

Brocade SAN Scalability Guidelines for Brocade Fabric OS 8.X

Version 8.2

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Contents

- Preface.....4
 - Document History.....4
 - About Brocade.....4
- Supported Platforms.....5
- Brocade FOS Layer 2 Scalability Limits.....6
- Brocade Virtual Fabrics Scalability.....9
- Fibre Channel Routing Scalability.....10
- Topologies Supported Using Inter-Chassis Links.....12

Preface

- Document History..... 4
- About Brocade..... 4

Document History

Date	Part Number	Description
11/17/2016	53-1004800-01	Initial version.
5/2/2017	53-1004800-02	Updated with an increased scalability limit with FOS 8.1 and limits for the Brocade G610 when applicable.
6/26/2018	53-1004800-03	Updated with limits for the Brocade G630.

About Brocade

Brocade, a Broadcom Inc. company, provides innovative storage networking solutions for data center, campus, and service provider networks, helping to reduce complexity and cost while enabling virtualization and cloud computing to increase business agility. To help ensure a complete solution, Brocade partners with world-class IT companies and provides comprehensive education, support, and professional services offerings (www.broadcom.com).

Supported Platforms

Brocade Fabric OS (FOS) version 8.X supports only 16Gb/s and 32Gb/s hardware platforms. This document provides scalability information for these platforms, but it does not cover hardware that operates with Brocade FOS versions before 8.0. Refer to the release notes for specific hardware models supported by a particular version of Brocade FOS.

For scalability guidelines related to Brocade FOS 7.X, refer to the [Brocade SAN Scalability Guidelines: Brocade Fabric OS v7.X](#).

Other Brocade products may participate in storage area networks (SANs) with products that use Brocade FOS 8.X via either Fibre Channel Routing (FCR) or direct Layer 2 (E_Port) fabric interoperability. In general, Brocade recommends following the recommendations from your equipment vendor, along with published Target Path release guidelines to select the ideal code level to run on a product.

Refer to the latest Brocade Fabric OS release notes for recommended and minimum versions required for fabric compatibility.

Brocade FOS Layer 2 Scalability Limits

Fabric scalability is typically limited by the least capable switch that participates in the fabric. [Table 1](#) provides the limits for products that are running Brocade Fabric OS 8.X. If a fabric includes products that are operating with an older version of Brocade FOS, the limits of the fabric must not exceed the maximum limits of that older version of Brocade FOS. For the appropriate limits, refer to the specific Brocade Fabric OS release notes and the appropriate SAN scalability guidelines.

[Table 1](#) provides two numbers for each fabric metric:

- The first number ("Tested") is the limit that has been explicitly tested by Brocade during the qualification process. This number is the maximum recommended limit to ensure the utmost stability and reliability.
- The second number ("Supported") is the maximum limit that Brocade supports. These values exceed what has been explicitly tested by Brocade, but they fall within reasonable limits for use in production environments. Brocade recommends that any fabric deployment that exceeds the tested limits be verified first in a nonproduction environment to ensure reliable behavior.

When only a single value is listed, it means that both values are the same.

TABLE 1 Brocade FOS Layer 2 Scalability Limits

Metric	Tested/Supported Limits for Brocade FOS 8.0 (and Later)
Maximum number of domains per fabric in Brocade FOS Native mode	56/56
Number of device connections in the fabric (initiators, targets, or NPIV devices logged in to the fabric) in Brocade FOS Native mode (interopmode 0)	9000/9000 (for fabrics with the following platforms only: Brocade X6/G610/G620/G630) ⁵ 6000/6000 (for fabrics with the following platforms only: Brocade DCX 8510/X6 and Brocade 6505/6510/6520/7840/G610/G620/G630)
Maximum number of logged-in devices per fabric with the management server enabled	1000
Maximum number of NPIV devices per port	255 127 (for the shared area ports on the Brocade FC8-48E and FC8-64 blades)
Maximum number of devices (initiators, targets, or NPIV devices) per switch	2048/2048 (Brocade DCX 8510/X6/6505/6510/6520/7840/G610/G620/G630 in a fabric with other platforms <i>not</i> listed here) 2048/4096 (Brocade DCX 8510/X6/6505/6510/6520/7840/G610/G620/G630 in a fabric with only the platforms listed here) 6000/6000 (for the Brocade X6)
Maximum number of NPIV devices per fabric	Refer to the <i>Number of device connections in the fabric</i> row above.
Maximum number of unique zone members (2 members per zone) ¹	Refer to Table 2 and Table 3, Brocade FOS Zoning Database Limits.
Maximum number of unique zone members (16 members per zone) ¹	Refer to Table 2 and Table 3, Brocade FOS Zoning Database Limits.
Maximum number of zones (2 members per zone) ¹	Refer to Table 2 and Table 3, Brocade FOS Zoning Database Limits.
Maximum number of zones (16 members per zone) ¹	Refer to Table 2 and Table 3, Brocade FOS Zoning Database Limits.
Maximum number of zone sets ¹	The total of all zone sets cannot exceed the overall 1-MB or 2-MB zoning database size. ²
Security database: SCC and DCC policies ⁴	56 switch WWNs 2560/9000 end device WWNs (should not exceed the device connection limit for the fabric or the 1-MB DCC policy size limit) ⁵
Maximum number of hops from source to destination	7 (19 for routed fabrics)
Maximum number of inter-switch links (ISLs) per switch	No limit (maximum port count)

TABLE 1 Brocade FOS Layer 2 Scalability Limits (continued)

Metric	Tested/Supported Limits for Brocade FOS 8.0 (and Later)
Maximum number of Brocade Access Gateways per fabric	50/300
Maximum number of F_Ports mapped to a single N_Port per Brocade Access Gateway	40/100
Maximum number of N_Ports per Brocade Access Gateway	8/8
Maximum number of N_Ports (connected to Brocade Access Gateways) per hosting switch ³	60/maximum switch port count

The number of zones and zone members that can be configured in a switch's zoning database depends on several factors. Table 2 and Table 3 give some guidelines on the limits that can be supported based on examples with several different average zone name lengths and the number of members per zone. Actual limits will vary depending on actual name lengths and other factors noted below. Use the `cfgsize` command to display the total usage of zoning configuration applied. If the Virtual Fabrics feature is enabled, the zone database size limit applies to the total of all virtual fabrics (VFs).

TABLE 2 Brocade FOS Zoning Database Limits (Average Zone Name Length: 25 Characters)

Average Zone Name Length: 25 Characters	Maximum Zoning Database Size ¹ : 1 MB	Maximum Zoning Database Size ¹ : 2 MB
Maximum number of unique zone members (2 members per zone)	20,500 (WWNs) 10,000 (using aliases [1 WWN per alias, 2 aliases per zone]) 13,500 (using aliases [2 WWNs per alias, 1 alias per zone]) 33,000 (D,P)	41,000 (WWNs) 20,000 (using aliases [1 WWN per alias, 2 aliases per zone]) 27,000 (using aliases [2 WWNs per alias, 1 alias per zone]) 66,000 (D,P)
Maximum number of unique zone members (16 members per zone)	38,000 (WWNs) 12,900 (using aliases [1 WWN per alias, 16 aliases per zone]) 33,900 (using aliases [16 WWNs per alias, 1 alias per zone]) 125,000 (D,P)	76,000 (WWNs) 25,800 (using aliases [1 WWN per alias, 16 aliases per zone]) 67,800 (using aliases [16 WWNs per alias, 1 alias per zone]) 250,000 (D,P)
Maximum number of zones (2 members per zone)	10,000 (WWNs) 5000 (using aliases [1 WWN per alias, 2 aliases per zone]) 6700 (using aliases [2 WWNs per alias, 1 alias per zone]) 16,500 (D,P)	20,000 (WWNs) 10,000 (using aliases [1 WWN per alias, 2 aliases per zone]) 13,500 (using aliases [2 WWNs per alias, 1 alias per zone]) 33,000 (D,P)
Maximum number of zones (16 members per zone)	2300 (WWNs) 800 (using aliases [1 WWN per alias, 16 aliases per zone]) 2100 (using aliases [2 WWNs per alias, 1 alias per zone]) 7800 (D,P)	4700 (WWNs) 1600 (using aliases [1 WWN per alias, 16 aliases per zone]) 4200 (using aliases [16 WWNs per alias, 1 alias per zone]) 15,600 (D,P)

TABLE 3 Brocade FOS Zoning Database Limits (Average Zone Name Length: 64 Characters)

Average Zone Name Length: 64 Characters	Maximum Zoning Database Size ¹ : 1 MB	Maximum Zoning Database Size ¹ : 2 MB
Maximum number of unique zone members (2 members per zone)	11,600 (WWNs) 4700 (using aliases [1 WWN per alias, 2 aliases per zone]) 6700 (using aliases [2 WWNs per alias, 1 alias per zone])	23,200 (WWNs) 9400 (using aliases [1 WWN per alias, 2 aliases per zone]) 13,400 (using aliases [2 WWNs per alias, 1 alias per zone])

TABLE 3 Brocade FOS Zoning Database Limits (Average Zone Name Length: 64 Characters) (continued)

Average Zone Name Length: 64 Characters	Maximum Zoning Database Size ¹ : 1 MB	Maximum Zoning Database Size ¹ : 2 MB
	14,700 (D,P)	29,500 (D,P)
Maximum number of unique zone members (16 members per zone)	32,000 (WWNs) 6300 (using aliases [1 WWN per alias, 16 aliases per zone]) 25,700 (using aliases [16 WWNs per alias, 1 alias per zone]) 78,800 (D,P)	64,000 (WWNs) 12,700 (using aliases [1 WWN per alias, 16 aliases per zone]) 51,500 (using aliases [16 WWNs per alias, 1 alias per zone]) 157,700 (D,P)
Maximum number of zones (2 members per zone)	5800 (WWNs) 2300 (using aliases [1 WWN per alias, 2 aliases per zone]) 3300 (using aliases [2 WWNs per alias, 1 alias per zone]) 7300 (D,P)	11,600 (WWNs) 4700 (using aliases [1 WWN per alias, 2 aliases per zone]) 6700 (using aliases [2 WWNs per alias, 1 alias per zone]) 14,700 (D,P)
Maximum number of zones (16 members per zone)	2000 (WWNs) 390 (using aliases [1 WWN per alias, 16 aliases per zone]) 1600 (using aliases [16 WWNs per alias, 1 alias per zone]) 4900 (D,P)	4000 (WWNs) 790 (using aliases [1 WWN per alias, 16 aliases per zone]) 3200 (using aliases [16 WWNs per alias, 1 alias per zone]) 9800 (D,P)

Table Notes

¹ Brocade FOS 8.0 and later support a 2-MB zoning database for the Brocade DCX 8510 and X6 director platforms only. If any other platforms exist in a fabric, the zoning database is limited to 1 MB. If the Virtual Fabrics feature is enabled, the zoning database size limit applies to the sum of all virtual fabrics. The number of zone sets, zones, and zone members that can be stored in the database depends on a number of interrelated factors, including the number of members in each zone, the number of characters used in each zone name, and the type of zoning used (World Wide Name [WWN] or Domain/Port [D,P] members). Zone members that have aliases defined also require additional memory. The numbers in Table 2 and Table 3 are guidelines that assume the same number of members per zone and the same type of members in the zones.

² Use the `cfgSize` command to display the total usage of zoning configuration applied.

³ A hosting switch is a fabric switch to which a Brocade Access Gateway is connected. Typically, each Brocade Access Gateway has multiple connections to the host switch, and it may have multiple connections to multiple host switches, each in a different fabric.

⁴ SCC and DCC = Switch Connection Control and Device Connection Control.

⁵ Requires all switches in the fabric to be running FOS 8.1 or later.

Other Notes

The Brocade G630 Switch is supported with Brocade FOS 8.2.0 and later.

The Brocade G620 Switch is supported with Brocade FOS 8.0.0 and later.

The Brocade G610 Switch is supported with Brocade FOS 8.1.0 and later.

The Brocade X6 Director is supported with Brocade FOS 8.0.1 and later.

Brocade Virtual Fabrics Scalability

Virtual Fabrics capabilities introduce additional factors to consider when assessing scalability. Specifically, when looking at the limits that an individual chassis or switch can support, it is no longer just a factor of the size of the Layer 2 fabric or the number of devices being imported from edge fabrics. Virtual Fabrics allows a single physical chassis to participate in up to eight separate Layer 2 fabrics, not including the additional impact from imported devices from FCR.

To account for Virtual Fabrics, each physical switch has limits that are supported for the aggregate environment. This means that if a single physical switch has three individual logical switches, each one participating in an independent logical fabric, the total number of domains and logged-in host/storage devices in all three logical fabrics must be counted and compared against the physical switch limits.

The limits for individual logical fabrics are the same as those noted in the previous chapter for a traditional Layer 2 fabric.

Table 4 lists the supported limits specific to environments enabled with Virtual Fabrics.

TABLE 4 Brocade Virtual Fabrics Scalability Limits

Virtual Fabrics Supported Limits for Brocade FOS 8.0 (and Later)	
Maximum number of logical switches per chassis/switch (including the default and base switch if defined)	16 (Brocade X6) ¹ 8 (Brocade DCX 8510) 4 (Brocade 6510/6520/7840/G620/G630)
Total number of logged-in devices (from all logical fabrics) per chassis	12,000 (Brocade X6) ² 9000 (Brocade DCX 8510/6510/6520/7840/G620/G630)
Total number of fabrics (logical switches and FCR-connected edge fabrics) per chassis	48 (Brocade DCX 8510/X6) 32 (Brocade 6510/6520/7840/G620/G630)
Total number of base switches creating a single base fabric	16
Total number of logical fabrics using a single base fabric	48

Table Notes

¹ Requires the X6 to be running FOS 8.1 or later. FOS 8.0.x supports 8 logical switches per chassis.

² Requires the X6 to be running FOS 8.1 or later. FOS 8.0.x supports 9000 logged-in devices from all logical fabrics per chassis.

Fibre Channel Routing Scalability

FCR scalability limits for Brocade Fabric OS 8.X are listed in [Table 5](#). This table provides two numbers for each fabric or metaSAN metric:

- The first number (“Tested”) is the limit that has been explicitly tested by Brocade during the qualification process. This maximum recommended limit ensures the greatest stability and reliability.
 - The second number (“Supported”) exceeds what has been explicitly tested by Brocade, but it is believed to be within reasonable limits for production deployments, based on testing that has been performed. Brocade recommends that any deployment of a fabric or metaSAN that exceeds the tested limits be verified first in a nonproduction environment to ensure reliable behavior.
- Brocade will support customers that deploy configurations up to, but not exceeding, the noted supported limits.
- If only a single number is listed, the tested and supported limits are the same.

NOTE

In metaSAN configurations that use a backbone fabric with multiple routers and many inter-fabric link (IFL) connections to edge fabrics, the IFLs should be evenly balanced across routers as much as possible. Failure to do so may cause problems with synchronization of information among the routers in the fabric.

TABLE 5 Fibre Channel Routing Scalability Limits

Metric	Tested/Supported Limits for Brocade FOS 8.0 (and Later)
Maximum number of Brocade FOS edge fabrics per metaSAN (with edge fabrics containing up to 1500 WWNs)	48 (Brocade DCX 8510/X6) 24 (Brocade 6510/6520/7840/G620/G630)
Maximum number of Brocade FOS edge fabrics per metaSAN (with edge fabrics containing up to 2000 WWNs)	32 (Brocade DCX 8510/X6) 12 (Brocade 6510/6520/7840/G620/G630)
Maximum number of Brocade FOS edge fabrics per metaSAN (with one or more edge fabrics exceeding 2000 WWNs) ²	24 (Brocade DCX 8510/X6) ² 8 (Brocade 6510/6520/7840/G620/G630) ²
Maximum number of Brocade FOS edge fabrics per metaSAN with more than 2000 local WWNs ²	4 (Brocade DCX 8510/X6) ² 2 (Brocade 6510/6520/7840/G620/G630) ²
Maximum number of edge fabrics per chassis. (Edge fabrics <i>per chassis</i> may never exceed the maximum number of edge fabrics <i>per metaSAN</i> noted above. In some cases, depending on the number of devices in an edge fabric or the type of switches, the maximum number of edge fabrics per metaSAN may be less than that supported per chassis. In these cases, the lower number applies.)	30 (Brocade DCX 8510/X6) 12 (Brocade 6510/6520/7840/G620/G630)
Maximum number of switches per edge fabric (only Brocade FOS switches in the edge fabric)	26
Maximum number of WWNs per edge fabric (only Brocade FOS switches in the edge fabric)	4000/6000 ^{2, 3} (with reduced edge fabric count)
Maximum number of imported devices from each edge fabric	4000
Maximum number of FCRs per backbone fabric	12 16 (with the Brocade X6/G620/G630 as backbone routers only) ⁵
Maximum number of local WWNs per backbone fabric (not including imported devices)	512
Maximum number of LSAN devices per metaSAN (total number of devices imported from all edge fabrics)	15,000 (with the Brocade X6 as backbone routers only) ⁵ 10,000 (with any Brocade DCX 8510/G620/G630 as routers) ⁴ 5000 (with any Brocade 6510/6520/7840 as routers) ⁴

TABLE 5 Fibre Channel Routing Scalability Limits (continued)

Metric	Tested/Supported Limits for Brocade FOS 8.0 (and Later)
Maximum number of LSAN zones per metaSAN	3000/5000 ¹ 7500 (with the Brocade X6 as backbone routers only) ⁵
Maximum number of devices per LSAN zone	64
Maximum number of hops between edge switches	12/19
EX_Ports per chassis with Integrated Routing	128 (Brocade DCX 8510/X6/G630) Maximum port count (Brocade 6510/6520/7840/G620)

Table Notes

¹ All backbone FCRs with Brocade FOS 8.0.1 and later.

² Requires that both FCR edge and backbone fabrics be running FOS 7.3 or later.

³ When deploying very large edge fabrics, the maximum number of local devices (WWNs) and imported devices (WWNs) in any single edge fabric cannot exceed the Layer 2 fabric limit.

⁴ FOS 7.4 and later support Location Embedded LSAN zones. When Location Embedded LSAN zones are used to isolate device sharing to a subset of FCRs in a backbone fabric, the maximum number of LSAN devices per metaSAN can exceed this limit.

⁵ Requires the backbone routers to be running FOS 8.1 or later.

Other Notes

IPFC over FCR is supported only for edge to edge.

Brocade FC Fast Write is supported only for edge to edge.

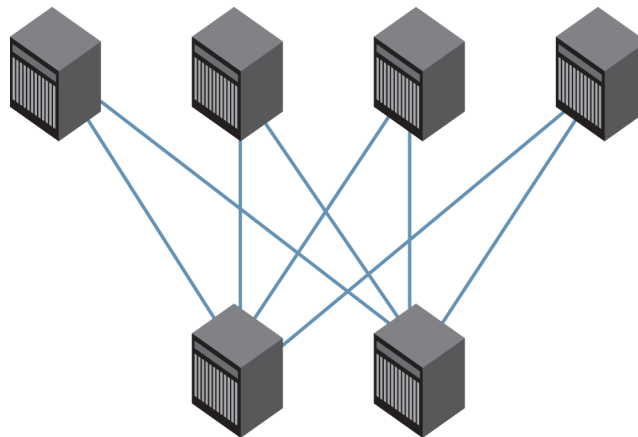
Topologies Supported Using Inter-Chassis Links

This section describes various topologies supported for deploying fabrics with inter-chassis links (ICLs), the high-density interconnections available on the Brocade DCX 8510-8, DCX 8510-4, X6-8, and X6-4 director platforms. The topologies supported include core-edge and full mesh.

Core-Edge Topology

In a core-edge ICL topology, every edge chassis is connected to every core chassis, but there are no direct ICL or ISL interconnections between the core chassis or between the edge chassis themselves.

The following diagram shows a core-edge topology with two core chassis and four edge chassis.



Full-Mesh Topology

In a full-mesh ICL topology, every chassis is connected to every other chassis in the fabric using ICLs.

The following diagram shows a full-mesh topology of three chassis and nine chassis.

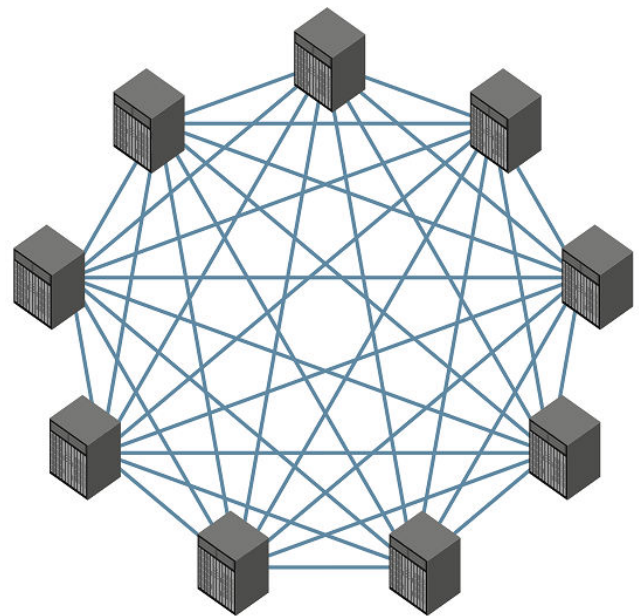
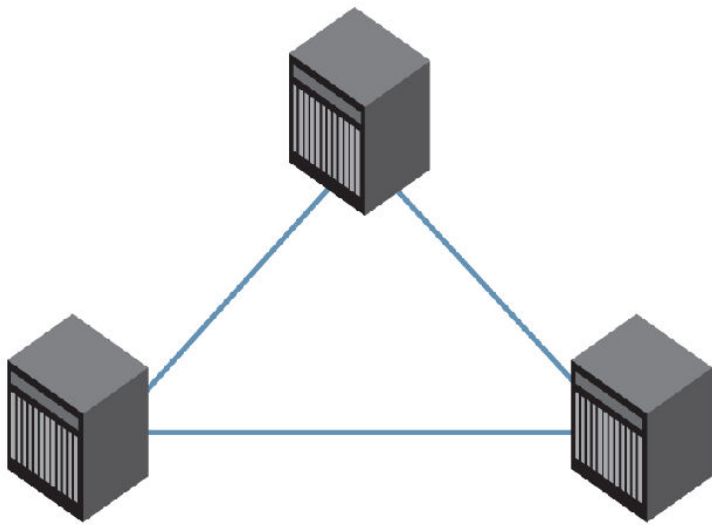


TABLE 6 Brocade DCX 8510/X6 ICL Topology Support¹

Metric	Brocade FOS 8.0.1 and Later
Maximum number of chassis that can be connected in a core-edge topology using ICLs ²	12
Maximum number of chassis that can be connected in a full-mesh topology using ICLs ³	9
Maximum number of chassis that can be connected to a chassis in any topology using ICLs	10

Table Notes

¹ For fabric topologies with more than four ICL-connected Brocade DCX 8510 chassis, an Enterprise ICL license is required on each Brocade DCX 8510 that is directly connected via ICLs (either as ISLs or IFLs) to four or more other DCX 8510 or X6 chassis. This applies on an individual chassis basis. In core-edge topologies, it is possible to have Enterprise ICL licenses required on some but not all chassis in the fabric. An Enterprise ICL license is not required on X6 chassis.

² When deploying core-edge topologies, additional switches can be added by connecting them via *ISL* to the core Brocade DCX 8510s or X6s in the fabric. Care should be taken never to create equal-cost routes between any host/target device pair that traverse an ISL in one route and an ICL in the other route. The maximum domain count in the fabric should not exceed the limits listed in [Table 1](#) on page 6.

³ When deploying full-mesh topologies with more than three chassis, Brocade recommends not deploying additional switches (domains) in the fabric. Additional switches can be deployed in Access Gateway mode to facilitate additional host/device connectivity.

Other Notes

For ICL interconnections, at least two ICL connections must be made from each core blade in one chassis going to the corresponding core blade in every other chassis to which it is connected. A minimum of four ICL connections are made between any pair of interconnected chassis. Therefore, the maximum number of neighboring Brocade DCX 8510s/X6s that can be directly connected to a single Brocade DCX 8510-8/X6-8 via ICLs is eight and to a single Brocade DCX 8510-4/X6-4 is four. For virtual fabrics using ICL, the maximum number of logical switches supported with ICL connectivity follows the same limits.