Ian Osborne

THE CLOUD MARKET PLACE

The word Cloud has its roots in the telecoms industry with cloud diagrams being used to represent networks. In the IT and computing industry, the term "Cloud Computing" is only six or seven years old. As computing has become commoditised, a large warehouse of general purpose computers, storage devices and networking equipment can now provide the infrastructure for almost any computing workload. Ian Osborne explains.

Cloud computing is a business model for delivering IT services from a data centre hosted somewhere on the Internet to end users located elsewhere on the Internet. Its advantages are a commodity approach to computing - accessing services on demand, paying only for what is used, and scaling up and down the resources as and when they are required.

There are several types of Cloud services. You can rent computing, storage and networking infrastructure. You can share the same software application with your own data stored centrally or locally and typically paying for the service by individual user. You can build your own platform services using tool-kits made available by service providers.

The adoption of Cloud computing has grown rapidly as functionality has improved, as reliability and dependability of services has become proven, and as the need to address increasingly large markets has rendered home-grown services infeasible. Most leaders in Cloud computing were not in existence 10 years ago. Google, Amazon, Salesforce, e-Bay and others have pioneered different parts of the Cloud ecosystem and now lead the marketplace in their respective areas.

CLOUD – THE BASICS

Cloud computing infrastructure comprises computers, storage systems and routers located in interconnected data centres. Data Centres commonly have multiple network access points with redundancy to assure continuity. This infrastructure supports three types of service. Software as a Service (SaaS), Infrastructure as a Service (IaaS), and Platform as a Service (PaaS).

SaaS Most people have now had experience of SaaS. For example, Hotmail is a Cloud-based email service, the data for which is stored somewhere in the World (an inbox "in the Cloud") although copies may be stored locally. Another example

is eBay, the auction site, which is a global network of servers each supporting key aspects of the business and all accessible from web interfaces on the sellers' and buyers' computers. Again the data is stored in the Cloud. For the SaaS model, the advantages of the Cloud (scalability -up or down- on-demand availability and usage-based payment), mean paying for a number of users, or documents stored, or downloaded and so on.

IaaS There are times when the demand for services from an organisation far exceeds the delivery capacity of its in-house systems. The IaaS model becomes extremely valuable when the users demanding the service rise a million times over a week and then dwindle back to a few thousand for the rest of the time. Businesses like Betfair and Comic Relief take full advantage of renting additional capacity in the Cloud during a major sporting event or charity campaign respectively, then revert back to lower levels of activity. Service assets (programmes and data) are uploaded to the Cloud service provider and scripts orchestrate the establishment of services as required by incoming user demand.

This is not the only use-case for IaaS. At the pragmatic level, it is very popular to acquire a smaller number of processors and upload storage for use in distributed search (e.g. an Hadoop[1] cluster looking for patterns in a data application). IaaS is also used to procure temporary processing capabilities to complement on-site capacity at busy times, described as Cloudbursting [1] and is also used to provide test environments during development. Examples of this sort of work are many, but the use of IaaS by the New York Times five years ago makes the point neatly. It was planning to scan the archive of physical papers and index the results to make them available on-line. The conventional approach would be to acquire and provision a physical server and software, a task that would take a few months at that time at a cost of several thousand dollars. Instead, Cloud services were used over a weekend at a cost of $450.

PaaS The notion of PaaS has been refining itself as new services are developed. At its most basic, it is about the tool-kit for service creation. Offerings include the types of provisioning and orchestration services made available by the leading vendors of IaaS, through to tools or service components made available in platforms offered by SaaS vendors. Force.com makes a good example to study at the application level. These systems allow the creation of services building on a platform of components, increasing the level of reuse and minimising the risks involved. The recent Cloud Foundry work at VMWare [2] is another good example. It is a tool-kit for developers allowing the incorporation of powerful features and components in the design and orchestration of new services and complies with the Open Standards and Open Source trend for custom build. Proprietary software solution vendors such as Oracle, SAP and Microsoft have their own equivalent offerings.

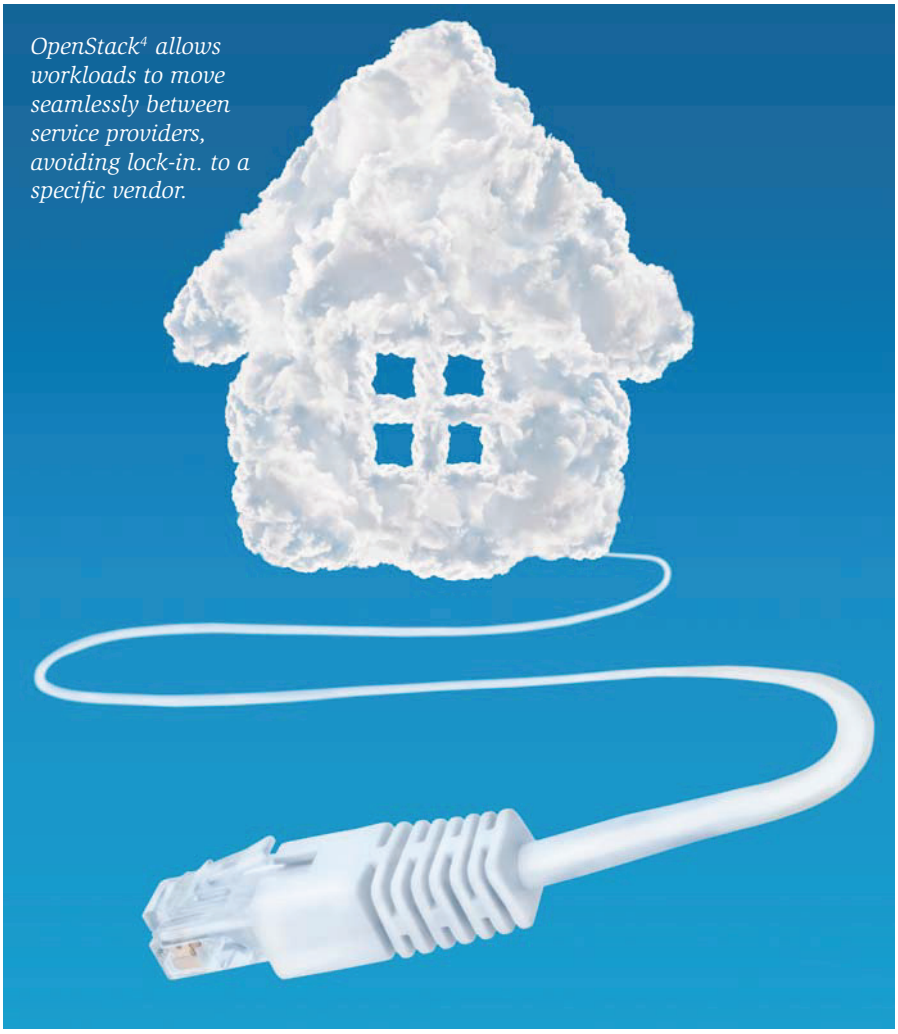
Finally, Cloud computing is really all about the business model of delivering IT as a service. In the telecoms world the opportunity to virtualise networks and provide businesses with their own network of devices/things is a direction to look for. The incorporation of the IP version 6 protocol (IPv6) will help facilitate this, each device having its own unique identity. *[**Editor's note:** For further insights into IPv6, turn to page 28 of this issue.]*

CLOUD @ PRESENT

Amazon Web Services (AWS) is a Cloud service provider business that was originally envisaged as a solution to the problem of how to cost-effectively cope with large peaks of activity, often seasonal. It led to the initial design of a scalable infrastructure, available on demand, orchestrated as services to support a business process. Today, AWS has a large proportion of the Cloud service business, including its own customer Amazon.com.

AWS's data centres and staff comply with the leading industry standards for security and its customer operations are treated as a black box in that there is no knowledge of what operations are being performed within the infrastructure. A telling point about the nature and strategic importance of the AWS business was noted by John Jenkins the Amazon.com Chief Information Officer (CIO) in 2011 after moving the whole of Amazon's business onto AWS infrastructure. His experience was that of moving from the classic 80:20 work ratio, spending most of his time keeping the lights on and ensuring sufficient capacity for business peaks, to a new regime where this only consumed 30% of his time, the remaining 70% being spent on introducing new services. These efficiency gains are hard to ignore (particularly by other Company Financial Officers) when they hit the press.

The days of operating on-premise data centres are numbered. For most businesses the use of information technology is essential but it is not a competitive advantage in itself. However, the ability to operate these systems effectively is more a function of staff and business processes. The use of Customer Relationship Management (CRM) systems which capture the history of interaction between a supplier and its customers is a perfect case in point. They are often used in sales teams, and the rise of Salesforce[2] as a power in the industry came precisely from that direction. Sales people signed up using their credit cards to capture customer data to support their sales objectives, independent of the company IT policy. However, it is vital to correctly enter and maintain records of customer interaction and this should take place consistently across the organisation. Hence the competitive advantage lies more with the staff and the business process than with any given software or solution adopted.



OpenStack[4] allows workloads to move seamlessly between service providers, avoiding lock-in. to a specific vendor.

Whilst AWS is the dominant supplier of infrastructure services today, there are alternatives. Google has opened up its global infrastructure to provide infrastructure and platform services to complement its SaaS offerings such as Gmail. Microsoft offers a wide range of services around its Windows Azure[3] Cloud platform allowing customers to operate locally on a machine, in a private data centre and in the public Cloud.

The most interesting competitive development is that at OpenStack[4]. This is a set of open standards that makes available an interoperable set of services, allowing a Cloud service customer to move workloads seamlessly between service providers. The major rationale for this move is to avoid "lock-in" to a specific vendor.

Another important aspect of this freedom to move workloads revolves around the ownership and custody of customer data. There are issues with porting data today. Firstly, standards support is limited and there is no legal framework. Secondly, some terms and conditions allow service providers to take ownership of the data and thus argue that it is their data. Reputable service providers will meet their customers' needs but this is important to clarify at the start. However, no assurances of data portability will guarantee that the functionality of the recipient system will be equivalent. So,caveat emptor; chose carefully when starting on this journey.

CLOUD – THE FUTURESTANDARDS

Although the computing industry took Cloud computing to its heart, the user community, led by the CIO, has been understandably cautious. Their responsibilities are to the business and the stewardship of business assets. The idea that they would shed these assets, to be held off-premise

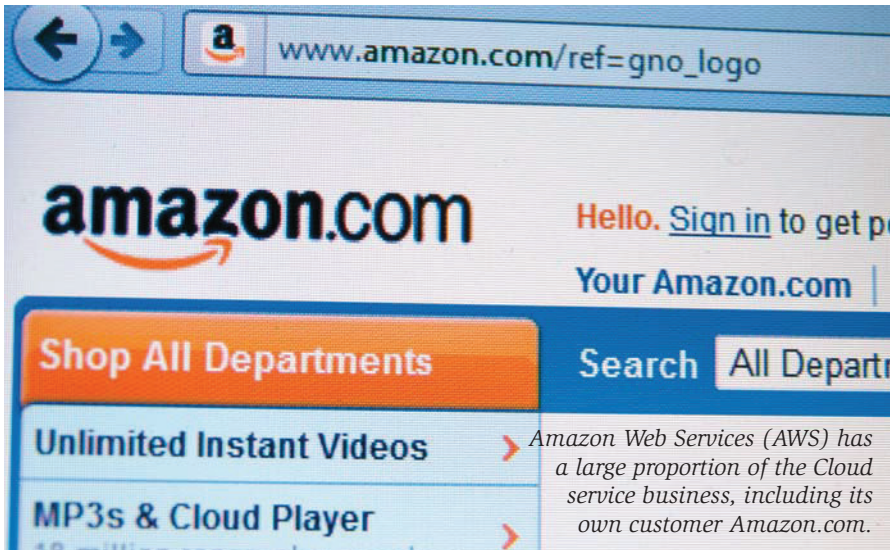
with no guarantees of security or control, is understandably worrying. More worrying is the fact that people in their business with access to the Internet and a credit card have been conducting IT procurement by purchasing Cloud services without their involvement. One way of regaining some measure of control is by demanding higher standards and compliance among their prospective supplier community.

These concerns have led to an explosion of standards development starting at the National Institute of Science and Technology in Washington DC where the original Cloud models were described. The International Standards Organisation and the International Telecommunications Union conveniently combined their efforts for Cloud and a reference architecture and taxonomy for Cloud computing is now out for vote. This complements the well-accepted International Standards Organisation standards related to information and service management both of which have been recently extended to cover Cloud computing requirements.

The World Wide Web Consortium has for some time been putting pieces of standard into the mix and now several other standards bodies have upped their game with more pieces of the standards pie. At the more pragmatic end, the Cloud Industry Forum[5] in the UK has introduced a code of practice for Cloud service providers aimed at raising professionalism and trust at the small and medium enterprise end of the business.

A key challenge is to provide well-reasoned, practical and timely standards. However, standards can be two to five years in the making followed by a two to three-year software development cycle. In the fast-moving software world, standards, open or not, cannot keep up. The goal of avoiding lock-in for interoperability and/or portability reasons cannot be assured at present. Contractual terms and conditions may apparently secure these, although the reality of the services provided may not.

Other areas where standards are vitally important are security and sovereignty. Security relates to the measures taken to secure customer data off-premises. Sovereignty relates to where the data is physically secured. The UK Data Protection Act sets the tone today for these concerns. CIOs need to understand this, and any other regulatory requirements, as they seek to identify their Cloud service needs. The supplier community also need to ensure they understand these requirements and that they can comply with them in advance. A Cloud-based infrastructure is often global and without properly conceived constraints it may well breach the laws involved by default.



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ENERGY EFFICIENCY

It is often simply assumed that operating at scale in the Cloud is automatically more efficient and thus reduces the demand for energy. This may be the case but there are several variables to consider before accepting a Cloud service on this basis.

Firstly, where is the data centre located? If it is remote and if data has to be transferred on a regular basis, it may negate the impact of shared services reducing energy during execution by incurring extra costs for data transfer.

Secondly, are servers and other devices shared across customers in the data centre? If so, then the number of servers in use will be fewer and therefore more efficiently used than if not shared.

Thirdly, how efficient is the data centre operation? The standard today is for natural air ventilation and minimal power backup capabilities. Software is used to create resilience, not hardware, minimising the need for expensive air conditioning. A useful indicator is the Power Usage Efficiency [3] metric which is a ratio between the total amount of energy supplied and that employed in delivering computing services. If a service provider operates at optimum efficiency and at scale, then it is very unlikely that a customer could compete with their own data centre.

GOVERNMENT INITIATIVES

The European Cloud Strategy [4] has been an important talking point in the past 12 months. Whilst the UK Government seized the initiative with the introduction of its G-Cloud Programme [5], Cloudstore6 as a Cloud service catalogue, and the Government Digital Service7 as a standard for service presentation, the rest of Europe has now woken up to the potential of Cloud and developed a strategy to encourage adoption. The three elements of the European Cloud Strategy are:

1. Cutting through the jungle of standards: What standards are required to meet public sector requirements?
2. Safe and fair contract terms: How can the one-sided terms and conditions on offer to "consumers" today be improved to meet the reasonable requirements of consumers?
3. European Cloud Partnership: What are the requirements of European public sector organisations?

A steering group for this overall initiative has been established by the European Commission and a €10mn project [6] is exploring this area further. The key issue is whether the Commission should set

the rules and standards required, or whether the market will remain free to innovate within the bounds of the applicable laws.

CHALLENGES AND OPPORTUNITIES

The frontier of Cloud computing is still relatively fragile. Whilst there are some world-leading services and service providers, performance standards are not consistent and the standards to assure portability, etc. are not yet fully in place. Also, whilst there is widespread adoption of commodity Cloud services (e.g. email, shared CRM, storage and back-up), there are practical boundaries at the upper end of transaction processing, such as the requirement to provide a certified secure service for banking or legal transactions or for truly confidential client services, where secure on-premise storage management is essential. Companies, therefore, will continue to mix-and-match their Cloud and private services for some time to come with firewalls and physical walls as appropriate. But eventually, industry experience, improving standards and the relatively low cost of commodity infrastructure will bring these barriers down too. After all, there was a time when energy security meant having your own steam engine or water mill! Journal

AUTHOR'S CONCLUSIONS

The promise of Cloud computing is really the promise of outsourcing services that change the way the organisation delivers so that services required for business, but not "core" to the business, may be obtained from commodity service providers. In his book, *Understanding Organisations* [7], Charles Handy wrote of the clover leaf organisation which is divided into three. One leaf features the core contributors to the business; they have the strategy, the market intimacy and key business understanding to create value. The second leaf implements the vision into high level designs and processes for delivering value; their strength is the execution of the strategy, but not necessarily the core value delivered. The third leaf is the commodity services that enable the implementation and coordination of the company. These are common to all businesses and therefore not differentiators.

Today the Cloud is focused on the third leaf - commodity services often delivered at lower total cost than an owned alternative. Tomorrow, the specialist services of the second leaf will be available as Cloud services to smooth the path of execution. This will leave those at the heart of the business, the first leaf, with the levers and pulleys to implement their visions in a much quicker and potentially cheaper manner.

FOOTNOTES

[1] See http://hadoop.apache.org/
[2] See https://www.salesforce.com/uk/
[3] See http://www.windowsazure.com
[4] See http://www.openstack.org/
[5] See http://www.cloudindustryforum.org/
[6] See http://gcloud.civilservice.gov.uk/cloudstore/
[7] See http://digital.cabinetoffice.gov.uk/

ABBREVIATIONS

AWS	Amazon Web Services
CRM	Customer Relationship Management
IaaS	Infrastructure as a Service
PaaS	Platform as a Service
SaaS	Software as a Service

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