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A Tsunami of Mobile Data Could Throttle Future Networks

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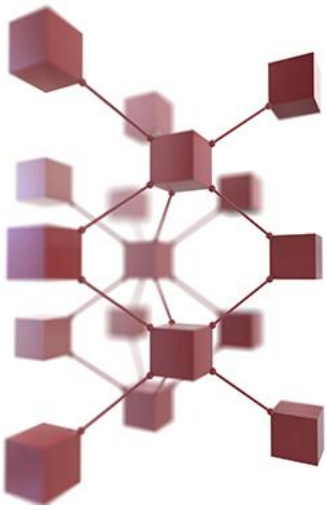

For global telecom operators, the last few months have been an interesting experiment. In many ways, the COVID-19 pandemic has been a scaled-down version of what might lie in store for networks as 5G is gradually rolled out.

According to a recent research report from the Technology Innovation Council (TIC), more than 40 percent of operators have seen network traffic increase between 60 and 100 percent, primarily driven by the lockdown measures imposed by countless countries around the world to combat the pandemic. Thousands of businesses were suddenly racing to enable their staff to work effectively from home, while children in many countries simply had their education paused or were homeschooled.

Either way, networks saw a sudden surge of usage as businesses, schools and families began to lean very heavily on the Internet to collaborate, communicate, and connect. While many companies thought—and perhaps even hoped—that remote working was a temporary measure, it's becoming increasingly apparent that it may be a part of the so-called "new normal." In fact, once they're beyond the productivity hurdle, many businesses are actually finding remote working a very viable and cost-effective option. And that has implications for telecom operators.

Operators on the frontline…of gaming!

This level of demand isn't going anywhere soon. As network operators continue to roll out their 5G networks, they are going to have to contend with high traffic, driven mainly by video, gaming and collaboration platforms.

Video streaming revenues alone are expected to hit $52 billion this year, according to Statista. But as 5G networks grow over the next five years, revenue from video streaming is expected to experience a 10.7 percent compound annual growth rate (CAGR), pushing the market to a staggering $86 billion by 2025. Moreover, MarketsandMarkets says cloud gaming will experience a CAGR of 59 percent, driving revenues from $306 million in 2019 to $3.1 billion by 2024.

It's a tough challenge for operators, but it's excellent news for gamers. Gone are the physical access barriers, such as needing a cutting-edge computer or handset that would once have stopped a player from enjoying the latest video game crop.

Cloud processing means that all the heavy lifting is done on the cloud, allowing consumers to spend more on games and less on hardware. What's more, the super low latency offered by 5G will make gaming more viable than ever before in a wireless, hand-held format. However, gaming is a heavily segmented market. For instance, the increasingly popular e-sports market has very little in common with mobile or console gaming. When it comes to market segmentation, the strategy taken by gaming companies will have a knock-on effect on the expectations set by analysts who—at least before the pandemic—were considering it would be the 5G equivalent to video in 4G.

And this is just the tip of the iceberg when it comes to 5G use cases. By 2024, vXchnge says 5G networks will cover 40 percent of the world, handling 25 percent of all mobile traffic data. But where 5G will truly create disruptive change is in the use cases it uniquely supports.

5G and IoT

Unlike 4G's massive cell towers, 5G networks are made up of towers of small cells that transmit data over a different part of the radio spectrum. Multiple 5G towers are deployed across a network to create interconnectivity and relay data faster. Denser towers enable 5G networks to support far more IoT devices than is possible on 4G networks.

According to IDC data cited by PwC, $6 trillion could have been spent on IoT solutions between 2015 and 2020. KPMG estimates that by 2025, investment in automation, including AI and machine learning, could reach $232 billion. Put simply, the greater the investment in AI and IoT, the more intense the data tsunami that operators have to face from the millions and billions of devices that come online.

Consider that 4G networks can support a few thousand devices per square mile, while 5G networks can support millions of devices over that same geography, creating tremendous possibilities for industrial IoT applications and the sensor networks needed for smart cities. We could be mere years away from autonomous street lighting, self-regulating traffic lights and interactive information boards.

While 5G may promise to be the solution to the data growth challenge, the new radio rollout will initially only have limited coverage. The radio technology used to fully benefit from 5G speed and latency selling points (mmWave) introduces new challenges to operators, as it requires substantially lower range towers, increasing the cost of deployment.

Operators will inevitably need to combine mmWave with alternative access technologies such as Sub-6 and LTE for ubiquitous coverage. This scenario will favor continuous access handovers, with evident latency, bandwidth and congestion impacts in 5G's early deployment phases.

With IoT applications in manufacturing and industrial settings, fast response times with low latency connections are essential. Current 4G networks generally have latency rates between 50 and 100 milliseconds, but initial 5G rollouts have reduced that to less than 30 milliseconds.

Low latency is also a major factor for the success of autonomous cars, which use sensors, GPS and navigation systems to communicate to the car where it is and what's going on around it. 5G networks will improve the quality of vehicle-to-vehicle (V2V) connectivity and vehicle-to-everything (V2X) connectivity. Likewise, 5G will provide support for passengers to access the Internet and have a consistent experience as they pass countless base stations that need to provide seamless handoff to maintain a consistent connection. This will sound like music to the ears of people who have spent years dipping in and out of signal range on their morning commute.

An encryption tsunami

Encryption from OTT players is already creating havoc on networks, hindering operators in the management of subscriber quality of experience (QoE). But operators are facing a new threat. New encryption techniques such as eSNI (Encrypted SNI) and DNS obfuscation through DNS over HTTPS (DoH) and DNS over TLS (DoT) will become a real threat as soon as early 2021.

On one hand, DPI and traditional inline traffic management solutions will not be able to identify traffic based on the SNI/domain. On the other, DNS traffic inspection may not be an option if the query to resolve a domain name is encapsulated into HTTPS.

While today only a small number of browsers and content providers—such as Firefox and Cloudflare—offer the possibility to enforce SNI encryption and to use encrypted alternatives to traditional DNS, the big players in the OTT ecosystem have already announced their readiness to transition to both DoH and eSNI as soon as a standard is approved.

In the absence of effective traffic management tools that can overcome the traffic identification and classification challenges imposed by the new encryption techniques, network congestion will be hardly possible to manage. Evidence of this has been the recent news from China blocking any eSNI-based TLS 1.3 traffic in the country.

The role of machine learning and AI

For operators to overcome congestion and fully monetize their networks, they must integrate machine learning (ML) technology that can intelligently manage data delivery through the RAN to preserve QoE and use costly RAN resources efficiently. ML will play a key role in helping operators automate 5G networks while increasing network performance and shortening time-to-market for new features.

Integration of machine learning into current and future generations of cellular access is critical to building a cellular network that continually adapts to customer requirements as well as to static and dynamic characteristics of different deployment options.

5G use cases and services like ultra-reliable low latency communications (URLLC), massive machine-type communications (mMTC) and enhanced mobile broadband (eMBB) place heavy demands on RANs in terms of performance, latency, reliability and efficiency. The wide variety of network requirements, paired with a growing number of control parameters of modern RANs, has given rise to an overly complicated system that belies the need for operators to simplify the management and provisioning of different services and improve the performance of the services offered.

AI-based tools and techniques make it possible for operators to achieve new objectives that are beyond the reach of classical optimization and rule-based approaches. Likewise, AI has the ability to significantly improve functions like anomaly detection, predictive maintenance and the reduction of site interventions through automated site inspections with drones.

AI can also manage the RAN automatically during peaks and troughs on the network, something that operators have needed to do for years but have lacked the technology to accomplish. Today, telecom networks are engineered for peak demands that are fairly predictable—peaks on wireless networks typically occur in the morning and early evening, for example, when people commute to and from their jobs. But in the future, engineering for peak traffic won't be so easy.

What next?

The digital landscape is far from static, and operators are used to keeping up with a picture that has a tendency to change rapidly and frequently. However, the rollout of 5G combined with the COVID-19 pandemic represent a tectonic shift of potentially epic proportions. As the land continues to move beneath the feet of operators and businesses—and indeed the world at large—operators must deploy ML and AI as they face the 'new' normal in traffic management.