



Q&A

CISCO ETHERSWITCH MODULES FOR CISCO 1800 (MODULAR), 2800, AND 3800 SERIES INTEGRATED SERVICES ROUTERS

GENERAL

Q. What are the integrated switching modules for the modular Cisco® 1800, 2800, and 3800 series integrated services routers?

A. Currently, Cisco Systems® offers three types of integrated switching modules for the integrated services routers:

- The 16- and 36-port Cisco EtherSwitch® modules are network modules based on the Cisco Catalyst® 2950 Series chipset. They are supported in the Cisco 2600, 3600, and 3700 series, as well as the Cisco 2811, 2821, 2851, and Cisco 3800 Series integrated services routers. These modules provide line-rate Layer 2 switching between ports on the module and use the router for switching Layer 3 traffic. They can provide Cisco Pre-standard Inline Power to support the installed base of Cisco IP phones and wireless access points. Inline power requires an internal inline power supply in the router, or an external power supply (not supported on the integrated services routers).
- The Cisco EtherSwitch 4- and 9-port switches are in the high-speed WAN interface card (HWIC) form factor. The Cisco EtherSwitch HWICs also provide line-rate Layer 2 switching between ports on the module and use the router for switching Layer 3 traffic. They can provide inline power---both Cisco Pre-standard Inline Power and IEEE 802.3af-compliant power---to attached devices. Inline power requires an internal inline power supply in the router. The Cisco EtherSwitch HWICs are supported on the Cisco 1841 and Cisco 2800 and 3800 series integrated services routers. The Cisco 1841, however, does not support the 9-port Cisco EtherSwitch HWIC, nor can it provide Power over Ethernet (PoE).
- The Cisco EtherSwitch service modules are available in four interface densities with six SKUs. They support the Enhanced Network Module (NME) specification and can provide Layer 2 and Layer 3 switching on the modules for IP traffic. Using Cisco StackWise technology they can expand to support up to eight additional switches in one virtual management unit. All Cisco EtherSwitch service modules support Cisco Pre-standard Inline Power and IEEE 802.3af-compliant PoE. They are supported in the Cisco 2691 Multiservice Platform, the Cisco 3700 Series plus the Cisco 2811, 2821, 2851, and Cisco 3800 Series integrated services routers. The Cisco 2691 has no inline power support for the Cisco EtherSwitch service modules because there are no external power connections. In the Cisco 3700 Series, only Cisco Pre-standard Inline Power is supported. EtherSwitch service modules are available as follows:
 - 16 10/100 Mbps switch ports and one 10/100/1000 Mbps switch port, available in both POE and non-POE SKUs
 - 23 10/100 Mbps switch ports and one 10/100/1000 Mbps switch port, available in both POE and non-POE SKUs
 - 24 10/100 Mbps switch ports with a Gigabit Ethernet Small Form-Factor Pluggable (SFP)-based port and Cisco StackWise connectors, available only with integrated POE
 - 48 10/100 Mbps switch ports and 2 Gigabit Ethernet SFP-based ports, available only with integrated POE

Q. Can you summarize the modules by platform support and PoE capability?

A. Table 1 summarizes the integrated switching modules by platform support and PoE capability.

Table 1. Integrated Switching Support by Platform

Platform	4-Port HWIC	9-Port HWIC	16-Port Network Module	36-Port NMD	16-Port NME	24-Port NME-X	24-Port + Cisco StackWise NME-XD	48-Port NME-XD
Cisco 3845	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cisco 3825	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cisco 2851	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cisco 2821	Yes	Yes	Yes	No	Yes	Yes	No	No
Cisco 2811	Yes	Yes	Yes	No	Yes	No	No	No

Platform	4-Port HWIC	9-Port HWIC	16-Port Network Module	36-Port NMD	16-Port NME	24-Port NME-X	24-Port + Cisco StackWise NME-XD	48-Port NME-XD
Cisco 2801	Yes	Yes	No	No	No	No	No	No
Cisco 1841	Yes	No	No	No	No	No	No	No
Cisco 3745	No	No	Yes	Yes	Yes	No	No	No
Cisco 3725	No	No	Yes	Yes	Yes	No	No	No
Cisco 3660 Multiservice Platform	No	No	Yes	Yes	No	No	No	No
Cisco 3640 and Cisco 3640A Multiservice Platforms	No	No	Yes	No	No	No	No	No
Cisco 3620 Multiservice Platform	No	No	Yes	No	No	No	No	No
Cisco 2691	No	No	Yes	No	Yes*	No	No	No
Cisco 2600XM	No	No	Yes	No	No	No	No	No
Cisco 2600 Series Multiservice Platform	No	No	Yes	No	No	No	No	No

* Cisco 2691 cannot provide inline power to the Cisco EtherSwitch Service Module.

Q. What is the feature comparison between the Cisco EtherSwitch modules?

A. Table 2 compares features supported on the Cisco EtherSwitch modules.

Table 2. Features Supported on Cisco EtherSwitch Modules

	EtherSwitch Network Modules (NM-16ESW and NMD-36ESW)	EtherSwitch HWICs (HWIC-4ESW and HWICD-9ESW)	EtherSwitch Service Modules (NME-16ES-1G, NME-16ES-1G-P, NME-X-23ES-1G, NME-X-23ES-1G-P, NME-XD-48ES-2S-P, and NME-XD-24ES-1S-P)
VLANs			
Multiple VLANs per Switch	Yes (varies by chassis; maximum of 64 on Cisco 3845)	Yes (maximum of 15 on any chassis)	Yes (maximum of 1,024 per switch or stack)
VLANs in 4,000 Range	No	No	Yes
IEEE 802.1Q Tagged and Untagged VLANs	Yes	Yes	Yes (802.1Q and Inter-Switch Link [ISL])
VLAN Trunking Protocol (VTP) Support for Client, Server, and Transparent Modes	Yes	Yes	Yes
Maximum Switched Virtual Interfaces (SVIs)	Based on MAC addresses per chassis; up to 64 maximum	15	1,000 (recommended maximum is 128)

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Layer 2 MAC-Related Feature Support			
Secure MAC Addresses	Yes	Yes (up to 200)	Yes (port access control list [PACL]-based)
Static and Dynamic MAC Addressing	Yes	Yes	Yes
MAC Addresses	8,000	2,000	12,000
Port Application Support			
Cisco EtherChannel Device---Port Aggregation	Yes	No	Yes (across stack)
Switched Port Analyzer (SPAN)---Port Monitoring	Yes (all frames have 802.1q tags)	Yes (all frames have 802.1q tags)	Yes (across stack)
Remote SPAN (RSPAN)	No	No	Yes
Router-Based Broadcast, Multicast, and Unicast Storm Control	Yes	Yes	Yes
Quality-of-Service (QoS) Feature Support			
IEEE 802.1p Class-of-Service (CoS) Priority for 802.1q Tagged Frame	Yes	Yes	Yes
Port-Based Priority for Native Frames	Yes	Yes	Yes
Port Priority to Overwrite the IEEE 802.1p Priority	Yes	Yes	Yes
Strict Priority and Weighted Round Robin (WRR) CoS Policies	Yes	Yes (limited; default values only)	Shaped Round Robin (SRR) and Weighted Tail Drop (WTD)
CoS-to-Differentiated Services Code Point (DSCP) Mapping	Yes	No	Yes
Internet Group Management Protocol (IGMP) Snooping	Yes	Yes	Yes
Network Time Protocol (NTP) Support	Yes	Yes	Yes
IEEE 802.1D Spanning Tree and Spanning Tree Protocol PortFast	Yes	Yes	Yes; 128 instances Uplink Fast, Backbone Fast, PortFast, root guard, and bridge protocol data unit (BPDU) guard
Simple Network Management Protocol (SNMP) Support	Yes	Yes	Yes
Telnet Client and Server Support	Yes	Yes	Yes
Version 1 and Version 2 Support	Yes	Yes	Yes
Flow Control for the Gigabit Ethernet Port Only	Yes	–	Yes
Fallback Bridging	Yes	Yes	Yes (IPv4 and non-IP protocols only)
Routed Port	Yes	No	Yes (up to 468 per stack)
Cisco Smartports	No	No	Yes

	EtherSwitch Network Modules (NM-16ESW and NMD-36ESW)	EtherSwitch HWICs (HWIC-4ESW and HWICD-9ESW)	EtherSwitch Service Modules (NME-16ES-1G, NME-16ES-1G-P, NME-X-23ES-1G, NME-X-23ES-1G-P, NME-XD-48ES-2S-P, and NME-XD-24ES-1S-P)
802.1x	Yes (authentication---port on/off only)	Yes (authentication---port on/off only)	Yes (authentication and full authentication, authorization, and accounting [AAA] and RADIUS modes) <ul style="list-style-type: none"> • With port VLAN ID (PVID) and voice VLAN ID (VVID) • With VLAN assignment • With DHCP assignment • With guest VLAN
Security Access Control Lists (ACLs)	Yes	No	Yes
IP ACLs for Layer 2 Ports	Yes	No	Yes
VACLs	No	No	Yes
Cisco Inline Power	Yes	Yes (no power support on Cisco 1841)	Yes (no power support on Cisco 2691)
IEEE 802.3af-Compliant PoE	No	Yes (no power support on Cisco 1841)	Yes (not available on Cisco 2691 or Cisco 3700 Series, no POE support at all on NME-16ES-1G and NME-X-23ES-1G)
Layer 3 Switching for IP Packets	Yes (this is done through the router)	Yes (this is done through the router)	Yes (on the module)
VTP Pruning	No	No	Yes
Network Port	No	No	Yes
Per-Port Enabling and Disabling of Unknown Multicast and Unicast Packets	No	No	Yes
Cisco Group Management Protocol (GMP) Client	No	No	Yes
Cisco Network Assistant Support	No	No	Yes
Cisco Emergency Responder Support	No	No	Yes

STACKING

Q. What is intra-chassis stacking?

A. Intra-chassis stacking is the ability to have multiple Cisco EtherSwitch network modules or Cisco EtherSwitch HWICs connected through the Gigabit Ethernet or Fast Ethernet connection in the same router. An example of intra-chassis stacking is placing two Cisco EtherSwitch network modules in the same router connected through the Gigabit Ethernet uplink. Intra-chassis stacking allows all the Fast Ethernet and Gigabit Ethernet interfaces to participate in the same Layer 2 domain. Intra-chassis stacking is required for using two of the Cisco EtherSwitch network modules or HWICs in a single chassis. It is neither required nor supported when using the Cisco EtherSwitch service modules.

Q. Can I stack two Cisco EtherSwitch network modules or two Cisco EtherSwitch HWICs in a chassis without connecting external ports?

A. No, stacking without connecting the two interfaces externally is not supported. Connecting the two stacking interfaces and using the **stacking-partner** command eliminates conflicts in the VLAN databases between the two modules. Installing two modules without this connection results in duplications in the VLAN databases and is not supported. If two Cisco EtherSwitch network modules or HWICs are installed in a chassis without connecting and configuring intra-chassis stacking, the router does not recognize the second module.

Q. Can I install multiple Cisco EtherSwitch service modules in a chassis without configuring intra-chassis stacking?

A. Because each Cisco EtherSwitch service module is a separate, standalone switch, it is not necessary (nor is it supported) to configure intra-chassis stacking on these modules. With the exception of the StackWise module NME-XD-24ES-1S-P), you can install up to 2 EtherSwitch service modules in a single chassis. Because the StackWise supports Cisco StackWise interfaces, only one per chassis is supported.

Q. Is there a limit to how many switching modules I can install in a platform?

A. Yes. Only two Cisco EtherSwitch network modules or HWICs can be installed in any platform, regardless of port density or slot density. All these switching modules share a common VLAN database file, called the vlan.dat file. Access to this file must be coordinated between modules, and this is accomplished using the “stacking” keyword in the configuration. Stacking can be applied to only one port per module, and that port must be connected externally to the stacking port on the mating module.

With the exception of the StackWise module, you can install up to 2 EtherSwitch service modules in a single chassis. Because the StackWise module supports Cisco StackWise interfaces, only one per chassis is supported.

Q. How are the modules supported across the integrated services routers and multiservice routers?

A. Table 3 shows support for the Cisco EtherSwitch modules.

Table 3. Support for the Cisco EtherSwitch Modules

Platform	4-Port HWIC	9-Port HWIC	16-Port Network Module	36-Port NMD	16-Port NME	23-Port NME-X	24-Port NME-XD With StackWise	48-Port NME-XD	Maximum Total Cisco Switchport Macros
Cisco 3845	2	2	2	2	2	2	1	2	112 Fast Ethernet and 4 Gigabit Ethernet SFPs
Cisco 3825	2	2	2	1	2	2	1	1	80 Fast Ethernet and 3 Gigabit Ethernet (2 SFPs)
Cisco 2851	2	2	1	1	1	1	1	1	64 Fast Ethernet and 2 Gigabit Ethernet SFPs
Cisco 2821	2	2	1	0	1	1	0	0	39 Fast Ethernet and 1 Gigabit Ethernet
Cisco 2811	2	2	1	0	1	0	0	0	32 Fast Ethernet and 1 Gigabit Ethernet
Cisco 2801	2	2	0	0	0	0	0	0	16 Fast Ethernet
Cisco 1841	2	0	0	0	0	0	0	0	6 Fast Ethernet
Cisco 3745	0	0	2	2	2	0	0	0	72 Fast Ethernet and 2 Gigabit Ethernet
Cisco 3725	0	0	2	1	2	0	0	0	48 Fast Ethernet and 2 Gigabit Ethernet
Cisco 3660	0	0	2	2	0	0	0	0	72 Fast Ethernet and 2 Gigabit Ethernet
Cisco 3640 and Cisco 3640A	0	0	2	0	0	0	0	0	32 Fast Ethernet
Cisco 3620	0	0	2	0	0	0	0	0	32 Fast Ethernet
Cisco 2691	0	0	1	0	1	0	0	0	16 Fast Ethernet and 1 Gigabit Ethernet

Platform	4-Port HWIC	9-Port HWIC	16-Port Network Module	36-Port NMD	16-Port NME	23-Port NME-X	24-Port NME-XD With StackWise	48-Port NME-XD	Maximum Total Cisco Switchport Macros
Cisco 2600XM	0	0	1	0	0	0	0	0	16 Fast Ethernet and 1 Gigabit Ethernet
Cisco 2600	0	0	1	0	0	0	0	0	16 Fast Ethernet and 1 Gigabit Ethernet

Q. Is there a limitation to which ports can be used for stacking?

A. On the EtherSwitch Network Modules (NM-16ESW and the NMD-36ESW), only a Gigabit Ethernet port supports the stacking command. On the EtherSwitch HWICs (HWIC-4ESW and HWICD-9ESW), stacking can be enabled on any one port on the card. On the Double-wide EtherSwitch HWIC (HWICD-9ESW), the ninth port cannot support PoE and is the recommended stacking port.

Q. Stacking ports must be connected externally to the chassis. What kind of cable should I use?

A. To stack two Cisco EtherSwitch network modules, you must use a Category 5 crossover cable connected to a Gigabit Ethernet interface. The interfaces on the Cisco EtherSwitch network modules do not support automatic medium-dependent interface crossover (Auto-MDIX). When an HWIC is involved in the stack, a crossover or straight-through Category 5 cable should be used.

Q. Do I need to worry about speed and duplex when stacking?

A. Both speed and duplex should be set to auto on stacking ports.

Q. Does the stacking interface show “UP UP” like the other interfaces?

A. No, it is normal to see “UP DOWN” on the interfaces used for stacking.

VLANs

Q. What is the VLAN database?

A. The VLAN database is a file that resides on the compact flash memory of the Cisco integrated services routers. This file contains detailed information needed to identify individual VLANs to the system, so that traffic to and from those VLANs can be properly identified. A VLAN must be created in the VLAN database before it can be used, even though interfaces can be assigned to it. If interfaces are assigned to a VLAN not present in the VLAN database, traffic does not flow properly. In order to ensure correct working of VLANs, the compact flash memory must be installed securely. You cannot swap it with another compact flash memory and expect VLANs to work. The Cisco EtherSwitch Service Module contains its own VLAN database, stored in NVRAM on the module. It has no dependency on the compact flash memory, nor does it have access to the vlan.dat file.

Q. Can I remove the compact flash memory from the routers while they are running?

A. Do not remove the compact flash memory during network operation. Removing this memory from the router during network operation can result in unpredictable behavior in the platforms. The vlan.dat file, along with several other files, are written to and stored on the compact flash memory. If the flash memory is removed during operation and the router needs to access those files, it may react unpredictably, including not forwarding packets. At that point, a power reset may be required.

Q. Can I create VLANs in the VLAN database from config mode?

A. No, VLANs can be created only directly in the VLAN database. Configuration lines in the global config mode will not create entries in the file.

Q. How many VLANs are supported on the Cisco EtherSwitch modules?

A. Table 4 shows the number of VLANs supported per platform by the Cisco EtherSwitch modules. When a Cisco EtherSwitch HWIC is included in the stack, the maximum allowed number of VLANs is 15, regardless of platform capacity.

Table 4. VLANs Supported per Platform

Platform	EtherSwitch Network Module (NM-16ESW and NMD-36ESW)	EtherSwitch HWICs (HWIC-4ESW and HWICD-9ESW)	EtherSwitch Service Modules (NME-16ES-1G-P, NME-X-23ES-1G-P, NME-XD-48ES-2S-P, and NME-XD-24ES-1S-P)
Cisco 1841	–	15	–
Cisco 2801	–	15	–
Cisco 2811	32	15	1024
Cisco 2821	32	15	1024
Cisco 2851	32	15	1024
Cisco 3825	48	15	1024
Cisco 3845	64	15	1024

ADDITIONAL FEATURES

Q. Do the Cisco EtherSwitch devices support Cisco EtherChannel® technology?

A. The Cisco EtherSwitch network modules and service modules support Cisco EtherChannel technology, including the Gigabit Ethernet ports. Up to eight ports with the same speed and duplex can be aggregated into a single channel group. The Cisco EtherSwitch HWICs do not support Cisco EtherChannel technology. If both a network module and an HWIC are used, the network module interfaces can be configured for Cisco EtherChannel technology, but those on the HWIC cannot.

Q. Can I configure the switch interfaces as Layer 3 ports?

A. The Cisco EtherSwitch network module and service module interfaces can be configured directly as Layer 3, or routed, ports by using the **no switchport** command and assigning an IP address directly to the port. Cisco Switchports on the HWIC do not support Layer 3 addresses natively; they must be assigned to a SVI and use a VLAN interface for Layer 3. Every switch port can be assigned to a unique VLAN, up to 15 VLANs maximum.

Q. What is SPAN?

A. A SPAN session is an association of a destination interface with a set of source interfaces. You can configure SPAN sessions using parameters that specify the type of network traffic to monitor. SPAN sessions allow you to monitor traffic on one or more interfaces and can send ingress traffic, egress traffic, or both to one or more destination interfaces. SPAN sessions do not interfere with the normal operation of the Cisco EtherSwitch module. The Cisco EtherSwitch network modules and HWICs support one SPAN session; however, frames on the SPAN port contain an 802.1q tag. The Cisco EtherSwitch service modules do not have this limitation.

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