Cisco 4000 Family Integrated Services Router

Contents

Cisco® 4000 Family Integrated Services Routers (ISRs) form an Software Defined WAN platform that delivers the performance, security, and convergence capabilities that today's branch offices need.

Product overview

The Cisco 4000 Family Integrated Services Router (ISR) revolutionizes WAN communications in the enterprise branch. With new levels of built-in intelligent network capabilities and convergence, it specifically addresses 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 Cisco 4000 Family 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

Cisco 4000 Family ISRs provide you with Cisco® Software Defined WAN (SDWAN) 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 Software Defined WAN

Cisco SDWAN 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. SDWAN-enabled routers like the ISR 4000 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 Cisco 4000 Series ISRs consolidate 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 digital network architecture (Cisco DNA)

The last few years has seen a rapid transformation and adoption of digital technologies. This puts pressure on the on the Network teams supporting this changing infrastructure - especially when provisioning, managing, monitoring and troubleshooting these diverse devices. Additionally innovations such as Software Defined WAN (SDWAN), Network Function Virtualization (NFV), Open APIs and Cloud Management show great promise in transforming Organizations IT networks. This transformation raises further questions and challenges for the 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 Cisco 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.

Table 1 breaks out many of the features and benefits of the Cisco 4000 Family that create a Software Define WAN (SDWAN) and a converged branch infrastructure.

Table 1. Cisco 4000 Family ISR 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 SDWAN solution for creating lower-cost, business-class Internet connections.

Business Requirement(s)	Feature/Solution
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 & Umbrella Branch) and Content Management using Cisco Cloud Web security & 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 an on-board 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	• ISR 4400 Series models (4461, 4451, and 4431 ISRs) support dual integrated power supplies for backup. The entire ISR 4000 Family supports optional power supply capable of delivering additional PoE power to endpoints. • Modular network interfaces with diverse connection options for load-balancing and network resiliency. • Modular interfaces with online removal and insertion (OIR) for module upgrades without network disruption. • Cisco Unified Survivable Remote Site Telephony (SRST), which 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, Gigabit and Ten-Gigabit Ethernet.
Lower telephony costs with 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).
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.

Platform architecture

Table 2 lists the primary hardware architectural features and benefits of the Cisco 4000 Family. 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, app 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 (FP) 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, enables WAN link security and VPN services.
Integrated Gigabit Ethernet ports	• The Cisco 4000 Family provides up to four built-in 10/100/1000 Ethernet ports for WAN or LAN. • Based 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 PoE+ can be enabled on two of the built-in front panel Gigabit Ethernet interfaces to provide power to external devices such as fourth-generation (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.
Cisco Enhanced Services 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].

[1] Not supported on ISR4221

[2] ISR4221 supports shared Console & Auxiliary ports

Architectural Features	Benefits/Description
Cisco Network Interface Modules (NIMs)[3]	• Up to three integrated NIM slots on the Cisco 4000 Family allow for flexible configurations. • Each NIM slot offers options of up to two 2Gbps connections. One towards the route processor and one for direct module to module communication. The ISR 4221 has only one 1Gbps connection to the Route Processor • NIMs support OIR. • Special NIMs add support Solid-State Drives (SSDs) and Hard Disk Drives (HDDs)[1].
Cisco Integrated Services Card (ISC) slot on motherboard	• Integrated Services Card natively supports the new Cisco High-Density Packet Voice Digital Signal Processor Modules (PVDM4s), providing greater-density rich-media voice. • Each Integrated Services Card slot connects to the system architecture through an up-to 2-Gbps link. • Future modules can be hosted on the Integrated Services Card 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 ISR4221 ships with a fixed 8GB Flash • Two USB type A 2.0 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 8GB for 4321) to provide additional scalability. • The ISR 4200 Series comes with 4GB Fixed DRAM

Managing your Cisco ISR 4000 Family 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 Software XE Embedded Management” 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.
Network-wide 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.

[3] Unified Communications (UC) and UC based NIM’s are not supported

Operational Phase	Application	Description
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][4],(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.

Product specifications

Table 4 lists the general product specifications for the Cisco 4000 Family routers.

Table 4. Specifications of Cisco 4000 Family integrated services routers

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
Aggregate Throughput (Default)	1.5Gbps	1 Gbps	500 Mbps	200 Mbps	100 Mbps	50 Mbps	35Mbps
Aggregate Throughput (Performance License)	3Gbps	2 Gbps	1 Gbps	400 Mbps	300 Mbps	100 Mbps	75 Mbps
Aggregate CEF Only[5] Throughput (Boost License)	Over 7Gbps	Over 4Gbps	Over 4Gbps	Over 2Gbps	Over 2Gbps	1.5Gbps	1.2Gbps

[4] It is suggested to use AppNav with an External WAAS device for the ISR4221

[5] Using onboard Gigabit Ethernet Interfaces

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
Total onboard WAN or LAN 10/100/1000 ports	4	4	4	3	3	2	2
Total onboard WAN or LAN 10Gbps ports	2	-	-	-	-	-	-
RJ-45-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
Doublewide service-module slots	2	1 (assumes no singlewide SM-X modules installed)	0	1 (assumes no singlewide 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
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/data planes)	NA	NA	NA	4 GB	4 GB	4 GB	4GB
Maximum memory DDR3 ECC DRAM (Combined control/services/data planes)	NA	NA	NA	16 GB	16 GB	8 GB	4GB
Default memory DDR3 ECC DRAM (data plane)	4 GB	2 GB	2 GB	NA	NA	NA	NA

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
Maximum memory DDR3 ECC DRAM (data plane)	4 GB	2 GB	2 GB	NA	NA	NA	NA
Default memory DDR3 ECC DRAM (control/services plane)	8 GB	4 GB	4 GB	NA	NA	NA	NA
Maximum memory DDR3 ECC DRAM (control/services plane)	32 GB	16 GB	16 GB	NA	NA	NA	NA
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 115.2 kbps)	1	1	1	1	1	1	0
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	N/A	N/A	N/A	NA

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
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 – 60V 12A Max	48 – 60V 12A Max	48 – 60V 12A Max	NA NA	24 – 60V 14 – 5A	NA NA	NA NA
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	60 A peak and less than 5 Arms per half cycle	<50 A	60 A peak and less than 5 Arms per half cycle	60 A peak and less than 12 Arms per half cycle	60 A peak and less than 5 Arms per half cycle	90 A peak and less than 3 Arms per half cycle	90 A peak and less than 3 Arms per half cycle
Typical power (no modules) (watts)		158	65	48	42	36	24
Maximum power with AC power supply (watts)	1000W (no PoE)	450 (no PoE)	250 (no PoE)	430	250	125	90
Maximum power with DC power supply (watts)	437 (no PoE)	437 (no PoE)	437 (no PoE)	437 (no PoE)	250 (no PoE)		
Maximum power with PoE power supply (platform only) (watts)	1000 with PoE redundant 1450 with PoE boost no redundancy	1000 with PoE redundant 1450 with PoE boost no redundancy	500 with PoE redundant 1000 with PoE boost no redundancy	990	530	260	NA (No PoE Support)
Maximum endpoint PoE power available from PoE power supply (watts)	500 W with optional redundancy	500 W with optional redundancy	250 W with optional redundancy	500	250	120	NA (No PoE Support)

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
Maximum endpoint PoE power capacity with PoE boost (watts)	950 W no redundancy	950 W no redundancy	500 W no redundancy	N/A	N/A	N/A	NA (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" (43.7 x 322.6 x 254 mm)
External Power Supply Dimensions (H x W x D)	N/A	N/A	N/A	N/A	N/A	2.95 x 1.18 x 6.10 in (75 x 30 x 155 mm)	37 x 73 x 152 mm (Phihong mfg PN: AA90U-120A-R) 36.5 x 67 x 155 mm (Delta mfg PN: ADP90GRBA)
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" (104.9 x 463.6 x 328.7 mm)
Rack height	3 Rack Units (3RU)	2 Rack Units (2RU)	1 Rack Units (1RU)	2 Rack Units (2RU)	1 Rack Unit (1RU)	1 Rack Unit (1RU)	1 Rack Unit (1RU)
Rack-mount 19in. (48.3 cm) EIA	Included	Included	Included	Included	Included	Included	Optional
Rack-mount 23in. (58.4 cm) EIA	Optional	Optional	Optional	Optional	Optional	N/A	NA
Wall-mount	No	No	Yes	No	Yes	Mounting holes under chassis	Yes
Weight with 1, 450-WAC power supply (no modules)		28.8 lb (13.1 kg)	N/A	28.8 lb (13.1 kg)	N/A	N/A	NA

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
Weight with 1 1,000-WAC power supply+ 1 PoE power module (no other modules)		30.6 lb (13.9 kg)	N/A	29.0 lb (13.2 kg)	N/A	N/A	NA
Weight with AC PS (no modules)		N/A	18.5 lb (8.4 kg)	N/A	13.5 lb (6.2 kg)	7.7 lb (3.5 kg) + 1.2 lb (0.66 kg) external PS	7.1 lb (3.22kg)
Weight with DC PS (no modules)		28.8lb (13.1kg)	28.8lb (13.1kg)	28.8lb (13.1kg)	13.5 lb (6.2 kg)		
Weight with AC PS with POE (no modules)		N/A	18.6 lb (8.4 kg)	N/A	14.1 lb (6.4 kg)	N/A	NA
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 (3.68kg)
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 (0.58kg)
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
MTBF (Hours)	480770	480770	512970	566310	587250	593270	593270
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 – 6,560 ft. (0 – 2,000 m)	0 – 6,560 ft. (0 – 2,000 m)	0 – 6,560 ft. (0 – 2,000 m)	0 – 6,560 ft. (0 – 2,000 m)	0 – 6,560 ft. (0 – 2,000 m)	0 – 6,560 ft. (0 – 2,000 m)	0 – 6,560 ft. (0 – 2,000 m)
Altitude (Rest of the world)	0 – 10,000 ft. (0 – 3,050 m)	0 – 10,000 ft. (0 – 3,050 m)	0 – 10,000 ft. (0 – 3,050 m)	0 – 10,000 ft. (0 – 3,050 m)	0 – 10,000 ft. (0 – 3,050 m)	0 – 10,000 ft. (0 – 3,050 m)	0 – 10,000 ft. (0 – 3,050 m)

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
Short Term Temperature upto 6560ft per NEBS GR-63-CORE	NA	NA	NA	NA	32° to 131° (0° to 55° C) (for ISR4331-DC version)	NA	NA
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
Acoustics: Sound power (Typical/ maximum)	Z	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 (4750m)	15,584 ft (4750m)	15,584 ft (4750m)	15,584 ft (4750m)	15,584 ft (4750m)	15,584 ft (4750m)	15,584 ft (4750m)

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
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, CISPR 24 KN22, KN24	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	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	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	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 EN 50121-1 EN61000-6-4 EN 50121-4	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
Telecom	T1 IC CS-03:2004 TIA-968-B:2009 HKTA 2028:2010 HKTA 2017:2010	T1 IC CS-03:2004 TIA-968-B:2009 HKTA 2028:2010 HKTA 2017:2010	TIA-968-B CS-03 ANSI T1.101 ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation	TIA-968-B CS-03 ANSI T1.101 ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation	TIA-968-B CS-03 ANSI T1.101 ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation	TIA-968-B CS-03 ANSI T1.101 ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation	TIA-968-B CS-03 ANSI T1.101 ITU-T G.823, G.824 IEEE 802.3 RTTE Directive Homologation

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
	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: 2004 PTC 220:2008 Ethernet IEEE 802.3 ANSA X3.263	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: 2004 PTC 220:2008 Ethernet IEEE 802.3 ANSA X3.263	requirements vary by country and interface type. For specific country information, refer to the online approvals data base at: https://www.ciscofax.com/ .	requirements vary by country and interface type. For specific country information, refer to the online approvals data base at: https://www.ciscofax.com/ .	requirements vary by country and interface type. For specific country information, refer to the online approvals data base at: https://www.ciscofax.com/ .	requirements vary by country and interface type. For specific country information, refer to the online approvals data base at: https://www.ciscofax.com/ .	requirements vary by country and interface type. For specific country information, refer to the online approvals data base at: https://www.ciscofax.com/ .

Technical Specifications	Cisco 4461	Cisco 4451	Cisco 4431	Cisco 4351	Cisco 4331	Cisco 4321	Cisco 4221
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 Router 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, CDP, ERSPAN, IPSLA, Call Home, EEM, IKE, ACL, EVC, DHCP, FR, DNS, LISP, OTV[6], HSRP, RADIUS, AAA, AVC, Distance Vector Multicast Routing Protocol (DVMRP), IPv4-to-IPv6 Multicast, MPLS, Layer 2 and Layer 3 VPN, IP sec, Layer 2 Tunneling Protocol Version 3 (L2TPv3), Bidirectional Forwarding Detection (BFD), IEEE802.1ag, and IEEE802.3ah						
Encapsulations	Generic routing encapsulation (GRE), Ethernet, 802.1q VLAN, Point-to-Point Protocol (PPP), Multilink Point-to-Point Protocol (MLPPP), Frame Relay, 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: DES, 3DES, AES-128 or AES-256 (in CBC and GCM modes); Authentication: RSA (748/1024/2048 bit), ECDSA (256/384 bit); Integrity: MD5, SHA, SHA-256, SHA-384, SHA-512						

Services plane: Enabling the Branch-in-a-Box

All Cisco ISR 4000 routers contain processing cores built-in as standard to allow full-featured services to run on-board. This includes the full-featured Cisco WAAS engine that provides application acceleration and 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 routers can be fitted with Solid State Drives (SSD) and server cards for local storage and computing capability. The Cisco UCS-E server cards are available with 8-core Intel Xeon processors with up to 48GB 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. UCS-E cards can be configured and managed using VMware vCenter and pooled with Data Center compute resources.

[6] Supported only on the 4451 for Bandwidths <100Mbps

Software Subscription through Cisco DNA Licensing

The ISR4000 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 ONE Advantage allowing customers to have a single unified solution that spans across the ISR4000 series routers and its ASR1000 and ISR1000 counterparts

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

Cisco DNA Licenses are supported for all ISR4000 platforms using the Cisco DNA Center, the controller and analytics platform at the heart of Cisco's intent-based network. For more information on the Cisco DNA Center and supported platforms, please refer to https://www.cisco.com/c/en/us/products/cloud-systems-management/dna-center/index.html

Enterprise NFV on ISR4000

Built to reduce costs without compromising vital network services, the 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 ISR4000 platform. Customers can now install virtualized applications on the ISR4000 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, please refer to the link at https://www.cisco.com/c/en/us/solutions/enterprise-networks/enterprise-network-functions-virtualization-nfv/index.html#~stickynav=2

Support for DC Power

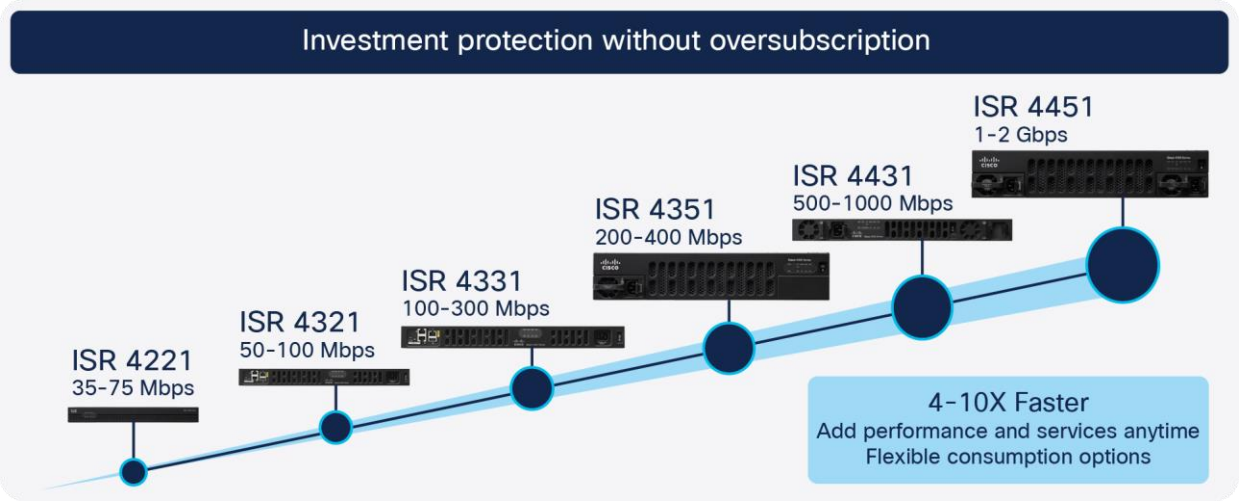
ISR4000 platforms support both DC and AC Power Supplies as options. Specifically, the ISR 4331 has two separate product SKU's – the ISR4331/K9 and the ISR4331-DC/K9 which support AC and DC Power respectively, The ISR4400 can independently support an AC or a DC Power supply on the same chassis. While the 4300 supports between 24V and 60Vdc, the 4400 supports between 48V and 60Vdc. The 4331 provides for upto 250W of power rating while the 4400 provides upto 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 its capabilities can be found at the below url 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 Cisco 4000 Family is built on a multicore CPU architecture. It runs modular Cisco IOS XE Software, which allows the platform to use to full advantage a distributed multicore architecture. The architecture of the Cisco 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 consists of 3 series of Routers – the ISR 4400 series, the 4300 series and ISR 4200 series whose performance levels may be represented by the chart below



Common for the new 4000 Family is that all platforms come with fixed maximum performance levels. One fixed base performance level is delivered as 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 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 a network administrator's guesswork when planning for new services.

For a more detailed document on ISR 4000 Series Performance and Platform Scalability, please refer to the Performance Whitepaper 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 the router to perform between five or more times than that of the throughput with Performance License. In contrast to the deterministic performance described above, in the Booster mode, the router does not provide the deterministic level of performance as provided 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 ISR4000's performance limiters. This will make the ISR 4000 platforms perform at entirely new performance levels, allowing for 4+ Gbps of IP Routing (CEF) performance on the 4400 series ISRs. For deployments using encryption, IPSec throughput with AES 256 increases to 250Mbps on the lowest platform up to 10Gbps on the ISR4461.

ISR 4000 Interfaces and Modules Support

The Cisco 4000 Series Integrated Services Routers (ISRs) are modular routers with LAN and WAN connectivity. The routers provide for Network Interface Module (NIM) slots and Enhanced 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 the complete list of supported modules on the ISR4000 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.

Software defined WAN with the ISR4000 Series

The ISR 4000 series is optimized for the Software Defined WAN (SD-WAN). For enterprises this means that business critical applications run faster, with more reliability and reduced Operational Expenditure (OpEx). The SDWAN achieves this by making all branches and Data Centers have 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 ISR4000 is maybe implemented by managing the end device either from the Cloud or On-Premise through ascending levels of throughput based licenses. All licenses that support SD-WAN, whether On-Premise or on Cloud are all enabled using Subscription Licenses. These subscription licenses enable all customers to seamlessly transition between On-Premise 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 SDWAN subscriptions are aligned across three subscription licenses of **Cisco DNA Essentials**, **DNA Advantage and Cisco DNA Premier,** each expanding functionally**.** The **Cisco DNA Essentials** covers all types of connectivity & router life cycle management, support for Network & application visibility coupled with basic premise and transport security. The **Cisco DNA Advantage** provides for Advanced WAN topologies, Application aware policies supported by enhanced network security. The **Cisco DNA Premier** provides for Cloud connectivity with unlimited segmentation, Advanced Application optimization & Network Analytics, secured by advanced threat protection

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

The benefits are immense;

1. Business-critical applications no longer have to contend each other or with traffic that should be served on best effort basis.
2. The Enterprise network becomes more reliable because multiple paths can be used.
3. Costs are greatly reduced because dual MPLS links can be replaced with a mix of MPLS and Internet.
4. 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.
5. Security is assured across these connections using a zero-touch secure VPN technology used by governments and finance organizations worldwide.

From a platform perspective, the ISR 4000 series has

1. Separated control and data planes for Denial of Service (DoS) attack prevention and Intrusion Prevention System (IPS) and firewall capability built-in.
2. SaaS applications can have content locally cached. The caching is automatic and peers directly with Akamai technology to obtain intelligence.
3. Application performance speed is greatly increased using in-built application acceleration technology that can locally cache at a byte-level.

Cisco Security Solutions for the ISR4000 Series

Cisco WAN MACsec

Cisco routers support a wide-range of ever enhancing security features on the ISR4000 routers. Cisco WAN MACsec is supported on the ISR4000 series routers 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, whether it be over 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 whitepaper 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 Encrypted Traffic Analytics 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 Cisco 4000 Series Integrated Services Routers (ISRs) 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 Integrated Services Router (ISR). 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 customers wish to enable ETA, the Security (SEC) license needs to be enabled. Enabling Snort needs a Security (SEC) license and a signature subscription license. Enabling Cisco Umbrella Branch needs an Umbrella Branch license and a subscription license.

Reducing Operational Costs using Cisco ISR

Support for Data Modelling

Enterprises and Service Providers (SP's) wish to drive down the operational cost (opex) of their networks and increase the agility and speed with which they deliver new services furthered by investments in Software Defined Networking (SDN) and Network Function Virtualization (NFV). Cisco routers provide support for Netconf and YANG data-modelling with increasing model coverage in successive releases

Software Maintenance Upgrades (SMU)

The ISR4000 routers now support Software Maintenance Upgrades (SMU)[7]. The Software Maintenance Upgrade (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 it does not have any prerequisites or dependencies. Please 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

Network Plug and Play

Network Plug and Play 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 Plug and Play (PnP), please refer to https://www.cisco.com/c/en/us/td/docs/solutions/Enterprise/Plug-and-Play/release/notes/pnp-connect-release-notes.html

[7] Supported from IOS-XE16.6.1 for all ISR4000 and ASR1000 series routers

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 by simply 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 IOS version 16.9.1, SDWAN support is provided for IOS image on the ISR4000 series router. The SDWAN features are provisioned through a separate image, the XE-SDWAN image. While the Universal IOS-XE image provides for routing features, the XE-SDWAN image provides support for OnPrem or Cloud based Software Defined WAN solutions. Unified Communications for XE-SDWAN will be supported in upcoming releases

When ordering an ISR router, a customer may choose either of IOS-XE or XE-SDWAN image. With IOS-XE image, customers may opt for subscription based licensing or for perpetual licensing. With XE-SDWAN image, customers may order only subscription licensing. Refer to 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 Cisco 4000 Family and use the IOS-XE image; these licenses can be activated through the Cisco software activation process identified at https://www.cisco.com/go/sa. The following licenses are available:

- IP Base: This technology package is available as default.
- Application Experience (APPX): This license includes data and application performance features.
- Unified Communications (UC)[8]: This license includes voice features.
- Security (SEC) or Security with No Payload Encryption (SEC-NPE): This license includes features for securing network infrastructure.

The Cisco 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[9] Mbps of crypto bandwidth would be available.

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

IOS-XE provides support for both perpetual and subscription licensing. Subscription Licensing with support for Cisco DNA Center is offered using the 3-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 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.

[8] Unified Communications is not supported by ISR4221

[9] The change to 250Mbps was achieved in the IOS-XE version 16.8.1 pursuant to revised Federal regulations

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

The following licenses are available:

- **Cisco DNA Essentials** covers all types of connectivity & router life cycle management, support for Network & application visibility coupled with basic premise and transport security
- **Cisco DNA Advantage** provides for Advanced WAN topologies, Application aware policies supported by enhanced network security
- The **Cisco DNA Premier** provides for Cloud connectivity with unlimited segmentation, Advanced Application optimization & Network Analytics, secured by advanced threat protection

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

Smart Software Licensing Support for IOS-XE

IOS-XE supports Smart Licensing beginning with image version 16.6.1 and Device Led Conversion with image version 16.9.1. Cisco Smart Licensing is a flexible licensing model that provides you with an easier, faster, and more consistent way to purchase and manage software across the Cisco portfolio and across your organization. And it's secure – you control what users can access. With Smart Licensing you get:

- **Easy Activation:** Smart Licensing establishes a pool of software licenses that can be used across the entire organization—no more PAKs (Product Activation Keys).
- **Unified Management:** My Cisco Entitlements (MCE) provides a complete view into all of your Cisco products and services in an easy-to-use portal, so you always know what you have and what you are using.
- **License Flexibility:** Your software is not node-locked to your hardware, so you can easily use and transfer licenses as needed.

To use Smart Licensing, you must first set up a Smart Account on Cisco Software Central (software.cisco.com). One or more Virtual Accounts maybe created under the Smart Account to enable the organization to logically segregate the purchased licenses. Device Led Conversion (DLC) allows the customer to convert all existing PAK and RTU licenses on the router into a Smart License.

For a more detailed overview on Cisco Licensing, go to cisco.com/go/licensingguide

Cisco ISR 4000 bundles

Cisco ISR 4000 is available is several attractive bundles. The AX bundles integrate Cisco Wide Area Application Services (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 6 for details.

Table 5. Cisco ISR 4000 feature 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[10] (Bandwidth <100Mbps) Application Experience: PfRv3, WAAS with AppNav, NBAR2, AVC, IP SLA Hybrid Cloud Connectivity: LISP, OTV (for Bandwidth <100Mbps), 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

Note: ISR4221/K9 does not support UC (Voice), hence no V, VSEC, AXV bundles for ISR4221/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.

Table 6. Cisco ISR 4000 performance licenses

Platform	Performance-on-Demand License	Features
ISR4461	FL-4460-PERF-K9	Increases the performance from base performance 1.5 Gbps to 3 Gbps
ISR4451	FL-44-PERF-K9	Increases the performance from base performance 1 Gbps to 2 Gbps
ISR4431	FL-44-PERF-K9	Increases the performance from base performance 500 Mbps to 1 Gbps
ISR4351	FL-4350-PERF-K9	Increases the performance from base performance 200 Mbps to 400 Mbps

[10] Supported only on the ISR4451

Platform	Performance-on-Demand License	Features
ISR4331	FL-4330-PERF-K9	Increases the performance from base performance 100 Mbps to 300 Mbps
ISR4321	FL-4320-PERF-K9	Increases the performance from base performance 50 Mbps to 100 Mbps
ISR4221	FL-4220-PERF-K9	Increases the performance from base performance 35 Mbps to 75 Mbps

Table 7. Cisco ISR 4000 Booster (boost) performance licenses

Part number	Description
FL-4220-BOOST-K9 (=)	Booster Performance License for 4220 Series Router
FL-4320-BOOST-K9 (=)	Booster Performance License for 4320 Series Router
FL-4330-BOOST-K9 (=)	Booster Performance License for 4330 Series Router
FL-4350-BOOST-K9 (=)	Booster Performance License for 4350 Series Router
FL-4430-BOOST-K9 (=)	Booster Performance License for 4430 Series Router
FL-44-BOOST-K9 (=)	Booster Performance License for 4450 Series Router
FL-4460-BOOST-K9 (=)	Booster Performance License for 4460 Series Router

Ordering information

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

Table 8. Cisco ISR 4000 Series 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

Product Name	Product Description
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 Cisco 4000 Family bundle offerings, please 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 Cisco ISR 4000 Family 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 Cisco ISR 4000 Series Integrated Services Routers have a 90-day limited liability warranty.

Product sustainability

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

Table 9. Product sustainability

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
	Information on product takeback and resuse program	Cisco Takeback and Reuse Program
	Sustainability Inquiries	Contact: csr_inquiries@cisco.com
	Environmental specifications	Table 4. Product specifications
	Regulatory and compliance	Table 4. Product specifications
	MTBF	Table 4. Product specifications

Sustainability Topic		Reference
Power	Power supplies	Table 4. Product specifications
	Power	Table 4. Product specifications
Material	Product packaging weight and materials	Contact: environment@cisco.com
	Size and Weights	Table 4. Product specifications
	Packaging Weight	Table 4. Product specifications

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Cisco SMARTnet® technical support for the Cisco ISR 4000 Family 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:

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For more information

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

Document history

New or revised topic	Described In	Date
Revised content on Smart Licensing	Smart Software Licensing Support for IOS-XE	May 25, 2021
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

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