Brocade® SAN Scalability Guidelines for Fabric OS® 9.x

Supported Platforms

Brocade® Fabric OS® (FOS) version 9.x supports only Gen 6 (32Gb/s) and Gen 7 (64Gb/s) hardware platforms. This document provides scalability information for these platforms, but it does not cover hardware that operates with Brocade FOS versions before 9.0. Refer to the release notes for specific hardware models supported by a particular version of Brocade FOS.

For scalability guidelines related to Brocade FOS v8.x, refer to the *Brocade SAN Scalability Guidelines for Brocade Fabric OS 8.x*.

Other Brocade products may participate in storage area networks (SANs) with products that use Brocade FOS v9.x via either Fibre Channel Routing (FCR) or direct Layer 2 (E_Port) fabric interoperability. Follow 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 9.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 Broadcom 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 Broadcom supports. This number exceeds what has been explicitly tested by Broadcom, but it falls within reasonable limits for use in production environments. Any fabric deployment that exceeds the tested limits should 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.

NOTE: Brocade FOS v9.0 and later supports a 4-MB zoning database for all Brocade Gen 6 and Gen 7 director and fixed-port switch platforms. If the Virtual Fabrics feature is enabled, the zone database size limit applies to each logical switch. The sum of the zoning database size of all logical switches is limited to 16 MB. If any other platforms with a lower (1-MB or 2-MB) zoning database limit exist in a fabric, the zoning database for the fabric is limited to the lowest database size (1 MB or 2 MB). The LSAN zone database size limit is 2 MB. 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. Use the `cfgSize` command to display the total usage of zoning configuration applied.

Table 1: Brocade FOS Layer 2 Scalability Limits

Metric	Tested/Supported Limits for Brocade FOS v9.0 (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/X7/G610/G620/G630/G710/G720/G730[a] 6000/6000 – for fabrics with the following platforms only: Brocade 7810
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 FC32-48 and FC32-64 blades in a Brocade X6 Director
Maximum number of devices (initiators, targets, or NPIV devices) per platform[b]	2048/4096 – Brocade DCX/7810/G610/G620/G630/G710/G720/G730 6000/6000 – Brocade X6/X7
Maximum number of NPIV devices per fabric	See the *Number of device connections in the fabric* row above.
Maximum number of unique zone members (2 members per zone)	See Table 2 and Table 3, Brocade FOS Zoning Database Limits.

Table 1: Brocade FOS Layer 2 Scalability Limits (Continued)

Metric	Tested/Supported Limits for Brocade FOS v9.0 (and Later)
Maximum number of unique zone members (16 members per zone)	See Table 2 and Table 3, Brocade FOS Zoning Database Limits.
Maximum number of zones (2 members per zone)	See Table 2 and Table 3, Brocade FOS Zoning Database Limits.
Maximum number of zones (16 members per zone)	See Table 2 and Table 3, Brocade FOS Zoning Database Limits.
Maximum number of zone sets	The total of all zone sets cannot exceed the overall 4-MB zoning database size.
Security database: switch connection control (SCC) and device connection control (DCC) policies	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)[a]
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)
Maximum number of Brocade Access Gateways per fabric	60/300
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[c]	60/maximum switch port count

a. Requires all switches in the fabric to be running FOS v8.1 or later.

b. Represents the physical switch limit. If Virtual Fabrics is enabled, the limit applies to the sum of all devices logged in to the logical switches within the physical switch.

c. 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.

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. Table 2 and Table 3 document the limits for each logical switch if the Virtual Fabrics feature is enabled. 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 Virtual Fabrics is enabled, the sum of the zone databases from all logical switches cannot exceed 16 MB.

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

Average Zone Name Length: 25 Characters	Maximum Zoning Database Size: 4 MB
Maximum number of unique zone members (2 members per zone)	82,000 – WWNs 40,000 – using aliases (1 WWN per alias, 2 aliases per zone) 54,000 – using aliases (2 WWNs per alias, 1 alias per zone) 132,000 – D,P
Maximum number of unique zone members (16 members per zone)	152,000 – WWNs 51,600 – using aliases (1 WWN per alias, 16 aliases per zone) 135,600 – using aliases (16 WWNs per alias, 1 alias per zone) 500,000 – D,P

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

Average Zone Name Length: 25 Characters	Maximum Zoning Database Size: 4 MB
Maximum number of zones (2 members per zone)	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 zones (16 members per zone)	9400 – WWNs 3200 – using aliases (1 WWN per alias, 16 aliases per zone) 8400 – using aliases (16 WWNs per alias, 1 alias per zone) 31,200 – 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: 4 MB
Maximum number of unique zone members (2 members per zone)	46,400 – WWNs 18,800 – using aliases (1 WWN per alias, 2 aliases per zone) 26,800 – using aliases (2 WWNs per alias, 1 alias per zone) 59,000 – D,P
Maximum number of unique zone members| (16 members per zone)	128,000 – WWNs 25,400 – using aliases (1 WWN per alias, 16 aliases per zone) 103,000 – using aliases (16 WWNs per alias, 1 alias per zone) 315,000 – D,P
Maximum number of zones (2 members 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) 29,400 – D,P
Maximum number of zones (16 members per zone)	8000 – WWNs 1580 – using aliases (1 WWN per alias, 16 aliases per zone) 6400 – using aliases (16 WWNs per alias, 1 alias per zone) 19,600 – D,P

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 16 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 v9.0 (and Later)	
Maximum number of logical switches per chassis/switch, including the default and base switch if defined	16 – Brocade X6/X7
	4 – Brocade G620/G630/G720/G730
	2 – Brocade G610/G710
Total number of logged-in devices from all logical fabrics	12,000 – Brocade X6/X7/G620/G630/G720/G730
Total number of fabrics (logical switches and FCR-connected edge fabrics) per chassis	48 – Brocade X6/X7
	32 – Brocade G620/G630/G720/G730
Total number of base switches creating a single base fabric	16
Total number of logical fabrics using a single base fabric	48

Fibre Channel Routing Scalability

FCR scalability limits for Brocade Fabric OS v9.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 Broadcom 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 Broadcom, but it is believed to be within reasonable limits for production deployments, based on testing that has been performed. Any deployment of a fabric or metaSAN that exceeds the tested limits should 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 v9.0 (and Later)
Maximum number of Brocade FOS edge fabrics per metaSAN with edge fabrics containing up to 1500 WWNs	48 – Brocade X6/X7 24 – Brocade 7810/G620/G630/G720/G730
Maximum number of Brocade FOS edge fabrics per metaSAN with edge fabrics containing up to 2000 WWNs	32 – Brocade X6/X7 12 – Brocade 7810/G620/G630/G720/G730
Maximum number of Brocade FOS edge fabrics per metaSAN with one or more edge fabrics exceeding 2000 WWNs[a]	24 – Brocade X6/X7 8 – Brocade 7810/G620/G630/G720/G730
Maximum number of Brocade FOS edge fabrics per metaSAN with more than 2000 local WWNs[a]	4 – Brocade X6/X7 2 – Brocade 7810/G620/G630/G720/G730
Maximum number of edge fabrics per chassis. Edge fabrics *per chassis* may never exceed the maximum number of edge fabrics *per metaSAN* 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 X6/X7 12 – Brocade 7810/G620/G630/G720/G730
Maximum number of switches per edge fabric with only Brocade FOS switches in the edge fabric	26
Maximum number of WWNs per edge fabric with only Brocade FOS switches in the edge fabric	4000/6000[b] – with reduced edge fabric count
Maximum number of imported devices from each edge fabric	4000 – Brocade X6/X7/G620/G630/G720/G730 2000 – Brocade 7810
Maximum number of FCRs per backbone fabric	12 16 – with the Brocade X6/X7/G620/G630/G720/G730 as backbone routers only
Maximum number of local WWNs per backbone fabric, not including imported devices	512

Table 5: Fibre Channel Routing Scalability Limits (Continued)

Metric	Tested/Supported Limits for Brocade FOS v9.0 (and Later)
Maximum number of LSAN devices per metaSAN (total number of devices imported from all edge fabrics)	15,000 – with the Brocade X6/X7 as backbone routers only 10,000 – with the Brocade 7810/G620/G630/G720/G730 as backbone routers only[a]
Maximum number of LSAN zones per metaSAN	3000/5000 – with the Brocade G620/G630/G720/G730 as backbone routers only 3000 – with the Brocade 7810 as backbone routers only 7500 – with the Brocade X6/X7 as backbone routers only
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 X6/X7/G630 Maximum port count – Brocade 7810/G620/G720/G730

a. 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.

b. 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.

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 X6-8, X6-4, X7-8, and X7-4 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.
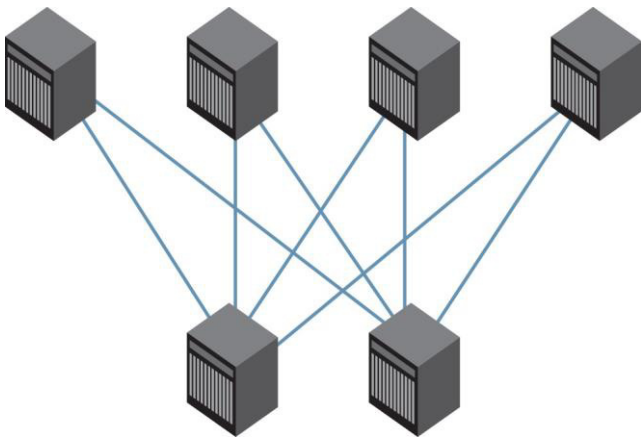
Full-Mesh Topology

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.
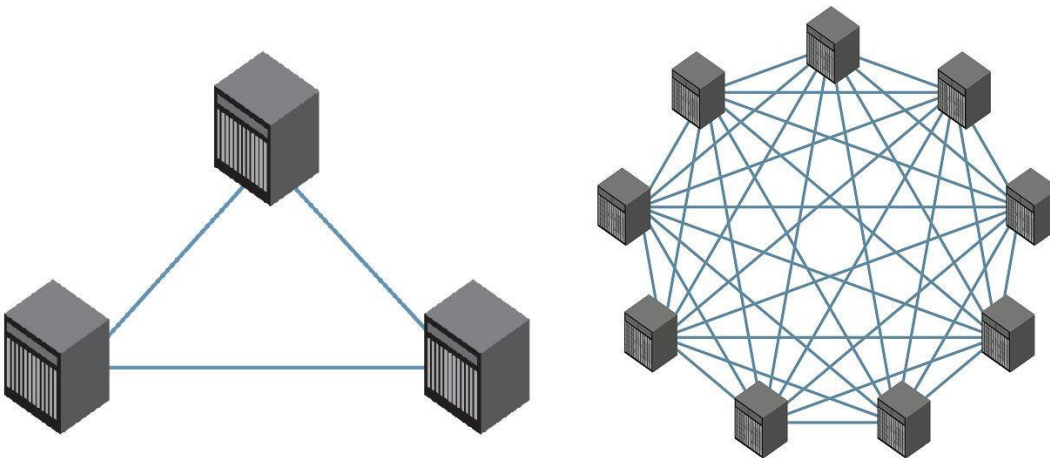
Table 6: Brocade X6/X7 ICL Topology Support

Metric	Brocade FOS v9.0 and Later
Maximum number of chassis that can be connected in a core-edge topology using ICLs[a]	12
Maximum number of chassis that can be connected in a full-mesh topology using ICLs[b]	9
Maximum number of chassis that can be connected to a chassis in any topology using ICLs	10

a. 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 traverses 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.

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

NOTE: 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 X6s/X7s that can be directly connected to a single Brocade X6-8/X7-8 via ICLs is eight and to a single Brocade X6-4/X7-4 is four. For virtual fabrics using ICL, the maximum number of logical switches supported with ICL connectivity follows the same limits.

Unified Storage Fabric Scalability

USF scalability limits for Brocade Fabric OS v9.x are listed in Table 7.

Table 7: Brocade USF Topology Support

Metric	Brocade FOS v9.2.1 and Later
Maximum number of IP Storage (IPS) logical switches per X7 Director	1
Maximum number of ports per IPS logical switch	192 (X7-8) 96 (X7-4)
Maximum number of LAGS per IPS logical switch	48
Maximum number of domains per IPS logical fabric	8
Maximum number of Ethernet ports per IPS logical fabric	800
Maximum number of devices per IPS logical fabric	1200[a]
Maximum number of VRFs per IPS logical fabric	4
Maximum number of VLANs per IPS port	16
Maximum number of VLANs per IPS logical fabric	256
Maximum number of static routes per IPS logical fabric	512

a. When deploying USF topologies, from FOS v9.2.2 any combination of direct attached devices and connection via L2 or L3 Top of Rack switches is supported.

Revision History

SAN-Scalability-FOS9x-UG102; October 15, 2024

- Updated with USF scalability numbers.
- Updated with the release of the Brocade G710.

SAN-Scalability-FOS9x-UG101; February 22, 2022

- Updated with the release of the Brocade G730.

SAN-Scalability-FOS9x-UG100; September 1, 2020

- Initial document version.