SE315: Cloud Computing

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Lecture 2ABC

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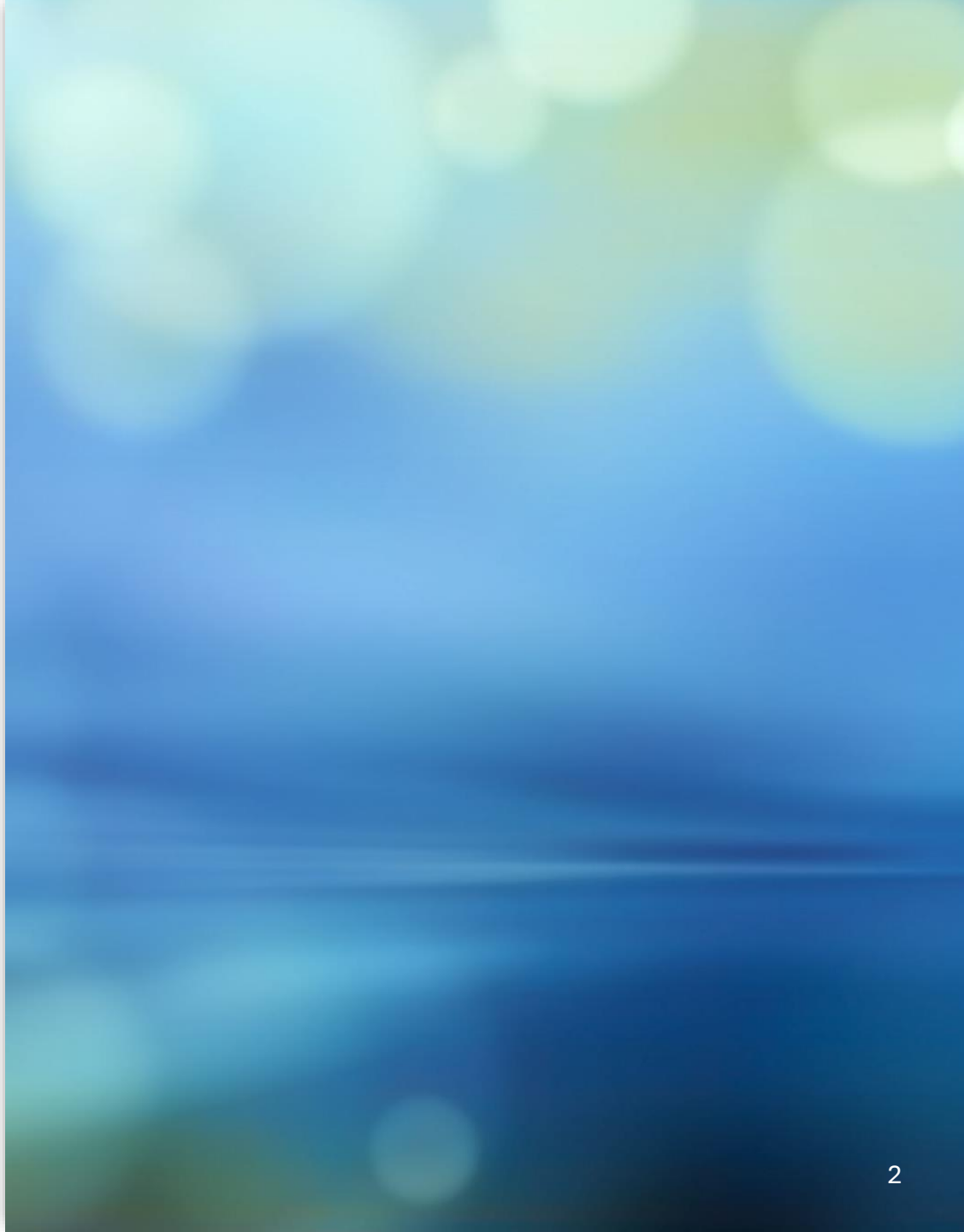
Agenda

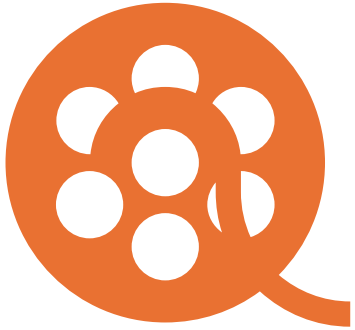
Cloud Characteristics

Cloud Delivery Models

- IaaS
- PaaS
- SaaS



Warm-up



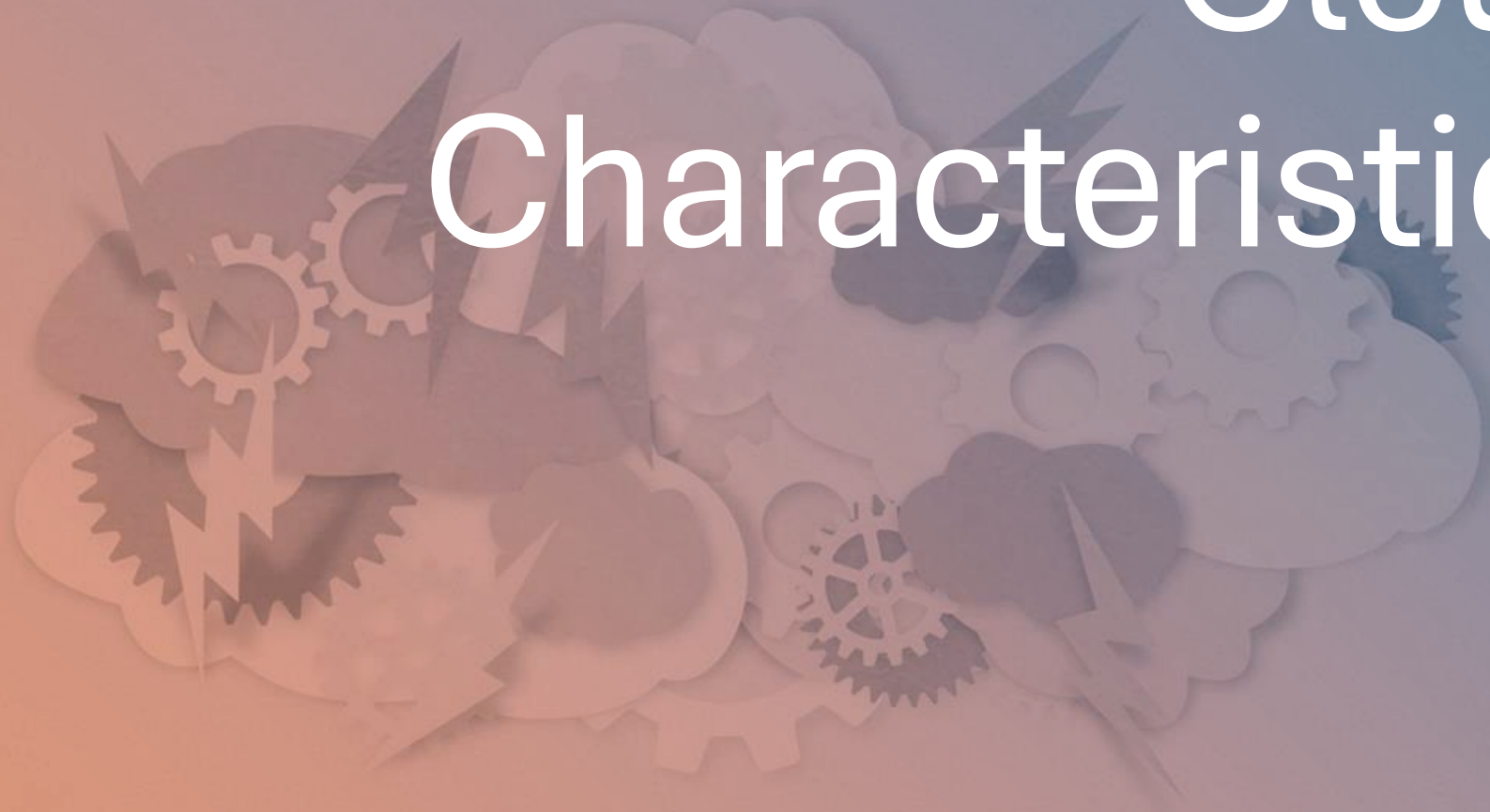
“How does Netflix stream seamlessly?”

“How does Google Drive let us access files anytime, anywhere?”

Cloud Computing Definition – National Institute of Standards and Technology (NIST)

"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****. This cloud model is composed of* ***five essential characteristics****,* ***three service models****, and* ***four deployment models****"*

Cloud Characteristics



Cloud Characteristics

❑ An IT environment requires a specific set of characteristics to enable the remote provisioning of scalable and measured IT resources in an effective manner.

❑ **Six specific common characteristics**

- On-demand Usage
- Ubiquitous Access
- Multitenancy
- Elasticity
- Measured Usage
- *Resiliency

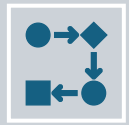
* excluded from the NIST definition of cloud computing

1. On-demand access

Examples

- Launching an AWS EC2 instance within minutes
- Creating a Google Drive document instantly
- Provisioning a VM on Microsoft Azure for testing

Users can ***instantly provision computing resources*** (compute, storage, network).



No need for manual intervention from service providers.

Reduces setup time for applications and services.

Eliminates upfront infrastructure investment.

Provides flexibility to experiment and innovate quickly.

2. Ubiquitous Access

Examples

- Accessing Dropbox files from phone and laptop
- Streaming Netflix across smart TVs and mobile devices
- Using Google Docs collaboratively from different locations

Cloud resources are ***available anywhere*** with an internet connection.

Supports ***access across multiple devices*** (PCs, mobile, IoT).

Enables remote work, global workforce, and collaboration.

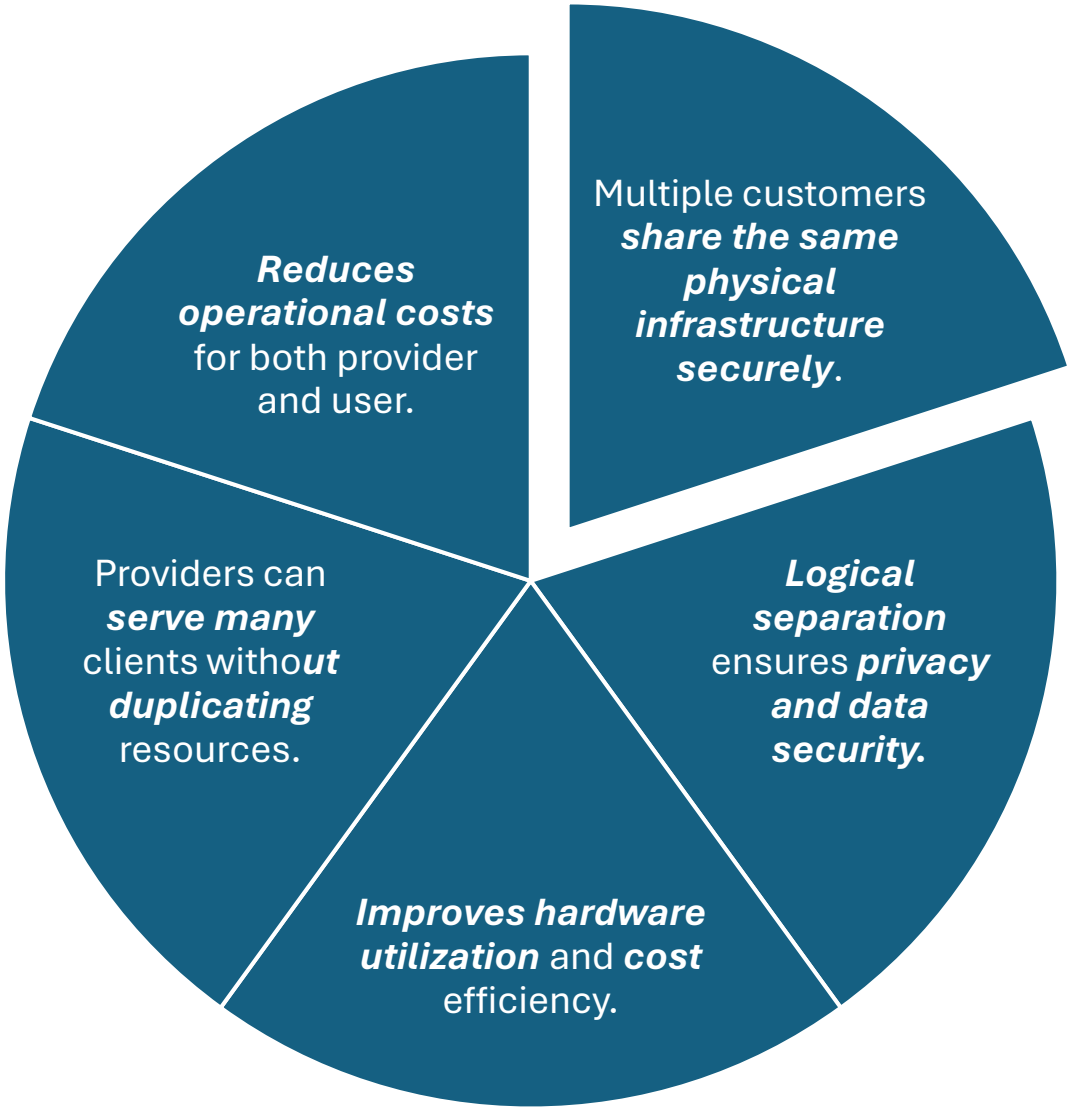
Provides ***consistent service*** experience ***regardless of location***.

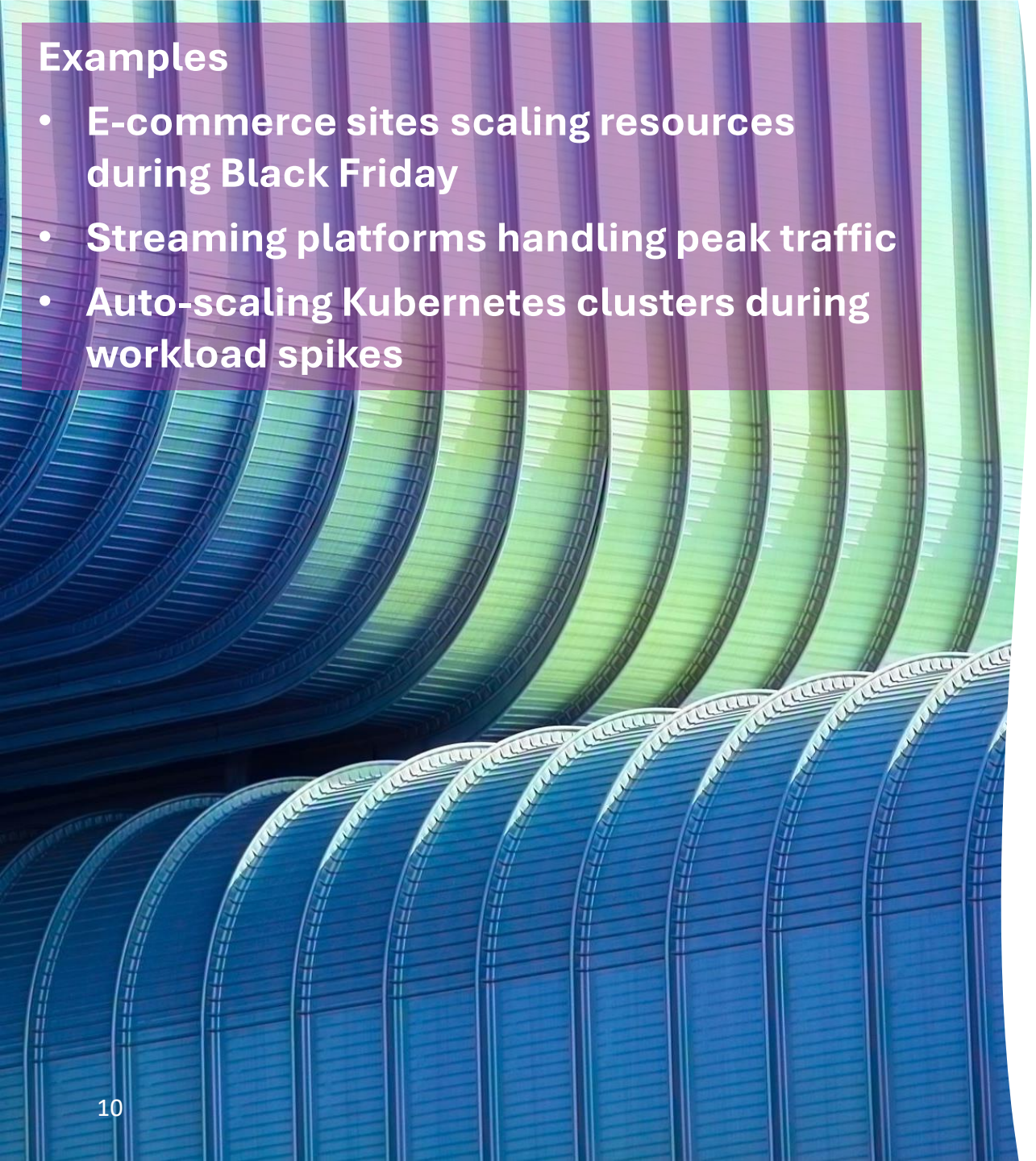
Encourages ***mobility and productivity***.

3. Multitenancy

Examples

- Salesforce serving multiple companies on the same servers
- Microsoft 365 accounts hosted on shared infrastructure
- AWS S3 storing data from multiple organizations securely





Examples

- **E-commerce sites scaling resources during Black Friday**
- **Streaming platforms handling peak traffic**
- **Auto-scaling Kubernetes clusters during workload spikes**

4. Elasticity

Resources ***scale up automatically*** during peak demand.

Scales down when ***demand reduces***, avoiding waste.

Ensures applications ***maintain performance*** during spikes.

Prevents **overprovisioning** and **underutilization**.

Offers **agility** to adapt to changing business needs.

5. Measured Usage

Examples

- AWS billing users only for storage/compute used
- Paying for Zoom cloud recordings based on hours stored
- Google Cloud charging based on API calls made

Follows a ***pay-as-you-go billing model***.

Customers ***pay only for what they consume***.

Usage is tracked, monitored, and reported.

Supports ***cost transparency*** and accountability.

Helps ***optimize resource consumption*** and budgeting.

6. *Resiliency

Examples

- Netflix using AWS for failover during outages
- Google Cloud ensuring data availability with replication
- Microsoft Azure Site Recovery providing disaster recovery

Cloud systems include redundancy for fault tolerance.

Provides high availability even during failures.

Disaster recovery capabilities ensure business continuity.

Self-healing systems reroute workloads automatically.

Reduces downtime and minimizes risk of data loss.

Summary – Cloud Charateristics

On-Demand Access 

Instant provisioning, no upfront cost

Ubiquitous Access 

Access anywhere, on any device

Multitenancy 

Shared but secure infrastructure

Elasticity 

Auto scale up/down with demand

Measured Usage 

Pay-as-you-go, transparent billing

Resiliency 

Redundancy, recovery, high availability


Cloud
Service Models

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*"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**. This cloud model is composed of **five essential characteristics**, **three service models**, and **four deployment models**"*

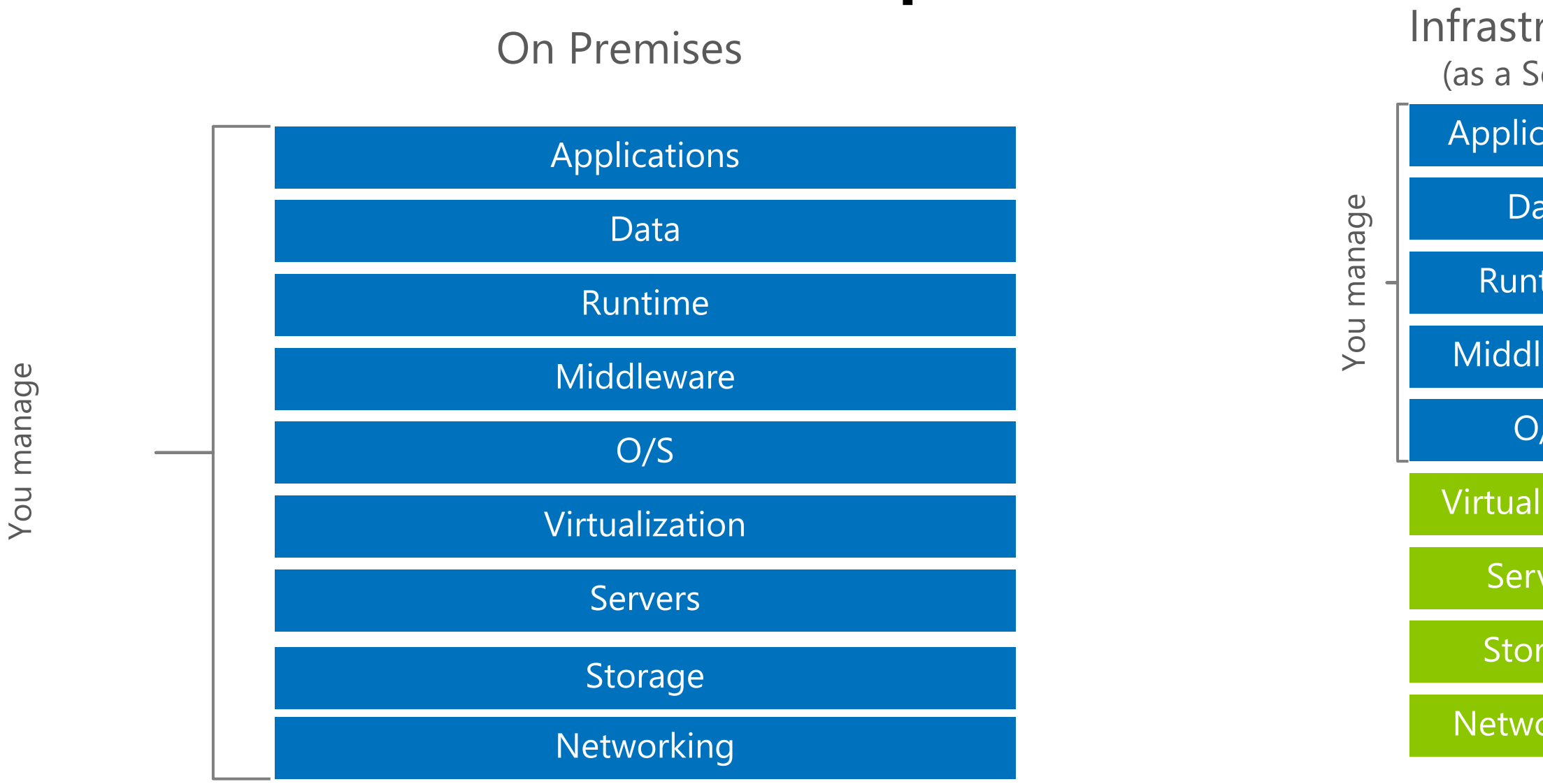
Cloud Delivery Models

- **A *specific, pre-packaged combination of IT resources* offered by a cloud provider**

- **Three** common cloud service models:
  - Infrastructure-as-a-Service (IaaS)
  - Platform-as-a-Service (PaaS)
  - Software-as-a-Service (SaaS)

- **As-a-Service…**
  - Storage-as-a-Service
  - Database-as-a-Service
  - Function-as-a-Service (e.g., AWS lambda)
  - Security-as-a-Service
  - Banking-as-a-Service
  - AI-as-a-Service
  - …

Cloud Models – A comparison



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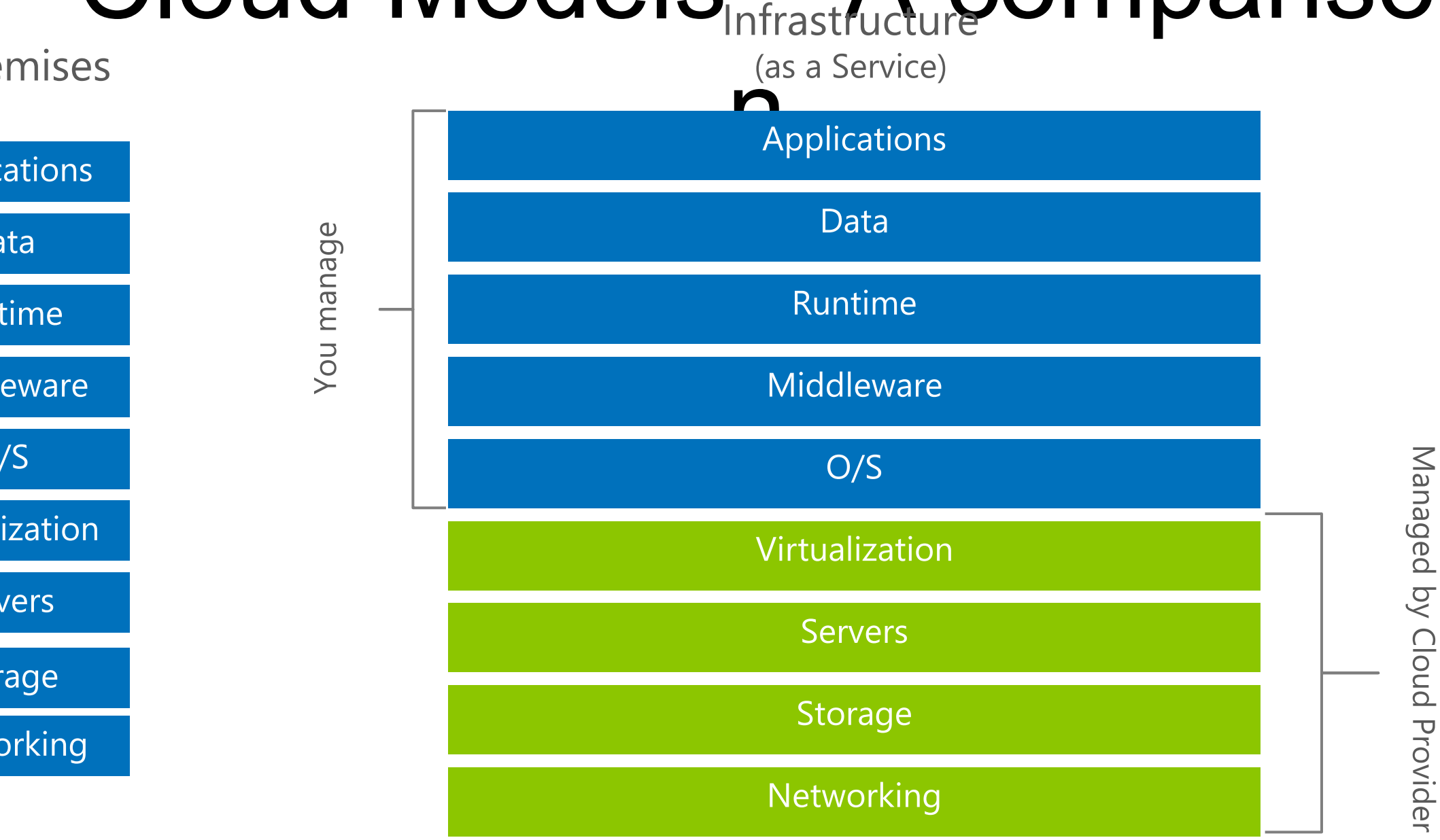

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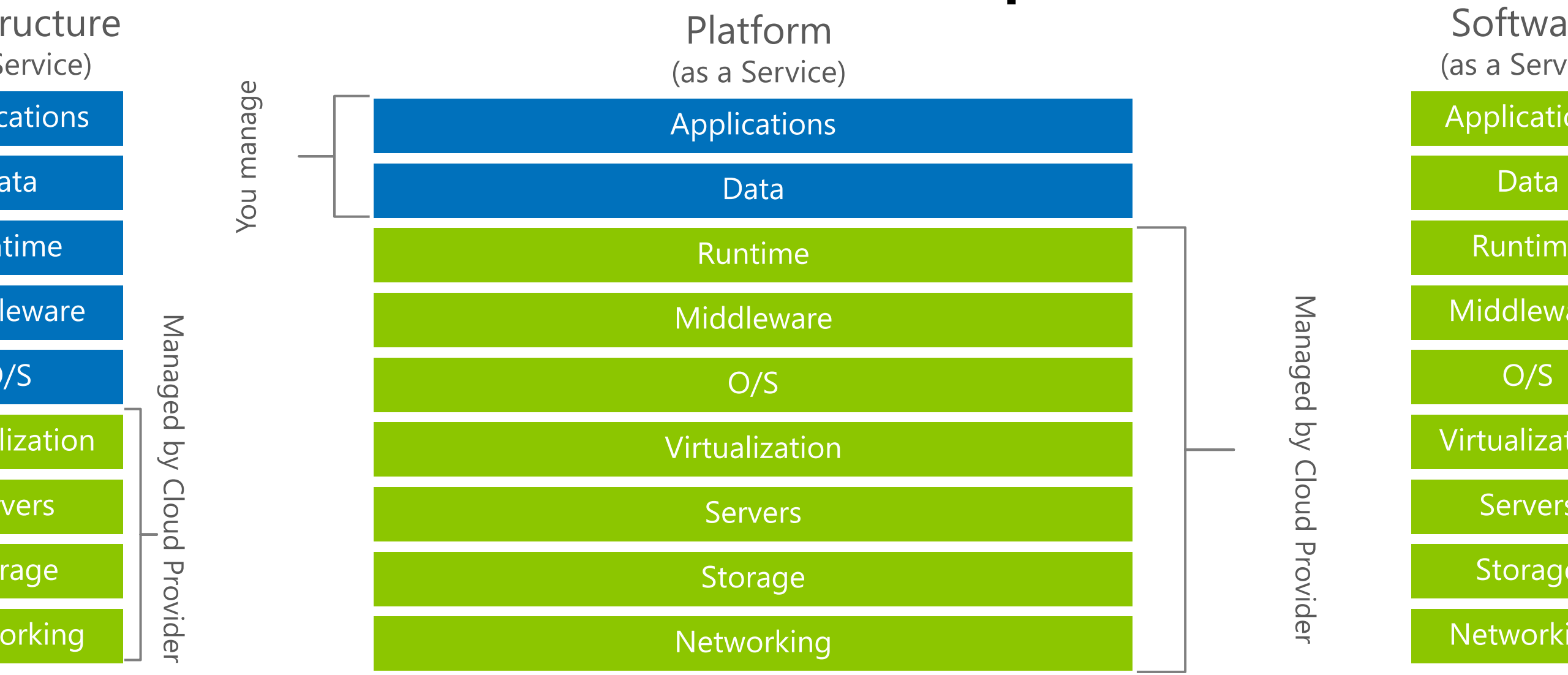

Cloud Models – A compariso n

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Managed by Cloud Provider

Software
(as a Service)

Applications
Data
Runtime
Middleware
O/S
Virtualization
Servers
Storage
Networking

Managed by Cloud Provider

Cloud Models – A compariso n