

# Zoning Fundamentals

Zone-220

**Student Guide**

---

Revision 0923



Broadcom, the pulse logo, Connecting everything, Brocade, and the stylized B logo are among the trademarks of Broadcom. The term “Broadcom” refers to Broadcom Inc. and/or its subsidiaries. Copyright © 2023 Broadcom Inc. All Rights Reserved. For product information, please visit [broadcom.com](http://broadcom.com).

Revision: Month 0923



# Zone-220

## Zoning Fundamentals

Brocade Education Services

Revision 0923

Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



## Legal Disclaimer

Broadcom, the pulse logo, Connecting everything, Brocade, and the stylized B logo are among the trademarks of Broadcom. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries. Copyright © 2023 Broadcom Inc. All Rights Reserved. For product information, please visit [broadcom.com](http://broadcom.com).

2 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.





## Course Overview

- The purpose of this course is to explain the concepts and supported types of zoning for a Brocade SAN

3 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



## Course Prerequisites

Before taking this course, you should complete the following course or have equivalent experience with Fibre Channel SANs:

- Basic Fibre Channel
- Brocade SAN Fabrics

4 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.





## Course Objectives

After completing this course, students should be able to:

- Describe the basic concepts associated with zoning
- Activate or deactivate a default zone
- Add a new switch to an existing fabric that has zoning enabled
- Describe how to determine the maximum zoning database size
- Differentiate between hardware and session enforcement
- State the best practices that should be considered when implementing zoning

5 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**   
A Broadcom Company



## Course Agenda

### Required Learning Elements:

- Module 01 – Zoning Overview
- Assessment Test

### Optional Learning Elements:

- Welcome to Brocade Education
- Student Guide (downloadable PDF)

6 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

## Basic Zoning Concepts

Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**   
A Broadcom Company

## Regular Zoning Overview

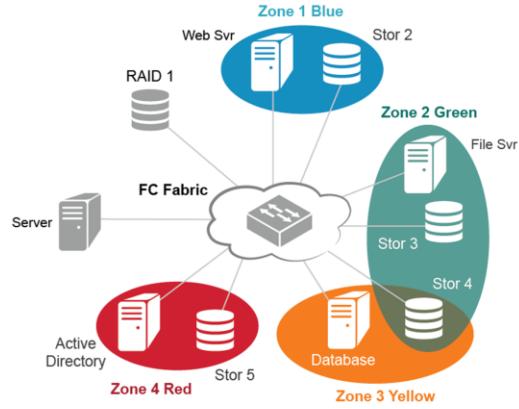
- Enables the partitioning of devices attached to a fabric into logical groups called zones
- When zoning is enabled:
  - Devices defined in the same zone are restricted to communicate only with devices in that zone
  - Devices not defined in a zone cannot communicate with any device

8 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



## Regular Zoning Overview (cont.)

- Web Server in Zone 1 sees disk array (Stor 2)
- File server in Zone 2 sees the two disk arrays
- Data Base Server in Zone 3 sees one disk array
- Active Directory in Zone 4 sees only one disk array (Stor 5)
- Generic Server sees no disks
- No servers see disk array RAID 1



9 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

A zone is a specified group of fabric-connected devices, also called *zone members*. Devices can only communicate with other devices in the same zone. Devices can be members of multiple zones and, as shown in the figure above, zones can overlap. Once zoning is enabled any device not defined in a zone will be unable to communicate. This is illustrated by the RAID 1 and Generic Server devices in the figure above. Web Server in Zone 1 is able to communicate with one of the RAID disks. File Server in Zone 3 can communicate with two separate RAID devices. Data Base server and File Server can both communicate with RAID 4 because this device is a member of both Zone 2 and Zone 3. This is an example of overlapping zones as well as cases where devices may be defined for multiple zones.

Devices are grouped into zones as zone members, zones are grouped into a zone configuration. A fabric can have multiple zone configurations defined; but **only one configuration may be enabled at any time**.

Zoning is a fabric wide configuration, changes made on any switch in the fabric will be propagated to the entire fabric. Changes in zoning will send RSCNs only to devices that are in the same zone and therefore affected by the change.

For more information on zoning see the Fabric OS Administrator's Guide.

## Regular Zoning Overview (cont.)

- Once zoning is enabled all devices must be in a zone to communicate
- Devices are only zoned with other devices where access is required
- Traditional regular zoning best practices:
  - One initiator per zone
    - This prevents initiators from trying to query each other within the same zone<sup>1</sup>
    - Referred to as single-initiator zoning
    - An initiator can be zoned to multiple target ports within the same zone
  - If a target port needed to be zoned with two different initiators
    - Two separate zones are created (each zone included the same target port)

10 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



**Footnote 1:** When zoning is enabled an end device RSCN is sent to all devices in that particular affected zone notifying each device of a change in the fabric. This causes devices (typically only initiators) within that zone to query the name server to learn about the changes.



## Default Zones

Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**   
A Broadcom Company

## Default Zoning

- In early versions of Fabric OS, when zoning was not implemented or zoning was disabled, all devices in the fabric could access each other
- This fabric-wide behavior is configurable by defining the default zone parameter
  - Controls whether device access is allowed within a fabric when zoning is not enabled
  - Can enable all device access with `defzone --allaccess` (default)
  - Can disable all device access with `defzone --noaccess`
  - The default zone setting when changed must be saved in the fabric in order to take effect<sup>1</sup>
- The `defzone` setting is:
  - In effect when a user-specified zone configuration is not enabled
  - Not in effect when a user-specified zone configuration is enabled

12 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



**Footnote 1:** The commands to save zoning changes in a fabric will be introduced later in this module. (i.e. `cfgsave` and `cfgenable`)

The default zone feature can enable or disable device access within a fabric. Default zones are based on the FC-GS standard.

The `defzone` command configures a default zone configuration and displays the current configuration. The command has no optional parameters, and takes one of three required arguments:

`--allaccess`: Enables all device-to-device access within the fabric. This is the default behavior in a non-zoned fabric.

`--noaccess`: Create a default zone that disables all device-to-device access within the fabric.

`--show`: Display the current default zone.

Names beginning with `d__efault__` are reserved for default zoning use (note: two underscore characters are used in each instance.)

Note: The setting of the `defzone` command is stored in the zoning transaction buffer.

Normally, a `cfgsave` is used to commit the zoning transaction to the entire fabric. A `cfgenable` or `cfgdisable` will do the commit since each command does an implied `cfgsave`. Because the setting is stored in the zoning transaction buffer, a `cfgtransabort` could be used to abort the `defzone` command.

# FULL NOTES PAGE

13 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



## Default Zoning (cont.)

- Display the current default zone and shows all devices cannot access each other if zoning is disabled

```
SW1:admin> defzone --show
Default Zone Access Mode
committed - No Access
transaction - No Transaction
```

- The default zone configuration can also be viewed by looking at the current zoning configuration<sup>1</sup>

```
SW1:admin> cfgshow
Defined configuration:

Effective configuration:
No Effective configuration: (No Access)
```

14 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



If the zoning configuration is set to “ALL Access” no default zone indication will appear using the `cfgshow` command. Use the `defzone --show` command to view the committed state.

```
SW1:admin> cfgshow
Defined configuration:
no configuration defined
Effective configuration:
no configuration in effect
SW1:admin> defzone --show
Default Zone Access Mode
committed - All Access
transaction - No Access
```



## Types of Zones

Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**   
A Broadcom Company

## Types of Zones

- Zoning does more than define which devices can access each other
- There are several different types of zoning that can be implemented:
  - “Regular” zones<sup>1</sup>
  - Peer zones
  - Target Driven zones
  - QoS zones
  - LSAN and peer LSAN zones

16 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



**Footnote 1:** In a single fabric, “regular” zoning refers to defining zones with the purpose that only devices within the same zone can access each other. This was the initial purpose for zoning. Zones now exist for additional purposes.

## Peer Zones

### Overview

- Introduced in Fabric OS v7.4 allows for multiple initiators and a single target added to a single zone
  - Multiple initiators in a Regular Zone would disrupt each other but in a Peer Zone each host can only communicate with the target
    - Benefit: Provides the efficiency of single-initiator zoning with the simplicity and lower memory characteristics of one-to-many zoning
- In a Peer Zoning configuration, the zone membership is differentiated into principal members and peer members
  - Allows communication between a principal member and a peer member
  - But it does not allow communication between two peer members or even two principal members if configured<sup>1</sup>

17 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



**Footnote 1:** There are use cases where you may want to put multiple principal members in the same zone configuration, such as an active / active controller situation within a single fabric. But within this peer zone the same rules apply, even with multiple principal members, the principal members are not allowed to communicate among themselves. In a typical zoning configuration, there are many more hosts (initiators) than storage devices (targets). By configuring the targets as principal members and hosts as peer members, Peer Zoning feature can achieve the following advantages over the traditional zoning:

- Single configuration with fewer zones compared to multiple single-initiator zones
- Reduce RSCN distribution, as in a single initiator zone
- Efficient use of ASIC CAM entries, as in a single initiator zone

FOS v7.4 implementation of Peer Zoning follows the FC-GS-6 and FC-GS-7 standard

### Target Driven Zoning Overview:

Target Driven Zoning is a variant of Peer Zoning. Where a regular Peer Zone is defined by a user-specified configuration, Target Driven Peer Zone is defined by the principal device. This device is usually a storage device, but not always.

Target Driven Zoning manages the zoning using a third-party management interface to manage the device and the switch interactions. To permit a Target Driven Peer Zone, Target Driven Zoning must be enabled on the F\_Port that connects the principal device to the fabric. Refer to the vendor manual for the device used as the principal device to determine the supported commands and options to construct a Target Driven Peer Zone.

## Peer Zones (cont.)

### Implementation

- Active configuration can contain both regular zones and peer zones
- In a single Peer Zone, a device can only be either a principal member or a peer member but not both<sup>1</sup>
- FOS zoning module internally attaches a special property member to any peer zone to distinguish the zone from regular zones
- RSCN distribution follows the same rules
  - Peer member events delivered to the principal members only, but not to other peer members.
  - Principal member events are delivered to all peer members, but not to other principal members

18 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



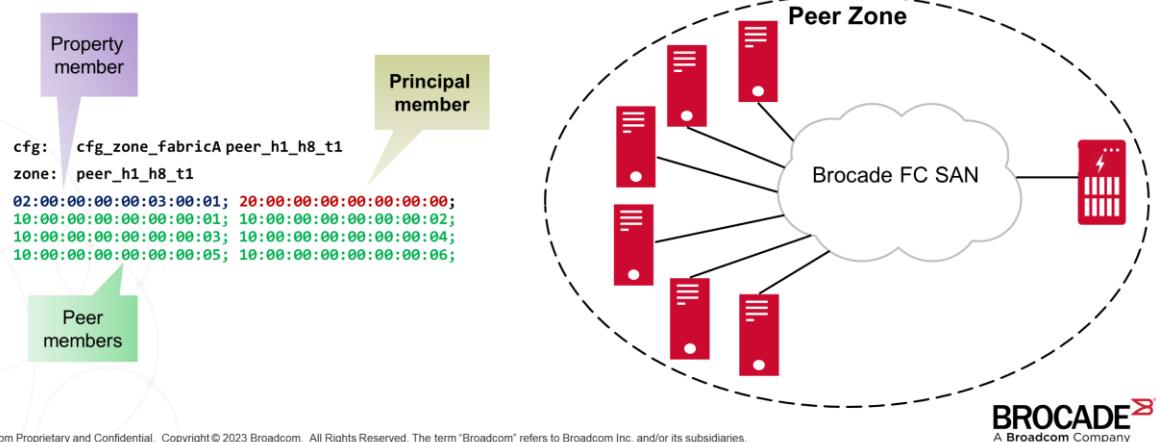
**Footnote 1:** If a regular zone exists with peer zone members in an active zone set, the non-principal members in the peer zone could still communicate with each other, if they are permitted by the regular zone

- Existing zone CLI commands are enhanced to support peer zones
- Peer (non-principal) members are allowed to communicate with a principal member.
- Peer (non-principal) members are not allowed to communicate among themselves.

## Peer Zones (cont.)

### Illustration

- With Peer Zoning, this results in only 1 zone, and a smaller footprint of zoning configuration data because it uses 5 less zones compared to single-initiator zones



19 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

## Peer Zones

### Limitations

- Within a single Peer Zone, members must be either all in (D,I) format or all in WWN format
  - Mixed (D,I) and WWN format in a single Peer Zone is not supported
  - Alias support first introduced in Fabric OS v8.1
- Only switches with Fabric OS v7.4.0/+ will enforce peer zoning rules
  - Switches with older FOS versions will treat the Peer Zones as Regular Zones
- Most production environments today use regular zones
  - Converting existing regular zones is not required unless there is a need to reduce the total zoning database size (discussed in next section)

20 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



Peer zoning over FCR is supported for both E2E (Edge-to-Edge) and B2E (Backbone-to-Edge)

The peer zones need to be created with LSAN tag in both the edge fabrics

The peer zoning rules are enforced in the edge switch. FCR importing does not use peer zoning rules

When a peer zone is created for an LSAN across FCR, all members must be in WWN format

QoS zoning is supported for peer zones. Similar to regular QoS zones, the “QOS” prefix needs to be used

When a switch containing peer zones configuration is upgraded to FOS v7.4, CAM entries will be reprogrammed according to the peer zone rules. As a result, peer zone rules will get enforced and devices attached to this switch may be disrupted if they are part of the peer zones

When a switch containing peer zones configuration is downgraded from FOS v7.4 to an older version, a message will appear to warn the user that the peer zones will be treated as regular zones after downgrade

## Target Drive Zones

### Overview

- Target Driven Zoning produces the same zoning configuration as Peer Zoning
  - Zone includes peer and principal members
  - WWN members , aliases (v8.1.x or later) and are supported (no support for D,I)
- Where a Peer Zone is defined by a user-specified configuration, Target Driven Peer Zone is defined by the principal device (typically a storage device)
  - Target Driven Zoning manages the zoning using a third-party management interface to manage the device and the switch interactions
- The Target Driven Zoning configuration mode must be enabled on the F\_Port to which the managing principal device is connected<sup>1</sup>
- Provides the efficiency of single-initiator zoning with the simplicity and lower memory characteristics of one-to-many zoning
- Same RSCN rules as with Peer Zones

21 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



The maximum number of devices allowed in a Target Driven Peer Zone, including a principal device, is 255

Target Driven Peer Zones cannot be created or modified using SANnav Management Platform or the CLI; however, they can be displayed or deleted using SANnav or the CLI. Switches running Fabric OS 8.2.0 and later do not allow you to edit the aliases that are members of TDZs

Footnote 1:

To enable Target Driven Zoning on a port or port range using the `portcfgtdz --enable` command.

The following example enables Target Driven Zoning. You can enable Target Driven Zoning for a single port, a range of ports, or all ports on a switch. `switch:admin> portcfgtdz --enable 8`

The following example enables Target Driven Zoning on a range of ports.

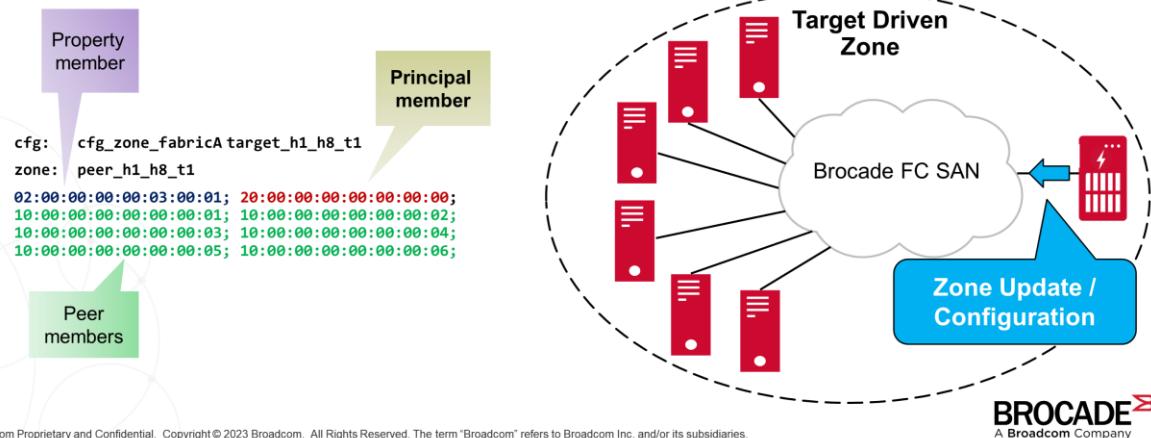
`switch:admin> portcfgtdz --enable 8-18`

The following example enables Target Driven Zoning on all ports. `switch:admin> portcfgtdz --enable "*"`

## Target Drive Zones (cont.)

### Illustration

- Identical to Peer Zoning, Target Driven Zoning also results in 1 zone, and a smaller footprint of zoning configuration data because it uses 5 less zones compared to single-initiator zones



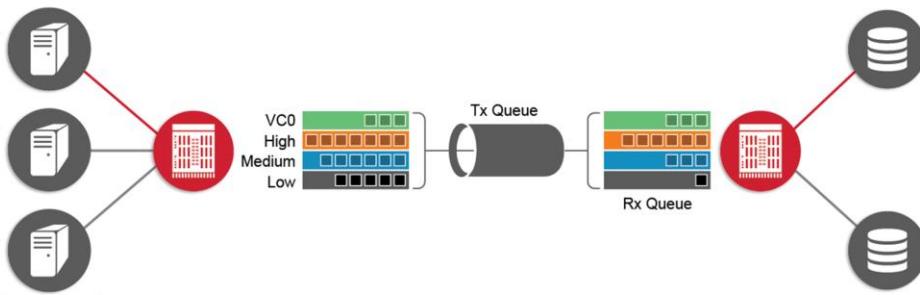
22 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

## QoS Zones

### Overview

- QoS enables the setting of traffic priorities between specific hosts and targets
- Prioritization is accomplished by the use of QoS zones, which appear as normal zones with a prefix of QOSH\_(High Priority) or QOSL\_(Low Priority)
- Default setting for all traffic is medium priority and is used when no QoS zones are specified or until a congestion state is reached



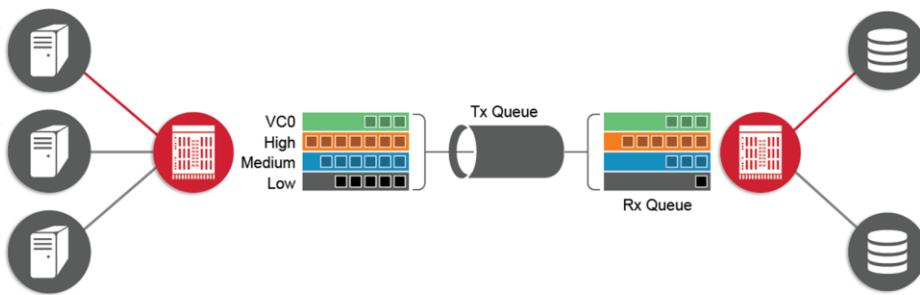
**BROCADE**  
A Broadcom Company

23 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

## QoS Zones

Overview (cont.)

- While bandwidth is not part of the calculation for QoS traffic flow, these generally stated percentages of bandwidth can be used to make prioritization decisions
  - High priority gets approximately 60% of the total bandwidth available for data traffic
  - Medium priority gets assigned approximately 30%
  - Low priority gets remaining bandwidth available less what F-Class VC0 traffic takes, approximately 10%



24 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

Zones must be created using WWN notation.

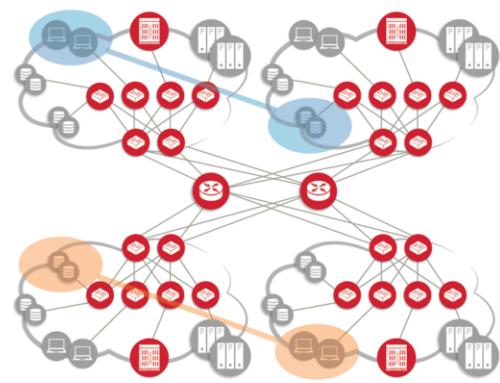
Virtual Fabrics can prioritize flows between devices in a logical fabric. The priority is retained for traffic going across ISLs and through the base fabric XISLs.

## LSAN and peer LSAN Zones

### Overview

- An LSAN is a zone that spans routed fabrics
- It is a logical storage area network that spans multiple physical fabrics, allowing devices in autonomous edge fabrics to communicate with each other
- Defines device communication between autonomous fabrics but only allows designated devices in those fabrics to communicate
- Can be defined in edge fabrics and backbone fabrics
- Discussed in detail in the **FC-FC Routing Fundamentals (FCR-120)** and **FC-FC Routing Implementation (FCR-221)** classes

LSAN zoned devices are depicted by the different colored circles



25 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

LSAN zones are architecturally compatible with Fabric OS. An FC Router uses LSAN defined zones to determine which devices need to be imported (phantoms) into which Routed fabrics. LSAN zones must be configured in fabrics where the physical devices exist. The Router performs zoning enforcement for edge fabrics at the ingress Router EX\_Port.

An LSAN zone is a traditional zone, created using traditional zoning tools and commands

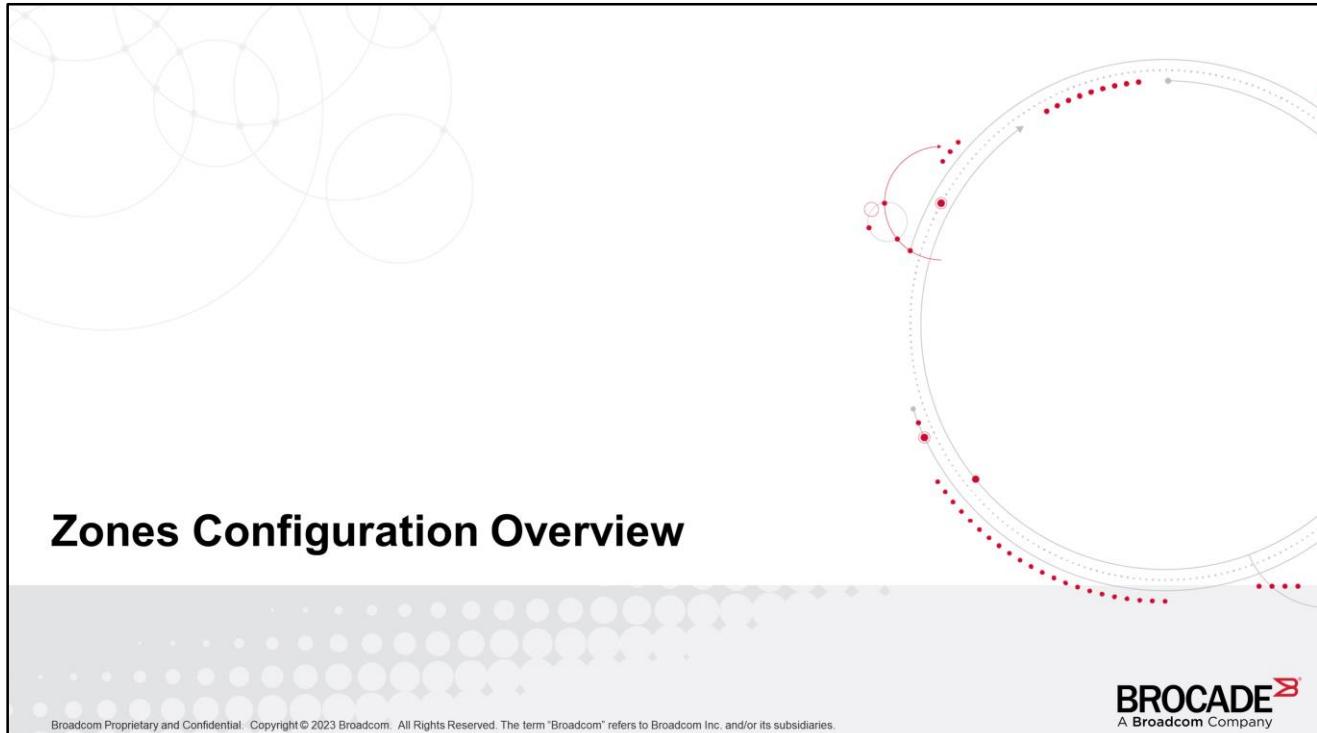
Zone names are case insensitive and must start with "Isan\_"

Configured like normal zones and subject to normal zoning enforcement

LSAN zone members must be identified by their PWWN

LSAN zone members must be defined and enabled in each fabric that will be sharing a particular device

When LSAN zones are created using Network Advisor, the zones are pushed to each participating fabric automatically



## Zones Configuration Overview

Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**   
A Broadcom Company

## Process to Implement Zoning

- Prepare
  - Create a detailed diagram of the fabric
- Define
  - Establish a naming convention
  - Identify each member using either
    - Domain, Index; WWPN (or PWWN); WWNN (or NWWN)
  - Set Default Zone permissions
  - Choose zoning type
  - Create aliases, zones, zone configuration
  - Exclude E\_Ports<sup>1</sup>
- Review zone configuration
  - With CLI, SANnav Management Portal, Web Tools, or SAN Health
- Enable the zone configuration
- Verify there is accessibility between zone members

27 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



**Footnote 1:** In standard zoning you can have E\_Ports in zones using D,I notation, however, it will not have an affect on device access or communication. In traditional zoning, to keep things simple do not include E\_Ports in your zones.

Create a detailed switch diagram of the fabric showing ISL connectivity. This will help account for every switch in the fabric and the E\_Ports that are in use. Expand each switch diagram to show every port (F\_Port, FL\_Port). Switch ports that are not in use should remain disabled using the `portcfgpersistentdisable` command.

Define a naming convention to help identify and reference devices in the fabric. Naming conventions can also be used when creating zones and zone configurations.

The zoning syntax when creating a zoning set ultimately defines what zoning scheme will be enforced as the frame is delivered to the destination port. More information on this will follow.

Analyze the zones to ensure that all nodes are members of the correct zone(s). When aliases have been added to zones and the zones have been added to the zone configuration, enable the zone configuration and test from the host that each target can be accessed. For fabrics with multiple zones enabled, it is generally best to configure one zone at a time and then test it with the Zone Analyzer available in Web Tools. If you create all the zones without testing each zone as it is created, it is difficult to debug. After the first zone is set up in the fabric, the user may plug in devices and then test the connections to confirm that everything is functioning properly.

## Zone Management

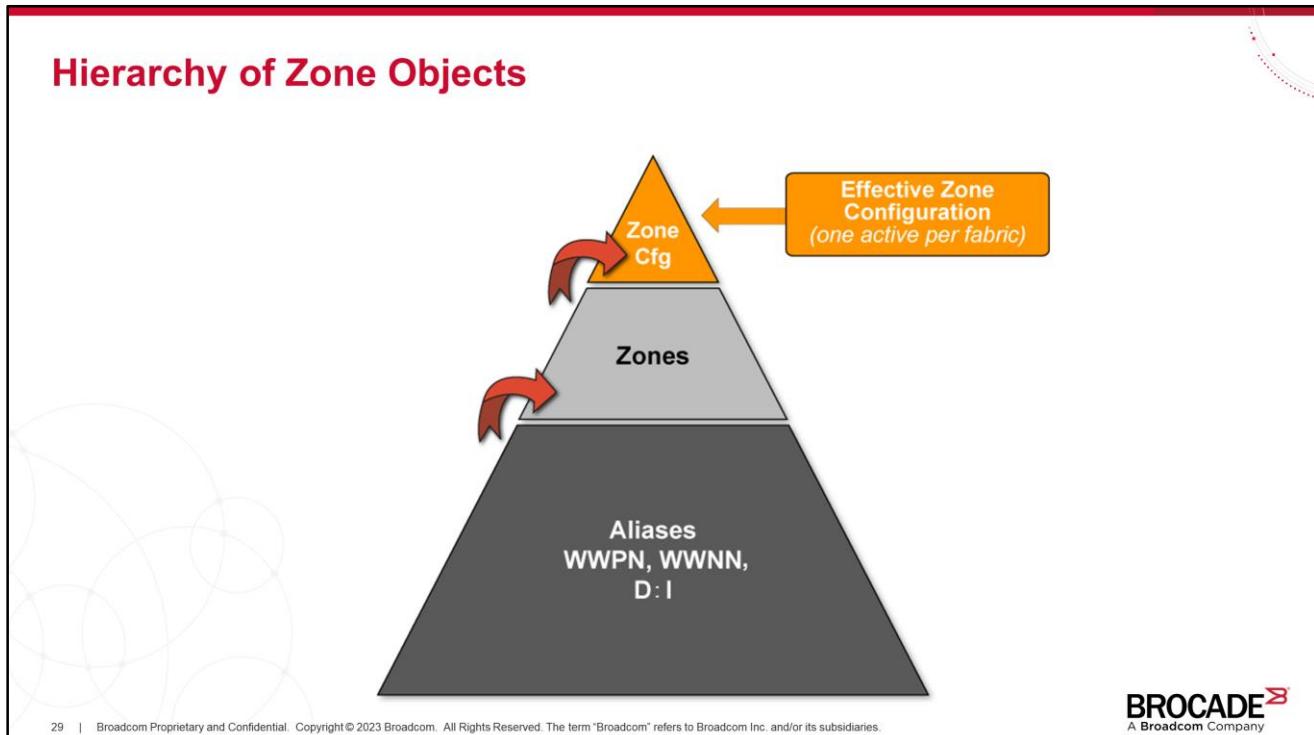
- Zoning can be managed using:
  - Command line interface (CLI)
  - SANnav Management Portal
    - **Recommendation:** SANnav v2.2.0 Management Portal Zoning (MPZO-221)
  - Web Tools
  - REST API

28 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



Web Tools and the SANnav Management Portal provide a GUI to simplify the administration of zoning.

It is recommended that zoning changes be made from the switch with the highest Fabric OS version.



### Member:

Alias is given a name, e.g. "Server\_1", "Disk\_Array\_2".

Physical Fabric port number or area number.

Node World Wide Name - Obtained using `nsshows` or `switchshow`.

Port World Wide Name – Obtained using `nsshows` or `portloginshow`.

64 characters maximum: A-Z, a-z, 0-9 and the "\_" are allowed.

### Zone:

Is given a name, e.g. "Red\_Zone".

Contains two or more members and uses a ";" as a separator.

The same member can be in multiple zones.

Zone definition is persistent; it remains until deleted or changed by an administrator.

### Configuration:

Is given a name, e.g. "Production\_Cfg".

Is one or more zones.

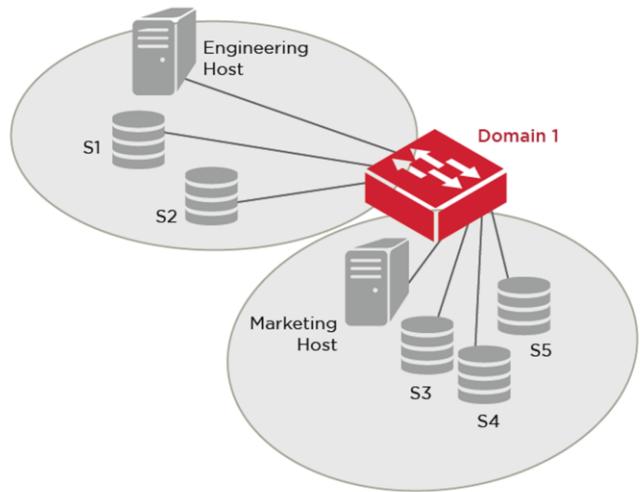
Configuration may be disabled or one configuration may be in effect from any switch in the fabric.

An administrator selects which configuration is currently enabled.

A configuration is saved when enabled and then distributed to the remaining switches in the fabric where it is enabled and saved.

## Zoning Example Steps

1. Create aliases (optional)
2. Create zones
3. Create configuration
4. Enable configuration



**BROCADE**  
A Broadcom Company

30 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

Brocade best practice recommendations include using only one device in an alias, zone using single initiator and either single or multiple targets per initiator. Different OEMs have different best practice recommendations.

Zoning is fabric-wide, thus any switch can be used to display the current zoning configurations. The defined configuration is the Zoning Database and contains all zone objects that have been created. It is possible to have several zone configurations but only one can be enabled.

## Zone Management

- The use of aliases is optional but aids in the management of the zoning structure and content
- Reduces future maintenance
  - Aliases can be updated once rather than having to update the members of multiple zones
- Naming
  - Must begin with an alpha character
  - Can include numeric and underscore characters
  - Up to 64 characters<sup>1</sup>
  - Case sensitive (DISK1 and Disk1 are unique names)
- Members
  - Domain, Index
  - Node World Wide Name – from `nsshow`
  - Port World Wide Name – from `nsshow`, `portloginshow` or `switchshow`
- Sample naming convention
  - Eng\_Host1, Eng\_Disk1, Eng\_Disk2, Mkt\_Host1, Mkt\_Disk1, Mkt\_Disk2
  - Zone\_Eng, Zone\_Mkt

31 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



**Footnote 1:** Zone and configuration names are also limited to 64 characters maximum. Zone aliases simplify repetitive entry of zone objects, such as PWWNs. For example, the name “Eng” could be used as an alias for PWWN: 10:00:00:80:33:3f:aa:11. An alias is a name assigned to a device or group of devices. By creating an alias, you can assign a familiar name to a device, or you can group multiple devices into a single name. This can simplify cumbersome entries and it allows an intuitive naming structure such as using NT\_Storage to define all NT storage ports in the fabric.

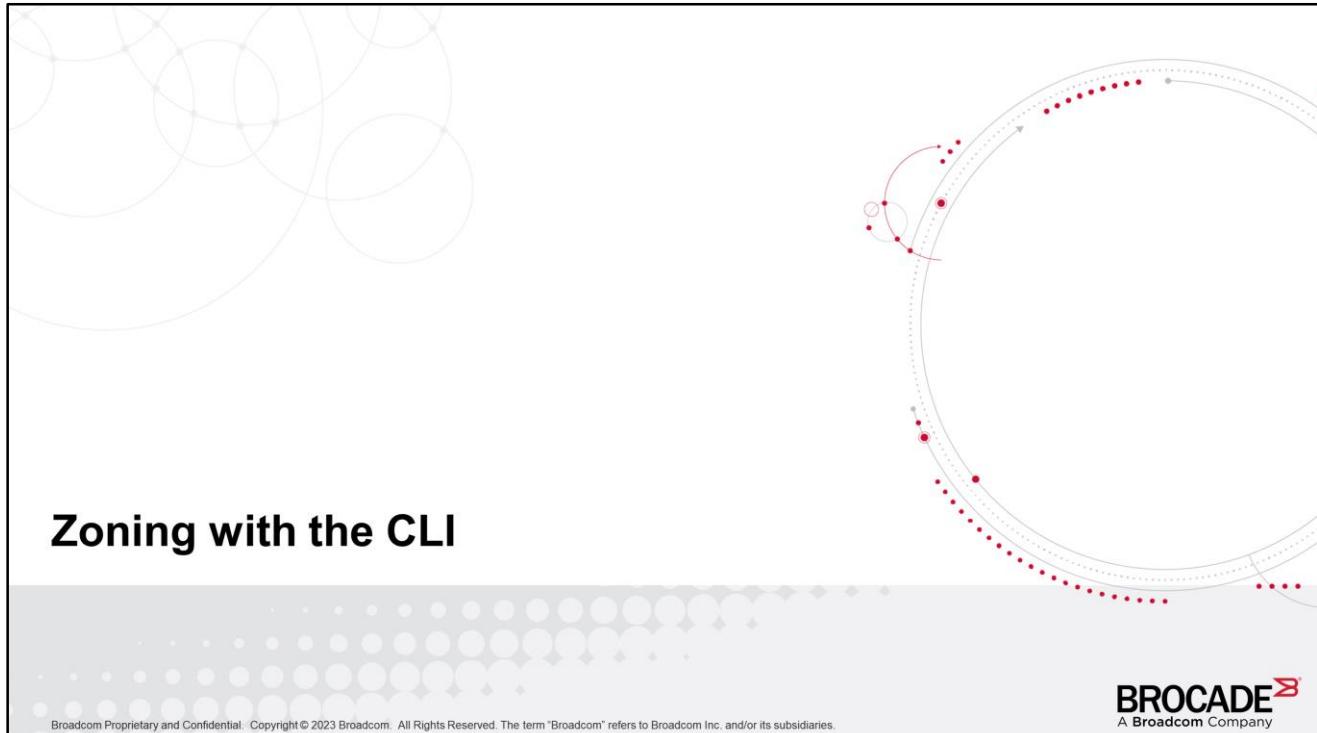
Alias objects only appear in the defined configuration since they are used to assign a meaningful name to a device or group of devices

Zone objects identified by “Domain, Index” are specified as a pair of decimal numbers where “Domain” is the Domain ID of the switch and “Index” is the index number for the port on that switch.

Zone objects identified by World Wide Name (WWN) are specified as a 16 digit hexadecimal number separated by colons, for example 10:00:00:90:69:00:00:8a. When a node name is used to specify a zone object, all ports on that device are in the zone. When a port name is used to specify a zone object, only that single port is in the zone.

When a zoned host receives the list of network targets (referenced by domain, index, PWWN, or NWWN) from the Name Server, the host sends a PLOGI request to the destination addresses. If the PLOGI frame is allowed to pass and the target address replies with an accept to the PLOGI request, the switch and the zoning configuration have completed their responsibility of networking the source and destination.

Limiting the number of LUNs and target IDs that the host can access is the responsibility of the management software being used at the storage end.



## Zoning with the CLI

Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**   
A Broadcom Company

## Zone Management using CLI

- Use `zonehelp` to display help information
  - The following base commands are the same for peer and regular zone administration (optional parameters will be different for each)
    - This next section will provide examples of each

Fabric OS Zone Management Commands					
	Create	Delete	Add	Remove	Show
Alias	<code>alicreate</code>	<code>alidelete</code>	<code>aliadd</code>	<code>aliremove</code>	<code>alishow</code>
Zone	<code>zonecreate</code>	<code>zonedelete</code>	<code>zoneadd</code>	<code>zoneremove</code>	<code>zoneshow</code>
Zone Config	<code>cfgcreate</code>	<code>cfgdelete</code>	<code>cfgadd</code>	<code>cfgremove</code>	<code>cfgshow</code>

33 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



The following commands are used to create/modify the defined zone configuration:

- \*`create` – Creates a new alias, zone, or configuration
- \*`delete` – Deletes the entire alias, zone, or configuration
- \*`add` – Adds a member to an existing alias, zone, or configuration
- \*`remove` – Removes one or more members from an existing alias, zone, or configuration
- \*`show` – Displays alias, zone, and/or configuration information

Switches running Fabric OS v6.0 or earlier must have an Advanced Zoning license installed. This license is not required starting with Fabric OS v6.1.

**Note:** It is recommended that zoning changes be made from the switch with the highest revision of Fabric OS.

## Regular Zoning using CLI Example

### 1. Plan zoning scheme to meet your objectives

### 2. Create aliases

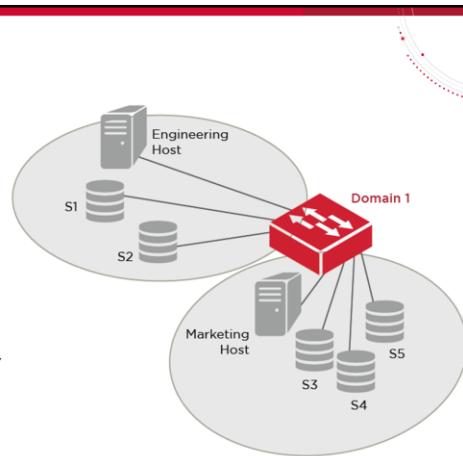
```
alicreate "Eng_Host", "1, 0"  
alicreate "Eng_Stor", "1, 1; 1, 3"  
alicreate "Mkt_Host", "10:00:00:05:1e:56:c8:2b"  
alicreate "Mkt_Stor", "s3wwn; s4wwn; s5wwn"
```

### 3. Create zones

```
zonecreate "Zone_Eng", "Eng_Host; Eng_Stor"  
zonecreate "Zone_Mkt", "Mkt_Host; Mkt_Stor"
```

### 4. Create configuration

```
cfgcreate "Cfg_EngMkt", "Zone_Eng; Zone_Mkt"
```



34 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

Brocade best practice recommendations include using only one device in an alias, zone using single initiator and either single or multiple targets per initiator. Different OEMs have different best practice recommendations.

**Note:** The double-quotes are not required in the first argument of the commands above since they do not consist of a list. For example the following commands would still be accepted by the switch shell:

```
alicreate Eng_Host, "1, 0"  
Zonecreate Zone_Mkt, "Mkt_Host; Mkt_Stor"  
cfgcreate Cfg_EngMkt, "Zone_Eng; Zone_Mkt"
```

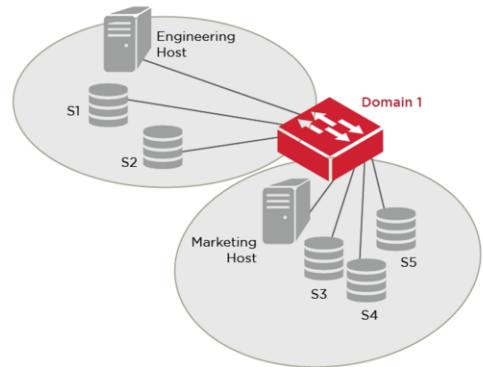
## Regular Zoning using CLI Example (cont.)

```
SW1:admin> cfgshow1
```

```
Defined configuration:  
cfg:   Cfg_EngMkt  
        Zone_Eng; Zone_Mkt  
zone:  Zone_Eng  
        Eng_Host; Eng_Stor  
zone:  Zone_Mkt  
        Mkt_Host; Mkt_Stor  
alias: Eng_Host 1,0  
alias: Eng_Stor 1,1;1,3  
alias: Mkt_Host 10:00:00:05:1e:56:c8:2b  
alias: Mkt_Stor  
      21:00:00:20:37:87:49:29; 21:00:00:20:37:87:e5:20; 21:00:00:20:37:87:20:c5
```

```
Effective configuration:
```

```
no configuration in effect
```



35 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

**Footnote 1:** The command `cfgshow` displays the defined configuration and since zoning has not been enabled, there is no effective configuration.

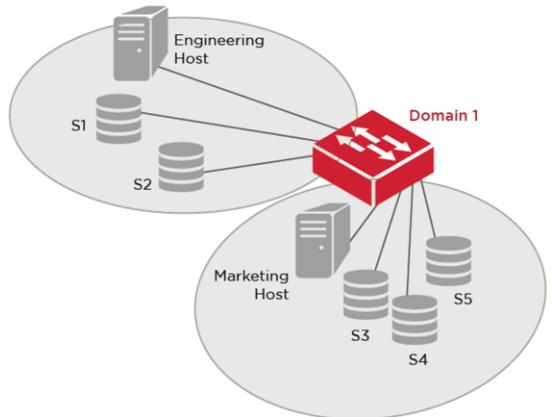
Zoning is fabric-wide, thus any switch can be used to display the current zoning configurations. The defined configuration is the Zoning Database and contains all zone objects that have been created. It is possible to have several zone configurations but only one can be enabled.

## Regular Zoning using CLI Example (cont.)

### 5. Enable Zoning Configuration

```
cfgenable Cfg_EngMkt
```

- **cfgenable** also saves the defined configuration and the name of the effective configuration to flash. It also distributes and saves the zoning configuration to every switch in the fabric



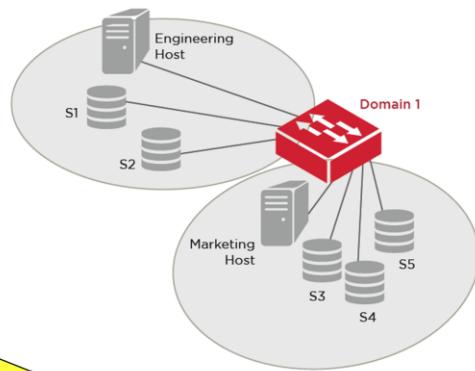
36 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**   
A Broadcom Company

## Regular Zoning using CLI Example (cont.)

```
SW1:admin> cfgshow
Defined configuration:
cfg: Cfg_EngMkt
  Zone_Eng; Zone_Mkt
  zone: Zone_Eng Eng_Host; Eng_Stor
  zone: Zone_Mkt Mkt_Host; Mkt_Stor
  alias: Eng_Host 1,0
  alias: Eng_Stor 1,1;1,3
  alias: Mkt_Host 10:00:00:05:le:56:c8:2b
  alias: Mkt_Stor
    21:00:00:20:37:87:49:29;
    21:00:00:20:37:87:e5:20;
    21:00:00:20:37:87:20:c5
```

```
Effective configuration:
cfg: Cfg_EngMkt
zone: Zone_Eng 1,0;1,1;1,3
zone: Zone_Mkt 21:00:00:20:37:87:e5:20
  21:00:00:20:37:87:49:29
  21:00:00:20:37:87:20:c5
  10:00:00:05:le:56:c8:2b
```



Alias objects will only appear in the defined configuration since they are only used to assign a meaningful name to a device or group of devices

37 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

Since zoning is now enabled, the configuration in effect is displayed.

## Peer Zoning using CLI Example

1. Create peer zones (aliases are supported for member definitions)

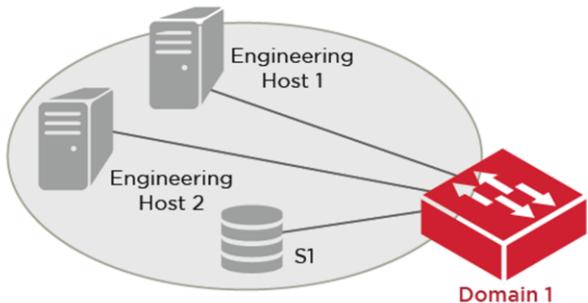
```
zonecreate --peerzone "Zone_Eng_2" -principal "1,0" -members "1,2; 1,3"
```

2. Create configuration

```
cfgcreate "Cfg_EngMkt", "Zone_Eng_2"
```

3. Enable configuration

```
cfgenable "Cfg_EngMkt"
```



**BROCADE**  
A Broadcom Company

38 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

```
zonecreate --peerzone "<zonenname>" -principal "<principal>[;  
<principal>...]" [-members "<member>[; <member>...]" ]
```

Operands:

--peerzone "zone_name"	Zone name of the new peer zone
-principal "principal_list"	List of principal members, separated by semi-colon. All members can either be WWN (or) D,I; mixed members not allowed
-members "member_list"	List of non-principal peer members, separated by semi-colon. All members can either be WWN (or) D,I; mixed members not allowed

**Modify Peer Zones:**

```
zoneadd --peerzone "<zoneName>" -principal "<principal_member>[;  
<principal_member>...]" [-members "<member>[; <member>...]" ]
```

```
zoneremove --peerzone "<zonenname>" -principal
```

```
"<principal_member>[; <principal_member>...]" [-members  
"<member>[; <member>...]" ]
```

Operands:

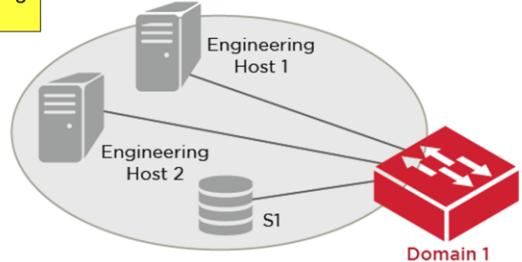
--peerzone "zone_name"	Zone name of the new peer zone
-principal "principal_list"	List of principal members. Note that removing the last principal member in a peer zone will delete the peer zone.

```
-members "member_list" List of non-principal peer members
```

## Peer Zoning using CLI Example (cont.)

```
SW1:admin> cfgshow
Defined configuration:
cfg: Cfg_EngMkt
  Zone_Eng_2
zone: 20:00:00:11:0D:0F:84:00
      10:00:00:05:1e:56:c8:2b
      10:00:00:05:1e:56:c8:2a
Effective configuration:
cfg: Cfg_EngMkt
zone: Zone_Eng_2
      20:00:00:11:0D:0F:84:00
      10:00:00:05:1e:56:c8:2b
      10:00:00:05:1e:56:c8:2a
SW1:admin> zoneshow --peerzone all
zone: Zone_Eng_2
  Property Member: 00:02:00:00:00:02:00:01
  Created by: User
  Principal Member(s):
    20:00:00:11:0D:0F:84:00
  Peer Member(s):
    10:00:00:05:1e:56:c8:2b
    10:00:00:05:1e:56:c8:2a
1 Peer Zones in Eff Cfg
```

To view the peer zone property member use the **--verbose** flag



To get a breakdown of Principal and Peer members use the **zoneshow --peerzone all** command

39 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

## QoS Zoning using CLI Example

To distinguish QoS zones from normal zones, special prefixes are used in the zone names:

- **QOSH\_** to set high priority

```
zonecreate "QoSH_bluezone", "10:00:00:05:1e:56:c8:2b;20:00:00:11:0D:0F:84:00"
```

- **QOSL\_** to set low priority

```
zonecreate "QoSL_greenzone", "10:00:00:05:1e:56:c8:2c;20:00:00:11:0D:0F:84:21"
```

```
sw0:admin> cfgshow
Defined configuration:
cfg:    cfg1      QoSH_bluezone; QoSL_greenzone
zone:  QoSH_bluezone          10:00:00:05:1e:56:c8:2b; 20:00:00:11:0D:0F:84:00
zone:  QoSL_greenzone         10:00:00:05:1e:56:c8:2c; 20:00:00:11:0D:0F:84:21
```

40 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



For new switches, QoS mode is automatically enabled on the E\_Ports, except for long-distance E\_Ports. For long-distance E\_Ports, you must manually enable QoS mode. Enter the `portCfgQos` command to enable QoS on the E\_Ports, by using the following syntax: `portcfgqos --enable [ slot/] port`

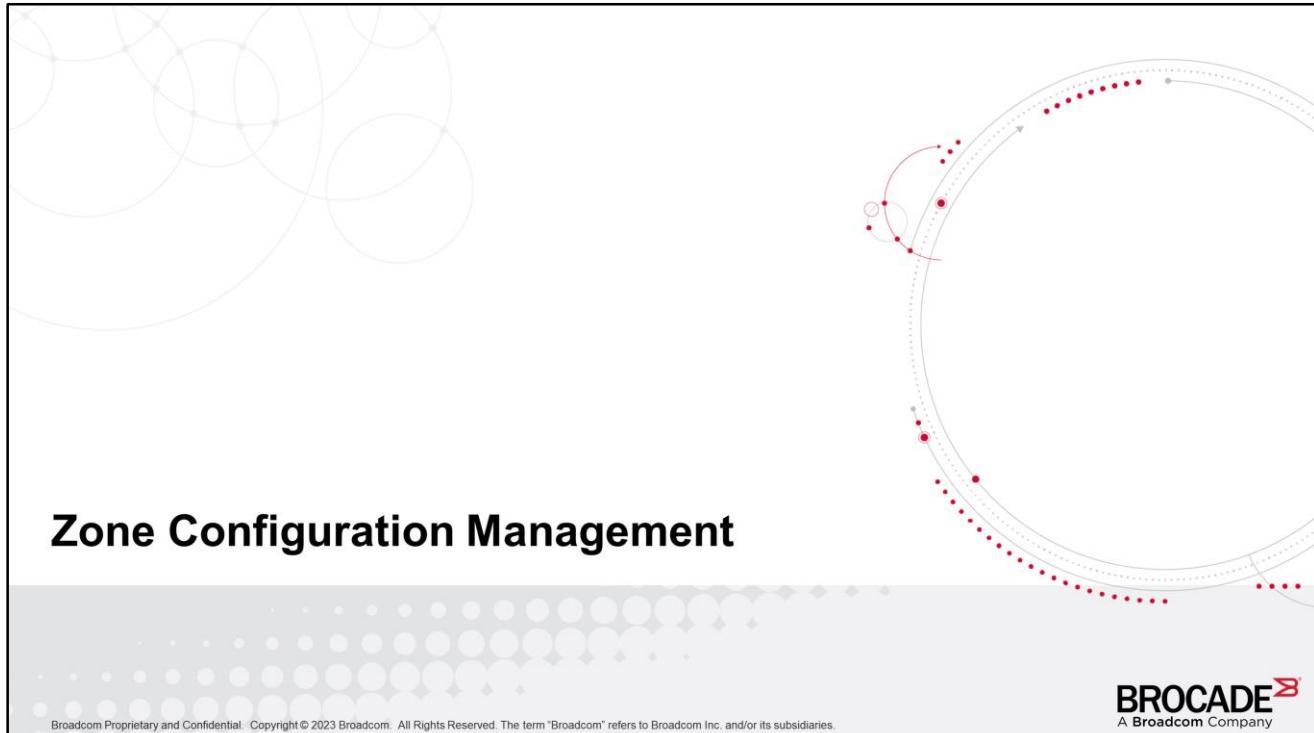
## Demo

G620:FID128:admin> 



41 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**   
A Broadcom Company



## Zone Configuration Management

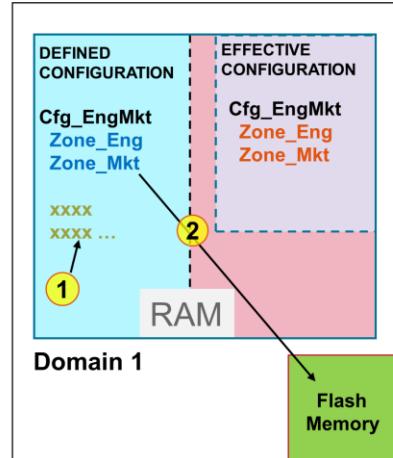
Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**   
A Broadcom Company

## Saving Zoning

- Use `cfgsave` to save zoning changes
- Saving changes made to the defined configuration does not enable them

- 1 Changes made to the defined configuration  
2 Defined configuration is written to flash memory



43 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

When the current zone configuration is saved, the defined configuration and the name of the effective configuration are written to flash memory in all switches in the fabric. Because the saved configuration is reloaded at power on, only valid configurations are saved. Saving the configuration verifies that the enabled configuration is valid by performing the same tests as enabling the configuration. If the tests fail, an error is displayed and the configuration is not saved. Tests might fail if a configuration has been modified since it was last enabled.

This command ends and commits the current transaction. If a transaction is open on a different switch in the fabric when this command is run, the transaction on the other switch is automatically aborted and a message is displayed on the other switches.

If the defined configuration is larger than the supported maximum zoning database size, the following message is issued:

Commit zone DB larger than supported - <zone db size> greater than <max zone db size>

## Enabling A Defined Configuration

- Enable one configuration over another using the `cfgenable "cfgname"` command
  - Saves the zone configuration to flash
  - Saved across power cycles, reboots
- Only one effective zone configuration for the entire fabric
- As a best practice do **not** disable the current effective zoning configuration in order to enable another
  - Enable a different config over an existing one to prevent RSCN storms, preventing devices from accessing other devices, or cutting off all fabric communications
- Effective zone configuration displayed in `switchshow` command, as well as in Web Tools and SANnav Management Platform

44 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



A zone configuration is a group of zones that is enforced whenever that zone configuration is enabled. A zone can be included in more than one zone configuration.

To define a zone configuration, specify the list of zones to be included and assign a zone configuration name. Zoning may be disabled at any time. When a zone configuration is in effect, all zones that are members of that configuration are in effect.

**Defined configuration:** The complete set of all zone objects that have been defined in the fabric.

**Effective configuration:** A single zone configuration that is currently in effect. The effective configuration is built when an administrator enables a specified zone configuration. This configuration is “compiled” by checking for undefined zone names, or zone alias names, or other issues.

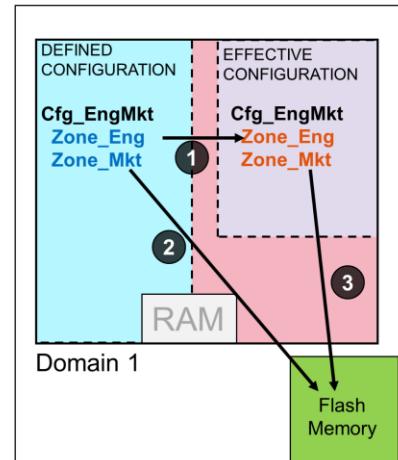
**Saved configuration:** A copy of the defined configuration plus the name of the effective configuration which is saved in flash memory by the `cfgsave` command. There may be differences between the saved configuration and the defined configuration if the system administrator has modified any of the zone definitions and has not saved them.

## Enabling Zoning Behavior

- Enabling zoning saves the configuration to flash memory without an explicit save command

```
cfgenable cfg_engmkt
```

- 1 **Cfg\_EngMkt** becomes effective configuration
- 2 Defined configuration is written to flash memory
- 3 Name of effective configuration is written to flash memory (“**Cfg\_EngMkt**”)



45 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

Use the `cfgenable` command to enable a zone configuration. The specified zone configuration is built by checking for undefined zone names, zone alias names, or other inconsistencies by expanding zone aliases, removing duplicate entries, and then installing the current configuration.

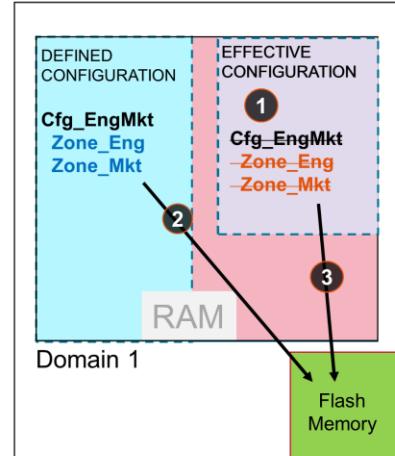
If the build fails, the previous state is preserved (zoning remains disabled, or the previous configuration remains in effect). If the build succeeds, the new configuration replaces the previous configuration.

## Disabling Zoning

- Disabling zoning allows all devices in the fabric to communicate with each other if the default access in the fabric is set to all access

`cfgdisable`

- ① Effective configuration is disabled
- ② Defined configuration is written to flash memory
- ③ Name of effective configuration set to “**none**” in flash memory



**BROCADE**  
A Broadcom Company

46 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

Use the `cfgdisable` command to disable the current zone configuration. The fabric returns to non-zoning mode, in which all devices see each other.

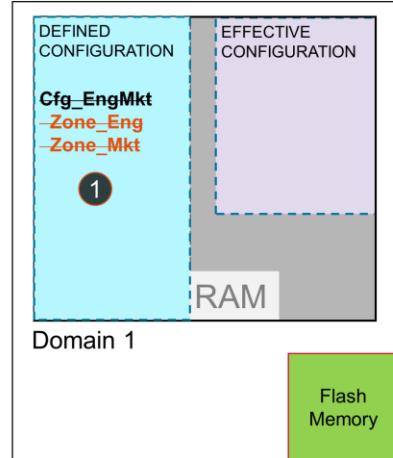
This command clears and commits the current zoning transaction buffer to both volatile and flash memory. If a transaction is open on a different switch in the fabric when this command is run, the transaction on the other switch is automatically aborted. A message is displayed on the other switches to indicate the aborting of the transaction.

## Clearing Zoning

- Clearing zoning does not disable the effective configuration and does not save anything to flash memory
- Use the following commands in the order listed below to fully clear the zoning database:

```
cfgdisable  
cfgclear  
cfgsave
```

- ① Defined configuration is cleared from RAM



47 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

Use the `cfgclear` command to clear all zone information in the defined configuration. All defined zone objects are deleted.

After using the `cfgclear` command, use the `cfgsave` command to commit the defined and effective configuration to flash memory for all the switches in the fabric.

To completely clear the zoning database, use the commands in the following order:

1. Enter the `cfgdisable` command.
2. Enter the `cfgclear` command.
3. Enter the `cfgsave` command.

**Note:** The `cfgsdisable` command must be issued first. If you don't disable the effective configuration the `cfgsave` command will fail.



Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**   
A Broadcom Company

## Adding a New Switch to a Zoned Fabric

1. Ensure the new switch has no zoning
2. Ensure the new switch has the same default zone settings as the fabric it is being joined to
3. Connect the switch to an existing fabric
4. Defined and effective configurations are propagated to the new switch

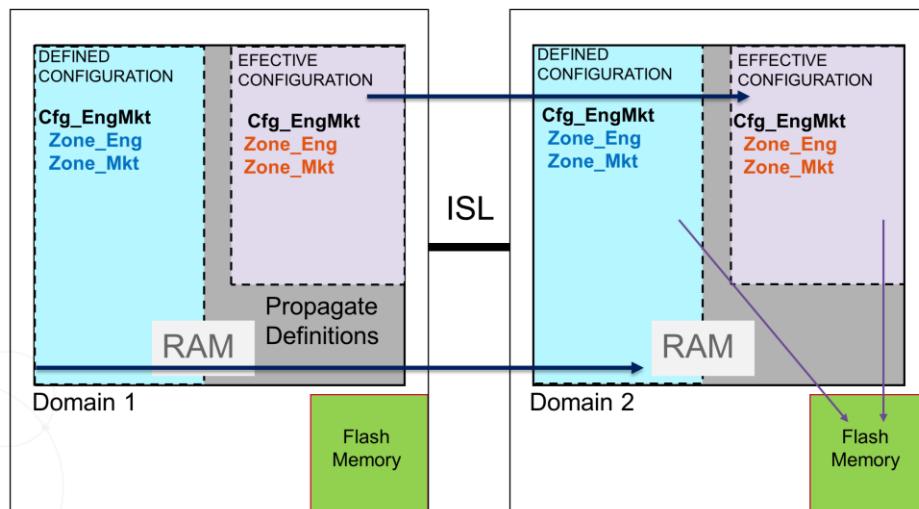
49 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



A new switch is one that has not previously been connected to a fabric. Before connecting the new switch, check to see if any zoning data exists with the `cfgshow` command. If it exists use the `cfgdisable`, `cfgclear`, and `cfgsave` commands to sanitize it.

When a new switch is connected to a zoned fabric, all zone configuration data is immediately copied from the zoned fabric into the new switch. If a zone configuration is enabled in the fabric, then the same configuration becomes enabled in the new switch. After this operation, the `cfgshow` command displays the same output on all switches in the fabric, including the new switch.

## Connect New Switch to Existing Fabric



50 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

The defined and effective configurations from the existing fabric are propagated to the new switch.

## Merging Two Zoned Fabrics: Segmentation

Segmentation Reason	Description
Zoning Configuration mismatch	Occurs when zoning is enabled in both fabrics and the <b>effective configurations</b> are different
Zoning Type mismatch	Occurs when the name of a zone object in one fabric is also used for a different type of zone object in the other fabric Fabric A: alias: Mkt_Host 1,16 Fabric B: zone: Mkt_Host 1,16
Zoning content mismatch	Occurs when the name and type of a zone object in one fabric is also used in the other fabric but the <b>content or order</b> is different Fabric A: alias: Eng_Stor wwn2; wwn1 Fabric B: alias: Eng_Stor wwn1; wwn2
Default Zone mismatch	The default zone setting must match between both fabrics otherwise segmentation will occur Fabric A: No Effective configuration: (No Access) Fabric B: No Effective configuration <sup>1</sup>

51 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

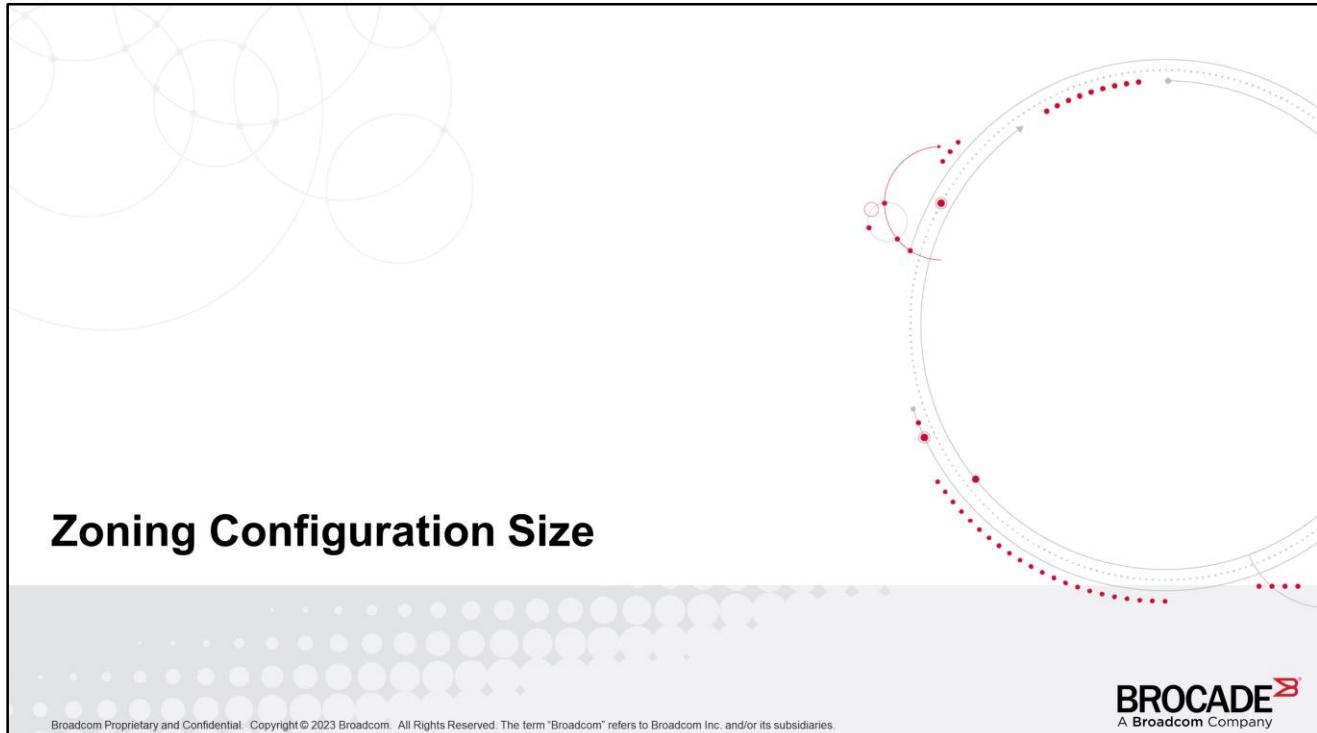


**Footnote 1:** The absence of a default zone statement indicates “ALL Access”

The RASLog message to indicate a zoning conflict is: A [FABR-1001] zoning conflict message is displayed

If the zoning changes are not done correctly, it is possible to have the merging of the fabrics fail due to a segmentation error.

The table above shows the three possible segmentations errors. The actual error would be a FABR-1001 message.



## Zoning Configuration Size

Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**   
A Broadcom Company

## Maximum Zoning Database Size

- Determined by the amount of Flash Memory available for storing the defined configuration
- Amount varies by Fabric OS release

Category	FOS v8.x	FOS v9.0
Fixed Port Switches	1 MB	4 MB
Directors	2 MB	4 MB
Chassis-Wide (Across All LS <sup>1</sup> )	Max supported size of platform (1 MB for fixed port switches and 2 MB for directors)	16 MB
Fabric	2 MB for director-only fabric, 1 MB if at least one fixed port switch in fabric	Lowest common denominator (4 MB max)

53 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



In Fabric OS v9.0 new increased limits which means more available space per Logical Switch

The Fabric OS v9.0 limits will ONLY be supported if all switches in the fabric support the increased limits

Zone data base (DB) size less than 2 MB:

Chassis-based system with 9.0 Active CP and 8.x Standby CP will support lowest max size of either CP (Standby CP in this case)

Zone DB size greater than 2 MB:

Chassis-based system with 9.0 Active CP will not sync to an 8.x Standby CP  
Firmware downgrade from 9.0 to earlier releases will only be allowed if the current zone database size is within limits of target release

## Zone Database Increased Scale: Modified CLI

- Size displayed with `cfgsize` command in bytes

### FOS v8.2.x (switch)

```
sw0:admin> cfgsize
Chassis-Wide Committed Zone DB size - 1086 bytes
Zone DB max size - 1045274 bytes
Available Zone DB size - 1044188 bytes
committed - 74
transaction - 0
```

### FOS v9.0 (switch)

```
sw0:admin> cfgsize
Chassis-Wide Max Zone DB size - 16777216 bytes
Chassis-Wide Committed Zone DB size - 16679724 bytes
Current Logical Switch Max Zone DB size - 4194304 bytes
Fabric-Wide Max Zone DB size - (Domain 086) 4194304 bytes
Available Zone DB size - 24292 bytes

Current Logical switch zone config sizes:
committed - 4169000
transaction - 0
Compressed sizes:
committed - 1901301
transaction - 0
```

54 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

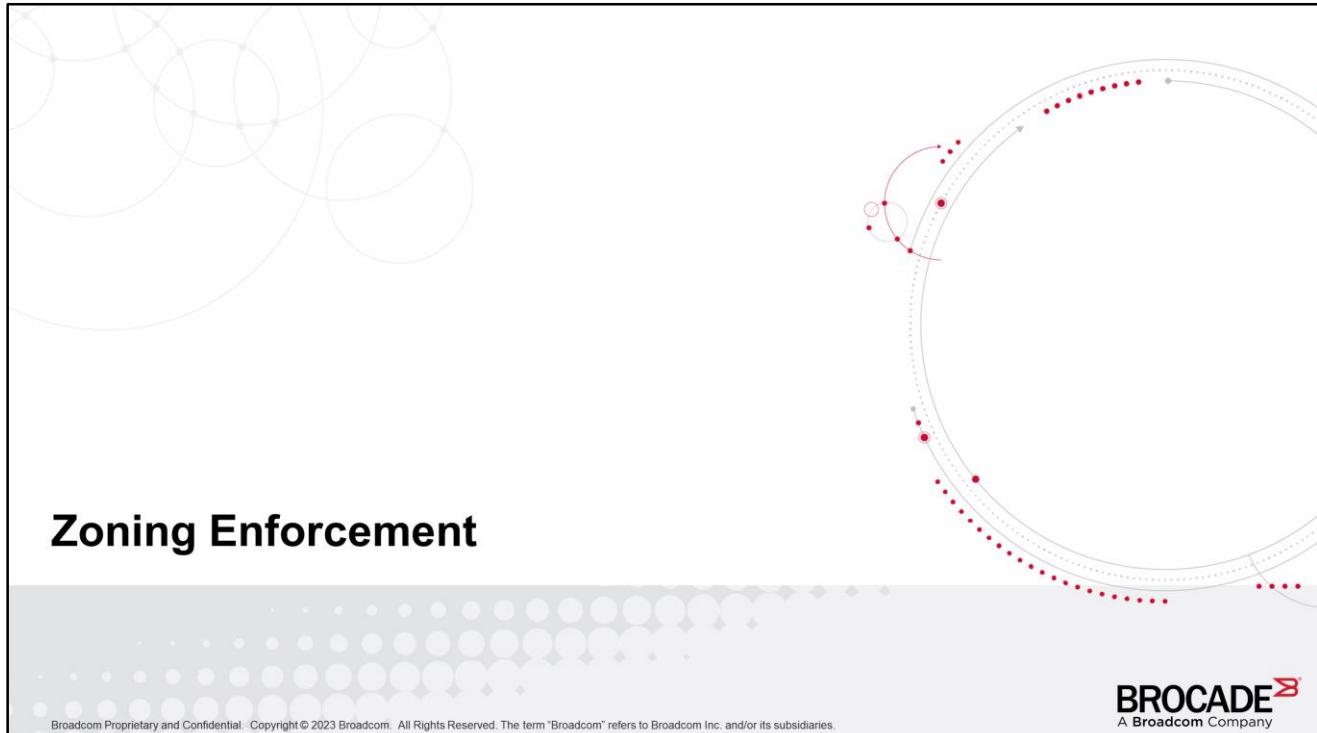


**Footnote1:** This is the maximum size of the local database (this switch) and may not be the fabric-wide max size. The switch with the lowest max zone database size, typically the switch with the lowest version of Fabric OS, will determine the maximum zoning database size in a fabric. The maximum supported zone database size is 4 MB for all switches. Use the `cfgsize` command to display the size details of the zone database. The size details include the Zone DB maximum size, the committed size, and the transaction size. All sizes are in bytes.

Zone DB max size is the upper limit for the defined configuration, determined by the amount of flash memory available for storing the defined configuration.

Committed size is the size of the defined configuration currently stored in flash memory.

Transaction size is the size of the uncommitted defined configuration. This value will be nonzero if the defined configuration is being modified, otherwise it is 0.



Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**   
A Broadcom Company

## Types of Zoning Enforcement

- Frame-based hardware enforcement
  - Source device is denied access to destination device if they are not defined in the same zone
  - Available through ASIC hardware logic checking at the destination port
  - More secure than session enforcement
- Session-based hardware enforcement
  - PLOGI is restricted at the ASIC
- Enforcement is based on how members in a zone are defined

Zone Membership	Example	2, 4, 8, 16, 32 and 64 Gbps ASIC Enforcement
All Domain,Index	Z1="dom1,index1;dom1,index2"	Frame-based
All WWNs	Z2="wwn1; wwn2; wwn3"	Frame-based
Mixed	Z3="dom1,index3; wwn4"	Session-based

56 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

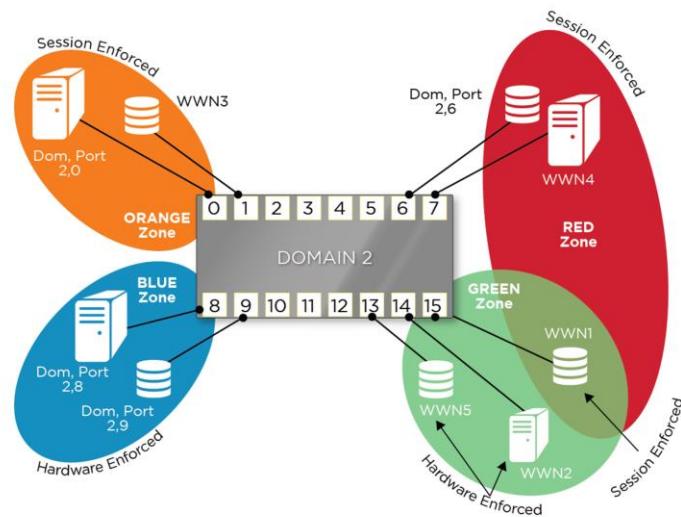


Devices that are session enforced cause any PLOGIs to the device to be rejected. Devices that are hardware enforced cause any frames that do not comply with the effective zone configuration to be rejected. This blocking is performed at the transmit side of the port where the source device is located. This is the highest level of protection for a device.

The decision for what enforcement a device receives is based on how the members in a given zone are defined.

**Note:** Brocade best practice is to make sure that all devices are defined consistently in the same zones (all WWN or all D,I)

## Zoning Enforcement (cont.)



57 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**  
A Broadcom Company

The Blue Zone is Hardware enforced because all devices have been specified by WWN. The Green Zone is also Hardware enforced because all devices have been specified by Port.

The Red Zone is Session enforced because a mix of ports and WWNs have been specified in the zone. The Orange Zone is also Session enforced because of a mix of ports and WWNs in the same zone.

**Note:** The Red and Orange Zones also illustrate that the type of device (initiator vs. target) has no bearing on the type of enforcement.

The diagram above shows the results of Hardware and Session enforced overlapping zones.

The Green zone is defined with all WWNs (WWN1, WWN2 and WWN5) and meets the rules for Hardware enforcement. The Red zone is defined with a mix of port and WWNs and meets the rules for Session enforcement.

The target device WWN1 is defined in both the Red and Green zones. When a device is defined in overlapping zones, where one is Hardware enforced and the other is Session enforced, the device will become Session enforced in all zones. What is important to note is the host (WWN2) is still Hardware enforced, even though the target device (WWN1) is now Session enforced. Under these conditions, zoning enforcement is determined at the device level, not the zone level.

## Zoning Enforcement (cont.)

- The **portzoneshow** command displays zoning enforcement for each online device port on the local switch

```
Switch1:admin> portzoneshow
PORT: 0 (0) F-Port Enforcement: HARD PORT defaultHard: 0 IFID: 0x43020000
PORT: 1 (1) F-Port Enforcement: HARD PORT defaultHard: 1 IFID: 0x43020001
PORT: 2 (2) Offline
<truncated output>
```

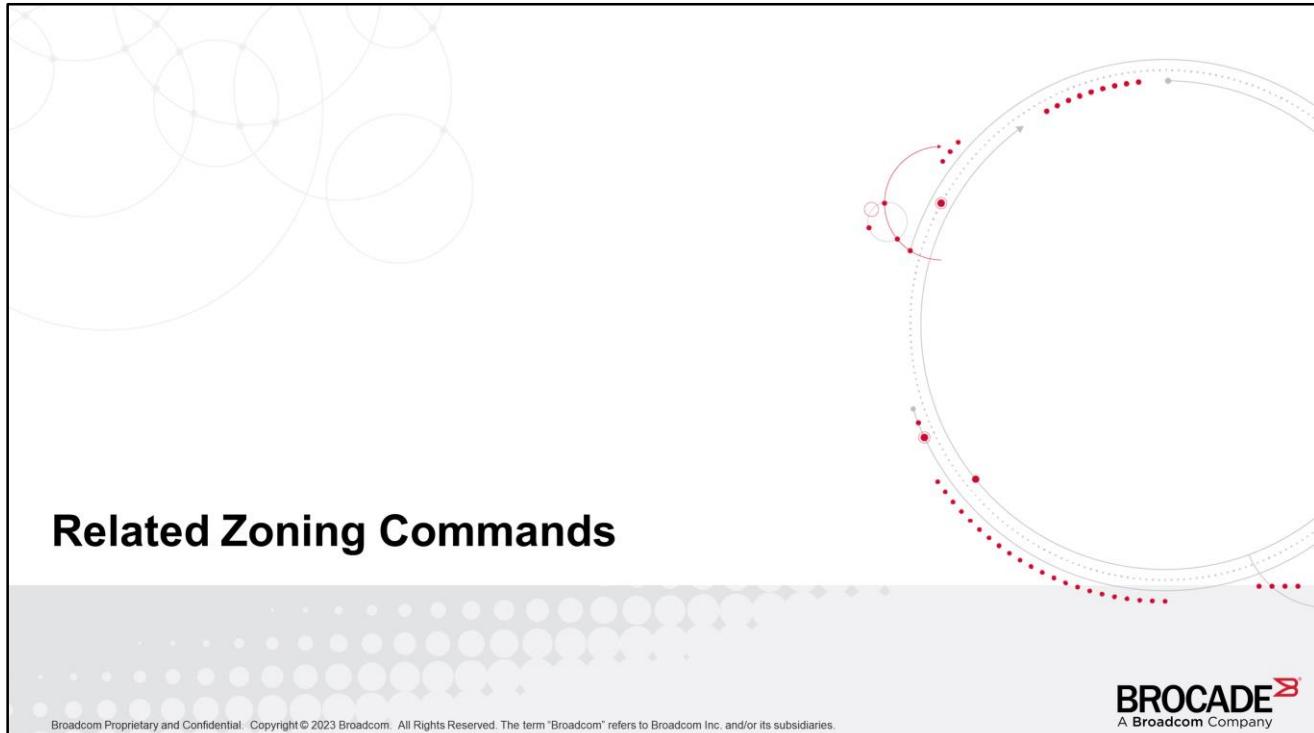
```
Switch1:admin> portzoneshow
PORT: 0 (0) F-Port Enforcement: HARD WWN defaultHard: 0 IFID: 0x43020000
PORT: 1 (1) F-Port Enforcement: HARD WWN defaultHard: 0 IFID: 0x43020001
PORT: 2 (2) Offline
<truncated output>
```

```
Switch1:admin> portzoneshow
PORT: 0 (0) F-Port Enforcement: SESSION BASED HARD defaultHard: 0 IFID: 0x43020000
PORT: 1 (1) F-Port Enforcement: SESSION BASED HARD defaultHard: 0 IFID: 0x43020001
PORT: 2 (2) Offline
<truncated output>
```

58 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



**Footnote 1:** IFID, or Interface ID, references engineering level information regarding the ASIC.



## Related Zoning Commands

Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

**BROCADE**   
A Broadcom Company

## Zone Object Commands

- The following commands can be used for all zone object types, configuration, zone, and alias:
  - Zoneobjectcopy
    - Copies a zone object to a new zone object
    - > `zoneobjectcopy "Cfg_EngMkt", "Cfg_Test"`
  - Zoneobjectreplace
    - Replaces one zone member with another zone member (does not work with aliases)
    - > `zoneobjectreplace "20:00:00:05:1e:a1:af:b2" "10:00:00:05:1e:a1:10:c1"`
  - Zoneobjectrename
    - Renames a zone object
    - > `zoneobjectrename "Zone_Redd", "Zone_Red"`
  - zoneobjectexpunge
    - Deletes the zone object and removes it from the member list of all other objects
    - > `zoneobjectexpunge "Mkt_Host"`
- The effective zoning database will not change until the `cfgenable` command is issued

60 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



## Zoning Display Commands

- `nsaliasshow` displays local name server information and the defined configuration aliases to which the device belongs

```
SW1:admin> nsaliasshow
Type Pid          COS PortName           NodeName           TTL(sec)
N 010100;        3;20:00:00:11:0d:0f:84:00;20:00:00:11:0d:0f:84:00; na
  FC4s: FCP
  PortSymb: [36] "Brocade University Virtual FC Target"
  Fabric Port Name: 20:01:c4:f5:7c:0e:d4:d8
  Permanent Port Name: 20:00:00:11:0d:0f:84:00
  Port Index: 1
  Share Area: No
  Device Shared in Other AD: No
  Redirect: No
  Partial: No
  LSAN: No
  Device link speed: 8G
  Aliases: Disk1
N 010300;        3;21:00:00:20:37:42:66:35;20:00:00:20:37:42:66:35;   na
  <truncated output>
  LSAN: No
  Device link speed: 16G
  Aliases:
The Local Name Server has 2 entries }
```

This node has been defined in an alias

This node has not been defined in an alias

61 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



This command is a duplicate of the `nsshow` command with the added feature of displaying the defined configuration aliases that the device belongs to.

The message “There is no entry in the Local Name Server” is displayed if there is no information in this switch, but there still may be devices connected to other switches in the fabric. The command `nsallshow` shows the 24 bit pids of all currently online devices in the fabric.

## Zoning Display Commands (cont.)

- **nodefind** displays all the name server entries matching a given WWN, PID (in hex) or alias

```
SW1:admin> nodefind Disk_1
Local:
Type Pid    COS      PortName          NodeName          SCR
N 010100;    3;20:00:00:11:0d:0f:84:00;20:00:00:11:0d:0f:84:00; na
  FC4s: FCP
  PortSymb: [36] "Brocade University Virtual FC Target"
  Fabric Port Name: 20:01:c4:f5:7c:0e:d4:d8
  Permanent Port Name: 20:00:00:11:0d:0f:84:00
  Port Index: 1
  Share Area: No
  Device Shared in Other AD: No
  Redirect: No
  Partial: No
  LSAN: No
  Device link speed: 8G
  Aliases: Disk1
```



62 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.

```
SW1:admin> nodefind 20:00:00:11:0d:0f:84:00
```

Local:

```
Type Pid    COS      PortName          NodeName
SCR
N 010100;    3;20:00:00:11:0d:0f:84:00;20:00:00:11:0d:0f:84:00;
na
  FC4s: FCP
  PortSymb: [36] "Brocade University Virtual FC Target"
  Fabric Port Name: 20:01:c4:f5:7c:0e:d4:d8
  Permanent Port Name: 20:00:00:11:0d:0f:84:00
  Port Index: 1
  Share Area: No
  Device Shared in Other AD: No
  Redirect: No
  Partial: No
  LSAN: No
  Device link speed: 8G
  Aliases: Disk1
```

## Zoning Display Commands (cont.)

- **nszonemember** displays the information of all online devices that are zoned with the given device (WWN or PID)

```
SW1:admin> nszonemember 010100
1 local zoned members:
  Type Pid      COS      PortName          NodeName      SCR
  010100;      3;20:00:00:11:0d:0f:84:00;20:00:00:11:0d:0f:84:00;    na
    FC4s: FCP
    PortSymb: [36] "Brocade University Virtual FC Target"
    Fabric Port Name: 20:01:c4:f5:7c:0e:d4:d8
    Permanent Port Name: 20:00:00:11:0d:0f:84:00
    Port Index: 1
<truncated output>
Device link speed: 8G

1 remote zoned members:
  N      030000;      3;10:00:00:05:1e:56:c8:2b;20:00:00:05:1e:56:c8:2b;    na
    FC4s: FCP
    PortSymb: [89] "Brocade-825 | 3.2.3.0 | DEV2-ST01-HBA | Windows Server (R) 2008 Standard | Service
Pack 1"
    NodeSymb: [40] "Brocade-825 | 3.2.3.0 | DEV2-ST01-HBA | "
    Fabric Port Name: 20:00:00:05:33:93:69:3f
    Permanent Port Name: 10:00:00:05:1e:56:c8:2b
    Port Index: 0
<truncated output>
Device link speed: 8G
```

63 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



```
SW1:admin> nszonemember 20:00:00:11:0d:0f:84:00
1 local zoned members:
  Type Pid      COS      PortName          NodeName
  SCR
  N      010100;
3;20:00:00:11:0d:0f:84:00;20:00:00:11:0d:0f:84:00; 0x01000003
    FC4s: FCP
    PortSymb: [36] "Brocade University Virtual FC Target"
    Fabric Port Name: 20:01:c4:f5:7c:0e:d4:d8
    Permanent Port Name: 20:00:00:11:0d:0f:84:00
    Device type: Physical Target
    Port Index: 1
    Share Area: No
    Device Shared in Other AD: No
    Redirect: No
    Partial: No
    LSAN: No
    Device link speed: 8G
1 remote zoned members:
  Type Pid      COS      PortName          NodeName
  N      030000;
3;10:00:00:05:1e:56:c8:2b;20:00:00:05:1e:56:c8:2b;
    FC4s: FCP
```

```
PortSymb: [89] "Brocade-825 | 3.2.3.0 | DEV2-ST01-HBA
| Windows Server (R) 2008 Standard | Service Pack 1"
NodeSymb: [40] "Brocade-825 | 3.2.3.0 | DEV2-ST01-
HBA | "
Fabric Port Name: 20:00:00:05:33:93:69:3f
Permanent Port Name: 10:00:00:05:1e:56:c8:2b
Device type: Physical Initiator
Port Index: 0
Share Area: No
Device Shared in Other AD: No
Redirect: No
Partial: No
Device Link speed: 8G
```

## Zone Display Commands (cont.)

- **zoneshow --alias** command helps to locate alias member(s) in the zone configuration
  - Displays the zones containing the alias member(s)

<pre>Switch1:admin&gt; zoneshow --alias "a*" zone: Zone3  ald1 zone: aliii  aldds zone: h1    al; Alil; dev3 zone: zone1  alil zone: zone4  dev2; aldds  Switch1:admin&gt; zoneshow --alias -ic "ali*" zone: h1    al; Alil; dev3 zone: zone1  alil zone: zone2  Alil; Ali2  Switch1:admin&gt; zoneshow --alias "*1*" zone: Zone3  ald1 zone: h1    al; Alil; dev3 zone: zone1  alil</pre>	<pre>Switch1:admin&gt; zoneshow --alias "?l?1" zone: Zone3  ald1 zone: h1    al; Alil; dev3 zone: zone1  alil zone: zone2  Alil  Switch1:admin&gt; zoneshow --alias "al[id]1" zone: Zone3  ald1 zone: zone1  alil  Switch1:admin&gt; zoneshow --alias -ic "alil" zone: h1    al; Alil; dev3 zone: zone1  alil zone: zone2  Alil; Ali2</pre>
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

64 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



**zoneshow --alias [-ic] [<pattern>]**

Command option **-ic** will ignore case in pattern search

The pattern **<pattern>** can be POSIX-style regular expression

## Zoning Display Commands (cont.)

- nszonemember -u displays all unzoned devices in the entire fabric

```
Switch1:admin> nszonemember -u
```

```
Pid: 0x010200;    Aliases:  
Pid: 0x010300;    Aliases:  
Pid: 0x010400;    Aliases:  
Pid: 0x010500;    Aliases:  
Pid: 0x010600;    Aliases:  
Pid: 0x010700;    Aliases:
```

```
Total of 7 unzoned device(s) in the fabric.
```

65 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



Some useful options with nszonemember:

- a: Displays each local device's online zoned data, including PID and zone alias.
- u: Displays all unzoned devices in the entire fabric.

## Zone Fabric Locking

- FOS v8.2.x and earlier
  - Single switch lock
    - Multiple users not allowed to start zone transactions concurrently on the same switch
- Fabric OS v9.0 and above will prevent local and non-local switches (users) from committing a zone change while a fabric lock is active
  - Once Active, a failsafe timer is started (5 mins by default)
    - Timer duration configurable (5-30 mins)
    - Timer restarted on every zone edit operation

```
sw0:FI0128:admin> zoneFabricLock --help
```

Usage:

```
    zoneFabricLock --timeout <timeoutValue>
    zoneFabricLock --show
    zoneFabricLock --help
```

Operands:

```
    --timeout <timeoutValue> : Specifies the new fabric lock timeout value. The supported
                                range is 5 to 30 minutes.
    --show                  : Displays the current lock data information.
```

66 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.


### Concurrent Transaction Detection (introduced in FOS v7.1)

- Fabric-wide detection mechanism
- Detect transactions at the CLI level only
- Warns users of concurrent transactions, but does not prevent

#### 1. Activating Fabric Lock

No explicit user action required

Implicitly sent on first zone edit or commit operation

create, add, remove, copy, expunge, rename, replace  
cfgClear, defZone, cfgSave, cfgEnable, cfgDisable

New switches joining fabric will inherit the lock

#### 2. Updating Fabric Lock

Timer restarted on every zone edit and commit operation

#### 3. Clearing Fabric Lock

At the end of a commit operation (e.g. cfgSave/cfgEnable/cfgDisable)

Lock timer expires

Zone transaction abort (e.g. user-initiated, preemption)

Lock owner leaves fabric, reboots, failover

#### Applicable to all interfaces

CLI, REST, PyFOS, WebEM, SANNav, TDZ

Feature on by default and cannot be disabled

## Additional Zone Management Commands

- **cfgtransshow**
  - Displays local open transaction token details
- **cfgTransShow --fabricLock**
  - Displays Zone Fabric Locking information
- **cfgtransabort**
  - Aborts the current zoning transaction (anything since the last save)

67 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



```
Switch1:admin> cfgtransshow
```

```
There is no outstanding zone transactions
```

```
Switch1:admin> cfgclear
```

```
Do you really want to clear all configurations? (yes, y, no, n): [no]  
y
```

```
Clearing All zoning configurations...
```

```
Switch1:admin> cfgtransshow
```

```
Current transaction token is 271010736
```

```
It is abortable
```

```
Switch1:admin> cfgtransabort
```

```
Switch1:admin> cfgactvshow
```

```
Effective configuration:
```

cfg:	Cfg_EngMkt	
zone:	Zone_Eng 1,0;	21:00:00:20:37:87:23:e2;
		21:00:00:20:37:87:48:e7
zone:	Zone_Mkt 1,16;	21:00:00:20:37:87:e5:20;
		21:00:00:20:37:87:49:29;
		21:00:00:20:37:87:20:c5

## Implementation Considerations and Best Practices

Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



## Implementation Considerations

- Using PWWN definitions (recommended practice)
  - Allows devices to communicate that have their WWN in the same zone
  - Requires a zoning change if the device's WWN changes
  - No zoning change if a device is moved to another port in the fabric
  - Provides frame-based hardware enforcement
- Using domain, index definitions
  - Allows devices to communicate that are connected to the ports defined within the zone
  - Requires a zoning change if a device is moved to a port outside the zone
  - No zoning change if the device's WWN changes
  - Provides frame-based hardware enforcement

69 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



## Zoning Best Practices

- Always implement zoning, even if LUN masking is used
- Use PWWN identification for all zoning configuration unless special circumstances require domain, index identification (for example, FICON)
- Make zone object names only as long as they need to be to be meaningful
- Define all zones so that frame-based enforcement is used
- Use Peer zoning if multiple initiators require access to the same target device
- Use separate zones for tape and disk traffic if an HBA is carrying both types of traffic<sup>1</sup>
- Implement `defzone --noaccess`
- Remove obsolete entries (decommissioned devices, etc.)

70 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



Setting the default zone to no access when the fabric is first built allows devices to connect to the fabric, do their FLOGI and Name Server update but not access any other device connected to the fabric. This permits the physical connection to be done in one phase and the enabling of a zone configuration to allow access to be done in another phase.

**Footnote 1:** Separating the disk and tape devices into separate zones prevents disk RSCNs from impacting tape devices, which tend to be more sensitive to RSCNs. While this level of Zoning might seem to be more labor-intensive compared to less granular grouping methods, it lays the best foundation for SANs, and will ultimately increase uptime and reduce the time required to troubleshoot problems.

## Zoning Best Practices (cont.)

- Use the free Brocade SAN Health software to validate zoning configurations
- Analyze zones to verify correct devices are communicating
  - SANnav Management Platform
  - nszonemember
  - fcping
  - SAN Health
- Backup with configupload or SANnav Management Platform

71 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



Virtual machines should always be zoned using WWNs, you cannot use D,P zoning on NPIV devices.

## Summary

- Zoning is used to partition devices in a fabric
  - Only devices in the same zone are allowed to communicate
- A device can be part of multiple zones and zones can overlap
- For a list of zoning commands issue `zonehelp` from the CLI
- The maximum zoning database size is determined by the Fabric OS version running on the switches
- The default zone can be disabled using the `defzone` command
  - Disabling the default zone means no devices can communicate unless they are implicitly configured in a zone

72 | Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.





## End of Module:

Brocade Education Services

---

[brocade.education@broadcom.com](mailto:brocade.education@broadcom.com)

Broadcom Proprietary and Confidential. Copyright © 2023 Broadcom. All Rights Reserved. The term "Broadcom" refers to Broadcom Inc. and/or its subsidiaries.



