

## Cisco CRS Label Switch Processors

The Cisco® Carrier Routing System (CRS) provides outstanding economical scale, IP and optical network convergence, and a proven architecture. Cisco CRS modular service cards (MSCs) are 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.

Networks are facing new challenges with the Internet of Everything. Trillions of things have become Internet ready and can start talking to each other, as well as to applications and people. The effects of machine-driven events change network dynamics and impose entirely new service requirements. Managing bandwidth is no longer enough. Networks must become more elastic and programmable, capable of adapting and evolving. As part of an evolving and programmable network, the Cisco CRS 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 supports up to 400-Gbps line rates, and its hardware is backward and forward compatible, helping to protect existing and future investments.

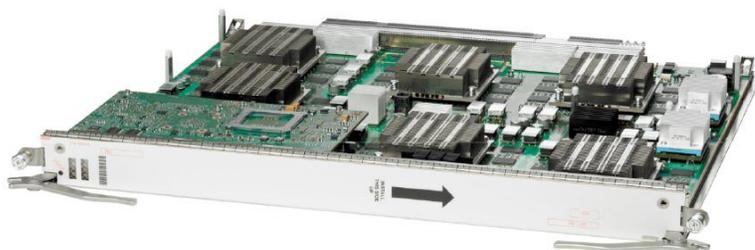
### Product Overview

Cisco CRS label switch processors provide distributed forwarding-engine capability for the Cisco CRS platform. The label switch processors allow a flexible packet transport solution and are responsible for forwarding-processing tasks, handling all network traffic flows through the data plane. They can switch Multiprotocol Label Switching (MPLS) traffic at high throughput and low latency and jitter and offer immediate scalability to hundreds of thousands of label switched paths (LSPs).

Both the Cisco CRS-X Label Switch Processor and the Cisco CRS-3 Label Switch Processor are supported across the Cisco CRS 8-slot, 16-slot, and multichassis form factors and are compatible with both Cisco CRS enhanced chassis and legacy chassis-based systems.

The Cisco CRS-X Label Switch Processor (Figure 1) features two 200-Gbps forwarding ASICs and can operate in either 200-Gbps or 400-Gbps mode. While operating in a 400-Gbps mode in a Cisco CRS enhanced chassis-based system, the line card delivers full 400-Gbps line-rate throughput. In a 200-Gbps mode, one of the two forwarding ASICs is in a shut-down state to conserve on power and thermals.

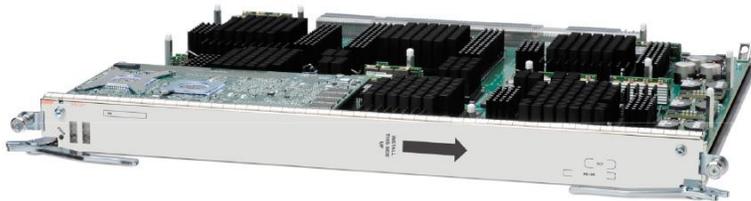
**Figure 1.** Cisco CRS-X Label Switch Processor



The Cisco CRS-X Label Switch Processor main features include:

- Flexibility to operate in 200-Gbps mode, where one of the two forwarding ASICs is in a shut-down state to conserve on power and thermals
- Seamless compatibility with previous-generation Cisco CRS-1 (40 Gbps) and Cisco CRS-3 (140 Gbps) line cards on the same chassis with Cisco CRS-X fabric
- Scaling of Cisco CRS per-slot forwarding capacity to 400 Gbps
- Single-flow traffic processing at 100 Gbps in each direction
- Packet transport forwarding engine with industry-leading, wire-rate performance at 400 Gbps
- Additional services, such as class of service (CoS) processing, multicast, traffic engineering, and statistics gathering, all performed at line-rate 400 Gbps

**Figure 2.** Cisco CRS-3 Label Switch Processor



The Cisco CRS-3 Label Switch Processor main features include:

- Powered by Cisco Flow Array<sup>®</sup>, one of the world's most sophisticated chipset architectures, which includes a 140-Gbps ASIC, based on 65-nanometer (nm) technology; Cisco Flow Array was engineered for Cisco CRS routers to provide higher bandwidth without compromising service performance
- Supported across all the Cisco CRS form factors: 4-slot, 8-slot, 16-slot, and multichassis
- Scaling of Cisco CRS per-slot forwarding capacity to 140 Gbps
- Two 140-Gbps forwarding ASICs for discrete ingress and egress packet handling
- Single-flow traffic processing at 140 Gbps in each direction

Both the Cisco CRS-X and CRS-3 Label Switch Processors are optimized for label switching functions in a service provider's network and include:

- Additional services such as CoS processing, multicast, traffic engineering, and statistics gathering, all performed at 140 Gbps line rate
- Deployment flexibility by occupying one-half slot, allowing pairing with a variety of different interface modules
- Support for up to 8 queues per port
- Scaling for hundreds of thousands of LSPs and traffic engineering midpoints
- Built-in support for carrier-class high availability with fast reroute (FRR) capability, providing restoration in 50 ms in case of link or node failure
- Built-in hardware acceleration for critical network control traffic
- Built-in support for video monitoring for a comprehensive video quality of experience (QoE)
- Accurate hardware-assisted time-stamping support for service-level agreement (SLA) monitoring

- Industry-leading environmental efficiency with a lower power and weight profile

## Product Specifications

Table 1 provides specifications for the Cisco CRS-X and CRS-3 label switch processors.

**Table 1.** Product Specifications

| Feature                             | Cisco CRS-X Label Switch Processor  | Cisco CRS-3 Label Switch Processor   |
|-------------------------------------|---|--|
| <b>Chassis compatibility</b>        | <ul style="list-style-type: none"> <li>• Compatible with legacy Cisco CRS line-card chassis (in 200-Gbps mode only)</li> <li>• Compatible with enhanced Cisco CRS line-card chassis (400-Gbps mode)</li> <li>• Requires 400-Gbps fabric cards</li> <li>• Compatible with 400-Gbps physical interface modules including 4x100GE-OTN, 40x10GE-WLO, and 2x100GE-FLEX-40</li> </ul>   | <ul style="list-style-type: none"> <li>• Compatible with all current Cisco CRS-3 line-card chassis</li> <li>• Compatible with all current Cisco CRS-1 line-card chassis with 140-Gbps fabric cards</li> <li>• Always paired with an interface module</li> <li>• Compatible with 100- and 140-Gbps interface modules</li> </ul> |
| <b>Software compatibility</b>       | Cisco IOS XR Software Release 5.1.1 or later  | Cisco IOS XR Software Release 4.1.1 or later   |
| <b>Features and protocols</b>       | <p>IP features:</p> <ul style="list-style-type: none"> <li>• Optimized IP features, such as unicast, equal-cost multipathing (ECMP), multicast, and load balancing</li> </ul> <p>Forwarding features:</p> <ul style="list-style-type: none"> <li>• Optimized QoS and security features</li> <li>• Queuing (both ingress and egress)</li> <li>• Diagnostic and network management support</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 (P2MP) traffic engineering</li> <li>• Multicast Label Distribution Protocol (LDP)</li> <li>• Policy-based tunnel selection (PBTS)</li> <li>• MPLS operations, administration, and maintenance (OAM)</li> <li>• User-network interface (UNI)</li> <li>• Link Management Protocol (LMP)</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 (EOAM), SLA, 802.1ag, 802.3ah, and Y.1731</li> </ul> <p>Accounting:</p> <ul style="list-style-type: none"> <li>• Interface statistics and Cisco NetFlow</li> </ul> |  |
| <b>Memory</b>                       | <ul style="list-style-type: none"> <li>• 8 GB of total physical memory</li> </ul>   | <ul style="list-style-type: none"> <li>• Configurable with up to 8 GB of route table memory</li> <li>• 1 GB of packet buffer memory per side (2 GB total per processor, ingress and egress)</li> </ul>   |
| <b>Performance</b>                  | <ul style="list-style-type: none"> <li>• 400-Gbps line-rate full-duplex throughput</li> <li>• Maximum number of label switch processors per chassis: 8 slot (8) and 16 slot (16)</li> </ul>   | <ul style="list-style-type: none"> <li>• 40-Gbps line-rate full-duplex throughput</li> <li>• 125-Mpps switching performance</li> <li>• Maximum number of label switch processors per chassis: 4 slot (4), 8 slot (8), and 16 slot (16)</li> </ul>  |
| <b>Reliability and availability</b> | <ul style="list-style-type: none"> <li>• Online insertion and removal (OIR) support without affecting system</li> <li>• In-service software patching</li> <li>• Out-of-resource management</li> <li>• Process restartability</li> <li>• FRR</li> <li>• MPLS traffic engineering FRR within 50-ms</li> <li>• MPLS loop-free alternate (LFA) FRR within 50-ms</li> </ul>  |  |
| <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>• XML interface</li> <li>• Cisco Prime™</li> </ul>  |  |

| Feature                         | Cisco CRS-X Label Switch Processor  | Cisco CRS-3 Label Switch Processor  |
|---------------------------------|---|---|
| <b>Physical dimensions</b>      | <ul style="list-style-type: none"> <li>• Occupies one-half slot on a Cisco CRS chassis</li> <li>• Weight: 14.75 lb (6.7 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>   | <ul style="list-style-type: none"> <li>• Occupies one-half slot on a Cisco CRS chassis</li> <li>• Weight: 14.75 lb (6.7 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>                    | <p>Expected value &lt; 650W in 400-Gbps mode</p> <p>Energy monitor functionality allows real-time power monitoring of each individual component - PLIMs and line cards, fabric, PRP through CLI, beginning with IOS XR Release 5.1.1</p>  | 446W  |
| <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/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 provides standards compliance information for Cisco CRS label switch processors.

**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>• 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>  |
| <b>EMI</b>                        | <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> </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 Home Page](#). Use the ordering information in Table 3.

**Table 3.** Ordering Information

| Product Part Number | Product Name                       |
|---------------------|------------------------------------|
| <b>CRS-LSP</b>      | Cisco CRS-3 Label Switch Processor |
| <b>CRS-LSP400G</b>  | Cisco CRS-X Label Switch Processor |

## Cisco Services

Services from Cisco and our partners help you get the most value from your investments in Cisco's 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, and 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>.



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