INFOBRIEF

Converged 4G/5G xHaul Transport Network Checklist

Enhanced 5G services are poised to unleash a new generation of innovative applications and use cases that will place even greater burdens on transport networks and operators. Delivering on the promise of 5G, while continuing to expand 4G services, requires a well-thought-out development strategy with a focus on demands today, and into the future. Network flexibility, openness, and automation are key. And revenue-generating opportunities are plentiful, given the right approach. Learn how to make the most of this exciting yet increasingly complex environment to help deliver on end-user expectations.

Following are ten key principles to ensure successful design and implementation of a 4G/5G converged transport network solution.

1. Think ahead and plan for the long term

5G transport network solutions should not only focus on current demands and requirements, but also on expected and potential changes as the market and technologies evolve. Make sure to address transport network implications related to new wireless spectrum usage, new Radio Access Network (RAN) architectures (additional centralization or virtualization), increased cell densification, and foreseeable new services and use cases.

Transport network solutions should be as flexible as possible, addressing any combination of xHaul—fronthaul, midhaul, and backhaul—and supporting existing and emerging standards. It should be designed to be open, scalable, and automated to enable 5G evolution.

2. Openness is the bridge to continuous innovation

5G is a phased multi-year deployment, based on standards that are still evolving and technology that is quickly advancing. This challenging scenario requires networks to continually adapt. Innovation is accelerated through more intelligent, open, virtualized, and interoperable networks, where operators are free to select best-in-breed network components from various vendors to evolve different segments of their network independently. Operators should not be limited by the innovation pace and financial constraints of a single vendor and their closed and proprietary architecture. Openness enables choice and increased flexibility, reducing the cost and increasing the speed to innovate and evolve the network.

3. Leave a large safety margin when gauging the required number of ports

As operators roll out new 5G services, they face an increased number of devices to be connected at cell sites. New radio units, distributed units, infrastructure management devices, aggregation of neighboring small cells, and other diverse connectivity demands are turning the availability of 10GbE/25GbE ports at the cell site into a critical factor for selecting RAN transport network platforms. Don't leave yourself short—have a margin to address additional port demand.

4. Plan for additional aggregate capacity demands

Fronthaul connectivity requires substantial throughput driven by massive MIMO radios, new 5G radio units, higher Enhanced Mobile Broadband (eMBB) bandwidth consumption, as well as new 5G use cases and other traffic needs at the cell site. Aggregate bandwidth is a juggernaut. To ensure the network will continue to deliver on future expectations, a large switching fabric coupled with enough 100/200/400GbE ports supported by highly scalable coherent optics is required.

5. Minimize space and power consumption at cell sites

Additional radio units and hardware elements, such as massive MIMO antennas, will inflict extra pressure over cell sites' costly and limited power and space. Platforms supporting 5G evolution must address these requirements through a minimal power and footprint approach. Compact form-factor, diverse mounting options for varied outdoor deployment, and extended temperature support that eliminates expensive and complex installations are key to addressing these pressing needs. The convergence of network functions yields less hardware at cell sites. This can be achieved by combining the fronthaul gateway, cell-site router, and built-in GNSS/GPS receiver into a common platform.

6. Assess timing and synch requirements

It is important to look carefully at the timing and synchronization requirements of the 5G RAN, particularly for fronthaul connectivity, and make sure the transport network platform will support current and future needs. Timing distribution using 1588v2 (ITU-T G.8275.1) and SyncE G.8262 distribution across network links will be required to address frequency, phase, and time requirements to ensure stringent 5G RAN performance while keeping the cell site infrastructure simple and power- and space-optimized.

7. Get ready to slice it

Network slicing is one of the major enablers of 5G monetization, supporting new advanced applications and premium services over a shared infrastructure via guaranteed end-to-end network performance over both wireless (radio) and wireline (transport network) domains. Even if slicing is not in the operators' near-term plans, it should be carefully considered when designing the network. Network platforms must support both soft slicing (segment routing and SRv6) and hard network slicing (FlexEthernet [FlexE]). They need to be highly instrumented and programmable to be incorporated into a Software-Defined Networking (SDN) architecture, allowing end-to-end network slicing orchestration and policy-based dynamic path computation. This ensures the network will be slicing-ready when necessary and avoids the need to replace network platforms when it is time to target applications and use cases that require differentiated Service Level Agreements (SLAs).

8. Look for robust and flexible integration interfaces

Mobile network architectures will become increasingly complex and dense—a lot more to manage and supervise—which will be exacerbated by small cell densification efforts. With most networks encompassing legacy elements and existing software and systems in place, transport network platforms need to support existing and new elements, while offering flexible and robust northbound software interfaces. Existing alarm management, telemetry, provisioning, or frequency and phase synchronization orchestrators, among other automation platforms, will require broad support to integrate standards such as gRPC/gNMI, NETCONF/YANG, SNMP, Y.1731 or TWAMP, 8275.2, and several others. To meet this need to integrate with multiple systems and platforms, transport solutions should be open by design, standards-based, highly programmable, and built to interoperate.

9. Position for wholesale opportunities

Towers and cell site infrastructure are often shared by multiple Mobile Network Operators (MNOs). Some of these operators will likely not have their own access in place and need connectivity services to link their assets to their networks. It may be in the form of dark fiber, wave services, active Ethernet, or even through more advanced managed network services. As connectivity is established at a site, the operator is able to offer managed services to other MNOs over the same deployed transport infrastructure. This enables new revenues, maximizing the impact of the investment. For instance, platforms that support FlexE allow operators to offer Ethernet connectivity to multiple MNOs, fully isolating their traffic flows over a shared connection—assuring the performance and independence of each flow with optimal cost-efficiency.

10. Converge services on a common infrastructure to unlock broader monetization opportunities

Monetization opportunities go beyond the mobile ecosystem. As a mobile network stretches over large areas, with transport elements at each site, equipping it with the right tools provides the ability to leverage this infrastructure to offer non-mobile connectivity. It is possible to address residential, business, or wholesale demands, opening additional revenue-generating opportunities by supporting multiple traffic streams over a simpler, common infrastructure. For example, a cell site router can host pluggable XGS-PON Optical Line Terminals (OLTs) for residential and business broadband near the cell site or provide last-mile active Ethernet business services to other service providers. This universal aggregation approach is a great way to reduce cost and complexity while increasing network monetization opportunities.