

**Data Technician**

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# Day 1: Task 1

Please research and complete the below questions relating to key concepts of cloud.

Be prepared to discuss the below in the group following this task.

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| What can cloud computing do for us in the real-world? | Cloud computing brings a wide range of real-world benefits across industries, businesses, and personal use. Here are some key things it can do:  **1. Enable Remote Work and Collaboration**   * Tools like Google Workspace and Microsoft 365 let people work together in real time from anywhere. * File sharing and version control are centralized and seamless.   **2. Reduce IT Costs**   * Companies can avoid expensive on-site hardware and only pay for what they use (e.g., AWS, Azure). * Maintenance, updates, and infrastructure scaling are handled by providers.   **3. Support Big Data and AI**   * Cloud platforms offer the computing power and storage to process massive datasets. * Machine learning models can be trained and deployed quickly using services like AWS SageMaker or Google AI.   **4. Improve Disaster Recovery and Backup**   * Data is automatically backed up across multiple locations. * In case of hardware failure or cyberattack, systems can be restored rapidly.   **5. Scale Applications Easily**   * Apps hosted in the cloud can scale up or down depending on demand (e.g., e-commerce sites during holiday sales). * No need to over-provision hardware.   **6. Power Smart Devices and IoT**   * Cloud platforms collect, analyze, and manage data from connected devices (smart homes, industrial IoT). * Enables automation and remote monitoring.   **7. Accelerate Software Development**   * Developers use cloud-based environments, CI/CD pipelines, and containerization (e.g., Docker, Kubernetes) to build and deploy apps faster.   **8. Enhance Cybersecurity**   * Top cloud providers offer advanced security features and compliance certifications. * Centralized logging, monitoring, and threat detection make security more manageable.   **Exampl Real World Adoption cases:**  **1. Healthcare**  **a. Remote Patient Monitoring & Telemedicine:**   * **Example:** *Philips HealthSuite on Azure*  allows hospitals to monitor patients remotely using connected devices that send real-time health data to the cloud. * **Benefit:** Enables care for chronic patients at home, reduces hospital visits.   **b. Medical Data Analysis & AI Diagnosis:**   * **Example:** *Mount Sinai Health System* uses cloud-based AI to analyze CT scans and predict COVID-19 severity. * **Benefit:** Speeds up diagnosis and improves treatment planning.   **c. Electronic Health Records (EHR):**   * **Example:** *Cerner*, a major EHR provider, migrated to the cloud to securely store and manage patient records. * **Benefit:** Enhances data access and interoperability between providers.   **2. Education**  **a. Virtual Classrooms & Learning Platforms:**   * **Example:** *Google Classroom and Microsoft Teams for Education* run on cloud infrastructure. * **Benefit:** Students and teachers collaborate in real-time from anywhere with internet access.   **b. Scalable Online Courses (MOOCs):**   * **Example:** *Coursera* uses cloud services to deliver video content, grading, and user tracking to millions of learners. * **Benefit:** High scalability and personalized learning experience.   **c. Data Analytics for Student Performance:**   * **Example:** Universities use platforms like *AWS Educate* to track student engagement and predict academic risk. * **Benefit:** Enables early intervention and tailored learning support.   **3. Retail**  **a. E-commerce Hosting and Scaling:**   * **Example:** *Shopify* is hosted on the cloud and allows businesses to quickly set up online stores. * **Benefit:** Easily handles traffic spikes (e.g., Black Friday) without downtime.   **b. Personalized Recommendations:**   * **Example:** *Amazon* uses cloud-based AI to deliver product suggestions based on browsing and purchase history. * **Benefit:** Increases customer engagement and sales.   **c. Inventory and Supply Chain Optimization:**   * **Example:** *Walmart* uses Microsoft Azure to track inventory in real time and forecast demand. * **Benefit:** Reduces overstock and improves delivery efficiency. |
| How can it benefit a business? | Cloud computing offers a wide range of benefits to businesses of all sizes, helping them operate more efficiently, reduce costs, and scale more easily. Here are the key advantages:  **1. Cost Efficiency**   * **Reduced Capital Expenses:** No need to invest heavily in physical infrastructure (servers, storage). * **Pay-as-you-go:** You only pay for what you use, helping manage cash flow better. * **Lower Maintenance Costs:** Cloud providers handle hardware and software maintenance.   **2. Scalability and Flexibility**   * **On-Demand Resources:** Easily scale up or down based on business needs (e.g., during peak seasons). * **Global Reach:** Deploy applications and services closer to your customers worldwide.   **3. Accessibility and Collaboration**   * **Remote Access:** Employees can access data and applications from anywhere with an internet connection. * **Enhanced Collaboration:** Teams can work on the same documents and applications in real time.   **4. Business Continuity**   * **Backup and Disaster Recovery:** Built-in redundancy and backup options reduce downtime risk. * **Data Replication:** Ensures data safety even in the event of hardware failure or natural disaster.   **5. Security and Compliance**   * **Advanced Security Features:** Cloud providers offer robust security tools, such as encryption, firewalls, and identity management. * **Regulatory Compliance:** Many providers help meet industry standards like GDPR, HIPAA, or ISO.   **6. Faster Deployment and Innovation**   * **Quick Setup:** Launch applications and services in minutes rather than weeks. * **Access to Advanced Technologies:** Use AI, machine learning, analytics, and more without investing in specialized infrastructure.   **7. Environmental Sustainability**   * **Energy Efficiency:** Centralized data centers are often more energy-efficient than multiple smaller setups. * **Optimized Resource Use:** Shared infrastructure means fewer idle resources.   Here's how **specific industries** are leveraging cloud computing to transform operations and drive innovation:  **1. Retail**  **Use Cases:**   * **E-commerce Scalability:** Retailers scale resources during high-traffic events like Black Friday without system crashes. * **Customer Personalization:** Cloud-based analytics help deliver tailored product recommendations and marketing. * **Inventory Management:** Real-time tracking and demand forecasting improve stock control and reduce waste.   **Example:** **Amazon** and **Walmart** use cloud analytics to understand shopping behavior and adjust inventory in real-time.  **2. Healthcare**  **Use Cases:**   * **Electronic Health Records (EHRs):** Cloud enables secure storage and sharing of patient data across facilities. * **Telemedicine:** Doctors conduct virtual consultations using cloud-hosted video platforms. * **AI Diagnostics:** Machine learning models analyze scans and test results faster and more accurately.   **Example:** **Mayo Clinic** uses cloud-based AI to improve diagnostic accuracy and patient outcomes.  **3. Financial Services**  **Use Cases:**   * **Fraud Detection:** Real-time monitoring of transactions via cloud AI systems. * **Customer Insights:** Banks use cloud data analytics to offer personalized financial products. * **Compliance Reporting:** Automates complex regulatory reporting with secure audit trails.   **Example:** **Capital One** migrated to the cloud to enhance agility, security, and customer experience.  **4. Manufacturing**  **Use Cases:**   * **Smart Factories:** Cloud IoT platforms monitor machinery, predict maintenance, and reduce downtime. * **Supply Chain Visibility:** Real-time cloud dashboards optimize logistics and supplier coordination. * **Product Design:** Engineers collaborate across geographies using cloud-based CAD software.   **Example:** **GE** uses cloud platforms for predictive maintenance and digital twins of industrial machines.  **5. Education**  **Use Cases:**   * **Virtual Classrooms:** Platforms like Google Classroom and Microsoft Teams are powered by the cloud. * **Student Analytics:** Schools track attendance, engagement, and performance using cloud systems. * **Resource Access:** Students and teachers access materials anytime from any device.   **Example:** **Arizona State University** uses Google Cloud to improve digital learning and student services. |
| What’s the alternative to cloud computing? | An alternative to cloud computing is **edge computing** or **on-premises computing** (also called **local computing**:  **1. On-Premises Computing**   * **Description**: All hardware and software resources are kept and managed locally within an organization’s own data center or physical location. * **Use Case**: Companies needing strict data control, low-latency processing, or compliance with regulations that limit cloud use. * **Pros**: Full control, potentially better security, no reliance on internet connectivity. * **Cons**: Higher upfront costs, complex maintenance, less scalability.   **2. Edge Computing**   * **Description**: Data is processed close to the source (e.g., IoT devices or local servers), reducing the need to send everything to the cloud. * **Use Case**: Real-time applications (e.g., autonomous vehicles, industrial IoT). * **Pros**: Reduced latency, bandwidth savings, improved reliability. * **Cons**: Limited computing power, complexity in distributed system management.   **3. Hybrid Computing**   * **Description**: Combines cloud and on-premises or edge computing, allowing flexible data and workload distribution. * **Use Case**: Businesses with both legacy systems and cloud-forward strategies. * **Pros**: Flexibility, scalability, and partial control. * **Cons**: Integration complexity, security challenges. |
| What cloud providers can we use, what are their features and functions? | **1. Amazon Web Services (AWS)**  **Provider Type**: Public cloud **Strengths**: Largest market share, extensive services, mature ecosystem  **Key Features & Services**:   * **Compute**: EC2 (virtual servers), Lambda (serverless) * **Storage**: S3 (object storage), EBS (block storage) * **Databases**: RDS (managed SQL), DynamoDB (NoSQL), Redshift (data warehouse) * **AI/ML**: SageMaker, Rekognition, Comprehend * **Containers**: ECS, EKS (Kubernetes), Fargate * **Networking**: VPC, Route 53 (DNS), CloudFront (CDN) * **Developer Tools**: CodePipeline, CodeBuild, CodeDeploy * **Security & IAM**: IAM, KMS (encryption), GuardDuty (threat detection)   **2. Microsoft Azure**  **Provider Type**: Public cloud **Strengths**: Strong enterprise integration, especially with Microsoft tools  **Key Features & Services**:   * **Compute**: Azure Virtual Machines, Azure Functions (serverless) * **Storage**: Blob Storage, Disk Storage, Files * **Databases**: Azure SQL Database, Cosmos DB (multi-model NoSQL), Synapse Analytics * **AI/ML**: Azure Machine Learning, Cognitive Services * **Containers**: AKS (Azure Kubernetes Service), Container Instances * **Networking**: Virtual Network, Azure DNS, Traffic Manager * **DevOps**: Azure DevOps, GitHub Actions * **Security**: Azure AD, Security Center, Key Vault   **3. Google Cloud Platform (GCP)**  **Provider Type**: Public cloud **Strengths**: Advanced data analytics and AI/ML tools  **Key Features & Services**:   * **Compute**: Compute Engine, Cloud Functions, App Engine * **Storage**: Cloud Storage, Persistent Disks * **Databases**: Cloud SQL, Firestore, Bigtable, BigQuery (analytics) * **AI/ML**: Vertex AI, AutoML, Vision AI, Natural Language API * **Containers**: GKE (Google Kubernetes Engine) * **Networking**: VPC, Cloud Load Balancing, Cloud CDN * **DevOps**: Cloud Build, Cloud Deploy * **Security**: IAM, Cloud Armor, Key Management   **4. IBM Cloud**  **Provider Type**: Public/Hybrid cloud **Strengths**: Hybrid cloud, AI, and enterprise services  **Key Features & Services**:   * **Compute**: Virtual servers, Kubernetes, Cloud Functions * **Storage**: Cloud Object Storage, Block Storage * **Databases**: Db2, Cloudant, PostgreSQL * **AI/ML**: Watson AI services (language, vision, etc.) * **Security**: Identity & Access, Data Encryption, Security Compliance   **5. Oracle Cloud Infrastructure (OCI)**  **Provider Type**: Public cloud **Strengths**: High-performance compute and databases, enterprise focus  **Key Features & Services**:   * **Compute**: VMs, Bare Metal, Functions * **Storage**: Object Storage, File Storage * **Databases**: Autonomous DB, Oracle DB * **AI/ML**: OCI Data Science * **Networking**: VCN (Virtual Cloud Network), Load Balancers   **6. Alibaba Cloud**  **Provider Type**: Public cloud **Strengths**: Dominant in Asia, cost-effective, scalable  **Key Features & Services**:   * **Compute**: ECS (Elastic Compute Service), Function Compute * **Storage**: OSS (Object Storage Service), NAS * **Databases**: RDS, POLARDB, AnalyticDB * **AI/ML**: Machine Learning Platform for AI (PAI) * **Networking**: VPC, CDN, SLB (Server Load Balancer)     Fig 1 Provided Services Summary of some of the top 6 Cloud Providers |

# Day 1: Task 2

Please research the below cloud offerings, explain what they are and examples of use cases.

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| Cloud Offerings | Explain what it is | When / how might you use this service in the real-world? |
| IaaS (Infrastructure as a service) | **IaaS (Infrastructure as a Service)** is a type of cloud computing service that provides virtualized computing resources over the internet. It offers fundamental infrastructure components such as:   * **Compute power** (e.g., virtual machines) * **Storage** (e.g., block or object storage) * **Networking** (e.g., virtual networks, load balancers) * **Other services** (e.g., firewalls, IP addresses)   **Key Features of IaaS:**   * **Scalability**: Easily scale resources up or down based on demand. * **Pay-as-you-go**: You only pay for what you use. * **Flexibility**: You control and manage operating systems, storage, deployed applications, and some networking components. * **Reduced hardware costs**: No need to purchase and maintain physical servers | **1. Hosting a Website or Web App**  Instead of buying servers, you can deploy your website on a virtual machine (VM) in the cloud. You choose the OS, scale resources as traffic grows, and only pay for what you use.  **Example:** A startup hosts its e-commerce site on AWS EC2 to avoid upfront hardware costs. **2. Disaster Recovery and Backup** IaaS allows you to replicate critical infrastructure in a different location, enabling fast recovery from data center failures or cyberattacks.  **Example:** A financial firm backs up all data to Azure cloud infrastructure to ensure business continuity.  **3. Software Development and Testing**  Developers can spin up and tear down test environments quickly without waiting for physical hardware to be provisioned.  **Example:** A development team uses GCP Compute Engine to test a new mobile app across multiple server configurations.  **4. Big Data Processing**  You can run massive data processing jobs using IaaS without buying high-performance computing hardware.  **Example:** A media company uses AWS EC2 Spot Instances to render 3D animations and process large video files.  **5. Scalable Storage Solutions**  Use cloud-based storage for archiving large amounts of data, such as logs, user files, or backups.  **Example:** A healthcare provider stores patient records and medical images in encrypted cloud storage for compliance and scalability. |
| PaaS (Platform as a service) | **PaaS (Platform as a Service)** is a category of cloud computing services that provides a ready-to-use platform for developers to build, deploy, and manage applications without having to manage the underlying infrastructure (such as servers, storage, networking, or operating systems).  **Key Features of PaaS:**   * **Development tools**: Includes tools for coding, testing, and debugging. * **Middleware**: Software that connects different applications or services. * **Database management**: Often comes with built-in database options. * **Application hosting**: Provides the environment for running applications. * **Scalability**: Automatically adjusts resources as needed. * **Security and compliance**: Managed by the provider.   **Benefits:**   * Faster development and deployment. * Reduces the complexity of managing hardware and software layers. * Encourages collaboration with built-in tools. * Cost-effective, pay-as-you-go pricing models.   **Examples of PaaS Providers:**   * **Google App Engine** * **Microsoft Azure App Services** * **Heroku** * **Red Hat OpenShift** | **1. Rapid App Development**   * **Use Case**: You’re a developer building a web or mobile app for a startup or client. * **How PaaS Helps**: You can focus solely on writing code while the platform handles the servers, runtime, database, and scaling. * **Example**: Using **Heroku** to build and deploy a Node.js web app in days instead of weeks.   **2. Microservices Architecture**   * **Use Case**: You're breaking a monolithic application into microservices. * **How PaaS Helps**: You can deploy each microservice independently, often with built-in support for containers and orchestration. * **Example**: Deploying microservices on **Red Hat OpenShift** or **Azure Kubernetes Service (AKS)**.   **3. Proof of Concept / MVP**   * **Use Case**: You need to create a **Minimum Viable Product (MVP)** to test an idea quickly. * **How PaaS Helps**: PaaS platforms allow you to get a prototype running without deep infrastructure setup. * **Example**: Building a quick data dashboard using **Google App Engine** with a Firebase backend.   **4. Automating Deployment (CI/CD)**   * **Use Case**: You want to automate testing, building, and deployment. * **How PaaS Helps**: Many PaaS offerings integrate CI/CD pipelines out of the box. * **Example**: Git push to Heroku triggers auto-build and deployment of your app.   **5. Business Applications**   * **Use Case**: Internal tools like HR portals, inventory systems, or CRMs. * **How PaaS Helps**: PaaS can streamline building and deploying custom solutions for business needs. * **Example**: Building a custom HR app on **Salesforce Platform (a PaaS)**. |
| SaaS (Software as a service) | **SaaS (Software as a Service)** is a software distribution model in which applications are hosted by a third-party provider and made available to users over the internet.  **Key Characteristics of SaaS:**   * **Hosted in the Cloud:** The software runs on servers maintained by the provider. * **Accessed via Internet:** Users typically access SaaS applications through a web browser without needing to install anything locally. * **Subscription-Based:** Most SaaS products are sold via monthly or annual subscription fees. * **Maintenance-Free for Users:** The provider handles updates, security, and maintenance. * **Scalable and Flexible:** Easy to scale up or down based on user needs.   **Examples of SaaS:**   * **Google Workspace** (Docs, Gmail, Sheets) * **Microsoft 365** * **Salesforce** * **Dropbox** * **Zoom** | You might use **PaaS (Platform as a Service)** in the real world when you're developing, testing, or deploying applications but want to avoid managing the underlying infrastructure like servers, storage, and networking.  **Real-World Scenarios Where You Might Use PaaS:**   1. **Web App Development:**    * A startup building a new website or mobile app can use PaaS to quickly set up the development environment, databases, and hosting.    * Example: Using **Heroku** or **Google App Engine** to deploy a web app without dealing with server setup. 2. **API Development and Integration:**    * A company creating APIs for internal or external use might use a PaaS to handle scaling, security, and monitoring.    * Example: Building and deploying an API using **AWS Elastic Beanstalk** or **Azure App Services**. 3. **Automated Testing and CI/CD:**    * Development teams often use PaaS to integrate continuous integration/continuous deployment (CI/CD) pipelines.    * Example: Running automated tests and deploying updates via **GitLab CI/CD** or **CircleCI** on a PaaS platform. 4. **Microservices Architecture:**    * When breaking a large application into microservices, PaaS platforms help manage each service independently with built-in load balancing and container orchestration.    * Example: Deploying microservices with **Red Hat OpenShift** or **Cloud Foundry**. 5. **Proof of Concept or MVPs:**    * Ideal for quickly building a prototype or minimum viable product without large upfront costs or infrastructure overhead. 6. **Collaborative Development:**    * Distributed teams can work on the same application using a common platform, often with version control, logs, and shared environments.   PaaS is especially valuable when your focus is on **writing code and solving business problems**, not managing infrastructure. |

# Day 1: Task 3

Please research the below terms and explain what they are, when they would be appropriate and a real-world example of where it could be implemented (i.e. what type of organisation).

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| Public Cloud | **What is a Public Cloud?**  A **public cloud** is a cloud computing model where services (such as servers, storage, networking, and applications) are delivered over the internet by a third-party provider (e.g., Amazon Web Services, Microsoft Azure, Google Cloud). These services are shared among multiple users or organizations—known as a **multi-tenant** environment.  Customers pay on a **pay-as-you-go** or subscription basis, without owning or maintaining the physical infrastructure.  **When is Public Cloud Appropriate?**  A public cloud is most appropriate when:   * **Scalability** is important (e.g., traffic spikes, global access). * **Cost-efficiency** is needed (no upfront capital expenses). * **Speed of deployment** matters (rapid time-to-market). * **Flexibility and innovation** are priorities (access to AI, big data tools, etc.). * Security/compliance needs are **moderate** or can be managed within the provider’s offerings.   It may be less suitable for highly sensitive data or strict regulatory environments without additional security measures.  **Real-World Example:**  **Startup or E-commerce Business**   * A fast-growing online retailer could use **Amazon Web Services (AWS)** to host its website, store customer data, and run machine learning for product recommendations. * The public cloud allows the company to **scale quickly during holiday seasons** and **reduce costs** when demand is lower. |
| Private Cloud | **What is a Private Cloud?**  A **private cloud** is a type of cloud computing environment that is exclusively used by a single organization. It provides many of the benefits of cloud computing—such as scalability, flexibility, and automation—but with greater control and security, as the infrastructure is dedicated solely to one entity. Private clouds can be hosted **on-premises** (within the organization’s own data center) or **off-premises** by a third-party provider, but they are not shared with other tenants.  **When is a Private Cloud Appropriate?**  A private cloud is most suitable in scenarios where:   * **Data Security and Compliance** are critical: Industries like healthcare, finance, and government often have strict regulations (e.g., HIPAA, GDPR) that require control over data storage and access. * **Custom Configuration or Legacy Systems** are involved: Organizations that need specific infrastructure setups or need to integrate with older systems benefit from a private environment. * **Performance and Reliability** are non-negotiable: High-performance computing or applications with low-latency requirements can take advantage of dedicated resources. * **Predictable Workloads** make it more cost-effective: Organizations with steady or predictable workloads may find private clouds more economical than public cloud services over time.   **Real-World Example**  **Organization Type:** A **large hospital network**  **Use Case:** The hospital handles vast amounts of **sensitive patient data**, including electronic health records (EHRs), imaging, and lab results. It must comply with regulations like **HIPAA** in the U.S., which mandates strict controls over data access and transmission.  **Why Private Cloud?**   * Ensures **data privacy** and **regulatory compliance** * Allows for **custom integration** with specialized medical software * Provides **dedicated resources** for high availability and fast access to critical patient information |
| Hybrid Cloud | **Hybrid Cloud** refers to a computing environment that combines **private cloud** (on-premises or dedicated infrastructure) with **public cloud** services (like AWS, Microsoft Azure, or Google Cloud), allowing data and applications to be shared and managed between them. This setup offers a mix of **flexibility, scalability, and control**.  **What is a Hybrid Cloud?**  A **Hybrid Cloud** setup:   * **Connects private and public clouds** to allow seamless data movement and workload portability. * Allows **organizations to run sensitive workloads** in a secure private environment while leveraging public cloud resources for less-sensitive operations or when extra capacity is needed.   **When is a Hybrid Cloud Appropriate?**  Hybrid cloud is most suitable when:   1. **Data sensitivity varies**: You have confidential data requiring on-premises security, but also need scalable public resources for general tasks. 2. **Regulatory compliance is a concern**: You must meet data residency or regulatory requirements for some workloads. 3. **Existing infrastructure investments**: You want to keep using existing on-prem servers while adopting cloud services gradually. 4. **Variable workloads**: You handle fluctuating workloads that need **burst capacity** (cloud bursting). 5. **Disaster recovery and backup**: You want cloud-based redundancy without migrating all systems.   **Real-World Example: Financial Institution**  **Organization Type**: A large bank  **Why Hybrid Cloud?**   * **Sensitive customer data** is kept on secure private infrastructure to comply with strict **data protection regulations**. * **Mobile banking apps**, **marketing campaigns**, and **customer portals** run on the **public cloud** to take advantage of scalability and faster deployment. * During high-traffic events like **Black Friday or end-of-quarter reporting**, extra resources are temporarily pulled from the public cloud (cloud bursting). |
| Community Cloud | **Community Cloud:**  **What is a Community Cloud?**  A **Community Cloud** is a type of cloud computing environment that is **shared by several organizations** with **common interests, goals, or regulatory concerns**. It is a **hybrid model** between private and public clouds, designed to offer a **collaborative infrastructure** where multiple entities can access, manage, and use shared resources securely.  This type of cloud is **jointly managed** by the participating organizations or a third-party provider and offers a balance between **cost-efficiency**, **control**, and **compliance**.  **When is a Community Cloud Appropriate?**  Community Clouds are ideal when:   * **Organizations have shared objectives** (e.g., security, compliance, or policy). * Data privacy and **regulatory compliance** are critical (e.g., healthcare, finance, government). * There is a need for **shared infrastructure** but with more **control than a public cloud**. * Collaboration across organizations requires **interoperability and secure data exchange**.   **Real-World Example of Use**  **Sector: Government**   * **Use Case:** Several government agencies (e.g., police, fire services, and emergency medical services) within a region need to **share data and coordinate emergency response efforts**. * **Why Community Cloud?** These agencies require **secure, compliant data storage**, real-time communication, and interoperability, but cannot use public clouds due to **sensitive data** and **regulatory constraints**. * **Implementation Example:** The UK Government’s **G-Cloud** initiative enables departments to share cloud services while meeting security and data protection standards.   **1. Healthcare Sector**  **Use Case:**  Multiple hospitals, clinics, and research institutions within a health network want to **share patient data**, **collaborate on research**, and **ensure HIPAA compliance**.  **Why Community Cloud?**   * All parties deal with **sensitive patient data**. * They must comply with **healthcare regulations** like HIPAA (in the U.S.) or GDPR (in Europe). * They need **shared access to electronic health records (EHRs)**, medical imaging, and research data while maintaining strict **privacy and security controls**.   **Example:**  A regional health authority sets up a Community Cloud to serve all public hospitals in a province. It hosts EHR systems, lab data, and analytics platforms used by different facilities, improving **care coordination** and **clinical research**.  **2. Education Sector**  **Use Case:**  A consortium of universities and colleges collaborates on **online learning platforms**, **shared research**, and **administrative systems**.  **Why Community Cloud?**   * Institutions want to share **academic resources** (like a learning management system or research database). * They require **custom access controls**, **data governance**, and **cost-sharing**. * They can pool IT resources while retaining **institutional autonomy**.   **Example:**  In Europe, several universities form an educational consortium and host a Community Cloud to provide a **joint e-learning platform** (e.g., Moodle), **library systems**, and **data analytics for student performance**, fostering academic collaboration and reducing IT overhead. |

# Day 2: Task 1

Describe, with examples, the **three** major areas that the Computer Misuse Act deals with.

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| Area | Description | Example |
| 1. **Unauthorized Access to Computer Material (Section 1)** | This section makes it illegal to access any computer system without permission, even if no harm is done. | **Example:** A student guesses their teacher’s password and logs into the school’s system to view exam papers, even without altering anything. This is unauthorized access. |
| 2. **Unauthorized Access with Intent to Commit or Facilitate a Crime (Section 2)** | This involves accessing a system without permission **with the intent** to commit a further crime, such as fraud or data theft. | **Example:** A hacker breaks into a company’s HR system to steal employee bank details, planning to commit identity theft or financial fraud. |
| 3. **Unauthorized Modification of Computer Material (Section 3)** | This section targets deliberate acts to **modify** data or programs without permission, such as deleting files, introducing viruses, or changing settings. | **Example:** An ex-employee gains access to their former employer’s server and deletes important business files in retaliation for being fired. |

The computer misuse act 1990 is an act where an individual can be criminalised because of computer related offense. Describe three extra powers that the Police and Justice Act 2006 (Computer Misuse) has added.

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| Description |
| The **Police and Justice Act 2006** introduced several important amendments to the **Computer Misuse Act 1990** to strengthen the UK’s ability to combat modern cybercrime. Here are three key **extra powers** or changes it added:  1. Denial-of-Service (DoS) Attacks Made Explicitly Illegal   * Before 2006: The original Computer Misuse Act did not clearly criminalise DoS attacks. * After Amendment: Section 3 was updated to make it a specific offence to intentionally cause a computer to perform any function that impairs or disables another system (e.g., flooding a website with traffic to knock it offline). * Punishment: Up to 10 years in prison. |
| 2. Increased Maximum Penalties   * Original Penalties: Many offences under the 1990 Act had maximum sentences of 6 months to 5 years. * Updated Penalties: The 2006 Act increased these penalties significantly, for example:   + Unauthorised access with intent to commit further offences (Section 2) increased to a maximum of 5 years.   + Unauthorised modification of computer material (Section 3) increased to a maximum of 10 years. |
| 3. New Offence of Making, Supplying or Obtaining Hacking Tools   * New Section (Section 3A): It became illegal to make, adapt, supply, or offer to supply any article (like software or scripts) intended to be used in computer misuse offences. * This targeted hackers-for-hire, malware authors, or anyone distributing hacking tools, even if they didn’t use them personally.   Summary  Police and Justice Act 2006 – Key Additions to the Computer Misuse Act 1990   * Denial-of-Service (DoS) Attacks Made Illegal   + Specifically criminalised DoS and DDoS attacks.   + Intentional acts that impair or disrupt computer systems.   + Punishable by up to 10 years in prison. * Increased Maximum Penalties   + Section 2 (unauthorised access with intent) → now up to 5 years.   + Section 3 (unauthorised modification, e.g., malware use) → now up to 10 years. * New Offence: Supplying or Creating Hacking Tools   + Section 3A added.   + Illegal to make, supply, or offer hacking tools (e.g., malware, keyloggers).   + Aimed at stopping the spread of tools used in cybercrime. |

Look at the below website to answer the questions:

<https://www.gov.uk/personal-data-my-employer-can-keep-about-me>

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| Write down three items of data which a company can store about an employee. |
| * Name, address * date of birth * National Insurance number |
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| Give three more examples of data that an employer can only store if they first get the employee’s permission. |
| Employers need their employees’ permission to keep certain types of ’sensitive’ data, including:   * race and ethnicity * religion * political membership or opinions |
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Conduct further research to answer the below questions.

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| Question | Answer |
| Provide one example of: Copyright infringement | A person uploads a full-length Hollywood movie to YouTube without the permission of the copyright holder (e.g., the movie studio). |
| Provide one example of: Plagiarism | A student copies and pastes several paragraphs from an online article into their research paper without using quotation marks or citing the source, and submits the paper as their own original work. |
| What are two consequences of copyright infringement and software piracy? |  **Legal Consequences**: Individuals or organisations caught infringing copyright can face **civil lawsuits** or even **criminal prosecution**. Penalties may include:   * Fines (up to £50,000 in Magistrates’ Court or unlimited in Crown Court) * Up to **10 years imprisonment** under the Copyright, Designs and Patents Act 1988 (as amended by later laws like the Digital Economy Act).    **Financial and Reputational Damage**:   * Offenders may be required to **pay compensation** or **damages** to the copyright holder. * Businesses found using pirated software risk **loss of trust**, **reputational harm**, and may face **audits or bans** from software providers or partners. |
| Give three possible consequences for individuals when using pirated software |  **Legal Consequences**: Using pirated software is a violation of copyright law. Individuals caught using or distributing it may face legal action, including fines or even criminal charges under the Copyright, Designs and Patents Act 1988.   **Security Risks**: Pirated software often comes from untrusted sources and may contain malware, spyware, or viruses. This can lead to data theft, identity fraud, or system damage.   **Lack of Support and Updates**: Users of pirated software typically can't access official updates or technical support. This makes the software more vulnerable to bugs and security flaws, reducing its reliability and performance. |

Listed below are some laws which we have covered today:

1. Computer Misuse Act 1990

2. Police and Justice Act 2006 (Computer Misuse)

3. Copyright, Designs and Patents Act 1988

4. Copyright (Computer Programs) Regulations 1992

5. The Health and Safety (Display Screen Equipment) Regulations 1992

6. Data Protection Act 2018

7. Consumer Rights Act 2015

* Insert a number in the first column of each row to match each of the statements with one of the above Acts.
* One of statements is incorrect and not illegal. For this statement, write ‘Not illegal’.

|  |  |
| --- | --- |
| **Act number** | **Clause** |
| 3 | With some exceptions, it is illegal to use unlicensed software |
| 7 | Any product, digital or otherwise, must be fit for the purpose it is supplied for |
| 1 | Unauthorised modification of computer material is illegal |
| Not illegal | It is illegal to create or use a hacking tool for penetration testing |
| 6 | Personal data may only be used for specified, explicit purposes |
| 5 | Employers must provide their computer users with adequate health and safety training for any workstation they work at |
| 2 | It is illegal to distribute hacking tools for criminal purposes |
| 3 | It is illegal to distribute an illicit recording |
| 6 | Personal data may not be kept longer than necessary |
| 1 | Gaining unauthorised access to a computer system is illegal |
| 5 | Employers must ensure that employees take regular and adequate breaks from looking at their screens |
| 1 | It is illegal to prevent or hinder access (e.g. by a denial-of-service attack) to any program or data held in any computer |
| 6 | Personal data must be accurate and where necessary kept up to date |

# 

# Day 3: Task 1

Please complete the below lab (3) *‘Explore relational data in Azure’* and paste evidence of the completed lab in the box provided.



|  |  |
| --- | --- |
| Completed lab | Fig 1 SELECT statement query    Fig 2 Select statement query    Fig 3 Select Statement final. |

# Day 3: Task 2

Please complete the below lab (4) *‘Explore non-relational data in Azure’* and paste evidence of the completed lab in the box provided.



|  |  |
| --- | --- |
| Completed lab | Fig 4 - Azure NoSQL Storage account created    Fig 5 product\_data folder created    Fig 6 Data Lake Gen2 upgrade    Fig 7 data container – After Gen 2 upgrade    Fig 8 File Share    Fig 9 File Share Connect    Fig 10 Azure Cosmos DB for NoSQL    Fig 11 products Table created in Cosmos      Fig 12 Comos DB – Data Explorer – NoSQL    Fig 13 Cosmos DB – NoSQL – Data Explorer    Fig14 Cosmos DB – Data Explorer –NoSQL |
|  | Fig 14 End of Cosmos DB Exercise - Delete Resource Group |

# Day 3: Task 3

Please complete the below lab (5) ‘Explore data analytics in Azure’ and paste evidence of the completed lab in the box provided.



|  |  |
| --- | --- |
| Completed lab | Lab omitted – Sandbox VM at Skillabel not Working |

# Day 4: Task 1

In your teams, complete the Azure DP-900 practice exam and paste your result below – this is open book and please research and discuss your answers as a team.



|  |  |
| --- | --- |
| Result |  |

# Day 4: Task 2

#### **1. Scenario Background**

"Paws & Whiskers" is a growing pet shop that aims to improve its business by analysing sales, customer information, and inventory data. Currently, the data is collected manually or stored in spreadsheets. Management is interested in transitioning to Microsoft Azure to streamline data storage, analysis, and reporting, enabling them to make data-driven decisions.

#### **2. Data Laws and Regulations**

Identify and explain the data laws and regulations relevant to handling customer data within the proposal. Ensure you cover the following points:

* **GDPR Compliance**: Highlight the importance of adhering to the General Data Protection Regulation (GDPR), particularly as it relates to storing and processing customer information.
* **Data Protection Act (DPA) 2018**: Outline how the DPA 2018 may affect the way "Paws & Whiskers" collects and stores data, ensuring compliance with UK laws on data privacy.
* **Other Industry Standards**: Research any additional data protection standards or regulations that may apply to pet shop data, particularly if they involve sensitive or payment information.

#### **3. Azure Service Recommendations**

Recommend Microsoft Azure services that would suit the company’s data analysis needs and explain why these services are suitable. Your recommendations should include:

* **Data Storage**: Identify suitable storage options, such as **Azure Blob Storage** or **Azure SQL Database**, and discuss the benefits of each for storing large datasets, including inventory, sales transactions, and customer details.
* **Data Analysis Tools**: Recommend tools such as **Azure Machine Learning** for customer behaviour analysis or **Azure Synapse Analytics** for analysing sales trends.
* **Data Integration and Automation**: Explain how services like **Azure Data Factory** could automate data collection and integration processes, improving efficiency.

#### **4. Data Types and Data Modelling**

Define the types of data "Paws & Whiskers" will need to work with and describe your approach to data modelling:

* **Data Categories**: Identify key data types, such as customer demographics, transaction history, pet inventory, and product categories.
* **Data Modelling Approach**: Outline how you would structure this data using a relational model or a data warehouse approach, considering factors like tables, entities, relationships, and primary keys.

#### **5. Data Storage Formats and Structures in Azure**

Discuss how you would store data within Azure and the formats you would recommend:

* **Data Formats**: Specify recommended formats (e.g., CSV for raw data imports, JSON for structured data, Parquet for analytics) and explain why these formats are suitable for specific data types.
* **Data Security and Encryption**: Include recommendations for securing data using Azure’s built-in encryption features and access controls to ensure compliance with data privacy regulations.

#### **6. Additional Considerations**

Provide any other considerations that might enhance data handling and efficiency in Azure, such as:

* **Backup and Disaster Recovery**: Outline a backup plan using **Azure Backup** or **Azure Site Recovery** to safeguard against data loss.
* **Data Visualisation**: Discuss potential use of **Power BI** within Azure for creating dashboards that provide management with real-time insights into sales and customer trends.
* **Future Scalability**: Comment on how Azure services can scale as the business grows, accommodating larger datasets and more complex analyses.

### **Submission Guidelines:**

1. **Structure**: Ensure your report is well-organised, with sections for each task (e.g., Data Laws, Azure Services, Data Types, etc.).
2. **Formatting**: Include headings, bullet points where appropriate, and any visuals or diagrams that support your explanations.
3. **References**: Cite any resources or regulations referenced in the report.
4. **Length**: Aim for 1500-2000 words.

|  |
| --- |
| Please see my attached Powerpoint in the email  File name : Justice Foli - Paws\_and\_Whiskers\_Azure\_Proposal- Week 5 |
|  |

|  |
| --- |
| **Course Notes** |

It is recommended to take notes from the course, use the space below to do so, or use the revision guide shared with the class:

|  |
| --- |
| **Additional Information** |

We have included a range of additional links to further resources and information that you may find useful, these can be found within your revision guide.

**END OF WORKBOOK**

**Please check through your work thoroughly before submitting and update the table of contents if required.**

**Please send your completed work booklet to your trainer.**