EAMON SCULLION

# ADVANCED INFRASTRUCTURE – CLOUD

# WHAT IS CLOUD COMPUTING?

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- Cloud computing is the on-demand delivery of compute power, database, storage, applications, and other IT resources via the internet with pay-as-you-go pricing, helping you lower your operating costs, run your infrastructure more efficiently and scale as your business needs change.




The main cloud providers are Amazon Web Services, Google Cloud Platform and Microsoft Azure.

# HOW DOES CLOUD COMPUTING WORK?

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- Cloud computing gives you access to servers, storage, databases, and a broad set of application services over the Internet.
- A cloud services provider owns and maintains the network-connected hardware required for these application services, while you provision and use what you need via a web application.

Cloud providers manage the infrastructure, and offer on-demand provisioning services which allow users to only use what they need.

# WHAT ARE THE BENEFITS?

## COST SAVINGS

- The cloud allows you to trade capital expense (data centres, physical servers, etc.) for variable expense and only pay for IT as you consume it.
- Plus, the variable expense is much lower than what you can do for yourself because of the larger economies of scale.

Instead of investing in hardware up-front, you can invest towards operational costs by using pay-as-you-go services.

Because cloud providers operate on such a large scale, provisioning servers is a lot cheaper than if you were to set everything up yourself.

By offering “elastic” components (we will cover in the next slide), you only pay for what you use, which can be adjusted easily to meet demand.

# GLOBAL SCALE

- The benefits of cloud computing include the ability to scale **elastically**.
- That means delivering the right amount of IT resources - for example, more or less computing power, storage, bandwidth - right when they're needed, and from the right geographic location.

Elastically - use only what you need.
Simple to provision in different regions.

# PERFORMANCE

- The biggest cloud computing services run on a worldwide network of secure data centres, which are regularly upgraded to the latest generation of fast and efficient computing hardware.
- This offers several benefits over a single corporate data centre, including reduced network latency for applications an greater economies of scale.

# SECURITY

- Many clouds providers offer a broad set of policies, technologies and controls that strengthen your security posture overall, helping to protect your data, apps and infrastructure from potential.

# SPEED

- Most cloud computing services are provided as self service and on demand, so even vast amounts of computing resources can be provisioned in minutes, typically with just a few mouse clicks, giving businesses a lot of flexibility and taking the pressure off capability planning.

# PRODUCTIVITY

- On-site data centres require a lot of “racking and stacking” - hardware setup, software patching and other time-consuming IT management chores.
- Cloud computing removes the need for many of these tasks, so IT teams can spend time on achieving more important business goals.

# RELIABILITY

- Cloud computing makes data backup, disaster recovery and business continuity easier and less expensive because data can be mirrored at multiple redundant sites on the cloud provider's network.

Five nines availability

# WHAT ARE THE DRAWBACKS?

# POSSIBLE DOWNTIME

- Cloud computing makes your business dependent on the reliability of your internet connection.
- Outages and slow speeds affect your ability to do business.
- Even the most reliable cloud computing service providers suffer outages occasionally.
- “Five Nines” is the target availability metric for cloud providers - this means that a service will be available 99.999% of the time.

# SECURITY

- Although most cloud providers use the most sophisticated data security systems, the security still depends on how the services are used.
- It is up to the users to invest in the right security training so that they can uphold and ensure correct identity and access management.
- This is especially important as we are essentially handing over data to a third party (cloud provider).
- For this reason, it is not suitable for all companies - some have restrictions on where they can store their data (so they may opt for private/hybrid cloud approach instead)

## LOSS OF CONTROL

- Users are dependent on the cloud provider - you are using their service so they can set pricing, what services are available etc.
- Once you are “locked in”, it can be difficult to switch provider.

Some approaches (like Kubernetes) can be used to make your technology stack “cloud agnostic” - meaning that it can run on any cloud provider.

# TYPES OF CLOUD COMPUTING

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- Not all clouds are the same and not one type of cloud computing is right for everyone.
- Several different models, types and services have evolved to help offer the right solution for your needs.
- First, you need to determine the type of cloud deployment, or architecture, that your cloud services will be implemented on. There are three different ways to deploy cloud services:
  - Public cloud
  - Private cloud
  - Hybrid cloud

# PUBLIC CLOUD

- Public clouds are owned and operated by third-party cloud service providers, who deliver their computing resources such as servers and storage over the Internet.
- With a public cloud, all hardware, software and other supporting infrastructure are owned and managed by the cloud provider.

# PRIVATE CLOUD

- A private cloud refers to cloud computing resources used exclusively by a single business or organization.
- A private cloud can be physically located on the company's on-site data centre.
- Some companies also pay third-party service providers to host their private cloud.
- A private cloud is one in which the services and infrastructure are maintained on a private network.

Also known as “On-premises” or “Enterprise” Cloud. The main difference between private and public cloud is that for private clouds, all data will be protected behind a firewall.

# HYBRID CLOUD

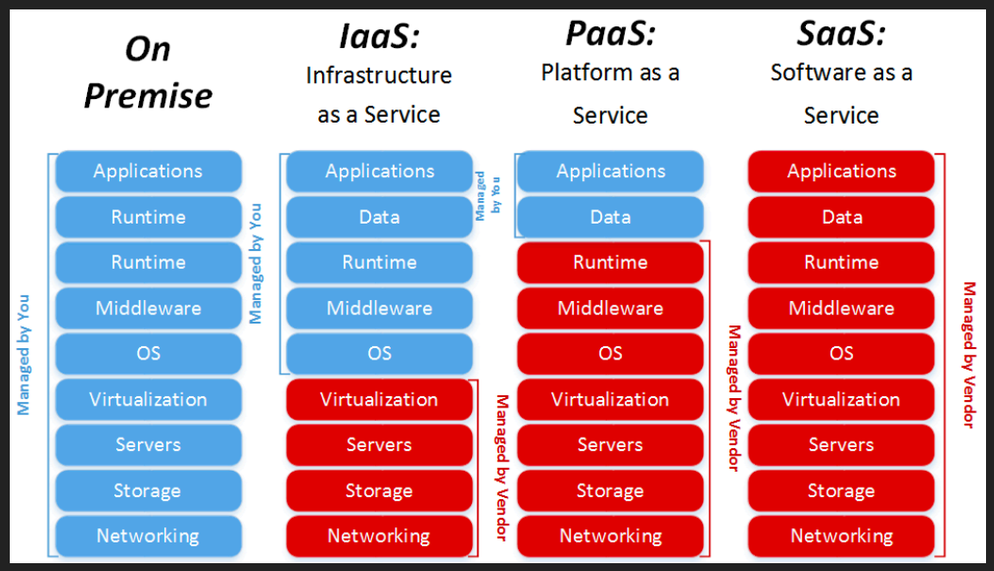
- Hybrid clouds combine public and private clouds, bound together by technology that allows data and applications to be shared between them.
- By allowing data and applications to move between private and public clouds, a hybrid cloud gives your business greater flexibility, more deployment options and helps optimise your existing infrastructure, security and compliance.

Hybrid is a way to connect infrastructure and applications between cloud-based resources and existing resources that are not located in the cloud.

An example of hybrid cloud could be a private cloud, which makes use of computing resources from a public cloud provider like AWS, GCP, Azure etc - a common use case when first migrating slowly over to the cloud.

# TYPES OF CLOUD COMPUTING SERVICES

# ON PREMISE VS CLOUD COMPUTING SERVICES



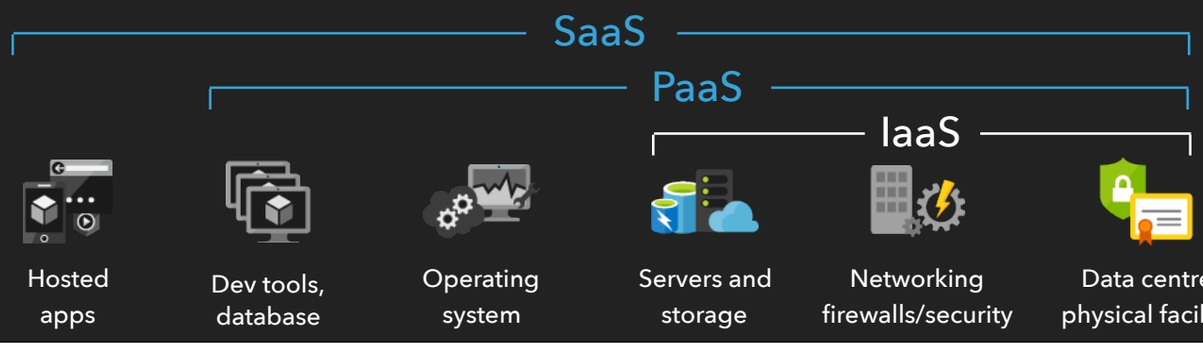

- We will also look at two other types of service (**Containers** as a service & **Functions** as a service)

Overview of the different types of services. As you can see for On Premise, everything is managed by the business.
IaaS - provider manages the infrastructure (networking, hardware etc)
PaaS - provider manages the infrastructure, plus the environment (OS, databases, runtime etc)
SaaS - provider manages everything - user can just focus on using the application

# INFRASTRUCTURE AS A SERVICE (IAAS)

# INFRASTRUCTURE AS A SERVICE (IAAS)

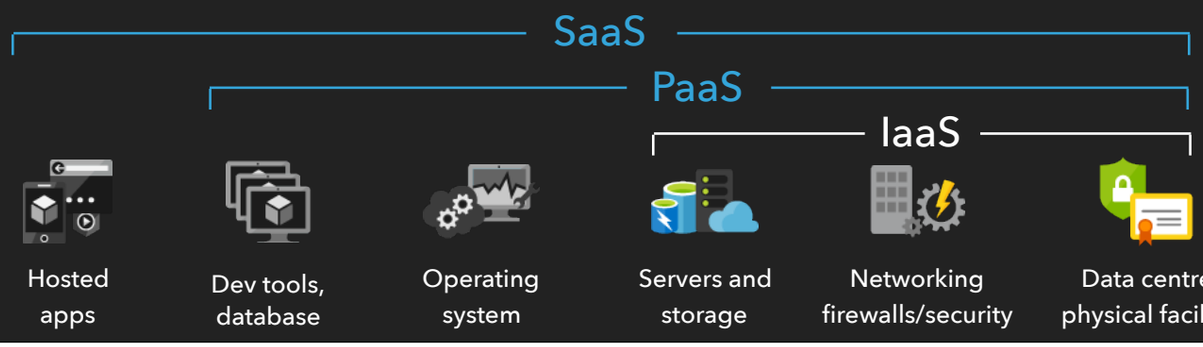
- With IaaS, you rent IT infrastructure - servers and virtual machines (VMs), storage, networks, operating systems - from a clouds provider on a pay-as-you-go basis.
- End users have to configure and manage platform, environment, deployment etc.




Infrastructure as a Service provides you with the highest level of flexibility and management control over your IT resources and is most similar to existing IT resources that many IT departments and developers are familiar with today.

# INFRASTRUCTURE AS A SERVICE (IAAS) EXAMPLES

- AWS - Elastic Compute Cloud (EC2)
- GCP - Compute Engine (CE)
- Azure - VM



# PLATFORM AS A SERVICE (PAAS)

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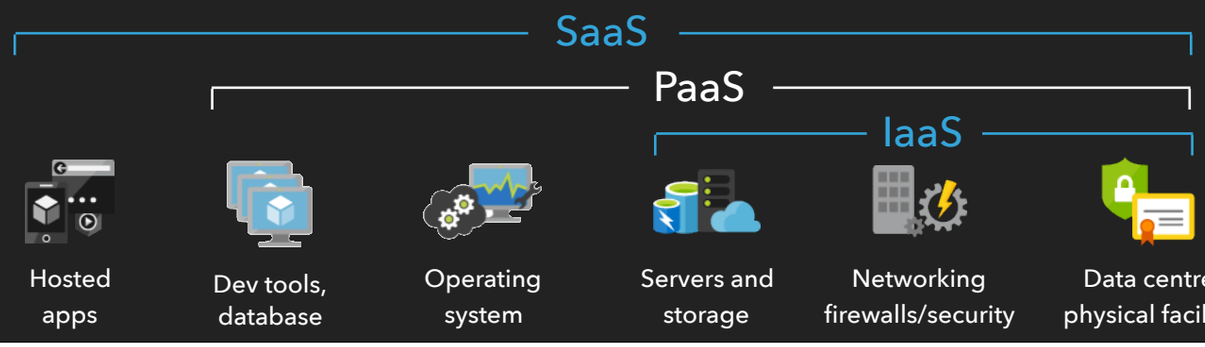
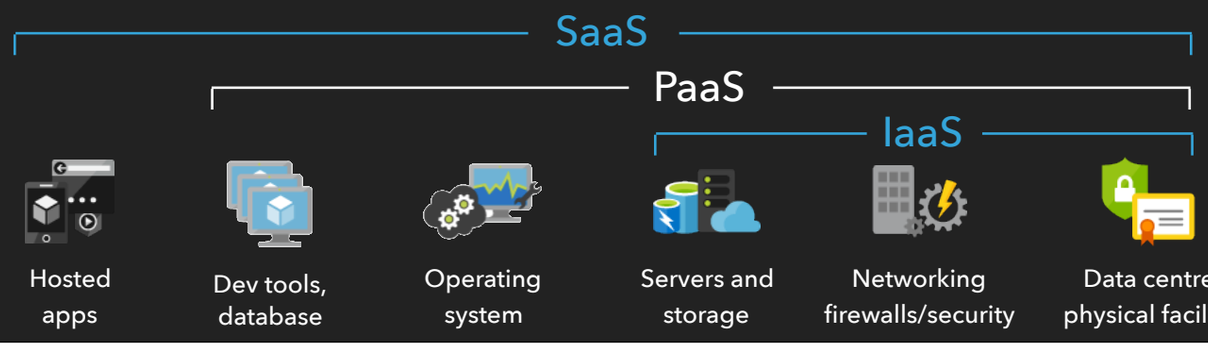
- PaaS supplies an on-demand environment for developing, testing, delivering and managing software applications.
- PaaS is designed to make it easier for developers to create apps, without worrying about setting up or managing the underlying infrastructure, storage, network and databases needed for development.




Removes the need to manage the underlying infrastructure and allow you to focus on the deployment and management of your applications. Has the same benefits as IaaS, but also manages the environment (OS, database, runtime etc)

# PLATFORM AS A SERVICE (PAAS) EXAMPLES

- AWS - Beanstalk
- GCP - App Engine
- Heroku



# SOFTWARE AS A SERVICE (SAAS)

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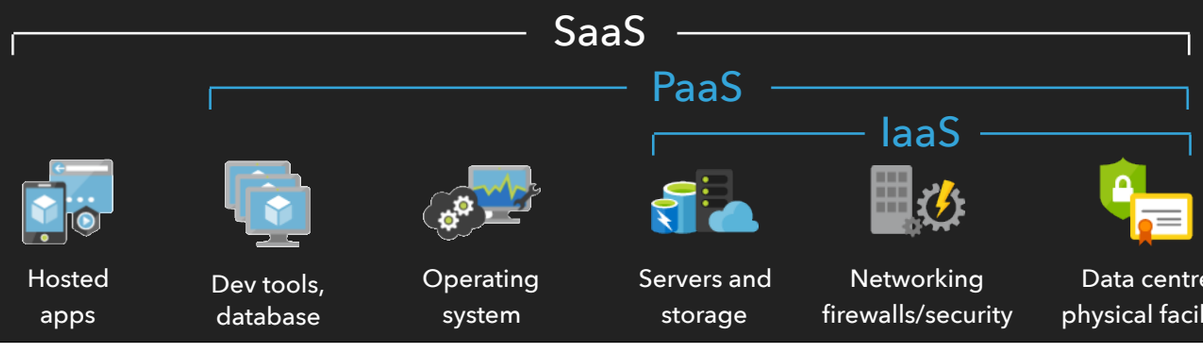
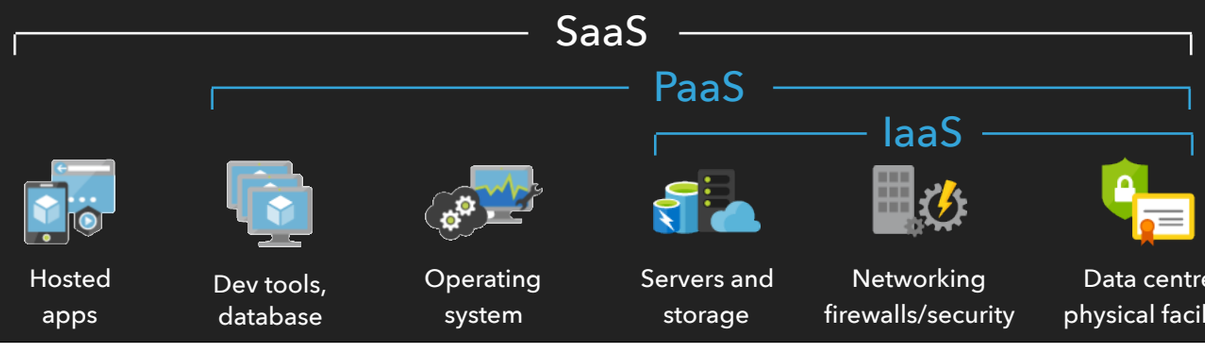
- Software as a service is a method for delivering software applications over the Internet, on demand and typically on a subscription basis.
- With SaaS, cloud providers host and manage the software application and underlying infrastructure, and handle any maintenance, such as software upgrades and security patching. Users connect to the application over the Internet, usually with a web browser on their phone, tablet or PC.




SaaS provides a complete software solution that you purchase on a pay-as-you-go basis from a cloud service provider.
All of the underlying infrastructure, middleware, app software and app data are located in the service provider's data centre.
The service provider manages the hardware and software, and with the appropriate service agreement, will ensure the availability and the security of the app and your data as well.
SaaS allows your organisation to get up and running quickly with an app, at minimal upfront cost.

# SOFTWARE AS A SERVICE (SAAS) EXAMPLES

- Google Apps - Docs, Gmail, Sheets etc
- Office 365
- Dropbox
- Salesforce




If you've used a web-based email service such as Outlook or Gmail, then you've already used a form of SaaS. With these services, you log in to your account over the Internet, often from a web browser. The email software is located on the service provider's network, and your messages are stored there as well. You can access your emails and stored messages from a web browser on any computer or Internet-connected device.

# CONTAINERS AS A SERVICE (CAAS)

## CONTAINERS AS A SERVICE (CAAS)

- Containers provide a standard way to package your application's code, configurations, and dependencies into a single object.
- CaaS offers infrastructure resources optimized for running containers, as well as a set of orchestration services that make it easy for you to build and run containerized applications in production.

Containers are covered in detail in another course, for now you just need to be aware that there are offerings that are specifically tailored towards running and deploying containerised applications.

# CONTAINERS AS A SERVICE (CAAS) EXAMPLES

- AWS - Elastic Container Service (ECS)
- GCP - Google Kubernetes Engine (GKE)
- Azure - Azure Container Service (ACS)

# FUNCTIONS AS A SERVICE (FAAS)

## FUNCTIONS AS A SERVICE (FAAS)

- Overlapping with PaaS, FaaS focuses on building app functionality without spending time continually managing the underlying servers and infrastructure.
- FaaS is highly scalable because it is event driven, only using resources when a specific function or trigger occurs.
- A common use case for FaaS is in a Serverless architecture.

Most commonly used in a Serverless architecture.

Serverless - gets it name from users not having to manage underlying infrastructure, and there doesn’t need to be a constantly running server process.

Serverless is a lot more scalable and cost effective as resources are only used when triggered.

# FUNCTIONS AS A SERVICE (FAAS) EXAMPLES

- AWS - Lambda
- GCP - Google Cloud Function
- Azure - Azure Functions

# SUMMARY

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- Cloud computing allows businesses to improve flexibility, reduced costs and focus on core competencies.
- Benefits and drawbacks of cloud computing.
- Types of cloud: Public, Private and Hybrid.
- Types of cloud services: IaaS, PaaS, SaaS, CaaS, FaaS.

# QUESTIONS?