

EtherSwitch Network Module (ESW) Configuration Example

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Introduction

Prerequisites

- Requirements
- Components Used
- Related Products
- Conventions

EtherSwitch Modules – Concepts

Configure

- Network Diagram
- Configurations
- Configure VLAN Interfaces
- Configure VTP, Trunk, Port Channel, and Spanning Tree
- Configure Access Ports
- Configure the Voice Port
- Configure Quality of Service (QoS)

Verify

Troubleshoot

Related Information

Introduction

This document provides a sample configuration for the EtherSwitch Network Module installed in the Integrated Service Router (ISR). This document does not discuss the configuration example for EtherSwitch Service Module.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

The information in this document is based on these software and hardware versions:

- Cisco 2800 Series Router on Cisco IOS® Software Release 12.4 or later
- NM-16ESW-PWR= 16 port 10/100 EtherSwitch Network Module (NM)

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Related Products

This configuration can also be used with these hardware and software versions:

- Cisco 2600/3600/3700/3800 Series Routers.
- Refer to Table 4 in Cisco EtherSwitch Network Modules – Data Sheet.

Conventions

Refer to the Cisco Technical Tips Conventions for more information on document conventions.

EtherSwitch Modules – Concepts

There are two types of EtherSwitch Modules available for Cisco ISRs. They are:

- EtherSwitch Network Module (ESW)
- EtherSwitch Service Module (ES)

ESW modules are configured by router IOS. These modules do not run separate software. The software is integrated into the host router IOS. You can create VLANs, configure VLANs, spanning tree, VLAN Trunking Protocol (VTP), and so forth from the host router. The router also stores the VLAN database file (vlan.dat) in the Flash. This document shows the configuration example for the ESW module.

- Refer to Cisco EtherSwitch Network Modules – Data Sheet for more information on ESW modules.
- Refer to Cisco EtherSwitch Network Modules Feature Guide to understand how to configure ESW modules.

ES modules have their own processors, switching engines and Flash memory that run independent of the host router resources. After the ES module is installed in the router, you can console into the ES module from the host router. Then you can create VLANs, configure VLANs, spanning tree, VTP, and so forth from the ES module. ES modules are based on the Catalyst 3750 platform.

- Refer to Cisco EtherSwitch Service Modules – Data Sheet for more information on ES modules.
- Refer to Cisco EtherSwitch Service Modules Feature Guide to understand how to administrate ES modules.
- Refer to Catalyst 3750 Series Switches – Configuration Guides to understand how to configure ES modules.

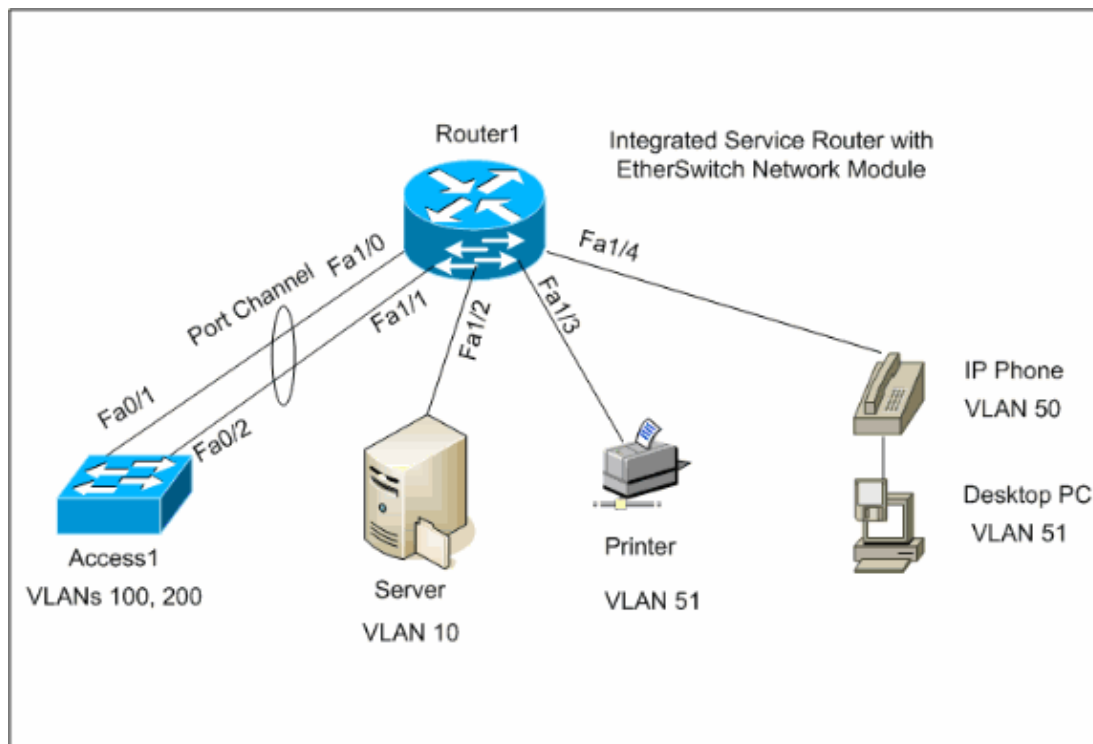
Configure

In this section, you are presented with the information to configure the features described in this document.

Note: Use the Command Lookup Tool (registered customers only) to obtain more information on the commands used in this section.

Network Diagram

This document uses this network setup:



Configurations

This document uses these configurations:

- VLAN Interfaces
- VTP, Trunk, Port Channel, Spanning–Tree
- Access Ports
- Voice Port
- Configure Quality of Service (QoS)

Configure VLAN Interfaces

By default all the ports belong to VLAN1. You can create VLANs only from VLAN database mode. After the VLANs are created from VLAN database mode, the `vlan.dat` file is created and stored in the Flash file system of the router. You can view the VLANs using the `show vlan-switch` command. In this example, a Dynamic Host Configuration Protocol (DHCP) server (172.16.10.20) is located in VLAN 10. The `ip helper-address` command is configured on all the VLANs except VLAN 10 in order to obtain the IP address from the DHCP server to the devices located at these VLANs.

```

Router1

Create VLANs

Router1#vlan database
Router1(vlan)#vlan 10
VLAN 10 added:
  Name: VLAN0010
Router1(vlan)#vlan 51
VLAN 51 added:
  Name: VLAN0051
Router1(vlan)#vlan 50
VLAN 50 added:

```

```

Name: VLAN0050
Router1(vlan)#vlan 100
VLAN 100 added:
Name: VLAN0100
Router1(vlan)#vlan 200
VLAN 200 added:
Name: VLAN0200
Router1(vlan)#exit
APPLY completed.
Exiting....
Router1#

```

Configure VLANs

```

Router1(config)#interface vlan 10
Router1(config-if)#ip address 172.16.10.1 255.255.255.0

Router1(config-if)#interface vlan 50
Router1(config-if)#ip address 172.16.50.1 255.255.255.0

Router1(config-if)#ip helper-address 172.16.10.20

Router1(config-if)#interface vlan 51
Router1(config-if)#ip address 172.16.51.1 255.255.255.0
Router1(config-if)#ip helper-address 172.16.10.20

Router1(config-if)#interface vlan 100
Router1(config-if)#ip address 172.16.100.1 255.255.255.0
Router1(config-if)#ip helper-address 172.16.10.20

Router1(config-if)#interface vlan 200
Router1(config-if)#ip address 172.16.200.1 255.255.255.0
Router1(config-if)#ip helper-address 172.16.10.20

```

```
Router1#show vlan-switch
```

VLAN	Name	Status	Ports
1	default	active	Fal/0, Fal/2, Fal/3, Fal/4, Fal/5, Fal/6, Fal/7, Fal/8, Fal/9, Fal/10, Fal/11, Fal/12, Fal/13, Fal/14, Fal/15
10	VLAN0010	active	
50	VLAN0050	active	
51	VLAN0051	active	
100	VLAN0100	active	
200	VLAN0200	active	
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	1002	1003
10	enet	100010	1500	-	-	-	-	-	0	0
50	enet	100050	1500	-	-	-	-	-	0	0
51	enet	100051	1500	-	-	-	-	-	0	0
100	enet	100100	1500	-	-	-	-	-	0	0

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
200	enet	100200	1500	-	-	-	-	-	0	0

1002	fddi	101002	1500	-	-	-	-	-	1	1003
1003	tr	101003	1500	1005	0	-	-	srb	1	1002
1004	fdnet	101004	1500	-	-	1	ibm	-	0	0
1005	trnet	101005	1500	-	-	1	ibm	-	0	0

Configure VTP, Trunk, Port Channel, and Spanning Tree

By default, VTP mode is the server and the domain name is blank. VTP can be configured only from VLAN database mode. The only spanning tree mode supported is PVST+. Default trunk encapsulation is dot1q. When you configure the trunk port to allow only specified VLANs, you might get an error message that says Bad VLAN allowed list. In this case, you might need to allow the default VLANs 1–2, 1002–1005 along with your custom VLAN list. Because of this, you also need to allow the default VLANs and your custom VLANs on the neighbor switch connected to this trunk port to avoid trunk inconsistencies.

```

Router1

VTP Configuration

Router1#vlan database
Router1(vlan)#vtp transparent
Setting device to VTP TRANSPARENT mode.
Router1(vlan)#vtp domain LAB
Changing VTP domain name from NULL to LAB
Router1(vlan)#exit
APPLY completed.
Exiting....

Spanning-Tree Configuration

Router1(config)#spanning-tree vlan 1 root primary
Router1(config)#spanning-tree vlan 10 root primary
Router1(config)#spanning-tree vlan 50 root primary
Router1(config)#spanning-tree vlan 51 root primary
Router1(config)#spanning-tree vlan 100 root primary
Router1(config)#spanning-tree vlan 200 root primary

Trunk and Port Channel Configuration

Router1(config)#interface port-channel 1
Router1(config-if)#switchport mode trunk

!--- dot1q is the default encapsulation.

Router1(config-if)#switchport trunk allowed vlan 100,200
Command rejected: Bad VLAN allowed list. You have to include all default vlans,
e.g. 1-2,1002-1005.
Command rejected: Bad VLAN allowed list. You have to include all default vlans,
e.g. 1-2,1002-1005.
Router1(config-if)#switchport trunk allowed vlan 1,1002-1005,100,200
Router1(config-if)#exit

Router1(config)#interface range fastEthernet 1/0 - 1
Router1(config-if-range)#switchport mode trunk

!--- dot1q is the default encapsulation.

```

```
Router1(config-if-range)#switchport trunk allowed vlan 1,1002-1005,100,200
Router1(config-if-range)#channel-group 1 mode on
Router1(config-if-range)#exit
```

Access1

Access1 Switch Configuration

```
Access1(config)#vlan 100,200
Access1(config-vlan)#exit
```

```
Access1(config)#vtp mode transparent
Setting device to VTP TRANSPARENT mode.
```

```
Access1(config)#vtp domain LAB
Changing VTP domain name from NULL to LAB
```

```
Access1(config)#interface port-channel 1
Access1(config-if)#switchport trunk encapsulation dot1q
Access1(config-if)#switchport mode trunk
Access1(config-if)#switchport trunk allowed vlan 1,1002-1005,100,200
Access1(config-if)#exit
```

```
Access1(config)#interface range FastEthernet 0/1 - 2
Access1(config-if-range)#switchport trunk encapsulation dot1q
Access1(config-if-range)#switchport mode trunk
Access1(config-if-range)#switchport trunk allowed vlan 1,1002-1005,100,200
Access1(config-if-range)#channel-group 1 mode on
Access1(config-if-range)#exit
```

```
Router1#show vtp status
```

```
VTP Version           : 2
Configuration Revision : 0
Maximum VLANs supported locally : 52
Number of existing VLANs : 10
VTP Operating Mode    : Transparent
VTP Domain Name       : LAB
VTP Pruning Mode      : Disabled
VTP V2 Mode           : Disabled
VTP Traps Generation  : Disabled
MD5 digest            : 0x8D 0x71 0x37 0x29 0x6C 0xB0 0xF2 0x0E
Configuration last modified by 172.22.1.197 at 2-20-07 22:31:06
Router1#
```

```
Router1#show interface fastethernet 1/0 trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Fal/0	on	802.1q	trunk-inbndl (Po1)	1

Port	Vlans allowed on trunk
Fal/0	1,100,200,1002-1005

Port	Vlans allowed and active in management domain
Fal/0	1,100,200

Port	Vlans in spanning tree forwarding state and not pruned
Fal/0	1,100,200

```
Router1#show spanning-tree summary
```

```
Root bridge for: VLAN1, VLAN10, VLAN50, VLAN51, VLAN100, VLAN200.
PortFast BPDU Guard is disabled
```

UplinkFast is disabled
BackboneFast is disabled

Name	Blocking	Listening	Learning	Forwarding	STP Active
VLAN1	0	0	0	1	1
VLAN10	0	0	0	1	1
VLAN50	0	0	0	1	1
VLAN51	0	0	0	1	1
VLAN100	0	0	0	1	1
VLAN200	0	0	0	1	1

6 VLANs	0	0	0	6	6

Configure Access Ports

The access port configuration is similar to the standard LAN switch configuration.

```
Router1

Port for Server Configuration

Router1(config)#interface fastEthernet 1/2
Router1(config-if)#switchport mode access
Router1(config-if)#switchport access vlan 10
Router1(config-if)#spanning-tree portfast
Router1(config-if)#speed 100
Router1(config-if)#duplex full
Router1(config-if)#exit

Port for Printer Configuration

Router1(config)#interface fastethernet 1/3
Router1(config-if)#switchport mode access
Router1(config-if)#switchport access vlan 51
Router1(config-if)#spanning-tree portfast
Router1(config-if)#exit
```

Configure the Voice Port

The voice port configuration is similar to the standard LAN switch configuration.

```
Router1

Configure the port for Voice

Router1(config)#interface fastethernet 1/4
Router1(config-if)#switchport mode access
Router1(config-if)#switchport access vlan 51
Router1(config-if)#switchport voice vlan 50
Router1(config-if)#spanning-tree portfast
Router1(config-if)#mls qos trust cos
```

Configure Quality of Service (QoS)

This is the default QoS configuration on the ESW module:

```
Router1#show wrr-queue bandwidth
WRR Queue : 1 2 3 4

Bandwidth : 1 2 4 8
wrr-queue bandwidth is disabled

Router1#show wrr-queue cos-map
CoS Value : 0 1 2 3 4 5 6 7

Priority Queue : 1 1 2 2 3 3 4 4
wrr-queue cos map is disabled

Router1#show mls qos maps cos-dscp
Cos-dscp map:
  cos: 0 1 2 3 4 5 6 7
-----
  dscp: 0 8 16 26 32 46 48 56

Router1#show mls qos maps dscp-cos
Dscp-cos map:
  dscp: 0 8 10 16 18 24 26 32 34 40 46 48 56
-----
  cos: 0 1 1 2 2 3 3 4 4 5 5 6 7
```

These sections explain these configurations:

- Configure wrr Queues
- Configure the Port to Trust Class of Service (CoS)
- Configure Policer

Configure wrr Queues

You cannot configure port-based QoS on the Layer 2 switch ports. Queues can be configured only from a global configuration. The configuration example maps the CoS values to the four different queues. When a packet enters the Layer 2 engine directly from a switch port, it is placed into one of four queues in the dynamic, 32 MB shared memory buffer. Any voice bearer packets that come in from the Cisco IP phones on the voice VLAN are automatically placed in the highest priority (Queue 4) based on the 802.1p value (CoS 5) generated by the IP phone. The queues are then serviced on a weighted round robin (WRR) basis. The control traffic, which uses a CoS or Type of Service (ToS) of 3, is placed in Queue 3.

Router1
Router1(config)#wrr-queue cos-map 1 0 1 Router1(config)#wrr-queue cos-map 2 2 Router1(config)#wrr-queue cos-map 3 3 4 Router1(config)#wrr-queue cos-map 4 5 6 7
<i>!--- wrr-queue cos-map <queue-number> <cos values separated by space></i>
Router(config)#wrr-queue bandwidth 1 16 64 255
<i>!--- wrr-queue bandwidth <Weight of Queue1> <Weight of Queue2> !--- <Weight of Queue3> <Weight of Queue4></i>

Verify the Queue parameters:

```

Router1#show wrr-queue bandwidth
WRR Queue   :   1   2   3   4

Bandwidth   :   1   2   4   8

!--- Default values

WRR Queue   :   1   2   3   4

Bandwidth   :   1  16  64 255

!--- Configured values

Router1#show wrr-queue cos-map
CoS Value    :   0   1   2   3   4   5   6   7

Priority Queue :   1   1   2   2   3   3   4   4

!--- Default values

CoS Value    :   0   1   2   3   4   5   6   7

Priority Queue :   1   1   2   3   3   4   4   4

!--- Configured values

```

This table shows the queue number, CoS value and the weight of each queue after the configuration.

Queue Number	CoS Value	Weight
1	0 1	1
2	2	16
3	3 4	64
4	5 6 7	255

Configure the Port to Trust CoS

```

Router1
Router1(config)#interface fastEthernet1/4
Router1(config-if)#mls qos trust cos

!--- Trust the CoS value of the frames from the IP phone.

Router1(config-if)#mls qos cos override

!--- Reset the CoS value of the frames from PC to 0.

Router1(config-if)#exit

Router1(config)#interface range fastEthernet 1/0 - 1
Router1(config-if-range)#mls qos trust cos

!--- Trust the CoS value of the frames from this trunk link.

Router1(config-if-range)#exit

```

Configure Policer

This sections shows the policer configuration on the interface fa1/2 to limit the FTP traffic to 5 Mbps.

```
Router1
Router1(config)#ip access-list extended ACTIVE-FTP
Router1(config-ext-nacl)#permit tcp any any eq ftp
Router1(config-ext-nacl)#permit tcp any any eq ftp-data
Router1(config-ext-nacl)#exit
Router1(config)#class-map ACTIVE-FTP-CLASS
Router1(config-cmap)#match class ACTIVE-FTP
Router1(config-cmap)#exit
Router1(config)#policy-map ACTIVE-FTP-POLICY
Router1(config-pmap)#class ACTIVE-FTP-CLASS
Router1(config-pmap-c)#police 5000000 conform-action transmit exceed-action drop
Router1(config-pmap-c)#exit
Router1(config-pmap)#exit
Router1(config)#interface fastethernet1/2
Router1(config-if)#service-policy input ACTIVE-FTP-POLICY
Router1(config-if)#exit
```

There are few restrictions in the policer configuration in the ESW modules. They are listed here:

- Policy maps with ACL classification in the egress direction are not supported and cannot be attached to an interface by using the **service-policy input policy-map-name interface** configuration command.
- In a policy map, the class named class-default is not supported. The switch does not filter traffic based on the policy map defined by the **class class-default policy-map** configuration command.
- You can create policy-map and apply only to ingress of the ESW interfaces. And in the policy-map, only the policer is supported.

```
Router1#show policy-map
Policy Map FINANCE-POLICY
Class FINANCE-CLASS
set cos 4
Router1(config)#interface fastethernet1/4
Router1(config-if)#service-policy input FINANCE-POLICY
%Error: FastEthernet1/4 Service Policy Configuration Failed.Only Police Action S
upported
```

- There is no support for policing at a VLAN or switched virtual interface (SVI) level.

Verify

There is currently no verification procedure available for this configuration.

Troubleshoot

There is currently no specific troubleshooting information available for this configuration.

Related Information

- [Troubleshooting Router Interfaces and Modules Issues](#)
 - [Technical Support & Documentation – Cisco Systems](#)
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