2020 VISION FOR CLOUD SERVICES

COMPETING IN TOMORROW'S TELECOM MARKET

STRATEGIC WHITE PAPER

The cloud is no longer a trend that we are predicting. It is the new normal in consumer services, and enterprise IT departments are fast migrating to it. For telecom it will be a longer journey, but the outcome will be much the same. Most of the software layer that currently controls, monitors and manages the network will run in the cloud.

This paper looks five to ten years ahead to ask the question: What will telecom services look like when they have migrated to the cloud? What will the implications be to the telecom industry and markets? The focus of the paper is on the kind of markets that will be created and services that will be sold.

We see three broad service groupings emerging: traditional operator-branded and sold services delivered from the cloud; vertically integrated, cloud-based digital solutions sold sometimes with, but more probably through partners with more relevant vertical brands; and third-party services distributed and sometimes resold by the operator based on their network or their own cloud infrastructure.

Telecom operators are late to the game of selling cloud-based services. We look at the strategies and day-to-day marketing used by the world's most successful cloud competitors and draw lessons for how telecom service providers will have to adapt to win in this space. We also assess their unique assets and how they can leverage them to play in new markets, developing dynamic new services with which they can monetize their network assets to greatest advantage in the coming telecom cloud marketplace.

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INTRODUCTION

The move to cloud computing has been anticipated for decades but, like many technologies, required numerous pieces to fall into place before it became mainstream. That time has arrived. Consumer-based cloud services are now well established. Business-based cloud services are taking off. Now that it is finally here, how far can the cloud paradigm be extended, and what effect will it have on the telecom market?

Some telecom service providers are already in the cloud market, expanding their own internal data centers to compete with IT-based companies for business data services and infrastructure as a service (IaaS).[1] There is also a broad consensus that cloud technologies can be profitably adopted into the network itself, with at least a subset of network functions that can be virtualized (NFV), and software-defined networks (SDN), which have been deployed widely in data centers, playing a key role in automating the WAN.

In the meantime, the cloud is blurring the lines between telecom and IT, introducing new players into traditional telecom territory, creating further pressure for telecom incumbents. It is also opening up new opportunities for service providers to enter the IT space, although at the beginning of 2014, the list of the top ten global cloud services players did not yet include any telecom players.[2]

In this paper, we will look ahead to 2020 to explore the implications of cloud for the telecom industry. We will look briefly at how the cloud experience is playing out in the consumer and enterprise space in order to draw out lessons and guidelines for telecom players. Then we will look at how the cloud will create opportunities for delivering new dynamic services and provide different opportunities for telecom providers to use the cloud as a foundation for a dynamic business in the future.

THE CLOUD DISRUPTION

"Cloud will continue to disrupt markets, spawn new business models and revolutionise information-sharing and business management for years to come."
- The Economist Intelligence Unit, June 2014

The quote from The Economist Intelligent Unit reflects the general wisdom: the cloud is big news and will be disruptive. Unfortunately, like much of what has been written about the cloud, it is short on detail. There are, of course, the macro projections[3], such as:

- 3.9 billion people connected to the Internet in 2017
- 70 billion things connected to the Internet in 2020
- 720 percent increase in video traffic (2012 – 2017)
- 300 percent increase in broadband speed (2012 – 2017)

For the cloud specifically, the projections are:

- 400 percent increase in cloud and data center traffic (2012 – 2017)
- 30 percent increase year over year for mission-critical services in data centers

1 *Heavy Reading* (September 2014) data shows that roughly 40 percent of telecom service providers are already in this market and most others are planning to be.
2 Companies listed in alphabetical order: Amazon, Google, HP, IBM, Microsoft, Oracle, Rackspace, Red Hat, Salesforce and VMware.
3 Source: Bell Labs

When we dive into these big numbers, however, things become less clear. Besides growing at mind-boggling rates, cloud services are having different rates of adoption and exhibit different dynamics.

The consumer cloud has been with us almost since the early days of the Web. In this market it is often hard to distinguish between the Internet/Web and the cloud. Companies such as Google, Facebook, Dropbox and Amazon built their Internet-based or "over-the-top" (OTT) services by providing cloud-based applications and e-commerce solutions to end users. Since the introduction of the iPhone in 2007, mobility has only deepened the consumer's reliance on the cloud — in part, because smart mobile devices had limited processing and storage capabilities and, in part, because for smartphones, tablets, desktops and TVs to stay in synch, the cloud is the most convenient way. Today, the major mobile platform battles are between vertically integrated platforms, each of which has put the cloud at the center of its strategy: Apple, Google, Microsoft and Amazon.

With lower security and reliability expectations, these consumer services were not initially taken seriously in the business world, but this perception is changing quickly. The old boundaries of the enterprise network "behind the firewall" have become more porous, with not only data moving to the public cloud, but software as a service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) increasingly penetrating the IT world. Some of the established enterprise players that have invested heavily in the cloud, including IBM, HP, Oracle and Microsoft, are competing alongside relative enterprise newcomers such as Amazon (AWS), Google, Salesforce, VMware and Rackspace — all offering cloud-based services to enterprises.

The enterprise cloud market as a whole is growing much more quickly than the economy. Gartner (Figure 1) estimates that IaaS, Management and Security, SaaS, PaaS and Business Process Services to Enterprises will grow by 18 percent (CAGR) between 2012 and 2018. If this rate of growth holds, they will be north of 220 billion United States dollars by 2020.

Figure 1. Public cloud end-user spending worldwide forecast (in millions of U.S. dollars)

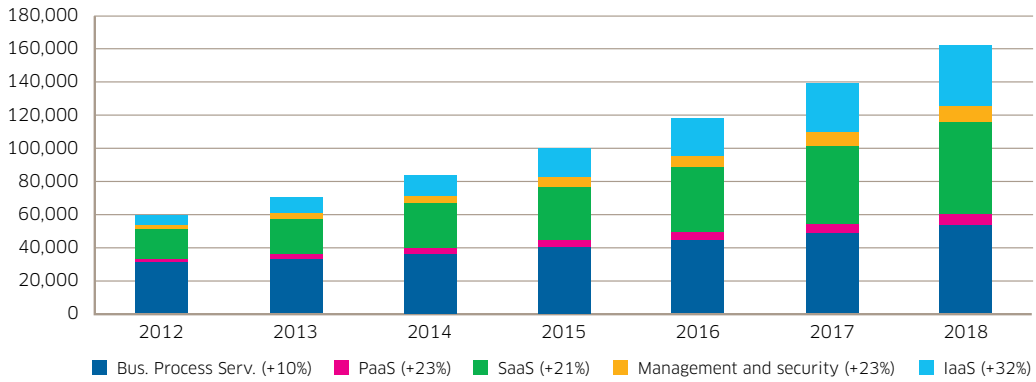

*chart created by Alcatel Lucent based on Gartner report
Source: Forecast: Public Cloud Services, Worldwide, 2012-2018, 3Q14 Update 29 September 2014 G00263155

It is this enterprise market, not the consumer-based Internet/Web market, which most commentators consider to be the cloud market, although as we have seen, mobile consumer platforms are all heavily dependent on the cloud.

The enterprise market has been a lucrative business for telecoms, especially in the private networking space. Telecom players also have established relationships with enterprises and can leverage these relationships with cloud services of their own, not so much in the areas of SaaS and PaaS, but certainly in IaaS. There may also be emerging service areas where the distributed carrier cloud has advantages for delivering vertical solutions such as security, content distribution and machine-to-machine communications.

CLOUD DYNAMICS

Despite some of the threats posed by this shift to the cloud, we also see an enormous opportunity for telecom players. Cloud-based technologies are penetrating the telecom layers of the network just as they are in IT. Architecturally, the virtualization of telecom network functions will increasingly mean that most services beyond mere connectivity will be software-provisioned and run off standard IT servers. This will be much more cost effective operationally, where the changes will be profound. There will also be new services and service features, from one-click purchasing and self-provisioning to embedding dynamic telecom functions into others' digital solutions.

Architecture

There are a number of architectural challenges to meet, such as achieving efficiency and creativity when scaling up the number of discrete service flows. That will require tightly integrated, automated, programmable and open network and IT systems, which don't exist today. It will include NFV, where it makes sense, and the implementation of SDN, critical to achieving the flexibility, programmability and scalability that the cloud demands.

Operations

If the network operators can achieve the automation and hyper-scalability of the IT cloud players, they will see a reduction of personnel costs for operations reaching several orders of magnitude. The operational costs associated with running IT data centers versus telecom central offices are significant. Moving from bespoke telecom gear to standards-based, uniform IT platforms will not only reduce capital expenditures but lead to a huge reduction in personnel (as well as significant changes in skill sets, favoring operations people with advanced programming skills). Carriers that don't go this route will find it difficult competing with those that do, simply on operating cost alone.

Services

Beyond operational cost savings, service providers with virtualized and software-defined networks will be able, as well, to provide customers with distinct service benefits. Almost every service that runs over the network should be able to be provisioned by software and, thus, self-selectable and self-manageable. As we have seen in the e-commerce world, telecom services will also be purchased with "one click."

Even more interesting, the turning on and off of discrete telecom-based services may also be managed upstream by applications on an on-demand basis. Services will become dynamic, turning on and off as the upstream application requires. In the future, digital solutions delivered on a mobile device, such as payment or healthcare services, may turn on specific network-based features without the network provider being part of the consumer-facing transaction. And in the world of machine-to-machine, the network operator may be playing a profound but nearly invisible role.

THE CLOUD MARKETPLACE

The rest of this paper will look more closely at the emerging services aspect of the cloud. We think telecom providers have an opportunity to exploit three types of services:

1. Traditional operator-branded services for the enterprise
2. Vertically integrated digital solutions where the carrier is either the customer-facing brand or is a partner enabling some part of the solution
3. Third-party branded services resold by the operator based either on their network or their own cloud infrastructure

The Cloud experience

The world's leading "cloud service provider" today is Amazon Web Services (AWS), which grew by 55 percent in 2013. AWS's core offerings are IaaS and PaaS. One of the keys to the success of AWS has been elastic scaling and on-demand, pay-per-use billing. Many of their clients are Internet startups, companies such as Airbnb, Pinterest or Reddit, who grew their businesses at rates that would have made it virtually impossible for them to raise the capital, let alone install and manage the exponential growth of their own infrastructure. AWS services such as Elastic Compute Cloud (EC2) made it possible to scale horizontally using the global availability of the AWS virtual server infrastructure. But it was the "pay-as-you-play" billing approach that appealed even more, given the unpredictability of demand during startup.

For more established companies, AWS also has a subscription-based model. They gain organizational efficiency and agility at a predictable monthly cost. For instance, Netflix, which accounts (with YouTube) for over 50 percent of the traffic on the Internet, has announced that its entire operation will be on the AWS cloud by 2015. The subscription-based billing from AWS gives them a fixed and predictable cost base that matches their subscription-based revenue model. As a result, other than negotiating content licensing, there are very few surprises in their business model.

AWS, being part of Amazon, also benefits from Amazon's focus on the online user experience. The user interface of AWS is designed to teach and explain, as much as to sell. The entry-way is simple, featuring online tutorials, video-based training, courses and 30-day free trials of services, as well as sandboxes to play in. They have a broad ecosystem of partners, as well as a network of global workers that they manage on behalf of clients. It is literally a one-stop IT shop, completely online, virtualized and simple.

Finally, AWS is also global. For an OTT service, such as Netflix, or global services such as Adobe's SaaS offering, having access to a global content delivery network (CDN) is critical, as it is for many of the companies that are using AWS's cloud. Along with flexible billing models and a simplified user experience, global reach is one of the key competitive advantages that AWS has over even the largest telecom players.

AWS is currently the market leader in cloud services, but its biggest competitors, Microsoft and Google, exhibit many of the same characteristics. There are some key lessons that a telecom provider thinking of offering cloud enterprise services can learn.

1. Add greater flexibility to accommodate every kind of enterprise user:
   a) Simplify the offers
   b) Provide trials and sandboxes so customers can play with the product or service before committing
   c) Have a low-cost entry model, with pay-to-play that can scale without limits, as well as a subscription model
   d) Provide a seamless range of connectivity services that are easy to purchase and configure with a range of security, scale and assurance options
2. For service providers that build their own front-end web platform for selling cloud-based services, pay attention to branding and user experience:
   a) Focus on the end-user experience and spend as much on design and user interface as Amazon, Google or Microsoft would.
   b) Don't let back-end systems' heterogeneity show up in the interface.
   c) Support personnel should always be standing by, but they shouldn't be part of the workflow by necessity.
   d) Integrate online learning and support resources into the offer; don't assume that IT professionals will continue to have the technical skills they had previously.
   e) Integrate billing and services for a "one-click" purchasing system.
3. Partner and collaborate to create or participate in a branded global cloud services platform. Global scale and brand are critical to compete with the likes of Amazon, Google and Microsoft, unless you have a niche market that is relatively isolated (for example, Japan) or very large (for example, the United States and China).

Vertically integrated digital solutions

Several of the larger telecom players, such as NTT DOCOMO, AT&T and Telefonica have explicitly pointed to vertically integrated digital solutions as the key to their future growth. In verticals markets such as healthcare, finance and transportation, machine-to-machine and other device interactions and transactions are everywhere. The carrier network plays a critical role in connecting devices, machines and sensors, and the cloud hosts platforms and applications for tracking, analyzing and directing them, sometimes in real time. Some of these functions are extremely critical and require the kind of 99.999 percent reliability that is typical of the carrier network — not that of the Internet. Some of them will have highly localized traffic patterns, making them more suitable for a highly distributed cloud that, like the telephone network, requires highly distributed points of presence (PoPs) for storage and compute functions.

This situation presents an opportunity for telecom operators. Because the devices, machines or sensors are highly specialized to each vertical, open platforms and generic applications are less relevant. The challenge is to integrate multiple specialized players in each vertical to create compelling enterprise solutions quickly. There will be industry pressures to create standardized platforms, but given the pace of technological change, vertically integrated solutions that can confer an advantage to a company will tend to be more rapidly adopted.

It is important for whoever takes the lead in creating the solution to have mastered the specific complexities of each vertical. Sometimes an integrator will play the lead role (for example, IBM), sometimes a manufacturer (for example, Boeing), but telecom providers with the resources and scale can do so as well. What is important is to add value that can be monetized, not necessarily to own the end-user relationship.

Despite the focus on standards in the telecom world, networking technology can still create product differentiation that can be monetized. Integration of specialized telecom features into the final vertical solutions may ensure a market-winning solution. As telecom providers move their infrastructure to the cloud, NFV and SDN will enable dynamic capabilities that can be turned on and off by vertical solutions that run on top of them. There will be an intermingling of specific telecom capabilities with device, machine and cloud-based software to analyze and respond to sensors (for example, biometric scanners, gyroscopes, GPS, gauges) and other machine functions to create product differentiation, as well as value-added services that the service provider can monetize.

As with other paradigm shifts of this magnitude, there will be a huge opportunity for different players to re-position themselves. We see a number of trends in the development of vertical cloud-based digital solutions:

- In specialized vertical markets, partners are key. It may be your partner's brand that is more important than your own. Being part of another brand's winning solution is better than losing with your own.
- Look for your best opportunities in the stack. Vertically integrated cloud, software and device-based solutions will provide many opportunities for success. The key is to know where you are adding the most value and focus on executing at that point.
- Look for the development of hybrid private-public cloud solutions by vertical; for instance, clouds developed for the use of the finance industry that have higher security requirements, and transportation industry clouds that focus on ubiquity and reliability. These kinds of requirements confer an advantage to a telecom operator over the typical enterprise IT data center providers.

Re-sell services

So far, we have discussed service providers selling their own cloud-based services and integrating their services into vertical digital solutions, either their own or, more often, those of partners. The third emerging possibility is re-selling other cloud-based services off their own cloud platform.

One of the key advantages of the telecom network is that it is highly distributed. Historically, the voice network was engineered in this way because of the mostly local nature of voice traffic. Many of the OTT-based services we have seen in the first two decades of the Web have not been especially sensitive to issues of far-flung distribution. AWS, for instance, has only nine major cloud nodes worldwide and even its CDN PoPs are scarcely more than double this number. Far more distributed is Akamai, which has pioneered CDNs for over a decade, with something in the neighborhood of 2500 locations and 280,000 servers worldwide. Nonetheless, even Akamai pales in comparison to telecom PoPs, with over 20,000 central offices (COs) in the United States alone, not to mention neighborhood cabinets and customer premises equipment (CPE).

There will be cloud-based applications that require greater distribution and require placing the cloud nodes closer to the user. In some cases, cloud functionality can even be built into residential or enterprise CPE. Security as a Service may gain distinct advantages if features such as firewalls can be remotely managed at the CPE for instance. Service providers already have some experience in reselling security services, for example, to residential customers, but servicing PCs remotely poses a host of problems. These disappear using a CPE-based cloud node for security.

Looking to 2020, we see an emerging class of cloud-based applications and services that telecom providers will resell off their highly distributed cloud as they establish this as a platform that can be monetized. Along with Security as a Service, another obvious application is video and virtual CDNs, including virtual set-top boxes, especially in under-serviced areas with slow connectivity issues. This would also apply to SaaS where bandwidth constraints may argue for closer caching of applications to the user.

SUMMARY

In order for telecom players to be successful in the cloud by 2020, we see three foundational pillars. First, they need to implement a highly distributed cloud architecture based on NFV and SDN across their networks. They have many reasons to virtualize their networks, but the most important is the second pillar, the need to achieve IT-like operational scale to compete head-to-head with IT and greenfield telecom companies on cost.

The third pillar, which has been the focus of this paper and which can only be addressed if the first two pillars are in place, is: telecom players need a three-pronged approach to market for dynamic services.

- For their own cloud services, a more flexible billing offer and a compelling customer experience that rivals the one-click models of consumer companies such as Amazon for both residential and enterprise services. Some form of global cloud presence for enterprise customers, probably through partnerships with other national telecom players would also help.
- For vertical digital solutions, partner with vertical players to dynamically deliver telecom features embedded in integrated digital solutions. This is a sell-through model where value-added telecom features (for example, security, reliability, distribution) provide compelling differentiation and are delivered at the specialized service or application level, either as the operator's offer or, more likely, as part of someone else's branded offer.
- Re-sale of third-party products or services leveraging the advantages of the telecom operator's cloud, for instance a highly distributed cloud infrastructure or highly personal and secure PoPs

The key for telecom players, as they move to the cloud, is strategic alliances and careful business-based decisions about how telecom services will be transacted. Some, like connectivity, may continue to be bought directly. Others will be sold, as cloud services now are, as part of a subscription service or pay-as-you go. However, some may be deeply embedded in vertical solutions where the final platform for transacting those services, whether it is based on a device, application or cloud platform, will require dynamic telecom-based features to ensure its success.

The cloud may yet prove an even greater disruption than either mobility or the Internet to the telecom marketplace. It has introduced new threats and competitors, resulting in shifting business models, and will demand huge skill shifts for personnel. Nonetheless, the opportunities are also enormous. As everything from consumer services to machine-to-machine moves to the cloud, it is important to remember that the network is the original cloud, and telecom operators own it. The key is to virtualize their network and then monetize this dynamic asset to greatest advantage in the coming cloud marketplace.

ACRONYMS

AWS	Amazon Web Services
CAGR	compound annual growth rate
CDN	content delivery network
CPE	customer premises equipment
EC2	Elastic Compute Cloud
IaaS	Infrastructure as a Service
NFV	network function virtualization
OTT	over the top
PaaS	Platform as a Service
PoP	point of presence
SaaS	Software as a Service
SDN	software-defined networking

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