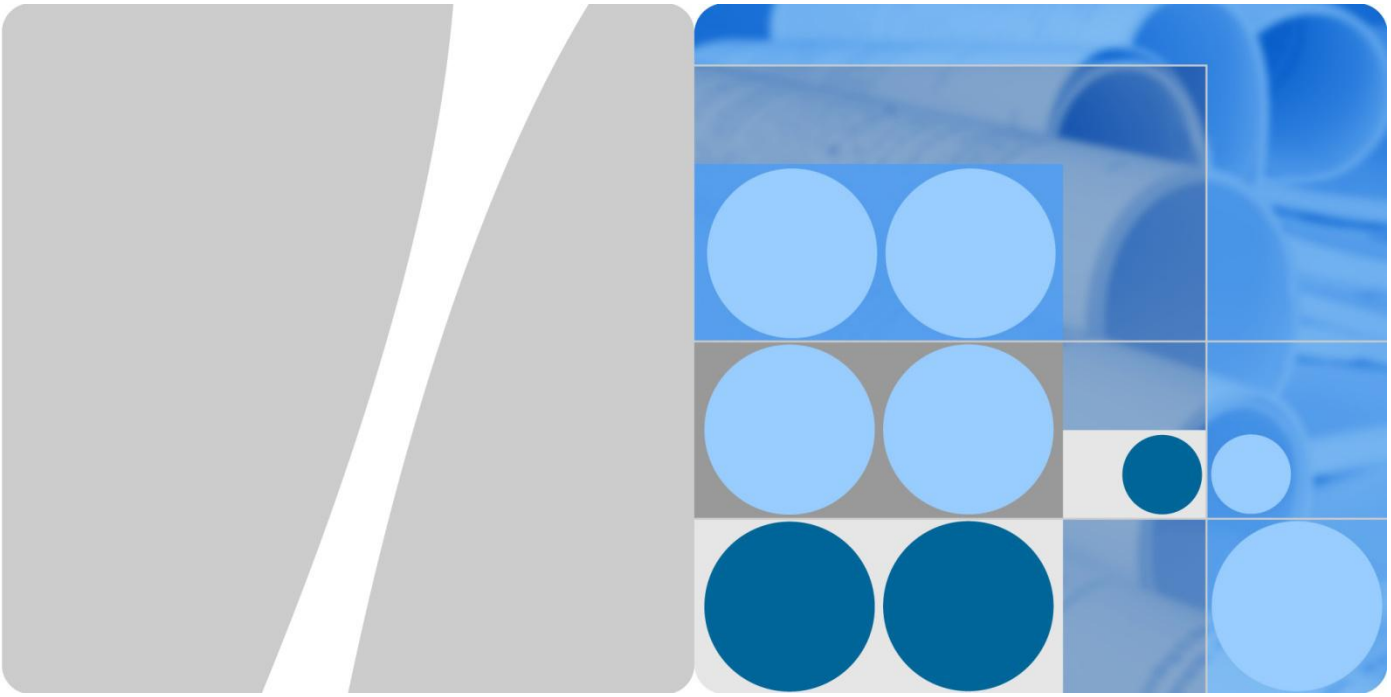

Huawei ATN Series Routers running VRP software V300R006C10SPC300

Security Target

Issue 1.4

Date 2022-07-12

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Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Date	Version	Change Description	Author
2020-07-02	0.1	Initial Draft	hujunli
2021-04-22	1.1	Internal review completed.	hujunli
2021-08-28	1.2	Internal review completed.	hujunli
2021-11-15	1.3	Revision based on the Observation Reports	hujunli
2022-07-12	1.4	Revision based on the Observation Reports	hujunli

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Tables

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1 Introduction

1.1 ST reference

ST Title	Huawei ATN Series Routers running VRP software V300R006C10SPC300 Security Target
ST version	1.4
Date	2022-07-12
Vendor and ST author	Huawei Technologies Co., Ltd

1.2 TOE Reference

TOE Name	Huawei ATN Series Routers running VRP software
TOE software version	V300R006C10SPC300
TOE Hardware Models	ATN 980C, ATN 950D, ATN 910C-G & ATN 910D-A

1.3 TOE overview

1.3.1 TOE Usage

Huawei ATN 980C, 950D, 910C-G & 910D-A series are multiservice access routers which inted to progress in the transition to LTE and FMC covergence carriers.

Huawei ATN series aim is to offer high-end IP boutique carrier network solutions. Delivering rich second and third layer characteristics and featuring amenities such as remote upkeep and administering, no on-site commissioning and plug-and-play functionality.

ATN series supports SDN virtual access and is meant to fulfill the needs of access-layer, large-scale deployment devices and integrated service access. Being a compact 2U high 10GE multiservice access router, it can share a cabinet with the base station, featuring a switching capacity of up to 56G and support a maximum access of 8*10GE.

1.3.2 TOE Type

The TOE type is a router product series (network devices) that provide multi-service access on the edge of metropolitan area networks (MANs).

1.3.3 Non TOE Hardware and Software

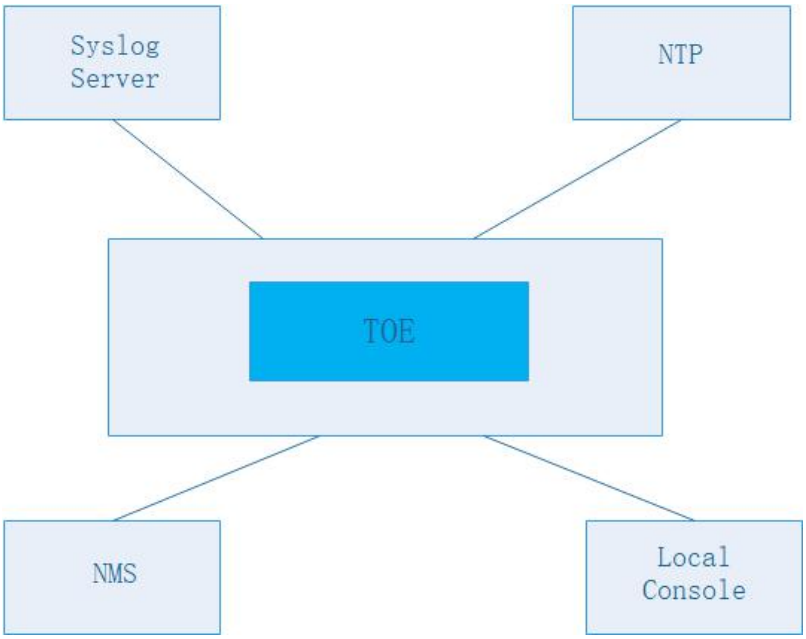
The TOE supports the following hardware, software, and firmware components in its operational environment. All of the following environment components are supported by all TOE evaluated configuration.

Table 1 IT Environment Components

Component	Required	Usage/Purpose Description for TOE performance
Network Management Server	YES	This includes any Management workstation with a SSH client installed that is used to establish a protected channel with the TOE.
Local Console	YES	This includes any Console that is directly connected to the TOE via the Serial Console Port and is used by the TOE administrator to support TOE administration.
Syslog Server	YES	This includes any syslog server to which the TOE would transmit syslog messages.
NTP server	YES	The TOE supports secure communications with an NTP server in order to synchronize the date and time on the TOE with the NTP server’s date and time. When the TOE acts as NTP server, it receives NTP request from client and send timestamp to the client.

Therefore, the following figure shows the IT entities which are connected to the TOE:

Figure 1-1 IT Entities which connect with TOE



The **HARDWARE** that is necessary for the TOE to work is the following:

Model	Description
ATN 980C	ATN 980C Assembly Chassis， 2 slots for CXP(System Control,Cross-connect and Multi-protocol Process Unit), 6 slots(AC) or 8 slots(DC) for PIC(Physical Interface Card).
ATN 950D	ATN 950D Assembly Chassis, 2 slots for CXP(System Control,Cross-connect and Multi-protocol Process Unit), 4 slots(AC) or 6 slots(DC) for PIC(Physical Interface Card)
ATN 910C-G	ATN 910C-G Integrated Chassis,Fixed interfaces.
ATN 910D-A	ATN 910C-A Integrated Chassis,Fixed interfaces.

- Huawei relies on 3rd party shipping world class logistics service providers such as DHL, KN, Schenker, Panalpina and so on to ensure the security of product in international transportation and regional warehousing, so as to deliver products to customers efficiently and securely. Huawei has a contractual agreement on Logistics Security that they have signed with all of these companies. Staff of the production facility shall notify the user of the shipping company that will ship the TOE in advance. In the e-mail, Huawei sent a delivery note with the information related to the TOE.

1.3.4 Major Security Features

(1) **Security Audit** - The TOE generates audit records to provide basis for system diagnosis and maintenance. Audit records reflect the operating status of a device and are used to analyze the

conditions of a network and to find out the causes of network failure or faults. Audit records are stored locally and may be backed up to a remote syslog server.

(2) **Cryptographic support** - The TOE provides cryptography in support of secure connections that includes remote administrative management.

(3) **Identification and authentication** - The TOE ensures that all Authorized Administrator are successfully identified and authenticated prior to gaining access to the TOE.

(4) **Secure Management** - The TOE restricts the ability to determine the behavior of and modify the behavior of the functions transmission of audit data to the security administrator. Only the security administrator can manage the cryptographic keys. Only the security administrator has the right of opening/closing the security services and creation/deletion/modification of the user accounts.

(5) **Protection of the TSF** - The TOE protects the pre-shared keys, symmetric keys, and private keys from reading them by an unauthorized entity. The TOE stores the users or administrator passwords in non-plaintext form preventing them from reading. The TOE verifies the packet before their installation and uses the digital signature.

(6) **TOE access through user authentication** - The TOE provides communication security by implementing SSH protocol.

(7) **Trusted path and channels for device authentication -** The TOE supports the trusted connections using TLS for the communication with the audit server.

1.4 TOE description

The TOE is ATN Series Routers running VRP software is comprised of software. The software is comprised of Versatile Routing Platform (VRP) software, VRP is a network OS incorporating Huawei's proprietary intellectual properties and capable of supporting various network systems of Huawei. The hardware is comprise of the following: **ATN 980C, ATN 910C-G, ATN 950D** and **ATN 910D-A**.

The Huawei ATN Series Routers running VRP software use the same VRP version. TSF relevant functions depend on software implementation. Table 1-2 below describes the models that have been claimed within this evaluation.

Table 2 IT Environment Components

Hardware	Configuration	Processor	Interface
ATN 980C	ATN 980C Assembly Chassis，2 slots for CXP(System Control,Cross-connect and Multi-protocol Process Unit), 6 slots(AC) or 8 slots(DC) for PIC(Physical Interface Card).	ARM	Based on TOE's I/O modules
ATN 950D	ATN 950D Assembly Chassis, 2 slots for CXP(System Control,Cross-connect and Multi-protocol Process Unit), 4 slots(AC) or 6 slots(DC) for PIC(Physical Interface Card)	ARM	Based on TOE's I/O modules
ATN 910C-G	ATN 910C-G Integrated Chassis,Fixed interfaces.	ARM	Based on TOE's I/O modules
ATN 910D-A	ATN 910C-A Integrated Chassis,Fixed interfaces.	ARM	Based on TOE's I/O modules

1.4.1 Physical scope

This section will define the physical scope of the ATN series routers to be evaluated.

The **SOFTWARE** part of the TOE is the following:

Hardware	Delivery Item	Version	Signature File	Sha256sum hash
ATN 980C ATN 950D	ATN950D980C-V300R006C10SPC300.cc	V300R006C10SPC300	ATN950D980C-V300R006C10SPC300.cc.asc	efb22f87588b0fb208fe0ed6ca9f934505b5b8623e4d06ceb120862cd4111e30
ATN 910C-G ATN 910D-A	ATN910C910D-V300R006C10SPC300.cc	V300R006C10SPC300	ATN910C910D-V300R006C10SPC300.cc.asc	63a9d1662a7814c0db7adafe5c9fc68987ed410ee345a1d42bad9202bad4a092

- Huawei will provide privileges to the customer's account that allows a user to log in the official website and download the corresponding software package. The software is available in the following link:

  https://support.huawei.com/carrier/navi?coltype=software#col=software&detailId=PBI1-251713955&path=PBI1-252291763/PBI1-252291797/PBI1-7275849/PBI1-9887881/PBI1-250590447&subModel=250521767

The **GUIDANCE** part of the TOE is the following:

Name of the document	Version/Issue	Sha256sum hash
Huawei ATN Series Routers running VRP software V300R006C10SPC300 Operational user Guidance.pdf	1.2	659ed527076c25b904853e1c698da6ac5e1b6ed0b2b308f9782a1b79592ed16d
Huawei ATN Series Routers running VRP software V300R006C10SPC300 Preparative Procedures.pdf	1.2	5cf243e1353051a444e585c2903e14dd427029cb58afd5a4134384a17671b7cc
Huawei ATN 980C&980B&950C&950D&910D&910C&950B&905 Product Documentation.chm	05	2a458c9b566c7f49e67a431423d5aac814af7c1e826580b2021c2b1a5e313631

- Huawei sends the previous documentation via an email generated automatically by Huawei File Transfer System (etrans).

1.4.1.1 Evaluated Configuration

Model	HW	Software
ATN 980C	ATN 980C Assembly Chassis，2 slots for CXP(System Control,Cross-connect and Multi-protocol Process Unit), 6 slots(AC) or 8 slots(DC) for PIC(Physical Interface Card).	V300R006C10SPC300
ATN 950D	ATN 950D Assembly Chassis, 2 slots for CXP(System Control,Cross-connect and Multi-protocol Process Unit), 4 slots(AC) or 6 slots(DC) for PIC(Physical Interface Card)	

ATN 910C-G	ATN 910C-G Integrated Chassis,Fixed interfaces.	
ATN 910D-A	ATN 910C-A Integrated Chassis,Fixed interfaces.	

Other software:

- SSH Client v2.0
- OpenSSL v1.1.1g

1.4.2 Logical Scope of the TOE

The TOE is comprised of several security features. Each of the security features identified above consists of several security functionalities, as identified below.

(1) Security audit

The log module of the host software records operations on a device and events that occur to a device. The recorded operations and events are log messages. Log messages provide evidence for diagnosing and maintaining a system. Log messages reflect the operating status of a device and are used to analyze the conditions of a network and to find out the causes of network failure or faults.

Key elements of log messages include timestamp, host name, Huawei identity, version, module name, severity, brief description, etc.

IC component are the module processing, outputting log records. Information hierarchy is designed to help the user roughly differentiate between information about normal operation and information about faults. Since the information center needs to output information to the terminal, console, log buffer, and log file.

(2) Cryptographic support

The TOE provides cryptography in support of secure connections that includes remote administrative management.

The cryptographic services provided by the TOE are described in Table below.

Table 3 Cryptography provided by TOE

Cryptography Function	Use in the TOE
DRBG	Used in session establishment of TLS and SSH
ECDH	Used in session establishment of SSH
DHE	Used in session establishment of TLS
SHA	Used to provide cryptographic hashing services
HMAC-SHA	Used to provide integrity and authentication verification
AES	Used to encrypt traffic transmitted through TLS and SSH
RSA	Used in the authentication of TLS and SSH

(3) Identification and authentication

The authentication functionality provides validation by user’s account name and password. Public

key authentication is supported for SSH users. Detailed functionalities, for example max idle-timeout period, max log-in attempts, UI lock, user kick out, can be applies by administrator according to networking environment, customized security considerations, differential user role on TOE, and/or other operational concerns.

(4) Secure Management

The TOE restricts the ability to determine the behavior of and modify the behavior of the functions transmission of audit data to the security administrator. Only the security administrator can manage the cryptographic keys. Only the security administrator has the right of opening/closing the security services and creation/deletion/modification of the user accounts.

(5) Protection of the TSF

The TOE protects the pre-shared keys, symmetric keys, and private keys from reading them by an unauthorized entity. The TOE stores the users or administrator passwords in non-plaintext form preventing them from reading. The TOE verifies the packet before their installation and uses the digital signature.

(6) TOE access through user authentication

The TOE provides communication security by implementing SSH protocol.

To protect the TOE from eavesdrop and to ensure data transmission security and confidentiality, SSH implements:

- authentication by password or by public-key;
- AES encryption algorithms;
- secure cryptographic key exchange;
- Besides default TCP port 22, manually specifying a listening port is also implemented since it can effectively reduce attack.

(7) Trusted path and channels for device authentication

The TOE supports the trusted connections using TLS for the communication with the audit server.

1.5 Standalone TOE

[CPP_ND], chapter 3 introduces distributed TOEs, i.e. TOEs that consist of more than one component. This does not refer to different software components running on one hardware component but same version software components running on each hardware components.

This ST refers to a standalone TOE which is not a distributed TOE in the sense of [CPP_ND], chapter 3. All additional requirements that are defined for distributed TOEs within [CPP_ND] are therefore ignored in this ST. There are dedicated paragraphs in several Application Notes of [CPP_ND] which are only applicable to distributed TOEs. These dedicated paragraphs have not been integrated into the Application Notes in this ST since the TOE is not a distributed TOE.

2 CPP_ND Conformance Claims

2.1 CPP_ND Conformance Claim

As defined by the references [CC1], [CC2] and [CC3], this ST:

- conforms to the requirements of Common Criteria v3.1, Revision 5
- is Part 2 extended, Part 3 conformant
- does not claim conformance to any other PP than the one specified in chap 2.2
- does not claim conformance to any Evaluation Assurance Level as defined in [CC3], chap. 8.

2.2 Protection Profile Conformance

This security target claims “Exact Conformance” to [CPP_ND]. Note that "Exact Conformance" is defined in [CPP_ND], chap. 2.

The methodology applied for the cPP evaluation is defined in [CEM]. In addition to [CEM], the evaluation activities for [CPP_ND] are completed in [SD_ND].

2.3 Conformance Rationale

2.3.1 TOE Appropriateness

The TOE provides all of the functionality at a level of security commensurate with that identified in the [CPP_ND].

2.3.2 TOE Security Problem Definition Consistency

The Threats, Assumptions, and Organization Security Policies included in the Security Target represent the Threats, Assumptions, and Organization Security Policies specified in [CPP_ND] for which conformance is claimed verbatim. All concepts covered in the collaborative Protection Profile Security Problem Definition are included in the Security Target.

2.3.3 Statement of Security Objectives Consistency

The security objectives included in the security target represent the security objectives specified in [CPP_ND] for which conformance is claimed verbatim. All concepts covered in Protection Profile`s Statement of security objectives are included in the Security Target.

2.3.4 Statement of Security Requirements Consistency

The Security Functional Requirements included in the Security Target represent the Security Functional Requirements specified in the [CPP_ND] for which conformance is claimed verbatim. All concepts covered the Protection Profile's Statement of Security Requirements are included in the Security Target. Additionally, the Security Assurance Requirements included in the Security Target are identical to the Security Assurance Requirements included in section 6 of the [CPP_ND].

3 Security Problem Definition

3.1 ASSET

The owner of the TOE presumably places value upon the following entities as long as they are in the scope of the TOE.

Asset Name	Description
Audit data	The data which is provided during security audit logging. TOE Security characteristic: confidentiality, integrity.
Authentication data	The data which is used to identify and authenticate the external entities such as account, password, certificate, etc. TOE Security characteristic: confidentiality, integrity.
Cryptography data	The data which is used for digital signature and encryption/decryption such as key. TOE Security characteristic: confidentiality, integrity.
Management data	The data which is used for software updates, and software integrity checking. TOE Security characteristic: integrity.
Configuration data	TOE Security characteristic: integrity.
Software &firmware	device firmware; software; TOE Security characteristic: integrity.
Critical network traffic	Administration traffic; Authentication traffic containing Authentication data; Audit traffic; traffic containing cryptography data; traffic containing Management data TOE Security characteristic: confidentiality, integrity.
Security Functionality of the Device	The TOE Security Functions (TSF) (Remark: In the context of this ST the Security Functionality of the device refers to the security functions of the TOE). TOE Security characteristic: integrity.
Network on which	The network on which the device resides.

the device resides	TOE Security characteristic: integrity.
Network device	The network device itself. TOE Security characteristic: integrity.
Trust relations with other network devices	Trust relations of the TOE with other network devices. TOE Security characteristic: integrity, authenticity.

Table 4 TOE Assets

3.2 Threats

The threats for the Network Device are grouped according to functional areas of the device in the sections below.

3.2.1 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.

SFR Rationale:

The Administrator role is defined in FMT_SMR.2 and the relevant administration capabilities are defined in FMT_SMF.1 and FMT_MTD.1/CoreData, with additional capabilities in FMT_MOF.1/Services.
The actions allowed before authentication of an Administrator are constrained by FIA_UIA_EXT.1, and include the advisory notice and consent warning message displayed according to FTA_TAB.1
The requirement for the Administrator authentication process is described in FIA_UAU_EXT.2
Locking of Administrator sessions is ensured by FTA_SSL_EXT.1 (for local sessions), FTA_SSL.3 (for remote sessions), and FTA_SSL.4 (for all interactive sessions)
The secure channel used for remote Administrator connections is specified in FTP_TRP.1/Admin
(Malicious actions carried out from an Administrator session are separately addressed by T.UNDETECTED_ACTIVITY)
(Protection of the Administrator credentials is separately addressed by T.PASSWORD_CRACKING).

3.2.2 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.

SFR Rationale:

Requirements for key generation and key distribution are set in FCS_CKM.1 and FCS_CKM.2 respectively
Requirements for use of cryptographic schemes are set in FCS_COP.1/DataEncryption, FCS_COP.1/SigGen, FCS_COP.1/Hash, and FCS_COP.1/KeyedHash
Requirements for random bit generation to support key generation and secure protocols (see SFRs resulting from T.UNTRUSTED_COMMUNICATION_CHANNELS) are set in FCS_RBG_EXT.1
Management of cryptographic functions is specified in FMT_SMF.1

3.2.3 T.UNTRUSTED_COMMUNICATION_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.

SFR Rationale:

The general use of secure protocols for identified communication channels is described at the top level in FTP_ITC.1 and FTP_TRP.1/Admin
Requirements for the use of secure communication protocols are set for all the allowed protocols in FCS_SSHS_EXT.1, FCS_TLSC_EXT.2
Requirements for use of public key certificates to support secure protocols are defined in FIA_X509_EXT.1/Rev, FIA_X509_EXT.2

3.2.4 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.

SFR Rationale:

The use of appropriate secure protocols to provide authentication of endpoints (as in the SFRs addressing T.UNTRUSTED_COMMUNICATION_CHANNELS) are ensured by the requirements in FTP_ITC.1 and FTP_TRP.1/Admin

3.2.5 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.

SFR Rationale:

Requirements for protection of updates are set in FPT_TUD_EXT.1
Certificate-based protection of signatures is supported by the X.509 certificate processing requirements in FIA_X509_EXT.1/Rev and FIA_X509_EXT.2

Requirements for management of updates are defined in FMT_SMF.1 and (for manual updates) in FMT_MOF.1/ManualUpdate

3.2.6 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.

SFR Rationale:

Requirements for basic auditing capabilities are specified in FAU_GEN.1 and FAU_GEN.2, with timestamps provided according to FPT_STM_EXT.1
Requirements for protecting audit records stored on the TOE are specified in FAU_STG.1
Requirements for secure transmission of local audit records to an external IT entity via a secure channel are specified in FAU_STG_EXT.1
Additional requirements for dealing with potential loss of locally stored audit records are specified in FAU_STG.3/LocSpace
Configuration of the audit functionality is specified in FMT_SMF.1.

3.2.7 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.

SFR Rationale:

Protection of secret/private keys against compromise is specified in FPT_SKP_EXT.1
Secure destruction of keys is specified in FCS_CKM.4
Management of keys is specified in FMT_SMF.1, and confining this functionality to Security Administrators is required by FMT_MTD.1/CryptoKeys
(Protection of passwords is separately covered under T.PASSWORD_CRACKING),

3.2.8 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.

SFR Rationale:

Requirements for password lengths and available characters are set in FIA_PMG_EXT.1
Protection of password entry by providing only obscured feedback is specified in FIA_UAU.7
Actions on reaching a threshold number of consecutive password failures are specified in FIA_AFL.1
Requirements for secure storage of passwords are set in FPT_APW_EXT.1.

3.2.9 T.SECURITY_FUNCTIONALITY_FAILURE

A component of the network device may fail during start-up or during operations causing a compromise or failure in the security functionality of the network device, leaving the device susceptible to attackers.

SFR Rationale:

Requirements for running self-test(s) are defined in FPT_TST_EXT.1

3.3 Assumptions

This section describes the assumptions made in identification of the threats and security requirements for network devices. The network device is not expected to provide assurance in any of these areas, and as a result, requirements are not included to mitigate the threats associated.

3.3.1 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 ST will not include any requirements on physical tamper protection or other physical attack mitigations. The ST 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.

[OE.PHYSICAL]

3.3.2 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).

[OE.NO_GENERAL_PURPOSE]

3.3.3 A.NO_THRU_TRAFFIC_PROTECTION

A standard/generic network device does not provide any assurance regarding the protection of traffic that traverses it. The intent is for the network device to protect data that originates on or is destined to the device itself, to include administrative data and audit data. Traffic that is traversing the network device, destined for another network entity, is not covered by this ST. It is assumed that this protection will be covered by cPPs for particular types of network devices (e.g., firewall).

[OE.NO_THRU_TRAFFIC_PROTECTION]

3.3.4 A.TRUSTED_ADMINISTRATOR

The Security Administrator(s) for the network device are assumed to be trusted and to act in the best interest of security for the organization. This includes 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.

The TOE supports 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).

[OE.TRUSTED_ADMIN]

3.3.5 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.

[OE.UPDATES]

3.3.6 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.

[OE.ADMIN_CREDENTIALS_SECURE]

3.3.7 A.RESIDUAL_INFORMATION

The Administrator must ensure that there is no unauthorized access possible for sensitive residual information (e.g. cryptographic keys, keying material, passwords etc.) on networking equipment when the equipment is discarded or removed from its operational environment.

[OE.RESIDUAL_INFORMATION]

3.4 Organizational Security Policies

An organizational security policy is a set of rules, practices, and procedures imposed by an organization to address its security needs.

3.4.1 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.

SFR Rationale:

An advisory notice and consent warning message is required to be displayed by FTA_TAB.1

[FTA_TAB.1]

4 Security Objectives

4.1 Security Objectives for the Operational Environment

The following subsections describe objectives for the Operational Environment.

4.1.1 OE. PHYSICAL

Physical security, commensurate with the value of the TOE and the data it contains, is provided by the environment.

4.1.2 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.

4.1.3 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.

4.1.4 OE. TRUSTED_ADMIN

TOE Administrators are trusted to follow and apply all guidance documentation in a trusted manner.

The TOE supports x.509v3 certificated-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.

4.1.5 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.

4.1.6 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.

4.1.7 OE. RESIDUAL_INFORMATION

The Security Administrator ensures that there is no unauthorized access possible for sensitive residual information (e.g. cryptographic keys, keying material, PINs, passwords etc.) on networking equipment when the equipment is discarded or removed from its operational environment.

5 Extended Components Definition

The extended components used in this ST are defined in [CPP_ND]. The following table provide a chapter specific reference in which chapter of [CPP_ND] each of the extended components is defined.

Table 5 Definition of Extended Components - references to [CPP_ND]

Extended Component	Defined in [CPP_ND] chap.
Mandatory Requirements (<M>)	
FAU_STG_EXT.1	C.1.2.1
FCS_RBG_EXT.1	C.2.1.1
FIA_PMG_EXT.1	C.3.1.1
FIA_UIA_EXT.1	C.3.2.1
FIA_UAU_EXT.2	C.3.3.1
FPT_SKP_EXT.1	C.4.1.1
FPT_APW_EXT.1	C.4.2.1
FPT_TST_EXT.1	C.4.3.1
FPT_TUD_EXT.1	C.4.4.1
FPT_STM_EXT.1	C.4.5.1
FTA_SSL_EXT.1	C.5.1.1
Optional Requirements (<O>)	
None	None.
Selection-Based Requirements (<S>)	
FCS_SSHS_EXT.1	C.2.2.7
FCS_TLSC_EXT.2	C2.2.8
FIA_X509_EXT.1/Rev	C.3.4.1
FIA_X509_EXT.2	C.3.4.2

6 Security Functional Requirements

6.1 Conventions

The conventions used in descriptions of the SFRs are as follows:

- Unaltered SFRs are stated in the form used in [CC2] or their extended component definition (ECD);
- Refinement made in the cPP: the refinement text is indicated with **bold text** and ~~strikethroughs~~;
- Selection wholly or partially completed in the cPP: the selection values (i.e. the selection values adopted in the cPP or the remaining selection values available for the ST) are indicated with underlined text
  - e.g. “[selection: *disclosure, modification, loss of use*]” in [CC2] or an ECD might become “disclosure” (completion) or “[selection: disclosure, modification]” (partial completion) in the PP;
- Assignment wholly or partially completed in the cPP: indicated with *italicized text*;
- Assignment completed within a selection in the cPP: the completed assignment text is indicated with *italicized and underlined text*
  - e.g. “[selection: *change_default, query, modify, delete, [assignment: other operations]*]” in [CC2] or an ECD might become “change_default, *select_tag*” (completion of both selection and assignment) or “[selection: change_default, *select_tag*, *select_value*]” (partial completion of selection, and completion of assignment) in the PP;
- Iteration: indicated by adding a string starting with “/” (e.g. “FCS_COP.1/Hash”)
- Application Notes added by the ST author are called 'Additional Application Note' which are enumerated as 'a', 'b', ... and are formatted with underline such as “Additional Application Note a”;

[CPP_ND] distinguishes mandatory requirements from optional requirements and selection-based requirements. This ST will mark mandatory requirements by <M>, optional requirements by <O> and selection-based requirements by <S>.

6.2 SFR Architecture

6.2.1 Security Audit (FAU)

6.2.1.1 FAU_GEN.1 Audit data generation<M>

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

a) Start-up and shut-down of the audit functions;

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

c) *All administrative actions 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).

Starting and stopping services.

d) *Specifically defined auditable events listed in Table 5* .

Additional Application Note: Audit functionality is enabled by default. The auditing functionality cannot be disabled.

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 PP/ST, *information specified in column three of* Table 6.

Table 6 Security Functional Requirements and Auditable Events

Requirement	Auditable Events	Additional Audit Record Contents
Mandatory Requirements (<M>)		
FAU_GEN.1	None.	None.
FAU_GEN.2	None.	None.
FAU_STG_EXT.1	None.	None.
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_RBG_EXT.1	None.	None.
FIA_AFL.1	Unsuccessful login attempts limit is met or	Origin of the attempt (e.g., IP address).

Requirement	Auditable Events	Additional Audit Record Contents
	exceeded.	
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.
FMT_MOF.1/ManualUpdate	Any attempt to initiate a manual update	None.
FMT_MTD.1/CoreData	All management activities of TSF data.	None.
FMT_SMF.1	None.	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).	None
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.)	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).
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
Optional Requirements (<O>)		
FAU_STG.1	None.	None.

Requirement	Auditable Events	Additional Audit Record Contents
FAU_STG.3/LocSpace	Low storage space for audit events.	None.
Selection-Based Requirements (<S>)		
FCS_SSHS_EXT.1	Failure to establish an SSH session.	Reason for failure.
FCS_TLSC_EXT.2	Failure to establish a TLS Session.	Reason for failure.
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 certification validation. Identification of certificates added, replaced or removed as trust anchor in the TOE's trust store.
FIA_X509_EXT.2	None.	None.
FMT_MOF.1/Services	Starting and stopping of services.	None.
FMT_MTD.1/CryptoKeys	Management of cryptographic keys.	None.

6.2.1.2 FAU_GEN.2 User identity association<M>

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.

6.2.1.3 FAU_STG_EXT.1 Protected Audit Event Storage<M>

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

FAU_STG_EXT.1.3 The TSF shall overwrite previous audit records according to the following rule*: overwrite the oldest log information always* when the local storage space for audit data is full.

6.2.1.4 FAU_STG.3/LocSpace Action in case of possible audit data loss < O >

FAU_STG.3.1/LocSpace The TSF shall *generate a warning to inform the Administrator* if the audit trail *exceeds the local audit trail storage capacity*.

Additional Application Note: The local storage that store audit data is CF card.

6.2.1.5 FAU_STG.1 Protected audit trail storage <O>

FAU_STG.1.1 The TSF shall protect the stored audit records in the audit trail from unauthorized deletion.

FAU_STG.1.2 The TSF shall be able to prevent unauthorized modifications to the stored audit records in the audit trail.

6.2.2 Cryptographic Support (FCS)

6.2.2.1 FCS_CKM.1 Cryptographic Key Generation (Refinement) <M>

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

FFC Schemes using Diffie-Hellman group 14 that meet the following: RFC 3526, Section 3;

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

6.2.2.2 FCS_CKM.2 Cryptographic Key Establishment (Refinement)<M>

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

Key establishment scheme using Diffie-Hellman group 14 that meets the following: RFC 3526, Section 3;

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

6.2.2.3 FCS_CKM.4 Cryptographic Key Destruction<M>

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;

~~*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*~~

that meets the following: *No Standard.*

Application Note: The TOE do not store plaintext keys in non-volatile memory.

6.2.2.4 FCS_COP.1/DataEncryption Cryptographic Operation (AES Data Encryption/ Decryption) <M>

FCS_COP.1.1/DataEncryption The TSF shall perform *encryption/decryption* in accordance with a specified cryptographic algorithm *AES used in GCM mode* and cryptographic key sizes: 128 bits, 256 bits that meet the following: *AES as specified in ISO 18033-3, GCM as specified in ISO 19772*.

6.2.2.5 FCS_COP.1/SigGen Cryptographic Operation (Signature Generation and Verification) <M>

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**)**: *3072 bits and 4096 bits,*

that meet the following:

For RSA schemes: FIPS PUB 186-4, "Digital Signature Standard (DSS)", Section 5.5, using PKCS #1 v2.1 Signature Schemes RSASSA-PSS and/or RSASSA-PKCS1v1_5; ISO/IEC 9796-2, Digital signature scheme 2 or Digital Signature scheme 3,

6.2.2.6 FCS_COP.1/Hash Cryptographic Operation (Hash Algorithm) <M>

FCS_COP.1.1/Hash The TSF shall perform *cryptographic hashing services* in accordance with a specified cryptographic algorithm: SHA-256, SHA-384 ~~and cryptographic key sizes [assignment: *cryptographic key sizes*]~~ and **message digest sizes 256, 384 bits** that meet the following: *ISO/IEC 10118-3:2004*.

6.2.2.7 FCS_COP.1/KeyedHash Cryptographic Operation (Keyed Hash Algorithm) <M>

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

6.2.2.8 FCS_RBG_EXT.1 Random Bit Generation<M>

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

FCS_RBG_EXT.1.2 The deterministic RBG shall be seeded by at least one entropy source that accumulates entropy from *1 hardware-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 CSPs that it will generate.

6.2.2.9 FCS_SSHS_EXT.1 SSH Server Protocol <S>

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

FCS_SSHS_EXT.1.2 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 The TSF shall ensure that, as described in RFC 4253, packets greater than *262144* bytes in an SSH transport connection are dropped.

FCS_SSHS_EXT.1.4 The TSF shall ensure that the SSH transport implementation uses the following encryption algorithms and rejects all other encryption algorithms: AEAD_AES_128_GCM, AEAD_AES_256_GCM.

FCS_SSHS_EXT.1.5 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 The TSF shall ensure that the SSH transport implementation uses hmac-sha2-256, 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 The TSF shall ensure that ecdh-sha2-nistp256, diffie-hellman-group14-sha1 *and* ecdh-sha2-nistp384, ecdh-sha2-nistp521 are the only allowed key exchange methods used for the SSH protocol.

FCS_SSHS_EXT.1.8 The TSF shall ensure that within SSH connections the same session keys are used for a threshold of no longer than one hour, and no more than one gigabyte of transmitted data. After either of the thresholds are reached a rekey needs to be performed.

6.2.2.10 FCS_TLSC_EXT.2 TLS Client Protocol with Authentication <S>

FCS_TLSC_EXT.2.1 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 supporting the following ciphersuites:

TLS_DHE_RSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5288
TLS_DHE_RSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5288

FCS_TLSC_EXT.2.2 The TSF shall verify that the presented identifier matches the reference identifier per RFC 6125 section 6.

FCS_TLSC_EXT.2.3 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.2.4 The TSF shall present the Supported Elliptic Curves Extension with the following NIST curves: secp256r1, secp384r1, secp521r1 and no other curves in the Client Hello.

FCS_TLSC_EXT.2.5 The TSF shall support mutual authentication using X.509v3 certificates.

6.2.3 Identification and Authentication (FIA)

6.2.3.1 FIA_AFL.1 Authentication Failure Management (Refinement)<M>

FIA_AFL.1.1 The TSF shall detect when an Administrator configurable positive integer within *3 to 5* unsuccessful authentication attempts occur related to *Administrators attempting to authenticate remotely*.

FIA_AFL.1.2 When the defined number of unsuccessful authentication attempts has been met, the TSF shall prevent the offending remote Administrator from successfully authenticating until *unlock* is taken by a local Administrator*;* prevent the offending remote Administrator from successfully authenticating until an Administrator defined time period has elapsed.

6.2.3.2 FIA_PMG_EXT.1 Password Management<M>

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: "!", "@", "#", "$", "%", "^", "&", "*", "(", ")", "-", "+", "=", "[", "]", "{", "}", "|", "\", ",", ".", "/", "<", ">", ";", "'", ":", """, "_";

b) Minimum password length shall be configurable to between 8 and 128 characters.

6.2.3.3 FIA_UIA_EXT.1 User Identification and Authentication <M>

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 actions on behalf of that administrative user.

6.2.3.4 FIA_UAU_EXT.2 Password-based Authentication Mechanism <M>

FIA_UAU_EXT.2.1 The TSF shall provide a local password-based authentication mechanism, no other authentication mechanism to perform local administrative user authentication.

6.2.3.5 FIA_UAU.7 Protected Authentication Feedback <M>

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**.

6.2.3.6 FIA_X509_EXT.1/Rev X.509 Certificate Validation <S>

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 certificate path by ensuring that all CA certificates in the certification path contain the basicConstraints extension with the CA flag set to TRUE.
- The TSF shall validate the revocation status of the certificate using a Certificate Revocation List (CRL) as specified in RFC 5280 Section 6.3.

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.

6.2.3.7 FIA_X509_EXT.2 X.509 Certificate Authentication <S>

FIA_X509_EXT.2.1 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 When the TSF cannot establish a connection to determine the validity of a certificate; the TSF shall not accept the certificate.

6.2.4 Security Management (FMT)

6.2.4.1 FMT_MOF.1/ManualUpdate Management of security functions behaviour <M>

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

6.2.4.2 FMT_MOF.1/Services Management of security functions behaviour <S>

FMT_MOF.1.1/Services The TSF shall restrict the ability to enable and disable **start and stop** ~~the functions~~ **services** *to Security Administrators*.

6.2.4.3 FMT_MTD.1/CoreData Management of TSF Data <M>

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

6.2.4.4 FMT_MTD.1/CryptoKeys Management of TSF data <S>

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

6.2.4.5 FMT_SMF.1 Specification of Management Functions <M>

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 *capability prior to installing those updates;*
Ability to configure the authentication failure parameters for FIA_AFL.1;

Ability to start and stop services.
Ability to configure audit behavior;
Ability to manage the cryptographic keys;
Ability to configure thresholds for SSH rekeying;

6.2.4.6 FMT_SMR.2 Restrictions on security roles <M>

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.

6.2.5 Protection of the TSF (FPT)

6.2.5.1 FPT_SKP_EXT.1 Protection of TSF Data (for reading of all pre-shared, symmetric and private keys) <M>

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

6.2.5.2 FPT_APW_EXT.1 Protection of Administrator Passwords<M>

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

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

6.2.5.3 FPT_TST_EXT.1 TSF Testing (Extended) <M>

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: *integrity of the firmware and software (software integrity check), the correct operation of cryptographic functions.*

Application Note: Certificates are not used by the self-test mechanism, therefore FPT_TST_EXT.2 is not included in the ST.

6.2.5.4 FPT_TUD_EXT.1 Trusted Update <M>

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

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

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

Application Note: Certificates are not used by the update verification mechanism, therefore, FPT_TUD_EXT.2 is not included in the ST.

6.2.5.5 FPT_STM_EXT.1 Reliable Time Stamps <M>

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.

6.2.6 TOE Access (FTA)

6.2.6.1 FTA_SSL_EXT.1 TSF-initiated Session Locking <M>

FTA_SSL_EXT.1.1 The TSF shall, for local interactive sessions,

terminate the session

after a Security Administrator-specified time period of inactivity.

6.2.6.2 FTA_SSL.3 TSF-initiated Termination (Refinement) <M>

FTA_SSL.3.1: The TSF shall terminate **a remote** interactive session after a *Security Administrator-configurable time interval of session inactivity*.

6.2.6.3 FTA_SSL.4 User-initiated Termination (Refinement)<M>

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

6.2.6.4 FTA_TAB.1 Default TOE Access Banners (Refinement) <M>

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.

6.2.7 Trusted path/channels (FTP)

6.2.7.1 FTP_ITC.1 Inter-TSF trusted channel (Refinement)<M>

FTP_ITC.1.1 The TSF shall **be capable of using TLS to provide a trusted** communication channel between itself and **authorized IT entities supporting the following capabilities: audit server, no other capabilities** that is logically distinct from other communication channels and provides assured identification of its end points and protection of the channel data from **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 service*.

6.2.7.2 FTP_TRP.1/Admin Trusted Path (Refinement) <M>

FTP_TRP.1.1/Admin The TSF shall **be capable of using SSH 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 channel 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*.

6.3 Assurance Security Requirements

The development and the evaluation of the TOE shall be done in accordance to the following security assurance requirements:

Table 7 Security Assurance Requirements

Assurance Class	Assurance Components
Security Target (ASE)	Conformance claims (ASE_CCL.1)
	Extended components definition (ASE_ECD.1)
	ST introduction (ASE_INT.1)
	Security objectives for the operational environment (ASE_OBJ.1)
	Stated security requirements (ASE_REQ.1)
	Security Problem Definition (ASE_SPD.1)
	TOE summary specification (ASE_TSS.1)
Development (ADV)	Basic functional specification (ADV_FSP.1)
Guidance documents (AGD)	Operational user guidance (AGD_OPE.1)
	Preparative procedures (AGD_PRE.1)
Life cycle support (ALC)	Labeling of the TOE (ALC_CMC.1)
	TOE CM coverage (ALC_CMS.1)
Tests (ATE)	Independent testing – sample (ATE_IND.1)
Vulnerability assessment (AVA)	Vulnerability survey (AVA_VAN.1)

This security target claims conformance with [CPP_ND]. In addition to [CEM], the evaluation activities for [CPP_ND] are completed in [SD_ND].

6.4 SFR Rationale

The following table lists all SFRs contained in [CPP_ND] together with the classification whether they are mandatory, optional or selection-based, indicates which are included in this ST and provides a dependency rationale. Justifications for any unsupported dependencies will be given in the table as well.

Table 8 Dependency rationale for SFRs

Requirement from [CPP_ND]	Dependencies	Satisfied by
Mandatory Requirements (<M>)		
FAU_GEN.1	FPT_STM.1	FPT_STM_EXT.1 included (which is hierarchic to FPT_STM.1)
FAU_GEN.2	FAU_GEN.1; FIA_UID.1	FAU_GEN.1; Satisfied by FIA_UIA_EXT.1, which specifies the relevant Administrator identification timing
FAU_STG_EXT.1	FAU_GEN.1; FTP_ITC.1	FAU_GEN.1; FTP_ITC.1
FCS_CKM.1	FCS_CKM.2 or FCS_COP.1; FCS_CKM.4	FCS_CKM.2; FCS_CKM.4
FCS_CKM.2	FTP_ITC.1 or FTP_ITC.2 or FCS_CKM.1; FCS_CKM.4	FCS_CKM.1; FCS_CKM.4
FCS_CKM.4	FTP_ITC.1 or FTP_ITC.2 or FCS_CKM.1	FCS_CKM.1
FCS_COP.1/DataEncryption	FTP_ITC.1 or FTP_ITC.2 or FCS_CKM.1; FCS_CKM.4	FCS_CKM.1; FCS_CKM.4
FCS_COP.1/SigGen	FTP_ITC.1 or FTP_ITC.2 or FCS_CKM.1; FCS_CKM.4	FCS_CKM.1; FCS_CKM.4
FCS_COP.1/Hash	FTP_ITC.1 or FTP_ITC.2 or FCS_CKM.1; FCS_CKM.4	Unsupported Dependencies: This SFR specifies keyless hashing operations, so initialisation and destruction of keys are not relevant
FCS_COP.1/KeyedHash	FTP_ITC.1 or FTP_ITC.2 or FCS_CKM.1; FCS_CKM.4	FCS_CKM.1; FCS_CKM.4
FCS_RBG_EXT.1	None	N/A
FIA_AFL.1	FIA_UAU.1	Satisfied by FIA_UIA_EXT.1, which specifies the relevant Administrator authentication
FIA_PMG_EXT.1	None	N/A

Requirement from [CPP_ND]	Dependencies	Satisfied by
FIA_UIA_EXT.1	FTA_TAB.1	FTA_TAB.1
FIA_UAU_EXT.2	None	N/A
FIA_UAU.7	FIA_UAU.1	Satisfied by FIA_UIA_EXT.1, which specifies the relevant Administrator authentication
FMT_MOF.1/ManualUpdate	FMT_SMR.1; FMT_SMF.1	FMT_SMR.2; FMT_SMF.1
FMT_MTD.1/CoreData	FMT_SMR.1; FMT_SMF.1	FMT_SMR.2; FMT_SMF.1
FMT_SMF.1	None	N/A
FMT_SMR.2	FIA_UID.1	Satisfied by FIA_UIA_EXT.1, which specifies the relevant Administrator identification
FPT_SKP_EXT.1	None	N/A
FPT_APW_EXT.1	None	N/A
FPT_TST_EXT.1	None	N/A
FPT_TUD_EXT.1	FCS_COP.1/SigGen or FCS_COP.1/Hash	FCS_COP.1/SigGen and FCS_COP.1/Hash
FPT_STM_EXT.1	None	N/A
FTA_SSL_EXT.1	FIA_UAU.1	Satisfied by FIA_UIA_EXT.1, which specifies the relevant Administrator identification
FTA_SSL.3	None	N/A
FTA_SSL.4	None	N/A
FTA_TAB.1	None	N/A
FTP_ITC.1	None	N/A
FTP_TRP.1/Admin	None	N/A
Optional Requirements (<O>)		
FAU_STG.1	FAU_STG.3	FAU_STG.3/LocSpace
FAU_STG.3/LocSpace	FAU_STG.1	FAU_STG.1
Selection-Based Requirements (<S>)		
FCS_SSHS_EXT.1	FCS_CKM.1; FCS_CKM.2; FCS_COP.1/DataEncryption; FCS_COP.1/SigGen; FCS_COP.1/Hash; FCS_COP.1/KeyedHash; FCS_RBG_EXT.1:	FCS_CKM.1; FCS_CKM.2; FCS_COP.1/DataEncryption; FCS_COP.1/SigGen; FCS_COP.1/Hash; FCS_COP.1/KeyedHash; FCS_RBG_EXT.1:
FCS_TLSC_EXT.2	FCS_CKM.1; FCS_CKM.2; FCS_COP.1/DataEncryption; FCS_COP.1/SigGen; FCS_COP.1/Hash; FCS_COP.1/KeyedHash; FCS_RBG_EXT.1:	FCS_CKM.1; FCS_CKM.2; FCS_COP.1/DataEncryption; FCS_COP.1/SigGen; FCS_COP.1/Hash; FCS_COP.1/KeyedHash; FCS_RBG_EXT.1:
FIA_X509_EXT.1/Rev	FIA_X509_EXT.2;	FIA_X509_EXT.2;
FIA_X509_EXT.2	FIA_X509_EXT.1;	FIA_X509_EXT.1/Rev;

Requirement from [CPP_ND]	Dependencies	Satisfied by
FMT_MOF.1/Services	FMT_SMR.1; FMT_SMF.1	FMT_SMR.2; FMT_SMF.1
FMT_MTD.1/CryptoKeys	FMT_SMR.1; FMT_SMF.1	FMT_SMR.2; FMT_SMF.1

7 TOE Summary Specification

7.1 Security Audit (FAU)

7.1.1 FAU_GEN.1 Audit data generation

The TOE generates an audit record whenever an audited event occurs. The types of events that cause audit records to be generated include identification and authentication related events, and administrative events (the specific events and the contents of each audit record are listed in the table within the FAU_GEN.1 SFR, “Table 6 Security Functional Requirements and Auditable Events”). Each of the events specified in the audit record is in enough detail to identify the user for which the event is associated (e.g. user identity, MAC address, IP address), when the event occurred, where the event occurred, the outcome of the event (*if the operation has been carried out successfully, the log records the audit associated to the operation, otherwise there is no audit*) and the type of event that occurred.

The audit trail consists of the individual audit records; one audit record for each event that occurred. The audit record contains a lot of information, such as the type of event that occurred, and two percent sign (%%), which follows the device name. As noted above, the information includes at least all of the required information. Additional information can be configured and included if desired.

Administrators have the ability to execute CLI command to generate/import of/delete cryptographic keys, each command will generate a log and will be stored in log file. The log contains the user name and IP address. The log does not contain the generated key information.

7.1.2 FAU_GEN.2 User identity association

Each auditable event is associated with the user that triggered the event and as a result, they are traceable to a specific user. For example, a human user, user identity or related session ID would be

included in the audit record. For an IT entity or device, the IP address, MAC address, host name, or other configured identification is presented.

The security log of user account management should include user name. Other types of security log have other rules about the information.

7.1.3 FAU_STG.1 Protected audit trail storage

Only the authorized administrators can monitor the logfile record, and operate the log files. The unauthorized users have no access to do those actions and therefore, records are protected against unauthorized modification or deletion. And the actions of the authorized administrators will be logged. The amount of audit data that are stored locally and how these records are protected against unauthorized modification or deletion are described in the following section.

7.1.4 FAU_STG_EXT.1 Protected audit event storage

The TOE supports to export syslog records to a specified, external syslog server. The TOE protects communications with an external syslog server via TLS v1.2. The TOE stores audit records on CF card whenever it is connected with syslog server or not.

The size of an information file is configurable by the administrator with value 4M/8M/16M/32M bytes. The default maximum size of each information file is 8 MB. When the size of an information file exceeds the configured maximum size, the information file is compressed into a smaller file in standard log_slot ID_time.log.zip format. The maximum quantity of compressed files is configurable by the administrator with a value ranging from 3 to 500. A maximum of 200 files can be stored on a device by default. The unauthorized users are disallowed to handle the audit records.

The logs are saved to flash memory (internal CF card) so records can’t be lost in case of failures or restarts. The log buffer is circular, so newer messages overwrite older messages after the buffer is full. Administrators are instructed to monitor the log buffer using the show logging privileged CLI command to view the audit records. The first message displayed is the oldest message in the buffer. There are other associated commands to clear the buffer, to reset log buffer, etc. The size of the log buffer can be configured by users with sufficient privileges.

When the local audit data store in CF card exceeds the maximum allowed size of log file storage, the system deletes oldest compressed files to save the latest log file.

An administrator cannot alter audit records but can delete audit records as a whole.

7.1.5 FAU_STG.3/LocSpace Action in case of possible audit data loss

If the log files have already occupied more than 85% of the total audit storage in CF card, or delete the old log files after saving them to the other storage device, an event will be generated and sent to management server to notice the clients of the warning information.

If the number of compressed log files generated in the system exceeded 85% of the maximum number of compressed files, an event will also be generated to notice net-manager the warning information.

If the number of recorded compressed files reach the maximum number that the security administrator has configured, or the storage with audit events reach the configured storage size, another event will be generated to notice net-manager.

7.2 Cryptographic Support (FCS)

7.2.1 FCS_CKM.1 Cryptographic Key Generation

The TOE generate asymmetric cryptographic keys in accordance with (FFC Schemes using Diffie-Hellman group 14 that meet the following: RFC 3526, Section 3) using the following keys:

Cipher Suites for TLS provided by TOE:

Cipher Suite	Protocol version	Key Exchange	Authentication	Encryption	Hash
TLS_DHE_RSA_WITH_AES_128_GCM_SHA256	TLS 1.2	DHE	RSA	AES-128-GCM	SHA256
TLS_DHE_RSA_WITH_AES_256_GCM_SHA384	TLS 1.2	DHE	RSA	AES-256-GCM	SHA384

SSH client supports the data integrity algorithms of hmac-sha2-256, AEAD_AES_128_GCM and AEAD_AES_256_GCM.

7.2.2 FCS_CKM.2 Cryptographic Key Establishment

The TOE supports Diffie-Hellman group 14 key establishment. The Hash DRBG is used for every random bits generation from the TOE in the key establishment process. DH Keys are generated using DH group14 parameters from RFC3526, Section.3.

[RFC3526, Section.3]

3. 2048-bit MODP Group

This group is assigned id 14.

This prime is: 2^2048 - 2^1984 - 1 + 2^64 * { [2^1918 pi] + 124476 }

Its hexadecimal value is:

FFFFFFFF FFFFFFFF C90FDAA2 2168C234 C4C6628B 80DC1CD1 29024E08 8A67CC74 020BBEA6 3B139B22 514A0879 8E3404DD EF9519B3 CD3A431B 302B0A6D F25F1437 4FE1356D 6D51C245 E485B576 625E7EC6 F44C42E9 A637ED6B 0BFF5CB6 F406B7ED EE386BFB 5A899FA5 AE9F2411 7C4B1FE6 49286651 ECE45B3D C2007CB8 A163BF05 98DA4836 1C55D39A 69163FA8 FD24CF5F 83655D23 DCA3AD96 1C62F356 208552BB 9ED52907 7096966D 670C354E 4ABC9804 F1746C08 CA18217C 32905E46 2E36CE3B E39E772C 180E8603 9B2783A2 EC07A28F B5C55DF0 6F4C52C9 DE2BCBF6 95581718 3995497C EA956AE5 15D22618 98FA0510 15728E5A 8AACAA68 FFFFFFFF FFFFFFFF

The generator is: 2.

7.2.3 FCS_CKM.4 Cryptographic Key Destruction

Table 9 Key Destructions

Name	Description of Key	Storage	Key destruction method
SSH session key	The key is used for encrypting/decrypting the SSH traffic in a secure connection.	SDRAM (plaintext)	Automatically after session terminated. Overwritten with: zeros
TLS session key	The key is used for encrypting / decrypting the TLS traffic in a secure connection.	SDRAM (plaintext)	Automatically after session terminated. Overwritten with: zeros
ECDH/DH Shared Secret	The key is used for key establishment.	SDRAM (plaintext)	Automatically after completion of use of the key. Overwritten with: zeros
ECDH/DH Private/Public Keys	The key pair is used for key establishment.	SDRAM (plaintext)	Automatically after completion of use of the key. Overwritten with: zeros
RSA key pair	The RSA key pair is used for digital signature. The RSA host key pair is imported into the SDRAM from the CF card, which is the RSA key pair.	SDRAM (plaintext)	Automatically after completion of use of the key. Overwritten with: zeros

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

The TOE provides symmetric encryption and decryption capabilities using AES algorithm with key size 128 bits, 256 bits in GCM mode as specified in ISO 19772.

- AES128 GCM, AES256 GCM are supported by TLS.
- AES128 GCM, AES256 GCM are supported by SSH.

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

The TOE provides cryptographic signature services using RSA with key sizes between 3072 and 4096 bits as specified in FIPS PUB 186-4 “Digital Signature Standard (DSS)”.

- The RSA with key size 3072 is used for signature generation and verification of SSH.
- The RSA with key size of 3072 to 4096 is used for signature generation and verification of TLS.

7.2.6 FCS_COP.1/Hash Cryptographic Operation (Hash Algorithm)

The TOE provides cryptographic hashing services using SHA-256, and SHA-384 as specified in FIPS Pub 180-3 “Secure Hash Standard.”, it also meet the ISO/IEC 10118-3:2004.

The association of the hash function with other TSF cryptographic functions:

Table 10 Usage of Hash Algorithm

Cryptographic Functions	Hash Function
HMAC-SHA-256	SHA-256
TLS Digital signature verification	SHA-256 & SHA-384
SSH Digital signature verification	SHA-256
Hash_DRBG	SHA-256

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

The TOE provides cryptographic keyed hash services using HMAC-SHA-256 according to RFC2104: HMAC, it also complies with the ISO/IEC 9797-2:2011, Section 7 “MAC Algorithm 2”.

Table 11 Specification of Keyed Hash Algorithm

HMAC function	Key length (bits)	Hash function	Block size (bits)	Output MAC length (bits)
HMAC-SHA-256	256	SHA-256	512	256

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

The TOE implements a deterministic random bit generator (DRBG) which is conformant to [ISO18031] using the DRBG mechanism Hash_DRBG as specified in [SP800-90A], chap. 10.1.1.

The entropy source is based on hardware (internal noise source). Random numbers from the internal noise source are only used for seeding the DRBG.

The TOE set new seed using at least 256 bits entropy before generate random bits as cryptographic key. The calculated min-entropy of the TOE is “0.939524 ”.

7.2.9 FCS_SSHS_EXT.1 SSH Server

7.2.9.1 FCS_SSHS_EXT.1.1

The TOE implements the SSH protocol that complies with RFCs 4251, 4252, 4253, 4254 and 6668.

7.2.9.2 FCS_SSHS_EXT.1.2

Both public key and password authentication modes are supported by SSH server function. The TOE implements the public key algorithms of ssh-rsa.

SSH users can be authenticated in eight modes: RSA, password, password-RSA, and All (any authentication mode of RSA or password is allowed with “ALL” mode). The SSH user that created by administrators shall configured one of mode. Then the external SSH client can login SSH server successfully via the configured SSH user and authentication mode.

7.2.9.3 FCS_SSHS_EXT.1.3

The TOE drops packets greater than 256 KB in an SSH transport connection Packets of size greater than 262144 bytes and smaller than 256 KB are not dropped because of that the TOE may support uncompressed big certificates.

7.2.9.4 FCS_SSHS_EXT.1.4

SSH server function supports the encryption algorithms of aes128-gcm and aes256-gcm.

When SSH Client establishes a connection, it will send a list of encryption algorithms to SSH server. SSH Server will check each algorithm in the list one by one. If it finds one algorithm in the list that is also supported by it, this algorithm will be chosen as the encryption algorithm between client and server. If no algorithm in the list is supported by SSH server, the connection will be terminated.

After the encryption algorithm is selected, Server and Client will create a random number and exchange. Client and Server will use own random number to create an encryption key.

Then SSH server will use its own encryption key to encrypt packet, and use SSH client's encryption key to decrypt packet.

7.2.9.5 FCS_SSHS_EXT.1.5

SSH server function supports the public key algorithm of ssh-rsa.

Before SSH Client and SSH Server build a connection, they both need to configure a Local Key-pair what is used for authentication. In Huawei device, this local key-pair is used for SSH server and SSH client.

When Client authenticates Server, first step is to consult public key algorithms. Client will send a list of public key algorithms to SSH server. SSH Server will check each algorithm in the list one by one. If it finds one algorithm in the list that is also supported by it, this algorithm will be chosen as the public key algorithm between client and server. If no algorithm in the list is supported by SSH server, the connection will be terminated.

7.2.9.6 FCS_SSHS_EXT.1.6

SSH server function supports the data integrity algorithms of hmac-sha2-256, AEAD_AES_128_GCM and AEAD_AES_256_GCM.

7.2.9.7 FCS_SSHS_EXT.1.7

SSH server supports the following key exchange algorithm: ecdh-sha2-nistp256, diffie-hellman-group14-sha1, ecdh-sha2-nistp384 and ecdh-sha2-nistp521

7.2.9.8 FCS_SSHS_EXT.1.8

The SSH connection will be rekeyed after one hour of session time or one gigabyte of transmitted data using that key which ever goes first.

The SSH allows either side to force another run of the key-exchange phase, changing the encryption and integrity keys for the session. The idea is to do this periodically, after one hour of session time or one gigabyte of transmitted data using that key which ever goes first.

7.2.10 FCS_TLSC_EXT.2 TLS Client Protocol with Authentication

7.2.10.1 FCS_TLSC_EXT.2.1

The TLS client supports the following ciphersuites:

- TLS_DHE_RSA_WITH_AES_128_GCM_SHA256 as defined in RFC 5288
- TLS_DHE_RSA_WITH_AES_256_GCM_SHA384 as defined in RFC 5288

7.2.10.2 FCS_TLSC_EXT.2.2

The reference identifier is established by the user and by an application (a parameter of an API). Based on a singular reference identifier's source domain and application service type (e.g. syslog), the client establishes all reference identifiers including DNS names (case-insensitive) for the Subject Alternative Name field. The client then compares this list of all acceptable reference identifiers to the presented identifiers in the TLS server's certificate.

The TOE doesn't support certificate pinning and use of wildcards in digital certificates. The TOE doesn't support to use IP addresses in digital certificates.

7.2.10.3 FCS_TLSC_EXT.2.3

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.

7.2.10.4 FCS_TLSC_EXT.2.4

The syslog TLS client will transmit the Supported Elliptic Curves extension in the Client Hello message by default with support for the following NIST curves: secp256r1, secp384r1, and secp521r1. The non-TOE server can choose to negotiate the elliptic curve from this set for any of the mutually negotiable elliptic curve ciphersuites no additional configuration is required. The TOE also supports key agreement using the server's RSA public key or DHG14 (2048 bits).

7.2.10.5 FCS_TLSC_EXT.2.5

The TOE uses client-side certificates for TLS mutual authentication.

7.3 Identification and Authentication (FIA)

7.3.1 FIA_AFL.1 Authentication Failure Management

The TOE can be configured within 3 to 5 unsuccessful authentication attempts by Administrators. When the defined number of unsuccessful authentication attempts has been met, the TOE will prevent the offending remote Administrator from successfully authenticating until unlock is taken by a local Administrator or prevent the offending remote Administrator from successfully authenticating until an Administrator defined time period has elapsed.

7.3.2 FIA_PMG_EXT.1 Password Management

The TOE supports the local definition of users with corresponding passwords which are used for security administrators' authentication of local or remote administration connections. The passwords can be composed of any combination of upper and lower case letters, numbers, and special characters (: "!", "@", "#", "$", "%", "^", "&", "*", "(", ")", "-", "+", "=", "[", "]", "{", "}", "|", "\", ",", ".", "/", "<", ">", ";", "'", ":", """);)". Minimum password length is settable by the Administrator, and support passwords from 8 characters to 128. Password composition rules specifying the types and number of required characters: that comprise the password are settable by the Administrator. Passwords have a maximum lifetime, configurable by the Administrator.

7.3.3 FIA_UIA_EXT.1 User Identification and Authentication

The TOE requires all users to be successfully identified and authenticated before allowing execution of any TSF mediated action except display of the banner.

The TOE supports user login over console or remote interface. Any login method need authentication before successfully logon.

- Local access is achieved by console port. Local authentication supports password-based authentication.
- Remote access is achieved by SSH. It also supports associated identity authentication of password and public-key. Users can also login with any of the identity authentication modes of password, and RSA when their login mode are configured to be 'ALL'.

7.3.4 FIA_UAU_EXT.2 Password-based Authentication Mechanism

The TOE can be configured to require local authentication or remote authentication as defined in the authentication policy for interactive (human) users.

The policy for interactive (human) users (Administrators) can be authenticated to the local user database, or have redirection to a remote authentication server. Interfaces can be configured to try one or more remote authentication servers, and then fail back to the local user database if the remote authentication servers are inaccessible.

If the interactive (human) users (Administrators) password is expired, the user is required to create a new password after correctly entering the expired password.

7.3.5 FIA_UAU.7 Protected Authentication Feedback

When a user inputs their password at the local console, the console will not display the input so that the user password is obscured. For remote session authentication, the TOE does not echo any characters as they are entered. The TOE does not provide any additional information to the user that would give any indication about the authentication data.

7.3.6 FIA_X509_EXT.1/Rev X.509 Certificate Validation

The TOE supports to verify the certificate and the certificate path by the rules specified in RFC 5280, using algorithm RSA.

The TOE supports to verify the revocation status by CRLs as specified in RFC 5280.

When the client recevices TLS Handshake's Server Certificate message, the client will check validation of the certificates and certificate revocation list. When an administrator imports a certificate, the TOE will check certificate integrity and validation of the certificates.

The TOE validates a certificate path by ensuring the presence of the basicConstraints extension and that the CA flag is set to TRUE for all CA certificates.

The TSF validates 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.

The TOE does not implements OCSP, so the id-kp-9 is not supported by the TOE. The TOE only acts as a client which only receives Server certificates, so the id-kp-2 is not supported by the TOE. The TOE does not use X509 certificates for the TOE updating, so the id-kp-3 is not supported by the TOE.

7.3.7 FIA_X509_EXT.2 X.509 Certificate Authentication

The certificate used by TLS authentication is sent by TLS server. The CRL should be loaded for certificate validation.

The TOE will send a security log when a connection cannot be established during the validity check of a certificate used in establishing a trusted channel. TLS only supports RSA certificate.

The check of validity of the certificates takes place at authentication of TLS connection and verification of code signing for system software updates. When the certificate is valid, we can trust the peer identity and use the certificate to verify the integrity of the message.

TOE chooses certificate which was configured by CLI for services (such as Syslog).

When the TSF cannot establish a connection to determine the validity of a certificate; the TSF shall not accept the certificate.

7.4 Security management (FMT)

7.4.1 FMT_MOF.1/ManualUpdate Management of security functions behaviour

The TSF shall restrict the ability to enable the functions to perform manual updates to Security Administrators.

Only administrators have the right to create or delete local user. While changing the local user privilege level, the configured new level of the local user cannot be higher than that of the login-in user. In this way no user except administrators can change another user to be at the privilege level of administrator. And only administrators have the ability to perform manual update. So the manual update is restricted to administrators. The TOE uses groups to organize users. Different kinds of users are in different group and every group has a specific level that identity its roles and scope of rights.

7.4.2 FMT_MOF.1/Services Management of security functions behaviour

Only administrators have ability to enable and disable the functions and services, the other users are disallowed to do it.

7.4.3 FMT_MTD.1/CoreData Management of TSF Data

Only administrators have privilege to manage the TSF data, the other users are disallowed to do it.

The TOE provides the ability for authorized administrators to access TOE data, such as audit data, configuration data. Each of the predefined and administratively configured user has different right to access the TOE data.

The access control mechanisms of the TOE are based on hierarchical access levels where a user level is associated with every user and terminal on the one hand and a command level is associated with every command. Only if the user level is equal or higher to a specific command, the user is authorized to execute this command. Management of security function is realized through commands. So for every management function sufficient user level is required for the user to be able to execute the corresponding command.

The administrative functions are described in section 7.4.5 of the present document. In order to perform these administrative functions, the administrator shall be log-in.

The TOE stores X.509v3 certificates in Flash ,and all pre-shared keys, symmetric keys, and private keys in the file system in Flash that can’t be read, copy or extract by administrators; hence no

interface access is available.

7.4.4 FMT_MTD.1/CryptoKeys Management of TSF data

Only administrators have the right to manage the cryptographic keys, the other users are disallowed to do this.

7.4.5 FMT_SMF.1 Specification of Management Functions

The TOE provides all the capabilities necessary to securely manage the TOE. The administrative user can connect to the TOE using the CLI to perform these functions via SSH encrypted session.

The management functionality provided by the TOE includes the following administrative 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 capability prior to installing those updates;
- Ability to configure the authentication failure parameters for FIA_AFL.1;
- Ability to start and stop services.
- Ability to configure audit behavior;
- Ability to manage the cryptographic keys;
- Ability to configure thresholds for SSH rekeying;

7.4.6 FMT_SMR.2 Restrictions on security roles

A Security Administrator is able to administer the TOE through the local console or through a remote SSH mechanism.

An administrator can create, delete and modify the other users and endow them with a proper right according to the users' roles. The TOE uses groups to organize users. Different kinds of users are in different group and every group has a specific level that identity its roles and scope of rights. Every user in one group has the same scope of rights that the group owns. The TOE has 4 default user groups: manage-ug, system-ug, monitor-ug, and visitor-ug.

7.5 Protection of the TSF (FPT)

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

The TOE stores all symmetric keys, and private keys in the file system in Flash that can't be read, copy or extract by administrators; hence no interface access.

7.5.2 FPT_APW_EXT.1 Protection of Administrator Passwords

The administrator passwords are stored to configuration file in cryptographic form hashed with salt by SHA-256, including username passwords, authentication passwords, console and virtual terminal line access passwords.

In this manner, the TOE ensures that plaintext user passwords will not be disclosed to anyone through normal interfaces including administrators.

7.5.3 FPT_TST_EXT.1 TSF testing

The TSF run a suite of self-tests during initial start-up to demonstrate the correct operation of the TSF, including software integration verification by integrity check and the correct operation of cryptographic functions.

During initial power on start-up, software integrity is checked at first. If integrity check is failed the start-up procedure will stop. After VRP gain control, it test the correct operation of cryptographic functions with known-answer test. If this testing fail the start-up procedure will also stop.

7.5.4 FPT_TUD_EXT.1 Trusted Update

Only authenticated administrators have the ability to manually initiate an update to TOE firmware/software. During the updating procedure, digital signature as defined at FCS_COP.1/SigGen will be verified by the TOE at first.

The administrators can query the currently executing version of the TOE firmware/software as well as the most recently installed version by the "display startup" command. The currently executing patches and most recently installed patches can also be checked out.

The validation of the firmware/software integrity is always performed before the process of replacing a non-volatile, system resident software component with another is started. All discrete software components (e.g. applications, drivers, kernel, and firmware) of the TSF are archived together into a

whole package and the single package is digitally signed. RSA as specified in FCS COP.1/SigGen can be used for firmware/software digital signature mechanism to authenticate it prior to installation and that installation fails if the verification fails.

When digital signature is verified correct, the new software will be installed successfully and become active when the TOE reboot.

7.5.5 FPT_STM_EXT.1 Reliable Time Stamps

Only administrators have the ability to modify the time of TOE, and all modification about time will be recorded.

The security functions that make use of time include:

1) With this information the real time for all audit data can be calculated.

2) The validation period of the certificate can be calculated.

The Network Time Protocol (NTP) is supported by TOE. NTP synchronizes clocks of all devices on a network so that the devices can implement applications based on the uniform time.

NTP is applied in the following situations where all the clocks of hosts or switches in a network need to be consistent:

- Network management: Analysis on logs or debugging information collected from different switches must be performed based on time.
- Charging system: Requires the clocks of all devices to be consistent.
- Completing certain functions: For example, timing restart of all the switches in a network requires the clocks of all the switches to be consistent.

7.6 TOE Access (FTA)

7.6.1 FTA_SSL_EXT.1 TSF-initiated Session Locking

An administrator can configure maximum inactivity times for both local and remote administrative sessions. When a session is inactive (i.e., not session input) for the configured period of time the TOE will terminate the session, flush the screen, and no further activity is allowed requiring the administrator to log in (be successfully identified and authenticated) again to establish a new session.

The allowable range is from 0 minute 0 second to 35791 minutes 59 seconds.

7.6.2 FTA_SSL.3 TSF-initiated Termination

When the remote session is inactive (i.e., not session input) for the configured period of time the TOE will terminate the session.

7.6.3 FTA_SSL.4 User-initiated Termination

The administrator can use the command “quit” in order to finish the administrator’s own interactive session.

7.6.4 FTA_TAB.1 Default TOE Access Banners

To provide some prompts or alarms to users, Administrator can use the header command to configure a title on the switch. If a user logs in to the switch, the title is displayed. Administrator can specify the title information, or specify the title information by using the contents of a file. The title displayed same for both local and remote users.

When a terminal (remote or local) connection is activated and attempt to log in, the terminal displays the contents of the title that is set by using the header login command. After the successful login, the terminal displays the contents of the title that is configured by using the header shell command.

The local Console port and the remote Secure Telnet interface are used for an administrator to communicate with the switch.

7.7 Trusted path/channels (FTP)

7.7.1 FTP_ITC.1 Inter-TSF trusted channel

The TOE protects communications between a TOE and its connected Audit server with TLS v1.2.

TLS/SSH protects the data from disclosure by encryption defined at 6.2.2.4 and ensure that the data has not been modified by MAC defined by 6.2.2.7.

7.7.2 FTP_TRP.1/Admin Trusted Path

All remote administrative communications take place over a secure encrypted SSH session. The remote users are able to initiate SSH communications with the TOE.

The TOE protects communications between a TOE and authorized remote administrator with SSH.

8 Crypto Disclaimer

The following cryptographic algorithms are used by ATN Series to enforce its security policy:

#	Purpose	Cryptographic Mechanism	Standard of Implementation	Key Size in Bits	Standard of Application	Comments
1	Key Generation	Elliptic curve-Diffie Hellman	FFC Schemes using Diffie-Hellman group 14 that meet the following: RFC 3526, Section 3	2048-bit or greater	NIST Special Publication 800-56B	FCS_CKM.1
2	Key Establishment	Elliptic curve-based key establishment schemes	Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography	2048-bit or greater	NIST Special Publication 800-56B	FCS_CKM.2
3	Confidentiality	AES in GCM mode		128 bits or 256 bits	AES as specified in ISO 18033-3, GCM as specified in ISO 19772	FCS_COP.1/ DataEncryption
4	Authentication	RSA signature	RSA: PKCS#1_V2.1, RSASSA-PKCS2v1_5	3072 bits	FIPS PUB 186-4, “Digital Signature Standard (DSS)”, Section 5.5	FCS_COP.1/ SigGen
			Digital signature scheme 2 or Digital Signature scheme 3	3072 bits	ISO/IEC 9796-2, Digital signature scheme 2 or Digital Signature scheme 3	FCS_COP.1/ SigGen
	Integrity	SHA-256 and SHA-384	-	256 bits,384 bits	ISO/IEC 10118-3:2004	FCS_COP.1/Hash

#	Purpose	Cryptographic Mechanism	Standard of Implementation	Key Size in Bits	Standard of Application	Comments
5	Cryptographic Primitive	HMAC-SHA-256	-	256 bits	ISO/IEC 9797-2:2011, Section 7 “MAC Algorithm 2”	FCS_COP.1/KeyedHash
6	Random Bit Generation	Hash_DRBG (any); DRG.2 acc. to SP800-90A	-	256 bits	SP800-90A ISO/IEC 18031:2011 Table C.1 “Security Strength Table for Hash Functions”	FCS_RBG_EXT.1
7	Trusted Channel	SSH V2.0	RFC 4251 RFC 4252 RFC 4253 RFC 4254 RFC 6668	-	-	FTP_TRP.1/Admin
		TLS1.1	RFC 3268 RFC 4346 RFC 5246 RFC 6125	-	-	FTP_ITC.1
		TLS1.2	RFC 3268 RFC 5246 RFC 6125	-	-	FTP_ITC.1

Referenced Documents

[FIPS 186-4] National Institute of Standards and Technology, Digital Signature Standard (DSS), Federal Information Processing Standards Publication FIPS PUB 186-4, July 2013

[PKCS#1] RSA Cryptography Specifications Version 2.1(RFC3447)

[PKCS#3] A cryptographic protocol that allows two parties that have no prior knowledge of each other to jointly establish a shared secret key over an insecure communications channel.

[FIPS 198-1]The Keyed-Hash Message Authentication Code (HMAC)--2008 July

[RFC 4251]The Secure Shell (SSH) Protocol Architecture, January 2006

[RFC 4252]The Secure Shell (SSH) Authentication Protocol, January 2006

[RFC 4253]The Secure Shell (SSH) Transport Layer Protocol, January 2006

[RFC 4254]The Secure Shell (SSH) Connection Protocol, January 2006

[RFC 6668]SHA-2 Data Integrity Verification for the Secure Shell (SSH) Transport Layer Protocol

[RFC 3268]Advanced Encryption Standard (AES) Ciphersuites for Transport Layer Security (TLS)

[RFC 4346]The Transport Layer Security (TLS) Protocol Version 1.1

[RFC 5246]The Transport Layer Security (TLS) Protocol Version 1.2

[RFC 8446]The Transport Layer Security (TLS) Protocol Version 1.3

[RFC 6125]Representation and Verification of Domain-Based Application Service Identity within Internet Public Key Infrastructure Using X.509 (PKIX) Certificates in the Context of Transport Layer Security (TLS)

[NIST SP 800-56A]National Institute of Standards and Technology, Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography, May 2013

[NIST SP 800-56B]National Institute of Standards and Technology, Recommendation for Pair-Wise Key Establishment Schemes Using Integer Factorization Cryptography August 2009

[ISO/IEC 18031:2011] Information technology -- Security techniques -- Random bit generation

[ISO 18033-3] Information technology — Security techniques — Encryption algorithms

[ISO/IEC 9796-2]Information technology -- Security techniques -- Digital signature schemes giving message recovery

[ISO/IEC 9797-2]Information technology -- Security techniques -- Message Authentication Codes (MACs)

[ISO/IEC 10118-3]Information technology -- Security techniques -- Hash-functions

[ISO/IEC 14888-3] Information technology -- Security techniques -- Digital signatures with appendix

9 Abbreviations Terminology and References

9.1 Abbreviations

Name	Explanation
AAA	Authentication Authorization Accounting
CA	Certificate Authority
CC	Common Criteria
CEM	Common Evaluation Methodology for Information Technology Security
CLI	Command Line Interface
EAL	Evaluation Assurance Level
EXEC	Execute Command
GUI	Graphical User Interface
IC	Information Center
IP	Internet Protocol
LMT	Local Maintenance Terminal
MAN	Metropolitan Area Network

Name	Explanation
NDcPP	collaborative Protection Profile for Network Device
NMS	Network Management Server
NTP	Network Tiem Protocal
PP	Protection Profile
RMT	Remote Maintenance Terminal
SFR	Security Functional Requirement
SSH	Secure Shell
SSL	Secure Sockets Layer
ST	Security Target
STP	Spanning-Tree Protocol
TLS	Transport Layer Security
TOE	Target of Evaluation
TSF	TOE Security Functions
VRP	Versatile Routing Platform
AC	Alternating Current
DC	Direct Current

9.2 Terminology

This section contains definitions of technical terms that are used with a meaning specific to this document. Terms defined in the [CC] are not reiterated here, unless stated otherwise.

Terminology	Explanation
Administrator:	An administrator is a user of the TOE who may have been assigned specific administrative privileges within the TOE. This ST may use the term administrator occasionally in an informal context, and not in order to refer to a specific role definition – from the TOE's point

Terminology	Explanation
	of view, an administrator is simply a user who is authorized to perform certain administrative actions on the TOE and the objects managed by the TOE. Since all user levels are assigned to commands and users and users can only execute a command if their associated level is equal or higher compared to the level assigned to a command, a user might have certain administrative privileges but lacking some other administrative privileges. So the decision whether a user is also an administrator or not might change with the context (e.g. might be able to change audit settings but cannot perform user management).
User:	A user is a human or a product/application using the TOE which is able to authenticate successfully to the TOE. A user is therefore different to a subject which is just sending traffic through the device without any authentication.

9.3 References

Name	Description
[CC]	Common Criteria for Information Technology Security Evaluation. Part 1-3 April 2017 Version 3.1 Revision 5
[CC1]	Common Criteria (CC) Part 1: Introduction and general model April 2017 Version 3.1 Revision 5
[CC2]	Part 2: Security functional components April 2017 Version 3.1 Revision 5
[CC3]	Part 3: Security assurance components April 2017 Version 3.1 Revision 5
[CEM]	Common Methodology for Information Technology Security Evaluation Evaluation methodology

Name	Description
	April 2017 Version 3.1 Revision 5
[CPP_ND]	collaborative Protection Profile for Network Devices, Version 2.1，24-Sep-2018
cPP	collaborative Protection Profile for Network Devices, Version 2.1，24-Sep-2018
[ISO18031]	Information technology — Security techniques — Random bit generation Second edition 2011-11-15
[RFC 3526]	This document defines new Modular Exponential (MODP) Groups for the Internet Key Exchange (IKE) protocol. It documents the well known and used 1536 bit group 5, and also defines new 2048, 3072, 4096, 6144, and 8192 bit Diffie-Hellman groups numbered starting at 14. Please refer to the following link: http://www.rfc-editor.org/info/rfc3526
[RFC 4251]	This document describes the architecture of the SSH protocol, as well as the notation and terminology used in SSH protocol documents. It also discusses the SSH algorithm naming system that allows local extensions. Please refer to the following link: http://www.rfc-editor.org/info/rfc4251
[RFC 5280]	This memo profiles the X.509 v3 certificate and X.509 v2 certificate revocation list (CRL) for use in the Internet. Please refer to the following link: http://www.rfc-editor.org/info/rfc5280
[RFC 5759]	This document specifies a base profile for X.509 v3 Certificates and X.509 v2 Certificate Revocation Lists (CRLs) for use with the United States National Security Agency's Suite B Cryptography. Please refer to the following link: http://www.rfc-editor.org/info/rfc5759
[SD_ND]	Evaluation Activities for Network Device cPP September-2018 Version 2.1
[SP800-56A]	Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography Revision 2 May 2013
[SP800-56B]	Recommendation for Pair-Wise Key Establishment

Name	Description
	Schemes Using Integer Factorization Cryptography Revision 1 September 2014
[SP800-90A]	Recommendation for Random Number Generation Using Deterministic Random Bit Generators Revision 1 June 2015