Cloud Computing 101

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5 W’s of Cloud

- What
- When
- Who
- Where
- Why
- DoD and the Cloud

What is the Cloud?

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.

NIST Special Publication 800-145

Put Simply, cloud is outsourcing your storage and compute

Image: http://www.nlyte.com/wp-content/uploads/markets-data-center.jpg

Examples

- Defense Travel System (DTS)
- Healthcare.gov
- Carbonite
- Word Press
- Gmail
- Facebook
- Netflix
- Google apps
- Office 365

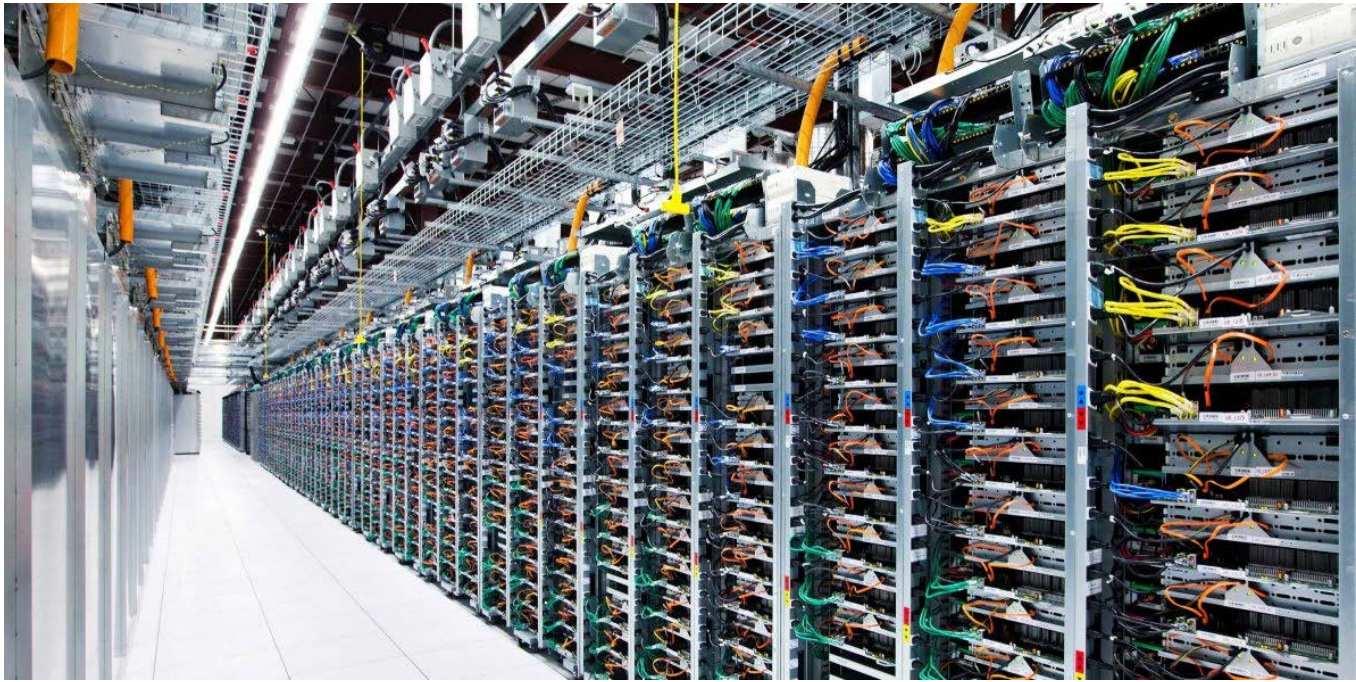


Image: https://blog.blesshost.com/wp-content/uploads/2017/07/take-a-rare-peek-inside-the-massive-data-centers-that-power-google.jpg

When: back to the future

- Reminiscent of the early days of computing
  - Mainframes
  - Centralized computing and Storage
- 2006 - Amazon offers Elastic Compute Service (ECS)
- 2008 - Google debuts Google App Engine
- Feb 2010 - Microsoft Azure
- July 2010 - Rackspace launches NASA developed OpenStack
- 2011 - IBM SmartCloud
- 2012 - Google Compute Engine

Image: https://www.computerhope.com/jargon/m/mainframe.jpg

Who

Big Three

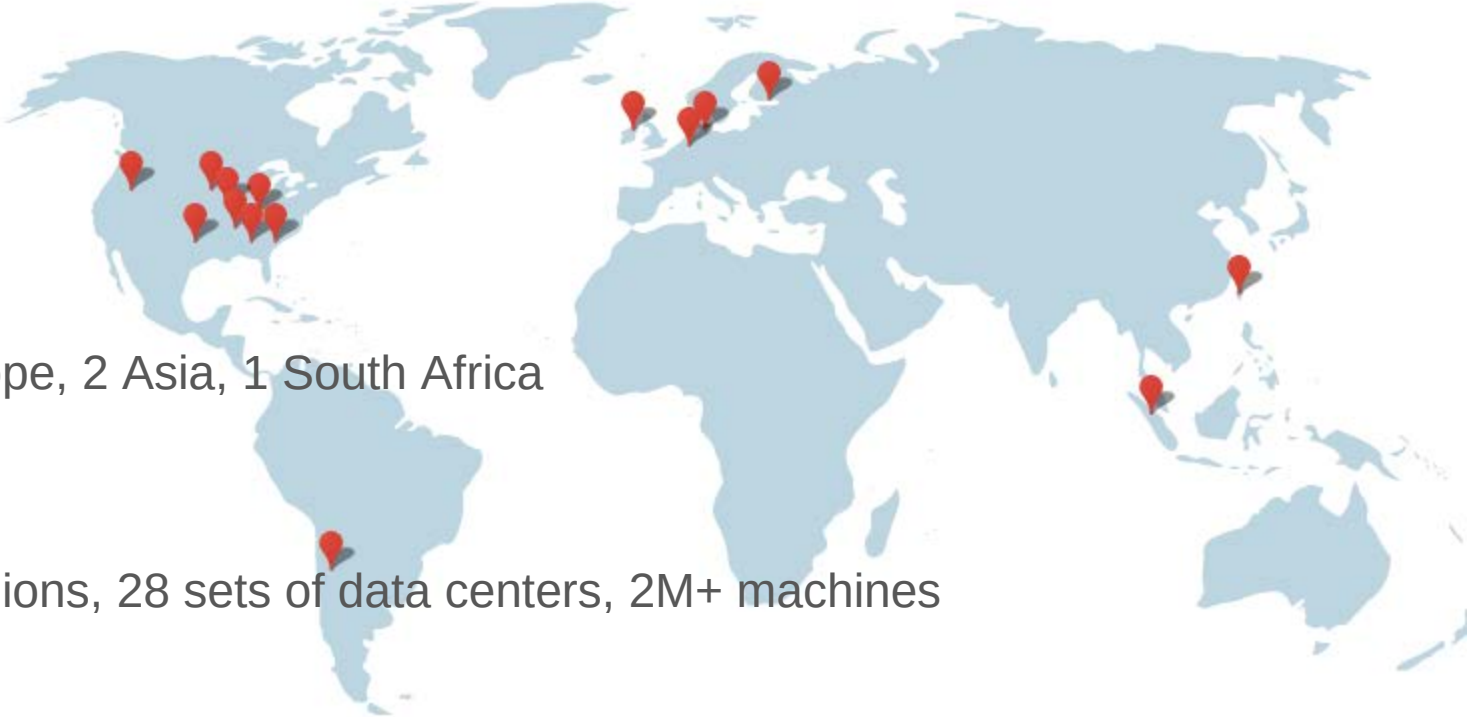
- Amazon
- Microsoft
- Google

Other Notables

- IBM
- Salesforce
- SAP
- Oracle
- ServiceNow
- Workday
- VMWare

Source: https://www.gartner.com/doc/reprints?id=1-2G2O5FC&ct=150519
https://www.forbes.com/sites/bobevans1/2017/11/07/the-top-5-cloud-computing-vendors-1-microsoft-2-amazon-3-ibm-4-salesforce-5-sap/#6e9de98e6f2e

Where



Google

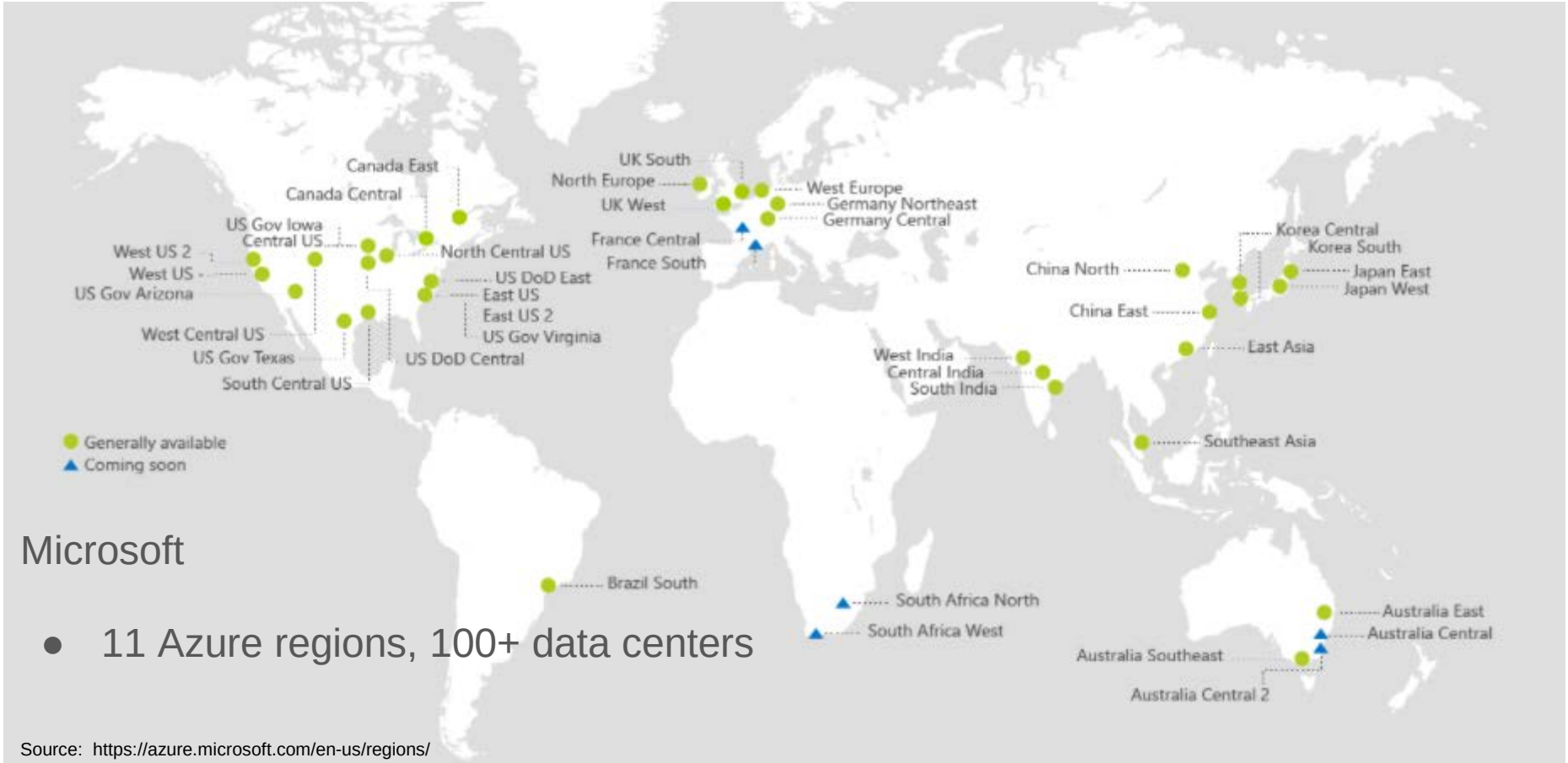
- 8 US, 4 Europe, 2 Asia, 1 South Africa

Amazon

- 11 Cloud regions, 28 sets of data centers, 2M+ machines

Source: http://www.datacenterknowledge.com/archives/2017/03/16/google-data-center-faq
https://www.google.com/about/datacenters/inside/locations/index.html
https://www.bloomberg.com/news/2014-11-14/5-numbers-that-illustrate-the-mind-bending-size-of-amazon-s-cloud.html

Where



Microsoft

- 11 Azure regions, 100+ data centers

Source: https://azure.microsoft.com/en-us/regions/

Why

Top Five

1. On-demand self-service (flexibility)
2. Broad network access (access/work from anywhere)
3. Resource pooling
4. Rapid elasticity (scale)
5. Measured Service (only pay for what you use)

Other Reasons

- No capital expenditure
- Security
- Reliability and Redundancy
- Potential for cost savings
- Ease of implementation

DoD and the Cloud

Initial Question

- Service model - how much to own and how much to out-source

Potential of the Cloud

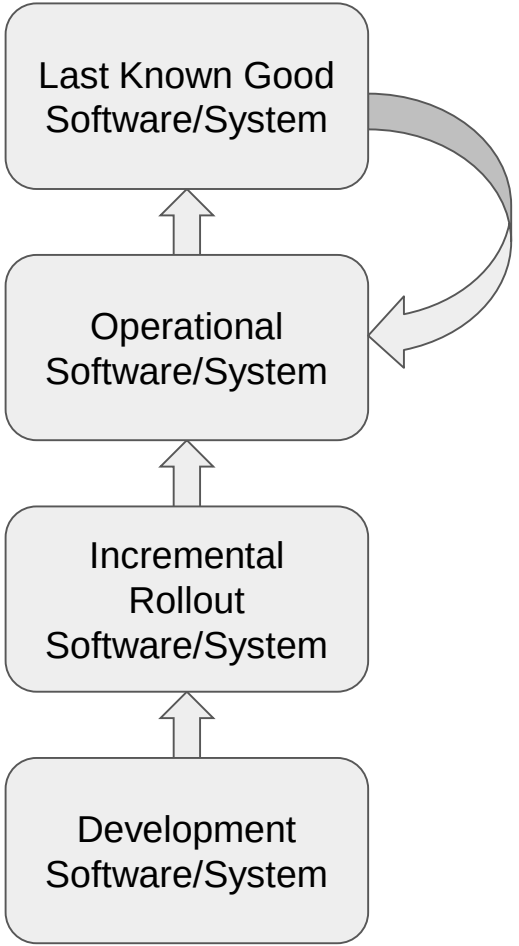
- Break down data silos, increased interoperability and data sharing
- Increase accessibility
- Lower total cost of ownership
- Flexibility (provider choices and competition)

Challenges of the Cloud

- Identity management
- Authorization/Role based access
- Increased importance of network reliability and access
- Are Service Level Agreements (SLAs) and security standards enough?

Assurance in the Cloud

- Testing
  - Automation
  - Incremental rollout
  - Ensure fallback capability
- Security and Availability
  - Much higher reliability and availability
  - Equal or better security is possible
  - Continous red teaming
    - Ex. Chaos monkey



Service and Deployment Models

Service Models (?aaS)

- Software
- Platform
- Infrastructure

Deployment Models

- Private
- Public
- Community
- Hybrid

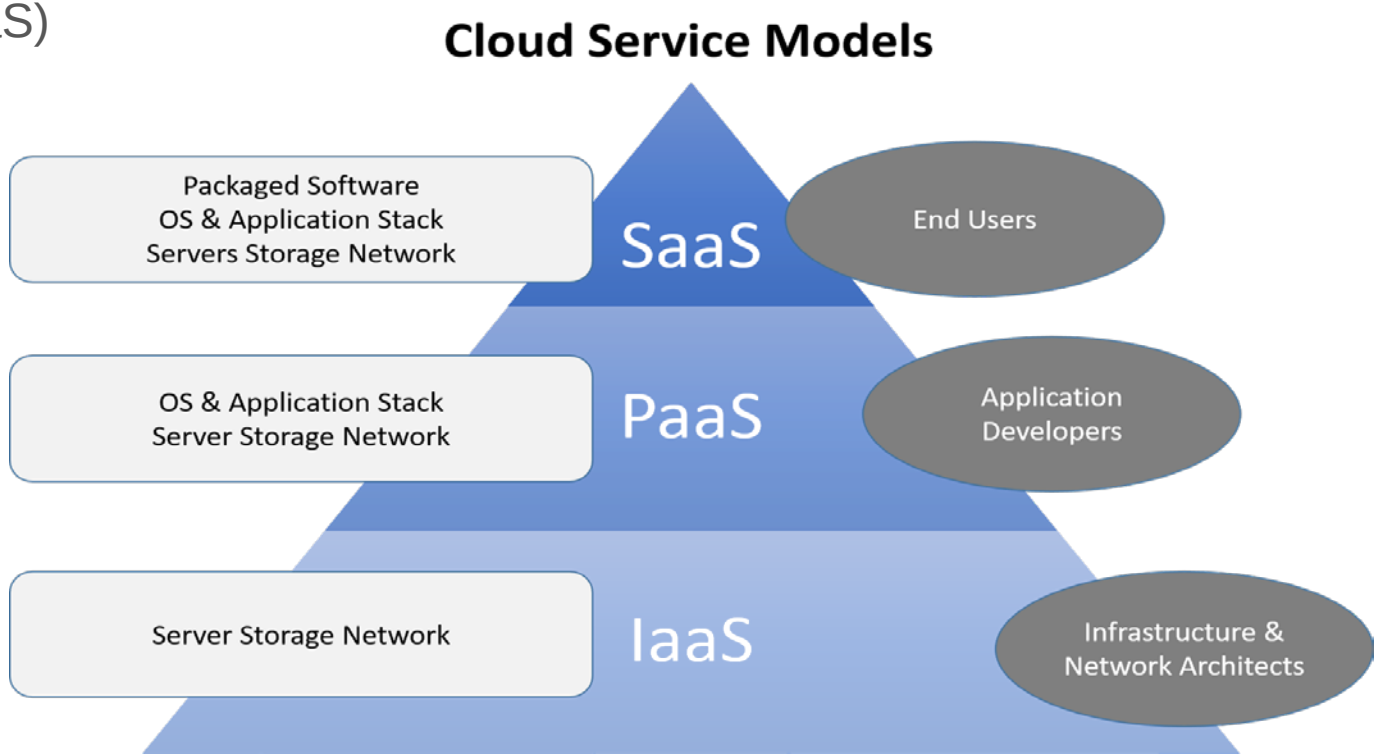


Image: https://media.licdn.com/mpr/mpr/AAEAAQAAAAAAAAzuAAAAJGIyMmQ5ZDMzLWQwZTAtNDgzOS1iNzY5LWY5M2EzMTI1MmNjZA.png

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