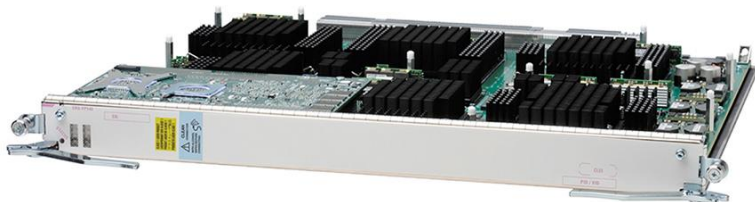# Cisco CRS Forwarding Processor Cards

## Product Overview

The Cisco® Carrier Routing System (CRS) provides outstanding economical scale, IP and optical network convergence, and a proven architecture. The Cisco CRS continues to evolve with the needs of the network, becoming more elastic and programmable. As part of an evolving and programmable network, the Cisco CRS delivers highly reliable operations and scales easily from a single-chassis to a massive multichassis system. The Cisco CRS design offers industry-leading efficiency in power consumption, cooling, and rack-space resources, while providing intelligent service-rich bandwidth capacity.
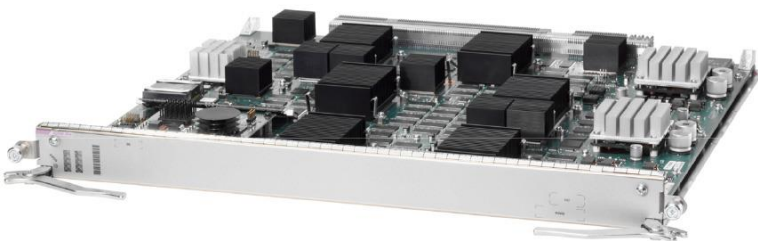
Cisco CRS forwarding processor cards provide distributed forwarding-engine capabilities and scalability, which are important for supporting the Internet of Everything. The Cisco CRS forwarding engine is responsible for data-plane processing tasks and handling all network traffic flows through the system. The forwarding processor card performs all baseline packet-routing operations, including Layer 3 forwarding, quality-of-service (QoS) classification, policing and shaping, security access control lists (ACLs), VPNs, load balancing, and Cisco NetFlow. Performance highlights of the forwarding processor cards include hardware-assisted policing and jitter- and latency-reducing multicast packet replication.

Cisco CRS forwarding processor cards include the Cisco CRS-X 400-Gbps Forwarding Processor Card, Cisco CRS-X Series 200-Gbps Lite Forwarding Processor Card, Cisco CRS-3 140-Gbps Forwarding Processor Card (Figure 1), and the Cisco CRS-1 Series 40-Gbps Forwarding Processor Card (Figure 2).

**Figure 1.**     Cisco CRS-3 140-Gbps Forwarding Processor Card



**Figure 2.**     Cisco CRS-1 Series 40-Gbps Forwarding Processor Card

## Features and Benefits

Cisco CRS forwarding processor cards offer many advantages:

- Support across multiple Cisco CRS form factors, including 8-slot, 16-slot, and multichassis

- Forward and backward compatibilities; the Cisco CRS-1 (40 Gbps), CRS-3 (140 Gbps), and CRS-X (400 Gbps) cards can coexist on the same chassis when using the Cisco CRS-X fabric

- Up to 400-Gbps line-rate throughput per slot, increasing the Cisco CRS capacity to 12.8 Tbps in a single chassis

- Occupies one-half slot, allowing the card to be paired with a variety of interface modules, providing deployment flexibility (Cisco CRS-FP400G and CRS-FP140 only)

- Layer 3 forwarding engine with industry-leading, wire-rate performance

- Built-in hardware acceleration for critical network-control traffic

- Accurate hardware-assisted time-stamping support for service-level agreement (SLA) monitoring

- Energy monitor functionality that allows real-time power monitoring of each individual component, including physical layer interface modules (PLIMs) and line cards, fabric, Performance Route Processor (PRP) through Command Line Interface (CLI), beginning with Cisco IOS® XR Release 5.1.1 (Cisco CRS-FP400G)

## Product Specifications

Table 1 provides specifications for Cisco CRS forwarding processor cards.

**Table 1.**    Product Specifications

| Feature | Description | | | |
|---|---|---|---|---|
| | **Cisco CRS-X 400-Gbps Forwarding Processor Card** | **Cisco CRS-3 140-Gbps Forwarding Processor Card** | **Cisco CRS-1 Series 40-Gbps Forwarding Processor** | **Cisco CRS-X 200-Gbps Lite Forwarding Processor Card** |
| **Chassis compatibility** | Compatible with legacy Cisco CRS line-card chassis (200-Gbps mode)<br>Compatible with enhanced Cisco CRS line-card chassis (400-Gbps mode)<br>* Requires 400-Gbps fabric cards<br>Compatible with 400-Gbps physical interface modules including Product IDs: 4x100GE-OTN, 40x10GE-WLO, and 2x100GE-FLEX-40 | Compatible with all current Cisco CRS-3 line-card chassis<br>Compatible with all current Cisco CRS-1 line-card chassis with 140-Gbps fabric cards<br>* Always paired with an interface module<br>Compatible with Product IDs:1X100GBE, 14X10GBE-WL-XFP, and 20X10GBE-WL-XFP interface modules | Supported across 4-slot and 8-slot Cisco CRS-3 chassis<br>Compatible with both 4-slot and 8-slot Cisco CRS-1 chassis | Compatible with legacy Cisco CRS line-card chassis (200-Gbps mode)<br><br>* Requires 400-Gbps fabric cards<br><br>Compatible with 400-Gbps physical interface modules including Product IDs:4x100GE-OTN, 40x10GE-WLO, and 2x100GE-FLEX-40 |
| **Software compatibility** | Cisco IOS XR Software Release 5.1.1. or later | Cisco IOS XR Software Release 4.0.0 or later | Cisco IOS XR Software Release 3.8.1 or later for Cisco CRS-1<br>Cisco IOS XR Software Release 4.0.0 or later for Cisco CRS-3 | Cisco IOS XR Software Release 5.1.4. or later |
| **Memory** | 8 GB physical memory | Configurable with up to 8 GB of route table memory<br>1 GB of packet buffer memory per side (2 GB total per line card [ingress and egress]) | 2 GB of route table memory<br>1 GB of packet buffer memory per side (2 GB total per line card [ingress and egress]) | 8 GB physical memory |

| Feature | Description | | | |
|---|---|---|---|---|
| | **Cisco CRS-X 400-Gbps Forwarding Processor Card** | **Cisco CRS-3 140-Gbps Forwarding Processor Card** | **Cisco CRS-1 Series 40-Gbps Forwarding Processor** | **Cisco CRS-X 200-Gbps Lite Forwarding Processor Card** |
| **Performance** | 400-Gbps line-rate throughput<br><br>Maximum number of forwarding processor modules per chassis: 8 slot (8) and 16 slot (16) | 140-Gbps line-rate throughput<br><br>Maximum number of forwarding processor modules per chassis: 4 slot (4), 8 slot (8), and 16 slot (16) | 40-Gbps line rate throughput | 200-Gbps line-rate throughput<br><br>Maximum number of forwarding processor modules per chassis: 8 slot (8) and 16 slot (16) |
| **Features and protocols** | IP features:<br>• IPv4 unicast services<br>• IPv6 unicast services<br>• IPv4/IPv6 equal cost multipath (ECMP)<br>• IPv4/IPv6 load balancing<br>Forwarding features:<br>• Access control lists (ACLs/xACLs)<br>• Quality of service (QoS) and class of service (CoS) using Modular QoS CLI (MQC)<br>• IP packet classification/marking<br>• Queuing (both ingress and egress)<br>• Policing (both ingress and egress)<br>• Diagnostic and network management support<br>IPv4 multicast features:<br>• Protocol Independent Multicast (PIM) Forwarding<br>• IP Multicast Priority Propagation<br>• Multicast Reverse Path Forwarding (RPF)<br>• Multicast Nonstop Forwarding (NSF)<br>• Multicast Forwarding Information Base (MFIB)<br>Multiprotocol Label Switching (MPLS) features:<br>• MPLS forwarding<br>• MPLS load balancing<br>• Traffic engineering and point-to-multipoint (P2MP) traffic engineering<br>• Policy-based traffic engineering selection (PBTS)<br>• MPLS OAM<br>• User network interface (UNI)<br>• Link Management Protocol (LMP)<br>Security features:<br>• Access control list<br>• Unicast Reverse Path Forwarding (uRPF)<br>• QoS-based policy propagation through Border Gateway Protocol (QPPB)<br>• Control packet policing (CPP)<br>• Dynamic control plane protection (DCoPP)<br>• GTSM RFC 3682 (BTSH)<br>Error detection and fast convergence features:<br>• Bidirectional forwarding detection (BFD)<br>• Ethernet OAM (E-OAM), service-level agreement (SLA), 802.1ag, 802.3ah, and Y.1731<br>Accounting:<br>• Cisco NetFlow<br>BGP policy accounting | | | |
| **Reliability and availability** | • Line-card online insertion and removal (OIR) support without affecting system<br>• In-service software patching<br>• Out of resource management<br>• Process restartability<br>• IP fast reroute (FRR)<br>• MPLS fast reroute (FRR) | | | |

| Feature | Description | | | |
|---|---|---|---|---|
| | **Cisco CRS-X 400-Gbps Forwarding Processor Card** | **Cisco CRS-3 140-Gbps Forwarding Processor Card** | **Cisco CRS-1 Series 40-Gbps Forwarding Processor** | **Cisco CRS-X 200-Gbps Lite Forwarding Processor Card** |
| **Network management** | • Cisco IOS XR Software command-line interface (CLI)<br>• Simple Network Management Protocol (SNMP)<br>• XML interface<br>• Cisco Prime™ | | | |
| **Physical dimensions** | • Occupies one-half slot<br>• Weight: 14.75 lb (6.7 kg)<br>• Height: 20.6 in. (52.2 cm)<br>• Depth: 18.62 in. (47.25 cm)<br>• Width: 1.8 in. (4.49 cm) | • Occupies one-half slot<br>• Weight: 14.75 lb (6.68 kg)<br>• Height: 20.6 in. (52.2 cm)<br>• Depth: 18.62 in. (47.25 cm)<br>• Width: 1.8 in. (4.49 cm) | • Occupies one slot<br>• Weight: 12 lb (5.44 kg)<br>• Height: 20.6 in. (52.2 cm)<br>• Depth: 18.62 in. (47.25 cm)<br>• Width: 1.8 in. (4.49 cm) | • Occupies one-half slot<br>• Weight: 13.57 lb (6.17 kg)<br>• Depth: 18.62 in. (47.25 cm)<br>• Width: 1.8 in. (4.49 cm) |
| **Power** | < 650W | 446W | 330W | 400W |
| **Environmental conditions** | Storage temperature: -40 to 158°F (-40 to 70°C)<br>Operating temperature:<br>• Normal: 41 to 104°F (5 to 40°C)<br>• Short-term: 23 to 122°F (-5 to 50°C)<br>Relative humidity:<br>• Normal: 5 to 85%<br>• Short-term: 5 to 90% but not to exceed 0.024 kg water per kg of dry air<br>Short-term refers to a period of not more than 96 consecutive hours or a total of 360 hours but not more than 15 instances in 1 year. | | | |

## Approvals and Compliance

Table 2 provides the standards and compliance information for Cisco CRS forwarding processor cards.

**Table 2.**     Compliance and Agency Approvals

| Feature | Description | | | |
|---|---|---|---|---|
| | **Cisco CRS-X 400-Gbps Forwarding Processor Card** | **Cisco CRS-3 140-Gbps Forwarding Processor Card** | **Cisco CRS-1 Series 40-Gbps Forwarding Processor** | **Cisco CRS-X 200-Gbps Lite Forwarding Processor Card** |
| **Safety standards** | • UL/CSA/IEC/EN 60950-1<br>• AS/NZS 60950.1<br>• IEC/EN 60825 Laser Safety<br>• FDA - Code of Federal Regulations Laser Safety | | | |
| **EMI** | • FCC Class A<br>• ICES 003 Class A<br>• AS/NZS CISPR 22 Class A<br>• CISPR 22 (EN55022) Class A<br>• VCCI Class A<br>• IEC/EN 61000-3-2: Power Line Harmonics<br>• IEC/EN 61000-3-3: Voltage Fluctuations and Flicker | | | |
| **Immunity (Basic standards)** | • IEC/EN-61000-4-2: Electrostatic Discharge Immunity (8-kV contact, 15-kV air)<br>• IEC/EN-61000-4-3: Radiated Immunity (10V/m)<br>• IEC/EN-61000-4-4: Electrical Fast Transient Immunity (2-kV power, 1-kV signal)<br>• IEC/EN-61000-4-5: Surge AC Port (4-kV CM, 2-kV DM)<br>• IEC/EN-61000-4-5: Signal Ports (1 kV)<br>• IEC/EN-61000-4-5: Surge DC Port (1 kV)<br>• IEC/EN-61000-4-6: Immunity to Conducted Disturbances (10 Vrms)<br>• IEC/EN-61000-4-8: Power Frequency Magnetic Field Immunity (30A/m)<br>• IEC/EN-61000-4-11: Voltage Dips, Short Interruptions, and Voltage Variations | | | |

| Feature | Description | | | |
|---|---|---|---|---|
| | Cisco CRS-X 400-Gbps Forwarding Processor Card | Cisco CRS-3 140-Gbps Forwarding Processor Card | Cisco CRS-1 Series 40-Gbps Forwarding Processor | Cisco CRS-X 200-Gbps Lite Forwarding Processor Card |
| ETSI and EN | • EN300 386: Telecommunications Network Equipment (EMC) <br> • EN55022: Information Technology Equipment (Emissions) <br> • EN55024: Information Technology Equipment (Immunity) <br> • EN50082-1/EN-61000-6-1: Generic Immunity Standard | | | |
| Network Equipment Building Standards (NEBS) | This product is designed to meet the following requirements (qualification in progress): <br> • SR-3580: NEBS Criteria Levels (Level 3) <br> • GR-1089-CORE: NEBS EMC and Safety <br> GR-63-CORE: NEBS Physical Protection | | | |

## Ordering Information

Table 3 provides ordering information. To place an order, visit the Cisco Ordering homepage. To download software, visit the Cisco Software Center.

**Table 3.**     Ordering Information

| Product Name | Part Number |
|---|---|
| Cisco CRS-1 Series Forwarding Processor 40G | CRS-FP40 |
| Cisco CRS-3 Forwarding Processor Card (140 Gbps) | CRS-FP140 |
| Cisco CRS-X Forwarding Processor Card Lite (200 Gbps) | CRS-FP200G-L |
| Cisco CRS-X Forwarding Processor Card (200 Gbps) | CRS-FP200G |
| Cisco CRS-X Series 200G to 400G Upgrade License | XC-FP200GTO400G |
| Cisco CRS-X Forwarding Processor Card (400 Gbps) | CRS-FP400G |

## Cisco Services

Services from Cisco and our partners help you get the most value from your investments in Cisco converged IP and optical solutions, quickly and cost effectively. We can help you:

- Design, implement, and validate your solution to speed migration and cutover
- Coordinate every step through to interworking, and deploy your solution in a predictable, efficient, accurate way
- Strengthen your team by sharing what we know

We develop award-winning services that incorporate our history of market-changing innovation, which are delivered by deeply experienced engineers using proven methods and automated tools built through more than 28 years of industry leadership.

## For More Information

For more information about the Cisco CRS visit http://www.cisco.com/go/crs or contact your local account representative.

Learn more about Cisco services at http://www.cisco.com/go/spservices.