

# Survey of Cloud Computing and Azure Foundation

## Cloud Computing Overview

# What is Cloud Computing?

*"The practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer."*

Oxford Dictionary

What do you think Cloud Computing  
is?



Cloud Computing

# Cloud Computing Perspectives

Perspectives highly influenced by roles and responsibilities within an organization

- End-User
- Application Developer
- IT Infrastructure Manager
- CIO
- CFO
- Service Provider

# What is Cloud Computing? – Take 2

Further perspectives include:

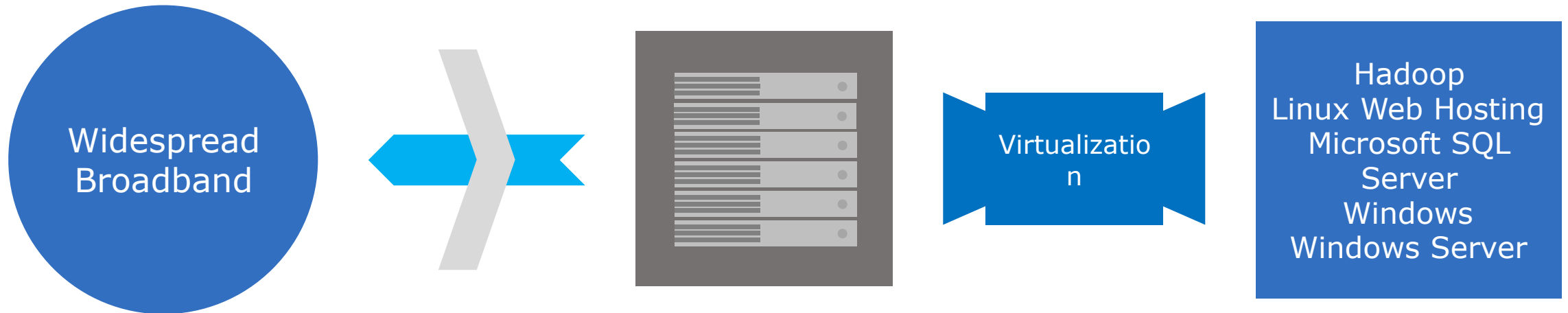
- “An approach to computing that’s about Internet scale and connecting to a variety of devices and endpoints.”
- “Treating hardware and software resources as a utility.”
- “A way to save a ton of money by only paying for what you need.”
- “A way to scale huge when you need something done fast.”

# Evolution of Cloud Computing

Order of Evolution	Stage	Characteristics
	Grid Computing	Solving large problems with parallel computing Made mainstream by Global Alliance
	Utility Computing	Computing resources offered as a metered service Late 1990s
	Software as a Service	Subscription-based software accessed over the Internet Gained momentum after 2001
	Cloud Computing	Next-generation datacenters with virtualization technology Full stack of service - IaaS, PaaS, & SaaS

# Key Enabling Technologies

- Ubiquitous fast wide-area networks
- Powerful and inexpensive servers
- High-performance virtualization technology



# Five Key Cloud Characteristics

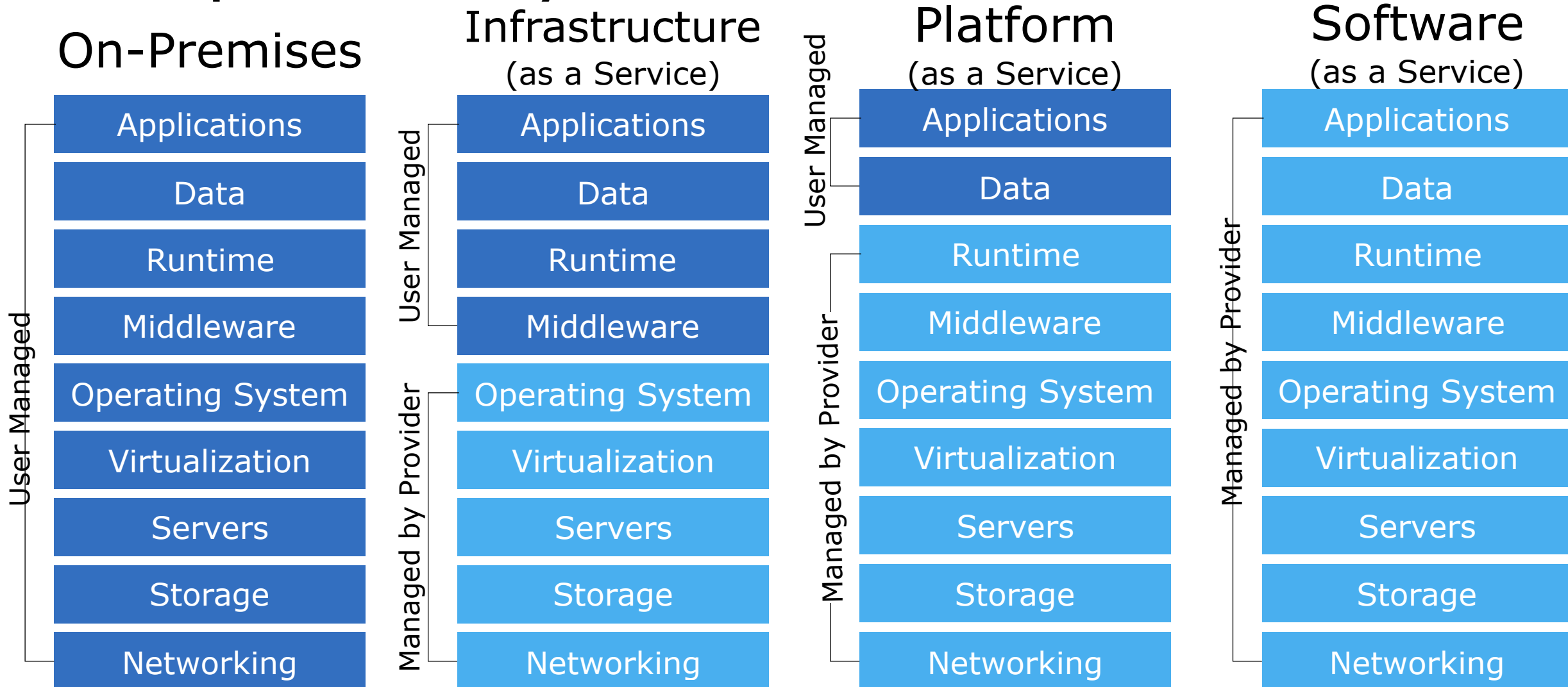
- On-demand self-service
- Ubiquitous network access
- Location-independent resource pooling
- Rapid elasticity
- Pay for what you use



# Cloud Computing Service Models

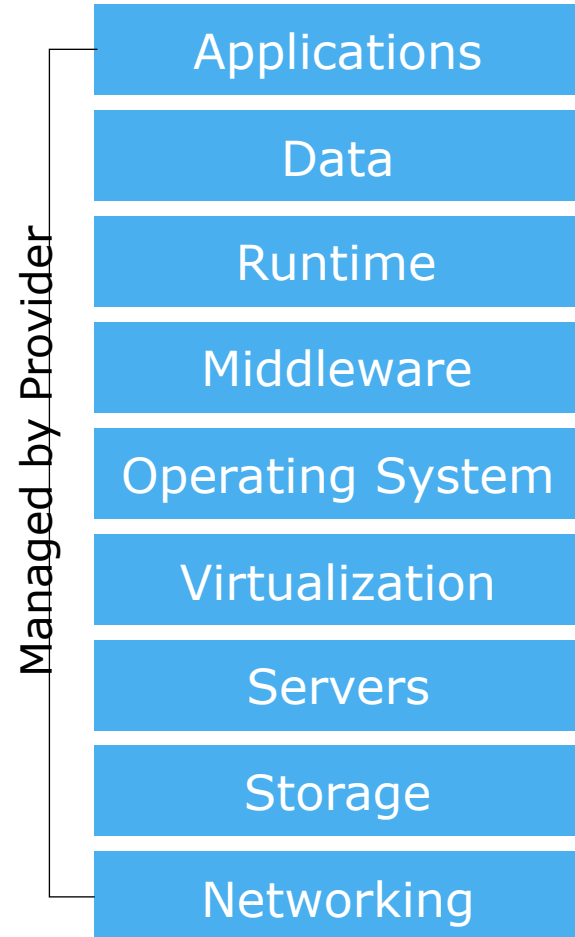
Model	Description
Software as a Service (SaaS)	Consume it End-User Applications delivered as a service, rather than by on-premises software
Platform as a Service (PaaS)	Build on it Application platform or middleware provided as a service on which developers can build and deploy custom applications
Infrastructure as a Service (IaaS)	Migrate to it Computing, storage, or other IT infrastructure provided as a service, rather than as a dedicated capability

# Service Model Division of Responsibility



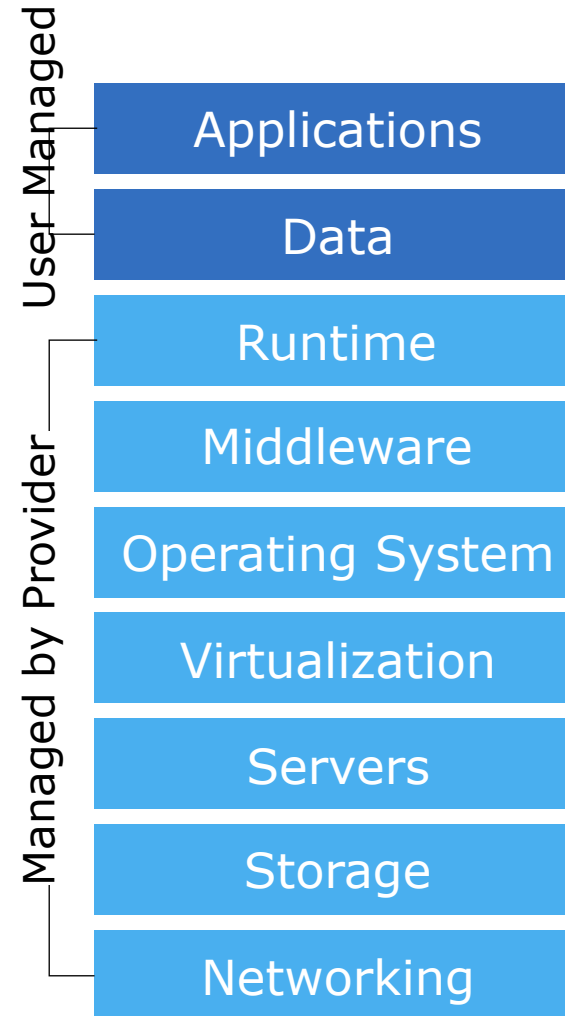
# Software as a Service (SaaS)

- Internet hosted software
- Full vendor maintenance
- No upfront cost
- Pay for services as they are consumed



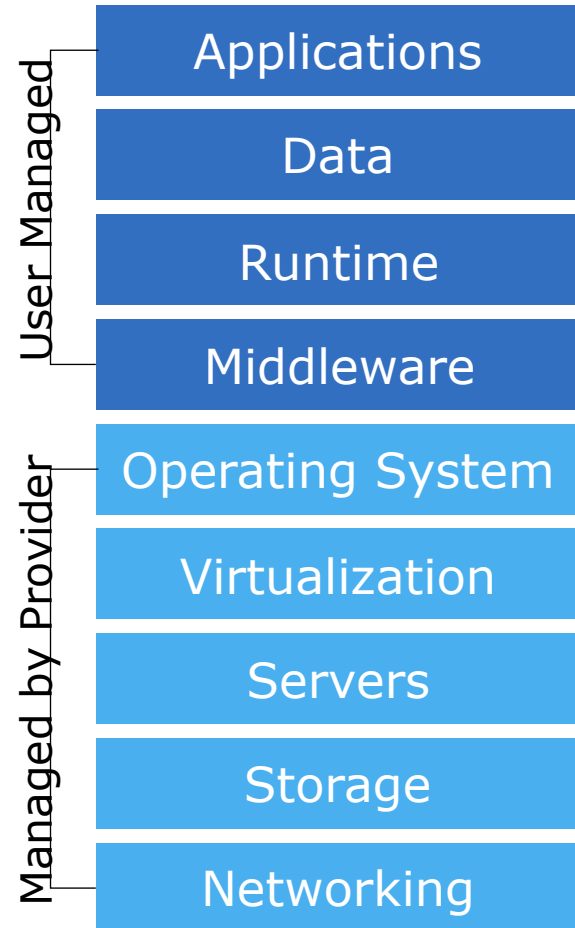
# Platform as a Service (PaaS)

- Delivers and manages various development environments
- Environment and tools can be easily provisioned and torn down

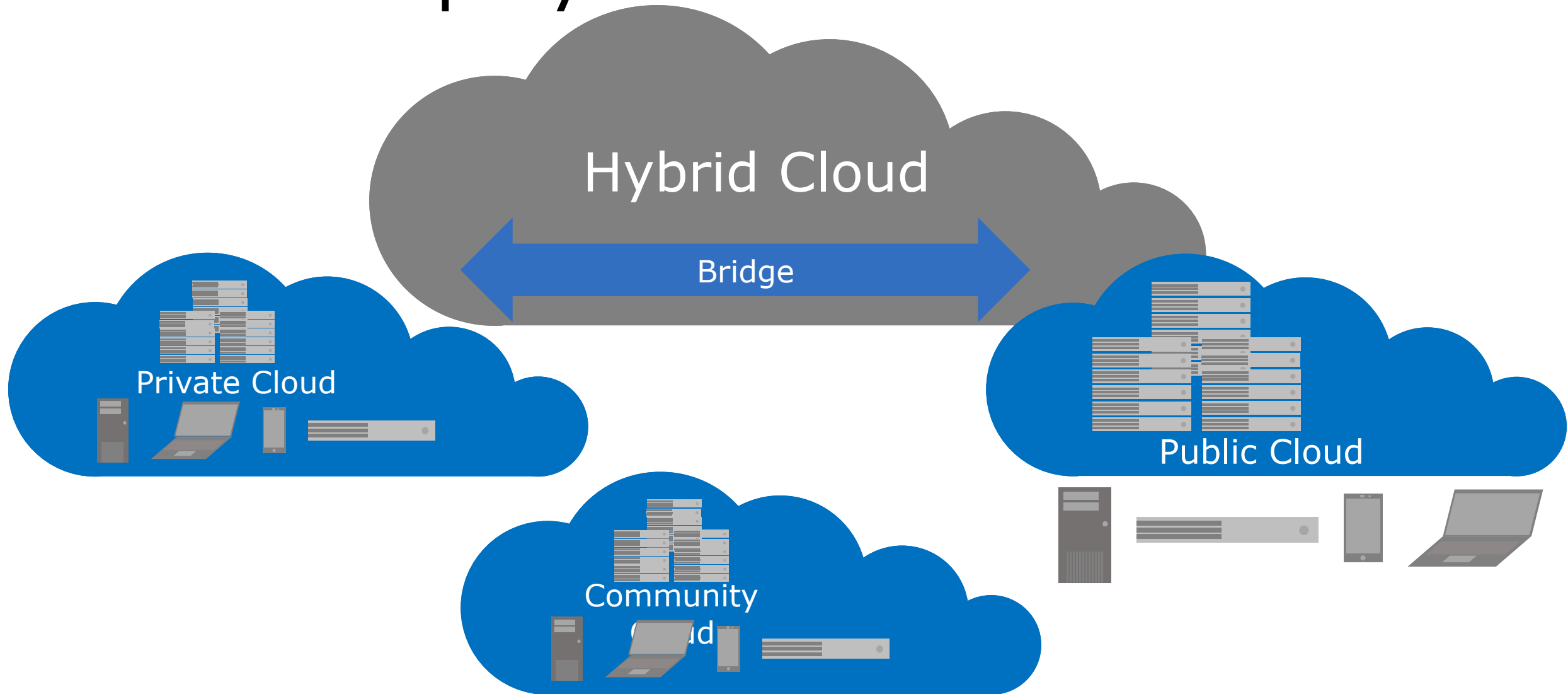


# Infrastructure as a Service (IaaS)

- Dedicated virtual machines (VMs)
- Users configure server type, operating system, storage, network, etc.
- Scale up and down



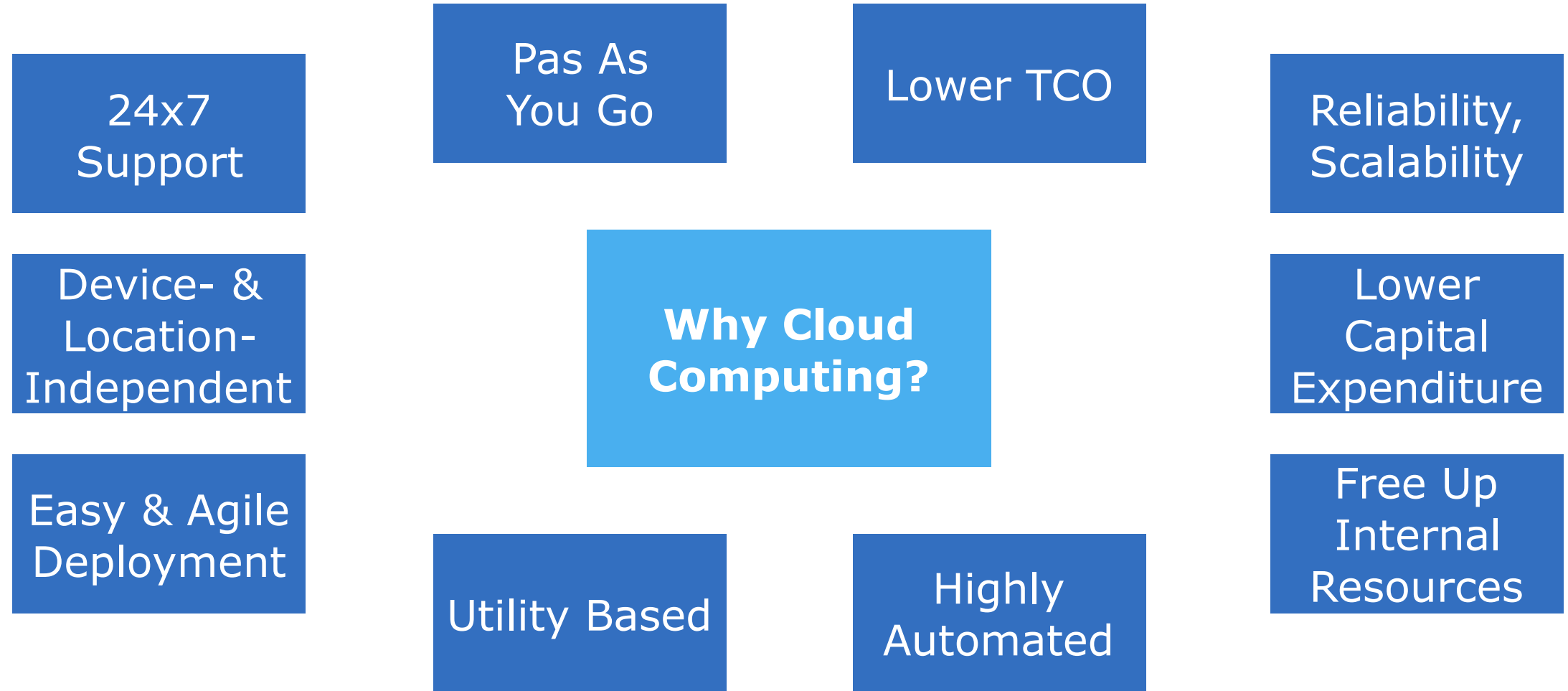
# Cloud Deployment Model



# Cloud Deployment Models – Advantages & Characteristics

Model	Advantages and Characteristics
Public	Shifts capital expense to operating expense Offers pay-as-you-go pricing Supports multiple tenants
Private	Leverages existing capital expense Can help reduce operating costs Intended for a single tenant
Hybrid	Bridges one or more community, private, or public clouds Allows manipulation of CapEx and OpEx to optimize cost Supports resource portability
Community	Allows sharing of CapEx and OpEx to reduce costs Brings together groups with a common interest Supports resource portability

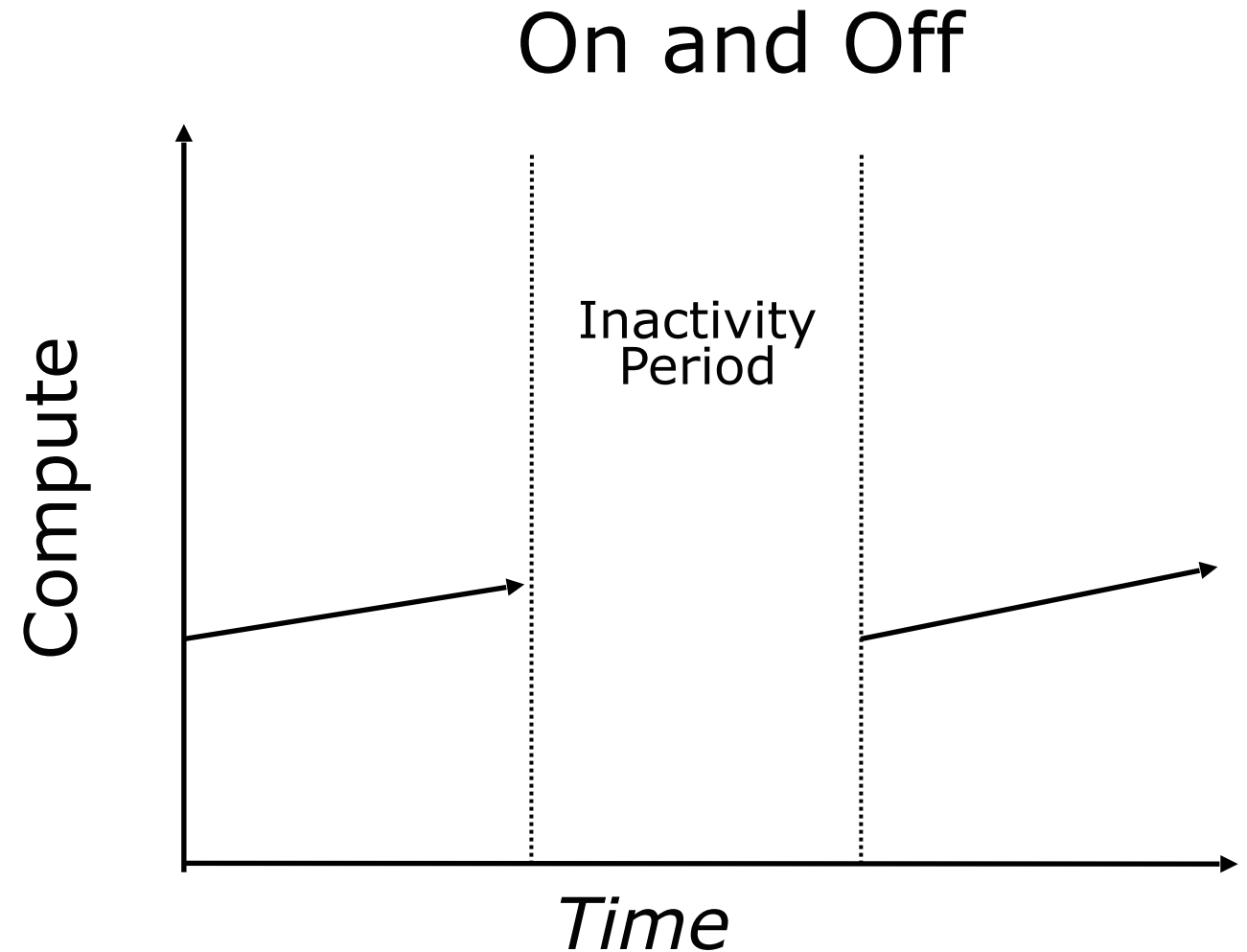
# Why Cloud Computing?





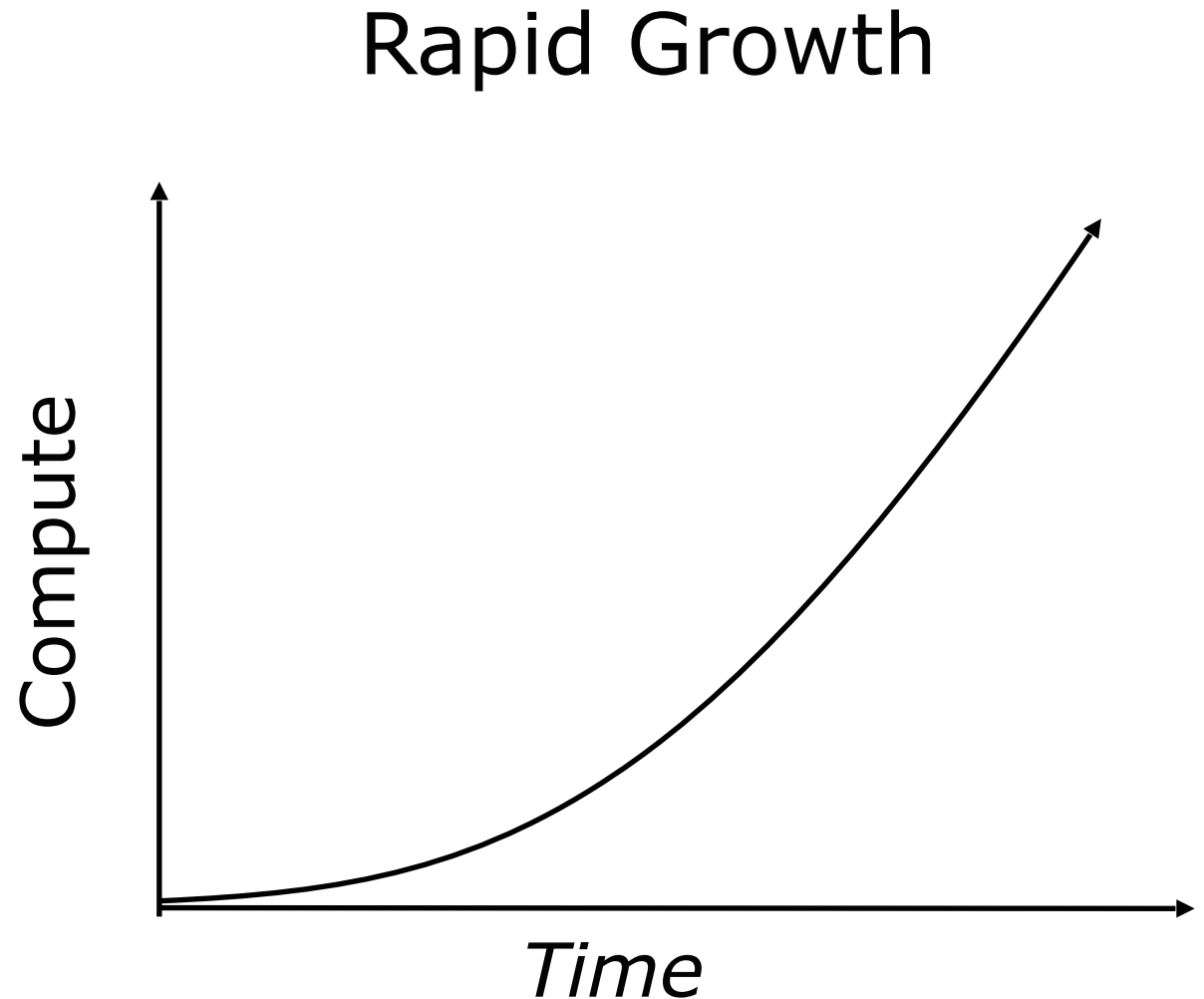
# Typical Computing Pattern

- On & off workloads
  - Batch jobs
- Wasted Capacity
- Time to market can be cumbersome



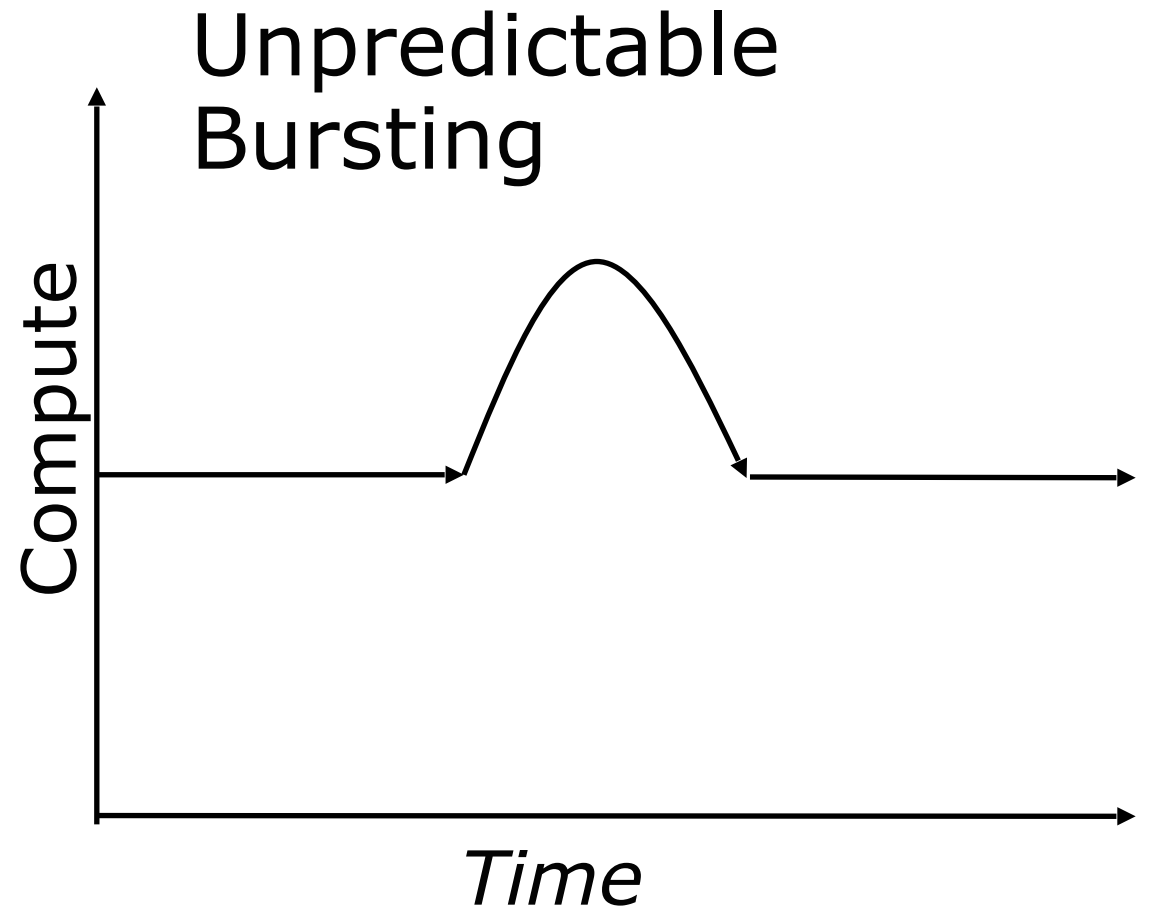
# Typical Computing Pattern

- Rapidly growing company
- Major challenge for IT dept. to keep up with growth
- Potential loss of business opportunity
- Potential customer service problems



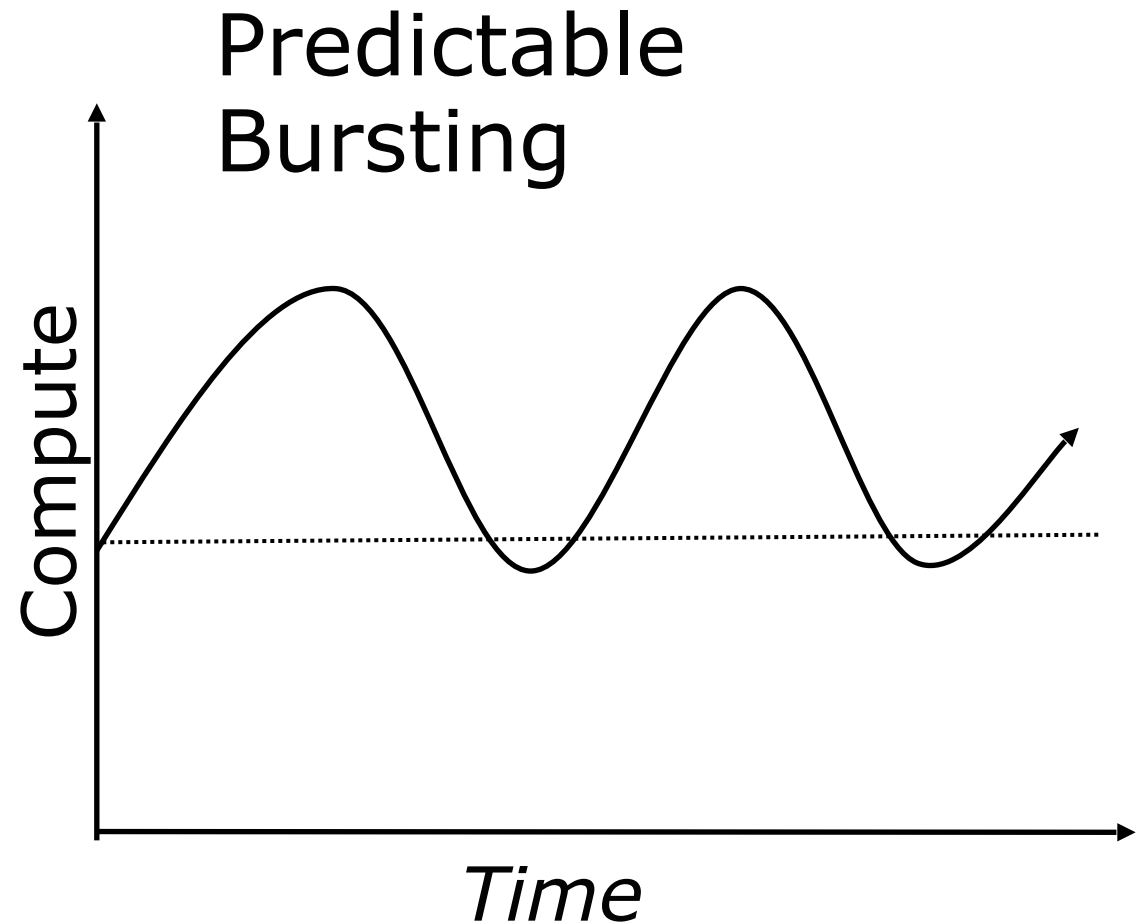
# Typical Computing Pattern

- Unexpected peak in demand
- Loss of business opportunity
- Wasted capacity if demand wanes



# Typical Computing Pattern

- Seasonal peaks and troughs
- Provisioning dilemma
  - Wasted capacity or
  - Loss of business

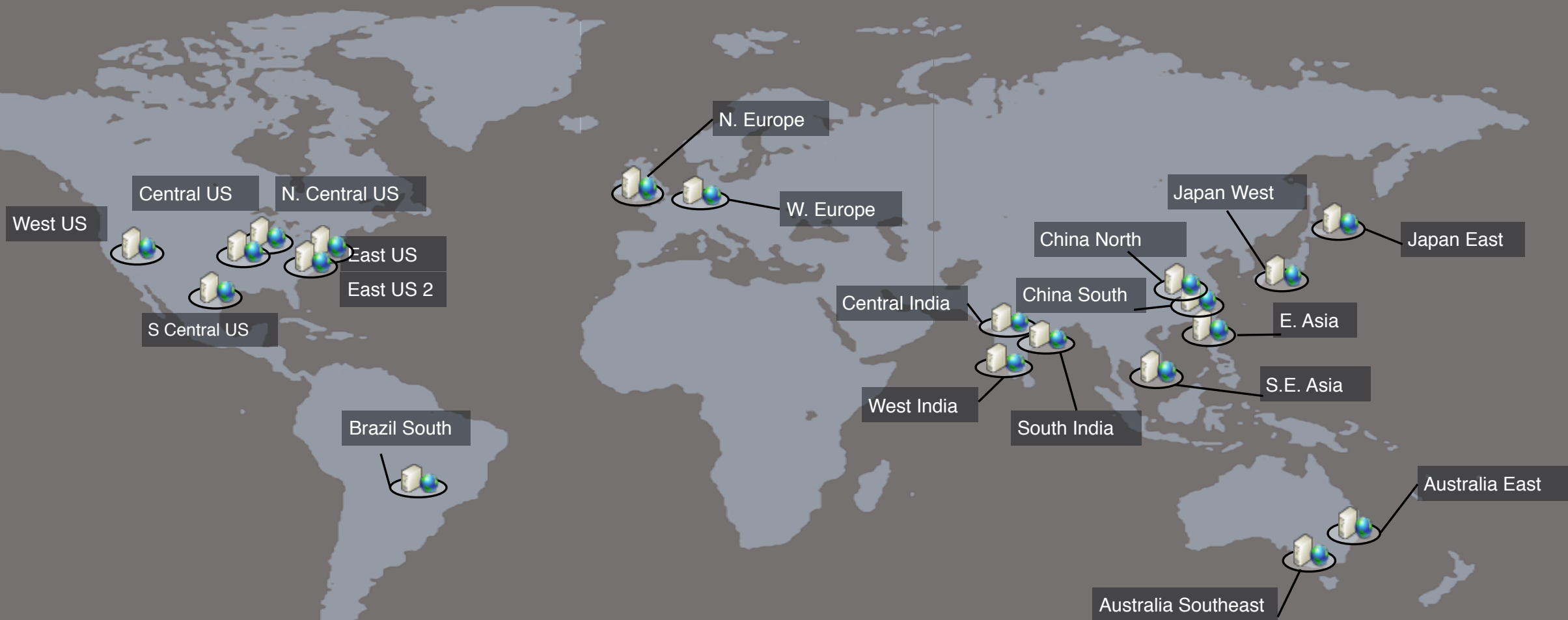


# Azure Datacenter Regions

## North America

## Europe

## Asia Pacific



# Amazon AWS Datacenter Regions

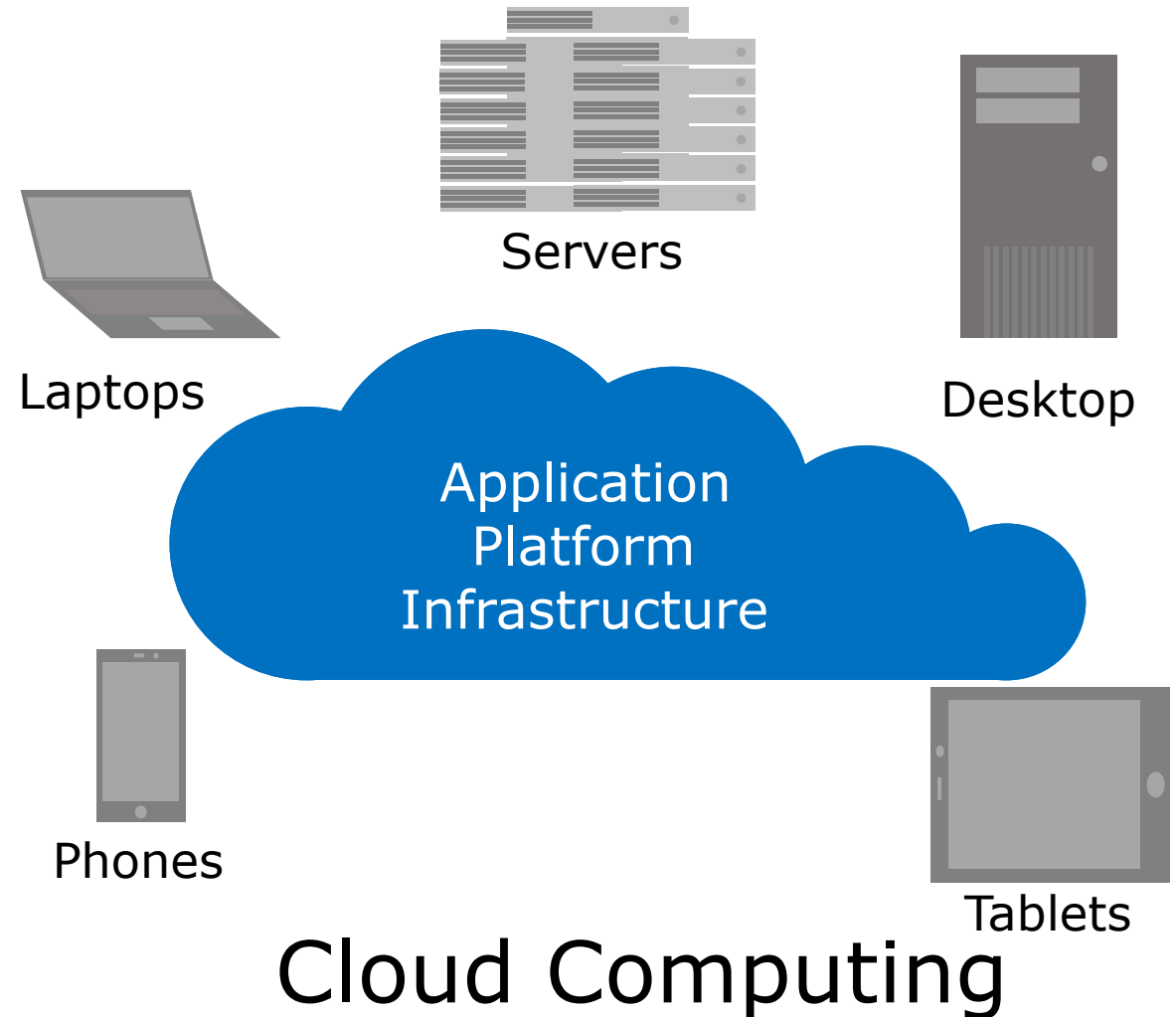


# Cloud Computing Examples

- A large enterprise quickly & economically deploys new internal applications to its distributed workforce.
- An e-commerce website accommodates sudden demand for a “hot” product caused by a viral buzz.
- A pharmaceutical research firm executes large-scale simulations using computing power provided by cloud vendors.
- A media company serves unlimited video, music, and other media to their worldwide customer base.

# Cloud Computing Nutshell

- End-users connect over the Internet to the cloud from their own personal computers or portable devices in order to access services.
- To the end-user, the underlying infrastructure such as the hardware, operating system, etc., is invisible





# Cloud Vendor - Azure & AWS

Microsoft Azure and Amazon Web Services (AWS) offer broad and deep capabilities with global coverage

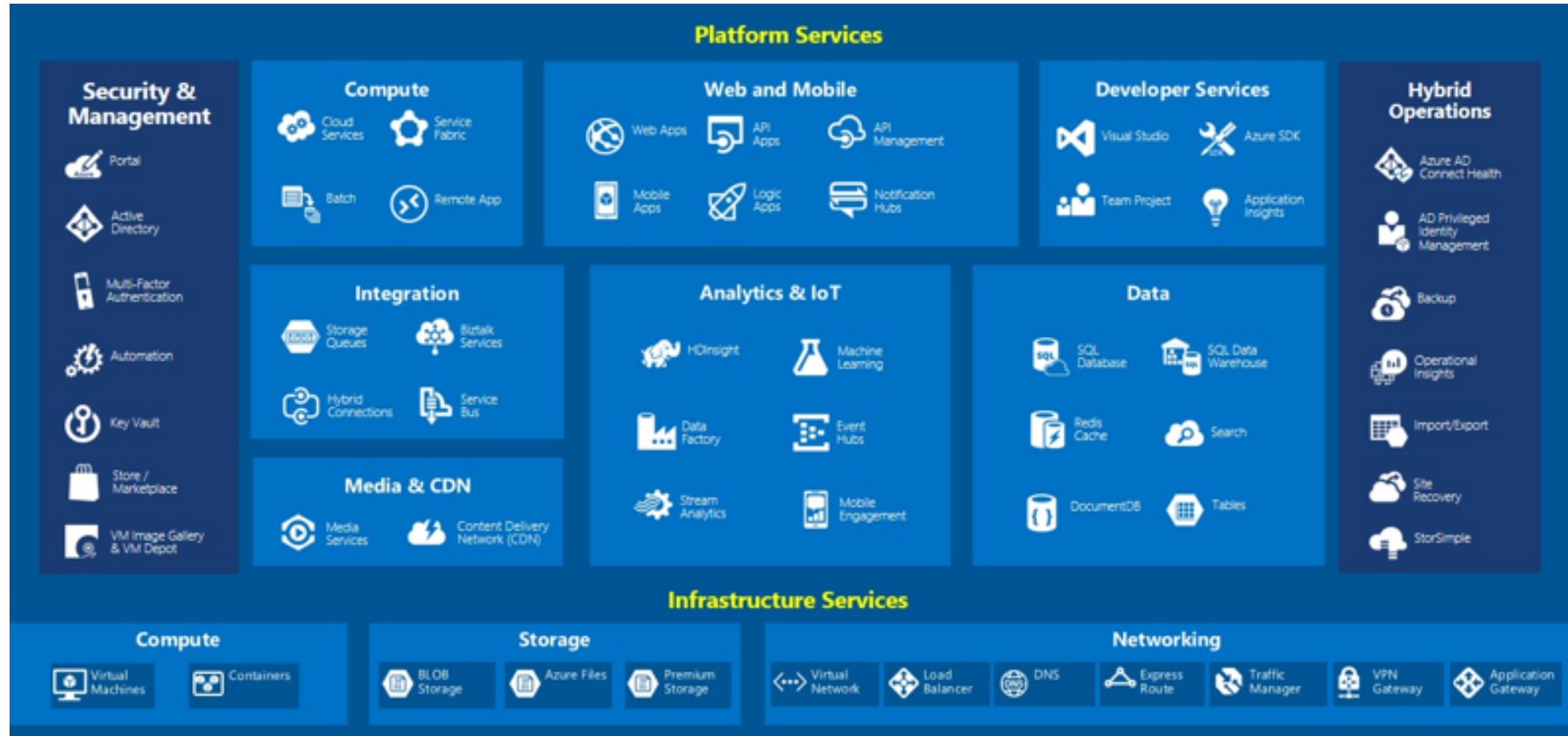
Category	Azure Service	AWS Service
<b>Computing infrastructure</b>	Virtual Machines	EC2
<b>Object storage infrastructure</b>	Blob Storage	S3
<b>Networking</b>	Virtual Network	Virtual Private Cloud
<b>Relational database-as-a-service</b>	SQL Database	RDS
<b>NoSQL document database</b>	DocumentDB	DynamoDB
<b>Big data processing</b>	HDInsight	Elastic MapReduce (EMR)
<b>Visualization</b>	Power BI	QuickSight

# Cloud Vendor - Bluemix & Google

IBM Bluemix and Google Cloud each offer and deploy applications on highly-scalable and reliable infrastructure

Category	Bluemix	Google Service
<b>Computing infrastructure</b>	Virtual Server, Containers	Compute Engine
<b>Object storage infrastructure</b>	Object, Block Storage	Cloud Storage
<b>Networking</b>	Virtual Private Network	Cloud Virtual Network
<b>Relational database-as-a-service</b>	SQL Database	Cloud SQL
<b>NoSQL document database</b>	MongoDB	Cloud Datastore, Bigtable
<b>Big data processing</b>	Analytics for Apache Hadoop	BigQuery, Cloud Dataproc
<b>Visualization</b>		

# Azure Services



# Azure Usage

- Azure Active Directory Users
  - More than 500 Million
- Storage transactions per day
  - More than 777 Trillion
- Messages processed by Azure IoT per month
  - More than 1.5 Trillion
- Active Websites
  - More than 250,000
- Percentage of Fortune 500 Companies using Azure
  - More than 80%
- Authentications per week
  - More than 13 Billion
- SQL Databases in Azure
  - More than 1.5 Million
- Developers registered with Visual Studio Online
  - More than 1 million

# Vendor Lock-In

Companies that adopt cloud computing must be wary of potential vendor lock-in issues

- Company's entire data is stored with a single vendor's cloud storage
- Company relies on a single vendor for all of its computations
- Changing vendors can be very costly

# Summary

In this lesson, you have learned:

- Cloud Computing
  - Ubiquitous via network access
  - Location-independent shared pool of computing resources
  - On-demand rapid provisioning and tear down
  - Pay only for current client requirements
- Service Models
  - IaaS, PaaS, SaaS
- Deployment Models
  - Public, Private, Community, and Hybrid