Cisco Catalyst 2350 Series Switches

The Cisco® Catalyst® 2350 Series Switches (Figure 1) are a line of standalone, top-of-rack, server aggregation switches for the data center. This series offers 48 10/100/1000 downlink ports with two 10 Gigabit Ethernet uplinks and an AC or DC power supply. The Cisco Catalyst 2350 Series Switches offer a line-rate, nonblocking solution in a one rack unit (1-RU) form factor.

Figure 1. Cisco Catalyst 2350 Series Switches

Features

- 48 10/100/1000 downlink ports with two 10 Gigabit Ethernet X2 uplink ports,
- Cisco TwinGig Converter Module for migrating uplinks from Gigabit Ethernet to 10 Gigabit Ethernet
- Modular fan and modular AC or DC power supply
- Out-of-band Ethernet management port along with RS-232 console port

Switch Configurations

Table 1 shows the configurations for the Cisco Catalyst 2350 Series Switch:

Table 1. Cisco Catalyst 2350 Series Switch Configurations

Product Name	Description
Cisco Catalyst 2350-48TD-S	48 Ethernet 10/100/1000 ports and 2 X2 10 Gigabit Ethernet uplinks, 265W AC power supply
Cisco Catalyst 2350-48TD-SD	48 Ethernet 10/100/1000 ports and 2 X2 10 Gigabit Ethernet uplinks, 265W DC power supply

Cisco Catalyst 2350 Series Software

The 2350 Series switches are available with basic quality of service (QoS), access control lists (ACLs), and security.

10 Gigabit Ethernet Uplinks and the Cisco TwinGig Small Form-Factor Pluggable Converter

The 2350 Series switches feature wire-speed 10 Gigabit Ethernet uplink ports for high-bandwidth applications, relieving congestion and helping ensure smooth delivery of data. The TwinGig converter (see Figure 2) converts a 10 Gigabit Ethernet X2 interface into two Gigabit Ethernet Small Form-Factor Pluggable (SFP) ports. This way, customers can initially use the switch with Gigabit Ethernet uplinks and later implement 10 Gigabit Ethernet uplinks as business demands change, without having to upgrade the access layer.

Figure 2. Cisco TwinGig Adapter Converting 10 Gigabit Ethernet X2 Interface into Two Gigabit Ethernet SFP Interfaces

Modular Power Supplies

Cisco Catalyst 2350 Series switches have one power supply slot and support the following power supplies:

- C3K-PWR-265WAC: 265WAC power supply
- C3K-PWR-265WDC: 265WDC power supply

Primary Features and Benefits

Ease of Use in Deployment

Ease-of-use features include:

- Dynamic Host Configuration Protocol (DHCP) autoconfiguration of multiple switches through a boot server eases switch deployment.
- Autonegotiation on all ports automatically selects half- or full-duplex transmission mode to optimize bandwidth.
- Dynamic Trunking Protocol (DTP) facilitates dynamic trunk configuration across all switch ports.
- Port Aggregation Protocol (PAgP) automates the creation of Cisco Fast EtherChannel groups or Gigabit EtherChannel groups to link to another switch, router, or server.
- Automatic, media-dependent interface crossover (MDIX) automatically adjusts transmit and receive pairs if an incorrect cable type (crossover or straight-through) is installed.

- Unidirectional Link Detection Protocol (UDLD) and Aggressive UDLD allow unidirectional links caused by incorrect fiber-optic wiring or port faults to be detected and disabled on fiber-optic interfaces.

Availability and Scalability

The Cisco Catalyst 2350 Series Switches are equipped with a robust set of features that allow for network scalability and higher availability. This is achieved through a complete suite of Spanning Tree Protocol enhancements that aim to maximize availability in a Layer 2 network. Enhancements to the standard Spanning Tree Protocol, such as Per-VLAN Spanning Tree Plus (PVST+), Uplink Fast, and Port Fast maximize network uptime.

- IEEE 802.1s/w Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP) provide rapid spanning-tree convergence independent of spanning-tree timers and also offer the benefit of Layer 2 load balancing and distributed processing.
- Rapid Per-VLAN Spanning Tree (RPVST+) allows rapid spanning-tree reconvergence on a per-VLAN spanning-tree basis, without requiring the implementation of spanning-tree instances.

Quality of Service

The Cisco Catalyst 2350 Series Switches offer the following QoS features:

- 802.1p class of service (CoS) and differentiated services code point (DSCP) field classification is provided, using marking and reclassification on a per-packet basis by source and destination IP address or Layer 4 TCP/UDP port number.
- Cisco control-plane and data-plane QoS ACLs on all ports help ensure proper marking on a per-packet basis.
- Four egress queues per port help enable differentiated management of up to four traffic types across the switch.
- Shaped Round Robin (SRR) scheduling helps ensure differential prioritization of packet flows by intelligently servicing the ingress queues and egress queues.
- Weighted Tail Drop (WTD) provides congestion avoidance at the ingress and egress queues before a disruption occurs.
- Strict priority queuing helps ensure that the highest-priority packets are serviced ahead of all other traffic.
- The Cisco committed information rate (CIR) function provides bandwidth in increments as low as 8 Kbps.
- Up to 64 aggregate or individual policers are available per Fast Ethernet or Gigabit Ethernet port.

Security

The Cisco Catalyst 2350 Series Switches support a basic set of security features, including the following:

- Secure Shell (SSH) Protocol and Simple Network Management Protocol Version 3 (SNMPv3) provide network security by encrypting administrator traffic during Telnet and SNMP sessions. SSH Protocol and the cryptographic version of SNMPv3 require a special cryptographic software image because of U.S. export restrictions.

- Bidirectional data support on the Switched Port Analyzer (SPAN) port allows the Cisco intrusion detection system (IDS) to take action when an intruder is detected.
- TACACS+ and RADIUS authentication facilitates centralized control of the switch and restricts unauthorized users from altering the configuration.
- Multilevel security on console access prevents unauthorized users from altering the switch configuration.
- Bridge protocol data unit (BPDU) guard shuts down Spanning Tree Port Fast-enabled interfaces when BPDUs are received to avoid accidental topology loops.
- Spanning Tree Root Guard (STRG) prevents edge devices not in the network administrator's control from becoming Spanning Tree Protocol root nodes.
- IGMP filtering provides multicast authentication by filtering out nonsubscribers and also limits the number of concurrent multicast streams available per port.

Management and Control Features

The Cisco Catalyst 2350 Series Switches come with a set of management and control features. These features include the following:

- Cisco IOS® Software CLI support provides common user interface and command set with all Cisco routers and Cisco Catalyst desktop switches.
- Generic On-Line Diagnostics (GOLD) checks the health of hardware components and verifies proper operation of the system data and control plane at run time and boot time.
- VLAN1 minimization allows VLAN1 to be disabled on any individual VLAN trunk.
- Internet Group Management Protocol (IGMP) Snooping for IPv4 and IPv6 MLD v1 and v2 Snooping provide fast client joins and leaves of multicast streams and limit bandwidth-intensive video traffic to only the requestors.
- Cisco VLAN Trunking Protocol (VTP) supports dynamic trunk configuration across all switches.
- Remote Switch Port Analyzer (RSPAN) allows administrators to remotely monitor ports in a Layer 2 switch network from any other switch in the same network.
- For enhanced traffic management, monitoring, and analysis, the embedded Remote Monitoring (RMON) software agent supports four RMON groups (history, statistics, alarms, and events).
- Layer 2 Traceroute eases troubleshooting by identifying the physical path that a packet takes from source to destination.
- Trivial File Transfer Protocol (TFTP) reduces the cost of administering software upgrades by downloading from a centralized location.
- Network Timing Protocol (NTP) provides an accurate and consistent time stamp to all intranet switches.
- A comprehensive and convenient visual management system is provided by multifunction LEDs per port for port status; half-duplex and full-duplex mode; and 10BASE-T, 100BASE-TX, and 1000BASE-T indication as well as switch-level status LEDs for system and bandwidth utilization.
- Jumbo frames (9216 bytes) are available for advanced data and video applications requiring very large frames.

Network Management Tools

The Cisco Catalyst 2350 Series Switches offer both a command-line interface (CLI) for detailed configuration and Cisco Network Assistant, a PC-based tool for quick, centralized view of the network through an easy-to-use GUI. In addition, CiscoWorks LAN Management Solution (LMS) supports the 2350 Series for network-wide management.

Cisco Network Assistant

A PC-based network management application designed for small and medium-sized business (SMB) networks with up to 250 users, Cisco Network Assistant offers centralized network management and configuration capabilities. Cisco Network Assistant features an intuitive GUI where users can easily apply common services across Cisco switches, routers, and access points. Cisco Network Assistant is a tool for:

- Configuration management
- Troubleshooting advice
- Inventory reports
- Event notification
- Network security settings
- Password synchronization
- Drag-and-drop Cisco IOS Software upgrades
- Secure wireless

For detailed information about Cisco Network Assistant, visit: http://www.cisco.com/go/cna.

CiscoWorks LAN Management Solution (LMS)

CiscoWorks LMS is a suite of powerful management tools that simplify the configuration, administration, monitoring, and troubleshooting of Cisco networks. CiscoWorks LMS integrates these capabilities into a world-class solution for improving the accuracy and efficiency of your operations staff, while increasing the overall availability of your network. LMS supports over 400 different device types, including the Cisco Catalyst 2350 Series Switches. LMS provides:

- Network discovery, topology views, end-station tracking, and VLAN management
- Real-time network fault analysis, with easy-to-deploy, device-specific best-practice templates
- Hardware and software inventory management, centralized configuration tools, and Syslog monitoring
- Network response time and availability monitoring and tracking
- Real-time device, link, and port traffic management, analysis, and reporting

For detailed information about CiscoWorks LMS, visit:
http://www.cisco.com/en/US/products/sw/cscowork/ps2425/index.html.

Cisco Catalyst 3560 SFP Interconnect Cable

The Cisco Catalyst 3560 SFP Interconnect Cable (see Figure 3) provides for a low-cost point-to-point Gigabit Ethernet connection between 2350 Series switches. The 50-cm cable is an alternative to using SFP transceivers when interconnecting 2350 Series switches through their SFP ports over a short distance.

Figure 3. Cisco Catalyst 3560 SFP Interconnect Cable

Product Specifications

Table 2 lists product specifications for the Cisco Catalyst 2350 Series Switches.

Table 2. Specifications for the Cisco Catalyst 2350 Series Switches

Description	Specification			
Performance	Switching Fabric		128 Gbps	
	DRAM		128 MB	
	FLASH		64 MB	
	VLANs		128	
	VLAN IDs		4000	
	Jumbo Frames		9216 B	
	Forwarding rate		101.2 Mpps	
	MAC, security, and QoS scalability numbers depend on the type of template used in the switch:			
	Default Template	Access Template	VLAN Template	Default Template
	MAC address	4K	12K	6K
Connectors and Cabling	1000BASE-T SFP-based ports: RJ-45 connectors, 2-pair Cat-5 UTP cabling 1000BASE-SX SFP-based ports: LC fiber connectors (multimode fiber) 10GBASE-SR, CX4, LRM X2-based ports: SC fiber connectors (single-mode, or multimode fiber) Ethernet management port: RJ-45 connectors, 2-pair Cat-5 UTP cabling Management console port: RJ-45-to-DB9 cable for PC connections			
Power Connectors	Internal power supply connector: The internal power supply is an autoranging unit. The internal power supply supports input voltages between 100 and 240VAC. Use the supplied AC power cord to connect the AC power connector to an AC power outlet.			
Indicators	Per-port status LEDs: link integrity, disabled, activity, speed, and full-duplex indications System-status LEDs: system and bandwidth-utilization indications			
Dimensions (H x W x D)			**Inches**	**Centimeters**
	Catalyst 2350-48TD		1.75 x 17.5 x 18.1	4.4 x 44.5 x 46
Weight			**Pounds**	**Kilograms**
	Catalyst 2350-48TD		18.8	8.6

Environmental Ranges	• Operating temperature: 32 to 113ºF (0 to 45ºC) • Storage temperature: –13 to 158ºF (–25 to 70ºC) • Relative humidity operating: 0 to 95% (noncondensing) • Relative humidity nonoperating: 10 to 85% (noncondensing) • Operating altitude: up to 10,000 ft (3049 m) • Storage altitude: up to 15,000 ft (4573 m)	
Acoustic Noise	International Organization for Standardization (ISO) 7779: bystander position operating to an ambient temperature of 30ºC	
	Catalyst 2350-48TD	45 dB
Mean Time Between Failure (MTBF)	Catalyst 2350-48TD	166,907 hours

Table 3 lists the management and standards support for the Cisco Catalyst 2350 Series Switches.

Table 3. Management and Standards Support for Cisco Catalyst 2350 Series Switches

Management	
• BRIDGE-MIB • CISCO-CDP-MIB • CISCO-CLUSTER-MIB • CISCO-CONFIG-MAN-MIB • CISCO-ENTITY-FRU-CONTROL-MIB • CISCO-ENVMON-MIB • CISCO-FLASH-MIB • CISCO-FTP-CLIENT-MIB • CISCO-IGMP-FILTER-MIB • CISCO-IMAGE-MIB • CISCO-IP-STAT-MIB • CISCO-L2L3-INTERFACE-CONFIG-MIB • CISCO-MEMORY-POOL-MIB • CISCO-PAGP-MIB • CISCO-PING-MIB • CISCO-PROCESS-MIB • CISCO-RTTMON-MIB • CISCO-STP-EXTENSIONS-MIB • CISCO-SYSLOG-MIB • CISCO-TCP-MIB • CISCO-VLAN-IFTABLE-RELATIONSHIP-MIB • CISCO-VLAN-MEMBERSHIP-MIB	• CISCO-VTP-MIB • ENTITY-MIB • ETHERLIKE-MIB • IF-MIB • IGMP-MIB • IPMROUTE-MIB • OLD-CISCO-CHASSIS-MIB • OLD-CISCO-FLASH-MIB • OLD-CISCO-INTERFACES-MIB • OLD-CISCO-IP-MIB • OLD-CISCO-SYS-MIB • OLD-CISCO-TCP-MIB • OLD-CISCO-TS-MIB • PIM-MIB • RFC1213-MIB • RFC1253-MIB • RMON-MIB • RMON2-MIB • SNMP-FRAMEWORK-MIB • SNMP-MPD-MIB • SNMP-NOTIFICATION-MIB • SNMP-TARGET-MIB • SNMPv2-MIB • TCP-MIB • UDP-MIB
Standards	
• IEEE 802.1s • IEEE 802.1w • IEEE 802.3ad • IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports • IEEE 802.1D Spanning Tree Protocol • IEEE 802.1p CoS Prioritization • IEEE 802.1Q VLAN • IEEE 802.3 10BASE-T specification • IEEE 802.3u 100BASE-TX specification • IEEE 802.3ab 1000BASE-T specification • IEEE 802.3z 1000BASE-X specification • 1000BASE-T • 1000BASE-SX	• 10GBASE-SR • 10GBase-CX4 • 10GBase-LRM • RMON I and II standards • SNMPv1, SNMPv2c, and SNMPv3

Table 4 lists the power supply compatibility matrix for all different models of Cisco Catalyst 2350 Series Switches.

Table 4. Power Specifications for Cisco Catalyst 2350 Series Switches

Description	C3K-PWR-265WAC	C3K-PWR-265WDC
Max Output Power	265W	265W
Input-Voltage Range and Frequency	100–240 VAC, 50–60 Hz	–36 VDC to –72 VDC
Input Current	5–2.5A	<5A@-72 VDC <10A@-36 VDC
Output Ratings	12V@22A	12V@22A
Output Holdup Time	20 ms minimum	> 2ms@-48 VDC
Power-Supply Input Receptacles	IEC 320-C13 (IEC60320-C14)	N/A
Power Cord Rating	15A	12A@-100 VDC

Table 5 lists the specifications of all the power supplies supported by the Cisco Catalyst 2350 Series Switches.

Table 5. Power Supply Specifications for the Cisco Catalyst 2350 Series Switches

Product Specifications	Power Supply	
	C3K-PWR-265WAC	C3K-PWR-265WDC
Physical Specifications	(H x W x D): 1.65 x 6.0 x 11.4 in Weight: 3.3 lb (1.5 kg)	(H x W x D): 1.65 x 6.0 x 11.4 in Weight: 3.5 lb (1.6 kg)
Total Output BTU **(Note: 1000 BTU/hr = 290W)**	907 BTU/hr, 265W	907 BTU/hr, 265W
Operating Temperature	23 to 113°F (–5 to 45°C)	
Storage Temperature	–40 to 158°F (–40 to 70°C)	
Relative Humidity Operating	10 to 85% noncondensing	
Relative Humidity Nonoperating	0 to 95% noncondensing	
Altitude	10,000 ft. (3000 meters), up to 45°C	
MTBF	Calculated MTBF must be greater than 300,000 hrs using Telcordia SR-332, Method 1, Case 3. Demonstrated MTBF is 500,000 hrs (with 90% confidence level).	
EMI and EMC Compliance	• FCC Part 15 (CFR 47) Class A • ICES-003 Class A • EN 55022 Class A • CISPR 22 Class A • AS/NZS 3548 Class A • VCCI Class A • EN 55024 • EN300 386 • EN 50082-1 • EN 61000-3-2 • EN 61000-3-3 • EN 61000-6-1 NEBS Compliant	
Safety Compliance	• UL 60950-1 1st Edition • CAN/CSA-C22.2 No. 60950-1 1st Edition • EN 60950-1 1st Edition • IEC 60950-1 1st Edition	
LED Indicators	• "AC OK": Input power to the power supply is OK. • "PS OK": Output power from the power supply is OK.	

Table 6 lists the safety and compliance information for the Cisco Catalyst 2350 Series Switches.

Table 6. Safety and Compliance

Feature	Specification
Safety Certifications	• UL60950-1 • C-UL to CAN/CSA 22.2 No.60950-1 • TUV/GS to EN 60950-1 • CB to IEC 60950-1 with all country deviations • CE Marking • CCC for PS FRU
Electromagnetic Emissions Certifications	• FCC Part 15 Class A • EN 55022 Class A (CISPR22 Class A) • CNS13438 Class A (applicable only to FRU power supplies) • AS/NZS CISPR22 Class A • EN55024 • GR-1089 CORE Class A • EN 300 368 • MIC • CE Marking • China (applicable only to FRU power supplies)
NEBS	• GR-63-CORE, GR-1089-CORE • Level 3 Type 2, 4 and Wall Mount • AT&T TP76200 Checklist • TCG NEBS Checklist
ETSI	EN 300 019 - Storage: Class 1.2, Transportation: Class 2.3, In-Use: Class 3.2
Environmental	Reduction of Hazardous Substances (ROHS) 5
Noise Specifications	Office Product Spec: 48dBA at 30℃ (refer to ISO 7779)
Telco	CLEI code
Warranty	Limited Lifetime Warranty

Service and Support

Cisco and its partners can help you deploy a robust, dependable Cisco desktop switching solution by taking a lifecycle approach that addresses all aspects of deploying, operating, and optimizing a complex solution, including people, processes, and technology.

Whether you are migrating your existing Cisco desktop switching solution or deploying a new solution, this approach helps align business and technical goals throughout the solution lifecycle. Upgrading from one Cisco IOS Software feature set (IP Base or IP Services) to another (IP Services or Advanced IP Services) involves the software activation process described in this document. Customers must purchase a feature- set-specific Cisco SMARTnet® Service contract to help ensure service coverage for newly activated Cisco IOS Software feature sets.

Cisco and its partners are specialists in Cisco desktop switching products and technologies, business analysis, and project management. Cisco services are available through various service programs designed to help accelerate customer success throughout the network lifecycle. For more information about Cisco Services, see Cisco Technical Support Services or Cisco Advanced Services.

Ordering Information

Table 7 lists ordering information for the Cisco Catalyst 2350 Series Switches. To place an order, visit the Cisco ordering homepage at: http://www.cisco.com/en/US/ordering/or13/or8/order_customer_help_how_to_order_listing.html.

Table 7. Ordering Information for the Cisco Catalyst 2350 Series Switches

Cisco Catalyst 2350 Series Switch	
Product Number	**Product Description**
Catalyst 2350-48TD-S	• 48 10/100/1000 ports + 2 X2-based 10 Gigabit Ethernet ports • 128-Gpbs, wire rate switch fabric • Field-replaceable 265WAC power supply and fan tray • 1-RU fixed configuration multilayer switch
Catalyst 2350-48TD-SD	• 48 10/100/1000 ports + 2 X2-based 10 Gigabit Ethernet ports • 128-Gpbs, wire rate switch fabric • Field-replaceable 265WDC power supply and fan tray • 1-RU fixed configuration multilayer switch
Power Supplies and Fan Module for the Cisco Catalyst 2350 Series Switches	
C3K-PWR-265WAC=	Catalyst 3750-E 265WAC power supply
C3K-PWR-265WDC=	Catalyst 3750-E 265WDC power supply
C3K-BLWR-60CFM=	Fan Module for the Catalyst 3750-E
TwinGig Converter Module for the Cisco Catalyst 2350 Series Switches	
CVR-X2-SFP=	TwinGig Converter Module
SFPs for the Cisco Catalyst 2350 Series Switches	
GLC-T=	1000BASE-T SFP
GLC-SX-MM=	GE SFP, LC connector SX transceiver
10GB X2 Module for Cisco Catalyst 2350 Series Switches	
X2-10GB-SR=	10GBASE-SR X2 Module
X2-10GB-CX4=	10GBASE-CX4 X2 Module
X2-10GB-LRM=	10GBASE-LRM X2 Module
Spare Power Cords for the Cisco Catalyst 2350 Series Switches	
CAB-AC=	Power Cord, 110V
CAB-16AWG-AC=	AC Power cord, 16AWG
CAB-ACA=	Plug, Power Cord, Australian, 10A
CAB-ACE=	Power Cord Europe
CAB-ACI=	Power Cord-Italian
CAB-ACR=	Power Cord Argentina
CAB-ACS=	Power Cord for Switzerland
CAB-ACU=	Power Cord UK
CAB-JPN=	Power Cord-Japan
CAB-L620P-C13-US=	Power Cord, 250VAC, 15A, NEMA L6-20 to C13, US
CAB-L620P-C13-JPN=	Power Cord, 250VAC, 15A, NEMA L6-20 to C13, JAPAN
CAB-IND=	Power Cord India
CAB-SFP-50CM=	SFP Interconnect Cable, 50 cm
Spare Rack Mount Kits for the Cisco Catalyst 2350 Series Switches	
RCKMNT-E-1RU=	Rack Mount Kit (1RU) for Catalyst 3750-E
RCKMNT-E-MISC=	RckMnt 1RU 23in 24in ETSI WallMnt for Cat 3750-E and 3560-E

For More Information

For more information about the Cisco Catalyst 2350 Series Switches, visit http://www.cisco.com/en/US/products/hw/switches/index.html or contact your local account representative.

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