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The Role of' 'Softwareization' in Carrier Networks

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In the cloud, the ‘softwareization’ of everything has already arrived, delivering a variety of benefits via innovative applications that created entirely new business models and revenue streams. When it comes to the network outside the data center, however, many functions are still performed manually—especially in long haul backbone environments. The potential for network transformation via the softwareization of currently manual processes offers tangible, operational benefits for backbone providers to enhance operational efficiencies and more nimbly serve clients’ needs while improving profitability. How can carriers use SDN and automation techniques to boost efficiency, improve existing services and enable new services such as bandwidth on demand? This article will explore the current state of SDN and what’s coming from softwareization in carrier networks.

Cloud and Data Center Interconnect Drives Growth, Innovation

According to excerpts from the most recent Cisco Global Cloud Index, 2016–2021, hyperscale data centers will represent 53 percent of all installed data center servers by 2021, and traffic within hyperscale data centers will quadruple, accounting for 55 percent of total traffic within all data centers by 2021. When it comes to non-hyperscale global data center traffic, annual global data center IP traffic will grow threefold from 2016 to 2021, growing at a CAGR of 25 percent.

While the networking market has seen tremendous expansion and innovation over the past two decades, in many ways connectivity remains a physical asset that requires manual resources to install, provision and manage. However, softwareization changes the way broadband services are sold and consumed. Network transformation via softwareization including (but not limited to) SDN promises to bring cloud-like agility to the network while reducing CAPEX and OPEX for operators and clients alike—and it has the potential to disrupt business models and corporate behavior in the same way the cloud has for other industries.

SD-WAN Transforms Public Internet into Private Backbone for Hybrid Cloud

The digitalization of business and its move towards the cloud have radically changed the telecom landscape, especially for enterprise services. Previously, large or globally dispersed enterprises connected their branch offices, data centers and campuses via dedicated MPLS services and hosted their applications in-house. While MPLS was promoted to be reliable and secure, these connections often involved costly, multi-year contracts and provided little flexibility if a firm needed to add new sites or upgrade its services, because MPLS connections can take months to provision.

Now, many enterprises use a hybrid of third-party cloud-based services and self-hosted apps in their own data centers. Traditional WAN services such as MPLS are not designed for directly connecting an enterprise office to cloud-powered SaaS applications such as Office 365 or Salesforce.com at the edge. However, these firms still require the reliability and security provided by traditional WANs to host their own data center applications. So how can businesses maintain critical application performance across both environments while still containing costs?

Now that SDN has matured, it has proven security and other features to reliably deliver QoS, enabling businesses to create reliable software-defined networks to link their hybrid cloud and data center environments. SDN's more recent progeny SD-WAN, which combines SDN and NFV, enables an optimized combination of MPLS and public Internet characteristics while delivering on the promise of reduced CAPEX and OPEX for carriers and customers alike. It creates hybrid networks to integrate broadband or other network services into the corporate WAN, not only handling general business workloads and traffic but also maintaining the performance and security of real-time and security-sensitive applications.

According to a recent Enterprise Management Associates' (EMA) research report, "Wide-Area Network Transformation: How Enterprises Succeed with Software-Defined WAN," 87 percent of distributed enterprises are increasing their use of the Internet as a primary WAN connectivity option, and 97 percent of them are engaged with SD-WAN.

As MPLS contracts expire, more and more enterprises are asking for SD-WAN services in their RFPs. SD-WAN now enables enterprises to connect hybrid clouds, branch offices and data centers at lower costs over long distances using the public Internet instead. While this doesn't signal the death of MPLS, it does mean enterprises will limit its use to environments that specifically require it, and Internet backbone traffic will increase.

Data Drives Automation of Manual Processes

Operators have unique access to lots of information and data about the network and services that, if properly analyzed, can lead to better business and network planning decisions, allowing carriers to reduce costs and increase revenues from existing infrastructure. Softwareization makes network data accessible to other applications—enabling new capabilities and services—and has the potential to transforms the data so it is more understandable, delivering greater insights to network operators.

Automation is a critical element because it can eliminate costly human errors and their impact on the network. It performs tasks faster and saves time and money by enabling personnel to focus on more strategic initiatives instead of day-to-day operations. It also enables the creation of innovative new services and can shorten time-to-service and therefore increase revenues. We are just beginning to see the potential increases in operational efficiency that can be driven by automation. Some examples include automated self-discovery, self-configuration and zero-touch provisioning of networks—and there are a lot of other areas that automation can improve.

Consider billing, for example. As a manual process, billing requires a lot of human resources to calculate how much customers should pay based on their traffic usage. Once automated, it has the potential to free these people to work on more value-added tasks. The need for increased

automation in fault management and prevention is another area that will be revolutionized by softwareization. In addition, enhanced network control automation and virtualization will help customers in their digital journey.

In another example, automation of network configuration services removes the manual performance assessments of optical wavelengths—a critical network performance management task. Automating fiber monitoring across the network can greatly benefit carriers, delivering access to trend analysis that can help with planning and optimization and enabling the greatest possible use of the maximum available spectrum.

Automation is even more important when it comes to serving cloud and data center operators at scale. Doing anything manually for the hyperscalers can be very challenging. Software-based automation will improve existing services and enable new services such as bandwidth on demand, allowing customers to control how they distribute their bandwidth while meeting the need for scalable, on-demand and self-service applications.

Carriers have long been squeezed between the demand for ever-increasing bandwidth and customers' desire to have it at a much lower cost. However, simply driving down costs is not automation's only benefit. Carriers need to leverage it to make them more attractive to do business with by making optimal use of data and creating new services and business models to grow the top line.

Implementing both SDN and automation together brings the industry much closer to the reality of bandwidth on demand, mirroring the nearly instant dial-up of compute, storage and network services and the pay-as-you-go business model of the cloud.

New Capabilities Empower Carrier Customers and their End Users

Software- and hardware-driven automation, data analytics, AI and machine learning provide tremendous opportunities and untapped potential when applied to backbone networks. Collaborations among vendors, carriers, and hyperscalers are already delivering PoCs and practical use cases in these areas—with more coming.

Especially important are the many open source hardware and software projects that push multivendor collaboration, as network operators require diverse solutions but need the network's disparate parts to work seamlessly together. With carriers providing open APIs and the larger vendor marketplace involved, these projects are rapidly delivering more complex and robust solutions, with simpler GUIs and lower costs than previously siloed environments. The projects also foster greater communications with carrier customers as enterprises, data center providers, cloud operators, and hyperscalers can ask for exactly what they want in their solutions.

The "Fail Fast" philosophy that works well for software development is unacceptable to carriers that need to maintain reliable broadband where a "No Fail" philosophy better serves clients and customers that demand 100 percent reliability to support their business. With all the benefits of softwareization, many of the greatest strides have been made on the hardware side. Despite all the hype, many elements of pure software-based solutions have yet to be fully proven in the carrier community while open source software-enabled hardware has been proven to work.

In one hardware-based example, Facebook's Telecom Infra Project has an Artificial Intelligence and Machine Learning Project Group (AI/ML) that is making great strides to enhance intelligence in network operations for improved optimization and planning. Working on capabilities such as predictive maintenance, dynamic resource allocation, and customer behavior-driven service optimization will enable carriers to enhance the overall customer experience. Another example is the Open ROADM Multi-Source Agreement which defines interoperability specifications for Reconfigurable Optical Add/Drop Multiplexers (ROADM). Included within it are software control of the ROADM switch as well as transponders and pluggable optics with specifications for both optical interoperability as well as YANG data models. This is driving open, standardized interfaces

among ROADMs with faster innovation, choice and competition among vendors.

On the software side, new SDN-enabled capabilities such VXLAN and network slicing—a key element built into 5G's architecture—and new data center fabrics coupled with software innovations among hardware vendors are enabling instant bandwidth or bandwidth-on-demand services. This is a critical link transforming today's carrier networks by delivering cloud-like agility and flexibility, allowing customers and their end users to dial broadband services up and down as needed. These technologies are also enabling new business models that blur the lines between enterprises and service providers by enabling the enterprise to more easily offer connectivity solutions to its customers that add value to the usual software or service offerings.

A significant benefit of owning your own backbone is that you can share a lot more network information with customers. New data-enabled customer portals and websites make customers' interactions easier, faster and more intuitive—and give them greater transparency and visibility into their networks. Customers have instant visibility into their services, invoices, and any ongoing incidents, and they can see what's happening in their network and anything that may affect them.

In a commoditized carrier landscape of ever-increasing complexity, it is important to simplify the customer experience. This requires carriers to offer a balance of automated technology—putting the customer's networks at their fingertips—and real people solving problems in real time. Getting this balance right means constantly updating the tools and services provided to clients. After all, even with the latest technology in-between us the end goal is still the same: connecting humanity and enabling its ongoing innovation.