Cisco 8404 Router

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Overview of the Cisco 8000 Series

The Cisco® 8000 Series combines the revolutionary Cisco Silicon One™, Cisco IOS® XR software, and a clean-sheet chassis design to deliver a breakthrough in high-performance routers. It offers a full range of feature-rich, highly scalable, and reliable platforms. The Cisco 8404 is part of a new complementary portfolio based on a centralized architecture.

The Cisco 8404 is a unique platform that combines flexibility and reliability while offering investment protection. Customers can achieve unmatched reliability with redundant control and data plane via redundant route switch processors. Unlike the behavior on a distributed architecture, the forwarding decisions on centralized platforms are centrally performed. The Cisco 8404 can also be operated in a nonredundant mode if required by the customer. The Cisco 8404 first-generation route switch card is powered by the Cisco Silicon One K100 Network Processing Unit (NPU). A variety of modular port adapters allow for a high level of interface diversity.

This data sheet is specifically for the Cisco 8404 router. In addition to the centralized architecture in the Cisco 8404 and Cisco 8608, the Cisco 8000 Series includes two other distinct router architectures that use the Cisco Silicon One NPUs:

- **Distributed:** The Cisco 8800 Series provides the highest bandwidth via distributed chassis with a redundant control plane and switch fabric. The 8800 Series includes the Cisco 8804, 8808, 8812, and 8818. These chassis deliver up to 28.8 Tbps per line card via 10G, 25G, 100G, 400G, and 800G (Gigabit Ethernet) ports.
- **Fixed:** The Cisco 8100 and 8200 Series use Cisco's standalone architecture to deliver full routing functionality with a single NPU per router. Both support the full routing feature set. The 8200 Series has deep buffers and expanded forwarding tables, while the 8100 Series is targeted for data center applications with lower buffering and forwarding table scale requirements.

Learn more about the Cisco 8000 distributed and fixed portfolio in the Cisco 8000 data sheet.

Cisco 8404 overview

Large, distributed chassis have traditionally been designed to cater to the market requirement for total system bandwidth, port diversity, and redundancy. The requirements far exceeded what could be accomplished with a single NPU. Therefore, the fabrics that weave together multi-NPU systems had to be provisioned to the highest-bandwidth use case and deployed 100% upfront, consuming power and capital regardless of the number of installed line cards. That wisdom held true for multiple generations of core, edge, and aggregation distributed systems.

Now, with the advent of dense Cisco Silicon One NPUs, we can address these roles with a new breed of centralized architectures that combine the best aspects of distributed and fixed systems. The Cisco 8404 combines the redundancy and I/O diversity of distributed systems with the economics and simple elegance of fixed platforms. As a result, it delivers redundancy at an optimized cost while enabling flexibility and expandability through generational continuity.

The key chassis components, all of them accessible via front of the chassis, are described in the table below.

Table 1. Cisco 8404 chassis components

Component	Details
Maximum bandwidth and NPU	• 4.8 Tbps, Cisco Silicon One K100; maximum of 6 Modular Port Adapters (MPAs) (4 pluggable, 1 integrated in each Route Switch Processor [RSP]) at 800G per MPA
Chassis	• 4RU in height with a sheet metal depth of 295 mm (11.61 in.) • Chassis hosts the commons such as fan and power entry modules, RSPs, and MPAs
Route Switch Processor (RSP)	• RSP hosts the CPU, the K100 NPU, I/O ports, and the integrated MPA card; RSPs fit horizontally in the front of the chassis • Up to two RSPs; RSPs work in active-standby mode, enabling both control and data plane redundancy • 8-core ARM CPU • 32-GB DDR5 DRAM and 40-GB eMMC • I/O and timing ports • Integrated MPA
Power Entry Module (PEM)	• 2 DC PEMs that provide 1+1 redundant power feed to the system
Fan tray	• The fan tray has two rows of fans for increased redundancy
Air filter	• The air filter protects the electronics against dust in the right-to-left-airflow chassis design
Supported Modular Port Adapters (MPAs)	• 84-MPA-2FH/6H-M with 2x QSFP56-DD or 6x QSFP28 • 84-MPA-2H12Z-M with 12x SFP56 and 2x QSFP28

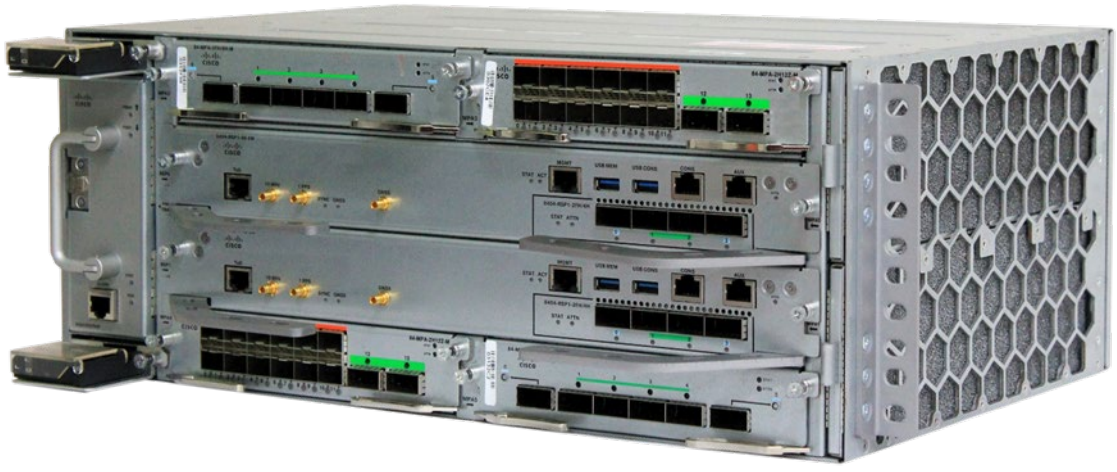

Figure 1.
Cisco 8404 router, front view

Silicon innovation with Cisco Silicon One

Cisco Silicon One is Cisco's first routing silicon architecture to break through the 10-Tbps benchmark for network bandwidth. This is accomplished without sacrificing route capacity, packet-per-second forwarding performance, or feature flexibility. The first-generation Cisco 8404 is driven by the K100 Cisco Silicon One 5 nm NPU, which delivers 4.8 Tbps of bandwidth and high-scale routing and deep buffering using High-Bandwidth Memory (HBM), thus avoiding any off-chip memory. HBM is connected via an ultra-fast silicon interface and delivers significant performance at low power.

Cisco 8404 system design innovation

The 8404 chassis uses a backplane design with advanced cooling via right-to-left airflow to support the smallest possible product depth of <300 mm (<11.8 in.). The chassis and all data path components for the Cisco 8404 benefit from a clean-sheet design that allows the system to take full advantage of the latest technologies and Cisco's design expertise. The four MPAs along with the two RSPs are horizontally oriented. Every major component of the Cisco 8404 was designed from the ground up, thus representing unprecedented investment and commitment to a long lifecycle for the platform.

Cisco 8404 value proposition

Redundancy: The Cisco 8404 introduces a new forwarding paradigm via a redundant control plane and data plane (RSP redundancy). A redundant 8404 requires two RSPs, while a nonredundant 8404 consists of a single RSP.

Extended temperature range: The Cisco 8404 supports an extended temperature range of -20°C to +65°C (-4°F to +149°F) with a startup temperature of -5°C (23°F). Combined with its chassis depth of <300 mm (<11.8 in.), the platform is ideally suited for installations in environmentally challenging situations.

Accessibility: The Cisco 8404 is designed with all Field-Replaceable Units (FRUs) accessible from the front for best serviceability in the field.

Investment protection: The design of the system allows for upgrade of all the major components of the chassis, such as the route switch cards. This will help ensure that customers' investments into the commons are protected while Cisco launches next-generation components.

Flexibility: The system offers flexibility via MPA modularity and interface diversity, plus native port speed support from 1G up to 400G. A wide variety of optics support multiple customer use cases.

Cisco 8404 route switch card

The Cisco 8404 route switch card is in the front of the chassis, horizontally oriented between the upper and lower row of MPAs. The NPU and CPU sit within the route switch card, with all forwarding and routing decisions driven by the route switch card. The RSP is built with an ARM 8-core 1.6-GHz CPU with 32 GB of DDR5 DRAM, 40-GB eMMC, RS-232 console, 100 Mbps/1 Gbps management, 2x USB 3.0, GPS (ToD, 10 MHz, 1 PPS) and GNSS. The RSP incorporates an integrated MPA, the iMPA, with 2x 400G 4x 100G ports. This is a true MPA that can also be accessed by a second installed RSP for full redundancy.

Figure 2.
Cisco 8404 route switch card

Cisco 8404 modular port adapters

The Cisco 8404 supports two different MPAs. The details are provided in the table below.

Table 2. Cisco 8404 MPAs

Product ID	Bandwidth	SFP56 physical ports	QSFP28 physical ports	QSFP56-DD physical ports	MACsec	Timing
84-MPA-2H12Z-M	800 Gbps	12	2	–	Yes	Class C
84-MPA-2FH/6H-M	800 Gbps	–	6	2	Yes	Class C

84-MPA-2H12Z-M

This MPA provides 800 Gbps of maximum throughput with MACsec support on all ports. The MPA supports **12x 1G/10G/25G/50G plus 2x 100G** ports. It supports 4x10G or 4x25G breakout.

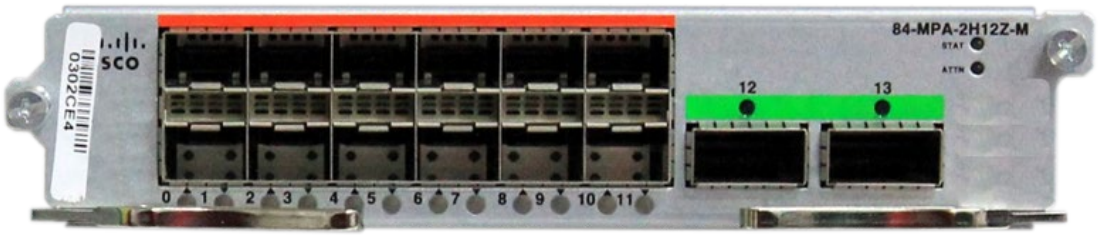

Figure 3.
12-port SFP56 plus 2-port QSFP28 MPA

84-MPA-2FH/6H-M

This MPA provides 800 Gbps of maximum throughput with MACsec support on all ports. The MPA can be operated either in 2x 400G native mode or a mix of 400G and 100G with each of the three adjacent ports sharing the total of 400G of capacity.

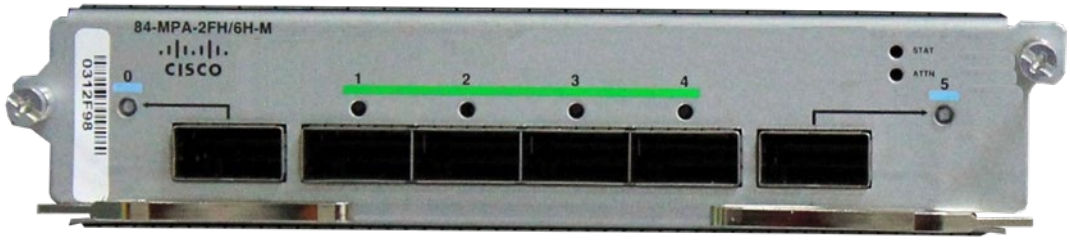

Figure 4.
2-port QSFP56-DD 6-port QSFP28 MPA

Security

Security is a major concern for all Cisco customers. Attacks on networking equipment can have disastrous results. Network operators need assurance that the platform is secure against hardware and software breaches. The Cisco 8404 Router supports a hardware root of trust based on the Trusted Computing Group (TCG) and IEEE 802.1 AR standards. It also supports advanced security features to ensure platform and OS integrity.

- Cisco secures the supply chain of every system at manufacturing time. A technology called Chip Protection allows customers to be assured that the hardware they receive from Cisco has no counterfeit components. This is accomplished with the use of unique identifiers that are stored inside the Cisco Trust Anchor module (TAm) device to identify and track components through the entire lifecycle of the router. The checks cover all major components, including network processors, CPUs, and field-programmable gate arrays.
- Every image that a customer downloads from the Cisco site is cryptographically signed using Cisco private keys. Each platform has a TAm (based on the TCG standard) that uses built-in cryptographic functions to validate the image signature. Once the signature is validated, the software is considered authentic and is ready for install.
- During normal operation, the Joint Test Action Group (JTAG) ports on the chips are monitored. (JTAG is a standard for chip testing and verification.) These ports are one of the most common attack surfaces and therefore must be secured. Cisco uses a technology called secure JTAG to monitor the port. If any illegal activity is detected, it is flagged, and the system CPU is held in reset mode.
- The Secure Boot root of trust is anchored in the TAm. It establishes an authentication chain that validates the entire boot process.

Cisco IOS XR software

Cisco IOS XR is a unified network OS spanning access, aggregation, edge, and core. The networking protocol stack within XR can be cut down by two-thirds when the IP transport architecture is simplified. Improvements to the XR internal architecture have reduced the memory footprint by 35 percent. By reducing the code size and the resources required, XR can be installed onto even the most constrained hardware designs with full security features without an impact on boot times.

Modernizing XR with install procedures using standard Linux software package managers has also improved operations. Instead of "one size fits all," XR provides modularity, so customers can load only what they will use.

Service providers can easily access new software packages from trusted Cisco Red Hat Package Manager (RPM) repositories. Alternatively, they can build their own repository of both Cisco and custom software packages, which can be fetched for final system configuration without the need to spend time trying to sort out software dependencies. All the required Cisco software packages, homegrown/third-party software packages, and router configurations can be pulled into a single Cisco software image known as a Golden ISO. Customized images can now be installed consistently and with confidence across devices in the network.

Cisco IOS XR brings an unmatched level of openness for programmability and customization.

IOS XR supports open, model-driven APIs at all layers of the software stack. At the management layer, XR supports a comprehensive list of both native and industry-driven OpenConfig models with multiple encoding (XML and JSON) and transport (gRPC, NETCONF) options. The APIs at the management layer allow operators to apply configuration to the device or retrieve the state of the system. The APIs also address advanced traffic engineering use cases, allowing applications to control the route followed by traffic within the network. These APIs can be used independently or combined with other ecosystem abstraction layers such as SONiC or P4Runtime.

IOS XR also supports the OFA (Open Forwarding Abstraction) API, which provides a logical representation of all the forwarding and telemetry capabilities of the underlying hardware. In addition, IOS XR provides a flexible consumption model, allowing third-party application software to run on the device alongside IOS XR to enable customization options for the customer network. With application hosting capabilities, operators can host their own controller agent or custom protocol; use various hosting apps for telemetry collection, traffic engineering, and configuration management; or manage the box like a Linux machine using third-party software such as Chef, Puppet, or Ansible.

Cisco IOS XR is the industry's most trusted network operating system.

IOS XR is the most advanced network operating system for improving the security posture of the router. The Cisco Secure Boot subsystem helps ensure that the device boot image is genuine and has not been tampered with. With advanced signing technology, XR can establish software integrity enforcement and measurement. To further enhance the trusted defense posture, multiple runtime defenses within XR guard against malicious actors and make exploitation of bugs more difficult. Even if booted securely, a router may run for months or years without rebooting, which could leave vulnerabilities at runtime undetected for a long time. XR leverages Integrated Measurement Architecture (IMA) to significantly enhance security by verifying the integrity of running software. In the IMA appraisal mode, signature validations prevent unauthorized images from launching. In the IMA measurement mode, the hashes of all images are logged in a secure location used for verification. Records of runtime processes can be sent for analysis, so the operator knows that system software, updates, or patches are running as intended.

Detailed information on IOS XR can be found in the IOS XR data sheet.

For a complete list of supported features, refer to the Cisco Feature Navigator.

Product characteristics

Table 3. Cisco 8404 specifications

Platform / PID	Physical specifications
Cisco 8404	• Operating temperature at 0 m Mean Sea Level (MSL): • -4°F to 149°F (-20°C to 65°C) operation • 23°F (-5°C) startup • Storage temperature: -40°F to 158°F (-40°C to 85°C) • Humidity: 5% to 95% (noncondensing); altitude: 0 to 9842 ft (0 to 3000 m) • Typical total system power without optics and with four 2x 400G or 6x 100G MPAs: ◦ Redundant system: 1050W (typical) ◦ Nonredundant system: 680W (typical) • PEM to back of chassis depth: 13.46 in. (342 mm) • Fully loaded chassis approximate maximum weight: 58.86 lb (26.7 kg) • Rack mountable in standard 19-in. (48.3-cm) rack
8404 chassis	• Chassis weight only: 18.5 lb (8.4 kg) • (HxWxD) 6.89 x 13.40 x 11.61 in. (17.5 x 44.2 x 29.5 cm) – 4 RU
8404-RSP1-48-EM	• One 4.8-Tbps K100 NPU (5 nm), 108 MB SRAM/8 GB HBM • ARM 8-core 1.6-GHz CPU with 32 GB of DDR5 DRAM, 40 GB eMMC, RS-232 console, 1G management, 2x USB 3.0, GPS (ToD, 10 MHz, 1 PPS), GNSS • Integrated MPA – 2x 400G 4x 100G • Weight: 10.87 lb (4.93 kg) • (HxWxD) 1.735 x 14.44 x 13.04 in. (44.08 x 36.67 x 33.16 cm)
84-MPA-2H12Z-M	• Weight: 3.08 lb (1.4 kg) • (HxWxD) 1.458 x 7.244 x 11.52 in. (37.05 x 18.40 x 29.28 cm)
84-MPA-2FH/6H-M	• Weight: 3.08 lb (1.4 kg) • (HxWxD) 1.458 x 7.244 x 11.52 in. (37.05 x 18.40 x 29.28 cm)
8404-DC-PEM	• 1+1 PEM redundancy • Weight: 0.837 lb (0.38 kg) • (HxWxD) 0.629 x 2.42 x 12.825 in. (1.6 x 6.15 x 32.57 cm)
8404-Filter	• Weight: 0.22 lb (0.1 kg) • (HxWxD) 3.295 x 0.28 x 11.39 in. (8.37 x 0.735 x 28.93 cm)
8404-FAN-TRAY	• N+1 internal fan redundancy • Weight: 4.03 lb (1.83 kg) • (HxWxD) 5.196 x 2.047 x 12.07 in. (13.2 x 5.2 x 30.07 cm)

Compliance

Table 4. Compliance

Specification	Description
Regulatory compliance	Products comply with CE Markings according to directives 2014/30/EU and 2014/35/EU
Safety	ANSI / UL 60950-1 CAN/CSA C22.2 No. 60950-1 ANSI / UL 62368-1 CAN/CSA C22.2 No. 62368-1 EN / IEC 62368-1
EMC: Emissions	FCC 47 CFR Part 15 Class A AS/NZS CISPR 32 Class A EN55032 Class A CISPR 32 Class A ICES-003 Class A VCCI Class A KS C 9832 Class A CNS-15936 Class A EN61000-3-2 EN61000-3-3
EMC: Immunity	EN 300 386 EN55035 CISPR 35 EN61000-6-1 KS C 9835
RoHS	The product is RoHS 6 compliant with exceptions for leaded ball grid array (BGA) balls and lead press fit connectors.

Warranty

Cisco hardware is backed by a limited warranty. For details, visit the Cisco Warranty Finder.

Service and support

Cisco offers a wide range of services to help accelerate your success in deploying and optimizing the Cisco 8404. These innovative Cisco Services offerings are delivered through a unique combination of people, processes, tools, and partners, and they are focused on helping you increase operating efficiency and improve your network.

Cisco Advanced Services uses an architecture-led approach to help you align your network infrastructure with your business goals and achieve long-term value.

Cisco Software Support offers the Cisco Smart Net Total Care® service, which helps you resolve mission-critical problems with direct access at any time to Cisco network experts and award-winning technical support coverage and maintenance releases for the Essentials and Advantage Software Suites. This support helps to keep your systems and your business running smoothly. Software Support is a required purchase with the Software Innovation Access (SIA) feature upgrade licenses.

Cisco SP Base provides device-level support and helps reduce downtime with fast, expert technical support and flexible hardware coverage provided by the Cisco Technical Assistance Center (TAC). With this service, you can take advantage of the Cisco Smart Call Home service, which offers proactive diagnostics and real-time alerts on your hardware.

Spanning the entire network lifecycle, Cisco Services offerings help increase investment protection, optimize network operations, support migration operations, and strengthen your IT expertise.

For information on services for the Cisco 8404, contact your Cisco sales representative. For an overview of all offers, visit Cisco Services for Service Providers.

Ordering overview

Hardware: The high-level hardware components are listed below. For full ordering information, please refer to the ordering documentation.

Table 5. Cisco 8404 hardware ordering overview

HW Product ID	Description
8404	Cisco 8404 – 4-Slot Centralized Chassis
8404-RSP1-48-EM	Cisco 8404 4.8T Route Switch Processor
8404-DC-PEM	Cisco 8404 DC Power Entry Module
8404-FAN-TRAY	Cisco 8404 Fan Tray
8404-FILTER	Cisco 8404 Fan Filter
84-MPA-2H12Z-M	Cisco 8404 MPA with 2x100G QSFP-28 + 12x1/10/25/50G SFP56
84-MPA-2FH/6H-M	Cisco 8404 MPA with 2x400G / 6x100G QSFP-DD
8K-4RU-2P-RMK	8000 4RU 2 Post Rack Mount Kit 19-in.

HW Product ID	Description
8K-4RU-2P-RMK-E	8000 4RU 2 Post Rack Mount Kit 23-in. ETSI
8K-4RU-F2B-AIR	8000 Universal 4RU Front to Back Airflow Redirector
8404-CBLMGMT	Cisco 8404 Cable Management Bracket

Software: The Cisco 8404 is launching with Cisco IOS XR Flexible Consumption Model 2.0. At First Customer Shipment (FCS) the platform will have the Cisco IOS XR 25.3.1 software release.

The high-level software components are listed below. For full ordering information, please refer to the ordering documentation.

Table 6. Cisco 8404 software ordering overview

SW Product ID	Description
ESS-8KE-100G-RTU	Essential Right-to-Use 100G for Cisco 8000E Series
ESS-8KE-400G-RTU	Essential Right-to-Use 400G for Cisco 8000E Series
ADN-8KE-100G-RTU	Advantage Right-to-Use 100G for Cisco 8000E Series
ADN-8KE-400G-RTU	Advantage Right-to-Use 400G for Cisco 8000E Series
PRM-8KE-100G-RTU	Premium Right-to-Use 100G for Cisco 8000E Series
PRM-8KE-400G-RTU	Premium Right-to-Use 400G for Cisco 8000E Series
8KSW-A-SIA-3	8000 Type A Device SIA for 3 to 5 year term FCM 2.0
8KSW-A-SIA-5	8000 Type A Device SIA for 5 to 7 year term FCM 2.0

The RTUs (Right-to-Use licenses) provide customers with the ability to access and use specific perpetual software functionalities without the requirement to purchase the complete software package.

The SIAs (Software Innovation Access licenses) are term-based agreements that provide customers with access to specific software benefits. They enable customers to optimize their software usage, easily manage licenses across their network infrastructure, and perform seamless upgrades to the latest versions of IOS XR Software.

Cisco Licensing

Cisco Licensing is a flexible and secure licensing model that provides you with an easier, faster, and more consistent way to purchase, activate, manage, renew, and upgrade software products across the Cisco portfolio and across your organization. And it's secure—you control what users can access. With Cisco Licensing you get:

- **Easy activation**. Cisco 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 provides a complete view into all 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.

In order to retrieve your licenses, you will first need to set up an account on Cisco Software Central.

For a more detailed overview of Cisco Licensing, go to the Cisco Software Licensing Guide at www.cisco.com/c/en/us/buy/licensing/licensing-guide.html.

The IOS XR Flexible Consumption Model (FCM) requires Cisco Licensing registration and license usage reporting. A customer network under IOS XR FCM 2.0 is considered compliant if the FCM 2.0-enabled devices in the customer's network are registered to Cisco Licensing and are reporting the usage.

Cisco Licensing greatly simplifies the operational overhead associated with license and device experience management for customers.

A successful registration and reporting to Cisco Licensing is essential to take advantage of all the benefits of SIA in FCM 2.0.

Product sustainability

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

Table 7. References to product sustainability topics

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 reuse program	Cisco Takeback and Reuse Program
	Sustainability Inquiries	Contact: csr_inquiries@cisco.com
Material	Product packaging weight and materials	Contact: environment@cisco.com

Cisco Capital

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For more information

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