Background

Cloud Computing

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April 22, 2015

Background

Historically, as hardware requirements grew companies would:

- Host their own servers and pay for network access
- Outsource to an IT service provider

Challenges with this:

- Expensive
- Not Elastic (Contractually fixed service levels)
- High entry barriers

Cloud Computing

Characteristica that identifies a cloud service:

- Offered by a third party
- Available when needed
- Dynamically scalable
- Low initial investment to get started
- Pay for what you use, when you use it
- Easily accessible

Five Main Principles

- Pooled Computing Resources
- Virtualised Computing Resources
- Elastic Scaling up or down as needed
- Automated creation/deletion of virtual machines
- Resource usage billed only as used.

. . .

- Note that *most* of these are oriented towards the underlying technology.
- Together, they enable a cloud provider to offer the service at a lower cost than for a company to host the servers themselves.
- Ends up in the ability to offer the last bullet.
- Network?
- Access API
- Storage + Databases

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Cloud Benefits

- Lower Initial barrier: Capital expenses $\rightarrow$ Operational expenses
- Responsiveness: You do not have to wait for procurement of new servers.
- Security: Dedicated staff whose sole business is to care about security issues
  - (Is this true for all types of cloud services?)

Types of Cloud Services: \b[A-Z]A{2}S\b

- IAAS Infrastructure As A Service
- PAAS Platform As A Service
- SAAS Software As A Service
- FAAS Framework As A Service
- AAAS Application As A Service

Also:

- DAAS Datacenter As A Service (Private Clouds)

Some popular Cloud Providers

- Amazon EC2 (IAAS)
- DigitalOcean (IAAS)
- Microsoft Azure (IAAS)
- Microsoft OneDrive (PAAS?)
- Microsoft Office Online (AAAS)
- Google Drive (PAAS?)
- Google Docs (AAAS)
- Google App Engine (PAAS)
- Rackspace (IAAS)
- Gmail/Yahoo/Outlook (AAAS)

Reasons for using the Cloud

- Need more Capacity
  - Computing Power
  - Storage capacity
  - Burst-rate capacity
  - ...
- Don't want to specialise on Server Maintenance
  - HW Repairs and Replacements
  - OS upgrades
  - Round-the-clock maintenance
- Higher Reliability / Availability
- Built-in and immediate Scalability (up as well as down)
- Easier(?) Software Licensing

Challenges when Developing Cloud Applications

- Understand your needs: What service level do you require (How many servers, for how long? How often?)
- Understanding your quality requirements. Why are you going to the cloud?
  - Hint: It is often more than one quality requirement that is important.
- Designing a scalable software architecture
- Setting up automated deployment of your application
- Setting up equivalent and automated development / test / stage / deployment envonments.
- Setting up automated Provisioning and Orchestration
- Defining your database needs, selecting the right database, and design a (cloud-) scalable database design.
  - Is it really possible to use a traditional RDBMS shared over several machines? What are your alternatives?

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Challenges when Developing Cloud Applications

- Security! Despite all the fancy promises, if you opt for IAAS or PAAS, you need to take care of this yourself!
- Security!! You also need to protect your application from other applications running on the same cloud provider.
- Security!!! Design your application to Protect/encrypt your data when it is on the cloud.

Also:

- What is the value of existing infrastructure? How does this influence your cost/value calculations?
- Are your software licenses “cloud friendly”?
- Are you aware of the legal, regulatory, and standards that are relevant for your application

Summary

- There are several reasons for “going cloud”
- There are several different service levels offered
- There is a unique set of development and management challenges when “going cloud”

In this course:

- Lab 1 focus on getting the development infrastructure in place
- The project focus on the design and implementation of your cloud application
- Lab 2 goes behind the scenes and reveals one simple thing that the cloud providers need to do