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Will Open Source Disrupt the Telecom Value Chain?

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Overview

The rapid emergence of open source models in the design of telecom and network infrastructure systems is a trend that could drastically change the industry value chain and underlying competitive dynamics. Several strategic initiatives initiated by Cloud and Internet players, telecom operators, and disruptive startups portend a new paradigm reshaping this sector over the next few years. We foresee that the telecom infrastructure value chain will experience significant change in dynamics within the next 3 to 5 years, where leading players must master technologies related to Cloud development and deployment models. The vendor landscape will also change significantly, led by Cloud centric players. Service providers will also face significant business and competitive pressures, due to the strategic push of new business models by cash-rich Internet and Cloud players.

In this paper, we summarize our view on the potential of open source technologies and impact on business models in the telecom ecosystem. These views are based on Xona Partners' involvement in the development of telecom networks and Cloud infrastructure, which we intersect with the observations of leaders in these ecosystems.

Introduction

The design of networking equipment for telecom operators has always been the realm of specialized vendors, whose solutions were based on proprietary, in-house implementations of standards-based technologies. Attempts to open source some solutions in the 1990s and 2000s, e.g. routing operating systems, business operating systems and security systems had a timid effect on the overall industry, with a limited impact on the ecosystem. In the 2010s, three major trends appeared that brought in a new perspective to open source. First is the emergence of Network Function Virtualization (NFV) in the data center compute and storage environment, and a gradual evolution into the data center networking infrastructure. Second is the involvement of the large-scale Cloud and Internet providers, who have for a long time designed most of their data center hardware and software in-house for competitive differentiation. The third trend is the fast evolution of open source in the areas adjacent to networking. This includes technologies such as: OpenStack and Docker's Cloud management and micro-service architectures; Hadoop and Cassandra's Big Data; and Jenkins and Spinnaker's DevOps continuous integration and delivery.

The Approach

To analyze the impact of open source on telecom, we divided the current and prospective telecom industry value chain into nine categories which include SPs, TEMs/SIs, semiconductor/baseband and software stack vendors, Internet, Open Source, and IT/Data center players, ODMs, and startup companies. We analyzed the impact of open source on each category supported by interviews with a representative sample in each category. We also analyzed different representative cases in the IT ecosystem to draw parallels with the telecom ecosystem.

The trends in open source intersect with shifting business dynamics that require telecom operators to adopt agile and service aware networks. Furthermore, the emergence of alternative wireless technologies is enabling new competing service providers including the insertion of the Internet and Cloud players in the telecom infrastructure value chain. These developments increased the momentum of open source telecom equipment solutions with the objective of increased agility, reduced time and cost of development and lower cost of deployment.

Open Source in Brief

Open source refers to the ability to access and modify source code, develop derived works, and sell or distribute software; i.e. open source does not imply free of charge. The construct of open source leads to collaborative communities, and consequently a philosophy in product development that is characterized by a relatively fast iterative process, where activities such as functional and interoperability testing are part of the development process. This contrasts the development process followed in telecom networks for standards-based equipment, which is characterized by a sequential 'waterfall' process that is well defined, but is relatively slow. Here, we like to note that while open source refers traditionally to software, it can apply to hardware as well in which case a reference design is shared in an open community.

Open Source Business Models.

Monetizing open source solutions can take different forms including the following common models:

- Offer complementary services or products to open source products such as support, maintenance, consulting, or hosting.
- Provide a commercial version or extension of open source products.
- Provide dual-licensing of proprietary solutions where a company offers its own proprietary software for use under either of an open source license or a paid commercial license.

The Present Landscape.

Hardware, or appliance, solutions make up the vast majority of telecom network infrastructure, a testimony of legacy services based on vendor-specific solutions. In recent years NFV, and to some extent Software Defined Networks (SDN), solutions began to appear in networks, starting with the outer perimeters in the OSS/BSS and services such as virtual operator enablement and IoT connectivity. NFV and SDN applications were then introduced into the core network when a few leading MNOs began implementing virtual EPCs and IMSs for commercial services. Now in its very early stages, this trend is expected to evolve and accelerate in the near future.

SDN/NFV solutions will see wider adoption and deployment as operators seek flexibility in developing and launching new services that are critical to their competitiveness, especially against the over-the-top (OTT) players. OTT players have leveraged IT infrastructure

virtualization and open source solutions to achieve economies of scale, cost efficiency, and service agility exceeding the established telecom service providers.

The Advent of Open Source in Telecom.

While virtualization provides a leap in flexibility over hardware-based networks, being transformative to business models and operations for both MNOs and vendors, virtualization solutions remain proprietary implementations that are optimized for performance. Open source solutions that build on SDN/NFV promise to open up the network to third parties, adding vitality to a mature market and stimulating innovation. A few open source projects were recently launched in telecom networks, such as the Carrier Open Compute Project (Carrier OCP) in January 2016 by AT&T, Deutsche Telekom, EE, SK Telecom, and Verizon. Carrier OCP builds on the OCP framework for data centers and extends the scope to the telecom infrastructure under the Telecom Infrastructure Project (TIP). TIP has the goal of bringing open source design models to hardware and software solutions that meet the requirements of telecom service providers. While this is still an early stage, it serves to highlight the efforts and momentum behind such initiatives.

Another example of a service provider led open source initiative is M-CORD, a joint project between the ON.Lab and The Linux Foundation, driven primarily by AT&T, SK Telecom, Verizon and NTT. In parallel to these initiatives, MNOs have transitioned certain aspects of their networks to open source. AT&T's ECOMP is one example which is related to the control, management and policy of the network. Another example is Open Source MANO (OSM) to which Telefonica made major contributions. There are so many open source projects today, that it is a challenge to assess which to participate in, contribute to, and more importantly which ones to develop solutions around. Moreover, it is important to note two fundamental aspects. The first is that open source has extended its reach from software-only to now include hardware in all its variants. The second is the heavy involvement of the Internet and Cloud players, such as Facebook with OCP and Google with M-CORD, to accelerate development and adoption of these technologies. The involvement of the Internet and Cloud giants in access technologies is a response to investor pressure on these highly-profitable, cash-rich companies for continued revenue growth – driving them to reach into lower, more cost-sensitive segments of the consumer market. Open source is therefore a vehicle to enable the development of applications and services across different market segments that otherwise would not be possible to achieve.

Motivations for Open Source in Telecom.

Open source projects are largely MNO-led initiatives with strong support from the Internet and Cloud players. The main reasons in priorities cited include:

a) Reduce vendor lock: Consolidation of Telecom Equipment Manufactures (TEMs) has led to a few companies, such as Ericsson and Huawei, with overwhelming infrastructure market share. This impacts the innovation cycle and it becomes imperative for MNOs to stimulate innovation and creative solutions through open source.

b) Morph cost models from capex to opex: The question of cost is complex, as MNOs are not necessarily expecting major reduction in the total cost of ownership from SDN/NFV-based solutions. What is certain is that in open source, as is the case with SDN/NFV-based solutions, the cost model is opex-based, which provides higher capital efficiency and is more responsive to network scalability, especially for new services such as machine connectivity.

c) Enabling new services: The leading MNOs feel highly constrained within the confines of the existing network infrastructure. They seek the ability to deploy new services and features more cost effectively to improve their competitive positioning, especially against OTT services. The type of services MNOs seek vary according to region and range, from highly advanced applications such as V2X to more common ones such as rural connectivity.

d) Stimulate and accelerate the innovation cycle: The leading MNOs participate heavily in standard activities to drive their vision into the process and ensure that the standard will meet their requirements. The 'waterfall' process is slow in the context of rapid technological innovation. Many standards exist, of which only a few are used. Open source as an iterative process is a means to accelerate the technology development and the deployment cycle.

The view among MNOs on open source is not universal, and there is divergence among leading Tier 1 service providers and others, who are more willing to take a wait-and-see approach.

Ecosystem Positioning on Open Source in Telecom.

TEMs who are a key part of the ecosystems, and often take on the system integration function, are largely ambivalent about open source projects at the current time; mainly because of uncertain financial benefits and large commitments. TEMs have invested heavily into product development, including optimization of complex interconnected sub-systems. They would argue that reliability, security and performance are paramount. Additionally, intellectual property rights form a significant source of revenue that TEMs will want to protect. They are currently evaluating potential loss/benefit scenarios for the transition to open source models. System integration, which is a critical function, would still be required irrespective of the approach to product development and deployment. Hence, open source can bring about a transformation in the telecom value chain that would result in a new division of functions. To kick-start the process, the MNOs themselves would have to lead the transformation, which is a challenging endeavor. New system integration entrants would need to have the financial and logistical strength to change the market, which is possible and more likely when a new application receives wide market traction to stimulate the open source model.

The Impact of Open Source in Telecom.

One fundamental trend is obvious - the gradual introduction of NFV/SDN solutions in telecom networks. With that, a gradual increase of open source components to build and deploy virtualized solutions. The consequence of this evolution is to morph the value chain

by raising system integration to the forefront, where different players will be positioned to build solutions around open source and provide end-to-end integration and deployment solutions. Although TEMs are best positioned to capture this activity in the early stages, the main threat comes from the players who possess full control over the virtualization, Cloud, and DevOps value chain that will form the cornerstone of the telecom services offering. The ability of these players to impact the market is stimulated by applications where virtualization is a cornerstone technology required to ensure cost effective operation. Consider, for example, IoT connectivity in wireless networks where core network elements are virtualized for scalability and cost efficiency. Other applications include enterprise services and small cell networks, particularly those operating in shared or license-exempt spectrum. The interest in open source is evolving in parallel with developments in 5G technology. 5G requirements and diversity of applications mandate a heterogeneous network where virtualization technology is a prerequisite to enabling concepts such as network slicing.

In our view, the telecom infrastructure value chain will experience a significant change in dynamics within the next 3 to 5 years, where leading players will have to master the technologies that are seen as adjacent to telecom today. Specifically, those that relate to deploying over Cloud infrastructure, agile application development, and efficient large data set management. All are areas where open source already plays a large role, which will extend to reach into telecom infrastructure. There are opportunities and challenges that will inject new vitality and innovative spirit into a market that is considered to be consolidated and mature.

Key Conclusions.

• Open source incursion in the telecom value chain is driven by telecom service providers and heavily supported by the Internet and Cloud giants.

• The main objective of open source is to provide service providers with a higher level of control over the network, and a flexible environment to quickly develop and launch services to generate new revenues.

• Cost is a secondary consideration for service provides, while it is a foremost consideration for the Internet and Cloud giants, who seek to lower the cost of Internet access to increase market penetration.

• The telecom infrastructure value chain is set to experience significant changes in dynamics within the next 3 to 5 years, where leading players have to master development and deployment technologies related to Cloud, Data and DevOps models.

• The vendor landscape is likely to change significantly, with the Cloud centric players likely to lead.

• The service providers will face significant business and competitive pressure due to the strategic push of new business models by cash-rich Internet and Cloud players.

Acronyms

BSS	Business Support System
ECOMP	Enhanced Control, Orchestration, Management & Policy
IoT	Internet of Things
LTE	Long Term Evolution
M-CORD	Mobile Central Office Re-architected as a Datacenter
MANO	Management and Orchestration
MNO	Mobile Network Operator
NFV	Network Function Virtualization
OCP	Open Compute Project
ODM	Original Design Manufacturer
OSM	Open Source MANO
OSS	Operations Support System
OTT	Over-The-Top
SDN	Software Defined Networks
SI	System Integrator
SP	Service Provider
TEM	Telecom Equipment Manufacturer
TIP	Telecom Infra Project
V2X	Vehicle to Anything

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