

Cisco NCS 540 Fronthaul Router Portfolio

Product overview

Radio Access Network (RAN) decisions are important and deserve a lot of attention. Given the large number of cell sites already in their networks, and those that will be added to meet the growing bandwidth demands from subscribers, RAN purchases can account for up to 80 percent of mobile operators' Capital Expenditures (CapEx). Additionally, it is estimated that RAN Operating Expenses (OpEx) account for 60 percent of TCO. Consequently, there is tremendous pressure on mobile operators to operate more efficiently and improve operational economics while meeting the increasing demands of legacy wireline, wireless services, and new 5G offerings.

Up to now, the RAN has been based on legacy network technology. However, the increase in base stations to support 4G LTE expansions, and new 5G service introductions, is driving Mobile Network Operators (MNOs) to seek out new densification strategies. It is time for the RAN to evolve to become cloud scale, software defined, and virtualized. To this end, industry forums such as the Open RAN Alliance, IEEE Subcommittees, and the CPRI Cooperation, are working with Service Providers (SPs), to develop and test new densification strategies that can help them realize their business objectives and improve their TCO.

Benefits

- **High-speed and ultra-low latency forwarding** to meet stringent radio transport requirements
- **Converged services** with optimized transport performance for fronthaul
- **Flexible and fully programmable** architecture to support evolving standards
- **Precise timing and synchronization** capabilities to support new radio techniques
- **Consistent end-to-end IP** network to simplify architecture and operations
- **Open and automated** management
- **Lowest TCO** for fronthaul

These densification strategies have been focused on demand for Cloud RAN or Centralized RAN (CRAN) architectures that are open, software defined, virtualized, and cloud scalable. CRAN disaggregates base stations by separating Radio Units (RUs) from Radio Equipment Controllers (RECs) and centrally locates these REC functions in regional/distributed data centers. This approach helps lower costs and improve performance and scalability.

The new Cisco Fronthaul Routers are key elements of the Cisco Converged SDN Transport architecture. The solution and the routers are designed to meet and exceed stringent bandwidth, latency, and scalability performance demands of 5G now and in the foreseeable future. This solution simplifies the mobile network architecture end to end and significantly reduces operator TCO. The router portfolio is fully programmable, permitting customers to extend xHaul capabilities as specifications continue to evolve. They are based on high-performance, low-latency, next-generation Application Specific Integrated Circuits (ASICs) extended with a Field-Programmable Gate Array (FPGA) that permits the flexibility for quickly adapting to evolving radio interface processing specifications for CPRI, eCPRI, and Radio over Ethernet (RoE).

Cisco has built these platforms with requisite hardware resources to permit operators to add RAN functions in a hosted model leveraging the built-in powerful FPGA. Leveraging a FPGA -enhanced architecture over a fixed ASIC pipeline, the Cisco Fronthaul Router product family offers the flexibility required to address both short-term and long-term mobile transport requirements.

The new Cisco Fronthaul Router portfolio is truly future proofed and designed to protect your investments in 5G and beyond.

Figure 1. NCS 540 fronthaul platforms



What it does

The New Cisco Fronthaul Routers extend the NCS540 access router portfolio to support packet-based fronthaul capabilities with the following benefits/capabilities:

- **High-speed and ultra-low latency forwarding to meet stringent radio transport requirements:** These packet-based routers are integral components of the Cisco Converged SDN Transport architecture, which can meet or exceed xHaul (fronthaul, midhaul, and backhaul) performance expectations (bandwidth, low latency, and scalability) to optimize the customer experience. The Fronthaul Router portfolio utilizes a flexible Field Programmable Gateway Array (FPGA) to handle emerging radio interfaces standards, and time-sensitive networking capabilities, as well as full packet processing for advanced forwarding features (SR/BGP VPN). The FPGA-enhanced architecture not only enables agility to adapt to evolving RAN specifications, but also is fundamental to supporting existing low-latency requirements for 5G fronthaul and midhaul applications.
- **Converged services with optimized transport performance for fronthaul:** The fronthaul portfolio supports legacy wireless and wireline services with new 5G service use cases (eMBB, URLLC, mMTC) while optimizing transport performance for fronthaul. In converged service implementations, fronthaul routers may have a mix of mobile and enterprise traffic. As a result, low-latency-sensitive fronthaul traffic can be delayed behind jumbo packets of enterprise traffic flows. To avoid these incidents from impacting latency-sensitive fronthaul traffic, frame preemption is implemented through 802.1Qbu and Time-Sensitive Networking (TSN) capabilities. Frame preemption capabilities guarantee that the low-latency demands of the fronthaul traffic are maintained while concurrently supporting converged traffic with less latency sensitivity. This enables operators to truly converge services onto a single transport infrastructure.
- **Flexible and fully programmable architecture to support evolving standards:** Cisco fronthaul routers are architected to be fully programmable. The portfolio is based on high-performance, low-latency, next-generation ASICs extended with a Field-Programmable Gate Array (FPGA) that permits the flexibility for quickly adapting to evolving radio interface processing specifications for CPRI, eCPRI, and RoE. The fronthaul routers are optimized for RoE type 0 and type 1 use cases, while offering mobile operators the ability to extend functionality to support unique RAN interworking requirements where and when necessary.
- **Precise timing and synchronization capabilities:** 5G radio networks require exact frequency and phase time synchronization of the radio equipment across the network in order to run 5G air interfaces. Advanced throughput optimization techniques such as intercell interference cancelation and MIMO-coordinated multipoint data delivery also require time synchronization between New Radio (NR) units. These radio techniques and others mandate that the transport network delivers phase and frequency synchronization, including diverse delivery of accurate time with robust reliability and redundancy. Cisco Fronthaul Routers can support the most stringent phase and frequency synchronization requirements with up to class C timing capabilities.
- **Consistent end-to-end IP network to simplify engineering and operations:** These packet-based routers are integral components of the Cisco Converged SDN Transport architecture and facilitate the adoption of an end-to-end IP network while meeting xHaul (fronthaul, midhaul, and backhaul) performance expectations. The Cisco Converged SDN Transport simplifies the design and operation of the mobile network end to end and significantly reduces operator TCO.

For more information

For further information on NCS-540 Fronthaul Router please visit [540Fronthaul Routers Data sheet](#).

- **Open and automated management:** The Cisco Fronthaul Router family and the NCS540 access family of products support open management interfaces/APIs to enable a full composite of management functions. Cisco offers off-the-shelf and customized function packs to automate provisioning of each mobile network domain and the fronthaul product family can be integrated into third-party, Cisco provided, or custom-built management applications supporting distinct management domains (such as RAN Domain) and/or end-to-end Network Management and Operating Service Systems (NMS/OSS). Cisco also offers a full suite of Fault, Configuration, Accounting and Performance (FCAPs) management applications through Cisco Crosswork™ Network Automation across mobile network domains including RAN transport.
- **Lowest TCO for fronthaul:** There are significant financial benefits for implementing Cisco xHaul routers to support RAN transport requirements over the Cisco Converged SDN Transport architecture. In short, the packet-based xHaul solution provides significantly more functionality with a lower TCO than the optical fronthaul networks that are predominately deployed today (see ACG Research study for more details).