The Adoption of IaaS – A Market Analysis

Introduction

Enterprises of all sizes are increasingly embracing the Cloud-based service model because it provides them with agility, self-service, on-demand access to a much richer range of services and applications at a lower cost than was traditionally available. One of the primary components of the overall Cloud-based services market is the Infrastructure-as-a-Service (IaaS) market. According to Gartner[1], the Cloud-based IaaS market will reach USD 10.5 billion in 2014.

The initial set of IaaS solutions that were brought to market by Cloud Service Providers (CSPs) were the basic compute and storage services that are necessary to run applications. However, the IaaS market is highly dynamic and IaaS providers are deploying myriad new services including:

- Disaster Recovery
- Virtual Private Data Centers
- High Performance Computing

The fact that IaaS is a new and rapidly evolving concept presents challenges for both IaaS providers and IT organizations. One of the key challenges facing IaaS providers is to understand the evolving requirements of the marketplace and to incorporate those requirements into their service offerings. One of the key challenges facing IT organizations is to understand how their plans to either develop IaaS solutions internally or to acquire them from an IaaS provider compare to the plans of other IT organizations. While it is always helpful for an IT organization to have insight into how its plans compare to those of the broader industry, that insight is particularly important in the current environment when so much change is occurring.

In order to help IaaS providers and IT organizations respond to the challenges described in the preceding paragraph, a survey was given to 171 IT professionals who work in an IT organization. Detail on the survey methodology is contained in the Appendix. Throughout this white paper, the IT professionals who completed the survey will be referred to as The Survey Respondents. In order to add context to the survey results, an enterprise architect for a multi-national, Fortune 50 company was interviewed. Throughout this white paper, the interviewee will be referred to as The Enterprise Architect.

Market Adoption

Because IaaS is a relatively new concept, it was not surprising that only a minority of The Survey Respondents indicated that their organization either provides IaaS solutions themselves or acquires them from a CSP. However, only 4% of The Survey Respondents indicated that they do not use Cloud-based IaaS solutions because their company has a policy that prohibits the use of those solutions.

[1] http://www.dejavutimes.com/business-technology/infrastructure/279-gartner-cloud-iaas-market-forecast-to-grow-to-usd-105-billion-in-2014-.html?sms_ss=twitter&at_xt=4db52179a7c48b23,0

Given the newness of IaaS combined with the growing interest in the topic, it was not surprising to see that roughly half of The Survey Respondents indicated that their IT organization was in the process of developing a strategy around both providing and acquiring IaaS services. This fact highlights what a critical time this is for both IaaS providers and IT organizations relative to the development and adoption of IaaS solutions.

The Survey Respondents were asked to indicate the IaaS services that their organization currently acquires from a CSP and the services that their organization will likely acquire from a CSP during the next year. Their responses are shown in Table 1.

	Currently Acquire	**Will Likely Acquire**
Storage	26.8%	16.9%
Computing	26.8%	9.2%
Virtual Private Data Center	17.6%	14.1%
Disaster Recovery	16.2%	21.8%
High Performance Computing	10.6%	9.9%

N = 142

Table 1: Current and Planned Adoption of IaaS Services

Because storage and computing were the initial set of IaaS services that were brought to market, it was not at all surprising to see that over a quarter of The Survey Respondents indicated that they currently used those services. After performing more detailed analysis, tt was also not surprising to see that small companies[2] are far more likely than large companies to make a broad use of IaaS services. In addition, given that high performance computing (HPC) is somewhat of a niche application, it was not surprising that there was relatively little interest in acquiring HPC from an IaaS supplier. It was, however, somewhat of a surprise to see the strong interest in both virtual private data center and disaster recovery services.

The Enterprise Architect says that his company uses Cloud-based IaaS solutions such as compute and storage services because he can get these services faster than they can be provisioned internally and that "You absolutely pay less for these services than you would if they were implemented internally." He added that another advantage of these services is that "If I don't want them in six months, I can get rid of them." When asked about the relative importance of cost savings vs. becoming more agile, The Enterprise Architect stated that, "They are both important, but agility is a bit more important."

Once his company has more experience with using basic compute and storage services provided by a CSP, The Enterprise Architect said that they would consider using services such a virtual private data center (VPDC). He doesn't expect, however, a wholesale adoption of VPDC because "It is difficult to make a business case to move a production application to a third party due to the overhead it takes and the fact that it often results in stranded capacity." He added that, "If we are deploying something new, it probably makes sense to do that in a VPDC."

[2] In this context, small companies have less than 1,000 employees and large companies have more than 10,000 employees.

Drivers and Inhibitors

In order to both assist IaaS providers to effectively evolve their services and to enable IT organizations to put their plans in the context of the broader marketplace, it is helpful to understand both the factors that are driving IT organizations to use IaaS solutions as well as the factors that are inhibiting IT organizations from either using those solutions or expanding their use of those solutions.

Drivers

The Survey Respondents were given a set of eleven factors and were asked to indicate the two factors that were the primary drivers of their organization's interest in using Cloud-based IaaS solutions. The responses of The Survey Respondents are shown in Table 2. In Table 2, the column on the right is labeled *Percentage of Respondents*. That column contains the percentage of The Survey Respondents that indicated that the factor in the left hand column of Table 2 was one of the two primary drivers of their organization's interest in using Cloud-based IaaS solutions.

Factor	Percentage of Respondents
Lower cost	30.4%
The ability to dynamically add capacity	30.4%
Reduce time to deploy new functionality	26.3%
Obtain functionality we are not able to provide ourselves	22.2%
Deploy more highly available solutions	19.3%
Free up resources	17.0%
Easier to justify OPEX than CAPEX	15.8%
Prefer to only pay for services that we use	14.0%
Satisfy temporary requirements	11.7%
Other	4.7%
Our strategy is to use IaaS providers wherever possible	4.1%
Leverage the security expertise of the provider	4.1%

N = 171

Table 2: Factors Driving the Adoption of IaaS Solutions

The conventional wisdom in the IT industry is that lower cost is the primary factor driving the adoption of Cloud-based IaaS solutions and that factors such as the ability to dynamically add new capacity, while important, are nowhere near as important. As the data in Table 2 highlights, the reality is that the ability to dynamically add new capacity is as important a driver of the adoption of Cloud-based IaaS solutions as is lowering cost. In addition, another very important driver of the adoption of Cloud-based IaaS solutions is the ability to reduce the time it takes to deploy new functionality. It is reasonable to look at the ability to dynamically add capacity and the ability to reduce the time it takes to deploy new functionality as two components of a single

factor – agility. Looked at this way, agility, not cost savings, is by a wide margin, the most important factor driving the adoption of Cloud-based IaaS solutions.

Inhibitors

The Survey Respondents were asked to indicate the two primary factors that limit their company's interest in using a Cloud-based IaaS solution. Those factors and the percentage of times that they were indicated by The Survey Respondents are shown in Table 3.

Factor	Public IaaS Solutions
We are concerned about the security and confidentiality of our data	57.9%
We don't see significant enough cost savings	24.0%
The lack of time and resources to sufficiently analyze the offerings and the providers	19.9%
Uncertainty about the provider living up to their promises	19.9%
We have concerns about the availability of the solutions	16.4%
Our lack of confidence in a shared infrastructure	15.2%
The lack of a meaningful SLA	14.6%
We don't believe that the gains in the agility of these solutions justifies the cost and/or the risk	11.7%
Our policy is to either limit or totally avoid using IaaS providers	8.8%
The provider is not capable of adding capacity in a dynamic enough fashion	4.7%

N = 171

Table 3: Inhibitors to the adoption of IaaS Solutions

One way to look at the data in Table 3 is that concerns about the security and confidentiality of data is by a wide margin the number one factor inhibiting the adoption of Cloud-based IaaS solutions; the lack of compelling cost savings is the second most important factor followed by a variety of factors, many of which have roughly the same importance.

A component of the concerns that IT organization have about security and confidentiality stems from the overall increase in the sophistication of hackers, For example, until relatively recently the majority of security attacks were caused by individual hackers, such as Kevin Mitnick, who served five years in prison in the late 1990s for computer- and communications-related hacking crimes. The goal of this class of hacker is usually to gain notoriety for themselves and they often relied on low-technology techniques such as dumpster diving.

However, over the last few years a new class of hacker has emerged and this new class of hacker has the ability in the current environment to rent a botnet or to develop their own R&D lab. This

new class includes crime families and hactivists such as Anonymous. In addition, some national governments now look to arm themselves with Cyber Warfare units and achieve their political aims via virtual rather physical means.

Another component of the concern that IT organizations have about security and confidentiality of their data stems from the fact that in most cases IT organization perceive that there is a higher security risk if their data is being stored on a device that is shared with other users which is tpically the case when an IT organization is using an IaaS solution. The security risk that is associated with all forms of cloud computing was discussed in IBM's X-Force 2011 Trend and Risk Report[3] that was published in March 2012. According to the IBM report, in 2011, there were many high profile cloud breaches affecting well-known organizations and large populations of their customers. IBM recommended that IT security staff should carefully consider which workloads are sent to third-party cloud providers and what should be kept in-house due to the sensitivity of data. The IBM X-Force report also noted that the most effective means for managing security in the cloud may be through Service Level Agreements (SLAs) and that IT organizations should pay careful consideration should be given to ownership, access management, governance and termination when crafting SLAs.

The Enterprise Architect stated that concerns over the security and confidentiality of data limit their use of IaaS solutions and that many of his company's international clients dictate the country in which their data must be stored and this also limits their use of IaaS solutions. He added that his organization is always concerned that a third party, whether that is an IaaS provider or a network services provider, will not live up to their promises. The way his company typically deals with those concerns is by having a good SLA and by having the ability to measure the service quality and hold the provider responsible.

The Survey Respondents were also asked to indicate the two primary factors that limit their company's interest in using internally provided IaaS solution. It was not surprising that concerns about the security and confidentiality of data is by a wide margin the number one factor inhibiting the adoption of Cloud-based IaaS solutions. What was surprising, however, was that contrary to the conventional wisdom, the security and confidentiality of data is also the primary factor that inhibits the adoption of private IaaS solutions. The five inhibitors to the adoption of private IaaS solutions that were indicated the most times by The Survey Respondents and the percentage of times that they were mentioned were:

- Concerns about the security and confidentiality of data (36.3%)
- Their lack of an internal strategy about IaaS (28.7%)
- Their lack of personnel to design and implement the solutions (25.7%)
- The relative immaturity of the technologies that would have to installed and managed (19.9%)
- The lack of significant enough cost savings (19.3%)

[3] X-Force 2011 Trend and Risk Report

The Role of Virtualized Network Services

One of the key results of both the survey and the interview with The Enterprise Architect is the criticality of IT organizations becoming more agile. The technology that has the greatest impact on increasing the agility of the IT organization is virtualization, of which server virtualization is the best example. While server virtualization is the most established form of virtualization, most IT organizations have also implemented storage virtualization. The component of IT that has been the slowest to virtualize is the network. If there was any doubt about the value of network virtualization, that doubt was erased in July 2012. In July 2012 VMware acquired Nicira, a start-up network virtualization vendor with little if any revenue, for just over $1.2 billion and Oracle acquired Xsigo for an undisclosed sum.

As previously mentioned, one of the key challenges facing IaaS providers is understanding the evolving requirements of the marketplace and incorporating those requirements into their service offerings. With that challenge in mind, The Survey Respondents were given a number of questions that related to the role that virtualized network services play in the evaluation and selection of Cloud-based IaaS services.

One of the questions contained a set of network services and The Survey Respondents were asked to indicate if they thought the network service should be part of a Cloud-based IaaS service and if they did, whether they preferred to manage the network service themselves or have the CSP manage it. The vast majority of The Survey Respondents (87%+) thought that each one of the network servcies listed in Table 4 should be part of a Cloud-based IaaS service. Columns two and three of Table 4 respectively contain the percentage of The Survey Respondents who prefer to manage the service themselves as well as the percentage of The Survey Respondents who prefer to have a CSP manage the service.

Network Service	Manage Ourselves	CSP Manage
Load Balancer	61.9%	38.1%
SSL Load Balancer	62.2%	37.8%
Firewall	81.4%	18.6%
WEB application firewall	68.5%	31.5%
IDS/IPS	64.1%	35.9%
VPN	70.2%	29.8%
WAN optimization	50.8%	49.2%

N = 171

Table 4: The Applicability and Management of Network Services

One obvious conclusion that can be drawn from the data in Table 4 is that there is a strong desire on the part of IT organizations to manage the security related network services that are part of an IaaS service. There is somewhat less interest on the part of IT organizations to manage the other network services and in the case of WAN optimization, the interest is evenly split.

The Enterprise Architect said that in most cases he wants to see network services such as load balancing, firewalls and IDS/IPS be part of an IaaS solution and that the importance of other

network services, such as WAN optimization, depends on the IaaS solution and how his company is using that solution. He added that before he would let an IaaS provider manage the network services he would have to feel comfortable with both their competency and their cost structure. In all cases, however, he would want a separate organization auditing the security of the overall IaaS solution.

Because IT organizations expect that Cloud-based IaaS services are supported by a wide range of network services, this raises the question, "When evaluating IaaS services, how carefully do IT organizations evaluate the associated network services?" To answer that question, The Survey Respondents were asked, "When your organization evaluates cloud services such as computing, storage and virtual private data centers, how carefully does your organization evaluate the enabling network services such as Load Balancer, SSL Load Balancer, Firewall?" Their answers are contained in Table 5.

How Careful	Percentage of Respondents
We don't evaluate them at all	8.6%
We look at them as a check-off item, but don't evaluate	10.0%
We pay some attention to them, but they are not a major component of the evaluation process	21.4%
They are a major component of the overall evaluation process	33.6%
They are a critical component of the overall evaluation process	26.4%

N = 171

Table 5: Importance of Network Services

The Enterprise Architect said that his organization pays some attention to network services when evaluating an IaaS solution, but they are not a major component of the evaluation process. His reasoning was that "Most load balancers have a lot of rich capabilities, but we don't use very many of them. To us, a load balancer is a load balancer."

The conventional wisdom in the IT industry is that network services, such as the ones listed in Table 5, are not that important a component of Cloud-based IaaS solutions. The survey data clearly refutes that belief as 60% of The Survey Respondents indicated that network services are either a major or a critical component of how they evaluate Cloud-based IaaS solutions.

Given the critical role that network services play in the evaluation of Cloud-based IaaS services, The Survey Respondents were asked to indicate the two most important criteria they look for when evaluating network services such as a Load Balancer, an SSL Load Balancer, or a Firewall, that enable cloud services. The criteria and the percentage of times that they were indicated by a survey respondent are shown in Table 6.

Criteria	Percentage of Respondents
A robust feature set similar to traditional	25.9%

networking equipment	
The ability to grow/shrink the capacity of the service on demand	23.8%
The ability to rapidly provision the network service; e.g., 5 minutes or less	21.1%
The ability to only pay for what we use	17.8%
A brand name vendor	6.3%
The ability to charge back to business units based on usage	5.1%

N = 171

Table 6: Criteria to Evaluate Networking Services

The conventional wisdom is that when IT organizations evaluate network services, that a name brand vendor is an important criterion. The data in Table 6 refutes that belief. The data in Table 6 highlights the fact that a robust feature set is the single most important criterion that IT organizations examine with evaluating networks services. However, another way to evaluate the data in Table 6 is based on the previous definition of agility[4]. Looked at this way, the data in Table 6 clearly indicates that the agility of network services is the most important criterion that IT organizations examine with evaluating networks services.

The Enterprise Architect said that a number of the criteria listed in Table 6 are important, but since his company currently makes very little use of sophisticated functionality when services such as load balancers are provided internally, they don't tend to be very concerned about a robust feature set when an IaaS provider offers those services. Also, while they do implement chargeback, it isn't done at a very granular level and so they don't need very granular data from their IaaS providers. The Enterprise Architect did elaborate on why agility is so important to his organization. He stated that in part because they are such a large company, often times the various organizations within the company don't communicate as well as they should and that "This sometimes results in a fire drill when we find out at the last minute that a major new application is being deployed or a large new office is coming online."

Summary

Over the last few years, cloud computing in general, and IaaS in particular, have become widely adopted and that adoption is expected to increase dramatically over the next several years. In addition to the adoption rate, what is also changing dramatically is the types of IaaS solutions being offered and the expectation that IT organizations have of those solutions, whether they provide those solutions internally or acquire them from a CSP.

For example, while the adoption of basic compute and storage services will continue to grow, they will not grow as rapidly as will virtual private data center and disaster recovery services. In addition, while cost savings will continue to drive the adoption of IaaS solutions, agility will be a bigger driver. Concerns over the security and confidentiality of data will remain the primary

[4] In this context, agility is the ability to dynamically add capacity and the ability to reduce the time it takes to deploy new functionality.

inhibitor of IaaS solutions, whether those solutions are provided internally by the IT organizations or they are acquired from a CSP.

On a going forward basis, IT organizations expect that a wide range of virtualized network services will be a part of IaaS solutions. The majority of IT organizations want to manage the security related network services themselves. There is less of a clear preference for who manages the other network services – the IT organization of the cloud service provider. In the majority of instances when IT organizations evaluate Cloud-based IaaS solutions, network services will either be a major or a critical component of that evaluation. When IT organizations evaluate network services, brand recognition has virtually no impact. In contrast, one of the key criteria that IT organizations use when evaluating network services is the robustness of the feature sets that they provide. The most important criterion, however, is the agility of those network services.

Appendix - Market Research

The survey was distributed to the subscribers of Webtorials during March 2012. In total, 295 people started the survey. There were 171 completions from professionals who work in IT organizations.

The survey respondents were given the following definition of Infrastructure-as-a-Service: Infrastructure-as-a-Service (IaaS) is the class of cloud computing solutions that focuses on components of IT such as compute, storage and networking and leverages enabling technologies such as virtualization and automation.