Introduction to Cloud Computing

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Introduction

- This is all about DataCentres
  - And scaling DataCentres
  - And scaling the enterprise's use of DataCentres
  - And scaling the consumer's interaction with on-line data/content
- Cloud Computing is not:
  - A new type of computer
  - A new type of networking device
  - An abstract computer
  - Using your laptop in an aeroplane

Data Centres

- Internet is about content
  - Users see websites and e-mail = Internet
- Traditional model
  - ISP provides email services:
    - POP3, IMAP, Webmail
  - ISP provides hosting services:
    - Customers host content on ISPs servers (either sharing web server, using dedicated webserver, or using dedicated hardware)
- But how to scale these services?
  - And provide redundancy as these services scale?

Scaling Data Centres

- ISPs can duplicate data centres:
  - To provide redundancy
    - One live, the other hot standby
    - Both operating live at the same time – customer uses nearest
  - To provide scalability
    - Operating all sites at the same time ensures that one site is not overloaded
    - Load-balancers used as front end to content
- Where does all this lead to?

Where does this lead?

- Service Providers operating multiple datacentres with multiple servers
  - All redundant
  - Customers get access to different classes of server
    - Shared address – virtual hosting, by context **small**
    - Unique address – virtual machine **medium**
    - Unique hardware – dedicated machine **large**
- Content providers developing services based around these concepts
  - The end-user no longer has visibility of the individual pieces which make up their content

Cloud Computing

- From wikipedia:

  Cloud computing is Internet-based computing, whereby shared resources, software, and information are provided to computers and other devices on demand, like the electricity grid.

- Or put another way, “The Cloud” is a simple reference to the Internet itself

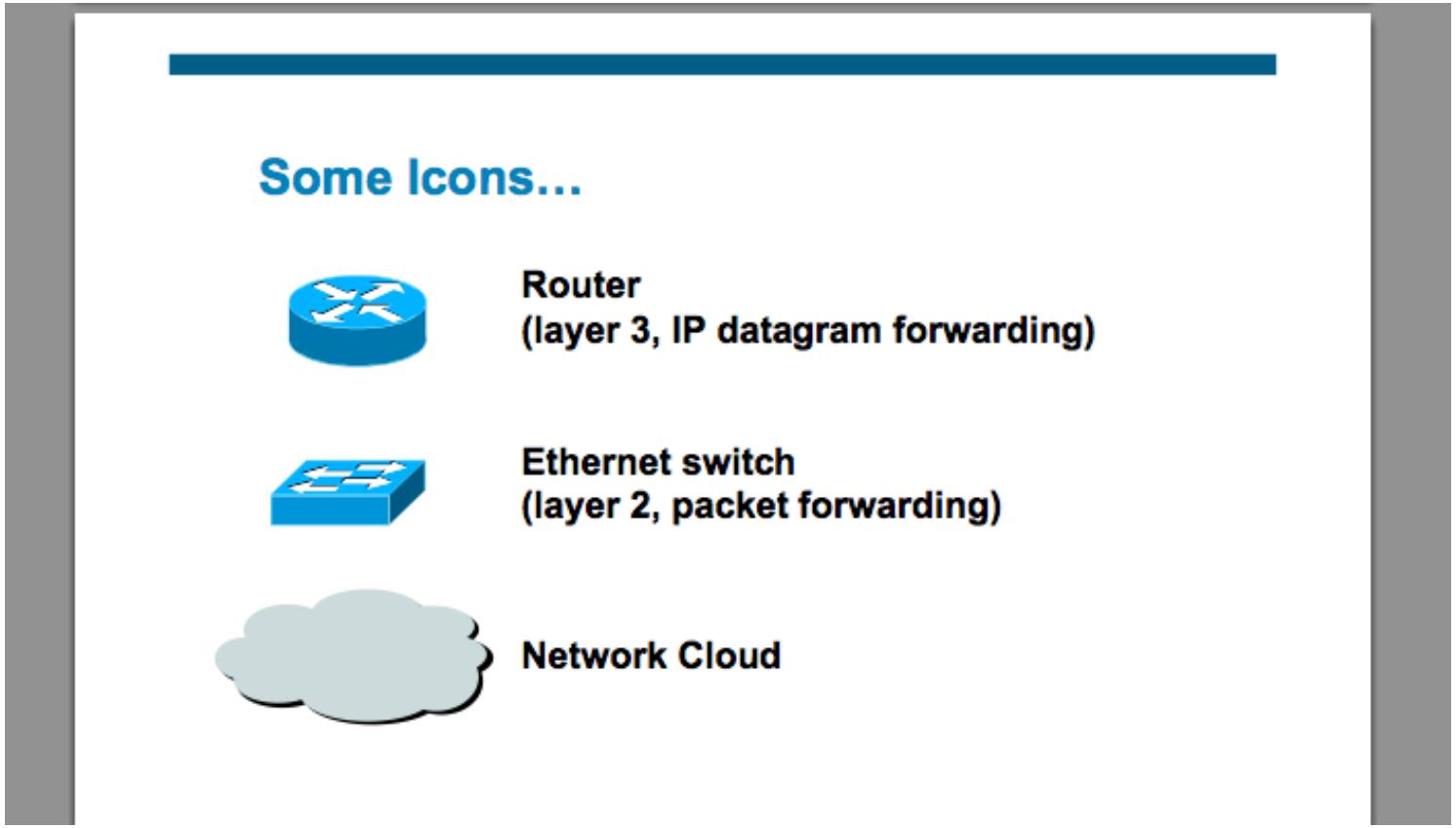
  The Internet being the service that users see, rather than the individual components that make it up

- Some describe this as a paradigm shift

  In reality it is more like that the Internet has grown up and is now the ubiquitous content and communications infrastructure in the way that the telephony network was “The Cloud” in the past

By the Way: Network Cloud

- For decades we've referred to network topologies and devices that make up the network as a Cloud:



The Cloud – Examples

- Typical Examples of components of “The Cloud” might include:

Facebook	Social Networking
Yahoo!/Google/Microsoft	Email, Search, News, Content
Amazon	Commerce
Salesforce.com	Customer relationship management

- In fact any globally distributed content provision operation
- These are public examples – there are also private clouds where businesses use “The Cloud” for their internal IT needs

Cloud Computing – Services

- Cloud Computing (Cloud) offers IT/Network infrastructures, platforms, software or applications as utility like services
- It is identified by three major services

Infrastructure as a Service (IaaS)

Compute, Storage and Network resources as service

Users: Enterprise/End-user Admins, Consumers

Platform as a Service (PaaS)

Software middleware services and development and testing platforms as service

Users: Software Developers

Software as a Service (SaaS)

Software applications as service

Users: Enterprise/End-user Admins, Consumers. Software Developers

Infrastructure as a Service

- An enterprise uses a “cloud infrastructure” as their IT service
- In reality this would be:
  - Servers
  - Storage
  - CPU power/processing – aka computing
- Outsourced to, hosted at and administered by a hosting provider
  - Who takes care of administration & management
  - Who takes care of backups & redundancy
  - Who takes care of security
- Releasing the enterprise IT to concentrate on more strategic operational issues

Platform as a Service

- Rather than providing a whole datacentre service, PaaS provides software platforms
  - Targeted at software developers primarily
  - They don't have to buy expensive software development platforms, rather lease time on the "Cloud" service
- Developers use SDK (software development kits) provided by the PaaS
- Examples of PaaS might include:
  - Google AppEngine
  - Microsoft Azure
  - Amazon SimpleDB

Software as a Service

- Fully finished software products are offered as a service
- Rather than buying a software product outright, an enterprise would buy into the SaaS organisation's "Cloud" offering
  - Outsourced, accessing their software & function via the Internet
- Examples of SaaS might include:
  - SalesForce.com
    - Provide customer relationship management software (used by an enterprises sales teams) for account management
  - WebEx
    - Video/Audio Conferencing system and collaboration tool
  - Google

Categories of Clouds (1)

- Public Cloud

  A service owned an operated by an ISP or Content provider, available and accessed over the Internet, for use by the general public

  Sometimes called an “external cloud”

- Private Cloud

  A service owned and operated by an enterprise IT department, for that enterprise’s internal users (departments, staff, etc)

  (Benefit is not clear as the enterprise still has to build, own and operate the environment)

  Sometimes called an “internal cloud”

- Virtual Private Cloud

  A private cloud operated by a service provider and provided for enterprise use over the public network (compare with VPN)

Categories of Clouds (2)

- Hybrid Cloud

  A cloud infrastructure providing a mix of the features of private and public clouds

  Usually this is a cloud delivered by internal and external service providers (common situation for most enterprises)

- Community Cloud

  A cloud infrastructure which is used by a small group of organisations all having similar requirements

  More secure than public cloud without the restriction of private cloud – and easier to spread the costs across participating organisations

- Inter-Cloud

  Any interaction between any of the above types of cloud

Major features & characteristics

- Cloud customers are offered abstracted and virtualised services:
  - Offload IT operations
  - CAPEX and OPEX savings
  - Cost-effective use of resources
  - Built-in business continuity and disaster recovery
  - Pay per use model
  - Service and Resource CRUD is immediate and fast
    - (CRUD = Create Read Update Delete)
  - Flexibility
    - Services and resources scale according to requirements

Being a Cloud Provider

- The next step for the DataCentre operator
- Considerations:
  - Multiple sites
  - Hardware (switches/routers/servers)
  - Software (virtual machines, services)
  - Network infrastructure (IPv4/IPv6, physical links)
  - Server virtualisation
  - Server and site redundancy
  - Service offerings
  - Security (different Clouds have different requirements)

Cloud Considerations – Consumer

- Security:
  - Where is my data and who else can see it?
  - What guarantees are there?
- Access & Performance:
  - Can I get my data at all times and all places?
  - And how quickly?
- Skills:
  - Using a Cloud means you don't develop skills to provide your own services
  - This may be good or bad

Cloud Considerations – Enterprise

- Availability
  - Must be better than running my IT department internally
  - Locked into Cloud provider's service?
- Security
  - Absolutely critical if using VPCs or any non-private cloud
  - Legal implications (access to data, country jurisdictions, confidentiality)
- Performance
  - The Internet is underlying transport
- Skills
  - Outsourcing skill set means no local skill set
  - Totally dependent on Cloud provider
- Costs
  - Must be cheaper than providing services within the organisation
  - What happens in future when the price balance tips unfavourably?

Cloud Computing: Summary

- It's really about Datacentres:
  - Scaling Datacentres
  - Virtualised Datacentres
  - Outsourcing Datacentre & Computing Services
  - The next big "marketing" concept for the Internet to describe the ongoing scaling and distribution of content provision and services around the world
- Security:
  - Security & data protection **must** be serious consideration