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Beyond. Efficiency

How the cloud will
(and won't) make your
operations more efficient



Beyond. The cloud

1 Executive Summary

* This white paper is based on "Cloudburst", first published by BT Global Services in October 2009

Everyone, it seems, is talking about the cloud. This white paper is one of a series that aims to move beyond the hype that currently surrounds the cloud.

This paper looks at the role the cloud plays in making networked IT more efficient.

It will help CIOs make decisions about their use of the cloud by first looking back at the past. It draws together a brief history of the cloud, focusing on its ability to make operations more efficient. It uses this historical perspective look at the hype that has surrounded the cloud in recent years, and takes a clear look at what efficiencies the cloud can actually deliver for an enterprise.

The paper explores virtualisation, as 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 efficiency benefits the cloud has to offer.

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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 so much of what's said is hype. 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, however, 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 investors and enterprises begin to take the cloud seriously as being viable and beneficial to the operational efficiency of businesses.

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

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 and greatly enhancing the efficiency of the network. 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.

In the early 1990s Ian Foster and Carl Kesselman came up with a new concept: ‘the grid’. They used the analogy 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 having 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. Enterprises were concerned about the implications for storage, security and data movement. 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.

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Reality check

- 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

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, the development of high-speed bandwidth and universal software interoperability standards has boosted their adoption. The evidence that these services boost operational efficiency has become clearer, but 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 possible to move beyond the hype? Can we provide the reality check that cloud services need to shift the focus from conceptual benefits to tangible rewards?

1969

1970: In December, Steve Crocker finishes the initial ARPANET Host-to-Host protocol, called the Network Control Protocol (NCP). This leads to the TCP/IP protocol that is the 'language' the internet uses today.

1986: The 56Kbps backbone between the United States National Science Foundation (NSF) centres leads to the creation of a number of regional feeder networks – JVN/CNET, NYSERNET, SURANET, SDSCNET and BARRNET – among others. With the backbone, these networks start to build a hub and spoke infrastructure.

1989: The number of hosts increases from 80,000 in January to 130,000 in July to over 160,000 in November. Australia, Germany, Israel, Italy, Japan, Mexico, Netherlands, New Zealand and the United Kingdom join the 'Internet.'

1991: The net's dramatic growth continues with NSF lifting any restrictions on commercial use.

1997: NetCentric tries to trademark the "cloud computing" but later abandons it in April 1999. Patent serial number 75291765.

2001: The New York Times runs an article by John Markoff about Microsoft's new .Net services platform, Hailstorm. It uses the phrase "'cloud' of computers".

2006: Amazon launches its Elastic Compute cloud (EC2) as a commercial web service that allows small companies and individuals to rent computers on which to run their own computer applications.

2009: Web 2.0 hits its stride, and Google and others start to offer browser-based enterprise applications, though services such as Google Apps.

1969: Supercomputers, mass storage systems and access by remote users to systems located elsewhere become reality as ARPANET establishes the first host-to-host network connection on Oct. 29, 1969

1982: Time magazine names 'the computer' its 'Man of the Year.'

1987: TCP/IP is available on workstations and PCs such as the newly introduced Compaq portable computer. Ethernet is becoming accepted for wiring inside buildings and across campuses.

1990: ARPANET formally shuts down. In 20 years, 'the net' has grown from four to over 300,000 hosts. Several search tools, such as ARCHIE, Gopher, and WAIS start to appear.

1992: The Internet becomes such a part of the computing establishment that a professional society forms, the Internet Society (ISOC), with Vint Cerf and Bob Kahn among its founders. What began as an ARPA experiment has, in the span of just 30 years, become a part of the world's popular culture.

1999: Salesforce.com pioneers the concept of delivering enterprise applications over the internet.

2002: Amazon Web Services launches, providing a suite of cloud-based services including storage, computation and even human intelligence through the Amazon Mechanical Turk.

2006: Eric Schmidt of Google describes its approach to SaaS as cloud computing at a search engine conference. This is possibly the first high profile usage of the term, where not just "cloud" but "cloud computing" was used to refer to SaaS.

2009

3

Feet on the ground or head in the cloud?

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

Beyond the hype, it is clear that some services are more suited than others for cloud delivery. We don't see why CIOs or other decision-makers should be concerned in particular with which services are migrated onto a cloud model. They should be free to focus on their business objectives. However, they need to ensure that their legal, cultural and financial expectations are cloud-compatible, because 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 innovate, 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.

“Cloud services use IT resources more efficiently, reducing the amount of power needed to run data centres.”

3

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.

"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."

4

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 measurable operational efficiency improvements and cost reductions. 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 effecting change right now

Virtualisation delivers efficiency by enabling 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 rather than just being used in limited clusters, these techniques will be applied across the entire data centre, 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.

“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.”

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Making the right cloud decisions

⁶ Source: http://www.computerworld.com/s/article/9137166/Cloud_Hype_Peaks_But_IT_Concerns_Increase

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 CIOs⁶ 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 ask 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

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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	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 also 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

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The future

⁷ For more details on cloud federation, please see BT Global Services white paper “Beyond the cloud: how the cloud will (and won’t) make your people more productive

As the marketplace becomes more sophisticated thanks to the 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 and this is a key role that cloud federators⁷ will play. 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.

“What becomes fundamentally more important is a system that allows you to manage multiple services and this is a key role that cloud federators⁷ will play.”

6

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, known as open innovation, has been used to increase the rate and reduce the cost of innovation. Moving to the cloud was a way to achieve both.

BT Solution:

BT used a Business Rules Management System to provide an autonomic suite of cloud services based on an end-to-end service management framework. It offers 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.

“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.”

6

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.

“Increase business agility: use our self-service web portal to make changes to your services and quickly respond to changes in your business.”

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Conclusion

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)

The 'Beyond the Cloud' series of white papers examines in depth specific aspects of running an organisation, and shows that, beyond the hype, cloud services have an important role to play. They should be seen as part of the solution to corporate challenges such as boosting productivity and efficiency, and meeting demands such as delivering better customer service and security.

The other papers in the series are:

- How the cloud will (and won't) make your people more productive
- How the cloud will (and won't) make your customers happier
- How the cloud will (and won't) impact your organisation's security

“The ‘Beyond the Cloud’ series of white papers should be seen as part of the solution to corporate challenges such as boosting productivity and efficiency, and meeting demands such as delivering better customer service and security.”

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