# Assurance Activities Report
# for
# Tenable Security Center 6.2.0

**Version 1.1**
**10 October 2023**

Evaluated By:

Leidos Inc.
https://www.leidos.com/civil/commercial-cyber/product-compliance
Common Criteria Testing Laboratory
6841 Benjamin Franklin Drive
Columbia, MD 21046

Prepared for:
National Information Assurance Partnership
Common Criteria Evaluation and Validation Scheme

© 2023 Leidos. All rights reserved

The Developer of the TOE:

Tenable, Inc.

7021 Columbia Gateway Dr.

Columbia, MD 21046

The TOE Evaluation was Sponsored by:

Tenable, Inc.

7021 Columbia Gateway Dr.

Columbia, MD 21046

Evaluation Personnel:

Greg Beaver

Srilekha Vangala

Armin Najafabadi

Pascal Patin

Allen Sant

**Common Criteria Version:**

- Common Criteria for Information Technology Security Evaluation Part 1: Introduction and general model, Version 3.1, Revision 5, April 2017.
- Common Criteria for Information Technology Security Evaluation Part 2: Security functional components, Version 3.1, Revision 5, April 2017.
- Common Criteria for Information Technology Security Evaluation Part 3: Security assurance components, Version 3.1, Revision 5, April 2017.

**Common Evaluation Methodology Version:**

- Common Methodology for Information Technology Security Evaluation, Evaluation Methodology, Version 3.1, Revision 5, April 2017.

**Protection Profiles:**

- Protection Profile for Application Software, Version 1.4, 7 October 2021 [PP_APP_v1.4]
- Functional Package for Transport Layer Security (TLS), Version 1.1, 1 March 2019 [PKG_TLS_V1.1]

## Revision History

| Version | Date | Description |
|---|---|---|
| 0.1 | 2/9/2023 | Initial draft |
| 1.0 | 9/11/2023 | Initial release |
| 1.1 | 10/10/2023 | Updated per validator comments |



© 2023 Leidos. All rights reserved

## Contents





© 2023 Leidos. All rights reserved

## LIST OF TABLES

NO TABLE OF FIGURES ENTRIES FOUND.



© 2023 Leidos. All rights reserved

# 1. Introduction

This document presents the results of performing assurance activities associated with the Tenable Security Center 6.2.0 evaluation. This report contains sections documenting the performance of evaluation activities associated with each of the Security Functional Requirements (SFRs) and Security Assurance Requirements (SARs) as specified in the following document:

- *Protection Profile for Application Software*, Version 1.4, 7 October 2021 [PP_APP_v1.4]
- *Functional Package for Transport Layer Security (TLS),* Version 1.1, 1 March 2019 [PKG_TLS_V1.1]

Note that, in accordance with NIAP Policy Letter #5, all cryptography in the TOE for which NIST provides validation testing of FIPS-approved and NIST-recommended cryptographic algorithms and their individual components must be NIST validated. The CCTL will verify that the claimed NIST validation complies with the NIAP-approved PP requirements the TOE claims to satisfy. The CCTL verification of the NIST validation will constitute performance of the associated assurance activity. As such, Test assurance activities associated with functional requirements within the scope of Policy Letter #5 are performed by verification of the relevant CAVP certification and not through performance of any testing as specified in the claimed PP documents.

## 1.1 Technical Decisions

The following NIAP Technical Decisions affecting [PP_APP_v1.4] apply to the TOE and have been accounted for in the ST development and the conduct of the evaluation, or were considered to be non-applicable for the reasons stated:

**TD0628: Addition of Container Image to Package Format**

- The TD is applicable to the evaluation. The ST accounts for this TD.

**TD0650: Conformance claim sections updated to allow for MOD_VPNC_V2.3 and 2.4**

- The TD is not applicable to the evaluation. No change to ST; affects only PP conformance claims and the ST does not claim conformance to the relevant PP-Module.

**TD0664: Testing activity for FPT_TUD_EXT.2.2**

- The TD is applicable to the evaluation. No change to ST; affects only evaluation activities.

**TD0717: Format changes for PP_APP_V1.4**

- The ST accounts for this TD. No change to ST; adds Extended Component Definitions to PP to satisfy APE_ECD.1.

**TD0719: ECD for PP APP V1.3 and 1.4**

- The ST accounts for this TD. No change to ST; adds Extended Component Definitions to PP to satisfy APE_ECD.1.

**TD0736: Number of elements for iterations of FCS_HTTPS_EXT.1**

- The ST accounts for this TD. The ST includes FCS_HTTPS_EXT.1.3/Server

**TD0743: FTP_DIT_EXT.1.1 Selection exclusivity**

- The ST accounts for this TD.



© 2023 Leidos. All rights reserved

**TD0747: Configuration Storage Option for Android**

- The TD is not applicable. The TOE is not evaluated on an Android platform.

**TD0756: Update for platform-provided full disk encryption**

- The ST accounts for this TD. The TD affects the FDP_DAR_EXT.1 Test Activity.

**TD0780: FIA_X509_EXT.1 Test 4 Clarification**

- The ST accounts for this TD. The TD affects the FIA_X509_EXT.1 Test Activity.

The following NIAP Technical Decisions affecting [PKG_TLS_V1.1] apply to the TOE and have been accounted for in the ST development and the conduct of the evaluation, or were considered to be non-applicable for the reasons stated:

**TD0442: Updated TLS Ciphersuites for TLS Package**

- The TD is not applicable to the evaluation. No change to ST; affects selections in FCS_TLSC_EXT.1 and FCS_TLSS_EXT.1 that are not applicable to the TOE.

**TD0469: Modification of test activity for FCS_TLSS_EXT.1.1 test 4.1**

- The TD is applicable to the TOE. No change to ST; the TD modifies evaluation activities only.

**TD0499: Testing with pinned certificates**

- The TD is applicable to the evaluation. No change to ST; affects only evaluation activities. Additionally, the TOE does not support pinned certificates.

**TD0513: CA Certificate loading**

- The TD is applicable to the evaluation. No change to ST; affects only evaluation activities.

**TD0588: Session Resumption Support in TLS package**

- The TD is applicable to the evaluation. The ST contains FCS_TLSS_EXT.1.

**TD0726: Corrections to (D)TLSS SFRs in TLS 1.1 FP**

- The ST accounts for this TD.

**TD0739: PKG_TLS_V1.1 has 2 different publication dates**

- The ST accounts for this TD. The TD modifies the evaluation activity for FCS_TLSS_EXT.1.3, Test 1.

**TD0770: TLSS.2 connection with no client cert**

- The ST accounts for this TD.

## 1.2 SAR Evaluation

The following Security Assurance Requirements (SARs) were evaluated during the evaluation of the TOE:

| SAR | Verdict |
|---|---|
| ASE_CCL.1 | Pass |
| ASE_ECD.1 | Pass |
| ASE_INT.1 | Pass |
| ASE_OBJ.2 | Pass |



© 2023 Leidos. All rights reserved

| SAR | Verdict |
|---|---|
| ASE_REQ.2 | Pass |
| ASE_TSS.1 | Pass |
| ADV_FSP.1 | Pass |
| AGD_OPE.1 | Pass |
| AGD_PRE.1 | Pass |
| ALC_CMC.1 | Pass |
| ALC_CMS.1 | Pass |
| ALC_TSU_EXT.1 | Pass |
| ATE_IND.1 | Pass |
| AVA_VAN.1 | Pass |

The evaluation work units are listed in the proprietary ETR. The evaluators note per the PP evaluation activities that many of the SARs were successfully evaluated through completion of the associated evaluation activities present in the claimed PP and PP-Modules.

## 1.3 References


[ST] *Tenable Security Center 6.2.0 Security Target,* Version 1.1, 10 October 2023

[Test] Tenable Security Center 6.2.0 Common Criteria Test Report and Procedures, Version 1.1, 10 October 2023

[AVA] *Tenable Security Center 6.2.0 Vulnerability Assessment*, Version 1.2, 10 October 2023

[CCECG] *Tenable Security Center 6.2.0 Common Criteria Evaluated Configuration Guide (CCECG), Last Revised: September 4, 2023*




© 2023 Leidos. All rights reserved

# 2. Security Functional Requirement Evaluation Activities

This section describes the evaluation activities associated with the SFRs defined in the ST and the results of those activities as performed by the evaluation team. The evaluation activities are derived from [PP_APP_v1.4] and the [PKG_TLS_V1.1]. NIAP Technical Decisions have been applied and are identified as appropriate.

## 2.1 Cryptographic Support (FCS)

All TOE cryptographic services are implemented by the OpenSSL cryptographic library. The TOE uses OpenSSL 3.0.10. The cryptographic algorithms supplied by the TOE are NIST-validated. The following table identifies the cryptographic algorithms used by the TSF, the associated standards to which they conform, and the NIST certificates that demonstrate that the claimed conformance has been met.

| Functions | Standards | Certificates |
|---|---|---|
| **FCS_CKM.1/AK Cryptographic Asymmetric Key Generation** | | |
| ECC key pair generation (NIST curves P-256, P-384) | FIPS PUB 186-4 | A3617 |
| **FCS_CKM.2 Cryptographic Key Establishment** | | |
| ECDSA based key establishment | NIST SP 800-56A | A3617 |
| **FCS_COP.1/SKC Cryptographic Operation – Encryption/Decryption** | | |
| AES-CBC and AES-GCM (128, 256 bits) | CBC as defined in NIST SP 800-38A<br>GCM as defined in NIST SP 800-38D | A3617 |
| **FCS_COP.1/Hash Cryptographic Operation – Hashing** | | |
| SHA-256, SHA-384, and SHA-512 (digest sizes 256, 384, and 512 bits) | FIPS PUB 180-4 | A3617 |
| **FCS_COP.1/Sig Cryptographic Operation – Signing** | | |
| RSA (2048-bit or greater) | FIPS PUB 186-4, Section 4 | A3617 |
| **FCS_COP.1/KeyedHash Cryptographic Operation – Keyed Hash Message Authentication** | | |
| HMAC-SHA-256, HMAC-SHA-384, HMAC-SHA-512 | FIPS PUB 198-1<br>FIPS PUB 180-4 | A3617 |
| **FCS_RBG_EXT.2 Random Bit Generation from Application** | | |
| CTR_DRBG<br>DRBG (256 bits) | NIST SP 800-90A<br>NIST SP 800-57 | A3617 |



© 2023 Leidos. All rights reserved

### 2.1.1 FCS_CKM_EXT.1 Cryptographic Key Generation Services[1]

#### 2.1.1.1 TSS Evaluation Activity

The evaluator shall inspect the application and its developer documentation to determine if the application needs asymmetric key generation services. If not, the evaluator shall verify the "***generate no asymmetric cryptographic keys***" selection is present in the ST. Otherwise, the evaluation activities shall be performed as stated in the selection-based requirements.

The SFR states that the TOE "implements asymmetric key generation". [ST] Section 6.2 states that the TOE uses a NIST-validated implementation to generate asymmetric keys in support of TLS communications.

#### 2.1.1.2 Guidance Evaluation Activity

None.

#### 2.1.1.3 Test Evaluation Activity

None.

### 2.1.2 FCS_CKM.1/AK Cryptographic Asymmetric Key Generation

#### 2.1.2.1 TSS Evaluation Activity

The evaluator shall ensure that the TSS identifies the key sizes supported by the TOE. If the ST specifies more than one scheme, the evaluator shall examine the TSS to verify that it identifies the usage for each scheme.

If the application "invokes platform-provided functionality for asymmetric key generation," then the evaluator shall examine the TSS to verify that it describes how the key generation functionality is invoked.

The SFR states that the TOE implements cryptographic asymmetric key generation. [ST] Section 6.2 states that the TOE uses a NIST-validated implementation to generate asymmetric keys in support of TLS communications. The TOE implements ECC key pair generation using NIST curves P-256 and P-384.

#### 2.1.2.2 Guidance Evaluation Activity

The evaluator shall verify that the AGD guidance instructs the administrator how to configure the TOE to use the selected key generation scheme(s) and key size(s) for all uses defined in this PP.

The guidance provided by [CCECG] includes instructions to the administrator on how to configure the TOE to use specific TLS cipher suites, which also determines the key establishment schemes the TOE will use, and the key establishment schemes determine the key generation schemes and key sizes the TOE will use. Refer to "Additional Resources > Encryption Strength > Configure Tenable Security Center for NIAP Compliance".

#### 2.1.2.3 Test Evaluation Activity

If the application "implements asymmetric key generation," then the following test activities shall be carried out.

[1] SFR re-named by TD0717.



© 2023 Leidos. All rights reserved

*Evaluation Activity Note: The following tests may require the developer to provide access to a developer environment that provides the evaluator with tools that are typically available to end-users of the application.*

**Key Generation for FIPS PUB 186-4 RSA Schemes**

The evaluator shall verify the implementation of RSA Key Generation by the TOE using the Key Generation test. This test verifies the ability of the TSF to correctly produce values for the key components including the public verification exponent e, the private prime factors p and q, the public modulus n and the calculation of the private signature exponent d. Key Pair generation specifies 5 ways (or methods) to generate the primes p and q. These include:

1. Random Primes:

    Provable primes

    Probable primes

2. Primes with Conditions:

    Primes p1, p2, q1,q2, p and q shall all be provable primes

    Primes p1, p2, q1, and q2 shall be provable primes and p and q shall be probable primes

    Primes p1, p2, q1,q2, p and q shall all be probable primes

To test the key generation method for the Random Provable primes method and for all the Primes with Conditions methods, the evaluator must seed the TSF key generation routine with sufficient data to deterministically generate the RSA key pair. This includes the random seed(s), the public exponent of the RSA key, and the desired key length. For each key length supported, the evaluator shall have the TSF generate 25 key pairs. The evaluator shall verify the correctness of the TSF's implementation by comparing values generated by the TSF with those generated from a known good implementation.

If possible, the Random Probable primes method should also be verified against a known good implementation as described above. Otherwise, the evaluator shall have the TSF generate 10 keys pairs for each supported key length nlen and verify:

$n = p \cdot q$,

p and q are probably prime according to Miller-Rabin tests,

GCD(p-1,e) = 1,

GCD(q-1,e) = 1,

$2^{16} \leq e \leq 2^{256}$ and e is an odd integer,

$|p-q| > 2^{nlen/2} - 100$,

$p \geq 2^{nlen/2} -1/2$,

$q \geq 2^{nlen/2} -1/2$,

$2(nlen/2) < d < LCM(p-1,q-1)$,

$e \cdot d = 1 \bmod LCM(p-1,q-1)$.

**Key Generation for Elliptic Curve Cryptography (ECC)**



© 2023 Leidos. All rights reserved

FIPS 186-4 ECC Key Generation Test For each supported NIST curve, i.e., P-256, P-384 and P521, the evaluator shall require the implementation under test (IUT) to generate 10 private/public key pairs. The private key shall be generated using an approved random bit generator (RBG). To determine correctness, the evaluator shall submit the generated key pairs to the public key verification (PKV) function of a known good implementation.

FIPS 186-4 Public Key Verification (PKV) Test For each supported NIST curve, i.e., P-256, P-384 and P-521, the evaluator shall generate 10 private/public key pairs using the key generation function of a known good implementation and modify five of the public key values so that they are incorrect, leaving five values unchanged (i.e., correct). The evaluator shall obtain in response a set of 10 PASS/FAIL values.

**Key Generation for Finite-Field Cryptography (FFC)**

The evaluator shall verify the implementation of the Parameters Generation and the Key Generation for FFC by the TOE using the Parameter Generation and Key Generation test. This test verifies the ability of the TSF to correctly produce values for the field prime p, the cryptographic prime q (dividing p-1), the cryptographic group generator g, and the calculation of the private key x and public key y. The Parameter generation specifies 2 ways (or methods) to generate the cryptographic prime q and the field prime p:

Cryptographic and Field Primes:

Primes q and p shall both be provable primes

Primes q and field prime p shall both be probable primes

and two ways to generate the cryptographic group generator g:

Cryptographic Group Generator:

Generator g constructed through a verifiable process

Generator g constructed through an unverifiable process.

The Key generation specifies 2 ways to generate the private key x:

Private Key:

len(q) bit output of RBG where $1 \leq x \leq q-1$

len(q) + 64 bit output of RBG, followed by a mod q-1 operation where $1 \leq x \leq q-1$.

The security strength of the RBG must be at least that of the security offered by the FFC parameter set. To test the cryptographic and field prime generation method for the provable primes method and/or the group generator g for a verifiable process, the evaluator must seed the TSF parameter generation routine with sufficient data to deterministically generate the parameter set. For each key length supported, the evaluator shall have the TSF generate 25 parameter sets and key pairs. The evaluator shall verify the correctness of the TSF's implementation by comparing values generated by the TSF with those generated from a known good implementation. Verification must also confirm

$g \neq 0,1$

q divides p-1

$g^q \bmod p = 1$

$g^x \bmod p = y$

for each FFC parameter set and key pair.



© 2023 Leidos. All rights reserved

**Diffie-Hellman Group 14 and FFC Schemes using "safe-prime" groups**

Testing for FFC Schemes using Diffie-Hellman group 14 and/or safe-prime groups is done as part of testing in CKM.2.1.

The TOE implements ECC key pair generation (NIST curves P-256 and P-384) according to the FIPS PUB 186-4 Standard. Correct operation was verified by CAVP Certificate A3617.

### 2.1.3 FCS_CKM_EXT.1/PBKDF Password Conditioning[2]

#### 2.1.3.1 TSS Evaluation Activity

Support for PBKDF: The evaluator shall examine the password hierarchy TSS to ensure that the formation of all password based derived keys is described and that the key sizes match that described by the ST author. The evaluator shall check that the TSS describes the method by which the password/passphrase is first encoded and then fed to the SHA algorithm. The settings for the algorithm (padding, blocking, etc.) shall be described, and the evaluator shall verify that these are supported by the selections in this component as well as the selections concerning the hash function itself. The evaluator shall verify that the TSS contains a description of how the output of the hash function is used to form the submask that will be input into the function. For the NIST SP 800-132-based conditioning of the password/passphrase, the required evaluation activities will be performed when doing the evaluation activities for the appropriate requirements (FCS_COP.1.1/KeyedHash). No explicit testing of the formation of the submask from the input password is required. FCS_CKM.1.1/PBKDF: The ST author shall provide a description in the TSS regarding the salt generation. The evaluator shall confirm that the salt is generated using an RBG described in FCS_RBG_EXT.1.

[ST] Section 6.2 states that all credential data is encrypted by the TOE using AES-CBC, except for administrative credentials to the TOE, which are encrypted using PBKDF2. The TOE uses the DRBG specified in FCS_RBG_EXT.2 to generate salts that contain at least as many entropy bits as the output key length. The TOE's PBKDF2 implementation performs 10,000 iterations and outputs a 128-bit strength key. Password-based derived keys are formed using a 128-bit salt that is randomly generated by the TOE's DRBG. This is input to the PBKDF function along with the password and specified hashing algorithm, which is SHA-512.

The TOE does not maintain a key hierarchy; the TOE's usage of PBKDF is to generate a hash.

#### 2.1.3.2 Guidance Evaluation Activity

None.

#### 2.1.3.3 Test Evaluation Activity

None.

[2] SFR re-named by TD0717.



© 2023 Leidos. All rights reserved

### 2.1.4 FCS_CKM.2 Cryptographic Key Establishment

#### 2.1.4.1 TSS Evaluation Activity

The evaluator shall ensure that the supported key establishment schemes correspond to the key generation schemes identified in FCS_CKM.1.1. If the ST specifies more than one scheme, the evaluator shall examine the TSS to verify that it identifies the usage for each scheme.

The security requirement states that the TOE uses elliptic curve-based key establishment schemes. [ST] Section 6.2 states that the TOE implements the use of elliptic curves as the method of key establishment. The TSF presents secp256r1 and secp384r1 as the supported values in the Supported Groups extension and uses the same NIST curves for key establishment.

#### 2.1.4.2 Guidance Evaluation Activity

The evaluator shall verify that the AGD guidance instructs the administrator how to configure the TOE to use the selected key establishment scheme(s).

The guidance provided by [CCECG] includes instructions to the administrator on how to configure the TOE to use specific TLS cipher suites, which also determines the key establishment schemes the TOE will use. Refer to “Additional Resources > Encryption Strength > Configure Tenable Security Center for NIAP Compliance”.

#### 2.1.4.3 Test Evaluation Activity

Tests

***Evaluation Activity Note**: The following tests require the developer to provide access to a test platform that provides the evaluator with tools that are typically not found on factory products.*

**Key Establishment Schemes**

The evaluator shall verify the implementation of the key establishment schemes supported by the TOE using the applicable tests below.

**SP800-56A Key Establishment Schemes**

The evaluator shall verify a TOE's implementation of SP800-56A key agreement schemes using the following Function and Validity tests. These validation tests for each key agreement scheme verify that a TOE has implemented the components of the key agreement scheme according to the specifications in the Recommendation. These components include the calculation of the DLC primitives (the shared secret value Z) and the calculation of the derived keying material (DKM) via the Key Derivation Function (KDF). If key confirmation is supported, the evaluator shall also verify that the components of key confirmation have been implemented correctly, using the test procedures described below. This includes the parsing of the DKM, the generation of MACdata and the calculation of MACtag.

**Function Test**

The Function test verifies the ability of the TOE to implement the key agreement schemes correctly. To conduct this test the evaluator shall generate or obtain test vectors from a known good implementation of the TOE supported schemes. For each supported key agreement scheme-key agreement role combination, KDF type, and, if supported, key confirmation role- key confirmation type combination, the tester shall generate 10 sets of test vectors. The data set consists of one set of domain parameter values (FFC) or the NIST approved curve (ECC) per 10 sets of public keys. These keys are static, ephemeral or both depending on the scheme being tested.



© 2023 Leidos. All rights reserved

The evaluator shall obtain the DKM, the corresponding TOE's public keys (static and/or ephemeral), the MAC tag(s), and any inputs used in the KDF, such as the Other Information (OtherInfo) and TOE id fields.

If the TOE does not use a KDF defined in SP 800-56A, the evaluator shall obtain only the public keys and the hashed value of the shared secret.

The evaluator shall verify the correctness of the TSF's implementation of a given scheme by using a known good implementation to calculate the shared secret value, derive the keying material DKM, and compare hashes or MAC tags generated from these values.

If key confirmation is supported, the TSF shall perform the above for each implemented approved MAC algorithm.

**Validity Test**

The Validity test verifies the ability of the TOE to recognize another party's valid and invalid key agreement results with or without key confirmation. To conduct this test, the evaluator shall obtain a list of the supporting cryptographic functions included in the SP800-56A key agreement implementation to determine which errors the TOE should be able to recognize. The evaluator generates a set of 24 (FFC) or 30 (ECC) test vectors consisting of data sets including domain parameter values or NIST approved curves, the evaluator's public keys, the TOE's public/private key pairs, MACTag, and any inputs used in the KDF, such as the OtherInfo and TOE id fields.

The evaluator shall inject an error in some of the test vectors to test that the TOE recognizes invalid key agreement results caused by the following fields being incorrect: the shared secret value Z, the DKM, the OtherInfo field, the data to be MACed, or the generated MACTag. If the TOE contains the full or partial (only ECC) public key validation, the evaluator will also individually inject errors in both parties' static public keys, both parties' ephemeral public keys and the TOE's static private key to assure the TOE detects errors in the public key validation function and/or the partial key validation function (in ECC only). At least two of the test vectors shall remain unmodified and therefore should result in valid key agreement results (they should pass).

The TOE shall use these modified test vectors to emulate the key agreement scheme using the corresponding parameters. The evaluator shall compare the TOE's results with the results using a known good implementation verifying that the TOE detects these errors.

**SP800-56B Key Establishment Schemes**

The evaluator shall verify that the TSS describes whether the TOE acts as a sender, a recipient, or both for RSA-based key establishment schemes.

If the TOE acts as a sender, the following evaluation activity shall be performed to ensure the proper operation of every TOE supported combination of RSA-based key establishment scheme:

To conduct this test the evaluator shall generate or obtain test vectors from a known good implementation of the TOE supported schemes. For each combination of supported key establishment scheme and its options (with or without key confirmation if supported, for each supported key confirmation MAC function if key confirmation is supported, and for each supported mask generation function if KTS-OAEP is supported), the tester shall generate 10 sets of test vectors. Each test vector shall include the RSA public key, the plaintext keying material, any additional input parameters if applicable, the MacKey and MacTag if key confirmation is incorporated, and the outputted ciphertext. For each test vector, the evaluator shall perform a key establishment encryption operation on the TOE with the same inputs (in cases where key confirmation is incorporated, the test shall use the MacKey from the test vector



© 2023 Leidos. All rights reserved

instead of the randomly generated MacKey used in normal operation) and ensure that the outputted ciphertext is equivalent to the ciphertext in the test vector.

If the TOE acts as a receiver, the following evaluation activities shall be performed to ensure the proper operation of every TOE supported combination of RSA-based key establishment scheme:

To conduct this test the evaluator shall generate or obtain test vectors from a known good implementation of the TOE supported schemes. For each combination of supported key establishment scheme and its options (with our without key confirmation if supported, for each supported key confirmation MAC function if key confirmation is supported, and for each supported mask generation function if KTS-OAEP is supported), the tester shall generate 10 sets of test vectors. Each test vector shall include the RSA private key, the plaintext keying material (KeyData), any additional input parameters if applicable, the MacTag in cases where key confirmation is incorporated, and the outputted ciphertext. For each test vector, the evaluator shall perform the key establishment decryption operation on the TOE and ensure that the outputted plaintext keying material (KeyData) is equivalent to the plaintext keying material in the test vector. In cases where key confirmation is incorporated, the evaluator shall perform the key confirmation steps and ensure that the outputted MacTag is equivalent to the MacTag in the test vector.

The evaluator shall ensure that the TSS describes how the TOE handles decryption errors. In accordance with NIST Special Publication 800-56B, the TOE must not reveal the particular error that occurred, either through the contents of any outputted or logged error message or through timing variations. If KTS-OAEP is supported, the evaluator shall create separate contrived ciphertext values that trigger each of the three decryption error checks described in NIST Special Publication 800-56B section 7.2.2.3, ensure that each decryption attempt results in an error, and ensure that any outputted or logged error message is identical for each. If KTS-KEMKWS is supported, the evaluator shall create separate contrived ciphertext values that trigger each of the three decryption error checks described in NIST Special Publication 800-56B section 7.2.3.3, ensure that each decryption attempt results in an error, and ensure that any outputted or logged error message is identical for each.

**RSA-based key establishment**

The evaluator shall verify the correctness of the TSF's implementation of RSAES-PKCS1-v1_5 by using a known good implementation for each protocol selected in FTP_DIT_EXT.1 that uses RSAES-PKCS1-v1_5.

Diffie-Hellman Group 14

The evaluator shall verify the correctness of the TSF's implementation of Diffie-Hellman group 14 by using a known good implementation for each protocol selected in FTP_DIT_EXT.1 that uses Diffie-Hellman group 14.

**FFC Schemes using "safe-prime" groups**

The evaluator shall verify the correctness of the TSF's implementation of safe-prime groups by using a known good implementation for each protocol selected in FTP_DIT_EXT.1 that uses safe-prime groups. This test must be performed for each safe-prime group that each protocol uses.

The TOE implements ECDSA based key establishment according to the NIST SP 800-56A Standard. Correct operation was verified by CAVP Certificate A3617.



© 2023 Leidos. All rights reserved

### 2.1.5 FCS_COP.1/SKC Cryptographic Operation - Encryption/Decryption

#### 2.1.5.1 TSS Evaluation Activity

None.

#### 2.1.5.2 Guidance Evaluation Activity

The evaluator checks the AGD documents to determine that any configuration that is required to be done to configure the functionality for the required modes and key sizes is present.

As described in Section 6.2 of [ST] ("Cryptographic Support"), Tenable Security Center uses a NIST-validated implementation to perform AES encryption and decryption in support of both TLS communications and secure storage of credentials.

The guidance provided by [CCECG] includes instructions to the administrator on how to configure the TOE to use specific TLS cipher suites, which also determines the key sizes and modes for AES the TOE will use. Refer to "Additional Resources > Encryption Strength > Configure Tenable Security Center for NIAP Compliance".

#### 2.1.5.3 Test Evaluation Activity

Tests

The evaluator shall perform all of the following tests for each algorithm implemented by the TSF and used to satisfy the requirements of this PP:

**AES-CBC Known Answer Tests**

There are four Known Answer Tests (KATs), described below. In all KATs, the plaintext, ciphertext, and IV values shall be 128-bit blocks. The results from each test may either be obtained by the evaluator directly or by supplying the inputs to the implementer and receiving the results in response. To determine correctness, the evaluator shall compare the resulting values to those obtained by submitting the same inputs to a known good implementation.

**KAT-1.** To test the encrypt functionality of AES-CBC, the evaluator shall supply a set of 10 plaintext values and obtain the ciphertext value that results from AES-CBC encryption of the given plaintext using a key value of all zeros and an IV of all zeros. Five plaintext values shall be encrypted with a 128-bit all-zeros key, and the other five shall be encrypted with a 256-bit all- zeros key. To test the decrypt functionality of AES-CBC, the evaluator shall perform the same test as for encrypt, using 10 ciphertext values as input and AES-CBC decryption.

**KAT-2.** To test the encrypt functionality of AES-CBC, the evaluator shall supply a set of 10 key values and obtain the ciphertext value that results from AES-CBC encryption of an all-zeros plaintext using the given key value and an IV of all zeros. Five of the keys shall be 128-bit keys, and the other five shall be 256-bit keys. To test the decrypt functionality of AES-CBC, the evaluator shall perform the same test as for encrypt, using an all-zero ciphertext value as input and AES-CBC decryption.

**KAT-3.** To test the encrypt functionality of AES-CBC, the evaluator shall supply the two sets of key values described below and obtain the ciphertext value that results from AES encryption of an all-zeros plaintext using the given key value and an IV of all zeros. The first set of keys shall have 128 128-bit keys, and the second set shall have 256 256-bit keys. Key i in each set shall have the leftmost i bits be ones and the rightmost N-i bits be zeros, for i in [1,N]. To test the decrypt functionality of AES-CBC, the evaluator shall supply the two sets of key and ciphertext value pairs described below and obtain the plaintext value that



© 2023 Leidos. All rights reserved

results from AES-CBC decryption of the given ciphertext using the given key and an IV of all zeros. The first set of key/ciphertext pairs shall have 128 128-bit key/ciphertext pairs, and the second set of key/ciphertext pairs shall have 256 256-bit key/ciphertext pairs. Key I in each set shall have the leftmost i bits be ones and the rightmost N-i bits be zeros, for i in [1,N]. The ciphertext value in each pair shall be the value that results in an all-zeros plaintext when decrypted with its corresponding key.

**KAT-4.** To test the encrypt functionality of AES-CBC, the evaluator shall supply the set of 128 plaintext values described below and obtain the two ciphertext values that result from AES-CBC encryption of the given plaintext using a 128-bit key value of all zeros with an IV of all zeros and using a 256-bit key value of all zeros with an IV of all zeros, respectively. Plaintext value i in each set shall have the leftmost i bits be ones and the rightmost 128-I bits be zeros, for i in [1,128].

To test the decrypt functionality of AES-CBC, the evaluator shall perform the same test as for encrypt, using ciphertext values of the same form as the plaintext in the encrypt test as input and AES-CBC decryption.

**AES-CBC Multi-Block Message Test**

The evaluator shall test the encrypt functionality by encrypting an i-block message where 1 < I <= 10. The evaluator shall choose a key, an IV and plaintext message of length i blocks and encrypt the message, using the mode to be tested, with the chosen key and IV. The ciphertext shall be compared to the result of encrypting the same plaintext message with the same key and IV using a known good implementation. The evaluator shall also test the decrypt functionality for each mode by decrypting an i-block message where 1 < i <=10. The evaluator shall choose a key, an IV and a ciphertext message of length i blocks and decrypt the message, using the mode to be tested, with the chosen key and IV. The plaintext shall be compared to the result of decrypting the same ciphertext message with the same key and IV using a known good implementation. AES-CBC Monte Carlo Tests The evaluator shall test the encrypt functionality using a set of 200 plaintext, IV, and key 3- tuples. 100 of these shall use 128 bit keys, and 100 shall use 256 bit keys. The plaintext and IV values shall be 128-bit blocks. For each 3-tuple, 1000 iterations shall be run as follows:

# Input: PT, IV, Key

for i = 1 to 1000:

if i == 1:

CT[1] = AES-CBC-Encrypt(Key, IV, PT)

PT = IV

else:

CT[i] = AES-CBC-Encrypt(Key, PT)

PT = CT[i-1]

The ciphertext computed in the 1000th iteration (i.e., CT[1000]) is the result for that trial. This result shall be compared to the result of running 1000 iterations with the same values using a known good implementation.

The evaluator shall test the decrypt functionality using the same test as for encrypt, exchanging CT and PT and replacing AES-CBC-Encrypt with AES-CBC-Decrypt.

**AES-GCM Monte Carlo Tests**



© 2023 Leidos. All rights reserved

The evaluator shall test the authenticated encrypt functionality of AES-GCM for each combination of the following input parameter lengths:

128 bit and 256 bit keys

Two plaintext lengths. One of the plaintext lengths shall be a non-zero integer multiple of 128 bits, if supported. The other plaintext length shall not be an integer multiple of 128 bits, if supported.

Three AAD lengths. One AAD length shall be 0, if supported. One AAD length shall be a nonzero integer multiple of 128 bits, if supported. One AAD length shall not be an integer

multiple of 128 bits, if supported.

Two IV lengths. If 96 bit IV is supported, 96 bits shall be one of the two IV lengths tested. The evaluator shall test the encrypt functionality using a set of 10 key, plaintext, AAD, and IV tuples for each combination of parameter lengths above and obtain the ciphertext value and tag that results from AES-GCM authenticated encrypt. Each supported tag length shall be tested at least once per set of 10. The IV value may be supplied by the evaluator or the implementation being tested, as long as it is known.

The evaluator shall test the decrypt functionality using a set of 10 key, ciphertext, tag, AAD, and IV 5-tuples for each combination of parameter lengths above and obtain a Pass/Fail result on authentication and the decrypted plaintext if Pass. The set shall include five tuples that Pass and five that Fail.

The results from each test may either be obtained by the evaluator directly or by supplying the inputs to the implementer and receiving the results in response. To determine correctness, the evaluator shall compare the resulting values to those obtained by submitting the same inputs to a known good implementation.

**AES-XTS Tests**

The evaluator shall test the encrypt functionality of XTS-AES for each combination of the following input parameter lengths:

256 bit (for AES-128) and 512 bit (for AES-256) keys

Three data unit (i.e., plaintext) lengths. One of the data unit lengths shall be a non-zero integer multiple of 128 bits, if supported. One of the data unit lengths shall be an integer multiple of 128 bits, if supported. The third data unit length shall be either the longest supported data unit length or 216 bits, whichever is smaller.

Using a set of 100 (key, plaintext and 128-bit random tweak value) 3-tuples and obtain the

ciphertext that results from XTS-AES encrypt.

The evaluator may supply a data unit sequence number instead of the tweak value if the implementation supports it. The data unit sequence number is a base-10 number ranging between 0 and 255 that implementations convert to a tweak value internally.

The evaluator shall test the decrypt functionality of XTS-AES using the same test as for encrypt, replacing plaintext values with ciphertext values and XTS-AES encrypt with XTS-AES decrypt. AES-CCM Tests It is not recommended that evaluators use values obtained from static sources such as http://csrc.nist.gov/groups/STM/cavp/documents/mac/ccmtestvectors.zip or use values not generated expressly to exercise the AES-CCM implementation.

The evaluator shall test the generation-encryption and decryption-verification functionality of AES-CCM for the following input parameter and tag lengths:



© 2023 Leidos. All rights reserved

Keys: All supported and selected key sizes (e.g., 128, 256 bits).

Associated Data: Two or three values for associated data length: The minimum (≥ 0 bytes) and maximum (≤ 32 bytes) supported associated data lengths, and 2^16 (65536) bytes, if supported.

Payload: Two values for payload length: The minimum (≥ 0 bytes) and maximum (≤ 32 bytes) supported payload lengths.

Nonces: All supported nonce lengths (7, 8, 9, 10, 11, 12, 13) in bytes.

Tag: All supported tag lengths (4, 6, 8, 10, 12, 14, 16) in bytes.

The testing for CCM consists of five tests. To determine correctness in each of the below tests, the evaluator shall compare the ciphertext with the result of encryption of the same inputs with a known good implementation.

**Variable Associated Data Test**

For each supported key size and associated data length, and any supported payload length, nonce length, and tag length, the evaluator shall supply one key value, one nonce value, and 10 pairs of associated data and payload values, and obtain the resulting ciphertext.

**Variable Payload Test**

For each supported key size and payload length, and any supported associated data length, nonce length, and tag length, the evaluator shall supply one key value, one nonce value, and 10 pairs of associated data and payload values, and obtain the resulting ciphertext.

**Variable Nonce Test**

For each supported key size and nonce length, and any supported associated data length, payload length, and tag length, the evaluator shall supply one key value, one nonce value, and 10 pairs of associated data and payload values, and obtain the resulting ciphertext.

**Variable Tag Test**

For each supported key size and tag length, and any supported associated data length, payload length, and nonce length, the evaluator shall supply one key value, one nonce value, and 10 pairs of associated data and payload values, and obtain the resulting ciphertext.

**Decryption-Verification Process Test**

To test the decryption-verification functionality of AES-CCM, for each combination of supported associated data length, payload length, nonce length, and tag length, the evaluator shall supply a key value and 15 sets of input plus ciphertext, and obtain the decrypted payload. Ten of the 15 input sets supplied should fail verification and five should pass.

**AES-CTR Tests**

**Test 1: Known Answer Tests (KATs)**

There are four Known Answer Tests (KATs) described below. For all KATs, the plaintext, IV, and ciphertext values shall be 128-bit blocks. The results from each test may either be obtained by the validator directly or by supplying the inputs to the implementer and receiving the results in response. To determine correctness, the evaluator shall compare the resulting values to those obtained by submitting the same inputs to a known good implementation.



© 2023 Leidos. All rights reserved

To test the encrypt functionality, the evaluator shall supply a set of 10 plaintext values and obtain the ciphertext value that results from encryption of the given plaintext using a key value of all zeros and an IV of all zeros. Five plaintext values shall be encrypted with a 128-bit all zeros key, and the other five shall be encrypted with a 256-bit all zeros key. To test the decrypt functionality, the evaluator shall perform the same test as for encrypt, using 10 ciphertext values as input.

To test the encrypt functionality, the evaluator shall supply a set of 10 key values and obtain the ciphertext value that results from encryption of an all zeros plaintext using the given key value and an IV of all zeros. Five of the key values shall be 128-bit keys, and the other five shall be 256-bit keys. To test the decrypt functionality, the evaluator shall perform the same test as for encrypt, using an all zero ciphertext value as input.

To test the encrypt functionality, the evaluator shall supply the two sets of key values described below and obtain the ciphertext values that result from AES encryption of an all zeros plaintext using the given key values an IV of all zeros. The first set of keys shall have 128 128-bit keys, and the second shall have 256 256-bit keys. Key_i in each set shall have the leftmost i bits be ones and the rightmost N-i bits be zeros, for i in [1, N]. To test the decrypt functionality, the evaluator shall supply the two sets of key and ciphertext value pairs described below and obtain the plaintext value that results from decryption of the given ciphertext using the given key values and an IV of all zeros. The first set of key/ciphertext pairs shall have 128 128-bit key/ciphertext pairs, and the second set of key/ciphertext pairs shall have 256 256-bit pairs. Key_i in each set shall have the leftmost i bits be ones and the rightmost N-i bits be zeros for i in [1, N]. The ciphertext value in each pair shall be the value that results in an all zeros plaintext when decrypted with its corresponding key.

To test the encrypt functionality, the evaluator shall supply the set of 128 plaintext values described below and obtain the two ciphertext values that result from encryption of the given plaintext using a 128-bit key value of all zeros and using a 256 bit key value of all zeros, respectively, and an IV of all zeros. Plaintext value i in each set shall have the leftmost bits be ones and the rightmost 128-i bits be zeros, for i in [1, 128]. To test the decrypt functionality, the evaluator shall perform the same test as for encrypt, using ciphertext values of the same form as the plaintext in the encrypt test as input.

**Test 2: Multi-Block Message Test**

The evaluator shall test the encrypt functionality by encrypting an i-block message where 1 less than i less-than-or-equal to 10. For each i the evaluator shall choose a key, IV, and plaintext message of length i blocks and encrypt the message, using the mode to be tested, with the chosen key. The ciphertext shall be compared to the result of encrypting the same plaintext message with the same key and IV using a known good implementation. The evaluator shall also test the decrypt functionality by decrypting an i-block message where 1 less-than i less-than-or-equal to 10. For each I the evaluator shall choose a key and a ciphertext message of length i blocks and decrypt the message, using the mode to be tested, with the chosen key. The plaintext shall be compared to the result of decrypting the same ciphertext message with the same key using a known good implementation.

**Test 3: Monte-Carlo Test**

For AES-CTR mode perform the Monte Carlo Test for ECB Mode on the encryption engine of the counter mode implementation. There is no need to test the decryption engine.

The evaluator shall test the encrypt functionality using 200 plaintext/key pairs. 100 of these shall use 128 bit keys, and 100 of these shall use 256 bit keys. The plaintext values shall be 128-bit blocks. For each pair, 1000 iterations shall be run as follows:



© 2023 Leidos. All rights reserved

For AES-ECB mode # Input: PT, Key for i = 1 to 1000: CT[i] = AES-ECB-Encrypt(Key, PT) PT = CT[i] The ciphertext computed in the $100^{0t}$h iteration is the result for that trial. This result shall be compared to the result of running 1000 iterations with the same values using a known good implementation.

The TOE implements AES-CBC (128, 256 bits) as defined in NIST SP 800-38A. The TOE implements AES-GCM (128, 256 bits) as defined in NIST SP 800-38D. The correct operation of both algorithms was verified by CAVP Certificate A3617.

### 2.1.6 FCS_COP.1/Hash Cryptographic Operation - Hashing

#### 2.1.6.1 TSS Evaluation Activity

The evaluator shall check that the association of the hash function with other application cryptographic functions (for example, the digital signature verification function) is documented in the TSS.

[ST] Section 6.2 states that the TOE uses a NIST-validated implementation to perform cryptographic hashing in support of TLS communications and password-based key derivation.

The TOE implements the SHA-512 hashing algorithm in the PBKDF function.

The TLS client implementation supports the following TLS cipher suites in the TOE's evaluated configuration:

- TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256
- TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384
- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384

The TLS ciphersuites implement SHA-256 and SHA-384.

#### 2.1.6.2 Guidance Evaluation Activity

None.

#### 2.1.6.3 Test Evaluation Activity

Tests

The TSF hashing functions can be implemented in one of two modes. The first mode is the byte-oriented mode. In this mode the TSF hashes only messages that are an integral number of bytes in length; i.e., the length (in bits) of the message to be hashed is divisible by 8. The second mode is the bit-oriented mode. In this mode the TSF hashes messages of arbitrary length. As there are different tests for each mode, an indication is given in the following sections for the bit-oriented vs. the byte-oriented testmacs. The evaluator shall perform all of the following tests for each hash algorithm implemented by the TSF and used to satisfy the requirements of this PP.

The following tests require the developer to provide access to a test application that provides the evaluator with tools that are typically not found in the production application.

**Test 1: Short Messages Test - Bit oriented Mode**. The evaluators devise an input set consisting of m+1 messages, where m is the block length of the hash algorithm. The length of the messages range sequentially from 0 to m bits. The message text shall be pseudorandomly generated. The evaluators



© 2023 Leidos. All rights reserved

compute the message digest for each of the messages and ensure that the correct result is produced when the messages are provided to the TSF.

**Test 2: Short Messages Test - Byte oriented Mode.** The evaluators devise an input set consisting of m/8+1 messages, where m is the block length of the hash algorithm. The length of the messages range sequentially from 0 to m/8 bytes, with each message being an integral number of bytes. The message text shall be pseudorandomly generated. The evaluators compute the message digest for each of the messages and ensure that the correct result is produced when the messages are provided to the TSF.

**Test 3: Selected Long Messages Test - Bit oriented Mode.** The evaluators devise an input set consisting of m messages, where m is the block length of the hash algorithm. The length of the ith message is 512 + 99*i, where 1 ≤ i ≤ m. The message text shall be pseudorandomly generated. The evaluators compute the message digest for each of the messages and ensure that the correct result is produced when the messages are provided to the TSF.

**Test 4: Selected Long Messages Test - Byte oriented Mode**. The evaluators devise an input set consisting of m/8 messages, where m is the block length of the hash algorithm. The length of the ith message is 512 + 8*99*i, where 1 ≤ i ≤ m/8. The message text shall be pseudorandomly generated. The evaluators compute the message digest for each of the messages and ensure that the correct result is produced when the messages are provided to the TSF.

**Test 5: Pseudorandomly Generated Messages Test.** This test is for byte-oriented implementations only. The evaluators randomly generate a seed that is n bits long, where n is the length of the message digest produced by the hash function to be tested. The evaluators then formulate a set of 100 messages and associated digests by following the algorithm provided in Figure 1 of [SHAVS]. The evaluators then ensure that the correct result is produced when the messages are provided to the TSF.

The TOE implements SHA-256, SHA-384, and SHA-512 (digest sizes 256, 384 bits, and 512 bits) according to the FIPS PUB 180-4 Standard. The correct operation of both algorithms was verified by CAVP Certificate A3617.

### 2.1.7 FCS_COP.1/Sig Cryptographic Operation - Signing

#### 2.1.7.1 TSS Evaluation Activity

None.

#### 2.1.7.2 Guidance Evaluation Activity

None.

#### 2.1.7.3 Test Evaluation Activity

Tests

The following tests require the developer to provide access to a test application that provides the evaluator with tools that are typically not found in the production application.

**ECDSA Algorithm Tests**

**Test 1: ECDSA FIPS 186-4 Signature Generation Test.** For each supported NIST curve (i.e., P-256, P-384 and P-521) and SHA function pair, the evaluator shall generate 10 1024-bit long messages and obtain for each message a public key and the resulting signature values R and S. To determine correctness, the evaluator shall use the signature verification function of a known good implementation.



© 2023 Leidos. All rights reserved

**Test 2: ECDSA FIPS 186-4 Signature Verification Test.** For each supported NIST curve (i.e., P-256, P-384 and P-521) and SHA function pair, the evaluator shall generate a set of 10 1024-bit message, public key and signature tuples and modify one of the values (message, public key or signature) in five of the 10 tuples. The evaluator shall obtain in response a set of 10 PASS/FAIL values.

**RSA Signature Algorithm Tests**

**Test 1: Signature Generation Test.** The evaluator shall verify the implementation of RSA Signature Generation by the TOE using the Signature Generation Test. To conduct this test the evaluator must generate or obtain 10 messages from a trusted reference implementation for each modulus size/SHA combination supported by the TSF. The evaluator shall have the TOE use their private key and modulus value to sign these messages. The evaluator shall verify the correctness of the TSF's signature using a known good implementation and the associated public keys to verify the signatures.

**Test 2: Signature Verification Test.** The evaluator shall perform the Signature Verification test to verify the ability of the TOE to recognize another party's valid and invalid signatures. The evaluator shall inject errors into the test vectors produced during the Signature Verification Test by introducing errors in some of the public keys, e, messages, IR format, and/or signatures. The TOE attempts to verify the signatures and returns success or failure.

The TOE implements RSA Signature Generation and Verification (2048-bit or greater) according to FIPS PUB 186-4, Section 4. Correct operation was verified by CAVP Certificate A3617.

### 2.1.8 FCS_COP.1/KeyedHash Cryptographic Operation - Keyed-Hash Message Authentication

#### 2.1.8.1 TSS Evaluation Activity

None.

#### 2.1.8.2 Guidance Evaluation Activity

None.

#### 2.1.8.3 Test Evaluation Activity

Tests

For each of the supported parameter sets, the evaluator shall compose 15 sets of test data. Each set shall consist of a key and message data. The evaluator shall have the TSF generate HMAC tags for these sets of test data. The resulting MAC tags shall be compared to the result of generating HMAC tags with the same key and IV using a known-good implementation.

The TOE implements Keyed Hash Message Authentication using HMAC-SHA-256, HMAC-SHA-384, and HMAC-SHA-512 according to FIPS PUB 198-1 and FIPS PUB 180-4 standards. Correct operation was verified by CAVP Certificate A3617.

### 2.1.9 FCS_HTTPS_EXT.1/Client HTTPS Protocol

#### 2.1.9.1 TSS Evaluation Activity

**FCS_HTTPS_EXT.1.1/Client**

The evaluator shall examine the TSS and determine that enough detail is provided to explain how the implementation complies with RFC 2818.



© 2023 Leidos. All rights reserved

**FCS_HTTPS_EXT.1.2/Client**

None

**FCS_HTTPS_EXT.1.3/Client**

None

[ST] Section 6.2 states that the TOE uses TLS client functionality for communications between the TOE and other Tenable applications in the operational environment. All communications between the TOE and Nessus and between the TOE and NNM use mutually-authenticated TLS, while outbound communications to LCE and to the operational environment do not.

The TOE's implementation of HTTPS conforms to RFC 2818. Regardless of whether the TOE is acting as a client or a server for HTTPS, the connection will be rejected if certificate validation fails.

#### 2.1.9.2 Guidance Evaluation Activity

None.

#### 2.1.9.3 Test Evaluation Activity

Tests

**FCS_HTTPS_EXT.1.1/Client**

The evaluator shall attempt to establish an HTTPS connection with a webserver, observe the traffic with a packet analyzer, and verify that the connection succeeds and that the traffic is identified as TLS or HTTPS.

**FCS_HTTPS_EXT.1.2/Client**

Other tests are performed in conjunction with the TLS package.

**FCS_HTTPS_EXT.1.3/Client**

Certificate validity shall be tested in accordance with testing performed for FIA_X509_EXT.1, and the evaluator shall perform the following test:

**Test 1:** The evaluator shall demonstrate that using a certificate without a valid certification path results in the selected action in the SFR. If "notify the user" is selected in the SFR, then the evaluator shall also determine that the user is notified of the certificate validation failure. Using the administrative guidance, the evaluator shall then load a certificate or certificates to the Trust Anchor Database needed to validate the certificate to be used in the function, and demonstrate that the function succeeds. The evaluator then shall delete one of the certificates, and show that again, using a certificate without a valid certification path results in the selected action in the SFR, and if "notify the user" was selected in the SFR, the user is notified of the validation failure.

This test was performed in conjunction with FIA_X509_EXT.1.1. The tests for that SFR require the TOE to refuse to establish a connection when an invalid certificate validation path is present. They also require the TOE to establish a connection when a certificate can be successfully validated.

### 2.1.10 FCS_HTTPS_EXT.1/Server HTTPS Protocol

#### 2.1.10.1 TSS Evaluation Activity

**FCS_HTTPS_EXT.1.1/Server**



© 2023 Leidos. All rights reserved

The evaluator shall examine the TSS and determine that enough detail is provided to explain how the implementation complies with RFC 2818.

**FCS_HTTPS_EXT.1.2/Server**

None

**FCS_HTTPS_EXT.1.3/Server**

None

The TOE uses TLS server functionality for communications from remote administrators to its Web GUI interface. Mutual authentication is supported for this interface. As with TLS server certificates, the CN and SAN of the client certificate are validated for this interface.

The TOE's implementation of HTTPS conforms to RFC 2818. Regardless of whether the TOE is acting as a client or a server for HTTPS, the connection will be rejected if certificate validation fails.

#### 2.1.10.2 Guidance Evaluation Activity

None.

#### 2.1.10.3 Test Evaluation Activity

Tests

**FCS_HTTPS_EXT.1.1/Server**

The evaluator shall attempt to establish an HTTPS connection to the TOE using a client, observe the traffic with a packet analyzer, and verify that the connection succeeds and that the traffic is identified as TLS or HTTPS.

This test was performed in conjunction with FCS_TLSS_EXT.1.1. The tests for that evaluation activity test demonstrated that the TOE was capable of establishing a connection and that all traffic was protected by TLS.

**FCS_HTTPS_EXT.1.2/Server**

Other tests are performed in conjunction with the TLS package.

This test was performed in conjunction with FCS_TLSS_EXT.1.1.

**FCS_HTTPS_EXT.1.3/Server**

**Modified per TD0736**

Other tests are performed in conjunction with the TLS Functional Package, FCS_HTTPS_EXT.2 (dependent on selections in FTP_DIT_EXT.1), and FIA_X509_EXT.1.

Other tests are performed in conjunction with the TLS Functional Package, FCS_HTTPS_EXT.2 (dependent on selections in FTP_DIT_EXT.1), and FIA_X509_EXT.1.

### 2.1.11 FCS_HTTPS_EXT.2 HTTPS Protocol with Mutual Authentication

#### 2.1.11.1 TSS Evaluation Activity

None.



© 2023 Leidos. All rights reserved

#### 2.1.11.2 Guidance Evaluation Activity

None.

#### 2.1.11.3 Test Evaluation Activity

Tests

Certificate validity shall be tested in accordance with testing performed for FIA_X509_EXT.1, and the evaluator shall perform the following test:

**Test 1:** The evaluator shall demonstrate that using a certificate without a valid certification path results in the selected action in the SFR. Using the administrative guidance, the evaluator shall then load a certificate or certificates to the Trust Anchor Database needed to validate the certificate to be used in the function, and demonstrate that the function succeeds. The evaluator then shall delete one of the certificates, and show that again, using a certificate without a valid certification path results in the selected action in the SFR.

This test was performed in conjunction with FIA_X509_EXT.1.1. The tests for that SFR require the TOE to refuse to establish a connection when an invalid certificate validation path is present. They also require the TOE to establish a connection when a certificate can be successfully validated.

### 2.1.12 FCS_RBG_EXT.1 Random Bit Generation Services

#### 2.1.12.1 TSS Evaluation Activity

If ***use no DRBG functionality*** is selected, the evaluator shall inspect the application and its developer documentation and verify that the application needs no random bit generation services.

If ***implement DRBG functionality*** is selected, the evaluator shall ensure that additional FCS_RBG_EXT.2 elements are included in the ST.

If ***invoke platform-provided DRBG functionality*** is selected, the evaluator performs the following activities. The evaluator shall examine the TSS to confirm that it identifies all functions (as described by the SFRs included in the ST) that obtain random numbers from the platform RBG. The evaluator shall determine that for each of these functions, the TSS states which platform interface (API) is used to obtain the random numbers. The evaluator shall confirm that each of these interfaces corresponds to the acceptable interfaces listed for each platform below.

It should be noted that there is no expectation that the evaluators attempt to confirm that the APIs are being used “correctly” for the functions identified in the TSS; the activity is to list the used APIs and then do an existence check via decompilation.

FCS_RBG_EXT.1.1 includes “implement DRBG functionality”. As a result, the additional FCS_RBG_EXT.2 elements are included in the ST.

#### 2.1.12.2 Guidance Evaluation Activity

None.



© 2023 Leidos. All rights reserved

#### 2.1.12.3 Test Evaluation Activity

If ***invoke platform-provided DRBG functionality*** is selected, the following tests shall be performed:

The evaluator shall decompile the application binary using a decompiler suitable for the application (TOE). The evaluator shall search the output of the decompiler to determine that, for each API listed in the TSS, that API appears in the output. If the representation of the API does not correspond directly to the strings in the following list, the evaluator shall provide a mapping from the decompiled text to its corresponding API, with a description of why the API text does not directly correspond to the decompiled text and justification that the decompiled text corresponds to the associated API.

**Linux**: The evaluator shall verify that the application collects random from `/dev/random` or `/dev/urandom`.

If invocation of platform-provided functionality is achieved in another way, the evaluator shall ensure the TSS describes how this is carried out, and how it is equivalent to the methods listed here (e.g. higher-level API invokes identical low-level API).

The [ST] selects “implement DRBG functionality” therefore, this test is Not Applicable.

### 2.1.13 FCS_RBG_EXT.2 Random Bit Generation from Application

#### 2.1.13.1 TSS Evaluation Activity

Documentation shall be produced - and the evaluator shall perform the activities - in accordance with Appendix C - Entropy Documentation and Assessment and the Clarification to the Entropy Documentation and Assessment Annex.

The vendor completed the Tenable Security Center Common Criteria Entropy Assessment Report.

#### 2.1.13.2 Guidance Evaluation Activity

None.

#### 2.1.13.3 Test Evaluation Activity

Tests

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

*Implementations Conforming to FIPS 140-2 Annex C.*

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

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

**Test 2**: The evaluators shall perform a Monte Carlo Test. For this test, they supply an initial Seed and DT value to the TSF RBG function; each of these is 128 bits. The evaluators shall also provide a key (of the length appropriate to the AES algorithm) that is constant throughout the test. The evaluators then invoke



© 2023 Leidos. All rights reserved

the TSF RBG 10,000 times, with the DT value being incremented by 1 on each iteration, and the new seed for the subsequent iteration produced as specified in NIST-Recommended Random Number Generator Based on ANSI X9.31 Appendix A.2.4 Using the 3-Key Triple DES and AES Algorithms, Section E.3. The evaluators ensure that the 10,000th value produced matches the expected value.

*Implementations Conforming to NIST Special Publication 800-90A*

**Test 1:** The evaluator shall perform 15 trials for the RNG implementation. If the RNG is configurable, the evaluator shall perform 15 trials for each configuration. The evaluator shall also confirm that the operational guidance contains appropriate instructions for configuring the RNG functionality.

If the RNG has prediction resistance enabled, each trial consists of (1) instantiate DRBG, (2) generate the first block of random bits (3) generate a second block of random bits (4) uninstantiate. The evaluator verifies that the second block of random bits is the expected value. The evaluator shall generate eight input values for each trial. The first is a count (0 – 14). The next three are entropy input, nonce, and personalization string for the instantiate operation. The next two are additional input and entropy input for the first call to generate.

The final two are additional input and entropy input for the second call to generate. These values are randomly generated. “generate one block of random bits” means to generate random bits with number of returned bits equal to the Output Block Length (as defined in NIST SP 800-90A).

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

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

**Entropy input:** the length of the entropy input value must equal the seed length.

**Nonce:** If a nonce is supported (CTR_DRBG with no Derivation Function does not use a nonce), the nonce bit length is one-half the seed length.

**Personalization string:** The length of the personalization string must be less then or equal to seed length. If the implementation only supports one personalization string length, then the same length can be used for both values. If more than one string length is support, the evaluator shall use personalization strings of two different lengths. If the implementation does not use a personalization string, no value needs to be supplied.

**Additional input:** the additional input bit lengths have the same defaults and restrictions as the personalization string lengths.

In the future, specific statistical testing (in line with NIST SP 800-90B) will be required to verify

the entropy estimates.

The TOE implements Random Bit Generation CTR_DRBG (256 bits) according to NIST SP 800-90A and NIST SP 800-57 standards. Correct operation was verified by CAVP Certificate A3617.



© 2023 Leidos. All rights reserved

### 2.1.14 FCS_STO_EXT.1 Storage of Credentials

#### 2.1.14.1 TSS Evaluation Activity

The evaluator shall check the TSS to ensure that it lists all persistent credentials (secret keys, PKI private keys, or passwords) needed to meet the requirements in the ST. For each of these items, the evaluator shall confirm that the TSS lists for what purpose it is used, and how it is stored.

[ST] Section 6.2 states that the TOE also uses OpenSSL to secure credential data at rest. Specifically, the TOE stores the following credentials:

- Web GUI authentication credentials: username and hashed password data for locally-defined users.
- Authenticated scanning credentials: operating system credential data that is stored by the TOE and used to perform authenticated scanning of remote systems.
- Passphrases for certificate encryption: used to encrypt PKI certificates that the TOE uses for communications with remote administrators and with the environmental Tenable applications when using TLS mutual authentication.

All credential data is encrypted by the TOE using AES-CBC, except for administrative credentials to the TOE, which are encrypted using PBKDF2.

#### 2.1.14.2 Guidance Evaluation Activity

None.

#### 2.1.14.3 Test Evaluation Activity

For all credentials for which the application implements functionality, the evaluator shall verify credentials are encrypted according to FCS_COP.1/SKC or conditioned according to FCS_CKM.1.1/AK and FCS_CKM.1/PBKDF. For all credentials for which the application invokes platform-provided functionality, the evaluator shall perform the following actions which vary per platform.

**Platforms: Linux**… The evaluator shall verify that all keys are stored using Linux keyrings.

The TOE implements the functionality of FCS_COP.1/SKC and FCS_CKM_EXT.1/PBKDF to securely store credentials.

The evaluator searched the files that were known to be used by the TOE for credential storage. A search for keys used showed that none came up.

### 2.1.15 FCS_TLS_EXT.1 TLS Protocol (TLS Package)

#### 2.1.15.1 TSS Evaluation Activity

None.

#### 2.1.15.2 Guidance Evaluation Activity

The evaluator shall ensure that the selections indicated in the ST are consistent with selections in the dependent components.

In Section 5.2.1.15 of [ST] (“FCS_TLS_EXT.1 TLS Protocol”), “TLS as a client” and “TLS as a server” are selected in FCS_TLS_EXT.1.1. The ST includes FCS_TLSS_EXT.1 and FCS_TLSC_EXT.1 from the selection-based requirements in [FPTLS], consistent with the selections made in FCS_TLS_EXT.1.1.



© 2023 Leidos. All rights reserved

#### 2.1.15.3 Test Evaluation Activity

None.

### 2.1.16 FCS_TLSC_EXT.1 TLS Client Protocol (TLS Package)

#### 2.1.16.1 TSS Evaluation Activity

**FCS_TLSC_EXT.1.1**
The evaluator shall check the description of the implementation of this protocol in the TSS to ensure that the cipher suites supported are specified. The evaluator shall check the TSS to ensure that the cipher suites specified include those listed for this component.

[ST] Section 6.2 identifies the supported cipher suites.

The TLS client implementation supports the following TLS cipher suites in the TOE's evaluated configuration:

- TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256
- TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384
- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384

The ciphersuites identified in the TSS agree with those identified in the SFR.

**FCS_TLSC_EXT.1.2**
The evaluator shall ensure that the TSS describes the client's method of establishing all reference identifiers from the application-configured reference identifier, including which types of reference identifiers are supported (e.g. Common Name, DNS Name, URI Name, Service Name, or other application-specific Subject Alternative Names) and whether IP addresses and wildcards are supported. The evaluator shall ensure that this description identifies whether and the manner in which certificate pinning is supported or used by the product.

[ST] Section 6.2 states that as part of certificate validation in the establishment of TLS connectivity, the TOE will validate the reference identifier of a presented server certificate. This is done through validation of the Common Name (CN) and Subject Alternative Name (SAN) certificate fields, the latter of which is expected to contain the FQDN of the external system that is presenting the certificate to the TOE. The reference identifier is established by configuration. IP addresses are not supported. Wildcards are only supported for the left-most label immediately preceding the public suffix. Certificate pinning is not supported.

**FCS_TLSC_EXT.1.3**
If the selection for authorizing override of invalid certificates is made, then the evaluator shall ensure that the TSS includes a description of how and when user or administrator authorization is obtained. The evaluator shall also ensure that the TSS describes any mechanism for storing such authorizations, such that future presentation of such otherwise-invalid certificates permits establishment of a trusted channel without user or administrator action.

[ST] Section 6.2 states that the connection will be rejected if certificate validation fails.



© 2023 Leidos. All rights reserved

#### 2.1.16.2 Guidance Evaluation Activity

**FCS_TLSC_EXT.1.1**
The evaluator shall also check the operational guidance to ensure that it contains instructions on configuring the product so that TLS conforms to the description in the TSS.

The guidance provided by [CCECG] describes how to configure the TOE such that TLS conforms to the description in the TSS. Refer to "Additional Resources > Encryption Strength > Configure Tenable Security Center for NIAP Compliance".

**FCS_TLSC_EXT.1.2**
The evaluator shall verify that the AGD guidance includes instructions for setting the reference identifier to be used for the purposes of certificate validation in TLS.

Section 6.4 of [ST] ("Identification and Authentication") states the TOE uses X.509 certificates for authentication of trusted communications. The specific circumstances where the TOE validates a presented server certificate are as follows: validation of administrator TLS client certificate; and validation of TLS server certificates for environmental Tenable applications (i.e., Nessus Manager and NNM).

The guidance provided by [CCECG] includes instructions to the administrator for setting the reference identifier to be used for TLS certificate validation.

For instructions on configuring the reference identifier (IP address or hostname) of a Nessus Manager server, refer to "Configure Scans > Resources > Nessus Scanners".

For instructions on configuring the reference identifier (IP address or hostname) of a Nessus Network Monitor server, refer to "Configure Scans > Resources > Nessus Network Monitor Instances > Add a Nessus Network Monitor Instance".

#### 2.1.16.3 Test Evaluation Activity

**FCS_TLSC_EXT.1.1**
The evaluator shall also perform the following tests:

**Test 1**: The evaluator shall establish a TLS connection using each of the cipher suites specified by the requirement. This connection may be established as part of the establishment of a higher-level protocol, e.g., as part of an EAP session. It is sufficient to observe the successful negotiation of a cipher suite to satisfy the intent of the test; it is not necessary to examine the characteristics of the encrypted traffic in an attempt to discern the cipher suite being used (for example, that the cryptographic algorithm is 128-bit AES and not 256-bit AES).

The evaluator verified that the TOE could successfully complete a TLS connection to a TLS Server selecting each of the claimed ciphersuites.

**Test 2:** The goal of the following test is to verify that the TOE accepts only certificates with appropriate values in the extendedKeyUsage extension, and implicitly that the TOE correctly parses the extendedKeyUsage extension as part of X.509v3 server certificate validation.

The evaluator shall attempt to establish the connection using a server with a server certificate that contains the Server Authentication purpose in the extendedKeyUsage extension and verify that a connection is established. The evaluator shall repeat this test using a different, but otherwise valid and trusted, certificate that lacks the Server Authentication purpose in the extendedKeyUsage extension and ensure that a connection is not established. Ideally, the two certificates should be similar in structure, the types of identifiers used, and the chain of trust.



© 2023 Leidos. All rights reserved

The evaluator verified that the TOE successfully completed a TLS connection when the presented server certificate contained the ServerAuthentication EKU and rejected connections when the presented server certificate lacked the ServerAuthentication EKU.

**Test 3:** The evaluator shall send a server certificate in the TLS connection that does not match the server-selected cipher suite (for example, send a ECDSA certificate while using the TLS_RSA_WITH_AES_128_CBC_SHA cipher suite or send a RSA certificate while using one of the ECDSA cipher suites.) The evaluator shall verify that the product disconnects after receiving the server's Certificate handshake message.

The evaluator verified that the TOE rejected connections when the certificate type presented does not match that specified by the ciphersuite.

**Test 4:** The evaluator shall configure the server to select the TLS_NULL_WITH_NULL_NULL cipher suite and verify that the client denies the connection.

The evaluator verified that the TOE rejected connection attempts when the Server selects the 'TLS_NULL_WITH_NULL_NULL' ciphersuite in the ServerHello.

**Test 5:** The evaluator shall perform the following modifications to the traffic:

**Test 5.1:** Change the TLS version selected by the server in the Server Hello to an undefined TLS version (for example 1.5 represented by the two bytes 03 06) and verify that the client rejects the connection.

The evaluator verified that the TOE rejected connection attempts when the ServerHello contains an undefined TLS version, specifically that of an anticipated TLS 1.5 using the bytes (0x03, 0x06).

**Test 5.2:** Change the TLS version selected by the server in the Server Hello to the most recent unsupported TLS version (for example 1.1 represented by the two bytes 03 02) and verify that the client rejects the connection.

The evaluator verified that the TOE rejects connection attempts when the ServerHello presents the most recent unsupported TLS version, specifically TLS 1.1 as represented by (0x03, 0x02).

**Test 5.3:** [conditional] If DHE or ECDHE cipher suites are supported, modify at least one byte in the server's nonce in the Server Hello handshake message, and verify that the client does not complete the handshake and no application data flows.

The evaluator verified that the TOE validates the signature of the Server's ServerKeyExchange record and if the signature is not calculated correctly that the TOE rejects the connection. Specifically, the Server's ServerHello.Random value is modified locally to the server prior to calculating the ServerKeyExchange signature. Thus, causing the signature of the ServerKeyExchange to be computed differently than the Client would calculate the Signature.

**Test 5.4:** Modify the server's selected cipher suite in the Server Hello handshake message to be a cipher suite not presented in the Client Hello handshake message. The evaluator shall verify that the client does not complete the handshake and no application data flows.

The evaluator verified that the TOE rejected Server ServerHello records that select a ciphersuite not offered by the TOE.

**Test 5.5:** [conditional] If DHE or ECDHE cipher suites are supported, modify the signature block in the server's Key Exchange handshake message, and verify that the client does not complete the handshake



© 2023 Leidos. All rights reserved

and no application data flows. This test does not apply to cipher suites using RSA key exchange. If a TOE only supports RSA key exchange in conjunction with TLS, then this test shall be omitted.

The evaluator verified that the TOE validates the signature of the Server's ServerKeyExchange record and if the signature is not calculated correctly that the TOE rejects the connection.

**Test 5.6:** Modify a byte in the Server Finished handshake message, and verify that the client does not complete the handshake and no application data flows.

The evaluator verified that the TOE rejects connection attempts if the Server Finished record does not have correct VerifyData.

**Test 5.7:** Send a message consisting of random bytes from the server after the server has issued the Change Cipher Spec message and verify that the client does not complete the handshake and no application data flows. The message must still have a valid 5-byte record header in order to ensure the message will be parsed as TLS.

The evaluator verified that if the server does not send the Finished record immediately after the Change Cipher Spec and instead sends random data instead, that the TOE rejects the connection attempt and no application data flows.

**FCS_TLSC_EXT.1.2**
**Modified per TD0499**

The evaluator shall configure the reference identifier according to the AGD guidance and perform the following tests during a TLS connection. ***If the TOE supports certificate pinning, all pinned certificates must be removed before performing Tests 1 through 6. A pinned certificate must be added prior to performing Test 7***.

**Test 1:** The evaluator shall present a server certificate that contains a CN that does not match the reference identifier and does not contain the SAN extension.

The evaluator shall verify that the connection fails. Note that some systems might require the presence of the SAN extension. In this case the connection would still fail but for the reason of the missing SAN extension instead of the mismatch of CN and reference identifier. Both reasons are acceptable to pass Test 1.

The evaluator verified that the TOE rejects connection attempts when the presented Server Certificate contains a CN that does not match the reference identifier and no SAN extension.

**Test 2:** The evaluator shall present a server certificate that contains a CN that matches the reference identifier, contains the SAN extension, but does not contain an identifier in the SAN that matches the reference identifier. The evaluator shall verify that the connection fails. The evaluator shall repeat this test for each supported SAN type.

The evaluator verified that the TOE rejects connection attempts when the presented Server certificate contains a CN that matches the reference identifier and contains a SAN that does not match the reference identifier.

**Test 3:** [conditional] If the TOE does not mandate the presence of the SAN extension, the evaluator shall present a server certificate that contains a CN that matches the reference identifier and does not contain the SAN extension. The evaluator shall verify that the connection succeeds. If the TOE does mandate the presence of the SAN extension, this Test shall be omitted.



© 2023 Leidos. All rights reserved

The evaluator verified that the TOE accepts connection attempts when the presented Server Certificate contains a CN that matches the reference identifier and no SAN extension.

**Test 4:** The evaluator shall present a server certificate that contains a CN that does not match the reference identifier but does contain an identifier in the SAN that matches. The evaluator shall verify that the connection succeeds.

The evaluator verified that the TOE accepts connection attempts when the presented Server Certificate contains a CN that does not match the reference identifier and contains a SAN extension that matches the reference identifier.

**Test 5:** The evaluator shall perform the following wildcard tests with each supported type of reference identifier. The support for wildcards is intended to be optional. If wildcards are supported, the first, second, and third tests below shall be executed. If wildcards are not supported, then the fourth test below shall be executed.

**Test 5.1:** [conditional]: If wildcards are supported, the evaluator shall present a server certificate containing a wildcard that is not in the left-most label of the presented identifier (e.g. foo.*.example.com) and verify that the connection fails.

The evaluator verified that the TOE rejects connection attempts when the presented Server Certificate contains a wildcard that is not in the leftmost field.

**Test 5.2:** [conditional]: If wildcards are supported, the evaluator shall present a server certificate containing a wildcard in the left-most label but not preceding the public suffix (e.g. *.example.com). The evaluator shall configure the reference identifier with a single left-most label (e.g. foo.example.com) and verify that the connection succeeds. The evaluator shall configure the reference identifier without a left-most label as in the certificate (e.g. example.com) and verify that the connection fails. The evaluator shall configure the reference identifier with two left-most labels (e.g. bar.foo.example.come) and verify that the connection fails.

The evaluator verified that if the server presents a certificate containing a wildcard that is in the leftmost label that the TOE behaved in the expected manner for each case. The TOE accepts and completes the connection when a single leftmost identifier is used in the reference identifier. The TOE rejects the connection when there is no leftmost identifier used in the reference identifier. The TOE rejects the connection when there are two leftmost identifiers used in the reference identifier.

**Test 5.3:** [conditional]: If wildcards are supported, the evaluator shall present a server certificate containing a wildcard in the left-most label immediately preceding the public suffix (e.g. *.com). The evaluator shall configure the reference identifier with a single left-most label (e.g. foo.com) and verify that the connection fails. The evaluator shall configure the reference identifier with two left-most labels (e.g. bar.foo.com) and verify that the connection fails.

The evaluator verified that if the server presents a certificate containing a wildcard in the domain section of the FQDN (immediately preceding the public suffix) the TOE rejected the connection attempt when using a reference identifier with a leftmost label (e.g. bar.foo.com) and without a leftmost label (e.g. foo.com).

**Test 5.4:** [conditional]: If wildcards are not supported, the evaluator shall present a server certificate containing a wildcard in the left-most label (e.g. *.example.com). The evaluator shall configure the reference identifier with a single left-most label (e.g. foo.example.com) and verify that the connection fails.



© 2023 Leidos. All rights reserved

N/A, wildcards are supported.

**Test 6:** [conditional] If URI or Service name reference identifiers are supported, the evaluator shall configure the DNS name and the service identifier. The evaluator shall present a server certificate containing the correct DNS name and service identifier in the URIName or SRVName fields of the SAN and verify that the connection succeeds. The evaluator shall repeat this test with the wrong service identifier (but correct DNS name) and verify that the connection fails.

N/A, URI and Service Name reference identifiers are not supported.

**Test 7: [**conditional] If pinned certificates are supported the evaluator shall present a certificate that does not match the pinned certificate and verify that the connection fails.

N/A, pinned certificates are not supported.

**FCS_TLSC_EXT.1.3**
The evaluator shall demonstrate that using an invalid certificate (unless excepted) results in the function failing as follows, unless excepted:

**Modified per TD0513**

**Test 1a**: *The evaluator shall demonstrate that a server using a certificate with a valid certification path successfully connects.*

**Test 1b**: *The evaluator shall modify the certificate chain used by the server in test 1a to be invalid and demonstrate that a server using a certificate without a valid certification path to a trust store element of the TOE results in an authentication failure.*

**Test 1c** *[conditional]: If the TOE trust store can be managed, the evaluator shall modify the trust store element used in Test 1a to be untrusted and demonstrate that a connection attempt from the same server used in Test 1a results in an authentication failure.*

The evaluator verified that the TOE accepts connections attempts when the presented certificate chain can be completed and anchored to a CA certificate in the platform trust store successfully. The evaluator verified that the TOE rejects connection attempts when the presented certificate chain cannot be completed and anchored to a CA certificate in the platform trust store successfully.

**Test 2:** The evaluator shall demonstrate that a server using a certificate which has been revoked results in an authentication failure.

The evaluator verified that the TOE rejects certificates which are indicating as revoked by the revocation provider.

**Test 3:** The evaluator shall demonstrate that a server using a certificate which has passed its expiration date results in an authentication failure.

The evaluator verified that the TOE rejects certificates which are past their expiration date.

**Test 4:** The evaluator shall demonstrate that a server using a certificate which does not have a valid identifier results in an authentication failure.

The evaluator verified that if the server presents a certificate which does not have a valid identifier the TOE rejects the connection.



© 2023 Leidos. All rights reserved

### 2.1.17 FCS_TLSC_EXT.2 TLS Client Support for Mutual Authentication (TLS Package)

#### 2.1.17.1 TSS Evaluation Activity

The evaluator shall ensure that the TSS description required per FIA_X509_EXT.2.1 includes the use of client-side certificates for TLS mutual authentication. The evaluator shall also ensure that the TSS describes any factors beyond configuration that are necessary in order for the client to engage in mutual authentication using X.509v3 certificates.

[ST] Section 6.2 states the TOE uses TLS client functionality for communications between the TOE and other Tenable applications in the operational environment. All communications between the TOE and Nessus Manager and between the TOE and NNM use mutually-authenticated TLS, while outbound communications to LCE and to the operational environment do not.

As part of certificate validation in the establishment of TLS connectivity, the TOE will validate the reference identifier of a presented server certificate. This is done through validation of the Common Name (CN) and Subject Alternative Name (SAN) certificate fields, the latter of which is expected to contain the FQDN of the external system that is presenting the certificate to the TOE. The reference identifier is established by configuration.

#### 2.1.17.2 Guidance Evaluation Activity

The evaluator shall ensure that the AGD guidance includes any instructions necessary to configure the TOE to perform mutual authentication. The evaluator also shall verify that the AGD guidance required per FIA_X509_EXT.2.1 includes instructions for configuring the client-side certificates for TLS mutual authentication.

**Nessus**

The guidance provided by [CCECG] includes a description of how to add a Nessus instance to the TOE environment and configure TLS communications between the TOE (the TLS client) and Nessus (the TLS server). The guidance also describes how to configure the client-side certificate used by the TOE to authenticate itself to the Nessus application. Refer to “Configure Scans > Resources > Nessus Scanners”.

**Nessus Network Monitor**

The guidance provided by [CCECG] includes a description of how to add a Nessus Network Monitor to the TOE environment and configure TLS communications between the TOE (the TLS client) and Nessus Network Monitor (the TLS server). The guidance also describes how to configure the client-side certificate used by the TOE to authenticate itself to the Nessus Network Monitor application. Refer to “Configure Scans > Resources > Nessus Network Monitor Instances > Add a Nessus Network Monitor Instance”.

#### 2.1.17.3 Test Evaluation Activity

The evaluator shall also perform the following tests:

**Test 1:** The evaluator shall establish a connection to a server that is not configured for mutual authentication (i.e. does not send Server’s Certificate Request (type 13) message). The evaluator observes negotiation of a TLS channel and confirms that the TOE did not send Client’s Certificate message (type 11) during handshake.

The evaluator verified that the TOE does not send a Client Certificate record if the Server does not send a CertificateRequest record.



© 2023 Leidos. All rights reserved

**Test 2:** The evaluator shall establish a connection to a server with a shared trusted root that is configured for mutual authentication (i.e. it sends Server's Certificate Request (type 13) message). The evaluator observes negotiation of a TLS channel and confirms that the TOE responds with a non-empty Client's Certificate message (type 11) and Certificate Verify (type 15) message.

The evaluator verified that the TOE responds to a Server CertificateRequest record by sending a non-empty Certificate Record containing the Certificates to be used for the mutually authenticated TLS session.

### 2.1.18 FCS_TLSC_EXT.5 TLS Client Support for Supported Groups Extension (TLS Package)

#### 2.1.18.1 TSS Evaluation Activity

The evaluator shall verify that TSS describes the Supported Groups Extension.

The TSF presents secp256r1 and secp384r1 as the supported values in the Supported Groups extension and uses the same NIST curves for key establishment.

#### 2.1.18.2 Guidance Evaluation Activity

None.

#### 2.1.18.3 Test Evaluation Activity

The evaluator shall also perform the following test:

**Test 1**: The evaluator shall configure a server to perform key exchange using each of the TOE's supported curves and/or groups. The evaluator shall verify that the TOE successfully connects to the server.

The evaluator verified that the TOE could successfully complete a key exchange when the Server uses each of the listed Supported Group values.

### 2.1.19 FCS_TLSS_EXT.1 TLS Server Protocol (TLS Package)

#### 2.1.19.1 TSS Evaluation Activity

**FCS_TLSS_EXT.1.1**
The evaluator shall check the description of the implementation of this protocol in the TSS to ensure that the cipher suites supported are specified. The evaluator shall check the TSS to ensure that the cipher suites specified include those listed for this component.

The TLS client and server implementation support the following TLS cipher suites in the TOE's evaluated configuration:

- TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256
- TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384
- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384.

The cipher suites identified in the TSS agree with those identified in the SFR.

**FCS_TLSS_EXT.1.2**
The evaluator shall verify that the TSS contains a description of the denial of old SSL and TLS versions consistent relative to selections in FCS_TLSS_EXT.1.2.



© 2023 Leidos. All rights reserved

[ST] Section 6.2 states that the TOE uses TLS 1.2 for client and server communications. In the case where the TOE acts as a TLS server, all other TLS versions are rejected. The TSS is consistent with the SFR.

**FCS_TLSS_EXT.1.3**
The evaluator shall verify that the TSS describes the key agreement parameters of the server's Key Exchange message.

[ST] Section 6.2 states that the TSF presents secp256r1 and secp384r1 as the supported values in the Supported Groups extension and uses the same NIST curves for key establishment.

#### 2.1.19.2 Guidance Evaluation Activity

**FCS_TLSS_EXT.1.1**
The evaluator shall also check the operational guidance to ensure that it contains instructions on configuring the TOE so that TLS conforms to the description in the TSS.

The guidance provided by [CCECG] includes instructions to the administrator on how to configure the TOE to use TLS. Refer to "Additional Resources > Encryption Strength > Configure Tenable Security Center for NIAP Compliance".

**FCS_TLSS_EXT.1.2**
The evaluator shall verify that the AGD guidance includes any configuration necessary to meet this requirement.

The guidance provided by [CCECG] includes instructions to the administrator on how to configure the TOE to use only TLS v1.2. Refer to "Additional Resources > Encryption Strength > Configure Tenable Security Center for NIAP Compliance".

**FCS_TLSS_EXT.1.3**
The evaluator shall verify that any configuration guidance necessary to meet the requirement must be contained in the AGD guidance.

The guidance provided by [CCECG] includes instructions to the administrator on how to configure the TOE to use TLS conformant with the requirement in the ST. Refer to "Additional Resources > Encryption Strength > Configure Tenable Security Center for NIAP Compliance".

#### 2.1.19.3 Test Evaluation Activity

**FCS_TLSS_EXT.1.1**
The evaluator shall also perform the following tests:

**Test 1:** The evaluator shall establish a TLS connection using each of the cipher suites specified by the requirement. This connection may be established as part of the establishment of a higher-level protocol, e.g., as part of an EAP session. It is sufficient to observe the successful negotiation of a cipher suite to satisfy the intent of the test; it is not necessary to examine the characteristics of the encrypted traffic in an attempt to discern the cipher suite being used (for example, that the cryptographic algorithm is 128-bit AES and not 256-bit AES).

The evaluator verified that the TOE could complete a TLS session using each of the claimed ciphersuites.

**Test 2:** The evaluator shall send a Client Hello to the server with a list of cipher suites that does not contain any of the cipher suites in the server's ST and verify that the server denies the connection. Additionally,



© 2023 Leidos. All rights reserved

the evaluator shall send a Client Hello to the server containing only the TLS_NULL_WITH_NULL_NULL cipher suite and verify that the server denies the connection.

The evaluator verified that the TOE rejected connection attempts from peers presenting the cipher suite TLS_NULL_WITH_NULL_NULL. The evaluator additionally verified that the TOE rejected a connection attempt presenting a cipher suite not in the list of claimed cipher suites.

**Test 3:** If RSA key exchange is used in one of the selected ciphersuites, the evaluator shall use a client to send a properly constructed Key Exchange message with a modified EncryptedPreMasterSecret field during the TLS handshake. The evaluator shall verify that the handshake is not completed successfully and no application data flows.

N/A. The TOE does not use RSA key exchange.

**Test 4:** The evaluator shall perform the following modifications to the traffic:

**Modified per TD0469**

**Test 4.1**: ~~Change the TLS version proposed by the client in the Client Hello to a non-supported TLS version (for example 1.3 represented by the two bytes 03 04) and verify that the server rejects the connection.~~

**Test 4.2:** Modify a byte in the data of the client's Finished handshake message, and verify that the server rejects the connection and does not send any application data.

The evaluator verified that the TOE rejected connection attempts where the Client Finished record was not computed correctly.

**Modified per TD0588**

**Test 4.3:** Demonstrate that the TOE will not resume a session for which the client failed to complete the handshake (independent of TOE support for session resumption): ~~Generate a Fatal Alert by sending a Finished message from the client before the client sends a ChangeCipherSpec message, and then send a Client Hello with the session identifier from the previous incomplete session, and verify that the server does not resume the session~~.

***Test 4.3i [conditional]:*** *If the TOE does not support session resumption based on session IDs according to RFC4346 (TLS1.1) or RFC5246 (TLS1.2) or session tickets according to RFC5077, the evaluator shall perform the following test:*

*a) The evaluator shall send a Client Hello with a zero-length session identifier and with a SessionTicket extension containing a zero-length ticket.*

*b) The evaluator shall verify the server does not send a NewSessionTicket handshake message (at any point in the handshake).*

*c) The evaluator shall verify the Server Hello message contains a zero-length session identifier or passes the following steps:*

*Note: The following steps are only performed if the ServerHello message contains a non-zero length SessionID.*

*d) The evaluator shall complete the TLS handshake and capture the SessionID from the ServerHello.*

*e) The evaluator shall send a ClientHello containing the SessionID captured in step d). This can be done by keeping the TLS session in step d) open or start a new TLS session using the SessionID captured in step d).*



© 2023 Leidos. All rights reserved

*f) The evaluator shall verify the TOE (1) implicitly rejects the SessionID by sending a ServerHello containing a different SessionID and by performing a full handshake (as shown in Figure 1 of RFC 4346 or RFC 5246), or (2) terminates the connection in some way that prevents the flow of application data.*

This test is not applicable as the TOE utilizes SessionID for resumption.

***Test 4.3ii [conditional]**: If the TOE supports session resumption using session IDs according to RFC4346 (TLS1.1) or RFC5246 (TLS1.2), the evaluator shall carry out the following steps (note that for each of these tests, it is not necessary to perform the test case for each supported version of TLS):*

*a) The evaluator shall conduct a successful handshake and capture the TOE-generated session ID in the Server Hello message. The evaluator shall then initiate a new TLS connection and send the previously captured session ID to show that the TOE resumed the previous session by responding with ServerHello containing the same SessionID immediately followed by ChangeCipherSpec and Finished messages (as shown in Figure 2 of RFC 4346 or RFC 5246).*

*b) The evaluator shall initiate a handshake and capture the TOE-generated session ID in the Server Hello message. The evaluator shall then, within the same handshake, generate or force an unencrypted fatal Alert message immediately before the client would otherwise send its ChangeCipherSpec message thereby disrupting the handshake. The evaluator shall then initiate a new Client Hello using the previously captured session ID, and verify that the server (1) implicitly rejects the session ID by sending a ServerHello containing a different SessionID and performing a full handshake (as shown in figure 1 of RFC 4346 or RFC 5246), or (2) terminates the connection in some way that prevents the flow of application data.*

The evaluator verified that the TOE could resume a valid session based on session ID values and performed a full key exchange if the session ID is no longer valid.

***Test 4.3iii [conditional]:** If the TOE supports session tickets according to RFC5077, the evaluator shall carry out the following steps (note that for each of these tests, it is not necessary to perform the test case for each supported version of TLS):*

*a) The evaluator shall permit a successful TLS handshake to occur in which a session ticket is exchanged with the non-TOE client. The evaluator shall then attempt to correctly reuse the previous session by sending the session ticket in the ClientHello. The evaluator shall confirm that the TOE responds with a ServerHello with an empty SessionTicket extension, NewSessionTicket, ChangeCipherSpec and Finished messages (as seen in figure 2 of RFC 5077).*

*b) The evaluator shall permit a successful TLS handshake to occur in which a session ticket is exchanged with the non-TOE client. The evaluator will then modify the session ticket and send it as part of a new Client Hello message. The evaluator shall confirm that the TOE either (1) implicitly rejects the session ticket by performing a full handshake (as shown in figure 3 or 4 of RFC 5077), or (2) terminates the connection in some way that prevents the flow of application data.*

This is not applicable as the TOE does not claim to support Session Tickets in the [ST].

**Test 4.4:** Send a message consisting of random bytes from the client after the client has issued the ChangeCipherSpec message and verify that the server denies the connection.

The evaluator verified that the TOE rejected connection attempts and sent a Fatal Alert when the peer did not send a Finished immediately after the ChangeCipherSpec record.

**FCS_TLSS_EXT.1.2**
Test 1: The evaluator shall send a Client Hello requesting a connection with version SSL 2.0 and verify that



© 2023 Leidos. All rights reserved

the server denies the connection. The evaluator shall repeat this test with SSL 3.0 and TLS 1.0, and TLS 1.1 if it is selected.

The evaluator verified that the TOE rejected connection attempts only supporting previous protocol versions of SSL 2.0, SSL 3.0, TLS 1.0, and TLS 1.1.

**FCS_TLSS_EXT.1.3**
The evaluator shall conduct the following tests. The testing can be carried out manually with a packet analyzer or with an automated framework that similarly captures such empirical evidence. Note that this testing can be accomplished in conjunction with other testing activities. For each of the following tests, determining that the size matches the expected size is sufficient.

**Modified per TD0739**

**Test 1:** [***conditional***] If RSA-based key establishment is selected, the evaluator shall ~~**attempt**~~ configure the TOE with a ~~**connection using**~~ certificate containing a supported RSA~~**-based key establishment with**~~ size and attempt a ~~**supported size**~~ connection. The evaluator shall verify that the size used matches that which is configured and that the connection is successfully established. The evaluator shall repeat this test for each supported size of RSA-based key establishment.

N/A. The TOE does not use RSA-based key establishment.

**Test 2**: [conditional] If finite-field (i.e. non-EC) Diffie-Hellman ciphers are selected, the evaluator shall attempt a connection using a Diffie-Hellman key exchange with a supported parameter size or supported group. The evaluator shall verify that the key agreement parameters in the Key Exchange message are the ones configured. The evaluator shall repeat this test for each supported parameter size or group.

N/A. The TOE does not use finite-field Diffie-Hellman ciphers.

**Test 3:** [conditional] If ECDHE ciphers are selected, the evaluator shall attempt a connection using an ECDHE ciphersuite with a supported curve. The evaluator shall verify that the key agreement parameters in the Key Exchange message are the ones configured. The evaluator shall repeat this test for each supported elliptic curve.

The evaluator verified that the TOE could successfully complete a TLS key exchange using each of the NamedCurve values specified in the [ST] and properly constructed the ServerKeyExchange record in each case.

### 2.1.20 FCS_TLSS_EXT.2 TLS Server Support for Mutual Authentication (TLS Package)

#### 2.1.20.1 TSS Evaluation Activity

**Modified per TD0770**

**FCS_TLSS_EXT.2.1 / FCS_TLSS_EXT.2.2**
The evaluator shall ensure that the TSS description required per FIA_X509_EXT.2.1 includes the use of client-side certificates for TLS mutual authentication.

If error messages are provided prior to terminating a session, the evaluator shall ensure the error messages are described.

[ST] Section 6.2 states The TOE uses TLS server functionality for communications from remote administrators to its Web GUI interface. Mutual authentication is supported for this interface. As with TLS server certificates, the CN and SAN of the client certificate are validated for this interface.



© 2023 Leidos. All rights reserved

The TOE does not send error messages prior to terminating a session.

**FCS_TLSS_EXT.2.3**
If the product implements mutual authentication, the evaluator shall verify that the TSS describes how the DN and SAN in the certificate is compared to the expected identifier.

[ST] Section 6.2 states the as part of certificate validation in the establishment of TLS connectivity, the TOE will validate the reference identifier of a presented server certificate. This is done through validation of the Common Name (CN) and Subject Alternative Name (SAN) certificate fields, the latter of which is expected to contain the FQDN of the external system that is presenting the certificate to the TOE. The reference identifier is established by configuration.

#### 2.1.20.2 Guidance Evaluation Activity

**FCS_TLSS_EXT.2.1 / FCS_TLSS_EXT.2.2**

The evaluator shall verify that the AGD guidance required per FIA_X509_EXT.2.1 includes instructions for configuring the client-side certificates for TLS mutual authentication. The evaluator shall ensure that the AGD guidance includes instructions for configuring the server to require mutual authentication of clients using these certificates.

The guidance provided by [CCECG] includes a description of how to configure the TOE to require mutual authentication of TLS clients. Refer to “Additional Resources > User Access > Certificate Authentication > Configure Tenable Security Center to Allow SSL Client Certificate Authentication”.

**FCS_TLSS_EXT.2.3**
If the DN is not compared automatically to the domain name, IP address, username, or email address, the evaluator shall ensure that the AGD guidance includes configuration of the expected identifier or the directory server for the connection.

The guidance provided by [CCECG] includes a description of how to create client certificates for logging in to the TOE. Refer to “Additional Resources > User Access > Log In to the Web Interface > Log In to the Web Interface via SSL Client Certificate”.

#### 2.1.20.3 Test Evaluation Activity

**Modified per TD0770**

**FCS_TLSS_EXT.2.1 / FCS_TLSS_EXT.2.2**

The evaluator shall use TLS as a function to verify that the validation rules in FIA_X509_EXT.1.1 are adhered to and shall perform the following tests. The evaluator shall apply the AGD guidance to configure the server to require TLS mutual authentication of clients for the following tests, unless overridden by instructions in the test activity.

If error messages are provided prior to terminating a session, the evaluator shall configure the test client to be able to observe application data sent over the non-mutually authenticated channel, and in addition to observing that the TSF terminates the session, that the only data received under the channel is the error message as described in the TSS:

**Test 1:** The evaluator shall configure the server to send a certificate request to the client. The client shall send a certificate_list structure which has a length of zero. The evaluator shall verify that no sensitive application data flows prior to termination; if error messages are sent, the evaluator shall observe that an



© 2023 Leidos. All rights reserved

non-mutually authenticated channel is established, observe the data received by the test client to ensure only the error message indicated in the TSS is provided, and observe that the channel is then terminated.

The evaluator verified that the TOE rejected connection attempts if the Client sends an empty Certificate record during a Mutual Authentication connection attempt.

**Modified per TD0770**

**Test 2:** The evaluator shall configure the server to send a certificate request to the client. The client shall send no client certificate message, and instead send a client key exchange message in an attempt to continue the handshake. The client is required to respond to the certificate request message, even if the certificate message is empty. The evaluator shall verify that the handshake is not finished successfully and no application data flows.

The evaluator verified that the TOE rejected connection attempts if the Client does not honor the record sequence for mutual authentication and does not send a Certificate record.

**Modified per TD0770**

**Test 3:** The evaluator shall configure the server to send a certificate request to the client without the supported_signature_algorithm used by the client's certificate. The evaluator shall attempt a connection using the client certificate and verify d no sensitive application data flows prior to termination; if error messages are sent, the evaluator shall observe that an non-mutually authenticated channel is established, observe the data received by the test client to ensure only the error message indicated in the TSS is provided, and observe that the channel is then terminated.

The evaluator verified that the TOE rejects certificates from Clients that do not meet the Support Signature Algorithms specified by the Server.

**Modified per TD0770**

**Test 4:** The evaluator shall demonstrate that using a certificate without a valid certification path results in the function failing. Using the administrative guidance, the evaluator shall then load a certificate or certificates needed to validate the certificate to be used in the function, and demonstrate that the function succeeds. The evaluator then shall delete one of the certificates, load the modified certificate path, and verify that no sensitive application data flows prior to termination; if error messages are sent, the evaluator shall observe that an non-mutually authenticated channel is established, observe the data received by the test client to ensure only the error message indicated in the TSS is provided, and observe that the channel is then terminated.

The evaluator verified that the TOE rejected client Certificates that do not chain to a Root CA that is installed in the TOE's trust store. The evaluator verified that the TOE accepted client Certificates that chain to a Root CA that is installed in the TOE's trust store.

**Modified per TD0770**

**Test 5:** The aim of this test is to check the response of the server when it receives a client identity certificate that is signed by an impostor CA (either Root CA or intermediate CA). To carry out this test the evaluator shall configure the client to send a client identity certificate with an issuer field that identifies a CA r39ecognized by the TOE as a trusted CA, but where the key used for the signature on the client certificate does not in fact correspond to the CA certificate trusted by the TOE (meaning that the client certificate is invalid because its certification path does not in fact terminate in the claimed CA certificate). The evaluator shall verify that no sensitive application data flows prior to termination; if error messages are sent, the evaluator shall observe that an non-mutually authenticated channel is established, observe



© 2023 Leidos. All rights reserved

the data received by the test client to ensure only the error message indicated in the TSS is provided, and observe that the channel is then terminated.

The evaluator verified that the TOE rejected client Certificates that are signed by a CA attempting to imposter a trusted CA of the TOE.

**Modified per TD0770**

**Test 6:** The evaluator shall configure the client to send a certificate with the Client Authentication purpose in the extendedKeyUsage field and verify that the server accepts the attempted connection. The evaluator shall repeat this test without the Client Authentication purpose and shall verify that no sensitive application data flows prior to termination; if error messages are sent, the evaluator shall observe that an non-mutually authenticated channel is established, observe the data received by the test client to ensure only the error message indicated in the TSS is provided, and observe that the channel is then terminated. Ideally, the two certificates should be identical except for the Client Authentication purpose.

The evaluator verified that the TOE accepted client Certificates that contain the ClientAuthentication EKU and rejected client Certificates that lack the ClientAuthentication EKU.

**Test 7:** The evaluator shall perform the following modifications to the traffic: a) Configure the server to require mutual authentication and then modify a byte in the client's certificate. The evaluator shall verify that the server rejects the connection. b) Configure the server to require mutual authentication and then modify a byte in the signature block of the client's Certificate Verify handshake message. The evaluator shall verify that the server rejects the connection.

The evaluator verified that the TOE rejected client Certificates that have been modified (does not parse correctly). The evaluator verified that the TOE correctly validated the clients CertificateVerify signature value and rejected the connection if the signature is not correctly validated.

**FCS_TLSS_EXT.2.3**
**Test 1**: The evaluator shall send a client certificate with an identifier that does not match any of the expected identifiers and verify that the server denies the connection. The matching itself might be performed outside the TOE (e.g. when passing the certificate on to a directory server for comparison).

The evaluator verified that the TOE establishes the TLS layer connection if the client presents a Certificate that is otherwise valid but does not contain a valid Reference Identifier and presents the login page to the web browser. However, the TOE does not allow any user to log in over this channel.

## 2.2 User Data Protection (FDP)

### 2.2.1 FDP_DAR_EXT.1(1) Encryption Of Sensitive Application Data

#### 2.2.1.1 TSS Evaluation Activity

The evaluator shall examine the TSS to ensure that it describes the sensitive data processed by the application. The evaluator shall then ensure that the following activities cover all of the sensitive data identified in the TSS.

[ST] Section 6.3 identifies the sensitive data processed by the TOE.



© 2023 Leidos. All rights reserved

| Sensitive Data | Exchange | Protection at Rest | Protection in Transit |
|---|---|---|---|
| GUI credentials | Admin's browser to TOE over browser connection | FCS_STO_EXT.1 (PBKDF) | HTTPS |
| Remote system scan credentials | TOE to Nessus; Nessus to remote system | FCS_STO_EXT.1 (AES-CBC) | TLS; native protocol used by applicable OE authentication mechanism |
| Nessus authentication credentials | TOE to Nessus over XML RPC | FCS_STO_EXT.1 (AES-CBC) | HTTPS |
| NNM authentication credentials | TOE to NNM over TLS | FCS_STO_EXT.1 (AES-CBC) | TLS |
| LCE authentication credentials | TOE to LCE over TLS | FCS_STO_EXT.1 (AES-CBC) | TLS |
| Passphrase for PKI certificate encryption | None | FCS_STO_EXT.1 (PBKDF) | N/A |
| Collected system scan data | Nessus to TOE | FDP_DAR_EXT.1(2) | HTTPS |
| Collected network traffic data | NNM to TOE | FDP_DAR_EXT.1(2) | TLS |
| Collected log data | LCE to TOE | FDP_DAR_EXT.1(2) | TLS |

All sensitive data that is not credential data is protected by the platform full disk encryption method specified in FDP_DAR_EXT.1(2).

If *not store any sensitive data* is selected, the evaluator shall inspect the TSS to ensure that it describes how sensitive data cannot be written to non-volatile memory. The evaluator shall also ensure that this is consistent with the filesystem test below.

Not applicable. Sensitive data processed and stored by the TOE.

#### 2.2.1.2 Guidance Evaluation Activity

None.

#### 2.2.1.3 Test Evaluation Activity

**Modified TD0756**

Evaluation activities (after the identification of the sensitive data) are to be performed on all sensitive data listed that are not covered by FCS_STO_EXT.1.

The evaluator shall inventory the filesystem locations where the application may write data. The evaluator shall run the application and attempt to store sensitive data. The evaluator shall then inspect those areas of the filesystem to note where data was stored (if any), and determine whether it has been encrypted.

If "implement functionality to encrypt sensitive data as defined in the PP-Module for File Encryption" or "protect sensitive data in accordance with FCS_STO_EXT.1" is selected, ~~,~~ the evaluator shall inventory the filesystem locations where the application may write data. The evaluator shall run the application and attempt to store sensitive data. The evaluator shall then inspect those areas of the filesystem to note where data was stored (if any), and determine whether it has been encrypted.



© 2023 Leidos. All rights reserved

**Platforms: Linux…** The Linux platform currently does not provide data-at-rest encryption services which depend upon invocation by application developers. The evaluator shall verify that the Operational User Guidance makes the need to activate platform encryption clear to the end user.

The sensitive data specified by this specific requirement is all protected according to FCS_STO_EXT.1 and thus does not need further testing.

In FCS_STO_EXT.1, the evaluator searched for a known password against a file that contains user credentials of the TOE's web gui. The output of the command indicated that the credentials were encrypted since nothing was displayed in the output section.

### 2.2.2 FDP_DAR_EXT.1(2) Encryption Of Sensitive Application Data

#### 2.2.2.1 TSS Evaluation Activity

The evaluator shall examine the TSS to ensure that it describes the sensitive data processed by the application. The evaluator shall then ensure that the following activities cover all of the sensitive data identified in the TSS.

[ST] Section 6.3 identifies the sensitive data processed by the TOE.

| Sensitive Data | Exchange | Protection at Rest | Protection in Transit |
|---|---|---|---|
| GUI credentials | Admin's browser to TOE over browser connection | FCS_STO_EXT.1 (PBKDF) | HTTPS |
| Remote system scan credentials | TOE to Nessus; Nessus to remote system | FCS_STO_EXT.1 (AES-CBC) | TLS; native protocol used by applicable OE authentication mechanism |
| Nessus authentication credentials | TOE to Nessus over XML RPC | FCS_STO_EXT.1 (AES-CBC) | HTTPS |
| NNM authentication credentials | TOE to NNM over TLS | FCS_STO_EXT.1 (AES-CBC) | TLS |
| LCE authentication credentials | TOE to LCE over TLS | FCS_STO_EXT.1 (AES-CBC) | TLS |
| Passphrase for PKI certificate encryption | None | FCS_STO_EXT.1 (PBKDF) | N/A |
| Collected system scan data | Nessus to TOE | FDP_DAR_EXT.1(2) | HTTPS |
| Collected network traffic data | NNM to TOE | FDP_DAR_EXT.1(2) | TLS |
| Collected log data | LCE to TOE | FDP_DAR_EXT.1(2) | TLS |

All sensitive data that is not credential data is protected by the platform full disk encryption method specified in FDP_DAR_EXT.1(2).

If *not store any sensitive data* is selected, the evaluator shall inspect the TSS to ensure that it describes how sensitive data cannot be written to non-volatile memory. The evaluator shall also ensure that this is consistent with the filesystem test below.



© 2023 Leidos. All rights reserved

Not applicable. Sensitive data processed by the TOE and stored by the platform implementing full disk encryption.

#### 2.2.2.2 Guidance Evaluation Activity

None.

#### 2.2.2.3 Test Evaluation Activity

**Modified TD0756**

Evaluation activities (after the identification of the sensitive data) are to be performed on all sensitive data listed that are not covered by FCS_STO_EXT.1.

If "implement functionality to encrypt sensitive data as defined in the PP-Module for File Encryption" or "protect sensitive data in accordance with FCS_STO_EXT.1" is selected, ~~T~~the evaluator shall inventory the filesystem locations where the application may write data. The evaluator shall run the application and attempt to store sensitive data. The evaluator shall then inspect those areas of the filesystem to note where data was stored (if any), and determine whether it has been encrypted.

If ***leverage platform-provided functionality*** is selected, the evaluation activities will be performed as stated in the following requirements, which vary on a per-platform basis:

**Platforms: Linux…** The Linux platform currently does not provide data-at-rest encryption services which depend upon invocation by application developers. The evaluator shall verify that the Operational User Guidance makes the need to activate platform encryption clear to the end user.

The AGD provides guidance on such configuration by enable the NIAP mode. This guidance is address in the *Configure Tenable Security Center for NIAP Compliance, and Evaluated Configuration Requirements* section of the AGD.



© 2023 Leidos. All rights reserved

## System Requirements

### Operating System Requirements

The evaluated version of Tenable Security Center is supported on Red Hat Enterprise Linux 8 (RHEL) 8, 64-bit.

### Evaluated Configuration Requirements

Confirm you have enabled the full disk encryption capabilities provided by the operating system on the host running Tenable Security Center. In addition, follow the instructions in Configure Tenable Security Center for NIAP Compliance. Tenable Security Center includes an implementation of OpenSSL with NIST-validated algorithm services that it uses to secure data at rest and in transit. The section Configure Tenable Security Center for NIAP Compliance provides instructions that configure the TOE's OpenSSL cryptographic module for conformance with the evaluated configuration. Use of other cryptographic engines was not evaluated or tested during the Common Criteria evaluation of Tenable Security Center.

## 2.2.3 FDP_DEC_EXT.1 Access to Platform Resources

#### 2.2.3.1 FDP_DEC_EXT.1.1

##### 2.2.3.1.1 TSS Evaluation Activity

None.

##### 2.2.3.1.2 Guidance Evaluation Activity

The evaluator shall perform the platform-specific actions below and inspect user documentation to determine the application's access to hardware resources. The evaluator shall ensure that this is consistent with the selections indicated. The evaluator shall review documentation provided by the application developer and for each resource which it accesses, identify the justification as to why access is required.

Section 6.3 of [ST] ("User Data Protection") states the TOE uses network connectivity for remote management and connections to environmental components.

The guidance provided by [CCECG includes a description of the TOE's access to network resources. It recommends Gigabit or faster network cards on the platform hosting the TOE, in order to increase the overall performance of web sessions, emails, LCE queries, and other network activities. The guidance in [CCECG] also identifies ports for inbound and outbound network traffic to which the TOE requires access and describes why access is necessary. Refer to "Evaluated Configuration > Hardware Requirements > Network Interface Requirements", and "Evaluated Configuration > System Requirements > Port Requirements".

##### 2.2.3.1.3 Test Evaluation Activity

**Platforms: Linux…** The evaluator shall verify that either the application software or its documentation provides a list of the hardware resources it accesses.

This test is satisfied by documentation provided with the TOE and does not require any testing activity.



© 2023 Leidos. All rights reserved

[CCECG] Section “Evaluated Configuration > Hardware Requirements” describes the hardware components that the TOE accesses.

#### 2.2.3.2 FDP_DEC_EXT.1.2

##### 2.2.3.2.1 TSS Evaluation Activity

None.

##### 2.2.3.2.2 Guidance Evaluation Activity

The evaluator shall perform the platform-specific actions below and inspect user documentation to determine the application's access to sensitive information repositories. The evaluator shall ensure that this is consistent with the selections indicated. The evaluator shall review documentation provided by the application developer and for each sensitive information repository which it accesses, identify the justification as to why access is required.

The statement of FDP_DEC_EXT.1.2 in Section 5.2.2.2 of [ST] (“FDP_DEC_EXT.1 Access to Platform Resources”) specifies “system configuration” as the only sensitive information repository accessed by the TOE.

Section 6.3 of [ST] (“User Data Protection”) states the TOE accesses system configuration to generate a diagnostic report of local system configuration for troubleshooting purposes.

The guidance provided by [CCECG] includes a description of how the administrator can display and create information that assists in troubleshooting issues that arise while using the TOE. Refer to “Evaluated Configuration > System Settings > Diagnostic Settings”.

##### 2.2.3.2.3 Test Evaluation Activity

**Platforms: Linux…** The evaluator shall verify that either the application software or its documentation provides a list of sensitive information repositories it accesses.

The evaluator verified that the [CCECG] provides a list of sensitive information repositories that the TOE accesses. The specific items can be seen in section “Evaluated Configuration > System Settings > Diagnostic Settings” of the [CCECG].

### 2.2.4 FDP_NET_EXT.1 Network Communications

#### 2.2.4.1 TSS Evaluation Activity

None.

#### 2.2.4.2 Guidance Evaluation Activity

None.

#### 2.2.4.3 Test Evaluation Activity

The evaluator shall perform the following tests:

**Test 1**: The evaluator shall run the application. While the application is running, the evaluator shall sniff network traffic ignoring all non-application associated traffic and verify that any network communications witnessed are documented in the TSS or are user-initiated.



© 2023 Leidos. All rights reserved

The evaluator ran a wire capture on the TOE's platform while the TOE was running. The traffic was examined and all non-user initiated traffic was standard management traffic for the RHEL platform.

**Test 2**: The evaluator shall run the application. After the application initializes, the evaluator shall run network port scans to verify that any ports opened by the application have been captured in the ST for the third selection and its assignment. This includes connection-based protocols (e.g. TCP, DCCP) as well as connectionless protocols (e.g. UDP).

The evaluator scanned the Host platform the TOE is installed on and verified that the TOE did not open any ports that are not strictly required. The verified all open ports were either documented in the ST or were part of the platform itself (e.g. SSH).

## 2.3 Identification and Authentication (FIA)

### 2.3.1 FIA_X509_EXT.1 X.509 Certificate Validation

#### 2.3.1.1 FIA_X509_EXT.1.1

##### 2.3.1.1.1 TSS Evaluation Activity

The evaluator shall ensure the TSS describes where the check of validity of the certificates takes place. The evaluator ensures the TSS also provides a description of the certificate path validation algorithm.

[ST] Section 6.4 states that  The TOE uses X.509 certificates for authentication of the following trusted communications: validation of administrator TLS client certificate and validation of TLS server certificates for environmental Tenable components that it communicates with (Nessus Manager, NNM, LCE).

The TOE validates X.509 certificates using the path validation algorithm defined in RFC 5280, which can be summarized as follows:

- Check the public key algorithm and parameters of each certificate in the path
- Check the current date/time against the validity period of each certificate in the path
- Check the revocation status of each certificate in the path
- Check the issuer name to ensure it equals the subject name of the previous certificate in the path
- Check name constraints to make sure the subject name is within the permitted subtrees list of all previous CA certificates and not within the excluded subtrees list of any previous CA certificate
- Check the asserted certificate policy OIDs against the permissible OIDs of the previous certificate, including any policy mapping equivalencies asserted by the previous certificate
- Check policy constraints to ensure any explicit policy requirements are not violated
- For all CA certificates, confirm the presence of the basicConstraints extension and that the CA flag is set to TRUE, and ensure the key usage field includes the caSigning purpose
- Check the path length does not exceed any maximum path length asserted in this or a previous certificate
- Check the key usage extension
- Process any other recognized critical extensions.

The TOE validates the certificate chain to its root to ensure it terminates with a trusted CA certificate. It performs a revocation check on each certificate in the chain (except the root certificate) using Online Certificate Status Protocol (OCSP) in accordance with RFC 6960. In the event the revocation status of a certificate cannot be verified (i.e., the OCSP responder cannot be reached), the TOE accepts the certificate.



© 2023 Leidos. All rights reserved

Because the TOE's use of the certificate validation function is to validate the authenticity of remote endpoints, the TSF chooses what certificates to use based on what is presented to it as part of establishing the TLS session. The TOE is only assigned one certificate for its own use, so there is only one certificate that it will present in cases where a remote entity may need to validate it.

#### 2.3.1.1.2 Guidance Evaluation Activity

None.

#### 2.3.1.1.3 Test Evaluation Activity

The tests described must be performed in conjunction with the other certificate services evaluation activities, including the functions in FIA_X509_EXT.2.1. The tests for the extendedKeyUsage rules are performed in conjunction with the uses that require those rules. If the application supports chains of length four or greater, the evaluator shall create a chain of at least four certificates: the node certificate to be tested, two Intermediate CAs, and the self-signed Root CA. If the application supports a maximum trust depth of two, then a chain with no Intermediate CA should instead be created.

**Test 1**: The evaluator shall demonstrate that validating a certificate without a valid certification path results in the function failing, for each of the following reasons, in turn:

- by establishing a certificate path in which one of the issuing certificates is not a CA certificate,
- by omitting the basicConstraints field in one of the issuing certificates,
- by setting the basicConstraints field in an issuing certificate to have CA=False,
- by omitting the CA signing bit of the key usage field in an issuing certificate, and
- by setting the path length field of a valid CA field to a value strictly less than the certificate path.

The evaluator shall then establish a valid certificate path consisting of valid CA certificates, and demonstrate that the function succeeds. The evaluator shall then remove trust in one of the CA certificates, and show that the function fails.

The evaluator verified that the TOE rejects certificates which chain to CA certificates which are not valid CA certificates in the specific cases of; the basicConstraints value either not set or set to false, the Certificate Signing KeyUsage bit is not set, the Path Length is not valid for the presented path length. The evaluator verified that the TOE accepted certificates when the full certificate chain could be validated. The evaluator verified that the TOE rejected certificates when the full certificate chain could not be completed.

**Test 2**: The evaluator shall demonstrate that validating an expired certificate results in the function failing.

The evaluator verified that the TOE rejected presented certificates which are past their expiration date.

**Test 3**: The evaluator shall test that the TOE can properly handle revoked certificates-–conditional on whether CRL, OCSP, OCSP Stapling or OCSP Multi-stapling is selected; if multiple methods are selected, then the following tests shall be performed for each method:

- The evaluator shall test revocation of the node certificate.
- The evaluator shall also test revocation of an intermediate CA certificate (i.e. the intermediate CA certificate should be revoked by the root CA), if intermediate CA certificates are supported. If OCSP Stapling per RFC 6066 is the only supported revocation method, this test is omitted.
- The evaluator shall ensure that a valid certificate is used, and that the validation function succeeds. The evaluator then attempts the test with a certificate that has been revoked (for each method chosen in the selection) to ensure when the certificate is no longer valid that the validation function fails.



© 2023 Leidos. All rights reserved

The evaluator verified that the TOE fully validated the revocation status of the presented chain. The evaluator verified that the TOE accepted the presented certificates if all certificates had a OCSP status of good. The evaluator verified that the TOE rejected the presented certificates if either the end-entity or an Intermediate CA certificate have an OCSP status of revoked.

**Modified in accordance with TD0780.**

**Test 4**: Test 4: If any OCSP option is selected, the evaluator shall configure the TSF to reject certificates if it cannot access valid status information, if so configurable. Then the evaluator shall ensure the TSF has no other source of revocation information available and configure the OCSP server or use a man-in-the-middle tool to present an OCSP response signed by a certificate that does not have the OCSP signing purpose and which is the only source of revocation status information advertised by the CA issuing the certificate being validated. The evaluator shall verify that validation of the OCSP response fails and that the TOE treats the certificate being checked as invalid and rejects the connection. If CRL is selected, the evaluator shall likewise configure the CA to be the only source of revocation status information, and sign a CRL with a certificate that does not have the cRLsign key usage bit set, ~~and~~. The evaluator shall verify that validation of the CRL fails and that the TOE treats the certificate being checked as invalid and rejects the connection.

The evaluator verified that the TOE rejects connections when the OCSP responder does not have the ocspsign EKU.

**Test 5**: The evaluator shall modify any byte in the first eight bytes of the certificate and demonstrate that the certificate fails to validate. (The certificate will fail to parse correctly.)

The evaluator verified that the TOE rejected certificates that fail to parse correctly (the first byte is not correct).

**Test 6**: The evaluator shall modify any byte in the last byte of the certificate and demonstrate that the certificate fails to validate. (The signature on the certificate will not validate.)

The evaluator verified that the TOE rejected certificates that fail to validate correctly, the signature is invalid when the last byte of the presented certificate has been modified .

**Test 7**: The evaluator shall modify any byte in the public key of the certificate and demonstrate that the certificate fails to validate. (The signature on the certificate will not validate.)

The evaluator verified that the TOE rejected certificates that fail to validate correctly, the public key on the presented certificate has been modified.

**Test 8**: (Conditional on support for EC certificates as indicated in FCS_COP.1/Sig). The evaluator shall establish a valid, trusted certificate chain consisting of an EC leaf certificate, an EC Intermediate CA certificate not designated as a trust anchor, and an EC certificate designated as a trusted anchor, where the elliptic curve parameters are specified as a named curve. The evaluator shall confirm that the TOE validates the certificate chain.

N/A, The TOE does not support EC certificates as indicated by FCS_COP.1/Sig.



© 2023 Leidos. All rights reserved

**Test 9**: (Conditional on support for EC certificates as indicated in FCS_COP.1/Sig). The evaluator shall replace the intermediate certificate in the certificate chain for Test 8a with a modified certificate, where the modified intermediate CA has a public key information field where the EC parameters uses an explicit format version of the Elliptic Curve parameters in the public key information field of the intermediate CA certificate from Test 8a, and the modified Intermediate CA certificate is signed by the trusted EC root CA, but having no other changes. The evaluator shall confirm the TOE treats the certificate as invalid.

N/A, The TOE does not support EC certificates as indicated by FCS_COP.1/Sig.

#### 2.3.1.2 FIA_X509_EXT.1.2

##### 2.3.1.2.1 TSS Evaluation Activity

None.

##### 2.3.1.2.2 Guidance Evaluation Activity

None.

##### 2.3.1.2.3 Test Evaluation Activity

The tests described must be performed in conjunction with the other certificate services evaluation activities, including the functions in FIA_X509_EXT.2.1. If the application supports chains of length four or greater, the evaluator shall create a chain of at least four certificates: the node certificate to be tested, two Intermediate CAs, and the self-signed Root CA. If the application supports a maximum trust depth of two, then a chain with no Intermediate CA should instead be created.

**Test 1**: The evaluator shall ensure that the certificate of at least one of the CAs in the chain does not contain the basicConstraints extension. The evaluator shall confirm that validation of the certificate path fails (i) as part of the validation of the peer certificate belonging to this chain; and/or (ii) when attempting to add the CA certificate without the basicConstraints extension to the TOE's trust store.

The evaluator verified that the TOE rejected Certificates which chain to a CA that does not contain the basicConstraints extension value.

Test 2: The evaluator shall ensure that the certificate of at least one of the CAs in the chain has the CA flag in the basicConstraints extension not set (or set to FALSE). The evaluator shall confirm that validation of the certificate path fails (i) as part of the validation of the peer certificate belonging to this chain; and/or (ii) when attempting to add the CA certificate with the CA flag not set (or set to FALSE) in the basicConstraints extension to the TOE's trust store.

The evaluator verified that the TOE rejected Certificates which chain to a CA that has the basicConstraints extension set to FALSE.

### 2.3.2 FIA_X509_EXT.2 X.509 Certificate Authentication

#### 2.3.2.1 TSS Evaluation Activity

The evaluator shall check the TSS to ensure that it describes how the TOE chooses which certificates to use, and any necessary instructions in the administrative guidance for configuring the operating environment so that the TOE can use the certificates.



© 2023 Leidos. All rights reserved

[ST] Section 6.4 states that the TOE's use of the certificate validation function is to validate the authenticity of remote endpoints, the TSF chooses what certificates to use based on what is presented to it as part of establishing the TLS session. The TOE is only assigned one certificate for its own use, so there is only one certificate that it will present in cases where a remote entity may need to validate it.

The evaluator shall examine the TSS to confirm that it describes the behavior of the TOE when a connection cannot be established during the validity check of a certificate used in establishing a trusted channel. The evaluator shall verify that any distinctions between trusted channels are described.

[ST] Section 6.4 states that in the event that the revocation status of a certificate cannot be verified (i.e., the OCSP responder cannot be reached), the TOE will accept the certificate.

If the requirement that the administrator is able to specify the default action, then the evaluator shall ensure that the operational guidance contains instructions on how this configuration action is performed.

The administrator is not required to configure the default action. The TOE will accept the certificate if the OCSP responder cannot be reached.

#### 2.3.2.2 Guidance Evaluation Activity

None.

#### 2.3.2.3 Test Evaluation Activity

The evaluator shall perform the following test for each trusted channel:

**Test 1**: The evaluator shall demonstrate that using a valid certificate that requires certificate validation checking to be performed in at least some part by communicating with a non-TOE IT entity. The evaluator shall then manipulate the environment so that the TOE is unable to verify the validity of the certificate, and observe that the action selected in FIA_X509_EXT.2.2 is performed. If the selected action is administrator-configurable, then the evaluator shall follow the operational guidance to determine that all supported administrator-configurable options behave in their documented manner.

The evaluator verified that the TOE behaved as described by [ST] in the event that the TOE could not verify the revocation status of a presented certificate, which led to the TOE terminating the session.

**Test 2**: The evaluator shall demonstrate that an invalid certificate that requires certificate validation checking to be performed in at least some part by communicating with a non-TOE IT entity cannot be accepted.

The evaluator verified that the TOE did not accept an invalid certificate which required validation with a non-TOE IT entity.

## 2.4 Security Management (FMT)

### 2.4.1 FMT_CFG_EXT.1 Secure by Default Configuration

#### 2.4.1.1 FMT_CFG_EXT.1.1

##### 2.4.1.1.1 TSS Evaluation Activity

The evaluator shall check the TSS to determine if the application requires any type of credentials and if the application installs with default credentials.



© 2023 Leidos. All rights reserved

[ST] Section 6.5 states that as part of initial setup of the TOE, the administrator performing the install must specify an initial username/password that is used to log on to the web GUI; the TOE is not pre-loaded with "default" administrator credentials. These credentials are stored locally and protected by the TSF as per FCS_STO_EXT.1. Following the initial installation, additional accounts can be created.

##### 2.4.1.1.2 Guidance Evaluation Activity

None.

##### 2.4.1.1.3 Test Evaluation Activity

If the application uses any default credentials the evaluator shall run the following tests.

**Test 1**: The evaluator shall install and run the application without generating or loading new credentials and verify that only the minimal application functionality required to set new credentials is available.

During TOE setup a user must specify a new password for the Admin account.

**Test 2**: The evaluator shall attempt to clear all credentials and verify that only the minimal application functionality required to set new credentials is available.

It is not possible to clear all credentials on the TOE. The evaluator demonstrated that an administrative account may not delete itself, so if the TOE is reduced to one account it cannot be deleted or cleared.

**Test 3**: The evaluator shall run the application, establish new credentials and verify that the original default credentials no longer provide access to the application.

During TOE installation an Admin account with a password of "admin" is created. It should be noted that this password is changed as part of the TOE setup process and the admin/admin credentials never actually exist once TOE installation is complete.

The evaluator attempted to access the TOE with the default credentials of admin/admin and confirmed they no longer worked after initial TOE setup.

#### 2.4.1.2 FMT_CFG_EXT.1.2

##### 2.4.1.2.1 TSS Evaluation Activity

None.

##### 2.4.1.2.2 Guidance Evaluation Activity

None.

##### 2.4.1.2.3 Test Evaluation Activity

The evaluator shall install and run the application. The evaluator shall inspect the filesystem of the platform (to the extent possible) for any files created by the application and ensure that their permissions are adequate to protect them. The method of doing so varies per platform.

**Platforms: Linux…** The evaluator shall run the command `find -L . -perm /002` inside the application's data directories to ensure that all files are not world-writable. The command should not print any files.

The evaluator verified there are no world-writable files present in the TOE's application data directories.



© 2023 Leidos. All rights reserved

### 2.4.2 FMT_MEC_EXT.1 Supported Configuration Mechanism

#### 2.4.2.1 TSS Evaluation Activity

The evaluator shall review the TSS to identify the application's configuration options (e.g. settings) and determine whether these are stored and set using the mechanisms supported by the platform or implemented by the application in accordance with the PP-Module for File Encryption. At a minimum the TSS shall list settings related to any SFRs and any settings that are mandated in the operational guidance in response to an SFR.

The TOE is a Linux application and is installed into /opt/sc.

All directories containing TOE software and data are configured by default in such a manner that nothing is world-writable. Configuration settings that affect the TOE's interaction with the host OS platform are stored in /etc.

The TOE supports the following configuration and security-relevant management functions:

- Configuration of transmission of system's hardware, software, or configuration information
    - Used to configure parameters related to the collection of system configuration, network, and log data performed by environmental components, such as identifying the collection targets and configuring periodic intervals for data collection (or manually initiating data collection)
- Configuration of transmission of application state (crashdump) information
    - Includes a diagnostics utility that is manually-initiated and is used to collect application state information that can be sent to Tenable for troubleshooting purposes
- Configuration of presentation (reporting/dashboards/analytics) of collected system and network data
    - Includes a number of tools and views that aggregate, organize, summarize, and report on collected data.

Conditional: If "***implement functionality to encrypt and store configuration options as defined by FDP_PRT_EXT.1 in the PP-Module for File Encryption***" is selected, the evaluator shall ensure that the TSS identifies those options, as well as indicates where the encrypted representation of these options is stored.

Not applicable. The ST does not contain the identified selection. The TOE invokes the mechanisms recommended by the platform vendor for storing and setting configuration options.

#### 2.4.2.2 Guidance Evaluation Activity

None.



© 2023 Leidos. All rights reserved

#### 2.4.2.3 Test Evaluation Activity

**Modified in accordance with TD0747.**

**The TOE is a Linux platform. TD0747 is not applicable since TD0747 applies to Android platforms.**

If "***invoke the mechanisms recommended by the platform vendor for storing and setting configuration options***" is chosen, the method of testing varies per platform as follows:

**Platforms: Linux…** The evaluator shall run the application while monitoring it with the utility `strace`. The evaluator shall make security-related changes to its configuration. The evaluator shall verify that `strace` logs corresponding changes to configuration files that reside in `/etc` (for system-specific configuration), in the user's home directory (for user-specific configuration), or `/var/lib/` (for configurations controlled by UI and not intended to be directly modified by an administrator).

The evaluator modified the TOE's settings for certificate verification depth while monitoring the TOE with strace. Changes were written to the appropriate directories for the application.

The evaluator verified that the TOE stored configuration options were stored in the appropriate location for the platform.

It should be noted that configuration settings are stored in /opt/sc, rather than in /etc. As discussed in TQ 1387 the Linux Filesystem Hierarchy Standard permits the use of locations other than /etc for configuration setting storage if this is required for a package to function propertly. (see https://refspecs.linuxfoundation.org/FHS_3.0/fhs/ch03s07.html ).

This TOE utilizes /opt rather than /etc for configuration storage in order to support the ability to upgrade and downgrade the product. The use of /etc would make this impossible for the TOE.

If "***implement functionality to encrypt and store configuration options as defined by FDP_PRT_EXT.1 in the PP-Module for File Encryption***" is selected, for all configuration options listed in the TSS as being stored and protected using encryption, the evaluator shall examine the contents of the configuration option storage (identified in the TSS) to determine that the options have been encrypted.

The [ST] does not make this selection.

### 2.4.3 FMT_SMF.1 Specification of Management Functions

#### 2.4.3.1 TSS Evaluation Activity

None.

#### 2.4.3.2 Guidance Evaluation Activity

The evaluator shall verify that every management function mandated by the PP is described in the operational guidance and that the description contains the information required to perform the management duties associated with the management function.

As described in Section 6.5 of [ST] ("Security Management"), the TOE supports the following security-relevant management functions:

- Configuration of transmission of system's hardware, software, or configuration information—used to configure parameters related to the collection of system configuration, network, and log data performed by other Tenable applications in the operational environment, such as identifying



© 2023 Leidos. All rights reserved

the collection targets and configuring periodic intervals for data collection (or manually initiating data collection)

- Configuration of transmission of application state (crashdump) information—includes a diagnostics utility that is manually-initiated and is used to collect application state information that can be sent to Tenable for troubleshooting purposes
- Configuration of presentation (reporting/dashboards/analytics) of collected system and network data:
    - includes a number of tools and views that aggregate, organize, summarize, and report on collected data

The guidance provided by [CCECG] describes how to configure transmission of system's hardware, software, or configuration information. Refer to "Configure Scans > Resources > Nessus Scanners" for a description of how to configure collection of system configuration information using a Nessus Scanner. Refer to "Configure Scans > Resources > Nessus Network Monitor Instances" for a description of how to configure collection of network information using an instance of Nessus Network Monitor.

The guidance provided by [CCECG] includes a description of how the administrator uses the diagnostics utility to collect application state information that can be sent to Tenable for troubleshooting purposes. Refer to "Evaluated Configuration > System Settings > Diagnostic Settings".

The guidance provided by [CCECG] includes a description of how the administrator can configure presentation of collected system and network data. Refer to "Analyze Data" and to the following sub-sections: "Analyze Data > Dashboards"; and "Analyze Data > Workflow Actions > Alerts".

#### 2.4.3.3 Test Evaluation Activity

| |
|---|
| The evaluator shall test the application's ability to provide the management functions by configuring the application and testing each option selected from above. The evaluator is expected to test these functions in all the ways in which the ST and guidance documentation state the configuration can be managed. |

The evaluator verified that each of the specified management functions could successfully be completed.

## 2.5 Privacy (FPR)

### 2.5.1 FPR_ANO_EXT.1 User Consent for Transmission of Personally Identifiable Information

#### 2.5.1.1 TSS Evaluation Activity

| |
|---|
| The evaluator shall inspect the TSS documentation to identify functionality in the application where PII can be transmitted. |

[ST] Section 6.6 states that the TOE is not responsible for the collection or transmission of PII. The TOE accepts administrative credentials as part of the GUI login process but user account information is not considered to be PII. The TOE prevents the unnoticed/unauthorized transmission of PII across a network by not having functionality that is intended for such transmissions.

#### 2.5.1.2 Guidance Evaluation Activity

| |
|---|
| None. |



© 2023 Leidos. All rights reserved

#### 2.5.1.3 Test Evaluation Activity

If ***require user approval before executing*** is selected, the evaluator shall run the application and exercise the functionality responsible for transmitting PII and verify that user approval is required before transmission of the PII.

This is not applicable as the TOE selects that it does not transmit PII .

## 2.6 Protection of the TSF (FPT)

### 2.6.1 FPT_AEX_EXT.1 Anti-Exploitation Capabilities

#### 2.6.1.1 FPT_AEX_EXT.1.1

##### 2.6.1.1.1 TSS Evaluation Activity

The evaluator shall ensure that the TSS describes the compiler flags used to enable ASLR when the application is compiled.

[ST] Section 6.7 states that the TOE implements address space layout randomization (ASLR) through the use of the `-fPIC` compiler flag and relies fully on its underlying host platforms to perform memory mapping. The TOE also does not use both PROT_WRITE and PROT_EXEC on the same memory regions. There is no situation where the TSF maps memory to an explicit address.

##### 2.6.1.1.2 Guidance Evaluation Activity

None.

##### 2.6.1.1.3 Test Evaluation Activity

The evaluator shall perform either a static or dynamic analysis to determine that no memory mappings are placed at an explicit and consistent address. The method of doing so varies per platform. For those platforms requiring the same application running on two different systems, the evaluator may alternatively use the same device. After collecting the first instance of mappings, the evaluator must uninstall the application, reboot the device, and reinstall the application to collect the second instance of mappings.

**Platforms: Linux…** The evaluator shall run the same application on two different Linux systems. The evaluator shall then compare their memory maps using `pmap -x PID` to ensure the two different instances share no mapping locations.

The evaluator verified that the TOE does not map the same memory locations during different instances of the TOE's execution.

#### 2.6.1.2 FPT_AEX_EXT.1.2

##### 2.6.1.2.1 TSS Evaluation Activity

None.

##### 2.6.1.2.2 Guidance Evaluation Activity

None.



© 2023 Leidos. All rights reserved

#### 2.6.1.2.3 Test Evaluation Activity

The evaluator shall verify that no memory mapping requests are made with write and execute permissions. The method of doing so varies per platform.

**Platforms: Linux…** The evaluator shall perform static analysis on the application to verify that both

- `mmap` is never be invoked with both the `PROT_WRITE` and `PROT_EXEC` permissions, and
- `mprotect` is never invoked with the `PROT_EXEC` permission.

The evaluator verified that mmap is never invoked with both PROT_WRITE and PROT_EXEC, and that mprotect is never invoked with PROT_EXEC.

### 2.6.1.3 FPT_AEX_EXT.1.3

#### 2.6.1.3.1 TSS Evaluation Activity

None.

#### 2.6.1.3.2 Guidance Evaluation Activity

None.

#### 2.6.1.3.3 Test Evaluation Activity

The evaluator shall configure the platform in the ascribed manner and carry out one of the prescribed tests:

**Platforms: Linux…** The evaluator shall ensure that the application can successfully run on a system with either SELinux or AppArmor enabled and in enforce mode.

The evaluator verified that the TOE could run with SELinux enabled and in enforce mode.

### 2.6.1.4 FPT_AEX_EXT.1.4

#### 2.6.1.4.1 TSS Evaluation Activity

None.

#### 2.6.1.4.2 Guidance Evaluation Activity

None.

#### 2.6.1.4.3 Test Evaluation Activity

The evaluator shall run the application and determine where it writes its files. For files where the user does not choose the destination, the evaluator shall check whether the destination directory contains executable files. This varies per platform:

**Platforms: Linux…** The evaluator shall run the program, mimicking normal usage, and note where all user-modifiable files are written. The evaluator shall ensure that there are no executable files stored in the same directories to which the application wrote user-modifiable files.

The evaluator verified that the TOE did not store any user modifiable files in the same directory as an executable file.



© 2023 Leidos. All rights reserved

#### 2.6.1.5 FPT_AEX_EXT.1.5

##### 2.6.1.5.1 TSS Evaluation Activity

None.

##### 2.6.1.5.2 Guidance Evaluation Activity

None.

##### 2.6.1.5.3 Test Evaluation Activity

The evaluator will inspect every native executable included in the TOE to ensure that stack-based buffer overflow protection is present.

**For PE** , the evaluator will disassemble each and ensure the following sequence appears:

mov rcx, QWORD PTR [rsp+(...)]

xor rcx, (...)

call (...)

**For ELF executables**, the evaluator will ensure that each contains references to the symbol

__stack_chk_fail.

Tools such as Canary Detector may help automate these activities.

The evaluator verified that the TOE's ELF executables contained a reference to '__stack_chk_fail'.

### 2.6.2 FPT_API_EXT.1 Use of Supported Services and APIs

#### 2.6.2.1 TSS Evaluation Activity

The evaluator shall verify that the TSS lists the platform APIs used in the application.

Appendix A.1 lists the APIs used by the TOE.

#### 2.6.2.2 Guidance Evaluation Activity

None.

#### 2.6.2.3 Test Evaluation Activity

The evaluator shall then compare the list with the supported APIs (available through e.g. developer accounts, platform developer groups) and ensure that all APIs listed in the TSS are supported.

The evaluator verified that each of the platform API's listed in Appendix A.1 of the [ST] are valid API's and are documented.

### 2.6.3 FPT_LIB_EXT.1 Use of Third Party Libraries

#### 2.6.3.1 TSS Evaluation Activity

None.



© 2023 Leidos. All rights reserved

#### 2.6.3.2 Guidance Evaluation Activity

None.

#### 2.6.3.3 Test Evaluation Activity

The evaluator shall install the application and survey its installation directory for dynamic libraries. The evaluator shall verify that libraries found to be packaged with or employed by the application are limited to those in the assignment.

The evaluator surveyed the TOE's installation directory for dynamic libraries and found that those present are consistent with the third party libraries specified by the [ST].

### 2.6.4 FPT_IDV_EXT.1 Software Identification and Versions

#### 2.6.4.1 TSS Evaluation Activity

If **"other version information"** is selected the evaluator shall verify that the TSS contains an explanation of the versioning methodology.

The SFR includes "other version information" in the assignment. [ST] Section 6.7 identifies that the TOE is using *semver* (Semantic Versioning) in the format x.y(.z) where x is the major version, y is the minor version, and the optional z is the patch version; SWID is not used.

#### 2.6.4.2 Guidance Evaluation Activity

None.

#### 2.6.4.3 Test Evaluation Activity

The evaluator shall install the application, then check for the existence of version information. If ***SWID tags*** is selected the evaluator shall check for a .swidtag file. The evaluator shall open the file and verify that is contains at least a SoftwareIdentity element and an Entity element.

The evaluator verified that the TOE possess version information. The TOE does not utilize SWID tags and thus that portion of the activity is Not Applicable.

### 2.6.5 FPT_TUD_EXT.1 Integrity for Installation and Update

#### 2.6.5.1 FPT_TUD_EXT.1.1

##### 2.6.5.1.1 TSS Evaluation Activity

None.

##### 2.6.5.1.2 Guidance Evaluation Activity

The evaluator shall check to ensure the guidance includes a description of how updates are performed.

The guidance provided by [CCECG] includes a description of how updates are performed. Refer to "Installation and Upgrade > Upgrade Tenable Security Center".



© 2023 Leidos. All rights reserved

#### 2.6.5.1.3 Test Evaluation Activity

| |
|---|
| The evaluator shall check for an update using procedures described in either the application documentation or the platform documentation and verify that the application does not issue an error. If it is updated or if it reports that no update is available this requirement is considered to be met. |

The evaluator verified that the TOE could successfully check for updates. The evaluator observed that no updates were currently available.

### 2.6.5.2 FPT_TUD_EXT.1.2

#### 2.6.5.2.1 TSS Evaluation Activity

| |
|---|
| None. |

#### 2.6.5.2.2 Guidance Evaluation Activity

| |
|---|
| The evaluator shall verify guidance includes a description of how to query the current version of the application. |

The guidance provided by [CCECG] includes a description of how to query the current version of the application. The **Username** menu in the top navigation bar of the Tenable.sc web interface includes the **About** menu item, which displays the Tenable Security Center version. Refer to "Evaluated Configuration > System Settings > User Profile Menu Settings". The "About" menu item displays TOE version information.

#### 2.6.5.2.3 Test Evaluation Activity

| |
|---|
| The evaluator shall query the application for the current version of the software according to the operational user guidance. The evaluator shall then verify that the current version matches that of the documented and installed version. |

The evaluator verified that it is possible to query the TOE version through the GUI as described in the guidance.

### 2.6.5.3 FPT_TUD_EXT.1.3

#### 2.6.5.3.1 TSS Evaluation Activity

| |
|---|
| None. |

#### 2.6.5.3.2 Guidance Evaluation Activity

| |
|---|
| None. |



© 2023 Leidos. All rights reserved

#### 2.6.5.3.3 Test Evaluation Activity

The evaluator shall verify that the application's executable files are not changed by the application.

**Platforms: Apple iOS…** The evaluator shall consider the requirement met because the platform forces applications to write all data within the application working directory (sandbox).

For all other platforms, the evaluator shall perform the following test:

**Test 1:** The evaluator shall install the application and then locate all of its executable files. The evaluator shall then, for each file, save off either a hash of the file or a copy of the file itself. The evaluator shall then run the application and exercise all features of the application as described in the ST. The evaluator shall then compare each executable file with the either the saved hash or the saved copy of the files. The evaluator shall verify that these are identical.

The evaluator collected a SHA256 hash of all of the TOE's executable files and verified that the TOE did not change or modify any of its executable files by recollecting the hash at a later point in time and comparing the two collection to each other.

### 2.6.5.4 FPT_TUD_EXT.1.4

#### 2.6.5.4.1 TSS Evaluation Activity

The evaluator shall verify that the TSS identifies how updates to the application are signed by an authorized source. The definition of an authorized source must be contained in the TSS. The evaluator shall also ensure that the TSS (or the operational guidance) describes how candidate updates are obtained.

[ST] Section 6.7 states that updates the TOE are digitally signed by Tenable using 4096-bit RSA. The updates are validated by the host platform prior to installation.

The TOE can leverage its OS platform to check for software updates and acquire them if they are available. In this case, candidate updates are obtained by the administrator downloading them directly from Tenable's website or through a package manager such as *yum*.

#### 2.6.5.4.2 Guidance Evaluation Activity

None.

#### 2.6.5.4.3 Test Evaluation Activity

None.

### 2.6.5.5 FPT_TUD_EXT.1.5

#### 2.6.5.5.1 TSS Evaluation Activity

The evaluator shall verify that the TSS identifies how the application is distributed. If "***with the platform***" is selected the evaluated shall perform a clean installation or factory reset to confirm that TOE software is included as part of the platform OS. If "***as an additional package***" is selected the evaluator shall perform the tests in FPT_TUD_EXT.2.

[ST] Section 6.7 states that the TOE is a standalone application that is not natively bundled as part of a host OS. FPT_TUD_EXT.2 is included in the Security Target.



© 2023 Leidos. All rights reserved

#### 2.6.5.5.2 Guidance Evaluation Activity

None.

#### 2.6.5.5.3 Test Evaluation Activity

None.

### 2.6.6 FPT_TUD_EXT.2 Integrity for Installation and Update

#### 2.6.6.1 FPT_TUD_EXT.2.1

#### 2.6.6.1.1 TSS Evaluation Activity

None.

#### 2.6.6.1.2 Guidance Evaluation Activity

None.

#### 2.6.6.1.3

#### 2.6.6.1.4 Test Evaluation Activity

**Modified in accordance with TD0628.**

If a container image is claimed the evaluator shall verify that application updates are distributed as container images. If the format of the platform-supported package manager is claimed, the evaluator shall verify that application updates are distributed in the format supported by the platform. This varies per platform:

Platforms: Linux....

> The evaluator shall ensure that the application is packaged in the format of the package management infrastructure of the chosen distribution. For example, applications running on Red Hat and Red Hat derivatives shall be packaged in RPM format. Applications running on Debian and Debian derivatives shall be packaged in DEB format.

The evaluator verified that the installation file of the TOE is packaged as a .rpm file.

#### 2.6.6.2 FPT_TUD_EXT.2.2

#### 2.6.6.2.1 TSS Evaluation Activity

None.

#### 2.6.6.2.2 Guidance Evaluation Activity

None.

#### 2.6.6.2.3 Test Evaluation Activity

**Modified in accordance with TD0664.**

~~**Platforms: Microsoft Windows...**~~



© 2023 Leidos. All rights reserved

~~The evaluator shall install the application and then locate all of its executable files. The evaluator shall then, for each file, save off either a hash of the file or a copy of the file itself. The evaluator shall then run the application and exercise all features of the application as described in the ST. The evaluator shall then compare each executable file with the either the saved hash or the saved copy of the files. The evaluator shall verify that these are identical.~~

~~**Platforms: Linux**~~

~~The evaluator shall install the application and then locate all of its executable files. The evaluator shall then, for each file, save off either a hash of the file or a copy of the file itself. The evaluator shall then run the application and exercise all features of the application as described in the ST. The evaluator shall then compare each executable file with the either the saved hash or the saved copy of the files. The evaluator shall verify that these are identical.~~

**For All Other Platforms:** The evaluator shall record the path of every file on the entire filesystem prior to installation of the application, and then install and run the application. Afterwards, the evaluator shall then uninstall the application, and compare the resulting filesystem to the initial record to verify that no files, other than configuration, output, and audit/log files, have been added to the filesystem.

The evaluator surveyed all the files present on the system prior to installing the TOE. The evaluator installed and utilized the TOE. The evaluator then uninstalled the TOE. After the TOE was uninstalled, the evaluator surveyed all of the files present on the system. The evaluator verified that the TOE did not leave any executable files on the system.

#### 2.6.6.3 FPT_TUD_EXT.2.3

##### 2.6.6.3.1 TSS Evaluation Activity

The evaluator shall verify that the TSS identifies how the application installation package is signed by an authorized source. The definition of an authorized source must be contained in the TSS.

[ST] Section 6.7 states that updates the TOE are digitally signed by Tenable using 4096-bit RSA. The updates are validated by the host platform prior to installation.

##### 2.6.6.3.2 Guidance Evaluation Activity

None.

##### 2.6.6.3.3 Test Evaluation Activity

None.

## 2.7 Trusted Path/Channels (FTP)

### 2.7.1 FTP_DIT_EXT.1 Protection of Data in Transit

#### 2.7.1.1 TSS Evaluation Activity

For platform-provided functionality, the evaluator shall verify the TSS contains the calls to the platform that TOE is leveraging to invoke the functionality.

[ST] Section 6.8 states that the TOE relies on its own mechanisms to secure some data in transit between itself and its operational environment.



© 2023 Leidos. All rights reserved

In the evaluated configuration, the TOE uses both its own cryptographic implementation and its host OS platform to encrypt sensitive data in transit. Listed below are the various external interfaces to the TOE that rely on trusted communications.

**Between TOE and operational environment:**

- Between user and TOE web GUI
  - Communications use mutually-authenticated TLS/HTTPS (TOE is server)
  - TCP port 443
  - Used to secure administrator interactions with the TOE

**Between TOE and environmental Tenable components:**

- Between TOE and Nessus
  - Communications use XML RPCs over mutually-authenticated TLS/HTTPS (TOE is client and Nessus is server)
  - Configurable TCP port, 8834 is default
  - Used by the TOE to retrieve Nessus/Nessus Agent scan results from Nessus
- Between TOE and Nessus Network Monitor
  - Communications use mutually-authenticated TLS (TOE is client)
  - Configurable TCP port, 8835 is default
  - Used by the TOE to collect network traffic data from NNM
- Between TOE and Log Correlation Engine
  - Communications use TLS (TOE is client)
  - TCP port 1243
  - Used by the TOE to collect unaltered bulk log data aggregated by LCE
- Between TOE and Log Correlation Engine
  - Communications use SSH (implemented by the operational environment)
  - TCP port 22
  - Used by the TOE to collect log data that has already been parsed by LCE as potential vulnerabilities

All use of SSH is accomplished through TSF invocation of the RHEL `ssh` utility.

#### 2.7.1.2 Guidance Evaluation Activity

| None. |
|---|



© 2023 Leidos. All rights reserved

#### 2.7.1.3 Test Evaluation Activity

The evaluator shall perform the following tests:

**Test 1:** The evaluator shall exercise the application (attempting to transmit data; for example by connecting to remote systems or websites) while capturing packets from the application. The evaluator shall verify from the packet capture that the traffic is encrypted with HTTPS, TLS, DTLS, SSH, or IPsec in accordance with the selection in the ST.

This test was performed in conjunction with FDP_NET_EXT.1.1 Test 1.

**Test 2:** The evaluator shall exercise the application (attempting to transmit data; for example by connecting to remote systems or websites) while capturing packets from the application. The evaluator shall review the packet capture and verify that no sensitive data is transmitted in the clear.

This test was performed in conjunction with FDP_NET_EXT.1.1 Test 1.

**Test 3:** The evaluator shall inspect the TSS to determine if user credentials are transmitted. If credentials are transmitted the evaluator shall set the credential to a known value. The evaluator shall capture packets from the application while causing credentials to be transmitted as described in the TSS. The evaluator shall perform a string search of the captured network packets and verify that the plaintext credential previously set by the evaluator is not found.

The evaluator examined the TSS and determined that the TOE does not transmit any user credentials.



© 2023 Leidos. All rights reserved

# 3. Security Assurance Requirement Assurance Activities

## 3.1 Development (ADV)

### 3.1.1 Basic Functional Specification (ADV_FSP.1)

#### 3.1.1.1 Assurance Activity

There are no specific assurance activities associated with these SARs, except ensuring the information is provided. The functional specification documentation is provided to support the evaluation activities described in Section 5.1, and other activities described for AGD, ATE, and AVA SARs. The requirements on the content of the functional specification information is implicitly assessed by virtue of the other assurance activities being performed; if the evaluator is unable to perform an activity because there is insufficient interface information, then an adequate functional specification has not been provided.

The Assurance Activities identified above provided sufficient information to determine the appropriate content for the TSS section and to perform the assurance activities. Since these are directly associated with the SFRs, and are implicitly already done, no additional documentation or analysis is necessary.

## 3.2 Guidance Documents (AGD)

### 3.2.1 Operational User Guidance (AGD_OPE.1)

#### 3.2.1.1 Assurance Activity

Some of the contents of the operational guidance will be verified by the assurance activities in Section 5.1 and evaluation of the TOE according to the [CEM]. The following additional information is also required.

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

The documentation must describe the process for verifying updates to the TOE by verifying a digital signature – this may be done by the TOE or the underlying platform.

The evaluator shall verify that this process includes the following steps:

Instructions for obtaining the update itself. This should include instructions for making the update accessible to the TOE (e.g., placement in a specific directory).

Instructions for initiating the update process, as well as discerning whether the process was successful or unsuccessful. This includes generation of the hash/digital signature. The TOE will likely contain security functionality that does not fall in the scope of evaluation under this PP. The operational guidance shall make it clear to an administrator which security functionality is covered by the evaluation activities.

The guidance provided by [CCECG] includes a description of how updates are performed on the RHEL 8 platforms. Refer to “Installation and Upgrade > Upgrade Tenable Security Center”.

The cryptographic functions are provided by the TOE. Refer to [CCECG] Section Additional Resources > Encryption Strength > Configure Tenable Security Center for NIAP Compliance for additional details.



© 2023 Leidos. All rights reserved

### 3.2.2 Preparative Procedures (AGD_PRE.1)

#### 3.2.2.1 Assurance Activity

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

The TOE in its evaluated configuration is supported on RHEL 8. See [CCECG] Section System Requirements > Operating System Requirements.

## 3.3 Tests (ATE)

### 3.3.1 Independent Testing – Conformance (ATE_IND.1)

#### 3.3.1.1 Assurance Activity

The evaluator shall prepare a test plan and report documenting the testing aspects of the system, including any application crashes during testing. The evaluator shall determine the root cause of any application crashes and include that information in the report. The test plan covers all of the testing actions contained in the [CEM] and the body of this PP's Assurance Activities.

While it is not necessary to have one test case per test listed in an Assurance Activity, the evaluator must document in the test plan that each applicable testing requirement in the ST is covered. The test plan identifies the platforms to be tested, and for those platforms not included in the test plan but included in the ST, the test plan provides a justification for not testing the platforms. This justification must address the differences between the tested platforms and the untested platforms, and make an argument that the differences do not affect the testing to be performed. It is not sufficient to merely assert that the differences have no affect; rationale must be provided. If all platforms claimed in the ST are tested, then no rationale is necessary. The test plan describes the composition of each platform to be tested, and any setup that is necessary beyond what is contained in the AGD documentation. It should be noted that the evaluator is expected to follow the AGD documentation for installation and setup of each platform either as part of a test or as a standard pre-test condition. This may include special test drivers or tools. For each driver or tool, an argument (not just an assertion) should be provided that the driver or tool will not adversely affect the performance of the functionality by the TOE and its platform.

This also includes the configuration of the cryptographic engine to be used. The cryptographic algorithms implemented by this engine are those specified by this PP and used by the cryptographic protocols being evaluated (IPsec, TLS, SSH). The test plan identifies high-level test objectives as well as the test procedures to be followed to achieve those objectives. These procedures include expected results.

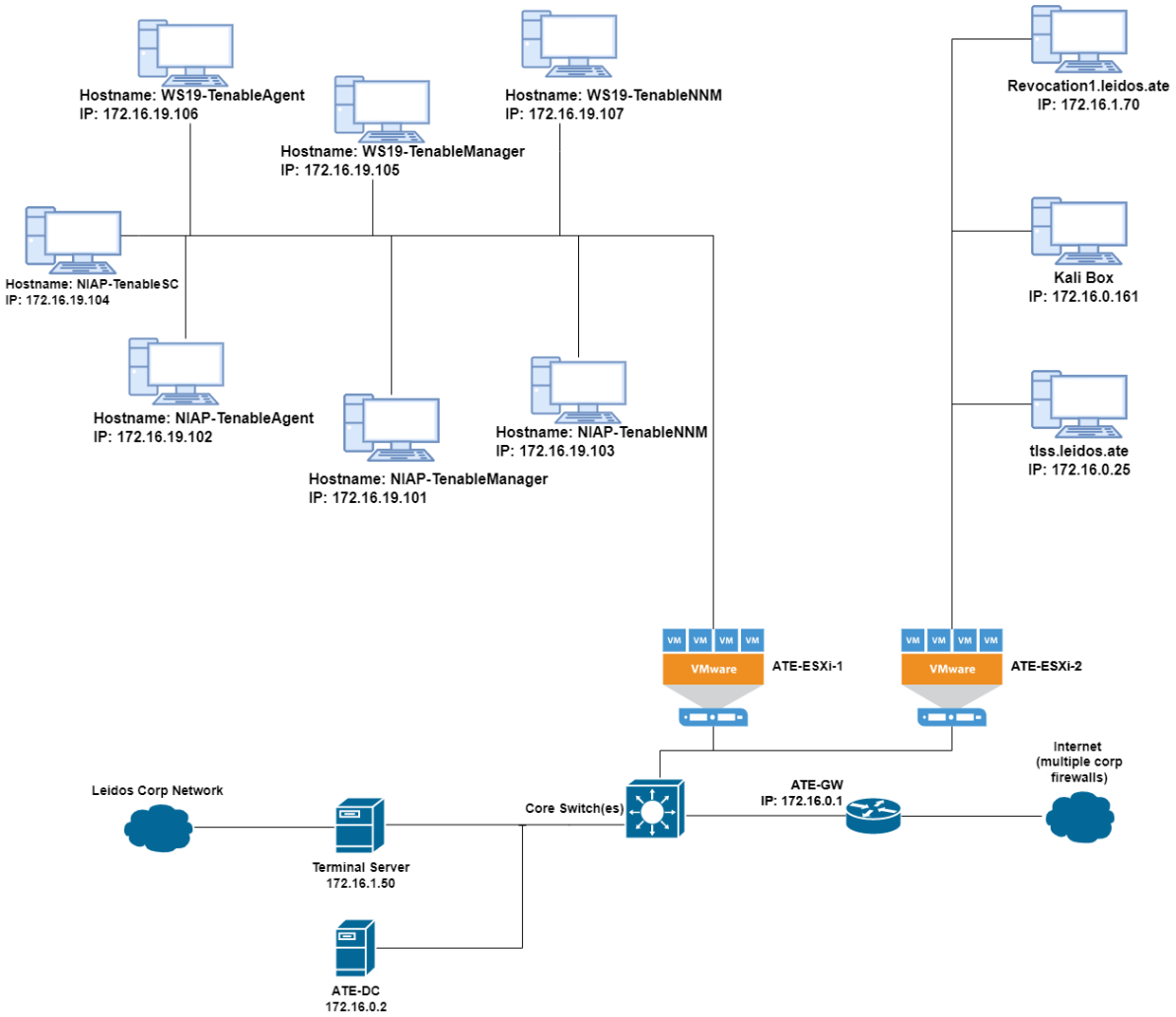
The test report (which could just be an annotated version of the test plan) details the activities that took place when the test procedures were executed, and includes the actual results of the tests. This shall be a cumulative account, so if there was a test run that resulted in a failure; a fix installed; and then a successful re-run of the test, the report would show a "fail" and "pass" result (and the supporting details), and not just the "pass" result.

Testing of the TOE was performed at the Leidos Accredited Testing and Evaluation Lab located in Columbia, Maryland from April 2023 to September 2023. The results are recorded in [Test].



© 2023 Leidos. All rights reserved

This section identifies the test configuration and verifies that each of the TOE components defined within the Security Target were included during testing.




As documented in the diagram above, the following hardware and software components were included in the evaluated configuration during testing:

**TOE**

- NIAP-TenableSC
  - Platform: RedHat Enterprise 8.7
  - IP:172.16.19.104
  - Running on ATE-ESXi-1 (VMware ESXi, 6.5.0)
    - CPU: AMD Ryzen Threadripper 1950X 16-Core Processor

**Additional Components**

- ATE-GW (Physical)
  - Purpose: Main router/gateway
  - IP/MASK/MAC: 172.16.0.1 / 16 / ac:1f:6b:95:0c:1d
  - OS: PfSense 2.4.4-RELEASE-p2
- ATE-DC (Physical)
  - Purpose: Main Domain Controller (DC) for Test environment/DNS server



© 2023 Leidos. All rights reserved

- IP/MASK/MAC: 172.16.0.2 / 16 / 00:22:19:58:EB:8D
- OS: Windows Server 2016 version 1607
- Protocols used: RDP, NTP, LDAP, DNS

- ATE-ESXi-1 (Physical)
  - Purpose: Virtualization server
  - IP/MASK/MAC: 172.16.1.62 / 16 / 10:7b:44:92:77:bf
  - OS: VMware ESXi, 6.5.0, 5969303
- ATE-ESXi-2 (Physical)
  - Purpose: Virtualization server
  - IP/MASK/MAC: 172.16.1.63 / 16 / ac:1f:6b:c6:50:96
  - CPU: Intel(R) Xeon(R) Gold 6248 CPU @ 2.50GHz
    OS: VMware ESXi, 6.7.0, 13006603
- Terminal Server
  - Purpose: Provide tester access to the Test Environment from corporate network.
  - IP/MASK/MAC: 172.16.1.50 / 16 / D4:BE:D9:B4:FE:66
  - OS: Windows server 2016 version 1607
  - Protocols used: RDP, NTP, LDAP, DNS, SSH
- Revocation1.leidos.ate (VM)
  - Purpose: Hosts TLS/OCSP Test Tools
  - IP/MASK/MAC: 172.16.1.70/ 16 / 00:50:56:b1:a0:fd
  - OS: Ubuntu 18.04.4
  - Protocols Used: SSH, TLS, OCSP
  - Running on ATE-ESXi-2 (VMware ESXi, 6.7.0, 13006603)
  - Relevant Software:
    - OpenSSL 1.1.1
    - Wireshark 2.6.10
- TLSS.leidos.ate (VM)
  - Purpose: Hosts TLS Test Tools
  - IP/MASK/MAC: 172.16.0.25 / 16 / 00:50:56:b1:66:0b
  - OS: Ubuntu 18.04.5
  - Protocols Used: SSH, TLS, NTP, DNS
  - Running on ATE-ESXi-2 (VMware ESXi, 6.7.0, 13006603)
  - Relevant Software:
    - Proprietary Python TLS test tools
    - OpenSSL 1.1.1
    - Wireshark 2.6.10
- Kali Box (VM)
  - Purpose: Hosts TLS Test Tools
  - IP/MASK/MAC: 172.16.0.161 / 16 / 00:50:56:b1:60:37
  - OS: Kali 2019.3
  - Protocols Used: SSH,
  - Running on ATE-ESXi-1 (VMware ESXi, 6.5.0)
    - CPU: AMD Ryzen Threadripper 1950X 16-Core Processor
  - Relevant Software:
    - SSLyze v2.0.6
    - OpenSSL 1.1.1



© 2023 Leidos. All rights reserved

- NIAP-TenableAgent
    - Platform: RedHat Enterprise 8.7
    - IP:172.16.19.102
    - Running on ATE-ESXi-1 (VMware ESXi, 6.5.0)
        - CPU: AMD Ryzen Threadripper 1950X 16-Core Processor
- WS19-TenableAgent
    - Platform: Windows Server 2019
    - IP: 172.16.19.106
    - Running on ATE-ESXi-1 (VMware ESXi, 6.5.0)
        - CPU: AMD Ryzen Threadripper 1950X 16-Core Processor
- NIAP-TenableManager
    - Platform: RedHat Enterprise 8.7
    - IP: 172.16.19.101
    - Running on ATE-ESXi-1 (VMware ESXi, 6.5.0)
        - CPU: AMD Ryzen Threadripper 1950X 16-Core Processor
- WS19-TenableManager
    - Platform: Windows Server 2019
    - IP: 172.16.19.105
    - Running on ATE-ESXi-1 (VMware ESXi, 6.5.0)
        - CPU: AMD Ryzen Threadripper 1950X 16-Core Processor
- NIAP-TenableNNM
    - Platform: RedHat Enterprise 8.7
    - IP: 172.16.19.103
    - Running on ATE-ESXi-1 (VMware ESXi, 6.5.0)
        - CPU: AMD Ryzen Threadripper 1950X 16-Core Processor
- WS19-TenableNNM
    - Platform: Windows Server 2019
    - IP: 172.16.19.107
        - Running on ATE-ESXi-1 (VMware ESXi, 6.5.0)CPU: AMD Ryzen Threadripper 1950X 16-Core Processor

## 3.4 Vulnerability Assessment (AVA)

### 3.4.1 Vulnerability Survey (AVA_VAN.1)

#### 3.4.1.1 Assurance Activity

The evaluator shall generate a report to document their findings with respect to this requirement. This report could physically be part of the overall test report mentioned in ATE_IND, or a separate document. The evaluator performs a search of public information to find vulnerabilities that have been found in similar applications with a particular focus on network protocols the application uses and document formats it parses. The evaluator shall also run a virus scanner with the most current virus definitions against the application files and verify that no files are flagged as malicious.

The evaluator documents the sources consulted and the vulnerabilities found in the report.



© 2023 Leidos. All rights reserved

For each vulnerability found, the evaluator either provides a rationale with respect to its non-applicability, or the evaluator formulates a test (using the guidelines provided in ATE_IND) to confirm the vulnerability, if suitable. Suitability is determined by assessing the attack vector needed to take advantage of the vulnerability. If exploiting the vulnerability requires expert skills and an electron microscope, for instance, then a test would not be suitable and an appropriate justification would be formulated.

**For Windows, Linux, macOS and Solaris:** The evaluator shall also run a virus scanner with the most current virus definitions against the application files and verify that no files are flagged as malicious.

The evaluation team performed each AVA evaluation activity and applied each AVA_VAN.1 CEM work unit. The evaluation team performed a vulnerability analysis following the processes described in the claimed PP. This comprised a search of public vulnerability databases.

The evaluation team performed a search of the National Vulnerability Database (https://nvd.nist.gov/).

Searches were performed on May 1, 2023. Follow up searches were performed on August 14, 2023, September 2, 2023, and October 2, 2023 using the following search terms:

The evaluation team used the following search terms in the searches of the repository listed above:

- "tenable"
- "nessus" (Note, as discussed in [ST], "Nessus Manager" is the same product as "Nessus", with an additional license enabled, so searching on "nessus" encompasses searching for "nessus manager")
- "tls v1.2"
- "openssl 3.0.10"
- Third-Party Libraries

  Listed below are the third-party libraries used by the TOE. Note that these libraries do not necessarily relate to the TOE functionality claimed in the Security Target; however, since they are bundled with the product itself they are disclosed since a vulnerability in outside the logical boundary of the product could still present an exploitable vulnerability.

| Plugin Name | Tenable Security Center 6.2.0 |
|---|---|
| Apache FOP | 2.8 |
| Apache HTTP Server | 2.4.57 |
| Apache Portable Runtime | 1.7.3 |
| Apache Portable Runtime Utils | 1.6.3 |
| Backbone | 1.4.1 |
| Bootstrap | 3.4.1 |
| ChartDirector | 7.0 |
| composer | 2.5.7 |
| D3 | 3.3.8 |
| fusioncharts | 3.18.0 |
| fusioncharts.charts | 3.18.0 |



© 2023 Leidos. All rights reserved

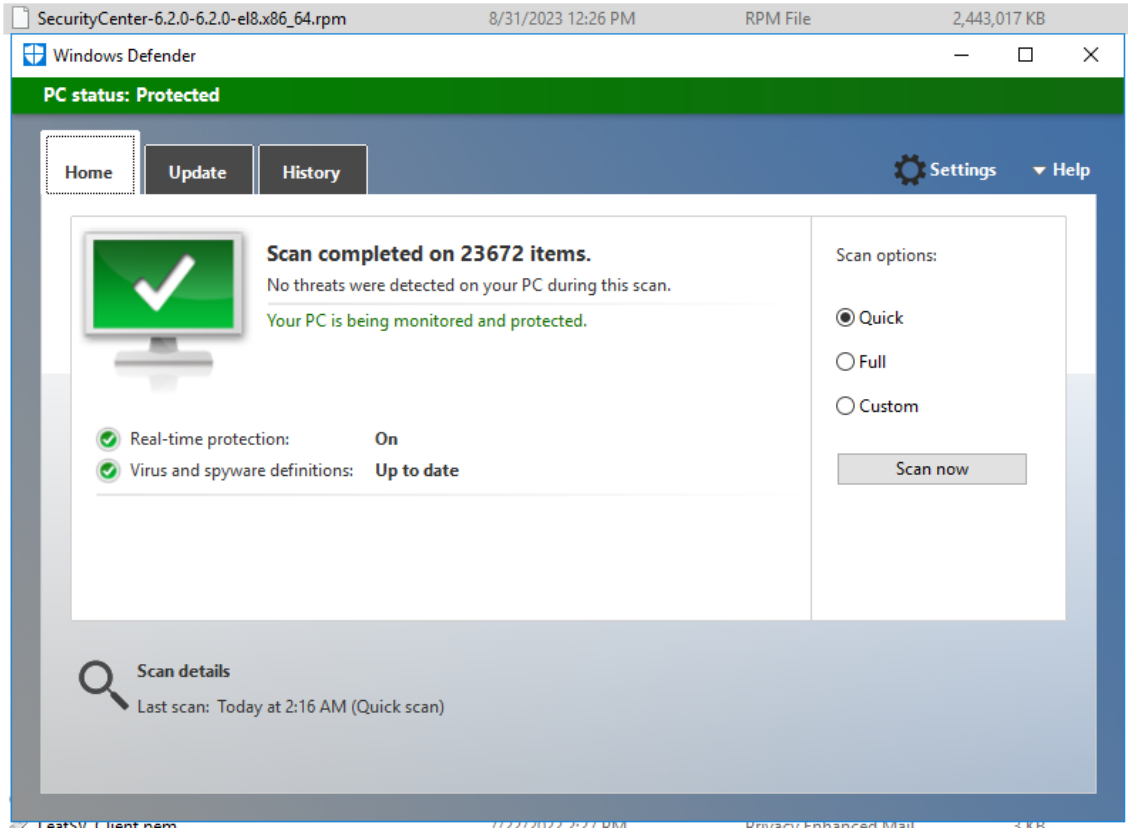
| | |
|---|---|
| fusioncharts.gantt | 3.18.0 |
| fusioncharts.theme.fusion | 3.18.0 |
| fusioncharts.timeseries | 3.18.0 |
| GMP | 6.3 |
| Handlebars | 4.7.7 |
| jQuery | 3.6.0 |
| jQuery UI | 1.13.2 |
| libcurl | 8.3.0 |
| libmcrypt | 2.5.8 |
| libssh2 | 1.11.0 |
| mcrypt | 1.0.6 |
| Moment Timezone | 0.5.38 |
| MomentJS | 2.29.4 |
| OpenLDAP | 2.6.6 |
| OpenSSL | 3.0.10 |
| PCRE / libpcre | 8.45 |
| PHP | 8.2.8 |
| PHP SourceGuardian Loaders | 14.0.1 |
| PHP SSH2 Extension | 1.10.0 |
| PHPMailer | 6.8.0 |
| RapidJSON | 1.1.0 |
| SimpleSAMLPHP | 2.0.4 |
| sqlite | 3.40.1 |
| SSH PECL | 1.3.1 |
| UnderscoreJS | 1.13.6 |
| zlib | 1.2.13 |

The results of these searches did not identify any vulnerabilities that are applicable to the TOE. The conclusion drawn from the vulnerability analysis is that no residual vulnerabilities exist that are exploitable by attackers with Basic Attack Potential as defined by the Certification Body in accordance with the guidance in the CEM.

A Windows Defender virus scan was executed against the TOE's installation file. This scan was performed with anti-virus definitions that were up to date as of August 31st, 2023.



© 2023 Leidos. All rights reserved




## 3.5 Life-Cycle Support (ALC)

### 3.5.1 Labeling of the TOE (ALC_CMC.1)

#### 3.5.1.1 Assurance Activity

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

Section 1.1 of [ST] (“Security Target, TOE and CC Identification”) includes the TOE identification. The TOE is identified in terms of the software included in the evaluated configuration. The TOE Security Center 6.2.0, supported on RHEL 8.

The TOE version is consistent with the version number of the TOE identified in [CCECG] and the version identified by the TOE sample received for testing.



© 2023 Leidos. All rights reserved

### 3.5.2 TOE Coverage (ALC_CMS.1)

#### 3.5.2.1 Assurance Activity

The "evaluation evidence required by the SARs" in this PP is limited to the information in the ST coupled with the guidance provided to administrators and users under the AGD requirements. By ensuring that the TOE is specifically identified and that this identification is consistent in the ST and in the AGD guidance (as done in the assurance activity for ALC_CMC.1), the evaluator implicitly confirms the information required by this component. Life-cycle support is targeted aspects of the developer's life-cycle and instructions to providers of applications for the developer's devices, rather than an in-depth examination of the TSF manufacturer's development and configuration management process. This is not meant to diminish the critical role that a developer's practices play in contributing to the overall trustworthiness of a product; rather, it's a reflection on the information to be made available for evaluation.

The evaluator shall ensure that the developer has identified (in guidance documentation for application developers concerning the targeted platform) one or more development environments appropriate for use in developing applications for the developer's platform. For each of these development environments, the developer shall provide information on how to configure the environment to ensure that buffer overflow protection mechanisms in the environment(s) are invoked (e.g., compiler flags). The evaluator shall ensure that this documentation also includes an indication of whether such protections are on by default, or have to be specifically enabled. The evaluator shall ensure that the TSF is uniquely identified (with respect to other products from the TSF vendor), and that documentation provided by the developer in association with the requirements in the ST is associated with the TSF using this unique identification.

As described in Section 3.5.1 above, the evaluator confirmed the TOE is labelled with unique software version identifiers. Section 6.7 of [ST] ("Protection of the TSF") describes how each TOE version uses security features and APIs provided by its platform. This includes data execution protection, stack-based buffer overflow protection, and compatibility with platform security features.

### 3.5.3 Timely Security Update (ALC_TSU_EXT.1)

#### 3.5.3.1 Assurance Activity

The evaluator shall verify that the TSS contains a description of the timely security update process used by the developer to create and deploy security updates. The evaluator shall verify that this description addresses the entire application. The evaluator shall also verify that, in addition to the TOE developer's process, any third-party processes are also addressed in the description. The evaluator shall also verify that each mechanism for deployment of security updates is described.

The evaluator shall verify that, for each deployment mechanism described for the update process, the TSS lists a time between public disclosure of a vulnerability and public availability of the security update to the TOE patching this vulnerability, to include any third-party or carrier delays in deployment. The evaluator shall verify that this time is expressed in a number or range of days.

The evaluator shall verify that this description includes the publicly available mechanisms (including either an email address or website) for reporting security issues related to the TOE. The evaluator shall verify that the description of this mechanism includes a method for protecting the report either using a public key for encrypting email or a trusted channel for a website.

Tenable supports a timely security update process for the TOE In addition to their own internal research, the product vendor supports disclosure of potential issues using community forums, direct engagement,



© 2023 Leidos. All rights reserved

and the Tenable support channel. For issues where there is a potential security concern, the support channel uses HTTPS for secure disclosure.

When an issue is reported, Tenable will determine its applicability to the product. The length of time needed to make this determination depends on the complexity of the issue and the extent to which it can be reproduced; well-documented issues such as exposure to a published CVE can be made quickly. If found to be a security issue, a patch is released within 30 days. Tenable monitors the third-party components used by the TOE for potential security issues as well. However, an issue with a dependent component may not be addressed if found not to be applicable to the TOE. For example, security issues are frequently found within the PHP image library but Tenable does not install this library as part of the Security Center distribution.

Security updates to the TOE are delivered as regular update packages in the same manner as a functional update.



© 2023 Leidos. All rights reserved