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From Virtualization to the Edge: 2018 Predictions

By: Johnny Ghibril

Introduction

With 2018 right around the corner, now is a good time to assess the current state of the telecom industry. Few industries are undergoing as much rapid change as telecom, with the expanded adoption of software defined networking (SDN), reliance on open source platforms, and highly demanding, low latency consumer services such as virtual reality and self-driving cars becoming commonplace. These developments on a continuously growing IoT landscape, which will be further enabled with the development and deployment of 5G and edge computing, ensure that 2018 will be a transformational year for the industry.

With Cisco predicting global mobile data traffic to grow *sevenfold*, between 2016 and 2021—from 7 exabytes to 49 exabytes, consumer demand for data is exploding. We have arrived at a crucial conjunction for the telecom industry: Will the necessary adaptation to service this level of demand occur? And, what needs to happen to do so? There are clear patterns and trends that give strong indications about the future of telecom, and based upon these observations, there are several developments we expect to occur in 2018.

Continued Movement Toward a Massively Distributed Network

Necessitated by more and more applications relying on nearly instantaneous responses, we will see the business case for edge computing start to take shape, with the first commercial production deployments servicing content to consumers taking place this coming year.

Consider the case of Madison, Wisconsin. In Madison, US Cellular and Ericsson partnered to conduct 5G trials in a real-world setting. During these trials, virtual reality (VR) and augmented reality (AR) applications were successfully tested, proving that these applications are ready to go mainstream. AR and VR functions are heavily reliant on low-latency connections, and these latency requirements cannot be met with a small number of massive data centers that are typically hundreds of miles away.

To function successfully, emerging applications, such as autonomous vehicles, need information in response times that can't be supported by a centralized network that has only a few data centers that are geographically distant. To deal with this, we will start to see micro data centers pop up in previously unlikely places—for example, cell towers. Two companies, Virtual Bridge and Crown Castle, have already announced they will start providing what are essentially micro data centers under their cell towers.

AT&T's CTO Andre Feutsch recently said: "Our network consists of over 5,000 central offices, over 65,000 cell towers, and even several hundred thousand distribution points beyond that, reaching into all the neighborhoods we serve. All of a sudden, all those physical locations become candidates for compute."

With locations such as these now *all* candidates for edge computing, it will bring computing closer

than ever to the customer, all while maintaining a high level of service. The advent of these micro data centers will be a key step in propelling an increasingly distributed architecture.

The ROI on Virtualization Will Not Meet Industry Expectations

Network function virtualization (NFV) underpins most, if not all, of these transformations for the operators—most carriers have already embarked on their journey to build their network clouds in one form or another. However, we predict that in 2018, many operators will see that the predicted ROI from virtualizing their networks will fail to materialize.

NFV promises to increase the flexibility, agility, resilience, and scalability of these networks. It will also enable far superior automation, resulting in improved services and reduced operational costs. The eroding factor to ROI stems mainly from the difficulty in, and lack of, adoption of cloud architecture and design best practices. Virtualized network functions are still not appropriately cloud-native, and true microservices and DevOps-driven operations do not yet take place even in some of the most advanced adopters of NFV.

The decoupling of the software and hardware layers through virtualization in network clouds, as well as the management of hybrid (physical and virtualized) networks, will increase operational complexity and cost—at least in the short term. In 2018 and beyond, operators will begin to gradually adopt best practices to achieve web-scale-enterprise-like cloud operations (e.g. Google, Netflix, etc.). Only after making these changes will they begin to reap the benefits of virtualization and realize the true potential of carrier clouds.

The Necessity of AI in Increasingly Complex Networks

Though obvious, artificial intelligence (AI) usage will continue to increase as it becomes necessary for the successful management of complex networks. As operators move their networks to the cloud, AI will be vital for the creation of autonomous, self-healing networks.

Technological advances in computing, with an emphasis on purpose-built chipsets aimed at mobile edge, and user equipment computing have now progressed to a point where AI is operationally feasible. AI algorithms, especially machine learning, are compute intensive operations that threatened to dilute their value by exacting too high a cost to run in micro-cloud, a challenge we continue to see addressed through hardware design and proliferation of open source AI with a considerable community behind it.

If you need to look for expertise in AI, there is a lot more talent available today than there used to be—the difference compared to even just 10 years ago is staggering. Combined with the now widespread availability of data and a willingness to use that data, we will begin to see AI embedded in more and more areas of telecom.

ONAP to Manage Virtual VoLTE

The progress of the Open Network Automation Platform (ONAP) continues to accelerate. The project was formed in spring of 2017, with the aim of advancing the development of a vibrant ecosystem around a globally shared architecture and implementation for network automation. After months of hard work, Amsterdam, ONAP's first united platform was release on Nov 20th to deliver a unified architecture for end-to-end, closed-loop network automation. As such, we believe that there will be several attempts to deploy ONAP-based orchestration next year. For that reason, it feels safe to predict that we will see at least one operational deployment.

Through Amsterdam, ONAP provided blueprints for two initial use cases, VoLTE and residential

vCPE. And, during the next year, we believe that the industry will see virtual VoLTE managed by ONAP. While "regular" VoLTE is already in widespread use, operators who hope to capitalize on virtualization benefits may start to virtualize VoLTE.

But don't expect to see a mainstream VoLTE deployment—those have happened already, and those operators won't feel a need to virtualize yet. More likely, we will see a virtual VoLTE deployment managed by ONAP from an operator with an IoT infrastructure or in a greenfield deployment from a small operator. This could be an operator that is starting up in 2018, or perhaps one who is just deploying VoLTE in a limited area—in which case they may decide to virtualize VoLTE. Finally, another potential deployment could be in remote locations where local communication could potentially be offered even in cases of network failure.

Looking Towards the Future

2018 will be a year of progress as the telecommunications industry continues to transform. Consumer demand for data is skyrocketing, and new applications are continually being developed that push current networks to the limit. For society, this progress will begin to enable technologies and applications that can improve everyday life via advances in emergency responses, telemedicine, or autonomous driving.

The industry as a whole must adapt, grow, and evolve as it seeks to keep up with the ever-growing consumer demand for connectivity. Edge computing will make high-demand, low-latency applications feasible. With careful planning, virtualization, whose benefits have already been widely known, will hopefully start to deliver on the ROI that many operators were hoping to see. We may even see virtualized VoLTE, which is another step towards making services more widely available for customers.

This will all be tied together by the increased adoption of AI. No longer just a futuristic concept, AI is real, and it will see some successful applications in supporting network operations—paving the way for the key role it will play in future large-scale deployments. Automation through intelligence is essential to allow the telecom industry to respond to demand and continue to expand. The more it grows, the more AI will be needed.