National Information Assurance Partnership

Common Criteria Evaluation and Validation Scheme

TM

Validation Report

Cisco Systems, Inc.
170 West Tasman Drive,
San Jose, CA 95134-1706

Cisco Catalyst 3K/4K Wired Access Switches

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National Institute of Standards and Technology
Information Technology Laboratory
100 Bureau Drive
Gaithersburg, MD 20899

National Security Agency
Information Assurance Directorate
9800 Savage Road STE 6940
Fort George G. Meade, MD 20755-6940

ACKNOWLEDGEMENTS

Validation Team

Paul Bicknell
Brad O'Neill
Chris Thorpe
The MITRE Corporation
Bedford, MA

Common Criteria Testing Laboratory

Tammy Compton
Chris Keenan
Khai Van
Gossamer Security Solutions, Inc.
Catonsville, MD

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1 Executive Summary

This report documents the assessment of the National Information Assurance Partnership (NIAP) validation team of the evaluation of Cisco Catalyst 3K/4K Wired Access Switches solution provided by Cisco Systems, Inc. It presents the evaluation results, their justifications, and the conformance results. This Validation Report is not an endorsement of the Target of Evaluation by any agency of the U.S. government, and no warranty is either expressed or implied.

The evaluation was performed by the Gossamer Security Solutions (Gossamer) Common Criteria Testing Laboratory (CCTL) in Catonsville, MD, United States of America, and was completed in December 2014. The information in this report is largely derived from the Evaluation Technical Report (ETR) and associated test reports, all written by Gossamer Security Solutions. The evaluation determined that the product is both Common Criteria Part 2 Extended and Part 3 Conformant, and meets the assurance requirements of EAL 1.

The Target of Evaluation (TOE) is the Cisco Catalyst 3K/4K Wired Access Switches family of products. The TOE is a purpose-built, switching and routing platform with OSI Layer2 and Layer3 traffic filtering capabilities.

The Target of Evaluation (TOE) identified in this Validation Report has been evaluated at a NIAP approved Common Criteria Testing Laboratory using the Common Methodology for IT Security Evaluation (Version 3.1, Rev 4) for conformance to the Common Criteria for IT Security Evaluation (Version 3.1, Rev 4). This Validation Report applies only to the specific version of the TOE as evaluated. The evaluation has been conducted in accordance with the provisions of the NIAP Common Criteria Evaluation and Validation Scheme and the conclusions of the testing laboratory in the evaluation technical report are consistent with the evidence provided.

The validation team monitored the activities of the evaluation team, provided guidance on technical issues and evaluation processes. The validation team found that the evaluation showed that the product satisfies all of the functional requirements and assurance requirements stated in the Security Target (ST). Therefore the validation team concludes that the testing laboratory's findings are accurate, the conclusions justified, and the conformance results are correct. The conclusions of the testing laboratory in the evaluation technical report are consistent with the evidence produced.

The Gossamer Security Solutions evaluation team concluded that the Common Criteria requirements for Evaluation Assurance Level (EAL) 1.

The technical information included in this report was obtained from the Cisco Catalyst 3K/4K Wired Access Switches Security Target and analysis performed by the Validation Team.

2 Identification

The CCEVS is a joint National Security Agency (NSA) and National Institute of Standards effort to establish commercial facilities to perform trusted product evaluations. Under this

program, security evaluations are conducted by commercial testing laboratories called Common Criteria Testing Laboratories (CCTLs) using the Common Evaluation Methodology (CEM) for Evaluation Assurance Level (EAL) 1 through 4 in accordance with National Voluntary Laboratory Assessment Program (NVLAP) accreditation.

The NIAP Validation Body assigns Validators to monitor the CCTLs to ensure quality and consistency across evaluations. Developers of information technology products desiring a security evaluation contract with a CCTL and pay a fee for their product's evaluation. Upon successful completion of the evaluation, the product is added to NIAP's Validated Products List.

Table 1 provides information needed to completely identify the product, including:

- The Target of Evaluation (TOE): the fully qualified identifier of the product as evaluated.
- The Security Target (ST), describing the security features, claims, and assurances of the product.
- The conformance result of the evaluation.
- The Protection Profile to which the product is conformant.
- The organizations and individuals participating in the evaluation.

Table 1: Evaluation Identifiers

Item	Identifier
Evaluation Scheme	United States NIAP Common Criteria Evaluation and Validation Scheme
TOE:	Cisco Catalyst 3K/4K Wired Access Switches (Specific models identified in Section 3.1)
Protection Profile	Protection Profile for Network Devices, version 1.1, 8 June 2012 (NDPP) (including the optional SSH and IPsec requirements) with Errata #3
ST:	Cisco Catalyst 3K/4K Wired Access Switches Security Target, Version 1.0, December 5, 2014
Evaluation Technical Report	Evaluation Technical Report for Cisco Catalyst 3K/4K Wired Access Switches, Version 1.1, December 21, 2014
CC Version	Common Criteria for Information Technology Security Evaluation, Version 3.1, rev 4
Conformance Result	CC Part 2 extended, CC Part 3 conformant
Sponsor	Cisco Systems, Inc.
Developer	Cisco Systems, Inc.
Common Criteria Testing Lab (CCTL)	Gossamer Security Solutions, Inc.
CCEVS Validators	Paul Bicknell Brad O'Neill

Item	Identifier
	Chris Thorpe
	The MITRE Corporation

3 Architectural Information

Note: The following architectural description is based on the description presented in the Security Target.

The TOE is comprised of both software and hardware. The hardware is comprised of the following: 3650, 3850, 4503-E, 4506-E, 4507R+E, 4510R+E, 4500-X and 4500X-F. The software is comprised of the Universal Cisco Internetwork Operating System (IOS) software image Release IOS-XE 3.6.1S.

The Catalyst 3K/4K Wired Access Switches (WAS) that comprises the TOE has common hardware characteristics. These characteristics affect only non-TSF relevant functions of the switches (such as throughput and amount of storage) and therefore support security equivalency of the switches in terms of hardware.

The Catalyst 3K/4K Wired Access Switches primary features include the following:

- Central processor that supports all system operations;
- Dynamic memory, used by the central processor for all system operation.
- Flash memory (EEPROM), used to store the Cisco IOS image (binary program).
- USB port (v2.0) (note, none of the USB devices are included in the TOE).
    - Type A for Storage, all Cisco supported USB flash drives.
    - Type mini-B as console port in the front.
- Non-volatile read-only memory (ROM) is used to store the bootstrap program and power-on diagnostic programs.
- Non-volatile random-access memory (NVRAM) is used to store router configuration parameters that are used to initialize the system at start-up.
- Physical network interfaces (minimally two) (e.g. RJ45 serial and standard 10/100/1000 Ethernet ports). Some models have a fixed number and/or type of interfaces; some models have slots that accept additional network interfaces.
- 10 Gigabit Ethernet (GE) uplinks and supports Power over Ethernet Plus (PoE+) and Universal POEP (UPOE). (Universal POEP is an enhancement to the PoEP (802.3at) standard to allow powered devices up to 60W to connect over a single Cat 5e cable. Standard PoEP uses only 2 twisted pairs (out of 4) in the Ethernet cable. UPOE uses all 4 twisted pairs to deliver 60W to the port.)
- Redundant power supplies and fans..

Cisco IOS is a Cisco-developed highly configurable proprietary operating system that provides for efficient and effective routing and switching

3.1 TOE Evaluated Platforms

The evaluated configuration consists of the Cisco Catalyst 3K/4K Wired Access Switches, including the following models: 3650, 3850, 4503-E, 4506-E, 4507R+E, 4510R+E, 4500-X and 4500X-F. All models are running the IOS-XE 3.6.1S software.

3.2 TOE Configuration

The TOE consists of one or more physical devices as specified in section 3.1 and includes the Cisco IOS-XE software. The TOE has two or more network interfaces and is connected to at least one internal and one external network. The Cisco IOS-XE configuration determines how packets are handled to and from the TOE's network interfaces. The router configuration will determine how traffic flows received on an interface will be handled. Typically, packet flows are passed through the internetworking device and forwarded to their configured destination.

The TOE can optionally connect to an NTP server on its internal network for time services. Also, if the Catalyst 3K/4K Wired Access Switches is to be remotely administered, then the management station must be connected to an internal network, SSHv2 must be used to connect to the switch. A syslog server is also used to store audit records. If these servers are used, they must be attached to the internal (trusted) network. The internal (trusted) network is meant to be separated effectively from unauthorized individuals and user traffic; one that is in a controlled environment where implementation of security policies can be enforced.

3.3 Physical Boundaries

The TOE is a hardware and software solution that makes up the switch models as follows: 3650, 3850, 4503-E, 4506-E, 4507R+E, 4510R+E, 4500-X and 4500X-F. The network, on which they reside, is considered part of the environment. The TOE guidance documentation that is considered to be part of the TOE can be found listed in the Cisco Catalyst 3K/4K Wired Access Switches Common Criteria Operational User Guidance and Preparative Procedures document and are downloadable from the http://cisco.com web site.

4 Security Policy

This section summaries the security functionality of the TOE:

1. Security audit
2. Cryptographic support
3. User data protection
4. Identification and authentication
5. Security Management
6. Protection of the TSF

7. TOE access
8. Trusted path/channels

4.1 Security audit

The Cisco Catalyst 3K/4K Wired Access Switches provides extensive auditing capabilities. The TOE generates a comprehensive set of audit logs that identify specific TOE operations. For each event, the TOE records the date and time of each event, the type of event, the subject identity, and the outcome of the event. Auditable events include: failure on invoking cryptographic functionality such as establishment, termination and failure of an IPsec SA; establishment, termination and failure of an SSH session; modifications to the group of users that are part of the authorized administrator roles; all use of the user identification mechanism; any use of the authentication mechanism; any change in the configuration of the TOE, changes to time, initiation of TOE update, indication of completion of TSF self-test, maximum sessions being exceeded, termination of a remote session and attempts to unlock a termination session; and initiation and termination of a trusted channel.

The TOE is configured to transmit its audit messages to an external syslog server. Communication with the syslog server is protected using IPsec and the TOE can determine when communication with the syslog server fails. If that should occur, the TOE can be configured to block new permit actions.

The logs can be viewed on the TOE using the appropriate IOS-XE commands. The records include the date/time the event occurred, the event/type of event, the user associated with the event, and additional information of the event and its success and/or failure. The TOE does not have an interface to modify audit records, though there is an interface available for the authorized administrator to clear audit data stored locally on the TOE.

4.2 Cryptographic support

The TOE provides cryptography in support of other Cisco Cat3K/4K Wired Access Switches security functionality. This cryptography has been validated for conformance to the requirements of FIPS 140-2 Level 2.

4.3 User data protection

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

4.4 Identification and authentication

The TOE performs two types of authentication: device-level authentication of the remote device (VPN peers) and user authentication for the Authorized Administrator of the TOE. Device-level authentication allows the TOE to establish a secure channel with a trusted peer. The secure channel is established only after each device authenticates the other.

Device-level authentication is performed via IKE/IPsec mutual authentication. The IKE phase authentication for the IPsec communication channel between the TOE and authentication server and between the TOE and syslog server is considered part of the Identification and Authentication security functionality of the TOE.

The TOE provides authentication services for administrative users to connect to the TOEs secure CLI administrator interface. The TOE requires Authorized Administrators to authenticate prior to being granted access to any of the management functionality. The TOE can be configured to require a minimum password length of 15 characters as well as mandatory password complexity rules. The TOE provides administrator authentication against a local user database. Password-based authentication can be performed on the serial console or SSH interfaces. The SSHv2 interface also supports authentication using SSH keys. The TOE supports use of a RADIUS AAA server for authentication of administrative users attempting to connect to the TOE's CLI.

4.5 Security management

The TOE provides secure administrative services for management of general TOE configuration and the security functionality provided by the TOE. All TOE administration occurs either through a secure SSHv2 session or via a local console connection. The TOE provides the ability to securely manage all aspects of the security requirements. The TOE supports two separate administrator roles: non-privileged administrator and privileged administrator. Only the privileged administrator can perform the above security relevant management functions.

4.6 Protection of the TSF

The TOE protects against interference and tampering by untrusted subjects by implementing identification, authentication, and access controls to limit configuration to Authorized Administrators. The TOE prevents reading of cryptographic keys and passwords. Additionally Cisco IOS-XE is not a general-purpose operating system and access to Cisco IOS-XE memory space is restricted to only Cisco IOS-XE functions.

The TOE internally maintains the date and time. This date and time is used as the timestamp that is applied to audit records generated by the TOE. Administrators can update the TOE's clock manually, or can configure the TOE to use NTP to synchronize the TOE's clock with an external time source. Finally, the TOE performs testing to verify correct operation of the switch itself and that of the cryptographic module.

4.7 TOE access

The TOE can terminate inactive sessions after an Authorized Administrator configurable time-period. Once a session has been terminated the TOE requires the user to re-authenticate to establish a new session. The TOE can also display an Authorized Administrator specified banner on the CLI management interface prior to allowing any administrative access to the TOE.

4.8 Trusted path/channels

The TOE allows trusted paths to be established to itself from remote administrators over SSHv2, and initiates outbound IPsec tunnels to transmit audit messages to remote syslog servers. In addition, IPsec is used to secure the session between the TOE and the authentication servers. The TOE can also establish trusted paths of peer-to-peer IPsec sessions. The peer-to-peer IPsec sessions can be used for securing the communications between the TOE and authentication server/syslog server.

5 Assumptions

The Security Problem Definition, including the assumptions, may be found in the *Protection Profile for Network Devices*, version 1.1, 8 June 2012 (NDPP). That information has not been reproduced here and the NDPP should be consulted if there is interest in that material.

6 Documentation

The following documents were available with the TOE for evaluation:

- Common Criteria Operational User Guidance and Preparative Procedures, version 1.0, December 5, 2014

7 IT Product Testing

This section describes the testing efforts of the developer and the Evaluation Team. It is derived from information contained in the Evaluation Team Test Report for the Cisco Catalyst 3K/4K Wired Access Switches, Version 0.1, December 8, 2014.

7.1 Developer Testing

No evidence of developer testing is required in the assurance activities for this product.

7.2 Evaluation Team Independent Testing

The evaluation team verified the product according the Common Criteria Operational User Guidance and Preparative Procedures, version 1.0, December 5, 2014 document and ran the tests specified in the NDPP including the optional SSH and IPsec tests.

8 Evaluated Configuration

The evaluated configuration consists of the Cisco Catalyst 3K/4K Wired Access Switches, including the following models: 3650, 3850, 4503-E, 4506-E, 4507R+E, 4510R+E, 4500-X and 4500X-F. All models are running the IOS-XE 3.6.1S software.

To use the product in the evaluated configuration, the product must be configured as specified in the Common Criteria Operational User Guidance and Preparative Procedures, version 1.0, December 5, 2014.

9 Results of the Evaluation

The results of the assurance requirements are generally described in this section and are presented in detail in the proprietary ETR. The reader of this document can assume that all EAL1 work units received a passing verdict.

A verdict for an assurance component is determined by the resulting verdicts assigned to the corresponding evaluator action elements. The evaluation was conducted based upon CC version 3.1 rev 4 and CEM version 3.1 rev 4. The evaluation determined the Product Name TOE to be Part 2 extended, and to meet the Part 3 Evaluation Assurance Level (EAL 1).

9.1 Evaluation of the Security Target (ASE)

The evaluation team applied each ASE CEM work unit. The ST evaluation ensured the ST contains a description of the environment in terms of policies and assumptions, a statement of security requirements claimed to be met by the Cisco Catalyst 3K/4K Wired Access Switches that are consistent with the Common Criteria, and product security function descriptions that support the requirements.

The validator reviewed the work of the evaluation team, and found that sufficient evidence and justification was provided by the evaluation team to confirm that the evaluation was conducted in accordance with the requirements of the CEM, and that the conclusion reached by the evaluation team was justified.

9.2 Evaluation of the Development (ADV)

The evaluation team applied each EAL 1 ADV CEM work unit. The evaluation team assessed the design documentation and found it adequate to aid in understanding how the TSF provides the security functions. The design documentation consists of a functional specification contained in the Security target and Guidance documents. Additionally the evaluator performed the assurance activities specified in the NDPP related to the examination of the information contained in the TSS.

The validator reviewed the work of the evaluation team, and found that sufficient evidence and justification was provided by the evaluation team to confirm that the evaluation was conducted in accordance with the requirements of the CEM, and that the conclusion reached by the evaluation team was justified.

9.3 Evaluation of the Guidance Documents (AGD)

The evaluation team applied each EAL 1 AGD CEM work unit. The evaluation team ensured the adequacy of the user guidance in describing how to use the operational TOE. Additionally, the evaluation team ensured the adequacy of the administrator guidance in describing how to securely administer the TOE. All of the guides were assessed during the design and testing phases of the evaluation to ensure they were complete.

The validator reviewed the work of the evaluation team, and found that sufficient evidence and justification was provided by the evaluation team to confirm that the evaluation was conducted in accordance with the requirements of the CEM, and that the conclusion reached by the evaluation team was justified.

9.4 Evaluation of the Life Cycle Support Activities (ALC)

The evaluation team applied each EAL 1 ALC CEM work unit. The evaluation team found that the TOE was identified.

The validator reviewed the work of the evaluation team, and found that sufficient evidence and justification was provided by the evaluation team to confirm that the evaluation was conducted in accordance with the requirements of the CEM, and that the conclusion reached by the evaluation team was justified.

9.5 Evaluation of the Test Documentation and the Test Activity (ATE)

The evaluation team applied each EAL 1 ATE CEM work unit. The evaluation team ran the set of tests specified by the assurance activities in the NDPP and recorded the results in a Test Report, summarized in the Assurance Activities Report.

The validator reviewed the work of the evaluation team, and found that sufficient evidence and justification was provided by the evaluation team to confirm that the evaluation was conducted in accordance with the requirements of the CEM, and that the conclusion reached by the evaluation team was justified.

9.6 Vulnerability Assessment Activity (VAN)

The evaluation team applied each EAL 1 AVA CEM work unit. The evaluation team performed a public search for vulnerabilities and did not discover any public issues with the TOE.

The validator reviewed the work of the evaluation team, and found that sufficient evidence and justification was provided by the evaluation team to confirm that the evaluation was conducted in accordance with the requirements of the CEM, and that the conclusion reached by the evaluation team was justified.

9.7 Summary of Evaluation Results

The evaluation team's assessment of the evaluation evidence demonstrates that the claims in the ST are met. Additionally, the evaluation team's testing also demonstrated the accuracy of the claims in the ST.

The validation team's assessment of the evidence provided by the evaluation team is that it demonstrates that the evaluation team followed the procedures defined in the CEM, and correctly verified that the product meets the claims in the ST.

10 Validator Comments/Recommendations

The validators did not have any specific additional comments or recommendations.

11 Annexes

Not applicable

12 Security Target

The Security Target is identified as *Cisco Catalyst 3K/4K Wired Access Switches Security Target, version 1.0, December 5, 2014*.

13 Glossary

The following definitions are used throughout this document:

- **Common Criteria Testing Laboratory (CCTL)**. An IT security evaluation facility accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) and approved by the CCEVS Validation Body to conduct Common Criteria-based evaluations.
- **Conformance**. The ability to demonstrate in an unambiguous way that a given implementation is correct with respect to the formal model.
- **Evaluation**. The assessment of an IT product against the Common Criteria using the Common Criteria Evaluation Methodology to determine whether or not the claims made are justified; or the assessment of a protection profile against the Common Criteria using the Common Evaluation Methodology to determine if the Profile is complete, consistent, technically sound and hence suitable for use as a statement of requirements for one or more TOEs that may be evaluated.
- **Evaluation Evidence**. Any tangible resource (information) required from the sponsor or developer by the evaluator to perform one or more evaluation activities.
- **Feature.** Part of a product that is either included with the product or can be ordered separately.
- **Target of Evaluation (TOE)**. A group of IT products configured as an IT system, or an IT product, and associated documentation that is the subject of a security evaluation under the CC.
- **Validation**. The process carried out by the CCEVS Validation Body leading to the issue of a Common Criteria certificate.

- **Validation Body**. A governmental organization responsible for carrying out validation and for overseeing the day-to-day operation of the NIAP Common Criteria Evaluation and Validation Scheme.

14 Bibliography

The Validation Team used the following documents to produce this Validation Report:

[1] Common Criteria for Information Technology Security Evaluation: Part 1: Introduction and General Model, Version 3.1, Revision 4, September 2012.

[2] Common Criteria for Information Technology Security Evaluation Part 2: Security functional components, Version 3.1, Revision 4, September 2012.

[3] Common Criteria for Information Technology Security Evaluation Part 3: Security assurance components, Version 3.1 Revision 4, September 2102.

[4] Protection Profile for Network Devices, version 1.1, 8 June 2012 (NDPP).

[5] Security Requirements for Networked Devices, Errata 3, 3 November 2014