

Getting Started with Cloud Computing

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Your level of prior awareness?

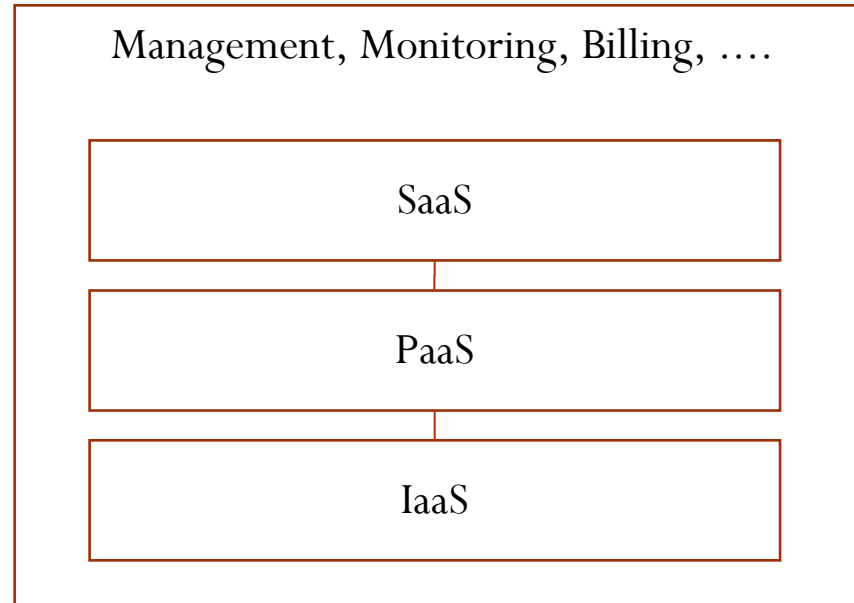
- Grid
 - Moderately clueless before this workshop
 - Interested but limited knowledge
 - Moderate knowledge but no hands on
 - Have done some work with Grids
 - Expert
- Cloud.
 - Moderately clueless before this workshop
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Cloud Computing: Is it important?

- US: apps.gov
 - The Federal government's Apps.gov, a storefront for approved cloud computing applications.
- UK: G-Cloud
 - Digital Britain report talks of government plans to develop a framework for cloud computing applications.
- Pick, and critique, a forecast:
 - IDC expects spending on IT cloud services to grow almost threefold, reaching \$42 billion by 2012 and accounting for 9% of revenues in five key market segments.

What is Cloud Computing?

- **three service models (NIST)**



You will also come across:

Business as a Service – BaaS

Data as a Service – DaaS *

Desktop as a Service – DaaS *

Everything as a Service – XaaS

Framework as a Service – FaaS

Hardware as a Service – HaaS (“bare metal”)

Organization as a Service – OaaS

...

SaaS – NIST Definition

Software as a Service (SaaS).

One of the 3 service models

The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure.

- The applications are accessible from various client devices through a thin client interface such as a web browser (e.g., web-based email).
- The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.

Example 1: Google Mail / Apps

- Trinity College Dublin – early 2007
 - **Legacy** email system that lacked the features that students wanted
 - No longer able to support **storage demands**
 - Couldn't be scaled efficiently to provide **services to alumni.**
 - Ongoing **maintenance** was high with a constant need to update virus and spam filters.
 - Achieved **cost savings** associated with labour and operational efficiencies
- Further case studies:
<http://www.google.com/a/help/intl/en/edu/customers.html>

Example 2: Google Mail

- Los Angeles City Council to outsource its e-mail system to Google making it the largest city in the US to make the move.
- Google beat Microsoft, as part of becoming a software provider to the world's cities and businesses.
- **\$7.25-million contract** (5 years) to move all 30,000 city employees to Google's cloud.
- "The City of Los Angeles, the second largest city in the nation, made a world-class decision today to support a state-of-the art e-mail system," said Councilman Tony Cardenas, who made the motion to approve the Google system.
- <http://latimesblogs.latimes.com/technology/2009/10/city-council-votes-to-adopt-google-email-system-for-30000-city-employees.html>

Others: Google Mail / Apps

- Other Universities
 - University of Westminster
 - Reported saving an estimated **£1 million** (to date) on IT costs
 - Improved email storage capabilities
 - University of Portsmouth – Google Applications (Mail, Calendars, Documents, Sites, Talk) to all students from September 2009
 - Sunderland
 - Loughborough
- Further case studies:
<http://www.google.com/a/help/intl/en/edu/customers.html>

Finding a balance

- Advantages of SaaS
 - Bespoke infrastructure not required
 - Reduced system administrator loading
 - No upfront software costs – PAYG respects level of use
 - Users supported by the organisation that knows the product
 - BUT, setup costs still necessary and training still required – system consistency is favourable; incremental changes may reduce training overhead.
- Disadvantages of SaaS?
 - Always-on connectivity / “thin pipes” problem?
 - Vendor lock-in?
 - Trust in third party?
 - Limited support in Service Level Agreements?
 - Emotional attachment to physical systems?

PaaS – NIST Definition

Platform as a Service (PaaS).

One of the 3 service models

The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired **applications created using programming languages and tools supported by the provider.**

- The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, **but has control over the deployed applications and possibly application hosting environment configurations.**

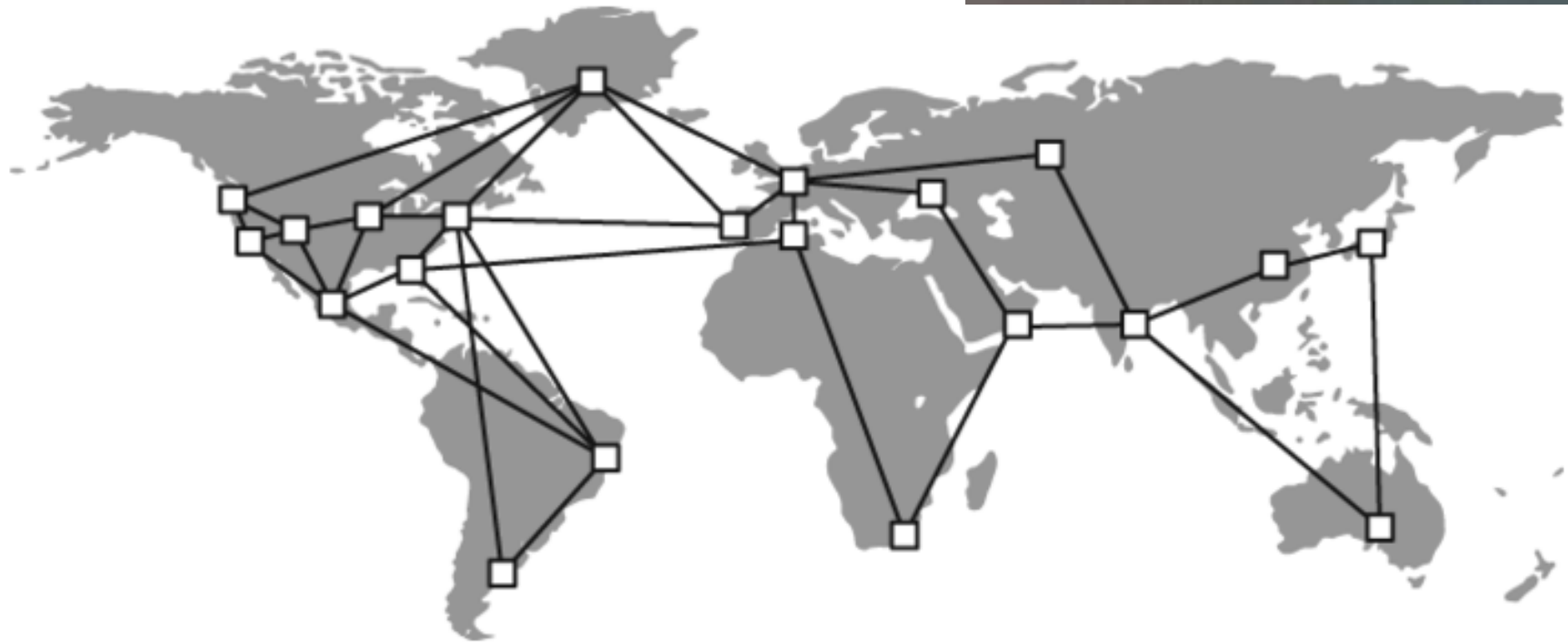
PaaS

- Most popular PaaS: Google App Engine.
 - Python or Java with Google's libraries
 - Certain restrictions may exist on functionality
- Microsoft Azure
 - .NET applications
- Force.com

GAppE: What is it?

- Google has lots of data centres

**My other computer
is a data center**



From: Using Google App Engine

PaaS

- PaaS environments such as GAppE provide:
 - hosting infrastructure – internet vital
 - test and deployment services
 - storage services (e.g. database)
 - management and administration services for monitoring resource use and application performance (and for billing)
 - development environments - programming language / SDK
 - interfaces? (e.g. SOAP, REST)
 - likely multi-tenant architecture
- **You program to the vendor's platform and the platform provides a range of additionally beneficial features that you don't have to think about.**

PaaS

- Disadvantages of PaaS:
 - vendor dependency / “lock-in” - applications coded to vendor-specific APIs.
 - need to learn a new programming language; entirely rewrite application
 - need operate with vendor-specific storage approach
 - may enforce changes of functionality
 - no control over platform updates which may break applications

IaaS – NIST Definition

Infrastructure as a Service (PaaS).

One of the 3 service models

The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications.

- The consumer does not manage or control the underlying cloud infrastructure **but has control over operating systems, storage, deployed applications, and possibly limited control of select networking components (e.g., host firewalls).**

IaaS

- The cloud competes against two approaches to IT:
 - Internal IT infrastructure and support
 - ownership, no matter where it is located
 - pay staff
 - buy replacements (or cannibalise existing machines)
 - requires Capital Expenditure (CapEx)
 - Outsourcing to managed services
 - rental (fees – Operational Expenditure, OpEx) - someone else owns your servers and keeps them running
 - rental company pays staff
 - not specifically paying for use
 - managing infrastructure is their problem - replacement depends on the **service-level agreement (SLA)**.

| Servers | 10% OFF | 20% OFF | 30% OFF | 40% OFF | 50% OFF |
|---|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|
| | DS 300 | DS 500 | DS 700 | DS 900X | DS 1000XX |
| Offer Price per month (for 3 months) | £53.10pm £62.39 inc. VAT | £63.20pm £74.26 inc. VAT | £83.30pm £97.88 inc. VAT | £89.40pm £105.05 inc. VAT | £104.50pm £122.79 inc. VAT |
| Normal price | £69.33 inc VAT | £92.83 inc VAT | £139.83 inc VAT | £175.08 inc VAT | £245.58 inc VAT |
| | BUY NOW! | BUY NOW! | BUY NOW! | BUY NOW! | BUY NOW! |
| Processor | 2.8GHz Dual Core | 2.8GHz Dual Core | 2.5GHz Quad Core | 2.66GHz Quad Core Xeon | 2 x 2.5GHz Quad Core Xeon |
| CPU Cores | 2 | 2 | 4 | 4 | 8 |
| Hard drives | 500GB SATA | 2 x 250GB SATA | 2 x 300GB SATA | 2 x 300GB SAS | 2 x 300GB SAS + 500GB SATA |
| RAID* | - | RAID 1 | RAID 1 | RAID 1 | RAID 1 |
| RAM | 2GB | 4GB | 8GB | 8GB | 16GB |
| Bandwidth | Unlimited | Unlimited | Unlimited | Unlimited | Unlimited |
| Pay Monthly Offer Price (for 3 months) | £53.10 £62.39 inc VAT | £63.20 £74.26 inc VAT | £83.30 £97.88 inc VAT | £89.40 £105.05 inc VAT | £104.50 £122.79 inc VAT |
| Normal price | £69.33 inc VAT | £92.83 inc VAT | £139.83 inc VAT | £175.08 inc VAT | £245.58 inc VAT |
| Pay Annually inc 3 month offer + 1 month free | £631.30 £741.78 inc VAT | £821.60 £965.38 inc VAT | £1201.90 £1412.23 inc VAT | £1460.20 £1715.74 inc VAT | £1985.50 £2332.96 inc VAT |
| Normal price | £762.58 inc VAT | £1021.08 inc VAT | £1538.08 inc VAT | £1925.83 inc VAT | £2701.33 inc VAT |
| | BUY NOW! | BUY NOW! | BUY NOW! | BUY NOW! | BUY NOW! |
| | Full details | Full details | Full details | Full details | Full details |

Ready-to-Go-Plans

Build Your Own

Assisted Service Plan

STEP 1: Select Components

Processor

Select your Intel® processor type for your dedicated server.

- Pentium® 4w/HT - 3.0GHz (included)
- [Core 2 Duo](#) - 2.13 GHz - Add \$29.99
- [Core 2 Duo](#) - 2.66 GHz - Add \$59.99
- [Quad-Core](#) - 2.5 GHz - Add \$79.99
- [Quad-Core](#) - 2.83 GHz - Add \$149.99

Operating System  [Edit](#)

Bandwidth  [Edit](#)


Hard Drives  [Edit](#)


RAM  [Edit](#)

Panel & Software  [Edit](#)

Firewall  [Edit](#)

Database  [Edit](#)

Backup  [Edit](#)

Assisted Service Plan  [Edit](#)

STEP 2: Review rate and buy

Current Configuration

Server: Dedicated Server
*Processor: Core 2 Duo 2.66 GHz
Operating System: CentOS or Fedora
Bandwidth: 500GB
Hard Drive: Single 120 GB Drive
RAM: 1GB
Control Panel: None
Software: No Additional
Firewall: None
Database: None
Backup: None
Service Plan: None


* (Upgrade)

[Print Quote](#)

Plus, get these FREE features!

- FREE! Setup Fee
- FREE! [SSL Certificate](#), a \$49.99/yr value!†††
- FREE! Up to \$60 [MySpace® myAds Credit†](#)
- FREE! Up to \$125 [Google® AdWords® Credit*](#)
- FREE! Up to \$50 [Facebook® Ad Credit††](#)

Review Rate:

12 months, \$125.98/mo SAVE 10%** 

Monthly Rate as Configured: **\$125.98/mo**

 **ADD TO CART**

Amazon Web Services (AWS)

- EC2: APIs for provisioning, managing, and deprovisioning virtual servers inside the Amazon cloud.
 - Any application anywhere on the Internet can launch a virtual server in the Amazon cloud with a single web services call.
- Several “data centres” (availability zones)
- Start a virtual server based on a predefined Amazon machine image (AMI) which can be customized.
 - Includes your operating system and any other prebuilt software.
- Storage:
 - Ephemeral on node
 - Elastic Block storage that acts like a SAN
 - S3 for general persistence, but not standard directory-like

Getting Started

- Register..



A certain
quantity may
be free.



Why might I go to EC2?

1. Need just that bit extra to get something done.
2. Want to run a few tests.
3. [Can't find my passport]
4.

Shallow Dive – Amazon EC2

- A quick look at EC2 – launching and connecting to a server!
 - Quick how-to:
 - <http://aws.amazon.com/console/>
 - Create or use keypair
 - Create or use security group (open SSH port, at least)
 - Select a Fedora image and Launch Instance
 - Instance will be running at
 - e.g. **ec2-174-129-83-56.compute-1.amazonaws.com**
 - *On Windows, use Puttygen to create PPK from PEM*
 - Use PPK in Putty (SSH/Auth) to connect to image; WinSCP or similar to drop files onto this system
 - Add another volume (e.g. enron_mail snapshot)
 - ***Don't forget to poweroff or terminate instance***

Some current efforts

1. MSc module on Cloud Computing inc. teaching grant from Amazon - \$100 per student
2. PhD relating to Service Level Agreements (price comparison service – Bin Li)
3. Eucalyptus (open source version of EC2) – FEPS, courtesy of John O’Laughlin. NASA use Eucalyptus

Some current efforts

JISC funded study on Cloud Computing: Use Cases for Research

Workshop session

If I had \$4,000 from Amazon to spend on running some research in the Cloud, would you like to help you spend it?

Facilitators: Max Hammond and Rob Hawtin (Curtis+Cartwright)

Workshop

What are the current requirements of your research, in terms of disk space, hardware, run time etc. and how are they met?