SDN/NFV TRANSFORMATION FOR SERVICE PROVIDER NETWORK

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Abstract

Telecom service providers across the globe are facing decreasing profitability due to rapidly changing market dynamics. High smart phone penetration, increased consumption of data and emergence of new traffic due to IoT/M2M connectivity are leading to an ever-increasing spend on network infrastructure to satisfy this rise in demand while yielding a minor share of the customer's wallet. Innovative applications are driving this consumption behavior and increasing consumer expectations. In this environment, service providers need to control their capex and opex while simultaneously increasing their agility to deploy new services to stay profitable.

The present network architecture is dependent on expensive hardware-based appliances with software tightly embedded into it. This network is highly rigid and fragmented as opposed to the external environment which has high variability in traffic, thus leading to incremental capital investments even though the network resources remain underutilized. Deploying new services takes huge upfront capex and takes a long time to become operational making these investments risky.

A new software based architecture enabled by SDN/NFV on top of COTS hardware can deliver the desired optimization of network, increase agility in rolling out new services and create new opportunities for revenue generation.

This paper looks into major use cases of SDN/NFV and recommends a transformation path for service providers with some market perspective across geographies.

Evaluation of Use Cases

vCPE

The current CPE deployment model of CSPs requires multiple specialized devices at customer premises that takes long installation hours and high capex. vCPE will replace multiple hardware appliances with a generic CPE, reducing both capex/opex. vCPE may lead to an estimated 45%[I]

TCO reduction in deployment of new CPEs. vCPE will enable customers to provision services on-demand and provide them the required flexibility to rapidly scale up/down services and a consistent/superior QoS.

With high TCO savings and low risk in adoption of vCPE, it is easier for CSPs to adopt vCPE across all geographies. Particularly in Europe, where CSPs are facing declining revenues and pressure of controlling capex/opex in hostile macro-economic and regulatory conditions, vCPE gives the right opportunity to save TCO and earn new revenue.

vRAN

vRAN reduces capex by replacing BBUs at sites with BBU VNFs running on COTS hardware at central BBU site. Opex will be reduced due to less power consumption and lower rents at cell site with an estimated TCO savings of 9%[2] in India.

But, deployment of vRAN needs additional fiber connections between RRH and central BBU sites, which makes TCO savings from cloud RAN highly variable across geographies and service provider network architectures.

In spite of the above challenges, vRAN can benefit service provider's overall savings substantially, as they spend a major chunk of their capex on RAN network. Additionally, vRAN gives much needed flexibility in radio capacity allocation based on demand.

In US and Japan, service providers have already made investments in their fiber networks for FTTH services, so that it will be less costly for service providers in US and Japan to adopt cloud RAN. As the benefits from cloud RAN are highly unpredictable, it will be difficult for European service providers to invest in vRAN due to immediate pressure of tightening capex.

vEPC

Virtualization of EPC will not only reduce capex/opex but provide the required agility to provision services rapidly. This agility will enable new use cases such as on-demand P-GW as a service to enterprises, auto scaling for events such as Olympics and flexibility of vEPCs for providing disaster resiliency. With virtualization, CSPs will be able to provide differentiated services to IoT and M2M customers each having their very specialized network capacity and resiliency requirements. We estimated a five year TCO reduction of 46%[3] with vEPC.

Simple deployment of vEPC VNFs on a general purpose IT-grade hypervisor may not meet the high performance requirements of a carrier-grade environment.

In both US and Europe, M2M and IoT provide lucrative opportunities for CSPs to team up with partners from new industries and diversify their revenue streams to combat declining revenue due to decrease in wireline voice and plummeting ARPUs. European market is highly fragmented with more than 100 service providers. Major EPCs have the opportunity to provide EPC VNF-as-a-service to these small players.

Virtual Access Network (vB-RAS)

Virtualization of B-RAS is the first step towards a virtual access network. A virtual access network will increase utilization of whole network, provide better QoS and more operational control to network operators.

The price of commercial vB-RAS is estimated to be 30%[4] lower than traditional B-RAS with similar capacity.

But it needs to be seen if commercial vB-RAS will be able to match performance and latency requirements of traditional B-RAS, if it is moved to data center from edge of the network.

Both US and EU have taken several measures to encourage competition and are pushing to accelerate broadband access for their citizens, which provide a supportive investment climate to CSPs to adopt next generation access network architectures in these geographies.

vCDN

Due to explosion in video consumption, CSPs have the imperative to increase the flexibility at the edge of the network to support multiple resolutions, formats of the content and variability in traffic. Virtualization of CDN will offer flexibility in accommodating sudden traffic demand changes and enable two sided revenue stream– revenue both from end customers and content generators. It is estimated that vCDN infrastructure will lead to cost savings of around 31%[5].

Low capex/opex model of vCDN will enable CSPs to construct their own CDN systems and be competitive in CDN market dominated by traditional CDN players. European CDN market is highly fragmented with many local players catering to different languages. vCDN can enable big CSPs to profitably offer CDN-as-a-service to these small players.

vSTB

Rising fees of content is eroding payTV margins. New technologies/standards (HTML5, H.265) are putting pressure on service providers to adopt network architectures that will enable them to deploy new services rapidly to compete against OTT and cable TV operators. vSTB will provide this required agility, lower customer acquisition costs, help in avoiding costly hardware upgrades and reduce opex spend on field staff.

But there is still a need to standardize interfaces/APIs from (STBs) to virtual devices in data center. It will take time before other applications like VoD transcoding, DRM encryption etc. are virtualized to provide the required scalability and gain benefits out of virtualization.

In both US and Europe, adoption of virtual set-top box (vSTB) will help to compete in payTV market which is facing intense competition from OTT players and cable network operators.

Comparison of Various Technologies

	New Revenue	TCO Reduction	Performance Issues	Maturity of Technology	Challenges in Integration Transformation	Scope for scalability
vCPE	HIGH	45%	LOW	HIGH	LOW	HIGH
vRAN	LOW	9%	HIGH	MEDIUM	HIGH	LOW
vEPC	HIGH	46%	MEDIUM	HIGH	LOW	HIGH
vCDN	MEDIUM	31%	LOW	LOW	LOW	LOW
vB-RAS	MEDIUM	30%	HIGH	MEDIUM	LOW	LOW
vSTB	MEDIUM	--%	MEDIUM	MEDIUM	MEDIUM	MEDIUM
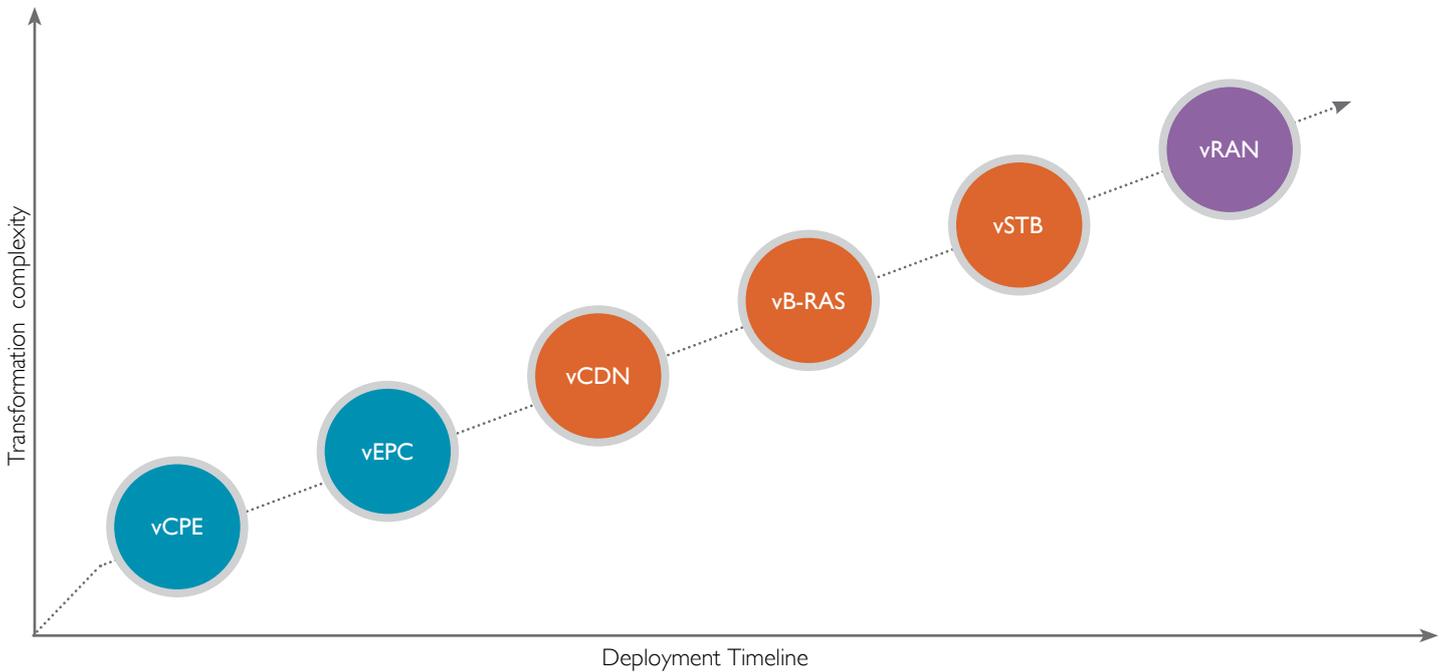
Process for Transformation

On the basis of comparison of discussed technologies on above parameters, the following phases of network transformation offer the best way forward to adopt SDN/NFV, starting with the least disruptive transformations and steadily adopting more drastic changes. Although it may take initial investments, SDN/NFV have potential to transform the future network architecture and increase the much desired profitability of CSP business.

References:

1. An estimated average of TCO savings

2. Based on our analysis after talking to several service providers in India

3. Based on an estimated average

4. It is based on talking to an internal consultant

5. Based on an estimated average

6. ETSI GS NFV 001 v1.1.1 – Network Function Virtualization (NFV) use cases

About the Authors

Subhas Chandra Mondal has over 22 years of Telecom experience spanning across Product R&D, Outsourced Software development, System Engineering, Solutions architecting, Technical presales. He currently heads the Wireline R&D practice that includes a portfolio of Optical, Ethernet and IP technologies. Subhas is a passionate technologist, always eager to learn new Technologies. SDN is a key interest area and he is developing SDN solutions that are relevant to Wipro customers.

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