

Cloud Computing

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So what really is cloud computing ?

- No one definition yet :(
- Cloud computing is a pay-per-use model for enabling available, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.



So what really is cloud computing ?

- **On-demand self-service** - as needed without requiring human interaction
- **Ubiquitous network access** - Capabilities are available over the network and accessed through standard mechanisms
- **Location independent resource pooling** - no control or knowledge over the exact location of the provided resources
- **Rapid elasticity** - quickly scale up quickly scale down
- **Pay per use** – Utility Computing

Platforms	Windows Azure	-	AppEngine	EC2
Vendors	Microsoft	Yahoo	Google	Amazon
Locations	Quincy, Washington	Sunnyvale, California	Dallas, Ore	Boardman, Ore
Area	43,600 m ²	13,000 m ²	6500 m ² (x 2)	-
Chiller Pipe	4.8 Km	-	-	-
Electrical Wire	965 Km	-	-	-
Batteries	1.5 metric tons	-	-	-
Drywall	92,900 m ²	-	-	-
Consumption	48 Mw	-	-	-

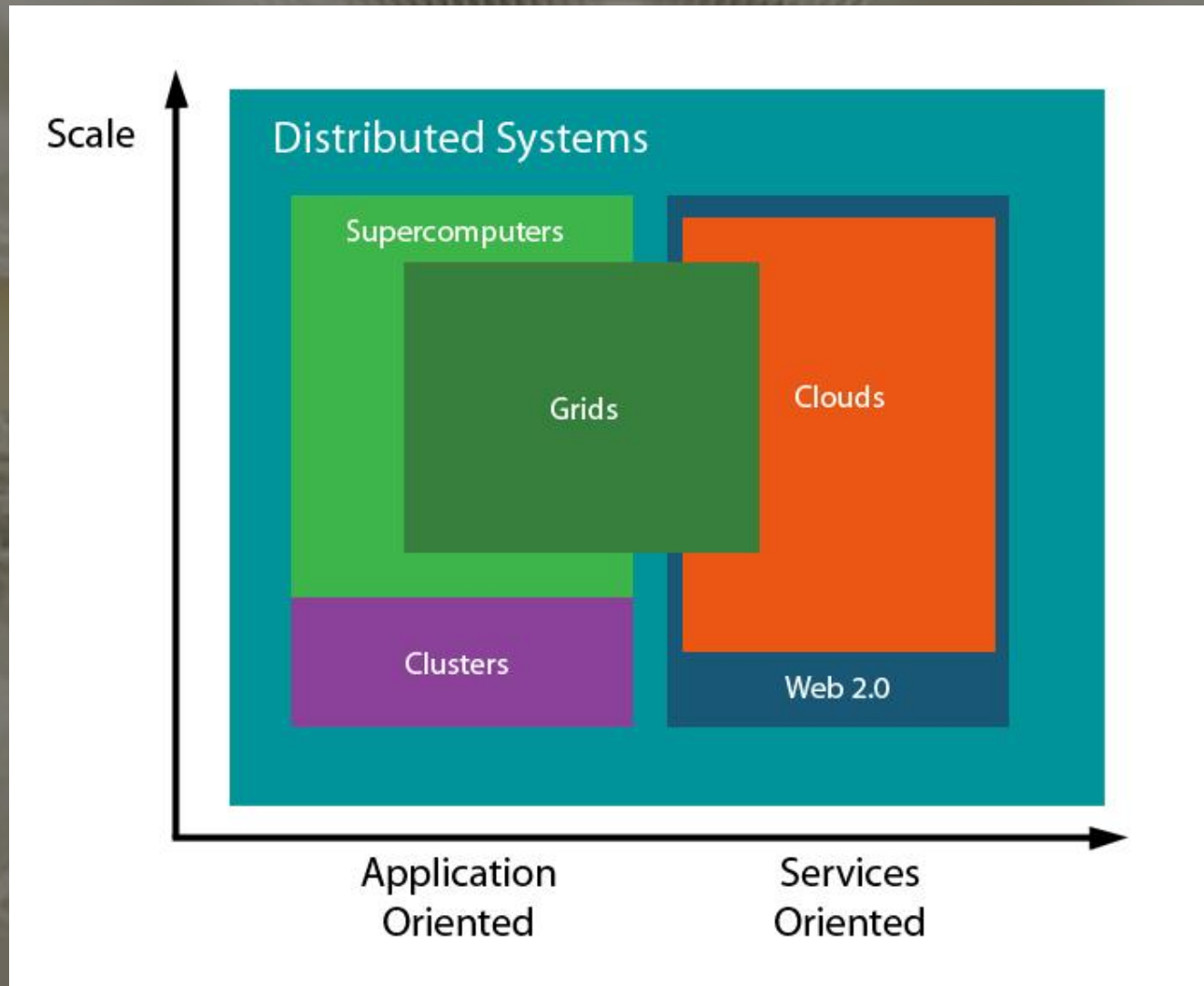
Virtualization

- Abstraction of Implementation
- Replaces the original system interfaces with new virtualized interfaces
- Enables computing system to acquire and release computing resources on demand.
- Can be created on top of hardware or software
- Entire software profile can be stored as an image file

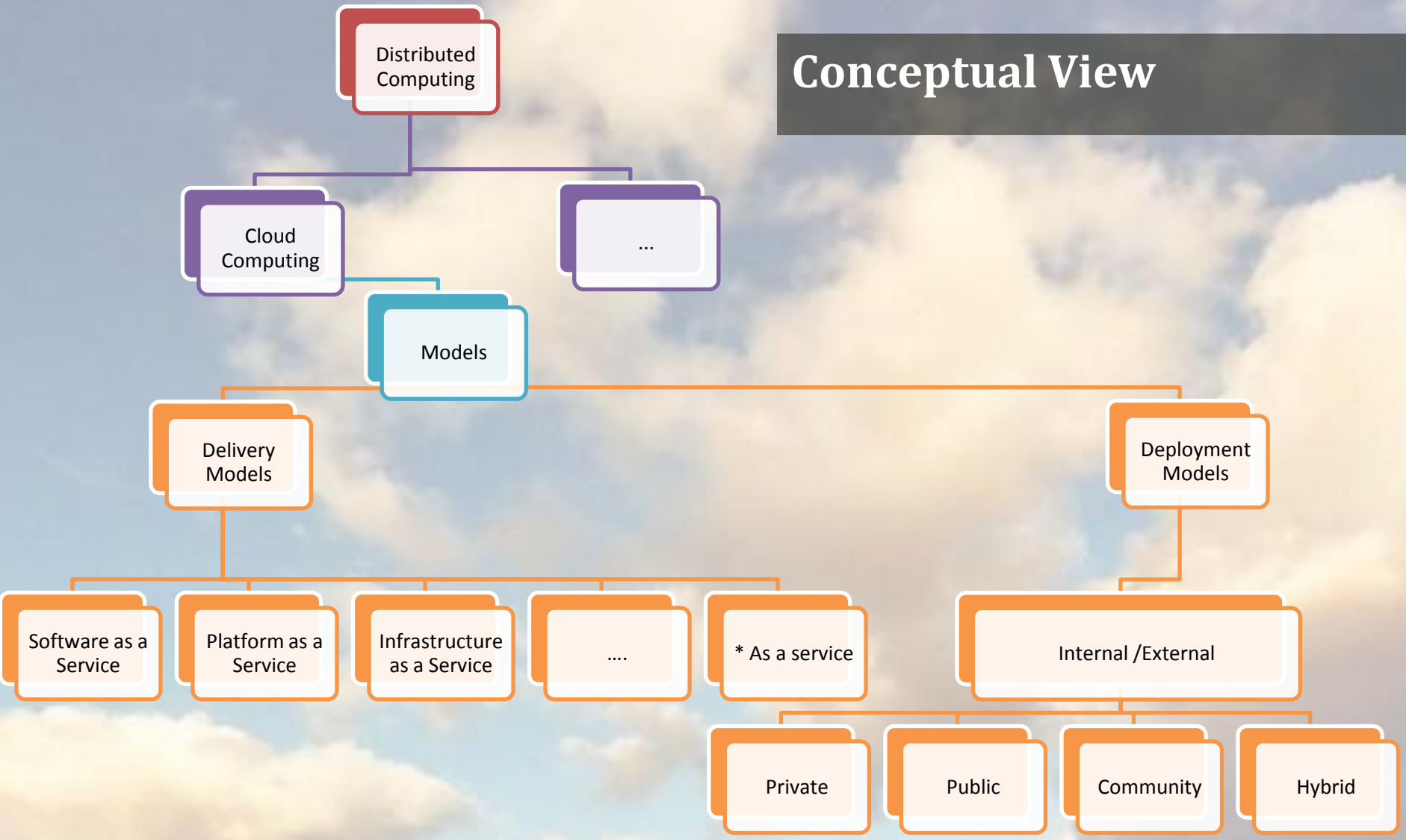
Grid vs Cloud

- Grid exposes much more wide interface as compared to Cloud
- Grid does not rely on virtualization as much as cloud does
- Grid offers more control of the resources
- Grid normally executes job for a user while others have to wait

Grid vs Cloud



Conceptual View



Delivery Models

Software as a Service



Platform as a Service



Infrastructure as a Service



Hardware as a Service

Software as A Service

- An software delivered as service and accessible through a web browser
- Requires no installation
- Multi-Tenant

- **Examples**



Platform as A Service

- A platform to create consumer-created applications using programming languages and tools supported by the provider

•Examples



Infrastructure as A Service

- Gives consumer an ability to rent processing, storage, networks, and other fundamental computing resources

- **Examples**



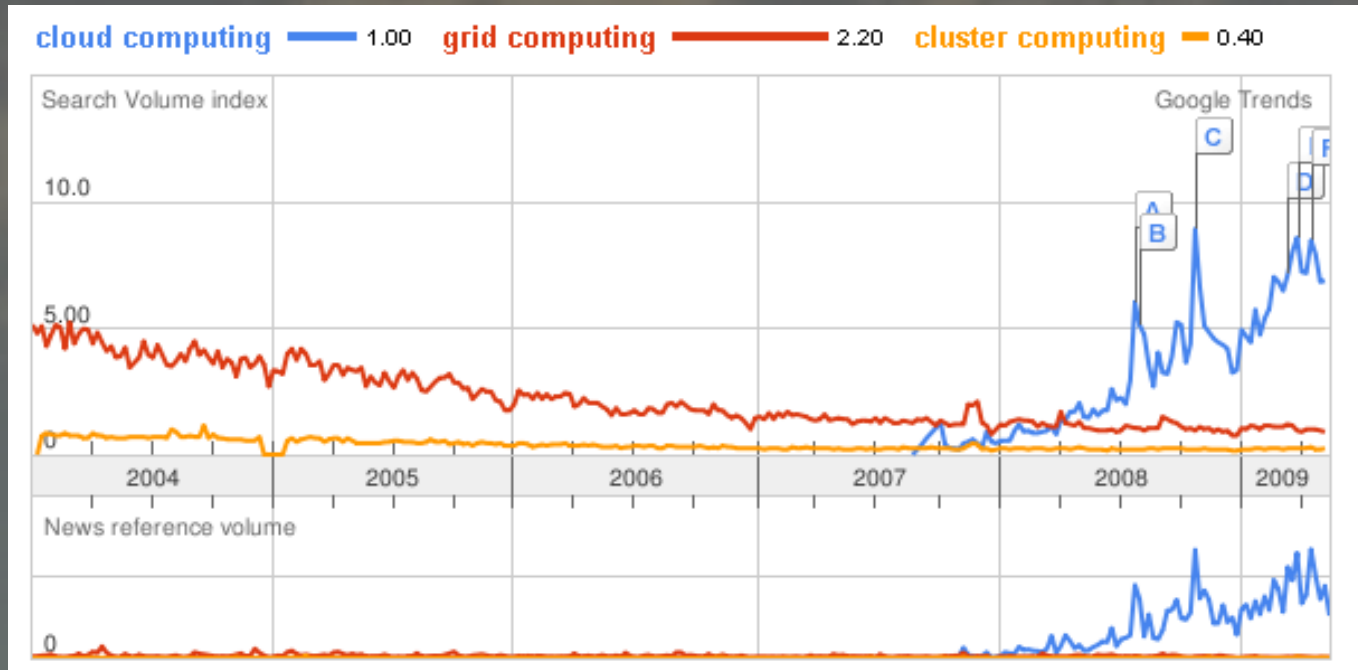
A white and grey multifunction printer is shown from a three-quarter perspective. A document is being printed and is emerging from the output tray. The document features a colorful pie chart with a green slice labeled '15%', a photograph of a house, and some text. The printer has a control panel with a small screen and several buttons. The background is plain white.

We are already using Printer as a Service in Massey University

Deployment Models

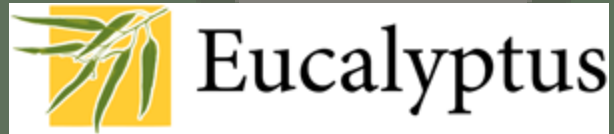
- Internal or External
- Private
- Public
- Community
- Hybrid

Hype of Cloud Computing



Open source

- Eucalyptus is an open-source system for implementing on-premise private and hybrid clouds using the hardware and software infrastructure



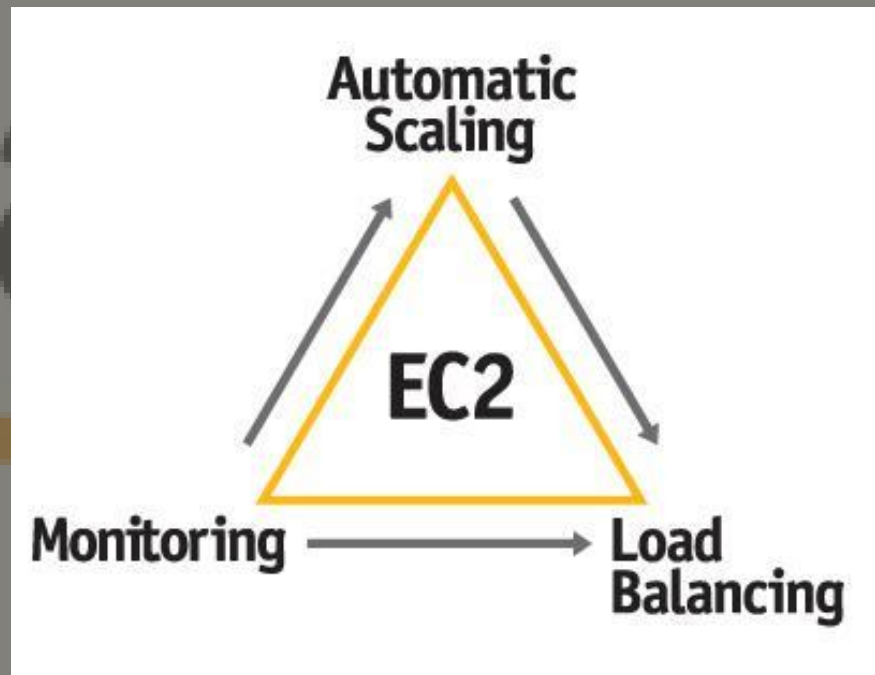
open source

Barriers

- Data Lock-In
- Data Confidentiality and Auditability
- Bugs in Large-Scale Distributed Systems
- Software Licensing

Case Study

Setting up cluster on Amazon EC2 and using MPI



Case Study

Create Amazon EC2 Account



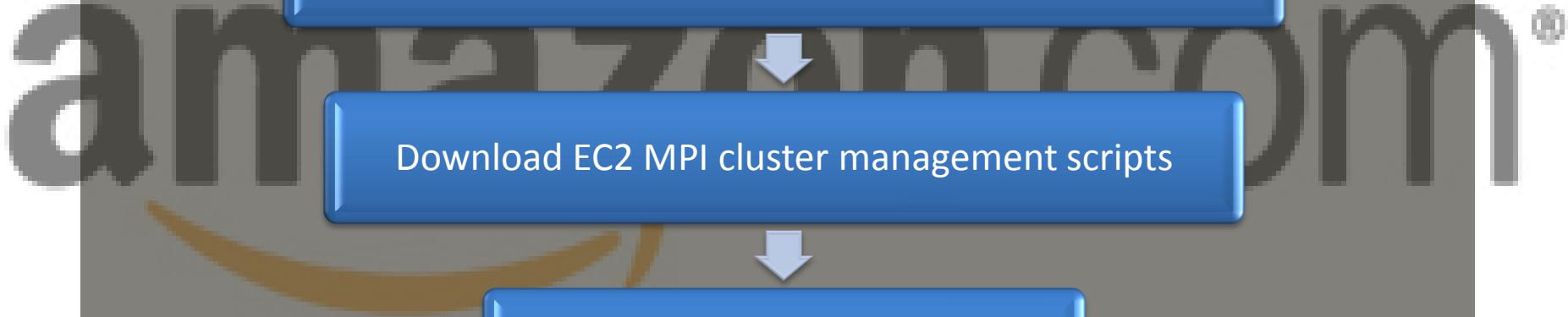
Download and Install Amazon EC2 Python Library



Download EC2 MPI cluster management scripts



Launch the EC2 nodes

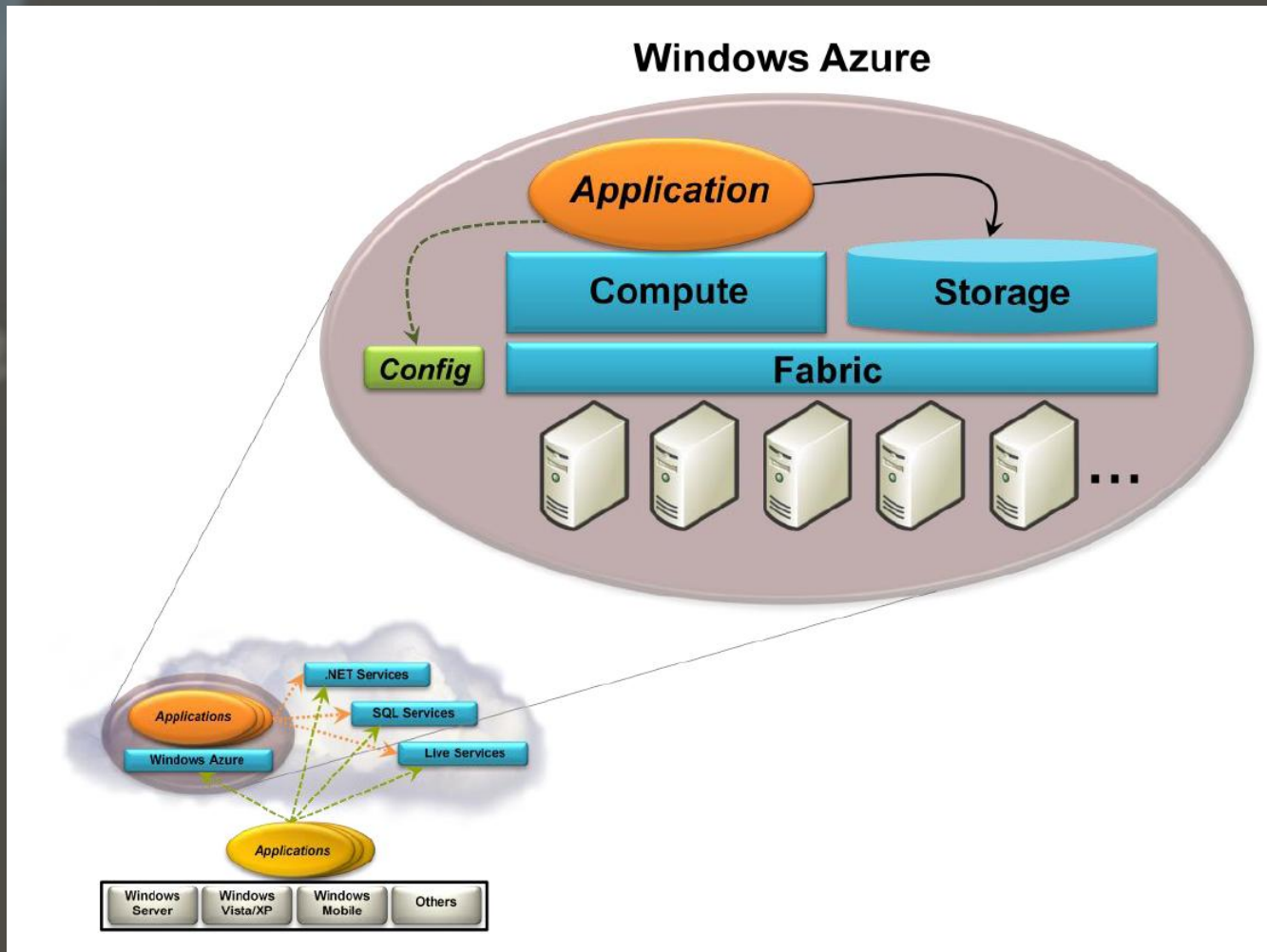


Case Study

- `$> ./ec2-start-cluster.py`
- The number of instances to boot `DEFAULT_CLUSTER_SIZE` in `EC2config.py`
- ```
[lamuser@domU-12-31-33-00-02-5A ~]$ mpiexec -n 5 /usr/local/src/mpich2-1.0.5/examples/cpi
Process 0 of 5 is on domU-12-31-33-00-02-5A
Process 1 of 5 is on domU-12-31-33-00-01-E3
Process 2 of 5 is on domU-12-31-33-00-03-E3
Process 3 of 5 is on domU-12-31-33-00-03-AA
Process 4 of 5 is on domU-12-31-33-00-04-19
pi is approximately 3.1415926544231230, Error is 0.0000000008333298
wall clock time = 0.007539
```
- `$> ./ec2-stop-cluster.py`
- <http://web.mit.edu/star/hpc/documentation/ec2scripts/>
- **\$2 on 20 Nodes Per Hour**

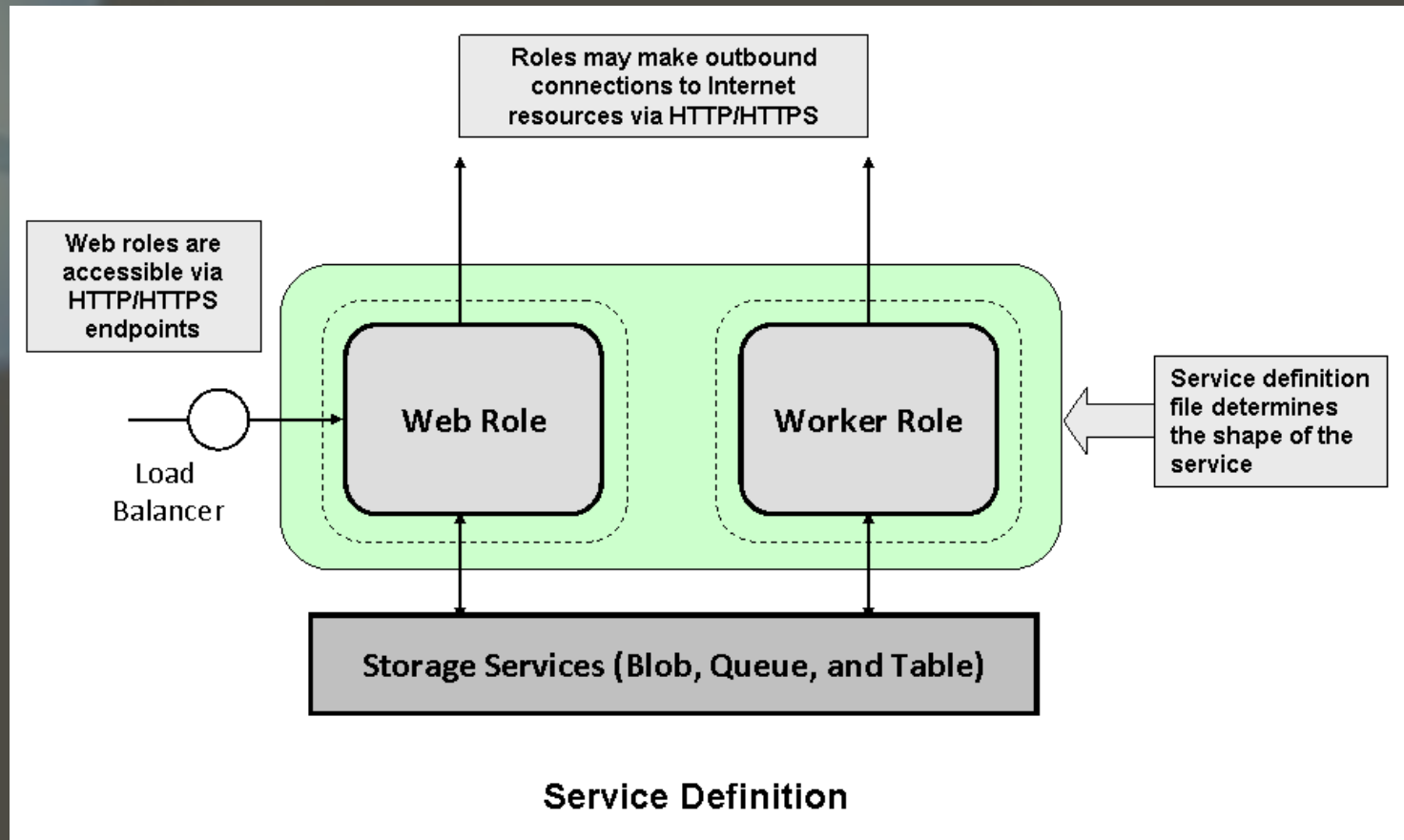
# Demo

## Developing a simple website on Windows Azure



# Demo

## Fabric



The background consists of several overlapping, slightly tilted white papers. Each paper has a large, dark grey question mark printed on it. The papers are arranged in a way that creates a sense of depth and layering. A dark grey horizontal bar is positioned at the top right of the image, containing the text "Questions ?" in white.

Questions ?