Chapter 7

**1. Cloud Computing:**

* **Definition:**
  + Cloud computing is a technology that enables access to a pool of computing resources over the internet, allowing users to use and pay for resources as needed.
* **Key Characteristics:**
  + *On-demand self-service:* Users can provision and manage computing resources as needed.
  + *Broad network access:* Services are available over the network and can be accessed by various devices.
  + *Resource pooling:* Resources are shared among multiple users to maximize efficiency.
  + *Rapid elasticity:* Resources can be rapidly scaled up or down based on demand.
  + *Measured service:* Usage is monitored, and users pay for the resources they consume.
* **Service Models:**
  + *Infrastructure as a Service (IaaS):* Provides virtualized computing resources over the internet.
  + *Platform as a Service (PaaS):* Offers a platform allowing customers to develop, run, and manage applications without dealing with the complexity of infrastructure.
  + *Software as a Service (SaaS):* Delivers software applications over the internet on a subscription basis.
* **Deployment Models:**
  + *Public Cloud:* Services are provided over the internet and are available to the general public.
  + *Private Cloud:* Cloud infrastructure is exclusively used by a single organization.
  + *Hybrid Cloud:* Combination of public and private clouds.

**2. Data Management:**

* **Definition:**
  + Data management involves the planning, execution, and supervision of activities related to the collection, storage, retrieval, and use of data.
* **Key Components:**
  + *Data Governance:* Establishing policies and procedures for managing data assets.
  + *Data Quality:* Ensuring the accuracy, completeness, and reliability of data.
  + *Master Data Management (MDM):* Managing and maintaining consistent and accurate business data.
  + *Data Integration:* Combining data from different sources to provide a unified view.
  + *Data Security:* Protecting data from unauthorized access and ensuring confidentiality.
  + *Data Warehousing:* Storing and managing data from different sources in a centralized repository.
* **Challenges:**
  + *Data Silos:* Isolated storage of data that hinders collaboration and data access.
  + *Data Security:* Protecting sensitive data from breaches and unauthorized access.
  + *Data Quality Issues:* Inaccurate or incomplete data impacting decision-making.
  + *Compliance and Regulations:* Adhering to data protection and privacy laws.

**3. Mobile Databases:**

* **Definition:**
  + Mobile databases are designed to operate in mobile and sometimes offline environments, allowing applications to store and retrieve data locally.
* **Characteristics:**
  + *Lightweight:* Optimized for mobile devices with limited resources.
  + *Synchronization:* Capabilities to synchronize data with a central server.
  + *Offline Support:* Ability to operate without a constant network connection.
* **Examples:**
  + *SQLite:* A self-contained, serverless, and zero-configuration relational database engine.
  + *Realm:* A mobile database that is easy to integrate and provides real-time synchronization.
  + *Firebase Realtime Database:* A NoSQL database that enables real-time data synchronization across devices.

**4. Hadoop:**

* **Definition:**
  + Hadoop is an open-source framework for distributed storage and processing of large datasets using a cluster of commodity hardware.
* **Components:**
  + *Hadoop Distributed File System (HDFS):* A distributed file system for storage.
  + *MapReduce:* A programming model for processing and generating large datasets.
* **Advantages:**
  + *Scalability:* Easily scales by adding more nodes to the Hadoop cluster.
  + *Fault Tolerance:* Can recover from hardware or software failures.
  + *Cost-Effectiveness:* Uses inexpensive, commodity hardware.
* **Use Cases:**
  + Big data processing, analytics, and storage of large datasets.

**5. SQLite Database:**

* **Definition:**
  + SQLite is a self-contained, serverless, and zero-configuration relational database engine.
* **Characteristics:**
  + *Embedded Database:* No separate server process and is embedded directly into the application.
  + *Lightweight:* Consumes minimal memory and disk space.
  + *ACID Properties:* Guarantees the reliability of transactions.
* **Use Cases:**
  + Embedded systems, mobile applications, small to medium-sized websites.

**6. SQL-MongoDB:**

* **SQL (Relational Database):**
  + *Structured Query Language:* A language used for managing and querying relational databases.
  + *Tables with Predefined Schema:* Data is organized into tables with a fixed structure.
  + *ACID Properties:* Ensures reliable processing of database transactions.
* **MongoDB (NoSQL Database):**
  + *JSON-like Documents (BSON):* Data is stored in flexible, JSON-like documents in BSON format.
  + *No Fixed Schema:* Each document in a collection can have a different structure.
  + *Horizontal Scalability:* Scales horizontally by adding more servers.
* **Use Cases:**
  + SQL is suitable for applications with structured and tabular data.
  + MongoDB is suitable for applications with unstructured or semi-structured data, or where flexible schema design is required.