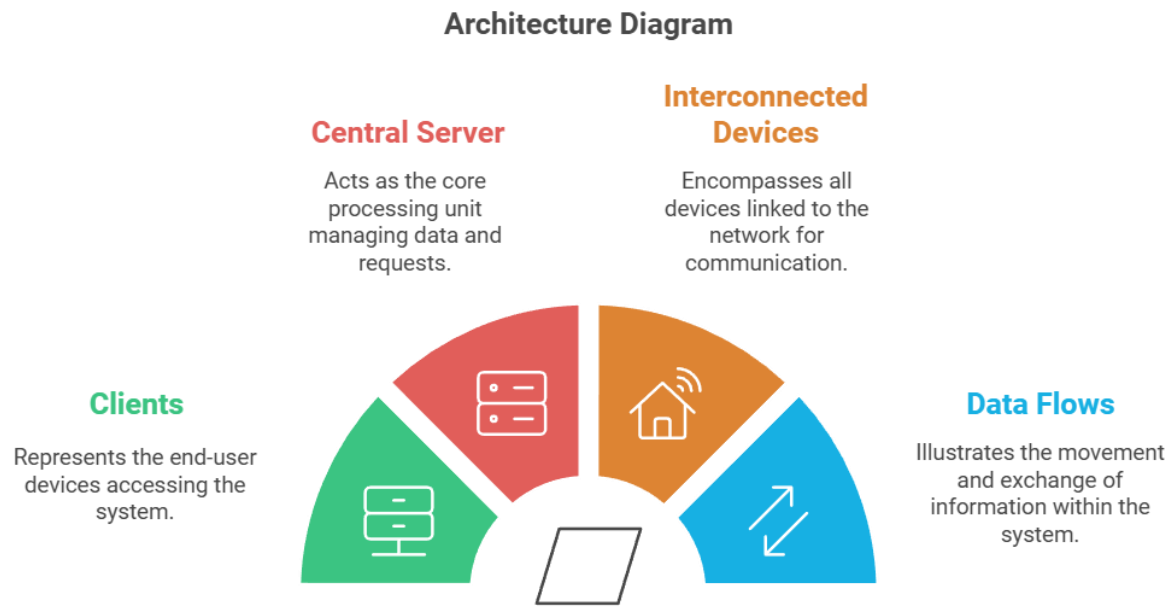
CLOUD ARCHITECTURE AND MODEL

1. Technologies for Network-Based Systems

Network-based systems use networking technologies to allow multiple devices to communicate and work together, creating the foundation for distributed systems and cloud computing. Key technologies include:

- **Networking Protocols**: Protocols like TCP/IP, HTTP, HTTPS, and FTP provide the means for data exchange.
- **Distributed Systems**: Involves multiple interconnected computers sharing resources to solve tasks. Examples include grid computing and peer-to-peer networks.
- **Virtualization**: A crucial technology allowing multiple virtual machines (VMs) to run on a single physical server. VMs isolate applications, making them scalable and efficient for cloud use.
- **Load Balancing**: Balancing requests across servers to ensure no single machine is overwhelmed, enhancing reliability and performance.



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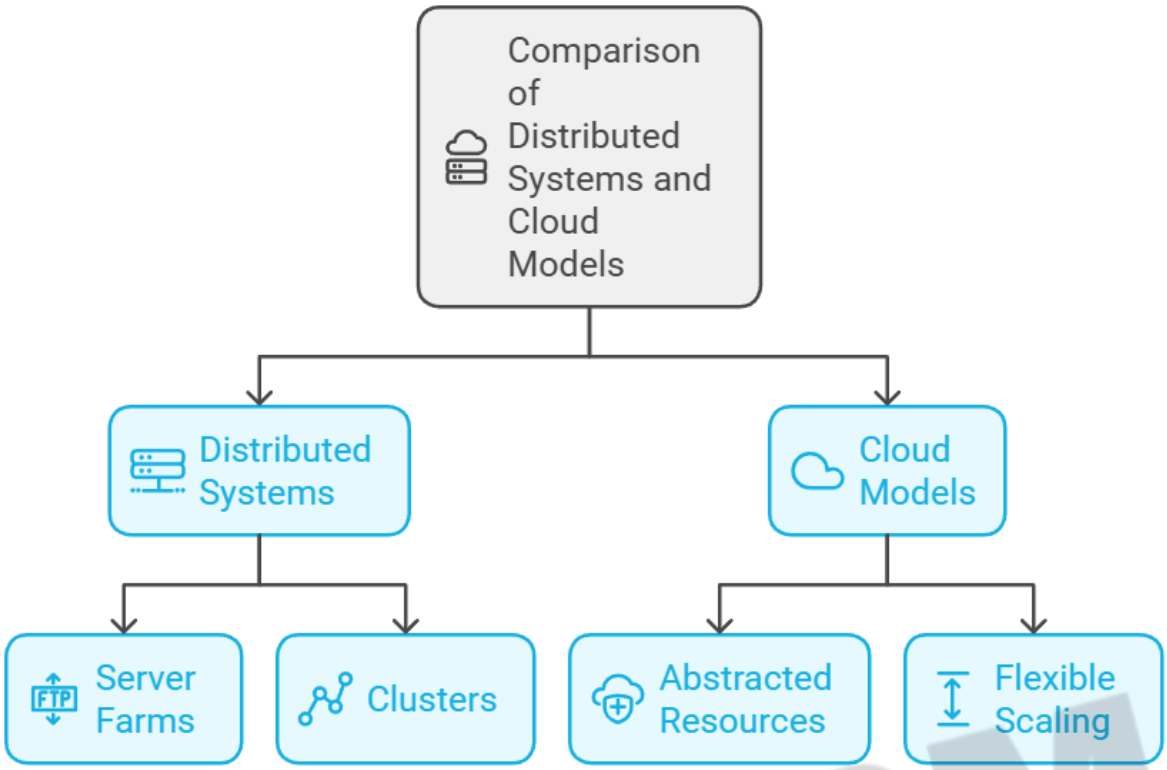
2. System Models for Distributed and Cloud Computing

System models describe the layout, components, and operations of distributed and cloud computing environments:

- **Distributed Computing Models**: These include client-server models, peer-to-peer models, and multi-tier architectures, where resources and tasks are distributed across multiple systems.
- **Cloud Computing Models**: Emphasizes elasticity, resource pooling, and self-service. Services are abstracted from hardware, meaning resources can be scaled up or down depending on user demand.



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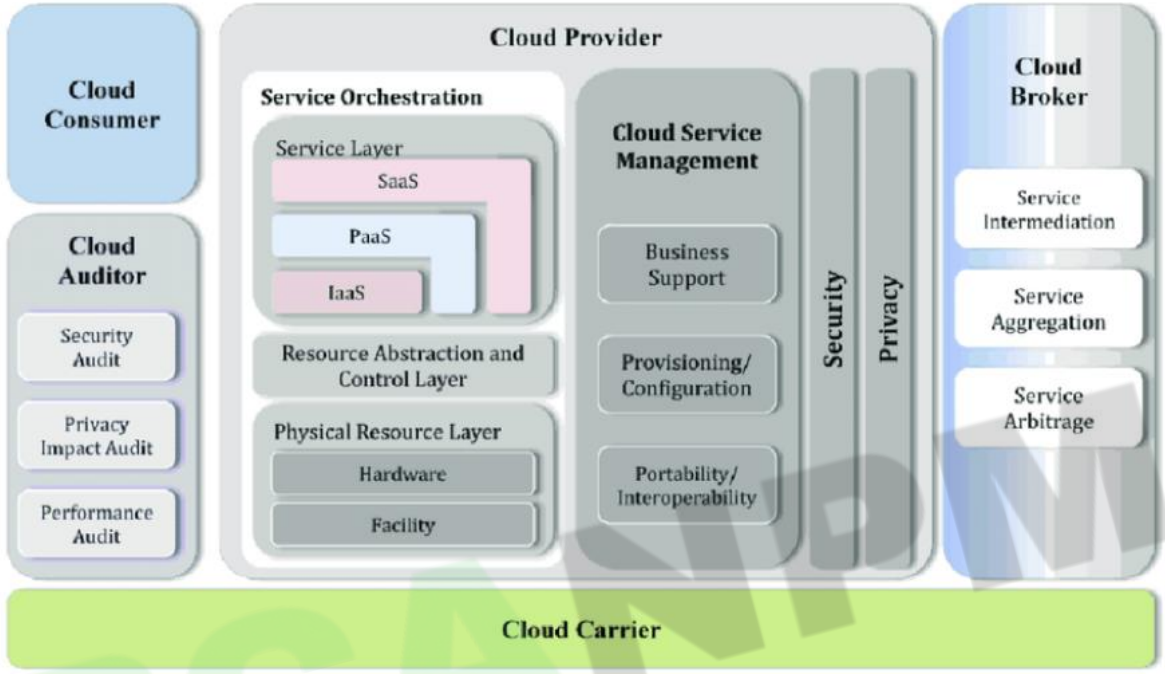
3. NIST Cloud Computing Reference Architecture

The **NIST (National Institute of Standards and Technology) Cloud Computing Reference Architecture** provides a standardized model to define the roles, responsibilities, and interactions in cloud environments. It identifies five major actors:

1. **Cloud Consumer**: Uses cloud services (e.g., IaaS, PaaS, SaaS).
2. **Cloud Provider**: Delivers and manages cloud services.
3. **Cloud Broker**: Intermediary that manages use and performance of services.

4. **Cloud Auditor**: Conducts audits to ensure compliance and performance.
5. **Cloud Carrier**: Provides the connection between consumers and providers.



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4. Cloud Models

Cloud computing models define how resources are structured and deployed. They offer a range of services and configurations tailored to user needs.

Characteristics of Cloud Computing

- **On-Demand Self-Service**: Users can provision resources as needed.
- **Broad Network Access**: Services accessible from anywhere with an internet connection.

- **Resource Pooling**: Shared resources dynamically allocated to meet demand.
- **Rapid Elasticity**: Services can be scaled quickly.
- **Measured Service**: Resource usage is tracked and billed based on consumption.

Cloud Services Models

1. **Infrastructure as a Service (IaaS)**: Provides basic infrastructure resources like storage and compute power. Users control operating systems, applications, and network configurations.
    - *Example*: Amazon EC2, Google Compute Engine.
2. **Platform as a Service (PaaS)**: Offers a platform allowing users to develop, run, and manage applications without managing the underlying infrastructure.
    - *Example*: Google App Engine, Microsoft Azure.
3. **Software as a Service (SaaS)**: Delivers software applications over the internet, accessible from any device without installation.
    - *Example*: Google Workspace, Salesforce.

RESPONSIBILITIES OF A CUSTOMER AND A CLOUD VENDOR

IAAS	PAAS	SAAS
Deployment	Deployment	Deployment
Data management	Data management	Data management
Network management	Network management	Network management
System management	System management	System management
On-demand scaling	On-demand scaling	On-demand scaling
Hardware maintenance	Hardware maintenance	Hardware maintenance

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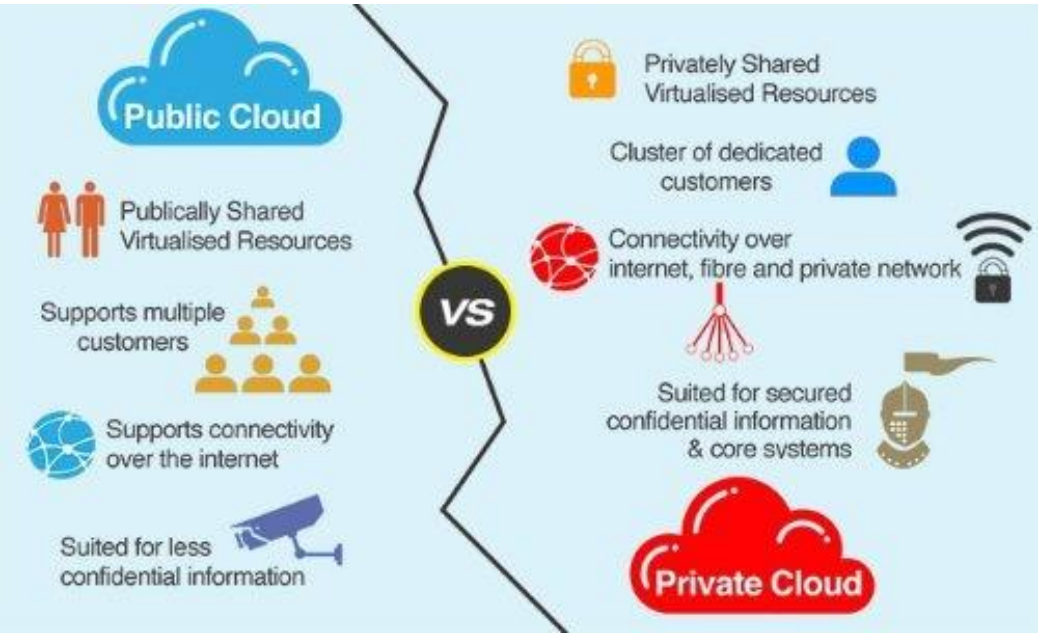
Public vs Private Cloud

1. **Public Cloud**: Resources are owned and operated by a third-party cloud provider. Accessible by multiple customers, often with shared infrastructure.
    - *Advantages*: Cost-effective, scalable, flexible.
2. **Private Cloud**: Used exclusively by a single organization, offering enhanced security and control over the infrastructure.
    - *Advantages*: Greater control, data privacy, and regulatory compliance.



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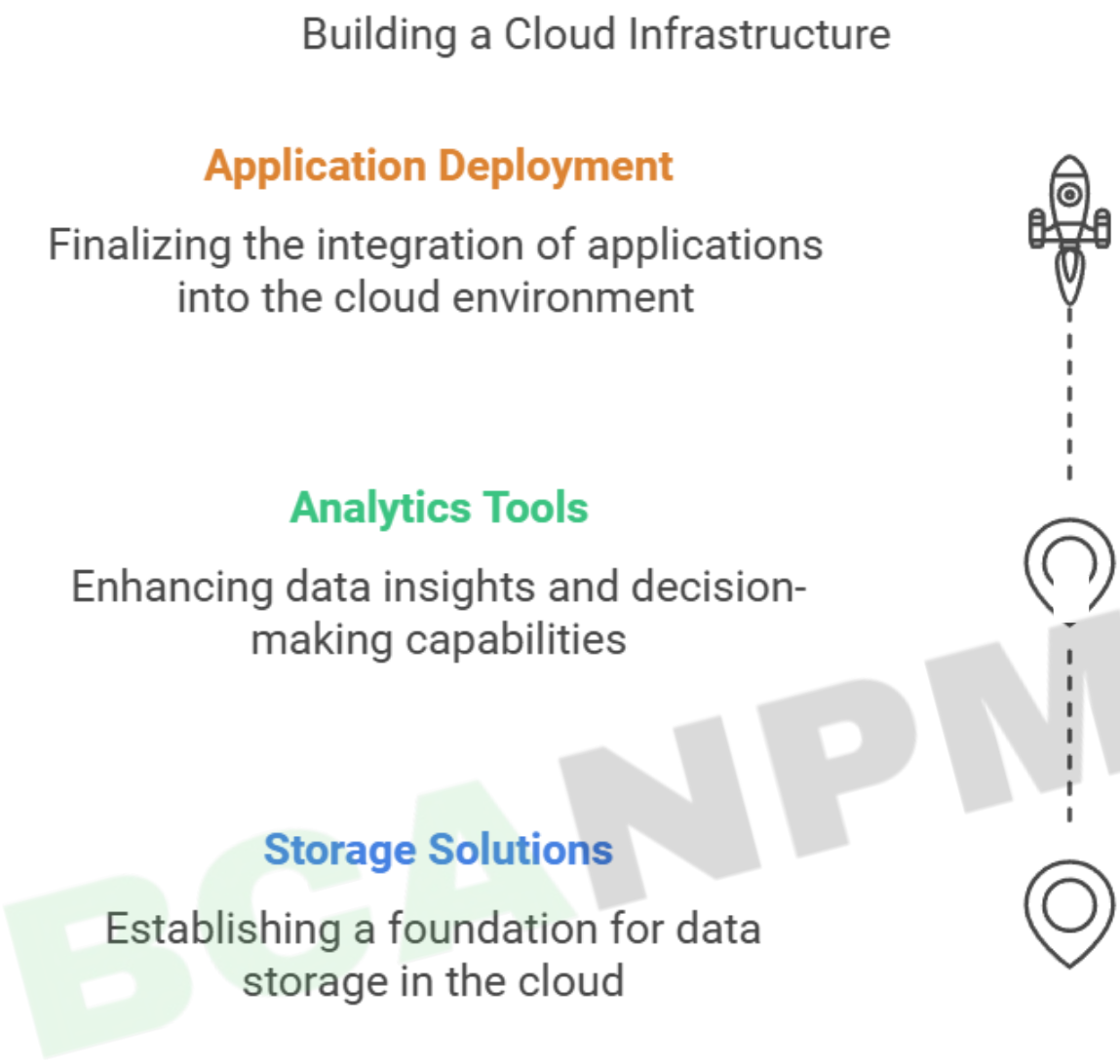
5. Cloud Solutions and Ecosystem

A cloud ecosystem comprises interconnected components, tools, and services supporting a unified cloud environment. Examples include:

- **Development Platforms**: Tools for application building (e.g., Kubernetes for container orchestration).
- **Data Storage and Management**: Cloud databases and storage services like Amazon S3, Google Cloud Storage.
- **APIs and Integrations**: Enable communication and data sharing between cloud applications.



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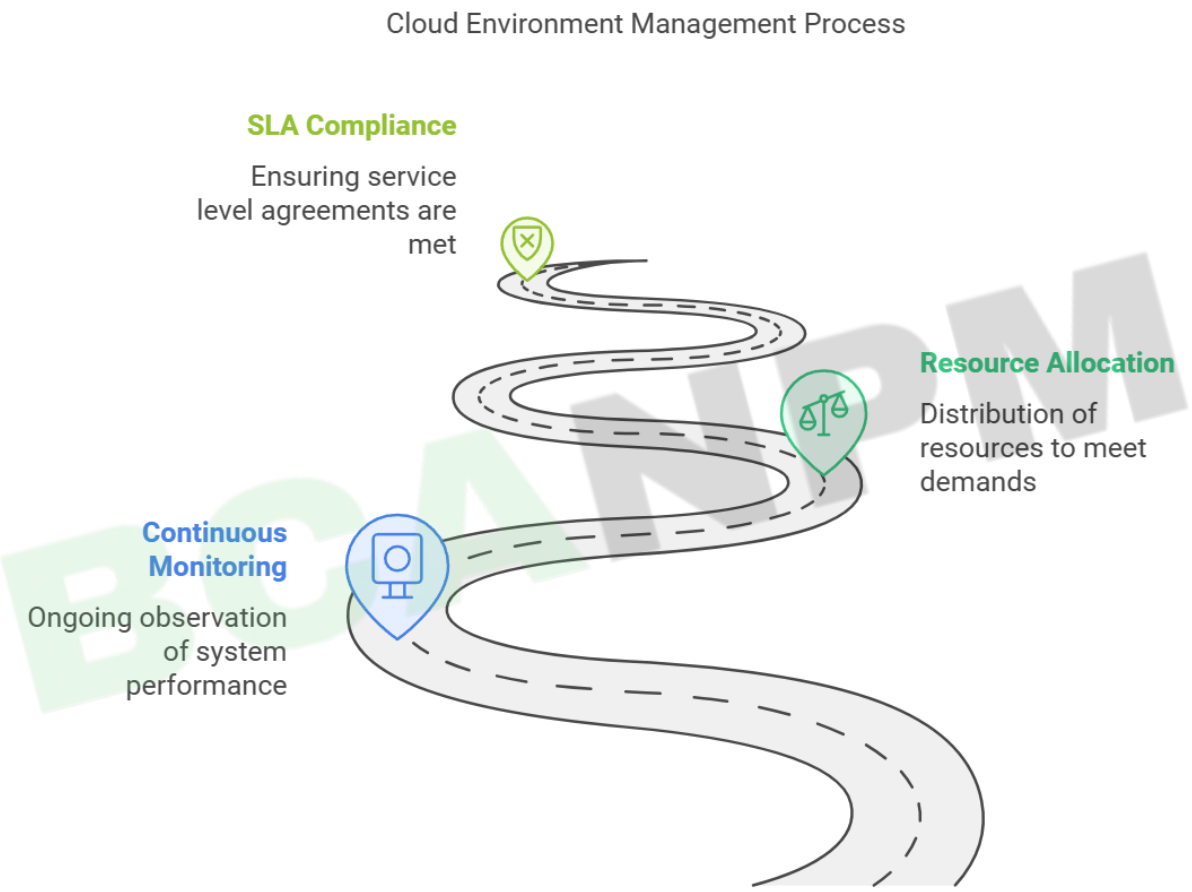
6. Service Management in Cloud Computing

Cloud **Service Management** involves the processes and policies required to manage cloud services. Key areas include:

- **Service Level Agreements (SLAs)**: Define expectations for service availability, performance, and response times.

- **Service Monitoring and Analytics**: Track service health, user activity, and resource usage to ensure optimal performance.
- **Resource Optimization**: Adjusting resources to prevent overuse or underutilization.



7. Computing on Demand

Computing on Demand is a model that allows users to access resources as they need them, paying only for what they use. This model is beneficial for:

- **Scalability**: Resources are scalable based on real-time demand.
- **Cost-Efficiency**: Users avoid upfront infrastructure investments, paying only for actual usage.
- **Flexibility**: Resources are available globally, enabling remote teams to access the same infrastructure.