Backhaul Evolution for 5G

The changing mobile network

As operators begin to migrate from 4G to 5G, they must support the changing nature of the mobile network. It's clear that one of the most important factors to address is the current and future architecture of the radio access network (RAN). The RAN is the link that the radio sites use to connect to the transport network and because a RAN can be geographically dispersed, it can be difficult to manage. Because the RAN is where service providers spend most of their money, any development or evolution of the RAN to improve the efficiency or reduce operational costs requires serious consideration.

Benefits

- Satisfy exploding bandwidth, scalability, and application demands of 5G.
- Reduce costs through RAN virtualization and standardization.
- Simplify operations and lower costs through automation.
- Scale a backhaul network cost-effectively with pay as you grow model.

5G is driving change

The massive radio deployments required for 5G are driving a transition in RAN architectures. To prepare for 5G, service providers need a way to reduce costs through RAN virtualization and standardization. Many operators have sought to build a virtualized infrastructure in their RAN hub locations, so they can deploy and scale out the software components of the radio base band unit. In addition to the virtualized infrastructure for RAN software, service providers also need network equipment at the hub locations for backhauling traffic to the network core and terminating physical interfaces from adjacent cell sites.

The move to 5G offers the potential for innovative new revenue streams for service providers, but often the changes to the network require end-to-end planning and significant financial and engineering resources. The new network infrastructure needs to simultaneously satisfy exploding bandwidth demands at lower costs, massive logical scale, and the low-latency needs of new applications and services in an efficient, automated, programmable manner.

Deploying a new fabric architecture

Deploying a fabric architecture supports the horizontal scaling of a virtualized RAN infrastructure. This architecture also allows for cost effect scaling of high-speed 10/25/100GE interfaces that are needed to handle 5G speeds. This solution is differentiated with the use of segment routing (SR) to support overlay networking, network slicing, and traffic segmentation within the fabric and in the transport network. Policies and intent can be encoded in the segment routing header and propagated throughout the network.

Segment routing enables:

- **Network resiliency**. Segment routing provides fast reroutes and protection that is superior to current levels of router protection and reduce network expenses.
- **Improved network utilization.** Segment routing provides network traffic engineering to effectively distribute load while guaranteeing bandwidth to mission-critical applications.
- **Network simplification.** Segment routing can be implemented and managed with relative simplicity and it also reduces network complexity. For example, simplified traffic engineering vs RSVP-TE or LDP eliminates the need for GTP in mobile backhaul. Simplified network slicing and other network simplification can reduce operating expenses (OpEx).
- **Network topology and latency.** 5G networks make use of Multi-Access Edge Computing (MEC) to implement applications at or near the network edge.

Latency is one of the constraints driving 5G applications. One approach is to locate all latency-sensitive applications at the far edge of the network, but it could be an expensive solution. Other approaches are to locate latency-sensitive applications near the edge in aggregation nodes, which is more cost effective. This model also allows the service provider to preserve and retain the investments in software and port it to next generation hardware, which gives the SP the flexibility to consume products in a pay-as-you-grow manner.

This fabric architecture solution also includes operational simplification with automation for zero-touch, day 1, and day 2 provisioning of the fabric and commercial competitiveness with a pay-as-you-grow RAN infrastructure.

Currently, many carriers are in trial or early deployments at centralized RAN (CRAN) locations for this new fabric design. However, the long-term goal for the SR Ethernet VPN (EVPN) backhaul fabric is to support existing 4G and all new 5G radio rollouts.

Measurable benefits

The backhaul fabric is the first implementation of segment routing in many service provider networks. As the technology matures and is adopted in other network domains, such as transport, IP core, and edge, new service offerings can be realized with end-to-end network slicing, and segmentation capabilities. The solution has the potential to achieve these measurable benefits:

- On time roll out of 5G.
- Scalable automated fabric for virtualized RAN infrastructure.
- Cost-effective scaling of the backhaul network to support the roll out of the 5G network.
- Expected lower operation due to fabric automation.

Learn more

For more details, go to www.cisco.com/go/telco

Figure 1. 5G mobile backhaul