

SIT706  
Cloud Computing Technology

Week 2  
Class-1: Cloud Introduction and Cloud Basics



**Chapter 3**  
**Understanding Cloud Computing**

## Outline

- ❖ Understanding Cloud Computing
  - What is Cloud Computing?
  - Public Clouds and Services
  - Cloud Infrastructure
  - Popularity
  - Why Use Clouds?
  - Essential Characteristics of Clouds
  - Benefits and Risks
  - Datacentres, Clusters, Hosts, Hypervisors, VMs
  - Templates, Data stores and Pods
  - NetLab+ VE Demonstration
  - Origins and Influences

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## What is Cloud Computing?

- Cloud computing appears to be a very difficult concept to define, including:
  - Basic web sites, e.g, CloudDeakin
  - PC applications, e.g., Office 365, Adobe Creative Cloud
  - Web applications, e.g., Google Apps (Gmail, etc.)
  - Internet services, e.g., Skype
  - Storage on the Internet, e.g., DropBox
  - Computation services, e.g., Amazon EC2

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## What is Cloud Computing?

- **Cloud computing delivers IT services** over the internet on a user-pays/pay-as-you-go basis
- **Using cloud services or technologies** is usually the basis for something being “**cloud based**”

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## What is Cloud Computing?

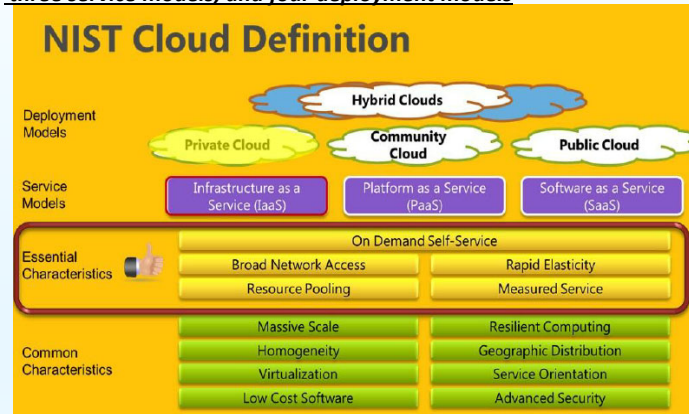
- Probably the commonly quoted definition is by the US National Institute of Standards and Technology (NIST):
  - **Cloud computing** is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. **This cloud model is composed of five essential characteristics, three service models, and four deployment models.**

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# What is Cloud Computing?

As per NIST cloud model is composed of five essential characteristics, three service models, and four deployment models



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## Public Clouds and Services

- |                    |   |
|--------------------|---|
| 1. Microsoft Azure | <a href="http://azure.microsoft.com">http://azure.microsoft.com</a>                             |
| 2. AWS             | <a href="http://aws.amazon.com">http://aws.amazon.com</a>                                       |
| 3. Google Cloud    | <a href="http://cloud.google.com">http://cloud.google.com</a>                                   |
| 4. Oracle Cloud    | <a href="https://cloud.oracle.com">https://cloud.oracle.com</a>                                 |
| 5. Salesforce      | <a href="http://www.salesforce.com/au">http://www.salesforce.com/au</a>                         |
| 6. IBM Cloud       | <a href="http://www.ibm.com/cloud-computing/au/en">http://www.ibm.com/cloud-computing/au/en</a> |

**Storage Services**  
**Computational Services**  
**Network Services**  
**Database Services**  
**Other Services**

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# Cloud Infrastructure

## Cloud Infrastructure Components:

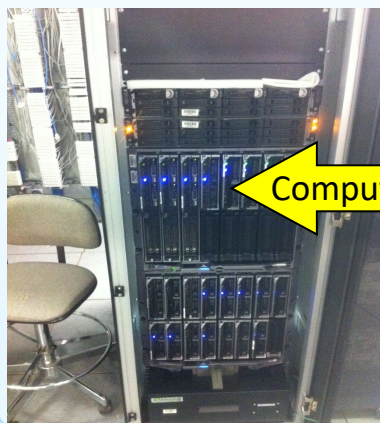
- User applications and services
- Application development and management tools
- Cloud infrastructure management services
- Networking
- Storage
- Servers and virtualisation
- Data Centre

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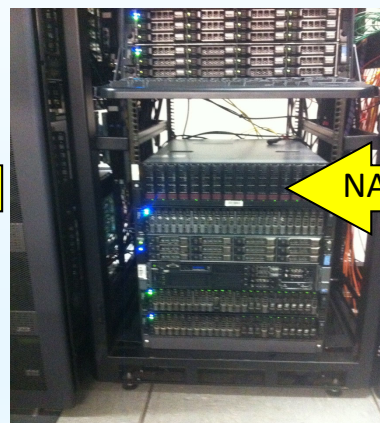
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# Cloud Infrastructure

## Old SIT Cluster at Geelong



Computation



NAS

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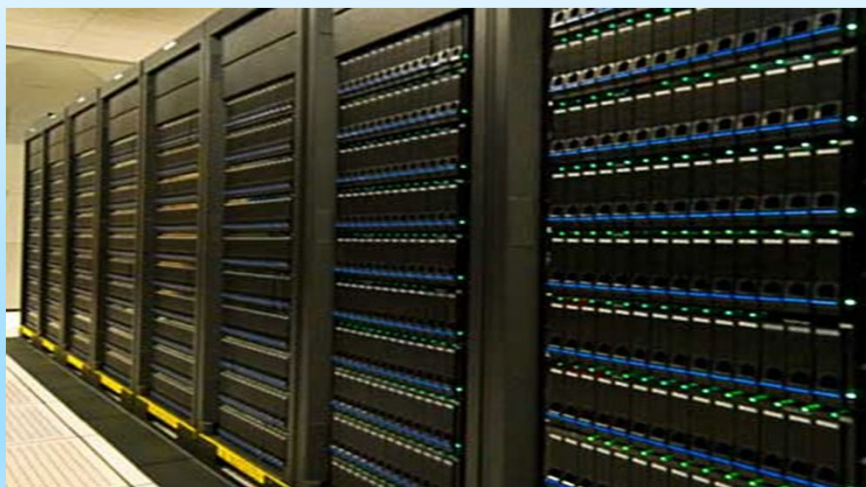
## Cloud Infrastructure



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## Cloud Infrastructure



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## Popularity (JB HIFI 2018)

 <p><b>WD</b> WD My Cloud Home (2TB) ★☆☆☆☆ 1.0 (1)</p>	 <p><b>WD</b> WD My Cloud Home Duo (8TB)</p>	 <p><b>WD</b> WD My Cloud Pro PR4100 4-Bay NAS (8TB) ★★★★☆ 3.7 (3)</p>	 <p><b>WD</b> WD My Cloud EX4100 32TB 4 Bay Private Cloud Storage NAS ★★★★☆ 4.3 (3)</p>
<b>\$279</b> 	<b>\$799</b> 	<b>\$1329</b> 	<b>\$2499</b> 

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## Popularity (JB HIFI 2019)

 <p><b>WD</b> WD My Cloud Home (2TB) ★★★★☆ 3.7 (3)</p>	 <p><b>WD</b> WD My Cloud Home Duo (8TB) ★★★★☆ 4.0 (1)</p>	 <p><b>WD</b> WD My Cloud Pro PR4100 4-Bay NAS (8TB) ★★★★☆ 3.7 (3)</p>	 <p><b>WD</b> WD My Cloud EX4100 32TB 4 Bay Private Cloud Storage NAS ★★★★☆ 4.3 (3)</p>
<b>\$229</b> 	<b>\$499</b> 	<b>\$1329</b> 	<b>\$2499</b> 

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## Can we have an Affordable Home Data Centre?

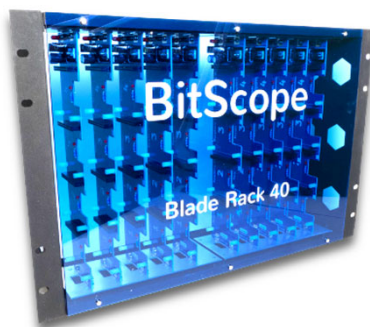
- Raspberry Pi 3 Model B+
  - Around \$55 AU
  - 1.4GHz
  - 64-bit quad-core
  - WiFi
  - Bluetooth 4.2/BLE
  - Ethernet
  - 4 USB ports
  - HDMI
  - Linux
  - VMWare recently announced a prototype ESXi running on a Raspberry Pi



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## Can we have an Affordable Home Data Centre?



ZWIJ6PZ3

bitscope.com / cluster

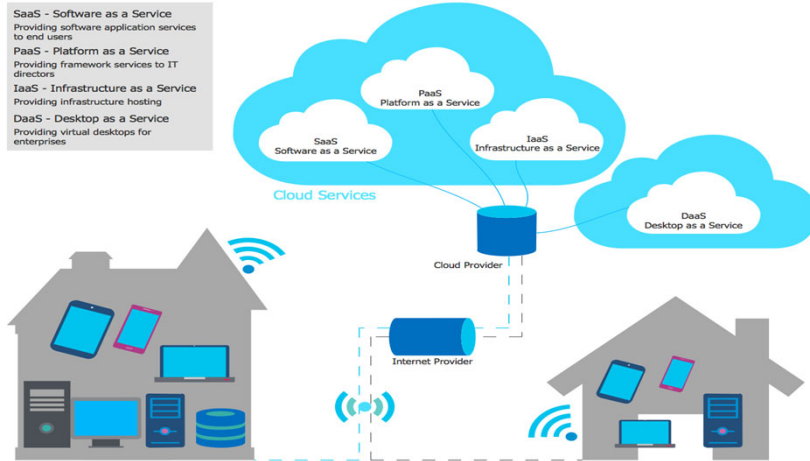
- 40 Raspberry Pi Capacity
- 10 Blades
- Around \$1100 AU
- 150 Raspberry Pis

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## How Cloud Computing Works?



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## Why Use Clouds?

1. File Storage
2. Backup
3. Disaster Recovery
4. Big Data Analytics
5. Test and Development
6. Infrastructure as a Service (IaaS)
7. Platform as a Service (PaaS)
8. Software as a Service (SaaS)

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## Essential Characteristics of Clouds

1. On-demand Self-service
2. Broad Network Access
3. Resource Pooling
4. Rapid Elasticity
5. Measured Service

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## Concepts and Terminology

- **IT Resource**: physical or virtual IT-related artefact
  - Software based,  
e.g., virtual server, custom software
  - Hardware based,  
e.g., physical server, network device
- **On-Premise**: an IT resource hosted in a conventional environment located on the premises of the IT enterprise (not cloud based)

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## Concepts and Terminology

- **Cloud**: environment for remote provisioning of scalable and measured IT resources
- **Cloud Provider**: the party that provides cloud-based IT resources
- **Cloud Consumer**: the party that uses cloud-based IT resources

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## Concepts and Terminology

- **Cloud Service**: any IT resource that is made remotely accessible via a cloud.
- **Cloud Service Consumer**: a temporary runtime role assumed by a software program when it accesses a cloud service

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## Concepts and Terminology

- **Scaling**: the ability of the IT resource to handle increased or decreased usage demands
  - **Horizontal scaling** (scaling out/in): allocating or releasing IT resources of the **same type**, e.g., adding/removing a virtual server

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## Concepts and Terminology

- **Vertical scaling** (scaling up/down):  
**replacement** of an existing IT resource with another with **higher or lower capacity**, e.g., increasing or decreasing the number of processors
  - **Less common** due to the downtime required while replacement is taking place

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## Benefits

- **Reduced investment**: most common rationale for investing in cloud-based IT resources is to reduce or even eliminate up-front IT investments (hardware, software, and ownership costs)
- **Proportional costs**: measured **operational** expenditures replace **capital** expenditures
  - i.e., as a cloud consumer you only pay for the resources you use versus purchasing and maintaining on-premise IT resources which may not be fully/effectively utilised

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## Benefits

- **Common measurable benefits**:
  - **On-demand access** to IT resources on a short term basis
  - **Perception** of on-demand **unlimited** IT resources
  - Add or remove IT resources at a **fine-grained level**
  - Abstraction of infrastructure so **applications are not locked into devices or locations**

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## Benefits

- Leads to “**elasticity**” of IT resources, e.g.,
  - Use 1 server x 100 hoursOr
  - Use 100 servers x 1 hour

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## Benefits

- **Increased scalability:**
  - Clouds can **instantly and dynamically allocate IT resources** to cloud consumers on-demand via direct configuration
    - Allows cloud consumers to scale IT resources automatically or manually **to accommodate fluctuations in demand**

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## Benefits

- **Increased availability and reliability**
  - **Outages** limit usage and revenue potential of IT resources, particularly during high-volume usage periods
    - **Cloud environments intrinsically increase availability and reliability** – important to carefully examine cloud provider SLAs

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## Summary of Benefits

1. **Reduce** up-front IT **investments**
2. **On-demand, short term access** to IT resources
3. Perception of **unlimited IT resources**
4. **Add/Remove IT resources** at a fine-grained level
5. **Elasticity**
6. Increased **availability**
7. Increased **reliability**

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## Risks

1. Operational Control
  - IT resources are off-premise, not on-premise
2. Security
  - Data security is shared with cloud provider
3. Trust
  - Cloud provider might be untrustworthy
4. Responsibility
  - **Cloud consumer is ultimately responsible** for security, integrity, and storage of their own data

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## Risks

5. Compatibility
  - Can we move from one provider to another?
5. Geographic Location
  - Large distances may decrease performance
  - Different laws in different countries

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## Risks: Notable Cloud vulnerabilities Incidents

- There are possibilities of affecting Clouds by malicious attacks and failures of the infrastructure, e.g., power failures.
- Such events can affect the Internet domain name servers and prevent access to a cloud or can directly affect the clouds:
  - in 2004 an attack at Akamai caused a domain name outage and a major blackout that affected Google, Yahoo, and other sites.
  - in 2009, Google was the target of a denial of service attack which took down Google News and Gmail for several days;
  - in 2012 lightning caused a prolonged down time at Amazon.

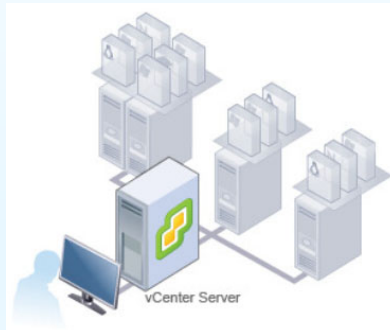
Source: Dan C. Marinescu

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## vCenter Servers, Datacentres, Clusters, Hosts, Hypervisors, VMs

- vCenter Server is used to manage datacentres, clusters, hosts, VMs; allowing you to automate and deliver virtual infrastructures.

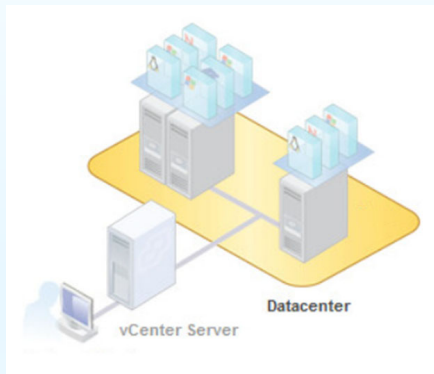


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## vCenter Servers, Datacentres, Clusters, Hosts, Hypervisors, VMs

- A datacentre is a container of IT resources such as clusters, hosts, VMs and folders.

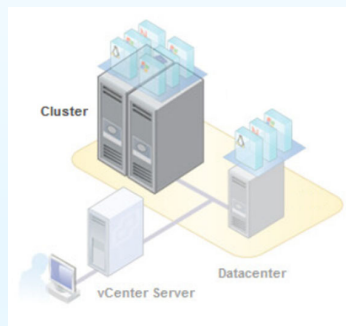


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## vCenter Servers, Datacentres, Clusters, Hosts, Hypervisors, VMs

- A cluster is a group of hosts that share IT resources, and a management interface. A host's resources are included within the cluster's resources.

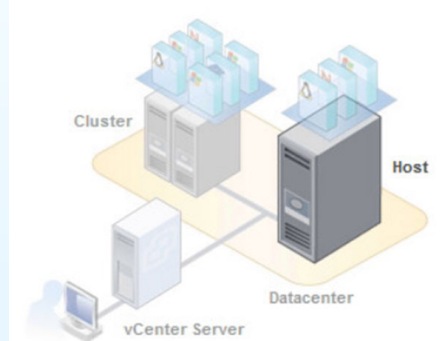


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## vCenter Servers, Datacentres, Clusters, Hosts, Hypervisors, VMs

- A host is a computer running virtualisation software (hypervisor such as ESXi) to manage multiple VMs.

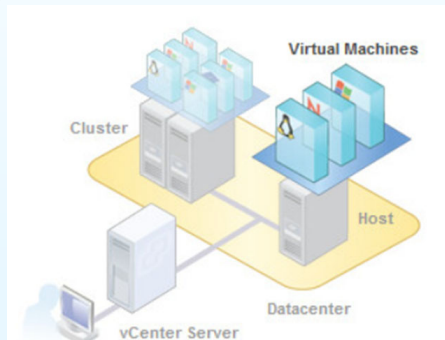


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## vCenter Servers, Datacentres, Clusters, Hosts, Hypervisors, VMs

- A VM is a software computer that runs an operating system and processes.



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## Templates and Datastores

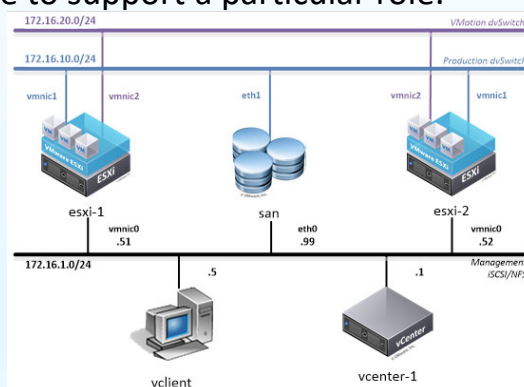
- A template is an image of a VM that can be used to create other VMs.
- A datastore is a logical container of VM files and other files for operating VMs.

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## POD

- A POD is a set of building blocks of hardware and software to support a particular role.

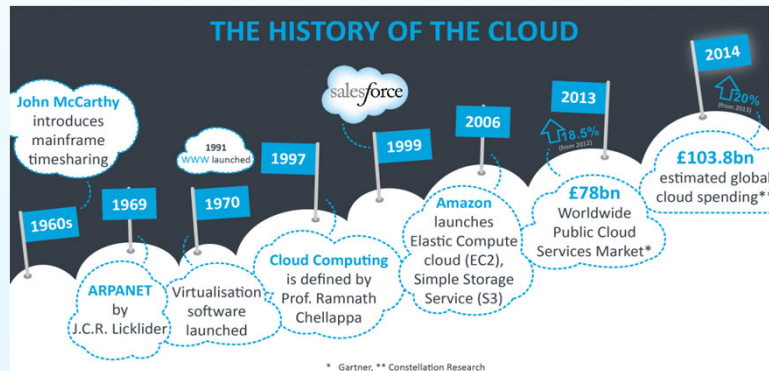


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## Origins and Influences

- ❖ It is interesting to know the brief history of cloud computing:



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## NetLab+ VE Demonstration

This demonstration includes:

- Logging in to NetLab+ VE  
<https://vmlab.it.deakin.edu.au>
- Reserving a Pod to participate in a Lab
- Logging in to the vSphere Web Client
- Accessing IT resources using the vSphere Web Client

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## Summary

- Cloud Infrastructure
- Popularity
- Why Use Clouds?
- Public Clouds and Services
- Essential Characteristics of Clouds
- Benefits and Risks
- Datacentres, Clusters, Hosts, Hypervisors, VMs
- Templates, Datastores and Pods
- NetLab+ VE Demonstration
- Brief History of Cloud Computing