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Digital Transformation

Unit 2 – Cloud Computing as Key Enabler

NCI Lárionad Néal-Inniúlachta Cloud Competency Centre

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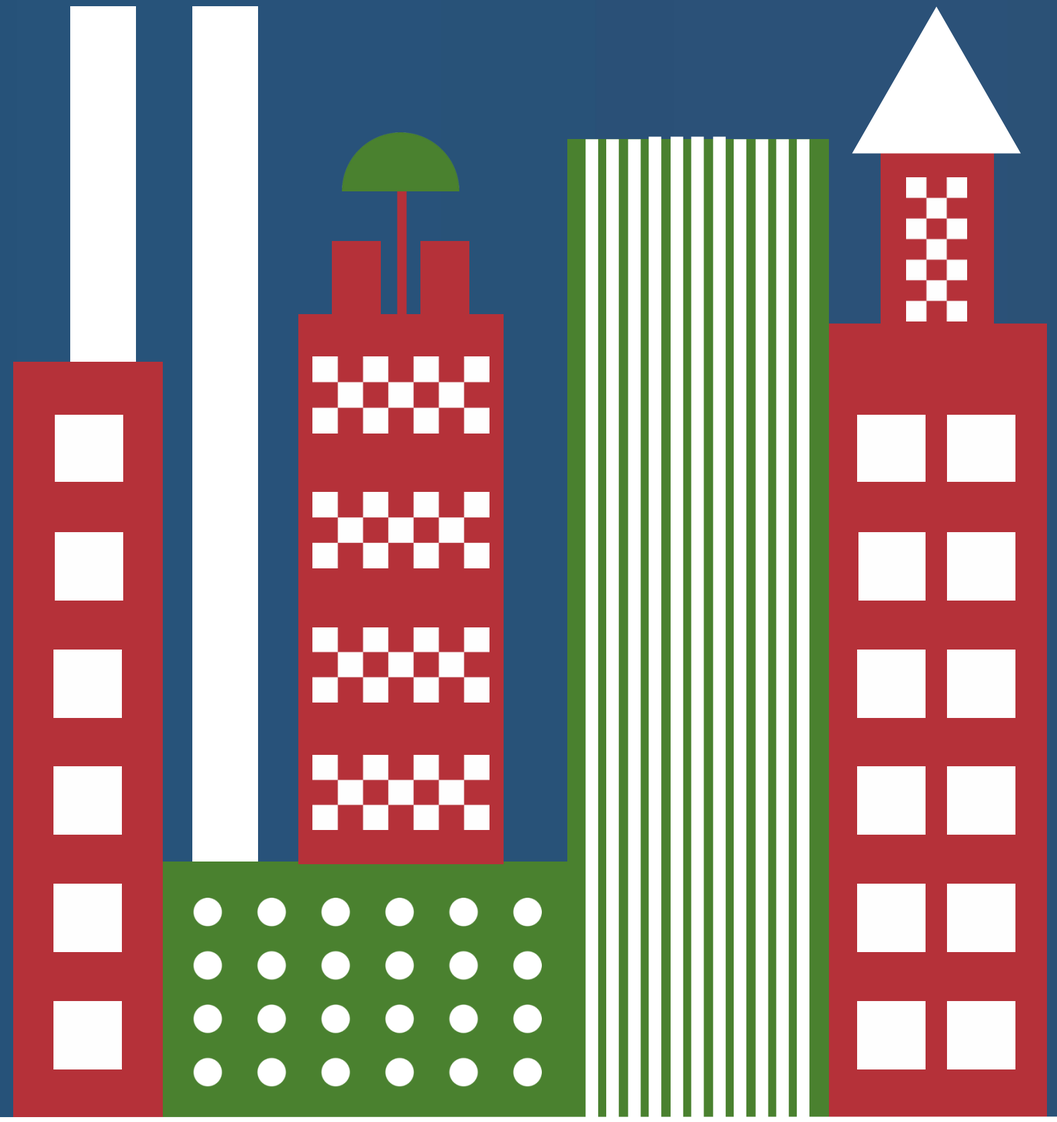

Unit 2 - Cloud Computing as Key Enabler

- What is Cloud Computing
- Cloud Computing Service Models
- Cloud Computing Deployment Models
- Cloud Technologies

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What is Cloud Computing?

"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"

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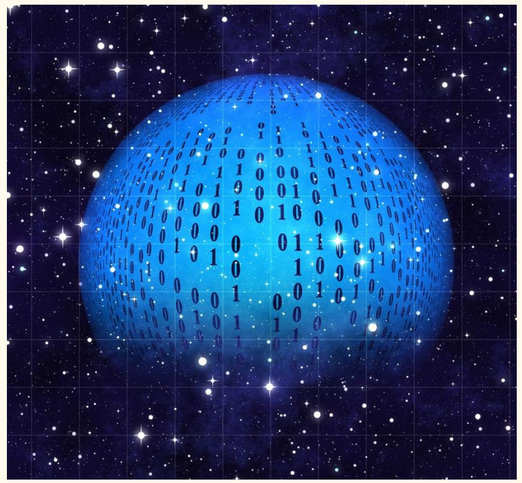
Service Models



Infrastructure as a Service (IAAS)

Platform as a Service (PAAS)

Software as a Service (SAAS)

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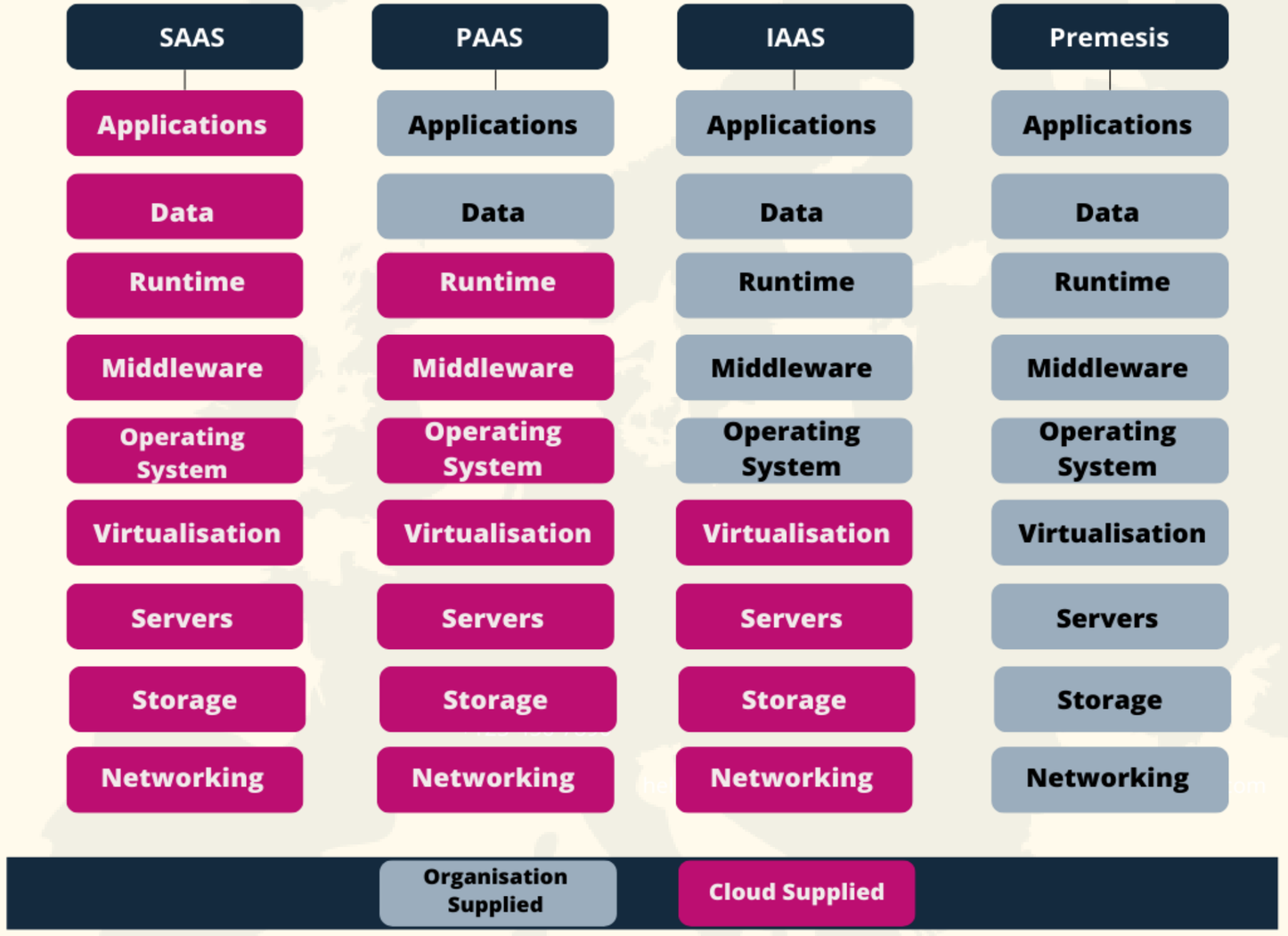
SAAS vs. PAAS vs. IAAS vs. Premesis



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Iaas Use Case: Real Estate Agency

A real estate agency looking to host a high-traffic website featuring property listings, virtual tours, and customer inquiries.

CLOUD RESOURCES PROVIDED

- High-bandwidth virtual servers to host a high-traffic website with property listings and virtual tours.
- Scalable storage solutions to accommodate a growing number of listings, images, and video content.
- Content Delivery Network (CDN) services to enhance website performance globally.

PROVIDED BY THE REAL ESTATE AGENCY

- The real estate agency would develop and update the website's content, including listings, photos, and videos.
- They would manage the website's design and functionality, including the integration of any specific tools for scheduling viewings or inquiries.
- The agency is responsible for marketing and SEO strategies to attract traffic to the website.

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Paas Use Case: Boutique Retailer

A boutique retailer looking to develop a custom online shopping platform to complement their physical store.

CLOUD RESOURCES PROVIDED

- A development platform with integrated development tools, databases, and application hosting capabilities to build an online shopping platform.
- Analytics and monitoring services to track user behavior and website performance.
- Integration APIs to connect with payment gateways, shipping services, and inventory management systems.

PROVIDED BY THE RETAILER

- The retailer provides the application code, designing the online shopping experience according to their brand identity and customer needs.
- They manage the product listings, descriptions, prices, and promotional content.
- The retailer handles customer service, including responding to inquiries and managing returns or complaints through the platform.

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Saas Use Case: Interior Design Business

An interior design business seeks an accessible solution for design, customer relationship management (CRM), and portfolio management.

CLOUD RESOURCES PROVIDED

- A design and portfolio management platform that allows for creating, storing, and presenting interior design projects.
- A CRM system for tracking client interactions, preferences, and project statuses.
- Cloud storage for high-resolution images and design files, ensuring they are accessible from any location.

PROVIDED BY THE BUSINESS

- The interior design business provides the creative content, including design concepts, visualisations, and project documentation.
- They manage client relationships, using the platform to communicate, present ideas, and gather feedback.
- The business is responsible for curating their portfolio on the platform, showcasing their work to attract new clients.

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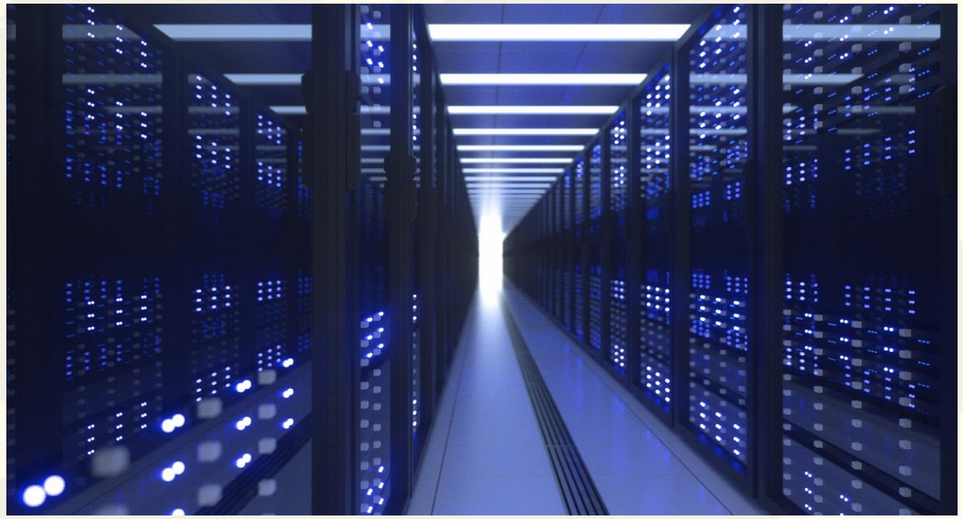
Benefits of Cloud Migration

- Cost Efficiency
- Scalability and Flexibility
- Business Continuity and Disaster Recovery
- Enhanced Collaboration
- Improved Accessibility and Mobility
- Automatic Software Updates



Potential Issues

- Security and Privacy Concerns
- Dependency on Internet Connectivity
- Potential for Vendor Lock-in
- Complexity in Cloud Management
- Data Migration Challenges
- Compliance and Legal Issues

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Deployment Models

PUBLIC CLOUD

- Computing resources available to to public through subscription or pay-per-use.
- Owned and operated by a third party.

PRIVATE CLOUD

- Cloud used by a single organisation.
- It may be managed by the organisation itself or by a service.

HYBRID CLOUD

- Mix of different cloud infrastructures.
- For example, part public cloud, part private cloud.

COMMUNITY CLOUD

- A number of organisations sharing cloud resources.

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Examples of Public Cloud

AWS, AZURE, GOOGLE CLOUD PLATFORM

This is the type of cloud that most people think of when they think of cloud computing. There are some free options, but most are subscription based.

AWS: AWS offers an extensive array of cloud services, including options for virtualisation, storage, and artificial intelligence. Known for its flexibility, it caters to various computing needs and scales, from small startups to large corporations.

Microsoft Azure: provides a broad spectrum of cloud services, emphasising seamless integration with Microsoft's software ecosystem.

Google Cloud Platform: Google Cloud Platform specialises in high-compute offerings like data analytics and machine learning, built on Google's cutting-edge infrastructure. It appeals to those needing advanced analytical capabilities and integration with Google's services.

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Public Cloud- Pro's and Cons

Pros

1. Cost-Effectiveness: Public clouds typically operate on a pay-as-you-go pricing model, meaning you only pay for the resources you use. This eliminates the need for large capital expenditures on hardware and reduces ongoing operational costs.
2. Scalability and Flexibility: Resources in the public cloud can be scaled up or down quickly to meet changing demands, providing businesses with a high degree of flexibility and efficiency.
3. Maintenance and Upgrades: The cloud service provider is responsible for maintaining the infrastructure, including regular software updates and security patches, reducing the IT burden on the customer.
4. Accessibility and Collaboration: Since services are offered over the Internet, users can access applications and data from anywhere, promoting remote work and facilitating collaboration among geographically dispersed teams.
5. Reliability: Public cloud providers typically offer a high level of redundancy and backup solutions, ensuring data availability and business continuity in case of failures.

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Public Cloud- Pro's and Cons

Cons

1. Security Concerns: While public cloud providers implement robust security measures, the nature of shared resources can raise concerns about data privacy and security, especially for sensitive or regulated data.
2. Compliance Issues: Businesses subject to strict regulatory requirements may find it challenging to ensure compliance in a public cloud environment due to shared resources and data residency issues.
3. Limited Control: Customers have less control over the infrastructure and computing environment in the public cloud. Customisation options may be limited compared to private or hybrid clouds.
4. Vendor Lock-in: Migrating services and data to or from a public cloud provider can be complex and costly, potentially leading to dependency on a single provider's technologies and pricing models.
5. Performance Variability: In a shared cloud environment, resource demands from other customers can potentially impact your service performance, although major cloud providers actively work to minimise this risk.

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Private Cloud Options

IN-HOUSE IT TEAMS OR THIRD PARTY SERVICE PROVIDERS OR VENDORS

This is a cloud infrastructure built specifically for a single organisation. It can be built by an In-House IT Team or Third-Party Cloud Service Providers or Vendors.

In-House IT Teams: This can be very expensive and would be for companies with a lot of resources and a highly skilled IT Staff skilled specifically in the area of building and maintaining this cloud infrastructure. It involves purchasing and configuring the necessary hardware and software to create a cloud environment that meets the organisations specific requirements.

- Pros: Full control over the configuration, security, and management of the cloud environment.
- Cons: Requires significant upfront investment in hardware and software, as well as ongoing costs for maintenance, security, and IT staff.

Third-Party Cloud Service Providers: Examples of these are AWS, Cisco, DELL, IBM and Google.

These providers can build and manage the Private Cloud. It can be built on the organisations premesis or it can be provided by the providers data center.

- Pros: Benefit from the provider's expertise in cloud infrastructure, security, and compliance. Often more cost-effective than building a private cloud from scratch.
- Cons: Some degree of dependency on the service provider for management and support.

Third-Party Cloud Vendors: Vendors such as the SAP HANA Platform, VMware and Microsoft Cloud can help an organisation build their own cloud but with their own infrastructure.

- Pros: Offers flexibility in terms of hardware and configurations. Can be more cost-effective for organisations that already have significant IT infrastructure.
- Cons: Requires a knowledgeable IT team to deploy, manage, and maintain the cloud software and infrastructure.

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Private Cloud Options

Managed Service Providers (MSPs): There's also the option of managed service providers. These MSPs specialise in managing and maintaining IT infrastructure, including private clouds, for other businesses. They can design, build, and manage a private cloud infrastructure and tailor it to an organisations needs.

Pros: Access to specialised expertise and 24/7 support. Can reduce the burden on in-house IT teams.

Cons: Businesses must carefully choose a reputable MSP that aligns with their security, compliance, and operational needs.

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Examples of Hybrid Cloud

A hybrid cloud combines public and private clouds, allowing data and applications to be shared between them. This model provides businesses with greater flexibility and more data deployment options.

Hybrid clouds can be very useful when an organisation is going through a time of pressure, whether it has a private cloud or holds its data on premises, an organisation can use a public cloud to scale up fast if needed.

Example 1: A clothes retailer runs a private cloud, but during certain times of year traffic on the website peaks, placing their cloud under pressure. The retailer uses a public cloud resources to scale up during the busy seasons rather than having to maintain extra private resources all year round.

Example 2: A software development firm uses public cloud resources to quickly deploy and scale development and testing environments for new projects. Once the applications are ready for production, they are moved to a private cloud or on-premises data center for deployment, combining the speed and flexibility of the public cloud with the control and security of private infrastructure.

Example 3: Businesses can use the public cloud as a cost-effective disaster recovery site, storing backups and enabling quick recovery in a public cloud environment while running their primary workloads in a private cloud or on-premises. This ensures business continuity with lower costs compared to traditional disaster recovery solutions.

Example 4: Microsoft Azure Stack allows businesses to run Azure services in their own datacenter, creating a seamless hybrid cloud environment with the public Azure cloud.

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Example of Community Cloud

A community cloud is a cloud shared by a group of organisations with a common goal and that share common needs.

An example of this may if a group of Credit Unions were to share a community cloud infrastructure to run banking software that complies with their specific regulatory standards and operational needs. By sharing resources, they may be able to afford sophisticated banking solutions that enable them to offer online banking services to their customers, compete with larger banks, and maintain regulatory compliance.

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Cloud Technologies

VIRTUALISATION
This is the technology that allows for the creation of multiple simulated environments from one piece of hardware. It can be virtualised servers, networks, storage or physical components.

CONTAINERS
This is where an application is stored with everything that it needs to run in any environment.

CLOUD STORAGE
There are three primary types of storage: object, block, and file storage. Each serves different data storage and access needs, utilising distributed architectures to ensure scalability and reliability across multiple locations.

SERVERLESS COMPUTING
This is a cloud computing model where the cloud provider manages the server infrastructure, dynamically allocating resources to automatically scale applications in response to demand, allowing developers to focus on writing code without worrying about server management.

CLOUD NETWORKING
This encompasses the suite of networking technologies and services in the cloud, enabling secure and scalable connections between cloud-based applications, data centers, and users, facilitating efficient data transfer and access across the internet and private networks.

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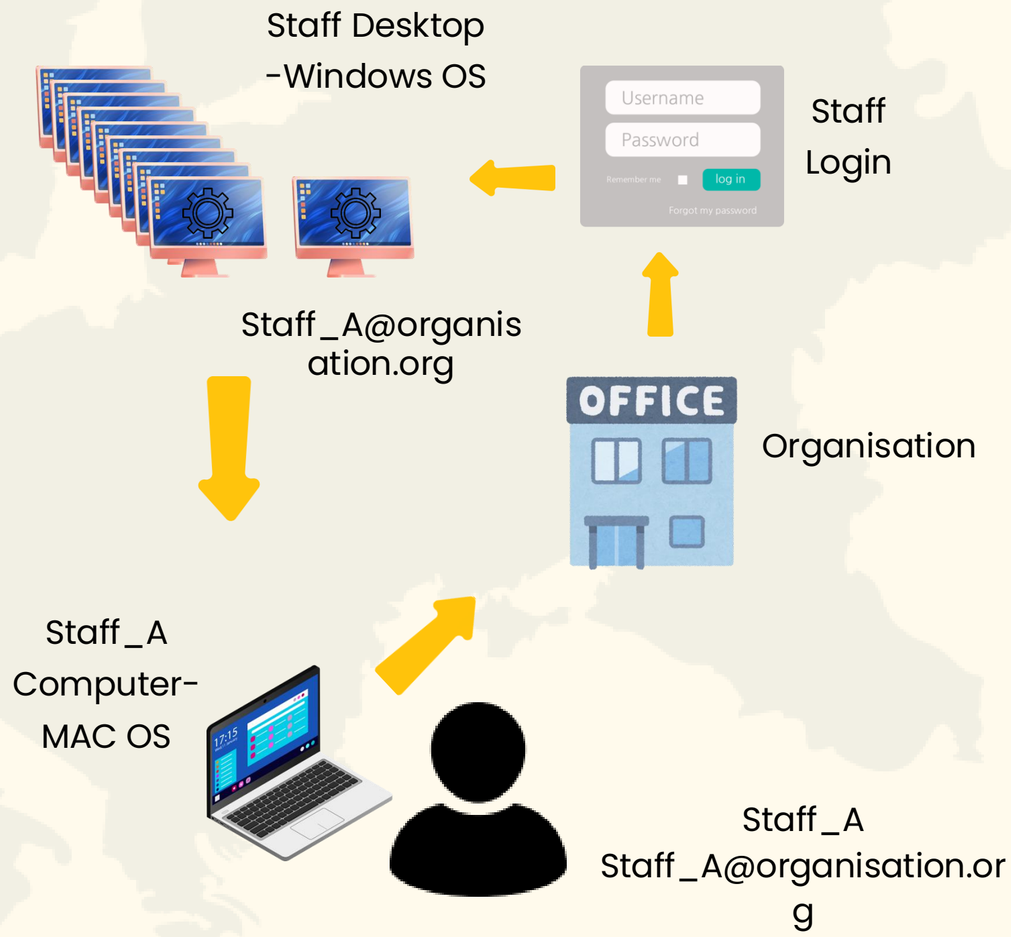
Virtualisation

Is done through the use of a hypervisor which is installed on your physical computer. This hypervisor allows for the physical machine and the virtual machine to communicate allowing for the virtual machine to use the physical machines resources and vice versa.

A simple example of virtualisation would be accessing your Staff Desktop through work. Demonstrated in the diagram here.



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Containers

Use Case

A small business selling handmade crafts online uses a website for sales, a separate payment system, and a database for inventory.

The Challenge: The business needs to efficiently manage website traffic spikes, ensure secure transactions, and streamline updates and inventory management.

Container Solution

Web Deployment:

- Web server and site code packaged into a container.
- Allows for easy deployment across cloud environments, ensuring compatibility.

Scalability:

- Containers make it easy to scale up the website's resources. Automatic scaling of website container instances during traffic surges.
- Maintains site responsiveness and availability.

Updates and Security:

- Any changes to the design or features of the website can be repackaged and deployed ensuring minimal downtime and a consistent environment for testing and deployment.

Payment Processing System:

- Website and payment processing run in separate containers for isolation.
- Limiting access to sensitive financial data.

Inventory Management:

- Inventory management application and database in its own container, allowing independent updates.
- Isolation ensures website and payment processes remain unaffected.

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Cloud Storage

Cloud storage allows you to save data and files in an off-site location that you access either through the public internet or a dedicated private network connection. It's maintained, operated, and managed by a cloud storage service provider on storage servers that are built on virtualisation techniques.

Types Of Cloud Storage:

Object Storage:

- Ideal for unstructured data such as photos, videos, and documents.
- Data is stored as objects with metadata and a unique identifier.
- Use Case: Web-based applications, data archives, and backup.

Block Storage:

- Stores data in fixed-sized blocks, similar to traditional hard drives.
- Each block acts independently, allowing for high performance.
- Use Case: Database storage, enterprise applications requiring high performance.

File Storage:

- Organises data as files in folders, similar to a file system on a personal computer.
- Supports hierarchical storage structure.
- Use Case: Shared drives, document management systems.

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Serverless Computing

Serverless computing is a cloud computing model that automatically manages the provisioning and scaling of servers. Developers can build and run applications and services without worrying about the underlying infrastructure.

Key Characteristics:

Event-driven:

Applications respond to events or triggers, scaling automatically based on demand.
Example: A file uploaded to a cloud storage triggers a function to resize the image.

Micro-billing:

Allows for payment only for the precise amount of computing resources consumed by each application execution, down to the function call level.
Example: Billing is based on the number of executions and runtime duration, rather than pre-purchased compute capacity.

Stateless Functions:

Each function call is treated as an independent event, with no reliance on the state of the server.
Example: A function to process payment transactions can run independently, scaling with the number of transactions without any server setup.

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Cloud Networking

Cloud Networking encompasses all the networking resources and capabilities provided in a cloud environment. It enables connectivity between cloud-based applications, data centers, and users, ensuring secure and efficient data transfer across the internet and within cloud platforms.

Key Elements:

Virtual Networks:

Create safe spaces in the cloud for your applications, similar to having a private network in your own home.

Content Delivery Networks (Cdns):

Ensure that your website or app loads quickly for users, no matter where they are in the world.

Load Balancers:

Help distribute user requests evenly across servers, ensuring no single server gets overloaded, which keeps applications running smoothly.

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Unit Completed - What's Next?

To consolidate your learning and reflect on the key concepts covered, please take a moment to complete this quiz.

Your feedback and results will help you track your progress and support continuous improvement of the training experience.

By completing this quiz, you will also become eligible to receive a certificate of successful training completion.

Click the link to begin the quiz!

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