Summary of Cloud Computing at University of Bristol 2018 / 2019*

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*This is just a simple summary. I am not responsible for the provided content or anything which belongs to this. If there are any questions please contact me at bauerflorian13@gmail.com .

Contents

Lecture 01: Introduction

Comparison of the internet and electricity network

- starts with everyone has his own (electricity/ computationally power)
- connection between every single users grows
- ends in an all connected world with only a few big services provided by a small number of providers (computationally power goes from the device of the endusers to the cloud, electricity comes from big providers)

Normal Failure

- cloud data centre with 99.999% survival rate
- 500000 server, probability of 100% of the servers are still running after 3 years is 1%.
- **solution**: modular data centres, *servers in container boxes*

Essential Characteristics of Cloud Computing

This definition belongs to NIST's characteristics of Cloud Computing

- **On-demand self service**
- **Broad network access**
- **Ressource pooling**
- **Rapid elasticity**
- **Measured service**

A common stratification: *aaS

Everything as a Service.

- **SaaS**: *Software as a Service*, for instance: everyone
- **PaaS**: *Platform as a Service*, for instance: *Google App Engine*, *Amazon Appstream*
- **IaaS**: *Infrastructure as a Service*, for instance: *Amazon EC2, S3*, *Google Compute Engine*

A small number of companies providing IaaS/PaaS s services. Convergence to an oligopoly of less than five providers seems certain.

Lecture 02: Coursework

Just a few informations about the coursework and programming project. May be hopefully not important for the exam...

L03: Economics of Cloud

The basic Economics

- **Cap**ital **Ex**penditure: *Capex*
- **Op**erating **Ex**panditure: *Opex*
- Capex vs Opex: *Why buy a cow if all you need is the milk?*

A typical warehouse scale computer

- *pizzabox* in a *refrigerator* is a server rack
- multiple server racks together are a cluster
- see Figure 1

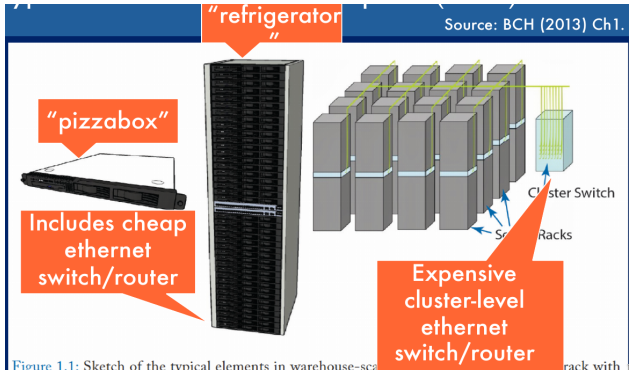


Figure 1: WSC - Warehouse-scale Computer

Energy & Power Efficiency

- cooling cost are around 42%
- optimizing the cooling efficiency will lower the overall costs massivley

Resume

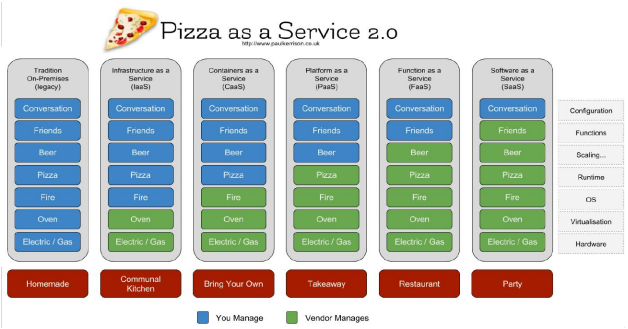
- there is a lot going on *under the hood of a WSC* (WSC = **Warehouse-scale Computer**)
- *prod¿¿dev*: The innovations are made by and in companies not universitys

L05: *aaS

Definiton see **??**

Why Xaas or *aaS

- avoiding of **Undiffertiated Heavy Lifting**
- the cloud is an ideal environment providing *scale, low cost, automation via Infrastructure-as-Code*



Structure of AWS Cloud

- **Availability Zones**: cluster of independent data centres, enables **fault isolation** and **high availability**
- **Regions**: entirely independent clouds, consists of a least two *AZ*s, interconnection on global backbone, different regions have different costings

Which Region should I choose?

- **Data souvereignty and compilance**: where to store user data?
- **Proximity of users to data**: where are the most of my users? -¿ lowest latency
- **Services and feature availability**: services and features may vary
- **Cost effectiveness**: each region has different costs (Europe and US are the cheapest)

High Availability & Fault Tolerance

High Availability:

- minimise service downtime by using redundant components
- require components in at least two AZs
- IaaS may have HA, PaaS usually will have HA

Fault Tolerance

- ensure no service disruption by using active-active architecture
- requires service components in at least three AZs
- Iaas is unlikely to offer FT, PaaS some offers FT

AWS Storage options

- Elastic Block Storage: SSDs, Magnetic, NAS, Use: OS, Apps
- S3: durable object storage, very cheap and big
- Instance Storage: on-host storage, very fast, caching
- Elastic File Store: shared storage across AZs

IaaS vs PaaS

- IaaS mainly used by SysAdmins, PaaS mainly used by Developers
- IaaS provides e.g. *VMs,Storage Services,Networking*, PaaS provides e.g. hosted databases, *App deployment and managment env.,test suites*
- IaaS lower cloud costs, PaaS lower human costs

L07: Virtualisation, Containers and Container Orchestration

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L09: Serverless

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L11: Scalable Systems

L13: MapReduce and GFS/HDFS

L14: CAP, Paxos, BGP

L15: The Hadoop Ecosystem

L16: Spark and In-Memory Methods

L17: NoSQL

L18: Graph Databases

L19: NewSQL & Event Stream Processing

L20: Cloud Security

L21: DevOp

Todo...