td><td>The TOE uses secure protocols to provide trusted communications between itself and authorized IT entities as specified in the table below:
<table>
<tr><th>IT Entity</th><th>TOE Acting as Client or Server</th><th>Secure Communication Mechanism/Protocol</th><th>Non-TSF Endpoint Identification</th></tr>
<tr><td>Syslog Server</td><td>Client</td><td>IPsec</td><td>X.509 Certificate</td></tr>
</table></td></tr>
<tr><td>FTP_TRP.1/Admin</td><td>All remote administrative communications take place over a secure encrypted SSHv2 session. The SSHv2 session is encrypted using AES encryption. The remote users (Authorized Administrators) can initiate SSHv2 communications with the TOE.</td></tr>
</table>

6.1. Key Zeroization

The table below describes the key zeroization referenced by FCS_CKM.4 provided by the TOE.

Table 18. Key Zeroization

Key	Description	Storage Location	Zeroization Method
SSH Session Key	Used to encrypt SSH traffic	SDRAM	Overwritten automatically with 0x00 when the SSH trusted channel is no longer in use.
SSH Private Key	Used in establishing a secure SSH session	NVRAM	Overwritten with 0x00 by using the following command: `#crypto key zeroize <label>`
Diffie-Hellman Shared Secret	The shared secret used in Diffie-Hellman (DH) exchange. Created per the Diffie-Hellman Exchange.	SDRAM	Overwritten automatically with 0x00 when the IPsec trusted channel is no longer in use.
Diffie Hellman private key	The private key used in Diffie-Hellman (DH) Exchange	SDRAM	Overwritten automatically with 0x00 when the IPsec trusted channel is no longer in use.
Skey_id	IKE SA key from which Phase2/Child IPsec keys are derived.	SDRAM	Overwritten automatically with 0x00 when the IPsec trusted channel is no longer in use.
IKE session encrypt key	Used for IKE payload protection	SDRAM	Overwritten automatically with 0x00 when the IPsec trusted channel is no longer in use.
IKE session authentication key	Used for IKE payload integrity verification	SDRAM	Overwritten automatically with 0x00 when the IPsec trusted channel is no longer in use.
IPsec encryption key	Used to secure IPsec traffic	SDRAM	Overwritten automatically with 0x00 when the IPsec trusted channel is no longer in use.
IPsec authentication key	Used to authenticate the IPsec peer	SDRAM	Overwritten automatically with 0x00 when the IPsec trusted channel is no longer in use.

6.2. CAVP Certificates

The table below lists the CAVP certificates for the TOE.

Table 19. CAVP Certificates

SFR	Selection	Algorithm	Implementation	Standard	Certificate Number
FCS_CKM.1 – Cryptographic Key Generation	3072	RSA	IC2M	FIPS PUB 186-4	A1462
FCS_CKM.1 – Cryptographic Key Generation	P-384	ECDSA	IC2M	FIPS PUB 186-4	A1462
FCS_CKM.2 – Cryptographic Key Establishment	P-384	KAS-ECC	IC2M	NIST SP 800-56A Rev 3	A1462
FCS_COP.1/DataEncryption – AES Data Encryption/Decryption	AES-CBC-256 AES-GCM-256	AES	IC2M	ISO/IEC 18033-3 (AES) ISO/IEC 10116 (CBC) ISO/IEC 19772 (GCM)	A1462
FCS_COP.1/SigGen – Cryptographic Operation (Signature Generation and Verification)	3072	RSA	IC2M	FIPS PUB 186-4	A1462
	P-384	ECDSA	IC2M	FIPS PUB 186-4	A1462
FCS_COP.1/Hash – Cryptographic Operation (Hash Algorithm)	SHA-256 SHA-512	SHS	IC2M	ISO/IEC 10118-3:2004	A1462
FCS_COP.1/KeyedHash – Cryptographic Operation (Keyed Hash Algorithm)	HMAC-SHA-256	HMAC	IC2M	ISO/IEC 9797-2:2011	A1462
FCS_RBG_EXT.1– Random Bit Generation	CTR_DRBG (AES) 256 bits	DRBG	IC2M	ISO/IEC 18031:2011	A1462

7. References

The documentation listed below was used to prepare this ST.

Table 20. References

Identifier	Description
[CC_PART1]	Common Criteria for Information Technology Security Evaluation – Part 1: Introduction and general model, dated September 2012, version 3.1, Revision 5, CCMB-2017-04-001
[CC_PART2]	Common Criteria for Information Technology Security Evaluation – Part 2: Security functional components, dated September 2012, version 3.1, Revision 5, CCMB-2017-04-002
[CC_PART3]	Common Criteria for Information Technology Security Evaluation – Part 3: Security assurance components, dated September 2012, version 3.1, Revision 5, CCMB-2017-04-003
[CEM]	Common Methodology for Information Technology Security Evaluation – Evaluation Methodology, dated September 2012, version 3.1, Revision 5, CCMB-2017-04-004

Identifier	Description
[NDcPP]	collaborative Protection Profile for Network Devices Version 3.0e, December 14, 2023
[SD]	Supporting Document – Evaluation Activities for Network Device cPP, version 3.0e, December 6, 2023
[AGD]	Cisco Catalyst 9200CX/9500X/9600X Series Switches 17.15 CC Configuration Guide, Version 1.0, August 4, 2025
ISO 18033-3	Information technology -- Security techniques -- Encryption algorithms -- Part 3: Block ciphers
ISO 10116	Information technology -- Security techniques -- Modes of operation for an n-bit block cipher
ISO 19772	Information technology -- Security techniques -- Authenticated encryption
ISO/IEC 10118-3:2004	Information technology -- Security techniques -- Hash-functions -- Part 3: Dedicated hash-functions
ISO/IEC 9797-2:2011	Information technology -- Security techniques -- Message Authentication Codes (MACs) -- Part 2: Mechanisms using a dedicated hash-function
ISO/IEC 18031:2011	Information technology -- Security techniques -- Random bit generation

7.1. Acronyms and Terms

The following acronyms and terms are common and may be used in this Security Target.

Table 21. Acronyms and Terms

Acronym/Term	Definition
AAA	Administration, Authorization, and Accounting
ACL	Access Control Lists
AES	Advanced Encryption Standard
CC	Common Criteria for Information Technology Security Evaluation
CEM	Common Evaluation Methodology for Information Technology Security
CM	Configuration Management
CMAC	Cipher-based Message Authentication Code
DHCP	Dynamic Host Configuration Protocol
EAL	Evaluation Assurance Level
EAP	Extensible Authentication Protocol
GE	Gigabit Ethernet port
ICMP	Internet Control Message Protocol
IT	Information Technology
KCK	Key Confirmation Key
KEK	Key Encryption Key

MU-MIMO	Multi-User Multiple-Input Multiple-Output
NDcPP	collaborative Network Device Protection Profile
OFDMA	Orthogonal Frequency-Division Multiple Access
OS	Operating System
PoE	Power over Ethernet
POST	Power On Self Test
PRF	Pseudo-random function
PP	Protection Profile
RFC	Request for Comment
SFP	Small–form-factor pluggable port
SHS	Secure Hash Standard
SSHv2	Secure Shell (version 2)
ST	Security Target
TCP	Transport Control Protocol
TOE	Target of Evaluation
TSC	TSF Scope of Control
TSF	TOE Security Function
TSP	TOE Security Policy
TSS	TOE Summary Specification
UDP	User datagram protocol
WAN	Wide Area Network

7.2. Obtaining Documentation and Submitting a Service Request

The Cisco Catalyst 9200CX/9500X/9600X Series Switches 17.15 CC Configuration Guide (AGD) should be obtained from the Product Listing on the NIAP site.

For information on obtaining other documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see *What's New in Cisco Product Documentation*.

To receive new and revised Cisco technical content directly to your desktop, you can subscribe to the What's New in Cisco Product Documentation RSS feed. The RSS feeds are a free service.

7.3. Contacting Cisco

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco website at www.cisco.com/go/offices.