THE ROLE OF 5G URLLC FOR THE FUTURE OF MOBILE SERVICE PROVIDERS

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URLLC INTRODUCES THE TRUE 5G REVOLUTION

5G is the hottest topic in the telco industry in 2019 and early adopters are switching on their networks to provide a better user experience for consumers. The enhanced Mobile Broadband (eMBB) and Fixed Wireless Access (FWA) use cases are currently the first priority on mobile service providers' 5G agendas, which is understandable, provided these use cases directly add value to their core revenue-generating businesses. 5G has already been launched in the United States, while there are pending commercial services targeting consumers in China, Finland, Japan, Qatar, and South Korea, albeit on a small scale. Nevertheless, these countries, and many more, will launch 5G services in the mainstream consumer market in 2019 and beyond, as the first wave of 5G-enabled smartphones, services, and capacity demands accelerate the deployment of the new cellular generation standard. As mobile service providers start to understand the intricacies and revenue potential of 5G eMBB in 2019, ABI Research expects the next wave of discussions to start beyond the realm of 3GPP standardization efforts, focusing on the next step in the evolution of 5G: low-latency services. These discussions will also start just before 3GPP Release 16, which fully specifies the Ultra-Reliable Low-Latency Communication (URLLC) use case to be completed in 1Q 2020.

URLLC and Release 16 are the first cases in which the 3GPP standard does not focus on connectivity alone, but in broader end-toend system aspects that become platforms for applications developed in the broader enterprise ecosystems. Previous releases, including Release 15, focused on optimizing the delivery of data through the wireless channel for mobile broadband capacity, with an appropriate amount of delay/reliability tolerance based on predominant traffic types. URLLC also optimizes the delivery of data, but based on different traffic requirements that include latency and reliability. Release 16 will focus on the ecosystem, end-to-end network orchestration, and may also make mobile operators focus on more key network parameters, rather than capacity and top speeds only. Release 16 and the introduction of URLLC will allow mobile service providers to introduce these features without a material impact on the performance of the broader 5G network. Low-latency capabilities have been present in previous standards (e.g., Release 15 introduced low-latency and ultra-reliability functions), but Release 16 is the first iteration in which scheduling efficiency and network capacity are fully specified. Figure 2 illustrates a summary of the improvements Release 16 introduces.

URLLC is also necessary to enable mobile service providers to evolve beyond connectivity and claim a place in the enterprise digitization that is currently progressing across many verticals. Webscale giants, including Alibaba, Amazon, Facebook, Google, and Tencent, are targeting the same verticals that mobile service providers want to address, but without a vital component: the last mile of connectivity

to consumers or enterprises that mobile service providers have with 4G and 5G. If mobile service providers do take advantage of a 5G radio network, URLLC, edge computing, and network automation/orchestration, there is a significant opportunity to become much more than connectivity providers. However, this transition will not be an easy task, and it will take a lot more than what mobile service providers currently provide, which is largely driven by connectivity alone.

WHAT WILL IT TAKE TO MAKE URLLC CREATE VALUE?

Contrary to previous iterations of the standard that required the supply chain to create chipsets, devices, and infrastructure, URLLC will require a lot more to succeed. Specifically, URLLC will require development in the following domains:

- **Radio Domain:** With URLLC, latency, reliability, and quality of service will have the same importance as capacity and higher speeds. This may require certain compromises in many parts of the network, including the base station scheduler, policy functions, and resource allocation, which may also reduce the system spectral efficiency in favor of more reliable and low-latency delivery of data. Even when this is implemented in the 3GPP standard and infrastructure, mobile service providers will need to change the way they design, dimension, and monetize their networks.

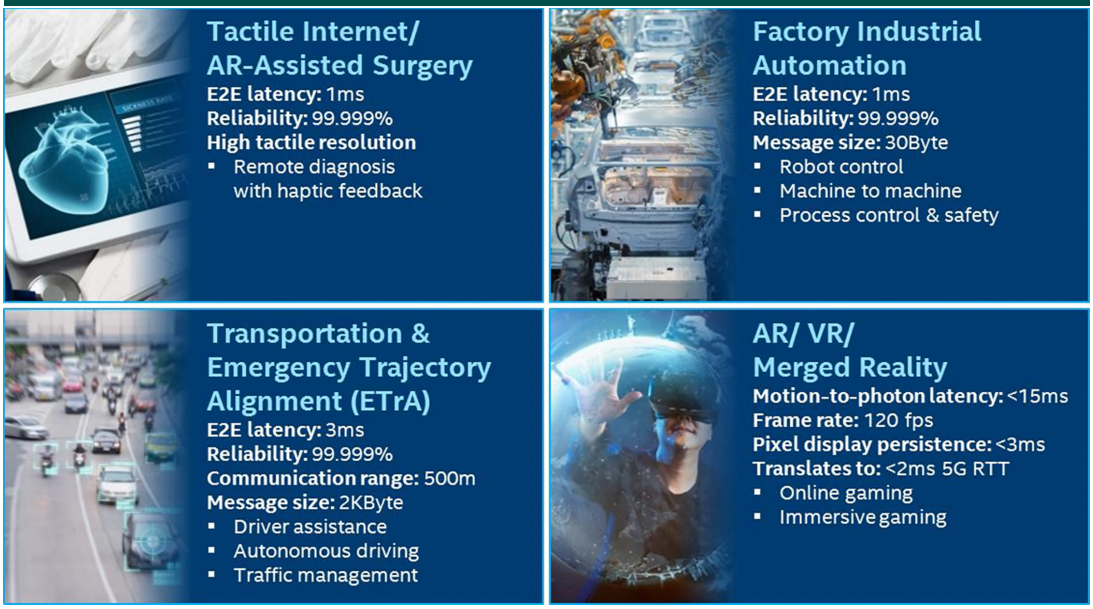
- **End-to-End System Considerations:** URLLC will require much more than lower latency in the radio domain. Edge computing, core network functionality, and even public cloud functions will need to be tied together and orchestrated to achieve end-to-end lower latency and reliable services. Although greenfield networks can achieve this level of orchestration, legacy networks that include both physical and virtual components from dozens of vendors will require a transition to achieve network homogeneity.

- **Application Ecosystem:** URLLC applications will likely be specific to individual enterprise verticals or even consumer applications (e.g., Augmented Reality (AR)/Virtual Reality (VR) and gaming), so it will not be possible for mobile service providers and the telco supply chain to create all—or even any—of them. Mobile service providers and infrastructure vendors will need to engage with vertical-specific systems integrators and application developers to create the applications that will use reliable and low-latency services. This is in contrast with the past, when mobile service providers designed and deployed all services, or created the connectivity platform for third parties to create value without their involvement (e.g., Apple App Store, Google Play, and Netflix).

All three of these domains will need to be brought together to successfully launch a URLLC service. The radio domain will surely be addressed by the 3GPP standard. The end-to-end domain will be partly addressed, and it will be up to mobile service providers, vendors, and systems integrators to tie the end-to-end systems together. The application ecosystem will not be addressed by the standard at all; it will be up to service providers and vendors to interface with third-party software developers and create applications and use cases.

Figure 1: Use Cases Enabled by URLLC

(Source: Intel)



The telco industry will also need to manage complexity in the design and implementation of URLLC services, because the three domains mentioned above require enhanced technology and extensive interfaces between them, with a change in one creating distortions in the other. This will become more complicated when there are several concurrent URLLC services running at the same time, developed for different enterprise verticals. Network slicing may address this concern, but system design will be much more complex compared to previous networks that are mostly designed for capacity.

SUPPLY CHAIN EVOLUTION AND NEXT STEPS

The telco supply chain has been—and still is—following a linear development model: chipsets are used in devices or infrastructure, which are then deployed in telco networks to enable services. Obviously, this in an oversimplified version, but it is expected to remain so with the first iterations of 5G eMBB services, especially when most mobile service providers have selected to deploy 5G with Non-Standalone Access (NSA), using a 4G packet core. However, when Next Generation Core (NG Core) and Standalone Access (SA), edge computing, network automation, and service orchestration become the norm, a linear development model will not be enough to connect infrastructure, devices, application developers, and enterprise verticals. To succeed, URLLC must usher in an era of platforms, in which each network and business layer will be transparent to the others so that applications are developed through consistent development tools and interfaces. This is increasingly being discussed in the industry and initiatives, such as MobiledgeX, illustrate that the future of URLLC is consistency, even between competing mobile service providers.

The telco supply chain itself will likely need to change so that URLLC can become successful. Traditional vendors will need to become platform developers, rather than proprietary hardware or software providers. Similar to other web giants, such as Amazon, which transformed itself from an online book retailer to a cloud computing giant, mostly through its determination to create platforms that were initially used internally and eventually sold externally. Carrier-grade, common computing platforms will likely be the foundational components of these new networks, and existing technology suppliers or even new companies will provide the innovation to tie all these systems and concepts together. ABI Research expects these new platforms to start appearing in 2019 and surely after URLLC is fully ratified.

Figure 2: Technical Features of URLLC Introduced in 3GPP Release 16

(Source: Intel)