Cloudburst

Beyond the hype of the cloud

October 2009

Contents

1

Executive summary

As trends in enterprise IT go, the cloud has grown as dramtically as the very best. An idea that originated in the 1960s, it began to be taken seriously in the late 1990s. Since then, its growth has been stellar – or has it?

This paper seeks to help CIOs make decisions about their use of the cloud in the future by first looking back at the past. It draws together a brief history of the cloud, reflecting the confusing and evolving mixture of terminology, concepts and uses of the cloud that are routinely bandied about by the industry. It uses this historical perspective to look at the hype that has surrounded the cloud in recent years, and examines what the cloud can actually deliver for an enterprise.

The paper explores virtualisation, as the emergence of the virtualised data centre is a central plank in the enterprise cloud services model. Critically, it takes a step by step look at the decision-making process a CIO must use when considering how their enterprise can harness the benefits the cloud has to offer.

2

A brief history of the cloud

From lone idea to pervasive power

Cloud services are discussed in glowing terms by commentators alongside related concepts like grid and utility computing, application service provision and software as a service (SaaS). But a clear understanding of how these terms relate to one another requires reflection on the history of networked IT.

The underpinning concept of delivering computing resources through a global network has its origins in the computing revolution of the 1960s.

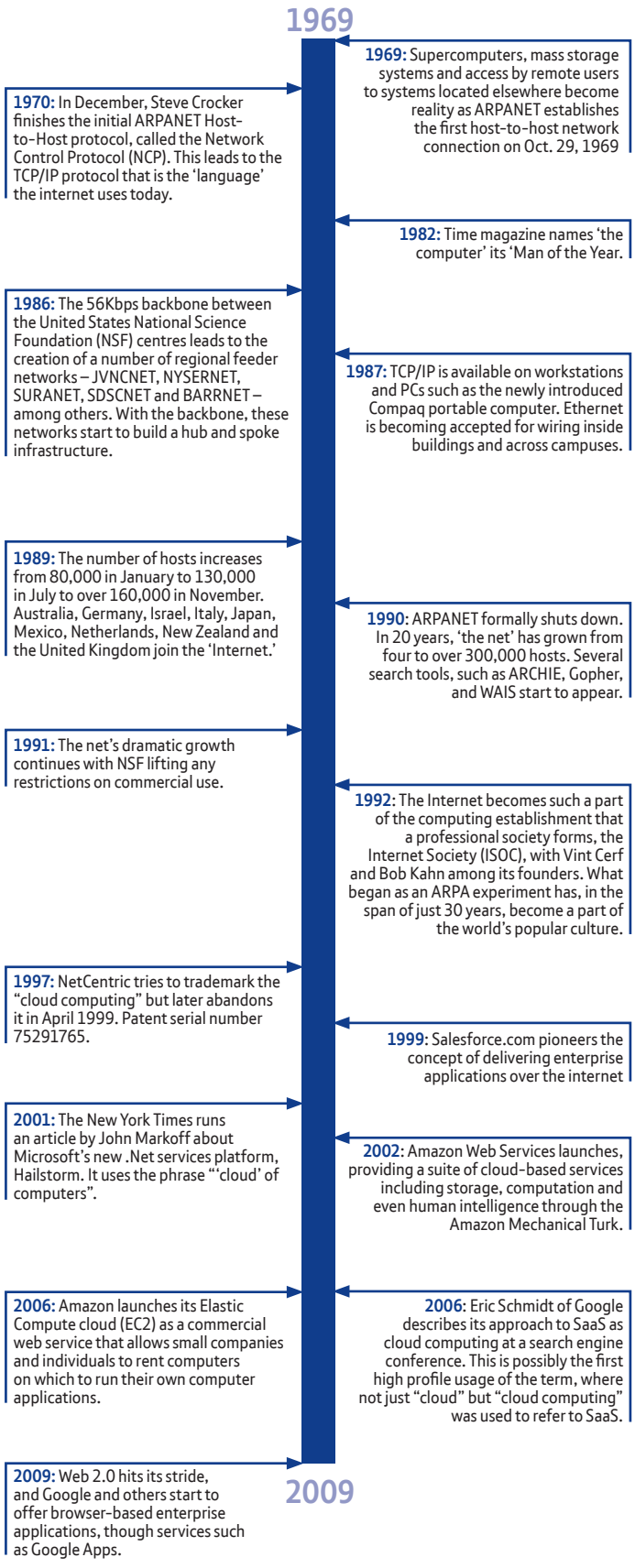
The idea of an "intergalactic computer network" was introduced in the 1960s by Joseph Carl Robnett Licklider, who was responsible for enabling the development of ARPANET (Advanced Research Projects Agency Network) in 1969.

Licklider's vision was for everyone in the world to be interconnected, accessing programs, services and data anytime, anywhere – a vision that began, years later, to become real with the advent of the internet and a vision that is essentially the same as what we now call the cloud.

Only once the internet began to offer significant bandwidth in the 1990s, however, did the cloud become a notion that was taken seriously by investors and enterprises as being viable and beneficial to people and business.

From 'the grid' to 'the cloud'

Before the 1990s, computers were clustered together to form a single larger computer. This was a technique common to the industry, and used by many IT departments. It allowed you to configure computers to talk with each other using specially designed protocols to balance the computational load across the machines. As a user, you didn't care about which CPU ran your program, and the cluster management software ensured that the "best" CPU at that time was used to run the code.



2

In the early 1990s Ian Foster and Carl Kesselman came up with a new concept: 'the grid'. The analogy used was of the electricity grid where users could plug into the grid and use a metered utility service. If companies could access a third party electricity supply rather than have to generate their own power, why couldn't the same apply to computing resources? Plug into a grid of computers and pay for what you use.

There were obstacles to this idea. Storage, security and data movement were chief among the concerns that held enterprises back from becoming potential customers. Businesses, understandably, wanted (and want, to this day) to feel assured that whoever was storing and handling their critical data knew just what impact any problem or change would have on their shareholders.

Even as providers sought to address these concerns, the idea of 'the grid' was evolving into the service offering space, to become 'the cloud'. In its initial, earliest sense, this took the concept of grid computing and wrapped it up in a service offered from data centres. Data and applications would be hosted in a data centre and accessed on a pay per use basis.

Reality check

The emergence of 'killer apps' became the most important contribution to the cloud. When companies like Amazon and Google began offering services in a way that was reliable and easy to consume, the knock-on effect to the industry as a whole was a wider general acceptance of online services. In recent years, adoption of these services has been boosted by the development of high-speed bandwidth and universal software interoperability standards, and the hype machine has become hard to suppress.

We have been told that we can only begin to **imagine** the scope and reach of the cloud. We are told by the media that 'cloud computing is changing the world'[1], that cloud computing is a 'paradigm shift'[2] – even that 'cloud computing is the new black'[3].

But those initial concerns, such as security and reliability, remain.

In recent years, we've seen the London Stock Exchange fail, undersea data cables cut in the Gulf, espionage in Lithuania and the failure of the most modern and well-known data farm at Amazon.

For all of the hype surrounding the cloud, there has always been a large element of the unknown involved for the enterprise. It takes, to some degree, a leap of faith to find solid footing in the cloud for mission critical applications. And leaps of faith do not come easily to businesses.

Gartner's latest 'Hype Cycle' describes the level of hype around cloud computing as "deafening."[4]

According to Jackie Fenn, vice president and Gartner Fellow, and co-author of the book "Mastering the Hype Cycle" (published by Harvard Business Press), "Technologies at the Peak of Inflated Expectations during 2009 include cloud computing, e-books and Internet TV, while social software and microblogging sites have tipped over the peak and will soon experience disillusionment among enterprise users."[5]

So, is it 'cloudburst' time? Or will bursting the hype provide the reality check that cloud services need to shift from conceptual benefits to tangible rewards?

1. Businessweek, August 2008
2. CNET, December 2008
3. CNET, August 2008
4. Gartner, Inc. "Hype Cycle for Emerging Technologies" by Jackie Fenn et al, 21 July 2009
5. Gartner, Inc. Press Release, "Gartner's 2009 Hype Cycle Special Report Evaluates Maturity of 1,650 Technologies", 11 August 2009

3

What is the cloud?

As a metaphor for the internet, 'the cloud' is familiar, but when combined with 'computing', as it often is, the meaning gets fuzzier. In its simplest formulation, the cloud is a way of consuming services that have traditionally been run on infrastructure that a business owns and houses on its premises. In the cloud environment, infrastructure, platform, software or processes are delivered via external network access, for example, over the internet. The service – let's say, storage capacity or a CRM program – is housed in the cloud, operated and maintained by a third-party provider, but available to customers who buy the right to use it.

Specifically, **cloud-based services can be categorised as either infrastructure as a service, platform as a service**, software as a service, or business process utility as a service. What this means for a CIO will be explored in more detail on page 12.

At an enterprise level, this can be conceptually daunting, but anyone who has ever used any form of webmail, such as Hotmail or Gmail, is already familiar with the basic premise of a service being hosted in an unknown environment. With webmail, the data is being stored and processed somewhere far away from the terminal that you sit at to access your messages.

The cloud is all about **renting** services as opposed to **buying** them. It has the potential to replace the need for major investment in IT infrastructure to run high-end applications for businesses around the world.

Note the word, 'potential'. This is the word that haunts the cloud. Until potential is converted to tangible benefits, the accusation of hype will always threaten to undermine the argument for the cloud.

Sifting through the hype

Fashion dictates that 'cloud is the new black' for the networked IT services industry. The hype behind the cloud – regardless of whether there is substance behind the claims – has, however, become so great that it has become a collective noun for 'anything-as-a-service', in a mix of public and private environments.

One of the most common mistakes in discussing the cloud and its benefits and risks is to think of it as only 'the internet'. There are in fact a range of cloud environments that can be used by the enterprise. The critical thing is deciding which type of service (and therefore business process) should be delivered by which type of cloud service.

Cloud economics dictate lower costs and this is arguably its biggest attraction. But lifting the lid on what's really on offer can expose issues, such as where data is stored or applications are executed, and provide little or a minimal guarantee of service. As international businesses are often bound by law to retain data on their premises and sometimes within country boundary, many are quick to dismiss the cloud.

But cloud environments are emerging that can assure where data and applications are based and which borders are crossed in the delivery of a service. Many businesses that BT Global Services talks to prefer a Private Cloud, where we transform their existing IT estate to act like a cloud environment.

Most current cloud offerings assume the customer is happy to trade off reasonable service levels on data security and availability, in order to capitalise on the potential technology (both hardware and software) and people available to them elastically. This is far greater than they could afford individually, so they are generally prepared to accept the risks.

3

This is an accepted model because it rarely fails – just like the internet. For example, Google has suffered a very small number of outages in the past year, and guarantees 99.9% service uptime to enterprise customers using its Gmail service, or else it suffers penalties[6]. Although everyone is aware that it '**might** go down', the probability of it doing so at any given moment is so low that a high level of confidence builds up.

The more complex an application environment, however – the more important the data and the larger the exposure to litigation – the more of today's cloud offerings are ruled out. These issues currently represent the main basic barriers to adoption. They are the brakes being applied to the hyped-up claims about the cloud at an enterprise level. They are threatening to burst the cloud.

This paper aims to offer some clarity on what the cloud **is**, what it can palpably deliver, now, and what it will almost certainly deliver in the near future.

What the analysts say:

The "five attributes of cloud computing"

According to Gartner, the five attributes of cloud computing are:

1. **Service-Based**: Consumer concerns are abstracted from provider concerns through service interfaces that are well-defined.
2. **Scalable and Elastic**: The service can scale capacity up or down as the consumer demands at the speed of full automation (which may be seconds for some services and hours for others).
3. **Shared**: Services share a pool of resources to build economies of scale.
4. **Metered by Use**: Services are tracked with usage metrics to enable multiple payment models.
5. **Uses Internet Technologies**: The service is delivered using Internet identifiers, formats and protocols, such as URLs, HTTP, IP and representational state transfer Web-oriented architecture.

"When approaching cloud computing, providers of cloud services and potential consumers of cloud services must examine the attributes of cloud computing to determine whether their services will deliver the expected outcomes."

Daryl Plummer,
managing vice president and Chief Gartner Fellow

Source: Gartner, Inc. Press Release, "Gartner Highlights Five Attributes of Cloud Computing", 23 June 2009

6. See http://www.informationweek.com/news/internet/google/showArticle.jhtml?articleID=219501181

4

Your choice right now: feet on the ground or head in the cloud?

Whether you believe the hype or not, five key trends **will** hasten the adoption of web-based applications and cloud services:

1. **Consumer innovation setting the pace**. Before broadband became ubiquitous in people's homes, the most innovative technologies could be found at work. With improved connectivity and less expensive hardware, however, most innovation occurs first in the consumer space. Businesses now have to catch up and show they too understand the needs of the end user.
2. **Advent of power collaboration**. Cloud services will allow for users to collaborate in real time and must be agnostic toward operating systems and other core pieces of technology. People won't care what operating system they're on. They should access an app on any platform or device.
3. **New economics of scale for IT**. If you accept the fact that the majority of services and software will move to the cloud someday, then you need to prepare for massive scalability challenges to host all the data. Google, which has been building data centres all over the world, has been preparing for this reality. If you had unlimited scalability, what projects would you be doing that you're not doing today?
4. **The innovation imperative**. In a global economy, the quest to be more innovative, to get new ideas to market faster and to use technology to speed up results is a major driver behind the cloud, which offers robust services, at lower cost, when and wherever it is needed.
5. **The need to use less energy**. The goal to reduce the energy used by IT gains traction daily as costs and concerns over carbon emissions increase. Cloud services use IT resources more efficiently, reducing the amount of power needed to run data centres. Excess computing power is put to use, rather than being powered on, using energy, but remaining idle. By pooling resources, cloud services scale up or down, saving energy and operating costs.

Can you believe the research?

There is a whole host of research on the web claiming to reveal how businesses see the cloud and its prospective benefits. The problem is, much of this research conflicts.

One survey by consulting company Information Technology Intelligence Corp. revealed that 38 per cent of respondents said they were unsure about adopting cloud services and another 47 percent said they won't consider the cloud in the next 12 months. Compare that to a study by vendor F5 Networks, in which 82 per cent of respondents said they are in some stage of trial, implementation or use of public clouds, and a like number said the same about private clouds.

A recent CIO.com survey shows scepticism about the cloud is growing along with awareness and interest. Only eight per cent of respondents said they were implementing cloud services, though 60 per cent said they were "actively researching" or at least had the cloud on their radar. Some 29 per cent had no interest in the cloud.

4

The need to use less energy: the path to virtualisation

Our thirst for data is growing at a ferocious pace. Take the case of spreadsheets, presentations and other documents. We continue to create them, but rarely delete them. Yes, we may archive them but while this removes them from individual computers, it doesn't reduce the overall data demands of the organisation. Then consider relatively new types of file – chiefly, audio and video files. It's not just young people downloading music files or their favourite TV shows. Video and audio files are enjoying increasing usage in the business world too. CEOs are issuing motivational statements or corporate updates to employees via vodcasts. CFOs and their teams are making financial statements available via live audiocasts and downloadable podcasts.

So data centres are under more strain than ever before. And demand will only increase in the years ahead – data-hungry organisations will only become hungrier. Unchecked, this promises to throw up some unwelcome economic and environmental side effects.

The common approach to the management of data centres has always been to compact the maximum computing power into the minimum space. But the latest high density servers are, on the whole, power-intensive. They also generate heat. So as well as the energy required running the data centres, you must generate the power needed to keep them cool. In combination this has the potential to add up to a dizzying level of energy consumption. Worse, it has the potential to bring businesses to their knees. Even back in 2006, analysts were reporting that the ever-increasing demands on the data centre would lead to 50 per cent of data centres having insufficient cooling capacity by 2008[7].

This scenario did not, of course, come to pass – largely because data centre providers realised the scale of the problem and began urgently to tackle the situation. Technologies were sought and systems developed to make a difference – both in order to prevent commercial disaster and to alleviate environmental impact.

The first four steps to progress were fairly straightforward:

1. Power your data centre with renewable energy

Just as in the domestic market, 'green' energy contracts are available to enterprises. Prices have grown increasingly competitive, an inevitable blip due to the global recession notwithstanding. For example, by partnering with npower and British Gas in one of the largest green energy deals in the world, BT Group saved the equivalent amount of carbon that is generated by 300,000 households in the UK through one of the largest green energy deals in the world.[8]

2. Fresh air cooling

The cooling needs of data centres are often enormous, which are an energy drain in themselves. Some new-build data centres are now able to channel the air that circulates outside the building into the data centre to help keep temperatures at an optimal level.

3. AC to DC

Computers operate over a range of DC voltages, yet power is delivered from utilities in the form of AC voltages, and at higher voltage levels than required within the computer. Converting this current requires power supply units. Switching from AC to DC immediately reduces power consumption.

7. Gartner Inc. Press Release, "Gartner Says 50 Percent of Data Centers Will Have Insufficient Power and Cooling Capacity by 2008". 29 November 2006

4

4. Multi-core processors

One of the new-wave of solutions to the green data centre issue. Multicore processors combine two or more processors into a single package. This means companies can consolidate many small servers on to fewer, more powerful systems and thus cut power consumption and energy spend.

But a fifth technological evolution has been cited as having the potential dramatically to reduce costs and carbon emissions: **virtualisation through cloud computing**. Is this just another case of cloud hype?

Illustration: Comparison of emissions for a typical 200-server Windows estate

This illustrative comparison shows the major impact virtualisation and data centre energy efficiency can make to CO_2 emissions.

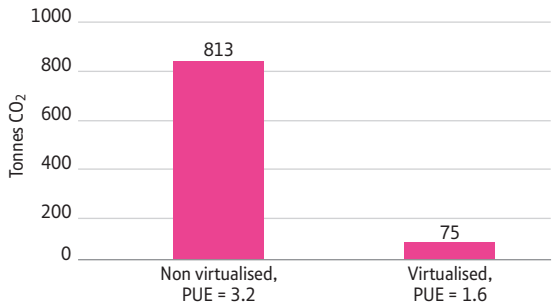
1. Impact of virtualisation
- Non virtualised: 130KW (~610 tonnes CO_2)
- Virtualised: 24-50KW (~112 – 130 tonnes CO_2)
- Virtualisation can reduce power consumption by between 66% and 82%

(Assumption: Average data centre Power Usage Efficiency* of 2.4)

2. Impact of data centre efficiency
- The difference in energy consumption between an inefficient data centre and an efficient one can be as much as 50%

(Assumption: PUE range from 3.2 to 1.6)

3. Combined impact:
Best and worst-case CO_2 emission scenarios



- Potential energy saving/CO_2 saving ~91%

* Note: PUE is the industry standard energy efficiency measure for data centres

Source: BT

8. At the time of writing, the UK Government was consulting on how UK organisations should measure and report their greenhouse gas emissions, in line with the Climate Change Act, and this could have some impact on how companies account for emissions from the purchase of green tariffs. For more information, visit: http://www.defra.gov.uk/corporate/consult/greenhouse-gas/index.htm

5

Virtualisation

A way for the cloud to transform the enterprise?

For years, virtualisation has promised improved utilisation rates for data storage, more effective distribution of network services, more efficient use of computing resources and thereby reduced costs. It would be easy to dismiss much of this as more hype. Two things, however, make virtualisation a genuine contender for an enterprise-transforming technology:

1. the demand for storage has rocketed and continues to expand exponentially
2. the technology itself has improved immeasurably and is affecting change right now

Virtualisation enables flexible and agile use of resources. Because the service being virtualised sits in 'the cloud' rather than on physical infrastructure on your premises, services can be provided quickly and can be scaled up or down as demand rises and falls. This means that enterprises can reduce costs, deliver services to and change services for their customers more rapidly.

Virtualisation for the data centre

Applying virtualisation to the data centre ensures idle resources are used more effectively and efficiently. Take the example of ten servers being used at just ten per cent of their individual capacities. Virtualisation can focus usage onto a single server, so that one server is being used to its full potential, while the others are not used, saving power. Saving power, of course, results in lower carbon emissions and lower costs. BT has made some headway in this field. Its main project in this area to date reduced a 1500-server data centre down to just over 100, saving £600,000 per year.

As the technology develops, it is anticipated that these techniques will continue to improve, multiplying the economic and environmental benefits. Ultimately, data centre managers will have an at-a-glance understanding of all the bandwidth, storage, memory and processing resources available to them across the entire data centre.

Virtualisation is also being automated. Much of today's scheduling is done by administrators. But by removing the need for high levels of hands-on human management and monitoring, data centres can be easily sited at locations where power is cheaper, and the climate cooler – both ways of saving money and reducing energy use.

The outlook for the future is encouraging. Just as developments in technology caused the problem of unsustainable data centres, so too might they eventually solve it.

6

Cloud Services: The CIO Decision Making Process

How much are the promises of virtualisation and the cloud realistically able to meet the demands of enterprise CIOs? Moving to the cloud is not a decision that can be taken lightly. For the 60 per cent of CIOs[9] who are actively researching cloud computing, or have it on their radar, the first thing they must consider in detail relates to the characteristics of cloud services, and how these will impact the enterprise.

Decision 1:

Will my organisation benefit from the characteristics of the cloud?

A comprehensive set of questions needs to be devised that are relevant to an individual enterprise, to examine the suitability of the cloud for that business. The questions to be asked can be grouped into four areas, based on the four key attributes of cloud services:

Attribute	Example questions the CIO needs to ask
Pay as you use	Do we want IT infrastructure to be an operational expense, rather than a capital expense? Can we account for costs that change according to monthly demand?
Elastic	Do we have a business model that may require the fast up – or down-scaling of IT capacity? If our requirements are steady, can we make the expected cost savings through cloud services?
Contract term length	Are we happy to deal with contracts of hours, days or months, rather than far longer fixed-term contracts? Do we have legal or procurement policies suited to buying in cloud services?
Consumed via an online interface (either a web portal or API)	Are we comfortable consuming this service through a technology portal, without human intervention? Are we trained and do we have the systems ready to buy in capacity on a monthly basis?

Decision 1: If CIOs can answer 'yes' to a comprehensive set of questions such as these, they should then consider what cloud services they need

Decision 2:

Are we clear what cloud services we will consume?

The cloud describes a way of consuming a service in one of four categories:

1. Infrastructure-as-a-service
2. Platform-as-a-service
3. Software-as-a-service
4. Business process utility-as-a-service

What CIOs select as a service, which will depend in part on how much of a function they are prepared to impart to a trusted third party, makes a huge difference to potential outcomes such as service availability and return on investment. The potential for delivering business impacts can be described like this:

Cloud service	Example: How the CIO would use the service	Potential business benefits	Potential business threats
Infrastructure	Rent virtual servers, disk space, network equipment and data centre resources, rather than investing in your own	Eradicates capital expenditure on server equipment; can have a positive environmental impact	Loss of strategic control over equipment investment programme; loss of direct control over service level
Platform	Rent infrastructure as well as operating system and application resources required to perform your business	As above, and also eradicates maintenance of applications and operating system upgrades; speed of development can be improved	Platform may be inflexible with respect to changing enterprise requirements; the ability to switch service provider could be impaired

9. Source: http://www.computerworld.com/s/article/9137166/Cloud_Hype_Peaks_But_IT_Concerns_Increase

6

Cloud service	Example: How the CIO would use the service	Potential business benefits	Potential business threats
Software	Rent applications on a pay-as-you-use basis	Allows immediate up – and down-scaling of operations based on key applications; service level moves from infrastructure to application	Software upgrades may have a disruptive impact on customers and suppliers, or may not be available; latency may be an issue
Business process utility	Pay for the delivery of a business process, rather than for hardware or software	Focuses on business delivery rather than IT delivery; can improve performance and cost control	Risk of project creep if initial scope is not thought through; not suitable for core business processes

Decision 2: If the CIOs have conducted a comprehensive analysis and are clear on the best approach for their enterprise, they should then consider the cultural impact of moving to the cloud

Decision 3:

How will we need to adapt as a business to benefit from the cloud?

CIOs need to take into account cultural and legal issues and the suitability of their organisational policies for services delivered via the cloud. Each enterprise will require its own analysis, but the questions that need to be asked can be grouped into three key areas:

Cultural or legal issue	Example questions the CIO needs to ask
Internal attitudes	Will the board agree to our putting mission-critical data and applications outside the direct control of the enterprise? Will end users welcome the change and the experience they get, whether this is better or worse than previously?
External attitudes	Is there any risk that this could become an issue with customers? Are there regulatory restrictions on how and where we can store and manage the data we use as a business?
Security issues	If our data was made public in error, could this threaten the survival of our business? Can we be sure our service will be treated as a priority in the case of an attack on the network?

Decision 3: If CIOs have taken all necessary steps to prepare the business both internally and externally for the move to the cloud, and the security implications are within the bounds of acceptability, then they are ready to move to the cloud

7

The future

As the marketplace becomes more sophisticated thanks to the exponential growth of cloud providers, the notion of entering the cloud will become outdated, and the more appropriate questions will become 'which services should I use?', 'who should I buy them from?' and 'can I get multiple services through a single broker?'

This more sophisticated view of the cloud presents complex problems, because different cloud services may have different characteristics, and stability could be jeopardised by attempting to move from one to another, or by running a service across multiple domains. What becomes fundamentally more important is a system that allows you to manage multiple services over multiple domains, such as a business rule management system (BRMS).

In this context, a service provider offering these capabilities allows a CIO to work with multiple vendors and services, and combine them to provide a bespoke service based on business requirements.

Using a BRMS, the different aspects of the cloud can be brought together and offered with higher service levels than could even be offered by the individual cloud providers themselves. The system will spot when these systems were reaching limits and can switch to alternatives as needed to maintain the service.

8

First steps into the cloud

There are two main approaches to adopting cloud services and the first thing the CIO needs to do is select an option.

The first is the most common approach used in the relatively immature enterprise market for cloud services, and is a similar approach someone would take when buying a car:

- Identify the service providers in the market
- Narrow down the list based on vendor core competencies and the business need
- Competitive vendor selection

While this approach is ideal for many enterprises, the market for the cloud remains at an early stage of development and some enterprises will see it as preferable to work with a strategic partner to offer a brokered or federated service. The advantages of this approach are:

- The overall service is bespoke
- Risk is shared between vendor and partner
- The service can grow with the partner as new services become available

Case study: Pharmaceutical Multinational

A global pharmaceutical company elected to move its core drug research IT functions into the cloud, to cut costs and improve collaboration.

Business Opportunity: The pace of drug research is the limiting factor for pharmaceutical industry innovation, and multi-company collaboration has been used to increase the rate and reduce the cost of innovation. Moving to the cloud was identified as a way to achieve both.

BT Solution: BT used a Business Rules Management System to provide via the cloud application, compute, storage and network infrastructure on demand, and aligned to the business need.

Results: The Business Rules Management System approach allowed BT to provide true end-to-end visibility across infrastructure and platform services, irrespective of who was managing the piece parts. Service levels were agreed with respect to the performance of drug research, rather than the availability of IT services. A federated approach also meant the customer was able to select from a number of cloud providers based on security, risk, performance profiles and cost.

8

BT's expertise

As the demands increase on businesses to improve return on investment from their fast-growing IT estates, turning to cloud services in incremental steps will offer enterprises a way to deliver their share of financial performance. BT Virtual Data Centre can be the simple first step a CIO needs to get onto the cloud journey without having to sift through the hype.

BT Virtual Data Centre offers a service-orientated approach to application hosting. Using the latest service delivery methods and virtualisation technologies across your computing, storage and network domains, we can help you:

- **Cut costs**: with infrastructure delivered as a "pay as you grow" service. You eliminate capital expenditure and significantly reduce operational expenditure.
- **Increase business agility**: use our self-service web portal to make changes to your services and quickly respond to changes in your business.
- **Improve service**: the virtualised environment is "self-healing," so should a physical problem occur, your services are automatically moved away from the impacted area.
- **Simplify infrastructure**: a virtual infrastructure helps optimise your IT environment and drives higher utilisation of resources, providing a better return on investment.
- **Reduce environmental impact**: a virtual infrastructure consumes less energy and produces fewer emissions than its traditional physical equivalent. You can cut your carbon footprint while expanding your business capabilities.

For more information on BT Virtual Data Centre and how it can improve ROI on the whole IT estate, please visit bt.com/globalservices or contact Craig Parker (craig.2.parker@bt.com)

Offices worldwide

PHME: 58800