BROCADE

VCS FABRIC HANDS-ON TRAINING

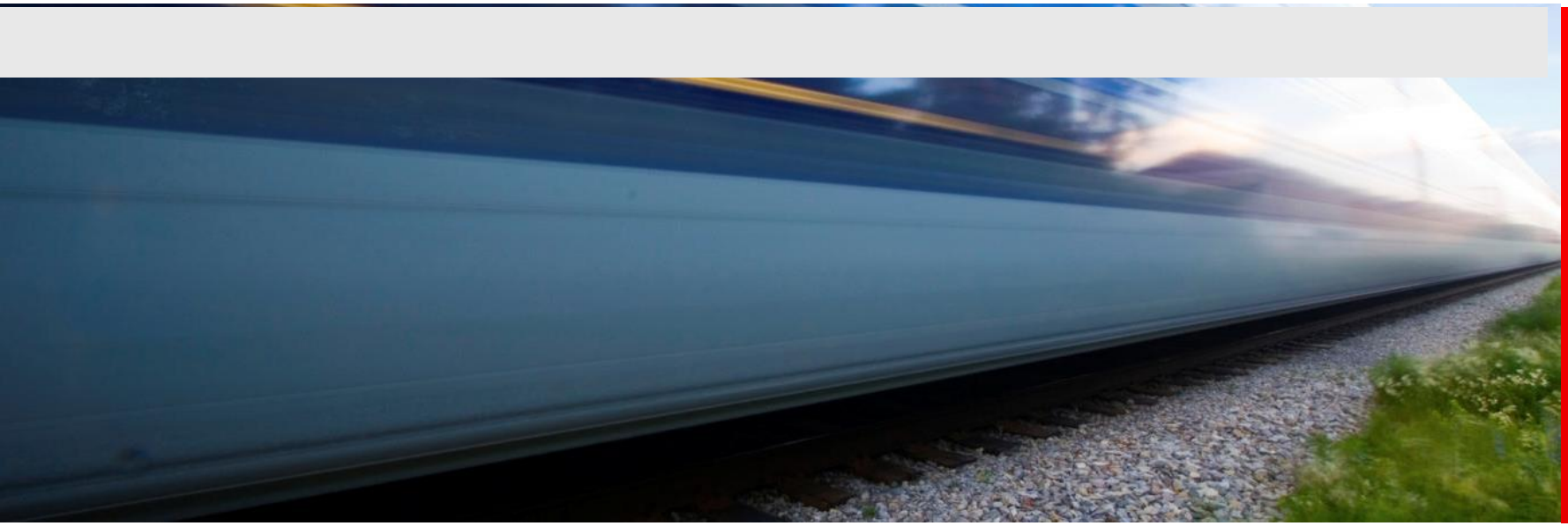
VDX Switch Quick Config Guide

教育訓練

內容

- 管理VDX
- 設定Management IP (Static Route)
- NOS firmware download
- 設定VCS Mode (Fabric Cluster Mode)
- 設定VCS Mode (Logical Chassis Mode)
- 設定VLAN (VLAN IP)
- 設定L2 Edge Port (Tagged, Untagged, vLAG)
- 設定ACL
- Password Recovery

管理VDX



查詢設備資訊

show chassis

- sw0# show chassis

```
Chassis Name:    BR-VDX6720-24
switchType: 95

FAN  Unit: 1
Time Awake:              0 days

FAN  Unit: 2
Time Awake:              0 days

POWER SUPPLY  Unit: 1
Factory Part Num:
Factory Serial Num:
Manufacture:             Day: 20  Month: 11  Year: 2012
Update:                  Day: 14  Month: 11  Year: 2014
Time Alive:              180 days
Time Awake:              0 days

POWER SUPPLY  Unit: 2
Factory Part Num:
Factory Serial Num:
Manufacture:             Day: 20  Month: 11  Year: 2012
Update:                  Day: 14  Month: 11  Year: 2014
Time Alive:              181 days
Time Awake:              0 days

CHASSIS/WWN  Unit: 1
Power Consume Factor:    0
Factory Part Num:        40-1000505-15
Factory Serial Num:      BKN2547H009
Manufacture:             Day: 31  Month: 10  Year: 2012
Update:                  Day: 14  Month: 11  Year: 2014
Time Alive:              181 days
Time Awake:              0 days

Airflow direction : Port side intake
```

查詢設備資訊

- sw0# show version

```
sw0# show version

Network Operating System Software
Network Operating System Version: 4.1.2
Copyright (c) 1995-2014 Brocade Communications Systems, Inc.
Firmware name:      4.1.2a
Build Time:         21:01:43 Jul  7, 2014
Install Time:       09:52:18 Aug 22, 2014
Kernel:             2.6.34.6

BootProm:           2.2.0
Control Processor:  e500v2 with 2048 MB of memory

Appl     Primary/Secondary Versions
------------------------------------------
NOS      4.1.2a
         4.1.2a
```

查詢設備資訊

- sw0# show system

```
sw0# show system
Stack MAC                       : 00:27:f8:3a:11:00

  -- UNIT 0 --
Unit Name                       : sw0
Switch Status                   : Online
Hardware Rev                    : 95.2
TengigabitEthernet Port(s)      : 24
Up Time                         : up 1:20
Current Time                    : 06:11:06 GMT
NOS Version                     : 4.1.2a
Jumbo Capable                   : yes
Burned In MAC                   : 00:27:F8:3A:11:00
Management IP                   : 172.21.1.249
Management Port Status          : UP

  -- Power Supplies --
PS1 is OK
PS2 is faulty

  -- Fan Status --
Fan 1 is Ok, speed is 3187 RPM
Fan 2 is Ok, speed is 3279 RPM
```

logging

- 將log導出至syslog server

  sw0(config)# logging syslog-server 192.168.100.101

- 設定log顯示的等級

  sw0(config)# logging raslog console INFO

```
sw0(config)# logging raslog console ?
Possible completions:
  [INFO]  CRITICAL  ERROR  INFO  WARNING
```

產生support檔案

- sw0# copy support ftp host 192.168.100.100 user user password user123 directory /

```
sw0# copy support ftp host 192.168.100.100 user user password user123 directory /
2015/01/09-09:36:58, [SS-2000], 32008,, INFO, VDX6720-24, Copy support started on rbridge-id 21.
copy support start
2015/01/09-09:36:58, [SS-1012], 32009,, INFO, VDX6720-24, Copy support upload Operation started.
Saving support information for chassis:sw0, module:RAS...

Saving support information for chassis:sw0, module:INFRA...
```

```
2015/01/09-09:43:05, [SS-1000], 32010,, INFO, VDX6720-24, Copy support upload operation is completed.


Slot Name        SS type         Completion Percentage

################################################

SWITCH          NORMAL          [100%]



Copy support completed

2015/01/09-09:43:05, [SS-2001], 32011,, INFO, VDX6720-24, Copy support completed on rbridge-id 21.
```

還原預設值

sw0# copy default-config startup-config

This operation will modify your startup configuration. Do you want to continue? [y/n]:y

2014/12/24-10:32:27, [DCM-1101], 26995,, INFO, VDX6740, Copy running-config to startup-config operation successful on this node.

sw0# reload

Warning: Unsaved configuration will be lost. Please run `copy running-config startup-config` to save the current configuration if not done already.

Are you sure you want to reload the switch? [y/n]:y

The system is going down for reload NOW !!

管理VDX License

檢視目前已安裝的License

```
sw0# show license
rbridge-id: 1
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    FCoE Base license
    Feature name:FCOE_BASE
    License is valid
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    Ports on Demand license - additional 8 port upgrade license
    Feature name:PORTS_ON_DEMAND_1
    License is valid
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
    VCS Fabric license
    Feature name:VCS_FABRIC
    License is valid
```

管理VDX License

新增License

- 取得License Key (XML檔)，例如: 20121028222102721CAK00002267.xml
  打開該XML檔案之後，License key為<lickey>與</lickey>內的所有文字，包含*。

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
- <lic:licenseInfo xmlns:lic="http://license.brocade.com/licensefile">
- <licenseHeader>
<serialNumber>BWE2516H01E</serialNumber>
<productNumber>BR-VDX6710-54VCS-01</productNumber>
<description>VCS_FABRIC</description>
<version>1.0</version>
<dateGenerated>20121028222102721</dateGenerated>
</licenseHeader>
- <license>
<featureName>VCS_FABRIC</featureName>
<featureVersion>1.0</featureVersion>
<licKey>*BZ8C4,LQrZnqxCz1,UJtZ3e2,Ls,xXiLtgLJgmC74wNL9bWoNmTCUjV8DUNDYmBsCf,
LZynfdSaC37ON3ruE,6mVC9ul9,WxrA4YPZ7RZB50f1*</licKey>
</license>
</lic:licenseInfo>
```

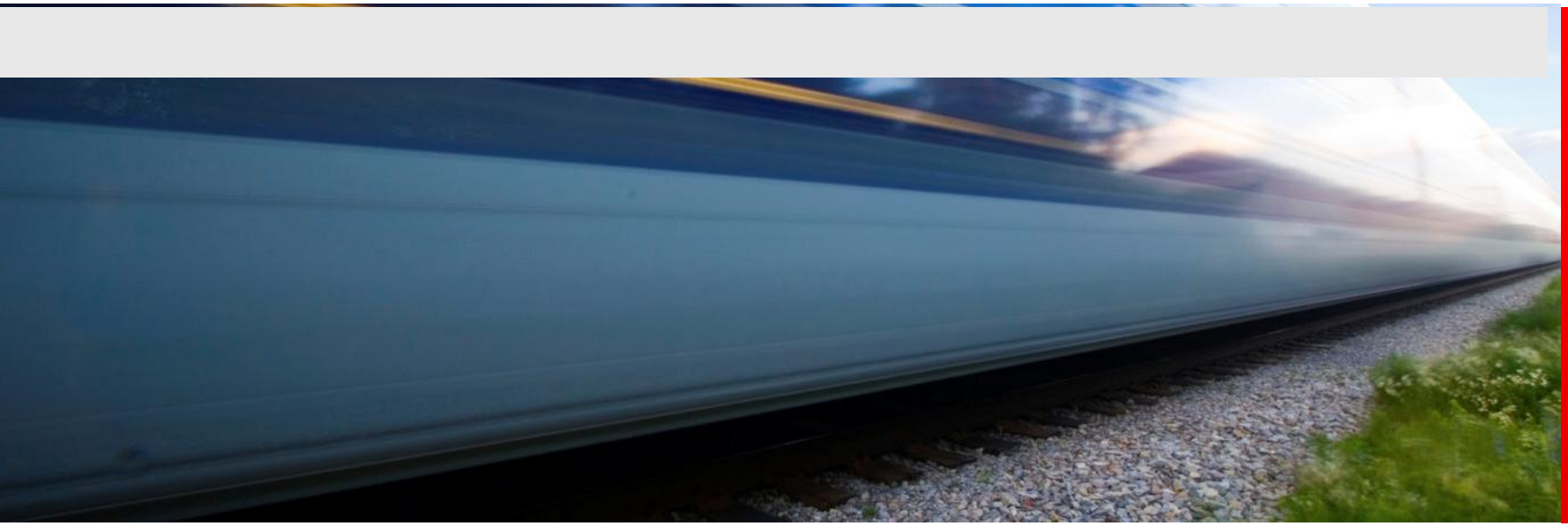
管理VDX License

新增License

- 新增License
  sw0# license add licStr "*BZ8C4,LQrZnqxCz1,UJtZ3e2,Ls,xXiLtgLJgmC74wNL9bWoNmTCUjV8D UNDYmBsCf,LZynfdSaC37ON3ruE,6mVC9ul9,Wxr8A4YPZ7RZB50f1"

- 移除License (Feature Name)
  sw0# license remove licStr "VCS_FABRIC"

設定Management IP



設定Management IP

out band和in band

- 出廠預設值 (RBrigeID 1, VCSID 1)
  Out of band MGMT預設為interface Management 1/0
  sw0# conf t
  sw0(config)# interface Management 1/0
  sw0(config-Management-1/0)# ip address 192.168.2.5/24

- 設定default gateway
  (default gateway和Layer 3配置，在rbridge-id下進行設定)
  sw0(config)# rbridge-id 1
  sw0(config-rbridge-id-1)# ip route 0.0.0.0/0 192.168.2.1

- In band管理，可以透過VLAN bind IP(VE)進行。

NOS firmware download

NOS Firmware Download

確認VDX的NOS版本

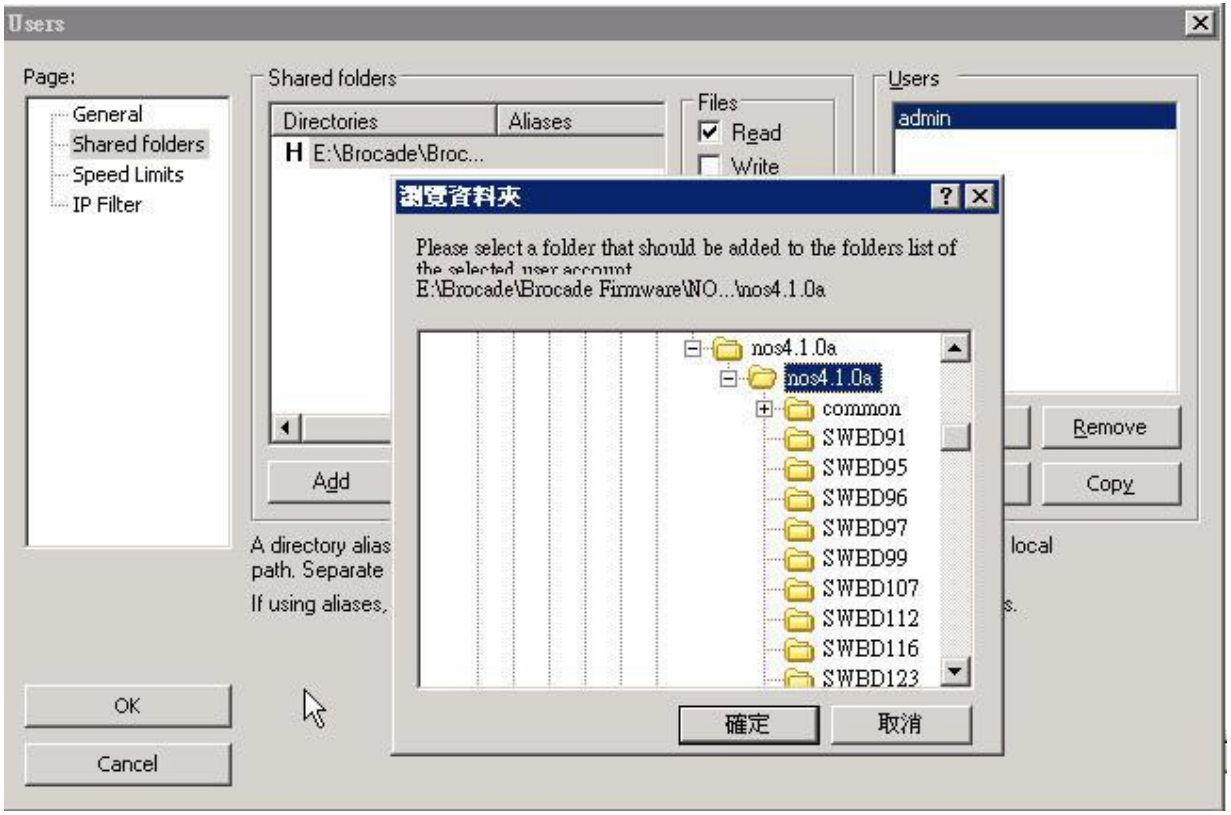
- SW0# show version all-partitions

```
Network Operating System Software
Network Operating System Version: 4.1.0
Copyright (c) 1995-2014 Brocade Communications Systems, Inc.
Firmware name: 4.1.0a
Build Time: 16:32:31 Feb 14, 2014
Install Time: 08:01:17 Mar 18, 2014
Kernel: 2.6.34.6
BootProm: 2.2.0
Control Processor: e500v2 with 2048 MB of memory
Appl    Primary/Secondary Versions
----------------------------------------
NOS     4.1.0a
        4.1.0a
```

NOS Firmware Download

更新VDX的NOS版本

- NOS可透過FTP、SCP或SFTP進行版本更新
- 請用NOS解壓縮後資料夾的根目錄，作為FTP的路徑，如下圖所示



NOS Firmware Download

更新VDX的NOS版本 (Cont.)

- SW0# firmware download interactive

```
Server name or IP address: 192.168.2.150
File name: /
Protocol (ftp, scp, sftp): ftp
User: admin
Password: ********
Reboot system after download? [y/n]:y
Do Auto-Commit after Reboot? [y/n]:y
Performing system sanity check...
```

NOS Firmware Download

更新VDX的NOS版本 (Cont.)

- 若是downgrade，有時會出現錯誤，

```
sw0# firmware download interactive
Server name or IP address: 192.168.10.1
File name: /
Protocol (ftp, scp, sftp): ftp
User: user
Password: *******
Reboot system after download? [y/n]:y
Do Auto-Commit after Reboot? [y/n]:y
Performing system sanity check...
Failed to access ftp://user:*******@192.168.10.1//
The server is inaccessible or firmware path is invalid. Please make sure the server name or IP address, the user/password and the fi
rmware path are valid.
sw0# firmware download interactive
Server name or IP address: 192.168.10.1
File name: /
Protocol (ftp, scp, sftp): ftp
User: user
Password: *******
Reboot system after download? [y/n]:y
Do Auto-Commit after Reboot? [y/n]:y
Performing system sanity check...
Firmware downgrade from the current version to NOS 4.0.x does not support ISSU. If any new feature of the current release is enabled
, please use the default-config option for the downgrade, otherwise please use coldboot option for downgrade.
Firmware cannot be downgraded to 4.0 if fcoe enodes configuration is in local mode. Please apply 'enodes-config global' under fcoe f
abric-map to allow downgrade
The preinstall script failed.
```

NOS Firmware Download

更新VDX的NOS版本 (Cont.)

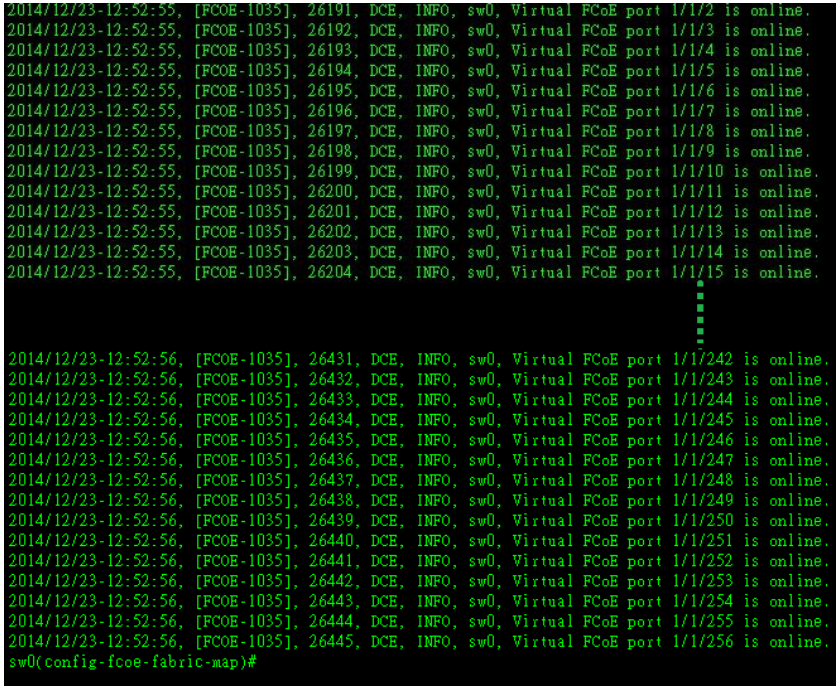
- 請輸入以下指令。

  sw0(config)# fcoe

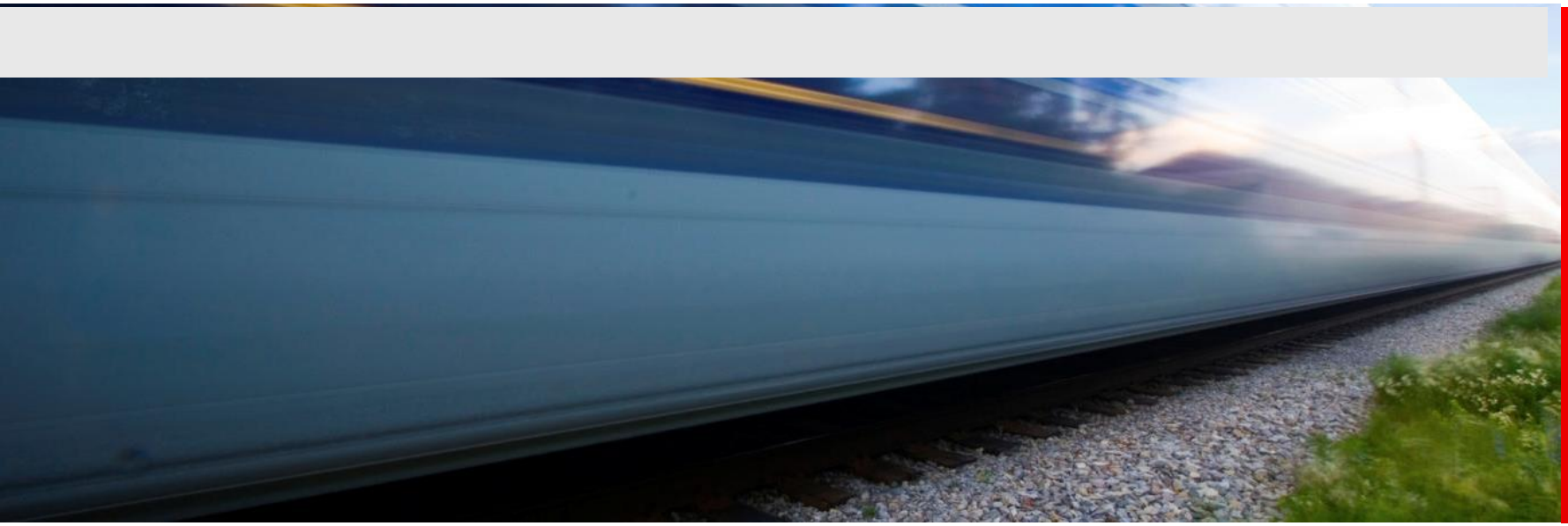
  sw0(config-fcoe)# fabric-map default

  sw0(config-fcoe-fabric-map)# enodes-config global

- 之後再重新更新NOS即可



設定VCS Mode (Fabric Cluster Mode)



Configuration Management

- Each switch in an Ethernet fabric is its own master and holds its own copy of the configuration
  - All interface configurations are local to each switch

- In NOS 2.0.0a, the administrator must perform the following:
  - Logon to each individual switch to configure
  - Provision each feature on each switch
    - For example, VLAN creation has to be done on both RB1 and RB2 in order to allow traffic between te 1/0/2 and te 2/0/2 for a VLAN

RBridge ID and VCS ID Assignment

- In NOS **4.x.x** , a unique RBridge ID is assigned manually by the administrator, along with the fabric VCS ID

```
VDX6720# vcs rbridgeid 11 vcsid 100 enable
```

- Enabling VCS requires the switch to be rebooted and all configuration information is removed
- The RBridge ID can also be explicitly set using[1]

```
VDX6720# vcs rbridgeid <value>
```

- The RBridge ID assigned to a switch is persisted across reboots
- All interface configurations use the RBridge ID as the first number in the interface number

```
VDX6720(config)# interface tengigabitethernet 11/0/1
```

Command Variations

VCS Configuration Task	VCS Command Example
Disables the switch, sets the RBridge ID, and enables VCS mode at the same time	`VDX6720# vcs rbridgeid 11 enable`
Disables the switch, sets the VCS ID and the RBridge ID, and enables VCS mode	`VDX6720# vcs rbridgeid 11 vcsid 100 enable`
Changes from Fabric Cluster mode to Standalone mode (sets the RBridge ID to 1 and the VCS ID to 0)	`VDX6720# no vcs enable`

VDX6740預設是enable的，只需要更改rbridgeid即可。

VDX6740# vcs rbridgeid 2 vcsid 2

Note: In above examples, the user will be notified that the switch will be rebooted and will be asked: "Do you want to continue? [y/n]:"

變更RBridge ID和VCS ID，指令後面不需要帶 enable

範例：**VDX6720#** vcs rbridgeid 12 vcsid 10 [enter]

Verifying RBridge ID and VCS ID Assignment

- After assigning an RBridge ID, a VCS ID, and rebooting, you can verify the VCS configuration using the `show vcs` command

```
VDX-6710# sh vcs
Config Mode : Local-Only
VCS Mode : Fabric Cluster
VCS ID : 2
Total Number of Nodes : 2
```

- The host name can be changed using the `switch-attributes` command in the following syntax:

`switch-attributes <rbridgeid> host-name <name>`

```
VDX6720(config)# switch-attributes 11 host-name VDX11
VDX11(config-switch-attributes-11)#
```

Fabric ISL Configuration

- Limited configuration is allowed on ISL interfaces
- No configuration needed for normal ISL operation (default configuration is already configured)

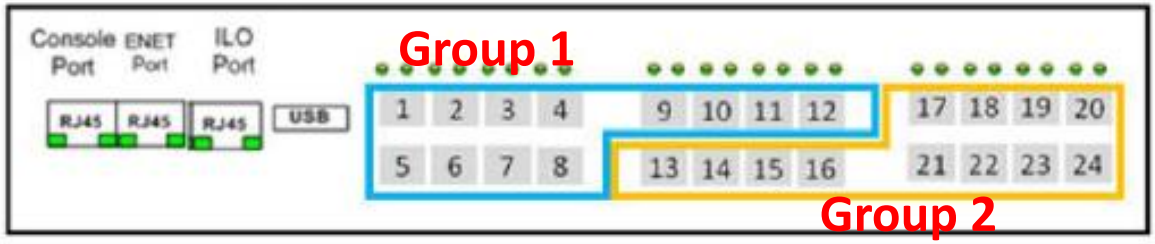
```
interface TenGigabitEthernet 11/0/1
 fabric isl enable
 fabric trunk enable
 no shutdown
```

- ISLs can be shutdown and have ISL and trunk functionality turned on or off

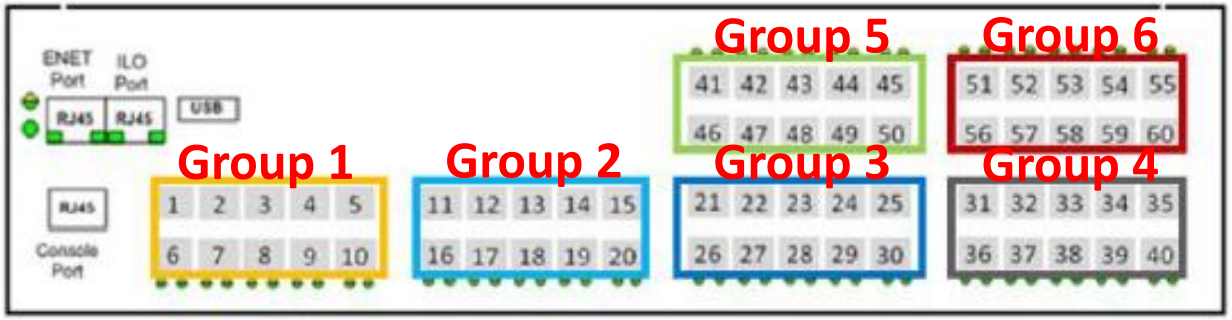
```
VDX11(config-if-te-11/0/1)# [no] shutdown
VDX11(config-if-te-11/0/1)# [no] fabric isl enable
VDX11(config-if-te-11/0/1)# [no] fabric trunk enable
```

Rules for Fabric Trunk Formation

- Fabric trunks do not form unless member ISLs are part of the same port group and are configured for the same speed
- Port groups:
  - VDX 6720-24: 1-12; 13-24

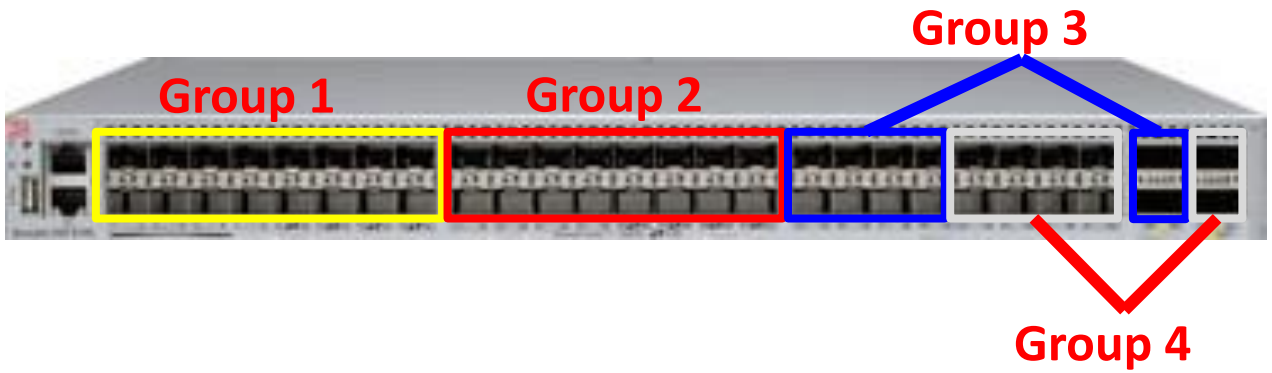


  - VDX 6720-60: 1-10; 11-20; 21-30; 31-40; 41-50; 51-60



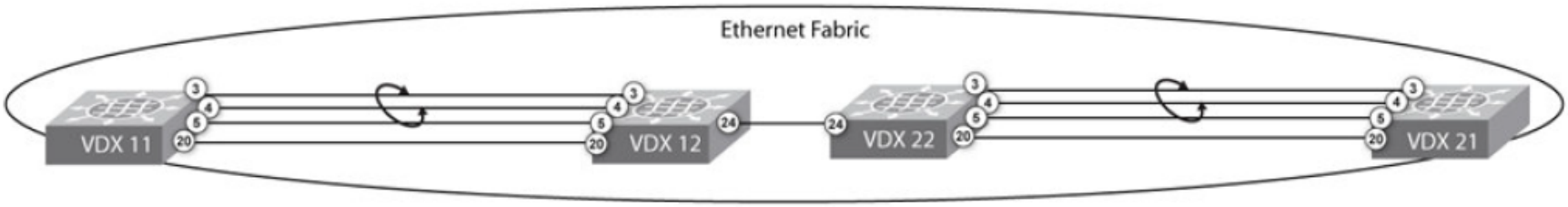
Rules for Fabric Trunk Formation

-VDX6740-48: 1-16; 17-32; 33-40 49-50; 41-48 51-52



Example Topology

- Shows ISL connections between switches in an Ethernet fabric



Verifying Fabric ISL Formation

- To quickly identify which ports are being used as ISLs or edge ports, use the `show ip interface brief` command

```
VDX11# show ip interface brief

Interface                 IP-Address      Status                Protocol
========================  ==========      ====================  ========
TenGigabitEthernet 11/0/1   unassigned      up                    up
TenGigabitEthernet 11/0/2   unassigned      up                    up
TenGigabitEthernet 11/0/3   unassigned      up                    up   (ISL)
TenGigabitEthernet 11/0/4   unassigned      up                    up   (ISL)
TenGigabitEthernet 11/0/5   unassigned      up                    up   (ISL)
TenGigabitEthernet 11/0/6   unassigned      up                    down
TenGigabitEthernet 11/0/7   unassigned      up                    down
TenGigabitEthernet 11/0/8   unassigned      up                    down
TenGigabitEthernet 11/0/9   unassigned      up                    down
TenGigabitEthernet 11/0/10  unassigned      up                    up
```

Verifying Fabric ISL Formation (cont.)

- NOS has a set of show commands to gather information about the fabric

```
VDX11# show fabric ?
Possible completions:
  all              Provides entire VCS fabric membership information
  isl              Provides ISL information
  islports         Provides switch and port information
  route            Provides routing information
  trunk            Provides trunk ISL information
```

Verifying Fabric ISL Formation (cont.)

```
VDX11# show fabric all

VCS Id: 100
Config Mode: Local-Only

RBridge-ID           WWN                 IP Address         Name
-------------------------------------------------------------------------
  11        10:00:00:05:33:40:1A:B1   10.255.248.198     "VDX11"
  12        10:00:00:05:33:40:4F:1B   10.255.248.199     "VDX12"
  21        10:00:00:05:33:3F:E1:4B   10.255.248.220   > "VDX21"*
  22        10:00:00:05:33:40:27:5D   10.255.248.221     "VDX22"

The Fabric has 4 RBridge(s)
```

Indicates Principal Switch

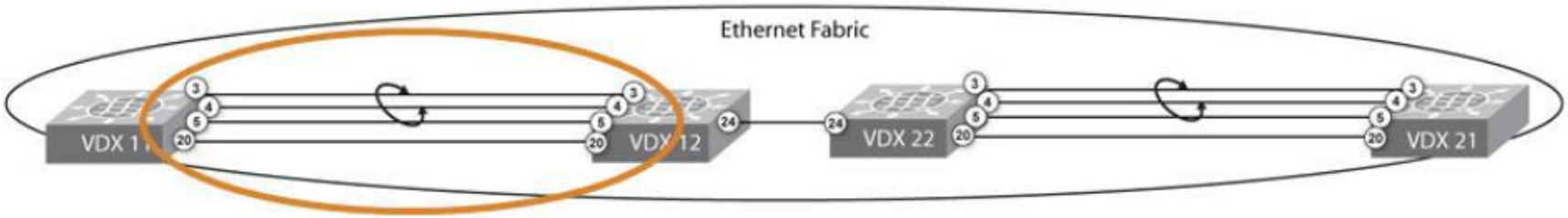
Inducates which switch you are logged in on

Verifying Fabric ISL Formation (cont.)

```
VDX11# show fabric isl

RBridge-ID: 11    #ISLs: 2

 Src-Port        Nbr-Port                 Nbr-WWN            BW   Trunk   Nbr-Name
------------------------------------------------------------------------------------
Te 11/0/3        Te 12/0/3        10:00:00:05:33:40:4F:1B   30G   Yes     "VDX12"
Te 11/0/20       Te 12/0/20       10:00:00:05:33:40:4F:1B   10G   Yes     "VDX12"
```

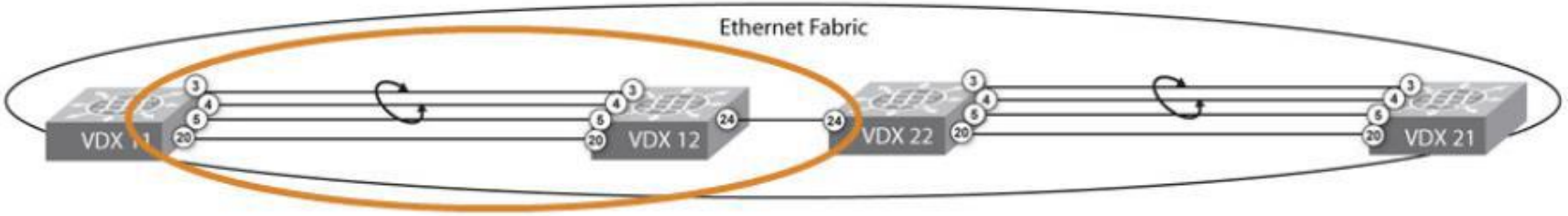


Verifying Fabric ISL Formation (cont.)

```
VDX12# show fabric isl

RBridge-ID: 12    #ISLs: 3

 Src-Port        Nbr-Port                 Nbr-WWN            BW   Trunk  Nbr-Name
------------------------------------------------------------------------------
Te 12/0/3        Te 11/0/3        10:00:00:05:33:40:1A:B1   30G  Yes    "VDX11"
Te 12/0/20       Te 11/0/20       10:00:00:05:33:40:1A:B1   10G  Yes    "VDX11"
Te 12/0/24       Te 22/0/24       10:00:00:05:33:40:27:5D   10G  Yes    "VDX22"
```



Verifying Fabric ISL Formation (cont.)

```
VDX11# show fabric islports
Name:        VDX11
Type:        95.2
State:       Online
Role:        Fabric Subordinate
VCS Id:      100
VCS Mode:    Fabric Cluster
RBridge-ID:  11
WWN:         10:00:00:05:33:40:1a:b1
FCF MAC:     00:05:33:40:1a:b1
```

```
 Port            State   Operational State
=============================================================
Te 11/0/1        Down
Te 11/0/2        Down
Te 11/0/3        Up      ISL 10:00:00:05:33:40:4f:1b "VDX12" (upstream) (Trunk Primary)
Te 11/0/4        Up      ISL (Trunk port, Primary is Te 11/0/3 )
Te 11/0/5        Up      ISL (Trunk port, Primary is Te 11/0/3 )
Te 11/0/6        Down
Te 11/0/7        Down
Te 11/0/8        Down
Te 11/0/9        Down
Te 11/0/10       Down
Te 11/0/11       Down
Te 11/0/12       Down
Te 11/0/13       Down
Te 11/0/14       Down
Te 11/0/15       Down
Te 11/0/16       Down
Te 11/0/17       Down
Te 11/0/18       Down
Te 11/0/19       Down
Te 11/0/20       Up      ISL 10:00:00:05:33:40:4f:1b "VDX12" (Trunk Primary)
<truncated output>
```

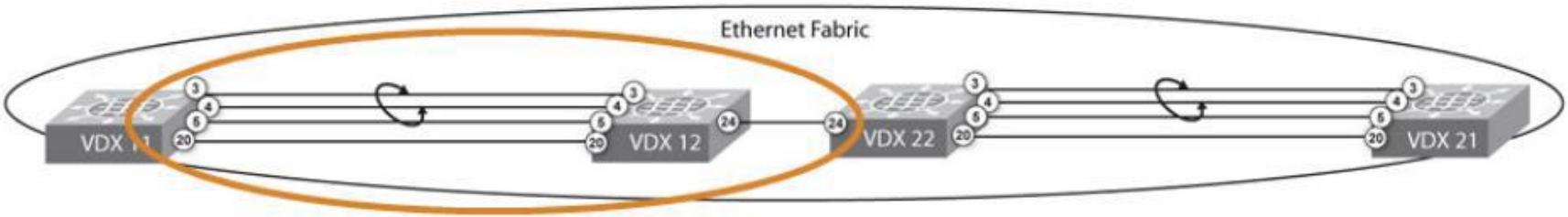
The `show fabric islports` command **only** displays ISL ports. If a device is connected to port 11/0/19, then the output displays it as `down`.

Verifying Fabric ISL Formation (cont.)

```
VDX12# show fabric trunk

RBridge-ID: 12

Group    Src-Port         Nbr-Port                 Nbr-WWN
------------------------------------------------------------------------
 1       Te 12/0/3        Te 11/0/3        10:00:00:05:33:40:1A:B1
 1       Te 12/0/4        Te 11/0/4        10:00:00:05:33:40:1A:B1
 1       Te 12/0/5        Te 11/0/5        10:00:00:05:33:40:1A:B1
 2       Te 12/0/20       Te 11/0/20       10:00:00:05:33:40:1A:B1
 3       Te 12/0/24       Te 22/0/24       10:00:00:05:33:40:27:5D
```



Viewing FSPF Routing Topology

```
VDX12# show fabric route topology

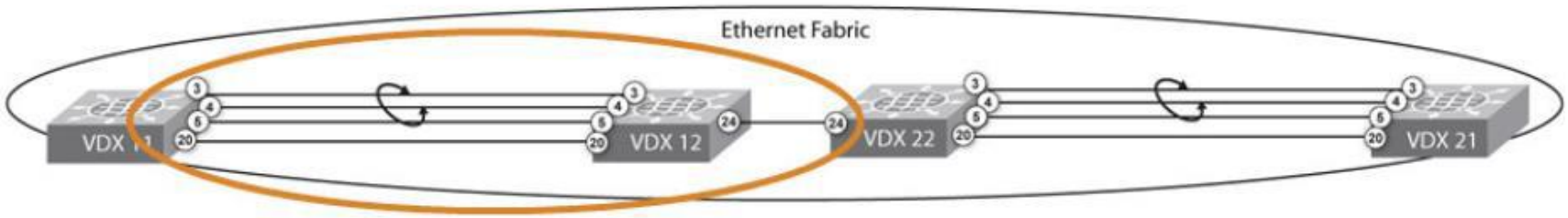
Total Path Count: 4

Src-ID  Dst-ID  OutPort        Hops     Cost     Nbr-Port        BW       Trunk
------------------------------------------------------------------------------
12      11      Te 12/0/3      1        500      Te 11/0/3       30G      Yes
        11      Te 12/0/20     1        500      Te 11/0/20      10G      Yes
        21      Te 12/0/24     2        1000     Te 22/0/24      10G      Yes
        22      Te 12/0/24     1        500      Te 22/0/24      10G      Yes
```

Source RB

Hop count

Different bandwidth, same link cost



Verifying VCS MAC Forwarding Database

```
VDX11# show mac-address-table
VlanId    Mac-address       Type      State      Ports
1002      0efc.000b.2200    FPMA      Active     Te 11/0/10
1002      0efc.000b.2700    FPMA      Active     Te 11/0/15
1         0100.1111.2222    Static    Inactive   Te 12/0/6
1         0050.56bf.0005    Dynamic   Active     Te 22/0/4
1         0050.56bf.0006    Dynamic   Active     Te 22/0/6
1         0050.56bf.0007    Dynamic   Active     Te 22/0/4
100       0010.9400.0005    Dynamic   Active     Po 10
Total MAC addresses    : 7
```

FCoE MAC addresses which are assigned by the switch are shown as FPMA

MAC address uses ingress port to the fabric of port channel 10

This is the eNS

The type field specifies whether the MAC entry was dynamically learned or statically configured

MAC Aging Time

- Must be configured on every switch

```
RB11# show mac-address-table aging-time
MAC Aging-time : 300 seconds (Default aging time)

RB11(config)# mac-address-table aging-time ?
Possible completions:
  <unsignedInt, 0 | 10 .. 100000>

RB11(config)# mac-address-table aging-time 600
```

Clearing MAC Address Table

- Clearing a MAC address on any switch clears the MAC address on all switches in the fabric

```
RB11# clear mac-address-table dynamic ?
Possible completions:
  address      MAC address type
  interface    Interface status and configuration
  vlan         Vlan interface
  |            Output modifiers
  <cr>
```

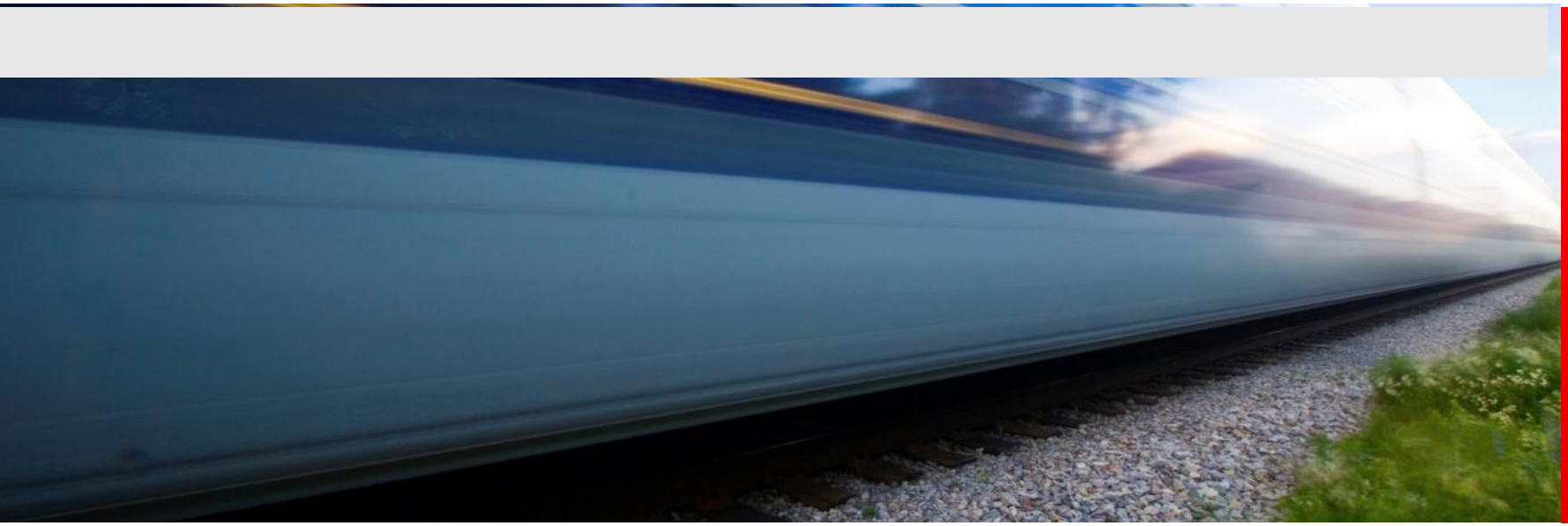
- This command clears all dynamically learned MAC addresses from the fabric (from all RBridges)

```
RB11# clear mac-address-table dynamic
```

- Clear a static MAC address by using a no statement

```
RB11(config)# no mac-address-table static 0000.1111.2222
  forward te 11/0/6 vlan 2
```

設定VCS Mode (Logical Chassis)

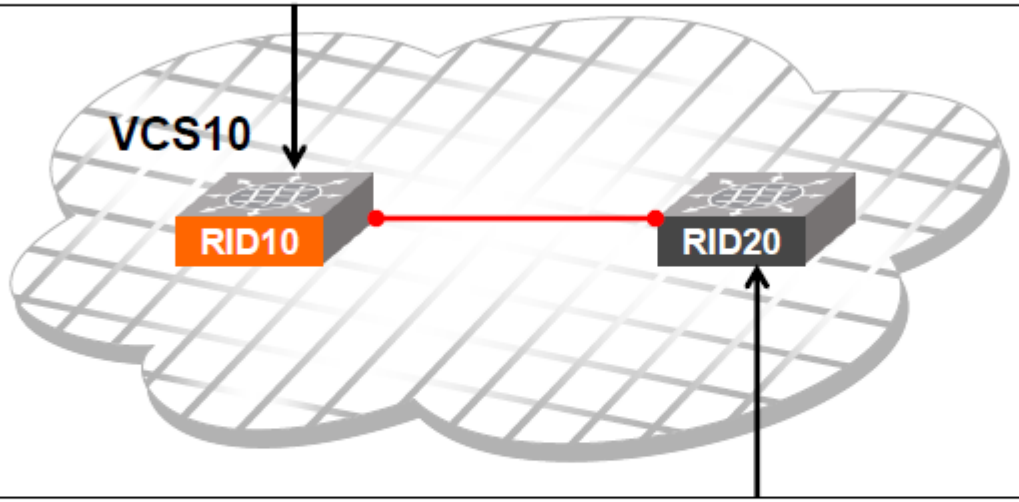


Configure your Fabric in logical-chassis mode

Define unique rbridge ID for each VDX

- Step 1: Configure VCS ID and RBridge IDs

```
sw0# vcs vcsid 10 rbridge-id 10 logical-chassis enable
```




```
sw0# vcs vcsid 10 rbridge-id 20 logical-chassis enable
```

- Same VCS id accros the cluster
- **Unique rbridge ID** for each VDX

Logical Chassis Mode

- In logical chassis mode, all switches in an Ethernet fabric are managed as if they were a single chassis
  - Requires NOS v4.0 or higher
- This module deals specifically with the distribution of management data with in the fabric
- If the issue is with the formation of the fabric or a switch missing from the fabric see on Fabric Formation issues
- If the issue is telnet connectivity to the principle check the module titled Telnet

Verify Config Mode

Run Command: `show vcs`

- Verify which switches are supposed to be in the fabric and verify VCS mode:

Distributed means that VCS Logical Chassis mode is enabled[1]

```
VDX1# show vcs
Config Mode     : Distributed
VCS ID          : 10
VCS GUID        : 2bc25fbe-61de-4807-8fe9-88b390cbaf0a
Total Number of Nodes          : 5
Rbridge-Id      WWN                              Management IP   Status    HostName
-----------------------------------------------------------------------------------
1               >10:00:00:05:33:40:4B:50*        10.255.248.7    Online    VDX1
2               10:00:00:05:33:40:CC:FC          10.255.248.8    Online    VDX2
4               10:00:00:05:33:FD:F6:54          10.255.248.118  Online    VDX4
5               10:00:00:27:F8:9A:DF:A4          .255.248.28     Online    VDX5
6               10:00:00:27:F8:9C:3C:A8          255.248.29      Online    VDX6
```

The > indicates this switch is the principal switch[2]

The * indicates which switch you are currently logged in on

Checking for a Virtual IP (VIP)

- Determining the VIP

```
VDX1# show vcs virtual-ip
Virtual IP                  : 10.255.248.115/25
Associated rbridge-id       : 1
```

- In this example either the VIP or the physical IP address of the management port can be used to access the principal switch

- Use the following command to set a VIP if needed

```
VDX1(config)# vcs virtual IP address 10.0.0.1/24
VDX1(config)# do show vcs virtual-ip
Virtual IP                    : 10.0.0.1/24
Associated rbridge-id         : 2
```

Configuration Changes from Non-Principal Switch

- When in VCS Logical Chassis mode most all configurations changes must be done from the principal switch[1]
  - If attempting to make a configuration from the non-principal switch that is not allowed[1] the following message will be displayed

```
SW1(conf-if-te-2/0/1)# switchport
%Error: This operation is not supported from a secondary node
```

Configuration Local[1] / Global

- Local (Port/Interface or Switch Level) configurations
  - Fabric ISL
  - MTU
  - LLDP DCBX
  - Channel group
  - LACP timeout
  - QoS
  - IP and L3 configuration
  - Port Profile Port
  - sFlow
  - Licensing
- Global
  - Username/RBACs
  - VLAN
  - Port Profiles (name, size, activate, QoS, security, VLAN, binding to Mac)
  - MAC address list, MAC address
  - IP Access List, IP IGMP snooping
  - LACP System Priority
  - vCenter Name
  - AAA authentication login, Radius server
  - VCS Virtual IP Address
  - Monitor Session
  - Event trap level

Configuration Local / Global (cont.)

- To view the local configuration run command:

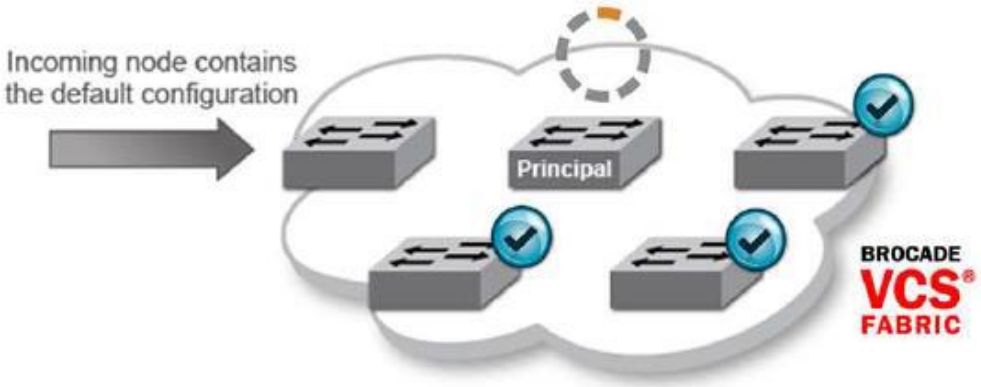
  ```
  VDX1# show local-running-config
  ```

- To view the global configuration run command:

  ```
  VDX1# show global-running-config
  ```

Adding a Switch

- The incoming switch is required to have the default configuration
  - If wanting to preserve interface configurations, backup/restore the local configuration for that switch using the copy local-running-config command
- Joining switches (new switches) receive the configuration database from the Principal switch
- There is no administrator intervention required to add a switch into the LC after the required conditions are met



Adding a Switch (cont.)

```
SW1# show vcs
VCS ID    : 1
VCS GUID : XXXXXXXX-XXXXXXXX-XXXXXXXX-XXXXXXXX

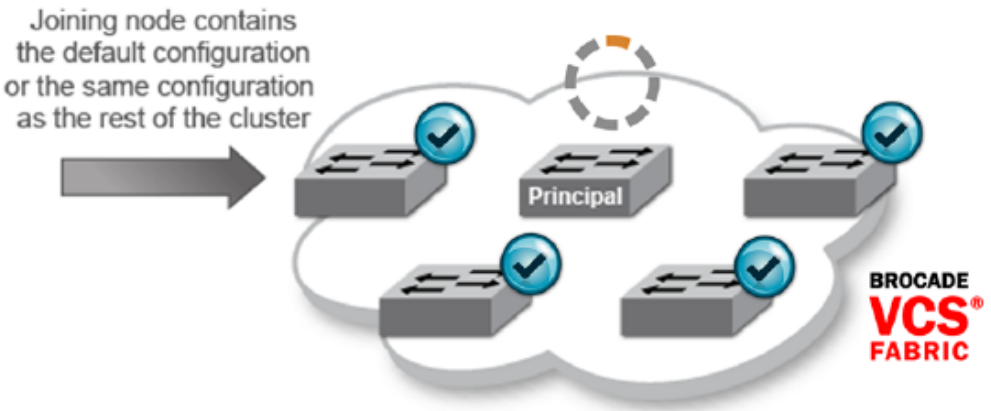

R-Bridge     WWN                          Switch-MAC          Status
_____________________________________________________________________

1           >11:22:33:44:55:66:77:81      AA:BB:CC::DD:EE:F1  Online
2            11:22:33:44:55:66:77:82      AA:BB:CC::DD:EE:F2  Online
3           *11:22:33:44:55:66:77:83      AA:BB:CC::DD:EE:F3  Online
4            11:22:33:44:55:66:77:84      AA:BB:CC::DD:EE:F4  Online
5            11:22:33:44:55:66:77:85      AA:BB:CC::DD:EE:F5  Online
6            11:22:33:44:55:66:77:86      AA:BB:CC::DD:EE:F6  Coming Online

Note:
    > Indicates the Cluster Principal
    * Indicates the current node on which this command is executed
```

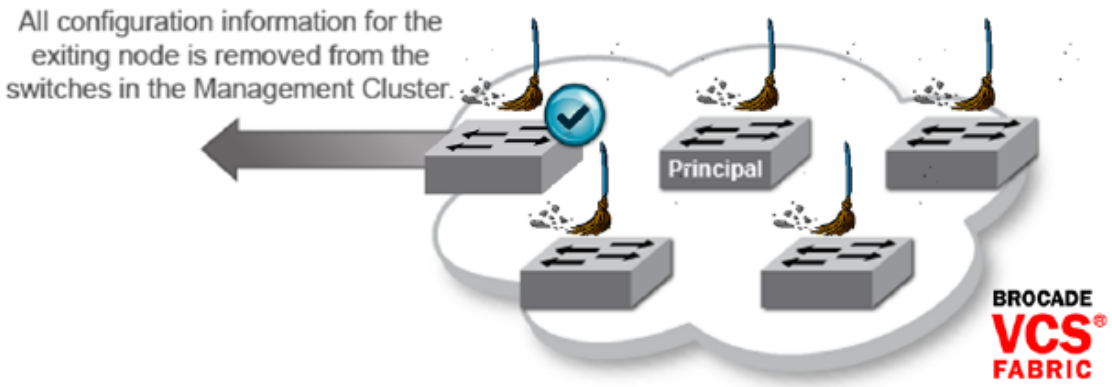
Rejoining a Switch

- Switches that are temporarily isolated from a LC for reasons such as (rebooting, link failures) can re-join the LC
- The joining switch should have the default configuration OR
- The joining switch should have the same configuration as the fabric
- Switch re-join is very similar to adding a switch except there is no post-boot step since the configuration is already in sync



Removing a Switch (cont.)

```
SW1# no vcs logical-chassis enable rbridge-id 3 default-config
This operation will perform a VCS cluster mode transition for the
selected rbridge-ids and reboot the selected rbridge-ids. The
default-config will be applied and any existing configurations will
be lost during the transition. Do you want to continue? [y/n]:y
VCS cluster will be transitioned from Logical-chassis mode to Local-
only mode.
Cluster formation is in progress. Please try after sometime.
```

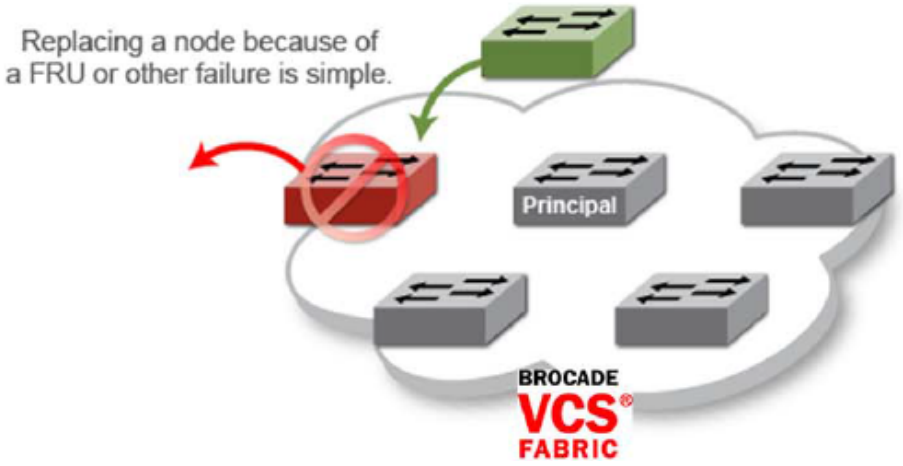


Removing a Switch (cont.)

- If a switch is physically disconnected from the fabric, the LC fabric retains all configuration information regarding the disconnected switch
- When issuing fabric commands such as show vcs, the switch will still be listed as a member RBridge in the LC, but will have a status of offline
- To keep the fabric configuration up-to-date, one of three steps should take place:
  - The switch is reconnected to the fabric
  - The “switch replacement” procedure is completed (next slide)
  - The database is updated by issuing the following command from the principal switch in the LC fabric:
    - `SW1# no vcs enable rbridge-id <ID>`

Switch Replacement

- One of the benefits of having a distributed configuration is that a switch can be physically replaced upon failure
- VCS switch replace – with Rbridge ID and WWN
- New switch will be rejoined to the fabric as a previously known switch
- No need to use snapshot, configuration is downloaded as part of switch replacement procedure



Switch Replacement (cont.)

```
SW1# vcs replace rbridge-id 239
Enter the WWN of the new replacement
10:00:00:05:33:EA:62:3C
This operation will remove and replace the switch from the fabric. Do you want
to continue? [Y/N]y

SW1# show vcs
Config Mode : Distributed
VCS ID : 8192
VCS GUID : 80abefce-9a8a-433e-ada9-9847f16975cb
Total Number of Nodes : 6
Rbridge-Id       WWN                 Management IP     Status            HostName
-----------------------------------------------------------------------------
112        10:00:00:05:33:6D:AE:F4   10.20.50.112      Online            SW1
114        10:00:00:05:33:6E:35:E4   10.20.50.114      Online            SW1
115       >10:00:00:05:1E:CD:4B:6A*  10.20.50.115      Online            SW1
118        10:00:00:05:33:14:22:00   10.20.50.118      Online            SW1
238        10:00:00:05:33:79:8D:2C   10.20.51.23       Online            SW1
239        10:00:00:05:33:EA:62:3C   10.20.51.19       Rejoining         SW1
```

Logical Chassis – Principal Priority

Principal Priority

- The configuration will only be allowed from the principal switch
- User can configure/change priorities of switches at any time
- When migrating from Fabric mode-to-LC mode, if the admin has not configured any priority, the current Fabric mode principal will act as LC principal
- Assigning priority will not trigger fabric formation
  - User needs to explicitly issue CLI for principal switch change

Logical Chassis – Principal Priority

Principal Priority

- Principal switch priority configuration

```
SW1(config)# rbridge-id 3
SW1(config-rbridge-id-3)# logical-chassis principal-priority 10
SW1(config-rbridge-id-3)# end
```

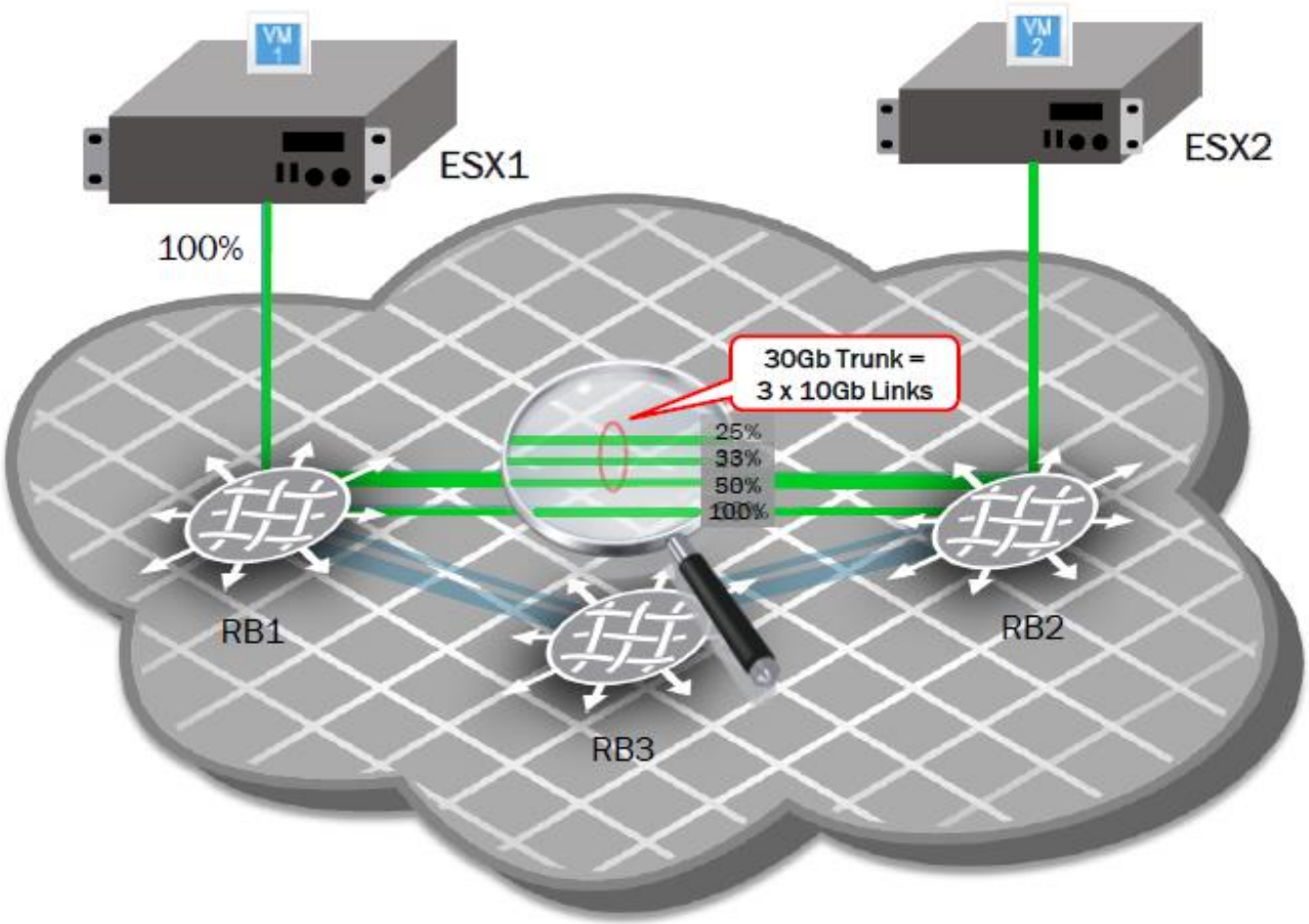
- Principal switchover CLI

```
SW1# logical-chassis principal switchover
```

ECMP

Ethernet Fabrics

Equal Cost Multi-pathing



ECMP provides very even traffic balance

4 Links (1 single link, 3 in a trunk) with balanced traffic

```
RB2# show interface tengigabitethernet 2/0/17 | include rate
Queueing strategy: fifo
    Input 2427.565040 Mbits/sec, 151336 packets/sec, 24.28% of line-rate
    Output 2519.642712 Mbits/sec, 146842 packets/sec, 25.20% of line-rate
RB2# show interface tengigabitethernet 2/0/1 | include rate
Queueing strategy: fifo
    Input 2464.649672 Mbits/sec, 151497 packets/sec, 24.65% of line-rate
    Output 2463.273888 Mbits/sec, 143580 packets/sec, 24.63% of line-rate
RB2# show interface tengigabitethernet 2/0/2 | include rate
Queueing strategy: fifo
    Input 2441.272776 Mbits/sec, 148736 packets/sec, 24.41% of line-rate
    Output 2476.909300 Mbits/sec, 144242 packets/sec, 24.77% of line-rate
RB2# show interface tengigabitethernet 2/0/3 | include rate
Queueing strategy: fifo
    Input 2438.666696 Mbits/sec, 152191 packets/sec, 24.39% of line-rate
    Output 2470.860516 Mbits/sec, 144166 packets/sec, 24.71% of line-rate
RB2#
```

ECMP Redistribution

After removing one link, traffic immediately rebalanced

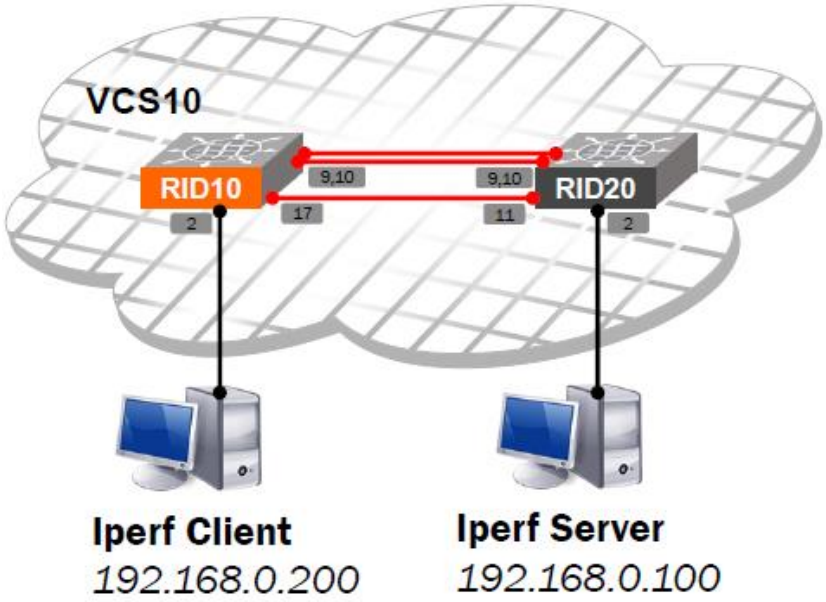
```
RB2(conf-if-te-2/0/1)# do show interface tengigabitethernet 2/0/2 | in ra
Queueing strategy: fifo
Transmit Statistics:
    Input 3265.368904 Mbits/sec, 201013 packets/sec, 32.65% of line-rate
    Output 3287.184864 Mbits/sec, 191695 packets/sec, 32.87% of line-rate
RB2(conf-if-te-2/0/1)# do show interface tengigabitethernet 2/0/3 | in ra
Queueing strategy: fifo
Transmit Statistics:
    Input 3311.434088 Mbits/sec, 200685 packets/sec, 33.11% of line-rate
    Output 3267.580168 Mbits/sec, 190552 packets/sec, 32.68% of line-rate
RB2(conf-if-te-2/0/1)# do show interface tengigabitethernet 2/0/17 | in ra
Queueing strategy: fifo
Transmit Statistics:
    Input 3280.195824 Mbits/sec, 199546 packets/sec, 32.80% of line-rate
    Output 3281.832392 Mbits/sec, 191864 packets/sec, 32.82% of line-rate
RB2(conf-if-te-2/0/1)#
```

Use another port group interface: 10/0/17

```
RB10# show fabric isl

Rbridge-id: 10   #ISLs: 2

 Src       Src            Nbr       Nbr
Index   Interface        Index   Interface              Nbr-WWN           BW    Trunk  Nbr-Name
------------------------------------------------------------------------------------------
16      Te 10/0/9         8      Te 20/0/9       10:00:00:05:33:94:EB:2D   20G   Yes   "RB20"
24      Te 10/0/17        10     Te 20/0/11      10:00:00:05:33:94:EB:2D   10G   Yes   "RB20"
```

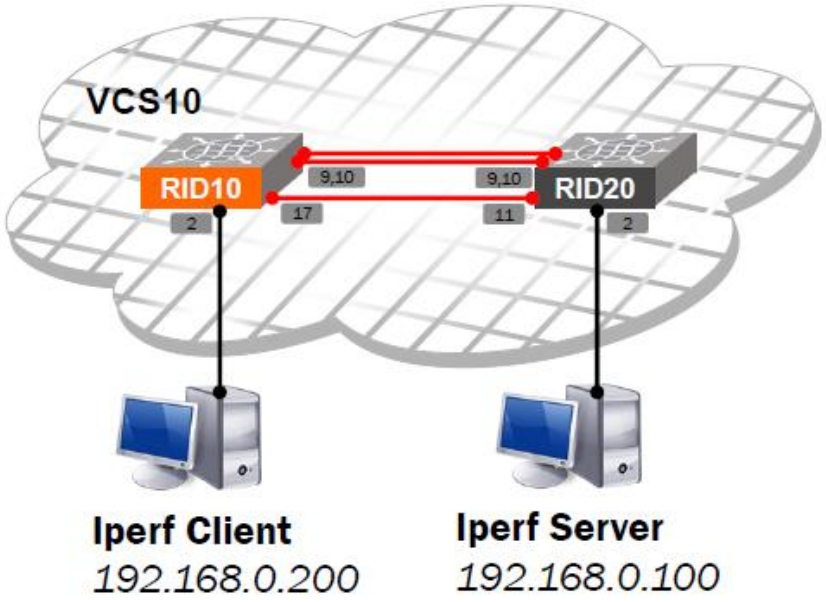


Use another port group interface: 10/0/17

```
RB10# show fabric route topology

Total Path Count: 2

Src     Dst     Out     Out                              Nbr     Nbr
RB-ID   RB-ID   Index   Interface       Hops   Cost      Index   Interface       BW    Trunk
-----------------------+-----------------------------------------------------------------
10      20      16      Te 10/0/9       1      500       8       Te 20/0/9        20G   Yes
        20      24      Te 10/0/17      1      500       10      Te 20/0/11       10G   Yes
```



Verifying Interface Usage

```
RB10# show interface ten 10/0/10 | inc rate
Queueing strategy: fifo
    Input 13.412864 Mbits/sec, 16730 packets/sec, 0.13% of line-rate
    Output 355.447528 Mbits/sec, 32928 packets/sec, 3.55% of line-rate

RB10# show interface ten 10/0/9 | inc rate
Queueing strategy: fifo
    Input 13.349528 Mbits/sec, 16648 packets/sec, 0.13% of line-rate
    Output 353.782808 Mbits/sec, 32776 packets/sec, 3.54% of line-rate

RB10# show interface ten 10/0/17 | inc rate
Queueing strategy: fifo
    Input 0.000000 Mbits/sec, 0 packets/sec, 0.00% of line-rate
    Output 0.000000 Mbits/sec, 0 packets/sec, 0.00% of line-rate
```

- ECMP between multiple path of the same cost
- How to use this link?

Traffic Generation with multiple sessions

Iperf Client & Server Configuration

Iperf Server *192.168.0.100*

```
C:\> iperf -s -P 8 -p 5001 -w 1M -t 60
```

8 sessions

60 seconds

Iperf Client *192.168.0.200*

```
C:\> iperf -c 192.168.0.100 -P 8 -p 5001 -w 1M -t 60
------------------------------------------------------------
Client connecting to 192.168.0.100, TCP port 5001
TCP window size: 1.00 MByte
------------------------------------------------------------
[212] local 192.168.0.200 port 61370 connected with 192.168.0.100 port 5001
[204] local 192.168.0.200 port 61369 connected with 192.168.0.100 port 5001
[196] local 192.168.0.200 port 61368 connected with 192.168.0.100 port 5001
[180] local 192.168.0.200 port 61366 connected with 192.168.0.100 port 5001
[164] local 192.168.0.200 port 61364 connected with 192.168.0.100 port 5001
[188] local 192.168.0.200 port 61367 connected with 192.168.0.100 port 5001
[172] local 192.168.0.200 port 61365 connected with 192.168.0.100 port 5001
[156] local 192.168.0.200 port 61363 connected with 192.168.0.100 port 5001
[ ID] Interval       Transfer     Bandwidth
[196]  0.0-60.0 sec   520 MBytes  72.7 Mbits/sec
[188]  0.0-60.0 sec   560 MBytes  78.3 Mbits/sec
[172]  0.0-60.0 sec   547 MBytes  76.4 Mbits/sec
[164]  0.0-60.2 sec   447 MBytes  62.2 Mbits/sec
[180]  0.0-60.3 sec   647 MBytes  90.0 Mbits/sec
[212]  0.0-60.4 sec   603 MBytes  83.7 Mbits/sec
[204]  0.0-60.4 sec   597 MBytes  82.9 Mbits/sec
[156]  0.0-60.5 sec   675 MBytes  93.6 Mbits/sec
[SUM]  0.0-60.5 sec  4.49 GBytes   637 Mbits/sec
```

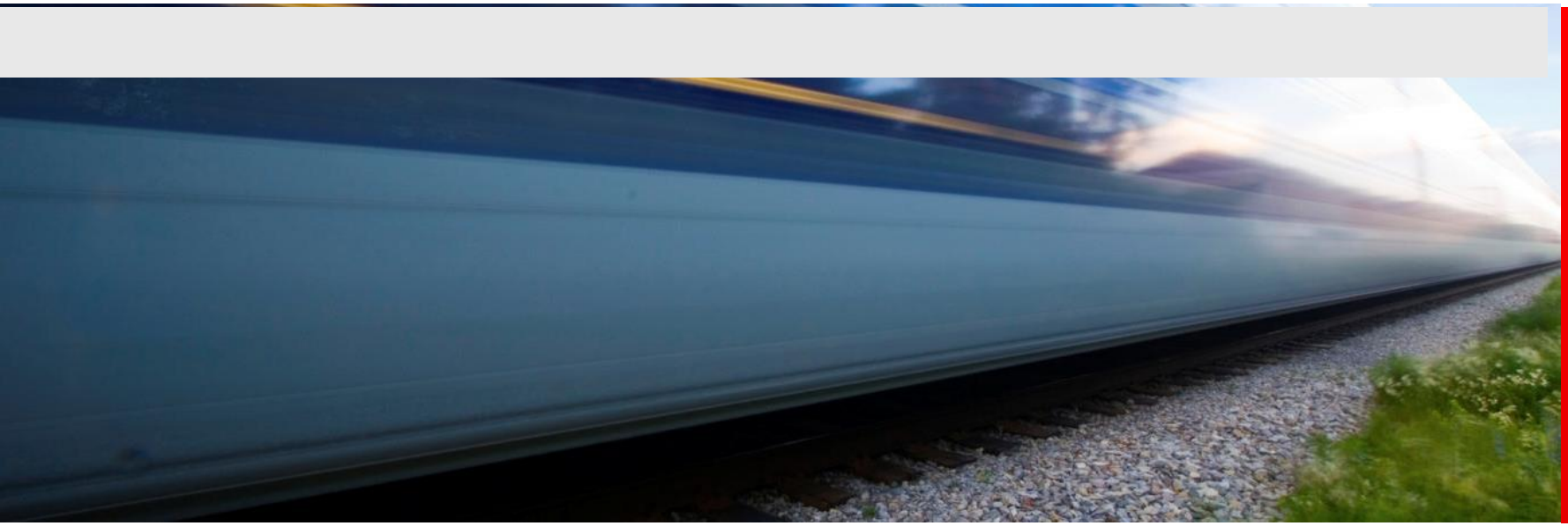
Verifying Interface Usage

```
RB10# show interface ten 10/0/9 | inc rate
Queueing strategy: fifo
    Input 7.143688 Mbits/sec, 8879 packets/sec, 0.07% of line-rate
    Output 310.850752 Mbits/sec, 28812 packets/sec, 3.11% of line-rate

RB10# show interface ten 10/0/10 | inc rate
Queueing strategy: fifo
    Input 10.224272 Mbits/sec, 12670 packets/sec, 0.10% of line-rate
    Output 313.923220 Mbits/sec, 29100 packets/sec, 3.14% of line-rate

RB10# show interface ten 10/0/17 | inc rate
Queueing strategy: fifo
    Input 2.734152 Mbits/sec, 3396 packets/sec, 0.03% of line-rate
    Output 185.672660 Mbits/sec, 17209 packets/sec, 1.86% of line-rate
```

設定VLAN



設定VLAN

VLAN設定注意事項

- 當有多台VDX互串時，在不同的VCS Mode，VLAN設定注意事項

1.Fabric Cluster Mode

在此模式底下，VLAN需要到個別VDX交換器進行配置。

2.Logical Chassis Cluster Mode

在此模式底下，只能在principal node (coordinator)VDX交換器設定配置VLAN，相關VLAN設定會自動複製到Cluster內的所有VDX交換器。

設定VLAN

新增VLAN

- 新增單一VLAN

  VDX6720(config)# interface Vlan 10

- 新增多個連續VLAN

  VDX6720(config)# interface Vlan 10-12

- 新增多個非連續VLAN

  VDX6720(config)# interface Vlan 20,30

view VLAN information

- Use the show vlan brief command

```
RB10# show vlan brief
Total Number of VLANs configured : 4
VLAN        Name                State    Ports
(F)-FCoE                                 (u)-Untagged, (t)-Tagged
                                         (c)-Converged
======== =============== ========================================
1        default         ACTIVE   Po 1(t)    Po 20(t)   Te 20/0/2(u)
                                  Te 10/0/2(u)
10       VLAN0010        ACTIVE   Po 1(t)    Po 20(t)
20       VLAN0020        ACTIVE   Po 1(t)    Po 20(t)
1002(F)  VLAN1002        ACTIVE
```

設定VLAN

VLAN bind IP (Interface VE)

- **檢視目前VE設定**

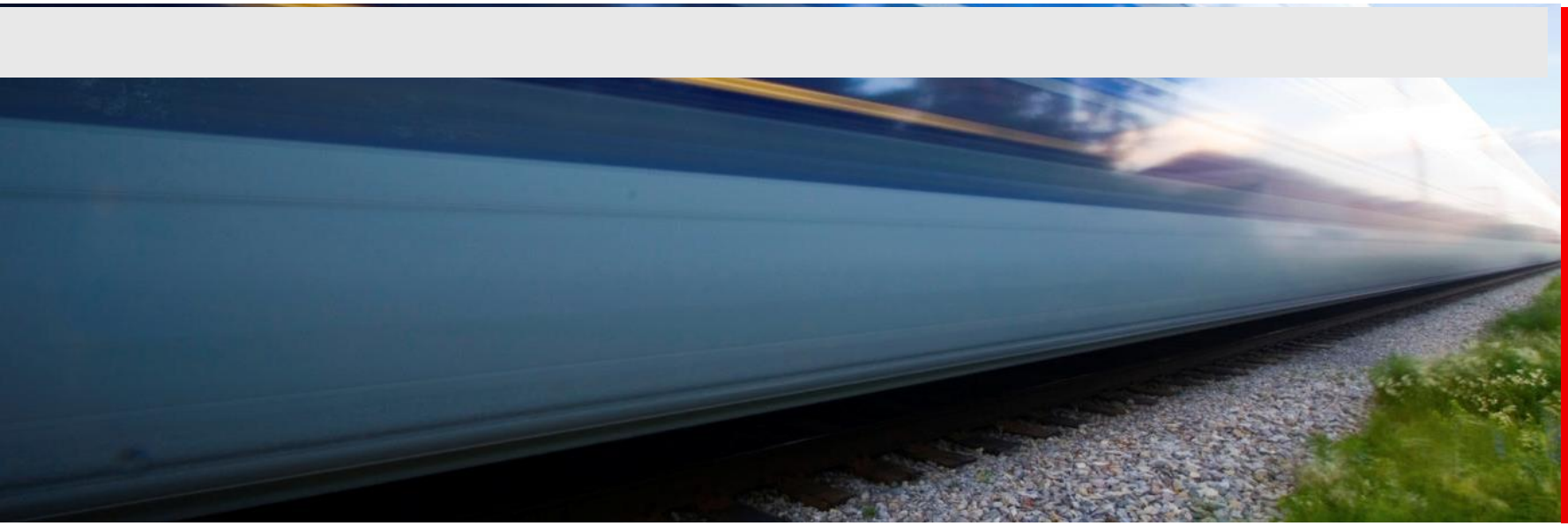
```
VDX6720# show running-config rbridge-id 1 interface ve
rbridge-id 1
 interface Ve 2
  ip proxy-arp
  ip address 192.168.2.1/24
  no shutdown
 !
 interface Ve 5
  ip proxy-arp
  ip address 192.168.5.1/24
  no shutdown
 !
!
```

- **新增Interface VE**

```
VDX6720# conf t
VDX6720(config)# rbridge-id 1
VDX6720(config-rbridge-id-1)# interface Ve 10
VDX6720(config-Ve-10)# ip address 192.168.10.1/24
```

- 創建VE之前，需先創建VLAN
- VE ID需和VLAN ID一致
  例如：Ve 10 對應VLAN 10

設定Edge Port
Tagged, Untagged, vLAG (port-channel)



設定Edge Port (L2)

檢視目前Edge port設定

VDX Edge port 預設為L3

- **檢視目前 Edge port 設定**

```
VDX6720# show running-config interface TenGigabitEthernet
interface TenGigabitEthernet 1/0/1
 fabric isl enable
 fabric trunk enable
 no shutdown
!
interface TenGigabitEthernet 1/0/2
 fabric isl enable
 fabric trunk enable
 no shutdown
!
interface TenGigabitEthernet 1/0/3
 fabric isl enable
 fabric trunk enable
 no shutdown
!
interface TenGigabitEthernet 1/0/4
 fabric isl enable
 fabric trunk enable
 no shutdown
!
```

實體Interface類型

GigabitEthernet	→ 1GbE
TenGigabitEthernet	→ 10GbE
FortyGigabitEthernet	→ 40GbE
HundredGigabitEthernet	→ 100GbE

Port-channel
FibreChannel

設定Edge Port (L2)

設定Edge port 為 Layer 2 switch port，Untagged

- 設定Edge port 為 L2，且為Untagged

```
VDX6720(config)# interface TenGigabitEthernet 1/0/10
VDX6720(conf-if-te-1/0/10)# switchport
VDX6720(conf-if-te-1/0/10)# switchport mode access
VDX6720(conf-if-te-1/0/10)# switchport access vlan 5
```

- 檢視之前Edge port設定，於config 下，要前置do

```
VDX6730(conf-if-te-1/0/10)# do sh run int te 1/0/10
interface TenGigabitEthernet 1/0/10
 fabric isl enable
 fabric trunk enable
 switchport
 switchport mode access
 switchport access vlan 5
 spanning-tree shutdown
 no shutdown
 !
```

設定Edge Port (L2)

設定Edge port 為 Layer 2 switch port，tagged

- 設定Edge port 為 L2，且為tagged

```
VDX6720(config)# interface TenGigabitEthernet 1/0/11
VDX6720(config)# int te 1/0/11
VDX6720(conf-if-te-1/0/11)# switchport
VDX6720(conf-if-te-1/0/11)# switchport mode trunk
 VDX6720(conf-if-te-1/0/11)# switchport trunk allowed 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/Tx through the Layer2 interface

VDX6720(conf-if-te-1/0/11)# switchport trunk allowed vlan all
```

設定Edge Port (L2)

設定Edge port 為 Layer 2 switch port，tagged

- 檢視之前Edge port設定，於config 下，要前置do

```
VDX6720(conf-if-te-1/0/11)# do sh run int te 1/0/11
interface TenGigabitEthernet 1/0/11
 fabric isl enable
 fabric trunk enable
 switchport
 switchport mode trunk
 switchport trunk allowed vlan all
 switchport trunk tag native-vlan
 spanning-tree shutdown
 no shutdown
 !
```

Verifying Interface Status

```
RB10# show ip interface brief

Interface                  IP-Address      Status                Protocol
=========================  ==========      ====================  ========
TenGigabitEthernet 10/0/1   unassigned        up                    down
TenGigabitEthernet 10/0/2   unassigned        up                    down
```

- Protocol down?
- What type of SFP do you have? Without Brocade Branded SFPs no auto-sensing, specify interface speed

Verifying Interface Status

- Other SFPs, specify the speed


```
RB10(config)# int ten 10/0/2
RB10(conf-if-te-10/0/2)# speed 1000

Interface                    IP-Address      Status                Protocol
=========================    ==========      ====================  ========
TenGigabitEthernet 10/0/1     unassigned        up                   down
TenGigabitEthernet 10/0/2     unassigned        up                   up
```

Verifying Interface Status

- Brocade Branded SFPs, do **not** specify the speed
- If the speed was previously specified, check the status

```
RB10(config)# do show logging raslog
2013/03/26-13:39:33, [NSM-1026], 1933, DCE, INFO, RB10,  SFP transceiver for interface
TenGigabitEthernet 10/0/2 is inserted.

2013/03/26-13:39:34, [NSM-1027], 1934, DCE, INFO, RB10,  SFP transceiver for interface
TenGigabitEthernet 10/0/2 is removed.

2013/03/26-13:39:38, [NSM-1028], 1935, DCE, ERROR, RB10,  Incompatible SFP transceiver for
interface TenGigabitEthernet 10/0/2 is detected.


RB10(conf)# do show running-config interface ten 10/0/2
interface TenGigabitEthernet 10/0/2
 speed 1000
 fabric isl enable
 fabric trunk enable
 switchport
 switchport mode access
 switchport access vlan 1
 shutdown
```

Verifying Interface Status

- Brocade Branded SFPs
- Remove the speed, then re-enable the interface since it was automatically shut by the system previously

```
RB10(config)# int ten 10/0/2
RB10(conf-if-te-10/0/2)# no speed 1000
RB10(conf-if-te-10/0/2)# no shut
RB10(conf-if-te-10/0/2)# do show ip int brief

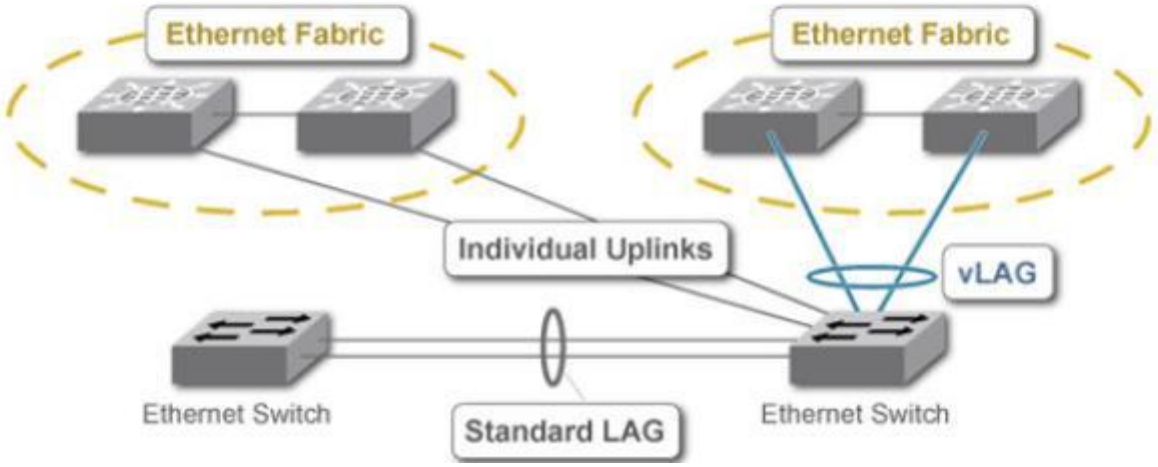
Interface                      IP-Address      Status                Protocol
==========================     ==========      ====================  ========
TenGigabitEthernet 10/0/1      unassigned      up                      down
TenGigabitEthernet 10/0/2      unassigned      up                      up
```

設定Edge Port 為 vLAG (port-channel)

- After completing this module, attendee's should be able to:
  - Describe the concept of a VCS™ Virtual Link Aggregation Group (vLAG)
  - Discuss how to implement and provision a VCS vLAG
  - Identify how MAC learning and multicast traffic is handled on a vLAG

vLAG Introduction

- A vLAG is a fabric service that allows LAGs to originate from multiple Brocade VDX™ switches acting as a single logical link to an external switch or server
  - It acts the same way as a static LAG or a standard dynamic LAG using the Link Aggregation Control Protocol (LACP), a method to control the bundling of several physical ports together to form a single logical link or trunk



vLAG Features

- Provisioning and management is consistent with a standard LAG implementation
- Interoperable with servers and third-party switches
  - Standard LACP (IEEE 802.3ad)-based interoperable solution
- Supports vLAG links across two VDX switches
  - They do not need to be directly connected
- From a user perspective, features running on top of the vLAG are configured and operate similarly to features running over a standard LAG (i.e. ACL, QoS)

  - 不同 NOS版本，可支援跨VDX交換器數量不同
    NOS 4.x.x，可跨 8 台
    NOS 3.x.x，可跨 4 台
    NOS 2.x.x，可跨 2 台

vLAG versus LAG Provisioning

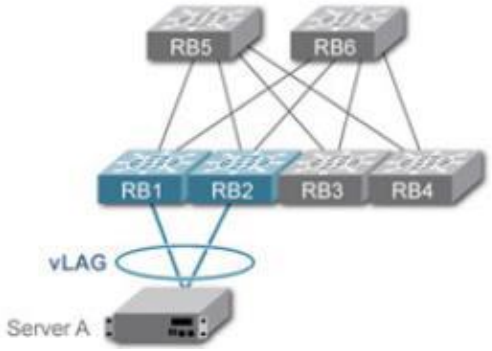
- Once VCS detects that the LAG configuration spans multiple VDX switches, the LAG automatically becomes a vLAG
- The standard "Admin Key" (Channel #) provisioning needs to be the same for ports that belong to the same vLAG
- Only ports with same speed are aggregated

vLAG configuration Steps

- Create port channel interfaces on both participating VDXs

```
RB1(config)# interface port-channel 10
RB1(config-Port-channel-10)# switchport
RB1(config-Port-channel-10)# switchport mode trunk
RB1(config-Port-channel-10)# switchport trunk allowed vlan all
RB1(config-Port-channel-10)# no shutdown

RB2(config)# interface port-channel 10
RB2(config-Port-channel-10)# switchport
RB2(config-Port-channel-10)# switchport mode trunk
RB2(config-Port-channel-10)# switchport trunk allowed vlan all
RB2(config-Port-channel-10)# no shutdown
```



Port-channel L2 常用設定

- 如果有配置port-channel，在Edge port 的 L2 設定可於port-channel 下配置

```
VDX6720(config)# interface Port-channel 10
VDX6720(config-Port-channel-10)# switchport
VDX6720(config-Port-channel-10)# switchport mode access
VDX6720(config-Port-channel-10)# switchport access vlan 5
VDX6720(config-Port-channel-10)# mtu 9216
VDX6720(config-Port-channel-10)# qos flowcontrol tx on rx on
VDX6720(config-Port-channel-10)# speed 1000*
```

常用設定說明

```
VDX6720(config)# interface Port-channel 10
VDX6720(config-Port-channel-10)#

Possible completions:
description     Interface specific description
mtu             Set mtu value to interface
qos             Quality of Service (QoS)
speed           Set speed informational parameter
switchport      Set the switching characteristics of the Layer2 interface
```

- 檢視之前port-channel 設定，於config 下，要前置do

```
VDX6720(config-Port-channel-10)# do sh run int po 10
interface Port-channel 10
 vlag ignore-split
 speed 1000
 mtu 9216
 switchport
 switchport mode access
 switchport access vlan 5
 qos flowcontrol tx on rx on
 spanning-tree shutdown
 shutdown
!
```

因為在port-channel下，沒有支援速率自動配置，因此當Edge port要套用某port-channel：
若該Edge port為10GbE，但使用1Gb SFP時，需要設定Speed 1000。

```
VDX6720(config-Port-channel-10)# speed ?
Possible completions:
 [10000] → 預設為10G
 1000    1Gbps
 10000   10Gbps
 40000   40Gbps
 100000  100Gbps
```

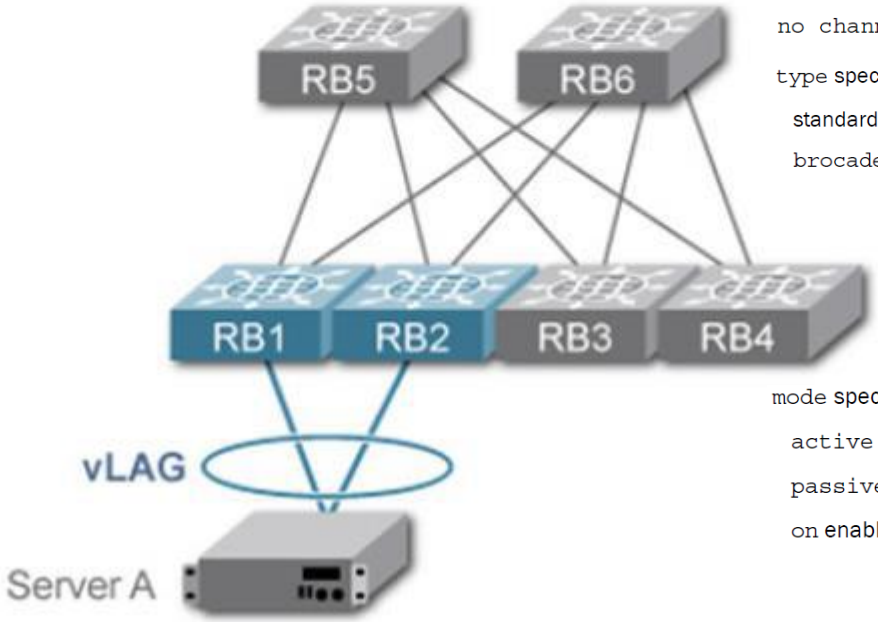
```
VDX6720(conf-if-te-1/0/12)# speed ?
Possible completions:
 1000      1Gbps
 10000     10Gbps
 auto      Auto negotiation (default)
```

vLAG configuration Steps (cont.)

- vLAG between Server A and Switches RB1 and RB2

```
RB1 (conf-if-te-1/0/21) # channel-group 10 mode active

RB2 (conf-if-te-2/0/21) # channel-group 10 mode active
```



Syntax:

`channel-group number mode [active | passive | on] [type standard | brocade]`

`no channel-group`

`type` specifies the type of LAG.

standard specifies the 802.3ad standard-based LAG.

`brocade` specifies the Brocade proprietary hardware-based trunking.

`mode` specifies the mode of Link Aggregation.

`active` enables the initiation of LACP negotiation on an interface.

`passive` disables LACP on an interface.

`on` enables static link aggregation on an interface.

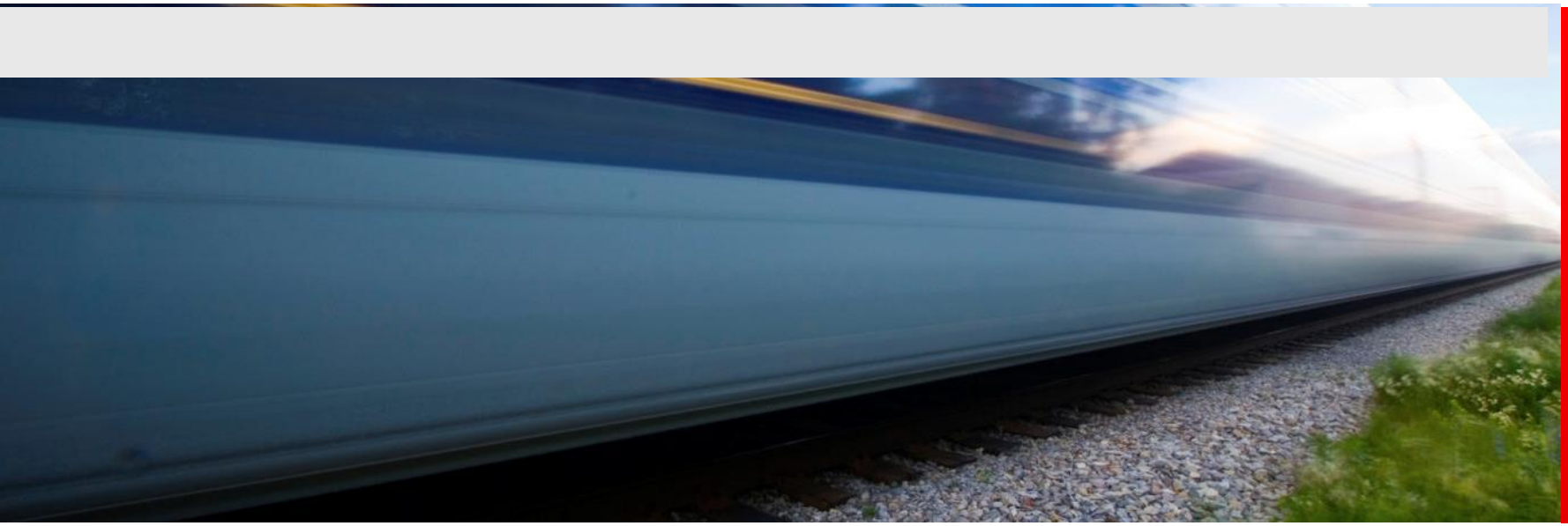
Verifying vLAG Formation

- To view vLAG details perform (recommended on all nodes of vLAG) the `show port-channel detail` command

```
RB1# show port-channel detail
 Aggregator Po 10 (vLAG)
  Member switches:
    RBridge id 1 (2)
    RBridge id 2 (2)
  Actor System ID - 0x8000,01-e0-52-00-01-00
  Actor System ID Mapped Id: 0
  Admin Key: 0010 - Oper Key 0010
  Receive link count: 2 - Transmit link count: 2
  Individual: 0 - Ready: 1
  Partner System ID - 0x0001,01-80-c2-00-00-01
  Link: Te 1/0/21 (0x18150014) sync: 1
  Link: Te 1/0/22 (0x18160015) sync: 1
```

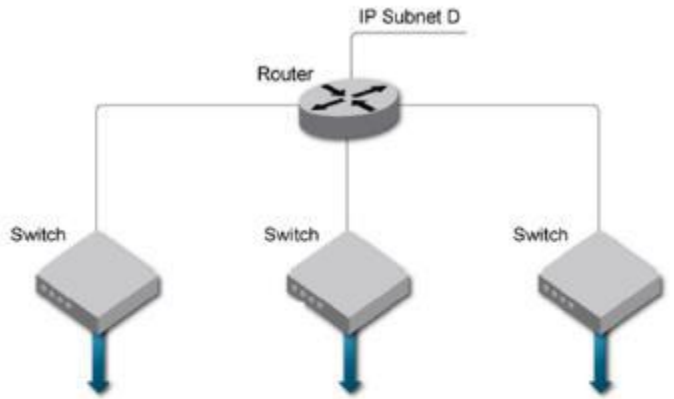
Sync: 1 means that link is up,
Sync: 0 means that link is down

Inter-VLAN Routing

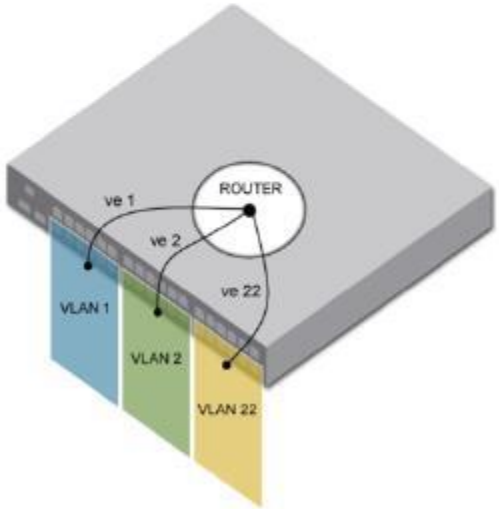


Integrated Switching and Routing

- Switch within a VLAN (port-to-port)

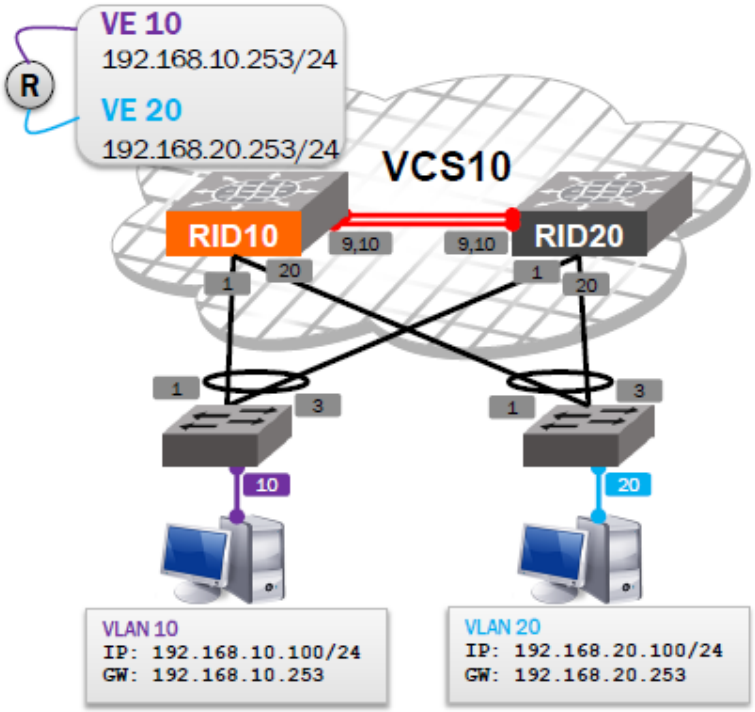


- Route between VLANs (VLAN-to-VLAN)
  1. Configure port-based VLAN
  2. Define Virtual Interface (VE)
  3. Assign an IP address to the VE



Inter-VLAN Configuration

```
RB10(config)# rbridge-id 10
RB10(config-rbridge-id-10)# interface ve 10
RB10(config-Ve-10)# ip addr 192.168.10.253/24
RB10(config-Ve-10)# no shut
RB10(config-Ve-10)# int ve 20
RB10(config-Ve-20)# ip addr 192.168.20.253/24
RB10(config-Ve-20)# no shut
```



- Configure pings between the two laptops
- What happens if RID10 fails?

Verifying Inter-VLAN

```
RB10# show ip route rbridge-id 10
Total number of IP routes: 4
Type Codes - B:BGP D:Connected I:ISIS O:OSPF R:RIP S:Static; Cost - Dist/Metric
BGP  Codes - i:iBGP e:eBGP
ISIS Codes - L1:Level-1 L2:Level-2
OSPF Codes - i:Inter Area 1:External Type 1 2:External Type 2 s:Sham Link
        Destination        Gateway         Port        Cost          Type Uptime
1       0.0.0.0/0          192.168.0.254   mgmt 1      1/1           S    1h31m
2       192.168.0.0/24     DIRECT          mgmt 1      0/0           D    1h29m
3       192.168.10.0/24    DIRECT          Ve 10       0/0           D    14m27s
4       192.168.20.0/24    DIRECT          Ve 20       0/0           D    14m15s
```

```
RB10# show ip int brief rbridge-id 10 | inc V
Interface          IP-Address       Vrf          Status                  Protocol
Ve 10              192.168.10.253   default-vrf  up                      up
Ve 20              192.168.20.253   default-vrf  up                      up
Vlan 1             unassigned                    administratively down   down
Vlan 10            unassigned                    up                      up
Vlan 20            unassigned                    up                      up
Vlan 4093          unassigned                    up                      up
Vlan 4095          unassigned                    administratively down   down
```

VEs are UP

Verifying Inter-VLAN

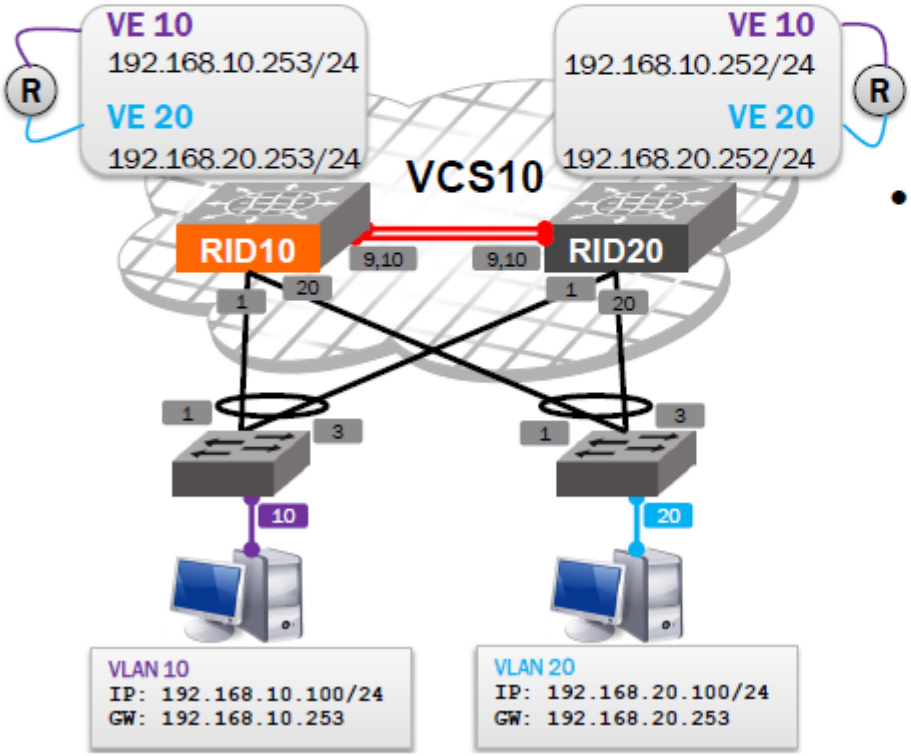
```
RB10# show vlan brief
Total Number of VLANs configured : 4
VLAN        Name                 State    Ports
(F)-FCoE                                  (u)-Untagged,  (t)-Tagged
                                          (c)-Converged
======== ================ ======= ============================================
1        default          ACTIVE  Po 1(t)    Po 20(t)
10       VLAN0010         ACTIVE  Po 1(t)    Po 20(t)
20       VLAN0020         ACTIVE  Po 1(t)    Po 20(t)
1002(F)  VLAN1002         ACTIVE
```

All VLANs Active

Inter-VLAN Configuration

Configure at least two VDXs as Routers for Redundancy

```
RB20(config)# rbridge-id 20
RB20(config-rbridge-id-20)# interface ve 10
RB20(config-Ve-10)# ip addr 192.168.10.252/24
RB20(config-Ve-10)# no shut
RB20(config-Ve-10)# int ve 20
RB20(config-Ve-20)# ip addr 192.168.20.252/24
RB20(config-Ve-20)# no shut
```



- Much better, but the clients/servers still use one or the other router as gateway, but not both

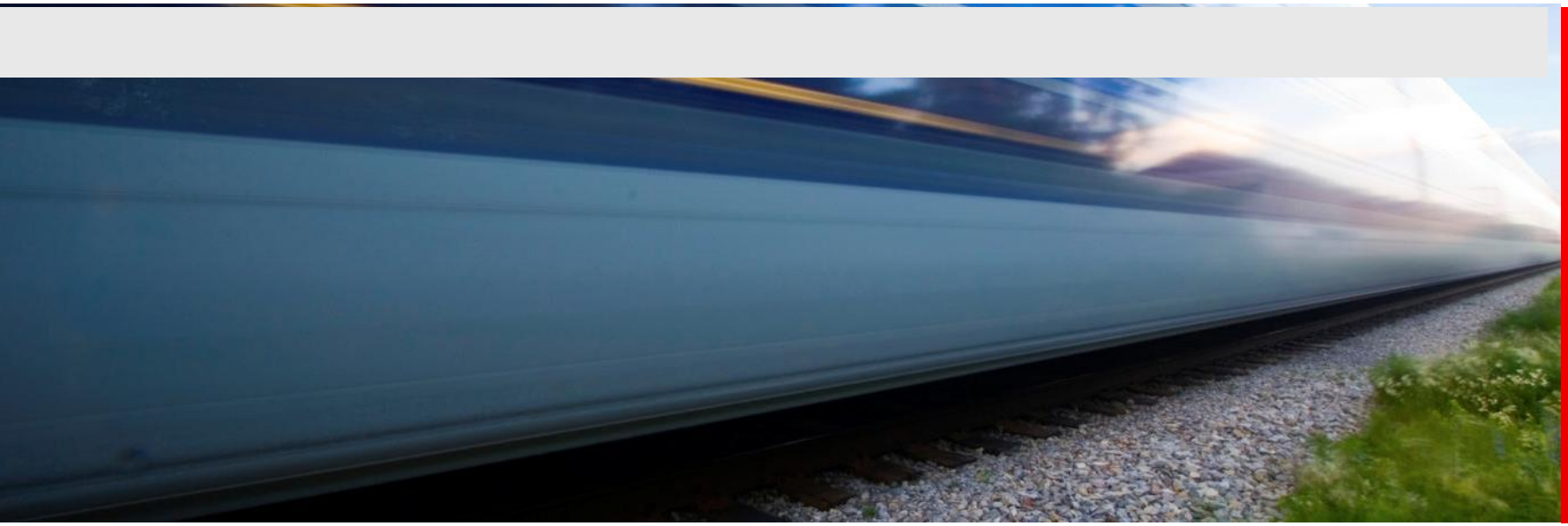
Verifying VCS MAC Forwarding Database

```
RB10# show mac-address-table
VlanId    Mac-address         Type      State         Ports
10        0005.3394.eb4e      System    Remote        XX 20/X/X
10        0026.5511.ddfe      Dynamic   Active        Po 1
20        0005.3394.eb4e      System    Remote        XX 20/X/X
20        0021.7097.bdf3      Dynamic   Active        Po 20
Total MAC addresses     :   4
```

```
RB20# show mac-address-table
VlanId    Mac-address         Type      State         Ports
10        0005.33b6.0f9d      System    Remote        XX 10/X/X
10        0026.5511.ddfe      Dynamic   Active        Po 1
20        0005.33b6.0f9d      System    Remote        XX 10/X/X
20        0021.7097.bdf3      Dynamic   Active        Po 20
Total MAC addresses     :   4
```

```
RB20# show vcs
Config Mode     : Distributed
VCS ID          : 10
VCS GUID        : 02a35e85-6760-4fe7-ab12-c088cb226013
Total Number of Nodes            : 2
Rbridge-Id       WWN                                Management IP    Status          HostName
-------------------------------------------------------------------------------------------
10                10:00:00:05:33:B6:0F:7C           192.168.0.10     Online          RB10
20               >10:00:00:05:33:94:EB:2D*          192.168.0.20     Online          RB20
```

ACL



NOS v3.0.0 ACL Feature Overview

- NOS v3.0.0 supports:
  - Filtering based on L2 and L3 header information:
    - (L2) MAC access list; (L3) IPv4 access list (new)
  - L2 ACL binding to physical interfaces, LAG interfaces and VLAN interfaces in L2 mode
  - L3 ACL binding to physical interfaces, LAG interfaces and VE interfaces regardless of their mode
  - ACLs on all VDX platforms
  - L2/L3 binding in both ingress and egress directions[1]
- An implicit default "permit any" rule at the end of a L2 ACL
- An implicit default "deny any" rule at the end of a L3 ACL

ACL

- Two types of ACLs:
  - **Standard** ACLs filter packets based on source IP address only
  - **Extanded** ACLs filter packets based on source and destination IP addresses, TCP/UDP ports, or protocol number
- Only one ACL per interface per direction (inbound or outbound) can be assigned

Configuring Standard ACLs

- How to configure ACLs:
  - Define the ACL(s) globally
  - Assign them to interfaces(s)
- Standard ACL Syntax:

```
sw0(config)# ip access-list standard NAME
[no] [seg seq-value] {permit | deny | hard-drop} {any | SIP mask | host SIP} [count][log]
sw0(configipacl-std)# deny 192.168.1.0 0.0.0.255
```

- CIDR and wildcard masks are supported
- seq option to insert a rule anywhere in the IP ACL
- Apply MAC/IP ACL to a L2 or a VLAN interface

```
sw0(conf-if-te-1/2/5)# ip access-group ip_example in
```

Configuring Extended ACLs

- Extended ACLs let you filter packets based on the following information:
  - IP protocol
  - Source / Destination IP address or host name
  - Source / Destination TCP or UDP port

Extended ACL Examples (cont.)

- Example:
  - Block a host with the IP address 10.24.26.145 from telnetting
  - Block http traffic
  - All other IP traffic is permitted

```
Router(config)# ip access-list extended ip_example
Router(config-ip-ext)# seq 5 deny tcp host 10.24.26.145 any eq 23
Router(config-ip-ext)# seq 7 deny tcp any any eq 80
Router(config-ip-ext)# seq 15 permit tcp any any

Router(config)# interface ethe 1
Router(config-if-1/1)# ip access-group ip_example in
```

General Guidelines for Using ACLs

- ACLs are executed sequentially from top to bottom
- Generally, place the «deny» statements before the «permit» statements
- There is an implicit «deny» statement at the end of each ACL
  - Specific statements should be before general statements
  - All traffic not specifically permitted will be automatically denied
- If possible apply ACLs inbound rather than outbound

Display ACL Status Example (cont.)

- Status on all ACLs bound to an interface

```
sw0# show access-list interface tengigabitethernet 1/4/11 in
ip access-list ip_example on TenGigabitEthernet 1/4/11 at Ingress
(From User)
    seq 10 permit ip host 192.168.1.1 host 192.85.1.2 count (Active)
    seq 20 permit ip host 192.168.2.2 host 192.85.1.2 count (Active)
```

- Status on an ACL on all interfaces on which it is bound

```
sw0# show access-list ip ip_example in
ip access-list ip_example on TenGigabitEthernet 1/4/11 at Ingress
    seq 10 permit ip host 192.168.1.1 host 192.85.1.2 count (Active)
    seq 20 permit ip host 192.168.2.2 host 192.85.1.2 count (Active)
ip access-list ip_example on TenGigabitEthernet 1/4/12 at Ingress
    seq 10 permit ip host 192.168.1.1 host 192.85.1.2 count (Active)
    seq 20 permit ip host 192.168.2.2 host 192.85.1.2 count (Active)
```

Display ACL statistics example

- Stats for a given ACL for all interfaces it is bound

```
sw0# show statistics access-list ip ip_example in
ip access-list ip_example on TenGigabitEthernet 1/4/11 at Ingress (From User)
    seq 10 permit ip host 192.168.1.1 host 192.85.1.2 count (0 frames)
    seq 20 permit ip host 192.168.2.2 host 192.85.1.2 count (0 frames)
ip access-list ip_example on TenGigabitEthernet 1/4/12 at Ingress (From User)
    seq 10 permit ip host 192.168.1.1 host 192.85.1.2 count (0 frames)
    seq 20 permit ip host 192.168.2.2 host 192.85.1.2 count (0 frames)
```

- Stats for all ACLs bound to a specific interface

```
sw0# show statistics access-list interface tengigabitethernet 1/4/11 in
ip access-list ip_example on TenGigabitEthernet 1/4/11 at Ingress (From User)
    seq 10 permit ip host 192.168.1.1 host 192.85.1.2 count (0 frames)
    seq 20 permit ip host 192.168.2.2 host 192.85.1.2 count (0 frames)
```

Configuring Standard ACLs(L2)

- Example：
  block host with mac address aaaa.bbbb.cccc

```
sw0(config)# mac access-list standard test1
sw0(conf-macl-std)# deny host aaaa.bbbb.cccc
or
sw0(conf-macl-std)# deny aaaa.bbbb.cccc ffff.ffff.ffff

sw0(config)# interface TenGigabitEthernet 41/0/5
sw0(conf-if-te-41/0/5)# mac access-group test1 in
```

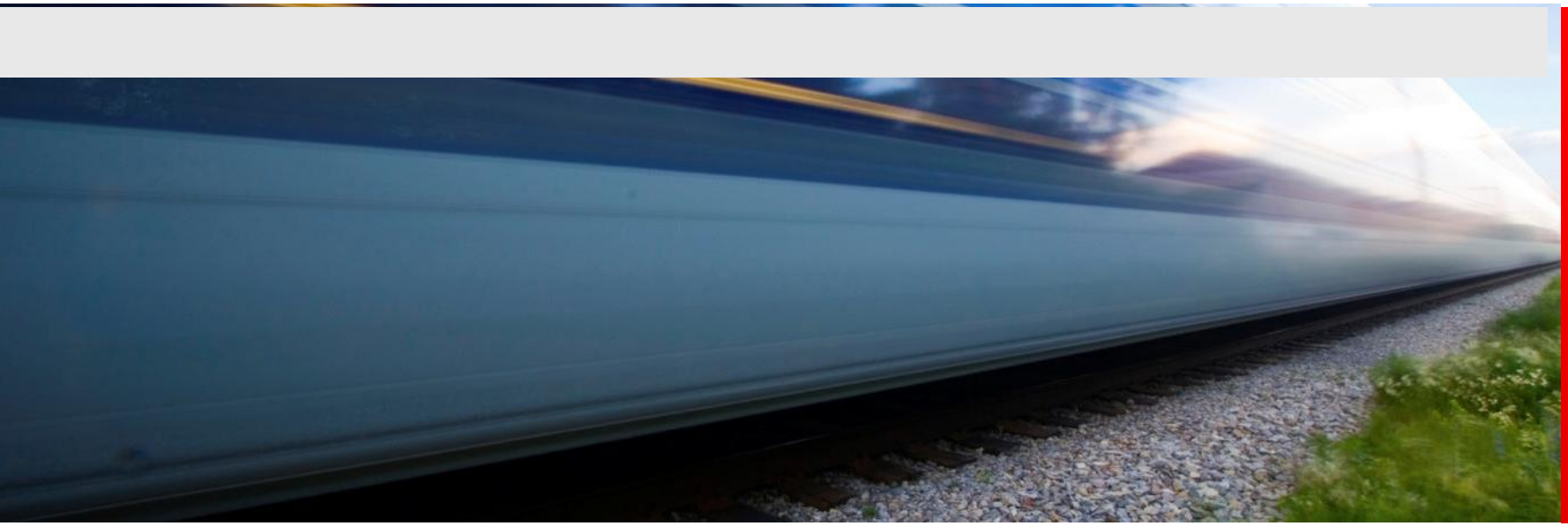
Configuring Extended ACLs(L2)

- Example：
  block host from with mac address aaaa.bbbb.cccc to any

```
sw0(config)# mac access-list standard test2
sw0(conf-macl-std)# deny host aaaa.bbbb.cccc any

sw0(config)# interface TenGigabitEthernet 41/0/7
sw0(conf-if-te-41/0/5)# mac access-group test2 in
```

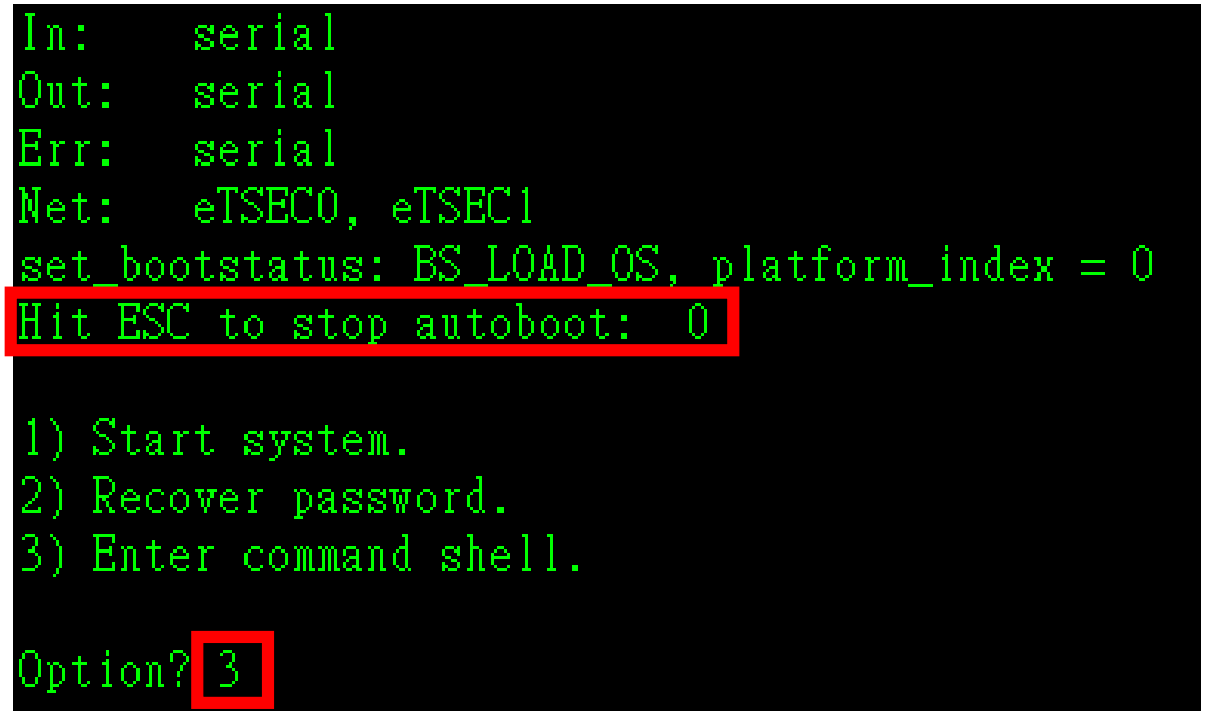
Password Recovery



Password Recovery

VDX6710 6720 6730

- 開機時，看到Hit ESC to stop autoboot:5時，按下ESC，
- 跳出選單後，選擇3) Enter command shell.



Password Recovery

VDX6710 6720 6730

- 出現命令列後，輸入
  - => setenv OSLoadOptions "single"
  - => saveenv
  - => boot
- 此時設備會重新啟動

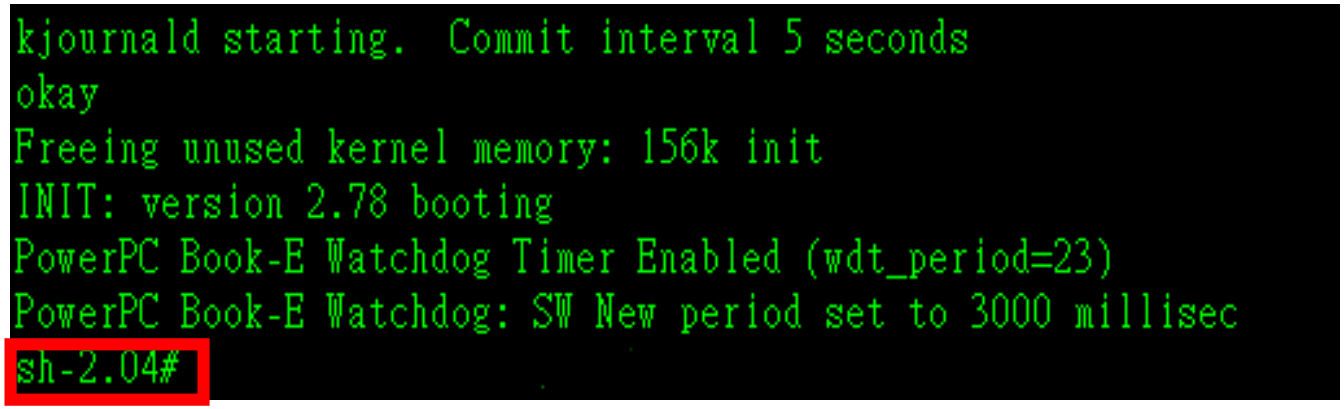
```
Boot PROM password has not been set.
=> setenv OSLoadOptions "single"
=> saveenv
Saving Environment to Flash...
Un-Protected 1 sectors
Un-Protected 1 sectors
Erasing Flash...
. done
Erased 1 sectors

. done
Erased 1 sectors
Writing to Flash... 9....8....7....6....5....4....3....2....1....9....8....7....6....5....4....3....2....1....Protected 1 sectors
Protected 1 sectors
=> boot
Map file at LBA sector 0x55f760
WARNING: adjusting available memory to 30000000
## Booting kernel from Legacy Image at 02000000 ...
   Image Name:   Linux-2.6.34.6
   Image Type:   PowerPC Linux Multi-File Image (gzip compressed)
   Data Size:    3464024 Bytes = 3.3 MiB
   Load Address: 00000000
   Entry Point:  00000000
```

Password Recovery

VDX6710 6720 6730

- 等到出現sh-2.04#



Password Recovery

VDX6710 6720 6730

- 依序輸入

  sh-2.04# mount -o remount,rw /
  sh-2.04# mount /dev/hda2 /mnt
  sh-2.04# /sbin/passwddefault
  sh-2.04# bootenv OSLoadOptions "quiet;quiet"
  sh-2.04# reboot -f

- 設備會再次重新啟動

```
sh-2.04# mount -o remount,rw /
EXT3-fs (hda2): using internal journal
sh-2.04# mount /dev/hda2 /mnt
sh-2.04# /sbin/passwddefault
All account passwords have been successfully set to factory default.
sh-2.04# bootenv OSLoadOptions "quiet;quiet"
sh-2.04# reboot -f
Restarting system.
```

Password Recovery

VDX6710 6720 6730

- 啟動完成後，出現登入畫面，使用root/fibranne登入

```
2015/01/21-14:39:11, [DCM-1116], 33655,, INFO, VDX6720-24, System initialization is complete. NOS is ready to handle all commands.
2015/01/21-14:39:12, [SEC-1197], 33656,, INFO, VDX6720-24, Changed account user.
2015/01/21-14:39:39, [FW-1424], 33657,, WARNING, sw0, Switch status changed from HEALTHY to MARGINAL.
2015/01/21-14:39:39, [FW-1427], 33658,, WARNING, sw0, Switch status change contributing factor Power supply: 1 bad.



Network OS (sw0)


sw0 console login:


Password:
```

Password Recovery

VDX6710 6720 6730

```
Disclaimer for Root and Factory Accounts Usage!

This switch is equipped with Root and Factory accounts that are intended
for diagnostics and debugging purposes solely by the Equipment vendor's
trained engineers. Improper use of the functionality made available
through the Root or Factory account could cause significant harm and
disruption to the operation of the SAN fabric.

Your use of the functionality made available through the Root or Factory
account is at your sole risk and you assume all liability resulting from
such use. The Equipment vendor shall have no liability for any losses
or damages arising from or relating to the use of the Root or Factory
account (and the functionality enabled thereby) by anyone other than
the Equipment vendor's authorized engineers.

Proceeding with the usage of this switch as the Root or Factory user
explicitly indicates your agreement to the terms of this disclaimer.

Please change passwords for switch default accounts now.
Use Control-C to exit or press 'Enter' key to proceed.
```

Password Recovery

VDX6710 6720 6730

- 按enter繼續，出現更換root的密碼的要求，至少要8個字元，輸入完成後出現sw0:root>

```
Changing default password for "root"
Warning:  Access to  the Root account may be required  for
complete access  of  the switch.  Please  ensure  the Root
password is documented in a secure location. Recovery of a
lost Root password will result in downtime.

Changing password for root
Enter new password:
Password must be between 8 and 40 characters long.
Enter new password:
Re-type new password:
passwd: all authentication tokens updated successfully

Saving passwords to stable storage.
Passwords saved to stable storage successfully
sw0:root>
```

Password Recovery

VDX6710 6720 6730

- 輸入noscli進入CLI介面

  sw0:root> noscli

```
sw0:root> noscli

WARNING: The default password of 'user' account has not been changed.

Welcome to the Brocade Network Operating System Software
admin connected from 127.0.0.1 using console on sw0
sw0#
```

Password Recovery

VDX6710 6720 6730

- 進入configuration模式更改admin的密碼，並儲存至startup-config

  sw0# configure

  sw0(config)# username admin password password

  sw0# copy running-config startup-config

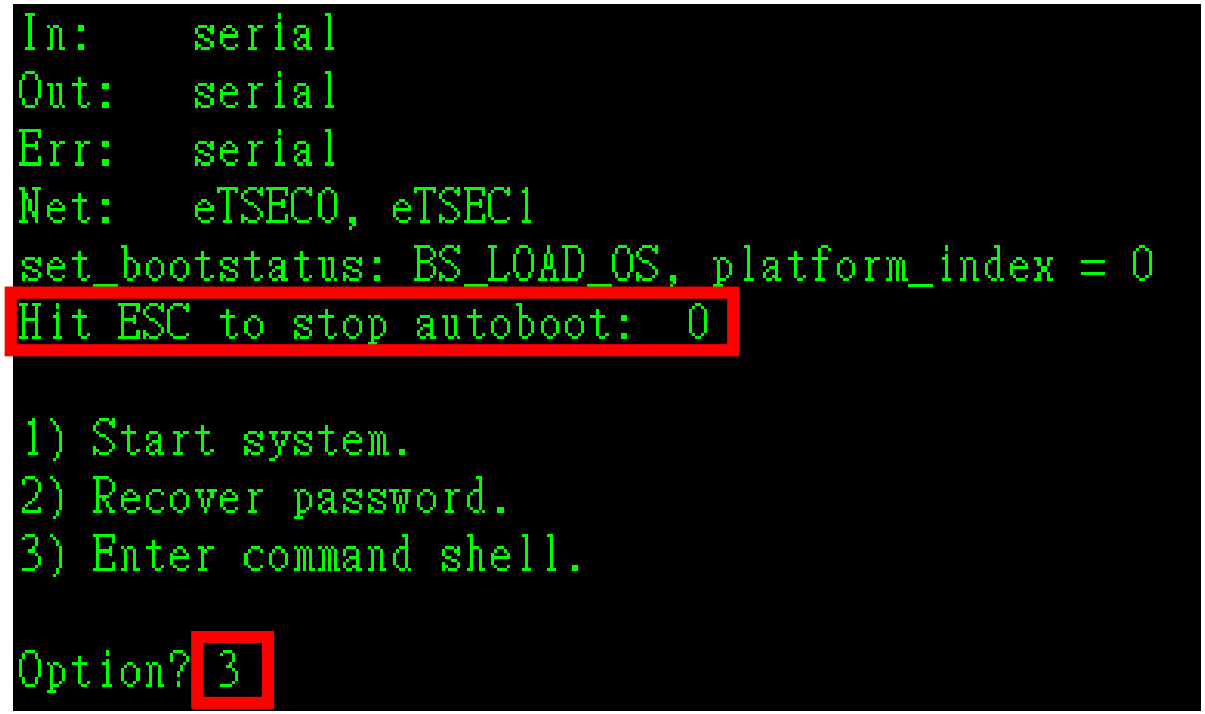
```
sw0# configure
Entering configuration mode terminal
sw0(config)# username admin password password
2015/01/21-15:00:46, [SEC-1197], 33663,, INFO, VDX6720-24, Changed account admin.
```

```
sw0(config)#
sw0# copy running-config startup-config
This operation will modify your startup configuration. Do you want to continue? [y/n]:y
sw0# 2015/01/21-15:01:46, [DCM-1101], 33664,, INFO, VDX6720-24, Copy running-config to startup-config operation successful on this n
ode.
```

Password Recovery

VDX6740 8770

- 開機時，看到Hit ESC to stop autoboot:5時，按下ESC，
- 跳出選單後，選擇3) Enter command shell.



Password Recovery

VDX6740 8770

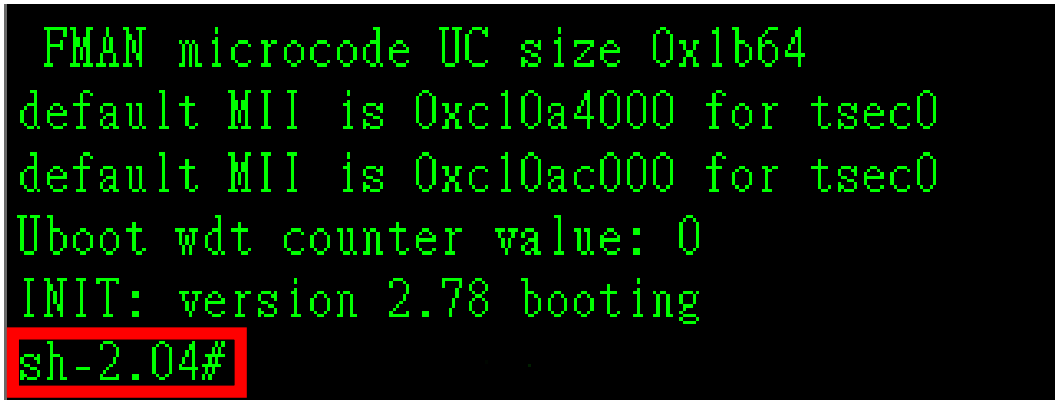
- 出現命令列後，輸入
  - => setenv bootargs "root=/dev/sda1 rootfstype=ext4 quiet S"
  - => saveenv
  - => boot
- 此時設備會重新啟動

```
Boot PROM password has not been set.
=> setenv bootargs "root=/dev/sda1 rootfstype=ext4 quiet S"
=> saveenv
Saving Environment to NVRAM...
=> reset
```

Password Recovery

VDX6740 8770

- 等到出現sh-2.04#



Password Recovery

VDX6740 8770

- 依序輸入

  sh-2.04# mount -vo remount,rw,noatime /
  sh-2.04# mount /dev/sda2 /mnt
  sh-2.04# /sbin/passwddefault
  sh-2.04# bootenv bootargs "root=/dev/sda1 rootfstype=ext4 quiet"
  sh-2.04# partman -r

- 設備會再次重新啟動

```
sh-2.04# mount -vo remount,rw,noatime /
/dev/root on / type ext4 (rw,noatime)
sh-2.04# mount /dev/sda2 /mnt
sh-2.04# /sbin/passwddefault
All account passwords have been successfully set to factory default.
sh-2.04# bootenv bootargs "root=/dev/sda1 rootfstype=ext4 quiet"
sh-2.04# partman -r
Syncing file system
Rebooting...
```

Password Recovery

VDX6740 8770

- 啟動完成後，出現登入畫面，使用root/fibranne登入

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Password Recovery

VDX6740 8770

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VDX6740 8770

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Password Recovery

VDX6740 8770

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Password Recovery

VDX6740 8770

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```

Thank You!