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Interconnecting the Cable Access Network

A Converged Interconnect Network (CIN) is the network fabric for converging multiple services onto a single network ready for mass scale, end-to-end automation.

To meet the increasing demand for bandwidth and optimize service delivery, MSOs need to transform their networks and how they operate them. MSOs need a network infrastructure that can scale to support both existing and new revenue-generating services. A centralized network architecture is no longer suited to meet the evolving demands for network services. Dedicated network overlays, complex service deployments and delivery, and manual processes are all contributing to the increase in operating expenses that has been necessary to keep up with demand. Transitioning from a centralized to a distributed access architecture (DAA) presents an opportunity to evolve the access network that exists between the Converged Cable Access Platform (CCAP) core and deep fiber nodes into a Converged Interconnect Network (CIN).
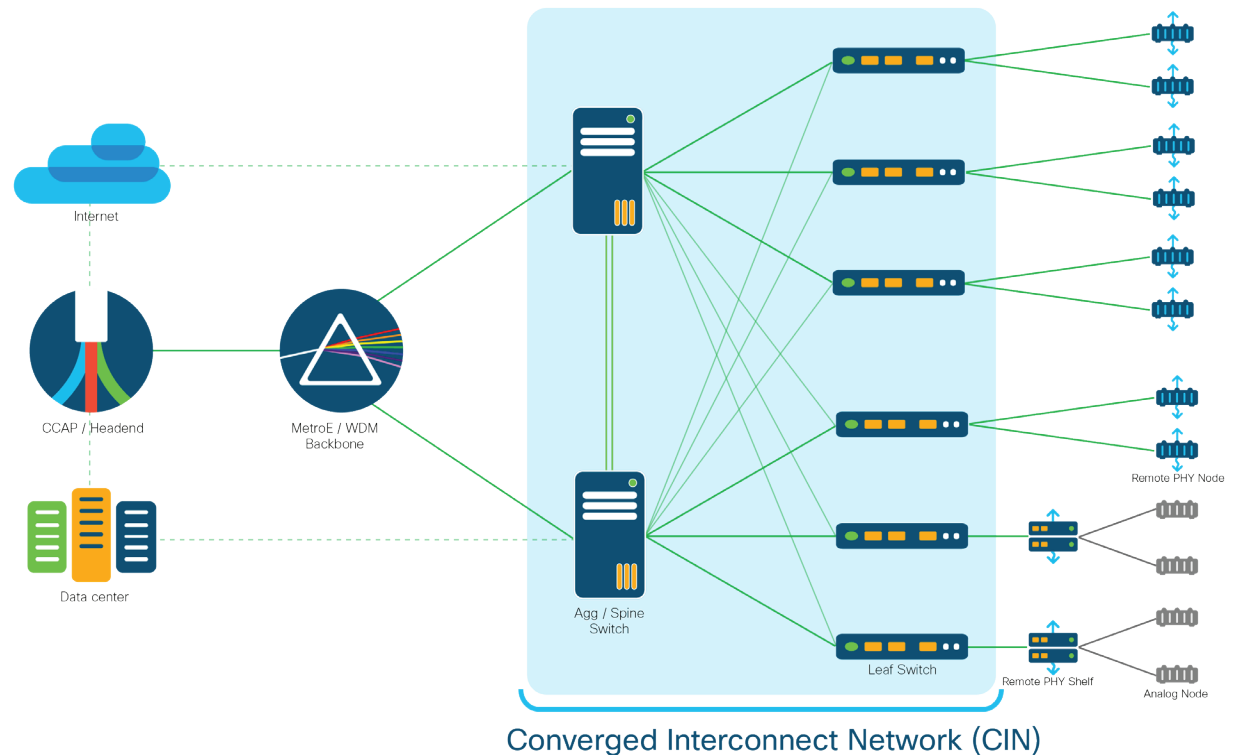
Benefits

- Simplify and reduce operating costs by converging all services onto a single network.

- Economically scale your services, your way, from 1G/10G/100G and beyond.

- Achieve end-to-end automation and optimization.

Building a Converged Interconnect Network will be your foundation for automation and optimization.

Planning your Converged Interconnect Network

Most CINs will have simple beginnings; they connect your Remote PHY Devices (RPDs) to CCAP cores for MAC processing. The CIN also interconnects the CCAP core with the video core and backend management systems. Unlike the traditionally linear, Layer 2 transport interconnect network, a CIN is capable of more than just east-to-west traffic. The CIN is meant to connect everything. It can connect outside plant endpoints, CCAP cores, cloud-based packet cores, data center fabrics, legacy systems, and beyond. However, selecting the right technology for your CIN evolution is an important decision. You need to consider the network capabilities you need today and how you plan on evolving and scaling your network into the future.

Figure 1: Representative Leaf-Spine architecture for a Converged Interconnect Network

Internet

CCAP / Headend

MetroE / WDM
Backbone

Data center

Agg / Spine
Switch

Leaf Switch

Remote PHY Node

Remote PHY Shelf

Analog Node

Converged Interconnect Network (CIN)

With Cisco IOS XR, you can simplify your CIN with a single operating system.

Build your Converged Interconnect Network with the NCS 5500 and NCS 500 Series

The Cisco NCS 5500 Series is optimally suited for providing optical-Ethernet switching. It also introduces layer 3 intelligence throughout your access network. The NCS 5500 Series is the solution for converging disparate network overlays and services into a single, highly scalable system. Each CIN architecture has unique considerations, and the NCS 5500 and NCS 500 Series is designed for all deployment scenarios. It can converge multiple access technologies onto a single platform with the industry-leading IOS XR Operating System supporting a full suite of standard layer-2 and layer-3 protocols.

Pre-aggregation and leaf solutions

The solutions have both fixed and modular configuration chassis with industry-leading performance and density of 1/10/40/100G ports.

- **NCS 5501:** 1 rack unit (RU). Up to 800 Gbps and IOS XR software.
- **NCS 55A2:** 2 RU. Up to 900 Gbps and IOS XR software.
- **NCS 540:** 1 RU. Up to 300 Gbps and IOS XR software.

Aggregation and spine solutions

Solutions with scalable, fixed, and modular chassis. They have industry-leading density of routed 100-GE ports for high-scale WAN aggregation, fabric, and spine networks.

- **NCS 55A1:** 1 RU. Up to 2.4 Tbps and IOS XR software.
- **NCS 5502:** 2 RU. Up to 4.8 Tbps and IOS XR software.
- **NCS 5504:** 7 RU. Up to 14.4 Tbps and IOS XR software.
- **NCS 5508:** 13 RU. Up to 28.8 Tbps and IOS XR software.

With Cisco IOS XR, you can simplify your CIN with a single operating system. It can be used for routing, aggregation, and optical transport. The software is packed with features that reflect more than 15 years of global development and deployment. Cisco IOS XR is modular so that major features are available as independent packages.

The following key features of IOS XR are included in the NCS 5500 and NCS 500 Series.

Zero-touch provisioning and iPXE

Boot and day-zero provisioning automates device onboarding; they are fast and bring devices online in minutes instead of hours. The iPXE feature supported in Cisco IOS XR software allows an administrator to boot from TFTP, HTTP, or FTP.

YANG data models for automated provisioning

Cisco IOS XR readily integrates with structured, data model-driven, high-performance APIs so you can move beyond the command line interface (CLI). A comprehensive set of YANG-based configuration and operational data models let you control the rich feature set of the OS. YANG-based configuration and operational data models (native, OpenConfig, IETF) let you control the rich feature set of the operating system. Encoding is decoupled from the model, so you can deploy with data encoded in JSON, XML, or Google protocol buffers (GPB) format. Transport is also decoupled from the choice of encoding for further flexibility, so you can use NETCONF, RESTCONF, or Google RPC (gRPC). You can auto-generate model-driven APIs from any YANG model for Python and C++ using the included YANG Development Kit (YDK) within IOS XR.

Model-driven telemetry for real-time, detailed visibility:

End-to-end visibility throughout your network infrastructure is a required feature for scaling and optimizing your services. Until now, visibility has been limited to sections of network topologies, especially in the access network where analog systems provide limited insight and weren't available to administrators in real time. But with the demands of a quickly digitizing world, you need to see what is going on in all facets of your network all the time. Network visibility must be continual and provide actionable insights to support the increasing scale and agility necessary for present and future services. Cisco IOS XR delivers new and improved approach to network monitoring with model-driven telemetry. Data is continuously streamed and captured from devices with efficient, incremental updates. Model-driven telemetry is fully configurable using telemetry YANG models. Using models, you can specify what data to stream, where to stream it, and the type of encoding and transport. With model-driven telemetry, you simply specify the YANG model that contains the data you want. Model-driven telemetry opens your entire operational space for fine-grained control. The increased visibility provided by the streaming telemetry push model enables the highly efficient techniques of segment routing for near real-time network optimization.

You need to plan your DAA to have an intelligent CIN that can support both your physical and virtual infrastructure. Automation, optimization, and lifecycle management are important considerations for how you plan on scaling your network services and operating processes. Your interconnect network is the fabric that will enable automation. Automation leads to network optimization, automated capacity planning, service integration and coordination, fault resiliency and an improved digital experience. You also must secure your network for your business and your customers. In addition to end-to-end interconnectivity, Cisco can help you with network automation, optimization, orchestration, and security. Our key technology solutions include:

Cisco Crosswork Network Automation

A solution framework that transforms the approach to operations and retooling to handle mass-scale networks with increased agility and predictability. The Crosswork platform automates and transforms operations using telemetry, data analytics, and machine learning. Crosswork Network Automation is a vendor- and layer-independent solution that is built with open-source and standard components. You can develop microservices and containerized software for optimal performance, scalability, and high availability.

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Cisco Services

Planning, designing, and building a Converged Interconnect Network is a challenge. Cisco Services has decades of professional services experience helping enterprise businesses, content providers, service providers and others plan, build, and manage network migration projects. Converged Interconnect Networks have unique requirements and require careful planning and thoughtful design. We have the knowledge and skills to help you achieve your goals. Cisco Services uniquely deliver innovative solutions, unmatched expertise, and smart service capabilities using a collaborative partner approach.

Cisco WAN Automation Engine (WAE)

WAE is a powerful and flexible optimization platform that automates the engineering and operations of multivendor physical and virtual WAN infrastructures. You can use WAE to deploy new services, including global load balancing, bandwidth on demand, and premium/latency-based network routing. It can help you optimize traffic load-balance over core Multiprotocol Label Switching (MPLS) and segment routing links. It can also minimize service down-time through worst-case failure analysis and reduce both OpEx and CapEx costs through efficient asset utilization.

Cisco Network Services Orchestrator (NSO)

Cisco NSO lets you deliver services faster and more easily to your customers through network automation. Using model-driven orchestration, it can drastically reduce the time it takes to on-board new services in the network. NSO can help you accelerate revenue-generating services with automated, self-service, on-demand provisioning that reduces activation times from months to minutes. You can increase business agility with the capability to create, reconfigure, and repurpose services in real time. Simplify your network operations by automating the end-to-end service lifecycle. You can reduce manual configuration steps by up to 70 percent according to Cisco estimates. NSO can help you differentiate the services you offer with automated advanced device features, bundled network services, and real-time assurance. NSO can reduce downtime with exceptional control over network changes and the capability to reconfigure devices and services during live production.

Cisco Security Solutions

Protect yourself and your customers and better anticipate and respond to new threats, reduce complexity and fragmentation, and agilely adapt to changing business models. Cisco offers a full, end-to-end suite of solutions and services that can help you from strategic planning and compliance to implementation and management. No matter what stage you are on the path, we can help you protect your business and adopt security technologies throughout your network environment.

Financing to Help You Achieve Your Objectives

Cisco Capital can help you acquire the technology you need to achieve your objectives and stay competitive. We can help you reduce CapEx. Accelerate your growth. Optimize your investment dollars and ROI. Cisco Capital financing gives you flexibility in acquiring hardware, software, services, and complementary third-party equipment. And there's just one predictable payment. Cisco Capital is available in more than 100 countries. Learn more.

Why Cisco?

As a global networking innovator, Cisco understands the needs of MSOs and businesses that need to harness the latest cost benefits and features of the network to survive and thrive. Our solutions span the broadest range of platforms, technologies, and topology options. They are designed to provide you with the right solution to address your needs. MSOs are undertaking major transformations; they are evolving from analog to digital, virtualizing functions, and pursuing a DAA. All of these transformations require a foundation that can scale both services and operations into the future. New, more efficient, more automated, and more economical ways of converging and interconnecting your network services are available. You can trust Cisco to be at the forefront of what is possible and look to us as your valuable partner for planning, designing, and building your Converged Interconnect Network.

Learn more

Learn more about Cisco cable network solutions:

- Cisco NCS 5500 Series
- Cisco NCS 500 Series
- Cisco Crosswork Network Automation

Contact your Cisco account representative today.