

53-1003783-02
23 September 2015

Network OS

MAPS Administrator's Guide

Network OS v6.0.1

BROCADE 

© 2015, Brocade Communications Systems, Inc. All Rights Reserved.

ADX, Brocade, Brocade Assurance, the B-wing symbol, DCX, Fabric OS, HyperEdge, ICX, MLX, MyBrocade, OpenScript, The Effortless Network, VCS, VDX, Vplane, and Vyatta are registered trademarks, and Fabric Vision and vADX are trademarks of Brocade Communications Systems, Inc., in the United States and/or in other countries. Other brands, products, or service names mentioned may be trademarks of others.

Notice: This document is for informational purposes only and does not set forth any warranty, expressed or implied, concerning any equipment, equipment feature, or service offered or to be offered by Brocade. Brocade reserves the right to make changes to this document at any time, without notice, and assumes no responsibility for its use. This informational document describes features that may not be currently available. Contact a Brocade sales office for information on feature and product availability. Export of technical data contained in this document may require an export license from the United States government.

The authors and Brocade Communications Systems, Inc. assume no liability or responsibility to any person or entity with respect to the accuracy of this document or any loss, cost, liability, or damages arising from the information contained herein or the computer programs that accompany it.

The product described by this document may contain open source software covered by the GNU General Public License or other open source license agreements. To find out which open source software is included in Brocade products, view the licensing terms applicable to the open source software, and obtain a copy of the programming source code, please visit <http://www.brocade.com/support/oscd>.

Contents

Preface.....	5
Document conventions.....	5
Text formatting conventions.....	5
Command syntax conventions.....	5
Notes, cautions, and warnings.....	6
Brocade resources.....	7
Contacting Brocade Technical Support.....	7
Document feedback.....	8
About This Document.....	9
Supported hardware and software.....	9
Using the Network OS CLI	10
What's new in this document.....	10
Monitoring and Alerting Policy Suite Overview.....	11
MAPS overview.....	11
MAPS interoperability with other features.....	11
MAPS and Fabric Watch.....	11
MAPS and High Availability.....	12
MAPS upgrade and downgrade considerations.....	12
MAPS Groups, Policies, Rules, and Actions.....	13
MAPS groups overview.....	13
Predefined MAPS groups.....	13
MAPS policies.....	15
Predefined MAPS policies.....	15
Viewing policy information.....	15
MAPS actions overview.....	16
Quick setup for MAPS.....	16
RASLog messages.....	17
SNMP traps.....	17
E-mail alert.....	18
Switch critical.....	19
Switch marginal.....	19
SFP marginal.....	19
MAPS Elements and Categories.....	21
MAPS structural elements.....	21
MAPS monitoring categories.....	21
Switch Policy Status.....	22
Port Health.....	22
FRU Health.....	23
Security Violations.....	24
Switch resource monitoring.....	24

Enabling and Configuring MAPS.....	25
Enabling MAPS.....	25
Configuring MAPS	25
Configuring MAPS alert targets.....	26
Monitoring IP storage.....	26
MAPS Dashboard.....	27
MAPS dashboard overview.....	27
MAPS dashboard viewing.....	27
Viewing the MAPS dashboard.....	27
MAPS Threshold Values.....	29
Thresholds overview.....	29
FRU state thresholds.....	29
Switch Policy Status thresholds.....	30
Security monitoring thresholds.....	31
Resource monitoring thresholds.....	31
Monitoring thresholds for 10 Gbps SFP transceivers.....	32
Monitoring thresholds for QSFP transceivers and all other SFP transceivers.....	34

Preface

- Document conventions.....5
- Brocade resources.....7
- Contacting Brocade Technical Support.....7
- Document feedback.....8

Document conventions

The document conventions describe text formatting conventions, command syntax conventions, and important notice formats used in Brocade technical documentation.

Text formatting conventions

Text formatting conventions such as boldface, italic, or Courier font may be used in the flow of the text to highlight specific words or phrases.

Format	Description
bold text	Identifies command names Identifies keywords and operands Identifies the names of user-manipulated GUI elements Identifies text to enter at the GUI
<i>italic text</i>	Identifies emphasis Identifies variables Identifies document titles
<code>Courier font</code>	Identifies CLI output Identifies command syntax examples

Command syntax conventions

Bold and italic text identify command syntax components. Delimiters and operators define groupings of parameters and their logical relationships.

Convention	Description
bold text	Identifies command names, keywords, and command options.
<i>italic text</i>	Identifies a variable.
value	In Fibre Channel products, a fixed value provided as input to a command option is printed in plain text, for example, --show WWN.

Convention	Description
[]	Syntax components displayed within square brackets are optional. Default responses to system prompts are enclosed in square brackets.
{ x y z }	A choice of required parameters is enclosed in curly brackets separated by vertical bars. You must select one of the options. In Fibre Channel products, square brackets may be used instead for this purpose.
x y	A vertical bar separates mutually exclusive elements.
< >	Nonprinting characters, for example, passwords, are enclosed in angle brackets.
...	Repeat the previous element, for example, <i>member[member...]</i> .
\	Indicates a “soft” line break in command examples. If a backslash separates two lines of a command input, enter the entire command at the prompt without the backslash.

Notes, cautions, and warnings

Notes, cautions, and warning statements may be used in this document. They are listed in the order of increasing severity of potential hazards.

NOTE

A Note provides a tip, guidance, or advice, emphasizes important information, or provides a reference to related information.

ATTENTION

An Attention statement indicates a stronger note, for example, to alert you when traffic might be interrupted or the device might reboot.



CAUTION

A Caution statement alerts you to situations that can be potentially hazardous to you or cause damage to hardware, firmware, software, or data.



DANGER

A Danger statement indicates conditions or situations that can be potentially lethal or extremely hazardous to you. Safety labels are also attached directly to products to warn of these conditions or situations.

Brocade resources

Visit the Brocade website to locate related documentation for your product and additional Brocade resources.

You can download additional publications supporting your product at www.brocade.com. Select the Brocade Products tab to locate your product, then click the Brocade product name or image to open the individual product page. The user manuals are available in the resources module at the bottom of the page under the Documentation category.

To get up-to-the-minute information on Brocade products and resources, go to [MyBrocade](#). You can register at no cost to obtain a user ID and password.

Release notes are available on [MyBrocade](#) under Product Downloads.

White papers, online demonstrations, and data sheets are available through the [Brocade website](#).

Contacting Brocade Technical Support

As a Brocade customer, you can contact Brocade Technical Support 24x7 online, by telephone, or by e-mail. Brocade OEM customers contact their OEM/Solutions provider.

Brocade customers

For product support information and the latest information on contacting the Technical Assistance Center, go to <http://www.brocade.com/services-support/index.html>.

If you have purchased Brocade product support directly from Brocade, use one of the following methods to contact the Brocade Technical Assistance Center 24x7.

Online	Telephone	E-mail
<p>Preferred method of contact for non-urgent issues:</p> <ul style="list-style-type: none"> • My Cases through MyBrocade • Software downloads and licensing tools • Knowledge Base 	<p>Required for Sev 1-Critical and Sev 2-High issues:</p> <ul style="list-style-type: none"> • Continental US: 1-800-752-8061 • Europe, Middle East, Africa, and Asia Pacific: +800-AT FIBREE (+800 28 34 27 33) • For areas unable to access toll free number: +1-408-333-6061 • Toll-free numbers are available in many countries. 	<p>support@brocade.com</p> <p>Please include:</p> <ul style="list-style-type: none"> • Problem summary • Serial number • Installation details • Environment description

Brocade OEM customers

If you have purchased Brocade product support from a Brocade OEM/Solution Provider, contact your OEM/Solution Provider for all of your product support needs.

- OEM/Solution Providers are trained and certified by Brocade to support Brocade® products.
- Brocade provides backline support for issues that cannot be resolved by the OEM/Solution Provider.

- Brocade Supplemental Support augments your existing OEM support contract, providing direct access to Brocade expertise. For more information, contact Brocade or your OEM.
- For questions regarding service levels and response times, contact your OEM/Solution Provider.

Document feedback

To send feedback and report errors in the documentation you can use the feedback form posted with the document or you can e-mail the documentation team.

Quality is our first concern at Brocade and we have made every effort to ensure the accuracy and completeness of this document. However, if you find an error or an omission, or you think that a topic needs further development, we want to hear from you. You can provide feedback in two ways:

- Through the online feedback form in the HTML documents posted on www.brocade.com.
- By sending your feedback to documentation@brocade.com.

Provide the publication title, part number, and as much detail as possible, including the topic heading and page number if applicable, as well as your suggestions for improvement.

About This Document

- Supported hardware and software..... 9
- Using the Network OS CLI 10
- What's new in this document..... 10

Supported hardware and software

In those instances in which procedures or parts of procedures documented here apply to some switches but not to others, this guide identifies exactly which switches are supported and which are not.

Although many different software and hardware configurations are tested and supported by Brocade Communications Systems, Inc. for Network OS 6.0.1, documenting all possible configurations and scenarios is beyond the scope of this document.

The following hardware platforms are supported by this release of Network OS:

- Brocade VDX 2740

NOTE

The Brocade VDX 2740 is the equivalent of the Lenovo Flex System EN4023 10Gb Scalable Switch. This platform is identified in the system as EN4023.

- Brocade VDX 2746
- Brocade VDX 6740
 - Brocade VDX 6740-48
 - Brocade VDX 6740-64
- Brocade VDX 6740T
 - Brocade VDX 6740T-48
 - Brocade VDX 6740T-64
 - Brocade VDX 6740T-1G
- Brocade VDX 6940-36Q
- Brocade VDX 6940-144S
- Brocade VDX 8770
 - Brocade VDX 8770-4
 - Brocade VDX 8770-8

To obtain information about a Network OS version other than this release, refer to the documentation specific to that version.

Using the Network OS CLI

For complete instructions and support for using the Network OS command line interface (CLI), refer to the *Network OS Command Reference*.

What's new in this document

This document describes the concepts and configuration of the Brocade Monitoring and Alerting Policy Suite for Network OS.

This is the first version of this document, and the first time this feature is available in Network OS. All content in this document is new.

Monitoring and Alerting Policy Suite Overview

- [MAPS overview.....](#) 11
- [MAPS interoperability with other features.....](#) 11
- [MAPS upgrade and downgrade considerations.....](#) 12

MAPS overview

The Monitoring and Alerting Policy Suite (MAPS) is an optional network health monitor supported on all devices running Network OS v6.0.1 or later that enables each device to constantly monitor for potential faults and automatically alert you to problems.

MAPS has a dashboard that provides you with the ability to view in a quick glance what is happening on the switch, and helps administrators dig deeper to see details of exactly what is happening on the switch (for example, the kinds of errors, the error count, and so on.)

MAPS is disabled by default, but no license is required to enable it.

MAPS provides a set of predefined monitoring policies that allow you to immediately use MAPS on activation.

MAPS interoperability with other features

MAPS interacts in different ways with different Network OS features, including Fabric Watch and High Availability.

MAPS and Fabric Watch

MAPS cannot coexist with Fabric Watch. Once MAPS is enabled, Fabric Watch is automatically disabled.

MAPS and High Availability

MAPS configuration settings are maintained across a High availability (HA) failover or HA reboot; however, MAPS will restart monitoring after an HA failover or HA reboot and the MAPS cached statistics are not retained.

MAPS upgrade and downgrade considerations

When upgrading or downgrading Network OS, the following MAPS-related behaviors should be expected:

- MAPS is not available in versions prior to Network OS v6.0.1.
- On a firmware upgrade from previous versions, MAPS will be disabled by default and all default policies will be present on the system.
- Downgrading from Network OS 6.0.1 to previous versions is blocked if MAPS is enabled and active. You must disable MAPS to perform a firmware downgrade.

MAPS Groups, Policies, Rules, and Actions

- [MAPS groups overview](#)..... 13
- [MAPS policies](#)..... 15
- [MAPS actions overview](#)..... 16

MAPS groups overview

A MAPS group is a collection of similar objects that you can monitor using a common threshold.

Predefined MAPS groups

MAPS provides several predefined groups that are used in the default policies for monitoring. These groups cannot be edited or deleted. For the groups that need dynamic membership update (such as ALL_ETH_PORTS or ALL_SFP), the updates are automatically handled by MAPS in the background. The following table lists these predefined groups organized by object type.

TABLE 1 Predefined MAPS groups

Group name	Element type	Description
ALL_ETH_PORTS	1G, 10G, 40G, 100 Gbps Interfaces	All ports physically present for interface error monitoring.
ALL_QSFP	QSFP	All 40 Gbps interfaces and small form-factor pluggable (SFP) transceivers for interface and SFP monitoring
ALL_NAS_PORTS	Ethernet Ports	All Ethernet ports configured as Network-Attached Storage (NAS) ports.
ALL_DAS_PORTS	Ethernet Ports	All Ethernet ports configured as Distributed Antenna System (DAS) ports.
ALL_ISCSI_PORTS	iSCSI ports	All Ethernet ports configured to be connected to iSCSI targets using the interface CLI.
ALL_SFP	SFP	Group that contains all the SFP transceivers inserted in the system.
ALL_QSFP_SR	QSFP	All 40 Gbps Short Reach quad small form-factor pluggable (QSFP) transceivers (works up to 100 m)
ALL_QSFP_LR	QSFP	All 40 Gbps Long Reach QSFP transceivers (works up to 10 km)

TABLE 1 Predefined MAPS groups (Continued)

Group name	Element type	Description
ALL_1G_SFP	SFP	All 1 Gbps interfaces and SFP transceivers for interface and SFP transceiver monitoring
ALL_1GSR_SFP	SFP	All 1 Gbps Short range GBIC/SFP transceivers
ALL_1GLR_SFP	SFP	All 1 Gbps Long range GBIC/SFP transceivers
ALL_10GSR_SFP	SFP	All 10 Gbps Short range GBIC/SFP transceivers
ALL_10GLR_SFP	SFP	All 10 Gbps Long range GBIC/SFP transceivers
ALL_10G_USR	SFP	All 10 Gbps UltraShort reach GBIC/SFP transceivers
ALL_100G_SFP	SFP	All 100 Gbps GBIC/SFP transceivers
ALL_100GSR_SFP	SFP	All 100 Gbps Short range GBIC/SFP transceivers
ALL_100GLR_SFP	SFP	All 100 Gbps Long range GBIC/SFPtransceivers
ALL_PS	Power supply	All power supplies present in the chassis. This group is used to monitor field-replaceable unit (FRU) events such as plug-in, plug-out, or faulty events.
ALL_LC	Line card	All line cards present in the system. This group is used to monitor FRU events such as plug-in, plug-out, or faulty events.
ALL_SLOTS	Slots	All slots present in the system. This group is used to monitor FRU events such as plug-in, plug-out, or faulty events.
ALL_SFM	SFM – Core Blade	All Switch Fabric Modules (SFMs) present in the system. This group is used to monitor FRU events such as plug-in, plug-out, or faulty events.
CHASSIS	Chassis	Default group used of defining rules on parameters that are global for the whole chassis, such as CPU or Flash.
ALL_FANS	Fan	All fans present in the system. This group is used to monitor FRU events such as plug-in, plug-out, or faulty events.
ALL_TS	Temperature sensor	All temperature sensors present in the system.
ALL_WWN	WWN card	All World Wide Name (WWN) cards present in the system.
ALL_FLASH	Compact flash	Group for monitoring compact flash usage.

MAPS policies

A MAPS policy is a set of rules that defines thresholds for measures and action to take when a threshold is triggered. When you enable a policy, all of the rules in the policy are in effect.

A switch can have multiple policies. For example, you can have a policy for everyday use and you can have another policy for when you are performing switch maintenance.

Only one policy can be active at a time. When you enable a policy, it becomes the active policy and the rules in the active policy take effect.

One policy must always be active on the switch. You can have an active policy with no actions, but you must have an active policy. You can only change the active policy by enabling a different policy.

Predefined MAPS policies

MAPS provides three predefined policies that you cannot modify or delete:

- `dflt_aggressive_policy` - Contains rules with very strict thresholds. Use this policy if you need a pristine fabric.
- `dflt_moderate_policy` - Contains rules with thresholds values between the aggressive and conservative policies.
- `dflt_conservative_policy` - Contains rules with more lenient thresholds that allow a buffer and do not immediately trigger actions. Use this policy in environments where the elements are resilient and can accommodate errors.

Viewing policy information

MAPS allows you to view all the policies on a switch by using the **show maps policy** command. You can use this command to show all policies on a device or in an RBridge ID.

For complete information on viewing policy information, refer to the **show maps policy** command in the *Network OS Command Reference*.

To view a summary of all the policies for an RBridge ID, enter the following command in privileged EXEC mode.

```
device# show maps policy summary rbridge-id 1
      Policy Name                               Number of Rules
-----
dflt_aggressive_policy                         :                196
dflt_conservative_policy                       :                198
dflt_moderate_policy                           :                198
Active Policy is 'dflt_conservative_policy'.
```

To view detailed information on the policies for an RBridge ID, enter the following command in privileged EXEC mode.

```
device# show maps policy detail rbridge-id 1
-----
Policies and Rules for RbridgeId 1
-----
dflt_aggressive_policy  Rules (ENABLED)
-----
Rules
List
Action                                     Condition
-----
defALL_ETH_PORTS_CRCA  RASLOG,SNMP,EMAIL
```

```

CRCALNALL_ETH_PORTS (MIN>6)
    defALL_ETH_PORTS_CRCALN_150          RASLOG,SNMP,EMAIL
CRCALNALL_ETH_PORTS (MIN>150)
    defALL_ETH_PORTS_RX_SYM_ERR_0      RASLOG,SNMP,EMAIL
RX_SYM_ERRALL_ETH_PORTS (MIN>0)

-----
dflt_conservative_policy Rules (NOT ENABLELD)
-----
Rules
List
Action                                     Condition
-----
    defALL_ETH_PORTS_RX_SYM_ERR_0      RASLOG,SNMP,EMAIL
RX_SYM_ERRALL_ETH_PORTS (MIN>0)
    defALL_ISCSI_PORTS_RX_SYM_ERR_0    RASLOG,SNMP,EMAIL
RX_SYM_ERRALL_ISCSI_PORTS (MIN>0)
    defALL_NAS_PORTS_RX_SYM_ERR_0      RASLOG,SNMP,EMAIL
RX_SYM_ERRALL_NAS_PORTS (MIN>0)

-----
dflt_moderate_policy Rules (ENABLED)
-----
Rules
List
Action                                     Condition
-----
    defALL_ETH_PORTS_RX_SYM_ERR_0      RASLOG,SNMP,EMAIL
ALL_ETH_PORTS (RX_SYM_ERRMIN>0)
    defALL_ISCSI_PORTS_RX_SYM_ERR_0    RASLOG,SNMP,EMAIL
ALL_ISCSI_PORTS (RX_SYM_ERRMIN>0)
    defALL_NAS_PORTS_RX_SYM_ERR_0      RASLOG,SNMP,EMAIL
ALL_NAS_PORTS (RX_SYM_ERRMIN>0)

```

MAPS actions overview

A MAPS action defines the activity that occurs if the condition defined in a rule evaluates to true.

Each rule can have one or more actions associated with it.

MAPS provides the following predefined actions:

- RASLOG messages
- SNMP traps
- E-mail alerts
- Port Fencing
- SW_DOWN (switch critical)
- SW_MARGINAL (switch marginal)
- SFP_MARGINAL (SFP marginal)

Quick setup for MAPS

MAPS provides the capability to define what actions are allowable on the device, regardless of the actions that are specified in individual rules.

You only need to specify the parameter values you are changing. The list of actions you specify replaces the existing list of actions on the device. If you want to add an action, you must specify all of

the existing actions as well as the new action. If you want to delete an action, you must specify the existing list minus the action you want to delete.

1. Enter RBridge configuration mode.

```
device(config)# rbridge-id 5
```
2. Enter MAPS configuration mode.

```
device(config-rbridge-id-5)# maps
```
3. Enter the **enable policy** command for each of the actions that you want to allow on the device, up to the complete set of actions.

```
device(config-rbridge-id-5-maps)# enable policy dflt_aggressive_policy actions
RASLOG SW_CRITICAL
```

RASLog messages

Following an event, MAPS adds an entry to the internal event log for an individual switch. The RASLog stores event information but does not actively send alerts. Use the **show logging raslog** command to view the RASLog. For details, refer to the *Network OS Command Reference*.

The RASLog message contains the following data:

- The notification level (all RASLog messages generated by MAPS are designated as "WARNING").
- The name of the device generating the message.
- The physical port on the device generating the message.
- The condition that was exceeded in order to generate the message.
- The current value of the condition violation.
- The name of the rule controlling the condition.
- The name of the category that displays this information when you use the MAPS dashboard.

The following example shows a RASLog log entry generated by MAPS:

```
2015/04/16-01:06:05 , [MAPS-1003], 5973, SW/0 | Active, WARNING, sw0, Eth Port
1/0/4 , Condition= ALL_ETH_PORTS(RX_SYM_ERR/min>5) , Current Value:[ RX_SYM_ERR,52
Errors ], RuleName =deFALL_ETH_PORTS_RX_SYM_ERR_5, Dashboard Category=Port Health.
```

SNMP traps

In environments where you have a high number of messages coming from a variety of switches, you may want to receive them in a single location and view them using a graphical user interface (GUI). In this type of scenario, Simple Network Management Protocol (SNMP) notifications may be the most efficient notification method. You can avoid having to log in to each switch individually as you would have to do for error log notifications.

When specific events occur on a switch, SNMP generates a message (called a "trap") that notifies a management station using SNMP. Log entries can also trigger SNMP traps if the SNMP agent is configured. When the SNMP agent is configured to a specific error message level, error messages at that level trigger SNMP traps.

An SNMP trap forwards the following information to an SNMP management station:

- The rule name that triggered the SNMP trap)
- The element type that triggered the rule (such as Ethernet port, SFP, and so on)
- The data type to be used to interpret the data sent for the "key" OID)
- The key OID (the unique ID for the element that triggered the rule)
- The condition that triggered the rule
- The number of MS/measures present in the condition
- The value for each of the MS/measures that triggered the rule
- The severity level of the MAPS event

- The action configured in the rule (this provides information on other actions triggered along with SNMP trap)
- The dashboard Category to which this rule belongs

To receive the event notifications, you must configure the SNMP software to receive the trap information from the network device, and configure the SNMP agent on the switch to send the trap to the management station. For additional information on configuring the SNMP agent, refer to the *Network OS Command Reference* and the *Network OS Administration Guide*.

The following example shows a typical SNMP trap generated by MAPS.

```
Specific: 1
Message reception date: 4/7/2015
Message reception time: 5:41:52.861 PM
Time stamp: 0 days 22h:43m:43s.00th
Message type: Trap (v1)
Protocol version: SNMPv1
Transport: IP/UDP
Agent
  Address: 10.17.37.171
  Port: 8000
Manager
  Address: 172.26.3.166
  Port: 4425
Community: public
SNMPv1 agent address: 10.17.37.171
Enterprise: maps
Specific Trap MIB Lookup Results
Bindings (10)
  Binding #1: mapsConfigRuleName.0 *** (OCTET STRING) defSWITCHSEC_LV_4
  Binding #2: mapsConfigObjectGroupType.0 *** (INTEGER) switch(11)
  Binding #3: mapsConfigObjectKeyType.0 *** (INTEGER) int32(1)
  Binding #4: mapsConfigObjectKeyValue.0 *** (OCTET STRING) 0
  Binding #5: mapsConfigNumOfMS.0 *** (Integer32) 1
  Binding #6: mapsConfigMsList.0 *** (OCTET STRING) SEC_LV,1,5
  Binding #7: mapsConfigSeverityLevel.0 *** (INTEGER) warning(3)
  Binding #8: mapsConfigCondition.0 *** (OCTET STRING) SWITCH(SEC_LV/min>4)
  Binding #9: mapsConfigAction.0 *** (Integer32) 19
  Binding #10: mapsDbCategory.0 *** (OCTET STRING) Security Violations
```

SNMP MIB support

MAPS requires SNMP management information base (MIB) support on the device for management information collection.

For additional information on SNMP MIB support, refer to the *Network OS Administration Guide*.

E-mail alert

An e-mail alert sends information about the event to one or more specified e-mail addresses. The e-mail alert specifies the threshold and describes the event, much like an error message.

You configure the e-mail recipients using the **email** command. You must include the complete e-mail address. For example, abc@12.com is a valid e-mail address; abc@12 is not. Refer to [Configuring MAPS alert targets](#) on page 26 for more information.

Switch critical

The switch critical action sets the state of the affected switch in the MAPS dashboard display to SW_CRITICAL. This action does not bring the switch down, but only affects what is displayed in the dashboard.

This action is valid only in the context of Switch Policy Status-related rules.

Switch marginal

The switch marginal action sets the state of the affected switch in the MAPS dashboard to SW_MARGINAL. This action does not affect the actual state of the switch, but only affects what is displayed in the dashboard.

This action is valid only in the context of Switch Policy Status-related rules.

SFP marginal

The SFP marginal action sets the state of the affected small form-factor pluggable (SFP) transceiver in the MAPS dashboard to “down”. This action does not bring the SFP transceiver down, but only affects what is displayed in the dashboard.

This action is valid only in the context of Advanced SFP groups.

MAPS Elements and Categories

- [MAPS structural elements](#).....21
- [MAPS monitoring categories](#).....21

MAPS structural elements

MAPS has the following structural elements: categories, groups, rules, and policies. The following table provides a brief description of each structural element.

TABLE 2 MAPS structural elements

Element	Description
Action	The activity performed by MAPS if a condition defined in a rule evaluates to true.
Category	A grouping of similar elements that can be monitored (for example, "Security Violations").
Condition	A true or false trigger created by the combination of a timebase and a threshold value.
Element	A value (measure or statistic) that can be monitored. This includes switch conditions, data traffic levels, error messages, and other values. For a complete list of elements, refer to the <i>Network OS Administration Guide</i> .
Group	A collection of similar objects that you can monitor as a single entity. For example, a collection of ports can be assembled as a group.
Rule	A direction associating a condition with one or more actions that must occur when the specified condition is evaluated to be true.
Policy	A set of rules defining thresholds for triggering actions MAPS is to take when that threshold is triggered. When a policy is enabled, all of the rules in the policy are in effect.

MAPS monitoring categories

When you activate rules, you specify an element to be monitored. MAPS provides the following categories you can monitor:

- Switch Policy Status
- Port Health
- FRU Health
- Security Violations
- Switch Resource

NOTE

The MAPS dashboard also displays the status of these categories.

Switch Policy Status

The Switch Policy Status category enables you to monitor the health of the switch by defining the number of types of errors that transitions the overall switch state into a state that is not healthy. For example, you can specify a switch policy so that if a switch has one fan failure, it is considered to be in a marginal state; if it has two failures, it is in a critical (down) state. The following table lists the monitored parameters in this category and identifies the factors that affect their health.

NOTE

Not all switches support the listed monitors.

TABLE 3 Switch Policy Status category parameters

Monitored parameter	Description
Power Supplies (BAD_PWR)	Power supply thresholds detect absent or failed power supplies, and power supplies that are not in the correct slot for redundancy.
Temperatures (BAD_TEMP)	Temperature thresholds, faulty temperature sensors.
Fans (BAD_FAN)	Fan thresholds, faulty fans.
Flash (FLASH_USAGE)	Flash thresholds.
Faulty blades (FAULTY_BLADE)	Faulty blades (applies to modular switches).
High Availability (HA_SYNC)	Switch does not have a redundant CP (applies to modular switches only).

Port Health

The Port Health category monitors port statistics and takes action based on the configured thresholds and actions. Only physical ports are configurable.

The Port Health category also monitors the physical aspects of a small form-factor pluggable (SFP) transceiver, such as voltage, current, receive power (RXP), transmit power (TXP), and state changes in physical ports. The following table lists the monitored parameters in this category and provides a brief description for each one.

TABLE 4 Port Health category parameters

Monitored parameter	Description
Cyclic redundancy check (CRC)	The number of times an invalid cyclic redundancy check error occurs on a port or a frame that computes to an invalid CRC. Invalid CRCs can represent noise on the network. Such frames are recoverable by retransmission. Invalid CRCs can indicate a potential hardware problem.
Symbol Errors (RX_SYM_ERR)	The number of symbol errors received.
RX Abnormal Frames (RX_ABN_FRAME)	The number of abnormal frames received.
Interframe Gap (IFG)	Specifies the parameters of the interframe gap for Ethernet packets.
SFP current (CURRENT)	The amperage supplied to the SFP transceiver. Current area events indicate hardware failures.
SFP receive power (RXP)	The power of the incoming laser in microwatts (μW). This is used to help determine if the SFP transceiver is in good working condition. If the counter often exceeds the threshold, the SFP transceiver is deteriorating.
SFP transmit power (TXP)	The power of the outgoing laser in microwatts (μW). This is used to help determine if the SFP transceiver is in good working condition. If the counter often exceeds the threshold, the SFP transceiver is deteriorating.
SFP voltage (VOLTAGE)	The voltage supplied to the SFP transceiver. If this value exceeds the threshold, the SFP transceiver is deteriorating.
SFP temperature (SFP_TEMP)	The temperature of the SFP transceiver in degrees Celsius. A high temperature indicates that the SFP transceiver may be in danger of damage.

FRU Health

The FRU Health category enables you to define rules for field-replaceable units (FRUs), including small form-factor pluggable (SFP) transceivers, power supplies, and flash memory. The following table lists the monitored parameters in this category and provides a brief description for each one. Possible states for all FRU measures are faulty, inserted, on, off, ready, and up.

TABLE 5 FRU Health category parameters

Monitored parameter	Description
Power Supplies (PS_STATE)	State of a power supply has changed.
Fans (FAN_STATE)	State of a fan has changed.
Blades (BLADE_STATE)	State of a slot has changed.
SFPs (SFP_STATE)	State of the SFP transceiver has changed.

Security Violations

The Security Violations category monitors different security violations on the switch and takes action based on the configured thresholds and their actions. The following table lists the monitored parameters in this category and provides a brief description for each one.

TABLE 6 Security Violations category parameters

Monitored parameter	Description
Login violations (SEC_LV)	Login violations which occur when a secure fabric detects a login failure.
Telnet violations (SEC_TELNET)	Telnet violations which occur when a Telnet connection request reaches a secure switch from an unauthorized IP address.

Switch resource monitoring

Switch resource monitoring enables you to monitor your system's temperature, flash usage, memory usage, and CPU usage.

You can use Switch Resource monitors to perform the following tasks:

- Configure thresholds for MAPS event monitoring and reporting for the environment and resource elements. Environment thresholds enable temperature monitoring, and resource thresholds enable monitoring of flash memory.
- Configure memory or CPU usage parameters on the switch or display memory or CPU usage. Configuration options include setting usage thresholds which, if exceeded, trigger a set of specified MAPS alerts. You can set up the system monitor to poll at certain intervals and specify the number of retries required before MAPS takes action.

The following table lists the monitored parameters in this category and provides a brief description for each one.

TABLE 7 Switch Resource category parameters

Monitored parameter	Description
Temperature (TEMP)	Refers to the ambient temperature inside the switch, in degrees Celsius. Temperature sensors monitor the switch in case the temperature rises to levels at which damage to the switch might occur.
ETH_MGMT_PORT_STATE	Refers to the current state of the Ethernet ports.
Flash (FLASH_USAGE)	Monitors the compact flash space available by calculating the percentage of flash space consumed and comparing it with the configured high threshold value.
CPU usage (CPU)	Monitors the percentage of CPU available by calculating the percentage of CPU consumed and comparing it with the configured threshold value.
Memory (MEMORY_USAGE)	Monitors the available RAM by calculating the percentage of memory consumed and comparing it with the configured threshold value.

Enabling and Configuring MAPS

- [Enabling MAPS.....](#) 25
- [Configuring MAPS](#) 25

Enabling MAPS

MAPS can be enabled at any time.

Once MAPS is enabled, all Fabric Watch system monitoring commands, such as **system-monitor** or **threshold-monitor**, will return an error.

When you enable MAPS, you must be logged in to the primary node in Logical Cluster mode. MAPS can be enabled from a secondary node in Fabric Cluster mode.

1. Enter global configuration mode on the device.
`device# configure terminal`
2. Enter RBridge ID configuration mode on the device.
`device(config)# rbridge-id 1`
3. Enter MAPS configuration mode on the device.
`device(config-rbridge-id-1)# maps`
4. Enable MAPS with a policy and action.
`device(config-rbridge-id-1-maps)# enable policy dflt_aggressive_policy actions RASLOG`
5. Confirm the MAPS configuration is active.
`device(config-rbridge-id-1-maps)# do show running-config rbridge-id 1 maps`
`rbridge-id 1`
`maps`
`enable policy dflt_conservative_policy`
`enable actions RASLOG`

For complete information on the options for the **enable policy** command, refer to the *Network OS Command Reference*.

Configuring MAPS

The following table lists the MAPS configuration tasks and the commands you use for these tasks.

TABLE 8 MAPS configuration tasks

Configuration task	Command
Enabling MAPS	maps
Enabling a policy	enable policy
Enabling or disabling actions at a global level	enable action
Sending alerts using e-mail	email

TABLE 8 MAPS configuration tasks (Continued)

Configuration task	Command
Sending alerts using a relay IP address and a domain name	relay

Configuring MAPS alert targets

Configure the MAPS alerts destination targets for all email and relay messages.

You must separate multiple targets with a comma and include the complete e-mail address, IP address, or domain name. For example, `admin@abc123.com` is a valid e-mail address; `admin@12` is not.

Use the no form of the **email** or **relay** command to remove the target information. For example, **no email webmaster@abc123.com** removes the given e-mail address from the MAPS configuration.

1. Enter global configuration mode.

```
device# configure terminal
```
2. Enter RBridge ID configuration mode.

```
device(config)# rbridge-id 5
```
3. Enter MAPS configuration mode.

```
device(config-rbridge-id-5)# maps
```
4. Configure the destination e-mail addresses for MAPS alerts.

```
device(config-rbridge-id-5-maps)# email admin@abc123.com
device(config-rbridge-id-5-maps)# email webmaster@abc123.com
```
5. Configure the destination relay IP address for MAPS alerts.

```
device(config-rbridge-id-5-maps)# relay 10.25.248.25 domainname abc123.com
```

Monitoring IP storage

If an IP or iSCSI storage element is added to the fabric through an interface port, you can monitor the element using existing rules for similar elements by using the **device connectivity** command to add that interface to the ALL_IP_TARGETS or ALL_ISCSI_TARGETS group monitoring.

The added element is automatically monitored using the existing rules that have been set up for the group as long as the rules are in the active policy. You do not need to re-enable the active policy.

The following example designates a ten-gigabit Ethernet port as being connected to iSCSI storage for MAPS.

```
device(config)# interface tengigabitethernet 1/2/5
device(conf-if-te-1/2/5)# device-connectivity iSCSI
```

NOTE

MAPS does not monitor Flexports configured as Fabric Cluster ports.

MAPS Dashboard

- [MAPS dashboard overview](#).....27
- [MAPS dashboard viewing](#).....27

MAPS dashboard overview

The MAPS dashboard provides a summary view of the switch health status that allows you to easily determine whether everything is working according to policy or whether you need to investigate further.

MAPS dashboard viewing

After a policy is activated, you can monitor the switch status by using the **show maps dashboard** command. There are three primary views: a summary view, a detailed view (which includes historical data), and a history-only view.

Viewing the MAPS dashboard

The dashboard is a central feature of MAPS, providing at-a-glance views of device health status, and allowing you to manage devices and easily know if the device is functioning within the limits that does not degrade the performance.

Use the **show maps dashboard** command to view the dashboard. The view displays the rules and the conditions in the rules that contributed to the information shown in other categories. Refer to the *Network OS Command Reference* for details on the **show maps dashboard** command.

The output of the command is divided into five basic sections:

- Basic information about the dashboard
- A status report on the current health of the switch
- A summary of the focus areas of the switch
- A list of the rules currently affecting the health of the switch
- A historical summary of the events on the switch over the last 24 hours

```
device# show maps dashboard rbridge-id 10
```

```
-----  
--  
                                Dashboard for RbridgeId 10  
-----  
--  
1 Dashboard Information:  
=====
```

DB start time : Thu May 21 17:27:28 2015

```
2 Switch Health Report:  
=====
```

Current Switch Policy Status: MARGINAL
Contributing Factors:

```
-----
*BAD_PWR (MARGINAL).
```

3.1 Summary Report:
=====

Category	Today	Last 7 days	
Port Health	No Errors	No Errors	
Fru Health	In operating range	In operating range	
Security Violations	No Errors	Out of operating range	
Switch Resource	In operating range	In operating range	

3.2 Rules Affecting Health:
=====

Category(Rule Count) Object	RepeatCount Triggered Value(Units)	Rule Name	Execution Time	
Security Violations (2 Switch 3)	1 Violations	defSWITCHSEC_LV_0	05/21/15 19:26:54	
Switch	1 Violations			
Switch	1 Violations	defSWITCHSEC_TELNET_0	05/21/15 19:26:54	

3.3 History Data:
=====

Stats(Units) --/--/--	Current --/--/--	--/--/--	--/--/--
Port (val)	Port (val)	Port (val)	Port (val)
-----	-----	-----	-----
CRCALN (CRCs)	-	-	-
-	-	-	-
RX_ABN_FRAME (Errors)	-	-	-
-	-	-	-
RX_SYM_ERR (Errors)	-	-	-
-	-	-	-
RX_IFG (IFGs)	-	-	-
-	-	-	-

<output truncated for clarity>

MAPS Threshold Values

- [Thresholds overview](#)..... 29
- [FRU state thresholds](#)..... 29
- [Switch Policy Status thresholds](#)..... 30
- [Security monitoring thresholds](#)..... 31
- [Resource monitoring thresholds](#)..... 31
- [Monitoring thresholds for 10 Gbps SFP transceivers](#).....32
- [Monitoring thresholds for QSFP transceivers and all other SFP transceivers](#)..... 34

Thresholds overview

The following tables describe the default monitoring thresholds used by the Monitoring and Alerting Policy Suite (MAPS) for RASLog, SNMP, and e-mail alert messages.

FRU state thresholds

The following table lists the default Field Replaceable Unit (FRU) monitoring thresholds. All threshold values are absolute.

TABLE 9 FRU state thresholds

Statistic	Aggressive policy	Moderate policy	Conservative policy	Actions
PS	In, Out, Off, Faulty	Same as Aggressive policy	Same as Aggressive policy	RASLOG, SNMP, EMAIL
Fan	In, Out, Off, Faulty	Same as Aggressive policy	Same as Aggressive policy	RASLOG, SNMP, EMAIL
SFP	In, Out, Off, Faulty	Same as Aggressive policy	Same as Aggressive policy	RASLOG, SNMP, EMAIL
Blade	In, Out, Off, Faulty	Same as Aggressive policy	Same as Aggressive policy	RASLOG, SNMP, EMAIL
WWN	On, Out, Off, Faulty	Same as Aggressive policy	Same as Aggressive policy	RASLOG, SNMP, EMAIL

Switch Policy Status thresholds

The following table lists the default Switch Policy Status monitoring thresholds. All threshold actions are triggered when they exceed the listed value. For thresholds with both an upper value and a lower value, the threshold action is triggered when it exceeds the upper value or drops below the lower value. These values apply to both marginal and critical thresholds.

TABLE 10 Switch Policy Status thresholds

Statistic	Aggressive policy	Actions	Moderate policy	Actions	Conservative policy	Actions
Bad Power	1 of 2	SW_CRITICAL, SNMP, EMAIL	1 of 2	Same as Aggressive policy	1 of 2	Same as Moderate policy
Bad Temp	1 of 2 2 of 4 6 of 8 (depending on device model)	Low threshold: SW_MARGINAL, SNMP, EMAIL High threshold: SW_CRITICAL, SNMP, EMAIL	1 of 2	Same as Aggressive policy	1 of 2	Same as Moderate policy
Bad Fan	1 of 2	Low threshold: SW_MARGINAL, SNMP, EMAIL High threshold: SW_CRITICAL, SNMP, EMAIL	1 of 2	Same as Aggressive policy	1 of 2	Same as Moderate policy
Flash Usage	90	RASLOG, SNMP, EMAIL	90	Same as Aggressive policy	90	Same as Moderate policy
Faulty Blade	1/-	Low threshold: SW_MARGINAL, SNMP, EMAIL High threshold: N/A	1/-	Same as Aggressive policy	1/-	Same as Moderate policy
Faulty WWN	-/1	Low threshold: N/A High threshold: SW_MARGINAL, SNMP, EMAIL	-/1	Same as Aggressive policy	-/1	Same as Moderate policy

TABLE 10 Switch Policy Status thresholds (Continued)

Statistic	Aggressive policy	Actions	Moderate policy	Actions	Conservative policy	Actions
Faulty SFM	1 of 2	Low threshold: SW_MARGINAL, SNMP, EMAIL High threshold: SW_CRITICAL, SNMP, EMAIL	1 of 2	Same as Aggressive policy	1 of 2	Same as Moderate policy
HA Sync	sync = 0	SW_MARGINAL, SNMP, EMAIL	sync = 0	Same as Aggressive policy	sync = 0	Same as Moderate policy

Security monitoring thresholds

The following table lists the default monitoring thresholds for security criteria. Unless noted otherwise, all thresholds are measured per minute and the actions are triggered when the thresholds are greater than the shown value.

The following table applies to RASLog, SNMP, and e-mail thresholds.

TABLE 11 Security monitoring thresholds

Statistics	Aggressive policy	Moderate policy	Conservative policy	Actions
Login Violations	0	2	4	RASLOG, SNMP, EMAIL
Telnet Violations	0	2	4	RASLOG, SNMP, EMAIL

Resource monitoring thresholds

The following table lists the default monitoring thresholds for resource criteria. All thresholds are measured per minute and the actions are triggered when the value is greater than the shown value.

The following table applies to both RASLog, SNMP, and e-mail thresholds.

TABLE 12 Resource monitoring thresholds

Statistics	Aggressive policy	Moderate policy	Conservative policy	Actions
Flash (percent used)	90	90	90	RASLOG, SNMP, EMAIL

TABLE 12 Resource monitoring thresholds (Continued)

Statistics	Aggressive policy	Moderate policy	Conservative policy	Actions
CPU (percent used)	80	80	80	RASLOG, SNMP, EMAIL
Memory (percent used)	75	75	75	RASLOG, SNMP, EMAIL

Monitoring thresholds for 10 Gbps SFP transceivers

The following tables list the default monitoring thresholds for 10 Gbps SFP transceivers. All threshold actions are triggered when they exceed the listed value. For thresholds with both an upper value and a lower value, the threshold action is triggered when the value exceeds the upper value or drops below the lower value.

The following tables apply to RASLog, SNMP, and e-mail thresholds.

TABLE 13 SFP monitoring thresholds for ALL_10GSR_SFP

Statistic	Aggressive policy	Moderate policy	Conservative policy	Actions
Current (amps)	13	13	13	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
RXP (μ w)	2000	2000	2000	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
TXP (μ w)	2000	2000	2000	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
VOLTAGE (volts)	2900 to 3700	2900 to 3700	2900 to 3700	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
TEMP ($^{\circ}$ C)	-13 to 93	-13 to 93	-13 to 93	SFP_MARGINAL,RAS LOG, SNMP, EMAIL

TABLE 14 SFP monitoring thresholds for ALL_10GLR_SFP

Statistic	Aggressive policy	Moderate policy	Conservative policy	Actions
Current (amps)	85	85	85	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
RXP (μ w)	1995	1995	1995	SFP_MARGINAL,RAS LOG, SNMP, EMAIL

TABLE 14 SFP monitoring thresholds for ALL_10GLR_SFP (Continued)

Statistic	Aggressive policy	Moderate policy	Conservative policy	Actions
TXP (μ w)	1585	1585	1585	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
VOLTAGE (volts)	2970 to 3630	2970 to 3630	2970 to 3630	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
TEMP ($^{\circ}$ C)	-5 to 90	-5 to 90	-5 to 90	SFP_MARGINAL,RAS LOG, SNMP, EMAIL

TABLE 15 SFP monitoring thresholds for ALL_10USR_SFP

Statistic	Aggressive policy	Moderate policy	Conservative policy	Actions
Current (amps)	13	13	13	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
RXP (μ w)	2000	1995	1995	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
TXP (μ w)	2000	1585	1585	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
VOLTAGE (volts)	2900 to 3700	2970 to 3630	2970 to 3630	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
TEMP ($^{\circ}$ C)	-13 to 100	-5 to 90	-5 to 90	SFP_MARGINAL,RAS LOG, SNMP, EMAIL

TABLE 16 SFP monitoring thresholds for ALL_100G_SFP

Statistic	Aggressive policy	Moderate policy	Conservative policy	Actions
Current (amps)	10	10	10	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
RXP (μ w)	2187	2187	2187	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
TXP (μ w)	2187	2187	2187	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
VOLTAGE (volts)	2970 to 3600	2970 to 3600	2970 to 3600	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
TEMP ($^{\circ}$ C)	-5 to 75	-5 to 75	-5 to 75	SFP_MARGINAL,RAS LOG, SNMP, EMAIL

Monitoring thresholds for QSFP transceivers and all other SFP transceivers

The following tables list the default monitoring thresholds for QSFP transceivers and all other SFP transceivers. All thresholds are triggered when a value exceeds the listed value. For thresholds with both an upper value and a lower value, the action is triggered when the reported value exceeds the upper threshold value or drops below the lower threshold value.

The following table applies to RASLog, SNMP, e-mail thresholds.

TABLE 17 ALL_QSFP

Statistic	Aggressive policy	Moderate policy	Conservative policy	Actions
Current (amps)	10	10	10	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
RXP (μ w)	1995	1995	1995	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
TXP (μ w)	N/A	N/A	N/A	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
VOLTAGE (volts)	2970 to 3630	2970 to 3630	2970 to 3630	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
TEMP ($^{\circ}$ C)	-5 to 85	-5 to 85	-5 to 85	SFP_MARGINAL,RAS LOG, SNMP, EMAIL

TABLE 18 ALL_QSFP_SR

Statistic	Aggressive policy	Moderate policy	Conservative policy	Actions
Current (amps)	10	10	10	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
RXP (μ w)	2188	2188	2188	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
TXP (μ w)	N/A	N/A	N/A	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
VOLTAGE (volts)	2970 to 3600	2970 to 3600	2970 to 3600	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
TEMP ($^{\circ}$ C)	-5 to 75	-5 to 75	-5 to 75	SFP_MARGINAL,RAS LOG, SNMP, EMAIL

TABLE 19 ALL_QSFP_LR

Statistic	Aggressive policy	Moderate policy	Conservative policy	Actions
Current (amps)	80	80	80	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
RXP (μ w)	3380	3380	3380	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
TXP (μ w)	N/A	N/A	N/A	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
VOLTAGE (volts)	2970 to 3630	2970 to 3630	2970 to 3630	SFP_MARGINAL,RAS LOG, SNMP, EMAIL
TEMP ($^{\circ}$ C)	-8 to 78	-8 to 78	-8 to 78	SFP_MARGINAL,RAS LOG, SNMP, EMAIL

