What’s Inside the Cloud?
An Architectural Mapping of the Cloud Landscape

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“Animoto was regularly using around 40 virtual machines...and needed to scale up to an astounding 5,000 servers in four days.” [1]
...but what is a cloud?

- “A Cloud is a type of parallel and distributed system consisting of a collection of interconnected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements established through negotiation between the service provider and consumers” - R. Buyya [2]

- “Clouds are vast resource pools with on-demand resource allocation... virtualized... and priced like utilities” - J. Pritzker [3]

- For me the simplest explanation for Cloud Computing is describing it as, ”internet centric software...“ - R. Cohen [3]

- “Cloud computing is ... the user-friendly version of Grid computing” - T. Doerksen [3]
Two main differences [4]:

1. “grid systems are architected so that individual user requests can (and should) consume large fractions of the total resource pool. Cloud systems often limit the size of an individual request to be tiny fraction of the total available capacity and, instead, focus on scaling to support large numbers of users.”

2. “From its inception, grid computing took a middleware-based approach as a way of promoting resource federation among cooperating, but separate, administrative domains. Cloud service venues, to date, are unfederated. That is, a cloud system is typically operated by a single (potentially large) entity with the administrative authority to mandate uniform configuration, scheduling policies, etc.”
The Cloud Stack
Infrastructure as a Service (IaaS)

- Hardware and physical location abstraction
- Allow to create a big datacenter in hours to satisfy peaks of requests
An IaaS Case Study: Eucalyptus

- Open Source version of Amazon EC2
  - Same API

- Highly modular to encourage extensions and community development

- Virtual Network Overlay
  - Isolate network traffic
  - Different clusters belonging to the same LAN

- Support for hybrid clouds (private + commercial)
The Eucalyptus Architecture
Platform as a Service (PaaS)

- Infrastructure abstraction
- No program installation, configuration or management
- The infrastructure scales with the use (pay-as-you-use)
Software as a Service (SaaS)

- Infrastructure, OS and programming language abstraction
- Direct service to the customer
- Often running on top of PaaS and IaaS
- Recursive
Human as a Service (HaaS)

- Outsourcing on the web!
- People as service providers
  - Political polls
  - Work providers
  - Information sources (YouTube)
Supporting Services

- Administration and business support
  - The least explored part of the cloud
- Lack of services across different cloud levels
  - Billing
  - Authentication
Questions?

Thank you!
References

[1] http://www.pcmag.com/article2/0,2817,2330239,00.asp