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Real Time: The New Mantra for the Agile and Smart Networks

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Telecommunications customers are increasingly categorized by one phrase: real-time. Whether “real time” relates to products, services, overall experience, or other factors, the single point of intersection between an operator and its customers is its network. The network drives customer experience, satisfaction, retention, revenue growth, and in untoward situations, churn.

To meet this real-time challenge, networks must now become agile, smart, and far less expensive to maintain and grow. One clear path exists to meet that challenge: a planned, well-executed transformation to SDN and NFV. Smart networking, dynamic resource allocations, casual service access, variable business and product models, significantly reduced overall NetEx, and many other advantages are within reach when operators embark on this path. However, a poorly executed strategy can lead to peril and even a permanently damaged business for an operator. Understanding the risks, planning for the unknowns, and quickly reacting to changing conditions during what should be a multi-year strategy will be crucial.

The Real-Time Customer

At first glance one would think, “We’ve always had real-time customers, haven’t we?” The short answer is a conditional "yes". We make and receive calls, surf the web, open applications and perform tasks when we need to. This level of activity has historically been relatively easy for operators to forecast, build capacity to support, and most importantly, monetize.

So why is the concept of *real-time* important now, especially within the context of transforming networks and business models to support this? It is because the profile of a customer is no longer what it traditionally was. Customer behaviors illustrate massive drops in traditional services, while consuming data-driven services at rates that no longer financially support the standard practice of overbuilding the network.

How is the customer profile evolving? With the rapid rise of IoT, device applications have exploded onto the market, with literally no end in sight as we “digitize” our lives. The definition of a customer is no longer bounded by a handset, or even a group of handsets (families, business customers, and so on). Today, a customer is a more complex entity, where handsets are just the beginning. A customer is now further profiled to include Smart Home systems (alarms, appliances, climate controls, lighting, landscape watering); Smart Vehicle systems (maintenance, navigation and traffic, streaming and WiFi access, autonomous driving, mobile commerce, etc.); Medical Health platforms (sensors to track health, inform loved ones, inform health care providers); Smart Cities (municipal traffic, air pollution, energy and sustainability monitoring); and many other potential device and access variables.

What further complicates the view of a given customer is the concept of "access". When customers had a single device in hand, an operator could know where a customer was on the network, and could manage and forecast necessary bandwidth and capacity to support that. The onslaught of IoT and the cloud has complicated it so that a customer can appear (to the network) to be in many places at once. Wireless and wired devices attached to that customer or their account may initiate activity, albeit large or small in consumption, through any of these devices, at any time.

Profiling and Predicting in a multi-dimensional world. Network forecasting and planning has evolved to become sophisticated over time. Predicting behaviors of different demographics of customers has helped operators effectively augment planning and budgeting. However, in the past, relationship of a customer to his or her access was a linear conversation: operators knew that behavior was *predominantly* driven through a single point of access — the mobile handset. With the advent of multiple devices generating data that is driven by a customer, group of customers, or an event (e.g., weather event), this is also changing.

Imagine if a digitally enabled car that is streaming videos to occupants, while autonomously driving those occupants for 20 miles. In this vehicle, there may be many connected devices, such as handsets occupying spectrum in CDMA/GSM and the vehicle platform itself as with LTE-connectivity, not to mention perhaps a passive GSM connectivity for roadside assistance services.

Perhaps this pattern is predictable, but what happens when the vehicle connectivity comes through an enterprise contract, not through the subscriber account? How can an operator now attach behavioral profiling to the subscriber with no visibility into the enterprise connection to that subscriber? Hence, operators now need to manage profiles on both subscriber and enterprise devices, and try (through Big Data analytics) to find a connection between both, *in real time*, to generate a truly representative profile for planning purposes.

Access and Transparency. A final piece to the *real-time* puzzle facing operators in their quest for agile networks and accurate planning is the move into deeper *omni-channel* experiences for customers. Customers expect similar, consistent experiences when accessing content through their devices. Whether they are sitting in front of a PC or a 17-inch Tesla vertical screen, they want the same ability to view, select, interact, or purchase a given product or service. How can operators maintain the same service, and quality of service, as that customer transitions from a fixed broadband experience to a mobile LTE experience, ultimately ending on a Wi-Fi network that is offloading users in a large urban area, saving cellular spectrum? The customer does not care how it happens. He or she simply wants *access* and *transparency*. The service must be maintained, in good quality, uninterrupted, and in *real-time.*

Addressing the Challenges —Where Rubber Meets the Road!

Wave Pools and Capacity Forecasting. Without over-simplifying network capacity predicting, we can illustrate capacity movement across a network by using the example of the Oceanographic Wave Pool. Network consumption has followed our lives from our homes in the mornings, through traffic and transit arteries, to our places of work, then back along similar paths during the afternoon and evening. In a wave pool, we can simulate this by initiating a linear “wave” (in this case, capacity consumption) along that path, terminating at our place of work, only to reverse that wave in the opposite direction later that day. Identification of residential clusters, transit paths, business clusters has, therefore, made the science of network capacity planning at least somewhat achievable.

Unfortunately, capacity planning has dramatically changed. To account for the changing profiles of customers, devices, and usage patterns in a complex digital world, we’ll now need to widen that wave pool (to allow for multiple wave directions), and launch waves from *any point in the pool,* at *any time.* To further complicate, let’s change the wave height (equivalent to capacity consumed) at *any point along the path of any given wave as it progresses across the pool*. Digital services, the devices they operate from when active, are now a constantly changing (and growing) variable. Now one begins to understand how a digitized world can take the complex science of Capacity forecasting, and make it far more difficult to manage.

Tackling today’s challenge: Network Agility. To serve the needs of a *real-time* customer, network agility must evolve and become far more efficient. Through the rapid rise in data-consuming services, and the amount of data consumed, operator revenues no longer match the increased capacity needs of the network when using previous strategies of “building the network for worst-case capacity scenarios." Instead, service and capacity support needs to be better at

deploying when needed, where needed, and then redeploying elsewhere once demand has subsided or relocated. This type of operational model is virtually impossible to meet by rolling hundreds, if not thousands, of field personnel daily to perform these network changes, especially when one considers that these changes can happen in moments, not hours. To achieve agility, networks need to be "smart" while also mechanized. Essentially, the network needs to manage itself, which is realistically achievable once the network becomes *software-defined*, and network functions become *virtualized*. Once this transformation is completed, the role of network operations can fully evolve to now ensure the smart network has the tools in place to effectively conduct itself as (and when) needed.

Software-Defined, Virtualized Networks and Functions (SDN/NFV): a differentiator. The advent of SDN/NFV has severed a long-standing link between function and platform in telecom networking. The industry has finally abstracted specialized network functions into a detached, *movable* software layer, while at the same time allowed that layer to run on a wide variety of commoditized hardware environments.

As a result of the SDN/NFV evolution, the larger network expense for an operator is poised to move into software (function) licensing, as opposed to hardware platform licensing. Considering the re-usability and re-location characteristics of a software license, the cost saving advantages become quite compelling. The asset driving the most attention within a telecom network going forward will be the software license that drives the function itself.

This has several substantial positive market impacts:

- Hardware costs are now driven by far more competition, as mainstream computing providers can access this market with high-performing alternatives,
- Capacity planning can focus on function agility and mobility, as computing resources can be more easily and inexpensively deployed,
- Sparing costs can be slashed, expensive specialized hardware categories are not needed in each warehouse, or hot spares in central offices.
- A single commodity platform can be tasked for any specialized function based on the software deployed on it, and
- Computing resources can be multi-tasked. A single rack of computers serving a telecom network can be re-tasked with different roles and services, throughout any given time period (e.g., a day, an hour, etc.) based on network needs.

Transforming for the future of *Real-Time*

Considering the trillions of dollars spent on existing network assets already deployed today, it is unreasonable to imagine those networks being "shut off" as next-gen networks are brought live. Instead, operators will run networks in parallel until they have exhausted the usable life of each asset.

As networks transform to "smart" operations to support the *real-time* customer, how do network operations team balance legacy networks during mid-transformation periods that could take years to traverse? These challenges will exist at core network levels and out into aggregation and access layers; maintaining a high level of service quality as events move across multiple delivery technologies is no small undertaking.

The business driver of any transformation strategy is customer experience. While operators are transforming to achieve agility, reduce expenses — to serve the needs of the real-time customer — the need to maintain a high-quality customer experience throughout this period will be critical. Operators should focus on a program to manage key initiatives to be executed during the move to SDN/NFV:

1. **Deployment of an *integrated* Service Orchestration (SO) layer**. While SO is being widely discussed as target-state for SDN//NFV, the need to operate a hybrid network (to include legacy components) will mean the SO should support legacy platforms within its operational scope.

2. **Capacity Forecasting and Planning**. While tactical (operational) capacity data is a staple of any Network Operating Centre (NOC), strategic views into capacity that look out 12 months will be crucial to determine where risks for exhaustion will exist and to determine how that issue should be resolved in any given point on the network. Accelerating a transformation is not always the correct answer.
3. **A strong program for Network Asset Lifecycle Management.** The strategic model which incorporates views into asset movement, utilizations during each deployment cycle, license performance metrics, changes in CAPEX and OPEX variables during transformative periods, and sophisticated demographic views to understand the changing consumption characteristics of the network consumers will give a clearer picture of overall Asset Investment analytics.

There is no end to the impacts of digital revolution on telecommunications networks, and certainly no clearly established strategy to drive more revenues from the increased demand being placed on those networks. The variables operators can most readily control, therefore, relate to cost and agility. The industry movement towards deploying a SDN/NFV network provides operators a path to answer these challenges: a network technology to reduce network costs, and a network agility, through self-awareness, to ensure resources are in place to provide a superior customer experience. As the real-time customer demands instant access, omni-channel benefits, and a superior experience, how well an operator can design, deploy, and control those variables will ultimately serve as a barometer to their long-term success.