Introduction

The telecom market is rapidly changing in terms of both the technologies used to deliver services and the business models used to compete. Hyper-scale, fast-moving Web players are disrupting the competitive landscape, forcing telcos to evaluate changes in their architectural approach in order to move with the same agility as these new competitors. Technologies that got their start in the data center, such as virtualization and automation, are now moving into telecom environments. Assuming these trends continue, the time will soon come when the distinction between the two vanishes.

Service providers are beginning to experiment with new technologies to see how best to implement them and provide more efficient and differentiated services. One area of focus is the virtualized customer edge, which offers the promise of lower operational expenses (opex) and more flexible service delivery. This becomes part of a service anchor point, from which services are delivered from a virtual machine (VM) in the service provider’s cloud.

Services providers have all the tools they need to begin their transformational journeys. Vendors such as Brocade have professional services that can be leveraged to help service providers confidently take their first steps toward realizing the benefits of software-defined networking (SDN) and network functions virtualization (NFV) architectures.

This white paper:

- Explores how virtualization is transforming the telecom network environment, and the impact new technologies and competitors are having on traditional telecom architectures and business models.
- Discusses how SDN and NFV are leading to new architectural frameworks, and how telecom operators can benefit from this architectural shift.
- Describes a new model for service providers that leverages a virtualized customer edge and a service anchor point that forms the foundation for new, virtualized services. It also discusses the steps operators can take to begin their transformational journey.

Blurring the Lines Between Data Center & Network

The movement toward virtualization is rapidly moving from the data center environment to the telecom network environment. Industry consortia such as OpenDaylight, the European Telecommunications Standards Institute (ETSI) NFV Industry Specification Group and Open Platform for NFV (OPNFV) are driving the standards and frameworks that will allow the telecom industry to reap the same benefits of virtualization that enterprises and cloud service providers have long enjoyed.

We are moving from a world in which a proprietary, manually provisioned network delivers a single service, to a common physical system that deploys many virtual services, in an automated environment. As a result, data centers are becoming the new network and, in turn, the network becomes the new data center.

A new paradigm is emerging that encompasses both SDN and NFV. SDN is an architectural framework that allows for greater agility and flexibility in the network.
NFV is an approach by which network functions are deployed in an automated virtual environment that allows for greater service agility. While each of these can result in lower capex and opex, the real power of the combination of SDN and NFV is the potential for greater revenue generation.

In addition to changing how telecom operators manage their networks, these technologies allow them to also offer services to their enterprise customers. Virtualization enables telecom operators to deliver new services quickly and cost-effectively, but also supports new software-as-a-service (SaaS) – or infrastructure-as-a-service (IaaS) – delivery models, whereby customers can directly manage their own services.

Cloud providers such as Amazon and Rackspace have already leveraged business agility as a competitive differentiator, with a fast and furious approach to service delivery that is eroding traditional carrier connectivity services in favor of subscriber-friendly, simple-to-use business offerings. By using the operator’s network purely as transport for their high-value services (VPN, teleconferencing, data center service, etc.), cloud providers treat the data center and network as a single innovation platform. Thus, carriers are becoming less and less relevant to their customers, who are bypassing them in favor of the more agile cloud providers.

The Service Provider Opportunity

Transforming to an SDN/NFV architectural framework, new services ride on a system of virtualized services running on common server and switching infrastructure, enabling telecom operators to mimic the cloud provider model. Without the physical installation of equipment, but with common deployment and provisioning tools, deployment is reduced to a fraction of that time, while configuration is automated. The ability to innovate in this new architecture allows new functionality to be added – by network operators, vendors or third-party developers – dynamically and with very little additional cost. This allows carriers to offer up new services more quickly and better compete with cloud providers, reducing the relevance gap that currently exists.

Taking Advantage of the Architectural Shift

As network operators transform their network to this new paradigm, it is imperative that they implement an architecture that can scale and provide the agility needed to compete. Some network operators are simply looking to implement NFV exactly as a legacy service – recreating with software the same box system that existed with legacy hardware, albeit in an x86 format. They are treating their new router as just an x86 server. While this may realize some of the cost savings, this approach does not take full advantage of the new paradigms of service agility and virtualization.

Once functions are virtualized, telecom operators and third-party developers can combine them to create new types of services. This allows them to achieve greater competitive differentiation and maximize the value of their network and associated services to better compete with cloud and OTT players.
The benefits really come when NFV technology intersects SDN – where NFV services are provisioned dynamically through customer-facing Web portals, where provisioning of networking and applications are initiated together through systems such as OpenStack, and where configuration changes are managed and automated through abstracted systems such as OpenDaylight.

Proofs of concept (PoCs) and trials have shown that the technologies supporting SDN and NFV work. Now is the time for forward-thinking telecom operators to move beyond trials and start leveraging this new model to generate new revenue streams. So where is the intersection point between the reality and maturity of software networking today, and the ability of a service provider to take advantage of this opportunity to deliver high-value services?

**A New Service Provider Model**

**Virtualizing the Customer Edge**

By virtualizing physical customer premises equipment (CPE) in the cloud and leaving relatively dumb equipment [e.g., an ONU or Ethernet switch] on site with the customer, expensive truck rolls, remote configuration and the multitude of problems faced with highly distributed network intelligence are greatly mitigated. Network operators that want to have on-site network services can also centrally manage and virtualize these services with an x86 platform at the customer premises, albeit at a higher cost.

**Figure 2: Virtualizing the Network Edge**

![Source: Brocade](image_url)

**Leveraging the Power of the Service Anchor Point**

Any telecom operator delivering network services to a customer, be they a consumer or an enterprise, is reliant on a service delivery point – a place where network services such as Internet or VPN connectivity are provided from within the service provider network. In this new model, the service anchor point is comprised of the...
customer equipment (CE) and the provider edge (PE), which become one virtual system delivered from a VM within the service provider cloud.

The purpose of the service anchor point is to unite the many different network services (and IP destinations) that a user may be entitled to receive. Delivering them from one virtualized location provides a higher level of customer experience by reducing the latency and complexity of having a user’s traffic be logically passed between many different routers and appliances to provide a single coherent service.

By combining these building blocks, telecom operators are able to substantiate a complete replacement service that works with existing CPE. At the same time, this model allows operators to migrate to a more flexible networking solution that reduces business friction and enables new service offerings for a fraction of the cost of legacy systems.

Assuring Network Resiliency

There are layers of resiliency that can be built into this service provider software networking model that are equal to, and even surpass, the resiliency of legacy systems. By taking advantage of cloud service provider tools, carrier-grade service quality can be delivered. VM provisioning systems can monitor the state of VMs and, if they detect a failure – either logical or physical – a new VM is established. Software load

Figure 3: The Service Anchor Point

Source: Brocade

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balancing provides an active-active or active-standby method of providing continuity in the event of failure, and state between VMs can be maintained with systems such as those leveraging Brocade vPlane technology, ensuring that stateful services such as VPN tunnels or NAT are maintained.

**Moving Forward**

The business benefits are apparent, so why aren’t network operators deploying software networking today at large scale?

This new model requires a shift in how resources and talent are deployed: Telecom operators now need software developers, not just network engineers. What was once manual now must be automated, and this requires new tools, the building of scripts, sizing of server capacity and chaining services. It’s not just what is changing – the move from hardware to software – but how it’s changing, that demands a new base of knowledge.

You’ve seen how Amazon and Rackspace have successfully launched new frictionless services, and at scale – and are wondering how you can, too. You’ve already got the tools, so it’s just a matter of taking some initial steps.

You can introduce software networking into your existing environment with few changes, and leverage the OpenStack, vCloud or other provisioning systems you already have. Assuming that you’ve got compute, you only need to identify the services (e.g., load balancing and firewalls) you wish to instantiate, then assign them the requisite resources.

To help smooth your transition, you can take advantage of the professional services offered by companies such as Brocade. These services can include confirming performance, testing, provisioning and training – all with an eye toward moving you from PoC to production.

**Conclusion**

The emergence of SDN and NFV has the potential to dramatically change the architectural approaches and frameworks for service providers. The benefits in terms of lower cost structure and improved business agility are compelling operators to evaluate and experiment with them, so that they can better compete in a rapidly evolving marketplace.

Virtualization and automation will increasingly be leveraged in telecom network environments, with the end result being the network essentially taking on functions traditionally performed in the data center.

A virtualized customer edge will enable service providers to reduce the operational expense of delivering services, while also benefiting from improved service agility. Customers will see an improved experience once the cloud becomes the delivery mechanism.

Brocade has a proven range of high-performance NFV and SDN software products that rely on servers typically found in data centers today. Combined with an extensive professional services portfolio, it is well placed to help service providers along their transformational journey.

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