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."

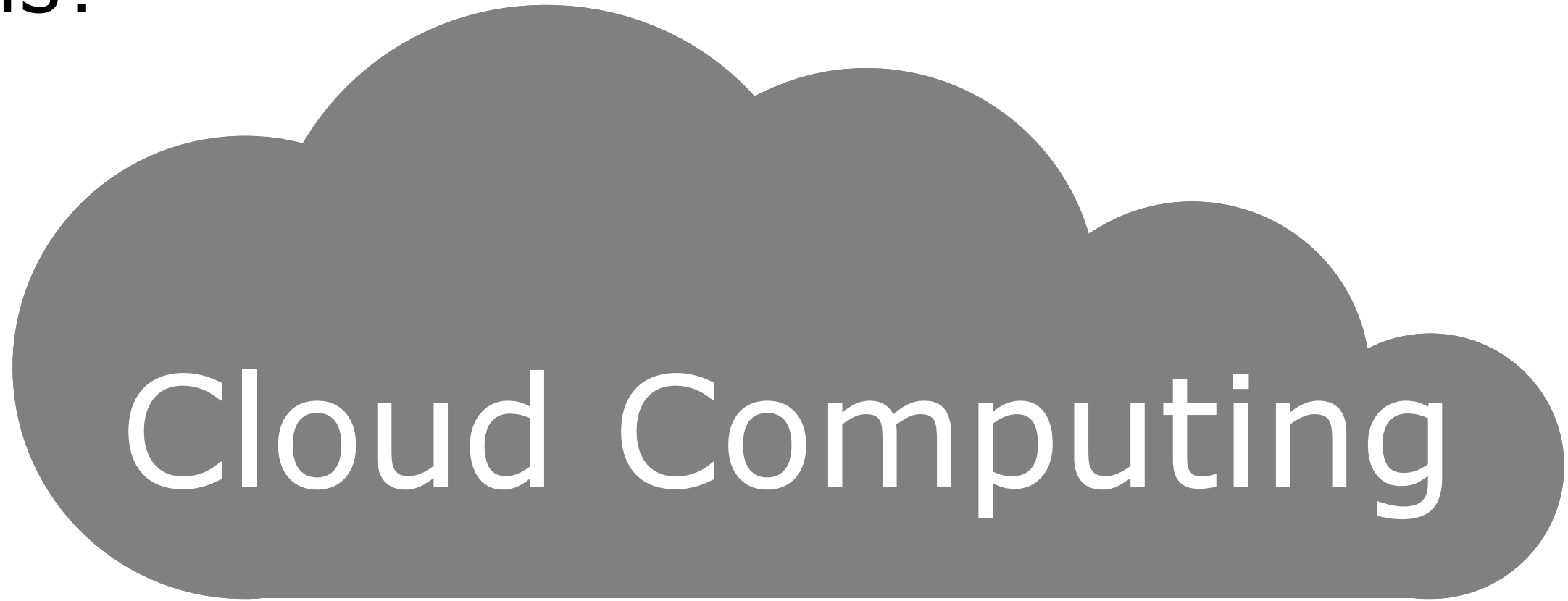
Oxford Dictionary

What is Cloud Computing?

"The practice of storing regularly used computer data on multiple servers that can be accessed through the Internet."

Webster Dictionary

What do you think Cloud Computing is?



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.”

Cloud Computing NIST Definition

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.

National Institute of Standards and Technology

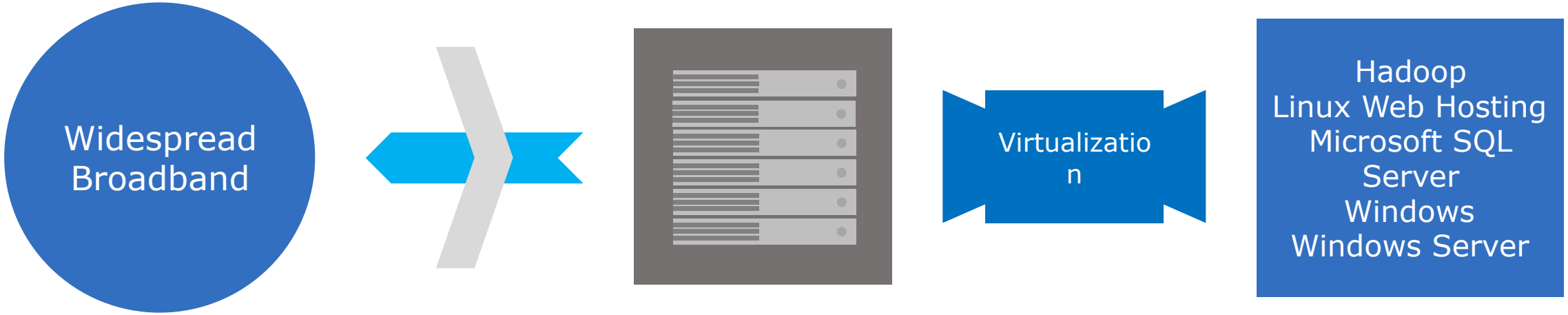
Evolution of Cloud Computing

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 - IasS, PaaS, & SaaS

Key Enabling Technologies

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



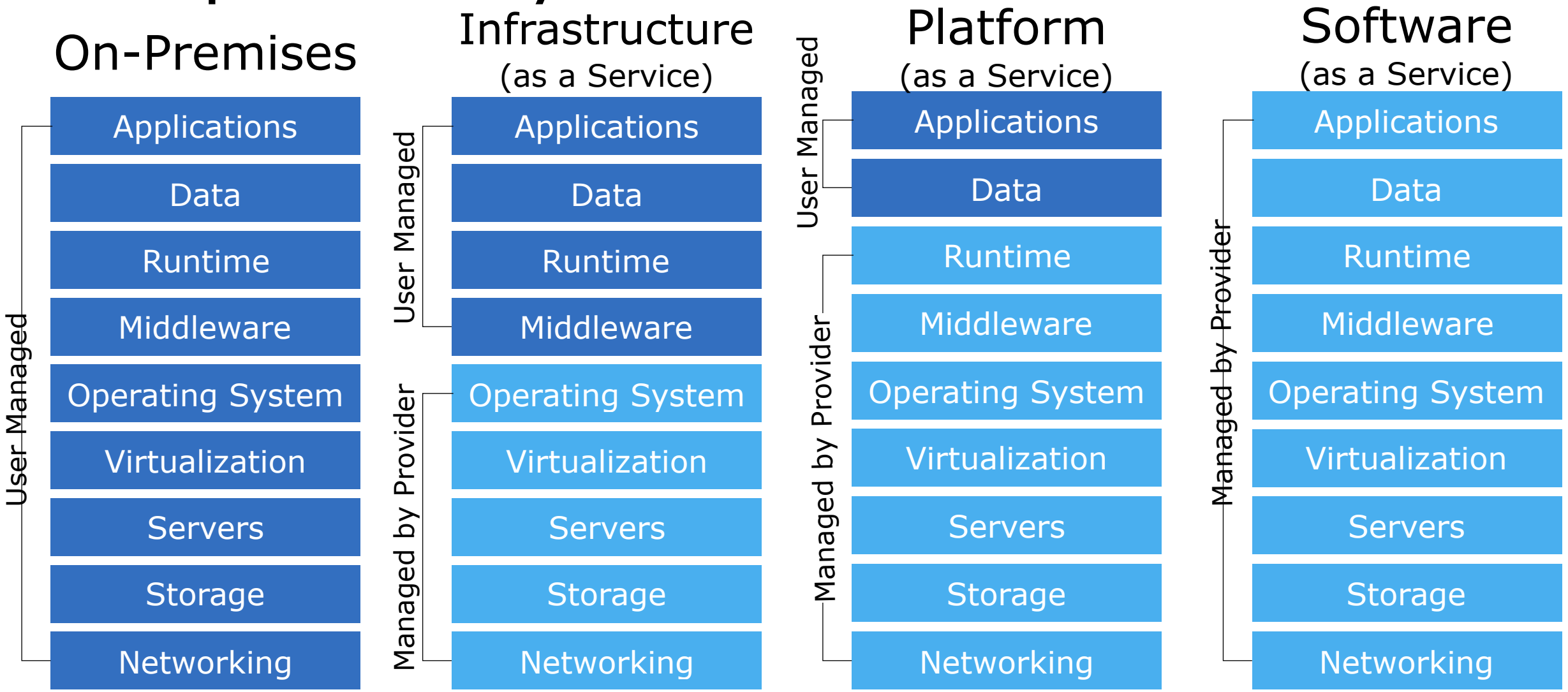
Five Key Cloud Characteristics

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

Cloud Computing Service Models

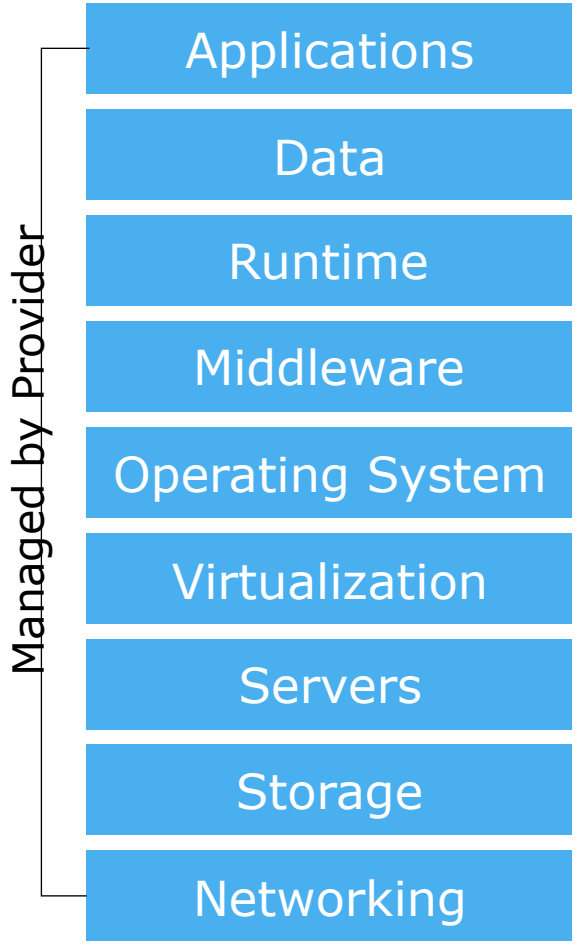
Model	Description
Software as a Service (SaaS)	Consume it End-User Applications delivered as a service, rather than by on-premises software
Platform as a Service (PaaS)	Build on it Application platform or middleware provided as a service on which developers can build and deploy custom applications
Infrastructure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



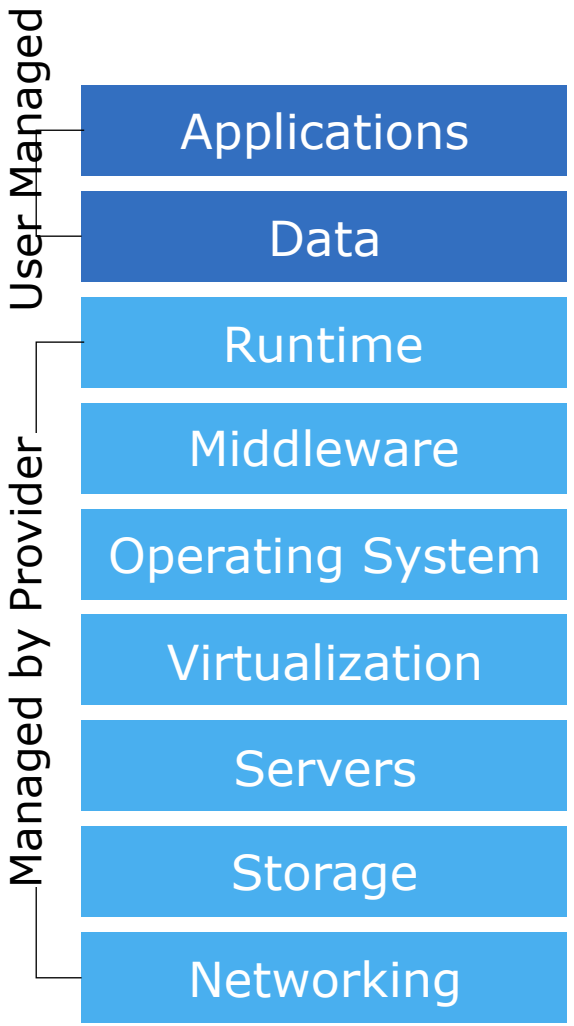
Software as a Service (SaaS)

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



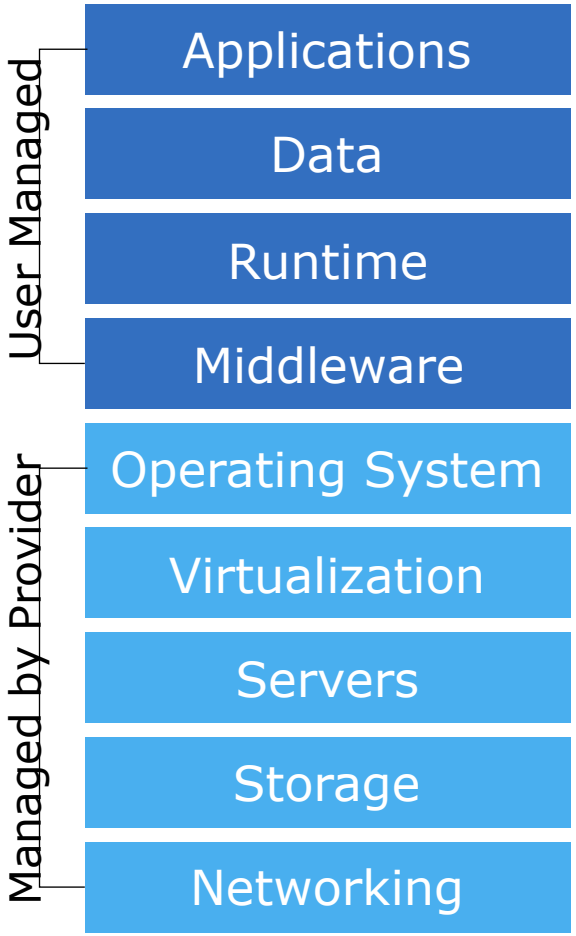
Platform as a Service (PaaS)

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

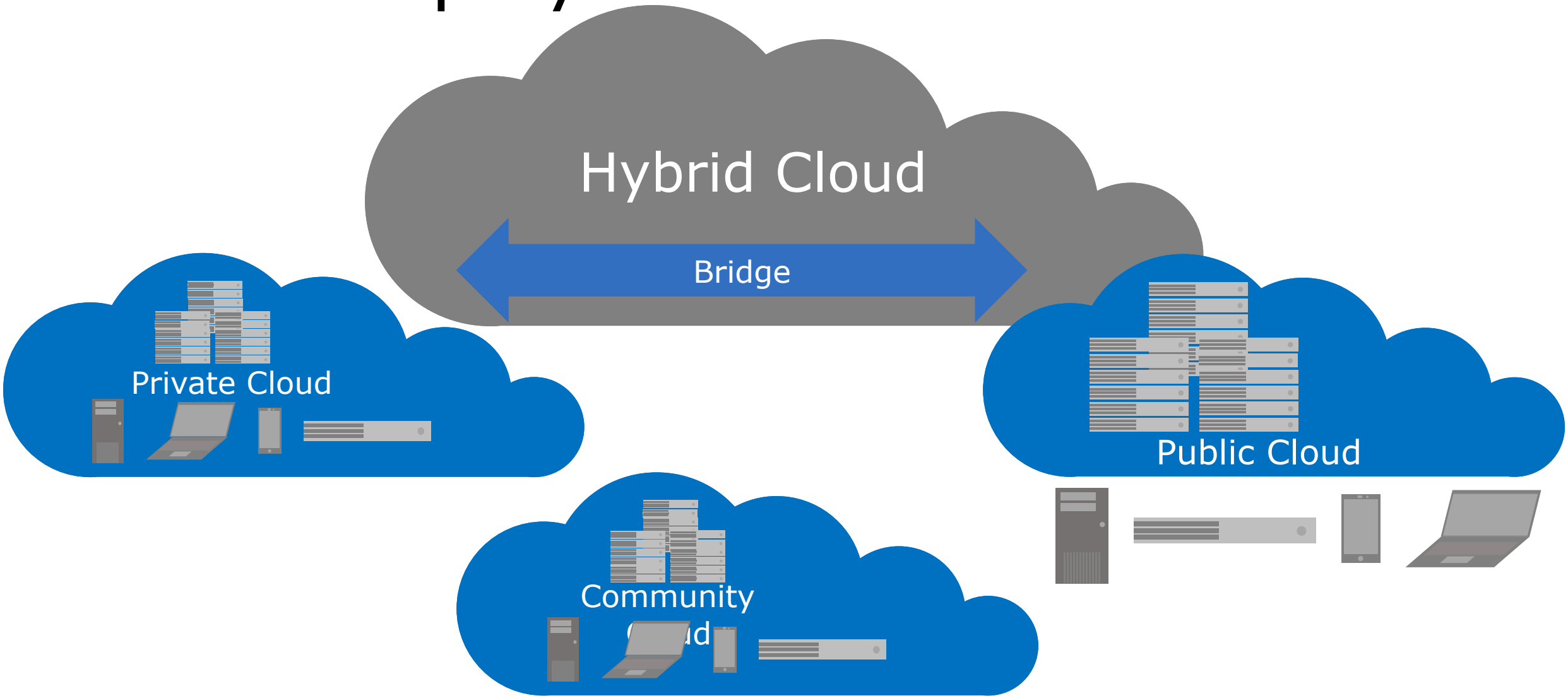


Infrastructure as a Service (IaaS)

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



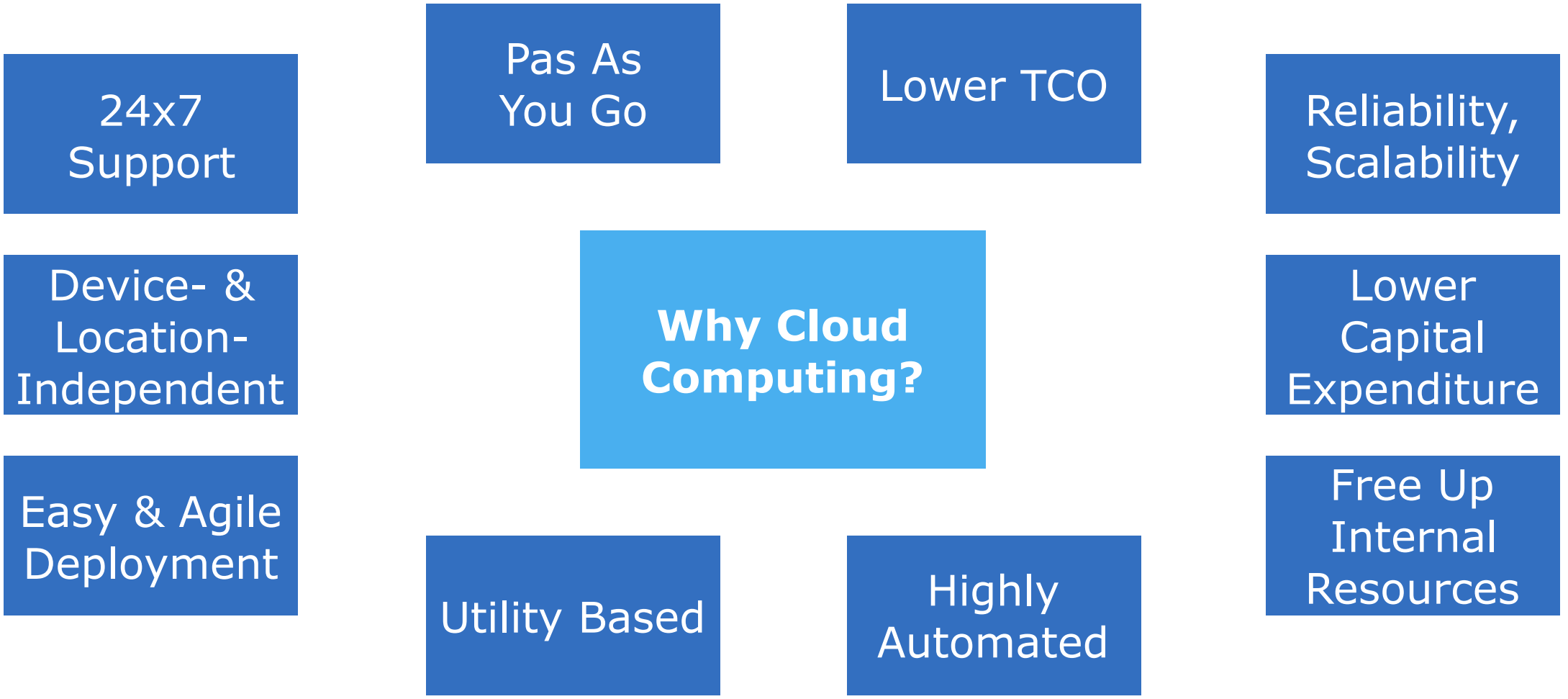
Cloud Deployment Model



Cloud Deployment Models – Advantages & Characteristics

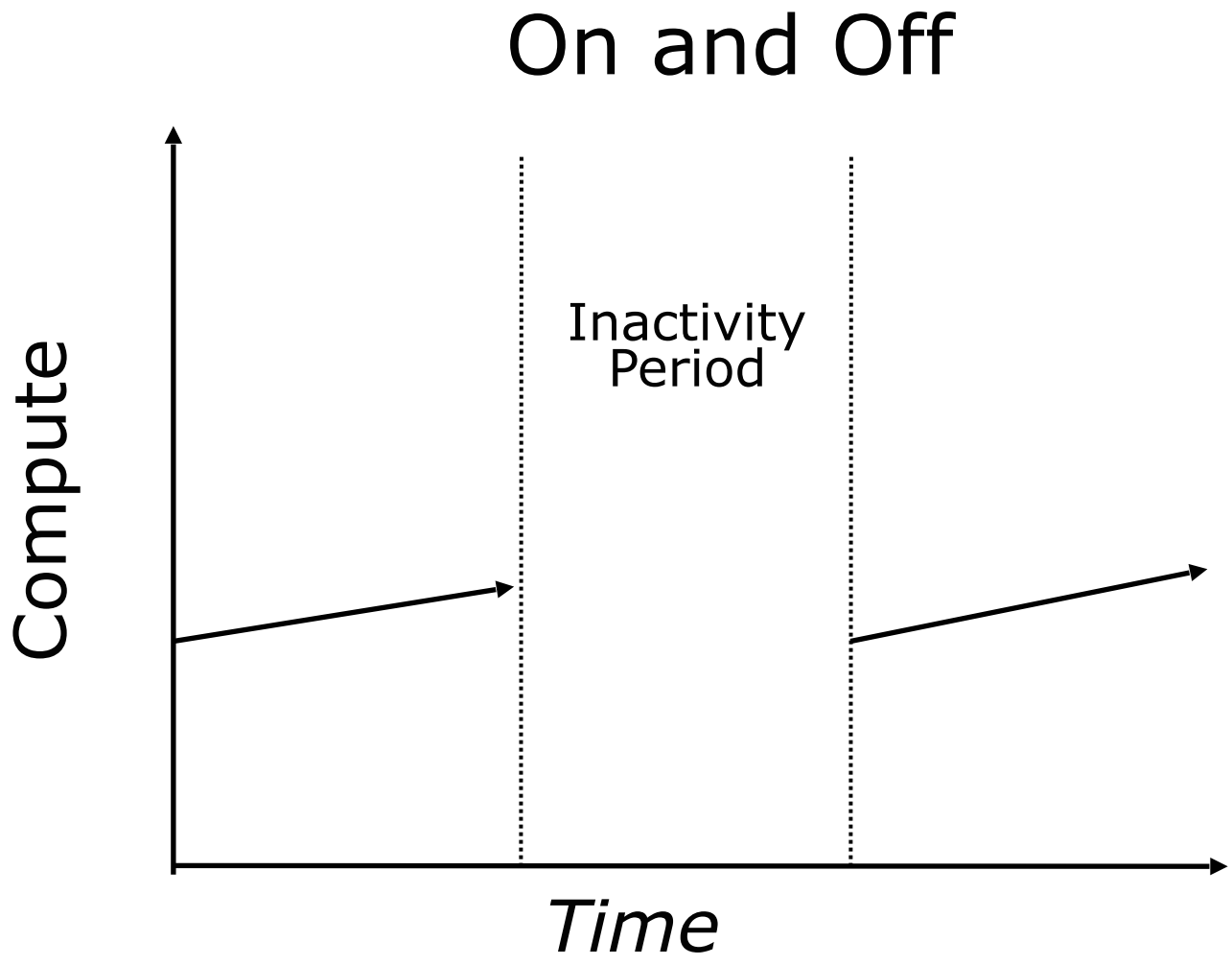
Model	Advantages and Characteristics
Public	Shifts capital expense to operating expense Offers pay-as-you-go pricing Supports multiple tenants
Private	Leverages existing capital expense Can help reduce operating costs Intended for a single tenant
Hybrid	Bridges one or more community, private, or public 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?



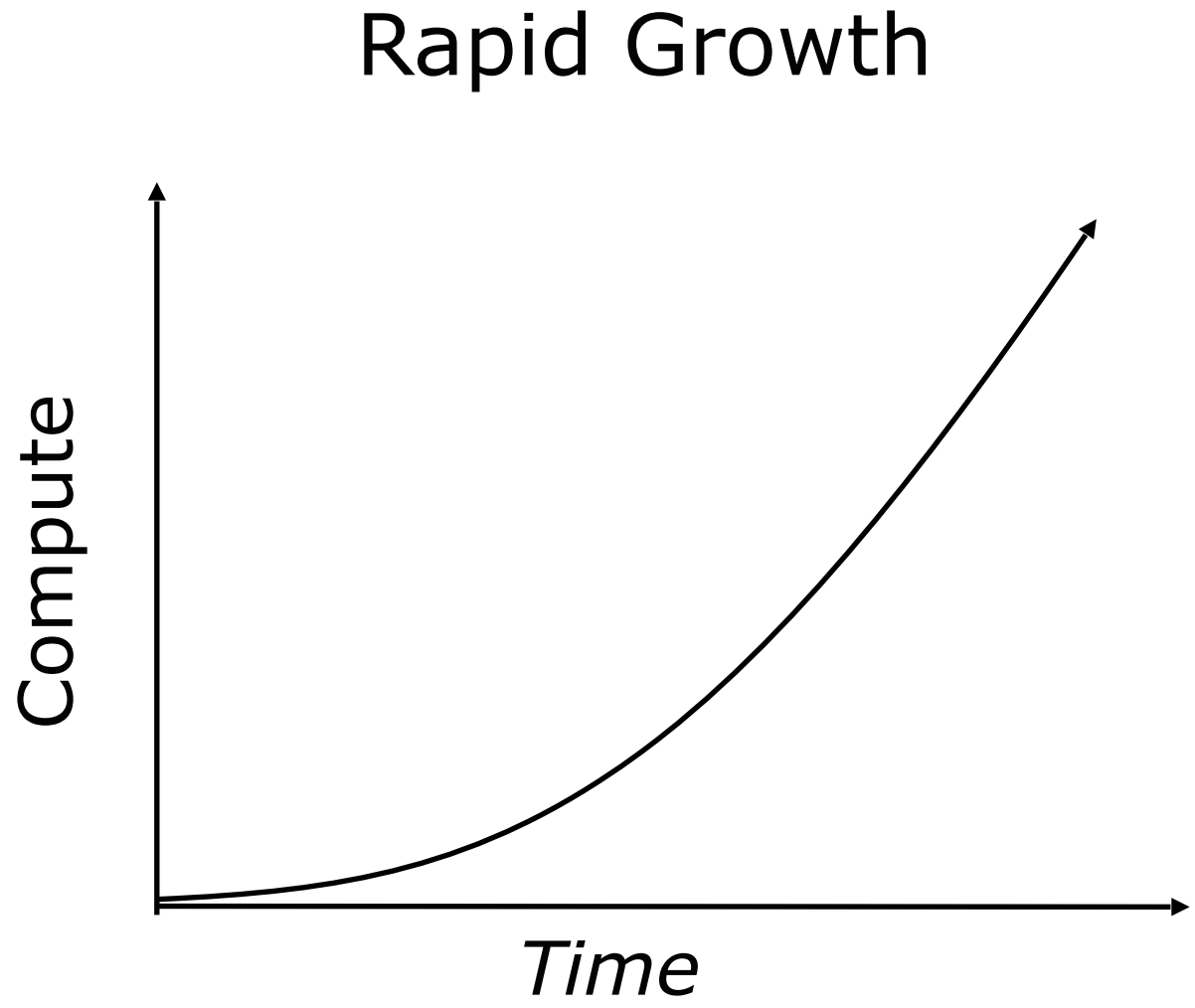
Typical Computing Pattern

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



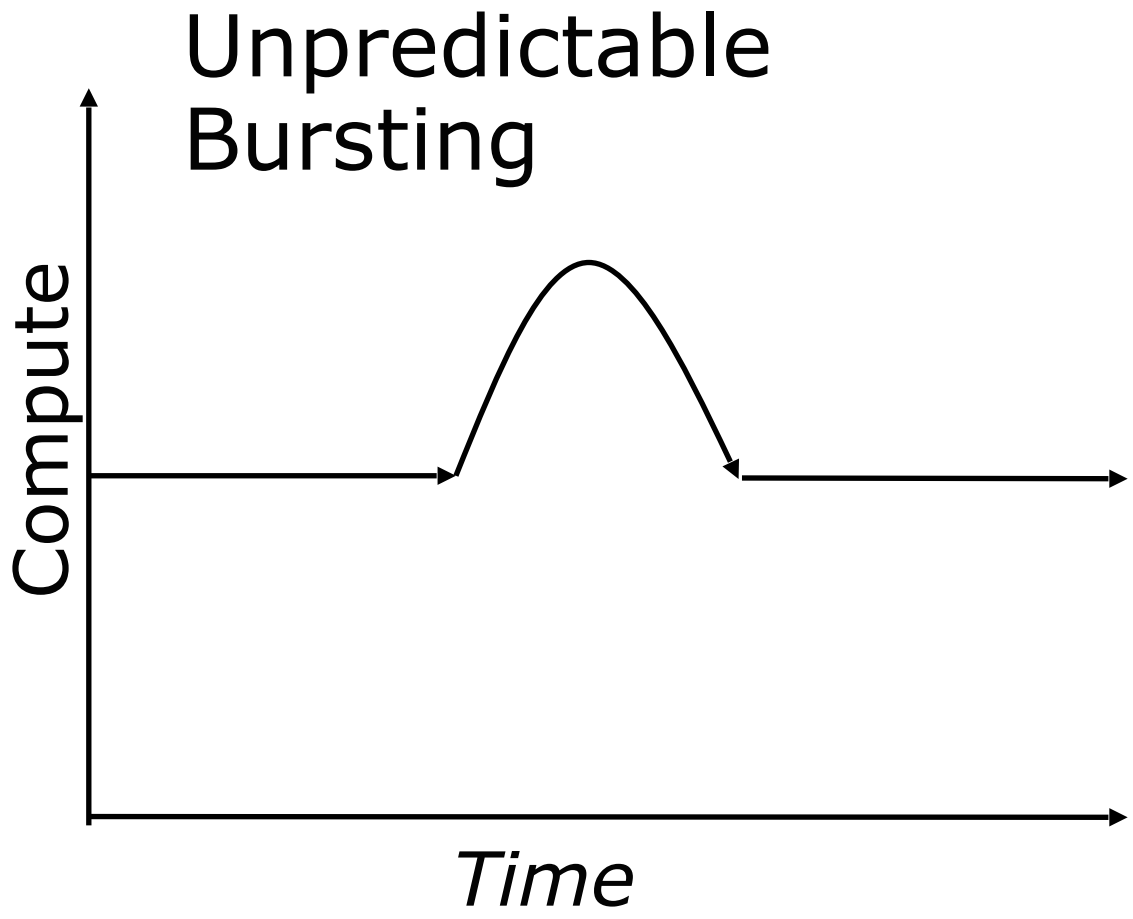
Typical Computing Pattern

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



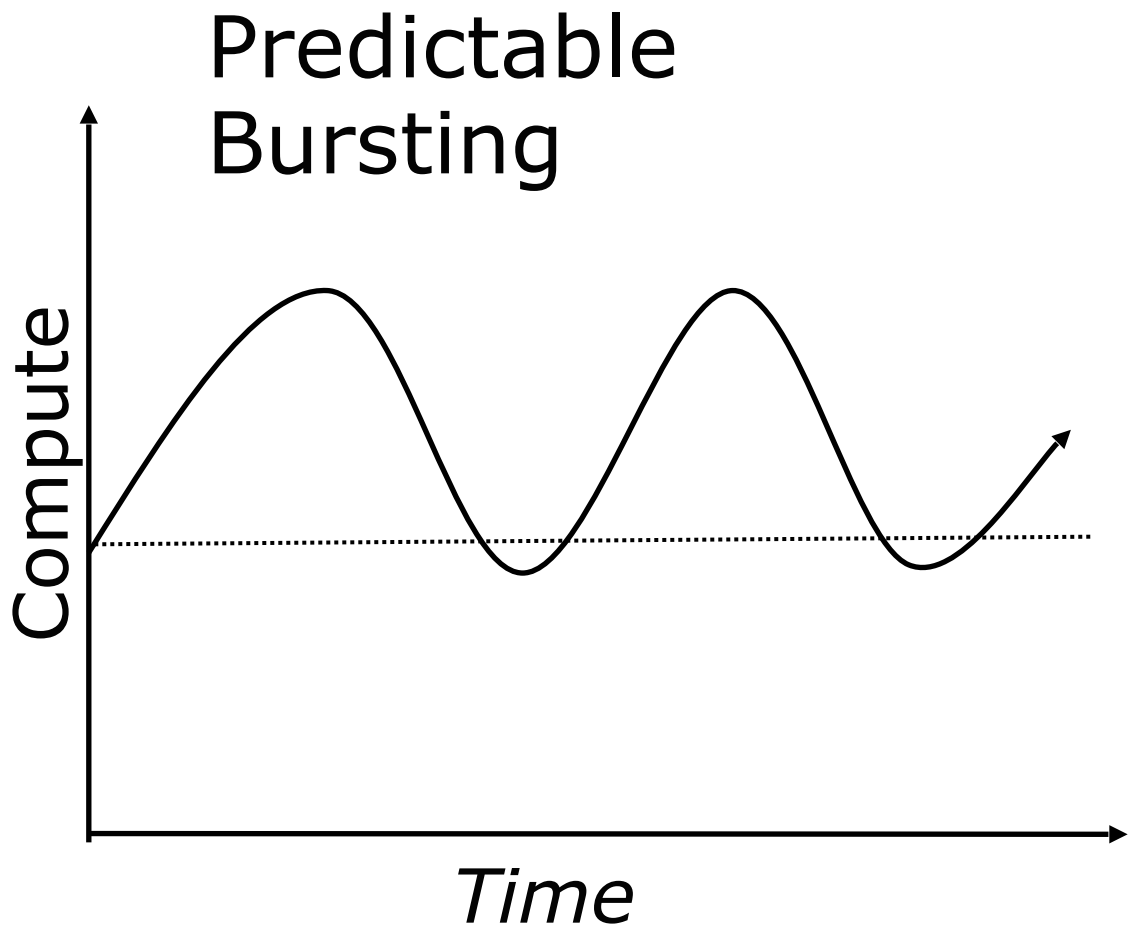
Typical Computing Pattern

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

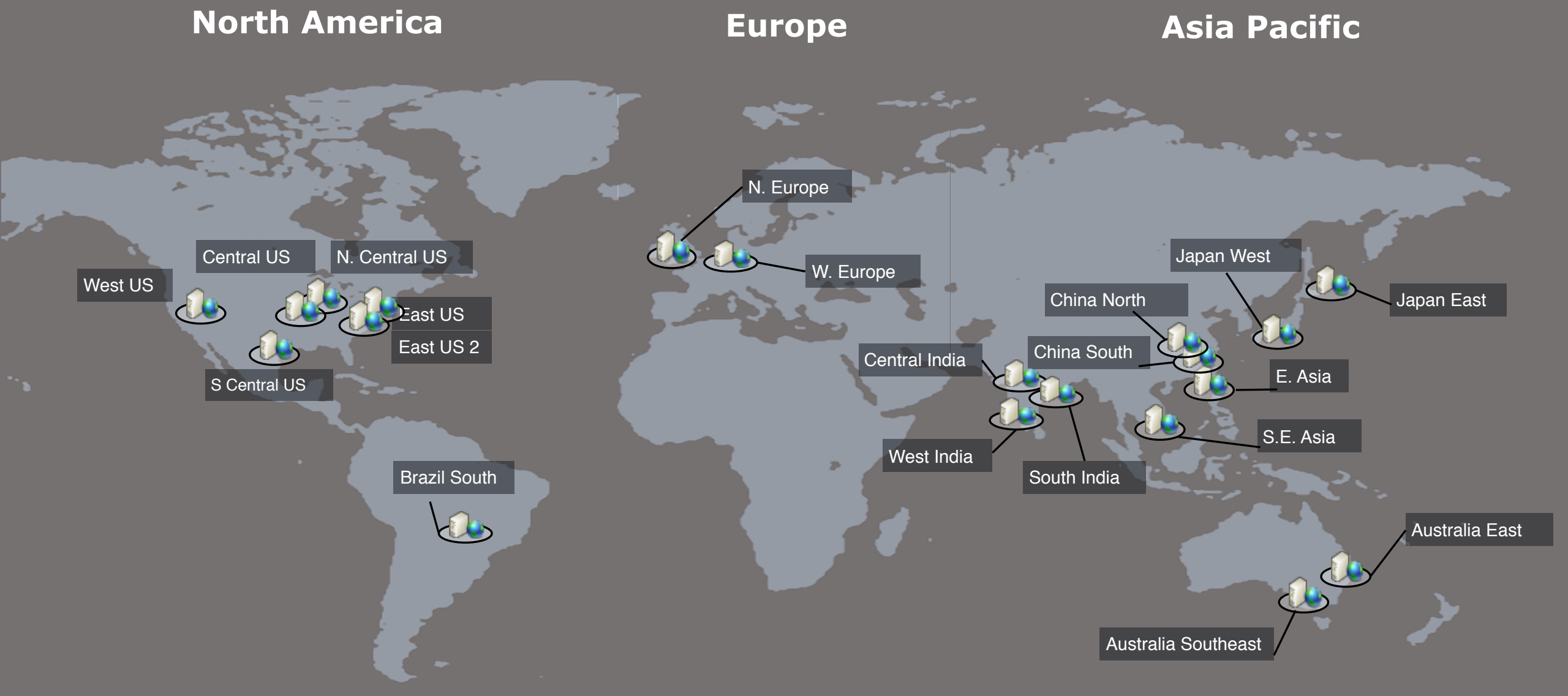


Typical Computing Pattern

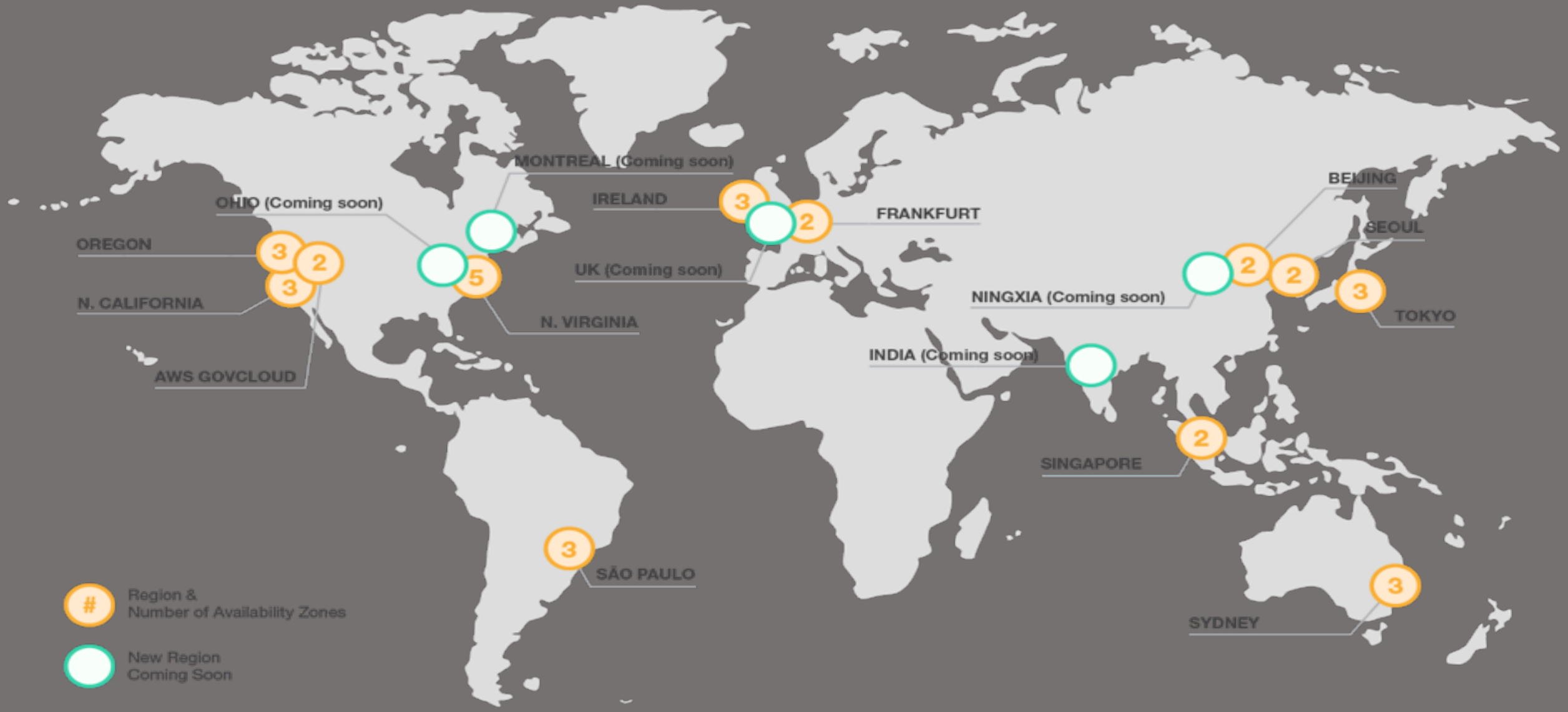
- Seasonal peaks and troughs
- Provisioning dilemma
  - Wasted capacity or
  - Loss of business



Azure Datacenter Regions



Amazon AWS Datacenter Regions

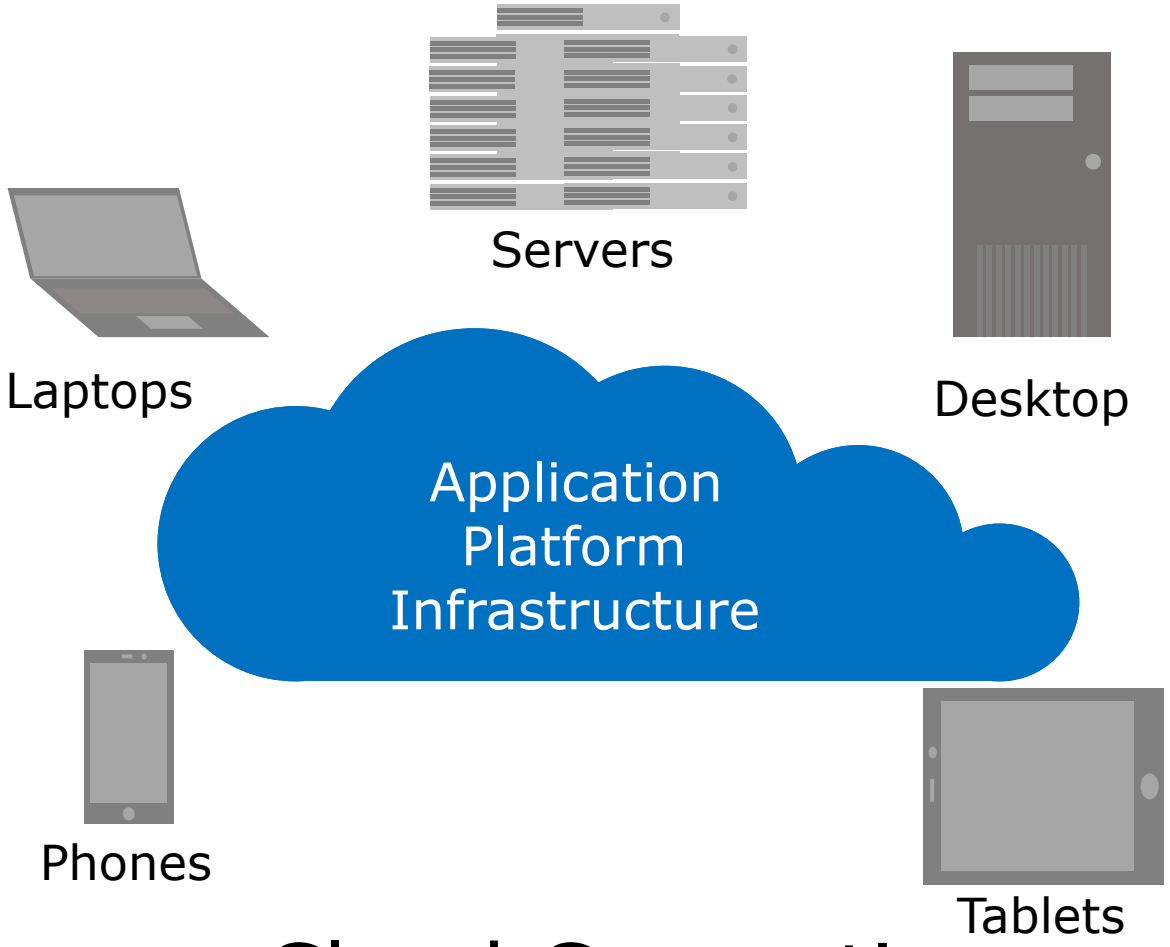


Cloud Computing Examples

- 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 Computing

Cloud Vendor - Azure & AWS

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

Category	Azure Service	AWS Service
Computing infrastructure	Virtual Machines	EC2
Object storage infrastructure	Blob Storage	S3
Networking	Virtual Network	Virtual Private Cloud
Relational database-as-a-service	SQL Database	RDS
NoSQL document database	DocumentDB	DynamoDB
Big data processing	HDInsight	Elastic MapReduce (EMR)
Visualization	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
Computing infrastructure	Virtual Server, Containers	Compute Engine
Object storage infrastructure	Object, Block Storage	Cloud Storage
Networking	Virtual Private Network	Cloud Virtual Network
Relational database-as-a-service	SQL Database	Cloud SQL
NoSQL document database	MongoDB	Cloud Datastore, Bigtable
Big data processing	Analytics for Apache Hadoop	BigQuery, Cloud Dataproc
Visualization		

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