

Switch Virtual Interface for Cisco Integrated Services Routers

Introduction

This document provides an overview of the switch virtual interface (SVI) for Cisco® Integrated Services Routers.

Cisco offers different flavors of integrated switching modules for the modular Cisco 3900, 3800, 2900, 2800, 1900 and 1800 Series Integrated Services Routers: the Cisco 4- and 8-Port Gigabit Ethernet Enhanced High-Speed WAN Interface Cards (EHWICs), 16- and 36-port Cisco EtherSwitch® modules, the Cisco EtherSwitch 4- and 9-port high-speed WAN interface cards (HWICs), the Cisco EtherSwitch service modules, and the Enhanced Cisco EtherSwitch service modules. In addition, the Cisco 1800 and 890 Series fixed-configuration Integrated Services Routers are integrated with an 8-port switch. The Cisco 880, 870, 860 and 850 Series Integrated Services Routers are integrated with a 4-port switch.

The integrated switch ports for the fixed-configuration Integrated Services Routers and the switch ports on the HWICs/EHWICs do not natively support Layer 3 addresses or Layer 3 features. They must be assigned to a SVI and use a VLAN interface for Layer 3 features. SVI represents a logical Layer 3 interface on a switch. In addition to basic routing, SVI can be used to support additional features for the network that the SVI represents.

Table 1 lists the Cisco IOS® Software features supported by SVI and summarized the typical use of these features. Please refer to the Feature Navigator Tool to check whether a specific platform supports a specific feature.

Table 1. Cisco IOS Software Features Supported by SVI

Cisco IOS Software Feature	SVI Use Scenario	SVI Support Status
Routing Features		
Routing protocols	Interconnects Layer 3 networks using protocols such as Routing Information Protocol (RIP), Open Shortest Path First (OSPF) Protocol, and Enhanced Interior Gateway Routing Protocol (EIGRP) configured under SVI	Yes
IP Version 6 (IPv6)	Provides IPv6 support	Yes
Network Address Translation (NAT)	Translates public IP addresses to private address pools, and private addresses to public IP addresses; SVI is typically used as a NAT inside interface	Yes
Dynamic Host Configuration Protocol (DHCP)	<ul style="list-style-type: none"> DHCP server feature: Dynamically assigns private IP addresses to devices connected to the switch ports DHCP client feature: Allows the SVI to receive a dynamically assigned IP address 	Yes
Hot Standby Routing Protocol (HSRP)	Supports redundancy and high availability with a secondary device connected to the LAN with SVI, using HSRP	Yes
Virtual Router Redundancy Protocol (VRRP)	Supports redundancy and high availability with a secondary device connected to the LAN with SVI, using VRRP	Yes
Gateway Load Balancing Protocol (GLBP)	Supports redundancy and high availability with a secondary device connected to the LAN with SVI, using GLBP	No
Policy-Based Routing (PBR)	Creates policy maps for routing decisions and QoS settings	Yes
Point-to-Point Protocol (PPP) over Ethernet (PPPoE)	Provides PPPoE client support for a device (such as a DSL modem) connected to the switch port; typically used when the SVI is the only interface available to provide backup using the external device	Yes
Multicast	Provides multicast support for clients connected to the switch ports	Yes
VPN Routing and Forwarding (VRF)	Associates a VRF instance with an SVI to map VLANs to different logical or physical VPN WAN connections	Yes
Layer 2 Tunnel Protocol Version 3 (L2TPv3)	Provides LAN extension between remote sites; SVI is used as the Layer 2 tunnel termination point	Yes (12.4(20)T or later)
Ethernet over MPLS (EoMPLS)	Provides Ethernet extension between remote sites; SVI interface used as the EoMPLS pseudowire attachment circuit	Yes(15.2(2)T or later)

Cisco IOS Software Feature	SVI Use Scenario	SVI Support Status
Security Features		
IP Security (IPsec)	<ul style="list-style-type: none"> • Supports Easy VPN remote as the inside interface • Provides IPsec tunnel termination on the SVI; typically used when SVI is the only interface available to provide backup WAN connection with an external device (such as a DSL modem) 	Yes
Generic Routing Encapsulation (GRE)	Provides GRE tunnel termination on the SVI; typically used when SVI is the only interface available to provide backup WAN connection with an external device (such as a DSL modem)	Yes
Firewall	Provides Firewall support for VLANs	Yes*
Intrusion Prevention System (IPS)	Provides IPS support for VLANs	Yes
IP access control lists (ACLs)	Provides packet filtering to control network traffic and restrict the access of users and devices to the network	Yes
Network Admission Control (NAC)	Enforces NAC of endpoint devices connected to the VLAN	Yes
Auth-proxy	Authenticates inbound and outbound users connected to the VLAN	Yes
Quality-of-Service (QoS) Features		
Classification with standard and extended access list	Provides QoS classification with standard and extended access lists	Yes (CSCsi01713)
Classification with IP type of service (ToS): IP precedence, differentiated services code point (DSCP), or destination address	Provides QoS classification with IP ToS bits	Yes
Classification with Network-Based Application Recognition (NBAR) with TCP	Provides QoS classification with NBAR TCP traffic	Yes
Class-based marking	Provides QoS marking based on user-defined traffic class with DSCP and IP precedence values	Yes
Policing	Limits the input or output transmission rate on SVI and specifies traffic handling policies when the traffic either conforms to or exceeds the specified rate limits	Yes (15.1(1)T or later)
Committed Access Rate	Limits the input or output transmission rate on SVI	Yes
Class-Based Traffic Shaping	Provides Generic Traffic Shaping based on user defined traffic class	No
Generic-Traffic Shaping	Limits the transmission rate of data to match the speed of the remote, target interface and helps ensure that the traffic conforms to policies contracted for it	No
Weighted Random Early Detection (WRED)	Provides early detection of congestion and differentiated performance characteristics for different classes of service	No
Class-Based Weighted Fair Queue (CBWFQ)	Allocates bandwidth based on user-defined traffic class	No
Low-Latency Queue (LLQ)	Provides strict priority queuing with CBWFQ to allow delay-sensitive data such as voice to be dequeued and sent first, giving delay-sensitive data preferential treatment over other traffic	No
Hierarchical QoS	Using a modular QoS command-line interface (CLI) in a hierarchical structure, provides a high degree of granularity for QoS policies and helps meet complex service-level agreement (SLA) requirements	No

* Transparent Firewall is only supported between a VLAN and WAN interfaces. It's not supported between 2 or more VLANs. Please refer to CSCse92575.

Conclusion

SVI on Cisco Integrated Services Routers is designed to provide basic Layer 3 functions for the Layer 2 switch ports that belong to a specific VLAN. The SVI does not provide the same feature set and functions as the integrated Layer 3 Ethernet ports of the integrated services routers and should not be used to entirely replace the Layer 3 Ethernet ports. Customer who need additional Layer 3 Ethernet ports for their Integrated Services Routers may consider the use of 1- and 2-Port Fast Ethernet High-Speed WIC for modular ISR platforms. The guidelines presented in this document summarize feature support considerations for an Integrated Services Router deployment that uses SVIs.

For More Information

Please refer to the following links for more information:

- Cisco 4- and 8-Port Gigabit Ethernet Enhanced High-Speed WAN Interface Cards:
- Cisco HWIC-4ESW and HWIC-D-9ESW EtherSwitch interface cards:
http://www.cisco.com/en/US/partner/products/sw/iosswrel/ps5207/products_feature_guide09186a00802c6bb6.html
- Cisco EtherSwitch modules comparison:
http://www.cisco.com/en/US/products/ps5854/products_qanda_item0900aecd802a9470.shtml
- 1- and 2-Port Fast Ethernet High-Speed WIC for Cisco 1841, 2800, and 3800 Integrated Services Routers:
http://www.cisco.com/en/US/partner/products/ps5853/products_data_sheet0900aecd80581fe6.html
- Cisco IOS Security Configuration Guide:
http://www.cisco.com/en/US/partner/products/ps6441/products_configuration_guide_book09186a008049e249.html
- Cisco IOS Quality-of-Service Solutions Configuration Guide:
http://www.cisco.com/en/US/partner/products/ps6441/products_configuration_guide_book09186a008065c7a1.html

SVI Configuration Examples

Easy VPN Remote and NAT

http://www.cisco.com/en/US/technologies/tk583/tk372/technologies_white_paper09186a00801fdef9.shtml

Zone-Based Policy Firewall

http://www.cisco.com/en/US/products/ps6350/products_feature_guide09186a008072c6e3.html

DHCP

```
! SDM Default Configuration
! The default startup configuration file for Cisco Router and Security Device
Manager (SDM)
! DO NOT modify this file; it is required by SDM as is for factory defaults
! Version 1.0
!
hostname yourname
!
logging buffered 51200 warnings
!
username cisco privilege 15 secret 0 cisco
!
ip dhcp excluded-address 10.10.10.1
!
ip dhcp pool sdm-pool
  import all
  network 10.10.10.0 255.255.255.248
  default-router 10.10.10.1
  lease 0 2
!
no ip domain lookup
ip domain-name yourdomain.com
```

```
!  
interface FastEthernet2  
  no ip address  
  no shutdown  
!  
interface FastEthernet3  
  no ip address  
  no shutdown  
!  
interface FastEthernet4  
  no ip address  
  no shutdown  
!  
interface FastEthernet5  
  no ip address  
  no shutdown  
!  
interface FastEthernet6  
  no ip address  
  no shutdown  
!  
interface FastEthernet7  
  no ip address  
  no shutdown  
!  
interface FastEthernet8  
  no ip address  
  no shutdown  
!  
interface FastEthernet9  
  no ip address  
  no shutdown  
!  
interface Vlan1  
  description $ETH-SW-LAUNCH$$INTF-INFO-FE 2$  
  ip address 10.10.10.1 255.255.255.248  
  ip tcp adjust-mss 1452  
!  
ip http server  
ip http access-class 23  
ip http secure-server  
ip http authentication local  
ip http timeout-policy idle 60 life 86400 requests 10000  
!  
access-list 23 permit 10.10.10.0 0.0.0.7  
!  
banner login ^  
-----  
Cisco Router and Security Device Manager (SDM) is installed on this device.
```

This feature requires the one-time use of the username "cisco" with the password "cisco". The default username and password have a privilege level of 15.

Please change these publicly known initial credentials using SDM or the IOS CLI.

Here are the Cisco IOS commands.

```
username <myuser> privilege 15 secret 0 <mypassword>
no username cisco
```

Replace <myuser> and <mypassword> with the username and password you want to use.

For more information about SDM please follow the instructions in the QUICK START GUIDE for your router or go to <http://www.cisco.com/go/sdm>

```
-----
^
!
no cdp run
!
!
line con 0
  login local
line vty 0 4
  access-class 23 in
  privilege level 15
  login local
  transport input telnet
  transport input telnet ssh
line vty 5 15
  access-class 23 in
  privilege level 15
  login local
  transport input telnet
  transport input telnet ssh
!
! End of SDM default config file
end
```

HSRP

Router A Config

```
interface Loopback0
  no ip address
!
interface FastEthernet0
  ip address 100.0.0.4 255.255.255.0
  duplex auto
  speed auto
!
interface FastEthernet2
  switchport mode trunk
!
interface Vlan1
  no ip address
!
```

```
interface Vlan2
  ip address 20.0.0.1 255.255.255.0
  standby 2 ip 20.0.0.254
  standby 2 preempt
  standby 2 track Loopback0 20
!
interface Vlan4
  ip address 40.0.0.1 255.255.255.0
  standby 4 ip 40.0.0.254
  standby 4 preempt
  standby 4 track Loopback0 20
```

Router B Config

```
interface Loopback0
  no ip address
!
interface FastEthernet0
  ip address 100.0.0.5 255.255.255.0
  duplex auto
  speed auto
!
interface FastEthernet2
  switchport mode trunk
!
interface Vlan1
  no ip address
!
interface Vlan2
  ip address 20.0.0.2 255.255.255.0
  standby 2 ip 20.0.0.254
  standby 2 priority 90
  standby 2 preempt
  standby 2 track Loopback0 20
!
interface Vlan4
  ip address 40.0.0.2 255.255.255.0
  standby 4 ip 40.0.0.254
  standby 4 priority 90
  standby 4 preempt
  standby 4 track Loopback0 20
!
```

QoS Marking

```
Current configuration: 2002 bytes
!
version 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname 1841-SVI-DUT
!
boot-start-marker
boot-end-marker
!
no aaa new-model
!
resource policy
!
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
ip subnet-zero
ip cef
!
class-map match-all non-critical-traffic
  match access-group name ACL2
class-map match-all PREC-5
  match ip precedence 5
class-map match-all critical-traffic
  match access-group name ACL1
class-map match-all DSCP-AF
  match dscp af21
!
!
policy-map mark-traffic
  class critical-traffic
    set ip dscp cs5
  class non-critical-traffic
    set ip precedence 2
!
interface FastEthernet0/0
  ip address 20.0.0.2 255.255.255.0
  speed 100
  full-duplex
!
interface FastEthernet0/1
  ip address 202.82.33.153 255.255.255.252
  shutdown
  duplex auto
```

```
    speed auto
!
interface FastEthernet0/0/0
!
interface FastEthernet0/0/1
!
interface FastEthernet0/0/2
!
interface FastEthernet0/0/3
    duplex full
    speed 100
!
interface Vlan1
    ip address 10.0.0.2 255.255.255.0
    service-policy input mark-traffic
!
ip classless
ip route 0.0.0.0 0.0.0.0 10.0.0.1
!
ip http server
no ip http secure-server
!
ip access-list standard ACL
ip access-list standard ACL1
    permit 10.0.0.100
!
ip access-list extended ACL2
    permit ip host 10.0.0.1 host 20.0.200.1
!
control-plane
!
line con 0
    exec-timeout 0 0
    privilege level 15
line aux 0
line vty 0 4
    exec-timeout 0 0
login
!
scheduler allocate 20000 1000
end
```


PBR

```
interface FastEthernet0/0/0
!
interface FastEthernet0/0/1
!
interface FastEthernet0/0/2
!
interface FastEthernet0/0/3
    duplex full
    speed 100
!
interface Vlan1
    ip address 10.0.0.2 255.255.255.0
    ip policy route-map PBR
!
route-map PBR permit 10
    match ip address ACL2
    set ip precedence critical
!
ip classless
ip route 0.0.0.0 0.0.0.0 10.0.0.1
!
ip http server
no ip http secure-server
!
ip access-list standard ACL
ip access-list standard ACL1
    permit 10.0.0.100
!
ip access-list extended ACL2
    permit ip host 10.0.0.1 host 20.0.200.1
!
control-plane
!
```

CAR

```
interface FastEthernet0/0
    ip address 20.0.0.2 255.255.255.0
    speed 100
    full-duplex
!
interface FastEthernet0/1
    ip address 202.82.33.153 255.255.255.252
    shutdown
    duplex auto
    speed auto
!
interface FastEthernet0/0/0
!
```

```
interface FastEthernet0/0/1
!
interface FastEthernet0/0/2
!
interface FastEthernet0/0/3
    duplex full
    speed 100
!
interface Vlan1
    ip address 10.0.0.2 255.255.255.0
    rate-limit output 128000 16000 16000 conform-action transmit exceedaction drop
!
ip classless
!
```



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