Data sheet
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Cisco Crosswork Network Controller

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Cisco Crosswork Network Controller (CNC) is an SDN controller for the IP Transport networks. It simplifies operational workflows by consolidating service lifecycle and device management along with closed-loop automation in a single integrated solution. CNC embraces an intent-driven approach to automation for day-to-day tasks such as network service provisioning, optimization, health monitoring, and troubleshooting in a multivendor network environment. Further, it plans to utilize multi-agentic framework that enables AI-driven insights to expedite operational decisions and empower customers to reinforce their journey towards closed-loop operations and autonomous networks.

Product overview

Network operators are facing signifigant challenges to support the exponential growth of traffic while addressing the pressures to efficiently run network operations. To mitigate these challenges, they are reducing network 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. To accelerate time to revenue, enhance end-user experience and boost operational agility, operators must prioritize automating service lifecycle functions, simplifying device management and implementing closed loop controls. Network operators are increasingly leveraging agentic-AI to achieve greater autonomy, unlocking a wide array of operational use-cases that are challenging for traditional rule-based techniques.

Cisco Crosswork Network Controller empowers customers to realize their journey towards closed-loop operations and autonomous networks. Customers can now deploy services faster, embrace intent-driven service health monitoring and network optimization, automate day-to-day operational tasks, and improve service delivery while mitigating network congestion issues. The Network Controller has been shaped by extensive experience with multiple tier-one service providers and large enterprise customers. The Network Controller automates everything from simple device turn-up to sophisticated full lifecycle service management. It delivers critical capabilities such as automated service orchestration and fulfilment, network optimization, path computation, service health monitoring, element management, and workflow automation.

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), Intent-based Assurance – with integrated UI, providing visibility and control via a single pane of glass. It implements standards-based protocols and mechanism to integrate with northbound systems and communicate with devices in the network.

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

- Services provisioning (for example, L2VPN, L3VPN services with associated segment routing policy).
- Segment Routing (SR-MPLS, SRv6) policy provisioning with explicit intent (for example, bandwidth constraints, latency minimization, etc).
- 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 provisioned segment routing policy.

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- Tactically optimize the network during times of congestion with bandwidth optimization techniques.
- Automate complex tasks such as Fleet upgrade using integrated workflow engine with the ability to create custom workflow for remediation, configuration push or maintenance tasks.
- 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:

- Expedited 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.

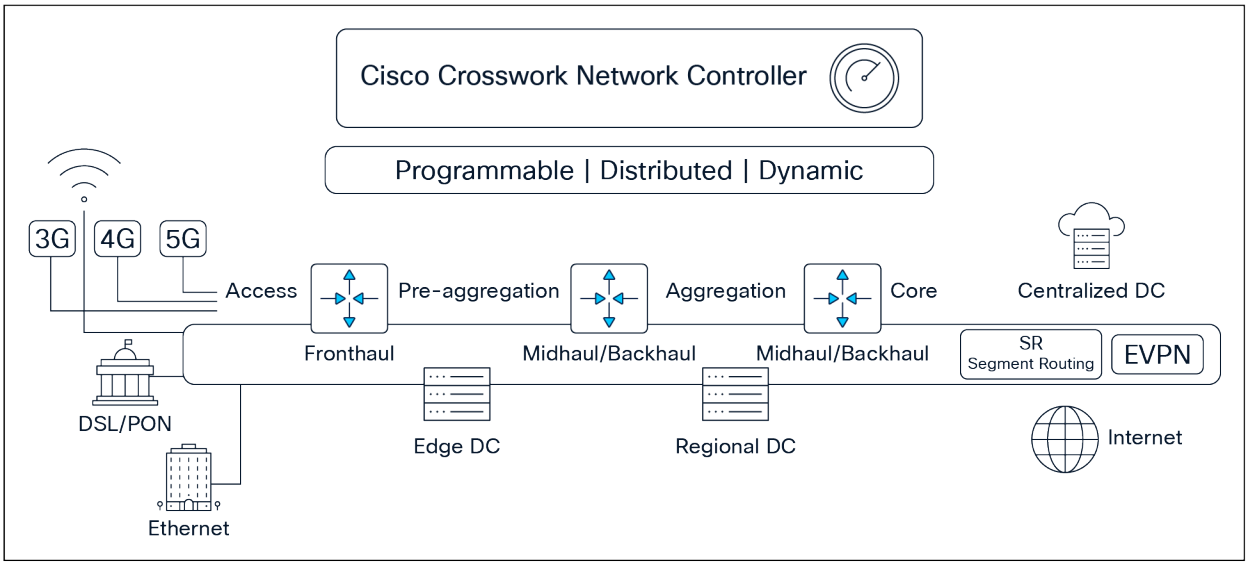


Figure 1.
SDN Transport Automation

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Features and benefits

Cisco Crosswork Network Controller includes a comprehensive set of features (Table 1) supporting automation across the IP Transport Network.

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-discover based on the IETF standard-Border Gateway Protocol Link State (BGP-LS) to automatically discover the IP topology in a heterogenous, multivendor network.
Route Analytics	• Gather ECMP graph and path change updates in the real-time between any pair of Source to Destination nodes within IGP domain.
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, optics, QoS and environmental parameters. Quickly isolate impacted group of devices and geo locations. • 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

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Feature	Benefit
	Configuration Backup and Restore • Simplify device configuration management: backup, restore, golden config **Underlay Configuration** • Perform on demand or scheduled device level configuration using templates • Visualize and modify interface 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 • On demand, visualize the native ECMP graph or Flexible Algorithm path between select head-end node and end-point node associated with a VPN service provisioned over SRv6 transport **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
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 Insights** • 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 (LCM)** • Effectively handle link congestion in a localized manner using tactical TE policies • Customize automatic deployment of LCM recommended policies and actions • Enable precise traffic distribution and improve efficiency with weighted Multi Segment Lists • Gain historical insights into LCM computations and actions taken in the network

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Feature	Benefit
	• 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 • **Deterministic Demand Matrix (DDM)** • Gain accurate visibility into end-to-end traffic demands and changing traffic patterns across your SRv6 network per domain
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) • Expert Knowledge is captured within heuristic package, assisting and automating troubleshooting tasks • Monitor data path performance using mechanisms such as Y.1731, SR-PM and Cisco PCA (Provider Connnectivity Assurance) probes
Transport Slicing Automation	• Simplify transport slice lifecycle management with automated provisioning, visualization, monitoring, and optimization • Enable new revenue stream via differentiated service offering based on catalog
Brownfield service support	• Onboard existing L2VPN and L3VPN service models previously developed with Cisco Crosswork NSO or discover the configured services in the network complying with IETF L2NM and L3NM standards • Provision and visualize such brownfield services with Crosswork Network Controller
Workflow Automation	• Create custom workflows utilizing a comprehensive programming framework, pre-packaged adapters and library functions
Workflow Designer	• Use graphical methods to build your workflows. Select workflow elements from the toolbox and drag them into your flow diagram as you build the workflow. The diagram will adapt as you move the elements, maintaining visibility as you progress
Fleet Upgrade	• Easily upgrade a large number of devices concurrently along with executing pre-check and post-check tasks. The feature includes pre-packaged MOP for upgrading XR and XE devices
Golden Configuration Compliance	• Gain comprehensive insights into configuration conformance by visualizing devices that are conformant or non-conformant with Golden Configuration templates • Enable network operators to effectively monitor and manage configuration compliance, enabling prioritization and execution of corrective actions for non-conformant devices

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Feature	Benefit
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 pre-tested 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
Geo-Redundancy	• Supported with parallel cluster design implementing Active and Standby roles.
Dual Stack Support[1]	• Manage network implementing with both IPv4 and IPv6 protocols. Communicate seamlessly and concurrently with various systems (such as NTP, DNS, and Syslog) and devices over IPv4 and IPv6
Extensible	• Prebuilt function packs for service and transport policy provisioning extensibility through custom development • Build custom workflows using programmable framework to automate operational tasks and actions
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)
Multivendor	• Crosswork Network Controller is multivendor enabled leveraging industry standards—BGP-LS, SNMP, gNMI, PCEP, segment routing, NETCONF/YANG
Flexible Deployment Choices	• Simplified deployment options with single-node and multi-node installations, offering ease of deployment and flexibility to address specific customer deployment use-cases[1]
Ease of use	• Intuitive workflows connecting the operational tasks across management lifecycle functions • Simple and streamlined installation and set-up • Rapid onboarding of devices and discovery of brownfield services • Ease of creating programmable workflows to automate complex tasks
Versatile consumption and pricing	• 1-year, 3-year (default), and 5-year subscription licenses • Pricing aligned to your consumption model

[1] Not available with CNC 7.2 deployed on AWS/EC2

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CNC offers functional packages (Table 2) to effectively align with customers' use-cases.

Table 2. CNC Packages

CNC Packages and associated functions[2]	Essentials	Advantage	Premier
Physical network topology visualization	✓	✓	✓
IP topology auto-discovery	✓	✓	✓
Element Management	✓	✓	✓
Route Analytics (API)	✓	✓	✓
Intent-based provisioning and visualization		✓	✓
Real-time intent optimization and Dynamic Traffic Engineering		✓	✓
Service health monitoring and troubleshooting		✓	✓
Brownfield service support		✓	✓
Transport Slicing Automation		✓	✓
Fleet Upgrade			✓
Golden Configuration Compliance			✓
Workflow Automation			✓
Workflow Designer			✓
Geo-Redundancy	Add-on	Add-on	Add-on

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. It is built on industry standards enabling multivendor compliance with 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).

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Table 3. 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 4. 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.

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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 and RHEL KVM
- **On-Premise:** Multi node cluster supported on VMWare vSphere and RHEL KVM
- **Cloud:** Multi node cluster supported on AWS/EC2[2] . Deployment on AWS/EC2 supports IPv4 connectivity only and does not yet support Premier tier.

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 an integrated solution 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 and Premier along with optional Add-on licenses. 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: https://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.

[2] Note that some of the features are not available with AWS/EC2 deployment option. Consult the release notes for more details.

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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:

Sustainapbility 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[3]; 49% more efficient IT network infrastructure teams; 51% lower productivity losses due to unplanned downtime; >2x more staff time spent on innovation[4].

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.

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

[4] 2021 IDC: The Business Value of Cisco Customer Experience Services; based on the experience of study participants using Solution Support

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Learn more

For more information on Cisco's network automation portfolio for service providers, please visit https://www.cisco.com/go/crosswork.

To learn more about Cisco Crosswork Network Controller or to schedule a demonstration, contact your Cisco sales representative.

Document history

New or Revised Topic	Described In	Date
Updated CNC Key Features and Functions	Table 1	October 21, 2024
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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Printed in USA C78-743456-11 01/26

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