Cisco Industrial Ethernet 2000U Series Switches

Product Overview

The Cisco® 2000U Industrial Ethernet Switches (IE 2000U) are a range of compact switches designed for the harsh, rugged environments often found in the energy and utility industries. IE 2000U switches are designed to support the communications infrastructure needs for the energy delivery infrastructure across distributed generation, transmission, and distribution sectors. This infrastructure includes utility- and customer-owned energy infrastructure, such as substation applications supporting electrical transmission and distribution, renewable generation, oil and gas, water, distributed generation, cogeneration, and trackside operations. The infrastructure also includes communications infrastructure for delivery applications such as transmission pipelines, distribution mains, and service lines for oil and gas and water.

Features and Benefits

Cisco IE 2000U Series Switches are designed for DIN rail mounting, low port counts, and small sizes:

- 4, 8, or 16 10/100BASE-T Ethernet ports fixed configurations with compact form factor
- 2x Gigabit combo ports, Small Form-Factor Pluggable (SFP) (100MB and 1G) or RJ45 uplinks
- IEC-62439-3: Parallel Redundancy Protocol/High-Availability Seamless Redundancy (PRP/HSR) support in hardware
- Dual-input DC power supply, alarm relays, DIN rail mount
- Swappable SD flash card, mini-USB connector
- Substation environmental compliance and certifications: IEC-61850-3 and IEEE 1613
- Conformal coating available

Primary IE 2000U Features

- Rugged industrial design and substation compliance: IEC-61850-3 and IEEE 1613 for utility substation environments
- Advanced quality of service (QoS) capabilities to support mission-critical substation applications such as Supervisory Control and Data Acquisition (SCADA) and IEC 61850 Generic Object Oriented Substation Events (GOOSE) messaging
- Tools for easy deployment, management, and replacement
- Extensive instrumentation and remote diagnostic capabilities
- Comprehensive network security features based on open standards

Primary Business Benefits

The IE 2000U is designed for network security, high availability, ease of use, and durability. Table 1 lists the business benefits of the IE 2000U.

Table 1. Primary Business Benefits of the IE 2000U

Benefits	Description
Rugged design for substation compliance	• Compliant with IEEE 1613 and IEC-61850-3 substation standards for rugged design. • Convection cooled, with no moving parts or fans for maximum reliability and reduced network outages.
Network security	• Advanced Cisco IOS® Software features such as 802.1x, Layer 2–Layer 4 access control lists (ACLs), port security, protected port/private VLAN, user network interfaces/enhanced network interfaces (UNI/ENI) in default shutdown mode and configuration file security to prevent unauthorized network access and reduce operational costs of securing the network.
High availability and redundancy	• Advanced Cisco IOS Software features such as Resilient Ethernet Protocol (REP) and FlexLink provide fast reconvergence in ring and hub-and-spoke topologies, minimizing network downtime and associated costs. • Hardware ready to support IEC 62439-3 protocols for transparent redundancy: Parallel Redundancy Protocol/High-Availability Seamless Redundancy (PRP/HSR) • Field-replaceable components such as power supplies and SFPs reduce redeployment time. • Optional redundant, hot-swappable power supply provides additional redundancy.
Ease of use	• Intuitive graphical user interface (GUI) in Cisco Configuration Professional simplifies configuration of switches and reduces training time and costs. Utility-focused enhancements have been added to further increase ease of use. • Smartport templates provide one-touch global and port-level macros to simplify switch deployments.
Investment protection	• Two Cisco IOS Software images are available from which to choose. This choice allows you to choose the right feature set for your networking needs. • Advanced Layer 2 switching feature set comes standard with the IE 2000U. • Ongoing development of software capabilities leads to a longer product lifecycle, lowering the total cost of ownership.
Energy efficiency	The IE 2000U architecture provides energy-saving features that include the following: • High-efficiency power supplies with dual connections for redundancy and high availability. • No fans are used, which reduces overall power consumption.

Software Optimized for Energy Applications

The IE 2000U software is optimized for energy applications and builds on the strength of Cisco IOS Software, which powers mission-critical networks across the world. Numerous new features make the IE 2000U the optimal Ethernet switch for energy network operators, such as Smartport templates, which enable simple configuration for utility environments. Features such as Generic Online Diagnostics (GOLD) publish an event when critical failures are detected, and this can be retrieved from the switch. Also, onboard failure logging (OBFL) collects and logs information from critical sensors in the switch, monitoring voltage, temperature, and other information.

In addition, many default behaviors of the IE 2000U are different from those of traditional Ethernet switches, making the IE 2000U easier to configure, manage, secure, and troubleshoot.

High Availability and Redundancy

High availability is a vital requirement for networks that transport mission-critical data. The IE 2000U supports dual connections for power supplies, SFP modules, and the connected grid swap drive, which increase network uptime and minimize redeployment time in the field. In addition, external alarm inputs/outputs allow network operators to monitor changes in the switch's environmental conditions before a failure occurs.

To further increase high availability on a networkwide level, the IE 2000U offers REP and FlexLink for fast reconvergence, link-state tracking, IEEE 802.1w Rapid Spanning Tree Protocol (RSTP), and per-VLAN Rapid Spanning Tree Plus (PVRST+). These capabilities help to create redundant, failsafe topologies. Strong, built-in security helps prevent the device and the network from succumbing to malicious attacks, thereby enhancing network uptime.

Security

The wide range of security features on the IE 2000U protects mission-critical traffic, prevents unauthorized access, and maintains uninterrupted operation. The IE 2000U protects operational and nonoperational data by focusing on securing connectivity, defending against network threats, and providing trust and identity features.

Protecting a network begins with securing connectivity. For example, ACLs can be used to restrict access to sensitive portions of the network. To defend against network threats such as Dynamic Host Configuration Protocol (DHCP) spoofing, DHCP snooping can be used to allow only DHCP requests (but not responses) from untrusted user-facing ports. Workforce management is a critical use case, where trust and identity features such as IEEE 802.1x can be used to enable strong security policies, yet provide maximum mobility to a remote workforce.

Table 2 lists these and other primary features of the security solution.

Table 2. Primary Features for Each Area of Comprehensive Security Solution

Secure Connectivity	Threat Defense	Trust and Identity
UNI/ENI default: control traffic shut down	Configurable control plane security	ACLs
DHCP snooping and IP source guard	Storm control	IEEE 802.1x
Dynamic Address Resolution Protocol (ARP) inspection	Port security	UNI/ENI default: port down
Private VLAN	Configurable per-VLAN MAC learning	Configuration file security

Switch Management Options

The IE 2000U offers an easy-to-use GUI for configuration through the Cisco Configuration Professional tool, as well as a superior command-line interface (CLI) for detailed configuration. In addition, the switches support Simple Network Management Protocol (SNMP) for networkwide management. Network operators can integrate the IE 2000U transparently into their network operations centers and enable improved flow-through provisioning.

Network operators can also manage the IE 2000U using SNMP Versions 2 and 3. A comprehensive set of MIBs is provided for network operators to collect traffic information from the IE 2000U.

Switch Performance and Scalability

- Line-rate/nonblocking uplink/downlink ports
- Forwarding rate: 6.5 mpps with 64-byte packets
- Egress buffer: 2MB
- Unicast MAC addresses: 8000
- IGMP multicast groups: 255
- Max VLANs: 255
- IPv4 MAC security Access Control Entries (ACE): 384 (default ternary content-addressable memory [TCAM] template)

- Switching Database Manager (SDM) templates for Layer 2 deployments: optimizes memory allocation to the desired features based on deployment-specific requirements

Switch Configurations

Figure 1 shows switch models, and Table 3 shows Cisco IE 2000U Series Switch configuration information.

Figure 1. Switch Models

Table 3. Cisco IE 2000U Series Configurations

Product Number	Total Ports	RJ45 Ports	Combo Ports	SFP Ports	Software	IEEE 1588
IE-2000U-4TS-G	6	4		2 GE	LAN Base	
IE-2000U-4T-G	6	6 (2 GE)			LAN Base	
IE-2000U-8TC-G	10	8	2 GE		LAN Base	X
IE-2000U-16TC-G	20	16	2 GE + 2FE		LAN Base	X
IE-2000U-16TC-G-X*	20	16	2 GE + 2FE		LAN Base	X
IE-2000U-16TC-GP	20	16	2 GE		LAN Base	X

* Conformal coating.

IE 2000U switches are field upgradable from LAN Base to IP Services image.

Table 4 shows power supplies and accessories.

Table 4. Power Supplies and Accessories

Product Number	Description
PWR-IE50W-AC	AC to DC 24V/2.1A DIN rail power supply, 110/220 VAC and 88-300 VDC
PWR-IE65W-PC-AC=	PoE AC input power module for IE 2000U Series Switches, 110/220 VAC
PWR-IE65W-PC-DC=	PoE DC input power module for IE 2000U Series Switches, 18–60 VDC
MEM-SD-1GB-RGD	1GB industrial-grade secure digital (SD) memory card
STK-RACKMNT-2955	19” DIN rail mount Kit

Product Specifications

Table 5 lists product specifications.

Table 5. Specifications

Description	Specification
Hardware	• 256MB DRAM with ECC memory • Hardware support for IEEE 1588v2, PTP • 64MB onboard flash memory • 1GB removable SD flash memory card (CG swap drive) • Mini-USB connector
Alarm	• Alarm I/O: two alarm inputs to detect dry contact open or closed, one alarm output relay
Power supply	• Redundant DC input voltage with operating range: 9.6 to 60 VDC • Maximum DC input current: 0.5A @48 VDC, 1A @24 VDC
Power consumption	• 6-port models: 9.5-15W • 10-port models: 11-16W • 20-port models: 13-20W
Connectors and cabling	• 100BASE-FX MMF (2 km), -LX SMF (10 km), -ZX SMF (100 km), BX10 SMF (10 km) SFP and CWDM SFP-based ports: LC fiber connectors • 10/100/1000BASE-T ports: RJ-45 connectors, 4-pair Category 5 UTP cabling
Dimensions (H x W x D), including DIN rail	• IE-2000U 6 ports chassis: 5.1 x 2.95 x 4.51 in (12.7 x 7.37 x 11.46 cm) • IE-2000U 10 ports long chassis: 5.1 x 3.6 x 5.26 in (12.7 x 8.89 x 13.36 cm) • IE-2000U 20 ports chassis: 5.1 x 5.0 x 5.26 in (12.7 x 12.45 x 13.36 cm)
Weight	• IE-2000U 6 ports chassis: 2.45 lbs (1.11 kg) • IE-2000U 10 ports long chassis: 3.45 lbs (1.56 kg) • IE-2000U 20 ports chassis: 4.35 lbs (1.97 kg)

Table 6 lists the primary features in the LAN Base Cisco IOS Software image.

Table 6. Primary Features for LAN Base Cisco IOS Software Image

LAN Base	
Per port per VLAN ingress policing	Resilient Ethernet Protocol
SCADA protocol classification using ACLs	FlexLink
Per GOOSE VLAN classification/statistics	Link-state tracking
Configurable egress queue bandwidth	UDLD
Configurable egress buffers/thresholds	xSTP: 802.1s/802.1w
Strict priority queuing with optional policer	EtherChannel/LACP/PAgP
IEEE 802.1x and identity-based network services	
Web- and MAC-based authentication	External alarm contacts
Port security + Cisco enhancements	Modbus memory map support
DHCP snooping, dynamic ARP inspection, IP source guard	Express setup
Spanning Tree Protocol security mechanisms	Cisco Configuration Professional
Storm control	Utility-specific Smartport macros
Wire-speed L2–L4 ACLs	DHCP autoconfig/image upgrade
Private VLAN	Config rollback/replace
Secure connectivity: SSH/SSL/SCP	SPAN/RSPAN
RADIUS/TACACS+	Layer 3 IP SLA
SNMPv3 crypto	GOLD

LAN Base	
Configuration file security	OBFL
UNI/ENI and NNI port types (configurable on all ports)	Time Domain Reflectometry (copper ports)
Configurable per VLAN MAC learning	Digital Optical Monitoring (DOM), optical ports
MAC address learning and aging notifications	Ethernet OAM Connectivity Fault Management (CFM): IEEE 802.1ag Ethernet in the first mile (EFM): IEEE 802.3ah Ethernet LMI (PE) -MEF Ethernet LMI (CE): MEF CFM to E-LMI Interworking CFM to EFM Interworking 802.1ag + IPSLA (Ethernet SLAs)
Configurable control plane security	
IEEE 802.1AR for hardware-based security	

Management and Standards

Table 7 provides management and standards support information for the IE 2000U.

Table 7. Management and Standards

Description	Specification	
Management	• BRIDGE-MIB (RFC1493) • BGP4-MIB (RFC1657) • CISCO-CABLE-DIAG-MIB • CISCO-BULK-FILE-MIB • CISCO-CDP-MIB • CISCO-CONFIG-COPY-MIB • CISCO-CONF-MAN-MIB • CISCO-DATA-COLLECTION-MIB • CISCO-ENVMON-MIB • CISCO-ERR-DISABLE-MIB • CISCO-ETHERNET-ACCESS-MIB • CISCO-FLASH-MIB • CISCO-FTP-CLIENT-MIB • CISCO-IETF-DOT3-OAM-MIB • CISCO-IGMP-FILTER-MIB • CISCO-IPLSA-ETHERNET-MIB • CISCO-PAGP-MIB • CISCO-PAE-MIB • CISCO-PING-MIB • CISCO-POE-EXTENSIONS-MIB • CISCO-PRIVATE-VLAN-MIB • CISCO-PROCESS-MIB • CISCO-PORT-QOS-MIB • CISCO-PORT-SECURITY-MIB • CISCO-PORT-STORM-CONTROL-MIB • CISCO-IMAGE-MIB • CISCO-LAG-MIB • CISCO-L2L3-INTERFACE-CONFIG-MIB • CISCO-MAC-NOTIFICATION-MIB • CISCO-MEMORY-POOL-MIB • CISCO-RTTMON-MIB • CISCO-STACK-MIB • CISCO-STP-EXTENSIONS-MIB	• CISCO-SYSLOG-MIB • CISCO-TCP-MIB • CISCO-UDLDP-MIB • CISCO-VLAN-IFTABLE-RELATIONSHIP-MIB • CISCO-VLAN-MEMBERSHIP-MIB • ENTITY-MIB (RFC2737) • ETHERLIKE-MIB • IEEE8021-PEA-MIB • IEEE8023-LAG-MIB • IF-MIB (RFC 1573) • 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 (MIB-II) • RMON-MIB (RFC 1757) • RMON2-MIB (RFC 2021) • SNMP-FRAMEWORK-MIB (RFC2571) • SNMP-MPD-MIB (RFC 2572) • SNMP-NOTIFICATION-MIB (RFC 2573) • SNMP-TARGET-MIB (RFC 2573) • SNMPv2-MIB (RFC 1907) • SNMP-USM-MIB (SNMP-USER-BASED-SM-MIB) (RFC2574) • SNMP-VACM-MIB (SNMP-VIEW-BASED-ACM-MIB) (RFC2575) • TCP-MIB (RFC 2012) • UDP-MIB (RFC 2013)

Description	Specification
Standards and protocols	• IEEE 802.1s • IEEE 802.1w • IEEE 802.1x • IEEE 802.3ad • IEEE 802.3ah • IEEE 802.1ag • IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports • IEEE 802.1D Spanning Tree Protocol • IEEE 802.1p CoS classification • IEEE 802.1Q VLAN • IEEE 802.3 10BASE-T • IEEE 802.3u 100BASE-T • IEEE 802.3ab 1000BASE-T • IEEE 802.3z 1000BASE-X • IEEE 802.3af (IE-2000U-16TC-GPE only) • IEEE 802.3at (IE-2000U-16TC-GPE only) • IEEE 1588v2 hardware ready • IPv6: MLD Snooping v1 and v2 • Management: SNMP versions 1, 2, and 3

SFPs for Cisco IE 2000U Switches

Table 8 provides SFP support information.

Table 8. SFP Support

Description	Description	Temperature Range*
GLC-FE-100FX-RGD=	100BASE-FX multimode rugged SFP	IND
GLC-FE-100LX-RGD=	100 Mbps single-mode rugged SFP	IND
GLC-SX-MM-RGD=	1000 Mbps multimode rugged SFP (supported on gigabit SFP ports only)	IND
GLC-LX-SM-RGD=	1000 Mbps single-mode rugged SFP (supported on gigabit SFP ports only)	IND
GLC-ZX-SM-RGD=	1000BASE-ZX single-mode rugged SFP (supported on gigabit SFP ports only)	IND
GLC-LH-SMD=	1000BASE-LX/LH SFP (DOM)	EXT
GLC-SX-MMD=	1000BASE-SX SFP (DOM)	EXT
GLC-ZX-SMD=	1000BASE-ZX Gigabit Ethernet SFP (DOM)	EXT
GLC-EX-SMD=	GE SFP, LC connector, EX transceiver	EXT
GLC-BX-D=	1000BASE-BX SFP, 1490NM	COM
GLC-BX-U=	1000BASE-BX SFP, 1310NM	COM
GLC-FE-100LX=	100BASE-LX SFP for FE port	COM
GLC-FE-100BX-D=	100BASE-BX10-D SFP	COM
GLC-FE-100BX-U=	100BASE-BX10-U SFP	COM
GLC-FE-100FX=	100BASE-FX SFP for FE port	COM
GLC-FE-100EX=	100BASE-EX SFP (40 km)	COM
GLC-FE-100ZX=	100BASE-ZX SFP (80 km)	COM
CWDM-SFP-1xxx= (i.e., 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610)	CWDM SFP w/ DOM (8 channels)	COM

*If nonindustrial (i.e., EXT, COM) SFPs are used, the IE 2000U operating temperature range must be derated.

Temperature Range	IE 2000U Operating Temperature Range Support
IND	-40ºF to +158ºF (-40ºC to +70ºC)
EXT	+23ºF to +158ºF (-5ºC to +70ºC)
COM	+32ºF to +131ºF (0ºC to +55ºC)

Safety and Compliance

Table 9 gives safety and compliance information for the IE 2000U.

Table 9. Safety and Compliance Specifications

Description	Specification
Environmental substation compliance	• IEC 61850-3 (reference certificate of approval) • IEEE1613 (reference certificate of approval)
EMC interface immunity	• IEC61000-4-2 (Criteria A—Class 2) • IEC61000-4-3/ENV50204 (Criteria A) • IEC61000-4-4 (Criteria A/Criteria B) • IEC61000-4-5 (Criteria B) • IEC61000-4-6 (Criteria A)
Standard electromagnetic emissions certifications	• FCC Part 15 Class A • EN 55022B Class A (CISPR22 Class A) • EN 55024 • EN 300 386 • VCCI Class I • AS/NZS 3548 Class A or AS/NZS CISPR22 Class A • KCC • CE Marking
Standard safety certifications	• UL 60950-1 • CSA 60950-1 • EN 60950-1 • IEC 60950-1 • ITE 60950-1 • UL 508
Operating environment	• -40 ºF to 158ºF (-40 to +70ºC) continuous operating temperature range • -40 ºF to 185ºF (-40 to +85ºC) type tested at 85ºC • Operating altitude: -60 m (-200 ft) to 3,000 m (10,000 ft), derate maximum operating temperature per IEEE-1613-2009 • Relative humidity: 5% to 95% noncondensing
Storage environment	• Temperature: -50ºC to +85 ºC • Altitude: 15,100 ft (4,600 m)
Industry Standard	• IP30

Warranty Information

IE 2000U Series Switches come with a five-year limited hardware warranty. More information is available on www.cisco-servicefinder.com/warrantyfinder.aspx.

Service and Support

Cisco offers a wide range of services programs to accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, resulting in high levels of customer satisfaction. Cisco Services help you protect your network investment, optimize network operations, and prepare your network for new applications to extend network intelligence and the power of your business. For more information about Cisco Services, refer to Cisco Technical Support Services or Cisco Advanced Services at www.cisco.com/go/services. For more information about Cisco products, contact:

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