Cisco Crosswork Network Controller

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Cisco Crosswork Network Controller (CNC) is a transport SDN controller that empowers customers to simplify and automate intent-based network service provisioning, health monitoring, and optimization in a multivendor network environment with a common GUI and API. Cisco CNC simplifies operational workflows by consolidating both the service lifecycle and device management functions in a single integrated solution.

Product overview

Network operators are facing challenges to support the exponential growth of network traffic while addressing the pressures to efficiently run network operations. Operators are reducing the management complexity by converging and collapsing their networks, migrating to Software-Defined Networks (SDNs), and automating daily operational tasks to become more efficient and competitive. Automating service lifecycle functions is vital to their success as it helps them to accelerate time to revenue, improve end-user experience, and boost the operational agility.

Cisco Crosswork Network Controller allows customers to deploy services faster and offers intent-based service health monitoring and network optimization, improving service delivery while mitigating network congestion issues. Cisco Crosswork Network Controller has been shaped by the experience of helping multiple tier-one service provider and large enterprise customers automate everything from simple device turn-up to sophisticated full lifecycle service management. It delivers critical capabilities for automating service orchestration and fulfilment, network optimization, path computation, service health monitoring, and element management. The underlying goal is to preserve the service policy intent and associated SLA.

As an integrated solution, Cisco Crosswork Network Controller combines multiple innovative, industry-leading capabilities such as Advanced Traffic Engineering, Segment Routing Path Computation Element (SR-PCE), Flexible Algorithms, Intent-based Assurance – with common API and UI, providing visibility and control via a single pane of glass.

With Cisco Crosswork Network Controller, you can realize a number of outcomes:

- Segment Routing (SR) policy provisioning with explicit intent (for example, bandwidth constraints, latency minimization, etc).

- Services provisioning (for example, L2VPN, L3VPN services with associated segment routing policy).

- Monitor and troubleshoot health of L2VPN and L3VPN services by combining empirical data plane verification with infrastructure health to realize true service impact. Service health status visualization can be augmented with infrastructure alarms.

- Collect real-time performance information and optimize the network to maintain the intent of the associated segment routing policy.

- Tactically optimize the network during times of congestion with bandwidth optimization techniques.

- Gain the most from migration to next-generation networks and technologies (for example, migration to SRv6 or Routed Optical Networks (RON), implementing multicast with SR Tree-SID, embracing 5G network slicing, etc.).

Cisco Crosswork Network Controller enables you to realize multiple benefits:

- Expedite provisioning of new services, underlying transport and changes to existing services.

- Improved service delivery and end-user experience along with optimal use of network resources.

- Enhanced operational efficiency with automation of functions across service and device lifecycle.

- Increased profitability and reduced costs through accelerating time to revenue and improving OpEx utilization.
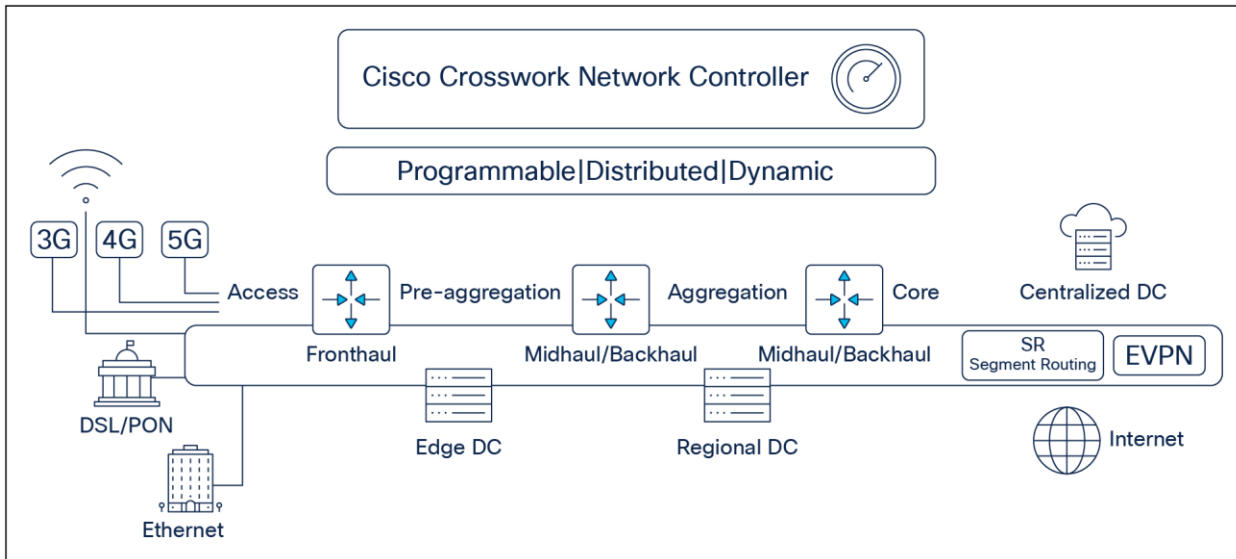

Figure 1.
SDN Transport Automation

Features and benefits

Cisco Crosswork Network Controller includes a comprehensive set of features (Table 1) supporting automation use-cases across device and service lifecycle management. These features are offered in packages (Essentials, Advantage, Add-on) to effectively align with customers' use-cases.

Table 1.   CNC Key Features and Functions

Feature	Benefit
Single pane of glass	• Crosswork Network Controller enables real-time visibility across the service and device lifecycle, with intuitive navigation across network topology, service inventory, transport policies, service health, device health, and more supporting a breadth of use-cases with a common and integrated user experience.
Physical network topology visualization	• Visualize the physical topology, i.e. L2 P2P connected topology which includes CDP/LLDP and 802.3ad LAG
IP topology auto-discovery	• Auto-discovery based on the IETF standard, Border Gateway Protocol Link State (BGP-LS), to automatically discover the IP topology across multiple vendors

Feature	Benefit
Element Management	**Inventory Visualization** • Augment the device and interface information with deeper inventory details including chassis, line cards, pluggable and ports. • Keep track of the installed HW by visualization of all FRU Part numbers and Serial numbers **Fault Visualization** • Expedite troubleshooting with alarm overlay on network topology and Assurance Graphs • Track health of network using consolidated view of the alarms collected from all managed devices **Metrics Visualization** • Contextual health monitoring of different infrastructure elements including devices, modules, ports and environmental params • Proactively monitor via configurable multi-level threshold alerts **Software Image Management** • Perform on demand or scheduled upgrade of device software including SMU's • Leverage seamless UI/API with in-built standard checks that enables successful Image upgrade **Zero Touch Device Onboarding** • Reduce cost with rapid provisioning and onboarding of network devices at a mass-scale using classic mode and secure RFC 8572 for supported XR devices. And PnP for supported XE devices. • Perform simplified device onboarding via Zero Touch profiles with day0 Image and day0 Configuration.
Intent-based provisioning and visualization	**Services** • Rapid L2VPN and L3VPN service provisioning in conformance to the intent expressed in the service models • Extend and customize the packaged L2VPN and L3VPN service definitions **Transport (SR-MPLS, SRv6, RSVP-TE)** • Service-oriented transport network policy provisioning with explicit SLAs by specifying optimization objective (latency/IGP/TE metric minimization) and constraints (affinities, disjoint paths, bandwidth, etc.) • Provision PCC-initiated SRv6-TE policies **SR Circuit Style** • Reserve bandwidth for bidirectional co-routed paths including backup and protection paths • Enable support for transport-circuit-like services (e.g. Optical circuits, TDM circuit) over a Segment Routing network **SR Tree-SID** • Visualize dynamic and static SR Multicast Tree-SIDs • Provision MVPNs and static SR Tree-SIDs in an intent based automated workflow.

Feature	Benefit
Closed-loop intent optimization and Dynamic Traffic Engineering	**Closed Loop Optimization** • Leveraging real-time protocols such as BGP-LS and Path Computation Element Communication Protocol (PCEP), Crosswork Network Controller enables closed-loop tracking of the network topology state changes, reacting quickly to changes in network conditions while preserving the service intent. • React to bandwidth and latency demand fluctuations in real time **Traffic Engineering Dashboard** • Network-wide visibility to help drive optimal traffic engineering decisions • Gain historical insights into LSP utilization, path change events, and related details **Local Congestion Mitigation** • Effectively handle link congestion in a localized manner using tactical TE policies • Customize automatic deployment of LCM recommended policies and actions • Group recommendations by IGP domains and deploy a specific set of actions for one domain without having to deploy it for others in the network **SR Flexible Algorithm** • Enhance traffic engineering utilizing flexible algorithms that allow customization of IGP shortest-path computation according to specific service needs • Discover and visualize prefix-SIDs (SR-MPLS), locators (SRv6), and flexible algorithm affinities
Service health monitoring and troubleshooting	• Dynamically associate service intent to capture telemetry and key performance indicators on a service basis; underlying resources are dynamically associated to service, monitored individually and data correlated to reflect service health • Improves ability to meet end-customer SLAs by reducing the Mean Time to Identify (MTTI) or Mean Time to Know (MTTK) • Knowledge within heuristic package, assisting and automating troubleshooting tasks
Transport Slicing Automation	• Simplify transport slice lifecycle management with automated provisioning, visualization, monitoring, and optimization. • Enable new revenue stream via differentiated service offering
Brownfield service support	• Onboard existing L2VPN and L3VPN service models previously developed with Cisco Crosswork NSO • Provision and visualize such brownfield services with Crosswork Network Controller
Northbound API	• An open and programmable framework enables network operators to develop their own applications based on API and integration into existing toolset • API integration pretested with Crosswork Hierarchical Controller supporting Cisco RON architecture
Layered Service Architecture (LSA) support	• Utilize LSA as a design approach to implement massively large and scalable service provisioning function with Cisco NSO integrated within Crosswork Network Controller
Multivendor	• Crosswork Network Controller is a multivendor capable of network and service provisioning, data collection, and network control leveraging industry standards—BGP-LS, SNMP, gNMI, PCEP, segment routing, NETCONF/YANG
Scalable and Resilient	• Microservices based architecture foundation to deliver High availability and scalability. • User access to assigned operational domains with granular role-based access control (defined by Device or Device Group)
Geo-Redundancy	• Supported with parallel cluster design implementing Active and Standby roles.
Dual Stack Support	• Manage network implementing with both IPv4 and IPv6 protocols. Communicate seamlessly and concurrently with various systems (such as NTP, DNS, and Syslog)

Feature	Benefit
	and devices over IPv4 and IPv6
Extensible	• Prebuilt function packs for service and transport policy provisioning Extensibility through custom development
Flexible consumption	• 1-year, 3-year (default), and 5-year subscription licenses

Product specifications

Cisco Crosswork Network Controller has been shaped by helping large, tier-one service provider and enterprise customers automate everything from simple device turn-up to cross-domain automation to sophisticated full lifecycle service management. Cisco Crosswork Network Controller is built on industry standards enabling multivendor compliance. Cisco Crosswork Network Controller has three areas of touch points into the network:

1. **Provisioning:** A model-based programmatic interface (NETCONF/YANG) that allows for control of everything from simple device turn-up and configuration management to sophisticated, full lifecycle service management.

2. **Data collection:** A common performance data collection using gNMI (gRPC Network Management Interface), SNMP (Simple Network Management Protocol), MDT (Model Driven Telemetry), CLI (Command Line Interface), etc.

3. **Network control:** Real-time network topology discovery via BGP-LS and network optimization and traffic control using PCEP.

Cisco Crosswork Network Controller provides a standards-based northbound interface to enable integration with external entities (for example, OSS/BSS or higher-level orchestration systems).

Table 2. Standard protocol support: SBI and NBI

Topic	Protocol details
Device, service, and policy provisioning	NETCONF/YANG
Real-time topology discovery	BGP-LS
Network traffic control	PCEP
Path engineering	SR-TE, RSVP-TE, SRv6, SR FlexAlgo
Network performance data collection	SNMP, gNMI/OpenConfig, MDT, CLI, Syslog
Northbound API	RESTCONF, REST

Protocol support

Table 3.   Standard protocol support: Key protocols

Protocol	Title
RFC 5440	Path Computation Element (PCE) Communication Protocol (PCEP)
RFC 8231	Path Computation Element Communication Protocol (PCEP) Extensions for Stateful PCE
RFC 8281	Path Computation Element Communication Protocol (PCEP) Extensions for PCE-Initiated LSP Setup in a Stateful PCE Model
RFC 3209	RSVP-TE: Extensions to RSVP for LSP Tunnels
RFC 3630	Traffic Engineering Extensions to OSPF Version 2
RFC 3784	(IS-IS) Extensions for Traffic Engineering (TE)
RFC 7752	Northbound Distribution of Link-State and Traffic Engineering (TE)
draft-ietf-spring-sr-replication-segment	SR Replication Segment for Multipoint Service Delivery
draft-ietf-pim-sr-p2mp-policy	Segment Routing Point-to-Multipoint Policy
draft-ietf-pce-sr-p2mp-policy	Segment Routing Point-to-Multipoint Policy PCEP Extensions for p2mp sr policy
draft-ietf-bess-mvpn-evpn-sr-p2mp	Multicast and Ethernet VPN with Segment Routing P2MP and Ingress Replication

Please reach out to your Cisco account representative for a detailed list of all supported RFCs and IETF drafts and any additional information.

Deployment

Cisco Crosswork Network Controller offers a breadth of deployment options to address the diverse set of customer use-cases:

- **On-Premise:** Single node supported on VMWare vSphere
- **On-Premise:** Multi node cluster supported on VMWare vSphere
- **Cloud:** Multi node cluster supported on AWS/EC2

Contact your Cisco sales representative to learn more about these deployment choices, and determine the best option based on the target use-cases.

System requirements

Cisco Crosswork Network Controller is designed for different customer network sizes. Only Cisco can offer this comprehensive and holistic automation approach delivered in a single pane of glass. Cisco Network Controller delivers a fully integrated solution targeting for your most challenging real-world problems. The system requirements vary based on the selected functional package and deployment option. Contact your Cisco sales representative to learn more about the system requirements matching your network scale.

Ordering information

Cisco Crosswork Network Controller offers modular packaging to effectively meet your deployment use-cases. The packages include functions classified as Essentials, Advantage along with optional Add-on components. Contact your Cisco account representative for details on how to order Cisco Crosswork Network Controller.

Warranty information

The Cisco Crosswork Network Controller is covered by the following warranty: www.cisco.com/c/en/us/products/warranties/warranty-doc-c99-740613.html.

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	[Materials](#)
Information on electronic waste laws and regulations, including products, batteries, and packaging	[WEEE Compliance](#)

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.

Implementation and optimization services

Experience streamlined support across the products and providers in your Cisco network environment with Cisco Solution Support. If an issue arises, skip the triage and just contact us. Cisco primary point of contact engineers are available 24x7 to deliver expert, centralized support across your software and hardware from Cisco and third-party technology vendors. We'll resolve your issue, or when needed, lead issue coordination with additional support teams inside and outside of Cisco to get the job done. The results: 44% faster complex issue resolution on average than using single product-focused support[1]; 49% more efficient IT network infrastructure teams; 51% lower productivity losses due to unplanned downtime; >2x more staff time spent on innovation[2].

Solution support

Maximize performance, reliability, and ROI of your Cisco Crosswork Network Controller with Cisco Solution Support. You get access to a team of Cisco solution experts who are your primary point of contact, delivering centralized support across your deployment 24x7x365. Whether you have an issue with a Cisco product or one from another vendor—or are just looking for guidance and assurance on your new solution—simply contact us. We'll take it from there and remain accountable for your case, from first call to resolution.

Note: If issues are identified as being due to third-party vendor devices, we expect you to engage the third-party vendor. Cisco will work with you to provide triage information to the third party.

Solution Support can help increase staff efficiency by 32 percent, reduce incident occurrence by 21 percent, save $37 million in downtime, and increase company revenue by an average of $3.5 million. We have a track record of resolving complex issues on average 43 percent more quickly than product support, making it the right kind of technical service for Cisco Crosswork Network Controller solution environments.

Cisco Capital

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Learn more

For more information on Cisco's network automation portfolio for service providers, please visit www.cisco.com/go/crosswork. To learn more about Cisco Crosswork Network Controller or to schedule a demonstration, contact your Cisco sales representative.

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[1] July 2020 Cisco internal study of 300,000 support cases

[2] 2021 IDC: The Business Value of Cisco Customer Experience Services; based on the experience of study participants using Solution Support.

Document history

New or Revised Topic	Described In	Date
Updated CNC Key Features and Functions	[Table 1](#)	September 16, 2024
Updated data sheet version 3	Data sheet	November 2, 2021
Updated data sheet version 2	Data sheet	February 22, 2020
Created data sheet version 1 (draft)	Data sheet	February 5, 2020

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