Monetizing SDN: Emerging Business Models

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Abstract

The networks have become critical component of infrastructure in society, and have evolved over decades, bringing in the complexities with them. However, the new requirements for the networks, such as data center networking, cloud computing, L4+ network services, and so on are finding the traditional networking approaches as huge barriers. The networks are bound to witness disruptive changes in overcoming these barriers.

At this juncture, SDN is emerging and is seen as a way to open up the closed network for innovation. SDN has now become reality and the speculation has ended, with many leading organizations strategizing around SDN.

The current vertically integrated closed telecom networks have opened up with SDN, transforming their business models and bringing in the new customers. The time is ripe, hence, for formulating the new business opportunities. The objective of this paper is to explore the ways to monetize SDN and formulate business models, through the findings by adopting Secondary Research methodology, by exploring SDN business ecosystem, driving factors and value chain. It also discusses the suitable business models that organizations could take forward, by discussing the applicability of business models in other domains to network domain, and formulating business models with Open source.

Keywords: SDN, NFV, Business Models, Open Source, Value Chain, Business Drivers

1. Introduction

Network growth is a looming nightmare for network administrators. Server virtualization, advanced data center management, cloud computing and smart mobile devices have become game-changers for both service providers and consumers. On one hand, these advancements enable service providers to deliver quick and cost-effective new services and on the other hand they enable consumers to work, play and collaborate anywhere at any time, using any device.

SDN has emerged predominantly aiding us in overcoming the difficult situation. It has also come to the reality, ending the speculation and the hype associated with it. This has opened a plethora of business opportunities for System Vendors, Network Enterprises and Startups.

2. Objective

The objective of this paper is to explore the ways to monetize SDN and formulate business models, through the findings by adopting Secondary Research methodology. Here, we observe the driving factors for the SDN ecosystem, the evolving value chain, the network transformation, while discovering the monetization opportunities, with an objective to explore Business Models for SDN. We further discuss the various business models that the system vendors, established enterprises and start ups could strategize with. Considering the wide patronage that Open Source SDN has received from leading Networking organizations including Cisco, Juniper, VMware, etc through the Open Daylight project, we have also extensively discussed the business models with Open Source.While we ponder upon the monetizing opportunities for SDN, the technological aspects of SDN/ NFV are beyond the scope of this paper.

3. Research Methodology

Adopting Secondary Research methodology, we have extensively explored the authentic sources including the annual reports, Standard bodies artifacts, and press reports to obtain the Key Findings. This has helped us in steering our discussion in the strategic direction.

4. SDN Overview

Traditional IP based networks were built to connect end users using hierarchical switches, routers, and other devices in a distributed fashion. This design proved resilient and scalable in the past but this static and closed architecture is not suitable for the dynamic computing and storage needs of end users, who access the network more often and in more ways. As elastic cloud architectures and dynamic resource allocation evolve, and as mobile computer operating systems and virtual machines usage grows, the need has risen for redesigning network architecture.

Software Defined Networking (SDN) is a new approach to network architecture for automation and dynamic provisioning of service provider networks. It refers to separating the control plane from the data plane, incorporating programming capability in the network, and centralizing control while distributing the elements of data plane. With SDN, today's traditional and static network can evolve into an extensible service delivery platform which is agile to respond to changing business, end-user and market needs. SDN provides granular level control of the data and control plane, abstracting the underlying network infrastructure from end user applications as well as enabling optimization and higher utilization of the existing network. As a result, service providers can now build highly scalable and agile networks, whose business value outweighs the CAPEX required to implement SDN. Telco CXOs can leverage the following benefits of SDN:

Lock In - SDN architecture offers opportunity to unbundle H/W, OS, and application, and brings openness in a controlled ecosystem. By managing the network complexity through centralized management plane, operators cannot be held captive by any vendor.

Time To Revenue - Instead of deploying, configuring (policies based on traffic), and then using the network, operators can now reduce their 'Time to Revenue' from day one by deploying and using the network resources through programmable networks and by defining the network behaviors based on network traffic growth.

CAPEX–Operators can now reduce CAPEX by utilizing the underutilized network resources and by managing investment through pay-as-you-go model.

The discussion on SDN is incomplete without visiting NFV in brief. NFV, an initiative driven by ETSI Industry Specification Group aims to offer a new way to design, deploy and manage networking services, by virtualizing network functions. The network functions have been currently performed by proprietary dedicated hardware. NFV decouples these network functions such as DNS (Domain Name Service), NAT, firewall,intrusion detection, etc from dedicated hardware appliances, to run on software. By leveraging IT virtualization technology, it is designed to consolidate and deliver the networking components needed to support a fully virtualized infrastructure including virtual servers, storage and even other networks.

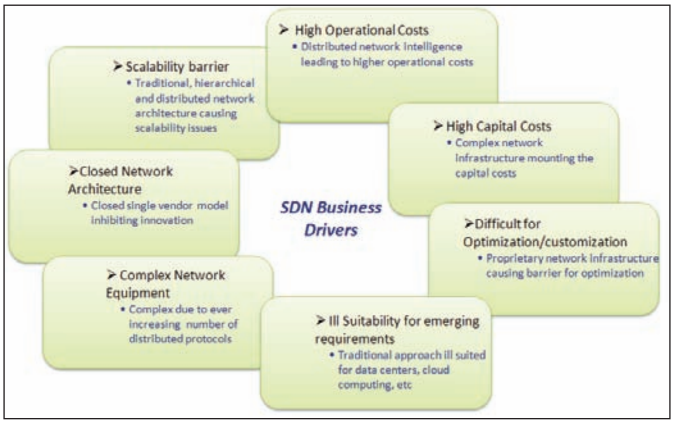
In short it could be said that while SDN is characterized by centralized control, separation of control and data plane and programmable network and deployed at data center or cloud, NFV is characterized by relocation of network functions from dedicated appliances to generic servers.

5. Key Findings

5.1. Business Drivers

These days, Telcos across the globe face the daunting task of effective management of CAPEX/ OPEX, and with fast evolving customer needs and service demands,it is increasingly difficult for Telcos to bring down their investment levels. From plain vanilla service of voice and SMS, Telcos now offer host of new data/voice/multimedia services, resulting in complex heterogeneous networks and applications, which, in turn, lead to a complex operating environment.Shown in figure 1 are business drivers of SDN.

Figure 1: SDN Business Drivers



6. Value Chain

As SDN matures and the hype becomes reality, uptake among SMBs (small and medium businesses) and large enterprises is expanding. Though SDN is still in its infancy, we believe it is an appropriate time to explore how the SDN value chain is taking shape and the battlefields that we need to be concerned about.

Figure 2. SDN Value Chain

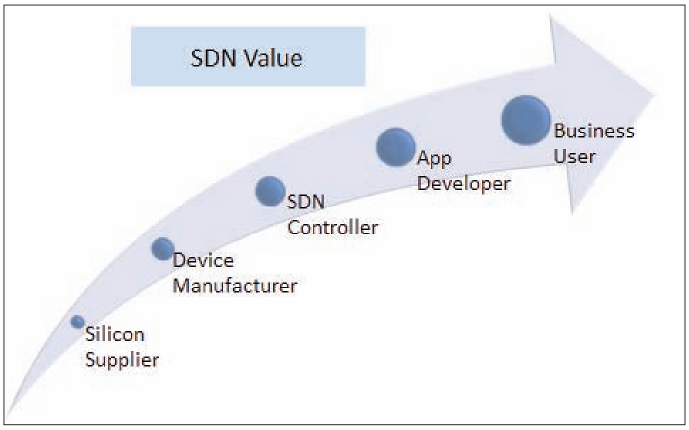


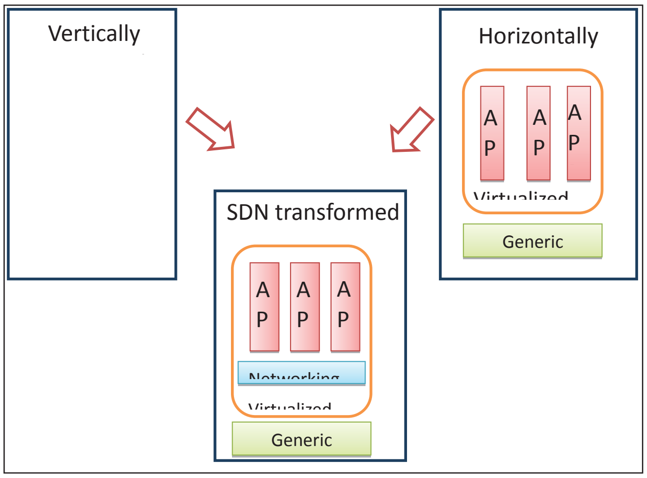
Figure 2 depicts the wide range of roles SDN providers play in the end-to-end SDN value chain. Dwelled in detail in earlier sections, the closed single vendor dominated system has opened to an open model, commoditizing and value adding at every stage, leading to generic hardware platforms with Silicon supplier and device manufacturer. App developers could develop modular independent applications, utilizing open source SDN controller. SDN controllers helps to provide centralized control of the network, which is overwhelmingly finding its application in Disaster Management Systems, etc. The SDN apps could be offered by business users either by bundling them as solution or by individual applications, throughvarious business models. This propels the network programmability and breed the desired openness of the network. While there could be security limitations, as SDN matures, the security aspect is also addressed.

7. Network Model Transformation & Monetization

SDN benefits Telcos or Service Providers through significant improvements in CAPEX/ OPEX, in network manageability, and in time required to deploy new network-oriented applications.

With traditional network architectures being ill-suited to meet the requirements of today's telecom operators, service providers, large enterprises, equipment vendors, and with the entry of new stakeholders such as data center & cloud/ web 2.0 providers, SDN is getting heralded as one of the most disruptive and revolutionary technologies to arrive into the market in recent years.

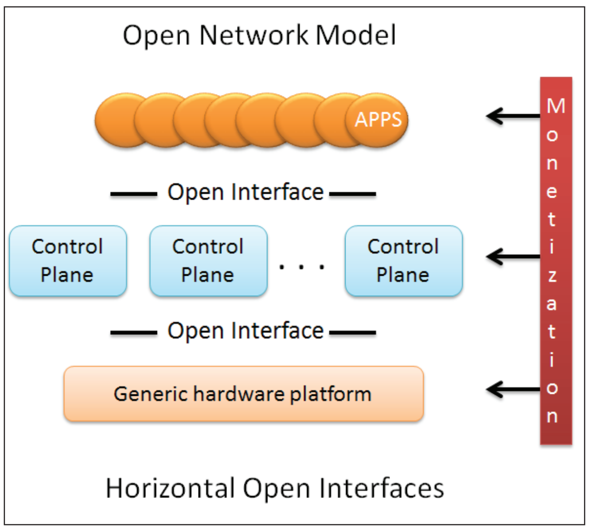
Figure 3: SDN Transformed Network Model



The traditional, vertically-integrated model characterized by proprietary software running on proprietary hardware is replaced by a horizontally-disaggregated model comprising generic hardware platforms based on general purpose processors, as well as an OS or hypervisor to deploy applications. This basically applies the standard computing model to networking.Based on transitions from hardware-centric to software-centric architectures, SDN transforms the business model for networking as depicted in figure 3.

Figure 4 depicts how OpenFlow/ SDN transforms the current computer networking ecosystem from a vertically integrated closed single vendor system to a horizontal open interface based ecosystem, opens up doors for monetization to various stakeholders, and facilitates new software licensing, business models and rapid innovation.

Figure 4: Monetizing SDN



Source SDNCentral

8. Exploration

8.1. Business Models

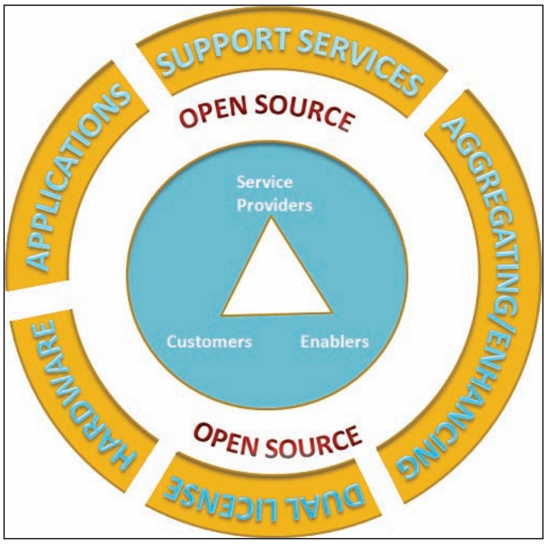
Since the SDN architecture offer flexibility of managing the complex network traffic effectively and efficiently, Telcos can experiment with multiple business models to offer unique services to complement the network capability.

- The open network architecture would trigger development of modular and independent Networking applications. These applications can be monetized and licensed individually or offered as a solution by bundling the applications. The Telcos or other stakeholders could further patronize them through SDN AppStores, taking the Smartphone model way, enabling new opportunities, for developing new applications that can shape how the network functions or is secured for end user applications or mission critical business applications. HP has foreseen this business opportunity and has created SDN app store, making the ability to innovate within networking possible.
- Taking the Server virtualization model, utilizing network virtualization technologies, multiple control planes could be developed and monetized as virtual applicances, that are independent of physical network and hardware. The Telcos could adapt one control place (Mobile Computing) in mobile networks, by pooling all the control software, thereby bringing down the infrastructure costs and making network management easier. On the other hand, this would bring the mobile analytics and big data mining technologies together, and enable new business models.
- The different capacities in the physical network could be licensed and monetized, through an on demand, pay-as-you-go model. This would ensure optimized utilization of network resources and better service elasticity.
- It can further be explored to deliver SDN as subscription service out of cloud to the existing equipment. An organization could build controller that is external to the network, build a logical network as an overlay over the Internet, and migrate some of the network function into conventional software.
- One such example could be delivery of network Management functionality as SaaS. If this software is delivered in the form of multi-tenant, single instance shared service, the value proposition of SaaS can be dramatically improved.
- SDN startups could also monetize through embedded model which is hardware based. System vendors could offer Controller and Open APIs for free and price the hardware such that it covers the cost of Software development. The software solution is concealed within the hardware price, technically. The benefits of this business model is that the hardware stays in the network for a long time, and the additonal add on software features, applications and upgrades can be sold at increasing profits. This model is suitable both for SDN start upsand networking infrastructure vendors that have hardware based solutions bundled with the Controller and applications.This model is seen predominantly successful, as the end users are favoring fully integrated software and hardware solution, much against piecing the components together themselves.
- Yet another innovative model is Cloud-Based or Application Hosting Model. This model is per virtual machine (VM) and is time based, similar to the Amazon usage-based billing system. Use a number of VMs within a certain period, and the price scales with the usage. There is no tie to specific hardware. It may sound like a low-cost entry approach, but this is likely to be one of the most expensive models because the complexity to evaluate the year-end cost is quite difficult. Additionally, it is likely tobe expensive for the typical enterprise to embrace, given large-scale virtualization deployments are in the very early stages.

9. Open Source Based Business Models

Open source plays significant role in the success of technology adaptation and formulating ecosystem. SDN with Open source opens a plethora of business opportunities. The flatter architecture of SDNs improves interoperability and creates opportunities for new players - the Enablers encompassing Web 2.0/ cloud providers, data center providers, application developers, and equipment manufacturers can deploy the open source, and by adapting a business model integrated with those of service providers, can enhance operator agility, lower capex, and disrupt the vendorlandscape.

Figure 5: SDN Open Source Business Models



9.1. Applications on Top of Open Source

Several different types of business models could be used to generate financial returns using open-source SDN controllers.

Organizations in the Linux world sell a range of commercial application offerings, ranging from desktop tp database that run on open-source Operating System. Standard Application Programming Interfaces (API) are the key enablers, which avoid the need to re-write applications for different hosts. Linux's standardized APIs abetted the rapid adoption of Apache Web Server, sometimes called the Linux "Killer app".

The paid-for-license SDN & NFV applications that run on top of Open Stack or SDN controllers can be offered and form the basis for a business.

9.2. Support Services

Companies built business model by providing support and services to opensource users, with the most successful being Linux. Redhat, a billion dollar company has been successful with such a business model.

Similar business opportunity lurks for SDN/NFV. Though SDN/NFV skills are not pervasive today, this model could be adapted as the SDN ecosystem picks up momentum.

9.3. Aggregating/ Enhancing

In the early days of open source Operating System evolvement, organizations offered bundled offerings. They exploited the fact that a Linux distribution comprised of many libraries and applications besides the Kernel. Companies made their own enhancements, and value adds and bundled them into a distribution. For example, Linux was a command-line driven, and it did not originally come with graphical management tools. Bundling of such tools provided extra value, and formed basis for their business model.

Borrowing this model, the various SDN components could be enhanced and aggregated by bolting together an OpenFlow Controller, OpenFlow enabled switch, such as Open Switch, virtualization technology, such as OpenStack, coupled with open source network functions such as firewall, and load balancer, and offer a low cost switch or middle box. This could probably open a new breed of network elements.

9.4. Dual License

An open source compatible business approach that is gaining momentum is Dual licensing. Dual licensing model offers the advantage of both open source and commercial approaches. Dual licensing is widely adopted to support free software business models in a commercial environment, in which the open source license allows downloading and running software at no charge. The service, support, and functional enhancements are provided through commercial license. A popular example of this type of business model is MySQL database by Oracle.

Dual licensing is gaining prominence in SDN space. Big Switch Network has its open source "Project Floodlight" and a commercial version "Big Network Controller"

9.5. Hardware

The system vendors, for example Switch companies, promote open source if it enables their equipments in providing a complete solution.This is seen predominantly in Linux world, where most of the home routers run OpenWRT, a Linux variant, tailored to the modest hardware in those boxes by stripping middleware and desktop applications.

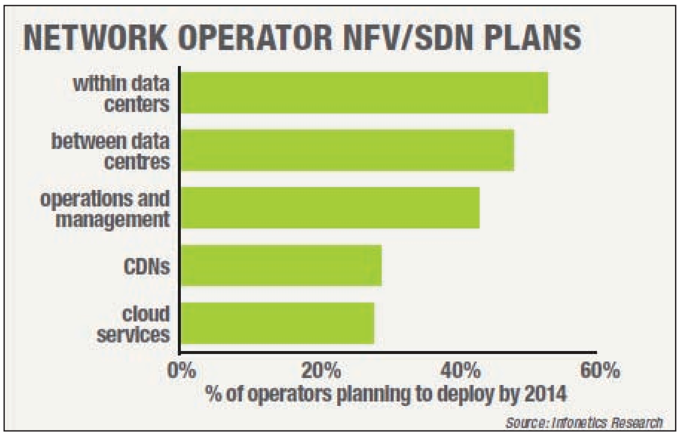
Equipment companies could focus on requirements relevant to devices in the field, while providing an open-source SDN stack that enables the device to act as a hybrid switch.

On the other hand, an SDN software company could opt for open source hardware design, to stimulate a community of builders to provide more platforms for their software.

10. Operator Success Stories

SDN has been discussed tremendously, it has moved from being theorotical to deployment mode. While there have been many SDN products and solutions by various vendors and IT players, it has been observed that the operators are cautiously embracing and formulating roadmaps. Currently, SDN is positioned for deployments within and between data centers. We could observe operators applying SDN for core and access networks. Coming years could witness SDN being utlizied beyond data centers.

Figure 6



SDN has picked up momentum with Telcos in mature markets such as America and Japan. Recently AT&T has announced a vision Domain 2.0 based on SDN & NFV, with a road map extending till 2020.

Another instance being NTT Docomo deployment for disaster management. It is worth to discuss how Japan Telco, NTT DoComo has applied the use of SDN in Disaster Recovery, by taking a leaf of their learnings during 2011 earthquake. The earthquake in Japan had critically impacted the communications and only 5% of call attempts were successful. It was observed that, surprisingly streaming videos and media access was normal as the network was statsicaaly configured to provide high quality media services as per the organizational goal.

This is best explained in fig 6. Networks need to support contradicting demands during normal and disaster times. NTT Docomo achieved this by SDN based control of system resources, reallocating resources based on the demand. Fig 7 explores on the architectural aspects of SDN based disaster management system.

Figure 7

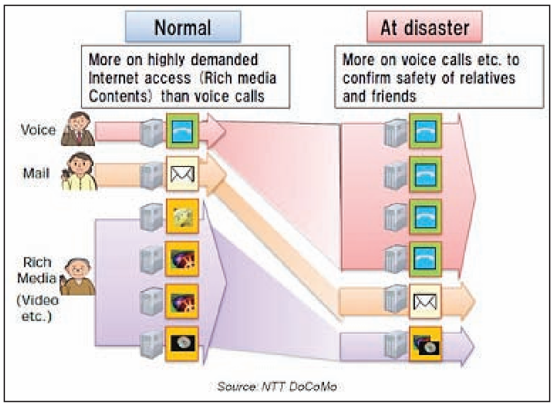
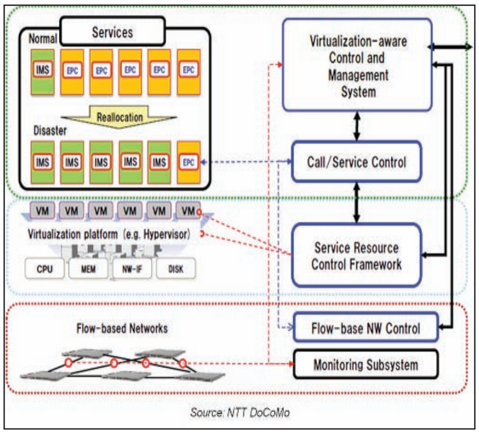


Figure 8



11. SDN Challenges & Risks

While SDN moves from hype to reality, it presents many challenges and risks. Few barriers have been identified by network analysts which include lack of service control software, Multivendor network control, Managing control traffic, Boundary functions are needed.

Coupled with this are few security risks. The layered hardware boundaries such as firewalls are removed by the centralized control in the SDN controller. The centralized controller only need to be compromized, to gain access to the entire network. New areas like network controller, its protocols and APIs are also introduced for attack, due to decoupling the control plane from data plane.

We believe that as SDN matures and evolves slowly, the challenges are addressed, paving way for adaptability of SDN.

12. Conclusion

Though SDN has been in making since 2008, and industry has been skeptical about SDN initially, it has picked up the momentum and many leading system vendors, carriers and over the top providers have started strategizing around SDN. While SDN combines innovations in technology and in business models, it is fascinating to see that business models from other domains are becoming applicable in the network domain - capitalizing on the opportunities in SDN with potential to change the business of networking.

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