Cisco FTD (NGFW) 6.4 on Firepower 4100 and 9300 Series with FMC/FMCv

Security Target

ST Version 1.6

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List of Acronyms

The following acronyms and abbreviations are common and may be used in this Security Target:

Table 1: Acronyms

Acronyms/Abbreviations	Definition
ACL	Access Control List
AES	Advanced Encryption Standard
CC	Common Criteria
CEM	Common Evaluation Methodology
CM	Configuration Management
DHCP	Dynamic Host Configuration Protocol
EAL	Evaluation Assurance Level
EHWIC	Ethernet High-Speed WAN Interface Card
ESP	Encapsulating Security Payload
FOM	FIPS Object Module
FTD	Firepower Threat Defense
Gbps	Gigabits per second
GE	Gigabit Ethernet port
HTTPS	Hyper-Text Transport Protocol Secure
ICMP	Internet Control Message Protocol
IKE	Internet Key Exchange
IPsec	Internet Protocol Security
IT	Information Technology
NDcPP	Network Device Collaborative Protection Profile
NGFW	Cisco Next-Generation Firewall
OE	Operational Environment
OS	Operating System
REST	Representational State Transfer
PoE	Power over Ethernet
POP3	Post Office Protocol
PP	Protection Profile
SA	Security Association
SFP	Small–form-factor pluggable port
SHA	Secure Hash Algorithm
SIP	Session Initiation Protocol
SSHv2	Secure Shell (version 2)
SSM	Security Services Module
SSP	Security Services Processor
ST	Security Target
TCP	Transport Control Protocol
TOE	Target of Evaluation
TSC	TSF Scope of Control
TSF	TOE Security Function
TSP	TOE Security Policy
UDP	User Datagram Protocol
VLAN	Virtual Local Area Network
VPN	Virtual Private Network
VS	Virtualization System
WAN	Wide Area Network
WIC	WAN Interface Card

DOCUMENT INTRODUCTION

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This document provides the basis for an evaluation of a specific Target of Evaluation (TOE), the Firepower Threat Defense (FTD) with Firepower Management Center (FMC). 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.

1 SECURITY TARGET INTRODUCTION

The Security Target contains the following sections:

- ♦ Security Target Introduction [Section 1]
- ♦ Conformance Claims [Section 2]
- ♦ Security Problem Definition [Section 3]
- ♦ Security Objectives [Section 4]
- ♦ IT Security Requirements [Section 5]
- ♦ TOE Summary Specification [Section 6]
- ♦ Supplemental TOE Summary Specification Information [Section 7]
- ♦ References [Section 8]

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 2: ST and TOE Identification

Name	Description
ST Title	Cisco FTD (NGFW) 6.4 on Firepower 4100 and 9300 Series with FMC/FMCv Security Target
ST Version	1.5
Publication Date	May 20, 2021
Vendor and ST Author	Cisco Systems, Inc.
TOE Reference	Cisco FTD (NGFW) 6.4 on Firepower 4100 and 9300 Series with FMC and FMCv
TOE Hardware Models	• Firepower 4100 Series (4110, 4115, 4120, 4125, 4140, 4145 and 4150) • Firepower 9300 (including chassis, supervisor blade, and security module) • Cisco Firepower Management Center (FMC) (FMC1000-K9, FMC2500-K9, FMC4500-K9, FMC1600-K9, FMC2600-K9 and FMC4600-K9) • FMCv running on ESXi 6.0 or 6.5 on the Unified Computing System (UCS) UCSB-B200-M4, UCSC-C220-M4S, UCSC-C240-M4SX, UCSC-C240-M4L, UCSB-B200-M5, UCSC-C220-M5, UCSC-C240-M5, UCS-E160S-M3 and UCS-E180D-M3
TOE Software Version	FTD 6.4, FXOS 2.6 and FMC/FMCv 6.4
Keywords	Firewall, VPN Gateway, Router

1.2 TOE Overview

The Cisco Firepower 4100 and 9300 security appliances are purpose-built, scalable platforms with firewall and VPN capabilities provided by Firepower Threat Defense (FTD) software that is running on the Firepower eXtensible Operating System (FXOS). FXOS is used to manage the FTD. The TOE includes one or more Firepower appliances (running FTD and FXOS software) that are centrally managed by a Firepower Management Center (FMC) appliance, and together the FMC and Firepower (running FTD/FXOS) appliances form the TOE (Distributed TOE Use Case 3). The TOE includes the hardware models as defined in Table 2 of section 1.1.

1.2.1 TOE Product Type

Each appliance component of the TOE consists of hardware and software that provide connectivity and security services onto a single, secure device.

The Cisco Firepower 9300 security appliance is a modular, scalable, carrier-grade appliance that includes the Chassis (including fans and power supply), Supervisor Blade[1] (to manage the security application running on the security module), network module (optional) and security module that contains the FTD software. The FP4100 Series appliance is a complete standalone, bundle unit that contains everything required above in one appliance. More details on the FP4100 is provided in sections 1.3 and 1.5.

Table 3: FP 9300 Components

Component	Required	Security-Relevant	Description
Chassis	Yes	No	Provides four fans to cool the entire system, two power supplies (AC or DC), and slots for the Supervisor blade, security module, and network module.
Supervisor Blade (or Module)	Yes	Yes	Running Firepower eXtensible Operating System (FXOS), this component is used to manage the FTD running on the security module. The processor for the Supervisor Blade is an Intel Xeon E3-1105C v2 (Ivy Bridge).
Security Module	Yes	Yes	FP 9300 must have at least one security module (on which FTD is installed) in the evaluated configuration but can handle up to 3 security modules at a time. The security modules supported are: • SM-24 • SM-36 • SM-40 • SM-44 • SM-48 • SM-56
Network Module	No	No	Provides additional network interfaces to the system. FP 9300 can handle two single-wide network modules or one double-wide network module.

For firewall services, the FTD running on the security module provides application-aware stateful packet filtering firewalls. A stateful packet filtering firewall controls the flow of IP traffic by matching information contained in the headers of connection-oriented or connection-less IP packets against a set of

[1] Also known as the Cisco FXOS chassis.

rules specified by the authorized administrator for firewalls. This header information includes source and destination host (IP) addresses, source and destination port numbers, and the transport service application protocol (TSAP) held within the data field of the IP packet. Depending upon the rule and the results of the match, the firewall either passes or drops the packet. The stateful firewall remembers the state of the connection from information gleaned from prior packets flowing on the connection and uses it to regulate current packets. The packet will be denied if the security policy is violated.

In addition to IP header information, the TOE mediates information flows on the basis of other information, such as the direction (incoming or outgoing) of the packet on any given firewall network interface. For connection-oriented transport services, the firewall either permits connections and subsequent packets for the connection or denies the connection and subsequent packets associated with the connection.

The application-inspection capabilities automate the network to treat traffic according to detailed policies based not only on port, state, and addressing information, but also on application information buried deep within the packet header. By comparing this deep-packet inspection information with corporate policies, the firewall will allow or block certain traffic. For example, it will automatically drop application traffic attempting to gain entry to the network through an open port-even if it appears to be legitimate at the user and connection levels-if a business's corporate policy prohibits that application type from being on the network.

The TOE also provides IPsec connection capabilities. All references within this ST to “VPN” connectivity refer to the use of IPsec tunnels to secure connectivity to and/or from the TOE, for example, gateway-to-gateway[2] VPN or remote access VPN.

1.2.2 Supported non-TOE Hardware/ Software/ Firmware

The TOE supports (in some cases optionally) the following hardware, software, and firmware in its environment when the TOE is configured in its evaluated configuration:

Table 4: IT Environment Components

Component	Required	Usage/Purpose Description for TOE performance
Management Workstation with SSH Client	Yes	This includes any IT Environment Management workstation with SSH client installed that is used by the TOE administrator to support TOE administration through SSHv2 protected channels. Any SSH client that supports SSHv2 may be used.
Management Workstation with Web Browser	Yes	This includes any IT Environment Management workstation with a web browser installed that is used by the TOE administrator to support TOE administration through TLS/HTTPS protected channels. Any browser that supports TLSv1.1 and TLSv1.2 may be used.
Audit (syslog) Server	Yes	This includes any syslog server to which the TOE would transmit syslog messages. Connections to remote audit servers must be tunneled in IPsec or TLS.
Certification Authority	Yes	This includes any IT Environment Certification Authority on the TOE network. This can be used to provide the TOE with a valid certificate during certificate enrollment.

[2] This is also known as site-to-site or peer-to-peer VPN.

Component	Required	Usage/Purpose Description for TOE performance
Remote Tunnel Endpoint	Yes	This includes any peer with which the TOE participates in tunneled communications. Remote tunnel endpoints may be any device or software client that supports IPsec tunneling. Both VPN clients and VPN gateways can be considered to be remote tunnel endpoints.
NTP Server	No	The TOE supports communications with an NTP server via IPsec tunnel.

1.3 TOE DESCRIPTION

This section provides an overview and description of the TOE. The TOE is comprised of both software and hardware. The models are comprised of the following: FP 4110, 4115, 4120, 4125, 4140, 4145, 4150, 9300 and Firepower Management Center (FMC) (FMC1000-K9, FMC2500-K9, FMC4500-K9, FMC1600-K9, FMC2600-K9, FMC4600-K9 and FMCv). The software is comprised of the FTD software image Release 6.4 (running directly on a 4100 series, or on a security module in a 9300), FXOS 2.6 (running on 4100 series or on the Supervisor blade of a 9300), and FMC (or FMCv) version 6.4.

The models that comprise the TOE have common hardware characteristics (for example, the same FXOS image runs on all the models 4100 series and 9300, and the same FTD image runs on the FXOS regardless of the platforms). These differing characteristics affect only non-TSF relevant functionality (such as throughput, processing speed, number and type of network connections supported, number of concurrent connections supported, and amount of storage) and therefore support security equivalency of the TOE in terms of hardware.

Figure 1: FP 9300 (first) and FP 4100 (second)

The hardware components in the TOE have the following distinct characteristics:

- **4110 -** The Firepower 4110 has the Intel Xeon E5-2658 v3 (Haswell), CN3550 (NITROX III series die) chip, Intel Xeon E3-1105C v2 (Ivy Bridge) on Supervisor Blade, one AC power supply module, one 200-GB SSD, and 64-GB of DDR4 RAM. You can add another power supply module for redundant power.

- **4115** – The Firepower 4115 has the Intel Xeon Silver 4116 (Skylake), CN5560 (NITROX-V GC) chip, Intel Xeon E3-1105C v2 (Ivy Bridge), dual AC or DC power supply, one 400-GB SSD, and 192-GB of DDR4 RAM.
- **4120 -** The Firepower 4120 has the Intel Xeon E5-2658 v3 (Haswell), CN3550 (NITROX III series die) chip, Intel Xeon E3-1105C v2 (Ivy Bridge), one AC power supply module, one 200-GB SSD, and 128-GB of DDR4 RAM. You can add another power supply module for redundant power.
- **4125** – The Firepower 4125 has the Intel Xeon Gold 6130 (Skylake), CN5560 (NITROX-V GC) chip, Intel Xeon E3-1105C v2 (Ivy Bridge), dual AC or DC power supply, one 800-GB SSD, and 192-GB of DDR4 RAM.
- **4140 -** The Firepower 4140 has a processor Intel Xeon E5-2699 v3 (Haswell), CN3550 (NITROX III series die) chip, Intel Xeon E3-1105C v2 (Ivy Bridge), dual AC power supply modules, one 400-GB SSD, and 256-GB of DDR4 RAM.
- **4145 -** The Firepower 4145 has a processor Intel Xeon Gold 6152 (Skylake), CN5560 (NITROX-V GC) chip, Intel Xeon E3-1105C v2 (Ivy Bridge), dual AC or DC power supply, one 800-GB SSD, and 384-GB of DDR4 RAM.
- **4150** – The Firepower 4150 has the Intel Xeon E5-2699 v4 (Broadwell), CN3550 (NITROX III series die) chip, Intel Xeon E3-1105C v2 (Ivy Bridge), dual AC power supply modules, one 400-GB SSD, and 256-GB of DDR4 RAM.
- **9300** – See section 1.2.1.
- The same FXOS and FTD images run on all of the model platforms identified above.

The Firepower eXtensible Operating System (FXOS) is used to manage the FTD. All the platforms run an instance of FXOS that provides management of the hardware and loads FTD. The 4k/9k chassis runs on its supervisor engine a fully featured build of FXOS referred to as the Management Input Output (MIO) build of FXOS. A separate, more limited build of FXOS runs on any Security Module (SM) installed within the chassis (the Firepower 4100 models contain one fixed Security Module, while the Firepower 9300 chassis supports up to three removable Security Modules). The SM hardware is a form of Cisco UCS server (based on a UCS B-series blade server), and as such it includes a Cisco Integrated Management Controller (CIMC), which is firmware running on a CIMC daughterboard on the server blade. The FTD software runs on FXOS on the SM. The FXOS software running on the chassis supervisor maintains a list of administrative accounts that are able to log in to the supervisor via CLI or WebUI/GUI, called Firepower Chassis Manager (FCM). All administrative accounts can be managed via both CLI and GUI, and the same authentication mechanisms can be used at the CLI or GUI.

The FMC hardware components in the TOE have the following distinct characteristics:

Table 5: FMC Models

Model	FMC1000-K9	FMC1600-K9	FMC2500-K9	FMC2600-K9	FMC4500-K9	FMC4600-K9
Processor	Intel Xeon E5-2640 v4 (Broadwell)	Intel Xeon Silver 4110 (Skylake)	Intel Xeon E5-2640 v4 (Broadwell)	Intel Xeon Silver 4110 (Skylake)	Intel Xeon E5-2620 v4 (Broadwell)	Intel Xeon Silver 4116 (Skylake)
Memory	32 GB	32 GB	64 GB	64 GB	128 GB	128 GB
Maximum Number of FTD devices Managed	50	50	300	300	750	750
Event Storage	900 GB	900 GB	1.8 TB	1.8 TB	3.2 TB	3.2 TB
Maximum Flow Rate	6,000 fps	6,000 fps	10,000 fps	10,000 fps	20,000 fps	20,000 fps
Maximum Network Map (hosts/users)	50,000/50,000	50,000/50,000	300,000/300,000	300,000/300,000	600,000/600,000	600,000/600,000
Network Interfaces	2 x 1Gbps	2 x 1Gbps	2 x 1Gbps	2 x 1Gbps	2 x 1Gbps 2 x 10Gbps	2 x 1Gbps 2 x 10Gbps

The underlying Cisco UCS hardware platforms within the TOE have common hardware characteristics. These differing characteristics affect only non-TSF relevant functionality (such as throughput, processing speed, number and type of network connections supported, number of concurrent connections supported, and amount of storage) and therefore support security equivalency of the FMCv in terms of hardware.

Figure 2: UCS Hardware

The UCS hardware components in the TOE have the following distinct characteristics:

Table 6: UCS Hardware

Model	B200 M4	B200 M5	C220 M4S	C220 M5	C240 M4SX	C240 M4L	C240 M5
Number of Processors	2	2	2	2	2	2	2
Processor	Intel® Xeon® E5-2620 v3 (Haswell), Intel Xeon E5-2609v4 (Broadwell)	Intel® Xeon® Bronze 3104 (Skylake), Intel® Xeon® Silver 4110 (Skylake) Intel® Xeon® Gold 6128 (Skylake) Intel® Xeon® Platinum 8153 (Skylake)	Intel® Xeon® E5-2620 v3 (Haswell), Intel Xeon E5-2609v4 (Broadwell)	Intel® Xeon® Bronze 3104 (Skylake), Intel® Xeon® Silver 4110 (Skylake) Intel® Xeon® Gold 6128 (Skylake) Intel® Xeon® Platinum 8153 (Skylake)	Intel® Xeon® E5-2620 v3 (Haswell), Intel Xeon E5-2609v4 (Broadwell)	Intel® Xeon® E5-2620 v3 (Haswell), Intel Xeon E5-2609v4 (Broadwell)	Intel® Xeon® Bronze 3104 (Skylake), Intel® Xeon® Silver 4110 (Skylake) Intel® Xeon® Gold 6128 (Skylake) Intel® Xeon® Platinum 8153 (Skylake)
Form factor	Half-width blade	Half-width blade	Half-width blade	1RU rack server	Half-width blade	Half-width blade	2 RU

Maximum Memory	1.5 TB, 24 DIMMs	3.0 TB, 24 x DDR4 DIMMs	3.0 TB, 24 x DDR4 DIMMs	3 TB, 24 x DDR4 DIMMs	3.0 TB, 24 x DDR4 DIMMs	3.0 TB, 24 x DDR4 DIMMs	3 TB, 24 x DDR4 DIMMs
Disk Space	3.2 TB	20.5 TB	20.5 TB	80 TB	20.5 TB	20.5 TB	197.6 TB
Max I/O per blade	80 Gbps (2 x 40 Gbps)	80 Gbps (2 x 40 Gbps)	80 Gbps (2 x 40 Gbps)	Undisclosed	80 Gbps (2 x 40 Gbps)	80 Gbps (2 x 40 Gbps)	Undisclosed

Model	**E160S M3**	**E180D M3**
Number of Processors	1	2
Processor	Intel® Xeon® D-1528 (Broadwell)	Intel® Xeon® D-1548 (Broadwell)
Physical dimensions (H x W x D)	1.58 x 7.44 x 7.5 in.	1.58 x 16.23 x 7.5 in.
Memory	8 – 64 GB	16 – 128 GB
Disk Space	4 TB	4 TB
I/O	● 2 internal Gigabit Ethernet ports (Broadcom 5719) ● 2 external 10 Gigabit Ethernet ports (1000/10000) (Integrated within Intel CPU)	● 2 internal Gigabit Ethernet ports (Broadcom 5719) ● 2 external 10 Gigabit Ethernet ports (1000/10000) (Integrated within Intel CPU) ● 1 dedicated management Ethernet port (10/100/1000) for Cisco IMC

1.4 TOE Evaluated Configuration

The TOE consists of one or more physical devices as specified in section 1.5 below and includes the Cisco FTD, FMC, and FXOS software. Each instantiation of the TOE has two or more network interfaces and is able to filter IP traffic to and through those interfaces.

The TOE can optionally connect to an NTP server via an IPsec tunnel for clock updates. If the TOE is to be remotely administered, the management station must connect using SSHv2. When web UI is used, a remote workstation with a TLS-enabled browser must be available. A syslog server can also be used to store audit records, and the syslog server must support syslog over TLS or IPsec.

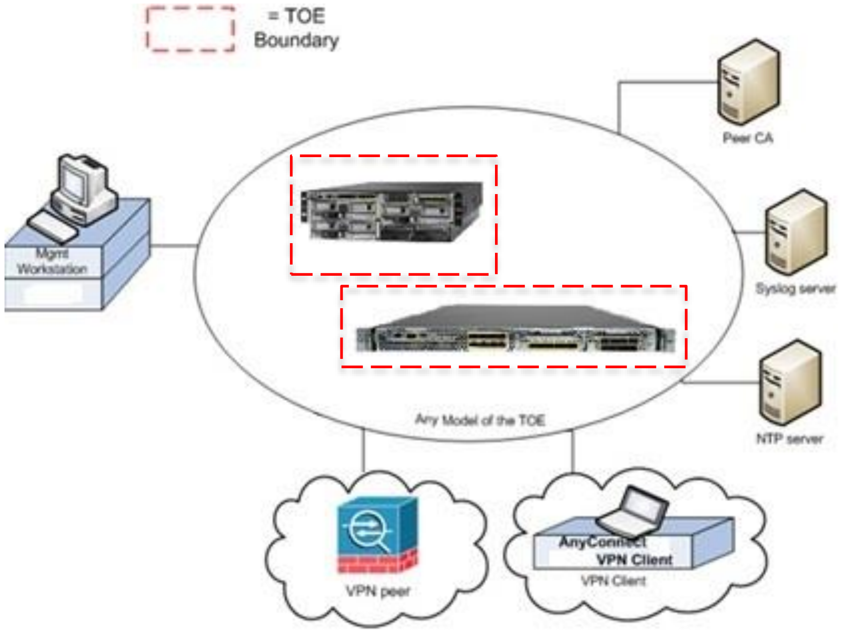
FTD supports two different TLS clients that send syslog messages to the external syslog server- FTD TLS client and FTD OS TLS Client. The FTD TLS Client is configured by the FMC and is the main audit system for audits generated by FTD. It sends audit events such as IPsec and login messages to the external syslog server. Mutual authentication is not supported. The FTD OS TLS client implementation is configured through the FTD's command line and sends audit events such as SSH login, console login, etc. to an external syslog server. Mutual authentication is supported.

The TOE can filter connections to/from these external entities using its IP traffic filtering, and can encrypt traffic where necessary using TLS, SSH, and/or IPsec. The TOE uses X.509v3 certificates to support authentication for both IPsec and TLS, and the CA server in the Operational environment can be used to obtain digital certificates.

The communication between the FMC software and FTD in Firepower appliance is protected by TLSv1.2. Digital certificates from a CA server are obtained when certificates are used as the authentication method for VPN connection. The TOE protects peer-to-peer VPN connections between itself and VPN peers (connections can be initiated by the TOE or by the peer) using IPsec.

The following figure provides a visual depiction of an example TOE deployment. The TOE boundary is surrounded with a hashed red line.

Figure 3: Example TOE Deployment



The previous figure includes the following:

- TOE components (at least one Firepower 4K/9K appliance (with FTD and FXOS) and FMC)
- VPN Peer (Operational Environment) or another instance of the TOE
- VPN Client (Operational Environment) (Cisco AnyConnect VPN Client)
- Management Workstation (Operational Environment)
- NTP Server (Operational Environment)
- CA Server (Operational Environment)
- Syslog server (Operational Environment)

1.5 Physical Scope of the TOE

The TOE is a hardware and software solution comprised of the components described in Table 7:

Table 7: Hardware Models and Specifications

TOE Configuration	Hardware Configurations	Software Version
FP 4110 **FP 4115** **FP 4120** **FP 4125** **FP 4140** **FP 4145** **FP 4150**	The Firepower 4100 chassis contains the following components: • Network module 1 with eight fixed SFP+ ports (1G and 10G connectivity), the management port, RJ-45 console port, Type A USB port, PID and S/N card, locator indicator, and power switch • Two network modules slots (network module 2 and network module 3) • Two (1+1) redundant power supply module slots • Six fan module slots • Two SSD bays	FXOS release 2.6 and FTD release 6.4
FP 9300	The Firepower 9300 chassis contains the following components: • Firepower 9300 Supervisor—Chassis supervisor module ◦ Management port ◦ RJ-45 console port ◦ Type A USB port ◦ Eight ports for 1 or 10 Gigabit Ethernet SFPs (fiber and copper) • Firepower 9300 Security Module—Up to three security modules ◦ 800 GB of solid state storage per security blade (2 x 800 GB solid state drives running RAID1)	FXOS release 2.6 and FTD release 6.4

	• Firepower Network Module—Two single-wide network modules or one double-wide network module • Two power supply modules (AC or DC) • Four fan modules	
FMC1000-K9 **FMC2500-K9** **FMC4500-K9** **FMC1600-K9** **FMC2600-K9** **FMC4600-K9**	See table above	FMC release 6.4
FMCv	FMCv running on ESXi 6.0 or 6.5 on the Unified Computing System (UCS) UCSB-B200-M4, UCSC-C220-M4S, UCSC-C240-M4SX, UCSC-C240-M4L, UCSB-B200-M5, UCSC-C220-M5, UCSC-C240-M5, UCS-E160S-M3 and UCS-E180D-M3	FMCv release 6.4

1.6 Logical Scope of the TOE

The TOE is comprised of several security features including stateful traffic firewall and VPN gateway. Each of the security features identified above consists of several security functionalities, as identified below.

1. Security Audit
2. Communication
3. Cryptographic Support
4. Full Residual Information Protection
5. Identification and Authentication
6. Security Management
7. Protection of the TSF
8. TOE Access
9. Trusted Path/Channels
10. Filtering

These features are described in more detail in the subsections below -

1.6.1 Security Audit

The TOE provides extensive auditing capabilities. The TOE can audit events related to cryptographic functionality, identification and authentication, and administrative actions. The TOE generates an audit record for each auditable event. The administrator configures auditable events, performs back-up operations, and manages audit data storage. The TOE provides the administrator with a circular audit trail where the TOE overwrites the oldest audit record with the newest audit record when space is full. Audit logs are backed up over an encrypted channel to an external audit server.

1.6.2 Communication

The TOE allows authorized administrators to control which FTD device is managed by the FMC. This is performed through a registration process over TLS. The administrator can also de-register a FTD device if he or she wish to no longer manage it through the FMC.

1.6.3 Cryptographic Support

The TOE provides cryptography in support of other TOE security functionality. The TOE provides cryptography in support of secure connections using IPsec and TLS, and remote administrative management via SSHv2, and TLS/HTTPS. The cryptographic random bit generators (RBGs) are seeded by an entropy noise source.

1.6.4 Full Residual Information Protection

The TOE ensures that all information flows from the TOE do not contain residual information from previous traffic. Packets are padded with zeros. Residual data is never transmitted from the TOE.

1.6.5 Identification and authentication

The TOE performs two types of authentication: device-level authentication of the remote device (VPN peers) and user authentication for the authorized administrator of the TOE. Device-level authentication allows the TOE to establish a secure channel with a trusted peer. The secure channel is established only after each device authenticates the other. Device-level authentication is performed via IKE/IPsec X509v3 certificate based authentication or pre-shared key methods.

The TOE provides authentication services for administrative users wishing to connect to the TOEs secure CLI and GUI administrator interfaces. The TOE requires authorized administrators to authenticate prior to being granted access to any of the management functionality. The TOE can be configured to require a minimum password length of 15 characters as well as mandatory password complexity rules. The TOE also implements a lockout mechanism when the number of unsuccessful authentication attempts exceeds the configured threshold.

The TOE provides administrator authentication against a local user database. Password-based authentication can be performed on the serial console or SSH and HTTPS interfaces. The SSHv2 interface also supports authentication using SSH keys.

1.6.6 Security Management

The TOE provides secure administrative services for management of general TOE configuration and the security functionality provided by the TOE. All TOE administration occurs either through a secure SSHv2 or TLS/HTTPS session, or via a local console connection. The TOE provides the ability to securely manage all TOE administrative users; all identification and authentication; all audit functionality of the TOE; all TOE cryptographic functionality; the timestamps maintained by the TOE; and the information flow control policies enforced by the TOE including encryption/decryption of information flows for VPNs. The TOE supports an “authorized administrator” role, which equates to any account authenticated to an administrative interface (CLI or GUI, but not VPN), and possessing sufficient privileges to perform security-relevant administrative actions.

When an administrative session is initially established, the TOE displays an administrator- configurable warning banner. This is used to provide any information deemed necessary by the administrator. After a configurable period of inactivity, administrative sessions will be terminated, requiring administrators to re-authenticate.

1.6.7 Protection of the TSF

The TOE protects against interference and tampering by untrusted subjects by implementing identification, authentication, and administrator roles to limit configuration to authorized administrators. The TOE prevents reading of cryptographic keys and passwords.

Additionally, the TOE is not a general-purpose operating system and access to the TOE memory space is restricted to only TOE functions.

The TOE internally maintains the date and time. This date and time are used as the timestamp that is applied to audit records generated by the TOE. Administrators can update the TOE's clock manually via FMC or FXOS or can configure the TOE (FXOS) to use NTP via an IPsec tunnel to synchronize the TOE's clock with an external time source. Additionally, the TOE performs testing to verify correct operation of the appliance itself and that of the cryptographic module. Whenever any system failures occur within the TOE the TOE will cease operation.

1.6.8 TOE Access

When an administrative session is initially established, the TOE displays an administrator- configurable warning banner. This is used to provide any information deemed necessary by the administrator. After a configurable period of inactivity, administrator and VPN client sessions will be terminated, requiring re-authentication. The TOE also supports direct connections from VPN clients and protects against threats related to those client connections. The TOE disconnects sessions that have been idle too long and can be configured to deny sessions based on IP, time, and day, and to NAT external IPs of connecting VPN clients to internal network addresses.

1.6.9 Trusted path/Channels

The TOE supports establishing trusted paths between itself and remote administrators using SSHv2 for CLI access, and TLS/HTTPS for GUI access. The TOE supports use of TLS and/or IPsec for connections with remote syslog servers and use of IPsec for connections with NTP servers. The TOE can establish trusted paths of peer-to-peer VPN tunnels using IPsec, and VPN client tunnels using IPsec or TLS. Note that the VPN client is in the operational environment.

1.6.10 Filtering

The TOE provides stateful traffic firewall functionality including IP address-based filtering (for IPv4 and IPv6) to address the issues associated with unauthorized disclosure of information, inappropriate access to services, misuse of services, disruption or denial of services, and network-based reconnaissance. Address filtering can be configured to restrict the flow of network traffic between protected networks and other attached networks based on source and/or destination IP addresses. Port filtering can be configured to restrict the flow of network traffic between protected networks and other attached networks based on the originating (source) and/or receiving (destination) port (service). Stateful packet inspection is used to aid in the performance of packet flow through the TOE and to ensure that only packets are only forwarded when they're part of a properly established session. The TOE supports protocols that can spawn additional sessions in accordance with the protocol RFCs where a new connection will be implicitly permitted when properly initiated by an explicitly permitted session. The File Transfer Protocol is an example of such a protocol, where a data connection is created as needed in response to an explicitly allowed command connection. System monitoring functionality includes the ability to generate audit messages for any explicitly defined (permitted or denied) traffic flow. TOE administrators have the ability to configure permitted and denied traffic flows, including adjusting the sequence in which flow control rules will be applied, and to apply rules to any network interface of the TOE.

The TOE also provides packet filtering and secure IPsec tunneling. The tunnels can be established between two trusted VPN peers as well as between remote VPN clients and the TOE. More accurately, these tunnels are sets of security associations (SAs). The SAs define the protocols and algorithms to be applied to sensitive packets and specify the keying material to be used. SAs are unidirectional and are established per the ESP security protocol. An authorized administrator can define the traffic that needs to be protected via IPsec by configuring access lists (permit, deny, log) and applying these access lists to interfaces using crypto map set.

1.7 Excluded Functionality

The following functionality is excluded from the evaluation.

Table 8: Excluded Functionality

Excluded Functionality	Exclusion Rationale
Telnet for management purposes	Telnet passes authentication credentials in clear text and is disabled by default.
Firepower Device Manager (FDM)	Firepower Device Manager is a web-based local manager. Use of FDM is beyond the scope of this Common Criteria evaluation.
Filtering of non-IP traffic provided by the EtherType option when configuring information flow policies is excluded from the evaluated configuration	Use of non-IP traffic filtering is beyond the scope of this Common Criteria evaluation.
Smart Call Home. The Smart Call Home feature provides personalized, e-mail-based and web-based notification to customers about critical events involving their individual systems.	Use of Smart Call Home is beyond the scope of this Common Criteria evaluation.
FXOS REST API	Allows users to programmatically configure and manage their chassis. Use of REST API is beyond the scope of this Common Criteria evaluation.
IPS Functionality of the TOE	The PP configuration claimed in this evaluation does not include evaluating the IPS functionality of the TOE.

These services will be disabled by configuration. The exclusion of this functionality does not affect compliance to collaborative Protection Profile for Network Devices (cpp_nd_v2.2e), PP-Module for Stateful Traffic Filter Firewalls (mod_cpp_fw_v1.4e) and PP-Module for Virtual Private Network (VPN) Gateways (mod_vpngw_v1.1).

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. For a listing of Assurance Requirements claimed see section 5.7.

The TOE and ST are CC Part 2 extended and CC Part 3 conformant.

2.2 Protection Profile Conformance

The TOE and ST are conformant with the Protection Profiles as listed in Table 9 below:

Table 9: Protection Profiles

Protection Profile	Version	Date
PP-Configuration for Network Devices, Stateful Traffic Filter Firewalls, and Virtual Private Network (VPN) Gateways (CFG_NDcPP-FW-VPNGW_V1.1)	1.1	1 July 2020
The PP-Configuration includes the following components:		
• Base-PP: Collaborative Protection Profile for Network Devices, (CPP_ND_V2.2E)	2.2e	23 March 2020
• PP-Module for Stateful Traffic Filter Firewalls, (MOD_CPP_FW_1.4E)	1.4 + Errata 20200625	25 June 2020
• PP-Module for Virtual Private Network (VPN) Gateways, (MOD_VPNGW_V1.1)	1.1	18 June 2020

The TOE and ST are conformant with the Protection Profiles as listed in Table above. The following NIAP Technical Decisions (TD) have also been applied:

Table 10: Technical Decisions

TD #	TD Name	Protection Profiles	Applied to this TOE
TD0581	NIT Technical Decision for Elliptic curve-based key establishment and NIST SP 800-56Arev3	CPP_ND_V2.2E	FCS_CKM.2
TD0580	NIT Technical Decision for clarification about use of DH14 in NDcPPv2.2e	CPP_ND_V2.2E	FCS_CKM.1.1, FCS_CKM.2.1
TD0572	NiT Technical Decision for Restricting FTP_ITC.1 to only IP address identifiers	CPP_ND_V2.2E	FTP_ITC.1
TD0571	NiT Technical Decision for Guidance on how to handle FIA_AFL.1	CPP_ND_V2.2E	FIA_AFL.1
TD0570	NiT Technical Decision for Clarification about FIA_AFL.1	CPP_ND_V2.2E	FIA_AFL.1
TD0569	NIT Technical Decision for Session ID Usage Conflict in FCS_DTLSS_EXT.1.7	CPP_ND_V2.2E	FCS_TLSS_EXT.1
TD0564	NiT Technical Decision for Vulnerability Analysis Search Criteria	CPP_ND_V2.2E	AVA_VAN.1

TD0563	NiT Technical Decision for Clarification of audit date information	CPP_ND_V2.2E	FAU_GEN.1
TD0556	NIT Technical Decision for RFC 5077 question	CPP_ND_V2.2E	FCS_TLSS_EXT.1
TD0555	NIT Technical Decision for RFC Reference incorrect in TLSS Test	CPP_ND_V2.2E	FCS_TLSS_EXT.1
TD0551	NIT Technical Decision for Incomplete Mappings of OEs in FW Module v1.4+Errata	MOD_CPP_FW_v1.4e	Sections 5.3.2 and 5.3.4
TD0549	Consistency of Security Problem Definition update for MOD_VPNGW_v1.0 and MOD_VPNGW_v1.1	MOD_VPNGW_v1.1	Assumption – A.CONNECTIONS
TD0547	NIT Technical Decision for Clarification on developer disclosure of AVA_VAN	CPP_ND_V2.2E	AVA_VAN.1
TD0546	*NIT Technical Decision for DTLS - clarification of Application Note 63*	*CPP_ND_V2.2E*	*Not applied because this ST does not include FCS_DTLSC_EXT.1.1*
TD0545	NIT Technical Decision for Conflicting FW rules cannot be configured (extension of RfI#201837)	MOD_CPP_FW_v1.4e	FFW_RUL_EXT.1.8
TD0538	NIT Technical Decision for Outdated link to allowed-with list	CPP_ND_V2.2E	Section 2 of PP
TD0537	NIT Technical Decision for Incorrect reference to FCS_TLSC_EXT.2.3	CPP_ND_V2.2E	FCS_TLSC_EXT.2.3
TD0536	NIT Technical Decision for Update Verification Inconsistency	CPP_ND_V2.2E	AGD_OPE.1
TD0528	NIT Technical Decision for Missing EAs for FCS_NTP_EXT.1.4	CPP_ND_V2.2E	FCS_NTP_EXT.1.4
TD0527	Updates to Certificate Revocation Testing (FIA_X509_EXT.1)	CPP_ND_V2.2E	FIA_X509_EXT.1/REV, FIA_X509_EXT.1/ITT

2.2.1 Protection Profile Additions or Modifications

The following requirements were added/modified:

- FAU_GEN.1 – Additional auditable events were added from mod_cpp_fw_v1.4e and mod_vpngw_v1.1
- FCS_COP.1/DataEncryption - This SFR has been modified from its definition in the NDcPP to support this PP-Module's IPsec requirements by mandating support for at least one of CBC or GCM modes and at least one of 128-bit or 256-bit key sizes at minimum.
- FCS_IPSEC_EXT.1 – Additional requirements from mod_vpngw_v1.1 have been added to this SFR, since IPsec is used to implement the VPN functionality required by mod_vpngw_v1.1.
- FIA_X509_EXT.2 – This SFR has been modified since it is mandatory for any TOE that claims conformance to mod_vpngw_v1.1 because a conformant TOE will always have the ability to receive an X.509 certificate from an external entity as part of IPsec communications
- FMT_MTD.1/CryptoKeys – This SFR has been refined to refer specifically to keys and certificates used for VPN operation.
- FMT_SMF.1 – This SFR has been modified to conform to the MOD_VPNGW_V1.1 requirements.
- FPT_TST_EXT.1 – This SFR has been modified from its definition in the NDcPP by requiring noise source health tests to be performed regardless of what other testing is claimed.
- FPT_TUD_EXT.1 – This SFR has been modified from its definition in the NDcPP because the MOD_VPNGW_V1.1 requires the digital signature method to be selected at a minimum.

- FDP_RIP.2[FW], FFW_RUL_EXT.1[FW], FFW_RUL_EXT.2[FW] and FMT_SMF.1/FFW[FW] – These SFRs were added to conform to MOD_CPP_FW_1.4E.
- FCS_CKM.1/IKE[VPN], FIA_PSK_EXT.1[VPN], FMT_SMF.1/VPN[VPN], FPF_RUL_EXT.1[VPN], FPT_FLS.1/SelfTest[VPN], FPT_TST_EXT.3[VPN], FTA_SSL.3/VPN[VPN], FTA_TSE.1[VPN], FTA_VCM_EXT.1[VPN] and FTP_ITC.1/VPN[VPN] - These SFRs were added to conform to MOD_VPNGW_V1.1

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:

- collaborative Protection Profile for Network Devices (cpp_nd_v2.2e)
- PP-Module for Stateful Traffic Filter Firewalls (mod_cpp_fw_v1.4e); and
- PP-Module for Virtual Private Network (VPN) Gateways (mod_vpngw_v1.1)

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 the NDcPPv2.2e, mod_cpp_fw_v1.4e and mod_vpngw_v1.1 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 the U.S. Government Protection Profile for Security Requirements for Network Devices 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 cpp_nd_v2.2e, mod_cpp_fw_v1.4e and mod_vpngw_v1.1 for which conformance is claimed verbatim and several additional Security Functional Requirements are included as a result. 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 section 7 of the NDcPP.

3 SECURITY PROBLEM DEFINITION

This chapter identifies the following:

- Significant assumptions about the TOE's operational environment.
- IT related threats to the organization countered by the TOE.
- Environmental threats requiring controls to provide sufficient protection.
- Organizational security policies for the TOE as appropriate.

This document identifies assumptions as A.assumption with "assumption" specifying a unique name. Threats are identified as T.threat with "threat" specifying a unique name. Organizational Security Policies (OSPs) are identified as P.osp with "osp" specifying a unique name.

3.1 Assumptions

The specific conditions listed in the following subsections are assumed to exist in the TOE's 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.

Table 11: TOE Assumptions

Assumption	**Assumption Definition**
Reproduced from cpp_nd_v2.2e	
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 and/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 will not include any requirements on physical tamper protection or other physical attack mitigations. The cPP will 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 a computing platform for general purpose applications (unrelated to networking functionality). In the case of vNDs, the VS is considered part of the TOE with only one vND instance for each physical hardware platform. The exception being where components of the distributed TOE run inside more than one virtual machine (VM) on a single VS. There are no other guest VMs on the physical platform providing non-Network Device functionality.
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

Assumption	Assumption Definition
	network entity, is not covered by the ND cPP. It is assumed that this protection will be covered by cPPs and PP modules for particular types of Network Devices (e.g., firewall).
A.TRUSTED_ADMINSTRATOR	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 being 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	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	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	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	For vNDs, it is assumed that the VS provides, and is configured to provide sufficient isolation between software running in VMs on the

Assumption	Assumption Definition
	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	For vNDs, it is assumed that the VS and VMs are correctly configured to support ND functionality implemented in VMs.
Reproduced from mod_vpngw_v1.1	
A.CONNECTIONS	It is assumed that the TOE is connected to distinct networks in a manner that ensures that the TOE security policies will be enforced on all applicable network traffic flowing among the attached networks.

3.2 Threats

The following table lists the threats addressed by the TOE and the IT Environment. The assumed level of expertise of the attacker for all the threats identified below is Enhanced-Basic.

Table 12: Threats

Threat	Threat Definition
Reproduced from cpp_nd_v2.2e	
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.
T.UNTRUSTED_COMMUNICATIONS _CHANNELS	Threat agents may attempt to target Network Devices that do not use standardized secure tunnelling 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.

Threat	**Threat Definition**
T.WEAK_AUTHENTICATION_ ENDPOINTS	Threat agents may take advantage of secure protocols that use weak methods to authenticate the endpoints, e.g. a 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 includes replacing existing credentials with an attacker’s credentials, modifying existing credentials, or obtaining the Administrator or device credentials for use by the attacker.
T.PASSWORD_CRACKING	Threat agents may be able to take advantage of weak administrative passwords to gain privileged access to the device. Having privileged access to the device provides the attacker unfettered access to the network traffic and may allow them to take advantage of any trust relationships with other Network Devices.
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.
Reproduced from the mod_cpp_fw_v1.4e	
T.NETWORK_DISCLOSURE	An attacker may attempt to “map” a subnet to determine the machines that reside on the network, and obtaining the IP addresses of machines, as well as the services (ports) those machines are offering. This information could be used to mount attacks to those machines via the services that are exported.

Threat	Threat Definition
T.NETWORK_ACCESS	With knowledge of the services that are exported by machines on a subnet, an attacker may attempt to exploit those services by mounting attacks against those services.
T.NETWORK_MISUSE	An attacker may attempt to use services that are exported by machines in a way that is unintended by a site's security policies. For example, an attacker might be able to use a service to "anonymize" the attacker's machine as they mount attacks against others.
T.MALICIOUS_TRAFFIC	An attacker may attempt to send malformed packets to a machine in hopes of causing the network stack or services listening on UDP/TCP ports of the target machine to crash.
Reproduced from the mod_vpngw_v1.1	
T.DATA_INTEGRITY	Devices on a protected network may be exposed to threats presented by devices located outside the protected network, which may attempt to modify the data without authorization. If known malicious external devices are able to communicate with devices on the protected network or if devices on the protected network can establish communications with those external devices then the data contained within the communications may be susceptible to a loss of integrity.
T. NETWORK_ACCESS	Devices located outside the protected network may seek to exercise services located on the protected network that are intended to only be accessed from inside the protected network or only accessed by entities using an authenticated path into the protected network. Devices located outside the protected network may, likewise, offer services that are inappropriate for access from within the protected network. From an ingress perspective, VPN gateways can be configured so that only those network servers intended for external consumption by entities operating on a trusted network (e.g., machines operating on a network where the peer VPN gateways are supporting the connection) are accessible and only via the intended ports. This serves to mitigate the potential for network entities outside a protected network to access network servers or services intended only for consumption or access inside a protected network. From an egress perspective, VPN gateways can be configured so that only specific external services (e.g., based on destination port) can be accessed from within a protected network, or moreover are accessed via an encrypted channel. For example, access to external mail services can be blocked to enforce corporate policies against accessing uncontrolled e-mail servers, or, that access to the mail server must be done over an encrypted link.

Threat	**Threat Definition**
T. NETWORK_DISCLOSURE	Devices on a protected network may be exposed to threats presented by devices located outside the protected network, which may attempt to conduct unauthorized activities. If known malicious external devices are able to communicate with devices on the protected network, or if devices on the protected network can establish communications with those external devices (e.g., as a result of a phishing episode or by inadvertent responses to email messages), then those internal devices may be susceptible to the unauthorized disclosure of information. From an infiltration perspective, VPN gateways serve not only to limit access to only specific destination network addresses and ports within a protected network, but whether network traffic will be encrypted or transmitted in plaintext. With these limits, general network port scanning can be prevented from reaching protected networks or machines, and access to information on a protected network can be limited to that obtainable from specifically configured ports on identified network nodes (e.g., web pages from a designated corporate web server). Additionally, access can be limited to only specific source addresses and ports so that specific networks or network nodes can be blocked from accessing a protected network thereby further limiting the potential disclosure of information. From an exfiltration perspective, VPN gateways serve to limit how network nodes operating on a protected network can connect to and communicate with other networks limiting how and where they can disseminate information. Specific external networks can be blocked altogether or egress could be limited to specific addresses and/or ports. Alternately, egress options available to network nodes on a protected network can be carefully managed in order to, for example, ensure that outgoing connections are encrypted to further mitigate inappropriate disclosure of data through packet sniffing.

Threat	Threat Definition
T.NETWORK_MISUSE	Devices located outside the protected network, while permitted to access particular *public* services offered inside the protected network, may attempt to conduct inappropriate activities while communicating with those allowed public services. Certain services offered from within a protected network may also represent a risk when accessed from outside the protected network. From an ingress perspective, it is generally assumed that entities operating on external networks are not bound by the use policies for a given protected network. Nonetheless, VPN gateways can log policy violations that might indicate violation of publicized usage statements for publicly available services. From an egress perspective, VPN gateways can be configured to help enforce and monitor protected network use policies. As explained in the other threats, a VPN gateway can serve to limit dissemination of data, access to external servers, and even disruption of services – all of these could be related to the use policies of a protected network and as such are subject in some regards to enforcement. Additionally, VPN gateways can be configured to log network usages that cross between protected and external networks and as a result can serve to identify potential usage policy violations.
T.REPLAY_ATTACK	If an unauthorized individual successfully gains access to the system, the adversary may have the opportunity to conduct a "replay" attack. This method of attack allows the individual to capture packets traversing throughout the network and send the packets at a later time, possibly unknown by the intended receiver. Traffic is subject to replay if it meets the following conditions: • Cleartext: an attacker with the ability to view unencrypted traffic can identify an appropriate segment of the communications to replay as well in order to cause the desired outcome. • No integrity: alongside cleartext traffic, an attacker can make arbitrary modifications to captured traffic and replay it to cause the desired outcome if the recipient has no means to detect these modifications.

3.3 Organizational Security Policies

The following table lists the Organizational Security Policies imposed by an organization to address its security needs.

Table 13: Organizational Security Policies

Policy Name	Policy Definition
Reproduced from cpp_nd_v2.2e	
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 TOE and the IT Environment. The security objectives identify the responsibilities of the TOE and the TOE's IT environment in meeting the security needs.

- ♦ This document identifies objectives of the TOE as O.objective with objective specifying a unique name. Objectives that apply to the IT environment are designated as OE.objective with objective specifying a unique name.

4.1 Security Objectives for the TOE

The following table, Security Objectives for the TOE, identifies the security objectives of the TOE. These security objectives reflect the stated intent to counter identified threats and/or comply with any security policies identified. An explanation of the relationship between the objectives and the threats/policies is provided in the rationale section of this document.

Table 14: Security Objectives for the TOE

TOE Objective	**TOE Security Objective Definition**
Reproduced from mod_cpp_fw_v1.4e	
O.RESIDUAL_INFORMATION	The TOE shall implement measures to ensure that any previous information content of network packets sent through the TOE is made unavailable either upon deallocation of the memory area containing the network packet or upon allocation of a memory area for a newly arriving network packet or both.
O.STATEFUL_TRAFFIC_FILTERING	The TOE shall perform stateful traffic filtering on network packets that it processes. For this the TOE shall support the definition of stateful traffic filtering rules that allow to permit or drop network packets. The TOE shall support assignment of the stateful traffic filtering rules to each distinct network interface. The TOE shall support the processing of the applicable stateful traffic filtering rules in an administratively defined order. The TOE shall deny the flow of network packets if no matching stateful traffic filtering rule is identified.
Reproduced from mod_vpngw_v1.1	
O.ADDRESS_FILTERING	To address the issues associated with unauthorized disclosure of information, inappropriate access to services, misuse of services, disruption or denial of services, and network-based reconnaissance, compliant TOE's will implement Packet Filtering capability. That capability will restrict the flow of network traffic between protected networks and other attached networks based on network addresses of the network nodes originating (source) and/or receiving (destination) applicable network traffic as well as on established connection information.

TOE Objective	TOE Security Objective Definition
O.AUTHENTICATION	To further address the issues associated with unauthorized disclosure of information, a compliant TOE's authentication ability (IPSec) will allow a VPN peer to establish VPN connectivity with another VPN peer. VPN endpoints authenticate each other to ensure they are communicating with an authorized external IT entity.
O.CRYPTOGRAPHIC_FUNCTIONS	To address the issues associated with unauthorized disclosure of information, inappropriate access to services, misuse of services, disruption of services, and network-based reconnaissance, compliant TOE's will implement a cryptographic capabilities. These capabilities are intended to maintain confidentiality and allow for detection and modification of data that is transmitted outside of the TOE.
O.FAIL_SECURE	There may be instances where the TOE's hardware malfunctions or the integrity of the TOE's software is compromised, the latter being due to malicious or non-malicious intent. To address the concern of the TOE operating outside of its hardware or software specification, the TOE will shut down upon discovery of a problem reported via the self-test mechanism and provide signature-based validation of updates to the TSF.
O.PORT_FILTERING	To further address the issues associated with unauthorized disclosure of information, etc., a compliant TOE's port filtering capability will restrict the flow of network traffic between protected networks and other attached networks based on the originating (source) and/or receiving (destination) port (or service) identified in the network traffic as well as on established connection information.
O.SYSTEM_MONITORING	To address the issues of administrators being able to monitor the operations of the VPN gateway, it is necessary to provide a capability to monitor system activity. Compliant TOEs will implement the ability to log the flow of network traffic. Specifically, the TOE will provide the means for administrators to configure packet filtering rules to 'log' when network traffic is found to match the configured rule. As a result, matching a rule configured to 'log' will result in informative event logs whenever a match occurs. In addition, the establishment of security associations (SAs) is auditable, not only between peer VPN gateways, but also with certification authorities (CAs).
O.TOE_ADMINISTRATION	TOEs will provide the functions necessary for an administrator to configure the packet filtering rules, as well as the cryptographic aspects of the IPsec protocol that are enforced by the TOE.

4.2 Security Objectives for the Environment

All of the assumptions stated in section 3.1 are considered to be security objectives for the environment. The following are the Protection Profile non-IT security objectives, which, in addition to those assumptions, are to be satisfied without imposing technical requirements on the TOE. That is, they will not require the implementation of functions in the TOE hardware and/or software. Thus, they will be satisfied largely through application of procedural or administrative measures.

Table 15: Security Objectives for the Environment

Environment Security Objective	IT Environment Security Objective Definition
Reproduced from cpp_nd_v2.2e	
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 documentation 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	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

Environment Security Objective	IT Environment Security Objective Definition
	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	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.
Reproduced from mod_vpngw_v1.1	
OE.CONNECTIONS	TOE is connected to distinct networks in a manner that ensures that the TOE security policies will be enforced on all applicable network traffic flowing among the attached networks.

5 SECURITY REQUIREMENTS

This section identifies the Security Functional Requirements for the TOE. The Security Functional Requirements included in this section are derived from Part 2 of the *Common Criteria for Information Technology Security Evaluation, Version 3.1, Revision 5, dated: April 2017* and all international interpretations.

5.1 Conventions

The CC defines operations on Security Functional Requirements: assignments, selections, assignments within selections and refinements. This document uses the following font conventions to identify the operations defined by the CC:

- Assignment: Indicated with *italicized* text;
- Refinement made by PP author: Indicated with **bold** text;
- Selection: Indicated with <u>underlined</u> text;
- Iteration: Indicated by appending the iteration number in parenthesis, e.g., (1), (2), (3).
- Where operations were completed in the cpp_nd_v2.2e, mod_cpp_fw_v1.4e and mod_vpngw_v1.1 itself, the formatting used there has been retained.

Extended SFRs are identified by having a label 'EXT' after the requirement name for TOE SFRs. Formatting conventions outside of operations and iterations matches the formatting specified within the PP and EP themselves. In addition, SFRs copied verbatim from mod_cpp_fw_v1.4e will have an extension [FW], SFRs copied from mod_vpngw_v1.1 will have extension [VPN] to distinguish them from the NDcPP. These SFRs that have an extension of [FW] or [VPN] do not exist in NDcPPv2.2e. Changes have been made to the base cPP SFRs as necessary to support the firewall and VPN functionality based on mod_cpp_fw_v1.4e and mod_vpngw_v1.1.

Except where noted, all aspects of SFRs are applicable to entire TOE (FTD, FMC and FXOS). Where specific functionality is only implemented in either FTD or FXOS, the applicable subcomponent is identified in an application note, or in embedded qualifiers within the text of the SFR. Application notes clarify distinctions where the TOE includes multiple implementations of a functionality and those implementations differ in their minimum support of the functionality. Thus, the SFR is stating the combined functionality of the TOE.

5.2 TOE Security Functional Requirements

This section identifies the Security Functional Requirements for the TOE. The TOE Security Functional Requirements that appear in the following table are described in more detail in the following subsections.

Table 16: Security Functional Requirements

Class Name	Component Identification	Component Name
Reproduced from cpp_nd_v2.2e		
FAU: Security Audit	FAU_GEN.1	Audit Data Generation
	FAU_GEN.2	User identity association
	FAU_GEN_EXT.1	Security Audit Generation
	FAU_STG_EXT.1	Protected Audit Event Storage

Class Name	Component Identification	Component Name
	FAU_STG_EXT.4	Protected Local Audit Event Storage for Distributed TOEs
	FAU_STG_EXT.5	Protected Remote Audit Event Storage for Distributed TOEs
FCO: Communication	FCO_CPC_EXT.1	Component Registration Channel Definition
FCS: Cryptographic Support	FCS_CKM.1	Cryptographic Key Generation
	FCS_CKM.2	Cryptographic Key Establishment
	FCS_CKM.4	Cryptographic Key Destruction
	FCS_COP.1/DataEncryption	Cryptographic Operation (AES Data Encryption/Decryption)
	FCS_COP.1/SigGen	Cryptographic Operation (Signature Generation and Verification)
	FCS_COP.1/Hash	Cryptographic Operation (Hash Algorithm)
	FCS_COP.1/KeyedHash	Cryptographic Operation (Keyed Hash Algorithm)
	FCS_HTTPS_EXT.1	HTTPS Protocol
	FCS_IPSEC_EXT.1	IPsec Protocol-FXOS
	FCS_NTP_EXT.1	NTP Protocol
	FCS_RBG_EXT.1	Random Bit Generation
	FCS_SSHS_EXT.1(1)	SSH Server Protocol (FXOS)
	FCS_SSHS_EXT.1(2)	SSH Server Protocol (FTD/FMC/FMCv)
	FCS_TLSC_EXT.1	TLS Client Protocol Without Mutual Authentication
	FCS_TLSC_EXT.2	TLS Client Support for Mutual Authentication
	FCS_TLSS_EXT.1	TLS Server Protocol
FIA: Identification and Authentication	FIA_AFL.1	Authentication Failure Management
	FIA_PMG_EXT.1	Password Management
	FIA_UIA_EXT.1	User Identification and Authentication
	FIA_UAU_EXT.2	Password-based Authentication Mechanism
	FIA_UAU.7	Protected Authentication Feedback

Class Name	Component Identification	Component Name
	FIA_X509_EXT.1/ITT	X.509 Certificate Validation
	FIA_X509_EXT.1/Rev	X.509 Certificate Validation
	FIA_X509_EXT.2(1)	X.509 Certificate Authentication [FTD OS TLS client and FMC]
	FIA_X509_EXT.2(2)	X.509 Certificate Authentication [FTD TLS Client and FXOS]
	FIA_X509_EXT.3	X.509 Certificate Requests
FMT: Security Management	FMT_MOF.1/ManualUpdate	Management of Security Functions Behaviour
	FMT_MTD.1/CoreData	Management of TSF Data
	FMT_MTD.1/CryptoKeys	Management of TSF Data
	FMT_SMF.1	Specification of Management Functions
	FMT_SMR.2	Restrictions on Security Roles
FPT: Protection of the TSF	FPT_SKP_EXT.1	Protection of TSF Data (for reading of all pre-shared, symmetric and private keys)
	FPT_APW_EXT.1	Protection of Administrator Passwords
	FPT_STM_EXT.1	Reliable Time Stamps
	FPT_TST_EXT.1	TSF Testing
	FPT_TUD_EXT.1	Trusted Update
	FPT_ITT.1	Basic internal TSF data transfer protection
	FPT_ITT.1/Join	Basic internal TSF data transfer protection – Registration Channel
FTA: TOE Access	FTA_SSL_EXT.1	TSF-initiated Session Locking
	FTA_SSL.3	TSF-initiated Termination
	FTA_SSL.4	User-initiated Termination
	FTA_TAB.1	Default TOE Access Banners
FTP: Trusted path/channels	FTP_ITC.1	Inter-TSF Trusted Channel
	FTP_TRP.1/Admin	Trusted Path
Reproduced from mod_cpp_fw_v1.4e		

Class Name	**Component Identification**	**Component Name**
FDP: User Data Protection	FDP_RIP.2[FW]	Full Residual Information Protection
FFW: Stateful Traffic Filtering	FFW_RUL_EXT.1[FW]	Stateful Traffic Filtering
	FFW_RUL_EXT.2[FW]	Stateful Filtering of Dynamic Protocols
FMT: Security Management	FMT_SMF.1/FFW[FW]	Specification of Management Functions
Reproduced from mod_vpngw_v1.1		
FCS: Cryptographic Support	FCS_CKM.1/IKE[VPN]	Cryptographic Key Generation (for IKE Peer Authentication)
	FCS_IPSEC_EXT.1[VPN]	IPsec Protocol – FTD
FIA: Identification and Authentication	FIA_PSK_EXT.1[VPN]	Pre-Shared Key Composition
FMT: Security Management	FMT_SMF.1/VPN[VPN]	Specification of Management Functions (VPN Gateway)
FPF: Packet Filtering	FPF_RUL_EXT.1[VPN]	Rules for Packet Filtering
FPT: Protection of the TSF	FPT_FLS.1/SelfTest[VPN]	Fail Secure (Self-Test Failures)
	FPT_TST_EXT.3[VPN]	Self-Test with Defined Methods
FTA: TOE Access	FTA_SSL.3/VPN[VPN]	TSF-Initiated Termination (VPN Headend)
	FTA_TSE.1[VPN]	TOE Session Establishment
	FTA_VCM_EXT.1[VPN]	VPN Client Management
FTP: Trusted path/channels	FTP_ITC.1/VPN[VPN]	Inter-TSF Trusted Channel (VPN Communications)

5.3 SFRs Drawn from NDcPP

5.3.1 Security audit (FAU)

5.3.1.1 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 <u>not specified</u> level of audit; and

c) All administrative actions comprising:

- *Administrative login and logout (name of user account shall be logged if individual user 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 user account shall be logged).*
- *[no other actions];*

d) *Specifically defined auditable events listed in Table 17.*

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 17.*

Table 17: Auditable Events

SFR	**Auditable Event**	**Additional Audit Record Contents**
Reproduced from NDcPP		
FAU_GEN.1	None.	None.
FAU_GEN.2	None.	None.
FAU_GEN_EXT.1	None.	None.
FAU_STG_EXT.1	None.	None.
FAU_STG_EXT.4	None.	None.
FAU_STG_EXT.5	None.	None.
FCO_CPC_EXT.1	• Enabling communications between a pair of components. • Disabling communications between a pair of components.	Identities of the endpoints pairs enabled or disabled.
FCS_CKM.1	None.	None.
FCS_CKM.2	None.	None.
FCS_CKM.4	None.	None.
FCS_COP.1/ DataEncryption	None.	None.
FCS_COP.1/SigGen	None.	None.
FCS_COP.1/Hash	None.	None.
FCS_COP.1/KeyedHash	None.	None.
FCS_HTTPS_EXT.1	Failure to establish a HTTPS session.	Reason for failure
FCS_IPSEC_EXT.1	Failure to establish an IPsec SA. Session Establishment with peer	Reason for failure. Entire packet contents of packets transmitted/received during session establishment.
FCS_NTP_EXT.1	• Configuration of a new time server • Removal of configured time server	Identity if new/removed time server

SFR	Auditable Event	Additional Audit Record Contents
FCS_RBG_EXT.1	None.	None.
FCS_SSHS_EXT.1(1)	Failure to establish an SSH session	Reason for failure
FCS_SSHS_EXT.1(2)	Failure to establish an SSH session	Reason for failure
FCS_TLSC_EXT.1	Failure to establish a TLS Session	Reason for failure
FCS_TLSC_EXT.2	None.	None.
FCS_TLSS_EXT.1	Failure to establish a TLS Session	Reason for failure
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_EXT.2	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/ITT	• 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.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(1)	None.	None.
FIA_X509_EXT.2(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_SKP_EXT.1	None.	None.
FPT_APW_EXT.1	None.	None.
FPT_TST_EXT.1	None.	None.
FPT_TUD_EXT.1	Initiation of update; result of the update attempt (success or failure)	No additional information.
FPT_STM_EXT.1	Discontinuous changes to time - either Administrator actuated or changed via an automated process. (Note that no continuous changes to time need to be logged. See also application note on FPT_STM_EXT.1)	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).

SFR	Auditable Event	Additional Audit Record Contents
FPT_ITT.1	• Initiation of the trusted channel. • Termination of the trusted channel. • Failure of the trusted channel functions.	Identification of the initiator and target of failed trusted channels establishment attempt
FPT_ITT.1/Join	• Initiation of the trusted channel. • Termination of the trusted channel. • Failure of the trusted channel functions.	Identification of the initiator and target of failed trusted channels establishment attempt
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.	Identification of the initiator and target of failed trusted channels establishment attempt
FTP_TRP.1/Admin	• Initiation of the trusted path. • Termination of the trusted path. • Failures of the trusted path functions.	None.
Reproduced from the mod_cpp_fw_v1.4e		
FDP_RIP.2[FW]	None.	None.
FFW_RUL_EXT.1[FW]	Application of rules configured with the ‘log’ operation	Source and destination addresses Source and destination ports Transport Layer Protocol TOE Interface
FFW_RUL_EXT.2[FW]	Dynamical definition of rule Establishment of a session	None.
FMT_SMF.1/FFW[FW]	All management activities of TSF data(including creation, modification and deletion of firewall rules).	None.
Reproduced from the mod_vpngw_v1.1		
FCS_CKM.1/IKE[VPN]	None.	None.
FCS_IPSEC_EXT.1[VPN]	Failure to establish an IPsec SA. Session Establishment with peer	Reason for failure. Entire packet contents of packets transmitted/received during session establishment.
FIA_PSK_EXT.1[VPN]	None.	None.

SFR	Auditable Event	Additional Audit Record Contents
FMT_SMF.1/VPN[VPN]	None.	None.
FPF_RUL_EXT.1[VPN]	Application of rules configured with the 'log' operation	Source and destination addresses Source and destination ports Transport Layer Protocol
FPT_FLS.1/SelfTest[VPN]	None.	None.
FPT_TST_EXT.3[VPN]	None.	None.
FTA_SSL.3/VPN[VPN]	None.	None.
FTA_TSE.1[VPN]	None.	None.
FTA_VCM_EXT.1[VPN]	None.	None.
FTP_ITC.1/VPN[VPN]	None.	None.

5.3.1.2 FAU_GEN.2 User Identity Association

FAU_GEN.2.1 For audit events resulting from actions of identified users, the TSF shall be able to associate each auditable event with the identity of the user that caused the event.

5.3.1.3 FAU_GEN_EXT.1 Security Audit Generation

FAU_GEN_EXT.1.1 The TSF shall be able to generate audit records for each TOE component. The audit records generated by the TSF of each TOE component shall include the subset of security relevant audit events which can occur on the TOE component.

5.3.1.4 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 be a distributed TOE that stores audit data on the following TOE components: [FMC, FTD, FXOS]*,
- *The TOE shall be a distributed TOE with storage of audit data provided externally for the following TOE components: [FTD transmits its audit data to FMC]*.]

FAU_STG_EXT.1.3 The TSF shall [*overwrite previous audit records according to the following rule: [the newest audit record will overwrite the oldest audit record]*] when the local storage space for audit data is full.

5.3.1.5 FAU_STG_EXT.4 Protected Local Audit Event Storage for Distributed TOEs

FAU_STG_EXT.4.1 The TSF of each TOE component which stores security audit data locally shall perform the following actions when the local storage space for audit data is full:

[

FMC: overwrite previous audit records according to the following rule: [oldest records are overwritten]

FXOS: overwrite previous audit records according to the following rule: [oldest records are overwritten]

FTD: overwrite previous audit records according to the following rule: [oldest records are overwritten]

]

5.3.1.6 FAU_STG_EXT.5 Protected Remote Audit Event Storage for Distributed TOEs

FAU_STG_EXT.5.1 Each TOE component which does not store security audit data locally shall be able to buffer security audit data locally until it has been transferred to another TOE component that stores or forwards it. All transfer of audit records between TOE components shall use a protected channel according to [FPT_ITT.1]

5.3.2 Communication (FCO)

5.3.2.1 FCO_CPC_EXT.1 Communication Partner Control

FCO_CPC_EXT.1.1 The TSF shall require a Security Administrator to enable communications between any pair of TOE components before such communication can take place.

FCO_CPC_EXT.1.2 The TSF shall implement a registration process in which components establish and use a communications channel that uses [

• A channel that meets the secure channel requirements in [FPT_ITT.1/Join]].

for at least TSF data.

FCO_CPC_EXT.1.3 The TSF shall enable a Security Administrator to disable communications between any pair of TOE components.

5.3.3 Cryptographic Support (FCS)

5.3.3.1 FCS_CKM.1 Cryptographic Key Generation

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 2048-bit or greater that meet the following: FIPS PUB 186-4, "Digital Signature Standard (DSS)", Appendix B.3;*
- *ECC schemes using "NIST curves" [P-256, P-384, P-521] that meet the following: FIPS PUB 186-4, "Digital Signature Standard (DSS)", Appendix B.4*
- *FFC schemes using cryptographic key sizes of 2048-bit or greater that meet the following: FIPS PUB 186-4, "Digital Signature Standard (DSS)", Appendix B.1*
- *FFC Schemes using 'safe-prime' groups that meet the following: "NIST Special Publication 800-56A Revision 3, Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography" and* [RFC 3526]

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

5.3.3.2 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: *[*

- *RSA-based key establishment schemes that meet the following: RSAES-PKCS1-v1_5 as specified in Section 7.2 of RFC 3447, "Public-Key Cryptography Standards (PKCS) #1: RSA Cryptography Specifications Version 2.1";*
- *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"*
- *Finite field-based key establishment schemes that meets the following: NIST Special Publication 800-56A Revision 2, "Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography"*
- *FFC Schemes using "safe-prime" groups that meet the following: 'NIST Special Publication 800-56A Revision 3, "Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography" and* [*groups listed in RFC 3526*]

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

5.3.3.3 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], destruction of reference to the key directly followed by a request for garbage collection];*
- *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 [*
  - o *logically addresses the storage location of the key and performs a [[one]-pass] overwrite consisting of [zeroes]];*
  - o *instructs a part of the TSF to destroy the abstraction that represents the key]*

that meets the following: *No Standard*.

5.3.3.4 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*] and [*no other*]** mode and cryptographic key sizes **[128 bits, 256 bits], and [*no other cryptographic key sizes*]** that meet the following: AES as specified in ISO 18033-3, ***[CBC as specified in ISO 10116, GCM as specified in ISO 19772]* and [*no other standards*]**.

5.3.3.5 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 and cryptographic key sizes (modulus) [2048 bits, 3072 bits]*
- *Elliptic Curve Digital Signature Algorithm and cryptographic key sizes [256, 384, and 521 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 RSASSAPKCS2v1_ 5; ISO/IEC 9796-2, Digital signature scheme 2 or Digital Signature scheme 3,*
- *For ECDSA schemes: FIPS PUB 186-4, "Digital Signature Standard (DSS)", Section 6 and Appendix D, Implementing "NIST curves" [P-256, P-384, P-521]; ISO/IEC 14888-3, Section 6.4*

].

5.3.3.6 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-1, SHA-256, SHA-384, SHA-512*] ~~and cryptographic key sizes [assignment: *cryptographic key sizes*]~~ and **message digest sizes** [***160, 256, 384, 512***] **bits** that meet the following: *ISO/IEC 10118-3:2004*.

5.3.3.7 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-1, HMAC-SHA-256, HMAC-SHA-384, HMAC-SHA-512]* and cryptographic key sizes [*160, 256, 384 and 512 bits*] **and message digest sizes** ***[160, 256, 384, 512] bits*** that meet the following: *ISO/IEC 9797-2:2011, Section 7 "MAC Algorithm 2"*.

5.3.3.8 FCS_HTTPS_EXT.1 HTTPS Protocol

FCS_HTTPS_EXT.1.1 The TSF shall implement the HTTPS protocol that complies with RFC 2818.

FCS_HTTPS_EXT.1.2 The TSF shall implement HTTPS using TLS.

FCS_HTTPS_EXT.1.3 If a peer certificate is presented, the TSF shall *[not require client authentication*] if the peer certificate is deemed invalid.

5.3.3.9 FCS_IPSEC_EXT.1 IPsec Protocol - FXOS

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 [*transport mode, tunnel mode*].

FCS_IPSEC_EXT.1.4 The TSF shall implement the IPsec protocol ESP as defined by RFC 4303 using the cryptographic algorithms [*AES-CBC-128 (RFC 3602), AES-CBC-256 (RFC 3602)*] together with a Secure Hash Algorithm (SHA)-based HMAC [*HMAC-SHA-1*]

FCS_IPSEC_EXT.1.5 The TSF shall implement the protocol: [

- *IKEv2 as defined in RFC 5996 and [with mandatory support for NAT traversal as specified in RFC 5996, section 2.23)], 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-CBC-128, AES-CBC-256 (specified in RFC 3602), AES-GCM-128 (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 within [60-1440 minutes, 1-24] hours*

  ]

].

FCS_IPSEC_EXT.1.8 The TSF shall ensure that [

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

  [

  - *length of time, where the time values can be configured within [30-480 minutes, 0.5-8] 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 [*512*] 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 all IKE protocols implement DH Group(s)

[

- [*14 (2048-bit MODP)] according to RFC 3526;*

].

FCS_IPSEC_EXT.1.12 The TSF shall be able to ensure by default that the strength of the symmetric algorithm (in terms of the number of bits in the key) negotiated to protect the [*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: [*Distinguished Name (DN*] and [*no other reference identifier type*]

5.3.3.10 FCS_NTP_EXT.1 NTP Protocol

FCS_NTP_EXT.1.1 The TSF shall use only the following NTP version(s) [*NTP v3 (RFC 1305)*].

FCS_NTP_EXT.1.2 The TSF shall update its system time using [

- [*IPsec*] to provide trusted communication between itself and an NTP time source.

].

FCS_NTP_EXT.1.3 The TSF shall not update NTP timestamp from broadcast and/or multicast addresses.

FCS_NTP_EXT.1.4 The TSF shall support configuration of at least three (3) NTP time sources in the Operational Environment.

5.3.3.11 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 [*[one] platform-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.

5.3.3.12 FCS_SSHS_EXT.1(1) SSH Server Protocol (FXOS)

FCS_SSHS_EXT.1.1(1) The TSF shall implement the SSH protocol that complies with RFC(s) 4251, 4252, 4253, 4254, [6668].

FCS_SSHS_EXT.1.2(1) The TSF shall ensure that the SSH protocol implementation supports the following authentication methods as described in RFC 4252: public key-based, [*password-based*].

FCS_SSHS_EXT.1.3(1) The TSF shall ensure that, as described in RFC 4253, packets greater than [*262149*] bytes in an SSH transport connection are dropped.

FCS_SSHS_EXT.1.4(1) The TSF shall ensure that the SSH transport implementation uses the following encryption algorithms and rejects all other encryption algorithms: [*aes128-cbc, aes256-cbc*].

FCS_SSHS_EXT.1.5(1) The TSF shall ensure that the SSH public-key based authentication implementation uses [*ssh-rsa*] as its public key algorithm(s) and rejects all other public key algorithms.

FCS_SSHS_EXT.1.6(1) The TSF shall ensure that the SSH transport implementation uses *[hmac-sha1, hmac-sha2-256, hmac-sha2-512]* as its MAC algorithm(s) and rejects all other MAC algorithm(s).

FCS_SSHS_EXT.1.7(1) The TSF shall ensure that [*diffie-hellman-group14-sha1*] and [*no other methods*] are the only allowed key exchange methods used for the SSH protocol.

FCS_SSHS_EXT.1.8(1) The TSF shall ensure that within SSH connections, the same session keys are used for a threshold of no longer than one hour, and each encryption key is used to protect no more than one gigabyte of data. After any of the thresholds are reached, a rekey needs to be performed.

5.3.3.13 FCS_SSHS_EXT.1(2) SSH Server Protocol (FTD/FMC/FMCv)

FCS_SSHS_EXT.1.1(2) The TSF shall implement the SSH protocol that complies with RFC(s) 4251, 4252, 4253, 4254, [6668].

FCS_SSHS_EXT.1.2(2) The TSF shall ensure that the SSH protocol implementation supports the following authentication methods as described in RFC 4252: public key-based, [*password-based*].

FCS_SSHS_EXT.1.3(2) The TSF shall ensure that, as described in RFC 4253, packets greater than [*32768*] bytes in an SSH transport connection are dropped.

FCS_SSHS_EXT.1.4(2) The TSF shall ensure that the SSH transport implementation uses the following encryption algorithms and rejects all other encryption algorithms: [*aes128-cbc, aes256-cbc, AEAD_AES_128_GCM, AEAD_AES_256_GCM*].

FCS_SSHS_EXT.1.5(2) The TSF shall ensure that the SSH public-key based authentication implementation uses [*ssh-rsa*] as its public key algorithm(s) and rejects all other public key algorithms.

FCS_SSHS_EXT.1.6(2) The TSF shall ensure that the SSH transport implementation uses *[hmac-sha1, hmac-sha2-256, hmac-sha2-512, AEAD_AES_128_GCM, AEAD_AES_256_GCM]* as its MAC algorithm(s) and rejects all other MAC algorithm(s).

FCS_SSHS_EXT.1.7(2) The TSF shall ensure that [*diffie-hellman-group14-sha1*] and [*no other methods*] are the only allowed key exchange methods used for the SSH protocol.

FCS_SSHS_EXT.1.8(2) The TSF shall ensure that within SSH connections, the same session keys are used for a threshold of no longer than one hour, and each encryption key is used to protect no more than one gigabyte of data. After any of the thresholds are reached, a rekey needs to be performed.

5.3.3.14 FCS_TLSC_EXT.1 TLS Client Protocol Without Mutual Authentication

FCS_TLSC_EXT.1.1 The TSF shall implement [*TLS 1.2 (RFC 5246), TLS 1.1 (RFC 4346)*] and reject all other TLS and SSL versions. The TLS implementation will support the following ciphersuites: *[*

Relevant to syslog over TLS from FTD (No mutual authentication):

- *TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256 as defined in RFC 5289 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384 as defined in RFC 5289 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5289 (TLSv1.2 only)*

Relevant to FPT_ITT.1 (No mutual authentication):

- *TLS_RSA_WITH_AES_128_CBC_SHA as defined in RFC 3268 (TLSv1.2, TLSv1.1)*
- *TLS_RSA_WITH_AES_256_CBC_SHA as defined in RFC 3268 (TLSv1.2, TLSv1.1)*

- *TLS_RSA_WITH_AES_128_CBC_SHA256 as defined in RFC 5246 (TLSv1.2, TLSv1.1)*
- *TLS_RSA_WITH_AES_256_CBC_SHA256 as defined in RFC 5246 (TLSv1.2, TLSv1.1)*
- *TLS_RSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5288 (TLSv1.2 only)*
- *TLS_RSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5288 (TLSv1.2 only)*
- *TLS_DHE_RSA_WITH_AES_128_CBC_SHA as defined in RFC 3268 (TLSv1.2, TLSv1.1)*
- *TLS_DHE_RSA_WITH_AES_256_CBC_SHA as defined in RFC 3268 (TLSv1.2, TLSv1.1)*
- *TLS_DHE_RSA_WITH_AES_128_CBC_SHA256 as defined in RFC 5246 (TLSv1.2, TLSv1.1)*
- *TLS_DHE_RSA_WITH_AES_256_CBC_SHA256 as defined in RFC 5246 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA as defined in RFC 4492 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA as defined in RFC 4492 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256 as defined in RFC 5289 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384 as defined in RFC 5289 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA as defined in RFC 4492 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA as defined in RFC 4492 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256 as defined in RFC 5289 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384 as defined in RFC 5289 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5289 (TLSv1.2 only)*

Relevant to syslog over TLS from FTD (With Mutual authentication):

- *TLS_RSA_WITH_AES_128_CBC_SHA256 as defined in RFC 5246 (TLSv1.2, TLSv1.1)*
- *TLS_RSA_WITH_AES_256_CBC_SHA256 as defined in RFC 5246 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256 as defined in RFC 5289 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384 as defined in RFC 5289 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5289 (TLSv1.2 only)*

Relevant to syslog over TLS from FMC/FMCv (With Mutual authentication):

- *TLS_RSA_WITH_AES_128_CBC_SHA256 as defined in RFC 5246 (TLSv1.2, TLSv1.1)*

- *TLS_RSA_WITH_AES_256_CBC_SHA256 as defined in RFC 5246 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256 as defined in RFC 5289 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384 as defined in RFC 5289 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384 as defined in RFC 5289 (TLSv1.2, TLSv1.1)*

] and no other ciphersuites.

FCS_TLSC_EXT.1.2 The TSF shall verify that the presented identifier matches [*the reference identifier per RFC 6125 section 6, the identifier per RFC 5280 Appendix A using [id-at-title] and no other attribute types*]

FCS_TLSC_EXT.1.3 When establishing a trusted channel, by default the TSF shall not establish a trusted channel if the server certificate is invalid. The TSF shall also [

- *Not implement any administrator override mechanism*.

]

FCS_TLSC_EXT.1.4 The TSF shall [*present the Supported Elliptic Curves/Supported Groups Extension with the following curves/groups: [secp256r1, secp384r1, secp521r1] and no other curves/groups*] in the Client Hello.

Application Note

FCS_TLSC_EXT.1 is applicable to two TLS clients that send syslog messages to the syslog server- ***FTD TLS client,*** *that is configured by the FMC and is the main audit system for audits generated by FTD. It sends audit events such as IPsec and login messages to the external syslog server and Mutual authentication is not supported; and the* ***FTD OS TLS client****, that is configured through the FTD's command line and sends audit events to an external syslog server such as SSH login, console login, etc. and Mutual authentication is supported.*

TLSv1.2 supports all the ciphersuites listed. TLSv1.1 only supports the ciphersuites with CBC.

The selection of – "the identifier per RFC 5280 Appendix A using [id-at-title]"in FCS_TLSC_EXT.1.2 is only applicable to the TLS connection that is relevant to FPT_ITT.1

5.3.3.15 FCS_TLSC_EXT.2 TLS Client Support for Mutual Authentication

FCS_TLSC_EXT.2.1 The TSF shall support TLS communication with mutual authentication using X.509v3 certificates.

Application Note

FCS_TLSC_EXT.2 is applicable to the TLS client in FMC/FMCv that is used for transmission of syslog over TLS, and to the FTD OS TLS client used for transmission of syslog over TLS.

TLSv1.2 supports all the ciphersuites listed. TLSv1.1 only supports the ciphersuites with SHA.

5.3.3.16 FCS_TLSS_EXT.1 TLS Server Protocol

FCS_TLSS_EXT.1.1 The TSF shall implement [*TLS 1.2 (RFC 5246), TLS 1.1 (RFC 4346)*] and reject all other TLS and SSL versions. The TLS implementation will support the following ciphersuites: *[*

Relevant to FPT_ITT.1 (TOE as Server- FMC and FTD):

- *TLS_RSA_WITH_AES_128_CBC_SHA as defined in RFC 3268 (TLSv1.2, TLSv1.1)*
- *TLS_RSA_WITH_AES_256_CBC_SHA as defined in RFC 3268 (TLSv1.2, TLSv1.1)*
- *TLS_RSA_WITH_AES_128_CBC_SHA256 as defined in RFC 5246 (TLSv1.2 only)*
- *TLS_RSA_WITH_AES_256_CBC_SHA256 as defined in RFC 5246 (TLSv1.2 only)*
- *TLS_RSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5288(TLSv1.2 only)*
- *TLS_RSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5288(TLSv1.2 only)*

Relevant to FTP_TRP.1/Admin (applicable to FMC/FMCv only):

- *TLS_RSA_WITH_AES_128_CBC_SHA as defined in RFC 3268 (TLSv1.2 only)*
- *TLS_RSA_WITH_AES_256_CBC_ SHA as defined in RFC 3268 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5289 (TLSv1.2 only)*

Relevant to FTP_TRP.1/Admin (applicable to FXOS only):

- *TLS_RSA_WITH_AES_128_CBC_SHA as defined in RFC 3268 (TLSv1.2, TLSv1.1)*
- *TLS_RSA_WITH_AES_256_CBC_ SHA as defined in RFC 3268 (TLSv1.2, TLSv1.1)*
- *TLS_RSA_WITH_AES_128_CBC_SHA256 as defined in RFC 5246 (TLSv1.2 only)*
- *TLS_RSA_WITH_AES_256_CBC_SHA256 as defined in RFC 5246 (TLSv1.2 only)*
- *TLS_RSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5288 (TLSv1.2 only)*
- *TLS_RSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5288 (TLSv1.2 only)*
- *TLS_DHE_RSA_WITH_AES_128_CBC_SHA as defined in RFC 3268 (TLSv1.2, TLSv1.1)*
- *TLS_DHE_RSA_WITH_AES_256_CBC_SHA as defined in RFC 3268 (TLSv1.2, TLSv1.1)*
- *TLS_DHE_RSA_WITH_AES_128_CBC_SHA256 as defined in RFC 5246 (TLSv1.2 only)*
- *TLS_DHE_RSA_WITH_AES_256_CBC_SHA256 as defined in RFC 5246 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA as defined in RFC 4492 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA as defined in RFC 4492 (TLSv1.2, TLSv1.1)*
- *TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256 as defined in RFC 5289 (TLSv1.2 only)*
- *TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384 as defined in RFC 5289 (TLSv1.2 only)*

] and no other ciphersuites.

FCS_TLSS_EXT.1.2 The TSF shall deny connections from clients requesting SSL 2.0, SSL 3.0, TLS 1.0, and [*none*].

FCS_TLSS_EXT.1.3 The TSF shall perform key establishment for TLS using [*RSA with key size [2048 bits], Diffie-Hellman parameters with size [2048 bits (FXOS only)], ECDHE curves [secp256r1, secp384r1 (FXOS only), secp521r1(FXOS only)] and no other curves]*].
FCS_TLSS_EXT.1.4 The TSF shall support [*session resumption based on session tickets according to RFC 5077*].

5.3.4 Identification and authentication (FIA)

5.3.4.1 FIA_AFL.1 Authentication Failure Management

FIA_AFL.1.1 The TSF shall detect when an Administrator configurable positive integer within [*1 to 99* ***(FMC)****, 1 to 10* ***(FXOS)****, 1 to 10* ***(FTD)***] 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 remote Administrator from successfully establishing remote session using any authentication method that involves a password until [unlocking] is taken by an Administrator*].

5.3.4.2 FIA_PMG_EXT.1 Password Management

FIA_PMG_EXT.1.1 The TSF shall provide the following password management capabilities for administrative passwords:

a) Passwords shall be able to be composed of any combination of upper and lower case letters, numbers, and the following special characters: [“!”, “@”, “#”, “$”, “%”, “^”, “&”, “*”, “(“, “)”, [“ ” ‘ ` (double or single quote/apostrophe), + (plus), - (minus), = (equal), , (comma), . (period), / (forward-slash), \ (back-slash), | (vertical-bar or pipe), : (colon), ; (semi-colon), < > (less-than, greater-than inequality signs), [ ] (square-brackets), { } (braces or curly-brackets),^ (caret), _ (underscore), and ~ (tilde)]];

b) Minimum password length shall be configurable to between *[8] and [32 (FTD, FMC) and 80 (FXOS)]* characters.

5.3.4.3 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.

5.3.4.4 FIA_UAU_EXT.2 Password-based Authentication Mechanism

FIA_UAU_EXT.2.1 The TSF shall provide a local [*password-based*] authentication mechanism to perform local administrative user authentication.

5.3.4.5 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**.

5.3.4.6 FIA_X509_EXT.1/ITT X.509 Certificate Validation

FIA_X509_EXT.1.1/ITT 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 two 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 [*no revocation method*].
- The TSF shall validate the extendedKeyUsage field according to the following rules:
    - *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/ITT 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.

5.3.4.7 FIA_X509_EXT.1/Rev1 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 [*the Online Certificate Status Protocol (OCSP) as specified in RFC 6960* ***(FTD-only)****, 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.

5.3.4.8 FIA_X509_EXT.2(1) Certificate Authentication [FTD OS TLS client and FMC]

FIA_X509_EXT.2.1(1) The TSF shall use X.509v3 certificates as defined by RFC 5280 to support authentication for [*TLS*], and [*no additional uses*].

FIA_X509_EXT.2.2(1) When the TSF cannot establish a connection to determine the validity of a certificate, the TSF shall [*accept the certificate*].

5.3.4.9 FIA_X509_EXT.2(2) Certificate Authentication [FTD TLS Client and FXOS]

FIA_X509_EXT.2.1(2) The TSF shall use X.509v3 certificates as defined by RFC 5280 to support authentication for **IPsec and** [***TLS***], and [*no additional uses*].

FIA_X509_EXT.2.2(2) When the TSF cannot establish a connection to determine the validity of a certificate, the TSF shall [*not accept the certificate*].

5.3.4.10 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.

5.3.5 Security management (FMT)

5.3.5.1 FMT_MOF.1/ManualUpdate Management of Security Functions Behaviour

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

5.3.5.2 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*.

5.3.5.3 FMT_MTD.1/CryptoKeys Management of TSF Data

FMT_MTD.1.1/CryptoKeys The TSF shall restrict the ability to [[*manage*]] the [*cryptographic keys* ***and certificates used for VPN operation***] to [*Security Administrators*].

5.3.5.4 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 locally and remotely;*
- *Ability to configure the access banner;*
- *Ability to configure the session inactivity time before session termination or locking;*
- *Ability to update the TOE, and to verify the updates using* **digital signature and [no other]** *capability prior to installing those updates;*
- *Ability to configure the authentication failure parameters for FIA_AFL.1;*
- ***Ability to manage the cryptographic keys;***
- ***Ability to configure the cryptographic functionality;***
- ***Ability to configure the lifetime for IPsec SAs;***
- ***Ability to import X.509v3 certificates to the TOE's trust store;***
- [
    - *Ability to configure the interaction between TOE components;*
    - *Ability to re-enable an Administrator account;*
    - *Ability to set the time which is used for time-stamps;*
    - *Ability to configure NTP;*
    - *Ability to configure the reference identifier for the peer;*

  ]

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

are satisfied.

5.3.6 Protection of the TSF (FPT)

5.3.6.1 FPT_SKP_EXT.1 Protection of TSF Data (for Reading of All Symmetric Keys)

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

5.3.6.2 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.

5.3.6.3 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* ***(FMC and FXOS)****, synchronise time with an NTP server* ***(FXOS-only)***].

5.3.6.4 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 demonstrate the correct operation of the TSF: **noise source health tests**, [*FIPS 140-2 standard power-up self-tests and firmware integrity test*].

5.3.6.5 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 a means to authenticate firmware/software updates to the TOE using a **digital signature mechanism and** [***no other mechanisms***] prior to installing those updates.

5.3.6.6 FPT_ITT.1: Basic Internal TOE TSF data transfer protection

FPT_ITT.1.1 The TSF shall protect TSF data from disclosure and **detect its** modification when it is transmitted between separate parts of the TOE **through the use of** [***TLS*****]**.

5.3.6.7 FPT_ITT.1/Join: Basic Internal TOE TSF data transfer protection – Registration Channel

FPT_ITT.1.1/Join The TSF shall protect TSF data from disclosure and **detect its** modification when it is transmitted between separate parts of the TOE **through the use of** [***TLS***].

5.3.7 TOE Access (FTA)

5.3.7.1 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.

5.3.7.2 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*.

5.3.7.3 FTA_SSL.4 User-initiated Termination

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

5.3.7.4 FTA_TAB.1 Default TOE Access Banners

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

5.3.8 Trusted Path/Channels (FTP)

5.3.8.1 FTP_ITC.1 Inter-TSF Trusted Channel

FTP_ITC.1.1 The TSF shall **be capable of using [*IPsec, TLS*] to** provide a trusted communication channel between itself and **authorized IT entities supporting the following capabilities: audit server, [*VPN Communications, NTP server*]** that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from **disclosure and detection of modification of the channel data**.

FTP_ITC.1.2 The TSF shall permit **the TSF or the authorized IT entities** to initiate communication via the trusted channel.

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

- *Audit server: transmit audit data via syslog over IPsec **(FXOS-only)** or TLS **(FMC and FTD)**;*
- *VPN client: VPN connections from VPN client using IPsec;*
- *NTP server using IPsec;*].

5.3.8.2 FTP_TRP.1/Admin Trusted Path

FTP_TRP.1.1/Admin The TSF shall **be capable of using** [***SSH, TLS (FMC and FXOS only), HTTPS (FMC and FXOS only), IPsec (FTD and FXOS only)***] **to** provide a communication path between itself and **authorized** remote **Administrators** that is logically distinct from other communication paths and provides assured identification of its end points and protection of the communicated data from **disclosure and provides detection of modification of the communicated data**.

FTP_TRP.1.2/Admin The TSF shall permit remote **Administrators** 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*.

5.4 SFRs Drawn from mod_cpp_fw_v1.4e

5.4.1 User Data Protection (FDP)

5.4.1.1 FDP_RIP.2[FW] Full Residual Information Protection

FDP_RIP.2.1[FW] The TSF shall ensure that any previous information content of a resource is made unavailable upon the [*allocation of the resource to*] all objects.

5.4.2 Stateful Traffic Filtering (FFW)

5.4.2.1 FFW_RUL_EXT.1[FW] Stateful Traffic Filtering

FFW_RUL_EXT.1.1[FW] The TSF shall perform Stateful Traffic Filtering on network packets processed by the TOE.

FFW_RUL_EXT.1.2[FW] The TSF shall allow the definition of Stateful Traffic Filtering rules using the following network protocol fields:

- *ICMPv4*
  - *Type*
  - *Code*
- *ICMPv6*
  - *Type*
  - *Code*
- *IPv4*
  - *Source address*
  - *Destination Address*
  - *Transport Layer Protocol*
- *IPv6*
  - *Source address*
  - *Destination Address*
  - *Transport Layer Protocol*
  - *[no other field]*
- *TCP*
  - *Source Port*
  - *Destination Port*

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

and distinct interface.

FFW_RUL_EXT.1.3[FW] The TSF shall allow the following operations to be associated with stateful traffic filtering rules: permit or drop with the capability to log the operation.

FFW_RUL_EXT.1.4[FW] The TSF shall allow the stateful traffic filtering rules to be assigned to each distinct network interface.

FFW_RUL_EXT.1.5[FW] The TSF shall:

a) accept a network packet without further processing of stateful traffic filtering rules if it matches an allowed established session for the following protocols: TCP, UDP, [*no other protocols*] based on the following *network packet attributes*:

1. TCP: source and destination addresses, source and destination ports, sequence number, Flags;

2. UDP: source and destination addresses, source and destination ports;

3. [no other protocols].

b) Remove existing traffic flows from the set of established traffic flows based on the following: [*session inactivity timeout, completion of the expected information flow*].

FFW_RUL_EXT.1.6[FW] The TSF shall enforce the following default stateful traffic filtering rules on all network traffic:

a) The TSF shall drop and be capable of [logging] packets which are invalid fragments;

b) The TSF shall drop and be capable of [logging] fragmented packets which cannot be re-assembled completely;

c) The TSF shall drop and be capable of logging packets where the source address of the network packet is defined as being on a broadcast network;

d) The TSF shall drop and be capable of logging packets where the source address of the network packet is defined as being on a multicast network;

e) The TSF shall drop and be capable of logging network packets where the source address of the network packet is defined as being a loopback address;

f) The TSF shall drop and be capable of logging network packets where the source or destination address of the network packet is defined as being unspecified (i.e. 0.0.0.0) or an address "reserved for future use" (i.e. 240.0.0.0/4) as specified in RFC 5735 for IPv4;

g) The TSF shall drop and be capable of logging network packets where the source or destination address of the network packet is defined as an "unspecified address" or an address "reserved for future definition and use" (i.e. unicast addresses not in this address range: 2000::/3) as specified in RFC 3513 for IPv6;

h) The TSF shall drop and be capable of logging network packets with the IP options: Loose Source Routing, Strict Source Routing, or Record Route specified; and

i) [[Other traffic dropped by default and able to be logged:

i. Slowpath Security Checks – The TSF shall reject and be capable of logging the detection of the following network packets:

1. In routed mode when the TOE receives a through-the-box:

a. *L2 broadcast packet (MAC address FF:FF:FF:FF:FF:FF)*

b. *IPv4 packet with destination IP address equal to 0.0.0.0*

c. *IPv4 packet with source IP address equal to 0.0.0.0*

2. *In routed or transparent mode when the TOE receives a through-the-box IPv4 packet with any of:*

a. *first octet of the source IP address equal to zero*

b. *network part of the source IP address equal to all 0's*

c. *network part of the source IP address equal to all 1's*

d. *source IP address host part equal to all 0's or all 1's*

e. *source IP address and destination IP address are the same ("land.c" attack)*

ii. *LAND Attack: The TSF shall reject and be capable of logging network packets with the IP source address equal to the IP destination, and the destination port equal to the source port.*

iii. *ICMP Error Inspect and ICMPv6 Error Inspect - The TSF shall reject and be capable of logging ICMP error packets when the ICMP error messages are not related to any session already established in the TOE.*

iv. *ICMPv6 condition - The TSF shall reject and be capable of logging network packets when the appliance is not able to find any established connection related to the frame embedded in the ICMPv6 error message.*

v. *ICMP Inspect bad icmp code - The TSF shall reject and be capable of logging network packets when an ICMP echo request/reply packet was received with a malformed code(non-zero)]].*

FFW_RUL_EXT.1.7[FW] The TSF shall be capable of dropping and logging according to the following rules:

a) *The TSF shall drop and be capable of logging network packets where the source address of the network packet is equal to the address of the network interface where the network packet was received;*

b) *The TSF shall drop and be capable of logging network packets where the source or destination address of the network packet is a link-local address;*

c) *The TSF shall drop and be capable of logging network packets where the source address of the network packet does not belong to the networks associated with the network interface where the network packet was received.*

FFW_RUL_EXT.1.8[FW] The TSF shall process the applicable Stateful Traffic Filtering rules in an administratively defined order.

FFW_RUL_EXT.1.9[FW] The TSF shall deny packet flow if a matching rule is not identified.

FFW_RUL_EXT.1.10[FW] The TSF shall be capable of limiting an administratively defined number of *half-open TCP connections. In the event that the configured limit is reached, new connection attempts shall be dropped and the drop event shall be [counted].*

5.4.2.2 FFW_RUL_EXT.2[FW] Stateful Filtering of Dynamic Protocols

FFW_RUL_EXT.2.1[FW] The TSF shall dynamically define rules or establish sessions allowing network traffic to flow for the following network protocols [*FTP*].

5.4.3 Security Management (FMT)

5.4.3.1 FMT_SMF.1/FFW[FW] Specification of Management Functions

FMT_SMF.1.1/FFW[FW] The TSF shall be capable of performing the following management functions:

- *Ability to configure firewall rules*

5.5 SFRs from mod_vpngw_v1.1

5.5.1 Cryptographic Support (FCS)

5.5.1.1 FCS_CKM.1/IKE[VPN] Cryptographic Key Generation (for IKE Peer Authentication)

FCS_CKM.1.1/IKE[VPN] The TSF shall generate **asymmetric** cryptographic keys **used for IKE peer authentication** in accordance with a specified cryptographic key generation algorithm: [

- ***FIPS PUB 186-4, "Digital Signature Standard (DSS)"; Appendix B.3 for RSA schemes;***
- ***FIPS PUB 186-4, "Digital Signature Standard (DSS)", Appendix B.4 for ECDSA schemes and implementing "NIST curves" P-256, P-384 and [P-521]***

]

and

[*no other key generation algorithms*]

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

5.5.1.2 FCS_IPSEC_EXT.1[VPN] IPsec Protocol-FTD

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

FCS_IPSEC_EXT.1.2[VPN] 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[VPN] The TSF shall implement [*transport mode, tunnel mode*].

FCS_IPSEC_EXT.1.4[VPN] The TSF shall implement the IPsec protocol ESP as defined by RFC 4303 using the cryptographic algorithms **[*AES-CBC-128(RFC 3602), AES-CBC-256 (RFC 3602), AES-GCM-128(RFC 4016), AES-GCM-256(RFC 4106)*] and [*no other algorithm*]** together with a Secure Hash Algorithm (SHA)-based HMAC [*HMAC-SHA-1, HMAC-SHA-256, HMAC-SHA-384, HMAC-SHA-512*]

FCS_IPSEC_EXT.1.5[VPN] The TSF shall implement the protocol: [

- *IKEv2 as defined in RFC 5996 and [with mandatory support for NAT traversal as specified in RFC 5996, section 2.23)], and [RFC 4868 for hash functions]*

].

FCS_IPSEC_EXT.1.6[VPN] The TSF shall ensure the encrypted payload in the [*IKEv2*] protocol uses the cryptographic algorithms [*AES-CBC-128, AES-CBC-256 (specified in RFC 3602), AES-GCM-128, AES-GCM-256 (specified in RFC 5282)*].

FCS_IPSEC_EXT.1.7[VPN] 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 within [120 to 2,147,483,647 seconds. The default is 86,400 seconds or 24] hours*

  ]

].

FCS_IPSEC_EXT.1.8[VPN] 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 within [120-2,147,483,647 seconds with the default being 28,800 seconds which is 8] hours;*

  ]

].

FCS_IPSEC_EXT.1.9[VPN] 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 [*512*] bits.

FCS_IPSEC_EXT.1.10[VPN] 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[VPN] The TSF shall ensure that all IKE protocols implement DH Group(s)

- **19 (256-bit Random ECP), 20 (384-bit Random ECP) according to RFC 5114 and**
  [
- *[14 (2048-bit MODP)] according to RFC 3526,*
- *[24 (2048-bit MODP with 256-bit POS)] according to RFC 5114*].
  ]

FCS_IPSEC_EXT.1.12[VPN] The TSF shall be able to ensure by default that the strength of the symmetric algorithm (in terms of the number of bits in the key) negotiated to protect the [*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[VPN] The TSF shall ensure that all IKE protocols perform peer authentication using [*RSA, ECDSA*] that use X.509v3 certificates that conform to RFC 4945 and [*Pre-shared Keys*].

FCS_IPSEC_EXT.1.14[VPN] 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: **Distinguished Name (DN),** [*SAN: Fully Qualified Domain Name (FQDN)*].

Application Note

In FCS_IPSEC_EXT.1.7[VPN], IKEv2 SA can be limited by time only. IKEv2 Child SA can be limited by time or number of kilobytes. The time is in number of seconds.

5.5.2 Identification and authentication (FIA)

5.5.2.1 FIA_PSK_EXT.1[VPN] Pre-Shared Key Composition

FIA_PSK_EXT.1.1[VPN] The TSF shall be able to use pre-shared keys for IPsec and [*no other protocols*].

FIA_PSK_EXT.1.2[VPN] The TSF shall be able to accept text-based pre-shared keys that:

- are 22 characters and [*[up to 127 characters]*];
- composed of any combination of upper and lower case letters, numbers, and special characters (that include: "!", "@", "#", "$", "%", "^", "&", "*", "(", and ")").

FIA_PSK_EXT.1.3[VPN] The TSF shall condition the text-based pre-shared keys by using [*SHA1, SHA-256, SHA-512, [SHA-384]*].

FIA_PSK_EXT.1.4[VPN] The TSF shall be able to [*accept*] bit-based pre-shared keys.

5.5.3 Security Management (FMT)

5.5.3.1 FMT_SMF.1/VPN[VPN] Specification of Management Functions (VPN Gateway)

FMT_SMF.1.1/VPN[VPN] The TSF shall be capable of performing the following management functions: [

- *Definition of packet filtering rules;*
- *Association of packet filtering rules to network interfaces;*
- *Ordering of packet filtering rules by priority;*
  [
- *No other capabilities*
  ]]

5.5.4 Packet Filtering (FPF)

5.5.4.1 FPF_RUL_EXT.1[VPN] Packet Filtering

FPF_RUL_EXT.1.1[VPN] The TSF shall perform Packet Filtering on network packets processed by the TOE.

FPF_RUL_EXT.1.2[VPN] The TSF shall allow the definition of Packet Filtering rules using the following network protocols and protocol fields:

- IPv4(RFC 791)
    - Source address
    - Destination Address
    - Protocol
- IPv6(RFC 2460)
    - Source address
    - Destination Address
    - Next Header (Protocol)
- TCP(RFC 793)
    - Source Port
    - Destination Port
- UDP(RFC 768)
    - Source Port
    - Destination Port

FPF_RUL_EXT.1.3[VPN] The TSF shall allow the following operations to be associated with Packet Filtering rules: permit and drop with the capability to log the operation.

FPF_RUL_EXT.1.4[VPN] The TSF shall allow the Packet Filtering rules to be assigned to each distinct network interface.

FPF_RUL_EXT.1.5[VPN] The TSF shall process the applicable Packet Filtering rules (as determined in accordance with FPF_RUL_EXT.1.4) in the following order: Administrator-defined.

FPF_RUL_EXT.1.6[VPN] The TSF shall drop traffic if a matching rule is not identified.

5.5.5 Protection of the TSF (FPT)

5.5.5.1 FPT_FLS.1/SelfTest[VPN] Fail Secure

FPT_FLS.1.1/SelfTest[VPN] The TSF shall **shut down** when the following types of failures occur: [*failure of the power-on self-tests, failure of integrity check of the TSF executable image, failure of noise source health tests*]

5.5.5.2 FPT_TST_EXT.3[VPN]: Self-Test with Defined Methods

FPT_TST_EXT.3.1[VPN] The TSF shall run a suite of the following self-tests [*[when loaded for execution]*] to demonstrate the correct operation of the TSF: [*integrity verification of stored executable code*].

FPT_TST_EXT.3.2[VPN] The TSF shall execute the self-testing through [*a TSF-provided cryptographic service specified in FCS_COP.1/SigGen*].

5.5.6 TOE Access (FTA)

5.5.6.1 FTA_SSL.3/VPN[VPN] TSF-initiated Termination (VPN Headend)

FTA_SSL.3.1/VPN[VPN] The TSF shall terminate **a remote VPN client** session after an [*Administrator-configurable time interval of session inactivity*].

5.5.6.2 FTA_TSE.1[VPN] TOE Session Establishment

FTA_TSE.1.1[VPN] The TSF shall be able to deny establishment of a **remote VPN client** session based on [*location, time, day*, [***no other attributes***]].

5.5.6.3 FTA_VCM_EXT.1[VPN] VPN Client Management

FTA_VCM_EXT.1.1[VPN] The TSF shall assign a private IP address to a VPN client upon successful establishment of a security session.

5.5.7 Trusted Path/Channels (FTP)

5.5.7.1 FTP_ITC.1/VPN[VPN] Inter-TSF Trusted Channel (VPN Communications)

FTP_ITC.1.1/VPN[VPN] The TSF shall **be capable of using IPsec to** provide a communication channel between itself and **authorized IT entities supporting VPN communications** that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from **disclosure and detection of modification of the channel data**.

FTP_ITC.1.2/VPN[VPN] The TSF shall permit [*the authorized IT entities*] to initiate communication via the trusted channel.

FTP_ITC.1.3/VPN[VPN] The TSF shall initiate communication via the trusted channel for [remote *VPN gateways/peers*].

5.6 TOE SFR Dependencies Rationale for SFRs Found in NDcPP and PP-modules

The NDcPP and PP modules contain all the requirements claimed in this Security Target. As such the dependencies are not applicable since the PP itself has been approved.

5.7 Security Assurance Requirements

5.7.1 SAR Requirements

The TOE assurance requirements for this ST are taken directly from the NDcPP which are derived from Common Criteria Version 3.1, Revision 5. The assurance requirements are summarized in the table below.

Table 18: Assurance Measures

Assurance Class	Components	Components Description
DEVELOPMENT	ADV_FSP.1	Basic Functional Specification
GUIDANCE DOCUMENTS	AGD_OPE.1	Operational User Guidance
	AGD_PRE.1	Preparative User Guidance
LIFE CYCLE SUPPORT	ALC_CMC.1	Labeling of the TOE
	ALC_CMS.1	TOE CM Coverage
TESTS	ATE_IND.1	Independent Testing - Conformance
VULNERABILITY ASSESSMENT	AVA_VAN.1	Vulnerability Analysis

5.7.2 Security Assurance Requirements Rationale

This Security Target claims conformance to the NDcPP. This target was chosen to ensure that the TOE has a basic to moderate level of assurance in enforcing its security functions when instantiated in its intended environment which imposes no restrictions on assumed activity on applicable networks. The ST also claims conformance to mod_cpp_fw_v1.4e and mod_vpngw_v1.1, which includes refinements to assurance measures for the SFRs defined in the two aforementioned modules including augmenting the vulnerability analysis (AVA_VAN.1) with specific vulnerability testing.

5.8 Assurance Measures

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

Table 19: Assurance Measures

Component	How requirement will be met
ADV_FSP.1	The functional specification describes the external interfaces of the TOE; such as the means for a user to invoke a service and the corresponding response of those services. The description includes the interface(s) that enforces a security functional requirement, the interface(s) that supports the enforcement of a security functional requirement, and the interface(s) that does not enforce any security functional requirements. The interfaces are described in terms of their purpose (general goal of the interface), method of use (how the interface is to be used), parameters (explicit inputs to and outputs from an interface that control the behavior of that interface), parameter descriptions (tells what the parameter is in some meaningful way), and error messages (identifies the condition that generated it, what the message is, and the meaning of any error codes). The development evidence also contains a tracing of the interfaces to the SFRs described in this ST.
AGD_OPE.1	The Administrative Guide provides the descriptions of the processes and procedures of how the administrative users of the TOE can securely administer the TOE using the interfaces that provide the features and functions detailed in the guidance.
AGD_PRE.1	The Installation Guide describes the installation, generation, and startup procedures so that the users of the TOE can put the components of the TOE in the evaluated configuration.
ALC_CMC.1	The Configuration Management (CM) document(s) describes how the consumer (end-user) of the TOE can identify the evaluated TOE (Target of Evaluation). The CM document(s), identifies the configuration items, how those configuration items are uniquely identified, and the adequacy of the procedures that are used to control and track changes that are made to the TOE. This includes details on what changes are tracked, how potential changes are incorporated, and the degree to which automation is used to reduce the scope for error.
ALC_CMS.1	
ATE_IND.1	Cisco provides the TOE for testing.
AVA_VAN.1	Cisco provides the TOE for testing.

6 TOE SUMMARY SPECIFICATION

6.1 TOE Security Functional Requirement Measures

This chapter identifies and describes how the Security Functional Requirements identified above are met by the TOE.

Table 20: How TOE SFRs Are Satisfied

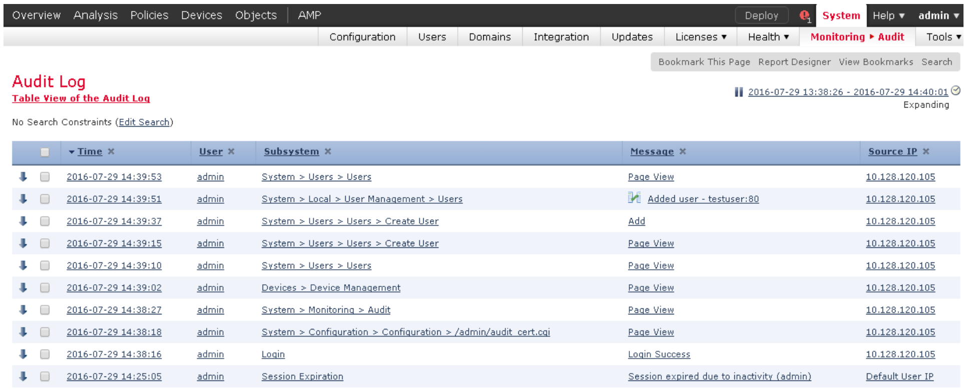
<table>
<tr><th>TOE SFRs</th><th>How the SFR is Satisfied</th></tr>
<tr><td colspan="2"><b>Security Functional Requirements Drawn from NDcPP</b></td></tr>
<tr><td>FAU_GEN.1,
FAU_GEN_EXT.1,
FAU_STG_EXT.1,
FAU_STG_EXT.4,
FAU_STG_EXT.5</td><td>

Auditing is the recording of events within the system. The TOE generates log records for a wide range of security relevant and other events as they occur. The events that can cause an audit record to be logged include starting the audit function[3], any use of an administrator command or action via the CLI and web interfaces, and all of the required auditable events identified in Table 17. For more information about the required audit events, please refer to Table 17 and the operational user guide (also known as the CC Supplemental User guide).

The FMC component of the TOE can generate an audit record for each user interaction with the web interface and each command in the CLI interface. The FXOS on Firepower 4100/9300 also generates audit records for administrative actions via its CLI (console or SSH), and GUI. The FTD component of the TOE can generate traffic events as part of the access control (firewall), and VPN policies and these event records are stored in logs separate from the audit logs for performance and security reasons. For more details about which auditable events are mapped to which SFRs, refer to Table 29.

FMC and FTD log auditing information for all user activity in a read-only format. Modifications are not allowed by the interfaces and only authorized administrators can delete the audit logs. Audit logs are presented in a standard event view that allows administrators to view, sort, and filter audit log messages based on any item in the audit view. The audit view contains columns with information field for each audit event such as time, user, subsystem, message, and source IP. Please see the figure below for example.

Figure 4: Audit View



Audit Log

Table View of the Audit Log

2016-07-29 13:38:26 - 2016-07-29 14:40:01
Expanding

No Search Constraints (Edit Search)

<table>
<tr><th></th><th>□</th><th>▾ Time ✖</th><th>User ✖</th><th>Subsystem ✖</th><th>Message ✖</th><th>Source IP ✖</th></tr>
<tr><td>⬇</td><td>□</td><td>2016-07-29 14:39:53</td><td>admin</td><td>System &gt; Users &gt; Users</td><td>Page View</td><td>10.128.120.105</td></tr>
<tr><td>⬇</td><td>□</td><td>2016-07-29 14:39:51</td><td>admin</td><td>System &gt; Local &gt; User Management &gt; Users</td><td>Added user - testuser:80</td><td>10.128.120.105</td></tr>
<tr><td>⬇</td><td>□</td><td>2016-07-29 14:39:37</td><td>admin</td><td>System &gt; Users &gt; Users &gt; Create User</td><td>Add</td><td>10.128.120.105</td></tr>
<tr><td>⬇</td><td>□</td><td>2016-07-29 14:39:15</td><td>admin</td><td>System &gt; Users &gt; Users &gt; Create User</td><td>Page View</td><td>10.128.120.105</td></tr>
<tr><td>⬇</td><td>□</td><td>2016-07-29 14:39:10</td><td>admin</td><td>System &gt; Users &gt; Users</td><td>Page View</td><td>10.128.120.105</td></tr>
<tr><td>⬇</td><td>□</td><td>2016-07-29 14:39:02</td><td>admin</td><td>Devices &gt; Device Management</td><td>Page View</td><td>10.128.120.105</td></tr>
<tr><td>⬇</td><td>□</td><td>2016-07-29 14:38:27</td><td>admin</td><td>System &gt; Monitoring &gt; Audit</td><td>Page View</td><td>10.128.120.105</td></tr>
<tr><td>⬇</td><td>□</td><td>2016-07-29 14:38:18</td><td>admin</td><td>System &gt; Configuration &gt; Configuration &gt; /admin/audit_cert.cgi</td><td>Page View</td><td>10.128.120.105</td></tr>
<tr><td>⬇</td><td>□</td><td>2016-07-29 14:38:16</td><td>admin</td><td>Login</td><td>Login Success</td><td>10.128.120.105</td></tr>
<tr><td>⬇</td><td>□</td><td>2016-07-29 14:25:05</td><td>admin</td><td>Session Expiration</td><td>Session expired due to inactivity (admin)</td><td>Default User IP</td></tr>
</table>

The following fields are recorded for each audit event in the audit view:

- **Time**: The time and date that the appliance generated the audit record.

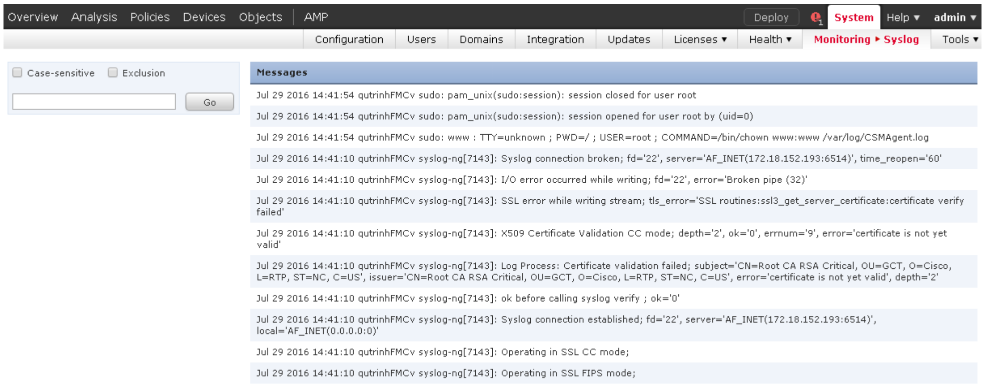
</td></tr>
</table>

[3] Note that the audit function cannot be disabled other than shutting down the entire system.

TOE SFRs	How the SFR is Satisfied

- **User**: The user name of the user that triggered the audit event.
- **Subsystem**: The menu path the user followed to generate the audit record. For example, “System > Monitoring > Audit” is the menu path to view the audit log.
- **Message**: The action the user performed. For example, “Page View” signifies that the user simply viewed the page indicated in the Subsystem, while “Save” means that the user clicked the Save button on the page.
- **Source IP**: The IP address of the host used by the user.

Figure 5: Syslog View



```
Jul 29 2016 14:41:54 qutrinhFMCv sudo: pam_unix(sudo:session): session closed for user root
Jul 29 2016 14:41:54 qutrinhFMCv sudo: pam_unix(sudo:session): session opened for user root by (uid=0)
Jul 29 2016 14:41:54 qutrinhFMCv sudo: www : TTY=unknown ; PWD=/ ; USER=root ; COMMAND=/bin/chown www:www /var/log/CSMAgent.log
Jul 29 2016 14:41:10 qutrinhFMCv syslog-ng[7143]: Syslog connection broken; fd='22', server='AF_INET(172.18.152.193:6514)', time_reopen='60'
Jul 29 2016 14:41:10 qutrinhFMCv syslog-ng[7143]: I/O error occurred while writing; fd='22', error='Broken pipe (32)'
Jul 29 2016 14:41:10 qutrinhFMCv syslog-ng[7143]: SSL error while writing stream; tls_error='SSL routines:ssl3_get_server_certificate:certificate verify
failed'
Jul 29 2016 14:41:10 qutrinhFMCv syslog-ng[7143]: X509 Certificate Validation CC mode; depth='2', ok='0', errnum='9', error='certificate is not yet
valid'
Jul 29 2016 14:41:10 qutrinhFMCv syslog-ng[7143]: Log Process: Certificate validation failed; subject='CN=Root CA RSA Critical, OU=GCT, O=Cisco,
L=RTP, ST=NC, C=US', issuer='CN=Root CA RSA Critical, OU=GCT, O=Cisco, L=RTP, ST=NC, C=US', error='certificate is not yet valid', depth='2'
Jul 29 2016 14:41:10 qutrinhFMCv syslog-ng[7143]: ok before calling syslog verify ; ok='0'
Jul 29 2016 14:41:10 qutrinhFMCv syslog-ng[7143]: Syslog connection established; fd='22', server='AF_INET(172.18.152.193:6514)',
local='AF_INET(0.0.0.0:0)'
Jul 29 2016 14:41:10 qutrinhFMCv syslog-ng[7143]: Operating in SSL CC mode;
Jul 29 2016 14:41:10 qutrinhFMCv syslog-ng[7143]: Operating in SSL FIPS mode;
```

The user can also view the audit log using the command “show audit-log” or “show syslog” via the CLI interface. All GUI actions and CLI commands are recorded in the audit log and can only be viewed by authorized administrators. To distinguish between the two, the Subsystem field will identify “Command Line” for commands and the Message field will identify the executed command.

In general, the logged audit records identify the date and time, the identity of the actor (e.g., user, daemon, or network host) responsible for the event, the subsystem that triggers the event, an indication of whether the event succeeded, failed or had some other outcome (if applicable), and the source IP (if applicable). The logged audit records also include event-specific content that includes at least all of the content required in table above.

The TOE (FMC) includes an internal log database implementation that can be used to store and review audit records locally. However, the internal log only stores a default of 100,000 entries in the local database (to configure the size, go to System > Configuration > Database, and click on “Audit Event Database”). When the audit log is full, the oldest audit records are overwritten by the newest audit records. In addition, the TOE (FMC) also includes a local syslog storage in /var/log/messages and these logs are viewable through the FMC GUI. The contents are stored in flat files which are rotated automatically. Similar to the audit log, when the syslog is full, the oldest syslogs messages are overwritten by the newest one.

For audit log, the events are stored in partitioned event tables. The TOE will prune (i.e., delete) the oldest partition whenever the oldest partition can be pruned without dropping the number of events count below the configured event limit. Note this limit defaults to 10,000 if you set it any lower. For example, if you set the limit to 10,000 events, the events count may need to exceed 15,000 events before the oldest partition can be deleted. For syslog, the logs are stored in /var/log/messages and are rotated daily or when the log file size exceeds 25 MB. After the maximum number of backlog files is reached, the oldest is deleted and the numbers on the other backlogs file are incremented.

To prevent the losing of critical audit records, the administrators can configure the system to transmit all the audit events (i.e., audit log and syslog) in real-time over a secure TLS

TOE SFRs	How the SFR is Satisfied
	connection or an IPsec connection (FXOS-only) to an external audit server in the operational environment. When an audit event is generated, it is sent to the local storage and external audit server simultaneously. This ensures that current audit events can be viewed locally while all events, new or old, are stored off-line as required by the NDcPP. Note that the protection of the audit records stored at the external audit server is the responsibility of the operational environment. The TOE is only responsible for the secure communication channel. It is recommended that the audit server is physically or logically separated (e.g., VLANs) from the other networks. The TOE can be configured to export syslog records to an administrator-specified, external syslog server. The TOE can be configured to encrypt the communications with an external syslog server using IPsec or TLS. FMC transmits syslog over TLS, FTD transmits syslog over TLS, and FXOS transmits syslog over IPsec. The audit records are also stored locally and when the local storage is full, the newest data will overwrite the oldest data. On FMC, log messages (those generated locally and those forwarded from FTD) are stored locally on FMC in a database. Different message types are stored separately in local databases, and each local store has a separately configurable size limit (configurable in FMC via System > Configuration > Database). Admin actions are stored in the Audit Event Database, firewall events are stored in Connection Database, and VPN events are stored in the VPN Troubleshooting Database. Messages generated by FTD are stored locally but the firewall events generated by FTD are immediately transmitted from FTD to an external syslog server. The VPN events are directly sent to FMC for retention in the FMC databases via secure TLS channel. As messages are generated by FTD, they are immediately transmitted from FTD to a remote syslog server and stored in a local buffer (buffer size configurable from 4096-52428800 bytes) which overwrites old messages with new ones when storage limits are reached. The local logs are viewable from the FTD CLI shell by using “show logging”. The local storage of audit events in FXOS (e.g., admin authentication, TLS/HTTPS session state, etc.) is viewable from the “fxos” shell (after using “connect fxos”) by using “show logging”. The storage limit of the local buffer is configurable via FXOS CLI with configurable size limit of 4096-4194304 bytes. This is a circular log (oldest records will be overwritten by new ones when the size limit is reached). For audit messages related to management of cryptographic keys, the audit message details include the name of the certificate associated with the key. Samples Audit Events Nov 21 2012 20:39:21: %ASA-3-713194: Group = 192.168.22.1, IP = 192.168.22.1, Sending IKE Delete With Reason message: Disconnected by Administrator. Creation Time: 2015-07-09T08:20:17.030 User: internal Session ID: internal ID: 3330860 Action: Creation Description: Fabric A: local user admin logged in from 172.23.33.113 Affected Object: sys/user-ext/sh-login-admin-pts_5_1_15135 Trigger: Session Modified Properties: id:pts_5_1_15135, name:admin, policyOwner:local

<table>
<tr><th>TOE SFRs</th><th>How the SFR is Satisfied</th></tr>
<tr><td></td><td>
Network interfaces have bandwidth limitations, and other traffic flow limitations that are configurable. When an interface has exceeded a limit for processing traffic, traffic will be dropped, and audit messages can be generated, such as:
Nov 21 2012 20:39:21: %ASA-3-201011: Connection limit exceeded *cnt*/*limit* for *dir* packet from *sip*/*sport* to *dip*/*dport* on interface *if_name*.
Nov 21 2012 20:39:21: %ASA-3-202011: Connection limit exceeded *econns/limit* for *dir* packet from *source_address/source_port* to *dest_address/dest_port* on interface *interface_name*
For more information on the required auditable events and the actual logs themselves, please refer to the Preparative Procedures & Operational User Guide for the Common Criteria Certified Configuration.
The following high-level events are auditable by the TOE:
<table>
<tr><th>Auditable Event</th><th>Rationale</th></tr>
<tr><td>Modifications to the group of users that are part of the authorized administrator role.</td><td>All changes to the configuration (and hence all security relevant administrator actions) are logged when the logging level is set to at least the 'notifications' level. These changes would fall into the category of configuration changes such as enabling or disabling features and services. The identity of the administrator taking the action and the user being affected (assigned to the authorized administrator role) are both included within the event.</td></tr>
<tr><td>All use of the user identification mechanism.</td><td>Events will be generated for attempted identification/ authentication, and the username attempting to authenticate will be recorded in the event.</td></tr>
<tr><td>Any use of the authentication mechanism.</td><td>Events will be generated for attempted identification/ authentication, and the username attempting to authenticate will be recorded in the event along with the origin or source of the attempt.</td></tr>
<tr><td>The reaching of the threshold for unsuccessful authentication attempts and the subsequent restoration by the authorized administrator of the user's capability to authenticate.</td><td>Failed attempts for authentication will be logged, and when the threshold is reached, it will also be logged.
All changes to the configuration are logged when the logging level is set to at least the 'notifications' level. Changes to restore a locked account would fall into the category of configuration changes.</td></tr>
<tr><td>All decisions on requests for information flow.</td><td>In order for events to be logged for information flow requests, the 'log' keyword may need to be in each line of an access control list. The presumed addresses of the source and destination subjects are included in the event.</td></tr>
<tr><td>Success and failure, and the type of cryptographic operation</td><td>Attempts for VPN connections are logged (whether successful or failed). Requests for encrypted session negotiation are logged (whether successful</td></tr>
</table>
</td></tr>
</table>

TOE SFRs	How the SFR is Satisfied	
		or failed). The identity of the user performing the cryptographic operation is included in the event.
	Failure to establish and/or establishment/termination of an IPsec session	Attempts to establish an IPsec tunnel or the failure of an established IPsec tunnel is logged as well as successfully established and terminated IPsec sessions with peer.
	Establishing session with CA and IPsec peer	The connection to CA’s or any other entity (e.g., CDP) for the purpose of certificate verification or revocation check is logged. In addition, the TOE can be configured to capture the packets’ contents during the session establishment.
	Changes to the time.	Changes to the time are logged with old and new time values.
	Use of the functions listed in this requirement pertaining to audit.	All changes to the configuration are logged when the logging level is set to at least the 'notifications' level. These changes would fall into the category of configuration changes.
	Loss of connectivity with an external syslog server.	Loss of connectivity with an external syslog server is logged as a terminated or failed cryptographic channel.
	Initiation of an update to the TOE.	TOE updates are logged as configuration changes.
	Termination of local and remote sessions. Note that the TOE does not support session locking, so there is no corresponding audit.	Termination of a local and remote session is logged. This also includes termination of remote VPN session as well. The user may initiate or the system may terminate the session based idle timeout setting.
	Initiation, termination and failures in trusted channels and paths.	Requests for encrypted session negotiation are logged (whether successful or failed). Similarly, when an established cryptographic channel or path is terminated or fails a log record is generated. This applies to HTTPS, TLS, IPsec, and SSH.
	Successful SSH rekey	SSH rekey event is logged.
	Application of rules configured with the ‘log’ operation	Logs are generated when traffic matches ACLs that are configured with the log operation.
	Indication of packets dropped due to too much network traffic	Logs are generated when traffic that exceeds the settings allowed on an interface is received.

TOE SFRs	How the SFR is Satisfied
FAU_GEN.2	The TOE ensures each action performed by the administrator at the CLI and web GUI is logged with the administrator's identity and as a result events are traceable to a specific user.
FCO_CPC_EXT.1	**FTD and FMC** In order for TOE components to communicate as part of a distributed TOE System, they must successfully complete a registration process. Each TOE component comes with a manufacture's TLS certificate. To start the registration process, the administrator must enable or register the TOE components. On the FMC, the administrator must go to Device Management UI and click on "Add Device". At the same time, the administrator must go to the FTD CLI, and click or enter "Configure Manager Add". The administrator must specify the peer hostname or IP address and the registration key used for the initial authentication. During the registration process, the manufacture's TLS certificates are used to setup the initial TLS channel on the internal trusted management network. If the authentication succeeded, the resident CA on the FMC will sign and issue a TLS certificate along with the private key to the FTD which will be used for subsequent TLS channel. To disable or de-register FTD, the administrator must initiate a "Delete Device" on the FMC Device Management UI and then perform a "Configure Manager Delete" action on the CLI of the FTD. This will destroy (i.e., zeroize) the TLS certificate and private key. Once this has occurred, no farther communication can happen without another registration process.
FCS_CKM.1, FCS_CKM.2, FCS_CKM.4, FCS_COP.1/ DataEncryption, FCS_COP.1/SigGen, FCS_COP.1/Hash, FCS_COP.1/ KeyedHash, and FCS_RBG_EXT.1	**FTD and FMC** Each FMC and each FTD appliance utilize a cryptographic module (i.e., Cisco FIPS Object Module) to provide supporting cryptographic functions. When the term "TOE" is used in this section, it refers to each appliance. The algorithm implementations have been tested in accordance to validation suites set by the Cryptographic Algorithm Validation Program (CAVP) and tested on specific processors. Refer to section 7.3 of this document for the listings of CAVP certificate for each TOE component for each SFR. The algorithms supported for keyed-hash message authentication are HMAC-SHA-1 (block size – 512 bits), HMAC-SHA-256 (block size – 512 bits), HMAC-SHA-384 (block size – 1024 bits) and HMAC-SHA-512 (block size – 1024 bits) with key sizes 160, 256, 384 and 512 bits and message digest sizes of 160, 256, 384 and 512 bits respectively. The TOE supports RSA, FFC, and ECDSA in the evaluated configuration. RSA and ECDSA digital signature are used in TLS connections and SSH connections (RSA only). The TOE can be configured to use RSA and ECDSA to authenticate IPsec connections. Key generation for asymmetric keys on all models of the TOE implements ECDSA with NIST curve sizes P-256, P-384, and P-521 according to FIPS PUB 186-4, "Digital Signature Standard (DSS)", Appendix B.4 and RSA with key sizes 2048 and 3072 bits according to FIPS PUB 186-4, "Digital Signature Standard (DSS)", Appendix B.3. Asymmetric cryptographic keys used for IKE peer authentication are generated according to FIPS PUB 186-4, Appendix B.3 for RSA schemes and Appendix B.4 for ECDSA schemes. Key establishment for asymmetric keys on the TOE implements RSA-based (RSAES-PKCS1-v1_5 as specified in Section 7.2 of RFC 3447), ECDSA-based and DH-based key establishment schemes as specified in NIST SP 800-56A "Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography". In addition, the TOE also supports DH group 14 key establishment scheme that meets standard RFC 3526, section 3 for interoperability. The TOE's software implementation uses the prime number and

<table>
<tr><th>TOE SFRs</th><th>How the SFR is Satisfied</th></tr>
<tr><td></td><td>
<p>generator value specified in RFC 3526 Section 3 when generating parameters for the DH Group 14 key exchange.</p>
<table>
<tr><th>Scheme</th><th>SFR</th><th>Services</th></tr>
<tr><td>RSA</td><td>FCS_TLSS_EXT.1,
FCS_IPSEC_EXT.1,
FCS_SSHS_EXT.1(1),
FCS_SSHS_EXT.1(2),
FCS_TLSC_EXT.1,
FCS_TLSC_EXT.2</td><td>HTTPS Remote Administration, SSH Remote Administration, syslog over IPsec, NTP over IPsec, Distributed TOE Communication, Syslog over TLS.</td></tr>
<tr><td>ECC (P-256, P-384, P-521)</td><td>FCS_TLSC_EXT.1,
FCS_TLSC_EXT.2,
FCS_IPSEC_EXT.1</td><td>Syslog over TLS, Syslog over IPsec, NTP over IPsec.</td></tr>
<tr><td>ECC (P-256, P-384, P-521)</td><td>FCS_TLSS_EXT.1</td><td>HTTPS Remote Administration</td></tr>
<tr><td>FFC</td><td>FCS_TLSC_EXT.1</td><td>Distributed TOE Communication</td></tr>
<tr><td>FFC</td><td>FCS_TLSS_EXT.1</td><td>HTTPS Remote Administration</td></tr>
<tr><td>Diffie-Hellman (Group 14)</td><td>FCS_SSHS_EXT.1(1)
FCS_SSHS_EXT.1(2)
FCS_IPSEC_EXT.1</td><td>SSH Remote Administration, IKE communication.</td></tr>
</table>
<p>The TOE uses a platform-based random bit generator that complies with ISO/IEC 18031:2011 using CTR_DRBG (AES-256) Deterministic Random Bit Generation (DRBG) operating in FIPS mode. In addition, the DRBG is seeded by an entropy source that is at least 256-bit value derived from various highly sensitive and proprietary noise sources described in the proprietary Entropy Design document.</p>
<p>Additionally, the TOE is designed to zeroize secret and private keys when they are no longer required by the TOE. The table in section 7.2 identifies the applicable secret and private keys and summarizes how they are deleted. The secret keys used for symmetric encryption, private keys, and CSPs used to generate keys, are zeroized immediately after use (for IPsec VPN functions, within FTD only), or on system shutdown (for all other functions). For plaintext keys unrelated to IPsec VPN: the TOE destroys the reference to the keys stored in volatile memory directly followed by a request for garbage collection; the TOE destroys the abstraction that represents the key for keys stored in non-volatile storage the TSF.</p>
<p><b><u>FXOS</u></b></p>
<p>The TOE utilizes a cryptographic module certificate (i.e., Cisco FIPS Object Module or FOM) to provide supporting cryptographic functions. The algorithm implementations have been tested in accordance to validation suites set by the Cryptographic Algorithm Validation Program (CAVP). Refer to section 7.3 of this document for the listings of CAVP certificate for each TOE component for each SFR.</p>
<p>The TOE supports RSA, FFC, and ECDSA in the evaluated configuration. RSA and ECDSA digital signature are used in TLS connections and SSH connections (RSA only). The TOE can be configured to use RSA to authenticate IPsec connections. Key establishment for asymmetric keys on the TOE implements RSA-based (RSAES-PKCS1-v1_5 as specified in Section 7.2 of RFC 3447), ECDSA-based and DH-based key establishment schemes as</p>
</td></tr>
</table>

TOE SFRs	How the SFR is Satisfied
	specified in NIST SP 800-56A "Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography". In addition, the TOE also supports DH group 14 key establishment scheme that meets standard RFC 3526, section 3 for interoperability. The TOE's software implementation uses the prime number and generator value specified in RFC 3526 Section 3 when generating parameters for the DH Group 14 key exchange. The algorithms supported for keyed-hash message authentication are HMAC-SHA-1 (block size – 512 bits), HMAC-SHA-256 (block size – 512 bits), HMAC-SHA-384 (block size – 1024 bits) and HMAC-SHA-512 (block size – 1024 bits) with key sizes 160, 256, and 512 bits and message digest sizes of 160, 256, and 512 bits respectively. The TOE uses a platform-based random bit generator that complies with ISO/IEC 18031:2011 using CTR_DRBG (AES-256) Deterministic Random Bit Generation (DRBG) operating in FIPS mode. In addition, the DRBG is seeded by an entropy source that is at least 256-bit value derived from various highly sensitive and proprietary noise sources described in the proprietary Entropy Design document. For plaintext keys in FXOS the TOE destroys the reference to the keys stored in volatile memory directly followed by a request for garbage collection, and the TOE destroys the abstraction that represents the key for keys stored in non-volatile storage the TSF.
FCS_HTTPS_EXT.1 FCS_TLSC_EXT.1 FCS_TLSC_EXT.2 FCS_TLSS_EXT.1	The TOE implements HTTP over TLS (or HTTPS) to support remote administration on FMC and FXOS, TLS clients to support secure syslog connections, and TLS server and clients to support FPT_ITT.1. A remote administrator can connect over HTTPS to the TOE with their web browser. FTD supports two different TLS clients that send syslog messages to the external syslog server- FTD TLS client and FTD OS TLS Client. When CC mode is enabled, the TOE is restricted to only support TLSv1.1 and TLSv1.2 for HTTPS sessions and client/server communications between TOE components, with AES 128- or 256-bit symmetric ciphers in CBC and GCM modes, in conjunction with SHA, RSA, and ECDSA. The FMC HTTPS/TLS interface only supports TLSv1.2. The following TLS cipher suites are implemented by the TOE in CC mode: • Relevant to FTP_ITC and FCS_TLSC_EXT.1, **FTD TLS client,** that is configured by the FMC and is the main audit system for audits generated by FTD. It sends audit events such as IPsec and login messages to the external syslog server and Mutual authentication is not supported. Listed in Section 5.3.3.14. • Relevant to FTP_ITC and FCS_TLSC_EXT.2, **FTD OS TLS client**, that is configured through the FTD's command line and sends audit events to an external syslog server such as SSH login, console login, etc. and Mutual authentication is supported. Listed in Section 5.3.3.14. • Relevant to FTP_ITC and FCS_TLSC_EXT.2, for syslog over TLS from FMC/FMCv (client only) as listed in Section 5.3.3.14 of this document. Mutual authentication is supported. • Relevant to FPT_ITT, FCS_TLSC_EXT.1, and FCS_TLSS_EXT.1 (client and server between FMC and FTD) are as listed in sections 5.3.3.14 and 5.3.3.16 of this document. • Relevant to FTP_TRP.1/Admin and FCS_TLSS_EXT.1 (server only) are as listed in section 5.3.3.16 of this document (FMC and FXOS) While the cryptographic modules of the TOE support additional cipher suites (for example, RSA_3DES_EDE_CBC_SHA, RSA_DES_CBC_SHA, RSA_RC4_128_MD5, RSA_RC4_128_SHA, etc.), they are all disabled while operating in CC mode. If the TLS client does not support TLSv1.1 or TLSv1.2, the TLS connection will fail and the administrators will not establish a HTTPS web-based session with the TOE.

TOE SFRs	How the SFR is Satisfied
	The Key establishment parameters for each of the TLS connections in the TOE are as follows – 1. FMC (HTTPS/TLS)- 2048-bit RSA and ECDHE secp256r1 2. FMC and FTD (ITT) – 2048-bit RSA 3. FXOS (HTTPS/TLS) - 2048-bit RSA, DHE 2048 and ECDHE secp256r1, secp384r1 and secp521r1 When in CC mode and the TOE acts as a TLS client (e.g., connection to the syslog server), the TOE will verify the server Subject Alternative Name (SAN) against the reference identity (wildcard is supported as required in section 6 of RFC 6125 and per RFC 5280 Appendix A. RFC 5280 is supported for the TLS connection between the distributed TOE components (FMC and FTD) and the attribute type "id-at-title" is used by the TOE client to match the presented identifier with the configured identifier). If verification fails, the TLS connection will not be established. The following NIST curves are presented with the Client Hello by default – secp256r1, secp384r1 and secp521r1. Mutual authentication must be configured with the client-side X.509v3 certificate with RSA 2048-bits (or higher) and SHA-256 (or higher). The key agreement parameters of the server key exchange message are specified in the RFC 5246 (section 7.4.3) for TLSv1.2 and RFC 4346 (section 7.4.3) for TLSv1.1. The TOE conforms to both RFCs. The FMC and FTD must successfully complete a registration process to communicate, which requires administrative actions on the FMC and corresponding administrative actions on the FTD. The administrative actions on FMC and FTD require the administrator to input a "registration key" that the two devices will use to authenticate their initial TLS communications. During the registration process, the FMC and FTD confirm they have a matching registration key and use their initial self-signed TLS certificates to uniquely identify themselves to each other (each device certificate signed by FMC, including its own, contains a unique identifier stored as an 'id-at-title' attribute, which FMC and FTD each as the unique reference identifier for each other). If the authentication succeeds, the local CA within the FMC will sign and issue a new TLS certificate for the FTD and send (over the existing TLS session) the FTD's new identity certificate and associated keys, and the FMC's root CA cert, and the FMC's root CA certificate and the device certificates which it signed will be used to authenticate all subsequent TLS sessions between the two devices. If device registration fails due to mismatched registration keys, or incorrect IP address or hostname, the information on the FMC and/or FTD needs to be corrected and the registration from FMC reinitiated. TLS session resumption is supported for the following TLS connections of the TOE – the WebUI of the FMC/FMCv and the WebUI of FXOS. The session tickets used for TLS session resumption are encrypted using symmetric algorithms consistent with FCS_COP.1/DataEncryption claims in this ST – AES used in CBC and GCM modes and key sizes of 128 and 256 bits. The session tickets adhere to the structural format provided in section 4 of RFC 5077.
FCS_IPSEC_EXT.1, FCS_IPSEC_EXT.1[VPN]	**FTD** The IPsec implementation provides VPN peer-to-peer, VPN site-to-site, and VPN client to TOE (i.e., remote access) capabilities. The VPN site-to-site tunnel allows for example the TOE acting as a VPN gateway and another TOE to establish an IPsec tunnel to secure the passing of user data [FTD Only]. Another configuration is the peer-to-peer configuration where the TOE can be set up with an IPsec tunnel with a VPN peer to secure the session between the TOE and the VPN peer [FTD and FXOS]. The VPN

TOE SFRs	How the SFR is Satisfied
	client to TOE configuration is where a remote VPN client connects into the TOE in order to gain access to an authorized private network [FTD Only]. Authenticating with the TOE would give the VPN client a secure IPsec tunnel to connect over the internet into their private network. The TOE implements IPsec to provide both X509v3 certificate (FTD and FXOS) and pre-shared key-based (FTD Only) authentications and encryption services to prevent unauthorized viewing or modification of data as it travels over the external network. The TOE implementation of the IPsec standard (in accordance with the RFCs noted in the SFR) uses the Encapsulating Security Payload (ESP) protocol to provide authentication, encryption and anti-replay services. In addition, the TOE supports both transport and tunnel modes. Transport mode is only supported for peer-to-peer IPsec connection while tunnel mode is supported for all VPN connections including remote access. IPsec Internet Key Exchange, also called IKE, is the negotiation protocol that lets two peers agree on how to build an IPsec Security Association (SA). In the evaluated configuration, only IKEv2 is supported. The IKEv2 protocols implement Peer Authentication using the RSA (FTD and FXOS), ECDSA (FTD Only) algorithm with X.509v3 certificates, or pre-shared keys (FTD Only). IKEv2 separates negotiation into two phases: SA and Child SA. IKE SA creates the first tunnel, which protects later IKE negotiation messages. The key negotiated in IKE SA enables IKE peers to communicate securely in IKE Child SA. During Child SA IKE establishes the IPsec SA. 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 peer authentication parameters, either signature based or pre-shared key based (FTD Only)), • 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. 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 The TOE implements IPsec using the ESP protocol as defined by RFC 4303, using the cryptographic algorithms AES-CBC-128, AES-CBC-256, AES-GCM-128 and AES-GCM-256 (both specified by RFCs 3602 and 4106) along with SHA-based HMAC algorithms, and using IKEv2, as specified for FCS_IPSEC_EXT.1.5, to establish security associations. NAT traversal is supported in IKEv2 by default. The IKE SA exchanges use only main mode and the IKE SA lifetimes are able to be limited to 24 hours for Phase 1 (SAs) and 8 hours for Phase 2 (Child SAs). Administrators can require use of main mode by configuring the mode for each IPsec tunnel, as in the following examples: **Devices > VPN > Site To Site** or **Devices > VPN > Remote Access** IKE Options (click on **IKE** tab) **IKEv2 Mode** **Tunnel mode** — (default) Encapsulation mode is set to tunnel mode. Tunnel mode applies ESP encryption and authentication to the entire original IP packet (IP header and data), hiding the ultimate source and destination addresses and becoming the payload in a new IP packet. **Transport preferred** — Encapsulation mode is set to transport mode with an option to fallback to tunnel mode if the peer does not support it. In Transport mode only the IP payload is encrypted, and the original IP headers are left intact.

TOE SFRs	How the SFR is Satisfied
	Transport required — Encapsulation mode is set to transport mode only, falling back to tunnel mode is not allowed. If the endpoints cannot successfully negotiate transport mode, due to one endpoint not supporting it, the VPN connection is not made. **Lifetime (seconds)** – The number of seconds a security association exists before expiring is in the range between 120 and 2,147,483,647 seconds The default is 28,800 seconds. **Lifetime (kbytes)** – The volume of traffic (in kilobytes) that can pass between IPsec peers using a given security association before it expires. The range is 10-2,147,483,647 (10KB to 2TB) and the default is 4,608,000 kilobytes. No specification allows infinite data. In the evaluated configuration, use of "confidentiality only" (i.e. using ESP without authentication) for IPsec connections is prohibited. The TOE allows the administrator to define the IPsec proposal for any IPsec connection to use specific encryption methods and authentication methods as in the following objects: **Objects > Object Management > VPN > IKEv2 IPsec Proposal** Choose **Add IKEv2 IPsec Proposal** Enter a **Name** Enter a **Description** Choose **ESP Hash** method from {sha-1 | sha-256 | sha-384 | sha-512 | null} Choose **ESP Encryption** method from {aes | aes-256 | aes-gcm | aes-gcm-256 ~~| aes-gmac | aes-gmac-192 | aes-gmac-256~~} **Note:** When AES-GCM is used for encryption, the ESP integrity selection will be "null" because GCM mode provides integrity. AES-GMAC is not allowed in the evaluated configuration. The IKEv2 protocols supported by the TOE implement the following DH groups: 14 (2048-bit MODP), 19 (256-bit Random ECP), 20 (384-bit Random EC), 24 (2048-bit MODP with 256-bit POS) and use the RSA and ECDSA algorithms for Peer Authentication. The following examples are used to specify the DH Group used for SAs: **Objects > Object Management > VPN > IKEv2 Policy** Choose **Add IKEv2 Policy** Enter a **Name** Enter a **Description** Enter a **Priority** Enter the **Lifetime** of the SA in seconds. You can specify a value from 120 to 2,147,483,647 seconds. The default is 86400. Choose **Integrity Algorithms** from **[**~~md5 |~~ sha | sha256 | sha384 | sha512**]** Choose **Encryption Algorithm** from [~~null | des | 3des |~~ aes | ~~aes-192~~[4] | aes-256 | aes-gcm | ~~aes-gcm-192~~ | aes-gcm-256] Choose **PRF Algorithm** from {sha | sha256 | sha384 | sha512} Add a **DH Group** from {14 | 19 | 20 | 24}

<table>
<tr><th>TOE SFRs</th><th>How the SFR is Satisfied</th></tr>
<tr><td></td><td>The secret ‘x’ generated is 64 bytes long (or 512 bits), is the same across all the DH groups, and is generated with the DRBG specified in FCS_RBG_EXT.1. This is almost double the size of the highest comparable strength value which is 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.
The TOE has a configuration option to deny tunnel if the phase 2 SA is weaker than the phase 1. The crypto strength check is enabled via the **Enable Security Association (SA) Strength Enforcement** checkbox.
The TOE can be configured to authenticate IPsec connections using RSA and ECDSA signatures. When using RSA and ECDSA signatures for authentication, the TOE and its peer must be configured to obtain certificates from the same certification authority (CA).
Devices > VPN > Site To Site or **Devices > VPN > Remote Access**
IKE Options (click on **IKE** tab)
Policy - Choose a predefined IKEv2 policy object or create a new one to use.
Authentication Type
• **Pre-shared Manual Key** — Manually assign the pre-shared key that is used for this VPN. Specify the **Key** and then re-enter it in **Confirm Key** to confirm.
When this option is chosen for IKEv2, the **Enforce hex-based pre-shared key only** check box appears, check if desired. If enforced, you must enter a valid hex value for the key, an even number of 2-256 characters, using numerals 0-9, or A-F.
• **Certificate** — When you use Certificates as the authentication method for VPN connections, peers obtain digital certificates from a CA server in your PKI infrastructure, and trade them to authenticate each other.
To configure an IKEv2 connection to use a RSA or ECDSA signature, select the authenticate type **Certificate**.
To define rules for matching the DN or FQDN of the IPsec peer certificate:
First, create a certificate map via FMC (Objects > Object Management > VPN > Certificate Map), and add a rule to the certificate map to match the “Alternative Subject” field of the certificate to a value (FQDN/DN)
Next, associate the certificate map with the tunnel, depending on tunnel type:
• Peer-to-peer VPN (Devices > VPN > Site To Site > Add VPN > Firepower Threat Defense Device > add a node > Certificate Map)
• Remote Access VPN (Devices > VPN > Remote Access > Advanced > Certificate Maps > check “Use the configured rules to match a certificate to a Connection Profile > Add Mapping > Certificate Map Name)
Pre-shared keys can be configured in TOE (FTD only) for IPsec connection authentication. However, pre-shared keys are only supported when using IKEv2 for peer-to-peer VPNs. The text-based pre-shared keys can be composed of any combination of upper and lower case letters, numbers, and special characters (that include: “!”, “@”, “#”, “$”, “%”, “^”, “&”, “*”, “(“, “)”, “?”, space “ “, tilde~, hyphen-, underscore_, plus+, equal=, curly-brackets{}, square-brackets[], vertical-bar(pipe)|, forward-slash/, back-slash\, colon:, semi-colon;, double-quote“, single-quote‘, angle-brackets<>, comma,, and period.. The text-based pre-shared keys can be 1-127 characters in length and is conditioned by a“prf” (pseudo-random function) configurable by the administrator. The bit-based pre-shared keys can be entered as HEX value as</td></tr>
</table>

TOE SFRs	How the SFR is Satisfied
	well. When using pre-shared keys for authentication, the IPsec endpoints must both be configured to use the same key. A crypto map (the Security Policy Definition) set can contain multiple entries, each with a different access list. The crypto map entries are searched in a top-down sequence - the TOE attempts to match the packet to the crypto access control list (ACL) specified in that entry. The crypto ACL can specify a single address or a range of address and the crypto map can be applied to an inbound interface or an outbound interface. When a packet matches a permit entry in a particular access list, the method of security in the corresponding crypto map of that interface is applied. If the crypto map entry is tagged as ipsecisakmp, IPsec is triggered. The traffic matching the permit crypto ACLs would then flow through the IPSec tunnel and be classified as PROTECTED. Traffic that does not match a permit crypto ACL or match a deny crypto ACL in the crypto map, but is permitted by other ACLs on the interface is allowed to BYPASS the tunnel. Traffic that does not match a permit crypto ACL or match a deny crypto ACL in the crypto map, and is also blocked by other non-crypto ACLs on the interface would be DISCARDED. **<u>FXOS</u>** When CC mode is enabled, FXOS supports the following: • **IKE version**: version 2 • **IPsec Mode**: tunnel o set mode {transport, tunnel} • **IKEv2 Mode**: main mode • **IKEv2 Ciphers**: o **Encryption algorithms**: AES-CBC-128, AES-CBC-256, AES-GCM-128 o **Integrity algorithms**: SHA-1 o **DH Groups**: 14 • **ESP Ciphers**: o **Encryption algorithms:** AES-CBC-128, AES-CBC-256 o **Integrity algorithms:** SHA-1 • **Authentication**: X.509v3 certificates o create authority *trustpoint_name* • **Traffic Selector**: remote host or subnet o set local-addr *ip_address* o set remote-addr *ip_address* o set remote-subnet *ip/mask* o set remote-ike-ident *remote_identity_name* • **IKEv2 SA Life Time:** Configurable within 60-1440 minutes, including 24 hours. o set ike-rekey-time *minutes* • **IKEv2 Child SA Life Time:** Configurable within 30-480 minutes, including 8 hours.

TOE SFRs	How the SFR is Satisfied
	o set esp-rekey-time *minutes* • **Reference Identifier** o set remote-ike-ident *remote_identity_name* The secret ‘x’ generated is 64 bytes long (or 512 bits), and is generated with the DRBG specified in FCS_RBG_EXT.1. This is almost double the size of the highest comparable strength value which is 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. The TOE has a configuration option to deny tunnel if the phase 2 SA is weaker than the phase 1. In FXOS, the SPDs are pretty simple because FXOS is not operating as a VPN gateway, and the SPDs are just based on IP addresses, so the type of traffic being tunneled (e.g. syslog) is irrelevant to the tunneling decisions. • The local-addr is the local management IP. • The remote-addr is the IP of the IPsec peer (in tunnel mode or transport mode). • A remote-subnet is applicable only in tunnel mode, and defines the subnet that would be reachable beyond the remote-addr. • Outbound traffic will be **encrypted** when the source address is local-addr, ***and***: o the destination address is the remote-addr (in tunnel or transport mode); ***or*** o the destination address is on the remote-subnet (in tunnel mode). • Outbound traffic will **bypass** the tunnel if: o the destination address is ***not*** the remote-addr; ***and*** o the destination address is ***not*** on the remote-subnet. • Inbound traffic will be **dropped** if: o the source address (prior to decryption) is on the remote-subnet (in tunnel mode); ***or*** o the source address is the remote-address, ***and*** the packets are ***not*** IKE or ESP. To configure an IPsec connection, rules need to be defined for matching the DN, defined in the SAN, of the IPsec peer certificate.
FCS_NTP_EXT.1	Administrators can update the TOE’s clock manually via FXOS or FMC or can configure the TOE (FXOS) to use NTP to synchronize the TOE’s clock with an external time source. The FTD automatically synchronizes its clock with the FXOS clock. NTPv3 is supported by the TOE and the NTP timestamp is not updated from broadcast or multicast addresses. IPsec is used to secure the connection between the TOE and the NTP time source.
FCS_SSHS_EXT.1(1)	**FXOS** FXOS implement SSHv2 servers as specified in RFCs 4252 and 4253 (telnet is disabled in the evaluated configuration). For SSH connections, the same session keys are used for a threshold of no longer than one hour, and each encryption key is used to protect no more than one gigabyte of data. Rekey occurs after any of the thresholds are reached. SSH connections will be dropped if the TOE receives a packet larger than 262,149 bytes. The FXOS’s implementation of SSHv2 supports:

TOE SFRs	How the SFR is Satisfied
	• Public key algorithm RSA for signing and verification as part of the SSH authentication. • Password-based authentication for administrative users. • Encryption algorithms, AES-CBC-128, AES-CBC-256 to ensure confidentiality of the session. • Hashing algorithm hmac-sha1 to ensure the integrity of the session for FXOS. FXOS additionally supports hmac-sha2-256 and hmac-sha2-512. • Requiring use of DH group 14. • The TOE verifying the SSH client's presented public key matches one stored within the TOE's SSH server's authorized keys file. FXOS allows authorized administrator to configure the maximum data and maximum time in compliance with the limits as specified in FCS_SSHS_EXT.1.8(1), such that the rekey will occur whichever threshold (data or time) is hit first. MIO-A /system/services # **set ssh-server rekey-limit volume** *[KB]* **time** *[Minutes]*
FCS_SSHS_EXT.1(2)	**<u>FMC and FTD</u>** The TOE supports SSHv2 with the following encryption algorithms - aes128-cbc, aes256-cbc, AEAD_AES_128_GCM, AEAD_AES_256_GCM, in conjunction with HMAC-SHA1, HMAC-SHA-256, HMAC-SHA-512, AEAD_AES_128_GCM and AEAD_AES_256_GCM for integrity and authenticity, and RSA with diffie-hellman-group14-sha1 for the key exchange method. While DES and 3DES, HMAC-MD5 and HMAC-MD5-96, and diffie-hellman-group-1 and other diffie-hellman-exchange groups are all implemented, they are disabled while the TOE is operating in CC Mode. In addition, SSHv1 is also disabled by default for security reasons. If the SSH client does not support the Approved algorithms or SSH version, the SSH connection will fail and the administrators will not establish an SSHv2 CLI session with the TOE. The TOE supports SSH public-key authentication using ssh-rsa and supports password-based authentication. The TOE ensures and verifies that the SSH client's presented public key matches one that is stored within the TOE's SSH server's authorized keys file. The TOE uses OpenSSH implementation version 7.6p1 to support the SSHv2 connections. The authentication timeout period is 90 seconds allowing clients to retry only 3 times. In addition, both public-key (RSA) and password-based authentication can be configured with password-based being the default method used. Whenever the timeout period or authentication retry limit is reached, the TOE closes the applicable TCP connection and releases the SSH session resources. As SSH packets are being received, the TOE uses a buffer to build all packet information. Once complete, the packet is checked to ensure it can be appropriately decrypted. However, if it is not complete when the buffer becomes full (256 Kbytes) the packet will be dropped. Note that the TOE manages a tracking mechanism for each SSH session so that it can initiate a new key exchange when either approximately 1 hour of time or 1GB of data is reached. An audit event is generated when a successful SSH rekey occurs when either of the thresholds mentioned occurs. SSH connections will be dropped if the TOE receives a packet larger than 32768 bytes.
FIA_AFL.1	**<u>FMC</u>**

TOE SFRs	How the SFR is Satisfied
	FMC provides the administrator the ability to specify the maximum number (can be set differently per account on FMC) of unsuccessful authentication attempts via SSH or WebUI (default is five attempts, configurable from 1-99) before the offending account is locked. The configured limit is the maximum number of allowed consecutive failures, thus the defined number of unsuccessful consecutive authentication attempts that results in locking of accounts is one more than the maximum number of allowed consecutive failures. Only an authorized administrator (with the 'administrator' role) can unlock a locked account. By default, the predefined 'admin' account is exempt from becoming locked, but that default is overridden when CC mode is enabled. If all admin accounts become locked for any reason, FMC can be accessed locally using password recovery procedures. **FXOS** FXOS will allow a maximum number (same value applies to all FXOS accounts) of consecutive failed login attempts via SSH or WebUI before the offending account becomes locked ('lock-status' set to 'locked'). When an account is locked, it can be unlocked by another administrator who has the 'admin' role (not just 'read-only'). If all admin accounts become locked for any reason, FXOS can be accessed locally using password recovery procedures. • All types of user accounts (including account type 'admin') are locked out of the system after exceeding the maximum number of login attempts. • The default maximum number of unsuccessful login attempts is '3' (configurable from 1-10). **FTD** The FTD CLI provides the administrator the ability to specify the maximum number of unsuccessful authentication attempts (configurable from 1-10) before the offending account is locked. Only an authorized administrator (with the 'administrator' role) can unlock a locked account. If all admin accounts become locked for any reason, FTD can be accessed locally using password recovery procedures.
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 as listed in the SFR (FXOS passwords do not support "=" or "$" characters). Minimum password length is settable by the Authorized Administrator, and support passwords of 8 to 32 characters (FTD and FMC) and 8 to 80 characters (FXOS) when "enforce-strong-password" option is enabled in security scope. Password composition rules specifying the types and number of required characters that comprise the password are settable by the Authorized Administrator. Passwords can be configured with a maximum lifetime, configurable by the Authorized Administrator. New passwords can be required to contain a minimum of 4-character changes from the previous password.
FIA_UIA_EXT.1	The TOE requires all users to be successfully identified and authenticated before allowing any TSF mediated actions to be performed. All the TOE components support authentication of Security Administrators according to FIA_UIA_EXT.1 and FIA_UAU_EXT.2. Administrative access to the TOE is facilitated through the TOE's CLI (SSH (password-based and public key-based) or local console in FTD, FMC and FXOS), or web GUI in FMC and FXOS. The TOE mediates all administrative actions through the CLI and GUI. The TOE presents a warning banner in accordance with FTA_TAB.1 requirement prior to initiating the identification authentication mechanism for those attempting to access the TOE. Once a potential administrative user attempts to access an administrative interface either locally or remotely, the TOE prompts the user for a username and password. Only after the

TOE SFRs	How the SFR is Satisfied
	administrative user presents the correct authentication credentials will access to the TOE administrative functionality be granted. No access is allowed to the administrative functionality of the TOE until an administrator is successfully identified and authenticated. The TOE provides an automatic lockout when a user attempts to authenticate and enters invalid credentials. After a defined number of authentication attempts fail exceeding the configured allowable attempts, the user is locked out until an authorized administrator can unlock the user account.
FIA_UAU_EXT.2	The TOE provides local password-based authentication mechanisms to FMC, FTD and FXOS. The process for authentication is the same for administrative access whether administration is occurring via a directly connected console cable or remotely via SSHv2 (password-based or public key-based) or TLS. At initial login in the administrative user is prompted to provide a username. After the user provides the username, the user is prompted to provide the administrative password associated with the user account. The TOE then either grants administrative access (if the combination of username and password is correct) or indicates that the login was unsuccessful. The TOE does not provide indication of whether the username or password was the reason for an authentication failure.
FIA_UAU.7	When logging in, the TOE will not echo passwords such that passwords are not inadvertently displayed to the user and any other users that might be able to view the login display. The TOE replaced the entered password character with a "*" character or not show any character at all. This depends on where the user is logging in from, for example, using web GUI versus the SSH client. If the authentication fails, the TOE is designed to not indicate either the username and/or password were incorrect. The error message would just state access denied or unable to authorize access. No other information about the failed login in can be ascertained from the error message. Note also that should a user have their session terminated (e.g., due to inactivity), they are required to successfully re-authenticate, by re-entering their identity and authentication data, in order to gain access to their session. The authentication data is not cached by the TOE for any reason.
FIA_X509_EXT.1/ITT FIA_X509_EXT.1/Rev FIA_X509_EXT.2(1) FIA_X509_EXT.2(2) FIA_X509_EXT.3	The TOE support X.509v3 certificates as defined by RFC 5280. Public key infrastructure (PKI) credentials, such as private keys and certificates are stored securely. The identification and authentication, and authorization security functions protect an unauthorized user from gaining access to the storage. The validity check for the certificates takes place at session establishment and/or at time of import depending on the certificate type. For example, server certificate is checked at session establishment while CA certificate is checked at both. The TOE conforms to standard RFC 5280 for certificate and path validation (i.e., peer certificate checked for expiration, peer certificate checked if signed by a trusted CA in the trust chain, peer certificate checked for unauthorized modification, peer certificate checked for revocation). The TOE can generate a RSA key pair that can be embedded in a Certificate Signing Request (CSR) created by the TOE. The CSR can be generated at the UI. The TOE can then send the CSR manually to a Certificate Authority (CA) for the CA to sign and issue a certificate. Once the certificate has been issued, the administrator can import the X.509v3 certificate into the TOE. Integrity of the CSR and certificate during transit are assured through the use of digital signature (signing the hash of the TOE's public key contained in the CSR and certificate). CRL is configurable and can be used for certificate revocation check (for FTP_ITC only, thus relevant only to FIA_X509_EXT.1/Rev, not relevant to FIA_X509_EXT.1/ITT as no revocation checking is used for communications between TOE components). Checking is also done for the 'basicConstraints' extension and the 'cA' flag to determine whether they

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	are present and set to TRUE. If they are not, the CA certificate is not accepted as a trust anchor. FMC and FXOS only support CRL, while FTD supports use of both CRL and OCSP (including verification of the OCSP signing purpose in the certificate that signs the OCSP response). FTD supports CRL for other purposes, i.e., for validation of syslog server certificates for both the TLS connections to TLS servers. The administrators can configure a trust chain by importing the CA certificate(s) that signed and issued the server (syslog) certificate. This will tell the TOE which CA certificate(s) to use during the validation process. If the TOE does not find the trusted root CA, the TLS connections (FTD TLS client and FTD OS TLS client) to the syslog server will fail. When the TOE cannot establish a connection for the validity check using CRL or the OCSP responder for verification, the FTD OS TLS client and the FMC will accept the certificate when transmitting messages to the syslog server, while the FTD TLS client and FXOS will not accept the certificate and the trusted channel will not be established. When communicating with peers, the TOE uses the default certificate that is configured through the FMC and one that matches the peer's request. For more information, please refer to the CC Supplemental User Guide.
FMT_MOF.1/ManualUpdate	The TOE restricts the ability to enable, disable, determine and modify the behavior of all of the security functions of the TOE to authorized administrators. The TOE provides the ability for authorized administrators to initiate TOE update, access TOE data, such as audit data, configuration data, security attributes, information flow rules, and session thresholds. **FMC** Only accounts with 'administrator' privilege can upload patches to FMC and initiate installation of patches to FMC or FTD devices (the FMC WebUI is used to manually initiate updates to FMC and FTD). Only accounts with 'administrator' privilege can update system configuration settings related to: • local logging and remote logging • clock settings • account management including account lockout settings and unlocking accounts (for FMC accounts only) • login banners • cryptographic functionality including SSH (FMC and FTD), TLS (FMC), and IPsec (FTD) • generation of CSRs, and import or delete X.509v3 certificates • firewall functionality • VPN functionality **FTD** Only accounts with 'config' privilege can update system configuration settings related to: • account management including account lockout settings and unlocking accounts (for FTD accounts only) **FXOS** Only accounts with 'admin' role can upload software updates to FXOS and initiate updates of FXOS and configure: • local logging and remote logging • clock settings • account management including account lockout settings and unlocking accounts

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	• login banners • cryptographic functionality including SSH, TLS, and IPsec
FMT_MTD.1/CoreData	**FTD and FMC** The TOE provides a web-based GUI (using HTTPS) management interface and CLI or shell (using SSH or serial connection) (FMC provides the Web GUI and CLI, while the FTD provides a CLI) for all TOE administration, including the policy rule sets, user accounts and roles, and audit functions. The ability to manage various security attributes, system parameters and all TSF data is controlled and limited to those users who have been assigned the appropriate administrative role and privileges associated with those roles. Note that all users created are TOE administrators **Predefined User Roles** The TOE supports the following predefined user roles: • **Administrators** can set up the appliance's network configuration, manage user accounts, and configure system policies and system settings. The Administrator Role provides access to analysis and reporting features, rule and policy configuration, system management, and all maintenance features. Users with the Administrator role have ALL access rights. Note: The only TOE user role is "Administrator". This role is granted when a new user account is created and cannot be changed. The web-based GUI is available on the FMC. The web-based GUI on the FMC is highly recommended for daily management of the FMC and its managed FTD. Local access to the shell which allows access to the underlying operating system is allowed in the CC evaluated configuration for the initial configuration only. For normal daily operations, the web GUI is still the recommended method. **FXOS** User accounts are used to access the FXOS system through the FXOS WebUI and CLI. Up to 48 local user accounts can be configured. Each user account must have a unique username and password. The 'admin' account is a default user account and cannot be modified or deleted. This account is the system administrator or superuser account and has full privileges. The term "authorized administrator" or "Security Administrator" applies to this account and other accounts assigned to the Administrator role.
FMT_MTD.1/CryptoKeys	The TOE only provides the ability for authorized administrators to access TOE data, such as audit data, configuration data, security attributes (such as cryptographic keys and certificates used in VPN), routing tables, and session thresholds.
FMT_SMF.1 FMT_SMF.1/FFW[FW] FMT_SMF.1/VPN[VPN]	The TOE includes the functions necessary to administer the TOE locally and remotely via the administrative interfaces of the FTD (SSH CLI, local console), FMC (WebUI, SSH CLI, local console) and FXOS (WebUI, SSH CLI and local console). All the management functions that are available to be performed on the TOE local console can also be performed remotely via SSH. No access or service is provided prior to identification and authentication, beyond viewing the login banner. **FMC** FMC administrators can perform the following functions: • Login locally via console CLI, and remotely via SSH CLI or TLS WebUI • Configure the access banner (via WebUI)

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	• Configure session inactivity time limits (via WebUI) • Update the FMC and FTD TOE components and verify updates using digital signature prior to installing updates (via WebUI) • Configure authentication failure parameters (via WebUI) • Manage cryptographic keys (via WebUI) • Configure cryptographic functionality (via WebUI) • Configure lifetime for IPsec SAs (via WebUI) • Import X.509v3 certificates (via WebUI) • Configure interaction between TOE components (via WebUI) • Re-enable an administrator account (via WebUI) • Set the time which is used for time-stamps (via WebUI) • Configure the reference identifier for the peer (via WebUI) • Configure firewall rules (via WebUI) • Define packet filtering rules for VPNs (via WebUI) • Associate packet filtering rules to network interfaces for VPNs (via WebUI) • Configure ordering/sequencing of packet filtering rules (via WebUI) **FTD** FTD administrators can perform the following functions: • Login locally via console CLI, and remotely via SSH CLI • Configure authentication failure parameters • Import X.509v3 certificates (for syslog servers only) • Configure interaction between TOE components • Re-enable an administrator account • Configure the reference identifier for the peer (for syslog servers only) **FXOS** FXOS administrators can perform the following functions: • Login locally via console CLI, and remotely via SSH CLI or TLS WebUI • Configure the access banner (via CLI) • Configure session inactivity time limits (via CLI) • Update the FXOS TOE component and verify updates using digital signature prior to installing updates (via CLI or WebUI) • Configure authentication failure parameters (via CLI) • Manage cryptographic keys (via CLI) • Configure cryptographic functionality (via CLI or WebUI) • Configure lifetime for IPsec SAs (via CLI) • Import X.509v3 certificates (via CLI) • Re-enable an administrator account (via CLI or WebUI) • Set the time which is used for time-stamps (via CLI or WebUI) • Configure NTP (via CLI or WebUI) • Configure the reference identifier for the peer (via CLI)
FMT_SMR.2	**FTD and FMC** The TOE includes one evaluated role which corresponds to the required 'Security Administrator' described in Section 5.3.5.5. **FXOS** The system contains the following user role:

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	Administrator Complete read-and-write access to the entire system. The default admin account is assigned this role by default and it cannot be changed.
FPT_SKP_EXT.1	**FTD and FMC** The TOE is designed to not to disclose or store plaintext passwords (e.g., passwords are never recorded in the audit records or display during authentication process). The passwords are stored hashed using Approved SHA-512 with a 32-bit salt value. Only 'root' user account with access to the shell can view the hashed passwords and this is prohibited in the evaluated configuration. The same is true for cryptographic keys such as encryption symmetric keys and private keys. The public keys can be viewed but cannot be modified without detection. Note that access to public keys is restricted to administrators. **FXOS** All keys are stored on volatile memory without encryption. Only admin users can load a debugging plugin (which is NOT given to customers) to have a file system based access to key files.
FPT_APW_EXT.1	**FTD and FMC** The TOE is designed to not to disclose or store plaintext passwords (e.g., passwords are never recorded in the audit records or display during authentication process). The passwords are stored hashed using Approved SHA-512 with a 32-bit salt value. Only 'root' user account with access to the shell can view the hashed passwords and this is prohibited in the evaluated configuration. The same is true for cryptographic keys such as encryption symmetric keys and private keys. The public keys can be viewed but cannot be modified without detection. Note that access to public keys is restricted to administrators. **FXOS** All passwords are stored in hashed form using SHA-512.
FPT_STM_EXT.1	The FMC and FXOS provides a source of date and time information for the TOE, used in audit timestamps, in validating service requests, and for tracking time-based actions related to session management including timeouts for inactive administrative sessions (FTA_SSL_EXT.*), and renegotiating SAs for IPsec tunnels (FCS_IPSEC_EXT.1). This function can only be accessed from within the configuration exec mode via the privileged mode of operation or using the appropriate role. The clock function is reliant on the system clock provided by the underlying hardware. The clock's date and time can be adjusted by authorized administrators. FMC's clock can be configured manually by the administrators. FXOS can either set its time manually or sync with an NTP server. The FTD automatically synchronizes its clock with the FXOS clock.
FPT_TST_EXT.1	The FTD, FMC and FXOS run a suite of self-tests during initial start-up (power-on-self-tests or POST) to verify its correct operation. When CC mode is enabled on the FMC, FTD and FXOS, additional cryptographic tests and software integrity test will be run during start-up. The self-testing includes cryptographic algorithm tests (known-answer tests) that feed pre-defined data to cryptographic modules and confirm the resulting output from the modules match expected values, and firmware integrity tests that verify the digital signature of the code image using RSA-2048 with SHA-512. The cryptographic algorithm testing verifies proper operation of encryption functions, decryption functions, signature padding functions, signature hashing functions, and random number generation. The firmware integrity testing

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	verifies the FTD, FMC and FXOS images have not been tampered with or corrupted. If any of these self-tests fails, the TOE will cease operation. Noise source health tests are run both periodically and at start-up on the FTD to determine the functional health of the noise source. These tests are specifically designed to catch catastrophic losses in the overall entropy associated with the noise source. Tests are run on the raw noise output, before the application of any conditioners. If a noise source fails the health test either at start-up or after the device is operational, the platform will be shut down. Whenever a failure (e.g., POST or integrity test fails) occurs within the FTD that results in the FTD ceasing operation, the FTD securely disables its interfaces to prevent the unintentional flow of any information to or from the FTD and reloads. So long as the failures persist, the FTD will continue to reload. This functionally prevents any failure from causing an unauthorized information flow. There are no failures that circumvent this protection.
FPT_TUD_EXT.1	The TOE components (FMC, FTD and FXOS) have specific versions that can be queried by an administrator. When updates are made available by Cisco, an administrator can obtain and manually install those updates. Digital signatures (RSA) are used to verify software/firmware update files (to ensure they have not been modified from the originals distributed by Cisco) before they are used to update the applicable TOE components. The update process will fail if the digital signature verification process fails. Updates can be downloaded from http://www.cisco.com/go/firepower9300-software or http://www.cisco.com/go/firepower4100-software or https://software.cisco.com with a Cisco.com account. The appropriate software image is then downloaded to the administrator's workstation, then uploaded to FMC, or FXOS (FTD updates are uploaded to FMC then pushed from FMC to FTD). Software update files are verified using digital signatures (RSA) automatically at the time they are uploaded to FMC or FXOS. Update files will fail to be stored on the device if they fail validation. Images stored on FXOS can be re-verified with the command – "verify platform-pack version *version_number*". On FMC, the FMC and FTD updates can uploaded and installed by navigating to System > Updates. Several upload files can remain stored locally on FMC and installed to FMC or FTD at a later time. When updates are initiated they are applied immediately, and the FMC or FTD will reload automatically with the new software version. That same page also shows the currently running version on FMC. To view the currently running version of any FTD, navigate to Devices > Device Management > then select the device > click on the 'Device' tab. On FXOS, FXOS updates can be uploaded by navigating to System > Updates. Several upload files can remain stored locally on FXOS and installed at a later time. When updates are initiated they are applied immediately, and the FXOS will reload automatically with the new software version. To view the currently running version of FXOS, click on the 'Overview' tab.
FPT_ITT.1, FPT_ITT.1/Join	The communication between the FMC and FTD is protected by TLSv1.1 and TLSv1.2. TLS provides authentication, key exchange, encryption and integrity protection of all data transmitted between the TOE components.
FTA_SSL_EXT.1	An administrator can configure maximum inactivity times for both local and remote administrative sessions. When a session is inactive (i.e., no session input) for the configured period of time the TOE will terminate the session, requiring the administrator to log in again to establish a new session when needed. The inactivity times are set at a default of 60
FTA_SSL.3	

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	minutes, but an Administrator can configure the inactivity time for the FMC and FTD through the FMC WebUI and FXOS through the FXOS CLI.
FTA_SSL.4	An administrator is able to exit out of both local and remote administrative sessions of the FMC, FTD and FXOS, effectively terminating the session so it cannot be re-used and will require authentication to establish a new session.
FTA_TAB.1	The TOE provides administrators with the capability to configure advisory banner or warning message(s) that will be displayed prior to completion of the logon process at the local console or via any remote connection (e.g., SSH or HTTPS). The TOE displays an advisory notice and a consent warning message for each administrative method of access: • FMC/FMCv: Console, SSH, and WebUI • FXOS: Console, SSH, and WebUI • FTD: The FTD CLI (SSH), which provides the login banner.
FTP_ITC.1	The TOE uses IPsec and/or TLS to protect communications between itself and remote entities for the following purposes: • The TOE protects transmission of audit records when sending syslog message to a remote audit server by transmitting the messages: o From FMC/FMCv as a TLS client, using X.509v3 certificates for assured identification of the syslog server and with mutual authentication supported. o From FXOS over IPsec, using X.509v3 certificates for assured identification of the syslog server. o From FTD as a TLS client (FTD TLS Client), that is configured by the FMC and is the main audit system for audits generated by FTD. It sends audit events such as IPsec and login messages to the external syslog server and Mutual authentication is not supported. o From FTD as a TLS client (FTD OS TLS Client), that is configured through the FTD's command line and sends audit events to an external syslog server such as SSH login, console login, etc. and Mutual authentication is supported. • The TOE protects communication with a NTP server: o From FXOS to a NTP server over IPsec, using RSA for peer authentication that X509v3 certificates. • The TOE (FTD only) protects peer-to-peer VPN connections between itself and VPN peers (connections can be initiated by the TOE or by the peer) using IPsec, using X.509v3 certificates for assured identification of the peer. • The TOE (FTD Only) protects VPN connections inbound from VPN clients using IPsec, using X.509v3 certificates for assured identification of the VPN client. Note that the remote VPN client is in the operational environment.
FTP_TRP.1/Admin	The TOE uses SSHv2 or HTTPS to provide the trusted path (with protection from disclosure and modification) for all remote administration sessions. Optionally, the FXOS and FTD support tunneling the SSH and HTTPS connections in IPsec VPN tunnels (remote VPN client). Remote administration of FMC can be performed using SSH or TLS/HTTPS. Remote administration of FXOS can be performed using SSH or TLS/HTTPS. Remote administration through the CLI of FTD is via SSH.

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Security Functional Requirements Drawn from mod_cpp_fw_v1.4e	
FDP_RIP.2[FW]	**FTD Only** The TOE ensures that packets transmitted through the TOE do not contain residual information from previous packets. Packets that are not the required length (for the temporary memory storage location, or for the minimum transmission unit size on the egress interface) use zeros for padding so residual data is never transmitted from the TOE. Packet handling within memory buffers ensures new packets cannot contain portions of previous packets by ensuring that when packets are written to memory locations those memory locations are padded with zeros as necessary to fill the allocated memory size, so no residual data exists within that memory range when the packet is read for transmission. This applies to data plane traffic and even administrative session traffic.
FFW_RUL_EXT.1.1[FW] FFW_RUL_EXT.1.2[FW]	**FTD Only** The TOE provides stateful traffic filtering of IPv4 and IPv6 network traffic. Administratively-defined traffic filter rules (access-lists or **Objects > Object Management > Access Control Lists > Extended**) can be applied to any interface to filter traffic based on IP parameters including source and destination address, transport layer protocol, type and code, TCP and UDP port numbers. The TOE allows establishment of communications between remote endpoints, and tracks the state of each session (e.g. initiating, established, and tear-down), and will clear established sessions after proper tear-down is completed as defined by each protocol, or when session timeouts are reached. To track the statefulness of sessions to/from and through the firewall, the TOE maintains a table of connections in various connection states and connection flags. The TOE updates the table (adding, and removing connections, and modifying states as appropriate) based on configurable connection timeout limits, and by inspecting fields within the packet headers. For further explanation of connection states, see section 7.1. The proper session establishment and termination followed by the TOE is as defined in the following RFCs: • RFC 792 (ICMPv4) • RFC 4443 (ICMPv6) • RFC 791 (IPv4) • RFC 2460 (IPv6) • TCP, RFC 793, section 2.7 Connection Establishment and Clearing • UDP, RFC 768 (not applicable, UDP is a “stateless” protocol) During initialization/startup (while the TOE is booting) the configuration has yet to be loaded, and no traffic can flow through any of its interfaces. No traffic can flow through the TOE interfaces until the POST has completed, and the configuration has been loaded. If any aspect of the POST fails during boot, the TOE will reload without forwarding traffic. If a critical component of the TOE, such as the clock or cryptographic modules, fails while the TOE is in an operational state, the TOE will reload, which stops the flow of traffic. If a component such as a network interface, which is not critical to the operation of the TOE, but may be critical to one or more traffic flows, fails while the TOE is operational, the TOE will continue to function, though all traffic flows through the failed network interface(s) will be dropped. When traffic exceeds the maximum rate the TOE can handle, the TOE drops the excess traffic and ensures that no traffic that wouldn’t pass stateful traffic filtering rules would be passed through.

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FFW_RUL_EXT.1.2[FW]	**FTD Only** The TOE supports filtering of the following protocols and enforces proper session establishment, management, and termination as defined in each protocol's RFC , using the following filtering options configured via FMC: To filter ICMPv4 or ICMPv6 Type and Code: • Policies > Access Control > Access Control > Add Rule > a. Zones (mapped to interfaces) > Available Zones > click either "Add to Source" or "Add to Destination" b. Networks > select IPv4 networks> add to source and/or destination c. Ports > Selected Destination Ports > Protocol > ICMP > select type and code To filter ICMPv6 Type and Code: As explained above for ICMPv4, but under "Networks" select IPv6 addresses. To filter IPv4 Source address, Destination Address, and Transport Layer Protocol: • Policies > Access Control > Access Control > Add Rule > a. Zones (mapped to interfaces) > Available Zones > click either "Add to Source" or "Add to Destination" b. Networks > select IPv4 networks > add to source and/or destination c. Ports > select a pre-named port, or create a new named protocol+port > add to source and/or destination To filter IPv6 Source Address, Destination Address, and Transport Layer Protocol: As explained above for IPv4, but under "Networks" select IPv6 addresses. To filter TCP Source Port and/or Destination Port: As explained above for IPv4 or IPv6, and under "Ports" select "TCP" and a port under either or both of "Selected Source Ports" and/or "Selected Destination Ports." To filter UDP Source Port and/or Destination Port: As explained above for IPv4 or IPv6, and under "Ports" select "UDP" and a port under either or both of "Selected Source Ports" and/or "Selected Destination Ports." • Addresses, type of service, fragmentation data, size and padding, and IP options including loose source routing, strict source routing, and record route as defined in RFC 791 (IPv4), and RFC 2460 (IPv6); • Port numbers, sequence and acknowledgement numbers, size and padding, and control bits such as SYN, ACK, FIN, and RST as defined in RFC 793 (TCP); • Port numbers, and length as defined in RFC 768 (UDP); and • Session identifiers, sequence numbers, types, and codes as defined in RFC 792 (ICMPv4), and RFC 4443 (ICMPv6). Cisco confirms proper implementation of the RFCs through interoperability testing with Cisco and 3rd party products and through protocol compliant testing. The TOE can also support deeper packet inspection and enforce additional RFC compliance beyond session management, but such traffic inspection functionality is not defined within the NDcPP and is therefore beyond the scope of this CC certification.
FFW_RUL_EXT.1.3[FW], FFW_RUL_EXT.1.4[FW]	**FTD Only**

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	Each traffic flow control rule on the TOE is defined as either a “permit” rule, or a “deny” rule, and any rule can also contain the keyword “log” which will cause a log message to be generated when a new session is established because it matched the rule. The TOE can be configured to generate a log message for the session establishment or an attempt at session establishment of any permitted or denied traffic. When a rule is created to explicitly allow a protocol which is implicitly allowed to spawn additional sessions, the establishment of spawned sessions is logged as well. Access Control Lists (ACLs) are only enforced after they’ve been applied to a network interface. Any network interface can have an ACL applied to it. Interfaces can be referred to by their identifier (e.g. GigabitEthernet 0/1). The interface types that can be assigned to an interface are: • Physical interfaces o Ethernet o GigabitEthernet o TenGigabitEthernet o Management • Port-channel interfaces (designated by a port-channel number) • Subinterface (designated by the subinterface number) The default state of an interface depends on the type and the context mode: • For the “system” context in single mode or multiple context mode, interfaces have the following default states: o Physical interfaces = Disabled o Subinterfaces = Enabled. However, for traffic to pass through the subinterface, the physical interface must also be enabled. • For any non-system context (in multiple context mode): All allocated interfaces (allocated to the context by the system context) are enabled by default, no matter what the state of the interface is in the system context. However, for traffic to pass through the interface, the interface also has to be enabled in the system context. If you shut down an interface in the system context, then that interface is down in all contexts to which that interface has been allocated. In interface configuration mode, the administrator can configure hardware settings (for physical interfaces), assign a name, assign a VLAN, assign an IP address, and configure many other settings, depending on the type of interface and the security context mode. For an enabled interface to pass traffic, the following interface configuration mode commands must be used (in addition to explicitly permitting traffic flow by applying and access-group to the interface): “**nameif”**, and, for routed mode, “**ip address”**. For subinterfaces, also configure the “**vlan”** command.
FFW_RUL_EXT.1.5[FW]	**FTD Only** All traffic that goes through the TOE is inspected using the Adaptive Security Algorithm and either is allowed through or dropped. A simple packet filter can check for the correct source address, destination address, and ports, but it does not check that the packet sequence or flags are correct. A filter also checks every packet against the filter, which can be a slow process. A stateful firewall like the TOE, however, takes into consideration the state of a packet: • Is this a new connection?

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	If it is a new connection, the TOE has to check the packet against access control lists and perform other tasks to determine if the packet is allowed or denied. To perform this check, the first packet of the session goes through the "session management path," and depending on the type of traffic, it might also pass through the "control plane path." The session management path is responsible for the following tasks: – Performing the access list checks – Performing route lookups – Allocating NAT translations (xlates) – Establishing sessions in the "fast path" The TOE creates forward and reverse flows in the fast path for TCP traffic; the TOE also creates connection state information for connectionless protocols like UDP, so that they can also use the fast path. • Is this an established connection? If the connection is already established, the TOE does not need to re-check packets against the ACL; matching packets can go through the "fast" path based on attributes identified in FFW_RUL_EXT.1.5. The fast path is responsible for the following tasks: – IP checksum verification – Session lookup – TCP sequence number check – NAT translations based on existing sessions – Layer 3 and Layer 4 header adjustments Existing traffic flows are removed from the set of established traffic flows when the session inactivity timeout hits or the completion of the expected information flow.
FFW_RUL_EXT.1.6[FW], FFW_RUL_EXT.1.7[FW]	**FTD Only** The TOE can be configured to implement default denial of various mal-formed packets/fragments, and other illegitimate network traffic, and can be configured to log that such packets/frames were dropped. The following traffic will be denied/dropped by the TOE, and when auditing of such actions has been enabled by an administrator the TOE will generate audit messages when the action occurs: a) Packets which are invalid fragments (The TOE will count the number packets that were dropped because the packets included invalid fragments. Invalid fragments include: overlapping fragments (‘teardrop’ attack); and invalid IP fragment size (‘ping of death’ attack)). b) Fragments that cannot be completely re-assembled (The TOE will count the number of packets that fail to be reassembled. Packets that fail to be reassembled include those that exceed any of the thresholds (configured globally, or per-interface) for fragment reassembly, including limits for: the maximum number of fragments allowed for a single packet (chain size); the maximum number of fragments the TOE will hold in its IP reassembly database waiting for reassembly (size limit); and the maximum number of seconds to wait for all fragments of a packet to be received (timeout limit).)

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	c) Packets where the source address is defined as being on a broadcast network d) Packets where the source address is defined as being on a multicast network e) Packets where the source address is defined as being a loopback address f) The TSF shall reject and be capable of logging network packets where the source or destination address of the network packet is defined as being unspecified (i.e. 0.0.0.0) or an address “reserved for future use” (i.e. 240.0.0.0/4) as specified in RFC 5735 for IPv4; g) The TSF shall reject and be capable of logging network packets where the source or destination address of the network packet is defined as an “unspecified address” or an address “reserved for future definition and use” (i.e. unicast addresses not in this address range: 2000::/3) as specified in RFC 3513 for IPv6; h) Packets with the IP options: Loose Source Routing, Strict Source Routing, or Record Route specified i) Other packets defined in FFW_RUL_EXT.1.6: • In routed mode when the TOE receives a through-the-box: o L2 broadcast packet (MAC address FF:FF:FF:FF:FF:FF) o IPv4 packet with destination IP address equal to 0.0.0.0 o IPv4 packet with source IP address equal to 0.0.0.0 • In routed or transparent mode when the TOE receives a through-the-box IPv4 packet with any of: o first octet of the source IP address equal to zero o network part of the source IP address equal to all 0's o network part of the source IP address equal to all 1's o source IP address host part equal to all 0's or all 1's o source IP address and destination IP address are the same (“land c” attack) • LAND Attack – Network packets with IP source address the same as the destination IP and the destination port the same as the source port. • ICMP Error Inspect and ICMPv6 Error Inspect (ICMP error packets when the ICMP error messages are not related to any session already established in the TOE). • ICMPv6 condition (when the appliance is not able to find any established connection related to the frame embedded in the ICMPv6 error message). • ICMP Inspect bad icmp code (when an ICMP echo request/reply packet was received with a malformed code(non-zero)). The following traffic will be denied/dropped by the TOE by the default action (deny/drop) of each Access Control Policy, and if logging is enabled for the default action the TOE will generate audit messages when the action occurs: a) Packets where the source address is equal to the address of the network interface where the network packet was received. b) Packets where the source or destination address of the network packet is a link-local address. c) Packets where the source address does not belong to the networks associated with the network interface where the network packet was received, including a description of how the TOE determines whether a source address belongs to a network associated with a given network interface.
FFW_RUL_EXT.1.8[FW]	**FTD Only**

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	The TOE administrators have control over the sequencing of access control entries (ACEs) within an access control list (ACL) to be able to set the sequence in which ACEs are applied within any ACL. The entries within an ACL are always applied in a top-down sequence, and the first entry that matches the traffic is the one that's applied, regardless of whether there may be a more precise match for the traffic further down in the ACL. By changing the ordering/numbering of entries within an ACL, the administrator chances the sequence in which the entries are compared to network traffic flows.
FFW_RUL_EXT.1.9[FW]	**<u>FTD Only</u>** An implicit "deny-all" rule is applied to all interfaces to which any traffic filtering rule has been applied. The implicit deny-all rule is executed after all admin-defined rules have been executed and will result in dropping all traffic that has not been explicitly permitted, or explicitly denied. If an administrator wants to log all denied traffic, a rule entry should be added that denies all traffic and logs it, e.g. "access-list sample-acl deny ip any any log".
FFW_RUL_EXT.1.10[FW]	**<u>FTD Only</u>** The TOE administrators can configure the maximum number of half-open TCP connections allowed by configuring a Network Analysis Policy to include SYN Attack Prevention with desired limits. After the configured limit is reached, the TOE will act as a proxy for the server and generates a SYN-ACK response to new client SYN request. When the TOE receives an ACK back from the client, it can then authenticate that the client is real and allow the connection to the server. If an ACK is not received in the configurable time frame, the session is closed, resource is returned to the free pool, and it will be counted. The default idle time until a TCP half-open connection closes is 10 minutes.
FFW_RUL_EXT.2[FW]	**<u>FTD Only</u>** The TOE supports TCP and UDP protocols that require dynamic establishment of secondary network sessions like FTP and the establishment of the sessions along with the dynamical definition of the rule are treated as auditable events. The TOE will manage establishment and teardown of the following protocols in accordance with the RFC for each protocol: • FTP (File Transfer Protocol) is a TCP protocol supported in either active or passive mode: o In active mode the client initiates the control session, and the server initiates the data session to a client port provided by the client; o For active FTP to be allowed through the TOE, the firewall rules must explicitly permit the control session from the client to the server, and "inspect ftp" must be enabled. The TOE will then explicitly permit a control session to be initiated from the client to the server, and implicitly permit data sessions to be initiated from the server to the client while the control session is active. o In passive (PASV) mode, the client initiates the control session, and the client also initiates the data session to a secondary port provided to the client by the server. For passive FTP to be permitted through the TOE, the firewall rules must explicitly permit the control session from the client to the server, and "inspect ftp" must be enabled with the "match passive-ftp" option enabled. That feature will cause the TOE to look for the PASV or EPSV commands in the FTP control traffic and for the server's destination port, and dynamically permit the data session.
Reproduced from mod_vpngw_v1.1	

TOE SFRs	How the SFR is Satisfied
FCS_CKM.1/IKE [VPN]	See FCS_CKM.1
FIA_PSK_EXT.1 [VPN]	**FTD Only** The TOE supports use of IKEv2 pre-shared keys for authentication of IPsec tunnels. Pre-shared keys can be entered as ASCII character strings, or HEX values. The text-based pre-shared keys can be composed of any combination of upper and lower case letters, numbers, and special characters. The TOE supports keys that are from 1 character in length up to 127 in length. The text-based pre-shared key is conditioned by one of the prf functions (HMAC-SHA-1, HMAC-SHA-256, HMAC-SHA-384, or HMAC-SHA-512) configured by the administrator.
FPF_RUL_EXT.1 [VPN]	**FTD Only** An authorized administrator can define the traffic that needs to be protected by configuring access lists (permit, deny, log) and applying these access lists to interfaces using access and crypto map sets. Therefore, traffic may be selected on the basis of the source and destination address, and optionally the Layer 4 protocol and port. The TOE enforces information flow policies on network packets that are received by TOE interfaces and leave the TOE through other TOE interfaces. When network packets are received on a TOE interface, the TOE verifies whether the network traffic is allowed or not and performs one of the following actions, pass/not pass information, as well as optional logging. The TOE implements rules that define the permitted flow of traffic between interfaces of the TOE for unauthenticated traffic. These rules control whether a packet is transferred from one interface to another based on: 1. Presumed address of source 2. Presumed address of destination 3. Transport layer protocol (or next header in IPv6) 4. Service used (UDP or TCP ports, both source and destination) 5. Network interface on which the connection request occurs These rules are supported for the following protocols: RFC 791(IPv4); RFC 2460 (IPv6); RFC 793 (TCP); RFC 768 (UDP). FTD compliance with these protocols is verified via regular quality assurance, regression, and interoperability testing. Packets will be dropped unless a specific rule has been set up to allow the packet to pass (where the attributes of the packet match the attributes in the rule and the action associated with the rule is to pass traffic). Rules are enforced on a first match basis from the top down. As soon as a match is found the action associated with the rule is applied. These rules are entered in the form of access lists at the CLI (via ‘access list’ and ‘access group’ commands). These interfaces reject traffic when the traffic arrives on an external TOE interface, and the source address is an external IT entity on an internal network; These interfaces reject traffic when the traffic arrives on an internal TOE interface, and the source address is an external IT entity on the external network; These interfaces reject traffic when the traffic arrives on either an internal or external TOE interface, and the source address is an external IT entity on a broadcast network; These interfaces reject traffic when the traffic arrives on either an internal or external TOE interface, and the source address is an external IT entity on the loopback network;

TOE SFRs	How the SFR is Satisfied
	These interfaces reject requests in which the subject specifies the route for information to flow when it is in route to its destination; and For application protocols supported by the TOE (e.g., DNS, HTTP, SMTP, and POP3), these interfaces deny any access or service requests that do not conform to its associated published protocol specification (e.g., RFC). This is accomplished through protocol filtering proxies that are designed for that purpose. Otherwise, these interfaces pass traffic only when its source address matches the network interface originating the traffic to the network interface corresponding to the traffic's destination address. During the boot cycle, the TOE first powers on hardware, loads the image, and executes the power on self-tests. Until the power on self tests successfully complete, the interfaces to the TOE are deactivated. Once the tests complete, the interfaces become active and the rules associated with the interface become immediately operational. There is no state during initialization/ startup that the access lists are not enforced on an interface. During initialization/startup (while the TOE is booting) the configuration has yet to be loaded, and no traffic can flow through any of its interfaces. No traffic can flow through the TOE interfaces until the POST has completed, and the configuration has been loaded. If any aspect of the POST fails during boot, the TOE will reload without forwarding traffic. If a critical component of the TOE, such as the clock or cryptographic modules, fails while the TOE is in an operational state, the TOE will reload, which stops the flow of traffic. If a component such as a network interface, which is not critical to the operation of the TOE, but may be critical to one or more traffic flows, fails while the TOE is operational, the TOE will continue to function, though all traffic flows through the failed network interface(s) will be dropped.
FPT_FLS.1/SelfTest[VPN]	**FTD Only** Noise source health tests are run both periodically and at start-up to determine the functional health of the noise source. These tests are specifically designed to catch catastrophic losses in the overall entropy associated with the noise source. Tests are run on the raw noise output, before the application of any conditioners. If a noise source fails the health test either at start-up or after the device is operational, the platform will be shut down. Whenever a failure (e.g., POST or integrity test fails) occurs within the FTD that results in the FTD ceasing operation, the FTD securely disables its interfaces to prevent the unintentional flow of any information to or from the FTD and reloads. So long as the failures persist, the FTD will continue to reload. This functionally prevents any failure from causing an unauthorized information flow. There are no failures that circumvent this protection.
FPT_TST_EXT.3[VPN]	See FPT_TST_EXT.1
FTA_SSL.3/VPN[VPN]	**FTD** When a remote VPN client session reaches a period of inactivity, its connection is terminated, and it must re-establish the connection with new authentication to resume operation. This period of inactivity is set by the administrator using **Objects > Object Management > Group Policy > Session Settings > Idle Timeout** in the VPN configuration. The Group Policy is then tied to a Connection Profile.
FTA_TSE.1[VPN]	**FTD**

TOE SFRs	How the SFR is Satisfied
	The TOE allows for creation of ACLs that restrict VPN connectivity-based client's IP address (location). These ACLs allow customization of all of these properties to allow or deny access (**Objects > Object Management > Group Policy > Traffic Filter Fields > Access List Filter)**. In addition, the administrator can create Group Policy tied to Connection Profile (**Objects > Object Management > Group Policy > Session Settings > Access Hours)** which can be used to restrict access based on date and time.
FTA_VCM_EXT.1 [VPN]	**FTD** The TOE provides the option to assign the remotely connecting VPN client an internal network IP address. The **Objects > Object Management > Address Pools** can be used to define the range of IP and IPv6 addresses to be available for use.
FTP_ITC.1.1[VPN]	See FTP_ITC.1

7 SUPPLEMENTAL TOE SUMMARY SPECIFICATION INFORMATION

7.1 Tracking of Stateful Firewall Connections

7.1.1 Establishment and Maintenance of Stateful Connections

As network traffic enters an interface of the TOE, the TOE inspects the packet header information to determine whether the packet is allowed by access control lists, and whether an established connection already exists for that specific traffic flow. The TOE maintains and continuously updates connection state tables to keep tracked of establishment, teardown, and open sessions. To help determine whether a packet can be part of a new session or an established session, the TOE uses information in the packet header and protocol header fields to determine the session state to which the packet applies as defined by the RFC for each protocol.

7.1.2 Viewing Connections and Connection States

To display the connection state for the designated connection type, use the **show conn** command in privileged EXEC mode. This command supports IPv4 and IPv6 addresses. The syntax is:

show conn [**count** | [**all**] [**detail**] [**long**] [**state** *state_type*] [**protocol** {**tcp** | **udp**}] [**scansafe**] [**address** *src_ip*[-*src_ip*] [**netmask** *mask*]] [**port** *src_port*[-*src_port*]] [**address** *dest_ip*[-*dest_ip*] [**netmask** *mask*]] [**port** *dest_port*[-*dest_port*]] [**user-identity** | **user** [*domain_nickname*\]*user_name* | **user-group** [*domain_nickname*\\]*user_group_name*] | **security-group**]

The **show conn** command displays the number of active TCP and UDP connections, and provides information about connections of various types. By default, the output of “**show conn**” shows only the through-the-TOE connections. To include connections to/from the TOE itself in the command output, add the **all** keyword, “**show conn all**”.

Table 21: Syntax Description

address	(Optional) Displays connections with the specified source or destination IP address.
all	(Optional) Displays connections that are to the device or from the device, in addition to through-traffic connections.
count	(Optional) Displays the number of active connections.
dest_ip	(Optional) Specifies the destination IP address (IPv4 or IPv6). To specify a range, separate the IP addresses with a dash (-). For example: 10.1.1.1-10.1.1.5
dest_port	(Optional) Specifies the destination port number. To specify a range, separate the port numbers with a dash (-). For example: 1000-2000
detail	(Optional) Displays connections in detail, including translation type and interface information.
long	(Optional) Displays connections in long format.
netmask *mask*	(Optional) Specifies a subnet mask for use with the given IP address.

port	(Optional) Displays connections with the specified source or destination port.
protocol {**tcp** | **udp**}	(Optional) Specifies the connection protocol, which can be **tcp** or **udp**.
scansafe	(Optional) Shows connections being forwarded to the Cloud Web Security server.
security-group	(Optional) Specifies that all connections displayed belong to the specified security group.
src_ip	(Optional) Specifies the source IP address (IPv4 or IPv6). To specify a range, separate the IP addresses with a dash (-). For example: 10.1.1.1-10.1.1.5
src_port	(Optional) Specifies the source port number. To specify a range, separate the port numbers with a dash (-). For example: 1000-2000
state *state_type*	(Optional) Specifies the connection state type. See Table 46-5 for a list of the keywords available for connection state types.
user [*domain_nickname*\] *user_name*	(Optional) Specifies that all connections displayed belong to the specified user. When you do not include the *domain_nickname* argument, the TOE displays information for the user in the default domain.
user-group [*domain_nickname*\\] *user_group_name*	(Optional) Specifies that all connections displayed belong to the specified user group. When you do not include the *domain_nickname* argument, the TOE displays information for the user group in the default domain.
user-identity	(Optional) Specifies that the TOE display all connections for the Identity Firewall feature. When displaying the connections, the TOE displays the user name and IP address when it identifies a matching user. Similarly, the TOE displays the host name and an IP address when it identifies a matching host.

The connection types that you can specify using the **show conn state** command are defined in the table below. When specifying multiple connection types, use commas without spaces to separate the keywords.

Table 22: Connection State Types

Keyword	Connection Type Displayed
up	Connections in the up state.
conn_inbound	Inbound connections.
ctiqbe	CTIQBE connections
data_in	Inbound data connections.
data_out	Outbound data connections.
finin	FIN inbound connections.
finout	FIN outbound connections.
h225	H.225 connections
h323	H.323 connections
http_get	HTTP get connections.
mgcp	MGCP connections.
nojava	Connections that deny access to Java applets.
rpc	RPC connections.
service_module	Connections being scanned by an SSM.
sip	SIP connections.
skinny	SCCP connections.

smtp_data	SMTP mail data connections.
sqlnet_fixup_data	SQL*Net data inspection engine connections.
tcp_embryonic	TCP embryonic connections.
vpn_orphan	Orphaned VPN tunneled flows.

When using the **detail** option, the TOE displays information about the translation type and interface information using the connection flags defined in the table below.

Table 23: Connection State Flags

Flag	Description
a	awaiting outside ACK to SYN
A	awaiting inside ACK to SYN
b	TCP state bypass. By default, all traffic that passes through the Cisco Adaptive Security Appliance (FTD) is inspected using the Adaptive Security Algorithm and is either allowed through or dropped based on the security policy. In order to maximize the firewall performance, the FTD checks the state of each packet (for example, is this a new connection or an established connection?) and assigns it to either the session management path (a new connection SYN packet), the fast path (an established connection), or the control plane path (advanced inspection). TCP packets that match existing connections in the fast path can pass through the adaptive security appliance without rechecking every aspect of the security policy. This feature maximizes performance.
B	initial SYN from outside
C	Computer Telephony Interface Quick Buffer Encoding (CTIQBE) media connection
d	dump
D	DNS
E	outside back connection. This is a secondary data connection that must be initiated from the inside host. For example, using FTP, after the inside client issues the PASV command and the outside server accepts, the FTD preallocates an outside back connection with this flag set. If the inside client attempts to connect back to the server, then the FTD denies this connection attempt. Only the outside server can use the preallocated secondary connection.
f	inside FIN
F	outside FIN
g	Media Gateway Control Protocol (MGCP) connection
G	connection is part of a group The G flag indicates the connection is part of a group. It is set by the GRE and FTP Strict fixups to designate the control connection and all its associated secondary connections. If the control connection terminates, then all associated secondary connections are also terminated.
h	H.225
H	H.323
i	incomplete TCP or UDP connection
I	inbound data
k	Skinny Client Control Protocol (SCCP) media connection
K	GTP t3-response
m	SIP media connection
M	SMTP data

O	outbound data
p	replicated (unused)
P	inside back connection This is a secondary data connection that must be initiated from the inside host. For example, using FTP, after the inside client issues the PORT command and the outside server accepts, the FTD preallocates an inside back connection with this flag set. If the outside server attempts to connect back to the client, then the FTD denies this connection attempt. Only the inside client can use the preallocated secondary connection.
q	SQL*Net data
r	inside acknowledged FIN
R	If TCP: outside acknowledged FIN for TCP connection If UDP: UDP RPC2 Because each row of "show conn" command output represents one connection (TCP or UDP), there will be only one R flag per row.
s	awaiting outside SYN
S	awaiting inside SYN
t	SIP transient connection For a UDP connection, the value t indicates that it will timeout after one minute.
T	SIP connection For UDP connections, the value T indicates that the connection will timeout according to the value specified using the "timeout sip" command.
U	up
V	VPN orphan
W	WAAS
X	Inspected by the service module, such as a CSC SSM.
y	For clustering, identifies a backup owner flow.
Y	For clustering, identifies a director flow.
z	For clustering, identifies a forwarder flow.
Z	Cloud Web Security

A single connection is created for multiple DNS sessions, as long as they are between the same two hosts, and the sessions have the same 5-tuple (source/destination IP address, source/destination port, and protocol). DNS identification is tracked by *app_id*, and the idle timer for each app_id runs independently. Because the app_id expires independently, a legitimate DNS response can only pass through the TOE within a limited period of time and there is no resource build-up. However, when the **show conn** command is entered, you will see the idle timer of a DNS connection being reset by a new DNS session. This is due to the nature of the shared DNS connection and is by design.

When the TOE creates a pinhole to allow secondary connections, this is shown as an incomplete conn by the **show conn** command. Incomplete connections will be cleared from the connections table when they reach their timeout limit, and can be cleared manually by using the "**clear conn"** command. When there is no TCP traffic for the period of inactivity defined by the **timeout conn** command (by default, 1:00:00), the connection is closed and the corresponding conn flag entries are no longer displayed.

If a LAN-to-LAN/Network-Extension Mode tunnel drops and does not come back, there might be a number of orphaned tunnel flows. These flows are not torn down as a result of the tunnel going down, but all the data attempting to flow through them is dropped. The **show conn** command output shows these orphaned flows with the **V** flag.

Table 24: TCP connection directionality flags

Flag	Description
B	Initial SYN from outside
a	Awaiting outside ACK to SYN
A	Awaiting inside ACK to SYN
f	Inside FIN
F	Outside FIN
s	Awaiting outside SYN
S	Awaiting inside SYN

7.1.3 Examples

The following is sample output from the **show conn** command. This example shows a TCP session connection from inside host 10.1.1.15 to the outside Telnet server at 10.10.49.10. Because there is no B flag, the connection is initiated from the inside. The "U", "I", and "O" flags denote that the connection is active and has received inbound and outbound data.

```
hostname# show conn
54 in use, 123 most used
TCP out 10.10.49.10:23 in 10.1.1.15:1026 idle 0:00:22, bytes 1774, flags UIO
UDP out 10.10.49.10:31649 in 10.1.1.15:1028 idle 0:00:14, bytes 0, flags D-
TCP dmz 10.10.10.50:50026 inside 192.168.1.22:5060, idle 0:00:24, bytes 1940435, flags UTIOB
TCP dmz 10.10.10.50:49764 inside 192.168.1.21:5060, idle 0:00:42, bytes 2328346, flags UTIOB
TCP dmz 10.10.10.51:50196 inside 192.168.1.22:2000, idle 0:00:04, bytes 31464, flags UIB
TCP dmz 10.10.10.51:52738 inside 192.168.1.21:2000, idle 0:00:09, bytes 129156, flags UIOB
TCP dmz 10.10.10.50:49764 inside 192.168.1.21:0, idle 0:00:42, bytes 0, flags Ti
TCP outside 192.168.1.10(20.20.20.24):49736 inside 192.168.1.21:0, idle 0:01:32, bytes 0, flags Ti
TCP dmz 10.10.10.50:50026 inside 192.168.1.22:0, idle 0:00:24, bytes 0, flags Ti
TCP outside 192.168.1.10(20.20.20.24):50663 inside 192.168.1.22:0, idle 0:01:34, bytes 0, flags Ti
TCP dmz 10.10.10.50:50026 inside 192.168.1.22:0, idle 0:02:24, bytes 0, flags Ti
TCP outside 192.168.1.10(20.20.20.24):50663 inside 192.168.1.22:0, idle 0:03:34, bytes 0, flags Ti
TCP dmz 10.10.10.50:50026 inside 192.168.1.22:0, idle 0:04:24, bytes 0, flags Ti
TCP outside 192.168.1.10(20.20.20.24):50663 inside 192.168.1.22:0, idle 0:05:34, bytes 0, flags Ti
TCP dmz 10.10.10.50:50026 inside 192.168.1.22:0, idle 0:06:24, bytes 0, flags Ti
TCP outside 192.168.1.10(20.20.20.24):50663 inside 192.168.1.22:0, idle 0:07:34, bytes 0, flags Ti
```

The following is sample output from the **show conn detail** command. This example shows a UDP connection from outside host 10.10.49.10 to inside host 10.1.1.15. The D flag denotes that this is a DNS connection. The number 1028 is the DNS ID over the connection.

```
hostname# show conn detail
```

```
54 in use, 123 most used
Flags: A - awaiting inside ACK to SYN, a - awaiting outside ACK to SYN,
    B - initial SYN from outside, b - TCP state-bypass or nailed, C - CTIQBE media,
    D - DNS, d - dump, E - outside back connection, F - outside FIN, f - inside FIN,
    G - group, g - MGCP, H - H.323, h - H.225.0, I - inbound data,
    i - incomplete, J - GTP, j - GTP data, K - GTP t3-response
    k - Skinny media, M - SMTP data, m - SIP media, n - GUP
    O - outbound data, P - inside back connection, p - Phone-proxy TFTP connection,
    q - SQL*Net data, R - outside acknowledged FIN,
    R - UDP SUNRPC, r - inside acknowledged FIN, S - awaiting inside SYN,
    s - awaiting outside SYN, T - SIP, t - SIP transient, U - up,
    V - VPN orphan, W - WAAS,
    X - inspected by service module
TCP outside:10.10.49.10/23 inside:10.1.1.15/1026, flags UIO, idle 39s, uptime 1D19h, timeout 1h0m, bytes 1940435
UDP outside:10.10.49.10/31649 inside:10.1.1.15/1028, flags dD, idle 39s, uptime 1D19h, timeout 1h0m, bytes 1940435
TCP dmz:10.10.10.50/50026 inside:192.168.1.22/5060, flags UTIOB, idle 39s, uptime 1D19h, timeout 1h0m, bytes 1940435
TCP dmz:10.10.10.50/49764 inside:192.168.1.21/5060, flags UTIOB, idle 56s, uptime 1D19h, timeout 1h0m, bytes 2328346
TCP dmz:10.10.10.51/50196 inside:192.168.1.22/2000, flags UIB, idle 18s, uptime 1D19h, timeout 1h0m, bytes 31464
TCP dmz:10.10.10.51/52738 inside:192.168.1.21/2000, flags UIOB, idle 23s, uptime 1D19h, timeout 1h0m, bytes 129156
TCP outside:10.132.64.166/52510 inside:192.168.1.35/2000, flags UIOB, idle 3s, uptime 1D21h, timeout 1h0m, bytes 357405
TCP outside:10.132.64.81/5321 inside:192.168.1.22/5060, flags UTIOB, idle 1m48s, uptime 1D21h, timeout 1h0m, bytes 2083129
TCP outside:10.132.64.81/5320 inside:192.168.1.21/5060, flags UTIOB, idle 1m46s, uptime 1D21h, timeout 1h0m, bytes 2500529
TCP outside:10.132.64.81/5319 inside:192.168.1.22/2000, flags UIOB, idle 31s, uptime 1D21h, timeout 1h0m, bytes 32718
TCP outside:10.132.64.81/5315 inside:192.168.1.21/2000, flags UIOB, idle 14s, uptime 1D21h, timeout 1h0m, bytes 358694
TCP outside:10.132.64.80/52596 inside:192.168.1.22/2000, flags UIOB, idle 8s, uptime 1D21h, timeout 1h0m, bytes 32742
TCP outside:10.132.64.80/52834 inside:192.168.1.21/2000, flags UIOB, idle 6s, uptime 1D21h, timeout 1h0m, bytes 358582
TCP outside:10.132.64.167/50250 inside:192.168.1.35/2000, flags UIOB, idle 26s, uptime 1D21h, timeout 1h0m, bytes 375617
```

7.2 Key Zeroization

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

Table 25: TOE Key Zeroization

Critical Security Parameters (CSPs)	Zeroization Cause and Effect
Diffie-Hellman Shared Secret	Automatically zeroized after completion of DH exchange, by calling a specific API within the two crypto modules, when module is shutdown, or reinitialized. Storage: DRAM Overwritten with: 0x00

Critical Security Parameters (CSPs)	Zeroization Cause and Effect
Diffie Hellman Private and Public Exponent	Automatically zeroized upon completion of DH exchange, by calling a specific API within the two crypto modules, and when module is shutdown, or reinitialized. Storage: DRAM Overwritten with: 0x00
skeyid	Session Encryption Key and IKE Session Authentication Key. Automatically zeroized after IKE session terminated. Storage: DRAM Overwritten with: 0x00
skeyid_d	Session Encryption Key and IKE Session Authentication Key. Automatically zeroized after IKE session terminated. Storage: DRAM Overwritten with: 0x00
IKE Session Encryption Key	Session Encryption Key and IKE Session Authentication Key. Automatically zeroized after IKE session terminated. Storage: DRAM Overwritten with: 0x00
IKE Session Authentication Key	Session Encryption Key and IKE Session Authentication Key. Automatically zeroized after IKE session terminated. Storage: DRAM Overwritten with: 0x00
ISAKMP Preshared	Zeroized using the following command: **# no crypto isakmp key** Storage: NVRAM Overwritten with: 0x00
IKE RSA and ECDSA Private and Public Keys	Automatically overwritten when a new key is generated or zeroized using the following commands: **# crypto key zeroize rsa** **# crypto key zeroize ec** Storage: NVRAM Overwritten with: 0x00

Critical Security Parameters (CSPs)	Zeroization Cause and Effect
IPsec Encryption Key	Automatically zeroized when IPsec session terminated. Storage: DRAM Overwritten with: 0x00
IPsec Authentication Key	Automatically zeroized when IPsec session terminated. Storage: DRAM Overwritten with: 0x00
SSHv2 Private and Public Key	Automatically zeroized upon generation of a new key Storage: NVRAM Overwritten with: 0x00
SSHv2 Session Key	Automatically zeroized when the SSH session is terminated. Storage: NVRAM Overwritten with: 0x00
All CSPs	Zeroized on-demand on all file systems via the “erase” command. Storage: NVRAM
TLS Server Private Key	Zeroized when the HTTPS server is no longer in use. Storage: NVRAM Overwritten with: 0x00

7.3 CAVP Certificate Equivalence

The TOE models and processors included in the evaluation are shown in the following table. The TOE includes multiple cryptographic modules across the range of TOE components. These modules are commonly referred to as FOM (FIPS Object Models). The CAVP-certified FOM of the TOE are listed in the table below (Table 26) along with the CPU for which they were certified, and the TOE component on which they’re used. The table on the following page (Table 27) lists the CAVP certificate numbers for each FOM for each applicable SFR.

Table 26: Model Processors

CPU Family	CPU Model (Microarchitecture)	FOM	Physical Appliances, Modules, and Blades	CAVP Certificate #
FTD				
Intel Xeon E5-2600 v3	Intel Xeon E5-2658 v3 (Haswell)	Cisco Security Crypto F6.2	FPR 4110, FPR 4120, FPR 9300 (SM-24)	Table 27 – Column - Cisco Security Crypto F6.2/Cisco SSL FOM 6.2 (FTD)
	Intel Xeon E5-2699 v3 (Haswell)	Cisco Security Crypto F6.2	FPR 9300 (SM-36), FPR 4140	
Intel Xeon E5-2600 v4	Intel Xeon E5-2699 v4 (Broadwell)	CiscoSSL FOM 6.2	FPR 4150, FPR 9300 (SM-44)	A397
Intel Xeon Scalable	Intel Xeon Silver 4116 (Skylake)	CiscoSSL FOM 6.2	FPR 4115	A402
	Intel Xeon Gold 6130 (Skylake)		FPR 4125, FPR 9300 (SM-40)	
	Intel Xeon Gold 6152 (Skylake)		FPR 4145	
	Intel Xeon Platinum 8160 (Skylake)		FPR 9300 (SM-48)	
	Intel Xeon Platinum 8176 (Skylake)		FPR 9300 (SM-56)	
FXOS				
Intel Xeon E3-1100 v2	Intel Xeon E3-1105C v2 (Ivy Bridge)	CiscoSSL FOM 6.2	Supervisor Blade (in FPR 4110, FPR 4120, FPR 4140, FPR 4150, FPR 4115, FPR 4125 and FPR 4145 and FPR 9300)	A397
FMC				

CPU Family	CPU Model (Microarchitecture)	FOM	Physical Appliances, Modules, and Blades	CAVP Certificate #
Intel Xeon E5-2600 v4	Intel Xeon E5-2620 v4 (Broadwell)	CiscoSSL FOM 6.2	FMC4500	A397
	Intel Xeon E5 2640 v4 (Broadwell)		FMC1000 and FMC2500	
Intel Xeon Scalable	Intel Xeon Silver 4110 (Skylake)		FMC1600 and FMC2600	
	Intel Xeon Silver 4116 (Skylake)		FMC4600	
FMCv				
Intel Xeon Scalable w/ Linux 4 on ESXi 6.5	Intel Xeon Bronze 3104 (Skylake) w/ Linux 4 on ESXi 6.5	CiscoSSL FOM 6.2	UCSB-B200-M5, UCSC-C220-M5 and UCSC-C240-M5	A399
	Intel Xeon Silver 4110 (Skylake) w/ Linux 4 on ESXi 6.5		UCSB-B200-M5, UCSC-C220-M5 and UCSC-C240-M5	
	Intel Xeon® Gold 6128[5] (Skylake) w/ Linux 4 on ESXi 6.5		UCSB-B200-M5, UCSC-C220-M5 and UCSC-C240-M5	
	Intel Xeon Platinum 8153 (Skylake) w/ Linux 4 on ESXi 6.5		UCSB-B200-M5, UCSC-C220-M5 and UCSC-C240-M5	

[5] While tested on the Intel Xeon Gold 6130 (Skylake), Intel Xeon Gold 6128 (Skylake) may also be used as part of the evaluated configuration

CPU Family	CPU Model (Microarchitecture)	FOM	Physical Appliances, Modules, and Blades	CAVP Certificate #
Intel Xeon E5-2600 v3 w/ Linux 4 on ESXi 6.5	Intel Xeon E5-2620 v3 (Haswell) w/ Linux 4 on ESXi 6.5	CiscoSSL FOM – Virtual 6.2	UCSB-B200-M4, UCSC-C220-M4S, UCSC-C240-M4L, UCSC-C240-M4SX	A971
Intel Xeon E5-2600 v4 w/ Linux 4 on ESXi 6.5	Intel Xeon E5-2609 v4 (Broadwell) w/ Linux 4 on ESXi 6.5	CiscoSSL FOM 6.2	UCSB-B200-M4, UCSC-C220-M4S, UCSC-C240-M4L, UCSC-C240-M4SX	A391
Intel Xeon D w/ Linux 4 on ESXi 6.5	Intel Xeon D-1528 (Broadwell) w/ Linux 4 on ESXi 6.5	CiscoSSL FOM – Virtual 6.2	UCS-E160S-M3	A971
	Intel Xeon D-1548 (Broadwell) w/ Linux 4 on ESXi 6.5		UCS-E180D-M3	

Table 27: Algorithm Numbers

Algorithm	SFR	Cisco Security Crypto F6.2/ CiscoSSL FOM 6.2 (FTD[6])	CiscoSSL FOM 6.2 (FXOS[7])	CiscoSSL FOM 6.2 (FMC)	Cisco SSL FOM 6.2/ CiscoSSL FOM – Virtual 6.2 (FMCv)
AES CBC 128/256 GCM 128/256	FCS_COP.1/DataEncryption	4905, A402, A397	A397	A397	A399, A391, A971
RSA 2048/3072 bits Signature Gen & Verify Key Gen	FCS_COP.1/SigGen FCS_CKM.1 FCS_CKM.1/IKE[VPN]	2678, A402, A397	A397	A397	A399, A391, A971
DSA 2048/3072 bits	FCS_CKM.1	1304, A402, A397	A397	A397	A399, A391, A971
ECDSA curves P-256, P-384 and P-521 Key Sizes – 256, 384 and 521 bits Signature Gen & Verify Key Gen and Verify	FCS_COP.1/SigGen FCS_CKM.1 FCS_CKM.1/IKE[VPN]	1254, A402, A397	A397	A397	A399, A391, A971
Hashing SHA-1, SHA-256, SHA-384, SHA-512	FCS_COP.1/Hash	4012, A402, A397	A397	A397	A399, A391, A971

[6] Each FTD appliance includes two instances of FOM 6.2; one for FTD and one for FX-OS (underlying OS for FTD). Only one instance of the FOM was tested because they both run on the same processor.

[7] FXOS is running FOM 6.2 on the Supervisor Blade or MIO.

Algorithm	SFR	Cisco Security Crypto F6.2/ CiscoSSL FOM 6.2 (FTD[6])	CiscoSSL FOM 6.2 (FXOS[7])	CiscoSSL FOM 6.2 (FMC)	Cisco SSL FOM 6.2/ CiscoSSL FOM – Virtual 6.2 (FMCv)
Keyed Hash HMAC-SHA-1, HMAC-SHA-256 HMAC-SHA-384 HMAC-SHA-512	FCS_COP.1/KeyedHash	3272, A402, A397	A397	A397	A399, A391, A971
DRBG CTR_DRBG(AES)	FCS_RBG_EXT.1	1735, A402, A397	A397	A397	A399, A391, A971
KAS ECC KAS FFC CVL	FCS_CKM.2	1520, A402, A397	A397	A397	A399, A391, A971

8 ANNEX A: REFERENCES

The following documentation was used to prepare this ST:

Table 28: References

Identifier	Description
[CC_PART1]	Common Criteria for Information Technology Security Evaluation – Part 1: Introduction and general model, dated April 2017, Version 3.1 Revision 5, CCMB-2017-04-001
[CC_PART2]	Common Criteria for Information Technology Security Evaluation – Part 2: Security functional components, dated April 2017, Version 3.1 Revision 5, CCMB-2017-04-002
[CC_PART3]	Common Criteria for Information Technology Security Evaluation – Part 3: Security assurance components, dated April 2017, Version 3.1 Revision 5, CCMB-2017-04-003
[CEM]	Common Methodology for Information Technology Security Evaluation – Evaluation Methodology, dated April 2017, Version 3.1 Revision 5, CCMB-2017-04-004
[800-38A]	NIST Special Publication 800-38A Recommendation for Block 2001 Edition Recommendation for Block Cipher Modes of Operation Methods and Techniques December 2001
[800-56A]	NIST Special Publication 800-56A, March, 2007 Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography (Revised)
[800-56B]	NIST Special Publication 800-56B Recommendation for Pair-Wise, August 2009 Key Establishment Schemes Using Integer Factorization Cryptography
[FIPS 140-2]	FIPS PUB 140-2 Federal Information Processing Standards Publication Security Requirements for Cryptographic Modules May 25, 2001
[FIPS PUB 186-4]	FIPS PUB 186-3 Federal Information Processing Standards Publication Digital Signature Standard (DSS) July 2013
[FIPS PUB 198-1]	Federal Information Processing Standards Publication The Keyed-Hash Message Authentication Code (HMAC) July 2008
[800-90]	NIST Special Publication 800-90A Recommendation for Random Number Generation Using Deterministic Random Bit Generators January 2012
[FIPS PUB 180-4]	FIPS PUB 180-4 Federal Information Processing Standards Publication Secure Hash Standard (SHS) March 2012

9 ANNEX B: SFR TOE COMPONENTS MAPPING

The following mapping was provided to show which SFR are supported by which TOE component:

Table 29: SFR Mapping

Requirement	Description	Distributed TOE SFR Allocation	Distributed TOE Audit Generation
Reproduced from NDcPP			
FAU_GEN.1	Audit Data Generation	All	All (startup/shutdown, and admin actions)
FAU_GEN.2	User Identity Association	All	N/A
FAU_GEN_EXT.1	Security Audit Generation	All	N/A
FAU_STG_EXT.1	Protected Audit Event Storage	All	N/A
FAU_STG_EXT.4	Protected Local Audit Event Storage for Distributed TOEs	All	N/A
FAU_STG_EXT.5	Protected Remote Audit Event Storage for Distributed TOEs	All	N/A
FCO_CPC_EXT.1	Communication Partner Control	FMC, FTD	FMC, FTD
FCS_CKM.1	Cryptographic Key Generation	All	N/A
FCS_CKM.2	Cryptographic Key Establishment	All	N/A
FCS_CKM.4	Cryptographic Key Destruction	All	N/A
FCS_COP.1/DataEncryption	Cryptographic Operation (AES Data Encryption/Decryption)	All	N/A
FCS_COP.1/SigGen	Cryptographic Operation (Signature Verification)	All	N/A
FCS_COP.1/Hash	Cryptographic Operation (Hash Algorithm)	All	N/A
FCS_COP.1/KeyedHash	Cryptographic Operation (Keyed Hash Algorithm)	All	N/A
FCS_HTTPS_EXT.1	Protocol Feature Dependent	FMC and FXOS	FMC and FXOS
FCS_IPSEC_EXT.1	IPsec Protocol – FXOS	FXOS	FXOS
FCS_IPSEC_EXT.1[VPN]	IPsec Protocol - FTD	FTD	FTD
FCS_NTP_EXT.1	NTP Protocol	FXOS	FXOS
FCS_RBG_EXT.1	Random Bit Generation	All	N/A
FCS_SSHS_EXT.1(1)	SSH Server Protocol (FXOS)	FXOS	FXOS
FCS_SSHS_EXT.1(2)	SSH Server Protocol (FTD/FMC/FMCv)	FMC, FTD	FMC, FTD
FCS_TLSC_EXT.1	TLS Client	FMC, FTD	FMC, FTD
FCS_TLSC_EXT.2	TLS Client with authentication	FMC, FTD	FMC, FTD
FCS_TLSS_EXT.1	TLS Server	All	All
FIA_AFL.1	Authentication Failure Management	All	All
FIA_PMG_EXT.1	Password Management	All	N/A
FIA_UIA_EXT.1	User Identification and Authentication	All	All
FIA_UAU_EXT.2	Password-based Authentication Mechanism	All	All
FIA_UAU.7	Protected Authentication Feedback	All	N/A

Requirement	Description	Distributed TOE SFR Allocation	Distributed TOE Audit Generation
FIA_X509_EXT.1/ITT FIA_X509_EXT.1/Rev	X.509 Certification Validation	All	All

FIA_X509_EXT.2(1)
FIA_X509_EXT.2(2)
	X.509 Certificate Authentication	All	N/A

FIA_X509_EXT.3	Certificate Requests	All	N/A
FMT_MOF.1/ManualUpdate	Trusted Update - Management of Security Functions behaviour	All	All
FMT_MTD.1/CoreData	Management of TSF Data	All	N/A
FMT_MTD.1/CryptoKeys	Management of TSF Data	All	N/A
FMT_SMF.1	Specification of Management Functions	FMC (*full*) FXOS (*subset*) FTD (*subset*) *(See TSS for details.)*	All
FMT_SMR.2	Restrictions on Security Roles	All	N/A
FPT_SKP_EXT.1	Protection of TSF Data (for reading of all symmetric keys	All	N/A
FPT_APW_EXT.1	Protection of Administrator Passwords	All	N/A
FPT_TST_EXT.1	Testing (Extended)	All	N/A
FPT_ITT.1	Basic internal TSF data transfer protection	FMC, FTD	FMC, FTD
FPT_ITT.1/Join	Basic internal TSF data transfer protection – Registration Channel	FMC, FTD	FMC, FTD
FPT_STM_EXT.1	Reliable Time Stamps	All	All
FPT_TUD_EXT.1	Trusted Update	All	All
FTA_SSL_EXT.1	TSF-Initiated Session Locking	All	All
FTA_SSL.3	TSF-initiated Termination	All	All
FTA_SSL.4	User-Initiated Termination	All	All
FTA_TAB.1	Default TOE Access Banner	All	N/A
FTP_ITC.1	Inter-TSF Trusted Channel	All	All
FTP_TRP.1/Admin	Trusted Path	All	All
Reproduced from mod_cpp_fw_v1.4e			
FDP_RIP.2[FW]	Full Residual Information Protection	FTD	N/A
FFW_RUL_EXT.1[FW]	Stateful Traffic Filtering	FTD	FTD
FFW_RUL_EXT.2[FW]	Stateful Filtering of Dynamic Protocols	FTD	FTD
FMT_SMF.1/FFW[FW]	Specification of Management Functions	FMC, FTD	FMC, FTD
Reproduced from mod_vpngw_v1.1			
FCS_CKM.1/IKE[VPN]	Cryptographic Key Generation (for IKE Peer Authentication)	FTD	N/A
FIA_PSK_EXT.1[VPN]	Pre-Shared Key Composition	FTD	N/A
FMT_SMF.1/VPN[VPN]	Specification of Management Functions (VPN Gateway)	FTD, FMC	FTD, FMC
FPF_RUL_EXT.1[VPN]	Packet Filtering	FTD	FTD

Requirement	Description	Distributed TOE SFR Allocation	Distributed TOE Audit Generation
FPT_FLS.1/SelfTest[VPN]	Fail Secure	FTD	FTD
FPT_TST_EXT.3[VPN]	Extended: TSF Testing	FTD	FTD
FTA_SSL.3[VPN]	TSF-initiated Termination	FTD	FTD
FTA_TSE.1[VPN]	TOE Session Establishment	FTD	FTD
FTA_VCM_EXT.1[VPN]	VPN Client Management	FTD	FTD
FTP_ITC.1/VPN[VPN]	Inter-TSF Trusted Channel	FTD	FTD