Cloud and the Enterprise Data Center: Everything Changes:

A Canonical Cloud Primer
Cloud (Finally) Comes of Age

But things are changing, and fast. In its August 2012 analysis of the cloud Hype Cycle, Gartner found that a number of cloud technologies are entering mainstream use, with others not too far behind. That means organisations are now doing things with cloud, rather than just talking about it. Some of this ebook is about what those things are, who’s doing them, and the results they’ve achieved.

But mainly, this ebook is about cutting through the geek-speak and making cloud as straight forward as possible. We’re thinking of it as a Cloud Primer for CIOs and other senior executives who want to reap the benefits of cloud, but aren’t entirely sure where to start.

**Over the next xx pages we’re going to:**
- Explain what we mean by the cloud
- Look at four critical decisions you should make when choosing a cloud strategy
- Profile three “Cloud Heroes”: organisations that are achieving great things in the cloud
- Introduce the concept of the flexible and future-proof ‘open cloud’

Some of it may be obvious, and you may well be doing some of it already. But if you’re relatively new to cloud, we hope it gives you a good grounding in how you can use it to bring real, tangible, business-transforming benefits to your organisation.

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**ABOUT US**
Canonical is the company behind Ubuntu, the world’s most popular operating system for the cloud. We provide consultancy, support and essential tools and services to organisations that are using Ubuntu to power their cloud computing infrastructure. Today, those organisations include NASA, Rackspace and Mercadolibre.

We’d love you to join them.

To find out more about Canonical, visit www.canonical.com or drop us a line at: ubuntu.com
What is Cloud?

One of the reasons why cloud has been so hyped is that it’s not a single technology but a wide – and growing – range of technologies, all of which share some fundamental underlying characteristics.
What is Cloud?

There may seem to be a world of difference between a popular, web-based email service like Gmail, and a semi-futuristic system for processing vast amounts of unstructured data, like Hadoop. But underpinning these and every other cloud technology is a set of architectural principles that define the way computing in general is heading over the next 10 years. These include:

**Software decoupled from hardware:** Cloud continues a trend that began with virtualization: the abstraction of the software layer from the hardware it runs on. Before virtualization, specific physical servers ran specific applications, and if a new application was introduced, new hardware had to be bought for it – even if existing resources were not being used to capacity. With virtualization, an individual physical server can be configured to run more than one operating system and more than one application, so its resources are used more efficiently. Cloud takes that model one step further and completely decouples the software from the hardware, enabling it to run across as many physical servers as are needed to cope with the demand for the application at any given time.

**Computing decoupled from the user base:** In the client/server model of computing, software was served from hardware located near to the user base, to ensure rapid access to applications and data over the corporate LAN or WAN. Advances in networking, and in particular, increased bandwidth on the public internet and virtual private networks (VPNs), mean hardware no longer has to be located near to users. This is becoming an even more practical proposition as advances in mobile computing enable users to work from anywhere, using a VPN or high-speed Wi-Fi, 3G or 4G connection to access corporate applications and data from a laptop or mobile device. Increasingly, users are themselves decoupled from their work location, so there’s less need to maintain computing resources there.

In theory, this means organisations no longer have to run and maintain their own data centres, as all of the computing resources and personnel required to provision, run and manage the enterprise IT landscape can be provided – usually very affordably – by a third party cloud services provider.
What is Cloud?

Resource elasticity and dynamic provisioning: Fundamental to the concept of cloud computing is the ability to scale applications and other software services (middleware, data storage, data processing) seamlessly over multiple physical servers as demand dictates.

An application may require few resources one day, but then experience a huge spike in demand the next. In a traditional, in-house IT environment, those spikes would be anticipated by purchasing more server hardware than needed, or the resulting slowdown or server downtime would simply be tolerated.

In a cloud environment, additional hardware and computing resources can be dynamically provisioned to accommodate the spike, then de-provisioned when demand returns to normal.

Elasticity and dynamic provisioning are especially important for applications where the user base is unpredictable or liable to expand and contract wildly (as is the case with many consumer-facing web applications), where there are significant spikes in usage at certain times (such as a financial consolidation and reporting system at quarter-end), or where intermittent bursts of high-volume data processing or analysis are required (such as a marketing intelligence application looking to turn a month’s worth of online customer activity into usable data).

Utility-style usage and billing:
The elasticity with which computing resources (compute, network, storage) are provisioned and used in a cloud environment means new models are needed for monitoring IT usage and billing or cross-charging it appropriately. Getting that model right is critical for organisations that are offering cloud services to third-party customers, but also for any organisation running a private cloud that wants to cross-charge IT usage to internal customers.

At its most fundamental, cloud signifies a general move away from expensive, server-centric computing to inexpensive, flexible, utility-style computing, where IT resources can be scaled seamlessly and inexpensively all the
Choosing a Cloud Strategy:
Four Key Considerations

When deciding how to begin with the cloud, four initial considerations are vital:

1. What Exactly Do We Want the Cloud to Do For Us?
2. SaaS, PaaS, or IaaS?
3. Closed Cloud or Open Cloud?
4. Public, Private or Hybrid?
Choosing a Cloud Strategy: Four Key Considerations

1. What Exactly Do We Want the Cloud to Do?

This may seem like an obvious question, but many enterprises have a rather narrow view of cloud – seeing it as simply a means of reducing IT costs. Yet Gartner research suggests that organisations that have a more strategic objective in mind have much greater success with the cloud than those that go into it simply with the idea of saving money.

You may already have a project, application or business area in mind that you would like to deploy in the cloud to evaluate its benefits.

But if not, start by identifying a small, manageable candidate project for a pilot deployment. Some examples might be:

- A new, third-party packaged application for an internal department or team
- A new internal application development project where the application will have highly variable workloads and user volumes
- A new, external-facing web application for customers, suppliers or other parties
- A high-volume data-crunching application for business or market intelligence

PRO TIP:

There are developers within your organisation who are already using a public cloud service – like Amazon Web Services or Amazon EC2 – to get experimental applications off the ground in an inexpensive and non-disruptive way. This could be a good place to start when selecting projects for cloud investment.

1961

The idea of computing as a public utility is theorised by Stanford professor and Turing Award winner John McCarthy.
Cloud Hero: Janrain

Cloud Challenge: Extreme scalability to accommodate hundreds of thousands of users

Janrain enables website users to use their existing online accounts, such as Facebook, Twitter or Disqus, to log into third-party websites. More than 350,000 organisations use Janrain’s products to allow users to log in without having to create a separate account. Founded in 2005, Janrain has always chosen not to deploy its cloud infrastructure in-house.

It needs a massively scalable infrastructure to deal with epic data workloads, so it made a fundamental, strategic decision to host its services in the Amazon EC2 public cloud using Ubuntu Cloud Guest to spin up guest instances with no licensing costs.

James Loope, Head of Operations at Janrain, knew Ubuntu was the most flexible and cost-effective choice of cloud operating system for the company’s needs.

Read the full Janrain case study

“[Ubuntu] offers great native support for Amazon EC2 and other cloud platforms, as well as true computing elasticity with no licensing costs whatsoever.”

James Loope, Head of Operations, Janrain

In the same year, the UNIX operating system is developed at AT&T’s Bell Labs.
“Based on an analysis of the Gartner Hype Cycle for Cloud Computing, 2012, the best results are being attained by enterprises that focus on a very specific strategy and look to cloud-based technologies to accelerate their performance.”

*Louis Columbus, Forbes.com, August 2012*
Choosing a Cloud Strategy: Four Key Considerations

2. SaaS, PaaS or IaaS?

Depending on what you want the cloud to do for you, the next decision is what sort of cloud platform you need to make it happen. This is a choice of three options, each one requiring a different level of technical expertise and investment.

**Software as a Service (SaaS):**
The most ‘complete’ cloud deployment option, SaaS refers to pre-built, browser-based software applications that enterprise users can access via the internet.

Most commonly, this will be third-party packaged applications like Salesforce.com for CRM, Basecamp for project management or SuccessFactors for people management.

Subscribing to these applications usually requires little or no technical investment on the buyer’s part – in fact one of the main marketing messages used by SaaS vendors is that they allow departmental heads to bypass internal IT when selecting and deploying new software systems.

**SaaS is most suitable for organisations where:**
- Lines of business want to get up and running on new packaged applications quickly
- New applications are needed, but there’s not enough CAPEX budget or computing
- Resources available to license and install them on-premise
- An existing packaged application is proving expensive or problematic to manage inhouse
- An application is only heavily used at certain times of the month or year, or its user
- Volumes vary significantly
Choosing a Cloud Strategy: Four Key Considerations

2. SaaS, PaaS or IaaS?

Platform as a Service (PaaS):
In a PaaS model, the cloud provider provides a cloud infrastructure (network, compute, operating system, storage) and allows the customer organisation either to deploy their own applications on to it, or use software tools provided with the platform to build applications from scratch and then deploy them on to the platform. The customer does not manage or control the underlying cloud infrastructure but has control over the deployed applications and also possibly application hosting environment configurations.

PaaS is most suitable for organisations with:
- Limited internal development resources
- A project that has little in the way of bespoke requirements, e.g. compliance with industry regulations or compatibility with complex legacy systems

Infrastructure as a Service (IaaS):
In an IaaS model, the cloud provider provides and manages the fundamental computing resources (processing, storage, networks) on which the customer organisation can create, deploy and run software including operating systems and applications.

IaaS is most suitable for organisations with:
- A strong reliance on complex IT systems
- A cloud-based service that’s aimed at large and unpredictable numbers of customers
- A desire to gain competitive advantage by making innovative and efficient use of IT

The customer organisation does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, deployed applications, and may have limited control of select networking components (e.g. host firewalls).

1970s
Time-sharing on mainframe computers becomes common practice, introducing many cloud concepts such as thin-client and optimised, shared access to computing infrastructure.
Choosing a Cloud Strategy: Four Key Considerations

3. Closed Cloud or Open Cloud?

One of the key technical decisions that will affect the results you get from the cloud (both now and in the future) is whether you take an open or closed approach to the cloud technologies you deploy.

With every enterprise technology vendor looking to get in on the cloud action, there is a lot of repackaging of traditional, proprietary technologies as open, cloud-enabling technologies.

However, organisations should step warily in the presence of that word ‘open’, as it can have different meanings, with potentially significant ramifications for your future technology direction and IT costs.

Depending on the vendor, ‘open cloud’ technology can mean the following:

1. A cloud infrastructure built with software components that can readily integrate with
2. Other software components in the same cloud stack
3. A cloud infrastructure built with software components that can readily integrate with other elements in the same cloud stack, AND which are built using open-source technology, AND which can integrate readily with software components in other cloud stacks to enable workloads to be switched easily between clouds when needed.

We’re going to put our cards on the table: we have a specific vision of the cloud, and it’s based on the second scenario: using open-source technologies that give organisations unrivalled choice and flexibility in how they deploy, modify and use their cloud infrastructure.
Choosing a Cloud Strategy: Four Key Considerations

3. Closed Cloud or Open Cloud?

While cloud components based on open standards allow integration, they don’t offer sufficient flexibility:

1. Even if the cloud stack is integrated, it remains closed in nature. Proprietary APIs mean it can’t readily integrate with other cloud infrastructures, making it hard to move workloads between private and public cloud infrastructures, or from one internal cloud stack to another.

2. The use of proprietary (licensed) software components in a cloud stack means software costs in the cloud rise. If you need to scale instances to accommodate high-volume workloads or spikes in user demand, open source technologies can deliver elasticity with zero license cost. By contrast, licensed software, brings a hefty bill for the processors or user seats.

3. Open-source technologies are continually refined and improved, so you are always benefiting from the latest advances in software technology at no cost to you.

4. The most popular and highest performing cloud platforms available today are built with open-source technologies. Many have been built using OpenStack, a set of integrated, open-source technologies that can be used to form a robust, reliable and ultra-flexible platform for the delivery of highly elastic, dynamically-provisioned cloud infrastructure.

INTRODUCING OPENSTACK

OpenStack is a cloud operating system that controls large pools of compute, storage, and networking resources in a datacenter, managed through a dashboard that gives administrators control while empowering their users to provision resources through a web interface. OpenStack is an open source project that was initiated by Rackspace and NASA, and has since become the standard for open cloud infrastructure.

All OpenStack code is available freely under the Apache 2.0 licence – so anyone can run it, build on it, or contribute to the project. OpenStack is built into Ubuntu Server, enabling Ubuntu users to get up and running quickly with an OpenStack cloud without needing to do a great deal of technical work. For more information, visit www.openstack.org
Founded in 2007, Musicmetric’s business is built on Big Data. The company aggregates and analyses vast amounts of online data about recording artists, from social media mentions to peer-to-peer file downloads. Musicmetric standardised on Ubuntu Server and Ubuntu Desktop for its workstations to create a complete, easy-to-manage infrastructure. Previously, it had relied on several different operating systems, which made management and application development a complex affair. Ubuntu was the clear choice for Jameel Syed, Musicmetric’s CTO:

“Ubuntu is one of the dominant distros for running Big Data applications based on its reliability, its ability to scale across literally hundreds of nodes, and its low cost of ownership.”

Jameel Syed, CTO, Musicmetric

**The Ubuntu Advantage:**
By implementing Ubuntu, Musicmetric now has the infrastructure it needs to serve up real-time industry data to its customers ranging from record labels to marketers.

Read the full Musicmetric case study

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1999
The SETI@home project uses distributed computing resources around the world to analyse data for signs of extra-terrestrial life, popularising the concept of Grid computing.
Choosing a Cloud Strategy: Four Key Considerations

4. Private, Public or Hybrid?

A third key decision is whether to deploy software in the public cloud, build your own private cloud, or use a mixture of the two (the so-called Hybrid Cloud). The type of cloud you use will depend on your organisation’s own specific circumstances, objectives and attitude to data privacy and risk.

**Private Cloud:** A cloud computing platform built on your own hardware and software. It gives you the advantage of greater control over the entire stack, from the bare metal up to the services accessible to users.

**Private cloud is a good choice for organisations that:**
- Are sensitive about where their data and applications reside
- Are subject to data protection regulations that have stringent rules governing where data is kept

**Public Cloud:** The public cloud allows end users to create services on systems that are hosted and managed outside their firewalls. Customers are typically billed by the hour for the resources they consume. Public cloud applications, storage, and other resources are made available to the general public by a service provider.

These services are free or offered on a pay-per-use model. Generally, public cloud service providers like Microsoft and Google own and operate the infrastructure and offer access only via Internet (direct connectivity is not offered).

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2002 Amazon launches Amazon Web Services, making its internal IT infrastructure available for third-parties to build and deliver web services for use in creating web-based applications.
Choosing a Cloud Strategy: Four Key Considerations

4. Private, Public or Hybrid?

Public cloud is a good choice for organisations that:

- Have applications with unpredictable workloads and user bases, where scalability and elasticity are critical to success
- Want to experiment with new applications without tying up internal computing resources
- Need to deploy new applications and services faster than internal resources will allow
- Lack the skills and resources internally to set up and manage a cloud infrastructure
- Are less sensitive about the physical whereabouts of data and applications

What to look out for:
Public cloud providers often offer both proprietary and open-source infrastructure options. Keep in mind that proprietary options may incur high licensing costs if you need to scale your applications massively. They may also make it difficult to move your workloads back into your data centre, or on to another cloud service, if you need to do so infuture.

Hybrid Cloud:
Some organisations will want to create a private cloud infrastructure for business-as-usual computing, but retain the option to ‘burst’ workloads out to the public cloud if there’s a temporary requirement for intense data processing/analysis or an anticipated massive spike in demand for the application or service.

Hybrid cloud model may be the best choice for organisations that:

- Experience huge but temporary spikes in user demand for one or more applications
- Need to conduct occasional, highly intensive data processing or data analysis exercises

What to look out for: A hybrid cloud strategy will only work if workloads can be moved easily from the private cloud environment to the public cloud. A closed-cloud infrastructure with pr...
Cloud Hero: Mercadolibre

Cloud Challenge: Provision internal IT resources instantly, in line with online user demand

The eighth largest online retailer in the world, Mercadolibre has grown to become Latin America’s leading e-commerce and auction website. Its growth from humble beginnings to online giant meant that it has had to evolve its IT provisioning and minimise manual admin or risk losing its edge.

To continue its success, Mercadolibre made the switch to cloud. Provisioning and scaling services now happens in real-time rather than weeks, thanks to Mercadolibre’s cloud infrastructure.

As Leandro Reox, Senior Analyst and Cloud Builder at Mercadolibre, explains: “The stability of Ubuntu gives us peace of mind that our systems and data will be constantly available, and that the site will stay up at all times.”

The Ubuntu Advantage: Deploying with Ubuntu Cloud infrastructure has also allowed Mercadolibre to implement Big Data applications such as Hadoop. Now the company has deep insight into customer behaviour and preferences, which is important for any retailer in today’s highly competitive online environment.

Read the full Mercadolibre case study

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Leandro Reox, Senior Analyst and Cloud Builder, Mercadolibre

2010
NASA and Rackspace launch OpenStack, an open-source software platform that lets any organisation create and offer cloud computing services running on standard hardware.
Where Next?

We hope this ebook has given you a good introduction to the fundamentals of cloud computing, the kind of results it can achieve for your organisation, and what to think about before you start.

For more detail on how you can make use of the cloud – whether public, private or hybrid, open or closed, or SaaS, PaaS or IaaS, we’ve included a list of further resources below. And if you’re ready to start with an open cloud project today, Canonical is here to help.

Our Jumpstart service is a fast, low-risk route to deploy private cloud infrastructure on your premises. Compatible with the Rackspace, HP and Amazon public clouds, it costs just $9,000 and is guaranteed to take just five days. To find out more, go to www.ubuntu.com/cloud/solutions/jumpstart.
Further Resources?

Webinar:

White Paper:

Glossary: