

EtherSwitch Service Module (ES) Configuration Example

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Introduction

This document provides a sample configuration for the EtherSwitch Service module installed in the Integrated Service Router (ISR). This document does not discuss the configuration example for the EtherSwitch Network 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(10)
- NME-16ES-1G-P – 16-port 10/100 Cisco EtherSwitch Service Module

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 Cisco 2600/3600/3700/3800 Series Routers.

Refer to Table 6 in Cisco EtherSwitch Service Modules – Data Sheet for more information.

Conventions

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

EtherSwitch Modules – Concepts

These are the two types of EtherSwitch modules available for Cisco ISRs:

- **EtherSwitch Service Module (ES)** ES modules have their own processors, switching engines, software 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, and Virtual Terminal Protocol (VTP) from the ES module. ES modules are based on the Catalyst 3750 platform. This document shows the configuration example only for the ES module.
 - ◆ Refer to Cisco EtherSwitch Service Modules – Data Sheet for more information on ES modules.
 - ◆ Refer to Cisco EtherSwitch Service Modules Feature Guide for information on how to administrate ES modules.
 - ◆ Refer to Catalyst 3750 Series Switches – Configuration Guides for information on how to configure ES modules.
- **EtherSwitch Network Module (ESW)** ESW modules are configured by Router IOS. These modules do not run separate software. It is integrated into the host router IOS. You can create VLANs, configure VLANs, spanning tree, and VTP from the host router. The router stores the VLAN database file (vlan.dat) in the flash.
 - ◆ Refer to Cisco EtherSwitch Network Modules – Data Sheet for more information on ESW modules.
 - ◆ Refer to Cisco EtherSwitch Network Modules Feature Guide for information on how to configure ESW modules.
 - ◆ Refer to EtherSwitch Network Module (ESW) Configuration Example for information on the basic ESW module configuration.

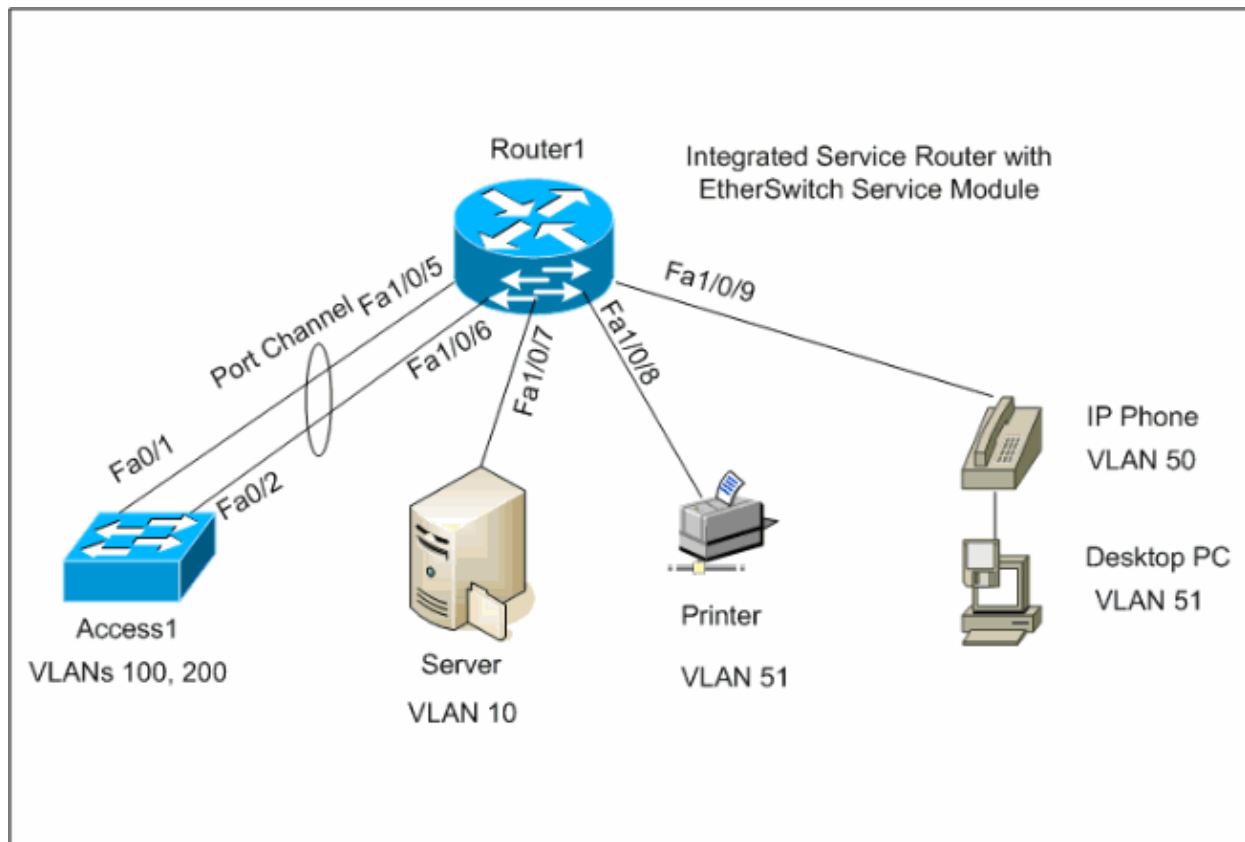
Configure

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:

- EtherSwitch Module Initial Configuration
- Configure VTP, VLAN
- Configure Spanning Tree, Trunk and Port Channel
- Configure Access Port
- Configure Voice Port
- Configure Routing
- Configure QoS

EtherSwitch Module Initial Configuration

After the ES module is installed on the router, you see a new **GigabitEthernet interface x/0** (where x is the slot number) recognized by the IOS. This output is taken after the ES module is installed on the router:

```
Router1#show ip interface brief
Interface                IP-Address      OK? Method Status          Protocol
GigabitEthernet0/0      1.1.1.3         YES NVRAM   up              down
GigabitEthernet0/1      unassigned      YES NVRAM   administratively down down
GigabitEthernet1/0      unassigned      YES unset  administratively down down
Vlan1                   unassigned      YES NVRAM   up              up
```

The **service-module gigabitEthernet x/0 session** command is the privileged EXEC mode command used to console into the ES module from the host router. You need to console into the ES module in order to

configure it. In order to console into the ES module, it is required to configure the IP address for the **GigabitEthernet interface x/0**. If you try to console into the module without assigning an IP address, you receive this error message:

```
Router1#service-module gigabitEthernet 1/0 session
IP address needs to be configured on interface GigabitEthernet1/0
```

```
Router1

Configure the host router to manage the ES module

Router1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router1(config)#interface gigabitEthernet 1/0

Router1(config-if)#ip address 172.16.1.1 255.255.255.0
Router1(config-if)#no shutdown
Router1(config-if)#exit
Router1(config)#exit

Console into the ES Module

Router1#service-module gigabitEthernet 1/0 session
Trying 172.16.1.1, 2066 ... Open

    --- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no

Would you like to terminate autoinstall? [yes]:
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname Switch-ES
Switch-ES(config)#interface gigabitEthernet 1/0/2

Switch-ES(config-if)#no switchport
Switch-ES(config-if)#ip address 172.16.1.2 255.255.255.0
Switch-ES(config-if)#exit

!--- GigabitEthernet 1/0/2 connects the ES module to the router.

Switch-ES(config)#line console 0
Switch-ES(config-line)#password a9913
Switch-ES(config-line)#exec-timeout 30
Switch-ES(config-line)#exit
Switch-ES(config)#line vty 0 4
Switch-ES(config-line)#password a9913
Switch-ES(config-line)#login
Switch-ES(config-line)#exec-timeout 30
Switch-ES(config-line)#exit
```

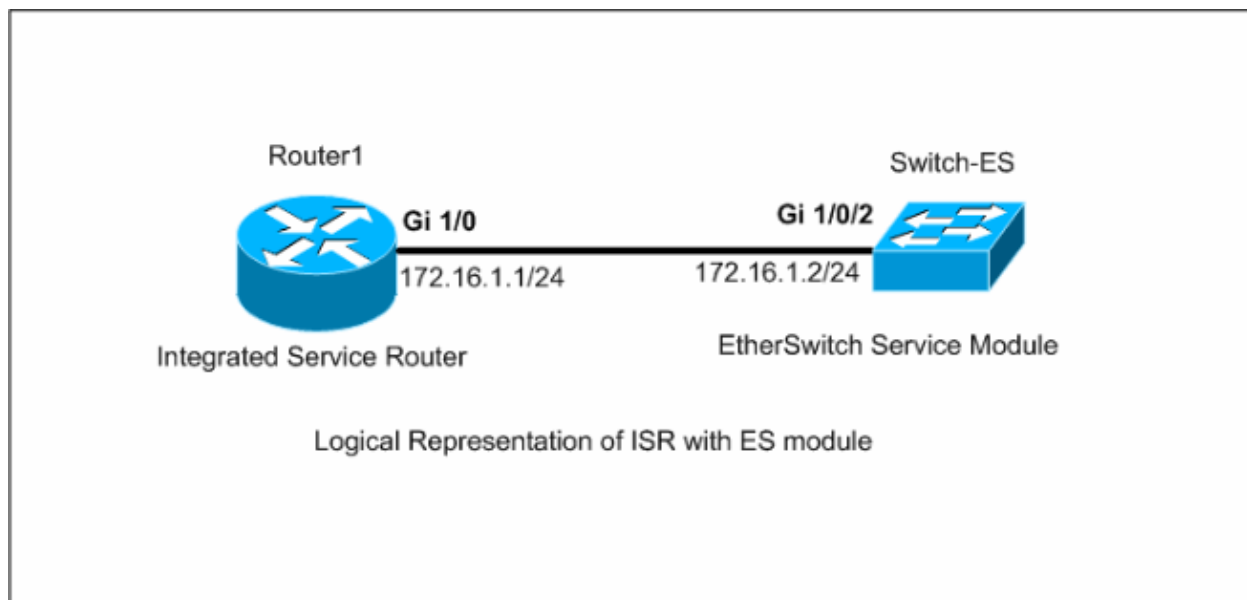
This output shows the **show ip interface brief** command from the ES module. The **GigabitEthernet1/0/2** interface connects the ES module to the **GigabitEthernet1/0** interface of the host router.

```
Switch-ES#show ip int brief
Interface          IP-Address      OK? Method Status          Protocol
Vlan1              unassigned     YES unset  administratively down  down
FastEthernet1/0/1  unassigned     YES unset  down            down
```

FastEthernet1/0/2	unassigned	YES	unset	down	down
FastEthernet1/0/3	unassigned	YES	unset	down	down
FastEthernet1/0/4	unassigned	YES	unset	down	down
FastEthernet1/0/5	unassigned	YES	unset	down	down
FastEthernet1/0/6	unassigned	YES	unset	down	down
FastEthernet1/0/7	unassigned	YES	unset	down	down
FastEthernet1/0/8	unassigned	YES	unset	down	down
FastEthernet1/0/9	unassigned	YES	unset	down	down
FastEthernet1/0/10	unassigned	YES	unset	down	down
FastEthernet1/0/11	unassigned	YES	unset	down	down
FastEthernet1/0/12	unassigned	YES	unset	down	down
FastEthernet1/0/13	unassigned	YES	unset	down	down
FastEthernet1/0/14	unassigned	YES	unset	down	down
FastEthernet1/0/15	unassigned	YES	unset	down	down
FastEthernet1/0/16	unassigned	YES	unset	down	down
GigabitEthernet1/0/1	unassigned	YES	unset	down	down
GigabitEthernet1/0/2	172.16.1.2	YES	manual	up	up

If the ES module or the devices connected to this ES module need to communicate to the external network via the host router, this port (GigabitEthernet1/0/2) needs to be a Layer 3 port or it needs to be a member of Layer 3 VLAN. See the Configure Routing section of this document to understand how to configure the routing on the ES module.

This diagram explains the host router and the ES module logical connectivity:



You need to press **Ctrl+Shift+6**, then **X** in order to go back to the host router.

If you need to clear the session from the router, issue the **service-module gigabitEthernet x/0 session clear** command from the router privileged EXEC mode.

Configure VTP and VLAN

By default, the VTP mode is server and the VTP domain name is null in ES module. By default, all the ports belong to vlan1. In this example, a DHCP server (172.16.10.20) is located in vlan 10. The **ip helper-address 172.16.10.20** command is configured on all the VLANs except vlan 10 in order to obtain the IP addresses from the DHCP server for the devices located in these VLANs.

Switch-ES

VTP Configuration

```
Switch-ES(config)#vtp mode transparent
Setting device to VTP TRANSPARENT mode.
Switch-ES(config)#vtp domain LAB
Changing VTP domain name from NULL to LAB
Switch-ES(config)#
```

Create VLANs

```
Switch-ES(config)#vlan 10,50,51,100,200
Switch-ES(config-vlan)#exit
Switch-ES(config)#
```

Configure VLANs

```
Switch-ES(config)#interface vlan 10
Switch-ES(config-if)#ip address 172.16.10.1 255.255.255.0
Switch-ES(config-if)#no shutdown
```

```
Switch-ES(config-if)#interface vlan 50
Switch-ES(config-if)#ip address 172.16.50.1 255.255.255.0
Switch-ES(config-if)#ip helper-address 172.16.10.20
Switch-ES(config-if)#no shutdown
```

```
Switch-ES(config-if)#interface vlan 51
Switch-ES(config-if)#ip address 172.16.51.1 255.255.255.0
Switch-ES(config-if)#ip helper-address 172.16.10.20
Switch-ES(config-if)#no shutdown
```

```
Switch-ES(config-if)#interface vlan 100
Switch-ES(config-if)#ip address 172.16.100.1 255.255.255.0
Switch-ES(config-if)#ip helper-address 172.16.10.20
Switch-ES(config-if)#no shutdown
```

```
Switch-ES(config-if)#interface vlan 200
Switch-ES(config-if)#ip address 172.16.200.1 255.255.255.0
Switch-ES(config-if)#ip helper-address 172.16.10.20
Switch-ES(config-if)#no shutdown
```

```
Switch-ES#show vlan
```

VLAN Name	Status	Ports
1 default	active	Fal/0/1, Fal/0/2, Fal/0/3 Fal/0/4, Fal/0/7, Fal/0/8 Fal/0/9, Fal/0/10, Fal/0/11 Fal/0/12, Fal/0/13, Fal/0/14 Fal/0/15, Fal/0/16, Gil/0/1 Gil/0/2
10 VLAN0010	active	
50 VLAN0050	active	
51 VLAN0051	active	
100 VLAN0100	active	
200 VLAN0200	active	
1002 fddi-default	act/unsup	
1003 token-ring-default	act/unsup	
1004 fddinet-default	act/unsup	
1005 trnet-default	act/unsup	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
10	enet	100010	1500	-	-	-	-	-	0	0
50	enet	100050	1500	-	-	-	-	-	0	0
51	enet	100051	1500	-	-	-	-	-	0	0
100	enet	100100	1500	-	-	-	-	-	0	0
200	enet	100200	1500	-	-	-	-	-	0	0
1002	fddi	101002	1500	-	-	-	-	-	0	0
1003	tr	101003	1500	-	-	-	-	-	0	0
1004	fdnet	101004	1500	-	-	-	ieee	-	0	0
1005	trnet	101005	1500	-	-	-	ibm	-	0	0

Remote SPAN VLANs

Primary	Secondary	Type	Ports
---------	-----------	------	-------

Switch-ES#show vtp status

```

VTP Version : 2
Configuration Revision : 0
Maximum VLANs supported locally : 1005
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 : 0x21 0x51 0xD5 0x4E 0x30 0xA5 0x46 0x3C
Configuration last modified by 0.0.0.0 at 10-27-06 18:28:10

```

Configure Spanning Tree, Trunk and Port Channel

This section shows the spanning-tree configuration on the ES module and the **Access1** switch. This section also shows the port channel and the trunk configuration between the ES module and the Access1 switch. This example configures the rapid spanning tree on all the switches. The ES module is configured as the spanning-tree root for all the VLANs.

Switch-ES
<p>Spanning-Tree Configuration</p> <pre> Switch-ES(config)#spanning-tree mode rapid-pvst Switch-ES(config)#spanning-tree vlan 10,50,51,100,200 root primary </pre>
<p>Trunk & Port Channel Configuration</p> <pre> Switch-ES(config)#interface port-channel 1 Switch-ES(config-if)#switchport trunk encapsulation dot1q Switch-ES(config-if)#switchport mode trunk Switch-ES(config-if)#switchport trunk allowed vlan 100,200 Switch-ES(config-if)#exit </pre>
<pre> Switch-ES(config)#interface range fastethernet 1/0/5-6 Switch-ES(config-if-range)#switchport trunk encapsulation dot1q </pre>

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

Access1

Access1 switch configuration

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

```
Access1(config)#spanning-tree mode rapid-pvst
```

```
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 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 100,200
Access1(config-if-range)#channel-group 1 mode on
Access1(config-if-range)#exit
```

```
Switch-ES#show spanning-tree summary
Switch is in rapid-pvst mode
Root bridge for: VLAN0001, VLAN0100, VLAN0200
Extended system ID      is enabled
Portfast Default        is disabled
PortFast BPDU Guard Default is disabled
Portfast BPDU Filter Default is disabled
Loopguard Default       is disabled
EtherChannel misconfig guard is enabled
UplinkFast              is disabled
BackboneFast            is disabled
Configured Pathcost method used is short
```

Name	Blocking	Listening	Learning	Forwarding	STP Active
VLAN0001	0	0	0	1	1
VLAN0100	0	0	0	1	1
VLAN0200	0	0	0	1	1
3 vlans	0	0	0	3	3

```
Switch-ES#show interface port-channel 1 trunk
```

Port	Mode	Encapsulation	Status	Native vlan
Po1	on	802.1q	trunking	1

Port	Vlans allowed on trunk
Po1	100,200

```
Port      Vlans allowed and active in management domain
Po1       100,200
```

```
Port      Vlans in spanning tree forwarding state and not pruned
Po1       100,200
```

Configure Access Port

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

```
Switch-ES

Configure the port for server

Switch-ES(config)#interface fastEthernet 1/0/7
Switch-ES(config-if)#switchport mode access
Switch-ES(config-if)#switchport access vlan 10
Switch-ES(config-if)#spanning-tree portfast
Switch-ES(config-if)#speed 100
Switch-ES(config-if)#duplex full
Switch-ES(config-if)#exit

Configure Port for Printer

Switch-ES(config)#interface fastEthernet 1/0/8
Switch-ES(config-if)#switchport mode access
Switch-ES(config-if)#switchport access vlan 51
Switch-ES(config-if)#spanning-tree portfast
Switch-ES(config-if)#exit
```

Configure Voice Port

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

```
Switch-ES

Configure the port for Voice

Switch-ES(config)#interface fastEthernet 1/0/9
Switch-ES(config-if)#switchport mode access
Switch-ES(config-if)#switchport access vlan 51
Switch-ES(config-if)#switchport voice vlan 50
Switch-ES(config-if)#spanning-tree portfast
```

Configure Routing

This example uses static routes to configure the routing.

```
Switch-ES

Configure the default route

Switch-ES(config)#ip routing
Switch-ES(config)#ip route 0.0.0.0 0.0.0.0 172.16.1.1
```

```
Router1
```

Configure the route to LAN

```
Router1(config)#ip route 172.16.0.0 255.255.0.0 172.16.1.2
```

Configure QoS

This section uses auto QoS to configure QoS. Refer to Cisco AutoQoS White Paper for more information on auto QoS.

Switch-ES

Configure QoS on the port where IP phone is connected

```
Switch-ES(config)#interface fastEthernet 1/0/9  
Switch-ES(config-if)#auto qos voip cisco-phone  
Switch-ES(config-if)#exit
```

Configure QoS on the uplink port to the host router.

```
Switch-ES(config)#interface gigabitEthernet 1/0/2  
Switch-ES(config-if)#auto qos voip trust
```

Router1

Create Class map

```
Router1(config)#class-map match-any VoIP-Control  
Router1(config-cmap)#match ip dscp AF31  
Router1(config-cmap)#exit
```

```
Router1(config)#class-map match-any VoIP-RTP  
Router1(config-cmap)#match ip dscp EF  
Router1(config-cmap)#exit
```

Create Policy map

```
Router1(config)#policy-map Policy-VoIP  
Router1(config-pmap)#class VoIP-RTP  
Router1(config-pmap-c)#priority percent 70  
Router1(config-pmap-c)#class VoIP-Control  
Router1(config-pmap-c)#bandwidth percent 5  
Router1(config-pmap-c)#class class-default  
Router1(config-pmap-c)#fair-queue  
Router1(config-pmap-c)#exit  
Router1(config-pmap)#exit
```

Apply the policy on the interface connects to the ES Module

```
Router1(config)#interface gigabitEthernet 1/0  
Router1(config-if)#service-policy output Policy-VoIP  
Router1(config-if)#exit
```

Verify

There is currently no verification procedure available for this configuration.

Troubleshoot

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

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