THE CARRIER CLOUD

DRIVING INTERNAL TRANSFORMATION AND NEW CLOUD REVENUE

STRATEGIC WHITE PAPER

Cloud computing brings service providers new opportunities to improve their own operations while generating revenue from cloud services. Like most enterprises, service providers are looking to increase business agility, efficiency and speed while reducing costs. With the right approach to cloud technology, service providers can use their move to the cloud to achieve these goals. At the same time, they can meet growing demand for next-generation cloud services that bring the business benefits of cloud to their enterprise and consumer customers. The carrier cloud is at the heart of both opportunities. With the carrier cloud, service providers have a single elastic environment that supports internal transformation and delivers next-generation cloud services with guaranteed performance and availability.

Alcatel·Lucent

AT THE SPEED OF IDEAS™

TABLE OF CONTENTS

1. OPPORTUNITIES IN THE CLOUD

The advent of cloud computing brings important opportunities to service providers and their enterprise customers.

When service providers think about moving to the cloud, internal transformation and its benefits may not come to mind. But cloud technology gives service providers an important opportunity to transform their infrastructure, operations and business model. They can use the efficiencies that cloud technology enables to increase business agility, accelerate service delivery and cut costs. They can also embrace new business models and aggressively streamline operations — actions that directly benefit their bottom line.

Like service providers, enterprises are constantly looking for new ways to increase their competitive edge and become more nimble. Public cloud computing offers them a new opportunity to increase business agility, efficiency and speed, while reducing costs. But enterprises typically take a conservative approach to cloud services. They won't risk putting their business-critical systems in a public cloud unless it can meet the stringent performance and availability requirements they demand of their own IT departments.

Meeting enterprise demand for enterprise-grade cloud services for business-critical systems creates another opportunity for service providers. Their carrier-grade services can meet the needs of the most demanding customers. They can claim a portion of the public cloud market. And they can improve margins by delivering cloud capabilities that go well beyond those offered by today's data center operators.

Before we explore where cloud needs to go to make the most of these opportunities, let's take a closer look at the advantages service providers can reap and offer by embracing cloud technology.

2. SERVICE PROVIDER ADVANTAGES

With the move to cloud technology, services are no longer delivered from segregated silos that require dedicated equipment, applications and resources. Instead, all services are delivered from a single, elastic environment. Equipment and applications are virtualized. Processes and operations are simplified. New services can be added quickly, easily and cost effectively.

These efficiencies are important because service providers have complex operations. They have all of the typical enterprise applications. In addition, they have to support all of the equipment and applications needed to operate and manage their networks and services. Service provider applications are much more demanding than typical enterprise applications. They require careful cloud deployments that define compute and storage characteristics as well as strict key performance indicators. Here, the network becomes a crucial asset. Because service providers have granular control of their networks, they can use its power to virtualize their operations and transform services.

Service providers that make the effort to move to the cloud will reap the benefits. Alcatel-Lucent Bell Labs researchers found that moving to a cloud environment reaches deep into service providers' network and service delivery layers, affecting up to 80 percent of their network equipment and software. They also found that moving to the cloud reduces both capital and operating expenditures (CAPEX and OPEX).

CAPEX savings in the cloud:
- Investments in network hardware that can be virtualized can be reduced by 25 percent to 80 percent
- Virtualization of customer premises equipment can deliver 30 percent savings
- Base station virtualization can reduce civil works costs by 60 percent
- Incremental capital investment for adding a subscriber can be reduced by 70 percent

OPEX savings in the cloud:
- Data center operations costs can be reduced by 40 percent
- Services operations costs can be reduced by 25 percent
- Network planning and engineering expenses can be reduced by 20 percent
- 100% savings in energy and real estate expenses is achieved for the network elements eliminated from the network through hardware reduction. 90% reduction in maintenance charges, and 45% reduction in network operations, is also realized for these elements.
- Base station virtualization leads to 60 percent savings in site rental costs and a 50 percent reduction in power consumption expenses

The Bell Labs researchers also found a connection between internal transformation and incremental revenue opportunities in the cloud:
- Faster time-to-market can potentially result in significant long-term market share advantages and higher average revenue per user (ARPU).
- The ability to offer try-before-you-buy functionality accelerates and increases market penetration

Service providers can take immediate advantage of the internal efficiencies and savings gained through the move to a cloud environment. They can add cloud services at the same time, or when the time is right.

2.1 Differentiating in the cloud

Service providers come to the cloud services market with deep service delivery experience, strong customer relationships and the right infrastructure. Together, these advantages set service provider cloud offerings very clearly apart from data center offerings. They also help service providers make the most of the incremental revenue opportunities in the cloud.

Relationships and business models
Many service providers have become important partners to their enterprise customers and a trusted source for business communications services. Cloud is an opportunity to sell new products to a very established customer base. Cloud services are also a natural extension of the leased line, business virtual private network (VPN) and wavelength services they're already providing to enterprises.

From a business model perspective, cloud is about delivering multi-tenant IT services. Service providers already know how to sell multi-tenant communications services. Important advantages will come from service providers' ability to deliver services that tie the network together with compute and storage. The network infrastructure effectively becomes a distributed cloud that helps to reduce costs and increase service differentiation. Service providers can offer compute and storage service options as well as network capabilities that ensure application performance in the cloud.

Beyond technical capabilities, service providers can offer a single support line for both network and cloud services. They can also potentially provide a single bill for all cloud and network services bundles. For example, service providers could create an all-in-one data center and VPN service. This cloud and network combination helps customers save money. At the same time, it helps service providers increase aggregate income. This is a definite business model advantage over data center operators that only know how to sell over the Internet.

For wireless service providers, the ability to offer online media, social media services and games from the cloud will help drive consumption of their primary resource — the wireless network. The more interesting the cloud services they offer, the more loyal customers are likely to become. Multi-play providers have an opportunity to give enterprises anytime, anywhere access to their business applications and communications services through mobile and fixed networks. For these providers, the quality of the mobile cloud experience will be crucial to differentiating.

Physical footprint
Footprint is a huge natural advantage for service providers. With central and distributed resources that cover broad territories, service providers can place services in the location that offers the best performance for cost. For example, by adding IT infrastructure components to their distributed central offices, service providers can take the cloud much closer to customers. Latency drops. Bandwidth costs drop. And customers can easily visit and inspect their local data center when needed.
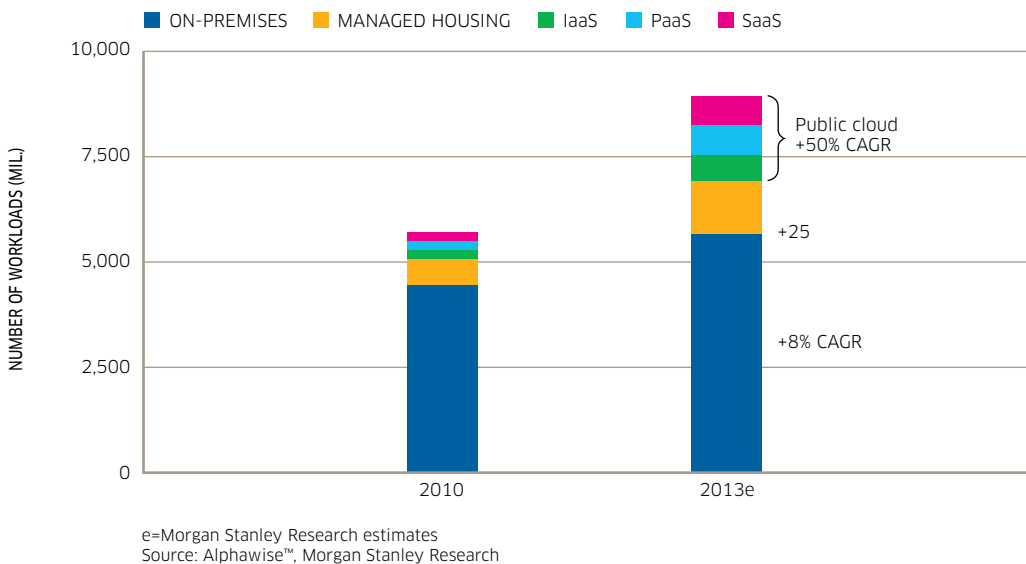
In some cases, using distributed resources to provide cloud services will make the most sense. In other cases, using centralized resources will be the better approach. The key is that service providers can smartly align their assets and costs with their customers' demands and willingness to pay for guaranteed performance. Because they also own the access network, service providers can guarantee service quality and performance from the virtual machine in the data center all the way to the customer premises.

3. THE PROBLEMS WITH TODAY'S CLOUD

One of the main reasons service providers have such a significant opportunity to take the lead in next-gen cloud services is that today's cloud simply doesn't deliver everything enterprises need.

Enterprise CIOs like the operational and cost efficiencies today's cloud-based Infrastructure as a Service (IaaS) offerings enable. In fact, they would like to take greater advantage of cloud for platform and software hosting services. Research projects a 50 percent compound annual growth rate (CAGR) in public cloud services between 2010 and 2013. By 2013, Platform as a Service (PaaS) and Software as a Service (SaaS) are expected to catch up with IaaS in popularity (Figure 1).

Figure 1. Demand for public cloud services is on the rise

e=Morgan Stanley Research estimates
Source: Alphawise™, Morgan Stanley Research
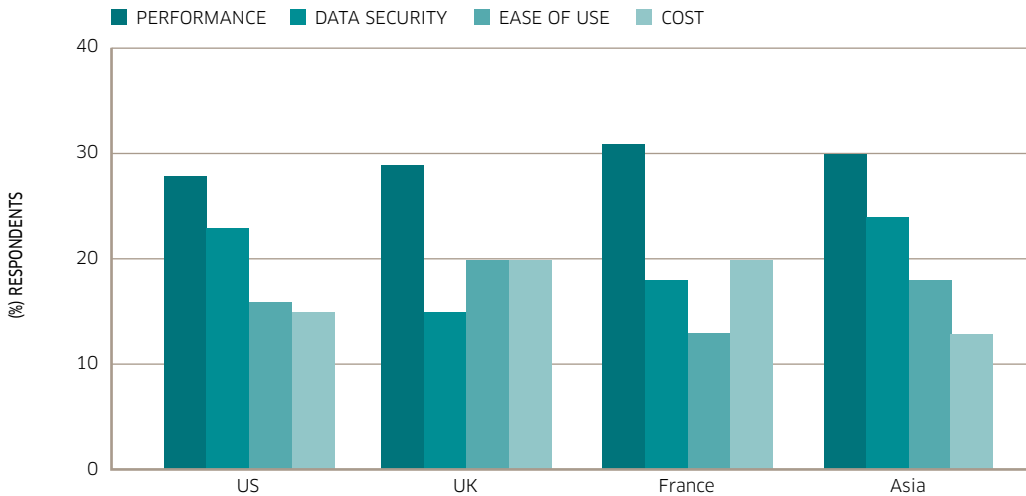
Unfortunately, today's cloud offerings have major shortcomings. Data center operators:

- Can't guarantee performance end-to-end. Their control over performance and quality of experience (QoE) ends at the doorstep of their data center.
- Don't own the network over which the cloud services travel. That means bandwidth can be expensive.
- Are limited by centralized architectures. They don't have the flexibility to move services closer to customers to ensure low latency.

Enterprise CIOs are reluctant to turn over business-critical applications to data center operators that can't guarantee performance and security end-to-end. Availability is also a crucial concern. Even short outages can have costly consequences. Alcatel-Lucent recently surveyed 3886 IT decision makers in seven countries. When asked to identify their main concerns with cloud services, the IT decision makers pointed to service outages. Based on this response, it's not surprising that performance topped the list of factors these decision makers said need the most improvement (Figure 2).

Figure 2. Performance is the major drawback to today's cloud services

Source: Alcatel-Lucent

To improve their own operations and make the most of their natural advantages in cloud, service providers are moving to a new cloud framework and a new class of cloud: The carrier cloud.

4. CARRIER CLOUD: A NEW CLASS OF CLOUD

The carrier cloud is based on the service provider's greatest asset: the network and its carrier-grade attributes. Carrier-grade networks are known for their high reliability and availability and their fast fault recovery. Based on this network, the carrier cloud:

- Ensures quality of experience with carrier-grade service level agreements (SLAs)
- Orchestrates security and governance
- Offers low latency
- Delivers voice, video, and data
- Supports on-demand, pay-per-use and automated self-service models
- Is dynamically connected and managed through the WAN
- Is highly scalable
- Enables widespread access and elastic availability
- Is application-aware
- Supports open innovation through web APIs
- Serves businesses and consumers
- Supports public, private and hybrid or federated cloud services
- Supports integrated IaaS, PaaS, SaaS, Communications as a Service (CaaS) and business process services

The carrier cloud is a dramatic evolution beyond existing data center clouds. While tremendously successful at supporting elasticity and availability for web applications, today's cloud was designed to support applications that are transaction oriented, stateless and have relaxed time constraints. In contrast, consider just a few of the benefits enabled by carrier cloud attributes.

4.1 Quality of experience and carrier-grade SLAs

As we saw in section 3, data center operators' biggest shortcoming is their inability to guarantee performance with meaningful end-to-end SLAs. While a number of data center operators offer SLAs, there's often no compensation if SLAs are not met. And none offer financial compensation for business losses due to outages. They simply can't take financial responsibility for poor performance that occurs once cloud services exit their data center walls.

In a recent Alcatel-Lucent survey of 3886 IT decision makers in seven countries:
- 46 percent cite annoying or intolerable latency (150 ms to 500 ms) in cloud services
- 36 percent say there is no remediation effort when cloud services SLAs are not met

Service providers have many years of experience meeting SLAs for business-critical services. In a carrier cloud environment, service providers can offer end-to-end SLAs. These SLAs can cover:
- Performance requirements and benchmarks
- Actions in case of failure
- Data security
- Data privacy
- Compliance with industry accountability and accounting practices and policies
- Audits and real-time analytics to monitor compliance
- Insurance that covers incidents such as data center security breaches
- Technical support
- Acceptance period
- Termination clauses, risk management and assistance
- End-to-end SLA integrity and accountability

4.2 Low latency and up-sell opportunities

At first glance, using distributed assets to deliver cloud services can seem expensive from a personnel and resource perspective. However, the corresponding drop in bandwidth costs and increase in selling opportunities help service providers manage profit margins. For example, they can take advantage of proximity to customers to offer better latency or more bandwidth options than data center operators. They can even offer several degrees of lower latency, each with a higher price.

Alcatel-Lucent research confirms that enterprises will pay for premium cloud enhancements, such as low latency and bandwidth. An Alcatel-Lucent research study based on 1050 surveys of mid- and large-sized enterprise in the United States (US) in June and July 2011 found that:
- Carrier-grade public cloud services have 10 times the revenue potential of basic cloud services.
- Carrier-grade cloud services are four times more attractive to enterprises than existing public cloud services.

4.3 Application Enablement and open innovation

The carrier cloud is open. This allows service providers to expose web APIs to trusted in-house or third-party developers. These developers can enhance cloud services offerings with network intelligence or develop new cloud services that are customized for specific enterprise needs or industry verticals. With more creative minds contributing to cloud services, innovation accelerates. Services providers can meet customer demands for more advanced cloud offerings faster. They can also create service mash-ups that combine innovations.

Cloud APIs can also be used to improve internal service operations and simplify service delivery. The key to this last benefit is the fact that services in the carrier cloud are not isolated in service delivery silos. They are all delivered from a single, elastic environment.

5. BUILDING THE CARRIER CLOUD

Service providers moving to the carrier cloud are building a single cloud environment that supports internal transformation and delivers next-gen cloud services with guaranteed performance and availability. This one cloud joins the service provider's network with other cloud entities — data centers, the public cloud and private enterprise clouds. The carrier cloud federates these cloud entities, providing visibility, orchestration and management across the combined entities.

Service providers can build the carrier cloud with an initial objective of internal transformation, next-gen cloud services delivery, or both. The value is in the flexibility of the carrier cloud. It adapts to service providers' business needs as they evolve their operations and their business. For example, service providers can:

- Start with IaaS offerings then add PaaS, SaaS and CaaS offerings when it makes sense for their business
- Securely host their own and third-party services in a multi-tenant environment
- Quickly scale their resource pool up and down to meet new demands
- Easily move workloads among data centers to ensure performance, improve resource utilization and recover from faults
- Tie customers into their data center resources
- Support real-time, latency-sensitive applications and services as well as non-latency-sensitive offerings
- Support next-generation services, such as immersive video communications services that require real-time video processing in the cloud and real-time communications applications that are hosted in the data center
- Support service automation through one or more types of cloud stacks
- Support scalable cloud management for more dynamic service provisioning and growth of industry services

5.1 Understanding the big picture

Service providers' WANs are crucial components of the carrier cloud. They become the fabric for the service providers' data centers and for connecting customers to service providers' data centers and IT services. In essence, the WAN fabric gives service providers a widely distributed, yet seamlessly interconnected, set of cloud resources. It's these distributed cloud resources that give service providers the flexibility to move workloads and quickly scale resources.
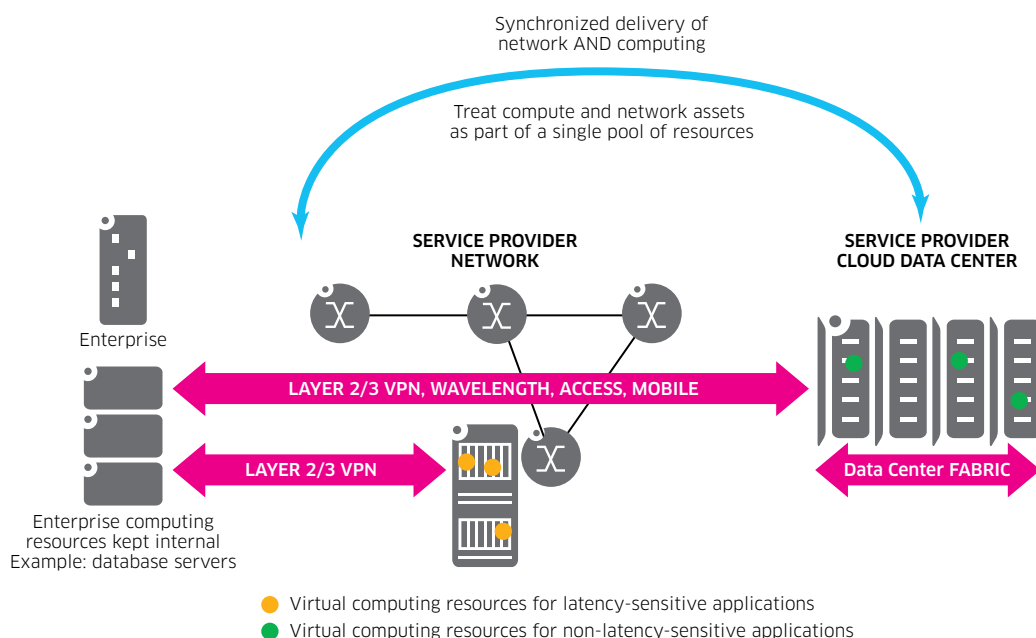
While the WAN must be scalable and agile, the idea is not simply to build extensive router networks and server farms. Rather, the WAN and the data centers together become the canvas upon which the cloud management system operates.

The cloud management system is the key to the carrier cloud. It lets service providers look at all of their different resource pools and services as if they were in a single environment. This overarching view of everything in between the cloud data centers and the operations support system (OSS) allows service providers to optimally place services based on any number of factors: cost to operate, customer location, SLA compliance, data center availability or expected service uptake.

The ability to closely align a widely distributed set of carrier cloud resources with any number of requirements gives service providers fine-grain control over cloud services performance and cost trade-offs. For example, if a particular server being considered for service placement is cost effective because it is located close to the customer but could put "five nines" availability at risk due to heavy occupancy, it might not be the right choice. Another server in a data center that is further away but less occupied may reduce risks of SLA non-compliance without eliminating profits.

Figure 3 illustrates the three main carrier cloud components: Carrier-grade data centers, the carrier-grade WAN and a cloud management system that understands and enables common management of both environments.

Figure 3. The carrier cloud synchronizes delivery of network and compute resources

Source: Alcatel-Lucent

With a carrier cloud infrastructure, service providers have the big picture: full visibility across networks, data centers, applications, services, OSSs and business support systems (BSSs). This visibility allows them to:

- Provide end-to-end SLAs for individual customers, applications or services
- Automate network and compute services
- View resource availability end-to-end
- Optimize application and service placement
- Validate and assure cloud services end-to-end

5.2 Developing a carrier cloud strategy

As service providers develop their strategy for building the carrier cloud, questions will arise:

- Which resources should I virtualize first? How do I prioritize virtualization after that?
- How do I interconnect resources and orchestrate across them?
- Where and how does an IP multimedia subsystem (IMS) fit into the picture?
- Which apps and services offer the best ability to recoup investments and increase profitability?
- How should I evolve my back office to support the carrier cloud?
- How can I build a carrier cloud that helps me differentiate my cloud services from the competition?

An experienced partner can help service providers answer these questions. Three types of professional services will be particularly important to service providers building the carrier cloud:

- Consulting services help service providers determine which carrier cloud services will be best to help them make money — in the short term and over the long term. Service providers have their own roadmap for carrier cloud services. Industry research and market data inform decisions. Consulting services also help service providers ensure that executives in different parts of the organization all have the same understanding of what the provider wants to accomplish with the carrier cloud, what the carrier cloud can deliver and what it can't deliver.
- Design and integration services help service providers ensure they have the right architecture to deliver carrier cloud performance and QoE end-to-end. Security is a crucial requirement because it applies to every aspect of carrier cloud services — from how customers access services from various locations, to how services are isolated from one another on virtual machines to protecting data centers from cyber attacks. Load balancing across data centers, integration of new network elements and orchestration across OSSs and BSSs are also important areas where experienced professionals can help service providers.
- Deployment services help service providers differentiate their carrier cloud offerings from other providers. Expertise in onboarding new carrier cloud applications and services, self-serve models and automating the operating processes behind cloud services in a cost-effective way are important here.

6. CONCLUSION

Moving to the carrier cloud allows service providers to virtualize and transform their operations to become more efficient and agile while reducing costs. It also puts them in a better position to increase revenue by meeting growing enterprise demand for highly available cloud services with end-to-end performance guaranteed.

To make the most of these opportunities, service providers need tools and systems that tightly link clouds, services, applications and network. Most importantly, they need a multiservice cloud management system that smartly combines compute and IT resources with customer requirements and network intelligence.

Service providers are in a strong position to lead in cloud services. Preliminary results of our survey of more than 2000 enterprises in the United States and the United Kingdom in June and July 2011 reveal that Tier 1 service providers are already considered among the most trusted cloud services providers. Along with trust, service providers have deep experience in large-scale service delivery over highly reliable and available carrier-grade networks. They're also experts in federating networks and have agreements for delivering services across networks globally.

With the right strategy and the right portfolio of carrier cloud products and services, service providers can finally move beyond the capacity management business. They can transform their own operations, cut costs and stake their claim in the fast-rising carrier cloud.

7. ABBREVIATIONS

API	application programming interface	IMS	IP multimedia subsystem
ARPU	average revenue per user	IT	information technology
BSS	business support system	OPEX	operational expenditure
CaaS	Communications as a Service	OSS	operations support system
CAGR	compound annual growth rate	PaaS	Platform as a Service
CAPEX	capital expenditure	QoE	quality of experience
CIO	Chief Information Officer	SaaS	Software as a Service
IaaS	Infrastructure as a Service	SLA	service level agreement
ISP	Internet service provider	VPN	virtual private network

8. RESOURCES

For more information about the carrier cloud, please contact your local sales team or visit www.alcatel-lucent.com/cloud

Alcatel·Lucent