MARKETING REPORT

MR-521.1: Marketing Report on 5G Network Architecture - Overview

Issue History

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1 Executive Summary

With the emergence of 5G, Network Operators are finding that they need to enhance their Transport Networks both to meet the increase demands and to deliver the new services that 5G makes possible. Broadband Forum is developing recommendations for the architecture of these new transport networks to enable operators to design, develop, and deploy the needed capabilities.

2 Motivation / Business Drivers

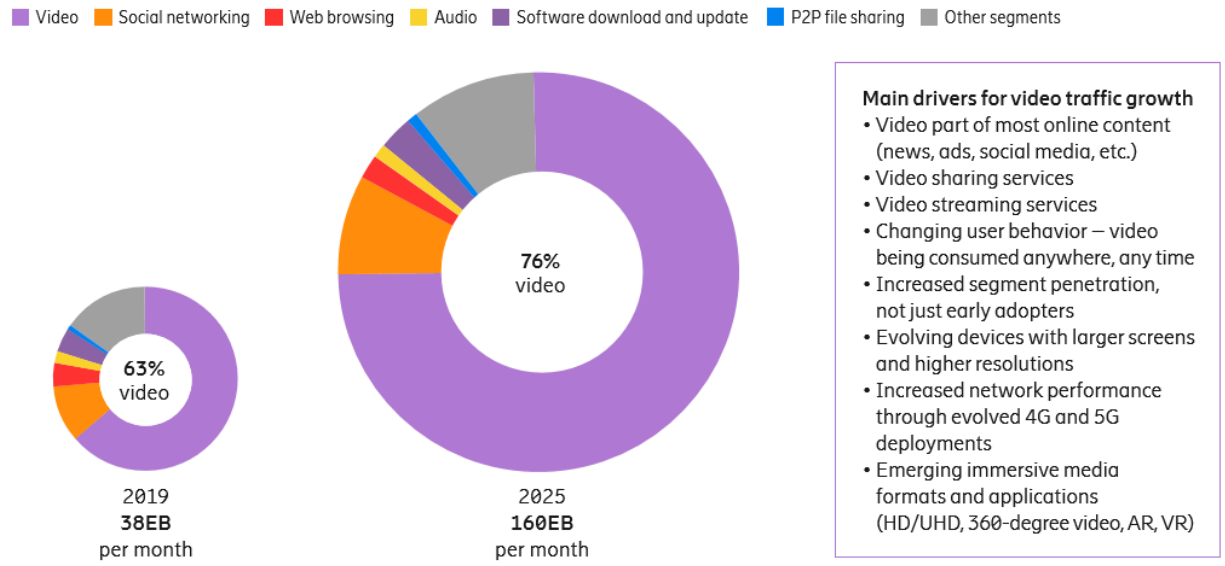
The advent of 5G is driving operators to take a holistic approach to transport network planning. In previous RAN evolutions, new radio technologies were often deployed and connected to the transport network using available facilities near the distributed RAN site. Over time, those transport network on-ramps had to be upgraded in most cases to support the increased capacity needs of the evolved RAN. With 5G comes a significant increase in capacity, an estimated doubling of radio sites deployed, and a new architecture with new RAN and Core interfaces. These new architectures and new interfaces each have specific requirements that must be met. New radio access technologies such as mmWave and Massive MIMO, combined with these new interfaces, will once again strain current transport networks by imposing higher capacity, lower latency, and new traffic flows like fronthaul and mid-haul, along with stricter timing and synchronization requirements. Additionally, new services are expected to require the ability for the transport network to deliver tighter delay and loss bounds.

Apart from capacity increase and interface density requirements in RAN, disaggregation in both RAN and core network can have impact in the transport network architecture. One such class of potential increase in demand is the expected significant increase in the number of UPF nodes deployed in the network. This is driven by a number of causes including the separation of data plane elements and control plane elements, the separation of monolithic data elements in multiple individual UPF, and the need to meet the service requirements and capacity.

Today most of the investments, traffic and subscriptions are in 2G, 3G or 4G networks. Modernizing existing networks, improving network performance and increasing user experience continue to be at the core of every service provider's day-to-day business.

By 2025, it is expected that 5G will have 2.6 billion subscriptions covering up to 65 percent of the world's population and generating 45 percent of the world's total mobile data traffic. Video traffic in mobile networks is forecast to grow by around 30 percent annually through 2025 to account for three-quarters of mobile data traffic, from slightly more than 60 percent in 2019.[1]

[1] https://www.ericsson.com/4acd7e/assets/local/mobility-report/documents/2019/emr-november-2019.pdf



The new complexities of 5G networks require intelligent, automated coordination between RAN, mobile core networks and the underlying transport network to meet the demands of 5G. Legacy transport systems need to be upgraded and backhaul systems must meet a suite of new demands to ensure superior RAN performance and maintain low total cost of ownership. 5G backhaul systems need to address increased capacity and increased interface density requirements. A typical 4G distributed RAN site, with 5G New Radio (5G NR) added, will require up to 10 Gbps backhaul capacity, while spectrum sharing solutions will drive demand for many 10GE ports to deliver RAN coordination. In addition, 5G NR will use the new enhanced common public radio interface (eCPRI) with up to 25 Gbps connections. As such, 5G backhaul baseband interfaces will need 10 Gbps capacity and need to scale efficiently up to 100GE.

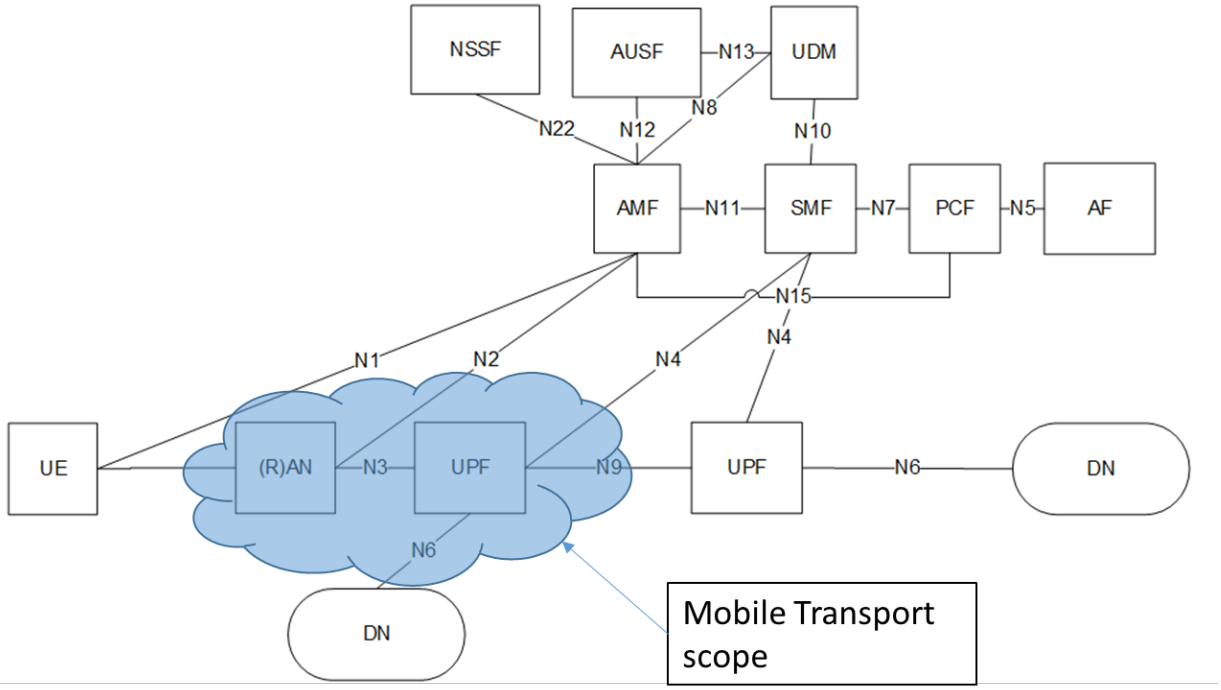
All of this means that operators need a Transport Network Architecture for 5G that will enable them to effectively provide the needed capabilities in a practical and effective manner. And this must leverage the many technology developments in Transport Networks that have occurred since LTE was rolled out many years ago. Broadband Forum is now developing this Network Architecture. It will leverage IPv6, MPLS, and other modern technologies to enable effective and scalable Transport Networks to support operator 5G deployments (while of course also supporting their existing LTE or older operations.)

3 Architecture and Benefits

The architecture being developed will enable highly scalable and future oriented network deployment and operations. Other work being done in Broadband Forum includes developing the necessary interfaces and considerations for enhanced automation and integration with other emerging technology drivers.

3.1 Reference Architecture

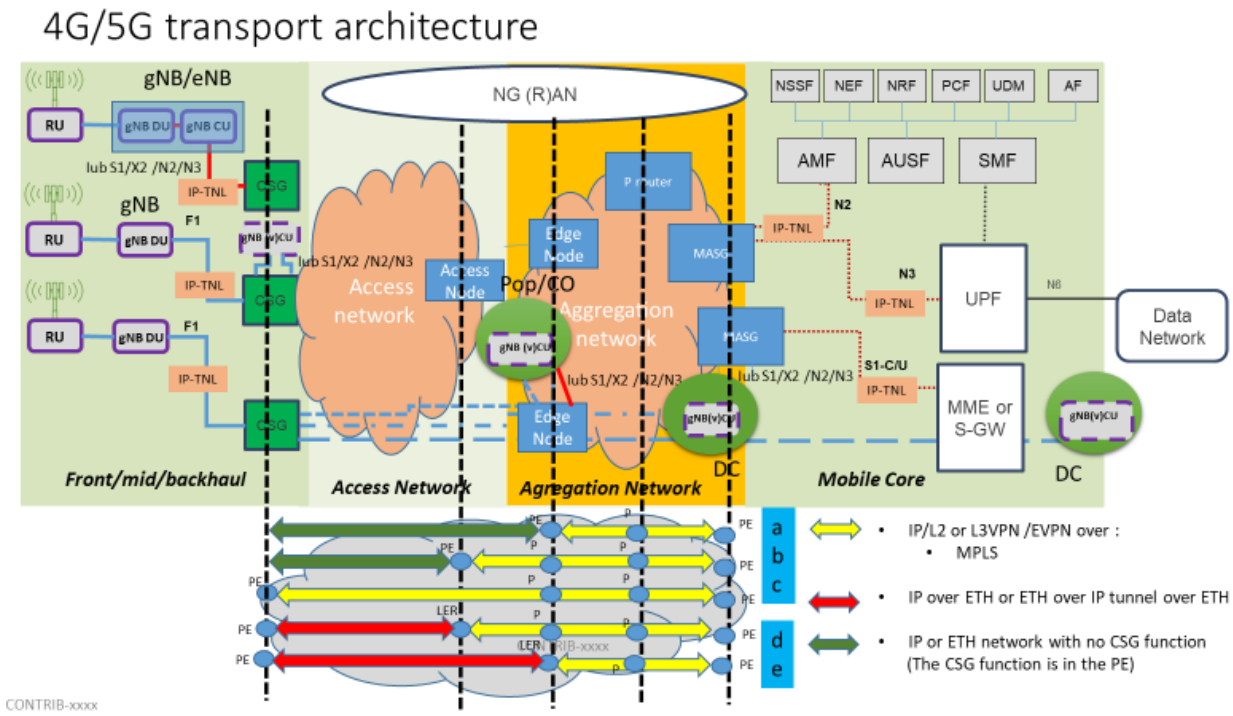
The reference architecture is based on the thorough work that has been done at 3GPP and other places to develop standards for 5G. This results in:



Our focus for this aspect of the work is the highlighted section and its capabilities

3.2 Intended Technologies

Using this architecture, Broadband Forum is selecting a set of available technologies and interfaces that can be best used to meet operators needs in deploying the highlighted portion of their network. Using combinations of Layer 2 Ethernet technology, MPLS, and IP, the resulting architecture can be seen as:



This enables operators to use their existing networks, and enhance and migrate them to support the new capabilities 5G needs in order to deliver on the promise it has.

4 Summary

While the initial focus in 5G is on potential use cases and the radio technology itself, 5G cannot exist without a transport network to support it. Technology and application performance requirements will lead to a future transport network that looks very different from today's.

Broadband Forum is leading the effort to define the architecture for that necessary Transport Network. This will enable operators to plan and deploy networks that will meet their needs as they go forward to 5G.

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