Universidad de los Andes Colombia

IASA Colombia Chapter

IASA An Association for all IT Architects

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Can your Enterprise exist in the Cloud?

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The Obvious

- Cloud computing is here to stay
  - Latest data published by Gartner expects cloud adoption to increase by 18.5% this year
  - Spending will top $131 Billion in 2013
  - 39% of organizations report implementing or maintaining a cloud deployment
  - In 2011 cloud budgets represented 15% of worldwide IT spending[1]
- More cloud providers and services are available all the time

Less Obvious

- Enterprise adoption, however, continues to be difficult
  - 83% of respondents cite significant barriers to deploying their cloud solution
- There are some obvious issues such as
  - Security
  - Regulation
  - Technical integration with legacy systems
- But these problems make up a small percentage of the issue
  - Today I'd like to talk about the other barriers that exist

Today

- What is cloud computing?
- What benefits does it offer?
- Where do these benefits come from?
- Organizational barriers
- Conclusions

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What Is Cloud Computing?

"Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."*

- National Institute of Standards and Technology - Publication 800-145

But What is it Really?

- The definition might be a bit nebulous
- Cloud computing does have a number of characteristics:
  - Subscription based service
  - Able to rapidly add capacity
  - On demand self-service
  - Hosted on the internet

Standard Analogy

- The analogy that is often used is that of the power grid
- Electricity is there as you need it
  - You just turn on the lights or air conditioner and they start consuming power
- You don't need to worry about the infrastructure to provide the power
- You pay only for what you use

Several Forms

- You often hear of several types of resources
  - Software as a Service (SaaS)
  - Platform as a Service (PaaS)
  - Infrastructure as a Service (IaaS)
- More are emerging all of the time
  - Data as a Service (DaaS)
  - Business Processes as a Service (BPaaS)
  - …
- In this talk we will mostly be talking about PaaS and IaaS

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Cloud Enabled Growth

- How many people have heard of Pinterest?
- How about Instagram?
  - Instagram was founded in 2010
  - The initial application was developed and launched by the two founders
  - It was purchased 2 years later for $1 Billion

Instagram: Growth

- Instagram had 1 million users within 2 months of launching
- Within one year they had 15 million users
- By April of 2012 they had 30 million users
  - 1 Billion photos uploaded
  - 5 million photos per day
  - 81 comments per second
- Instagram had 13 employees in September of 2012

Pinterest: Growth

- Launched in March 2010
- Had 10,000 users by December 2010
- By December 2011 it had 11 million visits a week
- By March of 2012 it was the 3rd largest social networking site
  - Behind Facebook and Twitter
- It had 10 employees at the time

Cloud Computing

- These examples exemplifies much of the promise of cloud computing
- Cloud Computing promises things like:
  - Reduced time to deployment
  - Ability to meet elastic demand
  - Ability to scale easily
  - Reduced capitol investment
  - Economies of scale
  - Lower operational costs
  - …

Reduced Time to Deployment

- The typical procurement and provisioning process takes a long time
  - Secure the budget
  - Order the hardware
  - Harden the hardware
  - Load the software
  - Deploy
- This can take weeks or even months
- In the cloud this takes seconds
- Additionally, a development platform is available enabling development, deployment, and monitoring

Elastic Demand

- Organizations often experience variable usage patterns
- Cloud deployments can scale up or down to meet the changes in demand
- New virtual instances can be rapidly provisioned and deployed as needed

Reduced Capitol Investment

- Cloud deployments move organizations from an upfront capitol investment model to a operational expenditure model
- This means that there is no large upfront expenditure required to launch a system or service
- You pay only as the system or service is used

Economies of Scale

- The unit cost of computing resources (data, compute, or network) is dependent on the scale of the infrastructure
- Cloud consumers are able to benefit from the economies of scale realized by the providers
- As a result the per unit cost is typically less than it would be if a small to medium sized organization were to purchase resources directly

Lower Operational Costs

- The organization doesn't require dedicated administrators and infrastructure
- The infrastructure is shared among multiple consumers
- As a result the operational costs are typically reduced

Organizational Goals

*Organizations cite the following drivers for moving toward a cloud deployment:

- Business agility (54.5%)
- Scalability (54.3%)
- Cost (48%)
- Mobile computing (25%)

* Future of Cloud Computing Survey conducted by GigaOM Research and North Bridge Venture Partners

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Enablers

- Virtualization
- Storage
- Development and deployment process

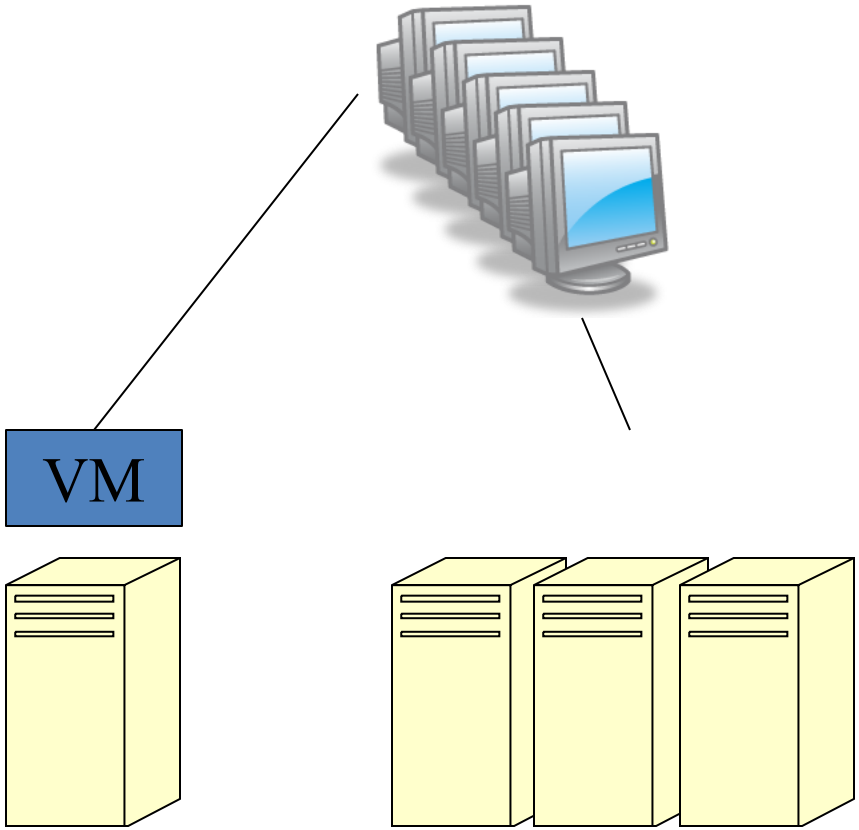
Achieving the Benefits

- The key enablers to providing the scalability and elasticity are:
  - Resource pooling
  - Virtualization
- We will talk briefly about virtualization

Virtualization

- Increased demand needs to be met with increased capability
- Clearly it takes too long to procure, provision, and deploy new physical instances
- The solution is to “virtualize” the physical resources
- If you need more capability you instantiate more virtual instances
  - The underlying hardware can be added independently

Server Virtualization



Virtual Machine

- A virtual machine provides a “virtual” computing platform
  - In other words it’s a software implementation of hardware (i.e. a computer)
- This provides a complete system platform that can execute the target OS
- This allows for more efficient use of computing resources
  - Different services can run in isolation on the same machine

Virtual machine images

- Bare (virtual) hardware may be all that is necessary for some uses. E.g. operating system revisions.
- For other uses it is useful to have an operating system and possibly some applications. Application licensing is, typically, by virtual machine.
- The cloud infrastructure provides the capability to preload a virtual machine with an image. This image can be from a library or from something created by the user on a previous visit to the cloud. Sample image might be LAMP – Linux, Apache Server, MySQL, PhP
- Furthermore, it might be that a memory image is saved by an application to allow for restart in the case of failure.

Hypervisor

- The Hypervisor or virtual machine manager (VMM) manages a “virtual operating platform”
- The hypervisor creates a virtual platform so that many OSs can share the same physical machine
- The hypervisor can create, snapshot, and remove instances as needed

Implications of This

- With the virtualized environment new instances can be added very quickly
  - In seconds
- As demand increases the system can provision and deploy as many instances as are needed from a Virtual Machine Image
- In fact the system will regularly take a snapshot of the system during normal operations
  - The system can then role back to this image if an issue occurs

New Environment

- The organization can now create hundreds or thousands of instance in minutes
  - Remember how long it took to procure a machine previously?
- Because operating conditions change rapidly it's not practically to respond manually
- Automation becomes critical to maintaining a healthy system

Testing and Deployment

- In fact it's not just the operations that's automated
- The testing and deployment process is also automated
- Because the environment changes so rapidly, it's impossible to anticipate the conditions under which the system will operate
- This makes testing sufficiently *a priori* very difficult
  - Instead there is typically a staged deployment

Staged Deployment

- Often organizations will start by using a “canary”
  - They will deploy the system to an isolated node initially
- Once the node passes some set of checks the system will be slowly rolled out
- If at any point something goes wrong the system will be rolled back
- All of this happens automatically
  - In fact in many cases there is a continuous integration and deployment pipeline that will automate this process

Live Testing

- It's recognized that the operating environment can't be predicted
- It's also difficult to maintain control of the system in a variety of ways
  - We'll explain this more in a minute
- As a result it's not uncommon for organizations to deal with this by having a variety of tests run on the operational system
  - The results are monitored and actions taken if need be

Development Lifecycle and DevOps

- Having an automated pipeline that manages the integration, deployment, and operations requires a significant infrastructure
- It's also the case that appropriate measures need to be defined for each step of the way
- These activities have become known as DevOps (a cross between development and operations)

Lifecycle and Development Teams

- In order to achieve significant agility organizations have a particular team structure and mode of operations
  - Team size is limited
  - Teams are autonomous
  - The business pays attention to the measures, not other details
- The result is that teams in this environment often have releases on a weekly basis

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Organizational Impact

- What does all of this mean to the organization?
  - New roles and responsibilities
  - Organizational structure is impacted
  - Decision making process is influenced
  - Incentive model might need to be changed

Roles and Responsibilities

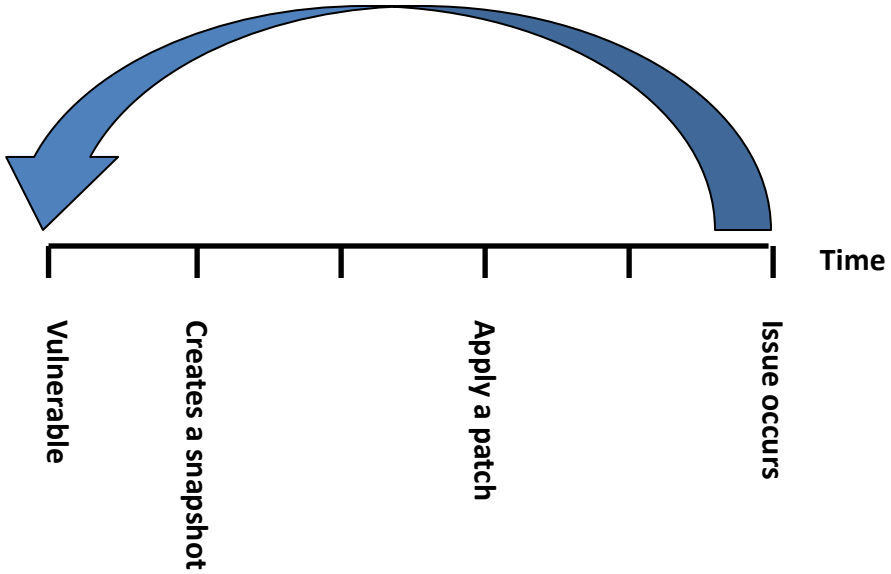
- There are a number of new responsibilities that emerge from this way of working
- Clearly the operations is something that goes beyond typical admin activities
- While more and more tools are available all the time, some development is typically needed for the infrastructure
- These skills and responsibilities typically don't exist in traditional environments

Complex Operational Concerns

- Think about the process of hardening your servers and applying security patches
- When your infrastructure changes very slowly this is something we know how to do
- How would you do this in a cloud environment, however?
- You can apply patches to the machine instance, but how do you guarantee this is the version that is currently operating?
  - Consider the following

For Example …

- You patch your system diligently …



Organizational Structure

- The team size needs to be small
  - Some organizations have something like the “2 pizza rule”
- The teams operate autonomously
  - They set their schedule and priorities
  - Coordination across teams reduces agility
  - It also impacts the availability of the system

Decoupled Systems

- Systems are independent “micro services”
- They can be deployed or removed independently
- This is critical for being able to realize the lifecycle model described earlier
  - It becomes very difficult to automate the system as described if it’s a large interdependent system

Quality Assurance

- There is often no separation between development and QA in “cloud based organizations”
- They’ve largely adopted a “code and own” strategy
- If you developed the system, you are responsible for ensuring the correct operation of the system
  - You carry a pager and need to respond to issues

Decision Making Process

- In mid to large enterprises decisions are typically related to strategic objectives
- This implies a top down structure
- Having such a structure relies on coordination across teams
- This often implies a number of dependencies across teams (technical and otherwise)

Incentive Model

- It's typical to evaluate development teams based on schedule and budget
- In this environment you want to ensure business measures are positively impacted
- If a system a system is being rolled out and the project manager is being incentivized based on schedule he/she wants to keep it in service
- If they are being evaluated on business impact they want to roll the system back if measures are negatively impacted

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Barriers to Adoption

- The organizations that developed and initially adopted cloud technologies are structured very differently than mid to large enterprises
- Moving IT operations into the cloud is more than just adopting a set of technologies
- The associated practices are needed to realize the anticipated benefits
- The typical business model and structure of these enterprises can inhibit adoption of the technologies and associated practices

Analysis is Required

- Organizations need to be aware of these potential barriers
- A migration plan should insure that associated processes, organizational structures, and organizational hierarchy support the business goals
- Evolution of the design and technical environment is important but needs to be coordinated with organizational evolution

Security is a Concern, But …

- Security is often identified as the number one barrier
- Mistrust of the infrastructure, security policies of the host, and multi tenancy are often identified as the concerns
- Security is an issue, but the risks really result from internal operations
  - VM sprawl is the biggest cause of vulnerabilities in the cloud

Volatile Environment

- The cloud is made up of unstable faulty elements
- If you operate in a way that recognizes this you can help ensure your system will be:
  - Secure
  - Available
  - Scalable
  - …
- The mindset (and organization) often needs to change to do this, however

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Thank You