Everything as a Service (XaaS)

COSC349—Cloud Computing Architecture

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Learning objectives

- Understand that ***X* as a Service** is often a cloud model
  - IaaS, SaaS and PaaS remain a core group of three though

- For at least three different types of XaaS offerings:
  - describe the **purpose** of that type of XaaS;
  - indicate its **positive and negative points**; and
  - sketch its typical **pricing structure**

Everything as a Service (XaaS, EaaS, *aaS)

- Success of IaaS, PaaS, and SaaS led to other services
- Collection is described as '**everything as a service**'
  - … although XaaS is not a single type of service itself

- May overlap with I/P/SaaS, but many are independent
- Share **pricing** as a service; **cloud-based hosting**
  - *e.g.*, specialising a particular PaaS allows for targeted pricing
  - … cloud provider can decide what overheads to absorb
    - Providers benefit from fine-grained knowledge about cloud use

Database as a Service (DBaaS)

- Or "**cloud database**", e.g., AWS RDS, Aurora, etc.
  - We've talked about Amazon Aurora previously
- Relational databases' SQL use provides portability
- Cloud database systems also include NoSQL / NewSQL
  - NoSQL / NewSQL DBs are designed to **scale-out over clusters**
  - **NoSQL** typically tuned for non-relational data-types
    - Key-value store; JSON; time-series data; graph databases; …
  - **NewSQL** instead scales out a typical relational database

Storage as a Service

- **Enterprise storage** systems are typically **multi-tier**:
  - RAM; SSD; spinning disk; tape
  - Storage as a Service integrates cloud offerings into tiers
  - Thus typically operates in a hybrid cloud mode
- … or **personal storage**: Dropbox, Box, OneDrive, etc.
- **Cloud backup systems**: an alternative to tiered storage
  - Backup client software typically runs on-site
  - Synchronise backup data with cloud storage—slow is OK

Network as a Service

- Can be external organisation running client network
  - **Bandwidth on Demand** (BoD)—avoids provisioning for peaks
  - **Virtual Private Network** (VPN)—provides secure network
    - VPNs let external devices appear as if inside organisation network
- **Content Delivery Networks** (CDN)
  - CDNs use global deployment to disseminate data, *e.g.*, video
- **Mobile Virtual Network Operator** (MVNO)
  - MVNO rents radio spectrum from infrastructure owner

Security as a Service (SECaaS)

- Also **Network Defence as a Service** (NDaaS)
- Operational services provided by SECaaS
  - **Identity and Access Management** (IAM)
  - **Email security**—phishing detection; privilege testing
  - **Web security**—detection of anomalous behaviour
  - **Virus / malware scanning**
- Risk mitigation services provided by SECaaS
  - **Intrusion detection and management**
  - **Business Continuity / Disaster Recovery**
  - **Data Loss Prevention** (DLP)—detect exfiltration

Unified communications as a Service (UCaaS)

- Organisations used to rely on wired phone extensions
  - Internal ‘exchange’ to manage n–m connectivity: PABX
- Multiple pressures have emerged:
  - **Mobile devices** render phone extensions less relevant
  - Demand for **video conferencing** on end-user devices
  - Integration between comms. and other systems (CRM, etc.)
  - May be inefficient to offer these services in-house
    - Can still **do digital transformation** in-house with VoIP…
- *e.g.*, UoOtago online meetings can use Zoom (really?!)

Logging as a Service (LaaS)

- **Security sensitivity** means LaaS is often private cloud
  - Splunk is a log management firm supporting public & private
- Log files emerge from all over enterprise IT
  - Server software; network components; hardware devices
- Raw log information often just a puzzle piece:
  - Need to **centralise & aggregate information** to see big picture
  - Potentially independent: collection; retention; analytics
- Want **alerting** to be managed in a **unified way**
  - Don't independently set up SMS recipients for each service

Monitoring as a Service

- More proactive compared to logging as a service
  - Often will monitor organisation's resources **from outside** the organisation—*e.g.*, are key websites / services up and running?
  - Server machine can be up while key services are down
- **Machine resources** are worth tracking at IaaS level
  - Free space on storage systems
  - CPU load / RAM: is there some sort of **unexpected spike**?
  - Bandwidth use through firewalls and on internal network
- At PaaS / SaaS, is the **request throughput** as expected?

Desktop as a Service / Desktop Virt.

- University of Otago Student / Staff Desktop
  - Otago ITS run the back-end **Virtual Desktop Infrastructure** (VDI)

- DaaS is **VDI in the cloud**
  - Facilitates access to 'work desktop' **from any device & place**
  - … even if an organisation's sites become disabled / destroyed
- Client doesn't need to provision / manage hardware
  - DaaS may **couple licensing**, *e.g.*, for short-time staff
  - DaaS allows **security** to be monitored by the provider (scale)

Mobile backend as a Service (MBaaS)

- MBaaS provides services useful to **mobile applications**
  - **Push notifications**; integration with other platforms (e.g., social)
  - Also known as 'BaaS', since this acknowledges web & mobile
  - Pricing often based on **number of API requests**
- Popular offerings from many large cloud providers, e.g.
  - **Apple's CloudKit**—the platform powering iCloud
    - Provides: file storage, databases, authentication, messaging, …
  - **Google's Firebase** (started 2011, acquired by Google in 2014)
    - Has above CloudKit offerings, plus testing, profiling, debugging

Search as a Service

- Large organisations need **search services**
  - Difficult when spanning multiple resources, such as web + DBs
- Publicly web accessible material? 'Google' (WLOG) it!
  - Can easily focus search engines, *e.g.*, using 'site:' directive
  - Can go further to more tightly 'brand' the search pages
- If internal, **non-public resources need searching**
  - Pre-cloud: put rack-mounted search appliances on your LAN
  - Post-pre-cloud: can have **software agents scan resources**
    - Services' indexes can help such search tools, *e.g.*, email headers