BROCADE

Ethernet Fabrics Lab

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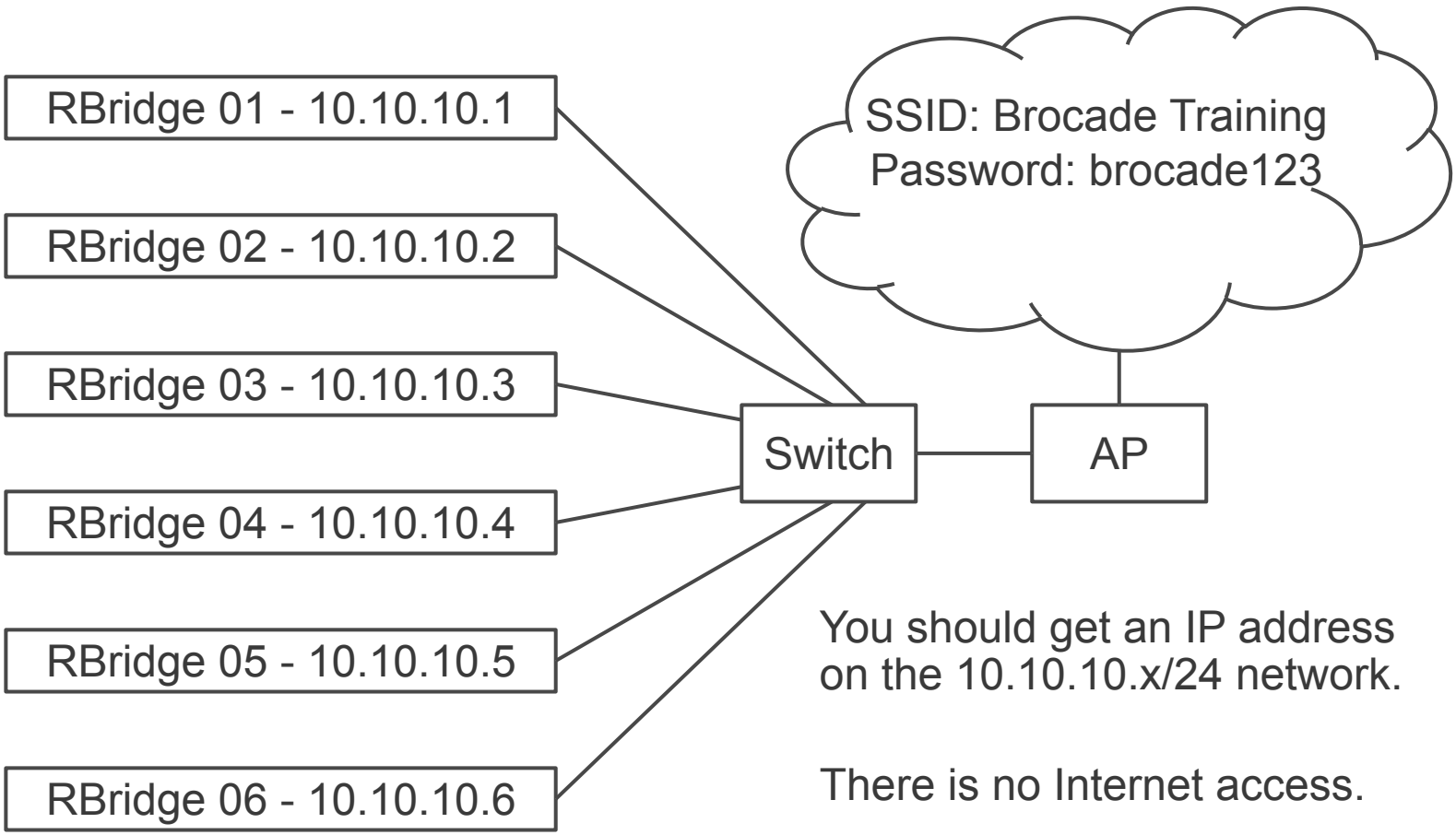
Lab Overview

Management Network



You should get an IP address on the 10.10.10.x/24 network.

There is no Internet access.

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Basic VCS Configuration

Basic Configuration

```
Roberts-MacBook-Pro:~ rjmontgom$ ssh admin@10.10.10.3

The authenticity of host '10.10.10.3 (10.10.10.3)' can't be established.
ECDSA key fingerprint is SHA256:zOlQZ7qvfhm80WEpkm1yPL4LOtjPogt+JBvDa8NsRGM.
Are you sure you want to continue connecting (yes/no)? yes

Warning: Permanently added '10.10.10.3' (ECDSA) to the list of known hosts.
admin@10.10.10.3's password: password

SECURITY WARNING: The default password for at least
one default account (root, admin and user) has not been changed.

Welcome to the Brocade Network Operating System Software
admin connected from 10.10.10.21 using ssh on sw0

sw0# vcs vcsid 12 rbridge-id 1 logical-chassis enable

This operation will perform a VCS cluster mode transition for this local node with new
parameter settings. This will change the configuration to default and reboot the
switch. Do you want to continue? [y/n]:y
```

While your RBridge reboots, connect it to the other RBridge in your fabric.

Configuration Information

	RBridge 01	RBridge 02	RBridge 03	RBridge 04	RBridge 05	RBridge 06
Management IP	10.10.10.1	10.10.10.2	10.10.10.3	10.10.10.4	10.10.10.5	10.10.10.6
Username	admin	admin	admin	admin	admin	admin
Password	password	password	password	password	password	password
VCSID	11	11	12	12	13	13
RBridge ID	1	2	1	2	1	2
Logical Chassis	Enabled	Enabled	Enabled	Enabled	Enabled	Enabled

vcs vcsid <value> rbridge-id <value> logical-chassis enable

Configure your switch to join your fabric. It will then start to reload.

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Monitoring the VCS Fabric

Viewing the Fabric

```
sw0# show fabric all

VCS Id: 11
Config Mode: Distributed

Rbridge-id           WWN               IP Address         Name
------------------------------------------------------------------------
   1          10:00:00:27:F8:CB:BF:80   10.10.10.1          "sw0"*
   2          10:00:00:27:F8:C3:5A:31   10.10.10.2        >"sw0"

The Fabric has 2 Rbridge(s)

sw0#
```

This is where we're logged in.

This is the principle switch.

Viewing the ISLs

```
sw0# show fabric isl all

No. of nodes in cluster: 2

Rbridge-id: 1   #ISLs: 1

 Src          Src      Nbr          Nbr
Index      Interface  Index      Interface             Nbr-WWN                 BW   Trunk  Nbr-
Name
----------------------------------------------------------------------------------------------
64         Te 1/0/1    64        Te 2/0/1   10:00:00:27:F8:C3:5A:31   10G   Yes   "sw0"


Rbridge-id: 2   #ISLs: 1

 Src          Src      Nbr          Nbr
Index      Interface  Index      Interface             Nbr-WWN                 BW   Trunk  Nbr-
Name
----------------------------------------------------------------------------------------------
64         Te 2/0/1    64        Te 1/0/1   10:00:00:27:F8:CB:BF:80   10G   Yes   "sw0"

sw0#
```

More ISL Information

```
sw0# show fabric islports rbridge-id 1
Name:            sw0
Type:            137.4
State:           Online
Role:            Fabric Subordinate
VCS Id:          11
Config Mode:     Distributed
Rbridge-id:      1
WWN:             10:00:00:27:f8:cb:bf:80
FCF MAC:

 Index   Interface   State   Operational State
==========================================================================
 64  Te 1/0/1         Up      ISL 10:00:00:27:f8:c3:5a:31 "sw0" (upstream)(Trunk Primary)
 65  Te 1/0/2         Down
 66  Te 1/0/3         Down

**SNIP**
```

More ISL Information

```
sw0# show fabric islports rbridge-id 2
Name:            sw0
Type:            137.4
State:           Online
Role:            Fabric Principal
VCS Id:          11
Config Mode:     Distributed
Rbridge-id:      2
WWN:             10:00:00:27:f8:c3:5a:31
FCF MAC:

 Index   Interface   State   Operational State
=====================================================================
 64  Te 2/0/1         Up      ISL 10:00:00:27:f8:cb:bf:80 "sw0" (downstream)(Trunk Primary)
 65  Te 2/0/2         Down
 66  Te 2/0/3         Down

**SNIP**
```

VCS Information

```
sw0# show vcs
Config Mode    : Distributed
VCS Mode       : Logical Chassis
VCS ID         : 11
VCS GUID       : c24c8810-2acd-4936-bf60-d052cf6486f7
Total Number of Nodes           : 2
Rbridge-Id  WWN                          Management IP   VCS Status   Fabric Status  HostName
-----------------------------------------------------------------------------------------------
1           10:00:00:27:F8:CB:BF:80*     10.10.10.1      Online       Online          sw0
2           >10:00:00:27:F8:C3:5A:31     10.10.10.2      Online       Online          sw0
sw0#
```

More VCS Information

```
sw0# show vcs detail
Config Mode    : Distributed
VCS Mode       : Logical Chassis
VCS ID         : 11
VCS GUID       : c24c8810-2acd-4936-bf60-d052cf6486f7
Total Number of Nodes           : 2
Nodes Disconnected from Cluster : 0
Cluster Condition               : Good
Cluster Status                  : All Nodes Present in the Cluster
Node :1
    Serial Number      : CQG2547J0K7
    Condition          : Good
    VCS Status         : Connected to Cluster
    VCS Id             : 11
    Rbridge-Id         : 1*
    Co-ordinator       : NO
    WWN                : 10:00:00:27:F8:CB:BF:80
    Switch MAC         : 00:27:F8:CB:BF:80
    FCF MAC            : DE:AD:BE:EF:DE:AD
    Switch Type        : BR-VDX6740T
    Firmware Ver       : v6.0.2
    Internal IP        : 127.1.0.1
    Management IP      : 10.10.10.1
    Fabric Status      : Online
```

Changing the Principal

```
sw0# configure terminal
Entering configuration mode terminal
sw0(config)# rbridge-id 1
sw0(config-rbridge-id-1)# logical-chassis principal-priority 10
sw0(config-rbridge-id-1)# end
sw0# logical-chassis principal switchover
This operation will trigger logical-chassis principal switchover. Do you want to continue?
[y/n]:y
Successfully triggered logical-chassis principal switchover.
sw0# show fab all

VCS Id: 11
Config Mode: Distributed

Rbridge-id           WWN              IP Address         Name
-----------------------------------------------------------------------
   1    10:00:00:27:F8:CB:BF:80   10.10.10.1        >"sw0"*
   2    10:00:00:27:F8:C3:5A:31   10.10.10.2         "sw0"

The Fabric has 2 Rbridge(s)

sw0#
```

The BUM Tree

```
sw0# show fabric route multicast all

No. of nodes in cluster: 2

Root of the Multicast-Tree
==========================
 Rbridge-id: 1
 Mcast Priority: 1
 Enet IP Addr: 10.10.10.1
 WWN: 10:00:00:27:f8:cb:bf:80
 Name: sw0

Src-Index  Src-Port       Nbr-Index  Nbr-Port         BW    Trunk
-------------------------------------------------------------------
64         Te 2/0/1       64         Te 1/0/1         10G   Yes
64         Te 1/0/1       64         Te 2/0/1         10G   Yes

sw0#
```

Changing the BUM Root

```
sw0# configure terminal
Entering configuration mode terminal
sw0(config)# fabric route mcast rbridge-id 2 priority 10
sw0(config-rbridge-id-2)# end
sw0# show fabric route multicast all

No. of nodes in cluster: 2

Root of the Multicast-Tree
==========================
 Rbridge-id: 2
 Mcast Priority: 10
 Enet IP Addr: 10.10.10.2
 WWN: 10:00:00:27:f8:c3:5a:31
 Name: sw0

Src-Index  Src-Port       Nbr-Index  Nbr-Port         BW    Trunk
-------------------------------------------------------------------
64         Te 2/0/1       64         Te 1/0/1         10G   Yes
64         Te 1/0/1       64         Te 2/0/1         10G   Yes

sw0#
```

Basic Configurations

Host & Chassis Names

```
sw0# configure terminal
Entering configuration mode terminal
sw0(config)# switch-attributes 1
sw0(config-switch-attributes-1)# host-name RBridge01
RBridge01(config-switch-attributes-1)# chassis-name RBridge01
RBridge01(config-switch-attributes-1)# exit
RBridge01(config)# switch-attributes 2
RBridge01(config-switch-attributes-2)# host-name RBridge02
RBridge01(config-switch-attributes-2)# chassis-name RBridge02
RBridge01(config-switch-attributes-2)# end
RBridge01# show fabric all

VCS Id: 11
Config Mode: Distributed

Rbridge-id           WWN              IP Address         Name
------------------------------------------------------------------------
   1    10:00:00:27:F8:CB:BF:80   10.10.10.1        >"RBridge01"*
   2    10:00:00:27:F8:C3:5A:31   10.10.10.2         "RBridge02"

The Fabric has 2 Rbridge(s)

RBridge01#
```

VCS Virtual IP Address

```
RBridge01# configure terminal
Entering configuration mode terminal
RBridge01(config)# vcs virtual ip address 10.10.10.11/24
RBridge01(config)# exit
RBridge01# exit
Connection to 10.10.10.1 closed.
Roberts-MacBook-Pro:~ rjmontgom$ ssh admin@10.10.10.11
The authenticity of host '10.10.10.11 (10.10.10.11)' can't be established.
ECDSA key fingerprint is SHA256:WtrZadKKPZX/ngYEow8R2xoJnlVAGCLO3cC7EK1LPP4.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.10.10.11' (ECDSA) to the list of known hosts.
admin@10.10.10.11's password: password

SECURITY WARNING: The default password for at least
one default account (root, admin and user) has not been changed.

Welcome to the Brocade Network Operating System Software
admin connected from 10.10.10.21 using ssh on RBridge01
RBridge01#
```

Test this command, switch the principal switch, and then try it again.

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Configuring the Management Interface

Configuring the Management Interface

```
RBridge03# configure terminal
Entering configuration mode terminal
RBridge03(config)# interface mannagement 1/0
RBridge03(config-Management-1/0)# ip address 10.10.10.3/24
RBridge03(config-Management-1/0)# end
RBridge03#
```

or

```
RBridge03# configure terminal
Entering configuration mode terminal
RBridge03(config)# interface mannagement 1/0
RBridge03(config-Management-1/0)# ip address dhcp
RBridge03(config-Management-1/0)# end
RBridge03#
```

The Management VRF

```
RBridge03# ping 10.10.10.2
Type Control-c to abort
PING 10.10.10.2 (10.10.10.2): 56 data bytes
ping: sendto: Network is unreachable
ping: sendto: Network is unreachable
^C--- 10.10.10.2 ping statistics ---
2 packets transmitted, 0 packets received, 100% packet loss

RBridge03# show vrf
Total number of VRFs configured: 2
VrfName                         VrfId  V4-Ucast  V6-Ucast
default-vrf                     1      Enabled   Enabled
mgmt-vrf                        0      Enabled   Enabled

RBridge03# ping 10.10.10.2 vrf mgmt-vrf
Type Control-c to abort
PING 10.10.10.2 (10.10.10.2): 56 data bytes
64 bytes from 10.10.10.2: icmp_seq=0 ttl=64 time=1.513 ms
64 bytes from 10.10.10.2: icmp_seq=1 ttl=64 time=0.519 ms
^C--- 10.10.10.2 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.372/0.801/1.513/0.507 ms
RBridge03#
```

MGMT-VRF Exercise

Verify that you can PING the management interfaces of the other switches.

- From your laptop.
- From your switch.

Explore the following commands:

- show vrf
- show vrf detail
- show ip route vrf mgmt-vrf

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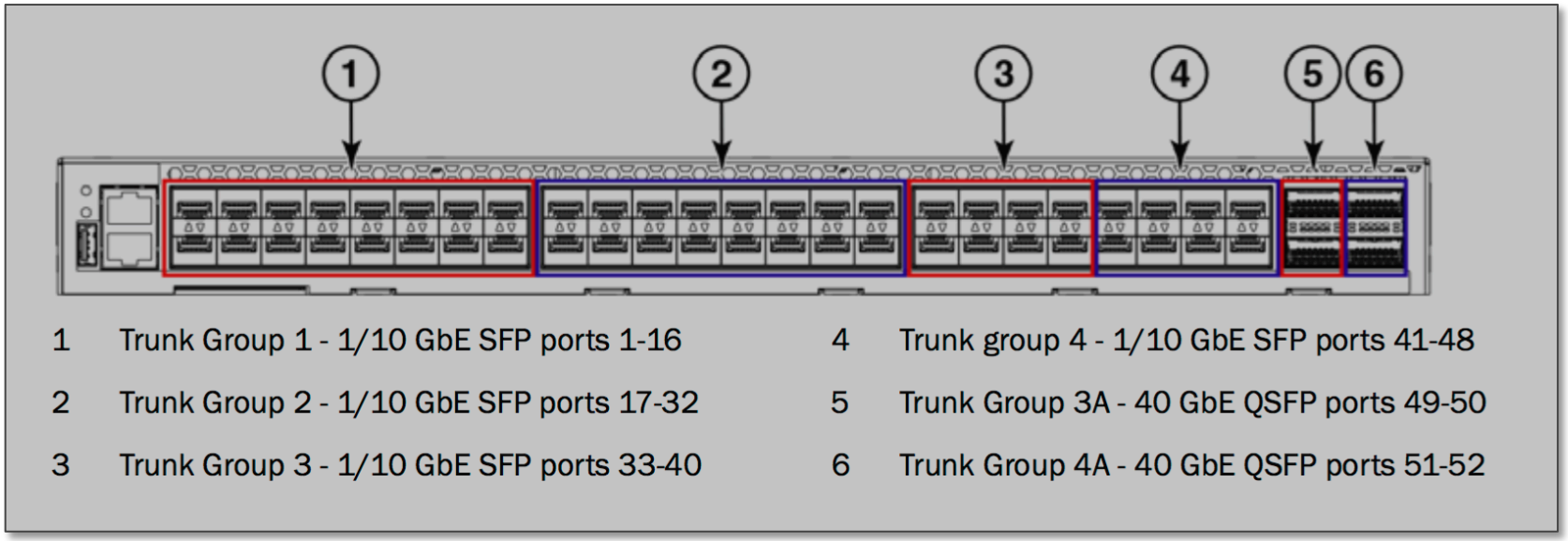
Brocade Trunks

Brocade Trunk Exercise



- Connect two ports in the same port group on your switch to two ports in the same port group on your partners switch.
- Use the “show fabric isl” command the view the results.
- Move one of the connections to another port group.
- Use the “show fabric isl” command to view the changes.

Creating a VLAN

Creating a VLAN

```
RBridge01# config t
Entering configuration mode terminal
RBridge01(config)# interface vlan 10
RBridge01(config-Vlan-10)# description "A Test VLAN"
RBridge01(config-Vlan-10)# exit
RBridge01(config)# exit
RBridge01# show vlan brief
Total Number of VLANs configured    : 3
Total Number of VLANs provisioned   : 3
Total Number of VLANs unprovisioned : 0
VLAN             Name            State                        Ports           Classification
(F)-FCoE                                                      (u)-Untagged
(R)-RSPAN                                                     (c)-Converged
(T)-TRANSPARENT                                               (t)-Tagged
=========   ==========  ========================== =============== ====================
1           default     INACTIVE(no member port)
10          VLAN0010    INACTIVE(no member port)
1002(F)     VLAN1002    INACTIVE(no member port)

RBridge01#
```

Tagging a Port

```
RBridge03# configure terminal
Entering configuration mode terminal
RBridge03(config)# interface TenGigabitEthernet 1/0/10
RBridge03(conf-if-te-1/0/10)# switchport
RBridge03(conf-if-te-1/0/10)# switchport mode trunk
RBridge03(conf-if-te-1/0/10)# switchport trunk allow vlan ?
Possible completions:
  add      Allow these VLANs to Xmit/Rx through the Layer2 interface
  all      Allow all Dot1Q VLANs to Xmit/Rx through the Layer2 interface
  except   Allow all VLANs except this vlan range to Xmit/Rx through the
           Layer2 interface
  none     Allow no Dot1Q VLANs to Xmit/Rx through the Layer2 interface
  remove   Remove a VLAN range that Xmit/Rx through the Layer2 interface
RBridge03(conf-if-te-1/0/10)# switchport trunk allow vlan all
RBridge03(conf-if-te-1/0/10)# end
RBridge03#
```


Native VLANs

```
RBridge03(config)# interface TenGigabitEthernet 1/0/10
RBridge03(conf-if-te-1/0/10)# switchport trunk native-vlan ?
Possible completions:
  native-vlan             Set the native VLAN characteristics of the Layer2
                          trunk interface for classifying untagged traffic
  native-vlan-untagged    Set the interface to accept only untagged native-vlan
                          traffic on ingress and untagged native-vlan traffic
                          on egress.
  native-vlan-xtagged     Set the interface to accept tagged|untagged
                          native-vlan traffic on ingress and egress as
                          specified by the user.
RBridge03(conf-if-te-1/0/10)# switchport trunk native-vlan _
```

Untagging a Port

```
RBridge03# configure terminal
Entering configuration mode terminal
RBridge03(config)# interface TenGigabitEthernet 1/0/11
RBridge03(conf-if-te-1/0/11)# switchport
RBridge03(conf-if-te-1/0/11)# switchport mode access
RBridge03(conf-if-te-1/0/11)# switchport access vlan 10
RBridge03(conf-if-te-1/0/11)# end
RBridge03#
```


Monitoring VLANs

```
RBridge03# show vlan brief
Total Number of VLANs configured    : 3
Total Number of VLANs provisioned   : 3
Total Number of VLANs unprovisioned : 0
VLAN             Name            State                        Ports           Classification
(F)-FCoE                                                      (u)-Untagged
(R)-RSPAN                                                     (c)-Converged
(T)-TRANSPARENT                                               (t)-Tagged
================ =============== ============================ =============== ================
1                default         INACTIVE(member port down) Te 1/0/10(t)
10               VLAN0010        INACTIVE(member port down) Te 1/0/10(t)
                                                            Te 1/0/11(u)
1002(F)          VLAN1002        INACTIVE(no member port)

RBridge03#
```

What's VLAN 1002?

```
RBridge03# show run | begin fcoe
fcoe
 fabric-map default
  vlan 1002
  san-mode local
  priority 3
  virtual-fabric 128
  fcmap 0E:FC:00
  advertisement interval 8000
  keep-alive timeout
 !
```


Split Brain

Detecting Split Brain

```
RBridge03# show fabric all

VCS Id: 12
Config Mode: Distributed

Rbridge-id          WWN              IP Address         Name
-----------------------------------------------------------------------------
   1    10:00:00:27:F8:C2:3E:BC   10.10.10.3        >"RBridge03"*

The Fabric has 1 Rbridge(s)

RBridge03#
```

Split Brain occurs when switches within a fabric become isolated.

Merging two sub-fabrics into a single fabric is difficult as there is no way to determine who has a “more correct” configuration.

The result is one or more missing Rbridges.

Verifying Split Brain

```
RBridge03# show fabric islports
Name:           RBridge03
Type:        137.4
State:       Online
Role:        Fabric Principal
VCS Id:         12
Config Mode:    Distributed
Rbridge-id: 1
WWN:    10:00:00:27:f8:c2:3e:bc
FCF MAC:

 Index   Interface   State   Operational State
==========================================================================
**SNIP**
 97 Te 1/0/34        Up      ISL segmented,(ESC mismatch, Distributed Config DB)(Trunk
Primary)
**SNIP**
RBridge03#
```

Another clue supporting the “split brain” hypothesis is an ISL that is segmented.

Split Brain Recovery

```
RBridge04# copy default-config startup-config
This operation will reboot all switches in the cluster. Do you want to continue? [y/n]:y

 copy default-config to startup-config is being processed...
 All nodes will reboot and form the cluster newly.
```

Simply clear the configuration on the “missing switches”. They will reboot and then join the fabric.

Virtual LAGs

Configuring a VLAG

```
RBridge01# configure tterminal
Entering configuration mode terminal
RBridge01(config)# interface Port-channel 1
RBridge01(config-Port-channel-1)# switchport
RBridge01(config-Port-channel-1)# switchport mode access
RBridge01(config-Port-channel-1)# switchport access vlan 10
RBridge01(config-Port-channel-1)# mtu 9216
RBridge01(config-Port-channel-1)# speed 10000
RBridge01(config-Port-channel-1)# vlag ignore-split
RBridge01(config-Port-channel-1)# no shutdown
RBridge01(config-Port-channel-1)# exit
RBridge01(config)# int ten 1/0/48
RBridge01(conf-if-te-1/0/48)# channel-group 1 mode active type standard
RBridge01(conf-if-te-1/0/48)# int ten 2/0/48
RBridge01(conf-if-te-2/0/48)# channel-group 1 mode active type standard
RBridge01(conf-if-te-2/0/48)# end
RBridge01#
```

Monitoring a VLAG

```
RBridge01# show port-channel
 LACP Aggregator: Po 1
 Aggregator type: Standard
 Member ports:
   Te 1/0/48   *
   Te 2/0/48

RBridge01# show port-channel summary
Flags:  D - Down                P - Up in port-channel (members)
        U - Up (port-channel)   * - Primary link in port-channel
        S - Switched
        M - Not in use. Min-links not met
===== ============== ========== ===============
Group Port-channel    Protocol   Member ports
===== ============== ========== ===============
1     Po 1    (SU)    vLAG       Te 1/0/48* (P)
                                 Te 2/0/48 (P)
RBridge01#
```

Monitoring a VLAG

```
RBridge01# show port-channel detail
 LACP Aggregator: Po 1 (vLAG)
 Aggregator type: Standard
 Ignore-split is enabled
  Member rbridges:
    rbridge-id: 1 (1)
    rbridge-id: 2 (1)
  Actor System ID - 0x8000,01-e0-52-00-00-0b
  Admin Key: 0001 - Oper Key 0001
  Receive link count: 2 - Transmit link count: 2
  Individual: 0 - Ready: 1
  Partner System ID - 0x8000,01-e0-52-00-00-0c
  Partner Oper Key 0001
 Member ports on rbridge-id 1:
   Link: Te 1/0/48 (0x10C060000) sync: 1   *

 Member ports on rbridge-id 2:
   Link: Te 2/0/48 (0x20C060000) sync: 1


RBridge01#
```

Monitoring a VLAG

```
RBridge03# show vlan 10
VLAN             Name            State                    Ports           Classification
(F)-FCoE                                                  (u)-Untagged
(R)-RSPAN                                                 (c)-Converged
(T)-TRANSPARENT                                           (t)-Tagged
================================================================================================
10               VLAN0010        ACTIVE                   Po 1(u)
                                                          Po 2(u)
                                                          Te 1/0/10(t)
                                                          Te 1/0/11(u)

RBridge03#
```

Monitoring a VLAG

```
RBridge01# show interface port-channel 1
Port-channel 1 is up, line protocol is up
Hardware is AGGREGATE, address is 0027.f8cb.bfc9
    Current address is 0027.f8cb.bfc9
Interface index (ifindex) is 671088641
Minimum number of links to bring Port-channel up is 1
MTU 9216 bytes
LineSpeed Actual     : 20000 Mbit
Allowed Member Speed : 10000 Mbit
Priority Tag disable
Last clearing of show interface counters: 00:16:05
Queueing strategy: fifo
Receive Statistics:
    88 packets, 11555 bytes
    Unicasts: 0, Multicasts: 88, Broadcasts: 0
    64-byte pkts: 0, Over 64-byte pkts: 4, Over 127-byte pkts: 84
    Over 255-byte pkts: 0, Over 511-byte pkts: 0, Over 1023-byte pkts: 0
    Over 1518-byte pkts(Jumbo): 0
    Runts: 0, Jabbers: 0, CRC: 0, Overruns: 0
    Errors: 0, Discards: 0
Transmit Statistics:
    88 packets, 11567 bytes
    Unicasts: 0, Multicasts: 88, Broadcasts: 0
    Underruns: 0
--more--
```

VLAG Exercise

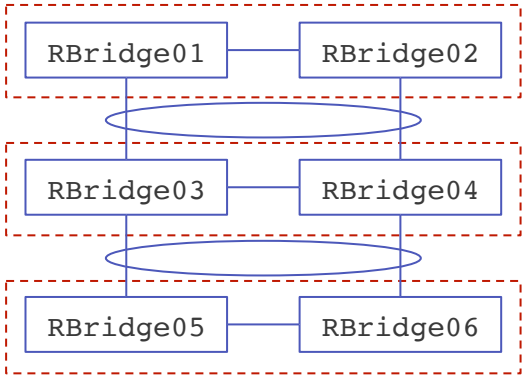
Configure VLAGs according to the drawing on this slide.

- Fabric 11 to Fabric 12
- Fabric 12 to Fabric 13

Verify that the VLAG is working.

Explore the following commands:

- show port-channel
- show port-channel detail
- show port-channel summary
- show port-channel load-balance
- show mac-address-table



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Basic Routing

Configuring Interfaces

```
RBridge01# configure terminal
Entering configuration mode terminal
RBridge01(config)# rbridge-id 1
RBridge01(config-rbridge-id-1)# interface ve 10
RBridge01(config-rbridge-Ve-10)# ip address 192.168.10.1/24
RBridge01(config-rbridge-Ve-10)# no shutdown
RBridge01(config-rbridge-Ve-10)# exit
RBridge01(config-rbridge-id-1)# exit
RBridge01(config)# rbridge-id 2
RBridge01(config-rbridge-id-2)# interface ve 10
RBridge01(config-rbridge-Ve-10)# ip address 192.168.10.2/24
RBridge01(config-rbridge-Ve-10)# no shutdown
RBridge01(config-rbridge-Ve-10)# end
RBridge01# ping 192.168.10.2
Type Control-c to abort
PING 192.168.10.2 (192.168.10.2): 56 data bytes
64 bytes from 192.168.10.2: icmp_seq=0 ttl=64 time=8.443 ms
64 bytes from 192.168.10.2: icmp_seq=1 ttl=64 time=3.187 ms
^C--- 192.168.10.2 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max/stddev = 3.187/5.815/8.443/2.628 ms
RBridge01#
```

Default Gateway

```
RBridge01# configure terminal
Entering configuration mode terminal
RBridge01(config)# rbridge-id 1
RBridge01(config-rbridge-id-1)# ip route 0.0.0.0/0 192.168.10.254
RBridge01(config-rbridge-id-1)# top
RBridge01(config)# rbridge-id 2
RBridge01(config-rbridge-id-2)# ip route 0.0.0.0/0 192.168.10.254
RBridge01(config-rbridge-id-2)# top
RBridge01(config)# end
RBridge01# show ip route
Total number of IP routes: 3
Type Codes - B:BGP D:Connected O:OSPF S:Static +:Leaked route; Cost - Dist/Metric
BGP  Codes - i:iBGP e:eBGP
OSPF Codes - i:Inter Area 1:External Type 1 2:External Type 2 s:Sham Link
       Destination        Gateway         Port           Cost          Type Uptime
       0.0.0.0/0          192.168.10.254  Ve 10          1/1           S    0m16s
       192.168.10.0/24    DIRECT          Ve 10          0/0           D    9m24s
       192.168.10.1/32    DIRECT          Ve 10          0/0           D    9m24s
RBridge01#
```

Routing Exercise

- Configure your system according to the table below.
- Verify that you can PING all of the other switches (using the 192.168.10.x address).

	RBridge 01	RBridge 02	RBridge 03	RBridge 04	RBridge 05	RBridge 06
Management IP	10.10.10.1	10.10.10.2	10.10.10.3	10.10.10.4	10.10.10.5	10.10.10.6
VLAN 10 IP	192.168.10.1/24	192.168.10.2/24	192.168.10.3/24	192.168.10.4/24	192.168.10.5/24	192.168.10.6/24
Default Gateway	192.168.10.254	192.168.10.254	192.168.10.254	192.168.10.254	192.168.10.254	192.168.10.254

VRRPe

Configuring VRRPe

```
RBridge01# configure terminal
Entering configuration mode terminal
RBridge01(config)# rbridge-id 1
RBridge01(config-rbridge-id-1)# protocol vrrp-extended
RBridge01(config-rbridge-id-1)# int ve 10
RBridge01(config-rbridge-Ve-10)# vrrp-extended-group 11
RBridge01(config-vrrp-extended-group-11)# advertise-backup
RBridge01(config-vrrp-extended-group-11)# preempt-mode
RBridge01(config-vrrp-extended-group-11)# short-path-forwarding
RBridge01(config-vrrp-extended-group-11)# virtual-ip 192.168.10.11
RBridge01(config-vrrp-extended-group-11)# enable
RBridge01(config-vrrp-extended-group-11)# top
RBridge01(config)# rbridge-id 2
RBridge01(config-rbridge-id-2)# protocol vrrp-extended
RBridge01(config-rbridge-id-2)# int ve 10
RBridge01(config-rbridge-Ve-10)# vrrp-extended-group 11
RBridge01(config-vrrp-extended-group-11)# advertise-backup
RBridge01(config-vrrp-extended-group-11)# preempt-mode
RBridge01(config-vrrp-extended-group-11)# short-path-forwarding
RBridge01(config-vrrp-extended-group-11)# virtual-ip 192.168.10.11
RBridge01(config-vrrp-extended-group-11)# enable
RBridge01(config-vrrp-extended-group-11)# top
RBridge01(config)# end
RBridge01#
```


Monitoring VRRPe

```
RBridge01# show vrrp summary rbridge-id all
============Rbridge-id:1============

Total number of VRRP session(s)   : 1
Master session count  : 1
Backup session count  : 0
Init session count    : 0

VRID  Session  Interface       Admin     Current   State    Short-path  Revert    SPF
                               State     Priority            Forwarding  Priority  Reverted
====  =======  =========       =====     ========  =====    ==========  ========  ========
11    VRRPE    Ve 10           Enabled   100       Master   Enabled     unset     No
============Rbridge-id:2============

Total number of VRRP session(s)   : 1
Master session count  : 0
Backup session count  : 1
Init session count    : 0

VRID  Session  Interface       Admin     Current   State    Short-path  Revert    SPF
                               State     Priority            Forwarding  Priority  Reverted
====  =======  =========       =====     ========  =====    ==========  ========  ========
11    VRRPE    Ve 10           Enabled   100       Backup   Enabled     unset     No
RBridge01#
```

VRRPe Exercise

Set up VRRP using the commands from the previous slides.

Try the following commands:

- show vrrp
- show vrrp detail
- show vrrp interface
- show vrrp summary
- show mac-address-table

Verify that you can ping the Virtual IPs of the other groups.

	RBridge 01	RBridge 02	RBridge 03	RBridge 04	RBridge 05	RBridge 06
Management IP	10.10.10.1	10.10.10.2	10.10.10.3	10.10.10.4	10.10.10.5	10.10.10.6
VLAN 10 IP	192.168.10.1/24	192.168.10.2/24	192.168.10.3/24	192.168.10.4/24	192.168.10.5/24	192.168.10.6/24
VRID	11	11	12	12	13	13
Virtual IP	192.168.10.11	192.168.10.11	192.168.10.12	192.168.10.12	192.168.10.13	192.168.10.13

OSPF

Configuring OSPF

```
RBridge01# configure terminal
Entering configuration mode terminal
RBridge01(config)# rbridge-id 1
RBridge01(config-rbridge-id-1)# router ospf
RBridge01(config-router-ospf-vrf-default-vrf)# area 0.0.0.0
RBridge01(config-router-ospf-vrf-default-vrf)# exit
RBridge01(config-rbridge-id-1)# interface ve 10
RBridge01(config-rbridge-Ve-10)# ip ospf area 0.0.0.0
RBridge01(config-rbridge-Ve-10)# exit
RBridge01(config-rbridge-id-1)# interface Loopback 1
RBridge01(config-Loopback-1)# ip address 192.168.1.1/32
RBridge01(config-Loopback-1)# ip ospf area 0.0.0.0
RBridge01(config-Loopback-1)# no shutdown
RBridge01(config-Loopback-1)# top
RBridge01(config)# rbridge-id 2
RBridge01(config-rbridge-id-2)# router ospf
RBridge01(config-router-ospf-vrf-default-vrf)# area 0.0.0.0
RBridge01(config-router-ospf-vrf-default-vrf)# exit
RBridge01(config-rbridge-id-2)# interface ve 10
RBridge01(config-rbridge-Ve-10)# ip ospf area 0.0.0.0
RBridge01(config-rbridge-Ve-10)# exit
RBridge01(config-rbridge-id-2)# interface Loopback 1
RBridge01(config-Loopback-1)# ip address 192.168.1.2/32
RBridge01(config-Loopback-1)# ip ospf area 0.0.0.0
RBridge01(config-Loopback-1)# no shutdown
RBridge01(config-Loopback-1)# end
RBridge01#
```


Monitoring OSPF

```
RBridge01# show ip ospf neighbors
Number of Neighbors is 5, in FULL state 5

Port           Address         Pri State      Neigh Address   Neigh ID        Ev      Opt Cnt
Ve 10          192.168.10.1    1   FULL/BDR   192.168.10.2    192.168.10.2    5       2   0
Ve 10          192.168.10.1    1   FULL/OTHER 192.168.10.3    192.168.10.3    5       2   0
Ve 10          192.168.10.1    1   FULL/OTHER 192.168.10.4    192.168.10.4    5       2   0
Ve 10          192.168.10.1    1   FULL/OTHER 192.168.10.5    192.168.10.5    5       2   0
Ve 10          192.168.10.1    1   FULL/OTHER 192.168.10.6    192.168.10.6    5       2   0

RBridge01# show ip route ospf
Total number of IP routes: 10
Type Codes - B:BGP D:Connected O:OSPF S:Static +:Leaked route; Cost - Dist/Metric
BGP  Codes - i:iBGP e:eBGP
OSPF Codes - i:Inter Area 1:External Type 1 2:External Type 2 s:Sham Link
       Destination        Gateway         Port           Cost          Type Uptime
       192.168.1.2/32     192.168.10.2    Ve 10          110/2         O    30m22s
       192.168.1.3/32     192.168.10.3    Ve 10          110/2         O    13m54s
       192.168.1.4/32     192.168.10.4    Ve 10          110/2         O    12m47s
       192.168.1.5/32     192.168.10.5    Ve 10          110/2         O    11m49s
       192.168.1.6/32     192.168.10.6    Ve 10          110/2         O    11m5s
RBridge01#
```

Testing OSPF

```
RBridge01# ping 192.168.1.6 source 192.168.1.1
Type Control-c to abort
PING 192.168.1.6 (192.168.1.6) from 192.168.1.1: 56 data bytes
64 bytes from 192.168.1.6: icmp_seq=0 ttl=64 time=4.368 ms
64 bytes from 192.168.1.6: icmp_seq=1 ttl=64 time=4.316 ms
64 bytes from 192.168.1.6: icmp_seq=2 ttl=64 time=4.107 ms
64 bytes from 192.168.1.6: icmp_seq=3 ttl=64 time=4.099 ms
64 bytes from 192.168.1.6: icmp_seq=4 ttl=64 time=4.138 ms
--- 192.168.1.6 ping statistics ---
5 packets transmitted, 5 packets received, 0% packet loss
round-trip min/avg/max/stddev = 4.099/4.206/4.368/0.113 ms
RBridge01#
```

OSPF Exercise

Configure OSPF

- Create Area 0.0.0.0
- Add VE 10 to Area 0.0.0.0
- Create a Loopback 1 Interface
- Add Loopback 1 to Area 0.0.0.0

Use the following commands to verify that it works:

- show ip ospf neighbors
- show ip route ospf
- ping <address> source <your loopback address>

	RBridge 01	RBridge 02	RBridge 03	RBridge 04	RBridge 05	RBridge 06
Management IP	10.10.10.1	10.10.10.2	10.10.10.3	10.10.10.4	10.10.10.5	10.10.10.6
VLAN 10 IP	192.168.10.1/24	192.168.10.2/24	192.168.10.3/24	192.168.10.4/24	192.168.10.5/24	192.168.10.6/24
Area ID	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0	0.0.0.0
Loopback 1 Address	192.168.1.1/32	192.168.1.2/32	192.168.1.3/32	192.168.1.4/32	192.168.1.5/32	192.168.1.6/32

BROCADE

Open Playtime

BROCADE

Thank You