

INTRODUCING THE CLOUD



AGENDA

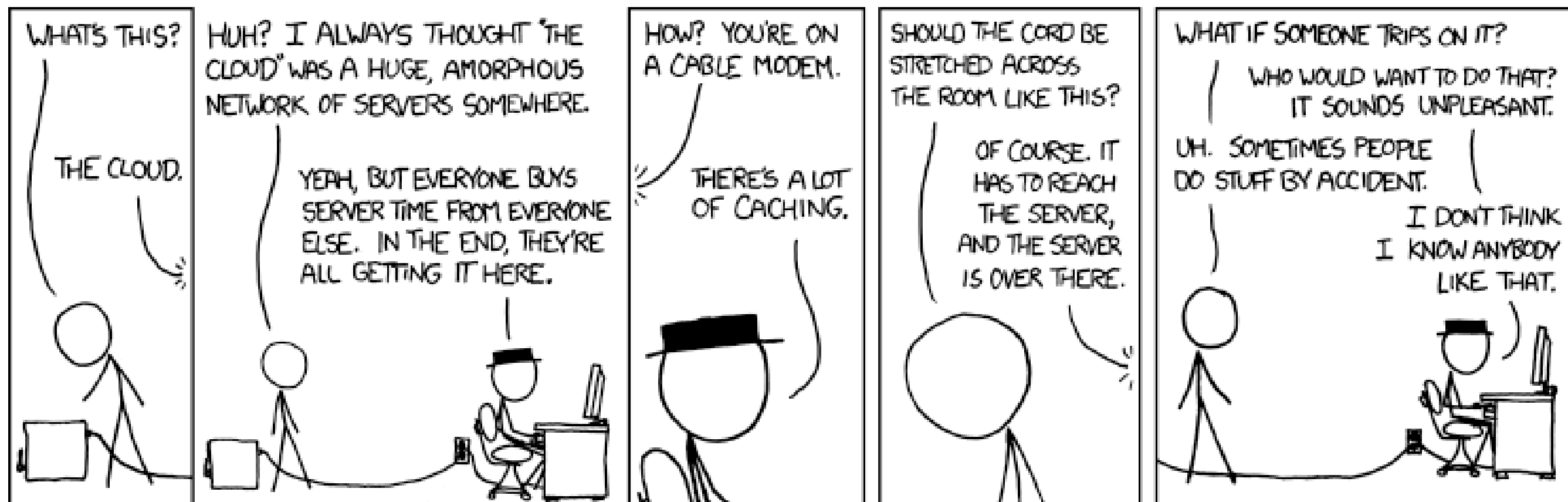
- Introducing the cloud and the cloud providers
- Common cloud concepts
- AWS, Azure, GCP observations
- Cloud comparisons

Cloud Computing

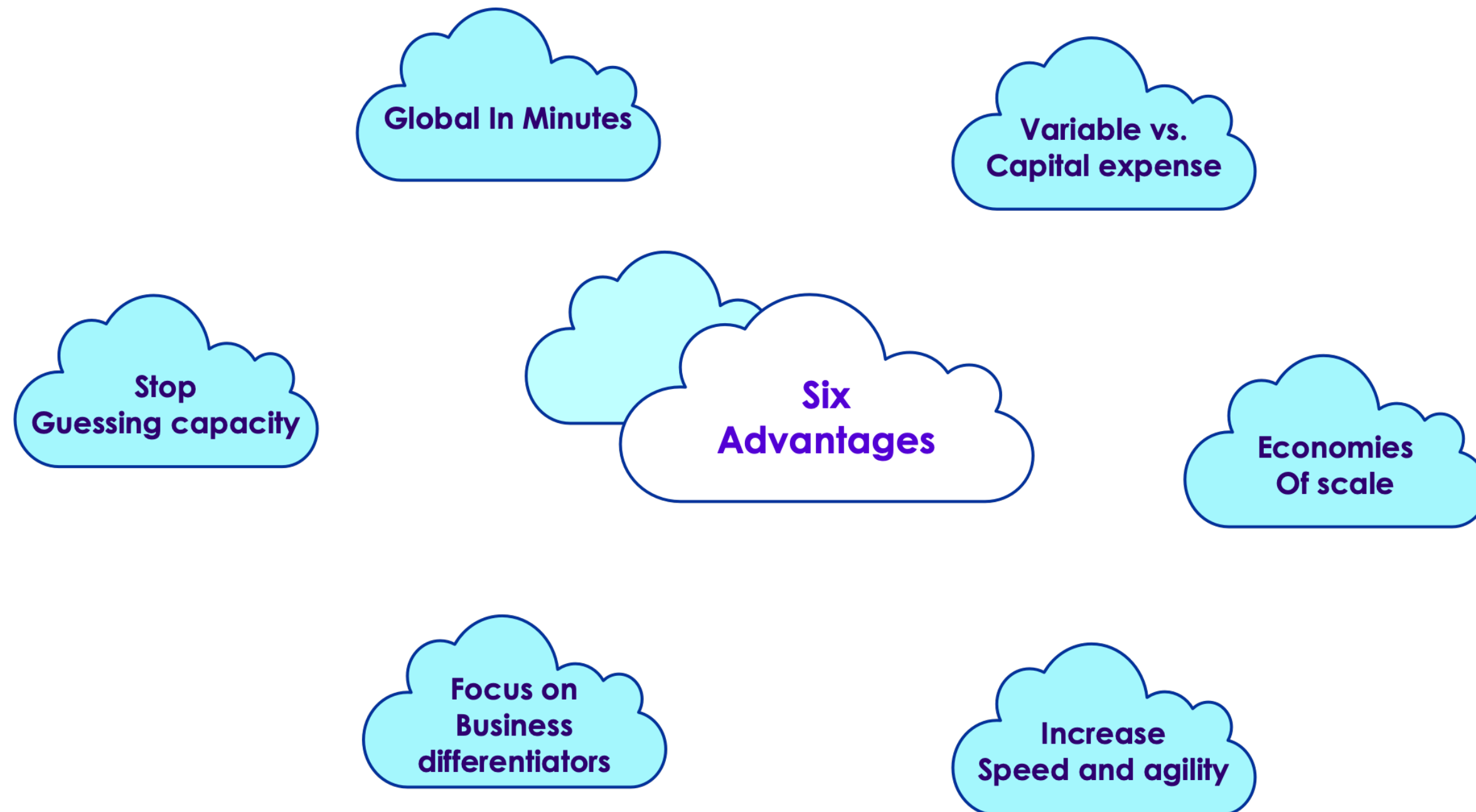
Cloud Computing
A Quick Tour of Cloud Offerings
Cloud Case Studies
Knowledge Checks
Backup Slides

WHAT IS CLOUD COMPUTING

- Shared resources
- On-demand
- Easily scalable
- Accessed via internet



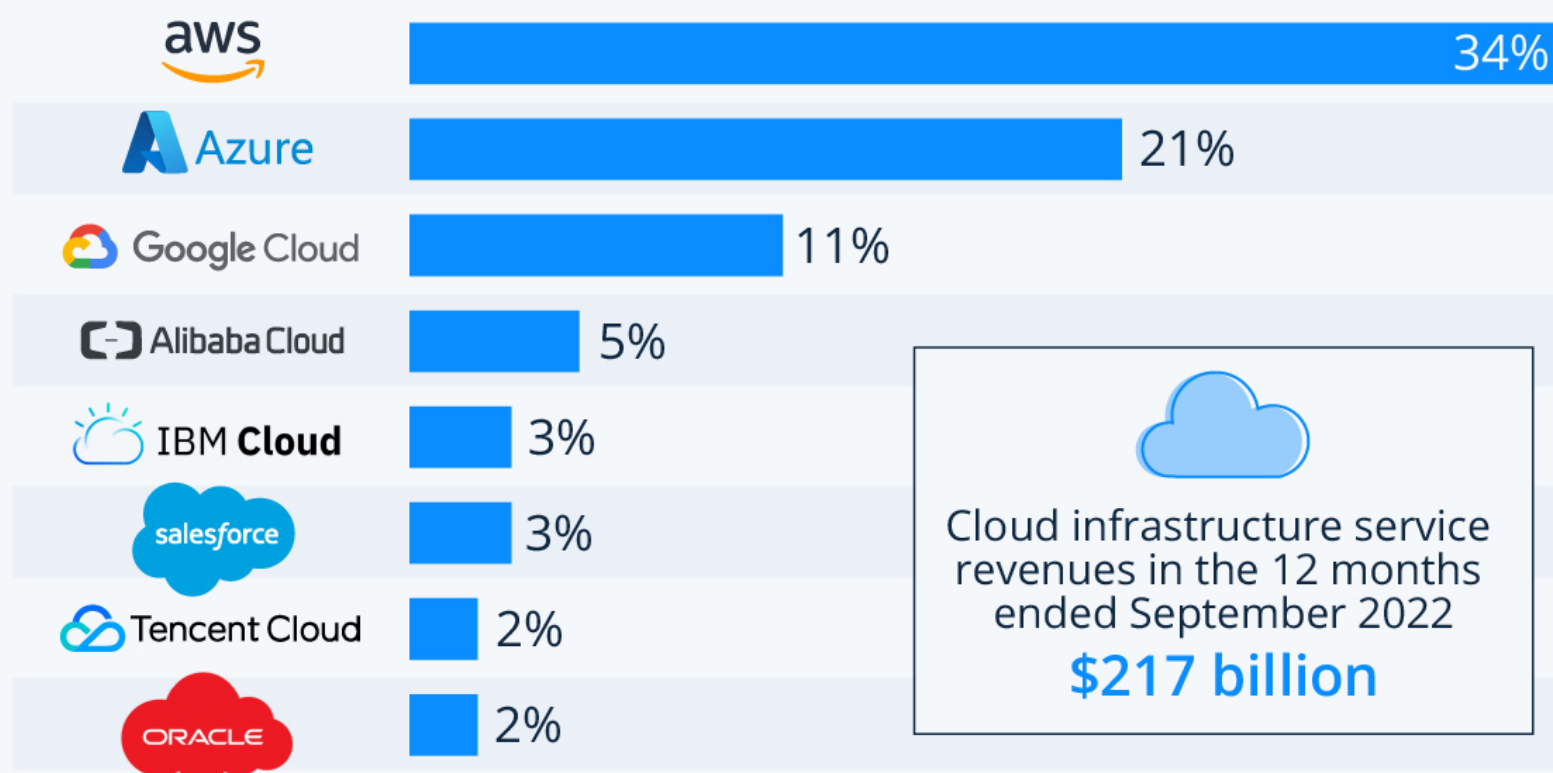
ADVANTAGES OF CLOUD



CLOUD MARKET SHARE

Amazon, Microsoft & Google Dominate Cloud Market

Worldwide market share of leading cloud infrastructure service providers in Q3 2022*



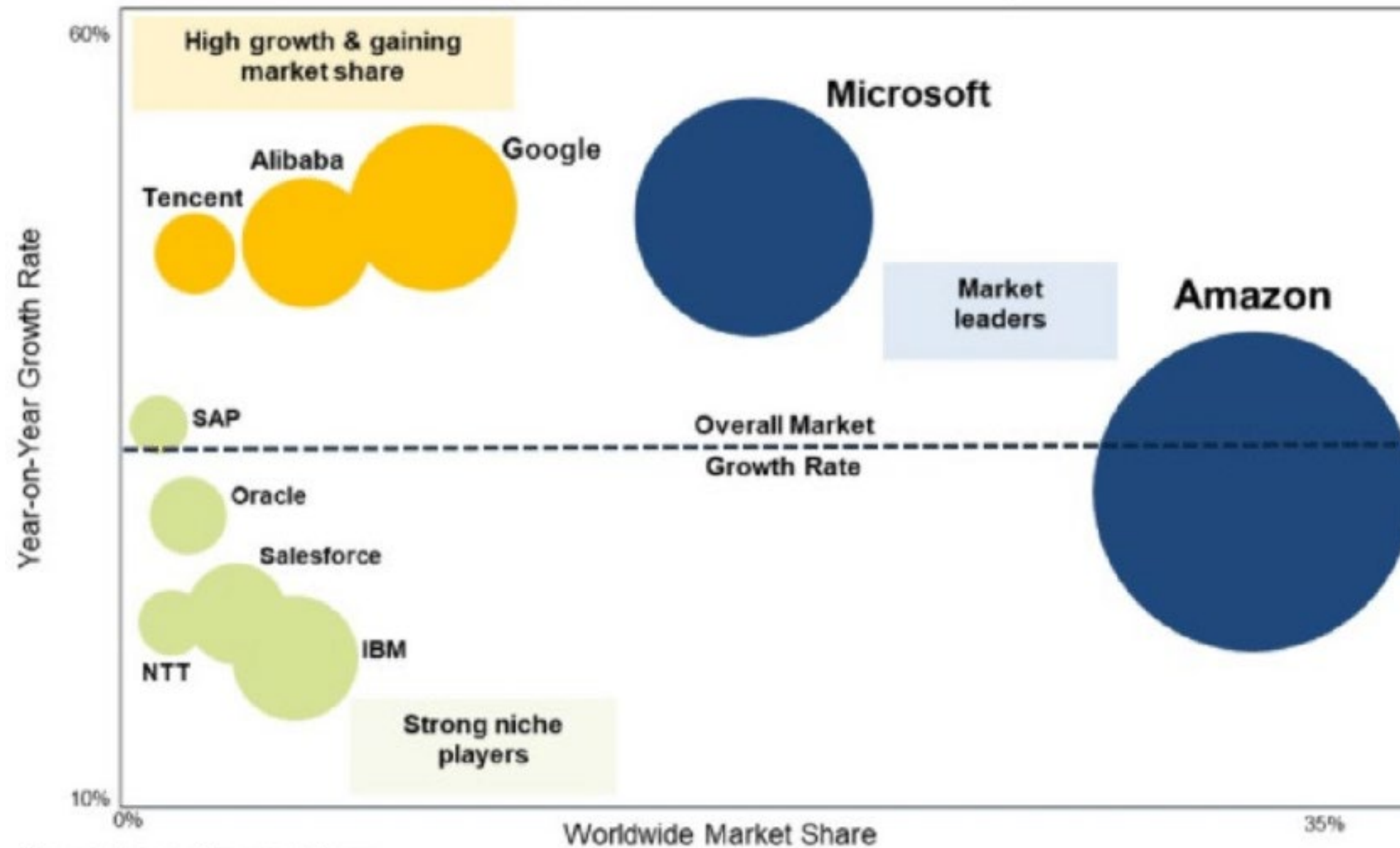
* includes platform as a service (PaaS) and infrastructure as a service (IaaS) as well as hosted private cloud services

Source: Synergy Research Group



statista

MARKET PLAYERS POSITIONING

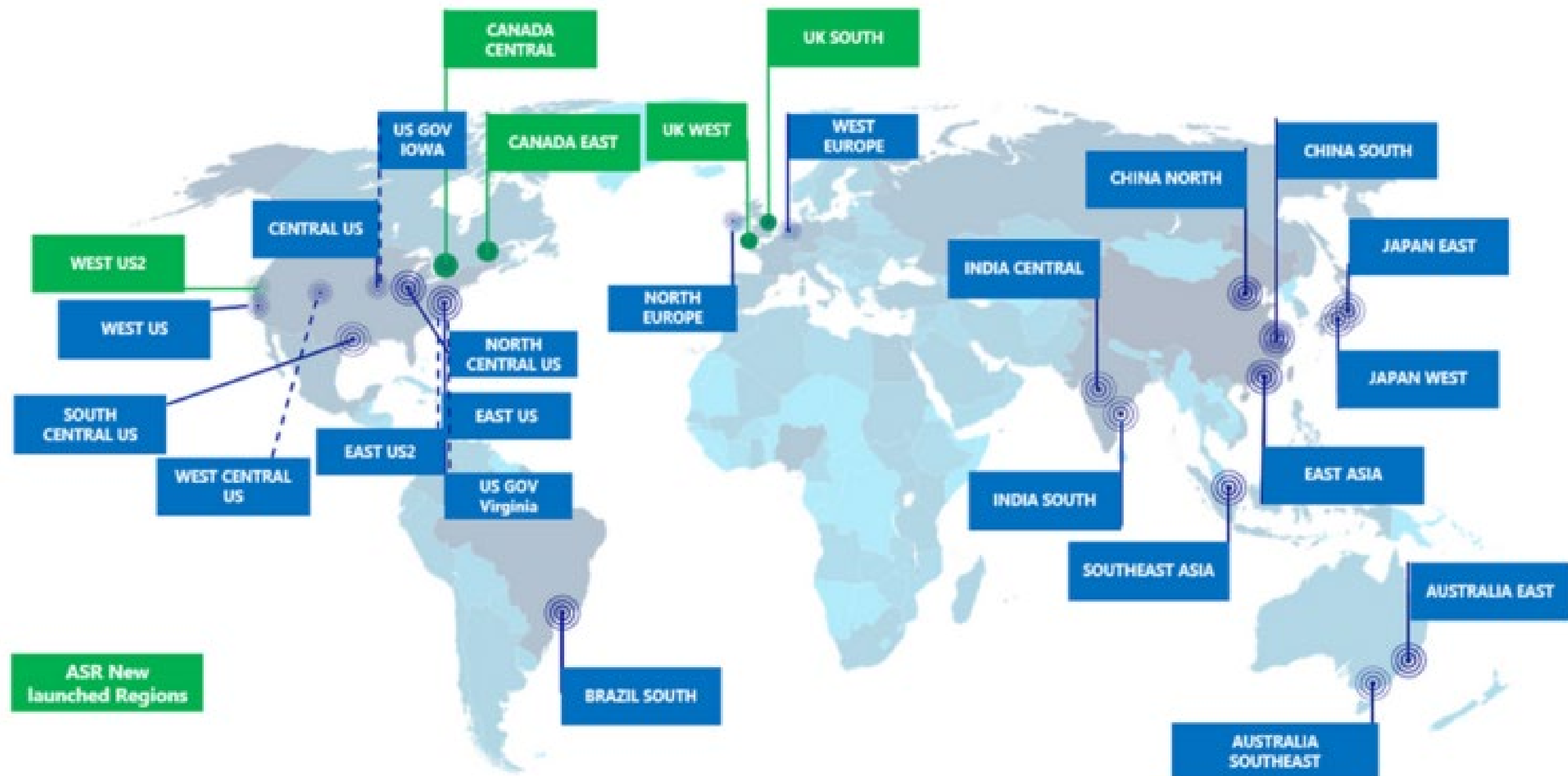


- Source

AWS VS AZURE VS GCP

- The major providers have all the core functionalities covered well
- AWS:
 - 80 Availability Zones within 25 geographic regions around the world, with announced plans for 15 more Availability Zones and 5 more AWS Regions in Australia, India, Indonesia, Spain, and Switzerland.
- Azure:
 - 54 regions worldwide, available in 140 countries
- GCP:
 - 25 regions, 76 zones, 200 + countries
- Resources
 - [Cloud feature comparison](#)

AZURE REGIONS



- Azure Regions

GCP REGIONS



- [Google Cloud Regions](#)

AWS REGIONS



- [AWS Regions](#)

REGIONS AND AVAILABILITY ZONES

- Each region consists of multiple availability zones.
- Each availability zone is physically separated and isolated from the others.
- All availability zones within a region are connected via highly redundant, low-latency, high-speed networks.



REGIONS AND AZ BEST PRACTICES

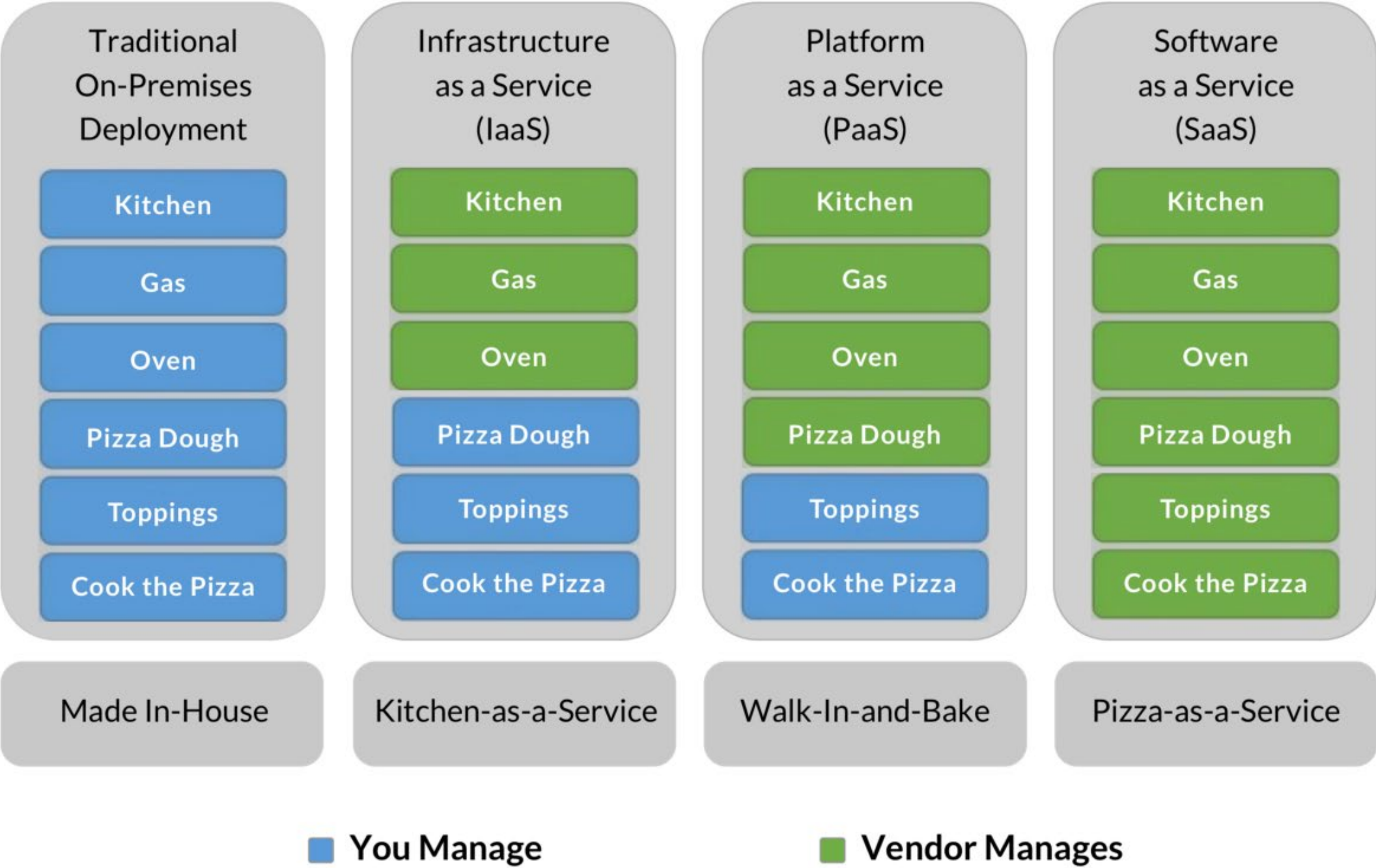
- Nearest to your physical location and/or your users' location to minimize network latency
- Not all regions are equal
- Service offerings (newly deployed services are first offered in selected regions only)
- Pricing is not equal across multiple regions; use cost calculators
- Service Level Agreement (SLA) will vary by region
- Compliance such as GDPR is specific to a country therefore, it varies region-to-region
 - Example: IRB-approved data with an audience that spans continents

FAULT TOLERANCE WITH MULTIPLE AVAILABILITY ZONES

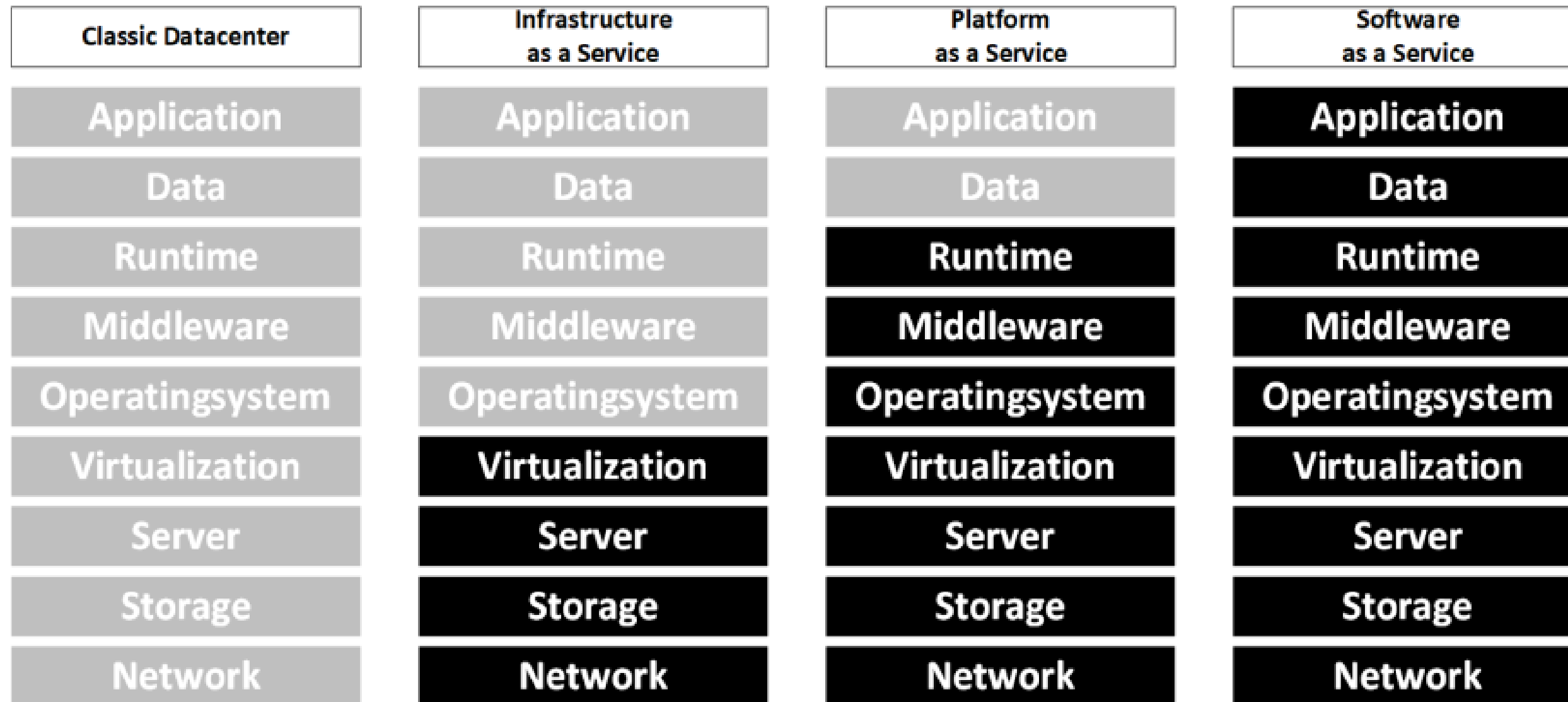
- If you distribute your instances across multiple Availability Zones and one instance fails, you can design your application so that an instance in another Availability Zone can handle requests
- Availability Zones give you the flexibility to launch production apps and resources that are highly available, resilient/fault-tolerant, and scalable as compared to using a single data center
- Large files (videos ..etc) may be better delivered through CDN. Cloud vendors usually offer Content Delivery Network (CDN)

CLOUD SERVICE MODELS FOR PIZZA

New Pizza as a Service



CLOUD SERVICE MODELS



- Grey: we manage
- Black: Cloud provider manages

CLOUD MIGRATION STRATEGIES

- 6 Strategies for Migrating Applications to the Cloud, or **6 R** 's
- Rehosting—Otherwise known as “lift-and-shift.”
- Replatforming—sometimes called this “lift-tinker-and-shift.”
- Repurchasing—Moving to a different product.
- Refactoring / Re-architecting
- Retire—Get rid of.
- Retain—Usually this means “revisit” or do nothing (for now).
- Resources
 - [6-strategies-for-migrating-applications-to-the-cloud](#)

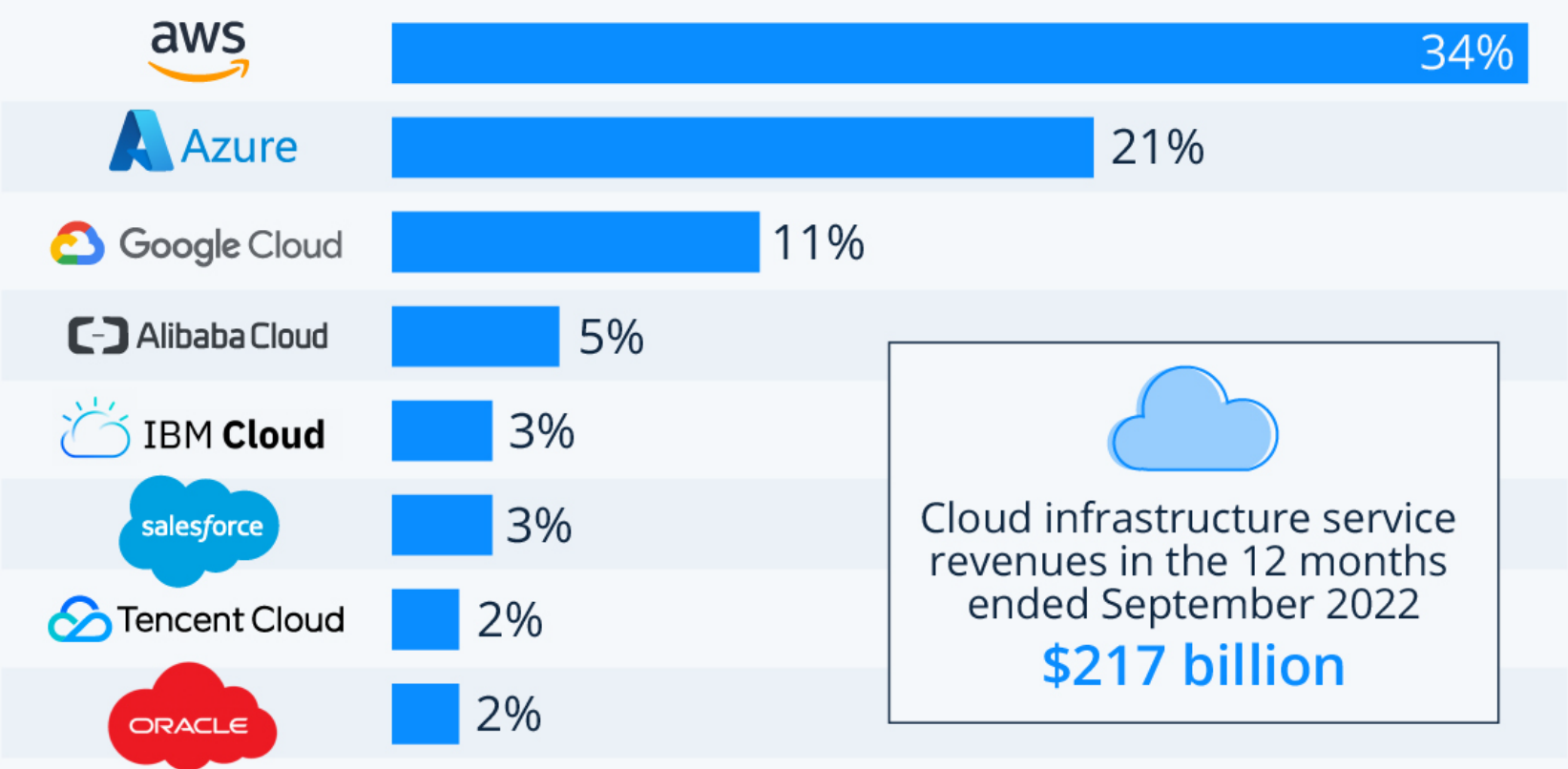
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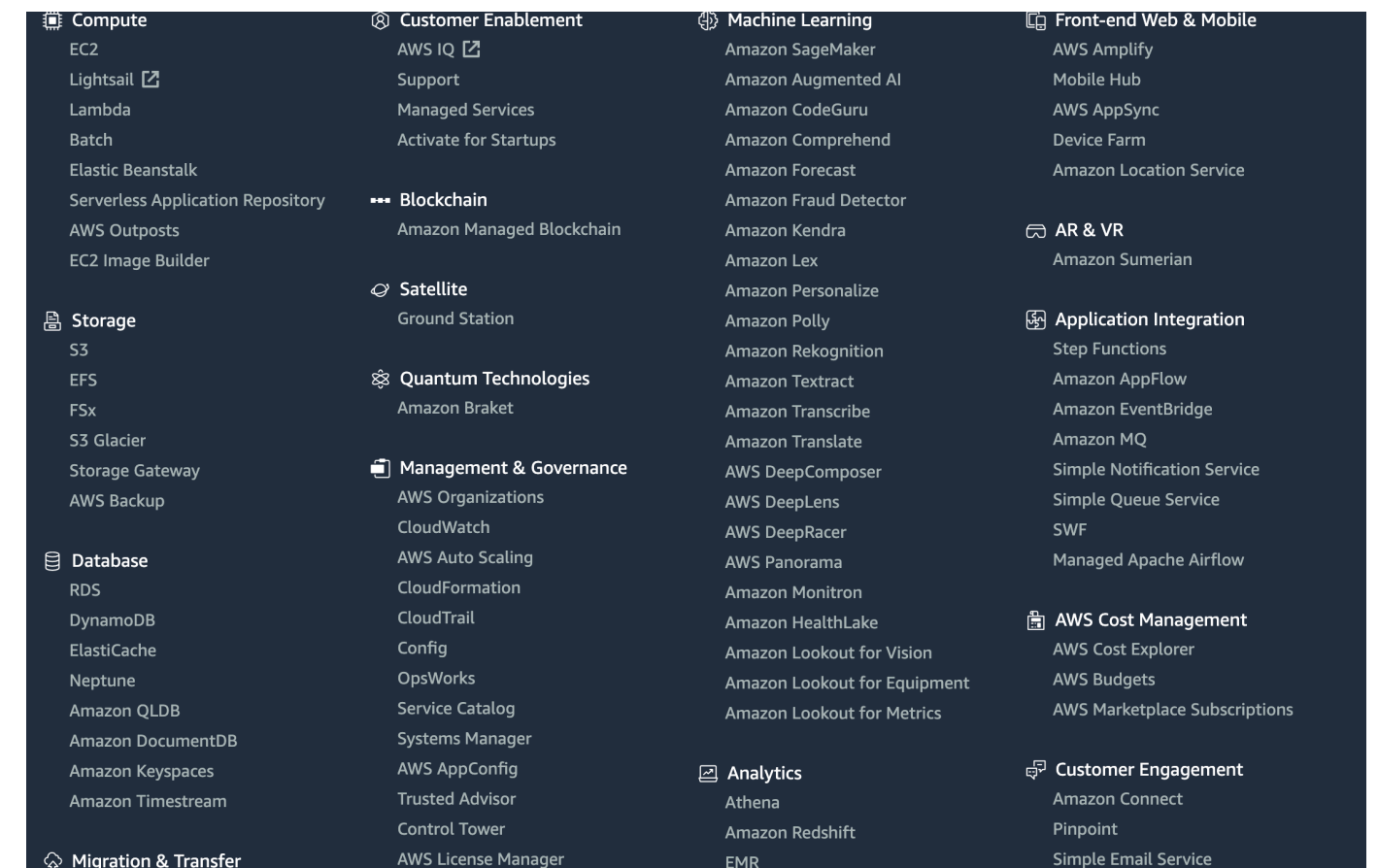
Source: Synergy Research Group



AWS (AMAZON WEB SERVICES)



- AWS is the **very first public cloud service** to be launched
- AWS is current market leader in Cloud space (34% marketshare)
- AWS offers more than 1,000 services, and it keeps adding services at regular intervals.
- aws.amazon.com



MICROSOFT AZURE



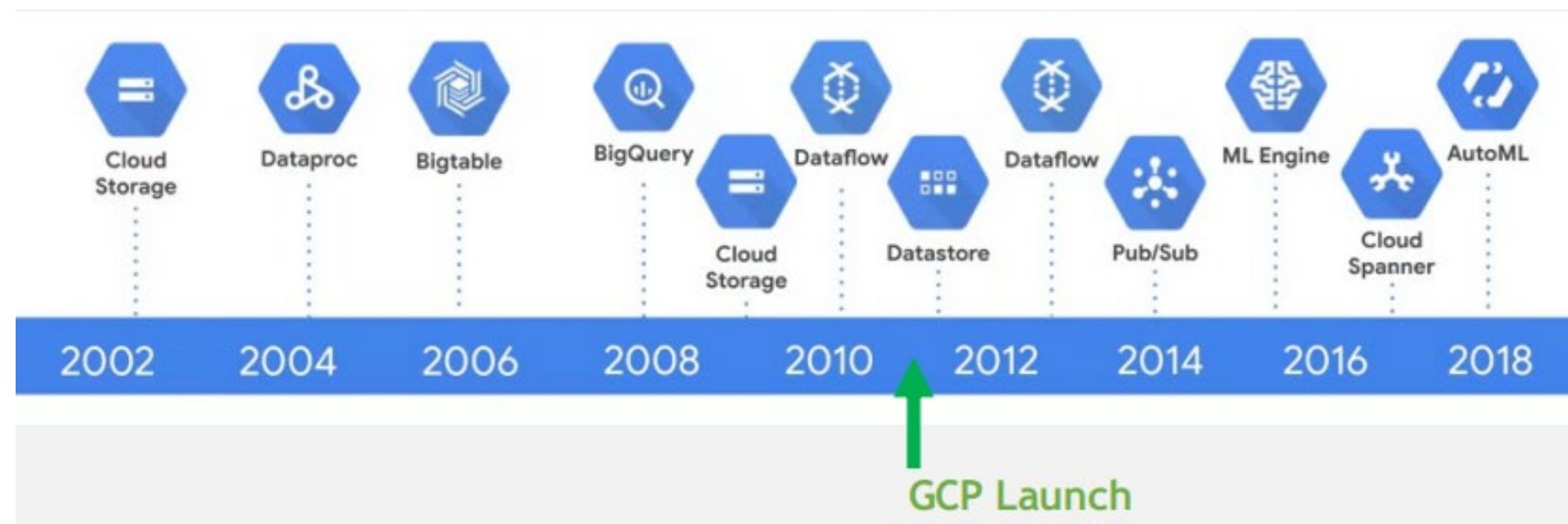
- Azure is Microsoft's portfolio of integrated cloud services, built for developers and IT professionals
- Launched in 2010, growing very rapidly (2nd to AWS)
- Microsoft pivoted to **Cloud First** strategy. Everything that Microsoft builds and develops is first made for Azure and Microsoft's other cloud offerings.
- In addition to the standard cloud components (Compute, Storage ..etc), Azure also offers proprietary Microsoft technologies, like Windows Desktops, Active Directory ..etc
- portal.azure.com

GOOGLE COMPUTE PLATFORM (GCP)



Google Cloud Platform

- Google had had a long history of building cloud-enabling technology (with a heavy focus on big data) before its cloud services were launched
- They are a late comer to the 'public cloud' and 3rd in market cap
- trying to differentiate themselves in **Machine Learning / AI** space



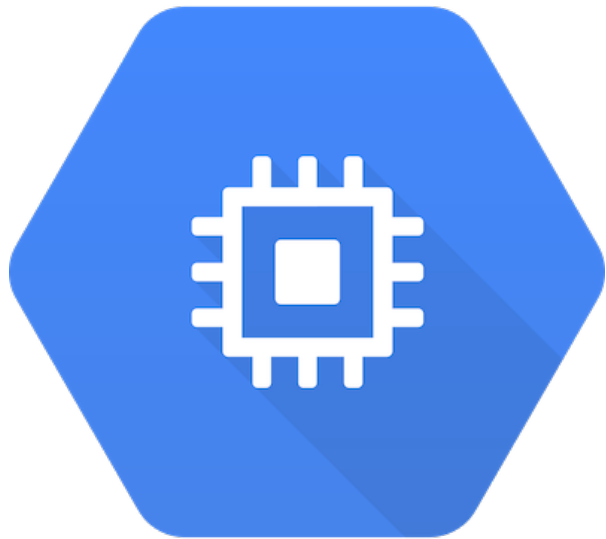
A CLOUD STACK

- Here is a typical stack in the cloud.
- Most vendors would offer these in some form.

Stack	Description
Compute	On demand virtual machines
Servless Compute	Computation without explicitly provision VMs
Storage	On demand, scalable storage
Databases	Managed datastores (SQL and noSQL)
Containers	Container hosting and serving (Docker, Kubernetes ..etc)
Queue	Managed queue services for streaming data
Analytics	Analytics stack often supporting Big Data
Machine Learning	Hosted ML/DL infrastructure
Monitoring	Monitor infrastructure, gather and analyze logs

COMPUTE SERVICES

Services	AWS	Azure	GCP
IaaS	Amazon Elastic Compute Cloud	Virtual Machines	Google Compute Engine
PaaS	AWS Elastic Beanstalk	App Service and Cloud Services	Google App Engine
Containers	Amazon Elastic Compute Cloud Container Service	Azure Kubernetes Service (AKS)	Google Kubernetes Engine
Serverless Functions	AWS Lambda	Azure Functions	Google Cloud Functions



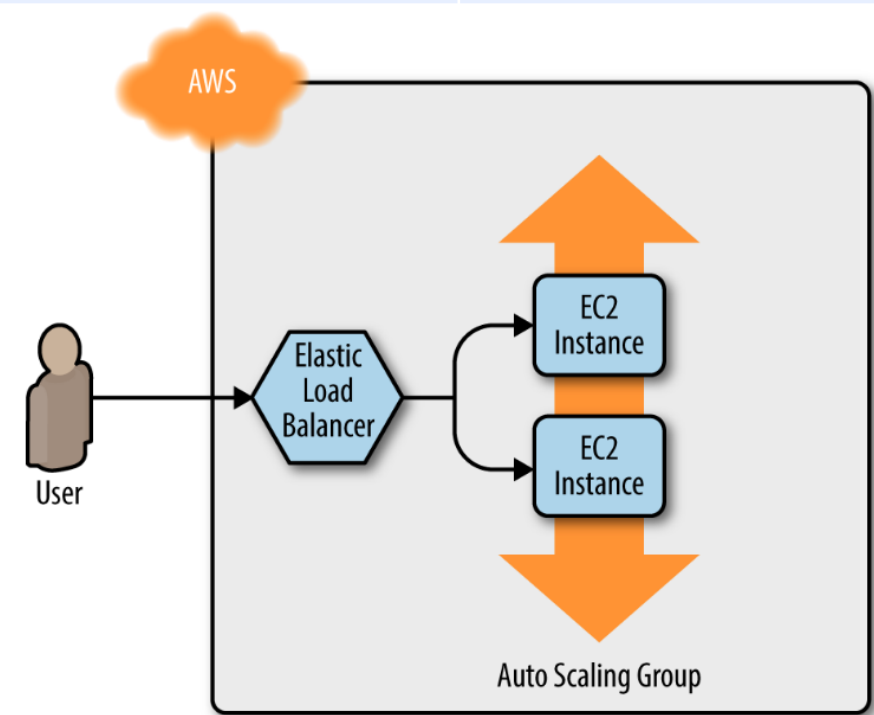
STORAGE

Services	AWS	Azure	GCP
Object Storage	Amazon Simple Storage Service	Azure Blob Storage	Google Cloud Storage
Block Storage	Amazon Elastic Block Store	Azure Block Storage	Google Compute Engine Persistent Disks
Cold Storage	Amazon Glacier	Azure Archive Blob Storage	Google Cloud Storage Nearline
File Storage	Amazon Elastic File System	Azure File Storage	Google Filestore



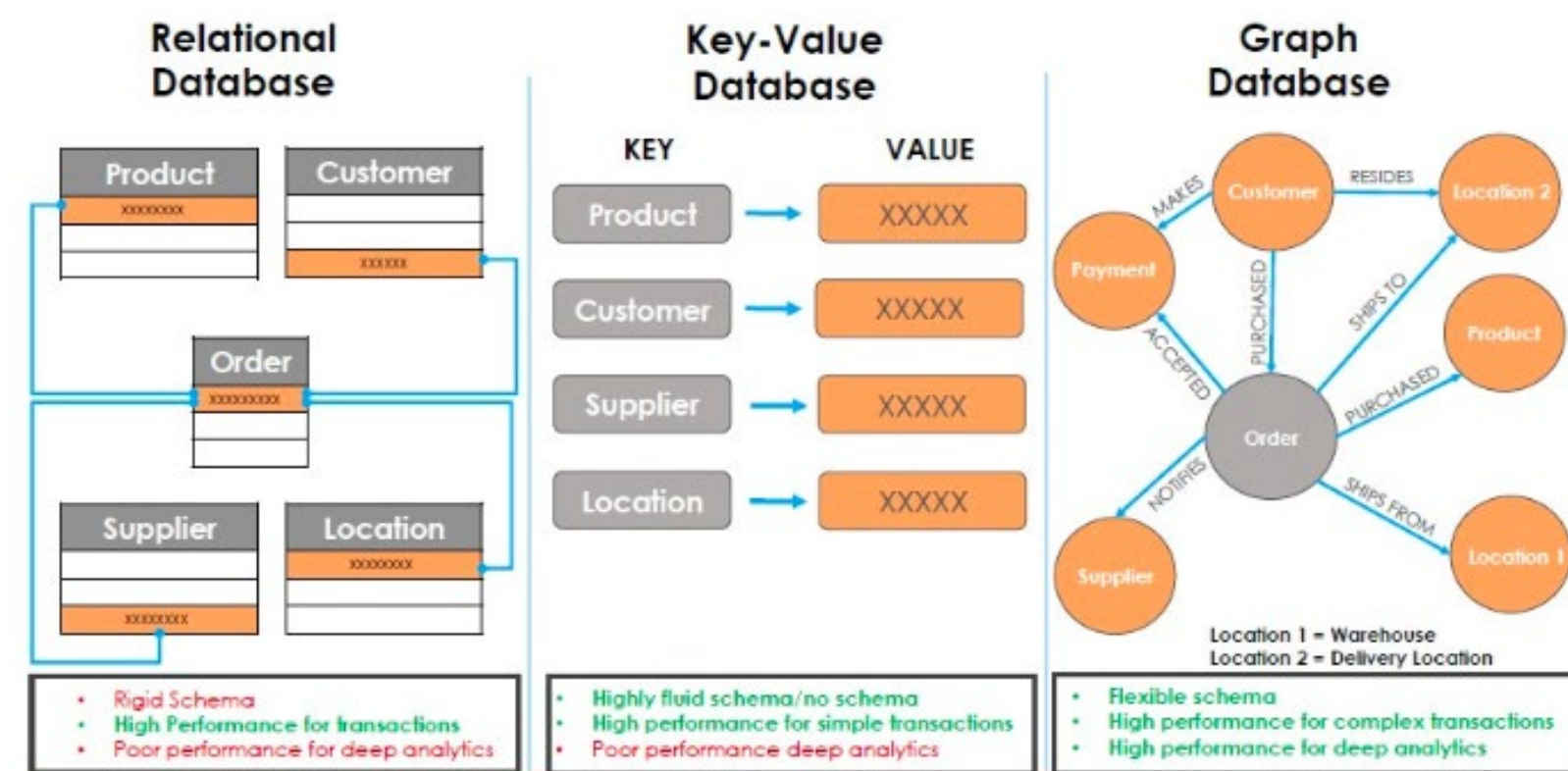
NETWORKING

Services	AWS	Azure	GCP
Virtual Network	Amazon Virtual Private Cloud (VPC)	Virtual Networks (VNETs)	Virtual Private Cloud
Load Balancer	Elastic Load Balancer	Load Balancer	Google Cloud Load Balancing
Peering	Direct Connect	ExpressRoute	Google Cloud Interconnect
DNS	Amazon Route 53	Azure DNS	Google Cloud DNS



DATASTORES

Services	AWS	Azure	GCP
RDBMS	Amazon Relational Database Service	SQL Database	Google Cloud SQL
NoSQL: Key–Value	Amazon DynamoDB	Table Storage	Google Cloud Firestore/Google Cloud Bigtable
NoSQL: Indexed	Amazon SimpleDB	Azure Cosmos DB	Google Cloud Datastore



COMPARING CLOUD VENDORS

- Please keep in mind, this is a very fluid market and things change very rapidly

AWS	Azure	GCP
Maturity	Great for developers	Aggressive growth
Service portfolio	Integration with open source	Attractive pricing models
Presence (market and geography)	Private datacenter integration	Best for AI and machine learning applications

- More references
 - [This differentiates core service offerings](#)
 - [This is community sourced and has a feature matrix](#)

Cloud Case Studies

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AWS CASE STUDIES

- Netflix
 - 100,000+ server instances for streaming / video encoding
 - Amazon S3 DNS
 - Amazon S3 as data storage: PB+ data created each day
 - References: [1](#)
- JP Morgan Chase
 - 450+ PB data stored and served by AWS S3
 - References: [1](#)
- See more case studies here: [1](#)

GCP CASE STUDIES

- Twitter
 - Ad engagement platform
 - Moved from home grown big data storage into Google Big Table
 - References: [1](#)
- UPS
 - Package routing system
 - BigQuery for adhoc queries
 - Running BigQuery + ML on 1 billion data points per day!
 - References: [1](#)
- See more case studies here: [1](#)

AZURE CASE STUDIES

- M&S (Marks and Spencer - Retail, UK)
 - Consolidated data platform on Azure Data Lake
 - Azure Databricks for large scale data analytics
 - Azure PowerBI for reporting
 - References: [1](#)
- AMD
 - Chip design (EDA) on Azure HPC
 - Large data storage at Azure Data Lake
 - References: [1](#)
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Knowledge Checks

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QUICK KNOWLEDGE CHECK

- Which is the order of cloud leaders, by market size?
 - A) Azure, GCP, AWS
 - B) GCP, Azure, AWS
 - C) AWS, GCP, Azure
 - D) AWS, Azure, GCP

QUICK KNOWLEDGE CHECK

- Which represents the correct order, from the most to the least amount of work done by you?
 - A) On Prem, IaaS, PaaS, SaaS
 - B) SaaS, PaaS, IaaS, On Prem
 - C) IaaS, PaaS, SaaS, On Prem
 - D) SaaS, IaaS, PaaS, On Prem

QUICK KNOWLEDGE CHECK

- A company wants to move to the cloud as their existing data center lease is expiring. What migration strategy should a company adopt for quickly migrating their existing applications to cloud?
 - A) Replatform
 - B) Retain
 - C) Repurchase
 - D) Rehost

QUICK KNOWLEDGE CHECK

- Which of these strategies takes more time to execute?
 - A) Retain
 - B) Replatform
 - C) Rehost
 - D) Rearchitect

END OF MODULE



EVERYONE COMPLAINS ABOUT AUTOCORRECT,
BUT WE FORGET ABOUT THE TIME IT
PREVENTED A NUCLEAR WAR.