



Swedish Certification Body for IT Security

Certification Report - F5 BIG-IP® 14.1.2 VE for LTM+AFM

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1 Executive Summary

The Target of Evaluation (TOE) is a firewall network device. The TOE consists of the BIG-IP LTM+AFM Version 14.1.2 (build BIGIP-14.1.2-0.89.37, also referred to as 14.1.2 + EHF) with Appliance Mode licensed, and running on any of the following hypervisors:

- VMWare ESXi 6.5.0 - Intel Xeon E5-2697v4 processor
- Hyper-V version 10.0 on Windows Server 2019 - Intel Xeon E5-2660v3 processor
- KVM on Centos 7 - Intel Xeon E5-2660v3 processor

The hypervisors are installed on the Dell PowerEdge R630.

The hardware, hypervisors, and BIG-IP software are included in the TOE boundary.

The customer is responsible for acquiring and installing the hardware and hypervisor and ensuring that the hardware and hypervisor on which the TOE software will run are free of tampering. Refer to the manufacturers of those components for details.

The TOE software is delivered via download in the form of a virtual edition (VE) image fileset that is protected via a digital signature. The TOE guidance is delivered via download in the form of an ISO image along with a SHA-256 checksum for verification by the customer.

The ST claims exact conformance to Collaborative Protection Profile for Stateful Traffic Filter Firewalls (FWcPP), version 2.0 + Errata 20180314.

The NIT technical decisions that have been applied to the Network Device Collaborative Protection Profile can be found in the ST.

There are six assumptions being made in the ST regarding the secure usage and environment of the TOE. The TOE relies on these to counter the thirteen threats and comply with the one organisational security policy (OSP) in the ST. The assumptions, the threat and the OSP are described in chapter 4 Assumptions and Clarification of Scope.

The evaluation has been performed by atsec information security AB and was completed 2020-10-22. The evaluation was conducted in accordance with the requirements of Common Criteria, version 3.1, release 5, and the Common Methodology for IT Security Evaluation, version 3.1, release 5.

atsec information security AB is a licensed evaluation facility for Common Criteria under the Swedish Common Criteria Evaluation and Certification Scheme. atsec information security AB is also accredited by the Swedish accreditation body SWEDAC according to ISO/IEC 17025 for Common Criteria evaluation.

The certifier monitored the activities of the evaluator by reviewing all successive versions of the evaluation reports. The certifier determined that the evaluation results confirm the security claims in the Security Target [ST], and have been reached in agreement with the requirements of the Common Criteria and the Common Methodology for evaluation assurance level:

EAL 1 + ASE_SPD.1 and in accordance with the FWcPP Evaluation Activities.

The certification results only apply to the version of the product indicated in the certificate, and on the condition that all the stipulations in the Security Target are met.

This certificate is not an endorsement of the IT product by CSEC or any other organisation that recognises or gives effect to this certificate, and no warranty of the IT product by CSEC or any other organisation that recognises or gives effect to this certificate is either expressed or implied.

2 Identification

| Certification Identification | |
|--|---|
| Certification ID | CSEC2019021 |
| Name and version of the certified IT product | BIG-IP LTM+AFM Version 14.1.2 (build BIGIP-14.1.2-0.89.37, also referred to as 14.1.2 + EHF) with Appliance Mode licensed. Running on any of the following hypervisors: <ul style="list-style-type: none">• VMWare ESXi 6.5.0 - Intel Xeon E5-2697v4 processor• Hyper-V version 10.0 on Windows Server 2019 - Intel Xeon E5-2660v3 processor• KVM on Centos 7 - Intel Xeon E5-2660v3 processorF5 |
| Security Target Identification | F5 BIG-IP® 14.1.2 VE for LTM+AFM Security Target, F5 Networks, Inc., 2020-04-01, Version 4.8 |
| EAL | EAL 1 + ASE_SPD.1 and FWcPP V2.0 + Errata 20180314. |
| Sponsor | F5 Networks, Inc. |
| Developer | F5 Networks, Inc. |
| ITSEF | atsec information security AB |
| Common Criteria version | 3.1 release 5 |
| CEM version | 3.1 release 5 |
| QMS version | 1.23.2 |
| Scheme Notes Release | 16.0 |
| Recognition Scope | CCRA |
| Certification date | 2020-11-04 |

3 Security Policy

The TOE provides the following security services:

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

3.1 Security Audit

The TOE implements implements syslog capabilities to generate audit records for security relevant events. In addition, the TOE protects the audit trail from unauthorized modifications and loss of audit data due to insufficient space.

3.2 Cryptographic Support

The TOE provides cryptographic functionality is provided by the OpenSSL cryptographic module. The TOE provides a secure shell (SSH) to allow administrators to connect over a dedicated network interface. The TOE also implements the TLS protocol to allow administrators to remotely manage the TOE. The TOE implements a TLS client for interactions with other TLS servers. These cryptographic implementations utilize the cryptographic module which provides random number generation, key generation, key establishment, key storage, key destruction, hash operations, encryption/decryption operations, and digital signature operations.

3.3 User Data Protection

The TOE implements residual information protection on network packets traversing through it. In other words, network packets traversing through the BIG-IP do not contain any residual data.

3.4 Identification and Authentication

The TOE provides an internal password-based repository that is implemented for authentication of management users. The TOE enforces a strong password policy and disabling user accounts after a configured number of failed authentication attempts.

3.5 Security Function Management

A command line interface (available via the traffic management shell "tmsh"), web-based GUI ("Configuration utility"), a SOAP-based API ("iControl API"), and a REST-based API ("iControl REST API") are offered to administrators for all relevant configuration of security functionality.

The TOE manages configuration objects in a partition which includes users, server pools, etc. This includes the authentication of administrators by user name and password, as well as access control based on pre-defined roles and, optionally, groups of objects ("Profiles"). "Profiles" can be defined for individual servers and classes of servers that the TOE forwards traffic from clients to, and for traffic that matches certain characteristics, determining the kind of treatment applicable to that traffic. Management capabilities offered by the TOE include the definition of templates for certain configuration options. The management functionality also implements roles for separation of duties.

3.6 Protection of the TSF

The TOE implements many capabilities to protect the integrity and management of its own security functionality. These capabilities include the protection of sensitive data, such as passwords and keys, self-tests, product update verification, and reliable time stamping.

3.7 TOE Access

Prior to interactive user authentication, the TOE can display an administrative defined banner. The TOE terminates interactive sessions after an administrator-defined period of inactivity and allows users to terminate their own authenticated session.

3.8 Trusted Path / Channels

The TOE protects remote connections to its management interfaces with TLS and SSH. The TOE also protects communication channels with audit servers using TLS.

3.9 Firewall

The TOE offers basic firewall functionality, including stateful packet inspection and network address translation, and logic to mitigate denial-of-service attacks.

4 Assumptions and Clarification of Scope

4.1 Assumptions

The Security Target [ST] makes six assumptions on the usage and the operational environment of the TOE.

A.PHYSICAL_PROTECTION

The firewall 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 firewall's physical interconnections and correct operation. This protection is assumed to be sufficient to protect the firewall and the data it contains. As a result, the cPP will not include any requirements on physical tamper protection or other physical attack mitigations. The cPP will not expect the product to defend against physical access to the firewall that allows unauthorized entities to extract data, bypass other controls, or otherwise manipulate the firewall.

A.LIMITED_FUNCTIONALITY

The firewall 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 firewall device should not provide a computing platform for general purpose applications (unrelated to networking functionality).

A.TRUSTED_ADMINISTRATOR

The Security Administrator(s) for the firewall 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 firewall. The firewall 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.

A.REGULAR_UPDATES

The firewall device firmware and software is assumed to be updated by an Administrator on a regular basis in response to the release of product updates due to known vulnerabilities.

A.ADMIN_CREDENTIALS_SECURE

The Administrator's credentials (private key) used to access the firewall device are protected by the platform on which they reside.

A.RESIDUAL_INFORMATION

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

4.2 Organisational Security Policies

The Security Target contains one Organisational Security Policies (OSPs), which have been considered during the evaluation.

P.ACCESS_BANNER

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

4.3 Clarification of Scope

The Security Target contains thirteen threats, which have been considered during the evaluation.

T.UNAUTHORIZED_ADMINISTRATOR_ACCESS

Threat agents may attempt to gain Administrator access to the firewall by nefarious means such as masquerading as an Administrator to the firewall, masquerading as the firewall 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 the firewall and a network device. Successfully gaining Administrator access allows malicious actions that compromise the security functionality of the firewall and the network on which it resides.

T.WEAK_CRYPTOGRAPHY

Threat agents may exploit weak cryptographic algorithms or perform a cryptographic exhaust against the key space. Poorly chosen encryption algorithms, modes, and key sizes will allow attackers to compromise the algorithms, or brute force exhaust the key space and give them unauthorized access allowing them to read, manipulate and/or control the traffic with minimal effort.

T.UNTRUSTED_COMMUNICATION_CHANNELS

Threat agents may attempt to target firewalls that do not use standardized secure tunneling protocols to protect the critical network traffic. Attackers may take advantage of poorly designed protocols or poor key management to successfully perform man-in-the-middle attacks, replay attacks, etc. Successful attacks will result in loss of confidentiality and integrity of the critical network traffic, and potentially could lead to a compromise of the firewall itself.

T.WEAK_AUTHENTICATION_ENDPOINTS

Threat agents may take advantage of secure protocols that use weak methods to authenticate the endpoints – e.g., shared password that is guessable or transported as plaintext. The consequences are the same as a poorly designed protocol, the attacker could masquerade as the Administrator or another device, and the attacker could insert themselves into the network stream and perform a man-in-the-middle attack. The result is the critical network traffic is exposed and there could be a loss of confidentiality and integrity, and potentially the firewall itself could be compromised.

T.UPDATE_COMPROMISE

Threat agents may attempt to provide a compromised update of the software or firmware which undermines the security functionality of the device. Non-validated updates or updates validated using non-secure or weak cryptography leave the update firmware vulnerable to surreptitious alteration.

T.UNDETECTED_ACTIVITY

Threat agents may attempt to access, change, and/or modify the security functionality of the firewall without Administrator awareness. This could result in the attacker finding an avenue (e.g., misconfiguration, flaw in the product) to compromise the device and the Administrator would have no knowledge that the device has been compromised.

T.SECURITY_FUNCTIONALITY_COMPROMISE

Threat agents may compromise credentials and firewall data enabling continued access to the firewall and its critical data. The compromise of credentials include replacing existing credentials with an attacker's credentials, modifying existing credentials, or obtaining the Administrator or firewall credentials for use by the attacker.

T.PASSWORD_CRACKING

Threat agents may be able to take advantage of weak administrative passwords to gain privileged access to the firewall. Having privileged access to the firewall provides the attacker unfettered access to the network traffic, and may allow them to take advantage of any trust relationships with other network devices.

T.SECURITY_FUNCTIONALITY_FAILURE

An external, unauthorized entity could make use of failed or compromised security functionality and might therefore subsequently use or abuse security functions without prior authentication to access, change or modify device data, critical network traffic or security functionality of the device.

T.NETWORK_DISCLOSURE

An attacker may attempt to “map” a subnet to determine the machines that reside on the network, and obtaining the IP addresses of machines, as well as the services (ports) those machines are offering. This information could be used to mount attacks to those machines via the services that are exported.

T.NETWORK_ACCESS

With knowledge of the services that are exported by machines on a subnet, an attacker may attempt to exploit those services by mounting attacks against those services.

T.NETWORK_MISUSE

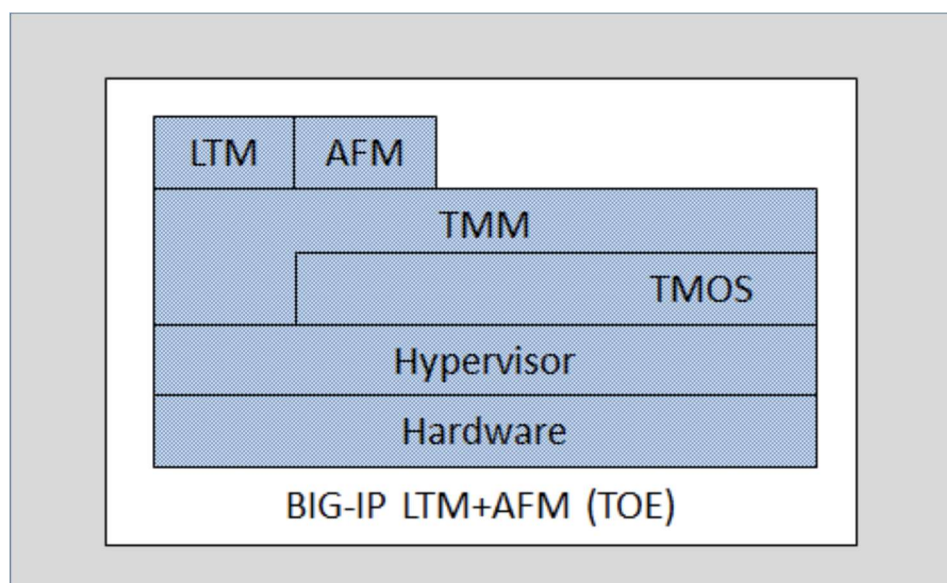
An attacker may attempt to use services that are exported by machines in a way that is unintended by a site’s security policies. For example, an attacker might be able to use a service to “anonymize” the attacker’s machine as they mount attacks against others.

T. MALICIOUS_TRAFFIC

An attacker may attempt to send malformed packets to a machine in hopes of causing the network stack or services listening on UDP/TCP ports of the target machine to crash.

5 Architectural Information

The following diagram shows the basic components that comprise the TOE.



The TOE is separated into two (2) distinct planes, the control plane and the data plane. The control plane validates, stores, and passes configuration data to all necessary systems. It also provides all administrative access to the TOE. The data plane passes user traffic through the TOE.

The TOE implements and supports the following network protocols: TLS (client and server), SSH, HTTPS, FTP. The TOE protects remote connections to its management interfaces with TLS and SSH. The TOE also protects communication channels with audit servers using TLS (TLSv1.1 and TLSv1.2). The cryptographic functionality implemented in the TOE is provided by OpenSSL.

The TOE is divided into six (6) subsystems: Hardware, Hypervisor, Traffic Management Operating System (TMOS), Traffic Management Micro-kernel (TMM), Local Traffic Manager (LTM), and Advanced Firewall Manager (AFM). F5's TMOS is a Linux-based operating system customized for performance. The TMM is the data plane of the product and all data plane traffic passes through the TMM. The LTM controls network traffic coming into or exiting the local area network (LAN) and provides the ability to intercept and redirect incoming network traffic. The AFM implements stateful traffic filtering on Level 2 and Level 4 network traffic packets using administrator-defined packetfiltering rules that are based on network packet attributes.

At the core of BIG-IP is a concept referred to as Traffic Management Microkernel (TMM), representing the data plane of the product when compared to traditional network device architectures. It is implemented by a daemon running with root privileges, performing its own memory management, and having direct access to the hypervisor. TMM implements a number of sequential filters both for the "client-side" and "server-side" network interfaces served by BIG-IP. The filters implemented in TMM include a TCP, TLS, compression, and HTTP filter, amongst others. If the hypervisor provides more than one CPU, TMM runs multi-threaded (one thread per CPU). In this case, disaggregators in the kernel are responsible for de-multiplexing and multiplexing network traffic for handling by an individual TMM thread.

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Additional plug-in filters can be added to this queue by individual product packages. These plug-ins typically have a filter component in TMM, with additional and more complex logic in a counter-part implemented in a Linux-based daemon (module). The plug-in modules relevant to this evaluation include:

- Local Traffic Manager (LTM): authentication of HTTP (based on Apache) traffic and advanced traffic forwarding directives
- Advanced Firewall Manager (AFM): network filtering as described in FWcPP.

6 Documentation

Relevant guidance documents for the secure operation of BIG-IP that are part of the TOE are:

- BIG-IP Common Criteria Evaluation Configuration Guide BIG-IP LTM+AFM and BIG-IP LTM+APM Release 14.1.2 VE
- K05254775: Common Criteria Certification for BIG-IP 14.1.2 VE
- BIG-IP AFM: Network Firewall Policies and Implementations
- BIG-IP AFM Operations Guide
- BIG-IP Device Service Clustering: Administration
- BIG-IP Digital Certificates: Administration
- BIG-IP Local Traffic Manager: Implementations
- BIG-IP Local Traffic Manager: Monitors Reference
- BIG-IP Local Traffic Manager: Profiles Reference
- BIG-IP Release Note
- BIG-IP System: Essentials
- BIG-IP System: SSL Administration
- BIG-IP System: User Account Administration
- BIG-IP Systems: Getting Started Guide
- BIG-IP TMOS: Implementations
- BIG-IP TMOS: Routing Administration
- External Monitoring of BIG-IP Systems: Implementations
- GUI Help Files
- iControl SDK
- iControl REST API User Guide
- K12042624: Restricting access to the Configuration utility using client certificates (12.x – 14.x)
- K13092: Overview of securing access to the BIG-IP system
- K13302: Configuring the BIG-IP system to use an SSL chain certificate (11.x – 14.x)
- K13454: Configuring SSH public key authentication on BIG-IP systems (11.x – 14.x)
- K14620: Managing SSL Certificates for BIG-IP systems using the Configuration utility
- K14783: Overview of the Client SSL profile (11.x – 14.x)
- K14806: Overview of the Server SSL profile (11.x – 15.x)
- K15497: Configuring a secure password policy for the BIG-IP system (11.x – 14.x)
- K15664: Overview of BIG-IP device certificates (11.x – 14.x)
- K42531434: Replacing the Configuration utility's self-signed SSL certificate with a CA-signed SSL certificate
- K5532: Configuring the level of information logged for TMM-specific events
- K6068: Configuring a pre-login or post-login message banner for the BIG-IP or Enterprise Manager system

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- K7752: Licensing the BIG-IP system
- K80425458: Modifying the list of ciphers and MAC algorithms used by the SSH service on the BIGIP system or BIG-IQ system
- K9908: Configuring an automatic logout for idle sessions
- Traffic Management Shell (tmsh) Reference Guide (versions 14.1.0 and 12.0.01)
- BIG-IP VE in Linux KVM
- BIG-IP VE in Microsoft Hyper-V
- BIG-IP VE in VMware ESXi
- BIG-IP Virtual Edition Supported Platforms
- K14810: Overview of BIG-IP VE license and throughput limits
- K14946: Overview of BIG-IP VE image sizes
- Linux KVM – BIG-IP VE Setup
- Linux KVM – BIG-IP VE Users Guide
- Linux KVM – Configure cryptographic offload for BIG-IP VE with Intel QAT
- Microsoft Hyper-V – BIG-IP VE Setup
- Microsoft Hyper-V – BIG-IP VE Users Guide
- Update BIG-IP VE
- VMware ESXi – BIG-IP VE Setup
- VMware ESXi – BIG-IP VE Users Guide

7 IT Product Testing

7.1 Evaluator Testing

The independent testing was performed on the TOE in the form that it is delivered to customers. The evaluator has performed more than 50 test cases, including extensive testing to test cryptographic protocols (SSH, TLS, HTTPS) as well as underlying cryptographic operations (FCS_COP, FCS_CKM) that were also separately tested in algorithm testing. All test cases passed successfully.

Algorithm testing is required to be performed by the NDcPP Supporting Document [EA-ND 2.0E] Algorithm test vectors were generated by CAVS tool to test all cryptographic algorithms of the TOE. The testing is valid for all hypervisors supported by the TOE, which is evident from the certificates: KVM, VMware and Hyper-V.

7.2 Penetration Testing

The approach for the penetration test was to scan all TCP/IP ports on the TOE platform to identify all open ports. The penetration test was performed on the TOE in the evaluated configuration. The results of the port scan found that there were no open ports.

8 Evaluated Configuration

The following configuration specifics apply to the evaluated configuration of the TOE:

- Appliance mode is licensed. This results in root access to the TOE operating system and bash shell being disabled.
- Certificate validation is performed using CRLs.
- Disabled interfaces:
 - All command shells other than tmsh are disabled. For example, bash and other user-serviceable shells are excluded.
 - Management of the TOE via SNMP is disabled.
 - Management of the TOE via the appliance's LCD display is disabled.
 - SSH client

9 Results of the Evaluation

The evaluators applied each work unit of the Common Methodology [CEM] within the scope of the evaluation, and concluded that the TOE meets the security objectives stated in the Security Target [ST] for an attack potential of Basic.

The certifier reviewed the work of the evaluators and determined that the evaluation was conducted in accordance with the Common Criteria [CC].

The evaluators' overall verdict is PASS.

The verdicts for the assurance classes and components are summarised in the following table:

| <i>Assurance Class/Family</i> | <i>Short name</i> | <i>Verdict</i> |
|---------------------------------|-------------------|----------------|
| Development | ADV | PASS |
| Functional Specification | ADV_FSP.1 | PASS |
| Guidance Documents | AGD | PASS |
| Operational User Guidance | AGD_OPE.1 | PASS |
| Preparative Procedures | AGD_PRE.1 | PASS |
| Life-cycle Support | ALC | PASS |
| CM Capabilities | ALC_CMC.1 | PASS |
| CM Scope | ALC_CMS.1 | PASS |
| Security Target Evaluation | ASE | PASS |
| ST Introduction | ASE_INT.1 | PASS |
| Conformance Claims | ASE_CCL.1 | PASS |
| Security Problem Definition | ASE_SPD.1 | PASS |
| Security Objectives | ASE_OBJ.1 | PASS |
| Extended Components Definition | ASE_ECD.1 | PASS |
| Security Requirements | ASE_REQ.1 | PASS |
| TOE Summary Specification | ASE_TSS.1 | PASS |
| Tests | ATE | PASS |
| Independent Testing | ATE_IND.1 | PASS |
| Vulnerability Assessment | AVA | PASS |
| Vulnerability Analysis | AVA_VAN.1 | PASS |
| Evaluation Activities for FWcPP | | PASS |

10 Evaluator Comments and Recommendations

None.

11 Glossary

| | |
|-------|-------------------------------------|
| CC | Common Criteria |
| CRL | Certificate Revocation List |
| EAL2 | Evaluation Assurance Level 2 |
| GUI | Graphical User Interface |
| ITSEF | IT Security Evaluation Facility |
| LTM | Local Traffic Manager |
| OSP | Organisational Security Policy |
| PP | Protection Profile |
| SOAP | Simple Object Access Protocol |
| ST | Security Target |
| TLS | Transport Layer Security |
| TMM | Traffic Management Microkernel |
| TMOS | Traffic Management Operating System |
| TOE | Target of Evaluation |
| TSF | TOE Security Functions |
| vCMP | Virtual Clustered Multi-Processing |
| VE | Virtual Edition |

12 Bibliography

| | |
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| ST | F5 BIG-IP 14.1.0 for LTM+AFM Security Target, F5 Networks Inc. 2019-07-10 document version 4.6 |
| ECG | BIG-IP Common Criteria Evaluation Configuration Guide BIG-IP LTM+AFM and BIG-IP LTM+APM Release 14.1.2 VE, F5 Networks Inc., 2020-10-16, document version 4.75 |
| FWcPP | Collaborative Protection Profile for Stateful Traffic Filter Firewalls, 2018-03-14, document version 2.0E (v2.0 + Errata 20180314) |
| EA-FW | Evaluation Activities for Stateful Traffic Filter Firewalls cPP, October 2017, document version 2.0 |
| EA-ND 2.0E | Evaluation Activities for Network Device cPP, 2018-03-14, document version 2.0E (v2.0 + Errata 20180314) |
| CCpart1 | Common Criteria for Information Technology Security Evaluation, Part 1, version 3.1 revision 5, CCMB-2017-04-001 |
| CCpart2 | Common Criteria for Information Technology Security Evaluation, Part 2, version 3.1 revision 5, CCMB-2017-04-002 |
| CCpart3 | Common Criteria for Information Technology Security Evaluation, Part 3, version 3.1 revision 5, CCMB-2017-04-003 |
| CC | CCpart1 + CCpart2 + CCpart3 |
| CEM | Common Methodology for Information Technology Security Evaluation, version 3.1 revision 5, CCMB-2017-04-004 |
| SP-002 | SP-002 Evaluation and Certification, CSEC, 2019-09-24, document version 31.0 |

Appendix A Scheme Versions

During the certification the following versions of the Swedish Common Criteria Evaluation and Certification scheme have been used.

A.1 Scheme/Quality Management System

During the certification project, the following versions of the quality management system (QMS) have been applicable since the certification application was received:

QMS 1.23 valid from 2019-10-14

QMS 1.23.1 valid from 2020-03-06

QMS 1.23.2 valid from 2020-05-11

In order to ensure consistency in the outcome of the certification, the certifier has examined the changes introduced in each update of the quality management system.

The changes between consecutive versions are outlined in “Ändringslista CSEC QMS 1.23.2”. The certifier concluded that, from QMS 1.23 to the current QMS 1.23.2, there are no changes with impact on the result of the certification.

A.2 Scheme Notes

The following Scheme interpretations have been considered during the certification.

- Scheme Note 15 - Demonstration of test Coverage
- Scheme Note 18 - Highlighted Requirements on the Security Target
- Scheme Note 21 - NIAP PP Certifications
- Scheme Note 22 - Vulnerability assessment
- Scheme Note 23 - Evaluation reports for NIAP PPs and cPPs
- Scheme Note 25 - Use of CAVP-tests in CC evaluations