The bridge to possible

Cisco 4000 Series Integrated Services Routers

Contents

Cisco 4000 Series Integrated Services Routers provide a software-defined WAN platform that delivers the performance, security, and convergence capabilities that today's branch offices need.

Product overview

The Cisco® 4000 Series Integrated Services Routers (ISR 4000) revolutionize WAN communications in the enterprise branch. With new levels of built-in intelligent network capabilities and convergence, they specifically address the growing need for application-aware networking in distributed enterprise sites. These locations tend to have lean IT resources. But they often also have a growing need for direct communication with both private data centers and public clouds across diverse links, including Multiprotocol Label Switching (MPLS) VPNs and the internet.

The ISR 4000 Series contains the following platforms: the 4461, 4451, 4431, 4351, 4331, 4321, and 4221 ISRs.

Figure 1.
Cisco 4000 Series Integrated Services Routers

Features and benefits

The ISR 4000 Series provides you with Cisco Software-Defined WAN (SD-WAN) software features and a converged branch infrastructure. Along with superior throughput, these capabilities form the building blocks of next-generation branch-office WAN solutions.

Cisco SD-WAN

Cisco SD-WAN is a set of intelligent software services that allow you to reliably and securely connect users, devices, and branch office locations across a diverse set of WAN transport links. SD-WAN-enabled routers such as the ISR 4000 Series dynamically route traffic across the "best" link based on up-to-the-minute application and network conditions for great application experiences. You get tight control over application performance, bandwidth usage, data privacy, and availability of your WAN links — control that you need as your branches conduct greater volumes of mission-critical business.

Cisco converged branch infrastructure

The ISR 4000 Series consolidates many must-have IT functions, including network, compute, and storage resources. The high-performance, integrated routers run multiple concurrent services, including encryption, traffic management, and WAN optimization, without slowing your data throughput. And you can activate new services on demand through a simple licensing change.

Cisco intent-based networking and Cisco DNA

The last few years have seen a rapid transformation and adoption of digital technologies. This puts pressure on the network teams supporting this changing infrastructure – especially when provisioning, managing, monitoring, and troubleshooting these diverse devices. Additionally, innovations such as SD-WAN, Network Functions Virtualization (NFV), open APIs, and cloud management show great promise in transforming organizations' IT networks. This transformation raises further questions and challenges for IT teams.

The Cisco Digital Network Architecture (Cisco DNA) is an open, extensible, software-driven architecture that provides for faster innovation, helping to generate deeper insights and deliver exceptional experiences across many different applications. Cisco DNA relies on intent-based networking, a revolutionary approach in networking that helps organizations automate, simplify, and secure the network.

The intent-based Cisco DNA network is:

- Informed by context: Interprets every byte of data that flows across it, resulting in better security, more customized experiences, and faster operations.

- Powered by intent: Translates your intent into the right network configuration, making it possible to manage and provision multiple devices and things in minutes.

- Driven by intuition: Continually learns from the massive amounts of data flowing through it and turns that data into actionable insight. Helps you solve issues before they become problems and learn from every incident.

Cisco DNA Center provides a centralized management dashboard across your entire network – the branch, campus, data center, and cloud. Rather than relying on box-by-box management, you can design, provision, and set policy end-to-end from the single Cisco DNA Center interface. This allows you to respond to organizational needs faster and to simplify day-to-day operations. Cisco DNA Analytics and Assurance and the Network Data Platform (NDP) help you get the most from your network by continuously collecting and putting insights into action. Cisco DNA is open, extensible, and programmable at every layer. It integrates Cisco and third-party technology, open APIs, and a developer platform to support a rich ecosystem of network-enabled applications.

Application visibility[*]

Applications and users are more distributed than ever, and the internet has effectively become the new enterprise WAN. As organizations continue to embrace internet, cloud, and Software as a Service (SaaS), network and IT teams are challenged to deliver consistent and reliable connectivity and application performance over networks and services they don't own or directly control.

Cisco ThousandEyes is natively integrated on eligible ISR 4000 Series platforms to expand visibility across the internet, cloud, and SaaS. IT managers now have expanded visibility, including hop-by-hop analytics, into network underlay, proactive monitoring of SD-WAN overlay, and performance measurement of SaaS applications. This granular visibility ultimately lowers the Mean Time To Identification of issues (MTTI) and accelerates resolution time.

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[*] Available in Release 17.6, targeted for Q3CY21.

Table 1 breaks out many of the features and benefits of the ISR 4000 Series that create an SD-WAN and a converged branch infrastructure.

Table 1.   General feature highlights

Business requirement(s)	Feature/solution
Performance • Throughput • Service reliability	• Concurrent software services at speeds up to 2 Gbps. Backplane architecture supports high-bandwidth module-to-module communication at speeds up to 10 Gbps. • A distributed multicore architecture with the industry's first internal services plane. • Remote installation of application-aware services, which run identically to their counterparts in dedicated appliances.
Lower WAN expenditures	• Embedded SD-WAN solution for creating lower-cost, business-class internet connections.
Pay-as-you-grow • Performance upgrade model • Investment protection • CapEx budget management	• Router capacity can be increased with a remote performance-on-demand license upgrade (no hardware upgrade) for exceptional savings.
Superior and secure user application experiences	• ISR-AX "Application Experience" software bundle with advanced routing and network monitoring services. • Dynamic Multipoint VPN (DMVPN), zone-based firewalls, intrusion prevention (Snort® and Cisco Umbrella® Branch), and content management using Cisco Cloud Web security and OpenDNS®, protecting data, providing authentication credentials, and transmissions not backhauled through the data center. • Secure Boot feature performs hardware-based authentication of the bootloader software to prevent malicious or unintended software from booting on the system. • Code signing verifies digital signatures of executables prior to loading to prevent execution of altered or corrupted code. • Hardware authentication protects against hardware counterfeiting by using onboard tamper-proof silicon, including field-replaceable modules. If authentication fails, the module is not allowed to boot.
IT consolidation, space savings, and improved total cost of ownership (TCO)	• Single converged branch platform integrates routing, switching, virtual server, storage, security, unified communications, WAN optimization, and performance management tools.
Business continuity and increased resiliency	• The 4400 Series ISRs (4461, 4451, and 4431) support dual integrated power supplies for backup. The entire ISR 4000 Series supports an optional power supply capable of delivering additional Power over Ethernet (PoE) to endpoints. • Modular network interfaces with diverse connection options enable load-balancing and network resiliency. • Modular interfaces with online removal and insertion (OIR) enable module upgrades without network disruption. • Cisco Unified Survivable Remote Site Telephony (SRST) serves as a resiliency complement to Cisco Hosted Collaboration Solution (HCS), a Cisco cloud-based UC service. • Support for multiple, diverse access links: T1/E1, T3/E3, serial, xDSL, 1 Gigabit Ethernet, and 10 Gigabit Ethernet.
Lower telephony costs with voice over IP (VoIP) and rich media experiences	• High-performance analog/digital gateway, allowing VoIP over less expensive Session Initiation Protocol (SIP) trunks. • Integrated IP PBX (Cisco Unified Communications Express) and Session Border Controller (Cisco Unified Border Element, or CUBE).

Business requirement(s)	Feature/solution
Easier manageability and support	- Single, universal software image for all features and performance-on-demand licensing flexibility. - No additional services and support needed for compute and storage. - Supported by Cisco and third-party management tools, with programmability and automation.
Visibility and actionable insight	- Internet and cloud intelligence with native integration with Cisco ThousandEyes.[*] - Sophisticated forecasting and what-if analysis for effective resource planning. - Insightful policy recommendations and root cause analysis based on traffic patterns.

[*] Available in Release 17.6, targeted for Q3CY21.

Platform architecture

Table 2 lists the primary hardware architectural features and benefits of the ISR 4000 Series. The routers run modular Cisco IOS® XE Software, widely deployed in the world's most demanding networks. The software's comprehensive portfolio of services spans multiple technology areas, including security, WAN optimization, application and network Quality of Service (QoS), and embedded management.

Table 2.   Architectural highlights

Architectural features	Benefits/description
Multicore processors	High-performance multicore processors support high-speed WAN connections. The data plane uses an emulated flow processor that delivers application-specific integrated circuit (ASIC)-like performance that does not degrade as services are added.
Embedded IP Security (IPsec) VPN hardware acceleration	Increases scalability. When combined with an optional Cisco IOS XE Software Security license, this feature enables WAN link security and VPN services.
Integrated Gigabit Ethernet ports	- The ISR 4000 Series provides up to four built-in 10/100/1000 Ethernet ports for WAN or LAN. - Depending on the platform, some of the 10/100/1000 Ethernet ports can support Small Form-Factor Pluggable (SFP)-based connectivity in addition to RJ-45 connections, enabling fiber or copper connectivity. - Optionally, depending on the platform, up to 30W of PoE+ can be enabled on two of the built-in front panel Gigabit Ethernet interfaces to provide power to external devices such as 4G LTE routers. - An additional dedicated Gigabit Ethernet port is provided for device management.[1]
USB-based console access	- A mini Type B USB console port[1] supports management connectivity when traditional serial ports are not available. - Traditional console and auxiliary ports are also available.[2]
Optional integrated power supply for distribution of PoE	- An optional upgrade to the internal power supply provides inline power (802.3af-compliant PoE or 802.3at-compliant PoE+) to optional integrated switch modules. - Redundant PoE conversion modules provide an additional layer of fault tolerance.
Optional integrated Redundant Power Supply (RPS)	- For the ISR 4400 Series, power redundancy is available by installing an optional integrated RPS for decreasing network downtime and protecting the network from power failures. - Optional PoE boost mode increases total PoE capacity to up to 1000W.

Architectural features	Benefits/description
Cisco EtherSwitch Service Module (SM-X)	• Each service-module slot offers high data-throughput capability of up to 10 Gbps toward the system and up to 1 Gbps to other module slots. • Support for both single- and double-wide service modules provides flexibility in deployment options. • An SM-X slot can be converted into a network interface module (NIM) slot using an optional carrier card. • Service modules support online insertion and removal (OIR), avoiding network disruption when installing new or replacement modules.[1]
Cisco Network Interface Modules (NIMs)	• Up to three integrated NIM slots on the ISR 4000 Series allow for flexible configurations. • Each NIM slot offers options of up to two 2-Gbps connections: one toward the route processor and one for direct module-to-module communication. The ISR 4221 has only one 1-Gbps connection to the route processor. • NIMs support OIR. • Special NIMs add support for SSDs and HDDs.[1]
Cisco Integrated Services Card (ISC) slot on motherboard	• The ISC slot natively supports the Cisco High-Density Packet Voice Digital Signal Processor Modules (PVDM4s), providing greater-density rich-media voice. • Each ISC slot connects to the system architecture through a link providing up to 2 Gbps. • Future modules can be hosted on the ISC slot, improving system functions.
Flash memory support	• A single flash memory slot is available to support high-speed storage densities, upgradable to up to 32 GB. The ISR 4221 ships with a fixed 8 GB flash. • Two USB 2.0 Type A ports provide capabilities for convenient storage.[1]
DRAM	• For the ISR 4400 Series, the default control-plane memory is 4 GB, upgradable to 16 GB to provide additional scalability for control-plane features. The default data-plane memory is 2 GB. • For the ISR 4300 Series, the default memory is 4 GB, upgradable to 16 GB (only 8 GB for the 4321) to provide additional scalability. • The ISR 4200 Series comes with 4 GB fixed DRAM

[1] Not supported on the ISR 4221.

[2] The ISR 4221 supports shared console and auxiliary ports.

[3] Unified Communications (UC) and UC-based NIMs are not supported.

Managing your 4000 Series ISRs

The Cisco network management applications listed at the top of Table 3 are standalone products that can be purchased or downloaded to manage your Cisco network devices. The applications are built specifically for the different operational phases; select those that best fit your needs. Those management capabilities listed under the "Cisco IOS XE Software Embedded Management Capabilities" heading are directly integrated into the routers' software operating system.

Table 3. Cisco DNA Center

Operational phase	Application	Description
Device staging and configuration	WebUI	• A GUI-based device-management tool for Cisco IOS and Cisco IOS XE Software-based access routers. This tool simplifies routing, firewall, VPN, unified communications, and WAN and LAN configuration through easy-to-use wizards.
Networkwide deployment, configuration, monitoring, and troubleshooting	Cisco Prime® Infrastructure	• Offers comprehensive lifecycle management of wired and wireless access, campus, and branch-office networks, rich visibility into end-user connectivity, and application performance assurance. • Provides wired lifecycle functions such as inventory, configuration, and image management; automated deployment; compliance reporting; integrated best practices; and reporting.
Staging, deployment, and changes to configuration and image files	Cisco Configuration Engine	• A secure network management product that provides zero-touch image and configuration distribution through centralized, template-based management.
Context-aware security configuration and monitoring	Cisco Prime Security Manager	• Management tool for configuring and managing context-aware security. The application supports both single- and multi-device manager form factors. • Provides the ability to write and enforce the granular context-aware security policies.
Cisco Wide Area Application Service (WAAS) management	Cisco WAAS Central Manager	• The management tool for the WAAS[1] (WAN optimization and application acceleration) integrated service. It provides a centralized mechanism for configuring WAAS features, reporting, and monitoring.

Cisco IOS XE Software embedded management capabilities	
Feature	**Description**
Cisco IOS Embedded Event Manager (EEM)	• A distributed and customized approach to event detection and recovery. • Offers the ability to monitor events and take informational, corrective, or any desired EEM action when the monitored events occur or when a threshold is reached.
Cisco IOS XE IP Service-Level Agreements (IP SLAs)	• Helps assure the performance of new business-critical IP applications as well as IP services that use data and voice in an IP network.
SNMP, Remote Monitoring (RMON), syslog, NetFlow, IP Flow Information Export (IPFIX)	• Network monitoring and accounting tools.

[1] We recommend using AppNav with an external WAAS device for the ISR 4221.

Product sustainability

Information about Cisco's Environmental, Social and Governance (ESG) initiatives and performance is provided in Cisco's CSR and sustainability reporting.

Sustainability Topic		Reference
General	Information on product-material-content laws and regulations	Materials
	Information on electronic waste laws and regulations, including our products, batteries and packaging	WEEE Compliance
	Sustainability Inquiries	Contact: csr_inquiries@cisco.com
	Information on product takeback and resuse program	Cisco Takeback and Reuse Program
	Airflow	Table 4. Specifications: Airflow
	Mean Time Between Failures (MTBF)	Table 4. Specifications: MTBF
	Operating conditions	Table 4. Specifications: Operating conditions
	Nonoperating conditions	Table 4. Specifications: Nonoperating conditions
	Safety, EMC and Telecom	Table 4. Specifications: Regulatory and compliance
Power	Product power information	Table 4. Specifications: Power specifications
	DC Power	Support for DC Power
Material	Product packaging weight and materials	Contact: environment@cisco.com
	Product and packaging dimensions and weights	Table 4. Specifications: Size and weights

Product specifications

Table 4 lists the general product specifications for the ISR 4000 Series.

Table 4.   Specifications

Technical specifications	ISR 4461	ISR 4451	ISR 4431	ISR 4351	ISR 4331	ISR 4321	ISR 4221
Aggregate throughput (default)	1.5 Gbps	1 Gbps	500 Mbps	200 Mbps	100 Mbps	50 Mbps	35 Mbps
Aggregate throughput (Performance license)	3 Gbps	2 Gbps	1 Gbps	400 Mbps	300 Mbps	100 Mbps	75 Mbps
Aggregate Cisco Express Forwarding only[1] throughput (Boost license)	Over 7 Gbps	Over 4 Gbps	Over 4 Gbps	Over 2 Gbps	Over 2 Gbps	1.5 Gbps	1.2 Gbps
Total onboard WAN or LAN 10/100/1000 ports	4	4	4	3	3	2	2
Total onboard WAN or LAN 10-Gbps ports	2	–	–	–	–	–	–
RJ45-based ports	4	4	4	3	2	2	2
SFP-based ports	4	4	4	3	2	1	1
Enhanced service-module slots	3	2	0	2	1	0	0
Double-wide service-module slots	2	1 (assumes no single-wide SM-X modules installed)	0	1 (assumes no single-wide SM-X modules installed)	0	0	0
NIM slots	3	3	3	3	2	2	2
OIR (all I/O modules)	Yes	Yes	Yes	Yes	Yes	Yes	No

Technical specifications	ISR 4461	ISR 4451	ISR 4431	ISR 4351	ISR 4331	ISR 4321	ISR 4221
Onboard ISC slot	1	1	1	1	1	1	No
Default memory double-data-rate 3 (DDR3) error-correction-code (ECC) DRAM (combined control, services, and data planes)	–	–	–	4 GB	4 GB	4 GB	4GB
Maximum memory DDR3 ECC DRAM (combined control, services, and data planes)	–	–	–	16 GB	16 GB	8 GB	4GB
Default memory DDR3 ECC DRAM (data plane)	4 GB	2 GB	2 GB	–	–	–	–
Maximum memory DDR3 ECC DRAM (data plane)	4 GB	2 GB	2 GB	–	–	–	–
Default memory DDR3 ECC DRAM (control and services plane)	8 GB	4 GB	4 GB	–	–	–	–
Maximum memory DDR3 ECC DRAM (control and services plane)	32 GB	16 GB	16 GB	–	–	–	–
Default flash memory	8 GB	8 GB	8 GB	4 GB	4 GB	4 GB	8GB
Maximum flash memory	32 GB	32 GB	32 GB	16 GB	16 GB	8 GB	8GB
External USB 2.0 slots (Type A)	2	2	2	2	1	1	1
USB console port -Type B mini (up to	1	1	1	1	1	1	0

Technical specifications	ISR 4461	ISR 4451	ISR 4431	ISR 4351	ISR 4331	ISR 4321	ISR 4221
115.2 kbps)							
Serial console port - RJ45 (up to 115.2 kbps)	1	1	1	1	1	1	1 (combo CON/AUX port)
Serial auxiliary port - RJ45 (up to 115.2 kbps)	1	1	1	1	1	1	1 (combo CON/AUX port)
Power-supply options	Internal: AC, DC, and PoE	Internal: AC, DC, and PoE	Internal: AC, DC, and PoE	Internal: AC, DC, and PoE	Internal: AC, DC, and PoE	External: AC and PoE	External AC only
Redundant power supply	Internal: AC, DC, and PoE	Internal: AC, DC, and PoE	Internal: AC, DC, and PoE	–	–	–	–
Power specifications							
AC input voltage	100 to 240 VAC autoranging	100 to 240 VAC autoranging	100 to 240 VAC autoranging	100 to 240 VAC autoranging	100 to 240 VAC autoranging	100 to 240 VAC autoranging	100 to 240 VAC autoranging
DC input voltage **Input voltage** **Input current**	48 to 60V 12A max	48 to 60V 12A max	48 to 60V 12A max	– –	24 to 60V 14 – 5A	– –	– –
AC input frequency	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz	47 to 63 Hz
AC input current range, AC power supply (maximum)	7.1 to 3.0A	7.1 to 3.0A	3 to 1.3A	7.1 to 3.0A	3 to 1.3A	1.5 to 0.6A	1.5 to 0.6A
AC input surge current	60A peak and less than 5 Arms per half cycle	Less than 50A	60A peak and less than 5 Arms per half cycle	60A peak and less than 12 Arms per half cycle	60A peak and less than 5 Arms per half cycle	90A peak and less than 3 Arms per half cycle	90A peak and less than 3 Arms per half cycle

Technical specifications	ISR 4461	ISR 4451	ISR 4431	ISR 4351	ISR 4331	ISR 4321	ISR 4221
Typical power (no modules)		158W	65W	48W	42W	36W	24W
Maximum power with AC power supply	1000W (no PoE)	450W (no PoE)	250W (no PoE)	430W	250W	125W	90W
Maximum power with DC power supply	437W (no PoE)	437W (no PoE)	437W (no PoE)	437W (no PoE)	250W (no PoE)		
Maximum power with PoE power supply (platform only)	1000W with PoE redundant 1450W with PoE boost, no redundancy	1000W with PoE redundant 1450W with PoE boost, no redundancy	500W with PoE redundant 1000W with PoE boost, no redundancy	990W	530W	260W	(No PoE support)
Maximum endpoint PoE power available from PoE power supply	500W with optional redundancy	500W with optional redundancy	250W with optional redundancy	500W	250W	120W	(No PoE support)
Maximum endpoint PoE power capacity with PoE boost	950W with no redundancy	950W with no redundancy	500W with no redundancy	–	–	–	(No PoE support)
Sizes and weights							
Dimensions (H x W x D)	3.5 x 17.25 x 18.5 in 88.9 x 438.15 x 469.9 mm)	3.5 x 17.25 x 18.5 in (88.9 x 438.15 x 469.9 mm)	1.73 x 17.25 x 19.97 in (43.9 x 438.15 x 507.2 mm)	3.5 x 17.25 x 18.5 in (88.9 x 438.15 x 469.9 mm)	1.75 x 17.25 x 17.25 in (44.45 x 438.15 x 438.15 mm)	1.75 x 14.55 x 11.60 in (44.55 x 369.57 x 294.64 mm)	1.72 x 12.7 x 10 in (43.7 x 322.6 x 254 mm)
External power supply dimensions (H x W x D)	–	–	–	–	–	2.95 x 1.18 x 6.10 in (75 x 30 x 155 mm)	1.45 x 2.87 x 5.98 in (37 x 73 x 152 mm) (Phihong mfg PN: AA90U-120A-R) 1.44 x 2.64 x 6.10 in (36.5 x 67 x 155 mm) (Delta mfg PN: ADP90GR BA)

Technical specifications	ISR 4461	ISR 4451	ISR 4431	ISR 4351	ISR 4331	ISR 4321	ISR 4221
Shipping box dimensions (H x W x D)	9.75 x 22.25 x 26 in (24.76 x 56.51 x 66.04 mm)	9.75 x 22.25 x 26 in (24.76 x 56.51 x 66.04 mm)	7.88 x 22.25 x 28.75 in (200.2 x 565.1 x 730.25 mm)	9.75 x 22.25 x 26 in (24.76 x 56.51 x 66.04 mm)	7.125 x 22.75 x 22.5 in (180.98 x 577.85 x 571.5 mm)	7.0 x 21.5 x 16.125 in (177.8 x 546.1 x 409.6 mm)	4.13 x 18.25 x 12.94 in (104.9 x 463.6 x 328.7 mm)
Rack height	3 rack units (3RU)	2 rack units (2RU)	1 rack unit (1RU)	2 rack units (2RU)	1 rack unit (1RU)	1 rack unit (1RU)	1 rack unit (1RU)
Rack-mount 19-in. (48.3 cm) EIA	Included	Included	Included	Included	Included	Included	Optional
Rack-mount 23-in. (58.4 cm) EIA	Optional	Optional	Optional	Optional	Optional	–	–
Wall-mount	No	No	Yes	No	Yes	Mounting holes under chassis	Yes
Weight with 1x 450W AC power supply (no modules)		28.8 lb (13.1 kg)	–	28.8 lb (13.1 kg)	–	–	–
Weight with 1x 1000W AC power supply + 1 PoE power module (no other modules)		30.6 lb (13.9 kg)	–	29.0 lb (13.2 kg)	–	–	–
Weight with AC power supply (no modules)		–	18.5 lb (8.4 kg)	–	13.5 lb (6.2 kg)	7.7 lb (3.5 kg) + 1.2 lb (0.66 kg) external PS	7.1 lb (3.22 kg)
Weight with DC power supply (no modules)		28.8 lb (13.1 kg)	28.8 lb (13.1 kg)	28.8 lb (13.1 kg)	13.5 lb (6.2 kg)		
Weight with AC power supply with PoE (no modules)		–	18.6 lb (8.4 kg)	–	14.1 lb (6.4 kg)	–	–
Typical weight (fully loaded with modules)		42.7 lb (19.4 kg)	22.4 lb (10.2 kg)	37.7 lb (17.1 kg)	16.1 lb (7.3 kg)	9.14 lb (4.2 kg) + 1.2 lb (0.66 kg) external PS	8.11 lb (3.68 kg)

Technical specifications	ISR 4461	ISR 4451	ISR 4431	ISR 4351	ISR 4331	ISR 4321	ISR 4221
Packaging weight		6.4 lb (2.9 kg)	5.9 lb (2.7 kg)	6.4 lb (2.9 kg)	4.6 lb (2.1 kg)	2.2 lb (1 kg)	1.28 lb (0.58 kg)
Airflow	I/O side to bezel side	I/O side to bezel side	I/O side to bezel side	I/O side to bezel side	I/O side to bezel side	Right I/O side to left I/O side	I/O side to bezel side
Mean time between failures (MTBF)	480,770 hours	480,770 hours	512,970 hours	566,310 hours	587,250 hours	593,270 hours	593,270 hours
Environmental specifications							
Operating conditions							
Temperature	32° to 104°F (0° to 40°C)	32° to 104°F (0° to 40°C)	32° to 104°F (0° to 40°C)	32° to 104°F (0° to 40°C)	32° to 104°F (0° to 40°C)	32° to 104°F (0° to 40°C)	32° to 104°F (0° to 40°C)
Altitude (China)	0 to 6560 ft. (0 to 2000 m)	0 to 6560 ft. (0 to 2000 m)	0 to 6560 ft. (0 to 2000 m)	0 to 6560 ft. (0 to 2000 m)	0 to 6560 ft. (0 to 2000 m)	0 to 6560 ft. (0 to 2000 m)	0 to 6560 ft. (0 to 2000 m)
Altitude (rest of the world)	0 to 10,000 ft (0 to 3050 m)	0 to 10,000 ft (0 to 3050 m)	0 to 10,000 ft (0 to 3050 m)	0 to 10,000 ft (0 to 3050 m)	0 to 10,000 ft (0 to 3050 m)	0 to 10,000 ft (0 to 3050 m)	0 to 10,000 ft (0 to 3050 m)
Short-term temperature up to 6560 ft per NEBS GR-63-CORE	–	–	–	–	32° to 131°F (0° to 55° C) (for ISR 4331-DC version)	–	–
Relative humidity	5% to 85%	5% to 85%	5% to 85%	5% to 85%	5% to 85%	5% to 85%	5% to 85%
Short-term humidity	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air	5% to 90%, not to exceed 0.024 kg water/kg of dry air
Acoustics: Sound pressure (typical/ maximum)	50.6/73.1 dBA	50.6/73.1 dBA	54.3/79.1 dBA	50.6/73.1 dBA	52.8/74.8 dBA	24.2/51.9 dBA	28.5/53 dBA

Technical specifications	ISR 4461	ISR 4451	ISR 4431	ISR 4351	ISR 4331	ISR 4321	ISR 4221
Acoustics: **Sound power** **(typical/maximum)**	58.2/78.8 dBA	58.2/78.8 dBA	57.2/80.8 dBA	58.2/78.8 dBA	61.2/81.6 dBA	31.9/59.9 dBA	41/68 dBA
Nonoperating conditions							
Temperature	–40° to 158°F (–40° to 70°C)	–40° to 158°F (–40° to 70°C)	–40° to 158°F (–40° to 70°C)	–40° to 158°F (–40° to 70°C)	–40° to 158°F (–40° to 70°C)	–40° to 158°F (–40° to 70°C)	–40° to 158°F (–40° to 70°C)
Relative humidity	5% to 95%	5% to 95%	5% to 95%	5% to 95%	5% to 95%	5% to 95%	5% to 95%
Altitude	15,584 ft (4750 m)	15,584 ft (4750 m)	15,584 ft (4750 m)	15,584 ft (4750 m)	15,584 ft (4750 m)	15,584 ft (4750 m)	15,584 ft (4750 m)
Regulatory and compliance							
Safety	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1	UL 60950-1 CAN/CSA C22.2 No. 60950-1 EN 60950-1 AS/NZS 60950-1 IEC 60950-1
EMC	47 CFR, Part 15 ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024,	47 CFR, Part 15 ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity)	47 CFR, Part 15 ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024,	47 CFR, Part 15 ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024,	47 CFR, Part 15 ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024, CISPR 24 KN22, KN24	ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024, CISPR 24 KN22, KN24	ICES-003 Class A EN55032 Class A CISPR32 Class A AS/NZS CISPR 32 Class A VCCI V-3 CNS 13438 EN 300-386 EN 61000 (Immunity) EN 55024, CISPR 24 KN22, KN24

Technical specifications	ISR 4461	ISR 4451	ISR 4431	ISR 4351	ISR 4331	ISR 4321	ISR 4221
	CISPR 24 KN22, KN24	EN 55024, CISPR 24 KN22, KN24	CISPR 24 KN22, KN24	CISPR 24 KN22, KN24	EN 50121-1 EN61000-6-4 EN 50121-4		
Telecom	T1 IC CS-03:2004 TIA-968-B:2009 HKTA 2028:2010 HKTA 2017:2010 HKTA 2015: 2006 G.703:2001 ID0002:2007 IS6100:2004 DSPR Gray Book:2000 DSPR Technical Condition: 2004 E1 AS/ACIF S016: 2001 AS/ACIF S038: 2001 G.703:2001 TBR 4:1995 TBR 12:1993 TBR 13:1996 RRA 2009-38 (RRL 2005-96) IDA TS DLCN:2011 IDA TS ISDN PRA:2005 IS6100:	T1 IC CS-03:2004 TIA-968-B:2009 HKTA 2028:2010 HKTA 2017:2010 HKTA 2015: 2006 G.703:2001 ID0002:2007 IS6100:2004 DSPR Gray Book:2000 DSPR Technical Condition: 2004 E1 AS/ACIF S016: 2001 AS/ACIF S038: 2001 G.703:2001 TBR 4:1995 TBR 12:1993 TBR 13:1996 RRA 2009-38 (RRL 2005-96)	TIA-968-B CS-03 ANSI T1.101 ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation requirements vary by country and interface type. For specific country information, refer to the online approvals database at: https://www.ciscofax.com/.	TIA-968-B CS-03 ANSI T1.101 ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation requirements vary by country and interface type. For specific country information, refer to the online approvals database at: https://www.ciscofax.com/.	TIA-968-B CS-03 ANSI T1.101 ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation requirements vary by country and interface type. For specific country information, refer to the online approvals database at: https://www.ciscofax.com/.	TIA-968-B CS-03 ANSI T1.101 ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation requirements vary by country and interface type. For specific country information, refer to the online approvals database at: https://www.ciscofax.com/.	TIA-968-B CS-03 ANSI T1.101 ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation requirements vary by country and interface type. For specific country information, refer to the online approvals database at: https://www.ciscofax.com/.

Technical specifications	ISR 4461	ISR 4451	ISR 4431	ISR 4351	ISR 4331	ISR 4321	ISR 4221
	2004 PTC 220:2008 Ethernet IEEE 802.3 ANSA X3.263	IDA TS DLCN:2011 IDA TS ISDN PRA:2005 IS6100: 2004 PTC 220:2008 Ethernet IEEE 802.3 ANSA X3.263					

Cisco IOS XE Software

Protocols	IPv4, IPv6, static routes, Routing Information Protocol Versions 1 and 2 (RIP and RIPv2), Open Shortest Path First (OSPF), Enhanced IGRP (EIGRP), Border Gateway Protocol (BGP), BGP Route Reflector, Intermediate System-to-Intermediate System (IS-IS), Multicast Internet Group Management Protocol Version 3 (IGMPv3), Protocol Independent Multicast Sparse Mode (PIM SM), PIM Source Specific Multicast (SSM), RSVP, Cisco Discovery Protocol, encapsulated remote switch port analyzer (ERSPAN), IPSLA, Call Home, EEM, Internet Key Exchange (IKE), access control list (ACL), Ethernet Virtual Connections (EVC), Dynamic Host Configuration Protocol (DHCP), Frame Relay (FR), DNS, LISP, Overlay Transport Virtualization (OTV),[2] Hot Standby Router Protocol (HSRP), RADIUS, authentication, authorization, and accounting (AAA), Advanced Video Coding (AVC), Distance Vector Multicast Routing Protocol (DVMRP), IPv4-to-IPv6 Multicast, MPLS, Layer 2 and Layer 3 VPN, IPsec, Layer 2 Tunneling Protocol Version 3 (L2TPv3), Bidirectional Forwarding Detection (BFD), IEEE 802.1ag, and IEEE 802.3ah
Encapsulations	Generic routing encapsulation (GRE), Ethernet, 802.1q VLAN, Point-to-Point Protocol (PPP), Multilink Point-to-Point Protocol (MLPPP), FR, Multilink Frame Relay (MLFR) (FR.15 and FR.16), High-Level Data Link Control (HDLC), serial (RS-232, RS-449, X.21, V.35, and EIA-530), and PPP over Ethernet (PPPoE)
Traffic management	QoS, Class-Based Weighted Fair Queuing (CBWFQ), Weighted Random Early Detection (WRED), Hierarchical QoS, Policy-Based Routing (PBR), Performance Routing, and NBAR
Cryptographic algorithms	Encryption: Data Encryption Standard (DES), 3DES, Advanced Encryption Standard (AES)-128 or AES-256 (in Cipher Block Chaining [CBC] and Galois/Counter Mode [GCM]) Authentication: RSA (748/1024/2048 bit), ECDSA (256/384 bit) Integrity: MD5, SHA, SHA-256, SHA-384, SHA-512

[*] Using onboard Gigabit Ethernet interfaces.

[2] Supported only on the 4451 for bandwidths less than100 Mbps.

Services plane: Enabling the branch-in-a-box

All 4000 Series ISRs contain processing cores built in as standard to allow full-featured services to run onboard. This includes the full-featured Cisco WAAS engine that provides application acceleration and a highly responsive virtual desktop experience. The technology is known as Cisco Service Containers, and it uses a standard hypervisor to allow x64 based applications to run.

The 4000 Series ISRs can be fitted with SSDs and server cards for local storage and computing capability. The Cisco UCS® E-Series server cards are available with 8-core Intel® Xeon® processors with up to 48 GB of high-

speed DDR3 memory and three drives built in, offering RAID 0, 1, and 5. This immense amount of compute power can eliminate the need for any dedicated servers at branch sites. Cisco UCS E-Series cards can be configured and managed using VMware vCenter and pooled with data center compute resources.

Software subscription through Cisco DNA licensing

The ISR 4000 Series supports software-based subscription using Cisco DNA based licensing. Three Cisco DNA based software subscription licenses are available for the WAN portfolio: Cisco DNA Essentials, Cisco DNA Advantage, and Cisco DNA Premier, allowing customers to have a single, unified solution that spans across the ISR 4000 Series and its ASR 1000 and ISR 1000 Series counterparts

The license tiers are structured to support growing business needs, enabling the customer to move from basic functionality using Cisco DNA Essentials to full functionality with Cisco DNA Advantage and expanding that to include WAN optimization and analytics with Cisco DNA Premier. This structure provides complete flexibility to move the same license across endpoints based on growing network and security requirements and growth in bandwidth based on user and application growth at the sites, as well as the ability to change the management of the platform from on-premises to cloud or vice versa.

Cisco DNA licenses are supported for all ISR 4000 platforms using Cisco DNA Center, the controller and analytics platform at the heart of Cisco's intent-based network. For more information on Cisco DNA Center and supported platforms, refer to https://www.cisco.com/c/en/us/products/cloud-systems-management/dna-center/index.html.

Enterprise NFV on the ISR 4000

Built to reduce costs without compromising vital network services, the Cisco UCS E-Series router-integrated branch blade servers provide support for a virtualization-ready and application-centric platform that can be seamlessly integrated on the ISR 4000 platform. Customers can now install virtualized applications on the ISR 4000 routers through the Cisco Enterprise NFV Infrastructure Software (NFVIS) – a virtualization infrastructure that integrates full VM lifecycle management, monitoring, device programmability, and service chaining in a single, installable package. For more information on Enterprise NFV and NFVIS, refer to https://www.cisco.com/c/en/us/solutions/enterprise-networks/enterprise-network-functions-virtualization-nfv/index.html#~stickynav=2.

Support for DC power

The ISR 4000 platforms support both DC and AC power supplies as options. Specifically, the ISR 4331 has two separate product SKUs – the ISR4331/K9 and the ISR4331-DC/K9 – that support AC and DC power, respectively, The ISR 4400 Series can independently support an AC or a DC power supply on the same chassis. While the ISR 4300 Series supports between 24V and 60V DC, the 4400 Series supports between 48V and 60V DC. The 4331 provides for up to 250W of power rating, while the 4400 Series provides up to 437W. It is important to note that when DC power supplies are installed on the router, PoE-based modules may not be used.

More details about the DC power supplies and their capabilities can be found at https://www.cisco.com/c/en/us/td/docs/routers/access/4400/hardware/installation/guide4400-4300/C4400_isr/FRUs_Modules.html#49534.

Product performance and scalability

The ISR 4000 Series is built on a multicore CPU architecture. It runs modular Cisco IOS XE Software, which allows the platform to take full advantage of its distributed multicore architecture. The architecture of the ISR 4000 separates control- and data-plane operations and integrates an industry-first services plane. This design delivers full-featured integrated services up to Layer 7 at high performance with the ability to deliver application-aware network services while maintaining a stable platform and a high level of performance during periods of heavy network traffic.

The ISR 4000 Series consists of three series of routers: the 4400 Series, the 4300 Series, and the 4200 Series, whose performance levels are represented by the chart below.
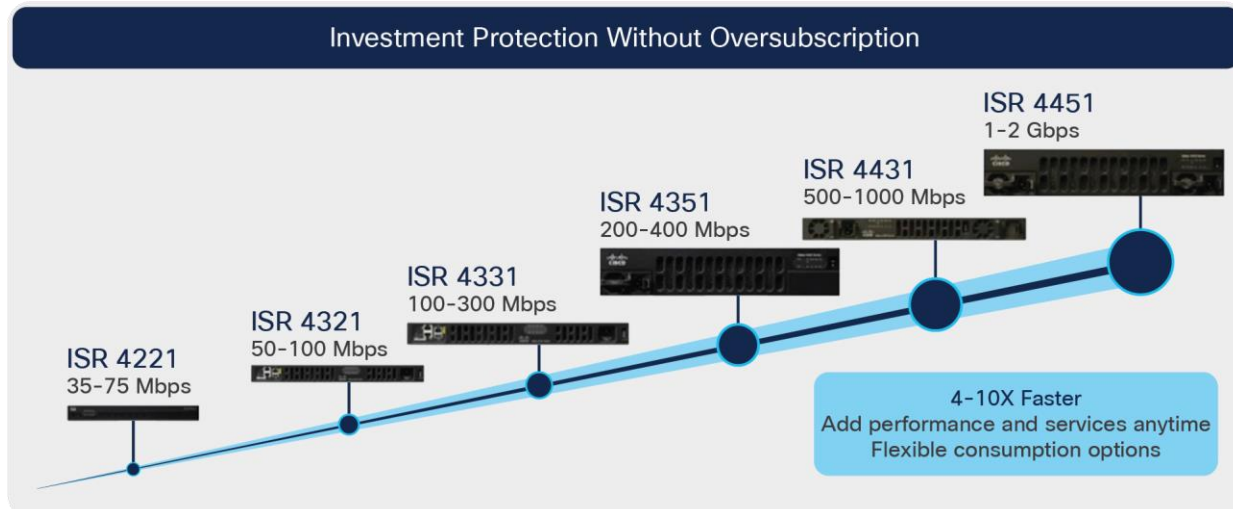
All platforms in the ISR 4000 Series come with fixed maximum performance levels. One fixed base performance level is delivered as a factory default with an optional performance-on-demand license to increase the base forwarding throughput. This scenario enables deployment in high-speed WAN environments through performance-on-demand licensing to double or, for one of the platforms, triple the router capacity without any hardware upgrades.

All ISR 4000 platforms have their fixed performance levels set well within actual capacity, with the result that performance does not necessarily degrade when a service is added to the configuration. This setup provides a deterministic performance, eliminating guesswork for the network administrator when planning new services.

For a more detailed description of the ISR 4000 Series performance and platform scalability, refer to the performance white paper at https://www.cisco.com/c/en/us/products/collateral/routers/4000-series-integrated-services-routers-isr/white-paper-c11-734550.html.

ISR 4000 Boost license

In addition to the Performance license, customers may now order a Booster (or Boost) license that allows router throughput that is five or more times that of the throughput available with the Performance license. In Booster mode, the router does not provide the deterministic level of performance that it does when operating with the default license or with the Performance license.

The Boost license provides a license tier above the Performance license, allowing customers to completely remove the ISR 4000's performance limiters. This will make the ISR 4000 platforms perform at entirely new performance levels, allowing for 4+ Gbps of IP routing (Cisco Express Forwarding) performance on the 4400 Series ISRs. For deployments using encryption, IPsec throughput with AES-256 increases to 250 Mbps on the lowest platform and up to 10 Gbps on the ISR 4461.

ISR 4000 interfaces and modules supported

The ISR 4000 Series consists of modular routers with LAN and WAN connectivity. The routers provide for NIM slots and EtherSwitch Service Module (SM-X) slots, offering a rich set of modules, such as LAN, WAN, and wireless interfaces plus a range of compute engines for embedded services.

For a complete list of supported modules on the ISR 4000 Series, refer to the Interfaces and Modules sheet at https://www.cisco.com/c/en/us/products/routers/4000-series-integrated-services-routers-isr/relevant-interfaces-and-modules.html.

SD-WAN with the ISR 4000 Series

The ISR 4000 Series is optimized for SD-WAN. For enterprises, this means that business-critical applications run faster, with more reliability and reduced OpEx. The SD-WAN achieves this by giving all branches and data centers the ability to monitor, control, move, and report on streams of application data, such as specific web (HTTP) traffic, for example. The ISR 4000 Series has deep packet inspection capability and can accurately identify and control thousands of different applications, including custom in-house enterprise applications.

The entire SD-WAN implementation on the ISR 4000 may be implemented by managing the end device either from the cloud or on-premises through ascending levels of throughput-based licenses. All licenses that support SD-WAN, whether on-premises or in the cloud, are enabled using subscription licenses. These subscription licenses enable all customers to seamlessly transition between on-premises and cloud management as needed. The license tiers are structured to support the growth in business needs through simple subscriptions that help simplify the journey to intent-based networking for the WAN.

The SD-WAN subscriptions are aligned across three subscription licenses of **Cisco DNA Essentials**, **Cisco DNA Advantage,** and **Cisco DNA Premier,** each expanding functionally. **Cisco DNA Essentials** covers all types of connectivity and router lifecycle management, with support for network and application visibility coupled with basic premises and transport security. **Cisco DNA Advantage** provides for advanced WAN topologies and application-aware policies supported by enhanced network security. **Cisco DNA Premier** provides for cloud connectivity with unlimited segmentation, advanced application optimization, and network analytics, secured by advanced threat protection.

For more information on Cisco SD-WAN, refer to https://www.cisco.com/c/en/us/products/software/one-wan-subscription/index.html.

The benefits are immense:

- Business-critical applications no longer have to contend each other or with traffic that should be served on a best-effort basis.

- The enterprise network becomes more reliable because multiple paths can be used.

- Costs are greatly reduced because dual MPLS links can be replaced with a mix of MPLS and internet.

- The time to bring up new remote sites is dramatically reduced because the SD-WAN supports rapidly deployed DSL and 3G/4G LTE connections as easily as MPLS.

- Security is assured across these connections through a zero-touch secure VPN technology used by governments and finance organizations worldwide.

From a platform perspective, the ISR 4000 Series has:

- Separated control and data planes for Denial-of-Service (DoS) attack prevention, Intrusion Prevention System (IPS), and firewall capability built in.

- The ability to locally cache SaaS application content. The caching is automatic and peers directly with Akamai technology to obtain intelligence.

- Greatly increased application performance speed by using in-built application acceleration technology that can locally cache at the byte level.

Cisco security solutions for the ISR 4000 Series

Cisco WAN MACsec

Cisco routers support a wide range of ever-enhancing security features on the ISR 4000 Series. Cisco WAN MACsec is supported on the ISR 4000 Series using the NIM-2GE-CU-SFP module. WAN MACsec provides a line-rate network encryption solution over Layer 2 Ethernet transport services and can be leveraged outside campus networks over either Metro Ethernet transport or Data Center Interconnect (DCI) links. MACsec also secures WAN connections that are leveraging Ethernet as the link-layer media. For more information, refer to the white paper at https://www.cisco.com/c/dam/en/us/td/docs/solutions/CVD/Aug2016/WP-WAN-MACsecDep-Aug2016.pdf.

Cisco Encrypted Threat Analytics

The rapid rise in encrypted traffic is changing the threat landscape. As more businesses become digital, a significant number of services and applications are using encryption as the primary method of securing information. Encrypted Threat Analytics (ETA) is a functionality that allows customers to do cryptographic assessments and identify malware communications in encrypted traffic through passive monitoring. Using information about events that occur inside of a flow or intraflow telemetry to identify malware communication in encrypted traffic means ETA can maintain the integrity of the encrypted flow without the need for bulk decryption. For more information and platform support, refer to https://www.cisco.com/c/dam/en/us/solutions/collateral/enterprise-networks/enterprise-network-security/nb-09-encrytd-traf-anlytcs-wp-cte-en.pdf.

Cisco Snort IPS and Cisco Umbrella Branch

Cisco Snort IPS for the ISR 4000 Series offers a lightweight threat defense solution that uses industry-recognized Snort open-source Intrusion Prevention System (IPS) technology. It is perfect for customers who are looking for a cost-effective solution that provides one box for both advanced routing capabilities and integrated threat defense security to help comply with regulatory requirements.

Cisco Umbrella Branch is a cloud-delivered security service for the Cisco ISRs. It provides the first layer of defense against threats at branch offices. And it offers the simplest, fastest way to protect every device on your branch network. You gain visibility and enforcement at the DNS layer, so you can block requests to malicious domains and IPs before a connection is ever made.

When enabling MACsec, you will need to procure the Security and HSEC licenses to stay within the limits of federal export control regulations. When enabling ETA, you need to enable the Security (SEC) license. Enabling Snort requires a Security (SEC) license and a signature subscription license. Enabling Cisco Umbrella Branch requires an Umbrella Branch license and a subscription license.

Reducing operational costs using Cisco ISR

Support for data modelling

Enterprises and service providers can reduce the OpEx of their networks and increase the agility and speed with which they deliver new services by investing in SDN and NFV. Cisco routers provide support for NETCONF and YANG data modelling, with model coverage increasing in successive releases.

Software Maintenance Upgrades (SMUs)

The ISR 4000 Series now supports Software Maintenance Upgrades.[*] The SMU is a package that can be installed on a system to provide a patch fix or security resolution to a released image. An SMU package is provided on a per-release and per-component basis and is specific to the platform. An SMU is an independent and self-sufficient package and does not have any prerequisites or dependencies. Refer to https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/config-mgmt/configuration/xe-16-6/config-mgmt-xe-16-6-book/cm-smu.html for additional details.

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[*] Supported beginning with Cisco IOS XE Release 16.6.1 for all ISR 4000 and ASR 1000 Series platforms.

Network Plug and Play

Cisco Network Plug and Play (PnP) helps automate the onboarding of new devices on your network by applying configuration settings without manual intervention. With the ease of a centrally managed controller, it reduces the time a new device takes to join your network and become functional. For more information on PnP, refer to https://www.cisco.com/c/en/us/td/docs/solutions/Enterprise/Plug-and-Play/release/notes/pnp-connect-release-notes.html

Cisco IOS Software licensing and packaging

Universal IOS XE and XE-SDWAN image

A single Cisco IOS XE Universal image encompassing all functions is delivered with the platform. Advanced features can be enabled simply by activating a software license on the Universal image. Technology packages and feature licenses, enabled through right-to-use licenses, simplify software delivery and decrease the operational costs of deploying new features.

Beginning with Cisco IOS Release 16.9.1, SD-WAN support is provided for the Cisco IOS image on the ISR 4000 Series. The SD-WAN features are provisioned through a separate image, the XE-SDWAN image. While the Universal Cisco IOS XE image provides for routing features, the XE-SDWAN image provides support for on-premises or cloud-based SD-WAN solutions. Unified communications for XE-SDWAN will be supported in upcoming releases

When ordering an ISR, a customer may choose either the Cisco IOS-XE or XE-SDWAN image. With Cisco IOS XE, customers may opt for subscription-based licensing or for perpetual licensing. With the XE-SDWAN image, customers may order only subscription licensing. Refer to the Cisco DNA Ordering Guide at https://www.cisco.com/c/dam/en/us/products/collateral/cloud-systems-management/dna-center/nb-09-dna-1-x-ordering-guide-cte-en-latest.pdf.

Four major technology licenses are available on the ISR 4000 Series and use the Cisco IOS XE image; these licenses can be activated through the Cisco software activation process described at https://www.cisco.com/go/sa. The following licenses are available:

- IP Base: This technology package is available as the default.

- Application Experience (APPX): This license includes data and application performance features.

- Unified Communications (UC):[*] This license includes voice features.

- Security (SEC) or Security with No Payload Encryption (SEC-NPE): This license includes features for securing network infrastructure.

The ISR 4000 Series has a performance-on-demand license to increase the base forwarding throughput with no hardware changes. Also present is the High Security (HSEC) license, which removes the curtailment enforced by the U.S. government export restrictions on the encrypted tunnel count and encrypted throughput. The HSECK9 license is a separately required license for a feature to have full crypto functionality. Without the HSECK9 license, only 1000 secure tunnels and 250 Mbps[**] of crypto bandwidth would be available.

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[*] Unified communications is not supported by the ISR 4221.

[**] The change to 250 Mbps was achieved in Cisco IOS XE Release 16.8.1 pursuant to revised federal regulations.

For additional information and details about Cisco IOS Software licensing and packaging on the ISR 4000 Series, visit https://www.cisco.com/c/en/us/td/docs/routers/access/4400/software/configuration/guide/isr4400swcfg.pdf.

Cisco IOS XE provides support for both perpetual and subscription licensing. Subscription licensing with support for Cisco DNA Center is offered using the three licenses of Cisco DNA Essentials, Cisco DNA Advantage, and Cisco DNA Premier, in line with similar licenses that provide support on the XE-SDWAN side. Please refer to the Cisco DNA Ordering Guide at https://www.cisco.com/c/dam/en/us/products/collateral/cloud-systems-management/dna-center/nb-09-dna-1-x-ordering-guide-cte-en-latest.pdf.

SDNs may be provisioned through three major licenses on the ISR 4000 Series; these licenses can be activated through the Cisco software activation process identified at https://www.cisco.com/go/sa using Cisco DNA Center or through the vManage management portal. The XE-SDWAN image provides for its own licensing schema through Cisco DNA licensing.

The following licenses are available:

- **Cisco DNA Essentials** covers all types of connectivity and router lifecycle management and support for network and application visibility, coupled with basic premises and transport security.

- **Cisco DNA Advantage** provides for advanced WAN topologies and application-aware policies supported by enhanced network security.

- **Cisco DNA Premier** provides for cloud connectivity with unlimited segmentation, advanced application optimization, and network analytics, secured by advanced threat protection.

For more information, refer to https://www.cisco.com/c/dam/en/us/products/collateral/software/dna-software-routing-subscription.pdf.

Smart Software Licensing support for Cisco IOS XE

Cisco IOS XE supports Smart Licensing beginning with image version 16.6.1 and Device-Led Conversion (DLC) beginning with image version 16.9.1. Smart Software licensing is a simplified license management system that delivers visibility into customer license ownership and consumption. Licenses are managed through a central Cisco Smart License cloud portal (SSM). The cloud portal maintains an account of what the customer has bought and what they are using, thus alerting the customer if they go out of compliance. Customers can determine what licenses they own and how they are being used. Customers benefit from being able to pool available licenses, providing for more straightforward license use across like platforms and thus decreasing operational costs.

While customers can purchase existing SKUs, they must mandatorily create a Smart Account when implementing Smart Licensing. One or more Virtual Accounts may be created under the Smart Account to enable the organization to logically segregate the purchased licenses. DLC allows the customer to convert all existing PAK and RTU licenses on the router into a Smart License. For more information, refer to https://www.cisco.com/c/en/us/products/software/smart-accounts/software-licensing.html.

Cisco ThousandEyes[*]

ThousandEyes is natively integrated with eligible ISR 4000 Series platforms with a minimum of 8 GB DRAM and 8 GB of bootflash/storage. Additional memory and storage will be necessary for concurrently running the ThousandEyes agent with containerized SD-WAN security services.

A valid ThousandEyes agent license is required to activate the ThousandEyes agent. Existing ThousandEyes subscriptions can be leveraged on eligible ISR 4000 Series routers. For additional ThousandEyes subscription information, go to https://www.thousandeyes.com/signup/?utm_source=Cisco&utm_medium=referral&utm_campaign=CiscoSD-WAN

ISR 4000 bundles

The ISR 4000 Series is available in several attractive bundles. The AX bundles integrate Cisco WAAS, Security (SEC), and Data (DATA) licenses into a single bundle that is simple to order, configure, and deploy. For customers who are also interested in voice along with all of these features, AXV presents an attractive option. See Table 5 for details.

Table 5.   Available bundles

Bundles	Features
Application Experience with Voice (AXV)	AX + voice
Voice with Security (VSEC)	Voice + security
Application Experience (AX)	IP Base + Security + advanced networking protocols: L2TPv3, BFD, MPLS, VRF, VXLAN[*] (for bandwidth less than 100 Mbps) Application Experience: PfRv3, WAAS with AppNav™, NBAR2, AVC, IP SLA Hybrid cloud connectivity: LISP, OTV (for bandwidth less than 100 Mbps), VPLS, EoMPLS Intelligent web caching: Akamai Connect
Voice (V)	IP Base + Unified Communications: CME, SRST, CUBE
Security (SEC)	IP Base + Advanced security: Zone-based firewall, IPsec VPN, EZVPN, DMVPN, FlexVPN

[*] Supported only on the ISR 4451.

Note: The ISR 4221/K9 does not support UC (voice); hence no V, VSEC, or AXV bundles are available for the ISR 4221/K9.

More information on ISR AX bundles is available at https://www.cisco.com/go/ax.

A pay-as-you-grow licensing model lets you increase the performance level for the platforms from the base level to a higher level. So you can purchase at an attractive entry-level price point and increase the performance level as your business demand grows. Table 7 describes the performance licenses.

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[*] Available in Release 17.6, targeting Q3CY21.

Table 6.   Performance licenses

Platform	Performance-on-demand license	Features
ISR4461	FL-4460-PERF-K9	Increases the performance from base performance of 1.5 Gbps to 3 Gbps
ISR4451	FL-44-PERF-K9	Increases the performance from base performance of 1 Gbps to 2 Gbps
ISR4431	FL-44-PERF-K9	Increases the performance from base performance of 500 Mbps to 1 Gbps
ISR4351	FL-4350-PERF-K9	Increases the performance from base performance of 200 Mbps to 400 Mbps
ISR4331	FL-4330-PERF-K9	Increases the performance from base performance of 100 Mbps to 300 Mbps
ISR4321	FL-4320-PERF-K9	Increases the performance from base performance of 50 Mbps to 100 Mbps
ISR4221	FL-4220-PERF-K9	Increases the performance from base performance of 35 Mbps to 75 Mbps

Table 7.   Booster (Boost) Performance licenses

Part number	Description
FL-4220-BOOST-K9 (=)	Booster Performance License for 4221 Router
FL-4320-BOOST-K9 (=)	Booster Performance License for 4321 Router
FL-4330-BOOST-K9 (=)	Booster Performance License for 4331 Router
FL-4350-BOOST-K9 (=)	Booster Performance License for 4351 Router
FL-4430-BOOST-K9 (=)	Booster Performance License for 4431 Router
FL-44-BOOST-K9 (=)	Booster Performance License for 4451 Router
FL-4460-BOOST-K9 (=)	Booster Performance License for 4461 Router

Ordering information

The Cisco ISR 4000 Series is orderable and shipping. To place an order, refer to Table 8 below and visit the Cisco Ordering Home Page.

Table 8. Ordering information

Product name	Product description
ISR4461/K9	Cisco ISR 4461 with 4 onboard GE, 3 NIM slots, 1 ISC slot, 3 SM slots, 8 GB Flash Memory default, 2 GB DRAM default (data plane), 4 GB DRAM default (control plane)
ISR4451-X/K9	ISR 4451 with 4 onboard GE, 3 NIM slots, 1 ISC slot, 2 SM slots, 8 GB Flash Memory default, 2 GB DRAM default (data plane), 4 GB DRAM default (control plane)
ISR4431/K9	ISR 4431 with 4 onboard GE, 3 NIM slots, 1 ISC slot, 8GB Flash Memory default, 2 GB DRAM default (data plane), 4 GB DRAM default (control plane)
ISR4351/K9	ISR 4351 with 3 onboard GE, 3 NIM slots, 1 ISC slot, 2 SM slots, 4 GB Flash Memory default, 4 GB DRAM default
ISR4331/K9	ISR 4331 with 3 onboard GE, 2 NIM slots, 1 ISC slot, 1 SM slots, 4 GB Flash Memory default, 4 GB DRAM default
ISR4321/K9	ISR 4321 with 2 onboard GE, 2 NIM slots, 1 ISC slot, 4 GB Flash Memory default, 4 GB DRAM default
ISR4221/K9	ISR 4221 with 2 onboard GE, 2 NIM slots, 1 ISC slot, 8 GB Flash Memory default, 4 GB DRAM default

For additional product numbers, including the ISR 4000 Series bundle offerings, contact your local Cisco account representative. To place an order, visit the Cisco Ordering Home Page. To download software, visit the Cisco Software Center.

Integrated Services Router migration options

The ISR 4000 Series is included in the standard Cisco Technology Migration Program (TMP). Refer to https://www.cisco.com/go/tmp and contact your local Cisco account representative for program details.

Warranty information

The ISR 4000 Series has a 90-day limited liability warranty.

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Cisco Smart Net Total Care® technical support for the ISR 4000 Series is available on a one-time or annual contract basis. Support options range from help-desk assistance to proactive, onsite consultation. All support contracts include:

- Major Cisco IOS Software updates for protocol, security, bandwidth, and feature improvements
- Full access rights to Cisco.com technical libraries for technical assistance, electronic commerce, and product information
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For more information

For more information about the ISR 4000 Series, visit https://www.cisco.com/go/ISR4K or contact your local Cisco account representative.

Document history

New or revised topic	Described In	Date
Change 4461 from 2RU to 3RU	Sizing Section	December 4, 2018
Added 4461 and SD-WAN		November 13, 2018
Added support for Cisco SD-WAN with IOS XE SD-WAN, 16.9.1 software release. Added Encrypted Traffic Analytics as well as Boost Performance Licensing support information.	Ordering Information	August 8, 2018
Added new ISR 4000 Series model, the ISR 4221. Updated all related modules, memory, licenses, and bundles support related to the ISR 4221.	Features and Benefits	August 23, 2017

Printed in USA

C78-732542-23   05/21