InfoVista
Your Successs Starts Here

An InfoVista White Paper

Delivering "Smart" Clouds

Removing Barriers to New Revenue for the CSP

Contents

Introduction

A week does not go by without a conversation that involves the cloud; both within the Communications Service Provider (CSP) and within the enterprise. These conversations inevitably involve some discussion of terminology, need, opportunity and impact. As the conversations continue, a greater understanding of these discussion topics and their related language will emerge, but the CSP cannot afford to wait for this moment of industry clarity to declare its position within the cloud ecosystem. In fact, research[1] from AMI-Partners (based on US data) shows that 48 percent of SMB customers would likely switch providers in the absence of a cloud offering from their CSP. Large enterprises may be less likely to change, but also more likely to reap strong financial benefits from cloud-based services that offload significant cost from their internal infrastructure and operations. For the CSP, the questions center on defining its role in this ecosystem and identifying what is needed to capitalize on this opportunity.

To capitalize on its assets, drive new revenue, and create value for customers the CSP needs to lead its enterprise customers through the cacophony of cloud discussions to deliver the required business value. Fundamentally this is an alignment of assets (including acquisitions) that need to deliver the guarantees enterprises require and the tangible *touch and feel* of each enterprise's services that they currently enjoy when the infrastructure exists internally versus in the cloud.

For the CSP to successfully engage and win the enterprise with its cloud offering, it must provide a common proof point with the service visualization that matches the tangible look and feel of the enterprise's own data center regardless of the virtualized and dynamic nature of the resources. Multiple studies[2] have shown that performance, service level guarantees and security are typically among the top three concerns for enterprises considering external cloud services (i.e. those that involve a third-party provider). Clearly the message from the enterprise is one of risk aversion—will their data be safe, and will the service perform as good as or better than existing methods. Ultimately enterprises cannot tolerate degraded performance and SLA-based credits. They need more than a contract to prove the CSP can deliver the required performance—they need to have visibility into the service and manage it in tandem with the systems that remain outside the cloud or those that move between the internal and external cloud (e.g. cloud-bursting).

Enabling this service visualization and bridging the gap between network and IT centers on a unified and subscriber-oriented view of the service, its performance and interdependencies. The solution is an open, easy-to-use Web 2.0-driven platform that can deliver this service visualization, incorporating all aspects of the infrastructure (compute, storage, and application), the network, the end-to-end performance and the relationships between these resources. This platform must be built on a foundation able to handle the scale of the CSP (hundreds of thousands of instances), the separation and security implicit in a multi-tenant design, alignment with the key network assets such as Carrier Ethernet services and standards and that empowers the subscriber as well as the CSP's operations.

[1] *AMI-Partners, 2010 US SMB Telco Channel Report*

[2] *Hosting.com, 2011 Cloud Trends Report – "Obstacles to Cloud Computing", IDC Private Cloud Management Survey, September 2010; "Ten Factors with Greatest Influence on Decisions Regarding Use of Public Versus Private Cloud Services", OVUM 201 Enterprise IT Architecture survey; "Main barriers to the adoption of Cloud Computing"*

Opportunity for the CSP

The worldwide market for enterprise cloud-based services is $12.1 (~ €8.3) billion US as of 2010 with estimated growth up to $35.6 billion US by 2015 [3]. Fixed and mobile telecoms operators, and cable TV operators, will take a 23 percent share of the year-on-year revenue growth, and managed service providers (MSPs) will account for the remaining 2 percent [4]. The growth rate is accelerated in the short term and although Software-as-a-Service accounts for the largest share of the services revenue, Infrastructure-as-a-Service will grow faster, increasing its share of the revenue by one third over the next 5 years [5].

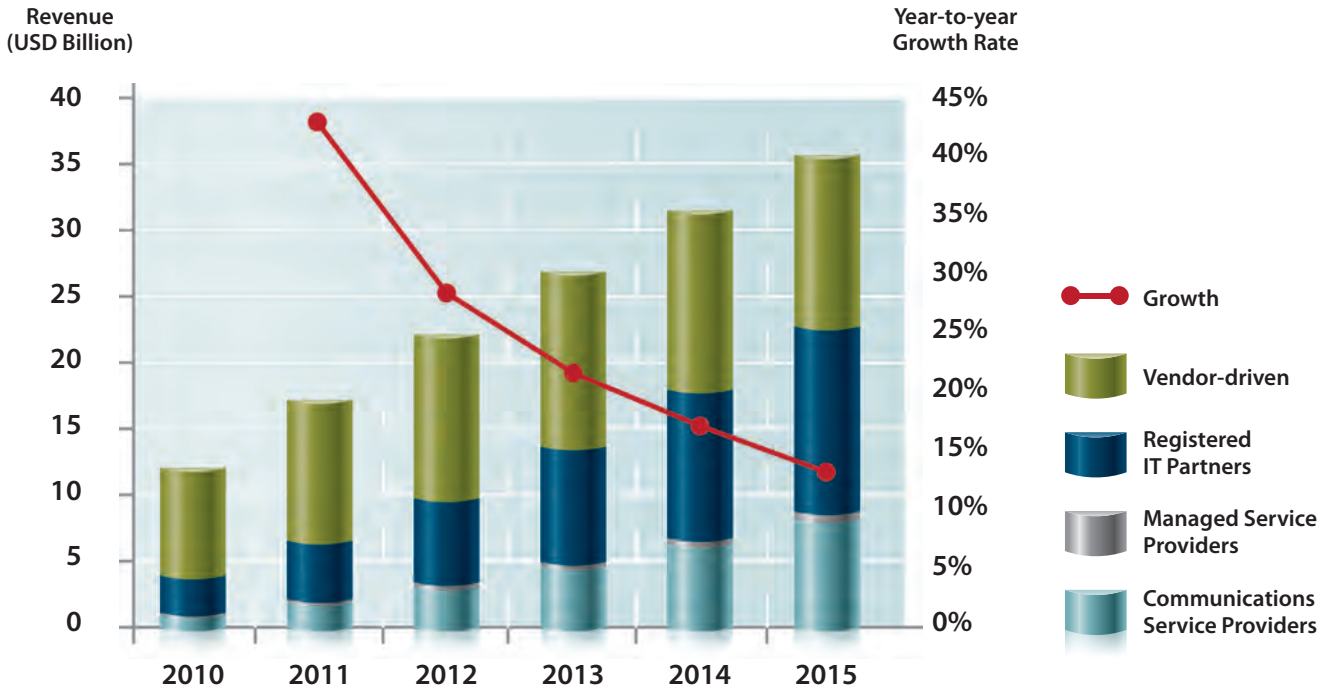

***Chart 1** – Cloud-Based Service Revenues (Source: Analysys Mason, 2010)*

Clearly the opportunity for the CSP is large, both in terms of direct business (i.e. MSP and CSP) and with vendor-driven and IT partner-based solutions because in all cases, regardless of the actual cloud provider, there is a critical need for connectivity and that connectivity will often be delivered via the CSP; either in the form of Internet-access services or enterprise data services.

Having the opportunity is good news, but the challenge is how best to address that opportunity; specifically:

1. What role should the CSP play to drive the most revenue in the long term?
2. What do enterprises need with respect to the core value of the CSP?
3. What are enterprises' primary concerns and how should they be addressed?
4. What is required to manage these services and drive adoption?

To answer these questions it is helpful to define a common vernacular.

[3] *Analysys Mason: Enterprise cloud services; Worldwide Forecast 2010-2015*
[4] *Ibid.*
[5] *Ibid.*

Understanding Cloud Services and their Taxonomy

As a preliminary step to describing the cloud taxonomy being adopted in today's market, it is important to understand the simple view that spawned the infamous "cloud" adjective for cloud computing and all related services and technology. The "cloud" is something the CSP has used for years—essentially it helps depict the details that the business must concern themselves with versus those they shouldn't.

For example, the image below—a simple point-to-point data service—shows two business locations with a device that sits at those locations (implying the need for space, power, etc.) and then an image of a cloud. The cloud simply represents the service, providing data connectivity between these two locations, and its purpose is to illustrate that there are many technical details within that "cloud" that are critical for the execution of providing that service (and meeting the SLA and business needs) but that aren't of direct concern to the end business. The details inside the cloud may change depending on the locations involved, it may change over time with new technologies, it may involve different technologies (Carrier Ethernet, IP/MPLS, PBB, etc.) but it's not the responsibility of the business to understand and manage those details as long as it receives the service it needs. The cloud image is a method of abstracting the myriad details of providing the service from the service itself.

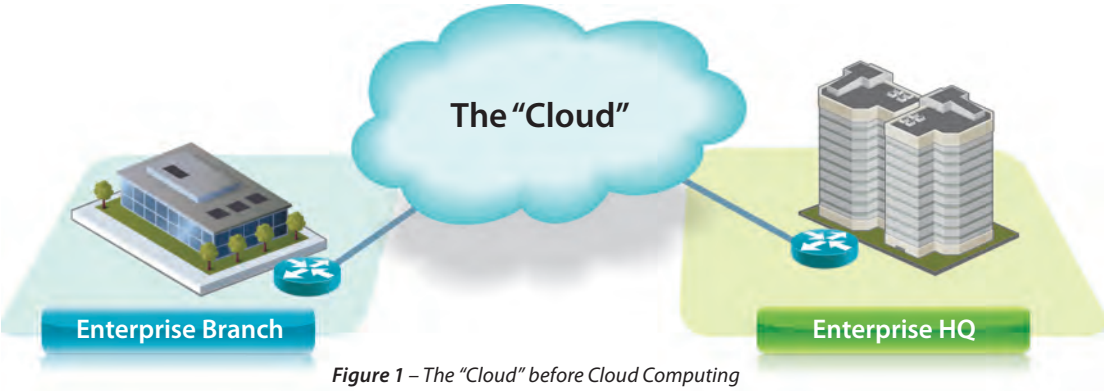

***Figure 1** – The "Cloud" before Cloud Computing*

The key differences with the "cloud" in cloud computing are:

1. Other providers outside of traditional CSPs are delivering these services.
2. More services and their details (infrastructure, applications, connectivity, etc.) have moved from the two ends in the diagram (the part that the business manages) into the part in the middle (the "cloud"). The cloud abstracts the details (provisioning, managing, purchasing, deploying, operating, etc.) which the cloud provider must manage and lets the enterprise focus on its primary concern—the end service being delivered.

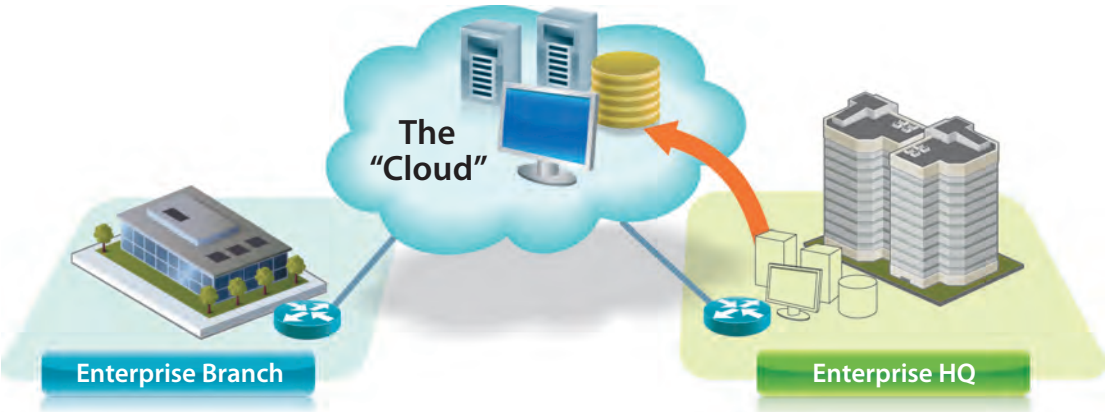

***Figure 2** – The new "Cloud" of Cloud Computing*

So in fact the cloud is the same as always—a delineation between details that the business must manage and understand versus those that a third-party must manage—in order for the end deliverable (be that a development platform, a PBX, a DB, a CRM application or a computing resource) to be available and perform according to the needs of the enterprise.

The NIST has been frequently referenced by other worldwide Solution Development Organizations (SDOs) for helping define the cloud taxonomy. The NIST has a mandate from the US Federal Government to accelerate the federal government's secure adoption of cloud computing by leading efforts to develop standards and guidelines in close consultation and collaboration with standards bodies. They have a specific group "The Architecture and Taxonomy Working Group" developing a reference architecture for the cloud [6].

To help define the potential role of the CSP, its helpful to look at the general roles (labelled "Actor") related to cloud computing as referenced below.

Table 1 *- Cloud Computing Actors and Their Roles* [7]

Actor	Definition
Cloud Consumer	Person or organization that maintains business relationships with, and uses service from, *Cloud Providers.*
Cloud Provider	Person, organization or entity responsible for making a service available to *Cloud Consumers.*
Cloud Auditor	A party that can conduct an independent assessment of cloud services, information system operations, performance and security of the cloud implementation.
Cloud Broker	An entity that manages the use, performance and delivery of cloud services, and negotiates relationships between *Cloud Providers* and *Cloud Consumers.*
Cloud Carrier	The intermediary that provides connectivity and transport of cloud services form *Cloud Providers* to *Cloud Consumers.*

The CSP obviously aligns with the Cloud Carrier role but can also play the role of Cloud Provider as well as Cloud Broker (Cloud Consumer is another potential role but outside the scope of this paper).

The next component to understanding the "cloud" is the classifications of cloud services—essentially what the Cloud Consumer needs from the Cloud Provider.

[6] *TM Forum Quick Insights; Standards Development 2011*
[7] *NIST Cloud Computing Reference Architecture, Version 1, March 30, 2011*

Table 2 *- Service Models* [8]

Service Models	Cloud Provider Responsibility	Example Cloud Consumers
SaaS	Installs, manages, maintains and supports the software application on a cloud infrastructure.	Business uses, software application administrators
PaaS	Provisions and manages cloud infrastructure and middleware for the platform consumers; provides development, deployment and administration tools to platform consumers.	Application developers, testers and administrators
IaaS	Provisions and manages the physical processing, storage, networking and the hosting environment and cloud infrastructure for IaaS consumers.	System developers, administrators, IT managers

The final piece is the operation of the cloud service. Ambiguity frequently revolves around private versus public clouds and the related implication of external versus internal operation. Below is an amalgamation of references from NIST as well as from the TM Forum's Enterprise Cloud Leadership Council Virtual Private Cloud (ECLC VPC) working group. It specifically addresses a gap with the commonly used definition of "hybrid cloud" as it precludes the possible (and likely) combination of internal and external private clouds, especially in the context of cloud-bursting (providing excess capacity on demand from one cloud to another). Thus the addition of the "enterprise hybrid private cloud" proposed by the TM Forum is of great relevance to the CSP.

Table 3 *- Service Deployment Types*

Service Deployment Type	Description	Operation with respect to the Enterprise	
		External	Internal
Private Cloud	The cloud infrastructure is operated solely for an organization. It may be managed by the organization or a third party and may exist on premise or off premise.	Hosted and operated by a 3rd party	Operated by the enterprise
Public Cloud	The cloud infrastructure is made available to the general public or a large industry group and is owned by an organization selling cloud services.	Publically available, accessed over the Internet	NA
Community Cloud	The cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be managed by the organizations or a third party and may exist on premise or off premise.	Hosted and operated by 3rd party	Operated by the community
Hybrid Cloud	The cloud infrastructure is a composition of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).	Potentially a combination of both externally-based and internally-based operations.	
Enterprise Hybrid Private Cloud	*A combination of external private cloud(s) and internal private cloud(s)*	Combines both externally-based and internally-based operations.	

[8] *NIST Cloud Computing Reference Architecture, Version 1, March 30, 2011.*

Service Deployment Types for the CSP

The primary service deployment types relevant to the CSP are:

- External Private Cloud
- External Community Cloud
- Enterprise Hybrid Private Cloud

However, the following service deployment types are still relevant in the sense that the CSP is likely to play a role in terms of access and connectivity and therefore may be able to create additional value through unifying the business model as well as adding additional options for the enterprise which is likely to make use of multiple service deployment types.

- Public Cloud
- Hybrid Cloud
- Internal (both Private and Community)

There are other legacy models such as colocation services and managed data center services that stem from the same enterprise need that drives cloud computing; that of abstracting the detailed operations and management of IT systems and applications to a third-party outsourcer in an effort to reduce cost and focus on core competencies.

There is a special tertiary case in which the CSP is a Cloud Consumer and using an internal private cloud deployment type for their own IT services – this case involves similar concerns to any other enterprise however it is not the focus of this paper.

The CSP's Role in the Cloud Computing Opportunity

There has been significant activity in tier-one CSPs as market share and cloud expertise is purchased through acquisition, such as Verizon's acquisition of Terremark and Century Link's acquisition of Savvis. This helps solidify those CSPs' positions as leaders in the cloud computing space. In fact, Savvis, Terremark and Verizon were placed in Gartner's Leadership Quadrant for Cloud Infrastructure as a Service and Web Hosting as of December 2010 along with AT&T and Rackspace—leaving Rackspace as the sole non-CSP leader.

Clearly the CSP's role includes the Cloud Carrier and in the case of IaaS, Cloud Provider is a strong possibility. In fact, this can be said for PaaS or SaaS as one explores specific examples. E.g. Unified Communications is an application and is arguably a flavor of SaaS (e.g. UCaaS or Hosted IP-PBX), thus many CSPs are already SaaS providers deploying the service as an external private cloud service.

Enterprise Drivers

The challenge for the CSP (leaders included) is the ability to drive adoption in the enterprise as well as small and medium business. It is helpful to understand the enterprise drivers for the use of cloud computing, such as:

- New application stress testing via IaaS requiring scale that is unavailable internally
- Cost savings through application migration to SaaS, e.g. e-mail.
- Accelerated development and reduced development costs through PaaS
- Deferred software and or infrastructure capital expenditure by purchasing as a service.

Barriers to Adoption

Next, the CSP should understand the key concerns for adoption of cloud services as this is where the opportunity lies and will highlight the critical role for the CSP. Based on the following two studies, from Ovum and Hosting.com respectively, security and related concerns (privacy, governance, access, and compliance) are critical. The second element is the issue of service levels (including the effect of using public Internet for connectivity) and loss of control. These two elements are related in that offering a service level is not necessarily the same as meeting it and ensuring the enterprise is able to meet its own business requirements and the needs of its customers.

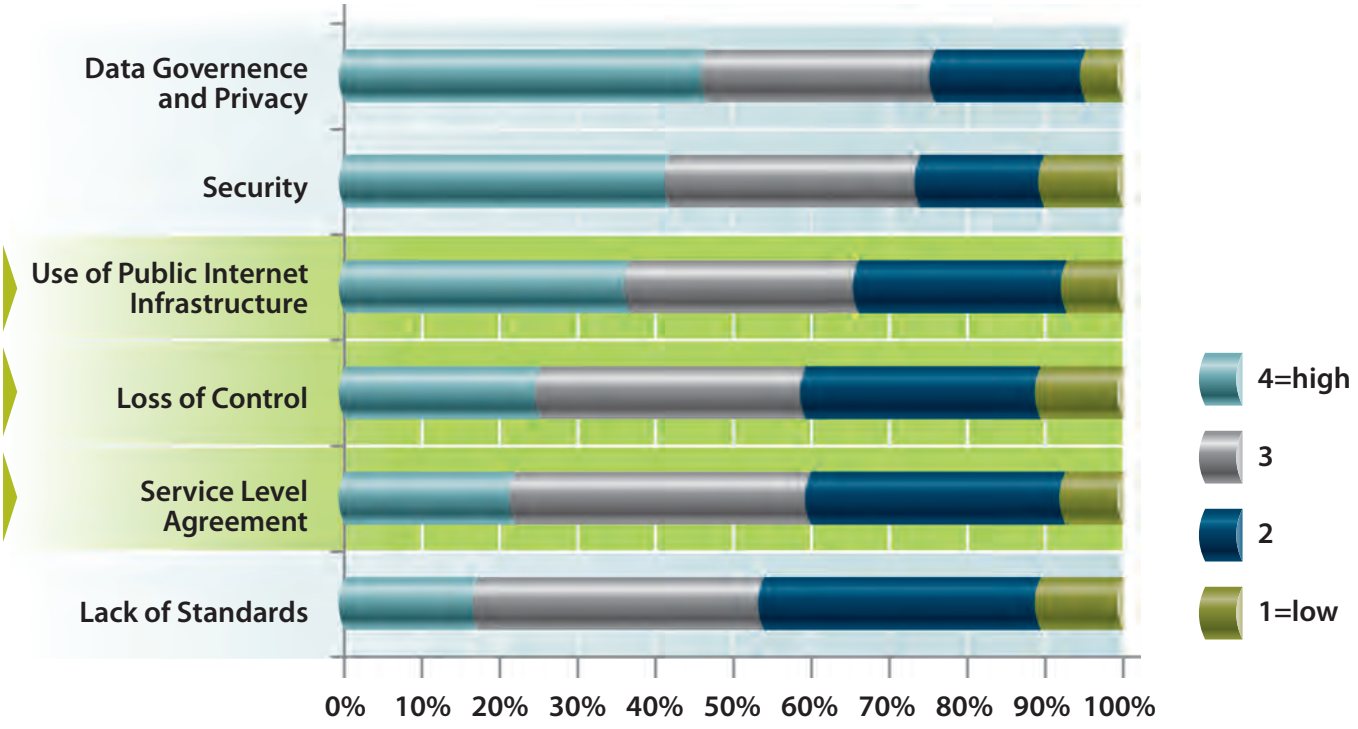

Chart 2 *– Cloud Computing Barriers to Adoption*
(Source – Ovum 2010 Enterprise IT Architecture Survey: 150 Large Enterprise in US, Asia and Europe)

OBSTACLES TO CLOUD COMPUTING 2011 HOSTING.COM CLOUD TRENDS AND BEST PRACTICES REPORT

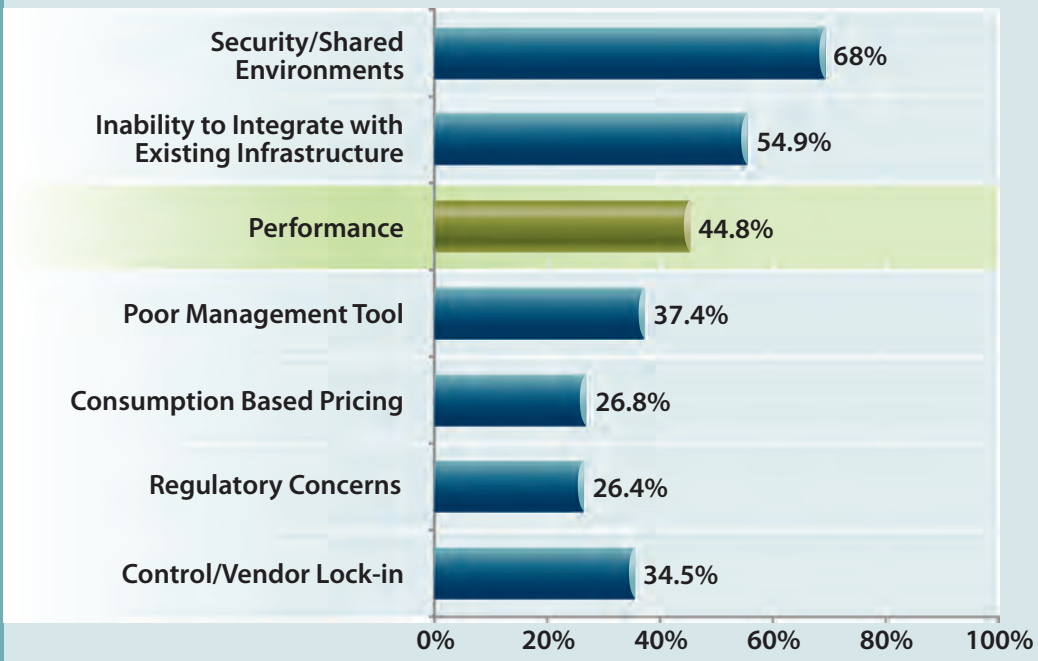

Chart 3– *Obstacles to Cloud Computing*
(Source: http://www.hosting.com/resources/ebooks/2011-cloud-computing-trends-report)

Unified Service Level Guarantee

In April of 2011, one of the leading public cloud providers, Amazon.com, suffered a very public display of downtime as problems began in its data center near Dulles Airport outside Washington D.C. Reports later cited issues in the company's storage systems that eventually led to the outage. The incident was widely covered in print, television and Internet-based media due to the increasing popularity of cloud computing as well as Amazon's brand recognition in the market. Arguably the incident didn't do much for promoting the use of cloud computing within the enterprise, especially the large enterprise, as fears increased over the performance and availability of these services once outside the enterprise's control. This wasn't the first incident for Amazon; another outage occurred in May of 2010 lasting seven hours and was related to power issues. The 2011 outage, however, seemed to garner significantly more publicity.

The savvy enterprise IT organization understands that problems happen and some are preventable and some just have to be managed. The underlying lesson to be learned from Amazon's downtime is that performance, availability and security guarantees are necessary to run business critical services. This lesson is supported by IDC's findings from their Private Cloud Management Survey results below which indicate that service-level guarantees represent a critical influencer for the enterprise when deciding between public cloud services versus private cloud services. When system failures such as those experienced by Amazon happen within the enterprise's internal IT operations, the IT organization is able to see the service and understand, resolve and communicate the issue to business management. This capability is diminished when the systems are part of a public cloud or an external private cloud service. Therefore, the ability to provide not only a unified service level guarantee but also the associated service visualization so that the enterprise maintains some visibility and sense of control, enables the CSP to break down this barrier to adoption whether acting as Cloud Carrier, Provider or Broker.

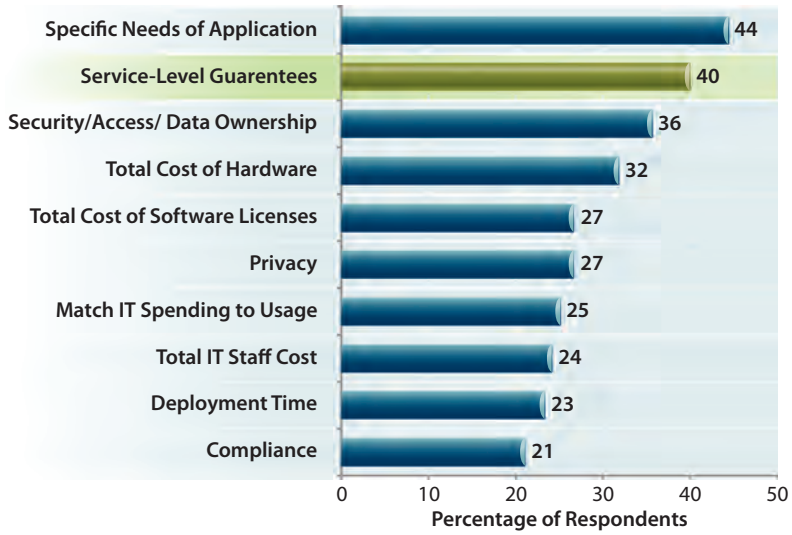

***Chart 4** – Public vs. Private Cloud Decision Influencers*
(Source: IDC Private Cloud Management Survey, September 2010)

The service level guarantee and its value are not exclusive to the external private cloud model as many enterprises will likely be involved in multiple cloud services, including:

Internal Private Cloud

The enterprise pursuing an internal private cloud model will most likely have multiple data centers as well as off-site locations for business continuity and disaster recovery, all of which need connectivity services. The CSP is already delivering services in this space; what changes is the criticality of network performance with respect to business impact. For example, if the enterprise is actively moving an in-production compute instance between data centers, the performance of that link is critical to the performance of that compute instance during the move. By offering services that take into consideration these use cases, the CSP is able to provide the guarantees required and receive the associated compensation.

Carrier Ethernet's Role in the Cloud

The worldwide growth of Carrier Ethernet is outpacing other technologies. This is an important trend in terms of the suitability of Carrier Ethernet for cloud computing. The cloud is dynamic in nature with virtual resources often in a state of transition with respect to the physical resources that support them. In addition, cloud computing is a set of IP-based services, therefore having a layer 2, carrier class network that can be quickly deployed and quickly modified to meet the necessary service levels is well-aligned with the needs of cloud computing. Additionally the Metro Ethernet Forum (MEF)-defined service types enable flexible and remote configuration of provisioned bandwidth, service level specifications and CoS mapping, Layer 2 Control Protocol handling and the ability to maintain customer VLANs across the network.

The CSP that adopts the role of Cloud Broker is able to take advantage of the MEF defined E-Access services using Operator Virtual Connections (OVC). Essentially the CSP can create end-to-end services between the enterprise and multiple cloud providers whether those providers are on-net or off-net. In the case of the latter, using the MEF 26 specification, the CSP can purchase the necessary OVCs to connect the Cloud Providers to the CSP and then through to the enterprise thus enabling one-stop shopping for the enterprise, a unified service level guarantee and end-to-end visibility.

Public Cloud

Although CSPs are less involved in public cloud services, they are likely providing Internet access services and in essence providing access to the Cloud Provider in this model. This presents opportunities for the CSP to create peering or similar relationships with the public cloud provider for enhanced SLA guarantees, perhaps using QoS mechanisms to prioritize public cloud traffic versus other Internet traffic while on-net. The end goal is for the enterprise to visualize, optimize and control its access to public cloud services.

By providing unified service level guarantees and aligning its assets, the CSP can create additional value for the enterprise not just as a Cloud Carrier but also as a Cloud Broker, and potentially a Cloud Provider, providing these benefits:

- Trusted partner
- Billing agent
- Expertise at third-party contracts
- SLA management
- Managing massive scale
- Intimacy with the enterprise
- Gateway to all Cloud Providers (i.e. private data services as well as Internet access services enabling the enterprise to reach its Cloud Provider)

Service Visualization

Security is the number one concern and adoption barrier for the enterprise. The CSP is well-positioned to address this concern because most of its existing customers already use its communication services to deal with sensitive information be it by phone, video or data services. There is already a preformed trust between the CSP and enterprise that the CSP can use to encourage the enterprise to adopt cloud-based services.

Loss of Control

The next most critical factor for enterprise adoption of cloud services is related to operational fear; that is, the fears that raise questions such as, "Will the service be available when I need it? Will it perform as well or better than internal solutions? How do we ensure it is available and performing? How do we manage it alongside our internal services?"

Alleviating these fears are perhaps less easy to solve for the CSP. In essence the enterprise is giving up some aspect of management to receive benefits such as cost control and risk avoidance. However, depending on the service in question, its purpose and criticality to the business, this loss of control presents a significant barrier to adoption. The loss of control presents a risk factor and the enterprise needs a means to mitigate that risk. The key to addressing loss of control is more than strictly managing SLOs to achieve an overall SLA; it's adding service visualization so that the enterprise can touch and feel the service in a similar fashion as it could if it was not based in the cloud.

Defining Service Visualization

Service visualization is the method of providing an online, real-time view of the service to the Cloud Consumer. It leverages a fully configurable, self-service interface such that one can see both abstract and physical resources in context, their availability and performance and their relationships (for example the relationship between a virtual machine, its host, its compute resources, the network and even the applications it's hosting in relationship to the network usage and performance). It can be both high-level and technical, in essence providing visibility to multiple audiences.

Visibility of all components including applications, network, storage and compute resources is included as well as their capacity, health and availability. A visual understanding of the linkage of the resources that work together to deliver a particular service maps everything together to provide a true look and feel of the service in the cloud. Thus an IaaS-based storage service would show storage performance, disk latency, network latency and throughput, error rates, read/write latencies, IOPS and capacity. The view provides a mechanism to enable both a high-level service-based view all the way down to an operational view involving analytical tools and charts and underlying components.

Empowering the Enterprise

Through service visualization the CSP is able to empower the enterprise and directly address the concern over loss of control; thereby driving increased adoption rates to cloud services, increasing the value of the relationship with the CSP, and differentiating the service, both in terms of new Cloud Provider services should the CSP take on that role as well as the more traditional role of Cloud Carrier.

A CSP that is involved as the Cloud Provider must adopt the language of IT—that is, the language and understanding of compute, storage and application metrics. This is necessary because the enterprise is managing these elements internally (at least in the mid-to-large enterprise market) and the CSP that is able to help bridge the gap between IT and networking will not only increase adoption rates but also further differentiate its services against those that are slower or unable to address this gap.

The adoption of IT disciplines includes not only visibility for IT infrastructure (virtualized compute, storage and network resources) but also application visibility both in terms of usage and performance. Furthermore, the successful CSP is able to demonstrate the linkage of these elements through service visualization and easily share performance data with the Cloud Consumer. This sharing allows the enterprise to use the CSP-provided service visualization as well as incorporate it into its service management methodology, making the cloud service truly transparent.

"Smart" Clouds

Consider the current commoditized nature of data transport services which have led to the term "dumb" pipe. Essentially the CSP provides a conduit and it's up to the enterprise to use it effectively. More recently, as the CSP looks for ways to add value and offset declining margins, the application-aware network has taken precedence—allowing the CSP to provide insight on the use of the transport and thereby help the enterprise make better use of the resource.

Now consider an IaaS offering from a CSP acting as both Cloud Provider and Cloud Carrier. In this instance, an enterprise customer purchases computing resources for additional application capacity brought on by a large project involving an acquisition. At present, it may be enough to provide the compute resources with a defined SLA incorporating availability of the resources and the network as well as some network-level characteristics (QoS policing and bandwidth priority). The enterprise pays for its usage of the compute resource. As this type of activity becomes more widely adopted as market studies predict, the enterprise will want to better understand the effectiveness of this compute resource; perhaps it is using up compute capacity unnecessarily due to an application issue such as a memory leak. This scenario is analogous to the previous "dumb" pipe versus application-aware network in that the CSP is able to provide additional visibility to the enterprise so that the effectiveness of the cloud service can be easily managed by the enterprise and therefore making the cloud service "smart."

Benefits of Service Visualization

Drives Adoption

Providing service visualization to the Cloud Consumer directly addresses the enterprise's fear of loss of control and together with the ability to secure the enterprise's assets (both in-flight and at-rest), ensures a commensurate share of the cloud opportunity for the CSP.

Differentiates the CSP's Service

By providing on-demand service visibility to the Cloud Consumer, the CSP can use functions such as self-service, geographic views, performance events, contextual navigation and application visibility to differentiate both its Cloud Carrier and potential Cloud Provider services.

Creates Added Value

By providing additional information to the Cloud Consumer with respect to service usage and capacity the CSP enables "Smart" clouds with higher value to the enterprise.

Increases Customer Intimacy

When the Cloud Consumer is able to see and interact with the cloud service and its components it is empowered to act on that information. This empowerment enables the enterprise to properly manage its cloud services and solidify the partnership with the CSP.

Improves Operational Efficiency

Enabling the CSP's internal operations and engineering to use the same information as the Cloud Consumer yet adapt the view to visualize the service the way they need helps to minimize operational costs. The savings come in terms of:

- removing duplicate data collection
- increasing MTTR
- working with the customer for problem resolution
- enabling proactive notification and management
- adapting to existing systems (fault, inventory, discovery)

Ensuring Successful Service Visualization

Bridging Network and IT Management Visibility

Using a unified view of the performance and availability of the whole service including network, compute, storage and application level visibility plus the linkage between application and network (e.g. flow-based analysis and DPI) helps pinpoint bottlenecks and performance degradation. This holistic view is essential for giving the Cloud Consumer a true "touch and feel" of the services through intuitive, graphical visualization of the service, its components and application dependency mapping.

CSP-focused Solution

The CSP and its operations are often unique in terms of scale, multi-tenancy and heterogeneous infrastructure. It is important to select a solution that understands the CSP business, its technologies and operations including the ability to collect, analyze and report on key network enablers such as IP/MPLS and Carrier Ethernet.

Rapid Adaptability

With the numerous combinations of cloud-based services within any of the cloud service models (IaaS, PaaS, SaaS), the ability to go from whiteboard to dashboard ensures that prospects can quickly experience the service as the CSP's sales teams rapidly configure specific demonstration scenarios. During roll-out the solution can be rapidly adapted to changing needs and service components and accelerate time to revenue.

Empowerment of the User

The solution should empower the CSP's subscriber by offering self-service customization, analysis and troubleshooting to increase customer intimacy, remove the fear of loss of control and optionally provide tiered offerings for increased revenue commensurate with the demonstrated value of the service that includes service visualization.

Open

Regardless of the future, the CSP has OSS and BSS investments in place and the solution needs to be able to easily adapt to and use the existing back-end such as fault management and inventory management. This openness must be configurable by the CSP or its agent and avoid lengthy development cycles, by using simple and well-defined APIs.

Enable Collaboration

The best solutions are those that enable people to work together and share what they've created inside and outside the department and the organization. The service visualization solution should enable Web-based access to information, reports and/or dashboards with interactive features as well as the ability to easily share data for use within other applications.

Understand Virtualization

The solution must include a service model that involves the combination of physical and virtual resources with the ability to easily abstract and configure those relationships; preferably by feeding it with data from external service catalogues and/or inventory systems.

Easily Extensible

Perhaps more frequent in cloud computing is the introduction of new technology, thus the visualization solution should have extensibility built into its core to easily adapt service models, add metrics, technologies and views.

Scale

The solution should be able to handle hundreds of thousands of instances in a multi-tenant architecture in terms of collection, storage and presentation of data to ensure security as well as optimize the cost of the solution. Additionally it should be able to easily grow in tandem with the CSP's investment and revenue. This factor is especially relevant with respect to cloud services which are often priced on a usage basis and therefore revenue becomes somewhat less predictable versus traditional telecom services.

Conclusion

Whether intentional or not, the CSP is entering the world of cloud computing. Even within the traditional role as Cloud Carrier, the market opportunity is substantial as is its growth. The CSP can choose to enhance its position within this opportunity by adopting additional roles such as Cloud Provider and the high-value role of Cloud Broker.

The CSP that chooses to adopt either the Provider (e.g. IaaS) or Broker role has an opportunity to address the needs of the enterprise perhaps better than other organizations in the market. By aligning its existing assets, the CSP is able to approach the number one adoption barrier for the enterprise—namely security; most especially for external private cloud services. The CSP arguably has the necessary trust in terms of the security barrier; however effectively addressing this barrier is not exclusive to the CSP. Where the CSP can truly differentiate, offering unique value to the enterprise, is with a unified service level guarantee that includes the critical network component along with service visualization to provide the service's touch and feel. Through service visualization the CSP can truly bridge the gap between network and IT giving the enterprise the necessary proof point for the service offering.

Furthermore, the enterprise is empowered to interact with its cloud service from network through infrastructure and up to the application. Such empowerment provides the highest probability of success for the enterprise's cloud services and further tightens the partnership between the enterprise and its CSP. By choosing a solution founded on Web 2.0 technology that is suited to the scale, diversity and multi-tenant operation of the CSP, as well as possessing alignment with respect to CSP core technologies such as IP/MPLS and Carrier Ethernet, the CSP can fully exercise its unique value proposition in the age of cloud computing and drive new and high-value revenue into its business.

About InfoVista

InfoVista enables managed service providers, mobile operators, broadband operators and enterprise IT organizations to ensure the availability and quality of the services they deliver at the lowest possible cost, empowering these organizations to successfully make the transformation from infrastructure providers to service providers. Our customers rely on InfoVista's proven solutions for service and infrastructure performance management to successfully launch new and high performance services, foresee potential service issues before they impact end users, reduce customer churn, and invest appropriately. Sample customers include Bell Canada, Bharti, BNP Paribas, Cable & Wireless, Citigroup, Deutsche Telekom, KPN International, Microsoft, SFR, SingTel, T-Mobile, Telefonica, Telstra, and Wells Fargo. InfoVista is traded on the Euronext Paris (FR0004031649) and can be found online at **www.infovista.com**.

For more information, please visit ***www.infovista.com***
For sales inquiries please email: ***marketing@infovista.com***

World and European Headquarters
InfoVista S.A.

6, rue de la Terre de Feu
91952 Courtaboeuf Cedex
Les Ulis, France
Tel +33 (0) 1 64 86 79 00
Fax +33 (0) 1 64 86 79 79

Americas Headquarters
InfoVista Corporation

12950 Worldgate Drive
Suite 250
Herndon, VA 20170
United States
Tel +1 703 435 2435
Fax +1 703 435 5122

Asia-Pacific Headquarters
InfoVista (Asia-Pacific) Pte Ltd

Block 750C, #03-16/17
Chai Chee Road
TechnoPark @ Chai Chee
Singapore 469003
Tel +65 6449 7641
Fax +65 6449 3054