Market Central, Inc.

SecureSwitch® Fiber Optic Switch
Models: 1:1, 2:1, 3:1, 4:1, 5:1, 6:1, 7:1 and 8:1

Security Target

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Document History

Version	Date	Author	Description
1.0	6 June 2016	Ark Infosec	Release for evaluation.
1.1	8 July 20116	Ark Infosec	Update TOE name and models.

Table of Contents

List of Tables

1 Introduction

1.1 Overview

1 This Security Target (ST) defines the SecureSwitch® Fiber Optic Switch Target of Evaluation (TOE) for the purposes of Common Criteria (CC) evaluation.

2 The TOE is an optical switch that allows a single host to connect to one or more (up to eight) networks, one at a time, whilst maintaining separation between the networks. The TOE user manually switches between networks.

3 The TOE uses a proprietary mirrored switching mechanism with specially designed mirrors to provide isolation of a minimum 75 dB between all unselected ports. The mirrors are positioned electronically to control the switching action.

1.2 Identification

Table 1: Evaluation identifiers

Target of Evaluation	SecureSwitch® 1:1 Fiber Optic Switch SecureSwitch® 2:1 Fiber Optic Switch SecureSwitch® 3:1 Fiber Optic Switch SecureSwitch® 4:1 Fiber Optic Switch SecureSwitch® 5:1 Fiber Optic Switch SecureSwitch® 6:1 Fiber Optic Switch SecureSwitch® 7:1 Fiber Optic Switch SecureSwitch® 8:1 Fiber Optic Switch
Security Target	SecureSwitch® Fiber Optic Switch, Models: 1:1, 2:1, 3:1, 4:1, 5:1, 6:1, 7:1 and 8:1 Security Target, v1.1

1.3 Conformance Claims

4 This ST supports the following conformance claims:

a) CC version 3.1 Revision 4

b) CC Part 2 extended

c) CC Part 3 conformant

d) Evaluation Assurance Level (EAL) 2 conformant

1.4 Terminology

Table 2: Terminology

Term	Definition
CC	Common Criteria
EAL	Evaluation Assurance Level

Term	Definition
PP	Protection Profile
TOE	Target of Evaluation
TSF	TOE Security Functionality

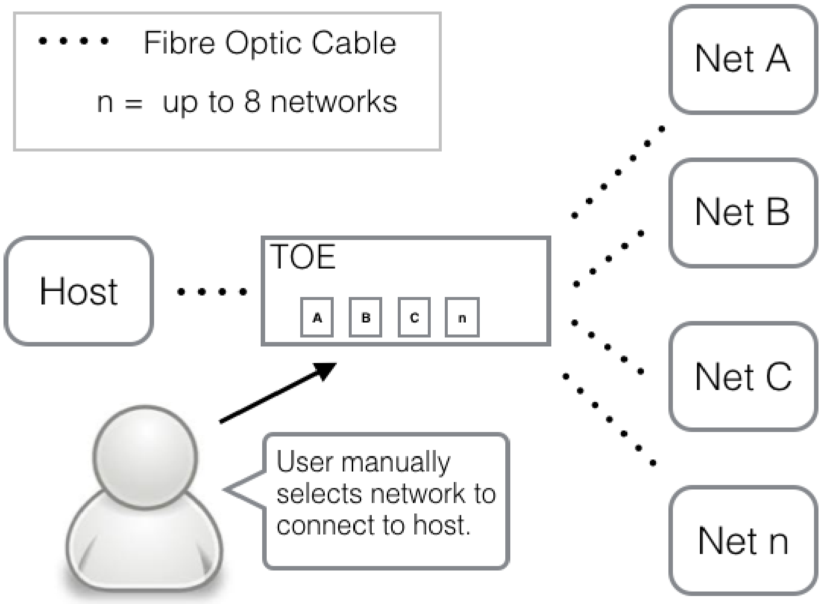
2 TOE Description

2.1 Type

5 The TOE is an optical switch.

2.2 Usage

6 The TOE is used when it is necessary to connect a single host to one or more (up to eight) networks, one at a time, whilst maintaining separation between the networks, such as those of different security classifications. As shown in Figure 1 below, to use the switch, the user selects the radio button on the front of the device (or on a connected remote control) that corresponds to the desired network. This connects the selected network to the host. LEDs and dry contact relay closures indicate which network is selected.



• • • • Fibre Optic Cable
n = up to 8 networks
Host
TOE
A
B
C
n
User manually selects network to connect to host.
Net A
Net B
Net C
Net n

Figure 1: TOE usage scenario

7 Figure 2 and Figure 3 show the TOE (SecureSwitch® 8:1 Fiber Optic Switch) front and back panels. The radio buttons with integrated LEDs on the front indicate the selected network. The ports on the back connect to the isolated networks and the Common port connects to the host.

8

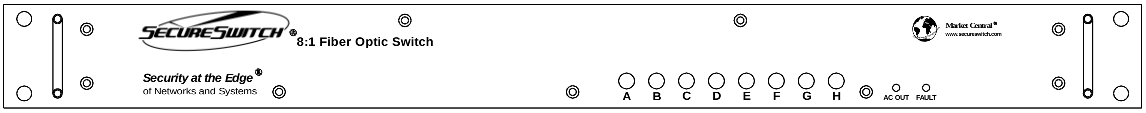


Figure 2: Front Panel SecureSwitch® 8:1 Fiber Optic Switch

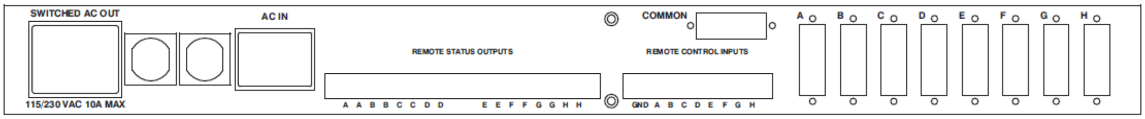


Figure 3: Back Panel SecureSwitch® 8:1 Fiber Optic Switch

9 The TOE is available in the models as follows. In all cases, the firmware and security enforcing mechanisms are the same:

a) SecureSwitch® 1:1 Fiber Optic Switch (1 port).

b) SecureSwitch® 2:1 Fiber Optic Switch (2 ports).

c) SecureSwitch® 3:1 Fiber Optic Switch (3 ports).

d) SecureSwitch® 4:1 Fiber Optic Switch (4 ports).

e) SecureSwitch® 5:1 Fiber Optic Switch (5 ports)

f) SecureSwitch® 6:1 Fiber Optic Switch (6 ports)

g) SecureSwitch® 7:1 Fiber Optic Switch (7 ports)

h) SecureSwitch® 8:1 Fiber Optic Switch (8 ports)

10 Each TOE model is available in single mode or multimode and in tabletop or 1U rackmount enclosures.

2.3 Security Functions

11 The TOE provides the following security functions:

a) **Switching.** An internal Mirror Switch allows optical communications to travel between the Common Port and one of the network ports at a time. When the user selects a different network, the Mirror Switch is repositioned to allow the host device that is connected to the Common Port to communicate with the selected network port. Each radio button has a corresponding LED that indicates which network port is currently selected. Only one button/network can be selected at a time.

b) **Isolation.** Due to the use of fiber-optic signals and the proprietary mirrored switching mechanism design, the TOE provides an isolation of a minimum of 75 dB between all unselected ports.

2.4 Physical Scope

12 The physical boundary of the TOE is the entire SecureSwitch® device. This includes the buttons, the LEDs, the Mirror Switch, the ports, as well as the internal electronics that operate the mirrored switching mechanism.

13 Each TOE model is available in multiple configurations as shown in Table 3. These configurations differ only in terms of enclosure (rackmount or desktop) and supported type of fiber (multimode or single mode). In all configurations, the firmware and security enforcing mechanisms are the same.

Table 3: TOE models and part numbers

Model	Part #	Enclosure	Fiber Type
SecureSwitch® 1:1 Fiber Optic Switch	5101720	1U rackmount	multimode
	5101721	tabletop	multimode
	5101722	1U rackmount	single mode
	5101723	tabletop	single mode
SecureSwitch® 2:1 Fiber Optic Switch	5101724	1U rackmount	multimode
	5101725	tabletop	multimode
	5101726	1U rackmount	single mode
	5101727	tabletop	single mode
SecureSwitch® 3:1 Fiber Optic Switch	5101728	1U rackmount	multimode
	5101729	tabletop	multimode
	5101730	1U rackmount	single mode
	5101731	tabletop	single mode
SecureSwitch® 4:1 Fiber Optic Switch	5101700	1U rackmount	multimode
	5101701	tabletop	multimode
	5101702	1U rackmount	single mode
	5101703	tabletop	single mode
SecureSwitch® 5:1 Fiber Optic Switch	5101704	1U rackmount	multimode
	5101705	tabletop	multimode
	5101706	1U rackmount	single mode
	5101707	tabletop	single mode
SecureSwitch® 6:1 Fiber Optic Switch	5101708	1U rackmount	multimode
	5101709	tabletop	multimode
	5101710	1U rackmount	single mode
	5101711	tabletop	single mode

Model	Part #	Enclosure	Fiber Type
SecureSwitch® 7:1 Fiber Optic Switch	5101712	1U rackmount	multimode
	5101713	tabletop	multimode
	5101714	1U rackmount	single mode
	5101715	tabletop	single mode
SecureSwitch® 8:1 Fiber Optic Switch	5101716	1U rackmount	multimode
	5101717	tabletop	multimode
	5101718	1U rackmount	single mode
	5101719	tabletop	single mode

2.4.1 Guidance Documents

14 The TOE includes the following guidance documents:

a) SecureSwitch® Fiber Optic Switch Manual, v1

2.4.2 Non-TOE Components

15 The TOE is not reliant on any external components.

2.5 Logical Scope

16 The logical scope of the TOE comprises the security functions defined in section 2.3.

3 Security Problem Definition

3.1 Threats

17 Table 4 identifies the threats addressed by the TOE.

Table 4: Threats

Identifier	Description
T.DIRECT	A remote attacker captures data of a separate network while the attacker’s network is connected to that separate network by the TOE.
T.CROSSTALK	A remote attacker captures data of a separate network while the attacker’s network is not connected to that separate network by the TOE.
T.ATTACK	A remote attacker performs malicious activity against the Host computer while the attacker’s network is connected to the Host computer by the TOE.

3.2 Organizational Security Policies

18 None.

3.3 Assumptions

19 Table 5 identifies the assumptions related to the TOE’s environment.

Table 5: Assumptions

Identifier	Description
A.INSTALL	The User has connected up to eight (depending on TOE model) distinct networks to the TOE Network Ports. The User has connected a computer on the Common Port that has a full-duplex network interface.
A.NOEVILUSER	The User is non-hostile.
A.COMPETENT	The User follows all user guidance when using the TOE.
A.ENVIRON	The TOE will be located in an environment that provides physical security, uninterruptible power, and temperature control required for reliable operation of the hardware. TOE connected optical cabling and equipment shall be protected from unauthorized physical access.

4 Security Objectives

4.1 Objectives for the Operational Environment

20 Table 6 identifies the objectives for the operational environment.

Table 6: Operational environment objectives

Identifier	Description
OE.INSTALL	The User has connected up to eight (depending on TOE model) distinct networks to the TOE Network Ports. The User has connected a computer on the Common Port that has a full-duplex network interface.
OE.NOEVILUSER	The User is non-hostile.
OE.COMPETENT	The User follows all user guidance when using the TOE.
OE.ENVIRON	The TOE will be located in an environment that provides physical security, uninterruptible power, and temperature control required for reliable operation of the hardware.

4.2 Objectives for the TOE

21 Table 7 identifies the security objectives for the TOE.

Table 7: Security objectives

Identifier	Description
O.NOCONNECT	The TOE will not allow two Network Ports to directly connect (i.e., no information flow is permitted).
O.ISOLATION	The TOE will provide isolation between all unselected ports.
O.SWITCH	The TOE will provide the User with the ability to connect the Common Port to one Network Port at a time.

5 Security Requirements

5.1 Conventions

22 This document uses the following font conventions to identify the operations defined by the CC:

a) **Assignment.** Indicated with italicized text.

b) **Refinement.** Indicated with bold text and strikethroughs.

c) **Selection.** Indicated with underlined text.

d) **Assignment within a Selection:** Indicated with italicized and underlined text.

e) **Iteration.** Indicated by appending the iteration number in parenthesis, e.g., (1), (2), (3).

5.2 Extended Components Definition

23 Table 8 identifies the extended component that is incorporated into this ST.

Table 8: Extended Components

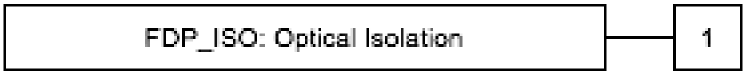
Component	Title	Rationale
FDP_ISO.1	Optical Isolation	No existing CC Part 2 SFRs address hardware port shielding and isolation. Since the purpose of optical isolation is to protect user data from unintended disclosure via crosstalk, a new family was created within the User Data Protection (FDP) class.

5.2.1 Secure Virtual Container (FDP_ISO)

5.2.1.1 Family Behavior

24 This family provides requirements that address the protection of user data unintended disclosure via crosstalk by means of optical isolation. Crosstalk occurs when a signal transmitted on one circuit or channel of a transmission system creates an undesired effect in another circuit or channel.

5.2.1.2 Component Leveling



25 FDP_ISO.1 Optical isolation addresses protection of user data from unintended disclosure via crosstalk.

5.2.1.3 Management: FDP_ISO.1

26 The following actions could be considered for the management functions in FMT:

a) None

5.2.1.4 Audit: FDP_ISO.1

27 The following actions should be auditable if FAU_GEN Security audit data generation is included in the PP/ST:

a) None

FDP_ISO.1 Optical Isolation

Hierarchical to: No other components.

Dependencies: None

FDP_ISO.1.1 The TSF shall ensure that there is a minimum of 75 dB of isolation between all ports that are not currently connected by the position of the Mirror Switch.

5.3 Functional Requirements

Table 9: Summary of SFRs

Requirement	Title
FDP_IFC.2	Complete Information Flow Control
FDP_IFF.1	Simple Security Attributes
FDP_ISO.1	Optical Isolation

5.3.1 User Data Protection (FDP)

FDP_IFC.2 Complete information flow control

Hierarchical to: FDP_IFC.1 Subset information flow control

Dependencies: FDP_IFF.1 Simple security attributes

FDP_IFC.2.1 The TSF shall enforce the *SecureSwitch Flow Control Policy* on *optical signals on the Common Port and each of the Network Ports* and all operations that cause that information to flow to and from subjects covered by the SFP.

FDP_IFC.2.2 The TSF shall ensure that all operations that cause any information in the TOE to flow to and from any subject in the TOE are covered by an information flow control SFP.

FDP_IFF.1 Simple security attributes

Hierarchical to: No other components.

Dependencies: FDP_IFC.1 Subset information flow control
FMT_MSA.3 Static attribute initialization

FDP_IFF.1.1 The TSF shall enforce the *SecureSwitch Flow Control Policy* based on the following types of subject and information security attributes: *the position of the Mirror Switch*.

FDP_IFF.1.2 The TSF shall permit an information flow between a controlled subject and controlled information via a controlled operation if the following rules hold: *Information may only flow between the Common Port and a single Network Port if the position of the Mirror Switch is in the single position that corresponds to that Network Port.*

FDP_IFF.1.3 The TSF shall enforce the *no additional rules.*

FDP_IFF.1.4 The TSF shall explicitly authorize an information flow based on the following rules: *no explicit authorization rules*.

FDP_IFF.1.5 The TSF shall explicitly deny an information flow based on the following rules: *no explicit denial rules*.

FDP_ISO.1 Optical Isolation

Hierarchical to: No other components.

Dependencies: None

FDP_ISO.1.1 The TSF shall ensure that there is a minimum of 75 dB of isolation between all ports that are not currently connected by the position of the Mirror Switch.

5.4 Assurance Requirements

28 The TOE security assurance requirements are summarized in Table 10 commensurate with EAL2.

Table 10: Assurance Requirements

Assurance Class	Components	Description
Development	ADV_ARC.1	Security Architecture Description
	ADV_FSP.2	Security-enforcing Functional Specification
	ADV_TDS.1	Basic Design
Guidance Documents	AGD_OPE.1	Operational User Guidance
	AGD_PRE.1	Preparative Procedures
Life Cycle Support	ALC_CMC.2	Use of a CM System
	ALC_CMS.2	Parts of the TOE CM Coverage
	ALC_DEL.1	Delivery Procedures

Assurance Class	Components	Description
Security Target Evaluation	ASE_CCL.1	Conformance Claims
	ASE_ECD.1	Extended Components Definition
	ASE_INT.1	ST Introduction
	ASE_OBJ.2	Security Objectives
	ASE_REQ.2	Derived Security Requirements
	ASE_SPD.1	Security Problem Definition
	ASE_TSS.1	TOE Summary Specification
Tests	ATE_COV.1	Evidence of Coverage
	ATE_FUN.1	Functional testing
	ATE_IND.2	Independent Testing - sample
Vulnerability Assessment	AVA_VAN.2	Vulnerability Analysis

6 TOE Summary Specification

6.1 Switching

Related SFRs: FDP_IFC.2, FDP_IFF.1

29 The SecureSwitch® device has a front panel with radio buttons labeled A - H (number of buttons depends on TOE model). The TOE also has remote control inputs on the rear panel labeled A - H (number of inputs depends on TOE model) plus a Ground connection labeled GND. Only one front panel radio button or only one rear panel remote control input can be selected at a time.

30 Each front panel button and each rear panel remote control input corresponds to a Network Port on the rear of the device. Each Network Port has a corresponding front panel LED that indicates if that Network Port is currently selected. The TOE also has remote control outputs on the rear panel labeled A - H (number of outputs depends on TOE model) that correspond to each Network Port, and that indicate if that Network Port is currently selected.

31 Another port on the rear of the TOE labeled Common is for connection to a host computer. The information flows from each of these ports are the only information flows in the TOE.

32 Inside the SecureSwitch® device is a Mirror Switch. The Mirror Switch is a specially designed set of miniature mirror movements that allow optical communications to travel between the Common Port and one of the Network Ports at a time. When the Mirror Switch is repositioned, the Common Port can communicate with a different Network Port. There is a single position for each Network Port.

33 The radio buttons on the front of the device and the rear panel remote control inputs control the Position of the Mirror Switch. For example, when button ‘A’ is pressed, or when remote control input ‘A’ is connected to the ‘GND’ pin, an electro-mechanical mechanism rotates the mirror to the position designated for Network Port ‘A’. The same applies to all buttons and remote control inputs.

34 The TOE is a self-contained unit that forwards information signals but is not affected by those signals.

6.2 Isolation

Related SFRs: FDP_ISO.1

35 Due to the use of fiber optic signals and the proprietary mirrored switching mechanism design, the TOE provides a minimum of 75 dB of isolation between all unselected ports. This high isolation was designed to comfortably meet the industry standard 65 dB isolation rating.

7 Rationale

7.1 Security Objectives Rationale

36 Table 11 provides a coverage mapping between security objectives, threats, OSPs and assumptions.

Table 11: Security Objectives Mapping

	T.DIRECT	T.CROSSTALK	T.ATTACK	A.INSTALL	A.NOEVILUSER	A.COMPETENT	A.ENVIRON
O.NOCONNECT	X						
O.ISOLATION		X					
O.SWITCH			X				
OE.INSTALL				X			
OE.NOEVILUSER					X		
OE.COMPETENT						X	
OE.ENVIRON							X

37 Table 12 provides the justification to show that the security objectives are suitable to address the security problem.

Table 12: Suitability of Security Objectives

Element	Justification
T.DIRECT	**O.NOCONNECT.** The TOE will not allow Network Ports to be connected to each other, directly addressing the threat of a direct connection.
T.CROSSTALK	**O.ISOLATION.** By providing isolation between ports, the only way for information to pass between ports is according to the TOE's information flow control policy.
T.ATTACK	**O.SWITCH.** The User has the ability to disconnect from a network from which malicious activity originates.
A.INSTALL	**OE.INSTALL.** The objective satisfies the assumption by providing the assumed installation configuration.
A.NOEVILUSER	**OE.NOEVILUSER.** The objective satisfies the assumption by

Element	Justification
	providing there will be no evil users.
A.COMPETENT	**OE.COMPETENT.** The objective satisfies the assumption by providing the User will follow guidance.
A.ENVIRON	**OE.ENVIRON.** The objective satisfies the assumption by providing the assumed operating conditions.

7.2 Security Requirements Rationale

7.2.1 SAR Rationale

38 EAL2 was chosen to provide a level of assurance that is consistent with good commercial practices.

7.2.2 SFR Rationale

Table 13: Security Requirements Mapping

	O.NOCONNECT	O.ISOLATION	O.SWITCH
FDP_IFC.2	X		X
FDP_IFF.1	X		X
FDP_ISO.1	X	X	

Table 14: Suitability of SFRs

Objectives	SFRs
O.NOCONNECT	**FDP_IFC.2** & **FDP_IFF.1** specify that only information may flow between the Common Port and a single Network Port at a time, never two Network Ports. **FDP_ISO.1** supports this objective, because it requires all ports be isolated from each other by a minimum of 75dB. This includes one Network Port to the next, thereby supporting the objective of not allowing a connection between Network Ports.
O.ISOLATION	**FDP_ISO.1** requires all ports be isolated from each other by a minimum of 75dB. This will prevent crosstalk and provide isolation between ports.
O.SWITCH	**FDP_IFC.2** & **FDP_IFF.1** define the SecureSwitch Flow Control Policy in accordance with O.SWITCH.

Table 15: SFR dependencies

SFR	Dependency	Rationale
FDP_IFC.2	FDP_IFF.1	Met
FDP_IFF.1	FDP_IFC.1	Met by inclusion of FDP_IFC.2.
	FMT_MSA.3	Not met. Not included as there are no objects or attributes that can be created that affect the SecureSwitch Flow Control Policy. Rather, the policy is determined by one attribute alone, the position of the Mirror Switch.
FDP_ISO.1	None	Met

7.3 TOE Summary Specification Rationale

39 Table 16 provides a coverage mapping showing that all SFRs are mapped to the security functions described in the TSS.

Table 16: Map of SFRs to TSS Security Functions

	Switching	Isolation
FDP_IFC.2	X	
FDP_IFF.1	X	
FDP_ISO.1		X