

# Cisco ASR 9900 Second Generation Switch Fabric Card 2, Switch Fabric Cards S and T

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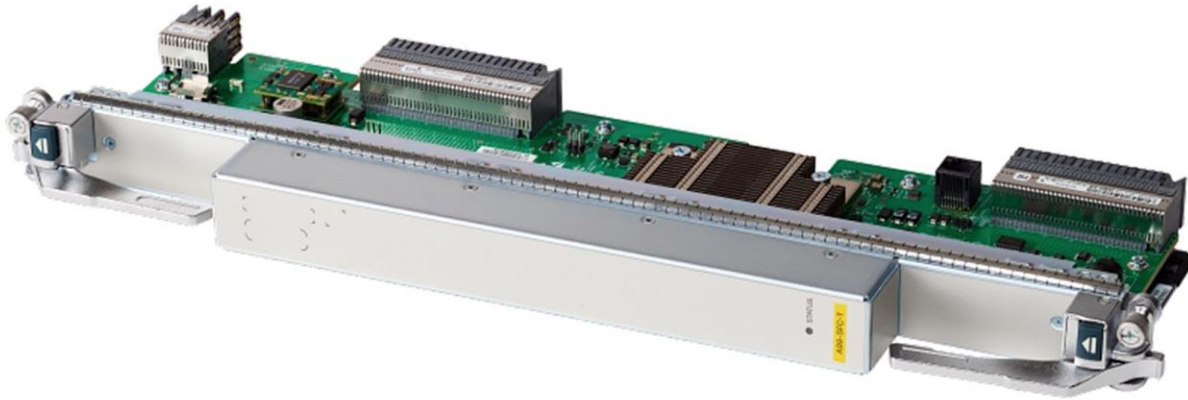
The Cisco ASR 9900 Switch Fabric Card 2 (Figure 1), Switch Fabric Card S (Figure 2) and Switch Fabric Card T (Figure 3) are the next-generation switch fabrics for the Cisco ASR 9922 Router, ASR 9912 Router, ASR 9910 Router and ASR 9906 Router, supporting high-density 100 Gigabit Ethernet line cards. The system architecture of the Cisco ASR 9900 Switch Fabric Card 2 (ASR 9900 SFC2), Switch Fabric Card S (ASR 9900 SFC-S) and Switch Fabric Card T (ASR 9900 SFC-T) is designed to accommodate new programmable deployment models and convergence of Layer 2 and Layer 3 services, as required by today's wireline, Data-Center-Interconnect (DCI), and Radio Access Network (RAN) aggregation applications.



**Figure 1.**  
Cisco ASR Switch Fabric Card 2



**Figure 2.**  
Cisco ASR Switch Fabric Card S



**Figure 3.**  
Cisco ASR Switch Fabric Card T

The ASR 9900 SFC2, SFC-S, SFC-T features provide exceptional scale, service flexibility, and high availability. Examples include:

- Distributed switch fabric architecture
- Support for up to seven ASR 9900 switch fabric cards SFC2 to provide scalability and high availability on the ASR 9922 and ASR 9912 Routers
- Support for up to five ASR 9900 switch fabric cards SFC-S to provide scalability and high availability on the ASR 9910 Router
- Support for up to five ASR 9900 switch fabric cards SFC-T to provide scalability and high availability on the ASR 9906 Router
- Multistage low-latency nonblocking architecture

The switch fabric is configured as a single stage of switching with multiple parallel planes, and it is responsible for transporting packets from one line card to another. Each fabric plane is a single-stage, nonblocking, packet-based, store-and-forward switch that works with the Cisco ASR 9000 Route Processor 2 and Cisco ASR 9000 Route Switch Processor RSP to support traffic management using the centralized Virtual Output Queue (VOQ) arbitration of the route processor.

The ASR 9922 and ASR 9912 chassis provide 6 + 1 redundancy using an all-active fabric-controllers configuration model that allows for distribution of the traffic load across all seven switch fabrics, taking advantage of the processing capacity of all. If a failure occurs on one fabric card, the remaining 6 active cards continue to forward traffic in the system, with hardware support for zero packet loss on fabric-card Online Insertion and Removal (OIR). Because all fabric cards are active and forwarding traffic, they are all ready to assume the full traffic load.

Compared to the ASR 9922 and ASR 9912, which can accommodate up to seven fabric cards, the ASR 9910 and ASR 9906 use up to five dedicated fabric cards in combination with the fabrics built in on the two route switch processors. As a result, the ASR 9910 and ASR 9906 can provide seven fabrics to switch the traffic.

The ASR 9910 and ASR 9906 chassis also provides 6 + 1 redundancy using an all-active fabric-controllers configuration model that allows for distribution of the traffic load across all seven switch fabrics, taking advantage of the processing capacity of all. If a failure occurs on one fabric (dedicated fabric card or route switch processor's built-in fabric), the remaining six active fabrics continue to forward traffic in the system, with hardware support for zero packet loss on fabric-card Online Insertion and Removal (OIR). Because all fabric cards are active and forwarding traffic, they are all ready to assume the full traffic load.

Third-generation high-density 100 Gigabit Ethernet line cards support up to seven fabric controllers, whereas second-generation Cisco ASR 9000 Series line cards support up to five fabric controllers. The switch fabric is fully redundant, with one copy of the fabric on each fabric card, and each fabric card carries enough switching capacity to meet the chassis throughput specifications.

Features and benefits of the ASR 9900 SFC2, SFC-S and SFC-T are listed in Table 1.

**Table 1.** Features and benefits of ASR 9900 SFC2, SFC-S and SFC-T

Feature	Description
<b>Highly scalable fabric</b>	<ul style="list-style-type: none"> <li>Designed to support high 1-, 10-, and 100-Gbps port densities</li> <li>Provides built-in scalability for investment protection</li> </ul>
<b>Up to seven switch fabrics</b>	<p>Offers traffic load balancing simultaneously across up to seven fabrics</p> <p>On the ASR 9922 and ASR 9912 Routers, the seven fabrics are located on seven dedicated fabric cards</p> <p>On the ASR 9910 and ASR 9906, two fabrics are built in on the route switch processor, and five fabrics are located on five dedicated fabric cards</p>
<b>Memoryless switch</b>	Provides transparent nonblocking, low-latency packet forwarding
<b>Fabric</b>	Single-stage, nonblocking, and packet-based
<b>Fabric speed</b>	230 Gbps per fabric card
<b>Fabric redundancy per system</b>	N + 1 up to seven fabrics

Table 2 lists the technical specifications for the ASR 9900 SFC2, SFC-S and SFC-T.

**Table 2.** Technical specifications for the ASR 9900 SFC2, SFC-S and SFC-T

Feature	Description
<b>FPGA</b>	Field-programmable gate array
<b>Serial Peripheral Interface Flash</b>	2 SPI Flash with 128 Mb
<b>Nonvolatile RAM (NVRAM)</b>	128Kb
<b>Double Data Rate 3 (DDR3)</b>	256 MB
<b>Software release</b>	<p>Cisco IOS XR Software Release 5.3.0 (for SFC2)</p> <p>Cisco IOS XR Software Release 6.0.1 (for SFC-S)</p> <p>Cisco IOS XR Software Release 6.3.1 (for SFC-T)</p>

## Cisco IOS XR Software

The Cisco ASR 9000 Series Aggregation Services Router delivers superior scale, service flexibility, and high availability into access and aggregation networks. It is powered by Cisco IOS XR Software, an innovative self-healing, distributed operating system designed for always-on operation. Cisco IOS XR Software supports a Software-Maintenance-Update (SMU) capability, which allows bug fixing or even small feature releasing without interrupting existing services. It also supports Field-Programmable Device (FPD) upgrades, which can be used to update Field-Programmable Gate Arrays (FPGAs), ROM monitor (ROMmon), and more, while systems are running.

Cisco ASR 9000 Series Carrier Ethernet applications include business services such as Layer 2 VPN (L2VPN) and Layer 3 VPN (L3VPN), Internet Protocol Television (IPTV), Content-Delivery Networks (CDNs), and mobile backhaul transport networks. Features supported include Ethernet Services; L2VPN; IPv4, IPv6, and L3VPN; Layer 2 and Layer 3 Multicast; IP over Dense Wavelength-Division Multiplexing (IPoDWDM); SyncE; Ethernet Operations, Administration, and Management (EOAM) and Multiprotocol Label Switching (MPLS) Operations, Administration, and Management (OAM); Layer 2 and Layer 3 Access Control Lists (ACLs); Hierarchical Quality of Service (H-QoS); MPLS Traffic Engineering Fast Reroute (MPLS TE-FRR); MultiChassis Link Aggregation (MC-LAG); Integrated Routing and Bridging (IRB); Cisco Nonstop Forwarding (NSF) and Nonstop Routing (NSR); Point-to-Multipoint Traffic Engineering (P2MP-TE); Lawful Intercept; Smart Call Home (SCH); and Multigigabit Service Control (MGSCP).

The Cisco ASR 9000 Series Multiservice Edge (MSE) and Ethernet MSE (E-MSE) capabilities allow enterprises to offer powerful business VPN services with strong Service-Level Agreement (SLA) enforcement. Such services typically require simultaneous scale increases across multiple dimensions, for example, the number of Virtual Route Forwarding (VRF) interfaces, IPv4 and IPv6 route scaling, Bidirectional Forwarding Detection (BFD) sessions, and instances of Border Gateway Protocol (BGP) Cisco NSR interfaces. A Cisco ASR 9900 system configuration requiring high multiple-dimensional scale requires the Service-Edge (SE) optimized route processor model to support the increased system scale.

## Product specifications

Table 3 provides details about the ASR 9900 SFC2, which supports the ASR 9912 and ASR 9922 chassis (thereby providing common sparing) and the ASR 9900 SFC-S and SFC-T, which supports the ASR 9910 and ASR 9906 chassis, respectively. The ASR 9922, ASR 9912, ASR 9910 and ASR 9906 systems are designed to the same high standards of performance and reliability, and they feature the same power and thermal innovations.

**Table 3.** Product specifications

Category	Part Number or Specification
Switch fabric card	A99-SFC2 (supports both ASR 9912 and ASR 9922 chassis)
	A99-SFC-S (supports ASR 9910 chassis)
	A99-SFC-T (support ASR 9906 chassis)

Category	Part Number or Specification	
Line cards supported	<p><b>ASR 9922, 9912 and 9910</b></p> <ul style="list-style-type: none"> <li>• <b>5th Generation</b> <ul style="list-style-type: none"> <li>◦ <b>A9K-8HG-FLEX-FC</b></li> <li>◦ A9K-8HG-FLEX-SE</li> <li>◦ A9K-8HG-FLEX-TR</li> <li>◦ <b>A99-4HG-FLEX-FC</b></li> <li>◦ A99-4HG-FLEX-SE</li> <li>◦ A99-4HG-FLEX-TR</li> <li>◦ <b>A9K-4HG-FLEX-FC</b></li> <li>◦ A9K-4HG-FLEX-SE</li> <li>◦ A9K-4HG-FLEX-TR</li> </ul> </li> <li>• <b>3rd Generation</b> <ul style="list-style-type: none"> <li>◦ <b>A99-12X100GE-FC</b></li> <li>◦ A99-12X100GE</li> <li>◦ A99-12X100GE-CM</li> <li>◦ <b>A99-8X100GE-FC</b></li> <li>◦ A99-8X100GE-SE</li> <li>◦ A99-8X100GE-TR</li> <li>◦ A99-8X100GE-CM</li> <li>◦ <b>A9K-8X100GE-FC</b></li> <li>◦ A9K-8X100GE-SE</li> <li>◦ A9K-8X100GE-TR</li> <li>◦ A9K-8X100GE-CM</li> <li>◦ A9K-8X100G-LB-SE</li> <li>◦ A9K-8X100G-LB-TR</li> <li>◦ <b>A9K-4X100GE-FC</b></li> <li>◦ A9K-4X100GE-SE</li> <li>◦ A9K-4X100GE-TR</li> <li>◦ <b>A9K-400GE-LAN-FC</b></li> <li>◦ A9K-4X100GE</li> <li>◦ <b>A99-48X10GE-1G-FC</b></li> <li>◦ A99-48X10GE-1G-TR</li> <li>◦ A99-48X10GE-1G-SE</li> <li>◦ <b>A9K-48X10GE-1G-FC</b></li> <li>◦ A9K-48X10GE-1G-TR</li> <li>◦ A9K-48X10GE-1G-SE</li> <li>◦ <b>A9K-48X10GE-1G-CM</b></li> <li>◦ <b>A9K-24X10GE-1G-FC</b></li> <li>◦ A9K-24X10GE-1G-TR</li> <li>◦ A9K-24X10GE-1G-SE</li> <li>◦ <b>A9K-24X10GE-1G-CM</b></li> <li>◦ <b>A9K-MOD400-FC</b></li> <li>◦ A9K-MOD400-SE</li> <li>◦ A9K-MOD400-TR</li> </ul> </li> </ul>	<p><b>ASR 9906</b></p> <ul style="list-style-type: none"> <li>• <b>5th Generation</b> <ul style="list-style-type: none"> <li>◦ <b>A9K-8HG-FLEX-FC</b></li> <li>◦ A9K-8HG-FLEX-SE</li> <li>◦ A9K-8HG-FLEX-TR</li> <li>◦ <b>A99-4HG-FLEX-FC</b></li> <li>◦ A99-4HG-FLEX-SE</li> <li>◦ A99-4HG-FLEX-TR</li> <li>◦ <b>A9K-4HG-FLEX-FC</b></li> <li>◦ A9K-4HG-FLEX-SE</li> <li>◦ A9K-4HG-FLEX-TR</li> </ul> </li> <li>• <b>3rd Generation</b> <ul style="list-style-type: none"> <li>◦ <b>A99-12X100GE-FC</b></li> <li>◦ A99-12X100GE</li> <li>◦ A99-12X100GE-CM</li> <li>◦ <b>A99-8X100GE-FC</b></li> <li>◦ A99-8X100GE-SE</li> <li>◦ A99-8X100GE-TR</li> <li>◦ A99-8X100GE-CM</li> <li>◦ <b>A9K-8X100GE-FC</b></li> <li>◦ A9K-8X100GE-SE</li> <li>◦ A9K-8X100GE-TR</li> <li>◦ A9K-8X100GE-CM</li> <li>◦ A9K-8X100G-LB-SE</li> <li>◦ A9K-8X100G-LB-TR</li> <li>◦ <b>A9K-4X100GE-FC</b></li> <li>◦ A9K-4X100GE-SE</li> <li>◦ A9K-4X100GE-TR</li> <li>◦ <b>A9K-400GE-LAN-FC</b></li> <li>◦ A9K-4X100GE</li> <li>◦ <b>A99-48X10GE-1G-FC</b></li> <li>◦ A99-48X10GE-1G-TR</li> <li>◦ A99-48X10GE-1G-SE</li> <li>◦ <b>A9K-48X10GE-1G-FC</b></li> <li>◦ A9K-48X10GE-1G-TR</li> <li>◦ A9K-48X10GE-1G-SE</li> <li>◦ <b>A9K-48X10GE-1G-CM</b></li> <li>◦ <b>A9K-24X10GE-1G-FC</b></li> <li>◦ A9K-24X10GE-1G-TR</li> <li>◦ A9K-24X10GE-1G-SE</li> <li>◦ <b>A9K-24X10GE-1G-CM</b></li> <li>◦ <b>A9K-MOD400-FC</b></li> <li>◦ A9K-MOD400-SE</li> <li>◦ A9K-MOD400-TR</li> </ul> </li> </ul>

Category	Part Number or Specification	
	<ul style="list-style-type: none"> <li>◦ A9K-MOD400-CM</li> <li>◦ <b>A9K-MOD200-FC</b></li> <li>◦ A9K-MOD200-SE</li> <li>◦ A9K-MOD200-TR</li> <li>◦ A9K-400G-DWDM-TR</li>   <li>● <b>2nd Generation</b></li> <li>◦ A9K-2X100GE-SE</li> <li>◦ A9K-2X100GE-TR</li> <li>◦ A9K-1X100GE-SE</li> <li>◦ A9K-1X100GE-TR</li> <li>◦ A9K-36X10GE-SE</li> <li>◦ A9K-36X10GE-TR</li> <li>◦ A9K-24X10GE-SE</li> <li>◦ A9K-24X10GE-TR</li> <li>◦ A9K-4T16GE-SE</li> <li>◦ A9K-4T16GE-TR</li> <li>◦ A9K-40GE-SE</li> <li>◦ A9K-40GE-TR</li> <li>◦ A9K-MOD160-SE</li> <li>◦ A9K-MOD160-TR</li> <li>◦ A9K-MOD80-SE</li> <li>◦ A9K-MOD80-TR</li> <li>◦ A9K-VSM-500</li> </ul>	<ul style="list-style-type: none"> <li>◦ A9K-MOD400-CM</li> <li>◦ <b>A9K-MOD200-FC</b></li> <li>◦ A9K-MOD200-SE</li> <li>◦ A9K-MOD200-TR</li> <li>◦ A9K-400G-DWDM-TR</li> </ul>
<b>Redundancy</b>	<ul style="list-style-type: none"> <li>● No single point of failure</li> <li>● N + 1 redundancy</li> </ul>	
<b>Physical specifications</b>	<p>Each switch fabric card occupies one slot; a full-capacity redundant configuration can occupy from five to seven slots (in the Cisco ASR 9922 and ASR 9912 chassis) or from zero to five slots (in the Cisco ASR 9910 and ASR 9906 chassis), depending on the line cards used. On the ASR 9922 and ASR 9912, the fabric cards are located at the front of the chassis. On the ASR 9910 and ASR 9906, the fabric cards are located at the rear of the chassis. (Refer to the Cisco ASR 9000 Series Aggregation Services Router Overview and Reference Guide for more details)</p>	
<b>Physical dimensions</b>	<p><b>A99-SFC2:</b></p> <p>Height: 1.68 in. (4.26 cm)</p> <p>Width: 16.87 in. (42.85 cm)</p> <p>Depth: 22.7 in. (57.66 cm)</p> <p>Weight: 12.1 lb (5.5 kg)</p>	<p><b>A99-SFC-S:</b></p> <p>Height: 2.96 in. (7.52 cm)</p> <p>Width: 19.52 in. (49.58 cm)</p> <p>Depth: 5.84 in. (14.83 cm)</p> <p>Weight: 5.85 lb (2.66 kg)</p> <p><b>A99-SFC-T:</b></p> <p>Height: 1.41 in. (3.58 cm)</p> <p>Width: 19.52 in. (49.58 cm)</p> <p>Depth: 5.84 in. (14.83 cm)</p> <p>Weight: 5.85 lb (2.66 kg)</p>



Category	Part Number or Specification
<b>Environmental Specifications</b>	
<b>Operating temperature (nominal)</b>	32 to 104°F (0 to 40°C)
<b>Operating temperature (short-term)</b>	23 to 131°F (-5 to 55°C) <b>Note:</b> Short-term refers to a period of not more than 96 consecutive hours and a total of not more than 15 days in 1 year (a total of 360 hours in any given year, but no more than 15 occurrences during that 1-year period).
<b>Operating humidity (nominal) (relative humidity)</b>	5 to 90%
<b>Storage temperature</b>	-40 to 158°F (-40 to 70°C)
<b>Storage (relative humidity)</b>	5 to 93%
<b>Operating altitude</b>	-60 to 4000m (up to 2000m conforms to IEC/EN/UL/CSA 60950 requirements)
<b>Compliance</b>	
<b>Network Equipment Building Standards (NEBS)</b>	Cisco ASR 9900 is designed to meet these standards: <ul style="list-style-type: none"> <li>• SR-3580: NEBS Criteria Levels (Level 3)</li> <li>• GR-1089-CORE: NEBS Electromagnetic Compatibility (EMC) and Safety</li> <li>• GR-63-CORE: NEBS Physical Protection</li> <li>• VZ.TPR.9205: Verizon TEEER</li> </ul>
<b>ETSI standards</b>	Cisco ASR 9900 platforms are designed to meet these standards (qualification in progress): <ul style="list-style-type: none"> <li>• EN300 386: Telecommunications Network Equipment (EMC)</li> <li>• ETSI 300 019 Storage Class 1.1</li> <li>• ETSI 300 019 Transportation Class 2.3</li> <li>• ETSI 300 019 Stationary Use Class 3.1</li> <li>• EN55022: Information Technology Equipment (Emissions)</li> <li>• EN55024: Information Technology Equipment (Immunity)</li> <li>• EN50082-1/EN-61000-6-1: Generic Immunity Standard</li> </ul>
<b>EMC standards emission</b>	Cisco ASR 9900 platforms are designed to meet these standards: <ul style="list-style-type: none"> <li>• FCC Class A</li> <li>• ICES 003 Class A</li> <li>• AS/NZS 3548 Class A</li> <li>• CISPR 22 (EN55022) Class A</li> <li>• VCCI Class A</li> <li>• BSMI Class A</li> <li>• IEC/EN 61000-3-2: Power Line Harmonics</li> <li>• IEC/EN 61000-3-3: Voltage Fluctuations and Flicker</li> <li>• EN 50121-4: Railway EMC</li> </ul>

Category	Part Number or Specification
<b>EMC standards immunity</b>	Cisco ASR 9900 platforms are designed to meet these standards: <ul style="list-style-type: none"> <li>• IEC/EN-61000-4-2: Electrostatic Discharge Immunity (8kV Contact, 15kV Air)</li> <li>• IEC/EN-61000-4-3: Radiated Immunity (10V/m)</li> <li>• IEC/EN-61000-4-4: Electrical Fast Transient Immunity (2kV Power, 1kV Signal)</li> <li>• IEC/EN-61000-4-5: Surge AC Port (4kV CM, 2kV DM)</li> <li>• IEC/EN-61000-4-5: Signal Ports (1kV)</li> <li>• IEC/EN-61000-4-5: Surge DC Port (1kV)</li> <li>• IEC/EN-61000-4-6: Immunity to Conducted Disturbances (10Vrms)</li> <li>• IEC/EN-61000-4-8: Power Frequency Magnetic Field Immunity (30A/m)</li> <li>• IEC/EN-61000-4-11: Voltage DIPS, Short Interruptions, and Voltage Variations</li> <li>• EN 50121-4: Railway EMC</li> </ul>
<b>Safety</b>	Cisco ASR 9900 platforms are designed to meet these standards: <ul style="list-style-type: none"> <li>• UL/CSA/IEC/EN 60950-1</li> <li>• IEC/EN 60825 Laser Safety</li> <li>• ACA TS001</li> <li>• AS/NZS 60950</li> <li>• FDA: Code of Federal Regulations Laser Safety</li> </ul>

## Cisco Services for Cisco ASR 9000 Series Route Processors

Through a lifecycle services approach, Cisco delivers comprehensive support to service providers to help them successfully deploy, operate, and optimize their Cisco Prime Evolved Programmable Networks. Cisco Services for the Cisco ASR 9000 Series Aggregation Services Routers provide the services and proven methodologies that help assure service deployment with substantial return on investment, operational excellence, optimal performance, and high availability. These services are delivered using leading practices, tools, processes, and lab environments developed specifically for Cisco ASR 9000 Series deployments and post implementation support.

The Cisco Services team addresses your specific requirements, mitigates risk to existing revenue-generating services, and helps accelerate time to market for new network services.

For more information about Cisco Services, contact your local Cisco account representative or visit:

<https://www.cisco.com/go/spservices>.

## Ordering information

Table 4 provides ordering information for the Cisco ASR 9900 SFC2 and SFC-S.

**Table 4.** Ordering information

Product Description	Supported Software Release	Part Number
ASR 9900 Series Switch Fabric Card 2	Cisco IOS XR Software Release 5.3.0 onwards	A99-SFC2
ASR 9900 Series Switch Fabric Card 2, Spare	Cisco IOS XR Software Release 5.3.0 onwards	A99-SFC2=
ASR 9910 Switch Fabric Card	Cisco IOS XR Software Release 6.0.1 onwards	A99-SFC-S
ASR 9910 Switch Fabric Card, Spare	Cisco IOS XR Software Release 6.0.1 onwards	A99-SFC-S=
ASR 9906 Switch Fabric Card	Cisco IOS XR Software Release 6.3.1 onwards	A99-SFC-T
ASR 9906 Switch Fabric Card, Spare	Cisco IOS XR Software Release 6.3.1 onwards	A99-SFC-T=

To place an order, visit the [Cisco Ordering Homepage](#) and refer to Table 4.

## Cisco environmental sustainability

Information about Cisco’s environmental sustainability policies and initiatives for our products, solutions, operations, and extended operations or supply chain is provided in the “Environment Sustainability” section of Cisco’s [Corporate Social Responsibility](#) (CSR) Report.

Reference links to information about key environmental sustainability topics (mentioned in the “Environment Sustainability” section of the CSR Report) are provided in the following table:

Sustainability topic	Reference
Information on product material content laws and regulations	<a href="#">Materials</a>
Information on electronic waste laws and regulations, including products, batteries, and packaging	<a href="#">WEEE compliance</a>

Cisco makes the packaging data available for informational purposes only. It may not reflect the most current legal developments, and Cisco does not represent, warrant, or guarantee that it is complete, accurate, or up to date. This information is subject to change without notice.

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## Cisco Capital

### Flexible payment solutions to help you achieve your objectives

Cisco Capital makes it easier to get the right technology to achieve your objectives, enable business transformation and help you stay competitive. We can help you reduce the total cost of ownership, conserve capital, and accelerate growth. In more than 100 countries, our flexible payment solutions can help you acquire hardware, software, services and complementary third-party equipment in easy, predictable payments.

[Learn more.](#)

For more information

<https://www.cisco.com/c/en/us/products/routers/asr-9000-series-aggregation-services-routers/index.html>.

## Document history

New or Revised Topic	Described In	Date
Expanded content for features and benefits of switch fabric cards	Features and Benefits	March 25, 2022
Updated part numbers of supported line cards	Product Specifications	March 25, 2022

**Americas Headquarters**  
Cisco Systems, Inc.  
San Jose, CA

**Asia Pacific Headquarters**  
Cisco Systems (USA) Pte. Ltd.  
Singapore

**Europe Headquarters**  
Cisco Systems International BV Amsterdam,  
The Netherlands

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