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5G Can Be a Catalyst for NFV:
Will CSPs Win the Battle for Value With OTT Providers?

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INTRODUCTION

Communications service providers (CSPs) are being challenged on numerous fronts. Over-the-top (OTT) providers such as Facebook and Netflix are only getting stronger, and continue to garner much of the value of content running CSPs' networks. This puts CSPs in a difficult position since they are not generating the revenue to offset the investment they need to make to increase network capacity. OTTs are also conditioning customers to expect highly customized, always available services, putting pressure on CSPs to do the same.

The coming transition to 5G technologies will give CSPs a needed boost in capacity, but just as importantly, it will give them an opportunity to develop new business models. With 5G, CSPs can segment their networks to support service tiering, and structure deals to allow them to garner an increase share of value in OTT content. Delivering on the flexibility to support new approaches for CSPs, customers and content providers will be critical to CSP success. 5G will also accelerate IoT service delivery, which is both an opportunity for new CSP revenue, but also a source of new technical requirements.

To fully leverage the capacity and services that 5G promises, CSPs will need to virtualize and automate the full stack – that is, they will need to embrace network functions virtualization (NFV) and deploy a cloud-based delivery model. This will allow CSPs to scale more efficiently, and operate in a more agile manner. Real-time databases will play a crucial role in enabling the faster response times and data processing that are needed in a cloud environment.

CSPs have visibility into a wide range of network and user behavior that they can leverage to provide higher-quality and more personalized services. This puts them in a more competitive position in relation to the OTT providers. CSPs that can combine the power of more capacity, new business models and greater agility will be best positioned to capture more of the value in the 5G market.

CSPs UNDER INCREASING PRESSURE

The market disruption caused by OTT players impacts CSPs in multiple ways. For one, they are seemingly capturing most of the value of CSPs' investments to increase capacity in their networks. Additionally, the OTTs are resetting customers' expectations about the services they consume. At the same time, CSPs are faced with sustained increases in mobile broadband traffic.

OTTs Are Capturing the Value From Smartphones & Mobile Broadband

OTT players such as Facebook, Google, Skype and Netflix are reaping the benefits of the increased broadband capacity in both fixed and mobile networks. Most of the services and applications consumed on smartphones and high-speed Internet come from these players, rather than the CSPs themselves. This is putting pressure on CSPs' revenues, as OTTs siphon off spending on traditional voice and messaging services.

In an effort to recapture some of the value of the content flowing over their pipes, CSPs are beginning to offer value-added services or bundle OTT services with their own. Some are looking to acquire content companies outright, as evidenced by Verizon's recent pursuit of Yahoo, and AT&T's pursuit of Time Warner.

OTTs Are Resetting Customers' Expectations for Real-Time, Personalized Services

Another way in which OTTs are forcing change on CSPs is by offering experiences that are much more personalized to the end user than traditional services were. Consumers now expect to be able to access any information, at any time, from any device, with no compromise on quality. Because they don't have to invest in managing the underlying infrastructure, OTT companies can put their focus on delivering a highly relevant service that customers are more than willing to pay for. OTTs have great visibility into subscriber behavior, and are using that information to provide ever more customized services.

This level of customization and real-time service has made subscribers expect to receive similar experiences from CSPs. Those that don't (or can't) meet these new expectations will lose customers to those that do. CSPs are therefore challenged to put more focus on using all the tools at their disposal – including network quality and subscriber usage data – to provide a more personalized, high-quality user experience.

CSPs Are Not Seeing Revenue Growth Commensurate With Traffic Growth

The advent of 4G and greater smartphone penetration has led to rapid mobile traffic growth. Cisco's most recent VNI Mobile Index says globally, mobile traffic grew 62 percent in 2016. However, according to the GSMA, global mobile revenue in 2016 grew by only 2.2 percent. OTT players such as Facebook and Netflix continue to grow rapidly, so there is every reason to expect mobile traffic growth to continue, if not accelerate.

Clearly, this is an unsustainable model for mobile CSPs. Therefore, they are looking at ways to transform their networks and operations not only to handle the expected sustained growth in mobile traffic more cost-effectively, but also to generate new sources of profitable services. In both cases, a software-based, cloud model is the preferred approach.

5G OFFERS NEW POTENTIAL OPPORTUNITIES

The most obvious benefit of 5G technologies is increased capacity. However, just as significant is the opportunity for CSPs to develop completely new business models and engage with their customers more intimately. The CSPs that can provide the flexibility to allow consumers and content providers to create new business models will be best positioned to succeed. 5G will also be critical in making IoT a viable new revenue stream for CSPs.

5G Will Make Network Slicing More Feasible

While 5G is often thought of in terms of the increased end-user capacity it will provide, it will also give CSPs an opportunity to segment their networks in new ways. They will now have the ability to apply specific policies to different portions of the network, and offer different terms accordingly. This sort of service tiering could help CSPs recoup some of their investment in ways they have been unable to do in the past.

Certainly, net neutrality could put a damper on such strategies in some markets, but CSPs will surely investigate partnerships with content providers that would allow reasonable pricing differentiation based on the quality of experience. More flexible revenue sharing models (be they revenue sharing, revenue splitting, or affiliate and partner arrangements) with content

owners is another way CSPs can capture more of the value of what flows over their networks. For smaller players, CSPs could offer a network-as-a-service that would also serve the same purpose.

IoT

Most industry forecasts show that mobile subscriber growth will slow in the coming years. However, if IoT connections are taken into account, that picture changes dramatically. Here, the expectation is that the number of connected endpoints coming from the industrial IoT market, including devices such as sensors, medical IoT, and others, will increase significantly faster than handsets.

Figure 1: Connected Devices Forecast

Connection Type	2015	2021	CAGR 2015-2021
Cellular IoT	0.4 billion	1.5 billion	27%
Non-cellular IoT	4.2 billion	14.2 billion	22%
Mobile phones	7.1 billion	8.6 billion	3%

Source: Ericsson

Even if each connection generates only a few cents, or even micro-cents per month, the scale of IoT means that each event will translate into meaningful revenue for those CSPs positioned to capture it.

As much as IoT is an opportunity, it will also put new types of requirements on CSPs. They will need to be able to support increases in data and signaling traffic, as well as put processing capabilities further into the network. For some use cases, such as smart cars, it will be critical to be able to take action on network events in real time. CSPs will need to make the right investments in the right technologies to benefit from the revenue potential these billions of new connections can bring. Those that don't, risk losing some of the opportunity to other companies. For example, Nokia's Worldwide IoT Network Grid (WING) provides a full-service model for IoT connectivity across different technologies. Nokia isn't a mobile network operator, but rather a flexible, cloud-based service provider.

TECHNOLOGY REFRESH NEEDED FOR 5G

Moving to 5G will, of course, require changes to the mobile core and radio access network (RAN). However, to fully benefit from this transition, CSPs should also deploy NFV and real-time databases.

NFV Needed to Provide Needed Agility & Flexibility

CSPs will need to virtualize – and eventually cloudify – their entire stack to achieve the agility and flexibility they so badly need to compete against each other, as well as formidable OTT players. Most are already considering, if not deploying, NFV.

NFV offers the promise of improving service levels and reducing capex and opex by moving network-based functions from proprietary platforms to virtualized services running on generic

IT servers in a cloud model. Moving to this model will allow CSPs to more efficiently and cost-effectively scale their networks to support increased traffic. Automated operations using cloud management tools will allow them to more quickly launch services and respond to change in a more agile way.

SDN can support NFV efforts by enabling a scalable implementation of policy enforcement and microservices architectures for service chaining and traffic engineering, e.g., computing least-cost routing. Containers will be a key element in deploying microservices architectures. CSPs need to separately address concerns between the infrastructure components (virtualized compute, network, storage resources) and the metadata needed to drive the policies and compute network traffic.

The result is that network service providers should be capable of hosting multiple tenants, applications and services with different network performance requirements, policies and revenue models – all on a common infrastructure.

CSPs may need to make room for online service providers that sit between the traditional telecom network and end-user organizations – a role that doesn't exist today. There will likely be a need for CSPs to build direct commercial relationships between content providers to deliver value, e.g., a media firm that wants to deliver its content to end users with a guarantee of service quality.

Real-Time Databases Become More Important With 5G

With 5G, CSPs will need to support lower latencies (as low as a millisecond for some mission-critical applications) and higher throughput than with 4G, while at the same time managing the increases in data traffic coming from smartphones, as well as signaling coming from notifications and IoT devices. To ensure responsive network management and appropriate QoS, they will need to analyze call, packet and event data records in real time, not in minutes. A real-time decisioning engine that is service-aware will be an essential enabler of real-time 5G applications. It must be able to support billions of messages in real time, and quickly deploy the necessary network resources to address the QoS requirements of each service or application.

Both fast data and big data are needed to manage increased volumes of data. Fast data refers to the need to process data that arrives every second, while big data refers to the analytics run on that data to identify trends. CSPs' applications and services will increasingly rely on database systems to ingest, analyze, store and make decisions on data in real time, while also ensuring those decisions are valid. Machine learning needs the large amounts of data that 5G will generate. Ensuring that the data is analyzed quickly and learnings are returned in a continuous feedback loop will be important to getting the most benefit from fast and big data.

NFV orchestration will also drive demand for real-time analytics. Orchestration systems will need to know, in real time, the utilization rates for compute, network and storage elements to make the best decisions on where to place VNFs, and determine when resources need to be scaled up or down in response to changing conditions.

In addition, SDN requires a data-driven representation of policies, network metadata and route cost information. Horizontally-scalable distributed databases that perform at carrier-grade throughputs and predictable latencies can hold the metadata needed to drive network policies and support traffic engineering.

To support the functionality described above, a real-time database will need to support a range of capabilities and characteristics. **Figure 2** illustrates some of the requirements for a real-time database, including:

- **Relational Database:** Representing a data model based on 3GPP specifications in this manner can be more suitable than a NoSQL database, where data content can be lost.

- **High Performance:** To meet CSPs' requirements for high throughput and low latency.

- **Cloud Ready:** To support the virtualization efforts that are becoming imminent for many CSPs.

- **Predictable Scalability:** To accommodate scaling as required, be able to fit into the virtualized environment, and allow operations to know when to scale out further to satisfy growing needs.

- **Immediately Consistent:** To be accurate in billing, especially catering to the move toward real-time billing and perhaps post-processing offer/campaign management.

- **Ability to Apply Logic to Data:** To allow CSPs to implement increasingly complex policy rules to the data to determine a variety of needs, such as meeting QoS SLAs, BotOrNot detection to avoid DDoS attacks and ThingBot attacks, and the ability to provide ratified service levels (if net neutrality is made lenient and enables band-width splitting for renting to different service providers/customers).

Figure 2: Requirements of a Real-Time Database
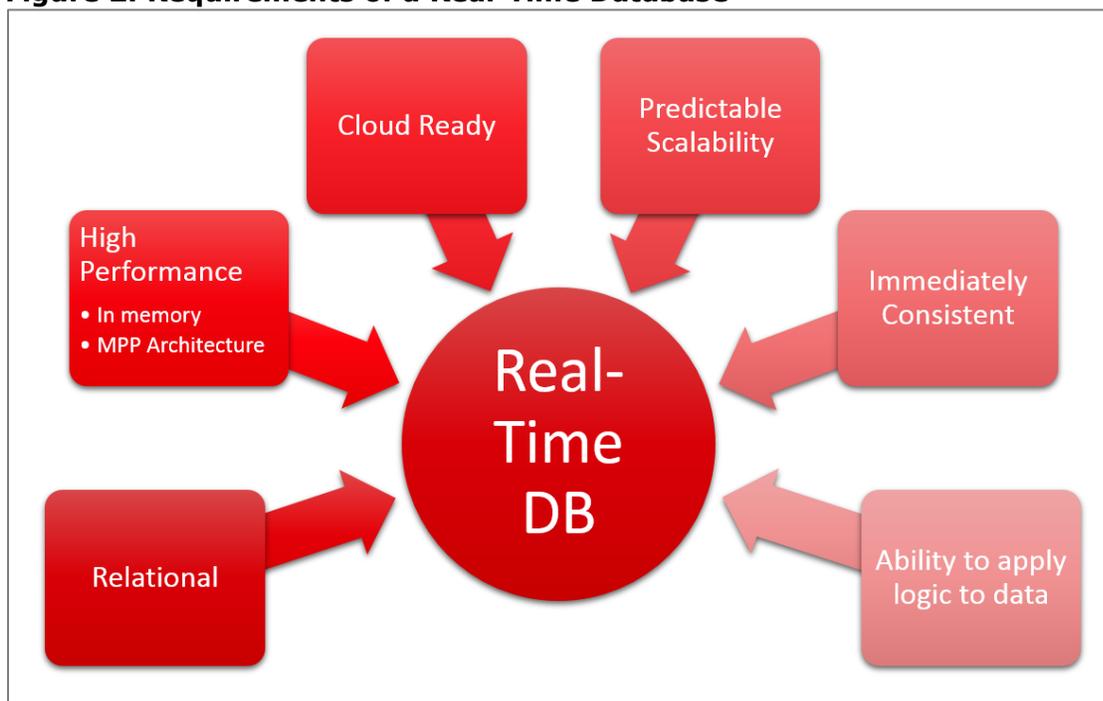
CSPs Can Leverage Insight From Data for Competitive Advantage

CSPs are in the best position to see the full range of network and end-user behavior and use that information to gain actionable insights to provide better service. Unlike the OTTs, they have visibility into network QoS, from latency connecting calls, to slowdowns in application

downloads or buffering in YouTube videos. They can also see the OTT traffic running over their networks, so they have a view of all the services their subscriber uses – which their OTT competitors cannot. If the CSPs can create a platform, they may not need to become the OTT, but they can have better monetary control over the OTTs that want access to their platform. If they can, they should certainly consider offering services that the OTTs will be providing, obviating the need for the traditional OTTs and, in effect, allowing the CSPs to become OTTs to their own networks.

While taking care to address privacy concerns using clear opt-in/opt-out policies, CSPs are well positioned to aggregate network and subscriber information to create a fuller picture that they can use to provide higher-quality, tailored solutions. With real-time processing and analytics, CSPs can take action on data as it arrives, and respond more quickly to ensure high levels of service. They can also use this information to anticipate user behavior, and proactively address customer care issues or deliver a targeted promotion.

CONCLUSION

CSPs are in a difficult position. They are faced with sustained competitive pressure from OTT players, while continuing to invest in network capacity in an environment of slow revenue growth. The transition to 5G, which has technology and business implications, offers the promise of some relief. Network slicing provides CSPs an opportunity to interact differently with their customers and the OTT players, potentially allowing them to garner a larger share of the value. IoT, too, is poised to deliver a new revenue stream. To fully benefit, though, CSPs need to embrace NFV and cloud delivery models. Together with real-time databases, the technologies will complement 5G to enable CSPs to operate more efficiently and deliver a better experience to their customers.