

## Cisco CRS-X Modular Services Card

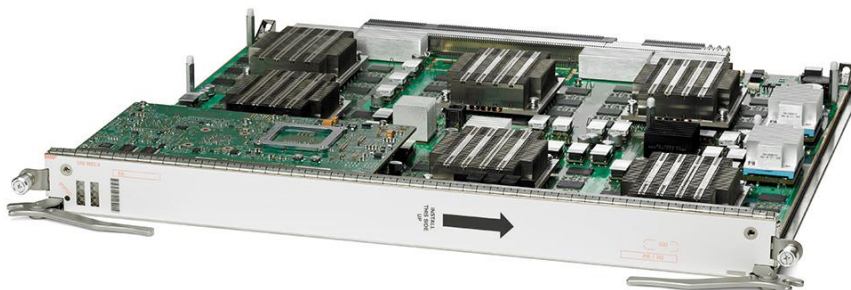
The Cisco® CRS-X Carrier Routing System provides outstanding economical scale, IP and optical network convergence, and a proven architecture that's delivered 10 times the capacity over 10 years. The Cisco CRS-X Modular Service Card (MSC) is powered by advanced application-specific integrated circuits (ASICs), a chipset architecture based on multidimensional engineering, and Cisco IOS® XR Software, a unique distributed operating system.

Packet-based data communications are being replaced by video and rich media transported on the IP Next-Generation Internet and his new traffic strains the architectural foundations of both public and private networks serving businesses and consumers. As part of the medianet, a media-aware Cisco Next Generation Internet, the Cisco CRS-X delivers highly reliable operations and scales easily from single-chassis form factors to a massive multichassis system. Its design offers industry-leading efficiency in power consumption, cooling, and rack-space resources, while providing intelligent service-rich bandwidth capacity. The Cisco CRS-X, which supports 400-Gbps line rates, is backward and forward compatible with the Cisco CRS-1 and the Cisco CRS-3, helping to protect existing and future investments.

The Cisco CRS-X Modular Services Card (Figure 1) offers the following advanced features and benefits:

- 400-Gbps line-rate throughput per slot, increasing the Cisco CRS capacity to 12.8 Tbps in a single chassis
- Advanced forwarding ASICs to support 100-Gbps single-flow traffic processing with optimized power consumption
- Superior investment protection that maintains the existing Cisco CRS architecture, making it compatible with existing Cisco CRS-1 and Cisco CRS-3 line cards and physical layer interface modules (PLIMs)
- Transparent and In-service migration from an existing Cisco CRS-1 or Cisco CRS-3
- Space, cost, and power savings with 100-Gbps Cisco CPAK™ optics
- Flexibility through Cisco AnyPort Technology, which introduces 100-Gbps to 40-Gbps and 40-Gbps to 10-Gbps breakout options

**Figure 1.** Cisco CRS-X Modular Services Card



The Cisco CRS-X MSC provides a distributed forwarding-engine capability for the Cisco CRS Family. Optimized for high-speed edge applications, it provides massive VLAN scale and wire-rate hierarchical quality of service (QoS). It is responsible for data-plane processing tasks, for all the network traffic that flows through it. The card performs all baseline packet routing operations, including Layer 3 forwarding, QoS classification, policing and shaping, security access control lists (ACLs), VPNs, load balancing, and Cisco NetFlow. Important performance features include hardware-assisted policing and multicast packet replication that reduces jitter and latency.

This Cisco CRS-X line card is supported across the Cisco CRS 8-slot, 16-slot, back-to-back, and multichassis form factors and is compatible with both Cisco CRS enhanced and traditional chassis-based systems. The line card has two 200-Gbps forwarding ASICs and can operate in either 200-Gbps or 400-Gbps mode. While operating in 400-Gbps mode in a CRS enhanced chassis-based system, both ASICs are functional, and the line card delivers full 400-Gbps line-rate throughput. In 200-Gbps mode, one of the two forwarding ASICs shuts down to conserve power.

The Cisco CRS-X MSC offers many advantages:

- Transparent operation with previous-generation Cisco CRS-1 and CRS-3 line cards on the same chassis with Cisco CRS-X fabric
- Increased capacity, by scaling the Cisco CRS per-slot forwarding capacity 10 times, from 40 Gbps to 400 Gbps
- Flexible pairing with a variety of interface modules, providing deployment flexibility
- Single-flow Layer 3 traffic processing at 100 Gbps in each direction
- Enhanced onboard multicore CPU for accelerated software processing
- Optimized for high-speed edge applications with enhanced QoS
- Outstanding interface and VLAN scalability
- Wire-rate hierarchical QoS
- Layer 3 forwarding engine with industry-leading, wire-rate performance
- Additional services, such as class-of-service (CoS) processing, multicast, traffic engineering, and statistics gathering, performed at line rate
- Support for up to 64,000 queues and 12,000 interfaces in hardware
- Built-in hardware acceleration for critical network control traffic
- Accurate hardware-assisted time-stamping support for service-level agreement (SLA) monitoring
- Support for several forwarding protocols, including IPv4, IPv6, and Multiprotocol Label Switching (MPLS)
- Enhanced performance with hardware-based prefix lookup for IPv4, IPv6, and MPLS
- Industry-leading environmental efficiency with a low power consumption and weight

## Product Specifications

Table 1 provides specifications for the Cisco CRS-X Modular Services Card.

**Table 1.** Product Specifications

Feature	Description
<b>Chassis compatibility</b>	<ul style="list-style-type: none"> <li>• Cisco CRS 8-slot, 16-slot, and multichassis systems with Cisco CRS-X fabric cards</li> <li>• Legacy Cisco CRS line-card chassis (200-Gbps mode)</li> <li>• Enhanced Cisco CRS line-card chassis (400-Gbps mode)</li> </ul>

Feature	Description
<b>Software compatibility</b>	Cisco IOS XR Software Release 5.1.1 or later
<b>Interface module compatibility</b>	400-Gbps physical interface modules, including Cisco part numbers 4x100GE-OTN and 40x10GE-WLO
<b>Features and protocols</b>	<p>IP features:</p> <ul style="list-style-type: none"> <li>• IPv4 unicast services</li> <li>• IPv6 unicast services</li> <li>• IPv4 and IPv6 equal cost multi-path (ECMP)</li> <li>• IPv4/IPv6 load balancing</li> </ul> <p>Forwarding features:</p> <ul style="list-style-type: none"> <li>• ACLs and XML ACLs (xACLs)</li> <li>• QoS and CoS using Modular QoS command line interface (MQC)</li> <li>• IP packet classification and marking</li> <li>• Queuing (both ingress and egress)</li> <li>• Policing (both ingress and egress)</li> <li>• Diagnostic and network management support</li> </ul> <p>IPv4 multicast features:</p> <ul style="list-style-type: none"> <li>• Protocol Independent Multicast (PIM) Forwarding</li> <li>• IP multicast priority propagation</li> <li>• Multicast reverse path Forwarding (RPF)</li> <li>• Multicast Nonstop forwarding (NSF)</li> <li>• Multicast forwarding information base (MFIB)</li> </ul> <p>MPLS features:</p> <ul style="list-style-type: none"> <li>• MPLS forwarding</li> <li>• MPLS load balancing</li> <li>• Traffic engineering, point-to-multipoint traffic engineering (P2MP)</li> <li>• L3VPNs</li> <li>• L2VPNs based on Ethernet virtual circuit (EVC) infrastructure</li> <li>• Policy-based traffic engineering selection (PBTS)</li> <li>• MPLS OAM</li> <li>• User Network Interface (UNI)</li> <li>• Link Management Protocol (LMP)</li> </ul> <p>Security features:</p> <ul style="list-style-type: none"> <li>• Access control list</li> <li>• Unicast reverse path forwarding (uRPF)</li> <li>• QoS-based policy propagation through Border Gateway Protocol (BGP)</li> <li>• Control packet policing (CPP)</li> <li>• Dynamic control plane protection (DCoPP)</li> <li>• GTSM RFC 3682 (formerly BTSH)</li> </ul> <p>Error detection and fast convergence features:</p> <ul style="list-style-type: none"> <li>• Bidirectional forwarding detection (BFD)</li> <li>• Ethernet OAM (E-OAM), SLA, 802.1ag, 802.3ah, and Y.1731</li> </ul> <p>Accounting:</p> <ul style="list-style-type: none"> <li>• Cisco NetFlow</li> <li>• BGP policy accounting</li> <li>• Mac accounting</li> </ul>
<b>Memory</b>	<ul style="list-style-type: none"> <li>• 8-GB CPU memory and 2 GB per forwarding ASIC, totaling 12 GB physical memory for route tables</li> <li>• 2 GB of packet buffer memory per line card (4 GB ingress and egress)</li> </ul>
<b>Performance</b>	<ul style="list-style-type: none"> <li>• 400-Gbps line-rate throughput</li> <li>• Maximum number of MSC per chassis: 8-slot chassis (8), 16-slot chassis (16)</li> </ul>
<b>Reliability and availability</b>	<ul style="list-style-type: none"> <li>• Line-card online insertion and removal (OIR) support without affecting system</li> <li>• In-service software patching</li> <li>• Out of resource management</li> <li>• Process re-start</li> <li>• IP fast reroute (FRR)</li> <li>• MPLS fast reroute (FRR)</li> </ul>

Feature	Description
<b>Network management</b>	<ul style="list-style-type: none"> <li>• Cisco IOS XR Software command-line interface (CLI)</li> <li>• Simple Network Management Protocol (SNMP)</li> <li>• Extensible Markup Language (XML) interface</li> <li>• Craft Works Interface (CWI)</li> <li>• Cisco Active Network Abstraction (ANA)</li> </ul>
<b>Physical dimensions</b>	<ul style="list-style-type: none"> <li>• Occupies one-half slot on a Cisco CRS chassis</li> <li>• Weight: 16.0 lbs (7.26 kg)</li> <li>• Height: 20.6 in. (52.2 cm)</li> <li>• Depth: 18.62 in. (47.25 cm)</li> <li>• Width: 1.8 in. (4.49 cm)</li> </ul>
<b>Power</b>	Expected value less than 700 watts in 400-Gbps mode; and less than 450W in 200-Gbps mode
<b>Environmental conditions</b>	<ul style="list-style-type: none"> <li>• Storage temperature: -40 to 158°F (-40 to 70°C)</li> <li>• Operating temperature: <ul style="list-style-type: none"> <li>◦ Normal: 41 to 104°F (5 to 40°C)</li> <li>◦ Short-term: 23 to 122°F (-5 to 50°C)</li> </ul> </li> <li>• Relative humidity: <ul style="list-style-type: none"> <li>◦ Normal: 5 to 85%</li> <li>◦ Short-term: 5 to 90% but not to exceed 0.024 kg water per kg of dry air</li> </ul> </li> </ul> <p>Short-term refers to a period of not more than 96 consecutive hours and a total of 360 hours but not more than 15 instances in 1 year.</p>

## Approvals and Compliance

Table 2 gives standards compliance information for the Cisco CRS-X Modular Services Card.

**Table 2.** Compliance and Agency Approvals

Feature	Description
<b>Safety standards</b>	<ul style="list-style-type: none"> <li>• UL/CSA/IEC/EN 60950-1, 2<sup>nd</sup> ed, AM 1</li> <li>• AS/NZS 60950.1</li> <li>• IEC/EN 60825 Laser Safety</li> <li>• FDA - Code of Federal Regulations Laser Safety</li> </ul>
<b>EMI</b>	<ul style="list-style-type: none"> <li>• FCC Class A</li> <li>• ICES 003 Class A</li> <li>• AS/NZS CISPR 22 Class A</li> <li>• CISPR 22 (EN55022) Class A</li> <li>• VCCI Class A</li> <li>• IEC/EN 61000-3-2: Power Line Harmonics</li> <li>• IEC/EN 61000-3-3: Voltage Fluctuations and Flicker</li> </ul>
<b>Immunity (basic standards)</b>	<ul style="list-style-type: none"> <li>• IEC/EN-61000-4-2: Electrostatic Discharge Immunity (8-kV contact, 15-kV air)</li> <li>• IEC/EN-61000-4-3: Radiated Immunity (10V/m)</li> <li>• IEC/EN-61000-4-4: Electrical Fast Transient Immunity (2-kV power, 1-kV signal)</li> <li>• IEC/EN-61000-4-5: Surge AC Port (4-kV CM, 2-kV DM)</li> <li>• IEC/EN-61000-4-5: Signal Ports (1 kV)</li> <li>• IEC/EN-61000-4-5: Surge DC Port (1 kV)</li> <li>• IEC/EN-61000-4-6: Immunity to Conducted Disturbances (10 Vrms)</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> </ul>
<b>ETSI and EN</b>	<ul style="list-style-type: none"> <li>• EN300 386: Telecommunications Network Equipment (EMC)</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>

Feature	Description
<b>Network Equipment Building Standards (NEBS)</b>	This product is designed to meet the following requirements (qualification in progress): <ul style="list-style-type: none"> <li>• SR-3580: NEBS Criteria Levels (Level 3)</li> <li>• GR-1089-CORE: NEBS EMC and Safety</li> <li>• GR-63-CORE: NEBS Physical Protection</li> </ul>

## Ordering Information

To place an order, contact your local Cisco representative or visit the [Cisco Ordering homepage](#). Use the ordering information in Table 3.

**Table 3.** Ordering Information

Product Name	Part Number
<b>Cisco CRS-X Modular Services Card (400G)</b>	CRS-MSC400G
<b>Cisco CRS-X Modular Services Card (200G)</b>	CRS-MSC200G

## Cisco Services

Cisco Services helps networks, applications, and the people who use them work together more effectively.

Today, the network is a strategic platform in a world that demands better integration between people, information, and ideas. The network works better when services, together with products, create solutions aligned with business needs and opportunities.

The unique Cisco Lifecycle approach to services defines the required activities at each phase of the network lifecycle to help ensure service excellence. With a collaborative delivery methodology that joins Cisco, our skilled network of partners, and our customers, we achieve the best results.

## For More Information

For more information about the Cisco CRS-X Modular Services Card, the Cisco Carrier Routing System, or other available interfaces, contact your local Cisco representative or visit: <http://www.cisco.com/go/crs>.



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

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at [www.cisco.com/go/offices](http://www.cisco.com/go/offices).

Cisco and the Cisco logo are trademarks or registered trademarks of Cisco and/or its affiliates in the U.S. and other countries. To view a list of Cisco trademarks, go to this URL: [www.cisco.com/go/trademarks](http://www.cisco.com/go/trademarks). Third party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1110R)