

# Brocade Fabric OS Access Gateway Administration Guide, 8.0.1

Supporting Fabric OS 8.0.1

© 2016, Brocade Communications Systems, Inc. All Rights Reserved.

Brocade, Brocade Assurance, the B-wing symbol, ClearLink, DCX, Fabric OS, HyperEdge, ICX, MLX, MyBrocade, OpenScript, VCS, VDX, Vplane, and Vyatta are registered trademarks, and Fabric Vision is a trademark 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

---

<b>Preface.....</b>	<b>7</b>
Document conventions.....	7
Text formatting conventions.....	7
Command syntax conventions.....	7
Notes, cautions, and warnings.....	8
Brocade resources.....	8
Contacting Brocade Technical Support.....	8
Brocade customers.....	8
Brocade OEM customers.....	9
Document feedback.....	9
<b>About This Document.....</b>	<b>11</b>
Supported hardware and software.....	11
Brocade Gen 5 platform (16-Gbps) fixed-port switches.....	11
Brocade Gen 6 platform (32-Gbps) fixed-port switches.....	11
What's new in this document.....	11
Changes made for the initial release (53-1004110-01) .....	11
Changes made for this release (53-1004110-02) .....	12
Key terms for Access Gateway.....	12
<b>Access Gateway Basic Concepts.....</b>	<b>15</b>
Brocade Access Gateway overview .....	15
Comparing Native Fabric and Access Gateway modes.....	15
Fabric OS features in Access Gateway mode.....	17
Buffer credit recovery support.....	19
Forward error correction support.....	20
Virtual Fabrics support.....	20
Device authentication support.....	20
AG mode without all Ports on Demand licenses.....	22
Password distribution support.....	22
FDMI support.....	23
NTP configuration distribution to Access Gateways.....	23
Access Gateway port types.....	23
Comparison of Access Gateway ports to standard switch ports .....	24
Access Gateway hardware considerations.....	25
<b>Configuring Ports in Access Gateway Mode.....</b>	<b>27</b>
Enabling and disabling Access Gateway mode.....	27
Port state description.....	28
Access Gateway mapping.....	28
Port mapping.....	29
F_Port Static Mapping.....	33
Device mapping.....	34
Considerations for Access Gateway mapping.....	40
N_Port configurations.....	41
Displaying N_Port configurations.....	42
Unlocking N_Ports .....	43
Persistent port online state .....	43

D_Port support.....	44
Saving port mappings.....	45
Limitations and considerations.....	45
<b>Managing Policies and Features in Access Gateway Mode.....</b>	<b>47</b>
Access Gateway policies overview.....	47
Displaying current policies .....	47
Access Gateway policy enforcement matrix .....	47
Advanced Device Security policy .....	48
How the ADS policy works.....	48
Enabling and disabling the ADS policy.....	48
Allow lists.....	48
ADS policy considerations.....	50
Upgrade and downgrade considerations for the ADS policy.....	50
Automatic Port Configuration policy .....	50
How the APC policy works.....	51
Enabling and disabling the APC policy.....	51
APC policy considerations.....	51
Upgrade and downgrade considerations for the APC policy.....	52
Port Grouping policy.....	52
How port groups work.....	52
Adding an N_Port to a port group.....	53
Deleting an N_Port from a port group.....	53
Removing a port group .....	54
Renaming a port group.....	54
Disabling the Port Grouping policy.....	54
Port Grouping policy modes.....	54
Creating a port group and enabling Automatic Login Balancing mode.....	55
Enabling MFNM mode.....	56
Disabling MFNM mode.....	56
Displaying the current MFNM mode timeout value.....	56
Setting the current MFNM mode timeout value.....	57
Port Grouping policy considerations.....	57
Upgrade and downgrade considerations for the Port Grouping policy.....	57
Device Load Balancing policy.....	57
Enabling the Device Load Balancing policy.....	58
Disabling the Device Load Balancing policy.....	58
Device Load Balancing policy considerations.....	58
Persistent ALPA policy.....	58
Enabling the Persistent ALPA policy.....	59
Disabling the Persistent ALPA policy.....	59
Persistent ALPA device data.....	59
Clearing ALPA values.....	60
Persistent ALPA policy considerations.....	60
Failover policy.....	60
Failover with port mapping.....	60
Failover with device mapping .....	63
Enabling and disabling the Failover policy on an N_Port.....	64
Enabling and disabling the Failover policy for a port group.....	64
Upgrade and downgrade considerations for the Failover policy.....	65
Failback policy.....	65

Failback policy configurations in Access Gateway.....	65
Enabling and disabling the Failback policy on an N_Port .....	66
Enabling and disabling the Failback policy for a port group.....	67
Upgrade and downgrade considerations for the Failback policy.....	67
Failback policy disabled on unreliable links (N_Port monitoring).....	67
Trunking in Access Gateway mode.....	67
How trunking works.....	68
Configuring trunking on the Edge switch.....	68
Configuration management for trunk areas.....	69
Enabling trunking .....	70
Disabling F_Port trunking.....	71
Monitoring trunking .....	71
AG trunking considerations for the Edge switch.....	71
Trunking considerations for Access Gateway mode.....	74
Upgrade and downgrade considerations for trunking in Access Gateway mode.....	74
Adaptive Networking on Access Gateway.....	74
QoS: Ingress rate limiting .....	74
QoS: SID/DID traffic prioritization .....	74
Upgrade and downgrade considerations for Adaptive Networking in AG mode.....	75
Adaptive Networking on Access Gateway considerations.....	75
Per-Port NPIV login limit.....	76
Setting the login limit.....	76
Duplicate PWWN handling during device login.....	76
Performance Monitoring.....	77
Flow Monitor.....	77
Considerations for the Brocade 6505 and 6510, and Brocade G620.....	77
<b>SAN Configuration with Access Gateway.....</b>	<b>79</b>
Connectivity of multiple devices overview.....	79
Considerations for connecting multiple devices.....	79
Direct target attachment.....	79
Considerations for direct target attachment.....	80
Target aggregation.....	81
Access Gateway cascading.....	82
Access Gateway cascading considerations.....	83
Fabric and Edge switch configuration.....	84
Verifying the switch mode.....	84
Enabling NPIV on M-EOS switches.....	84
Connectivity to Cisco fabrics.....	85
Enabling NPIV on a Cisco switch.....	85
Rejoining Fabric OS switches to a fabric.....	85
Reverting to a previous configuration.....	86
<b>Troubleshooting.....</b>	<b>87</b>



# Preface

---

• Document conventions.....	7
• Brocade resources.....	8
• Contacting Brocade Technical Support.....	8
• Document feedback.....	9

## 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
<b>bold text</b>	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
Courier font	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
<b>bold text</b>	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, <b>--show</b> WWN.
[ ]	Syntax components displayed within square brackets are optional.
{ x   y   z }	Default responses to system prompts are enclosed in square brackets.
	A choice of required parameters is enclosed in curly brackets separated by vertical bars. You must select one of the options.
x   y	In Fibre Channel products, square brackets may be used instead for this purpose.
< >	A vertical bar separates mutually exclusive elements.
	Nonprinting characters, for example, passwords, are enclosed in angle brackets.

**Convention****Description**

...

Repeat the previous element, for example, *member{member...}*.

\

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](http://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](http://MyBrocade). You can register at no cost to obtain a user ID and password.

Release notes are available on [MyBrocade](http://MyBrocade) under Product Downloads.

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

## 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](http://www.brocade.com).
- By sending your feedback to [documentation@brocade.com](mailto: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

---

• <a href="#">Supported hardware and software</a> .....	11
• <a href="#">What's new in this document</a> .....	11
• <a href="#">Key terms for Access Gateway</a> .....	12

## Supported hardware and software

In those instances in which procedures or parts of procedures documented here apply to some devices but not to others, this list identifies which devices are supported by Fabric OS 8.0.1.

Although many different software and hardware configurations are tested and supported by Brocade Communication Systems, Inc for Fabric OS 8.0.1, documenting all possible configurations and scenarios is beyond the scope of this document.

Brocade Access Gateway features in Fabric OS 8.0.1 are supported on the following hardware platforms.

### Brocade Gen 5 platform (16-Gbps) fixed-port switches

- Brocade 6505 switch
- Brocade M6505 Blade Server SAN I/O Module
- Brocade 6510 switch
- Brocade 6543 blade server SAN I/O module
- Brocade 6547 blade server SAN I/O module
- Brocade 6545 blade server SAN I/O module
- Brocade 6546 blade server SAN I/O module
- Brocade 6548 blade server SAN I/O module
- Brocade 6558 blade server SAN I/O module

### Brocade Gen 6 platform (32-Gbps) fixed-port switches

- Brocade G620 Switch

## What's new in this document

### Changes made for the initial release (53-1004110-01)

The following content is new or has been significantly revised for the initial release of this document:

- The document is updated for the supported Gen 5 and Gen 6 switch platforms. References to non-supported platforms or features are removed.
- The list of supported platforms in [Supported hardware and software](#) on page 11 is updated for Fabric OS 8.0.1.
- Bottleneck detection is deprecated and not supported (the **bottleneckmon** command).
- Port mirroring is deprecated and not supported (the **portmirror** command).

- Removed Admin Domain in [Enabling and disabling Access Gateway mode](#) on page 27. Administration Domains is not supported.

#### NOTE

In Fabric OS 8.0.1, support for Administration Domains (ADs) is deprecated. In Fabric OS 8.0.1, a warning message will be displayed and a RASLog entry be generated for any AD configuration commands or if an AD is activated through a command or zone merge.

- Added information about F\_Port trunking support in [Configuring trunking on the Edge switch](#) on page 68, [Monitoring trunking](#) on page 71, and [Trunking considerations for Access Gateway mode](#) on page 74.

## Changes made for this release (53-1004110-02)

The following content is new or has been significantly revised for this release of the document:

- Minor updates are made throughout the document to include information about cascaded Access Gateway devices, which are supported in Fabric OS 8.0.1.
  - [Buffer credit recovery support](#) on page 19
  - [Forward error correction support](#) on page 20
  - [Limitations and considerations](#) on page 22
  - [NTP configuration distribution to Access Gateways](#) on page 23
  - [Considerations for using F\\_Port Static Mapping with other AG features and policies](#) on page 33
  - [Device mapping considerations](#) on page 41
  - [D\\_Port support](#) on page 44
  - [Limitations and considerations](#) on page 45
  - [Access Gateway cascading](#) on page 82
- Added information about **nsshow** display showing 32Gbps when device is connected through the F\_Port in [Configuring trunking on the Edge switch](#) on page 68.

## Key terms for Access Gateway

For definitions of SAN-specific terms, visit the Storage Networking Industry Association online dictionary at:

<http://www.snia.org/education/dictionary>

For definitions specific to Brocade and Fibre Channel, refer to the *Brocade Glossary*.

The following terms are used in this manual to describe Access Gateway mode and its components.

<b>Access Gateway (AG)</b>	Fabric OS mode for switches that reduces storage area network (SAN) deployment complexity by leveraging N_Port ID Virtualization (NPIV).
<b>Advanced Device Security (ADS) policy</b>	Advanced Device Security (ADS) is a security policy that restricts access to the fabric at the AG level to a set of authorized devices.
<b>Device</b>	Any host or target device with a distinct WWN. Devices may be physical or virtual.
<b>D_Port</b>	A port configured as a diagnostic port on an AG switch, connected fabric switch, or connected cascaded AG switch to run diagnostic tests between the ports and test the link.
<b>E_Port</b>	An interswitch link (ISL) port. A switch port that connects switches together to form a fabric.
<b>Edge switch</b>	A fabric switch that connects host, storage, or other devices, such as Brocade Access Gateway, to the fabric.
<b>Fabric system</b>	A fabric system consists of interconnected nodes that look like a single logical unit when viewed collectively. This refers to a consolidated high-performance network system consisting of coupled storage devices, networking

devices, and parallel processing high bandwidth interconnects such as 8 Gbps, 10 Gbps, 16 Gbps 32 Gbps Fibre channel ports.

<b>F_Port</b>	A fabric port. A switch port that connects a host, host bus adapter (HBA), or storage device to the SAN. On Brocade Access Gateway, the F_Port connects to a host or a target.
<b>FCoE</b>	Fibre Channel over Ethernet (FCoE) refers to a network technology that encapsulates Fibre Channel frames over Ethernet networks. This allows Fibre Channel to use 10-Gigabit Ethernet or higher speed networks while preserving the Fibre Channel protocol.
<b>Mapping</b>	In Access Gateway, mapping defines the routes between devices or F_Ports to the fabric facing ports (N_Ports).
<b>N_Port</b>	A node port. N_Port presents the AG-connected host or storage device to the fabric. On Brocade Access Gateway, the N_Port connects to the Edge switch.
<b>NPIV</b>	N_Port ID Virtualization. This is a Fibre Channel facility allowing multiple F_Port IDs to share a single physical N_Port. Multiple F-ports can be mapped to a single N-port. This allows multiple Fibre Channel initiators to occupy a single physical port, easing hardware requirements in storage area network design, especially for virtual SANs.
<b>Port Grouping (PG) policy</b>	Port Grouping (PG) policy is used to partition the fabric, host, or target ports within an AG-enabled module into independently operated groups.



# Access Gateway Basic Concepts

---

• <a href="#">Brocade Access Gateway overview .....</a>	15
• <a href="#">Fabric OS features in Access Gateway mode.....</a>	17
• <a href="#">Access Gateway port types.....</a>	23
• <a href="#">Access Gateway hardware considerations.....</a>	25

## Brocade Access Gateway overview

Brocade Access Gateway (AG) is a Fabric OS feature that you can use to configure your fabric to handle additional devices instead of domains. You do this by configuring F\_Ports to connect to the fabric as N\_Ports, which increases the number of device ports you can connect to a single fabric. Multiple AG devices can connect to the Brocade DCX 8510-4, Brocade DCX 8510-8, and Brocade G620 switches.

Access Gateway is compatible with M-EOS v9.1 or v9.6 or later, and Cisco-based fabrics that support standards-based N\_Port ID Virtualization (NPIV). You can use the command line interface (CLI), Web Tools, or Brocade Network Advisor (BNA) to enable and disable AG mode and configure AG features on a switch. This document describes configurations using the CLI commands. Refer to the *Fabric OS Command Reference*, the *Brocade Web Tools Administrator's Guide*, or the *Brocade Network Advisor User Guide* for more information.

After you enable AG mode on a switch, the F\_Ports connect to the fabric as N\_Ports rather than as E\_Ports.

[Comparing Native Fabric and Access Gateway modes](#) on page 15 shows a comparison of a configuration that connects eight hosts to a fabric using AG mode to the same configuration with Fabric OS switches in Native mode.

Switches in AG mode are logically transparent to the host and the fabric. Therefore, you can increase the number of hosts that have access to the fabric without increasing the number of switch domains. AG mode simplifies configuration and management in a large fabric by reducing the number of domain IDs and ports.

### NOTE

In this document, a switch operating in Access Gateway mode is also referred to as an Access Gateway device or AG device.

## Comparing Native Fabric and Access Gateway modes

The following points summarize the differences between a Fabric OS switch functioning in Native operating mode and a Fabric OS switch functioning in AG operating mode:

- The Fabric OS switch in Native mode is a part of the fabric; it requires two to four times as many physical ports, consumes fabric resources, and can connect to a Fabric OS fabric only.
- A switch in AG mode is outside of the fabric; it reduces the number of switches in the fabric and the number of required physical ports. You can connect a switch in AG mode to a Fabric OS, M-EOS, or Cisco-based fabric.

The following figures show differences between the switch function in Native mode and switch function in AG mode.

FIGURE 1 Switch function in Native mode

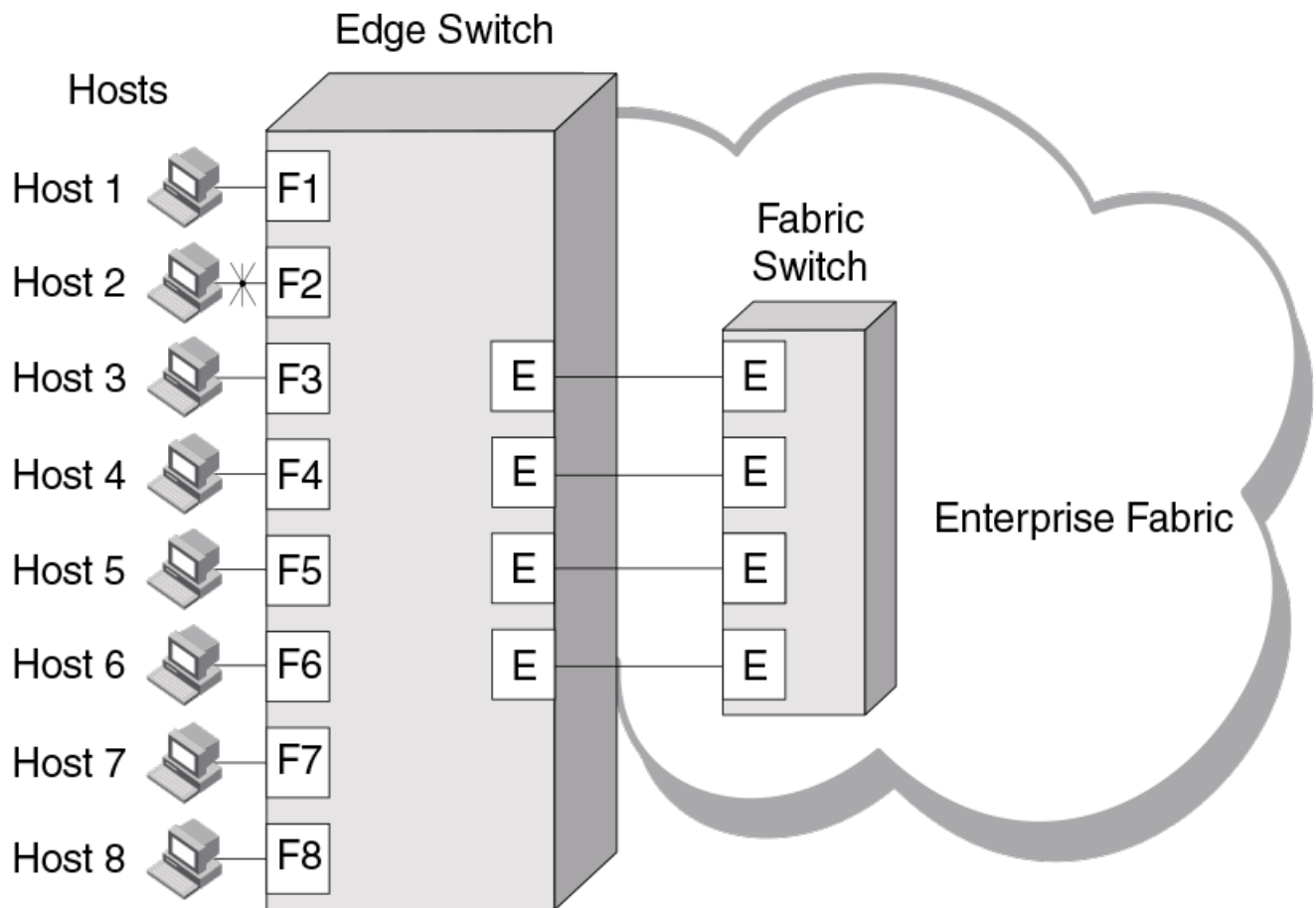
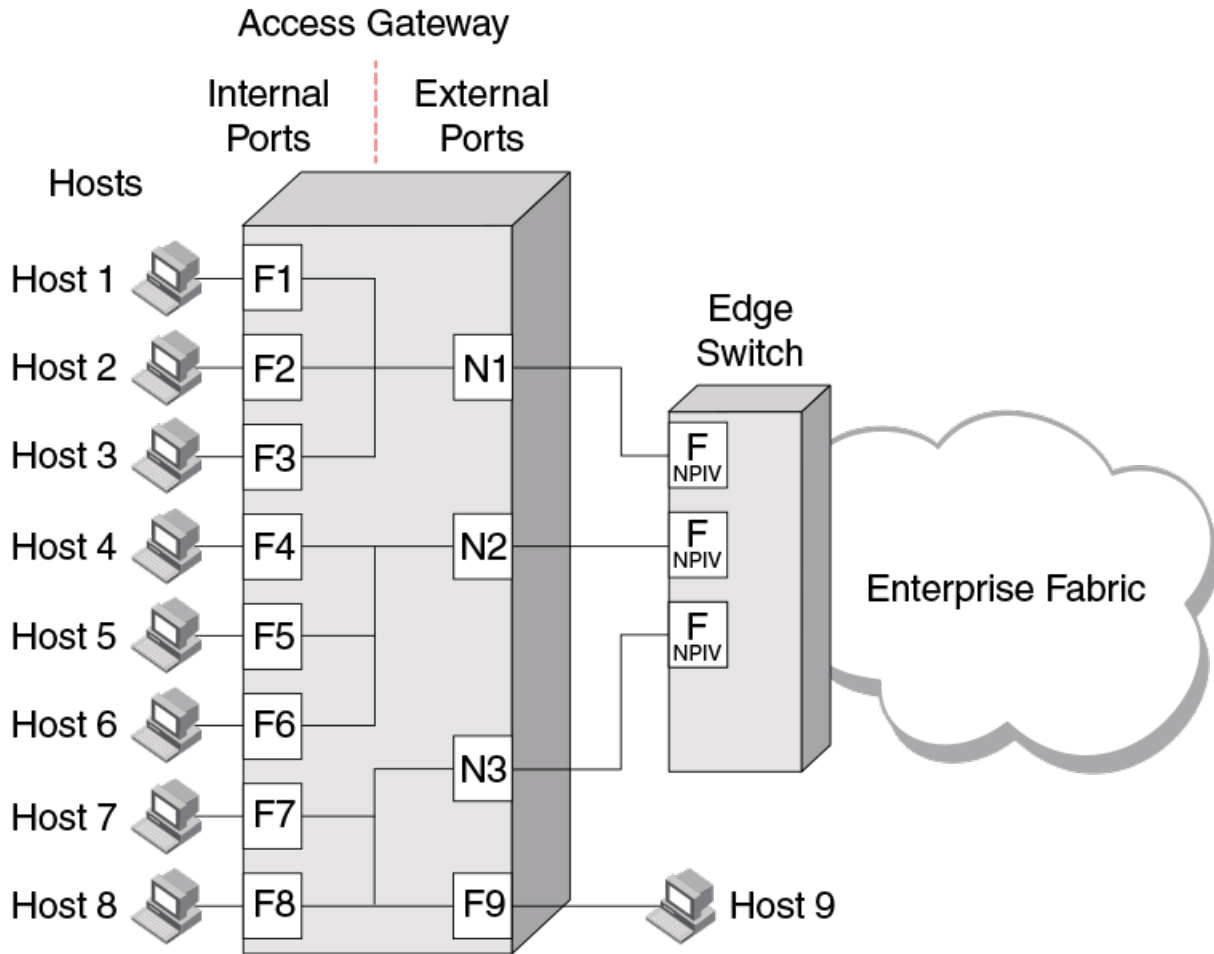




FIGURE 2 Switch function in Access Gateway mode



## Fabric OS features in Access Gateway mode

The following table lists feature support for a switch operating in Access Gateway mode. Feature support is indicated in the following ways:

- **Yes** means the feature is supported in Access Gateway mode.
- **No** means the feature is not supported in Access Gateway mode.
- **NA** means the feature is not applicable in Access Gateway mode.
- **Yes\*** means the feature is transparent in Access Gateway mode. The request is forwarded to the Enterprise fabric.
- **Yes\*\*** means the feature is available on a Brocade Enterprise fabric, but possibly not available if the Enterprise fabric is not a Brocade fabric.

For more information on features listed in the table, refer to the *Fabric OS Administrator's Guide* and *Fabric OS Command Reference*.

**TABLE 1** Fabric OS components supported in Access Gateway mode

Feature	Support
Access Control <sup>1</sup>	Yes (limited roles)

**TABLE 1** Fabric OS components supported in Access Gateway mode (continued)

Feature	Support
Adaptive Networking	Yes
Admin Domains	No
Audit	Yes
Beaconing	Yes
Bottleneck Detection	No Support is deprecated in Fabric OS 8.0.0.
Buffer Credit Recovery (CR)	Yes Refer to <a href="#">Buffer credit recovery support</a> on page 19.
Config Download/Upload	Yes
Device Authentication	Yes Refer to <a href="#">Device authentication support</a> on page 20.
DHCP	Yes
Diagnostic Port (D_Port)	Yes Refer to <a href="#">D_Port support</a> on page 44.
Duplicate PWWN handling during device login	Yes Refer to <a href="#">Duplicate PWWN handling during device login</a> on page 76.
Encryption Configuration and Management	No
Environmental Monitor	Yes
Error Event Management	Yes
Extended Fabrics	No
Fabric Assigned PWWN (FA-PWWN)	Yes
Fabric Device Management Interface (FDMI)	Yes*
Fabric Manager	Yes**
Fabric Provisioning	No
Fabric Services	No
Fabric Watch	No Support is deprecated in Fabric OS 7.4.0.
Fibre Channel Routing (FCR) services	No
FICON (includes CUP)	No
Forward Error Correction (FEC)	Yes Refer to <a href="#">Forward error correction support</a> on page 20.
High Availability	Yes
Hot Code Load	Yes
License	Yes**
Lightweight Directory Access Protocol (LDAP)	Yes
Log Tracking	Yes

<sup>1</sup> When a switch is operating in AG mode, RBAC features in Fabric OS are available, with limitations. For more information on the limitations, refer to [Access Gateway hardware considerations](#) on page 25.

**TABLE 1** Fabric OS components supported in Access Gateway mode (continued)

Feature	Support
Management Server	NA
Manufacturing Diagnostics	Yes
Monitoring and Alerting Policy Suite (MAPS)	Yes
N_Port ID Virtualization (NPIV)	Yes
Name Server	NA
Native Interoperability Mode	NA
Network Time Protocol (NTP)	Yes
Open E_Port	NA
Performance Monitor	No Support is deprecated in Fabric OS 7.4.0.
Persistent ALPA	Yes
Port Decommission	No
Port Mirroring	No Not supported in previous releases, deprecated in Fabric OS 8.0.0.
QuickLoop, QuickLoop Fabric Assist	No
Remote Authentication Dial-In User Service (RADIUS)	Yes
Resource Monitor	Yes
Security	Yes ADS/DCC Policy
SNMP	Yes
Speed Negotiation	Yes
Syslog Daemon	Yes
Track Changes	Yes
Trunking	Yes**
User-Defined Roles	Yes
Value Line Options (Static POD, DPOD)	Yes
Virtual Fabrics	No Refer to <a href="#">Virtual Fabrics support</a> on page 20.
Web Tools	Yes
Zoning	NA

## Buffer credit recovery support

Buffer credit recovery is a Fabric OS feature supported on 8 Gbps, 16 Gbps, and 32 Gbps platforms in the following configurations:

- Between the AG device F\_Port and a QLogic BR-1860 16Gbps Host Bus Adapter (HBA) port running version 3.2 or later firmware.
- Between the AG device F\_Port and any device that supports credit recovery.
- Between the AG device N\_Port and a Brocade fabric switch or a cascaded AG device F\_Port.

### NOTE

If a device that supports 16 Gbps or 32 Gbps is connected to a device that supports only 8 Gbps, buffer credit recovery is disabled, even if both devices are running 8 Gbps.

Switch platforms support buffer credit recovery in R\_RDY or VC\_RDY mode. In R\_RDY mode, buffer credit recovery is supported without FA-PWWN and QoS. In VC\_RDY mode, buffer credit recovery is supported with fabric-assigned PWWN (FA-PWWN), FEC, QoS, and trunking.

Disable this feature on the AG device before connecting to a switch running Fabric OS earlier than 7.1. Use the **portcfgcreditrecovery** command to enable and disable credit recovery. Refer to the *Fabric OS Command Reference* for more information.

## Forward error correction support

Forward error correction (FEC) is a Fabric OS feature supported in the following configurations:

- Between the AG device F\_Port and a QLogic BR-1860 16Gbps Host Bus Adapter (HBA) port running version 3.2 or later firmware.

Consider the following limitations for FEC:

- Supported on Brocade 16 Gbps and 32 Gbps platforms only.
- Supported by Fabric OS 7.1.0 and later.
- Enabled by default.
- Disabled when Fabric OS is downgraded to a release prior to Fabric OS 7.1.0.
- Supported on specific switch platforms in R\_RDY mode or VC\_RDY mode.

## Virtual Fabrics support

Virtual Fabrics is a Fabric OS feature supported on 8 Gbps, 16 Gbps, and 32 Gbps platforms with the following limitations:

- A switch cannot be enabled for both Virtual Fabrics and AG mode.
- Virtual Fabrics can connect to ports on an AG device.

## Device authentication support

By default, Fabric OS 6.2.0 and subsequent releases use Diffie-Hellman Challenge Handshake Authentication Protocol (DH-CHAP) or Fibre Channel Authentication Protocol (FCAP) for authentication. These protocols use shared secrets and digital certificates, based on switch WWN and public key infrastructure (PKI) technology, to authenticate switches.

Authentication automatically defaults to FCAP when both devices are configured to accept FCAP authentication. To use FCAP on both devices, PKI certificates must be installed. If a PKI certificate is present on each device, FCAP has precedence over DH-CHAP.

If ports are configured for in-flight encryption, authentication defaults to DH-CHAP. Both devices must be configured to accept DH-CHAP for authentication.

If DH-CHAP or FCAP fail to authenticate, the Access Gateway port is disabled.

Authentication policy is supported in the following configurations for Access Gateway devices:

- Access Gateway device N\_Port connected to Brocade fabric switch F\_Port. The N\_Port enables authentication when authentication is enabled on the connected switch. Enable switch policy on the AG device, and enable device policy on the fabric switch.
- Access Gateway switch F\_Port connected to an HBA. The F\_Port enables authentication when the connected device sends a login request with authentication enabled. Enable device policy on the AG device. For authentication between an AG device and an HBA, use DH-CHAP. The HBA supports DH-CHAP only.

For details on installing FCAP certificates and creating DH-CHAP secrets on the switch in AG or Native mode, refer to the *Fabric OS Administrator's Guide* or *Fabric OS Command Reference*.

For general information on authentication, refer to the authentication policy for fabric elements in the *Fabric OS Administrator's Guide*.

## Supported policy modes

A switch in Access Gateway mode supports the following switch and device policy modes:

- **On:** Strict authentication is enforced on all ports. During AG initialization, authentication is enabled on all ports. The ports on the AG device that are connected to another switch or device are disabled when the connected switch or device does not support authentication or when the policy mode is set to off.
- **Off:** Authentication is disabled. The AG device does not support authentication and rejects any authentication negotiation request from the connected fabric switch or HBA. Off is the default mode for both switch and device policy. You must configure DH-CHAP shared secrets or install FCAP certificates on the AG device and connected fabric switch before switching a policy mode from off to on.
- **Passive:** Incoming authentication requests are accepted. The AG device does not initiate authentication when connected to a device, but accepts incoming authentication requests if the connecting device initiates authentication. The F\_Ports on the AG device are not disabled if the connecting device does not support authentication or the policy mode is off. Passive mode is the safest mode for an AG device when the connected devices do not support authentication.

For device policy support, the AG device supports policy modes on, off, and passive.

For switch policy support, the AG device supports policy modes on and off.

The following tables describe interactions between switch policy modes on the AG device and policy modes on the connected devices for both fabric switches and HBAs.

	Fabric switch, device policy mode ON	Fabric switch, device policy mode PASSIVE	Fabric switch, device policy mode OFF
<b>AG device, switch policy mode ON</b>	Authorization negotiation - accept  DH-CHAP/FCAP: Success - N_Port Failure - disable	Authorization negotiation - accept  DH-CHAP/FCAP: Success - N_Port Failure - disable	Authorization negotiation - reject  N_Port without authentication
<b>AG device, switch policy mode OFF</b>	No negotiation  No light	No negotiation  N_Port without authentication.	No negotiation  N_Port without authentication

	AG device, device policy mode ON	AG device, device policy mode PASSIVE	AG device, device policy mode OFF
<b>HBA, authentication enabled</b>	Authorization negotiation - accept  DH-CHAP Success - F_Port Failure - disable	Authorization negotiation - accept  DH-CHAP Success - F_Port Failure - disable	Authorization negotiation - reject  F_Port without authentication
<b>HBA, authentication disabled</b>	No negotiation  No light	No negotiation  F_Port without authentication	No negotiation  F_Port without authentication

## Supported Fabric OS commands

The following Fabric OS commands for authentication policy apply to AG mode:

- `authutil --policy`

- `authutil --show`
- `authutil --set`
- `secauthsecret --set`
- `secauthsecret --show`

#### NOTE

Although `authutil --authinit` is not supported in AG mode, it is supported in Native mode.

For more information, refer to the *Fabric OS Command Reference*.

## Limitations and considerations

Be aware of the following limitations and considerations when configuring authentication policy on an AG device:

- Authentication policy is not supported on cascaded AG device configurations.
- Authentication is not supported between an AG device running Fabric OS 7.1.0 (or subsequent release) and a fabric switch running a version prior to Fabric OS 7.1.0. If the AG device is connected to a fabric switch running a version prior to Fabric OS 7.1.0, the AG device N\_Ports will be disabled if authentication is enabled on both switches. Devices mapped to N\_Ports connected to fabric switches running any version prior to Fabric OS 7.1.0 will also be disabled.
- If authentication is disabled on the fabric switch, the AG device N\_Port will come online without authentication policy.
- Device and switch policies must be disabled on the AG device before converting it to Native mode.
- Device and switch policies must be disabled on the fabric switch in Native mode before converting it to AG mode.
- Authentication policy is disabled by default on all ports in AG mode.
- High availability (HA) reboots are supported.

## AG mode without all Ports on Demand licenses

Consider the following points while running the switches in AG mode without Ports on Demand (PoD) licenses:

- By default, configured N\_Ports will come up as disabled because a PoD license is not installed for those ports.
- All F\_Ports mapped to the default N-Port will come up as disabled with a message displayed: `N-Port Offline for F-Port`.
- You must manually configure N\_Ports in the AG device using the `portcfgnport` command, and move the cable connections accordingly.
- You can update the N\_Port-to-F\_Port mapping using the `ag --mapdel` and `ag --mapadd` commands.

## Password distribution support

In Fabric OS 7.3.0 and subsequent releases, you can distribute the password database to all switches that are connected to the same fabric whether they are in AG mode or Native mode. Use the `distribute` command on any switch that is in Native mode to distribute the password database to all AG devices and switches connected to the same fabric. You can selectively distribute the password database by specifying the AG device name or use a wildcard-matching character (\*) to distribute to all switches and AG devices.

Consider the following points when configuring password distribution:

- On the AG device, the `fddcfg` command is used to either accept or reject the password database from any of the switches in the same fabric.
- To accept the password database from any switch, the AG device must be running Fabric OS 8.0.0 or later, and at least one of the switches in Native mode within the same fabric must be running Fabric OS 7.3.0 or later.

- Other databases supported by **fdccfg** are not supported on AG devices.
- Virtual Fabrics (VF) mode distribution does not apply to an AG device.
- The **distribute** command is not supported in AG mode. Therefore, an AG device cannot distribute its password database to switches that are in Native mode.

## FDML support

In Fabric OS 7.3.0 and subsequent releases, an AG device can register its N\_Port with FDMI devices. Use the **fdmishow** command to display the device details in AG mode. The **fdmishow** command displays only the local devices. Remote device details cannot be displayed.

## NTP configuration distribution to Access Gateways

Any switch running Fabric OS 7.4.0 or later can distribute the NTP server configuration to core Access Gateway (AG) devices connected to the fabric. The core AG devices must be running Fabric OS 7.4.0 or later to be able to distribute the NTP configuration to other cascaded or edge AG devices. However, AG devices are not capable of distributing the NTP configuration to other switches in the fabric.

A switch running Fabric OS 7.4.0 or subsequent release can distribute the NTP server configuration to Access Gateways devices connected to the fabric. However, AG devices cannot distribute the NTP configuration to other switches in the fabric.

In switch mode, the principal or primary FCS switch synchronizes its time with the external NTP server every 64 seconds and sends time updates to other switches in the fabric. The time updates are not sent in-band to AG devices. An AG device need not sync with the external NTP server as it can receive NTP server configuration from the connected FOS switch. If the AG device is connected to more than one fabric, the latest clock server request received is configured.

Consider the following points when distributing the NTP server configuration:

- The **tsClockServer** command distributes the NTP server configuration to all switches within the fabric and AG devices connected to the same fabric.
- Already distributed NTP server configurations will persist on the AG device after firmware downgrade from Fabric OS 8.0.1 to a prior version on supported platforms.
- Already distributed NTP server configurations will persist on the AG device after firmware downgrade from Fabric OS 8.0.1 to an earlier version on supported platforms. However, the AG device cannot distribute any configuration to the edge AG devices.

## Access Gateway port types

Brocade Access Gateway (AG) is a Fabric OS feature that you can use to configure your fabric to handle additional devices instead of domains. When a fabric switch operates in AG mode, it is referred to as an AG device.

An AG device connects to the fabric by means of node ports (N\_Ports). Typically, switches connect to the fabric using interswitch link (ISL) ports, such as E\_Ports.

AG devices use the following Fibre Channel (FC) ports:

- F\_Port - Fabric port that connects a host, HBA, or storage device to an AG device.
- N\_Port - Node port that connects an AG device to the F\_Port of the fabric switch.
- D\_Port - Diagnostic port that is configured in diagnostic mode to run tests between it and a connected D\_Port on another switch or HBA.

**NOTE**

Use the **portcfgpersistentenable** command on all external (outward facing) ports to ensure that these ports come back online after a switch reboot or power failure. To ensure this command persists on an embedded switch, enter the **portcfgpersistentenable** command through the chassis management console and not the CLI. Refer to [Persistent port online state](#) on page 43 for more information.

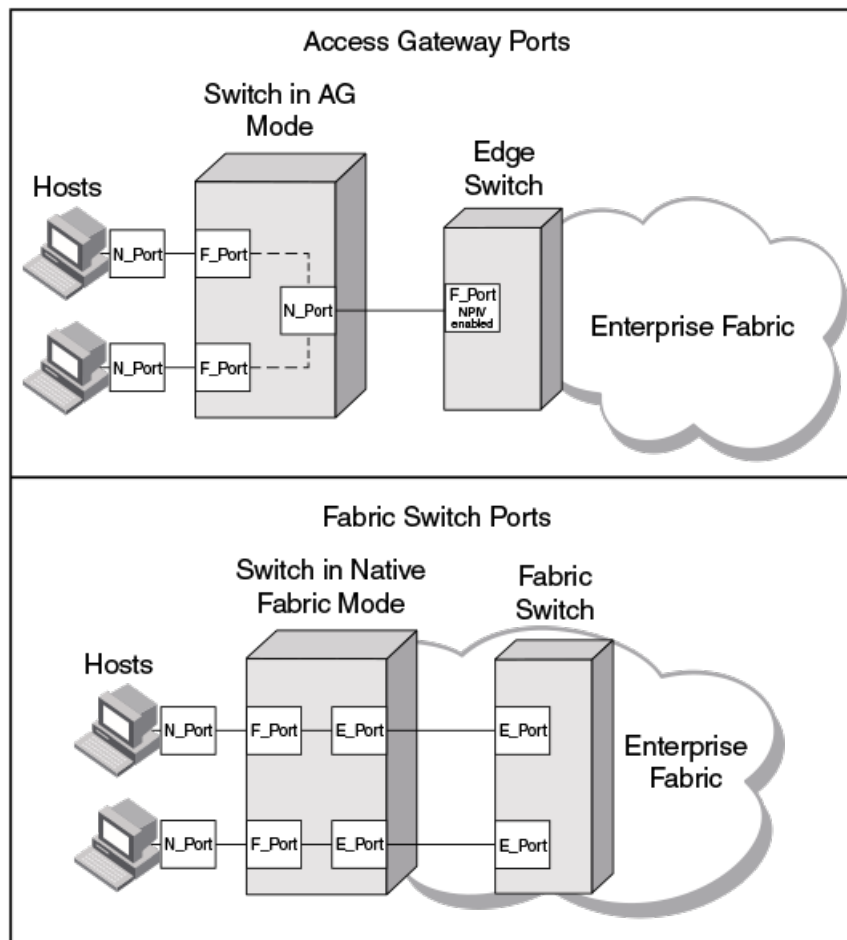
## Comparison of Access Gateway ports to standard switch ports

The Access Gateway device multiplexes host connections to the fabric. It presents an F\_Port to the host and an N\_Port to the edge fabric switch. Using N\_Port ID Virtualization (NPIV), the AG device allows multiple FC hosts to access the SAN on the same physical port. This feature reduces the hardware requirements and management overhead of hosts to the SAN connections.

A fabric switch presents F\_Ports (or FL\_Ports) and storage devices to the host and presents E\_Ports, VE\_Ports, or EX\_Ports to other switches in the fabric. A fabric switch consumes SAN resources, such as domain IDs, and participates in fabric management and zoning distribution. A fabric switch requires more physical ports than an AG device to connect the same number of hosts.

The following figure compares the ports an AG device uses to the ports a switch uses in Native mode.

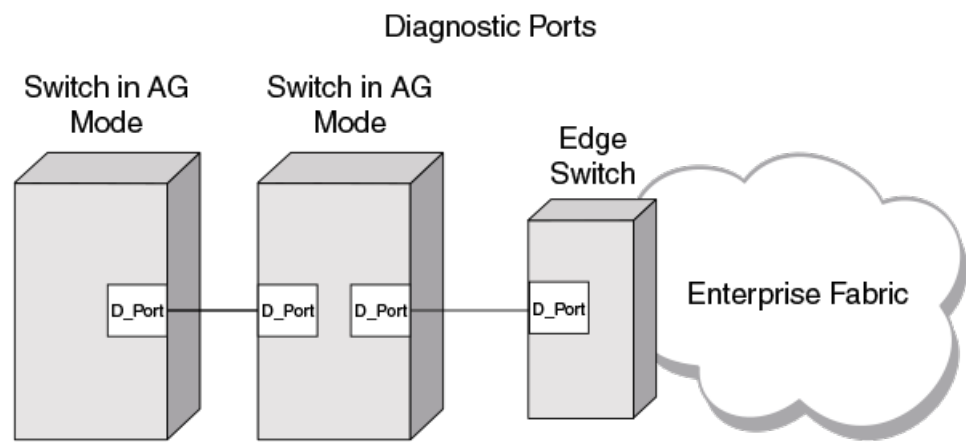
**FIGURE 3** Port Comparison





You can test the link between ports on an AG device and another AG device, fabric switch, or HBA by configuring each connection in the link as a D\_Port. When you configure the ports at each end of the link as D\_Ports, diagnostic tests automatically initiate on the link when the D\_Ports come online. You can view results by using Fabric OS commands, such as `portdporttest`, during or after testing. When configured as a D\_Port, the port does not participate in fabric operations, log in to a remote device, or transmit data traffic. The following figure shows D\_Port links between multiple devices.

FIGURE 4 Diagnostic port configurations



The following table shows a comparison of port configurations between AG devices and a standard fabric switch.

TABLE 4 Port configurations

Port type	Available on Access Gateway?		Available on Fabric switch?	
F_Port	Yes	Connects hosts and targets to Access Gateway.	Yes	Connects devices, such as hosts, HBAs, and storage to the fabric.
N_Port	Yes	Connects Access Gateway to a fabric switch.	N/A	N_Ports are not supported.
E_Port	N/A	ISL is not supported. <sup>2</sup>	Yes	Connects the switch to other switches to form a fabric.
D_Port	Yes	Allows diagnostic testing across link to connected AG device, fabric switch, or HBA.	Yes	Allows diagnostic testing across link to connected AG device.

## Access Gateway hardware considerations

Hardware considerations for Access Gateway devices are as follows:

<sup>2</sup> The switch is logically transparent to the fabric, therefore it does not participate in the SAN as a fabric switch.

- The Access Gateway feature is supported on the switch platforms and embedded switch platforms listed in [Supported hardware and software](#) on page 11.
- Loop devices are not supported.
- Direct connections to SAN target devices are supported only when the AG device is connected to a fabric. Cascaded AG devices do not support SAN target devices.

# Configuring Ports in Access Gateway Mode

• Enabling and disabling Access Gateway mode.....	27
• Access Gateway mapping.....	28
• N_Port configurations.....	41
• D_Port support.....	44

## Enabling and disabling Access Gateway mode

Use the following steps to enable and disable Access Gateway mode. After you enable AG mode, some fabric information is erased, such as the zone and security databases. Enabling AG mode is disruptive because the switch is disabled and rebooted. You can display the port mappings and status of the host connections to the fabric when Access Gateway mode is enabled. For more information on the **ag** commands used in these steps, refer to the *Fabric OS Command Reference*.

When you disable AG mode, the switch automatically reboots in Fabric OS Native mode and comes back online using the fabric switch configuration. The AG mode parameters, such as port mapping, and Failover and Failback, are automatically removed. To rejoin the switch to the core fabric, refer to [Rejoining Fabric OS switches to a fabric](#) on page 85.

1. Connect to the switch and log in using an account with admin permissions.
2. Before enabling or disabling AG mode on a switch, use the **configUpload** command to save the current configuration file.
3. Ensure that no zoning transaction buffers are active. If any transaction buffer is active, enabling AG mode will fail with the error, "Failed to clear Zoning configuration."
4. Verify that the switch is set to Native mode.
  - a) Use the **switchShow** command to verify the switch mode.
  - b) If the switch mode is not Native, use the **ag --modedisable** command to set the switch to Native mode.

For more information on setting switches to Native mode, refer to the *Fabric OS Administrator's Guide*.

5. Enter the **switchDisable** command.

```
switch:admin> switchdisable
```

This command disables all user ports on a switch. All Fibre Channel ports are taken offline. If the switch is part of a fabric, the remaining switches reconfigure. You must disable the switch before making configuration changes.

6. Enter the **ag --modeenable** command.

```
switch:admin> ag --modeenable
```

The switch automatically reboots and comes back online in AG mode using a factory default port mapping. For more information on AG mode default port mapping, refer to [Table 7](#) on page 30.

7. Enter the **ag --modeshow** command to verify that AG mode is enabled.

```
switch:admin> ag --modeshow
Access Gateway mode is enabled.
```

8. Use the **ag --mapshow** command to display all the mapped ports.

The **ag --mapshow** command shows all enabled N\_Ports, even if those N\_Ports are not connected.

9. Use the **switchshow** command to display the status and port state of all ports.

Refer to the *Fabric OS Command Reference* for examples of output. For a description of the port state, refer to [Table 5](#) on page 28.

10. Enter the **switchdisable** command to disable the switch.

```
switch:admin> switchdisable
```

11. Enter the **ag --modedisable** command to disable AG mode.

```
switch:admin> ag --modedisable
```

12. Enter the **ag --modeshow** command to verify that AG mode is disabled.

```
switch:admin> ag --modeshow
Access Gateway mode is NOT enabled
```

## Port state description

The following table shows the port state and a description of the port state.

**TABLE 5** Port state description

State	Description
No _Card	No interface card present
No _Module	No module (GBIC or other) present
Mod_Val	Module validation in process
Mod_Inv	Invalid module
No_Light	Module is not receiving light
No_Sync	Receiving light but out of sync
In_Sync	Receiving light and in sync
Laser_Flt	Module is signaling a laser fault
Port_Flt	Port marked faulty
Diag_Flt	Port failed diagnostics
Lock_Ref	Locking to the reference signal
Testing	Running diagnostics
Offline	Connection not established (only for virtual ports)
Online	Port is up and running

## Access Gateway mapping

When a switch operates in AG mode, you must specify routes that the AG device uses to direct traffic from the devices on its F\_Ports to the fabric ports connected to its N\_Ports. The routes must be pre-provisioned. The process of pre-provisioning routes in AG mode is called mapping. (By comparison, a switch operating in Native mode determines the best routing path between its F\_Ports.)

You can create two types of maps, port maps and device maps. Port maps are required. Device maps are optional and assign device World Wide Names (WWNs) to N\_Ports and N\_Port groups. Port mapping and device mapping operate as follows:

- Port mapping

Port mapping ensures that all traffic from a specific F\_Port always goes through the same N\_Port. A single F\_Port is mapped to a single N\_Port, or to an N\_Port group. To map an F\_Port to an N\_Port group, map the F\_Port to an N\_Port that belongs to that port group. All F\_Ports mapped to an N\_Port group are part of that N\_Port group.

- Device mapping

Device mapping is optional. Port maps must exist before you can create device maps. Device mapping allows a virtual port to access its destination device regardless of the F\_Port where the device resides. Device mapping also allows multiple virtual ports on a single physical machine to access multiple destinations residing in different fabrics.

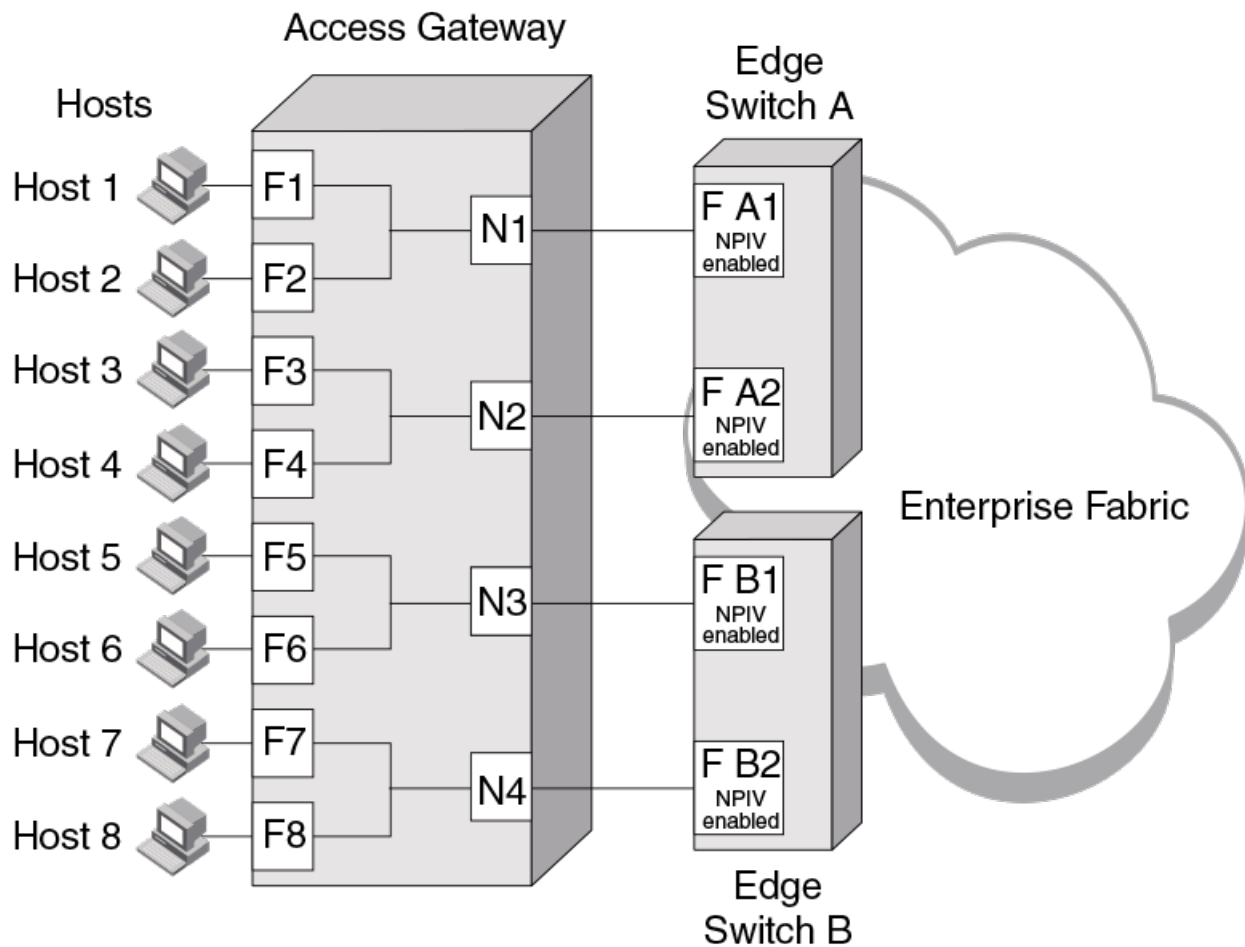
The preferred method is to map a device WWN to an N\_Port group. When a device WWN is mapped to an N\_port, and a failover N\_port is also specified, the device can reach the fabric through the primary or secondary N\_port only. However, when a device WWN is mapped to a port group, it can login to the fabric until the last N\_port in the particular port group remains online.

You can map a device to multiple groups. Alternatively, you can map a device to a specific N\_Port.

## Port mapping

F\_Ports must be mapped to N\_Ports before the F\_Ports can come online. The following figure shows an example in which eight F\_Ports are mapped evenly to four N\_Ports on a switch in AG mode. The N\_Ports connect to the same fabric through different Edge switches.

FIGURE 5 Port mapping example



The following table describes the port mapping details shown in the example.

**TABLE 6** Description of port mapping

Access Gateway		Fabric	
F_Port	N_Port	Edge switch	F_Port
F_1, F_2	N_1	Switch_A	F_A1
F_3, F_4	N_2	Switch_A	F_A2
F_5, F_6	N_3	Switch_B	F_B1
F_7, F_8	N_4	Switch_B	F_B2

## Default port mapping

When you enable AG mode on a switch, a default mapping is used for the F\_Ports and N\_Ports. The following table describes the default port mapping for all supported hardware platforms.

### NOTE

By default, Failover and Failback policies are enabled on all N\_Ports.

To change the default mapping, refer to [Adding F\\_Ports to an N\\_Port](#) on page 32. Note that all F\_Ports must be mapped to an N\_Port before the F\_Port can come online.

### NOTE

For Fabric OS 7.3.0 and later, all PoD licenses are not required to run in AG mode.

**TABLE 7** Access Gateway default port mapping

Brocade Model	Total Ports	F_Ports	N_Ports	Default port mapping
6505	24	0-15	16-23	0, 1 mapped to 16 2, 3 mapped to 17 4, 5 mapped to 18 6, 7 mapped to 19 8, 9 mapped to 20 10, 11 mapped to 21 12, 13 mapped to 22 14, 15 mapped to 23
M6505	24	1-16	0, 17-23	1, 2 mapped to 17 3, 4 mapped to 18 5, 6 mapped to 19 7, 8 mapped to 20 9, 10 mapped to 21 11, 12 mapped to 22 13, 14 mapped to 23 15, 16 mapped to 0
6510	48	0-39	40-47	0-4 mapped to 40 5-9 mapped to 41 10-14 mapped to 42

**TABLE 7** Access Gateway default port mapping (continued)

Brocade Model	Total Ports	F_Ports	N_Ports	Default port mapping
				15–19 mapped to 43 20–24 mapped to 44 25–29 mapped to 45 30–34 mapped to 46 35–39 mapped to 47
6547	48	1–28	0, 29–47	1, 21 mapped to 0 2, 22 mapped to 29 3, 23 mapped to 30 4, 24 mapped to 31 5, 25 mapped to 32 6, 26 mapped to 33 7, 27 mapped to 34 8, 28 mapped to 35 9 mapped to 36 10 mapped to 37 11 mapped to 38 12 mapped to 39 13 mapped to 40 14 mapped to 41 15 mapped to 42 16 mapped to 43 17 mapped to 44 18 mapped to 45 19 mapped to 46 20 mapped to 47
6548	28	1–16	0, 17–27	1, 13 mapped to 0 2, 14 mapped to 17 3, 15 mapped to 18 4, 16 mapped to 19 5 mapped to 20 6 mapped to 21 7 mapped to 22 8 mapped to 23 9 mapped to 24 10 mapped to 25 11 mapped to 26 12 mapped to 27

**TABLE 7** Access Gateway default port mapping (continued)

Brocade Model	Total Ports	F_Ports	N_Ports	Default port mapping
G620	64	0-39	40-47	0-4 mapped to 40 5-9 mapped to 41 10-14 mapped to 42 15-19 mapped to 43 20-24 mapped to 44 25-29 mapped to 45 30-34 mapped to 46 35-39 mapped to 47

### Considerations for initiator and target ports

The following connections are possible for the Fibre Channel Protocol (FCP) initiator (host) and target ports through an AG device:

- All F\_Ports connect to all host ports.
- All F\_Ports connect to all target ports.
- Some F\_Ports connect to host ports and some F\_Ports connect to target ports.

#### NOTE

Communication between host and target ports is not supported if both are mapped to the same N\_Port.

Use the following recommendations for mapping between host and target ports:

- Use separate port groups for the host and target ports.
- If connecting a host and target port to the same AG device, map the host and target to separate N\_Ports and connect those N\_Ports to the same fabric.
- When configuring secondary port mapping for failover and failback situations, make sure that host and target F\_Ports do not fail over or fail back to the same N\_Port.

### Adding F\_Ports to an N\_Port

You can modify the default port mapping by adding F\_Ports to an N\_Port. Adding an F\_Port to an N\_Port routes that traffic to and from the fabric through the specified N\_Port.

You can assign an F\_Port to only one primary N\_Port at a time. If the F\_Port is already assigned to an N\_Port, you must first remove it from the N\_Port before you can add it to a different N\_Port.

Use the following steps to add an F\_Port to an N\_Port.

1. Connect to the switch and log in using an account with admin permissions.
2. Enter the **ag --mapadd *n\_portnumber f\_port1;f\_port2;...*** command to add the list of F\_Ports to the N\_Port.

The F\_Port list can contain multiple F\_Port numbers separated by semicolons. In the following example, F\_Ports 6 and 7 are mapped to N\_Port 13.

```
switch:admin> ag --mapadd 13 "6;7"
F-Port to N-Port mapping has been updated successfully
```

3. Enter the **ag --mapshow** command and specify the port number to display the list of mapped F\_Ports. Verify that the added F\_Ports appear in the list.



## Removing F\_Ports from an N\_Port

You can assign an F\_Port to only one primary N\_Port at a time. If the F\_Port is already assigned to an N\_Port, you must first remove it from the N\_Port before you can add it to a different N\_Port.

Use the following steps to remove an F\_Port from an N\_Port.

1. Connect to the switch and log in using an account assigned with admin permissions.
2. Remove any preferred secondary N\_Port settings for the F\_Port.  
Refer to [Deleting F\\_Ports from a preferred secondary N\\_Port](#) on page 63 for instructions.
3. Enter the **ag --mapdel f\_port1;f\_port;...** command to remove F\_Ports from an N\_Port.

The F\_Port list can contain multiple F\_Port numbers separated by semicolons. In the following example, F\_Ports 17 and 18 are removed from the N\_Port where they were mapped.

```
switch:admin> ag --mapdel 40 "17;18"
F-Port to N-Port mapping has been updated successfully
```

4. Enter the **switchShow** command to verify that the F\_Port mapping is deleted and not assigned.

The output for this command displays the following information in the `Proto` column for each unassigned F\_Port: Disabled (No mapping for F\_Port)

## F\_Port Static Mapping

The F\_Port Static Mapping feature adds the **staticadd** and **staticdel** keywords to the **ag** Fabric OS command. These keywords simplify how you change N\_Port to F\_Port mapping. Using the **ag staticadd** command, any existing mappings are removed and replaced with the new mapping information. The actions of the **ag --mapdel** and **ag --mapadd** commands are combined.

Use the following steps to change F\_Port to N\_Port mapping.

1. Connect to the switch and log in using an account with admin permissions.
2. Use the **ag** command with the **staticadd** keyword to add or change static port mapping. In the following example, F\_Port 1 is added to N\_Port 17 and F\_Port 1 is removed from any existing N\_Port mapping.

```
switch:admin> ag --staticadd 17 1
```

When the F\_Port static mapping is changed or added, the F\_Port and all attached devices log out of the previously mapped N\_Port and log in to the new N\_Port.

3. Use the **ag** command with the **staticdel** keyword to remove static port mapping.  
In the following example, F\_Ports 3, 4, and 5 are removed from N\_Port 17.

```
ag --staticdel 17 "3;4;5"
```

## Considerations for using F\_Port Static Mapping with other AG features and policies

Consider the following when using F\_Port Static Mapping with Access Gateway features and policies:

- F\_Port Static Mapping works with cascaded Access Gateway configurations.
- Failover, fallback, and preferred secondary N\_Port settings are disabled for F\_Ports that are statically mapped.
- Statically mapped ports are blocked from using the Automatic Port Configuration (APC) and Advanced Device Security (ADS) policies. You cannot enable the APC policy until all static mappings are deleted using the **ag --staticdel** command.
- F\_Port Static Mapping works with the Port Grouping (PG) policy with some modifications to policy behavior. If static mapping is applied to an F\_Port already mapped to an N\_Port, the F\_Port loses its mapping to the N\_Port applied through the Port

Grouping policy. Therefore, the F\_Port does not have the failover, failback, or preferred N\_Port settings that other F\_Ports have when mapped to an N\_Port in that port group. To remap to an N\_Port with PG policy attributes, use the **ag --staticdel** command to remove the static mapping, and then remap to another N\_Port using the **ag --mapadd** command.

- F\_Port Static Mapping does not work with Device Load Balancing. Because F\_Port Static Mapping forces the F\_Port to map to a specific N\_Port, NPIV devices that log in to the F\_Port cannot redistribute themselves among N\_Ports in the port group.
- F\_Port Static Mapping does not work with port trunking. If an F\_Port is statically mapped to an N\_Port and trunking is enabled, the F\_Port goes offline. If port trunking is enabled for an F\_Port already, you cannot configure static mapping for the F\_Port.

## Upgrade and downgrade considerations

- All static mappings are maintained when upgrading to the latest Fabric OS version.
- When downgrading, you must remove all static mappings or downgrade will not be allowed.

## Device mapping

Device mapping allows you to map individual N\_Port ID Virtualization (NPIV) devices to N\_Ports. By mapping device WWNs directly to an N\_Port group, traffic from the device will always go to the same N\_Port group, independently of the F\_Port where the device logs in. When the Port Grouping and Device Load Balancing policies are enabled for a port group, WWNs mapped to that port group are automatically balanced among the online N\_Ports in that group (refer to [Port Grouping policy modes](#) on page 54).

### NOTE

Port Grouping policy is not supported when both Automatic Login Balancing and Device Load Balancing are enabled.

Device mapping does not affect or replace the traditional port mapping. Device mapping is optional and is in addition to the existing port mapping. In general, it is recommended that you map devices to N\_Port groups rather than map devices to individual N\_Ports within a port group. Group mapping ensures maximum device up-time during failover conditions and system power up. Connections occur more quickly when a large number of devices must connect to the same fabric through a single port group.

The following aspects of device mapping are important to note:

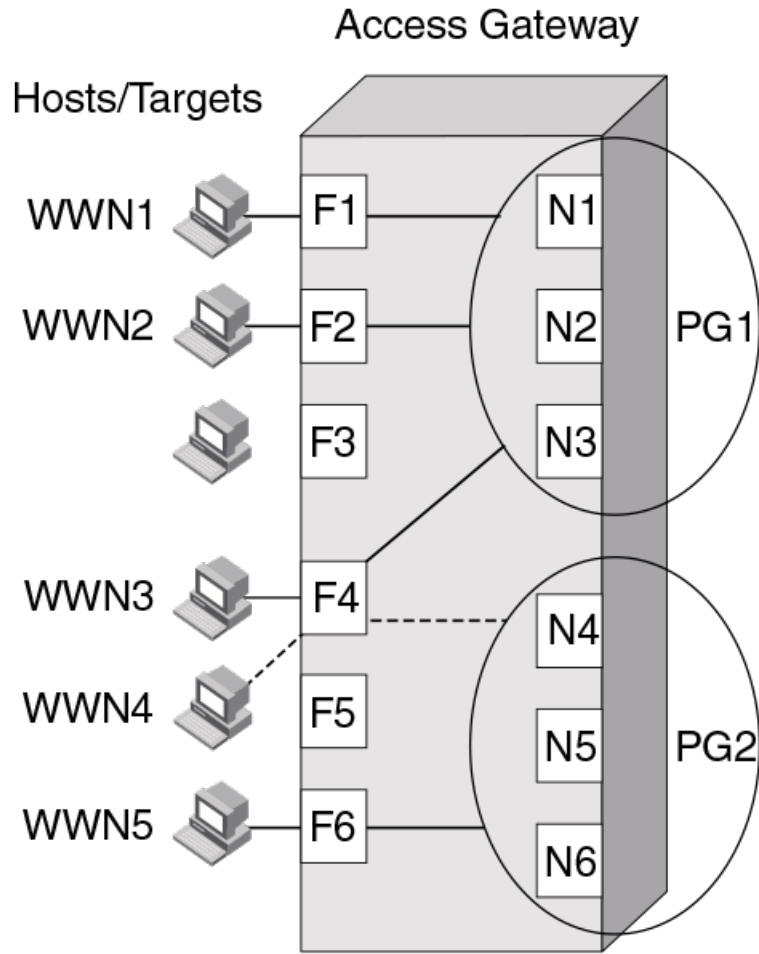
- Device mapping has priority over port mapping. That is, logins from a device mapped to a specific N\_Port group or N\_Port always have priority over unmapped devices that log in to an F\_Port that has been mapped to the same N\_Port group or N\_Port.
- Current device routing (dynamic mapping) may turn out different than your intended mapping (static mapping), depending on which N\_Ports are online and which policies are enabled, for example, Automatic Port Configuration, Device Load Balancing, Failover, or Failback. Therefore, it is recommended to map devices to N\_Port groups instead of specific N\_Ports within a port group when using device mapping.

### NOTE

Automatic Port Configuration and Device Load Balancing cannot be enabled at the same time.

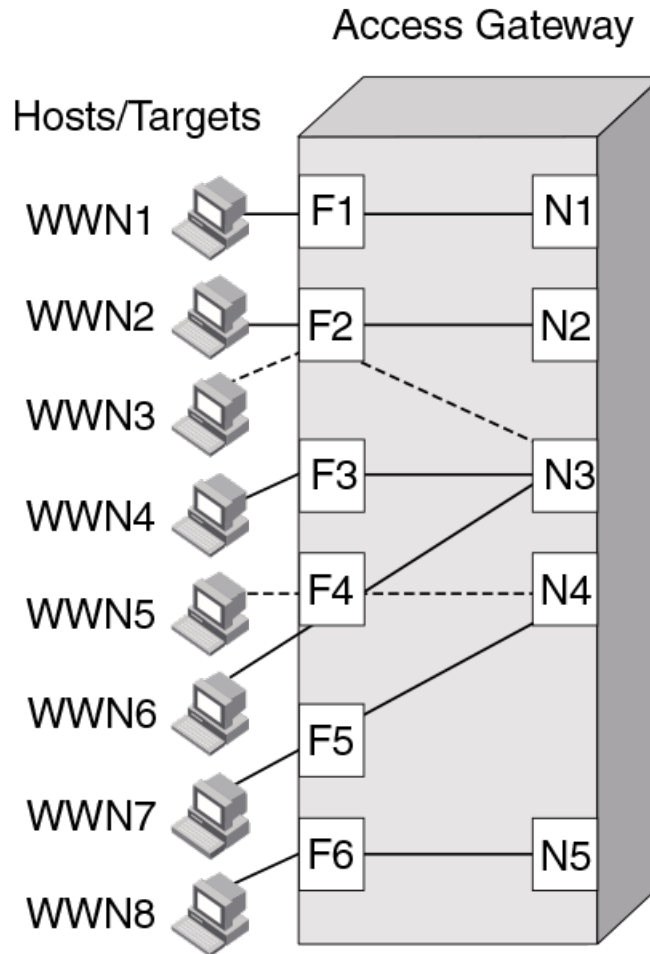
The following figure illustrates an example of device mapping to port groups. In the example, WWNs 1, 2, and 3 can connect to any N\_Port in Port Group 1 (PG1), while WWNs 4 and 5 can connect with any N\_Port in Port Group 2 (PG2).

**FIGURE 6** Example of device mapping to N\_Port groups



The following figure shows an example of device mapping to specific N\_Ports. Note that you can map one or multiple WWNs to one N\_Port to allow multiple devices to log in through one N\_Port.

FIGURE 7 Example device mapping to an N\_Port



### Static versus dynamic mapping

Device mapping is of two types, static or dynamic. Static device mapping has the following considerations:

- Static device mapping is when a device is mapped to an N\_Port group or N\_port.
- Static device mappings persist across reboots.
- Static device mappings can be saved and restored with the **configUpload** and **configDownload** commands.

Dynamic device mapping has the following considerations:

- Dynamic device mapping is when Automatic Device Load Balancing is enabled.
- Dynamic device mapping exists only while a device is logged in. When the device logs out, the mapping for that device no longer exists.
- Dynamic device mapping cannot be saved or edited, and does not persist when the switch reboots.
- Dynamic mapping shows the current mapping for devices as opposed to the original static mapping. If a device is mapped to an N\_Port group, then all mapping is dynamic.

**NOTE**

Static and dynamic mapping only applies to NPIV devices and cannot redirect devices that are physically attached to Access Gateway devices because physically-attached devices use port maps to connect to the fabric.

## Device mapping to port groups (recommended)

Device mapping is recommended when a number of devices must connect to the same group of N\_Ports. This approach provides the flexibility to move the devices to any available F\_Port. Device mapping provides load balancing and connects the device to the least-loaded N\_Port in the group when the device comes online. For more information on port groups, refer to [Port Grouping policy](#) on page 52.

Use the following steps to map one or more devices to an N\_Port group or to remove device mapping from an N\_Port group.

1. Connect to the switch and log in using an account assigned to the admin role.  
After you have logged in, you can apply any of the following commands to configure how devices are mapped to port groups.
2. To add one or multiple device WWNs to an N\_Port group, use the **ag --addwnpgmapping** command.

All the listed device WWNs will use the least-loaded N\_Port in the port group when they log in, unless a specific device mapping can be used instead. This command can only map devices currently connecting through NPIV.

The following example adds two devices to port group 3.

```
ag --addwnpgmapping 3 "10:00:00:06:2b:0f:71:0c;10:00:00:05:1e:5e:2c:11"
```

3. To change all currently existing device mappings to a different port group, use the **--all** keyword instead of listing all the WWNs.  
The following example changes all the currently mapped devices to use port group 3 instead of the current port group mappings.

```
ag --addwnpgmapping 3 --all
```

4. To remove one or multiple devices to an N\_Port group, use the **ag --delwnpgmapping** command.

All the listed devices stop using the least-loaded N\_Port in the group when they log in.

The following example removes mapping for two devices from port group 3.

```
ag --delwnpgmapping 3 "10:00:00:06:2b:0f:71:0c;10:00:00:05:1e:5e:2c:11"
```

5. To remove all devices mapped to an N\_Port group, use the command with the **--all** keyword instead of listing all WWNs. All of the devices will cease automatic use of the least-loaded port in the port group when they log in. The **--all** keyword is a shortcut for specifying all of the devices that are already mapped with the **ag --addwnpgmapping** command.

The following example removes all devices mapped to port group 3.

```
ag --delwnpgmapping 3 --all
```

6. Optionally, you can use the **ag --wnmapshow** command to display the list of WWNs mapped to port groups and verify that the correct devices have been mapped to the desired port group.

## Device mapping to N\_Ports

Use the following steps to add one or more devices to an N\_Port to route all device traffic to and from the device through the specified N\_Port. Also use these steps to remove device mapping to an N\_Port.

1. Connect to the switch and log in using an account with admin permissions.  
After you have logged in, you can apply any of the following commands to configure how devices are mapped to port groups.

- To add one or multiple devices to an N\_Port , use the **ag --addwwnmapping** command. All listed device WWNs use the N\_Port if it is available.

The following example adds two devices to N\_Port 17.

```
ag --addwwnmapping 17 "10:00:00:06:2b:0f:71:0c;10:00:00:05:1e:5e:2c:11"
```

The **--all** option edits all the currently existing mappings. None of the **--all** options can detect what devices are using the switch. This option affects the mappings that are in the list.

- To change all current device mappings to a different N\_Port, use the **ag --addwwnmapping** command with the **--all** keyword.

The following command changes all the existing device mappings to use port 17.

```
ag --addwwnmapping 17 --all
```

- To remove mapping for one or multiple devices from an N\_Port, use the **ag --delwwnmapping** command. All listed device WWNs no longer attempt to use the N\_Port unless a device logs in through an F\_Port that is mapped to the N\_Port.

The following example removes two devices from N\_Port 17.

```
ag --delwwnmapping 17 "10:00:00:06:2b:0f:71:0c;10:00:00:05:1e:5e:2c:11"
```

- To remove all devices currently mapped from an N\_Port, use the **ag --delwwnmapping** command with the **--all** keyword. All listed devices no longer attempt to use the N\_Port unless a device logs in through an F\_Port that is mapped to the N\_Port. The **--all** keyword is a shortcut for specifying all of the devices that are already mapped with the **ag --addwwnmapping** command.

The following command removes all devices currently mapped to port 17.

```
ag --delwwnmapping 17 --all
```

- Optionally, use the **ag --wwnmapshow** command to display the list of N\_Ports mapped to WWNs and verify that the correct WWNs have been mapped or removed from the desired N\_Ports.

## Disabling device mapping

Use the following procedures to disable device mapping for all or only specific devices. These procedures are useful when you want to temporarily disable device mapping, and then enable this at a later time without reconfiguring your original mapping.

- Connect to the switch and log in using an account assigned to the admin role.  
After you have logged in, you can one of the following commands to disable how devices are mapped to port groups.
- Use the **ag --wwnmappingdisable** command to disable mapping for specific WWNs. The device mappings are ignored for all the listed device WWNs without removing the entry from the WWN mapping database.

The following example disables device mapping for two WWNs.

```
switch:admin> ag --wwnmappingdisable "10:00:00:06:2b:0f:71:0c; 10:00:00:05:1e:5e:2c:11"
```

- Use the **ag --wwnmappingdisable** command with the **--all** to disable mapping for all available WWNs. The **--all** keyword will not affect mappings made in the future. Disabled mappings can be modified without automatically enabling them.  
The following example removes device mapping for all available WWNs.

```
switch:admin> ag --wwnmappingdisable --all
```

## Enabling device mapping

Use the following steps to enable device mapping for all devices or specific devices that were previously disabled.

1. Connect to the switch and log in using an account with admin permissions.  
After you have logged in, you can use one of the following commands to enable how devices are mapped to port groups.
2. Use the **ag --wwnmappingenable** command to enable mapping for specific WWNs.

The following example enables two device WWNs.

```
switch:admin> ag --wwnmappingenable "10:00:00:06:2b:0f:71:0c; 10:00:00:05:1e:5e:2c:11"
```

3. Use the **ag --wwnmappingenable** command with the **--all** keyword to enable mapping for all currently available WWNs. The **--all** keyword does not affect mappings made in the future. Any mapping added for a new device for which mapping is not specifically disabled is enabled by default. Disabled mappings can be modified without automatically enabling them.

The following example enables all previously disabled device mappings.

```
switch:admin> ag --wwnmappingenable --all
```

## Displaying device mapping information

The **ag --wwnmapshow** command displays static and dynamic mapping information about all device WWNs that have been mapped to N\_Ports or N\_Port groups. For each WWN, this command displays the following:

- WWN - Device WWNs that are mapped to N\_Ports
- 1st N\_Port - First or primary mapped N\_Port (optional)
- 2nd N\_Port - Secondary or failover N\_Port (optional)
- PG\_ID - Port Group ID where the device is mapped
- Current - The N\_Port that the device is using (none displays if the device is not logged in)
- Enabled - Indicates whether device mapping is enabled or disabled

### NOTE

New device mappings are only enabled and displayed the next time the device logs in to the switch.

To display device mapping information, use the **ag --wwnmapshow** command.

## Pre-provisioning

Pre-provisioning is when you use Fabric OS commands, Web Tools, and Fabric Manager to map devices not yet connected to the fabric. Pre-provisioning allows management programs to push configuration changes with no concern for the order in which the changes are received. For example, if system administrators must push port group changes and device mapping changes, those changes can be pushed in either order without error. Pre-provisioning also applies to using Fabric OS commands for device mapping.

## VMware configuration considerations

When device mapping is enabled for individual virtual machines (VMs) running on a VMware ESX server connected to an F\_Port, network traffic for those VMs is redirected, but only when the ESX server is configured to use Raw Device Mapped storage. All traffic originates from a VM WWN and follows any mapping configured for the WWN.

If anything interrupts the virtual port connection for the VM, such as a failover port being used, traffic will originate from the ESX server base device port ID and not the VM port ID.

If there are any additional disruptions, the server does not switch back to the virtual port, and the VM traffic does not follow the configured device mapping. Note that this behavior can also occur when a VM first boots, prior to any failover.

When this behavior occurs, the VM WWN will be logged in to the fabric. The WWN appears in the output of **ag --show** and **ag --wwnmapshow**, as well as on the switch. The **portperfshow** command displays all traffic on the port to which the ESX server port is mapped (base PID).

### Configuring device mapping

To configure WWN mapping on VMware ESX systems, use the following steps.

1. Make sure that virtual world wide port names (VWWPNs) of virtual machines (VMs) are mapped to the correct port group (or N\_Port). Brocade recommends that you map all VWWPNs to N\_Ports to avoid confusion.
2. Make sure all VWWPNs are mapped for LUN access for array-based targets.
3. Make sure to include all VWWPNs in the zone configuration.
4. Reboot the VM.
5. Zone the physical port on the server to the storage device.
6. Check the traffic that originates from the virtual node PID (VN PID). If the configuration is correct, traffic will flow from the VN PID.

### Failover and failback considerations

When using device mapping with VMware, the base device initiates port login (PLOGI) and process login (PRLI) to the target, and then discovers the logical unit number (LUN). The virtual device also initiates a PLOGI and PRLI to the target, but LUN discovery does not occur. Therefore, when the device-mapped port is toggled and failover or failback takes place, traffic resumes from the base device. One of the following actions is recommended when using device mapping with VMware:

- Make sure targets can be reached by the base device so that network traffic can resume if the mapped device fails over and traffic moves over to the base PID.
- Reboot the server so that it initializes and uses configured device mapping.

## Considerations for Access Gateway mapping

This section presents considerations and limitations for Access Gateway mode mapping types.

### Mapping priority

To avoid problems when both port and device mapping are implemented, AG mode uses a priority system to select the N\_Port where a fabric login (FLOGI) is routed. Access Gateway mode considers mappings in the following order until one can be used.

#### NOTE

Only NPIV devices can use device mapping and the automatic Device Load Balancing policy. Device Load Balancing policy is enabled per module rather than per port group.

For more information, refer to [Port Grouping policy](#) on page 52.

1. Static device mapping to N\_Port (if defined)
2. Device mapping to N\_Port group (if defined)
3. Automatic Device Load Balancing within a port group (if enabled)
4. Port mapping to an N\_Port
5. Port mapping to an N\_Port in a port group (if defined)



## Device mapping considerations

Consider the following points when using device mapping:

- When the N\_Port is disabled, all devices that are mapped to it are disabled. Depending on the effective failover policy, the devices are enabled on other N\_Ports.
- Similar to port mappings, device mappings are affected by changes to underlying F\_Ports. In other words, if an F\_Port is taken offline, both the physical device and all virtual nodes behind it momentarily go offline.
- When devices are mapped to an N\_Port rather than an N\_Port group, they cannot be automatically rebalanced to another N\_Port if an additional N\_Port comes online.
- In some instances, two NPIV devices logging in to the same F\_Port are mapped to two different N\_Ports, which in turn are connected to two different fabrics. When this occurs, both NPIV devices can be allocated the same PID by their respective fabrics. Once Access Gateway detects this condition, it will disable that F\_Port, and the event will be logged.

### NOTE

Access Gateway algorithms reduce the chances of PID collisions, but they cannot be totally eliminated. In some cases, you may be able to configure your virtual or physical fabrics to further reduce PID collisions.

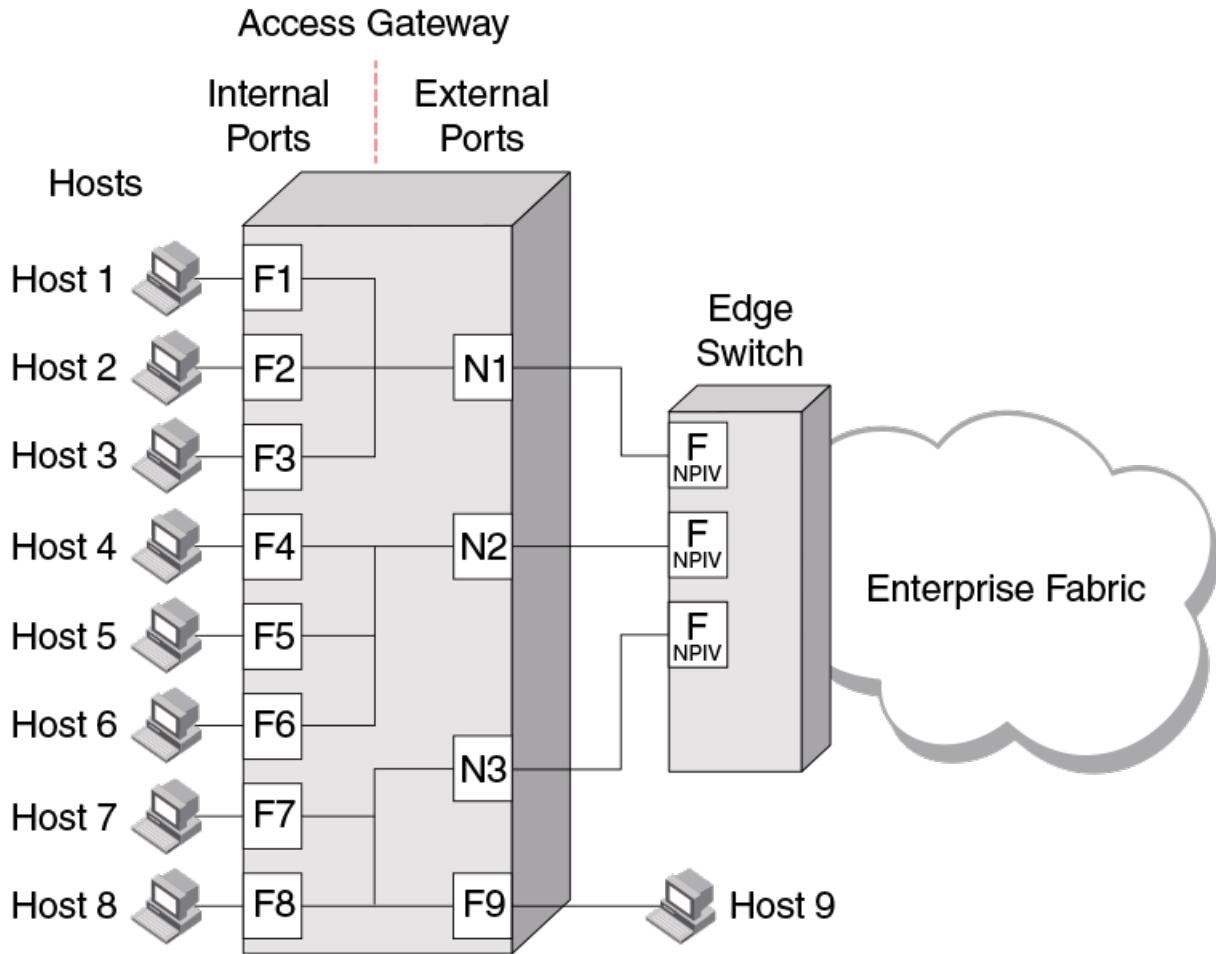
- Static and dynamic device mapping are only supported on the edge module in a cascaded Access Gateway device configuration.
- When mapping devices to a port group, make sure all ports in that group have the same NPIV login limit. If some ports have a lower login limit than the other ports, and there are many logins to the group, some devices can repeatedly attempt to connect to the device with the lower limit, because it has the fewest logins, and fail to connect.

## N\_Port configurations

For embedded switches, the internal ports on an Access Gateway device are configured as F\_Ports by default. All external ports are configured, or locked, as N\_Ports. On standalone switches that support AG mode, a preset number of ports are locked as N\_Ports and the remaining ports operate as standard F\_Ports.

The following figure shows a host connected to external ports of an embedded switch that is in AG mode.

FIGURE 8 Example of adding an external F\_Port (F9) on an embedded switch



Although some ports are locked as N\_Ports, you can convert N\_Ports to F\_Ports, as follows.

1. Before converting an N\_Port to an F\_Port, remap all F\_Ports on that N\_port to another N\_Port.
2. Remove all the F\_Ports that are mapped to the selected N\_Port.
3. Unlock the selected port from N\_Port state.
4. Define a map for the port.

A switch in Access Gateway mode must have at least one port configured as an N\_Port. Therefore, the maximum number of F\_Ports that can be mapped to an N\_Port is the number of ports on the switch minus one.

#### NOTE

If the Automatic Port Configuration (APC) policy is enabled, the port conversion is done automatically and no user intervention is necessary. For more information on which ports are locked as N\_Ports by default, refer to [Table 7](#) on page 30.

## Displaying N\_Port configurations

Use the following steps to determine which ports on a switch are locked as N\_Ports.

1. Connect to the switch and log in using an account with admin permissions.
2. Enter the **portcfgnport** command. The command output displays ON for locked N\_Ports.

## Unlocking N\_Ports

By default, when you enable Access Gateway mode on embedded switches, all external ports are configured in N\_Port lock mode. A switch in Access Gateway mode connects only Fibre Channel Protocol (FCP) hosts and targets to the fabric. It does not support other types of ports, such as interswitch link (ISL) ports.

On fabric switches in Native mode, the port types are not locked. Fabric OS Native mode dynamically assigns the port type based on the connected device: F\_Ports and FL\_Ports for hosts, HBAs, and storage devices; and E\_Ports, EX\_Ports, and VE\_Ports for connections to other switches.

When you unlock an N\_Port, the configuration automatically changes the port to an F\_Port. Any F\_Ports mapped to that N\_Port are unmapped and disabled.

The following steps show how to unlock and lock N\_Ports.

1. Connect to the switch and log in using an account with admin permissions.
2. Enter the **portcfgnport** command to display which ports on the switch are locked as N\_Ports. Command output will display ON for locked N\_Ports.

### NOTE

The **portcfgnport** command only works when the Port Grouping policy is enabled.

3. To unlock N\_Port mode, enter the **portcfgnport** command and specify the N\_Port port number and 0 (zero).

```
switch:admin> portcfgnport 10 0
```

4. To lock a port in N\_Port mode, enter the **portcfgnport** command and specify the port number and 1.

```
switch:admin> portcfgnport 10 1
```

## Persistent port online state

Use the **portCfgPersistentEnable** command on all external or outward facing ports to ensure that these ports come back online after a switch reboot or power failure. For an embedded switch, execute this command through the chassis management console and not the Fabric OS CLI or the command may not persist.

### NOTE

If the port is connected to another switch when this command is entered, the fabric may reconfigure.

After the port is persistently enabled, devices connected to the port can again communicate with the fabric when the port comes back online. You can identify a single port to be configured by its port number or by its port index number. Port ranges are supported with index numbers or by specifying a slot or a slot range. Use the **switchShow** command for a list of valid ports, slots, and port index numbers.

As an example, to persistently enable a single port, enter the following command.

```
switch:admin> portcfgpersistentenable 4
```

Refer to the *Fabric OS Command Reference* for more information.

## D\_Port support

The D\_Port (diagnostic port) feature is supported on 16 Gbps and 32 Gbps ports in the following configurations:

- An AG device connected to an AG device in cascaded configuration (supports only static D\_Port).
- An AG device connected to a Brocade fabric switch (supports only static D\_Port).
- An AG device connected to an HBA. Supported modes are as follows:
  - Static D\_Port starting with Fabric OS 7.2.0
  - Dynamic D\_Port starting with Fabric OS 7.3.0 and HBA v3.2.0.

The following types of D\_Ports are supported:

- **Static D\_Port:** You can convert a Fibre Channel port to a D\_Port on an AG device, an HBA, or a fabric switch or another AG device in a cascaded configuration to test the link between the ports. When you configure the ports on each end of the link as a D\_Port, diagnostic tests automatically initiate on the link when the D\_Ports come online. After the port is in D\_Port mode, the port does not participate in fabric operations, log in to a remote device, or run data traffic. Refer to [Comparison of Access Gateway ports to standard switch ports](#) on page 24 for information on the supported D\_Port configurations.

### NOTE

N\_Port-to-F\_Port mappings must be removed from an AG device F\_Port before configuring it as a D\_Port. Refer to [Saving port mappings](#) on page 45 for more information.

- **Dynamic D\_Port:** An AG device supports dynamic D\_Port mode starting with Fabric OS 7.3.0. If the port on the connected HBA is configured as a static D\_Port, the AG device port automatically enters D\_Port mode. After the AG device port enters dynamic D\_Port mode, the switch runs all diagnostic tests automatically from the AG device to the connected HBA. When the tests are complete, the AG device port automatically reverts to F\_Port mode, if the HBA or device port reverts back to be a normal port. However, dynamic D\_Port mode is not supported in AG-to-AG and AG-to-Switch connections; you must configure and remove the D\_Port statically in these cases.

To verify dynamic D\_Port support on the switch, enter the **configure** command:

```
switch:admin> configure
Configure...

Fabric parameters (yes, y, no, n): [no]
Virtual Channel parameters (yes, y, no, n): [no]
F-Port login parameters (yes, y, no, n): [no]
D-Port parameters (yes, y, no, n): [no] y
Dynamic D-Port (on, off): [on]
```

By default, the dynamic D\_Port is on.

You can view the results from D\_Port testing by using Fabric OS commands such as **portDPortTest --show** during or after testing. The adapter, fabric switch, or AG device is the initiator and the other device is the responder. You can view detailed results from the initiator.

The following tests automatically run on the link between configured D\_Ports:

- Electrical loopback in SFP
- Optical loopback in SFP
- Link traffic test to test frame flow to ASIC or CPU
- Link latency and distance measurement

For details on configuring D\_Ports, using D\_Ports, and D\_Port limitations and considerations, refer to the *Fabric OS Administrator's Guide*. For details on D\_Port-related commands, refer to the *Fabric OS Command Reference*.

## Saving port mappings

Before configuring static D\_Ports, you must remove all mappings between the ports and devices because mappings are not retained on D\_Ports. This includes port (N\_Port-to-F\_Port), device (WWN), static, and dynamic mapping. You can use Fabric OS commands to save N\_Port mappings and to delete saved N\_Port mappings. When you disable the D\_Ports, use the saved mapping information to assist manual reconfiguration of the deleted port mappings. Refer to the *Fabric OS Command Reference* for more details on the backup mapping commands.

### Save port mappings

The following steps show how to save configured N\_port mappings.

1. Use the **ag --backupmappingsave** command with the *N\_Port* variable. The following example saves mappings on N\_port 44.

```
switch:admin>ag --backupmappingsave 44
Configured static and preferred mappings have been saved for the N_port successfully
N_Port                                44
Backed-up Configured F_Ports          20:21:22
Backed-up Static F_Ports              23:24
Backed-up Preferred F_Ports           26:27:28:29
```

### Display port mappings

The following steps show how to display saved N\_port mappings.

1. Use the **ag --backupmappingshow** command with the *N\_Port* variable to display saved N\_Port mappings. You can use the displayed information to reconfigure the ports. The following example displays mappings on N\_port 44.

```
switch:admin>ag --backupmappingshow 44
N_Port                                44
Backed-up Configured F_Ports          20:21:22
Backed-up Static F_Ports              23:24
Backed-up Preferred F_Ports           26:27:28:29
```

### Delete port mappings

The following steps show how to delete configured N\_Port mappings.

1. Use the **ag --backupmappingdel** command with the *N\_Port* variable to delete configured N\_Port mappings. The following example deletes mappings on N\_port 44.

```
switch:admin>ag --backupmappingdel 44
```

## Limitations and considerations

Consider the following limits and conditions when using D\_Ports in AG device configurations:

- Any D\_Port must be configured on the AG device, fabric switch, cascaded AG device, or HBA before enabling D\_Ports on both sides of the link. Otherwise, the port will be persistently disabled.
- After configuring a D\_Port for an AG device port, mapping is not retained. Static D\_Port configuration cannot be made unless mappings are removed from the port. This includes F\_Port-to-N\_Port, static, preferred, and device (WWN) mapping. Therefore, all mappings must be manually removed on the Access Gateway port before configuring the port as a D\_Port.

For a complete list of D\_Port limitations and considerations, refer to the *Fabric OS Administrator's Guide*.



# Managing Policies and Features in Access Gateway Mode

• Access Gateway policies overview.....	47
• Advanced Device Security policy .....	48
• Automatic Port Configuration policy .....	50
• Port Grouping policy.....	52
• Device Load Balancing policy.....	57
• Persistent ALPA policy.....	58
• Failover policy.....	60
• Failback policy.....	65
• Trunking in Access Gateway mode.....	67
• Adaptive Networking on Access Gateway.....	74
• Per-Port NPIV login limit.....	76
• Duplicate PWWN handling during device login.....	76
• Performance Monitoring.....	77
• Considerations for the Brocade 6505 and 6510, and Brocade G620.....	77

## Access Gateway policies overview

This chapter provides detailed information on all Access Gateway policies. These policies can be used to control various advanced features, such as failover, failback, and trunking, when used in Access Gateway mode.

## Displaying current policies

You can use the **ag --policyshow** command to display policies that are currently enabled or disabled on a switch.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --policyshow** command.

## Access Gateway policy enforcement matrix

The following table shows which policies can be enabled at the same time. For example, in the Auto Port Configuration policy row, only N\_Port Trunking and Advanced Device Security can be enabled with this policy.

**TABLE 8** Policy enforcement matrix

Policies	Auto Port Configuration	N_Port Grouping	N_Port Trunking	Advanced Device Security
Auto Port Configuration	N/A	No	Yes	Yes
N_Port Grouping	Mutually exclusive	N/A	Yes	Yes
N_Port Trunking	Yes	Yes	N/A	Yes
Advanced Device Security <sup>3</sup>	Yes	Yes	Yes	N/A
Device Load Balancing <sup>4</sup>	No	Yes	Yes	Yes

<sup>3</sup> The ADS policy is not supported when using device mapping.

## Advanced Device Security policy

Advanced Device Security (ADS) is a security policy that restricts access to the fabric at the AG level to a set of authorized devices. Unauthorized access is rejected and the system logs a RASLOG message. You can configure the list of allowed devices for each F\_Port by specifying their Port WWN (PWWN). The ADS policy secures virtual and physical connections to the SAN.

### How the ADS policy works

When you enable the ADS policy, it applies to all F\_Ports on the AG-enabled device. By default, all devices have access to the fabric on all ports. You can restrict the fabric connectivity to a particular set of devices where the AG device maintains a per-port allow list for the set of devices whose PWWN you define to log in through an F\_Port. You can view the devices with active connections to an F\_Port using the **ag --show** command.

#### NOTE

The **ag --show** command only displays F\_Ports on Core AGs, such as the AG devices that are directly connected to fabric. Use the **agshow --name** command on the fabric switch to display the F\_Ports of the Core AGs and Edge AGs.

Alternatively, the security policy can be established in the Enterprise fabric using the Device Connection Control (DCC) policy. For information on configuring the DCC policy, refer to [Enabling the DCC policy on a trunk](#) on page 70. The DCC policy in the Enterprise fabric takes precedence over the ADS policy. It is generally recommended to implement the security policy in the AG module rather than in the main fabric, especially if the Failover and Failback policies are enabled.

### Enabling and disabling the ADS policy

By default, the ADS policy is disabled. When you manually disable the ADS policy, all of the allow lists (global and per-port) are cleared. Before disabling the ADS policy, save the configuration using the **configUpload** command in case you need this configuration again.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --policyenable ads** command to enable the ADS policy.

```
switch:admin> ag --policyenable ads
The policy ADS is enabled
```

3. Enter the **ag --policydisable ads** command to disable the ADS policy.

```
switch:admin> ag --policydisable ads
The policy ADS is disabled
```

#### NOTE

Use the **ag --policyshow** command to determine the current status of the ADS policy.

### Allow lists

You can determine which devices are allowed to log in on a per-F\_Port basis by specifying lists of F\_Ports and device WWNs in the **ag --adsset** command. The ADS policy must be enabled for this command to succeed.

```
ag --adsset "F_Port[ ;F_Port2;...]" "WWWN[ ;WWN2;...]"
```

<sup>4</sup> Device Load Balancing and Automatic Login Balancing cannot be enabled for the same port group.



Lists must be enclosed in quotation marks. List members must be separated by semicolons. The maximum number of entries in the allowed device list is twice the per-port maximum login count.

Use an asterisk (\*) instead of port numbers in the F\_Port list to add the specified WWNs to all the F\_Ports allow lists. Use an asterisk (\*) instead of WWNs to indicate access to all devices from the specified F\_Port list. A blank WWN list ("") indicates no access.

Use an asterisk enclosed in quotation marks ("") to set the allow list to "all access." Use a pair of double quotation marks ("") to set the allow list to "no access."

Consider the following characteristics of the allow list:

- The maximum number of device entries allowed in the allow list is twice the per-port maximum login count.
- Each port can be configured to "not allow any device" or "to allow all the devices" to log in.
- If the ADS policy is enabled, by default, every port is configured to allow all devices to log in.
- The same allow list can be specified for more than one F\_Port.

## Setting the list of devices allowed to log in

The following steps show how to set the allowed devices.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Use the **ag --adsset** command with the appropriate options to set the list of devices allowed to log in to specific ports. In the following example, ports 1, 10, and 13 are set to "all access."

```
switch:admin> ag --adsset
"1;10;13" "*"
WWN list set successfully as the Allow Lists of the F_Port[s]
```

## Setting the list of devices not allowed to log in

The following steps show how to set the list of devices that are not allowed to log in.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --adsset** command with the appropriate options to set the list of devices not allowed to log in to specific ports. In the following example, ports 11 and 12 are set to "no access."

```
switch:admin > ag --adsset
"11;12" ""
WWN list set successfully as the Allow Lists of the F_Port[s]
```

## Removing devices from the list of allowed devices

Remove specified WWNs from the list of devices allowed to log in to the specified F\_Ports using the **ag --adsdel** command. Lists must be enclosed in quotation marks. List members must be separated by semicolons. Replace the F\_Port list with an asterisk (\*) to remove the specified WWNs from all the F\_Ports allow lists.

**ag --adsdel "F\_Port [ ; F\_Port2; ... ]" "WWN [ ; WWN2; ... ]"**

For more details on this command and its operands, refer to the *Fabric OS Command Reference*.

The following steps show how to remove devices from a list of allowed devices. The ADS policy must be enabled for this command to succeed.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Use the **ag --adsdel** command to remove one or more devices from the list of allowed devices.

In the following example, two devices are removed from the list of allowed devices (ports 3 and 9).

```
switch:admin> ag --adsdel "3;9"
"22:03:08:00:88:35:a0:12;22:00:00:e0:8b:88:01:8b"
WWNs removed successfully from Allow Lists of the F_Port[s]Viewing F_Ports allowed to login
```

## Adding new devices to the list of allowed devices

Add specified WWNs to the list of devices allowed to log in to the specified F\_Ports using the **ag --adsadd** command. Lists must be enclosed in quotation marks. List members must be separated by semicolons. Replace the F\_Port list with an asterisk (\*) to add the specified WWNs to all the F\_Ports allow lists.

**ag --adsadd "F\_Port [ ; F\_Port2; ...]" "WWN [ ; WWN2; ...]"**

For more details on this command and its operands, refer to the *Fabric OS Command Reference*.

The following steps show how to add devices to a list of allowed devices. The ADS policy must be enabled for this command to succeed.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Use the **ag --adsadd** command with the appropriate options to add one or more new devices to the list of allowed devices.

In the following example, two devices are added to the list of allowed devices (for ports 3 and 9).

```
switch:admin> ag --adsadd "3;9"
"20:03:08:00:88:35:a0:12;21:00:00:e0:8b:88:01:8b"
WWNs added successfully to Allow Lists of the F_Port[s]
```

## Displaying the list of allowed devices on the switch

The following steps show how to display the list of allowed devices on the switch.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Use the **ag --adsshow** command.

For each F\_Port, command output will show access for all devices, a list of device WWNs, or no access. For more details on this command and its output, refer to the *Fabric OS Command Reference*.

## ADS policy considerations

The following are considerations for setting the ADS policy:

- The ADS policy can be enabled or disabled independent of the status of other AG policies.
- The ADS policy is not supported with device mapping.

## Upgrade and downgrade considerations for the ADS policy

The Brocade G620 is supported in Fabric OS 8.0.0 and subsequent releases. Downgrading to a prior release is not supported.

## Automatic Port Configuration policy

The Automatic Port Configuration (APC) policy provides the ability to automatically discover port types (host, target, or fabric) and dynamically update the port maps when a change in port-type connection is detected. This policy is intended for a fully hands-off operation of Access Gateway. APC dynamically maps F\_Ports across available N\_Ports so they are evenly distributed.

## How the APC policy works

When the APC policy is enabled and a port on AG is connected to a Fabric switch, AG configures the port as an N\_Port. If a host is connected to a port on AG, then AG configures the port as an F\_Port and automatically maps it to an existing N\_Port with the least number of F\_Ports mapped to it. When the APC policy is enabled, it applies to all ports on the switch.

## Enabling and disabling the APC policy

Use the following steps to enable and disable Automatic Port Configuration policy. This policy is disabled by default in Access Gateway.

### Enabling the APC policy

The following steps show how to enable the APC policy on a switch.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **switchDisable** command to ensure that the switch is disabled.
3. Enter the **configUpload** command to save the switch's current configuration.
4. Enter the **ag --policydisable pg** command to disable the Port Grouping (PG) policy.
5. Enter the **ag --policyenable auto** command to enable the APC policy.
6. At the command prompt, type **Y** to enable the policy.

The switch is ready. A reboot is not required.

### Disabling the APC policy

The following steps show how to disable the APC policy on a switch.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **switchDisable** command to ensure that the switch is disabled.
3. Enter the **configUpload** command to save the switch's current configuration.
4. Enter the **ag --policyDisable auto** command to disable the APC policy.
5. At the command prompt, type **Y** to disable the policy.
6. Enter the **switchEnable** command to enable the switch.

## APC policy considerations

Following are the considerations for the Automatic Port Configuration (APC) policy:

- The APC and the PG policies cannot be enabled at the same time. You can still benefit from the automatic port mapping feature of the APC policy when the Port Grouping policy is enabled by enabling the auto-distribution feature for each port group.
- You cannot manually configure port mapping when the APC policy is enabled.
- The APC policy applies to all ports on the switch.
- Enabling the APC policy is disruptive and erases all existing port mappings. Therefore, before enabling the APC policy, you should disable the AG module. When you disable the APC policy, the N\_Port configuration and the port mapping revert back to the default factory configurations for that platform. It is recommended that before you either disable or enable APC policy, you save the current configuration file using the **configUpload** command in case you need this configuration again.
- The APC policy is disabled by default on the switch.
- The APC policy is not supported in cascaded Access Gateway configuration, either on core or edge AG devices.

## Upgrade and downgrade considerations for the APC policy

The Brocade G620 is supported in Fabric OS 8.0.0 and subsequent releases. Downgrading to a prior release is not supported.

## Port Grouping policy

Use the Port Grouping (PG) policy to partition the fabric, host, or target ports within an AG-enabled module into independently operated groups. Use the PG policy in the following situations:

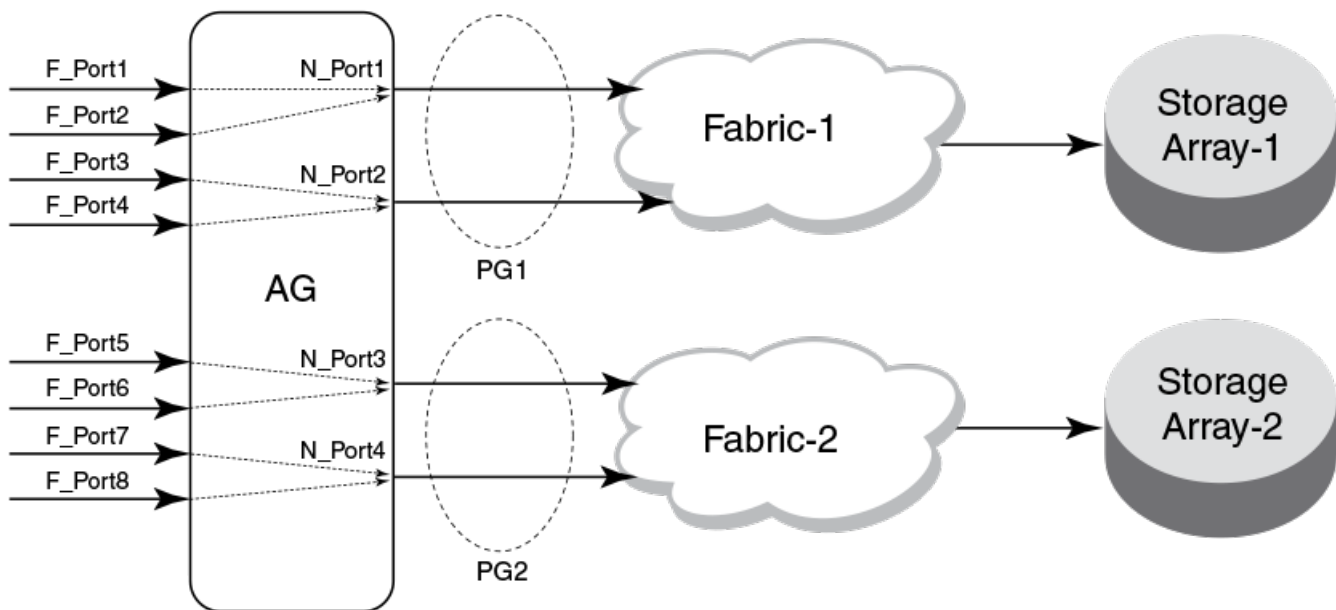
- When connecting the AG module to multiple physical or virtual fabrics.
- When you want to isolate specific hosts to specific fabric ports for performance, security, or other reasons.

## How port groups work

Create port groups using the **ag --pgcreate** command. This command groups N\_Ports together as port groups. By default, any F\_Ports mapped to the N\_Ports belonging to a port group will become members of that port group. Port grouping fundamentally restricts failover of F\_Ports to the N\_Ports that belong to that group. For this reason, an N\_Port cannot be member of two port groups. The default PGO group contains all N\_Ports that do not belong to any other port groups.

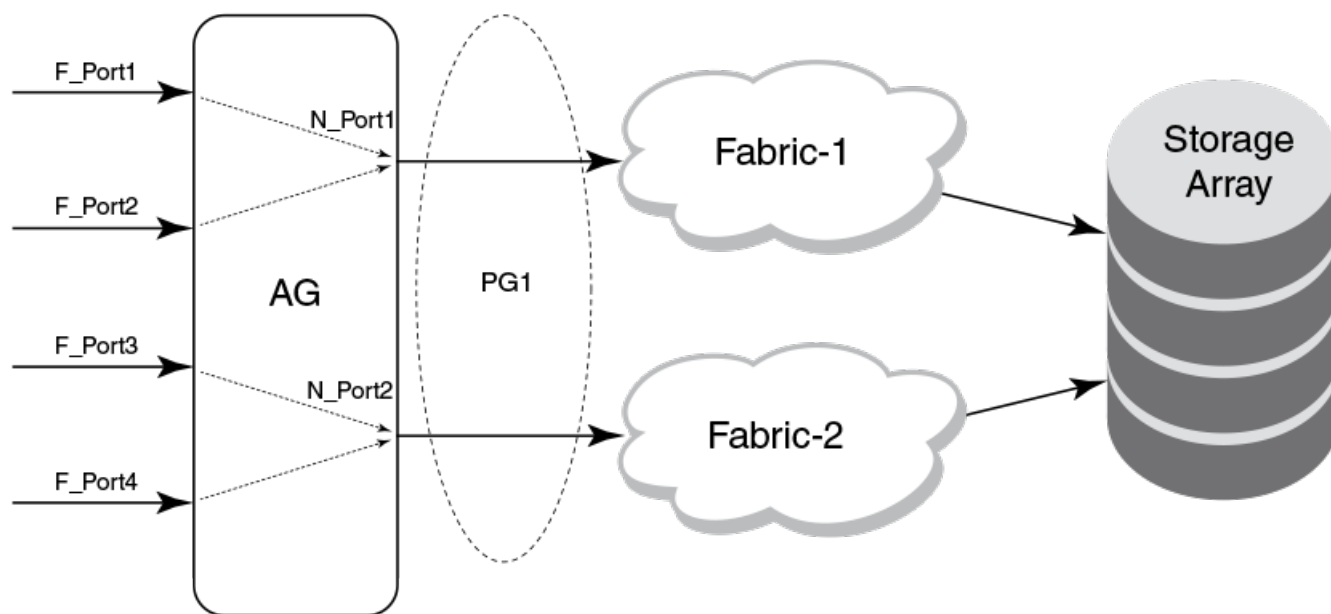
The following below shows that if you have created port groups and then an N\_Port goes offline, the F\_Ports being routed through that port will fail over to any of the N\_Ports that are part of that port group and are currently online. For example, if N\_Port 4 goes offline, then F\_Ports 7 and 8 are routed through to N\_Port 3 as long as N\_Port 3 is online because both N\_Ports 3 and 4 belong to the same port group, PG2. If no active N\_Ports are available, the F\_Ports are disabled. The F\_Ports belonging to a port group do not fail over to N\_Ports belonging to another port group.

FIGURE 9 Port grouping behavior



When a dual redundant fabric configuration is used, F\_Ports connected to a switch in AG mode can access the same target devices from both of the fabrics. In this case, you must group the N\_Ports connected to the redundant fabric into a single port group. It is recommended to have paths fail over to the redundant fabric when the primary fabric goes down.

FIGURE 10 Port group 1 (PG1) setup



## Adding an N\_Port to a port group

The following steps show how to add an N\_port to a port group.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --pgadd** command with the appropriate options to add an N\_Port to a specific port group. In the following example, N\_Port 14 is added to port group 3.

If you add more than one N\_Port, you must separate them with a semicolon.

```
switch:admin> ag --pgadd 3 14
N_Port[s] are added to the port group 3
```

## Deleting an N\_Port from a port group

Before deleting an N\_Port, all F\_Ports mapped to the N\_Port should be remapped before the N\_Port is deleted from a port group.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --pgdel** command with the appropriate options to delete an N\_Port from a specific port group. In the following example, N\_Port 13 is removed from port group 3.

```
switch:admin> ag --pgdel 3 13
N_Port[s] are deleted from port group 3
```

3. Enter the **ag --pgshow** command to verify the N\_Port was deleted from the specified port group.

## Removing a port group

The following steps show how to remove a port group.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --pgremove** command with the appropriate options to remove a port group. In the following example, port group 3 is removed.

```
switch:admin> ag --pgremove 3
```

## Renaming a port group

The following steps show how to rename a port group.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --pgrename** command with the appropriate options to rename a port group. In the following example, port group 2 is renamed to MyEvenFabric.

```
switch:admin> ag --pgrename 2 MyEvenFabric
Port Group 2 has been renamed as MyEvenFabric successfully
```

## Disabling the Port Grouping policy

The Port Grouping (PG) policy is enabled by default for Access Gateway. To disable this policy, use the following steps.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --policydisable pg** command to disable the Port Grouping policy.

## Port Grouping policy modes

You can enable and disable the Automatic Login Balancing and Managed Fabric Name Monitoring (MFNM) Port Grouping policy modes when you create port groups using the **pgcreate** command. Alternately, you can enable these modes using the **ag --pgsetmodes** command.

### Automatic Login Balancing mode

If Automatic Login Balancing mode is enabled for a port group and an F\_Port goes offline, logins in the port group are redistributed among the remaining F\_Ports. Similarly, if an N\_Port comes online, port logins in the port group are redistributed to maintain a balanced N\_Port-to-F\_Port ratio.

Consider the following notes about Automatic Login Balancing mode:

- Automatic Login Balancing mode is disruptive. However, you can minimize disruption by disabling or enabling rebalancing of F\_Ports on F\_Port offline events or N\_Port online events.
- You must explicitly enable Automatic Login Balancing on a port group.
- If an N\_Port is deleted from a port group enabled for Automatic Login Balancing mode, the F\_Ports mapped to that N\_Port stay with the port group as long as there are other N\_Ports in the group. Only the specified N\_Port is removed from the port group. This is because the F\_Ports are logically associated with the port groups that are enabled for Automatic Login Balancing mode. This is not the case for port groups not enabled for Automatic Login Balancing mode. When you delete an N\_Port from one of these port groups, the F\_Ports that are mapped to the N\_Port move to PGO along with the N\_Port. This is because the F\_Ports are logically associated with the N\_Ports in port groups not enabled for Automatic Login Balancing mode.

## Managed Fabric Name Monitoring mode

When enabled, Managed Fabric Name Monitoring (MFNM) mode queries the fabric name at a specific time period. If it detects an inconsistency, for example, all the N\_Ports within a port group are not physically connected to the same physical or virtual fabric, it generates a RASLOG message. In “default” mode, a message is logged into RASLOG. In “managed” mode, automatic failover is disabled for all N\_Ports within the N\_Port group, and a message is logged into RASLOG about multiple fabrics.

Enable or disable MFNM mode on a port group using the steps under [Enabling MFNM mode](#) on page 56 and [Disabling MFNM mode](#) on page 56. In both default and managed mode, the system queries the fabric name once every 120 seconds. You can configure the monitoring timeout value to something other than 120 seconds using the steps under [Setting the current MFNM mode timeout value](#) on page 57.

## Creating a port group and enabling Automatic Login Balancing mode

The following steps show how to create a port group and enable Automatic Load Balancing mode.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --pgcreate** command with the appropriate options to create a port group. In the following example, a port group named “FirstFabric” is created that includes N\_Ports 1 and 3 and has Automatic Login Balancing (lb) enabled.

```
switch:admin> ag --pgcreate 3 "1;3" -n FirstFabric1 -m "lb"
Port Group 3 created successfully
```

3. Enter the **ag --pgshow** command to verify the port group was created. A table containing a port group with ID 3 and ports 1 and 3 should display.

## Rebalancing F\_Ports

To minimize disruption that could occur once F\_Ports go offline or when additional N\_Ports are brought online, you can modify the default behavior of Automatic Login Balancing mode by disabling or enabling rebalancing of F\_Ports when F\_Port offline or N\_Port online events occur.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **agautomapbalance --enable** command with the appropriate options to enable automatic login redistribution of F\_Ports. In the following example, rebalancing of F\_Ports in port group 1 in Access Gateway is enabled when an F\_Port online event occurs.

```
switch:admin> agautomapbalance --enable -fport -pg 1
```

3. Enter the **agautomapbalance --disable -all** command with the appropriate options to disable automatic login distribution of N\_Ports for all port groups in the Access Gateway when an N\_Port online event occurs.

```
switch:admin> agautomapbalance --disable -nport -all
```

4. Enter the **agautomapbalance --disable -all** command with the appropriate options to disable automatic login distribution of F\_Ports for all port groups in the Access Gateway when an F\_Port online event occurs.

```
switch:admin> agautomapbalance --disable -fport -all
```

5. Enter the **agautomapbalance --show** command to display the automatic login redistribution settings for port groups. In the following example, there are two port groups, 0 and 1.

```
switch:admin> agautomapbalance --show
AG Policy: pg
-----
PG_ID LB mode nport fport
-----
```

0 Enabled	Enabled	Disabled
1 Disabled	-	-

This command also displays the automatic login redistribution settings for N\_Ports and F\_Ports. For more details on this command and its output, refer to the *Fabric OS Command Reference*.

## Considerations when disabling Automatic Login Balancing mode

Consider the following when disabling Automatic Login Balancing mode:

- Be aware that modifying Automatic Login Balancing mode default settings using the **agautomapbalance** command may yield uneven distribution of F\_Ports to N\_Ports. In such cases, you might consider a manual login distribution that forces a rebalancing of F\_Ports to N\_Ports.
- To control automatic rebalancing to avoid disruptions when the Port Grouping policy is enabled, refer to [Rebalancing F\\_Ports](#) on page 55.

## Enabling MFNM mode

The following steps show how to enable MFNM mode.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --pgsetmodes** command with the appropriate options to enable MFNM mode.

This command changes the monitoring mode from "default" to "managed." In the following example, MFNM mode is enabled for port group 3.

```
switch:admin> ag --pgsetmodes 3 "mfnm"
Managed Fabric Name Monitoring mode has been enabled for Port Group 3
```

## Disabling MFNM mode

The following steps show how to disable MFNM mode.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Use the **ag --pgdelmodes** command with the appropriate options to disable MFNM mode.

In the following example, MFNM mode is disabled for port group 3.

```
switch:admin> ag --pgdelmodes 3 "mfnm"
Managed Fabric Name Monitoring mode has been disabled for Port Group 3
```

3. Use the **ag --pgshow** command to display the port group configuration. If the port group disabled, "mfnm" should not display under PG\_Mode for port 3.

For more details on this command and its operands, refer to the *Fabric OS Command Reference*.

## Displaying the current MFNM mode timeout value

The following steps show how to display the current MFNM mode timeout value.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Use the **ag --pgfnmtov** command to display the current MFNM timeout value.

```
switch:admin> ag --pgfnmtov
Fabric Name Monitoring TOV: 120 seconds
```



## Setting the current MFNM mode timeout value

The following steps show how to set MFNM mode the current MFNM mode timeout value.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Use the **ag --pgfnmtov** command, followed by a value in seconds.

The following example sets the timeout value to 100 seconds.

```
switch:admin> ag --pgfnmtov 100
```

## Port Grouping policy considerations

Policy considerations for the Port Grouping policy include the following:

- A port cannot be a member of more than one port group.
- The PG policy is enabled by default in Fabric OS 6.0 and later. A default port group "O" (PGO) is created, which contains all ports on the AG.
- APC policy and PG policy are mutually exclusive. You cannot enable these policies at the same time.
- If an N\_Port is added to a port group or deleted from a port group and Automatic Login Balancing mode is enabled or disabled for the port group, the N\_Port maintains its original failover or fallback setting. If an N\_Port is deleted from a port group, it automatically gets added to port group O.
- When specifying a preferred secondary N\_Port for a port group, the N\_Port must be from the same group. If you specify an N\_Port as a preferred secondary N\_Port and it already belongs to another port group, the operation fails. Therefore, it is recommended to form groups before defining the preferred secondary path.
- If the PG policy is disabled while a switch in AG mode is online, all the defined port groups are deleted, but the port mapping remains unchanged. Before disabling the PG policy, you should save the configuration using the **configUpload** command in case you might need this configuration again.
- If N\_Ports connected to unrelated fabrics are grouped together, N\_Port failover within a port group can cause the F\_Ports to connect to a different fabric. The F\_Ports may lose connectivity to the targets to which they were connected before the failover, thus causing I/O disruption, as shown in [How port groups work](#) on page 52. Ensure that the port group mode is set to MFNM mode (refer to [Enabling MFNM mode](#) on page 56). This monitors the port group to detect connection to multiple fabrics and disables failover of the N\_Ports in the port group. For more information on MFNM, refer to [Managed Fabric Name Monitoring mode](#) on page 55.

## Upgrade and downgrade considerations for the Port Grouping policy

The Brocade G620 is supported in Fabric OS 8.0.0 and subsequent releases. Downgrading to a prior release is not supported.

## Device Load Balancing policy

When the Device Load Balancing policy is enabled, devices mapped to a port group always log in to the least-loaded N\_Port in that port group. This helps to distribute the login load on each of the N\_Ports. This policy is intended for use in conjunction with device mapping. It provides an automatic approach to mapping devices to the least-loaded N\_Port within an N\_Port group. To effectively use this policy, it is recommended that you map devices to desired N\_Port groups before enabling this policy. The Port Grouping policy must be enabled before you can enable Device Load Balancing.

Manually created mappings from devices to N\_Ports take precedence over automatically created mappings. Refer to [Mapping priority](#) on page 40 for details on connection priority for AG port mapping. For more information on device mapping, refer to [Device mapping](#) on page 34.

## Enabling the Device Load Balancing policy

Use the following steps to enable Device Load Balancing.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **configUpload** command to save the switch's current configuration.
3. The Port Grouping policy must be enabled to enable Device Load Balancing. Enter the **ag --policyshow** command to determine if the Port Grouping policy is enabled. If it is not enabled, enter **ag --policyenable pg** to enable this policy.
4. Enter the **ag --policyenable wwnloadbalance** command to enable the Device Load Balancing policy. Because Fibre Channel devices are identified by their WWNs, CLI commands use device WWNs.

## Disabling the Device Load Balancing policy

Before disabling this policy, you should save the configuration using the **configUpload** command in case you need this configuration again.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --policydisable wwnloadbalance** command to disable the Device Load Balancing policy.
3. Enter the **ag --policyshow** command to determine the current status of the Device Load Balancing policy.

## Device Load Balancing policy considerations

The following considerations apply to Device Load Balancing.

- The Device Load Balancing policy is not applicable on a port group when the APC policy or Automatic Login Balancing are enabled.
- If a device is mapped to a port that is currently part of a trunk, then the device will use that trunk. When trunking is used with the Device Load Balancing policy, then the load on each trunk will be proportional to the number of ports in that trunk. Use the **ag --show** command to determine the devices using a particular trunk.
- When using the Device Load Balancing policy, make sure that all ports in the port group have the same NPIV login limit. If some ports have a lower login limit than the other ports, and there are many logins to the group, some devices will repeatedly attempt to connect to the device with the lower limit (because it has the fewest logins) and fail to connect.

## Persistent ALPA policy

The Persistent ALPA policy is meant for host systems with operating systems that cannot handle different PID addresses across login sessions when booting over a SAN. The Persistent ALPA policy for switches in Access Gateway mode allows you to configure the AG module so that the host is more likely to get the same PID when it logs out of and into the same F\_Port. Because the Arbitrated Port Loop Address (ALPA) field makes up a portion of the PID, the PID may change across switch or server power cycles. This policy, if enabled, helps reduce the chances of a different PID being issued for the same host.

The benefit of this policy is that it ensures that a host has the same ALPA on the F\_Ports through the host power cycle. You can also achieve the same behavior and benefit by setting the same policy in the main (core) fabric. When this policy is enabled, AG will request the same ALPA from the core fabric. However, depending on the fabric, this request may be denied. When this occurs, the host is assigned a different ALPA. The following modes deal with this situation:

- In “Flexible” mode, the AG logs an event that it did not receive the same (requested) ALPA from the core fabric and brings up the device with the ALPA assigned by the fabric. An unassigned ALPA value is assigned when the ALPA assigned to the device is taken by another host.
- In the “Stringent” mode, if the requested ALPA is not available, the server login will be rejected and the server port cannot log in to the fabric if assignment of the same ALPA is not possible.

## Enabling the Persistent ALPA policy

By default, Persistent ALPA is disabled. You can enable Persistent ALPA using the **ag --persistentalpaenable** command with the following syntax and with one of the following value types:

```
ag --persistentalpaenable 1/0[On/Off] -s/-f[Stringent/Flexible]
```

To enable Persistent ALPA, use the following steps.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --persistentalpaenable** command to enable persistent ALPA in flexible (-f) or stringent (-s) mode. The following example shows enabling the policy in flexible mode.

```
switch:admin> ag --persistentalpaenable 1 -f
```

To ensure consistency among the different devices, after Persistent ALPA is enabled, all the ALPAs become persistent, whether or not they were logged in before the Persistent ALPA policy was enabled.

## Disabling the Persistent ALPA policy

When you disable this policy, do not specify the value type (for example, flexible ALPA or stringent ALPA). Use the following steps.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --persistentalpadisable** command.

```
switch:admin> ag --persistentalpaenable 0
```

## Persistent ALPA device data

Access Gateway uses a table to maintain a list of available and used ALPAs. When the number of entries in this table is exhausted, the host receives an error message. You can remove some of the entries to make space using the instructions in [Removing device data from the database](#) on page 59.

## Removing device data from the database

Use the following steps to remove device data from the database.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --deletewwnfromdb** command.

```
switch:admin> ag --deletewwnfromdb PWWN
```

In the example, PWWN is the port that you want to remove from the database.

## Displaying device data

You can view the ALPA of the host related to any ports you delete from the database.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --printalpamap** command with the appropriate option to display a database entry for a specific F\_Port. The following example will display an entry for F\_Port 2.

```
switch:admin> ag --printalpamap 2
```

## Clearing ALPA values

You can clear the ALPA values for a specific port.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --clearalpamap** command with the appropriate option to remove the PWW-to-ALPA mapping for a specific port. In the following example, the mapping for port 2 is cleared from the database.

```
switch:admin> ag --clearalpamap 2
```

### NOTE

All the device data must be persistent in case of a reboot. During a reboot, the tables will be dumped to the `persistent_NPIV_config` file.

## Persistent ALPA policy considerations

The Persistent ALPA policy is not supported in the following situations:

- When AG device N\_Ports are connected to the shared ports of 48-port Director blades.
- When connected to Cisco fabrics, enable Persistent FCID mode on the connecting Cisco switch to achieve the same functionality.
- When the **configDefault** command is used, Persistent ALPA configuration will not change to the default but will retain the previous configuration.

## Failover policy

The Access Gateway Failover policy ensures maximum uptime for the servers. When a port is configured as an N\_Port, the Failover policy is enabled by default and is enforced during power-up. The Failover policy allows hosts and targets to automatically remap to another online N\_Port if the primary N\_Port goes offline.

### NOTE

For port mapping, the Failover policy must be enabled on an N\_Port for failover to occur. For device mapping, if a device is mapped to an N\_Port in a port group, the device will always reconnect to the least-loaded online N\_Port in the group (or secondary N\_Port in the group if configured) if the primary N\_Port goes offline. This occurs regardless of whether the Failover policy is enabled or disabled for the primary N\_Port.

## Failover with port mapping

The AG device provides an option to specify a secondary failover N\_Port for an F\_Port. The Failover policy allows F\_Ports to automatically remap to an online N\_Port if the primary N\_Port goes offline. If multiple N\_Ports are available for failover, the Failover

policy evenly distributes the F\_Ports to available N\_Ports belonging to the same N\_Port group. If no other N\_Port is available, failover does not occur and the F\_Ports mapped to the primary N\_Port go offline as well.

#### NOTE

If failover and failback policy are disabled, an F\_Port mapped to an N\_Port will go offline when the N\_Port goes offline and it will come online when the N\_Port comes online.

## Failover configurations in Access Gateway

The following sequence describes how a failover event occurs:

- An N\_Port goes offline.
- All F\_Ports mapped to that N\_Port are temporarily disabled.
- If the Failover policy is enabled on an offline N\_Port, the F\_Ports mapped to it will be distributed among available online N\_Ports. If a secondary N\_Port is defined for any of these F\_Ports, these F\_Ports will be mapped to those N\_Ports. If the Port Grouping policy is enabled, then the F\_Ports only fail over to N\_Ports that belong to the same port group as the originally offline N\_Port.

## Failover example

The following example shows the failover sequence of events in a scenario where two fabric ports go offline, one after the other. Note that this example assumes that no preferred secondary N\_Port is set for any of the F\_Ports.

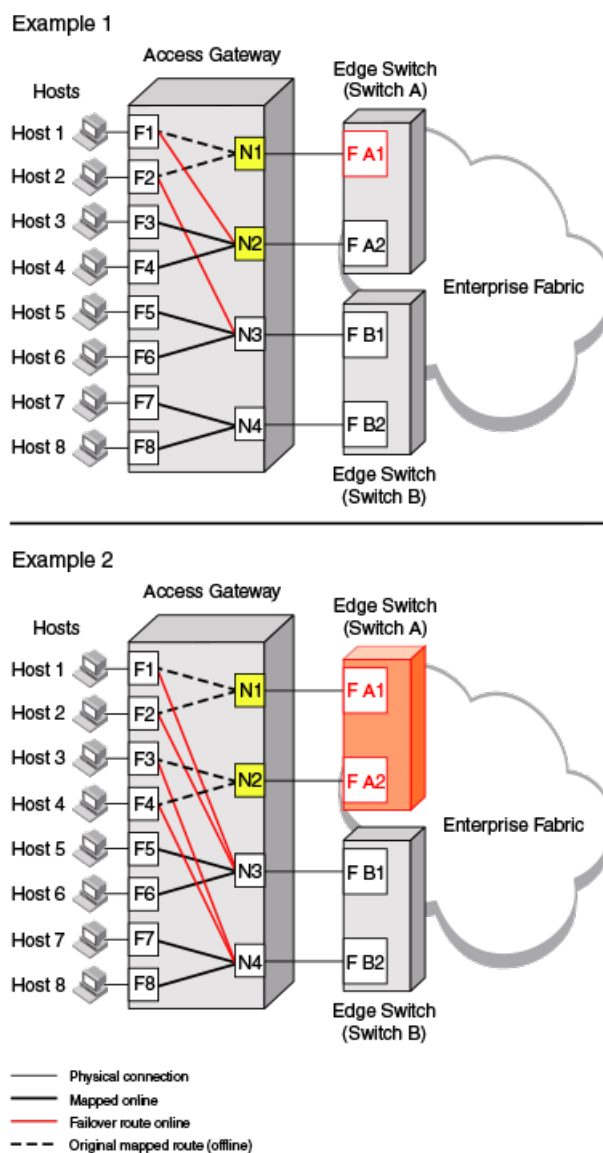
- First, the Edge switch F\_A1 port goes offline, as shown in Example 1 in the following figure, causing the corresponding Access Gateway N\_1 port to be disabled.

The ports mapped to N\_1 fail over; F\_1 fails over to N\_2 and F\_2 fails over to N\_3.

- Next, the F\_A2 port goes offline, as shown in Example 2 in the following figure, causing the corresponding Access Gateway N\_2 port to be disabled.

The ports mapped to N\_2 (F\_1, F\_3, and F\_4) fail over to N\_3 and N\_4. Note that the F\_Ports are evenly distributed to the remaining online N\_Ports and that the F\_2 port did not participate in the failover event. The following figure shows this example.

FIGURE 11 Failover behavior



### Adding a preferred secondary N\_Port (optional)

F\_Ports automatically fail over to any available N\_Port. Alternatively, you can specify a preferred secondary N\_Port in case the primary N\_Port fails. If the primary N\_Port goes offline, the F\_Ports fail over to the preferred secondary N\_Port (if it is online), then re-enable. If the secondary N\_Port is offline, the F\_Ports will disable. Define the preferred secondary N\_Ports per F\_Port. For example, if two F\_Ports are mapped to a primary N\_Port, you can define a secondary N\_Port for one of those F\_Ports and not define a secondary N\_Port for the other F\_Port. F\_Ports must have a primary N\_Port mapped before a secondary N\_Port can be configured.

The following steps show how to add a preferred secondary N\_Port.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --prefset** command with the "F\_Port1; F\_Port2, ..."N\_Port options to add the preferred secondary F\_Ports to the specified N\_Port.

The F\_Ports must be enclosed in quotation marks and the port numbers must be separated by a semicolon, as shown in the following example.

```
switch:admin> ag --prefset "3;9" 4
Preferred N_Port is set successfully for the F_Port[s]
```

#### NOTE

Preferred mapping is not allowed when Automatic Login Balancing mode is enabled for a port group. All N\_Ports are the same when Automatic Login Balancing mode is enabled.

## Deleting F\_Ports from a preferred secondary N\_Port

The following steps show how to delete F\_Ports from a preferred secondary N\_Port.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --prefdel** command with the "F\_Port1[, F\_Port2, ...]"N\_Port options to delete F\_Ports from an N\_Port.

The list of F\_Ports must be enclosed in quotation marks. Port numbers must be separated by a semicolon. In the following example, F\_Ports 3 and 9 are deleted from preferred secondary N\_Port 4.

```
switch:admin> ag --prefdel "3;9" 4
Preferred N_Port is deleted successfully for the F_Port[s]
```

## Failover with device mapping

Failover is handled similarly for port mapping and device mapping if devices are mapped to N\_Port groups. If a device is mapped to an N\_Port in a group, and an N\_Port goes offline, the devices mapped to that N\_Port will reconnect on the least-loaded online N\_Ports in the group.

Enabling or disabling the Failover or Failback policies for N\_Ports has no effect on device mapping. A device will always fail over to an online N\_Port in the port group, regardless of whether the Failback policy is enabled for an N\_Port or not. Whereas, with port mapping, if you disable the Failover or Failback policy on an N\_Port, the F\_Port will not fail over or fail back to other N\_Ports.

Failover behavior is different if a device is mapped to a specific N\_Port instead of to an N\_Port group. If mapping a device to a specific N\_Port, you can define a secondary N\_Port that will be used if the primary N\_Port is offline. To maximize the device uptime, it is recommended to map the device to a port group rather than to specific N\_Ports.

## Adding a preferred secondary N\_Port for device mapping (optional)

Use the following steps to configure a secondary N\_Port where devices will connect if their first or primary N\_Port, if defined, is unavailable.

1. Connect to the switch and log in using an account assigned to the admin role.
2. To configure an N\_Port as a failover port for one or multiple devices mapped to a specific N\_Port, enter the **ag --addwwnfailovermapping N\_Port** command with the "[WWN]/[WWN]" option. All of the listed device WWNs will use the listed N\_Port if it is available and the first mapped N\_Port is unavailable.

The following example configures N\_Port 32 as the failover port for two devices already mapped to a primary N\_Port.

```
ag --addwwnfailovermapping 32 "10:00:00:06:2b:0f:71:0c;10:00:00:05:1e:5e:2c:11"
```

To configure N\_Port 32 as a failover port for all WWNs mapped to the N\_Port, use the **ag --addwwnfailovermapping** command with the *N\_Port* and **--all** options.

```
ag --addwwnfailovermapping 32 --all
```

## Deleting a preferred secondary N\_Port for device mapping (optional)

Use the following steps to remove a secondary N\_Port where devices will connect if their first or primary N\_Port, if defined, is unavailable.

1. Connect to the switch and log in using an account assigned to the admin role.
2. To delete an N\_Port configured as a failover port for one or multiple devices mapped to a specific N\_Port, use the **ag --delwwnfailovermapping N\_Port** command with the "[WWN]:[WWN]" option. All of the listed devices will stop using the N\_Port if the first N\_Port mapped to the devices is unavailable unless they log in through F\_Ports that are mapped to the N\_Port.
  - The following example removes N\_Port 32 as the secondary N\_Port for two devices already mapped to a primary N\_Port.

```
ag --delwwnfailovermapping 32 "10:00:00:06:2b:0f:71:0c;10:00:00:05:1e:5e:2c:11"
```

- To remove an N\_Port as a failover port for *all* devices mapped to the N\_Port, use the **ag --delwwnfailovermapping N\_Port** command with the **--all** option.

The following command removes N\_Port 32 as the secondary N\_Port for all available devices.

```
ag --delwwnfailovermapping 32 --all
```

## Enabling and disabling the Failover policy on an N\_Port

Use the following steps to enable or disable the Failover policy on a specific N\_Port.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --failovershow N\_Port** command to display the failover setting.

```
switch:admin> ag --failovershow 13
Failover on N_Port 13 is not supported
```

3. Enter the **ag --failoverenable N\_Port** command to enable failover.

```
switch:admin> ag --failoverenable 13
Failover policy is enabled for port 13
```

4. Enter the **ag --failoverdisable N\_Port** command to disable failover.

```
switch:admin> ag --failoverdisable 13
Failover policy is disabled for port 13
```

## Enabling and disabling the Failover policy for a port group

The Failover policy can be enabled on a port group. Use the following steps to enable or disable the failover on all the N\_Ports belonging to the same port group.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --failoverenable -pg pgid** command to enable failover.

```
switch:admin> ag --failoverenable -pg 3
Failover policy is enabled for port group 3
```

3. Enter the **ag --failoverdisable -pg pgid** command to disable failover.

```
switch:admin> ag --failoverdisable -pg 3
Failover policy is disabled for port group 3
```



## Upgrade and downgrade considerations for the Failover policy

The Brocade G620 is supported in Fabric OS 8.0.0 and subsequent releases. Downgrading to a prior release is not supported.

## Failback policy

The Failback policy provides a means for hosts that have failed over to automatically reroute back to their intended mapped N\_Ports when these N\_Ports come back online. The Failback policy is an attribute of an N\_Port and is enabled by default when a port is locked to the N\_Port.

Only the originally mapped F\_Ports fail back. In the case of multiple N\_Port failures, only F\_Ports that were mapped to a recovered N\_Port experience failback. The remaining F\_Ports are not redistributed.

### NOTE

For port mapping, the Failback policy must be enabled on an N\_Port for failback to occur. For device mapping, the Failback policy has no effect. If a device is mapped to a port group, it will always fail over to an online N\_Port in the port group (or secondary N\_Port if configured) and will remain connected to this failover N\_Port when the original N\_Port comes back online.

### NOTE

If failover and failback policy are disabled, an F\_Port mapped to an N\_Port will go offline when the N\_Port goes offline and it will come online when the N\_Port comes online.

## Failback policy configurations in Access Gateway

The following sequence describes how a failback event occurs:

- When an N\_Port comes back online, with the Failback policy enabled, the F\_Ports that were originally mapped to it are temporarily disabled.
- The F\_Port is rerouted to the primary mapped N\_Port, and then re-enabled.
- The host establishes a new connection with the fabric.

### NOTE

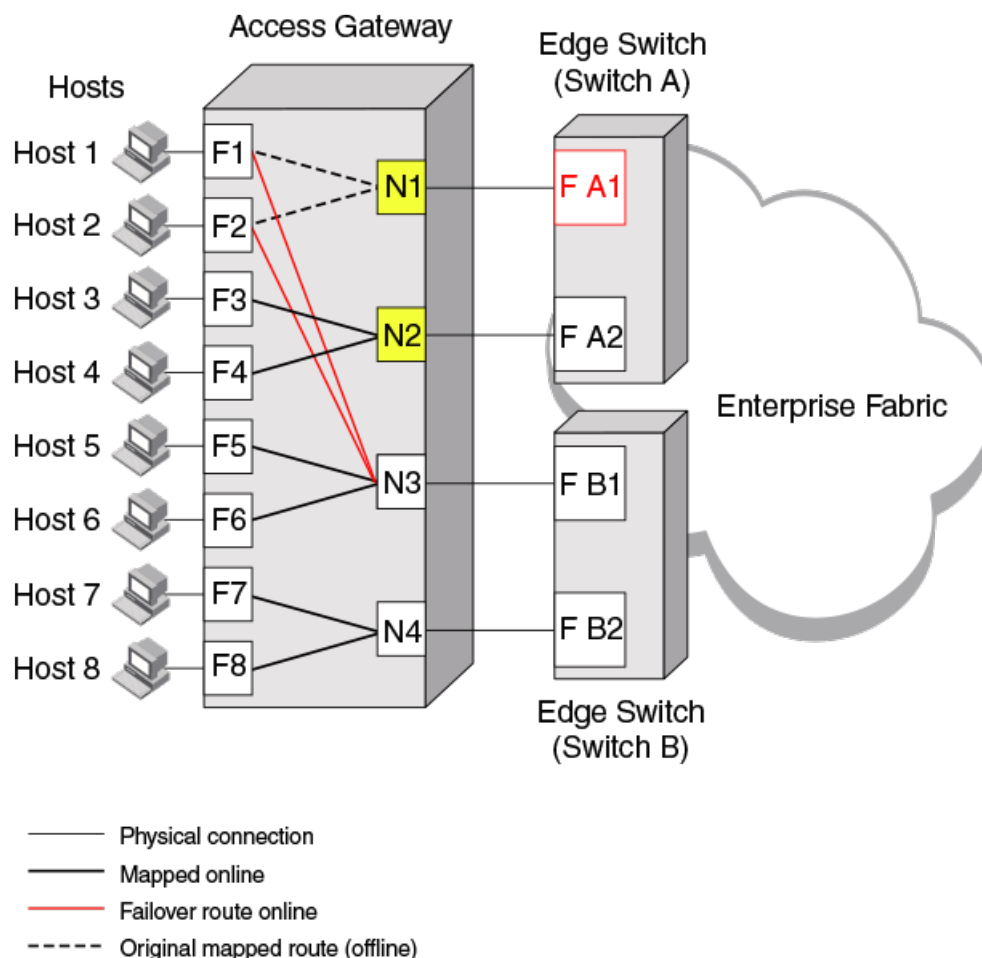
The failback period is quite fast and rarely causes an I/O error at the application level.

## Failback example

In the following figure, the Access Gateway N\_1 remains disabled because the corresponding F\_A1 port is offline. However, N\_2 comes back online. Refer to [Failover example](#) on page 61 for the original failover scenario.

Ports F\_1 and F\_2 are mapped to N\_1 and continue routing to N\_3. Ports F\_3 and F\_4, which were originally mapped to N\_2, are disabled and rerouted to N\_2, and then enabled.

FIGURE 12 Failback behavior



## Enabling and disabling the Failback policy on an N\_Port

Use the following steps to enable or disable the Failback policy on N\_Ports.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **ag --failbackshow *n\_portnumber*** command to display the failback setting.

```
switch:admin> ag --failbackshow 13
Failback on N_Port 13 is not supported
```

3. Use the following commands to enable or disable the Failback policy:

- Enter the **ag --failbackenable *n\_portnumber*** command to enable failback.

```
switch:admin> ag --failbackenable 13
Failback policy is enabled for port 13
```

- Enter the **ag --failbackdisable *n\_portnumber*** command to disable failback.

```
switch:admin> ag --failbackdisable 13
Failback policy is disabled for port 13
```

## Enabling and disabling the Failback policy for a port group

Use the following steps to enable or disable the Failback policy on all the N\_Ports belonging to the same port group.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Use the following commands to enable or disable the Failback policy for a port group:
  - Enter the **ag --failbackenable pg *pgid*** command to enable failback on a port group.

```
switch:admin> ag --failbackenable -pg 3
Failback policy is enabled for port group 3
```

- Enter the **ag --failbackdisable pg *pgid*** command to disable failback on a port group.

```
switch:admin> ag --failbackdisable -pg 3
Failback policy is disabled for port group 3
```

## Upgrade and downgrade considerations for the Failback policy

The Brocade G620 is supported in Fabric OS 8.0.0 and subsequent releases. Downgrading to a prior release is not supported.

## Failback policy disabled on unreliable links (N\_Port monitoring)

Links from all N\_Ports are monitored for the number of online and offline static change notifications (SCNs) that occur during a set time period (5 minutes). If the number of SCNs on a link exceeds a set threshold, the link is considered unreliable, and failback is disabled for that N\_Port. Failover continues for the port as needed. Once the number of SCNs drops below the set threshold, the port is deemed reliable again and failback is re-enabled. If the link from a preferred secondary N\_Port for an F\_Port becomes unreliable, failover will not occur to that N\_Port.

The default threshold is 25 SCNs per 5 minutes. You can modify the SCN threshold counter using the following command.

```
ag --reliabilitycounterset "count"
```

You can view counter settings using the following command.

```
ag --reliabilitycountershow
```

## Considerations for Failback policy disabled on unreliable links

Consider the following when an N\_Port link becomes reliable again after being unreliable:

- Preferred N\_Port settings are enforced.
- If failback is enabled, configured F\_Ports will fail back to the N\_Port.
- If the configured F\_Ports are offline, they will go back online.
- If Device Load Balancing is enabled, rebalancing occurs.

## Trunking in Access Gateway mode

The hardware-based Port Trunking feature enhances management, performance, and reliability of Access Gateway N\_Ports when they are connected to Brocade fabrics. Port trunking combines multiple links between the switch and AG module to form a single, logical port. This enables fewer individual links, thereby simplifying management. This also improves system reliability by maintaining in-order delivery of data and avoiding I/O retries if one link within the trunk fails. Equally important is that framed-based trunking provides maximum utilization of links between the AG module and the core fabric.

Trunking allows transparent failover and failback within the trunk group. Trunked links are more efficient because of the trunking algorithm implemented in the switching ASICs that distributes the I/O more evenly across all the links in the trunk group.

Trunking in Access Gateway is mostly configured on the Edge switch

ch. To enable this feature, you must install the Brocade ISL Trunking license on both the Edge switch and the module running in AG mode and ensure that both modules are running the same Fabric OS version. If a module already has a trunking license, no new license is required. After the trunking license is installed on a switch in AG mode and you change the switch to standard mode, you can keep the same license.

#### NOTE

You can also enable N\_Ports on the Access Gateway switch for trunking using the `portcfgtrunkport` command. However, do not create an F\_port trunk if the connecting Edge switch has no trunking capability (no license or license disabled). Doing so can cause the Edge switch ports to not link up.

#### NOTE

N\_Port trunking is only supported for HBAs connected to switches running in Native mode. It is not supported for HBAs connected to switches running in Access Gateway mode.

## How trunking works

Trunking in Access Gateway mode provides a trunk group between N\_Ports on the AG module and F\_Ports on the Edge switch. With trunking, all but one link within a trunk group can go offline or become disabled, but the trunk remains fully functional and no reconfiguration is required. Trunking prevents reassignments of the port ID when N\_Ports go offline.

## Configuring trunking on the Edge switch

Because AG trunking configuration is mostly on the Edge switch, information in this section is applicable to the Edge switch and not the AG device. On the AG device, you only need to ensure that the trunking license is applied and enabled. On the Edge switch, you must first configure an F\_Port trunk group and statically assign an Area\_ID to the trunk group. Assigning a Trunk Area (TA) to a port or trunk group enables F\_Port masterless trunking on that port or trunk group.

In the `nsshow` command, end devices that log in to the edge fabric through an F\_Port trunk will show the F\_Port trunk speed and not necessarily the actual device speed. For example, when a host using an 8Gbps interface is attached to the AG device and logs in to the fabric through a 32Gbps F\_Port trunk, the device link speed will show 32Gbps (the trunk speed) and not 8Gbps (the device speed).

#### NOTE

Do not create an F-port trunk if the connecting Edge switch has no trunking capability (no license or trunk port configuration disabled). Doing so can cause the Edge switch ports to not link up.

On switches running in Access Gateway mode, the masterless trunking feature trunks N\_Ports because these are the only ports that connect to the Enterprise fabric. When a TA is assigned to a port or trunk group, the ports will immediately acquire the TA as the area of its port IDs (PIDs). When a TA is removed from a port or trunk group, the port reverts to the default area as its PID.

#### NOTE

By default, trunking is enabled on all N\_Ports of the AG device. Verify that this feature has not been disabled on N\_Ports that are part of a port trunk group.

## Trunk group creation

Port trunking is enabled between two separate Fabric OS switches that support trunking and where all the ports on each switch reside in the same quad and are running the same speed. Trunk groups form when you connect two or more cables on one Fabric OS switch to

another Fabric OS switch with ports in the same port group or quad. A port group or a quad is a set of sequential ports; for example, ports 0-3. The trunking groups are based on the user port number, with eight contiguous ports as one group, such as 0-7, 8-15, 16-23, and up to the number of ports on the switch.

## Setting up trunking

Use the following steps to set up trunking.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Ensure that both modules (Edge switch and the switch running in AG mode) have the trunking licenses enabled.
3. Ensure that the ports have trunking enabled by issuing the **portcfgshow** command. If trunking is not enabled, issue the **portcfgtrunkport [ slot / ] port, 1** command.
4. Ensure that the ports within a trunk have the same speed.
5. Ensure that the ports within an ASIC trunk group are used to group the ports as part of a trunk on the Edge switch or on an AG.
6. Ensure that both modules are running the same Fabric OS versions.

## Configuration management for trunk areas

The **porttrunkarea** command does not allow ports from different admin domains (ADs) and ports from different logical switches to join the same trunk area (TA) group.

When you assign a TA, the ports within the TA group will have the same Index. The Index that was assigned to the ports is no longer part of the switch. Any Domain,Index (D,I) AD that was assumed to be part of the domain may no longer exist for that domain because it was removed from the switch.

### Trunk area assignment example

If you have AD1: 3,7; 3,8; 4,13; 4,14 and AD2: 3,9; 3,10, and then create a TA with Index 8 with ports that have index 7, 8, 9, and 10. Then index 7, 9, and 10 are no longer with domain 3. This means that AD2 does not have access to any ports because index 9 and 10 no longer exist on domain 3. This also means that AD1 no longer has 3,7 in effect because Index 7 no longer exists for domain 3. AD1's 3,8, which is the TA group, can still be seen by AD1 along with 4,13 and 4,14.

A port within a TA can be removed, but this adds the Index back to the switch. For example, the same AD1 and AD2 with TA 8 holds true. If you remove port 7 from the TA, it adds Index 7 back to the switch. That means AD1's 3,7 can be seen by AD1 along with 3,8; 4,13 and 4,14.

### Assigning a trunk area

You must enable trunking on all ports to be included in a trunk area (TA) before you can create a trunk area. Use the **portCfgTrunkPort** or **switchCfgTrunk** command to enable trunking on a port or on all ports of a switch.

Issue the **porttrunkarea** command to assign a static TA on a port or port trunk group, to remove a TA from a port or group of ports in a trunk, and to display masterless trunking information.

You can remove specified ports from a TA using the **porttrunkarea --disable** command, however, this command does not unassign a TA if its previously assigned Area\_ID is the same address identifier (Area\_ID) of the TA unless all the ports in the trunk group are specified to be unassigned. For more information on the **porttrunkarea** command, enter **porttrunkarea --help** or refer to the *Fabric OS Command Reference*.

**TABLE 9** Address identifier

23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Domain ID								Area_ID								Port ID							

The following steps show how to assign a trunk area.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Disable the ports to be included in the TA.
3. Enable a TA for the appropriate ports. The following example enables a TA for ports 13 and 14 on slot 10 with port index of 125.

```
switch:admin> porttrunkarea --enable 10/13-14 -index 125
```

4. Display the TA port configuration (ports still disabled) using the **porttrunkarea --show enabled** command.
5. Enable the ports specified in step 3 using the **portenable** command.

```
switch:admin> portenable 10/13
switch:admin> portenable 10/14
```

6. Show the TA port configuration after enabling the ports using the **porttrunkarea --show enabled** command. The ports that you enabled should appear in the output.

## Enabling the DCC policy on a trunk

After you assign a Trunk Area, the **porttrunkarea** command checks whether there are any active Device Connection Control (DCC) policies on the port with the index TA, and then issues a warning to add all the device WWNs to the existing DCC policy with index as TA. All DCC policies that refer to an Index that no longer exist will not be in effect.

Use the following steps to enable the DCC policy on a trunk.

1. Add the WWN of all the devices to the DCC policy against the TA.
2. Enter the **secpolicyactivate** command to activate the DCC policy.

You must enable the TA before issuing the **secpolicyactivate** command in order for security to enforce the DCC policy on the trunk ports.

3. Turn on the trunk ports.

Trunk ports should be turned on after issuing the **secpolicyactivate** command to prevent the ports from becoming disabled in the case where there is a DCC security policy violation.

## Enabling trunking

The following steps show how to enable trunking.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Disable the desired ports by entering the **portdisable port** command for each port to be included in the TA.
3. Enter the **porttrunkarea--enable 3** command with the appropriate options to form a trunk group for the desired ports. For example, if ports 36-39 were disabled in step 2, then the following example command forms a trunk group for ports 36-39 with index 37. These will be connected to N\_Ports on an AG device.

```
switch:admin> porttrunkarea --enable 36-39 -index 37
Trunk area 37 enabled for ports 36, 37, 38 and 39.
```

4. Enter the **portenable port** command for each port in the TA to re-enable the desired ports, such as ports 36-39.

5. Enter the **switchshow** command to display the switch or port information, including created trunks.

## Disabling F\_Port trunking

Use the following steps to disable F\_Port trunking.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **porttrunkarea --disable** command.

```
switch:admin> porttrunkarea --disable 36-39
ERROR: port 36 has to be disabled
```

If an error occurs as in the previous example, disable each port using the **portdisable port** command, and then reissue the command.

```
switch:admin> porttrunkarea --disable 36-39
trunk area 37 disabled for ports 36, 37, 38 and 39.
```

## Monitoring trunking

For F\_Port masterless trunking, you must install monitors on the F\_Port trunk port. If the master port changes, you need not move the monitors to the new master port. For example, if a master port goes down, a new master port is selected from the remaining slave ports and becomes active. The new master port monitoring starts automatically because the existing F\_Port trunk ports have monitors installed. When you add a monitor to a slave port, it is automatically added to the master port.

For more information about installing monitors on F\_Port trunks, refer to the *Flow Vision Administrator's Guide* publication.

## AG trunking considerations for the Edge switch

Refer to the following table for information about trunking considerations for the Edge switch.

**TABLE 10** Access Gateway trunking considerations for the Edge switch

Category	Description
Area assignment	You statically assign the area within the trunk group on the Edge switch. That group is the F_Port masterless trunk. The static trunk area you assign must fall within the F_Port trunk group starting from port 0 on an Edge switch or blade. The static trunk area you assign must be one of the port's default areas of the trunk group.
Authentication	Authentication occurs only on the F_Port trunk master port and only once per the entire trunk. This behavior is the same as E_Port trunk master authentication. Because only one port in the trunk does FLOGI to the switch, and authentication follows FLOGI on that port, only that port displays the authentication details when you issue the <b>portshow</b> command.  <b>NOTE</b> Authentication is also supported on switches configured in AG mode.
Management Server	Registered Node ID (RNID), Link Incident Record Registration (LIRR), and Query Security Attributes (QSA) Extended Link Service Requests (ELSSs) are not supported on F_Port trunks.
Trunk area	The port must be disabled before assigning a Trunk Area on the Edge switch to the port or removing a Trunk Area from a trunk group. You cannot

**TABLE 10** Access Gateway trunking considerations for the Edge switch (continued)

Category	Description
	assign a Trunk Area to ports if the standby CP is running a firmware version earlier than Fabric OS 6.2.0.
PWWN	The entire Trunk Area trunk group shares the same Port WWN within the trunk group. The PWWN is the same across the F_Port trunk that will have 0x2f or 0x25 as the first byte of the PWWN. The TA is part of the PWWN in the format listed in <a href="#">Table 11</a> .
Downgrade	<p>You can have trunking on, but you must disable the trunk ports before performing a firmware downgrade.</p> <p><b>NOTE</b> Removing a Trunk Area on ports running traffic is disruptive. Use caution before assigning a Trunk Area if you need to downgrade to a firmware earlier than Fabric OS 6.1.0.</p>
Upgrade	No limitations on upgrade to Fabric OS 7.1.0 and subsequent releases if the F_Port is present on the switch. Upgrading is not disruptive.
HA Sync	If you plug in a standby CP with a firmware version earlier than Fabric OS v6.1.0 and a Trunk Area is present on the switch, the CP blades will become out of sync.
Port Types	Only F_Port trunk ports are allowed on a Trunk Area port. All other port types that include F/FL/E/EX are persistently disabled.
Default Area	Port X is a port that has its Default Area the same as its Trunk Area. The only time you can remove port X from the trunk group is if the entire trunk group has the Trunk Area disabled.
<b>portCfgTrunkPort</b> <i>[slot/] port, 0</i>	<b>portCfgTrunkPort</b> <i>[slot/] port, 0</i> will fail if a Trunk Area is enabled on a port. The port must be Trunk Area-disabled first.
<b>switchCfgTrunk 0</b>	<b>switchCfgTrunk 0</b> will fail if a port has TA enabled. All ports on a switch must be TA disabled first.
Port Swap	When you assign a Trunk Area to a Trunk group, the Trunk Area cannot be port swapped; if a port is swapped, then you cannot assign a Trunk Area to that port.
Trunk Master	No more than one trunk master is permitted in a trunk group is permitted. The second trunk master will be persistently disabled with reason "Area has been acquired".
Fast Write	When you assign a Trunk Area to a trunk group, the trunk group cannot have fast write enabled on those ports; if fast-write is enabled on a port, the port cannot be assigned a Trunk Area.
FICON	FICON is not supported on F_Port trunk ports. However, FICON can still run on ports that are not F_Port trunked within the same switch.
Trunking	You must first enable trunking on the port before the port can have a Trunk Area assigned to it.
PID format	F_Port masterless trunking is only supported in CORE PID format.
Long Distance	Long distance is not allowed when AG is enabled on a switch. This means you cannot enable long distance on ports that have a Trunk Area assigned to them.
Port mirroring	Port mirroring is not supported on Trunk Area ports or on the PID of an F_Port trunk port.
Port speed	Ports within a trunk must have the same port speed for a trunk to successfully be created.



**TABLE 10** Access Gateway trunking considerations for the Edge switch (continued)

Category	Description
<b>configDownload</b> and <b>configUpload</b>	<p>If you issue the <b>configdownload</b> command for a port configuration that is not compatible with F_Port trunking, and the port is Trunk-Area-enabled, then the port will be persistently disabled.</p> <p><b>Note:</b> Configurations that are not compatible with F_Port trunking are long distance, port mirroring, non-CORE_PID, and Fast Write.</p> <p>If you issue the <b>configupload</b> command, consider the following:</p> <ul style="list-style-type: none"> <li>• A configuration file uploaded when AG mode is disabled cannot be downloaded when AG mode is enabled.</li> <li>• A configuration file uploaded when AG mode is enabled cannot be downloaded when AG mode is disabled.</li> <li>• A configuration file uploaded when the PG policy is enabled cannot be downloaded when the APC policy is enabled.</li> <li>• A configuration file uploaded when the APC policy is enabled cannot be downloaded when the PG policy is enabled.</li> </ul>
ICL port	F_Port trunks are not allowed on ICL ports. The <b>porttrunkarea</b> command does not allow it.
AD	You cannot create a Trunk Area on ports with different Admin Domains. You cannot create a Trunk Area in AD255.
DCC Policy	DCC policy enforcement for the F_Port trunk is based on the Trunk Area; the FDISC request to a trunk port is accepted only if the WWN of the attached device is part of the DCC policy against the TA. The PWWN of the FLOGI sent from the AG will be dynamic for the F_Port trunk master. Because you do not know ahead of time what PWWN AG will use, the PWWN of the FLOGI will not go through DCC policy check on an F_Port trunk master. However, the PWWN of the FDISC will continue to go through DCC policy check.
D,I Zoning (D,I) AD (D, I) DCC and (PWWN, I) DCC	<p>Creating a Trunk Area may remove the Index ("I") from the switch to be grouped to the Trunk Area. All ports in a Trunk Area share the same "I". This means that Domain,Index (D,I), which refers to an "I", that might have been removed, will no longer be part of the switch.</p> <p><b>Note :</b> Ensure to include AD, zoning, and DCC when creating a Trunk Area.</p> <p>You can remove the port from the Trunk Area to have the "I" back into effect. D,I will behave as normal, but you may see the effects of grouping ports into a single "I".</p> <p>Also, D,I continues to work for Trunk Area groups. The "I" can be used in D,I if the "I" was the "I" for the Trunk Area group.</p> <p><b>Note :</b> "I" refers to Index and D,I refers to Domain,Index.</p>
Two masters	Two masters is not supported in the same F_Port trunk group.
QoS	Supported.

Refer to the following table for information about PWWN format for F\_Port and N\_Port trunk ports.

NAA = 2	2f:xx:nn:nn:nn:nn:nn:nn (1)	Port WWNs for: switch FX_Ports.	The valid range of xx is [0 - FF], for a maximum of 256 port WWNs.
---------	--------------------------------	------------------------------------	--

NAA = 2	25:xx:nn:nn:nn:nn:nn (1)	Port WWNs for: switch FX_Ports	The valid range of xx is [0 - FF], for a maximum of 256 port WWNs.
---------	-----------------------------	--------------------------------	--

## Trunking considerations for Access Gateway mode

Consider the following for trunking in Access Gateway mode:

- Access Gateway trunking is not supported on M-EOS or third-party switches.
- Trunk groups cannot span across multiple N\_Port groups within an AG module in AG mode. Multiple trunk groups are allowed within the same N\_Port group. All ports within a trunk group must be part of the same port group; ports outside of a port group cannot form a trunk group.
- The **ag --wwnmapshow** command will not display trunking for device-mapped ports. If a device is mapped to a port with device mapping and that port is currently part of a trunk, then the device will use that trunk. When trunking is used with the Device Load Balancing policy, then the load on each trunk will be proportional to the number of ports in that trunk. Use the **ag --show** command to determine the devices using a particular trunk.

## Upgrade and downgrade considerations for trunking in Access Gateway mode

The Brocade G620 is supported in Fabric OS v8.0.0 and subsequent releases. Downgrading to a prior release is not supported.

## Adaptive Networking on Access Gateway

Adaptive Networking (AN) services ensure bandwidth for critical servers, virtual servers, or applications in addition to reducing latency and minimizing congestion. Adaptive Networking in Access Gateway works in conjunction with the Quality of Service (QoS) feature on Brocade fabrics. Fabric OS provides a mechanism to assign traffic priority, (high, medium, or low) for a given source and destination traffic flow. By default, all flows are marked as medium.

You can configure the ingress rate limiting and SID/DID traffic prioritization levels of QoS for the following configurations:

- Supported HBA to AG to switch
- Unsupported HBA to AG to switch

### QoS: Ingress rate limiting

Ingress rate limiting restricts the speed of traffic from a particular device to the switch port. On switches in AG mode, you must configure ingress rate limiting on F\_Ports.

For more information and procedures for configuring this feature, refer to "Ingress Limiting" in the *Fabric OS Administrator's Guide*.

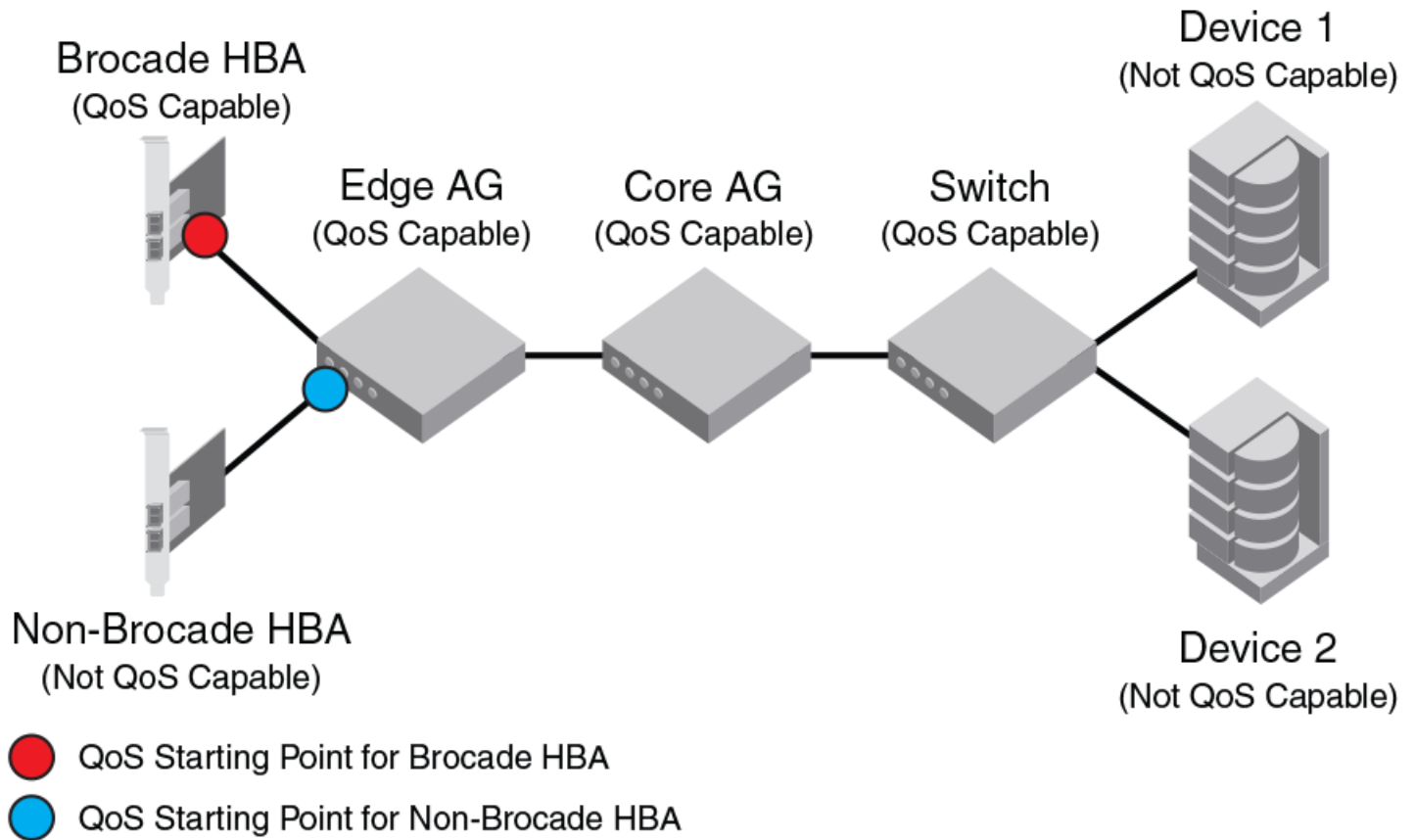
### QoS: SID/DID traffic prioritization

SID/DID traffic prioritization allows you to categorize the traffic flow between a given host and target as having a high or low priority; the default is medium. For example, you can assign online transaction processing (OLTP) to a high priority and the backup traffic to a low priority.

For detailed information on this feature, refer to "QoS: SID/DID traffic prioritization" in the *Fabric OS Administrator's Guide*.

The following figure shows the starting point for QoS in various Brocade and non-Brocade configurations.

FIGURE 13 Starting point for QoS



## Upgrade and downgrade considerations for Adaptive Networking in AG mode

The Brocade G620 is supported in Fabric OS v8.0.0 and subsequent releases. Downgrading to a prior release is not supported.

## Adaptive Networking on Access Gateway considerations

- QoS is configured in the fabric, as normal, and not on the AG device.
- You should disable HBA QoS if connecting to an AG device running Fabric OS 6.2 or prior release.
- Disable QoS on an AG port if it connects with a switch running Fabric OS 6.2. Otherwise, the port will automatically disable with an error. To recover, disable QoS on the port, and then enable the port.
- Disabling QoS on online N\_Ports in the same trunk can cause the slave N\_Port ID Virtualization (NPIV) F\_Port on the Edge switch to become persistently disabled with "Area has been acquired." This is expected behavior because after QoS is disabled, the slave NPIV F\_Port on the Edge switch also tries to come up as a master. To avoid this issue, simply persistently enable the slave F\_Port on the switch.
- QoS takes precedence over ingress rate limiting
- Ingress rate limiting is not enforced on trunked ports.

## Per-Port NPIV login limit

The Per-Port NPIV login limit feature allows you to set a specific maximum NPIV login limit on individual ports. This feature works in both Native and Access Gateway modes. Using this feature, you can use additional tools to design and implement a virtual infrastructure. In Access Gateway mode, this feature allows smaller login limits for F\_Ports and larger limits for N\_Ports. Note that N\_Ports are restricted by the NPIV login limit of the connecting port on the Edge switch.

Note the following aspects of this feature:

- The value that you set is persistent across reboots and firmware upgrades.
- This feature supports virtual switches, so each port can have a specific NPIV login limit value in each logical switch.
- The login limit default is 126. This value will be set for a port when the **portCfgDefault** command is used to reset port default values. The F\_Port must then be re-mapped to its N\_Port after using **portCfgDefault**.
- Before changing the login limits, you must disable the port.
- This feature only applies to ports enabled for NPIV operation. To enable NPIV functionality for a port, you can use the **portCfgNPIVPort --enable** command when the switch is in Fabric OS Native mode. For details, refer to the *Fabric OS Command Reference*.

## Setting the login limit

Use the following procedure to set the NPIV login limit for a port.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Disable the port by entering the **portdisable port** command.
3. Enter the **portcfgnpiv --setloginlimit [Slot/]Port loginlimit[ Slot/] Port loginlimit** command to set the login limit. For example, the following example sets the login limit on port 12 to 200.

```
portcfgnpivport --setloginlimit 12 200
```

## Duplicate PWWN handling during device login

Handling of logins from two devices using the same PWWN follows standards for all Fabric OS switches. Having two devices with the same PWWN logged into the fabric at the same time may not be desirable, as there have been cases when ports coming online get stuck in G\_Port state in the AG switch. You can configure three policies:

- Default: The Access Gateway switch will not accept a second login request from a PWWN when a device with the same PWWN has already logged into the fabric. The second request with similar PWWN will be rejected and the port will be persistently disabled with reason as "Duplicate Port WWN detected."
- Enforced login: The second login request will have precedence over the existing login and Access Gateway will accept the login.
- Mixed: This option takes port type into consideration. The second login request will have precedence over the existing login in case of a duplicate entry exit on the F\_Port with an NPIV device logged in. The first login takes precedence over the second login request in case of a duplicate entry exit on the F\_Port without any NPIV device logged in.

You can configure different handling of duplicate PWWNs other than the default operation using the **configure** command through the F\_Port login parameters. For more information on configuration and handling of duplicate PWWNs during device login, refer to the "Duplicate PWWN handling during device login" section in the *Fabric OS Administrator's Guide*.

This feature is supported in the following configurations:

- AG switch connected to Brocade fabric switch.

- AG switch connected to a Host Bus Adapter (HBA).

## Performance Monitoring

Performance monitoring is available through the Flow Vision Flow Monitor feature for platforms using Fabric OS 7.2 and later. In Fabric OS 7.4.0 and later, legacy Advanced Performance Monitoring features are no longer supported.

### Flow Monitor

Flow Vision flow monitoring is a licensed feature supported on platforms using Fabric OS 7.2.0 and later. It provides a unified platform to manage traffic-related applications on Fabric OS devices. Storage administrators can use this platform to simulate, monitor, and capture the network's traffic patterns and to make capacity-planning decisions based on the collected statistical data.

To access Flow Vision, the Fabric Vision (FV) license must be installed on the switch.

The Flow Monitor component of Flow Vision is supported by Access Gateway. Flow Monitor allows you to monitor the network's traffic pattern and provides statistics to make capacity planning decisions based on the collected data. Flow Monitor provides a single interface to manage flows and unifies different performance monitoring features such as end-to-end monitors and frame monitors.

Flow Monitor expands on basic performance monitoring by allowing you to monitor any hardware-supported flow parameters and define your own flows using combinations of source and destination devices, source and destination IDs, LUN IDs, CSCTL values, and frame types as parameters.

Following are examples of monitors that you can replicate using Flow Monitor:

- End to End Monitor: This measures the traffic in terms of word count between a pair of ports (host and target). Use this to view end-to-end traffic values on an Access Gateway.
- Frame monitoring: Set up an SCSI monitor so that you can view the **-frametype** frame and byte count for a flow.
- LUN monitoring: This allows you to view the **-frametype** frame and byte count for a specific LUN.
- Flow learning monitor: This learns flows going through a specific F\_Port in the Access Gateway.
- DST monitor: This provides the legacy support equivalent to a frame monitor.

Access Gateway switches support flow monitors on F\_Ports only, and only the ingress port parameter is supported. For more information on using Flow Monitor features for Access Gateway in Flow Vision, refer to the *Flow Vision Administrator's Guide*.

## Considerations for the Brocade 6505 and 6510, and Brocade G620

The Brocade 6505 and 6510, and Brocade G620 can function in either Fabric OS Native mode or Brocade Access Gateway mode. These switches are shipped in Fabric OS Native mode. They are also supported in Access Gateway cascaded configurations. All PoD licenses must be present to support Access Gateway for all releases prior to Fabric OS 7.3.0. However, starting with Fabric OS 7.3.0, all PoD licenses are not required. The Brocade G620 is supported in Fabric OS 8.0.1 and later.



# SAN Configuration with Access Gateway

- Connectivity of multiple devices overview..... 79
- Direct target attachment..... 79
- Target aggregation..... 81
- Access Gateway cascading..... 82
- Fabric and Edge switch configuration..... 84
- Connectivity to Cisco fabrics..... 85
- Rejoining Fabric OS switches to a fabric..... 85

## Connectivity of multiple devices overview

This chapter describes how to connect multiple devices to a switch in Access Gateway (AG) mode, and discusses Edge switch compatibility, target aggregation, direct target attachment, port requirements, NPIV HBA, and interoperability. Switches in AG mode can connect to third-party fabrics with the following firmware versions:

- Fabrics operating with M-EOSc v9.6.2 or later and M-EOSn v9.6 or later.
- Cisco fabrics that support standards-based NPIV.

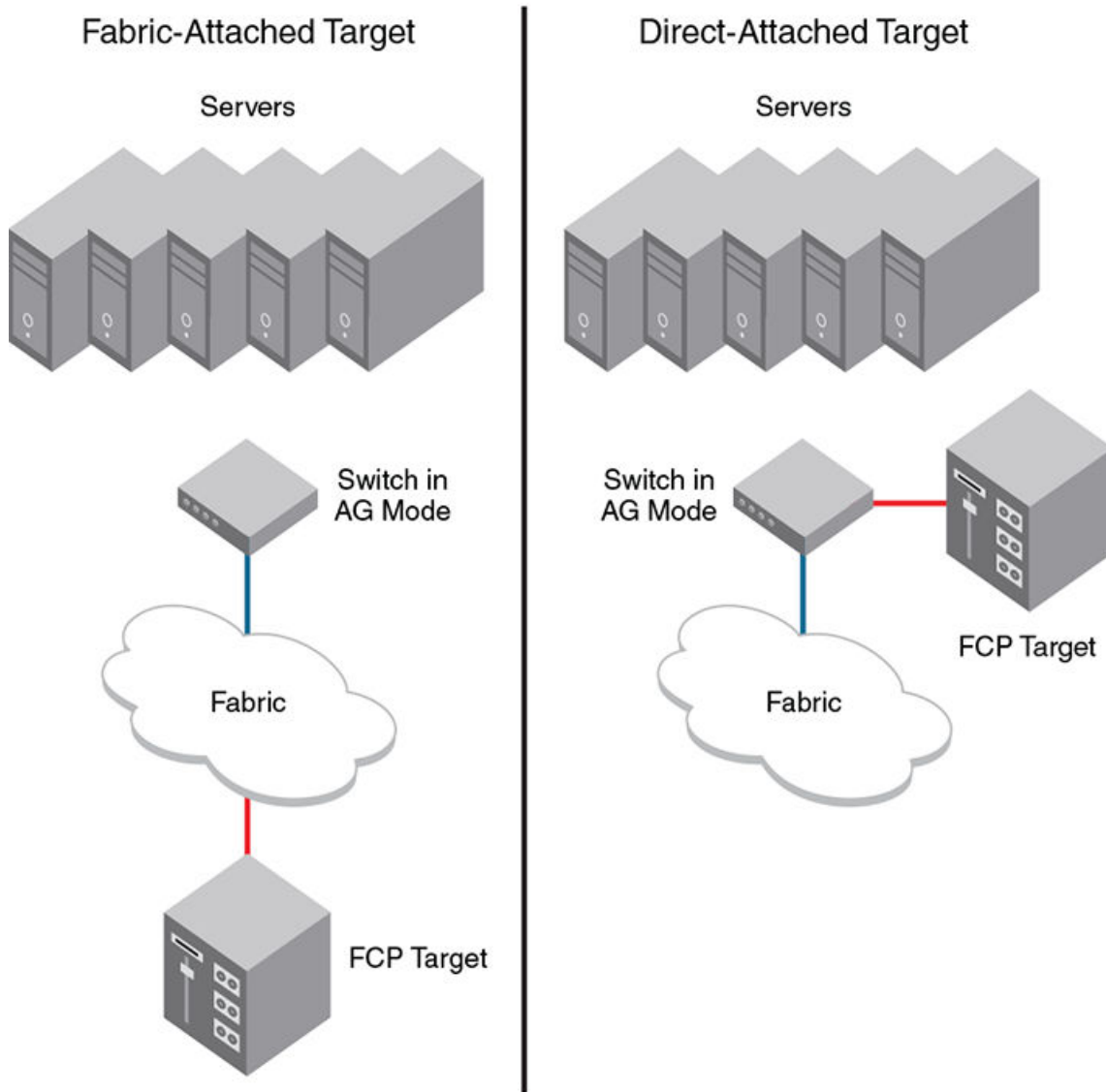
## Considerations for connecting multiple devices

Consider the following points when connecting multiple devices to a switch in AG mode:

- AG does not support daisy chaining when two AG devices are connected to each other in a loop configuration.
- Loop devices and FICON channels/control unit connectivity are not supported.
- When a switch is in AG mode, it can be connected to NPIV-enabled HBAs, or F\_Ports that are NPIV-aware. Access Gateway supports NPIV industry standards per FC-LS-2 v1.4.

## Direct target attachment

FCP targets can directly connect to an AG module instead of through a fabric connection, as illustrated in the following figure.

**FIGURE 14** Direct target attachment to switch operating in AG mode

Although target devices can be connected directly to AG ports, it is recommended that the switch operating in AG mode be connected to the core fabric.

## Considerations for direct target attachment

Consider the following points for direct target attachment:

- Direct target attachment to AG is only supported if the AG module is also connected to a core fabric. A switch module running in AG mode does not provide Name Services on its own, and routing to the target devices must be established by the core fabric.
- A recommended practice is that you do not map hosts and targets to the same N\_Port.

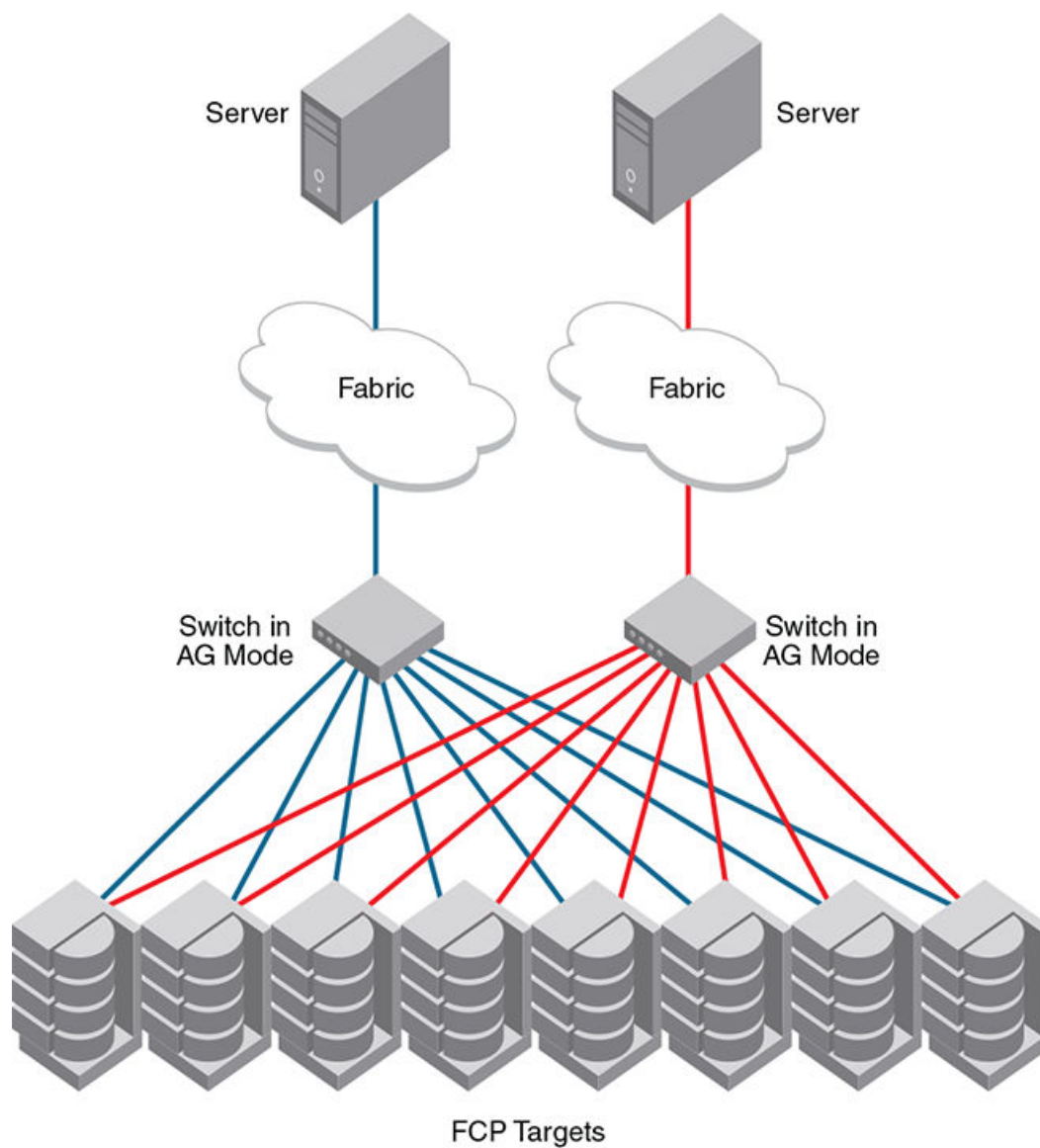


- Redundant configurations should be maintained so that when hosts and targets fail over or fail back, they do not get mapped to a single N\_Port.
- Hosts and targets should be in separate port groups.
- Direct target attachment configurations are not enforced.

## Target aggregation

Access Gateway mode is normally used as host aggregation. In other words, a switch in AG mode aggregates traffic from a number of host systems onto a single uplink N\_Port. Similarly, many targets can be aggregated onto to a single uplink N\_Port, as shown in the following figure. Target aggregation has many applications. As one example, you can consolidate targets with various lower Fibre Channel speeds (such as 1, 2, or 4 Gbps) onto a single high-speed uplink port to the core fabric. This reduces the number of core fabric ports used by target devices and allows higher scalability.

FIGURE 15 Target aggregation

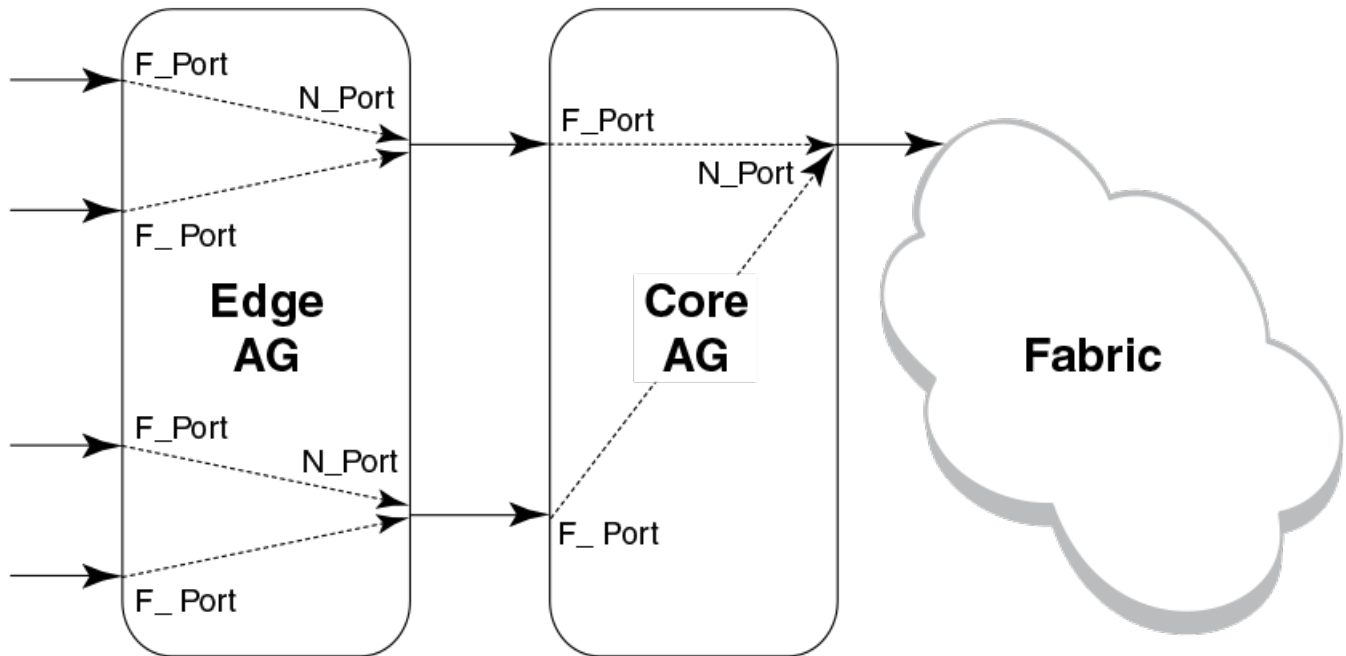


## Access Gateway cascading

Access Gateway cascading is an advanced configuration supported in Access Gateway mode. Access Gateway cascading allows you to further increase the ratio of hosts to fabric ports to beyond what a single switch in AG mode can support.

Access Gateway cascading allows you to link two Access Gateway (AG) switches back to back. The AG switch that is directly connected to the fabric is referred to as the Core AG. In this document, the AG switch connected to the device is referred to as the Edge AG.

FIGURE 16 Access Gateway cascading



AG cascading provides higher over-subscription because it allows you to consolidate the number of ports going to the main fabric. There is no license requirement to use this feature.

## Access Gateway cascading considerations

Note the following configuration considerations when cascading Access Gateways:

- Only one level of cascading is supported. Note that several Edge AG switches can connect into a single Core AG switch to support an even higher consolidation ratio.
- AG trunking between the Edge and Core AG switches is not supported. Trunking between the Core AG switch and the fabric is supported.
- It is recommended that you enable Advanced Device Security (ADS) policy on all AG F\_Ports that are directly connected to devices.
- APC policy is not supported when cascading.
- Loopbacks (Core AG N\_Port to Edge AG F\_Port) are not allowed.
- The **agshow** command issued on the fabric will discover only the Core AG switches. If issued as **agshow --name AG name**, then the F\_Ports of both the Core and Edge AG switches will be shown for the Core AG switch.
- Due to high subscription ratios that could occur when cascading AG switches, ensure there is enough bandwidth for all servers when creating such configurations. The subscription ratio becomes more acute in a virtual environment.
- In Fabric OS 7.3.0 and later, the registration and de-registration of FDMI devices connected to an AG switch or cascaded AG switch is supported, and the **fdmishow** command on AG will display the local FDMI devices connected to the AG. However, remote FDMI devices will not be displayed.

## Fabric and Edge switch configuration

To connect devices to the fabric using Access Gateway, configure the fabric and Edge switches within the fabric that will connect to the AG module using the following parameters. These parameters apply to Fabric OS, M-EOS, and Cisco-based fabrics:

- Install and configure the switch as described in the switch's hardware reference manual before performing these procedures.
- Verify that the interop mode parameter is set to Brocade Native mode.
- Configure the F\_Ports on the Edge switch to which Access Gateway is connected as follows:
  - Enable NPIV.
  - Disable long distance mode.
  - Allow multiple logins for M-EOS switches. The recommended fabric login setting is the maximum allowed per port and per switch.
- Use only WWN zoning for devices behind AG.
- If DCC security is being used on Edge switches that directly connect to AG, make sure to include the Access Gateway WWN or the port WWN of the N\_Ports. Also include the HBA WWNs that will be connected to AG F\_Ports in the switch's Access Control List (ACL). It is recommended to use AG ADS policy instead of the DCC policy on the Edge switch.
- Allow inband queries for forwarded fabric management requests from the hosts. Add the Access Gateway switch WWN to the access list if inband queries are restricted.

Before connecting Access Gateway to classic Brocade switches, disable the Fabric OS Management Server Platform Service to get accurate statistical and configuration fabric data.

## Verifying the switch mode

The following steps show how to verify the switch mode.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **switchShow** command to display the current switch configuration.

The following example shows partial output for this command for a switch in the Fabric OS Native mode where **switchMode** displays as Native.

```
switch:admin> switchshow
switchName:      switch
switchType:      76.6
switchState:     Online
switchMode:      Native
switchRole:      Subordinate
switchDomain:     13
switchId:        fffc01
switchWwn:       10:00:00:05:1e:03:4b:e7
zoning:          OFF
switchBeacon:    OFF
=====
```

Refer to [Table 5](#) on page 28 for a description of the port state.

If the switch is in Native mode, you can enable AG mode; otherwise, set the switch to Native mode, and then reboot the switch.

## Enabling NPIV on M-EOS switches

The following steps show how to enable NPIV on M-EOS switches.

1. Connect to the switch and log in as admin on the M-EOS switch.
2. Enable Open Systems Management Server (OSMS) services by using the following command.

For the Mi10K switch, enter the following command.

```
fc osmsState vfid state
```

In the command, *vfid* is the virtual fabric identification number. The *state* variable can be **enable** for the enabled state or **disable** for the disabled state.

The *osmsState* variable can be **enable** or **1** for the enabled state or **disable** or **0** for the disabled state.

3. Enable NPIV functionality on the Edge fabric ports so that multiple logins are allowed for each port. Use the following command on the M-EOS switch to enable NPIV on the specified ports.

```
config NPIV
```

Your M-EOS switch is now ready to connect.

#### NOTE

You can use the **agshow** command to display Access Gateway information registered with the fabric. When an Access Gateway is exclusively connected to non-Fabric-OS-based switches, it will not show up in the **agshow** output on other Brocade switches in the fabric.

## Connectivity to Cisco fabrics

When connecting a switch in Access Gateway mode to a Cisco fabric, you need to make sure that NPIV is enabled on the connecting switch and that Fabric OS 3.1.0 or later is used.

## Enabling NPIV on a Cisco switch

The following steps show how to enable NPIV on a Cisco switch.

1. Log in as admin on the Cisco MDS switch.
2. Enter the **show version** command to determine if you are using the correct SAN operating system version and if NPIV is enabled on the switch.
3. Enter the **configure terminal** command to begin configuration mode on the MDS switch.
4. Enter the **npiv enable** command to enable NPIV.
5. Press **Ctrl-Z** to exit configuration mode.
6. Enter the **copy** command to save the configuration.
7. Enter the **run** command to load the configuration.
8. Enter the **start** command to restart the switch with the new configuration.

Your Cisco switch is now ready to connect to a switch in Access Gateway mode.

## Rejoining Fabric OS switches to a fabric

When a switch reboots after AG mode is disabled, the Default zone is set to "no access." Therefore, the switch does not immediately join the fabric to which it is connected. Use one of the following methods to rejoin a switch to the fabric:

- If you saved a Fabric OS configuration before enabling AG mode, download the configuration using the **configDownload** command.
- If you want to rejoin the switch to the fabric using the fabric configuration, use the following procedure.

To rejoin the Fabric OS switch to a fabric, perform the following steps:

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **switchDisable** command to disable the switch.
3. Enter the **defZone --allAccess** command to allow the switch to merge with the fabric.
4. Enter the **cfgSave** command to commit the Default zone changes.
5. Enter the **switchEnable** command to enable the switch and allow it to merge with the fabric.

The switch automatically rejoins the fabric.

## Reverting to a previous configuration

The following steps show how to revert to a previous configuration.

1. Connect to the switch and log in using an account assigned to the admin role.
2. Enter the **switchDisable** command to disable the switch.
3. Enter the **configDownload** command to revert to the previous configuration.
4. Enter the **switchEnable** command to bring the switch back online.

The switch automatically joins the fabric.

# Troubleshooting

The following table provides troubleshooting information for Fabric OS switches in AG mode.

**TABLE 12** Troubleshooting

Problem	Cause	Solution
Switch is not in Access Gateway mode	Switch is in Native switch mode	<p>Disable switch using the <b>switchDisable</b> command.</p> <p>Enable Access Gateway mode using the <b>ag --modeenable</b> command.</p> <p>Answer yes when prompted; the switch reboots.</p> <p>Log in to the switch.</p> <p>Display the switch settings using the <b>switchShow</b> command. Verify that the field <b>switchMode</b> displays Access Gateway mode.</p>
NPIV disabled on Edge switch ports	Inadvertently turned off	<p>On the Edge switch, enter the <b>portCfgShow</b> command.</p> <p>Verify that NPIV status for the port to which Access Gateway is connected is ON.</p> <p>If the status displays as "--" NPIV is disabled. Enter the <b>portCfgNpivPort port_number</b> command with the <b>enable</b> option to enable NPIV.</p> <p>Repeat this step for each port as required.</p>
Need to reconfigure N_Port and F_Ports	Default port setting not adequate for customer environment	<p>Enter the <b>portCfgShow</b> command.</p> <p>For each port that is to be activated as an N_Port, enter the <b>portCfgNport port_number</b> command with the <b>1</b> option.</p> <p>All other ports remain as F_Ports.</p> <p>To reset the port to an F_Port, enter the <b>portCfgNpivPort port_number</b> command with the <b>disable</b> option.</p>
LUNs are not visible	<p>Zoning on fabric switch is incorrect.</p> <p>Port mapping on Access Gateway mode switch is incorrect.</p> <p>Cabling not properly connected.</p>	<p>Verify zoning on the Edge switch.</p> <p>Verify that F_Ports are mapped to an online N_Port. Refer to <a href="#">Table 7</a> on page 30.</p> <p>Perform a visual inspection of the cabling; check for issues such as wrong ports, twisted cable, or bent cable. Replace the cable and try again.</p> <p>Ensure the F_Port on AG module is enabled and active.</p>
Failover is not working	Failover disabled on N_Port.	<p>Verify that the failover and failback policies are enabled, as follows:</p> <p>Enter the <b>ag --failoverShow</b> command with the <i>port_number</i> option.</p> <p>Enter the <b>ag --failbackShow</b> command with the <i>port_number</i> option.</p>

TABLE 12 Troubleshooting (continued)

Problem	Cause	Solution
		<p>Command returns "Failback (or Failover) on N_Port <i>port_number</i> is supported."</p> <p>If it returns, "Failback (or Failover) on N_Port <i>port_number</i> is not supported." Refer to <a href="#">Adding a preferred secondary N_Port (optional)</a> on page 62.</p>
Access Gateway is mode not wanted	Access Gateway must be disabled.	<p>Disable switch using the <b>switchDisable</b> command.</p> <p>Disable Access Gateway mode using the <b>ag --modeDisable</b> command.</p> <p>Answer yes when prompted; the switch reboots.</p> <p>Log in to the switch.</p> <p>Display the switch settings using the <b>switchShow</b> command. Verify that the field <b>switchMode</b> displays Fabric OS Native mode.</p>
"Login Rejected by FC stack" messages on console may be seen during F_Port and N_Port disruptions on Brocade 8470 in AG mode.	The CNA host is retrying a login before the switch has finished processing a previous fabric logout (LOGO) attempt.	Messages display as designed. After the switch has completed LOGO processing, it will accept another login.