UAB Universitat Autònoma de Barcelona




Distributed systems and web technologies

Bioinformatics BSc

University Autonoma of Barcelona

A. Espinosa 16/09/24

Objectives

- Methodologies for web application development and distributed data analysis in cloud computing environments.
- Introduction to web applications structure, frameworks and cloud services related.
- Focus on current tools for web application building using cloud computing services

Content blocks

Block 1: Web Programming

Web Applications & technologies. Fundamental protocols, APIs and languages for web applications. Design of web applications based on the Model-View-Controller pattern

Frameworks and tools for web application development

Block 2: Distributed systems and cloud computing

Introduction to distributed systems and cloud computing

Introduction to data management in cloud computing context

Block 3: Distributed data processing applications

Introduction to distributed data processing

Data analysis practice with Spark framework

Assessment and grades

- The success in meeting the course learning objectives will be measured by theoretical exams and practical exercises. There will be one theoretical exam (TExam) consisting of short questions and it is compulsory.
- There will be 3 lab deliverables, and each of them will be assessed individually. Laboratories will be done in two-member teams that will be defined the first day of class and will remain for the whole term.
- The final grade will be computed as: TExam*0.5+0.5*Lab
- Only those students with a grade equal or higher than 5.0 will pass the subject.

Re-assessment

- Only the students that have not passed the theoretical exam after the evaluation can take a final theoretical exam in January.
- The grade obtained at the new exam will substitute the grade of the previous failed exam during the trimester and will be used to calculate the final grade according to the rules and percentages reported above.
- The maximum grade that can be obtained in this examination is 5.

Class scheduling

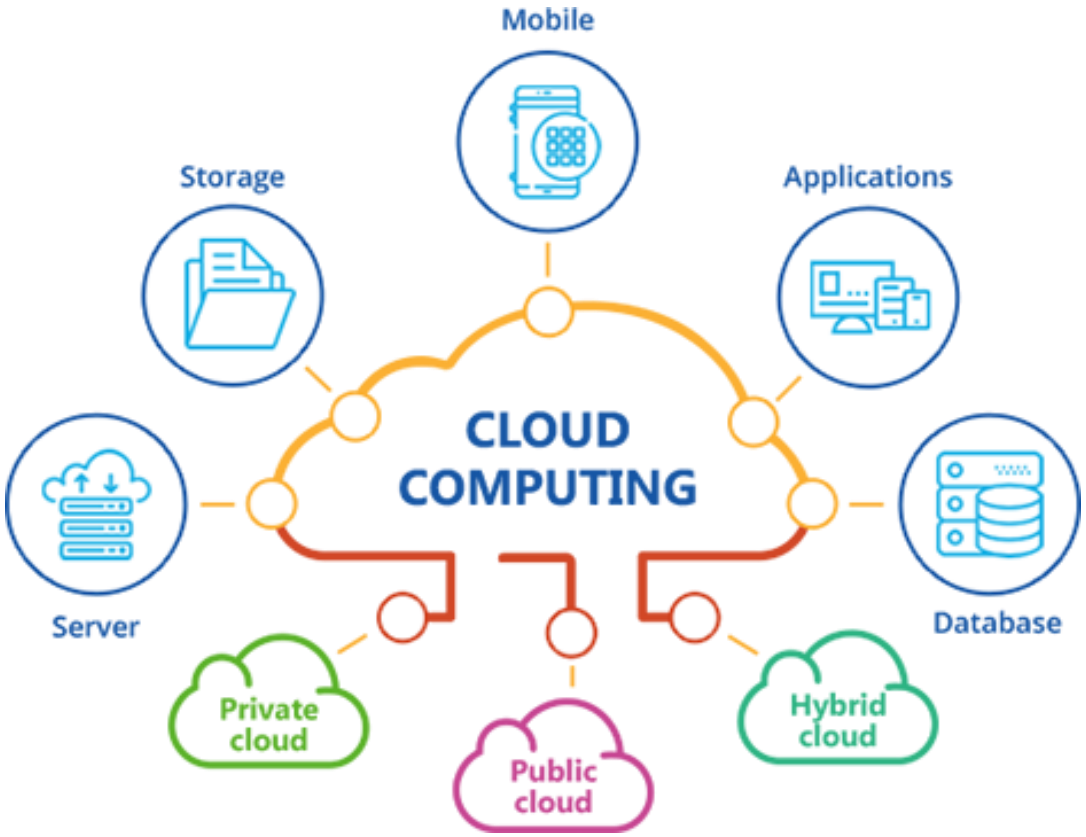
Distributed systems and Web Technologies					
Week		Mondays 11:30-13:30		Fridays 11:30 - 13:30	
		Date	Topic	Date	Topic
1	16-sept	16-sept	Introduction to cloud computing	20-sept	Web applications
2	23-sept	23-sept	no class	27-sept	Web applications
3	30-sept	30-sept	Django Azure	4-oct	Django AWS
4	7-oct	7-oct	Django lab	11-oct	Django lab
5	14-oct	14-oct	In-memory DB	18-oct	Redis tutorial
6	21-oct	21-oct	Redis lab	25-oct	Redis lab
7	28-oct	28-oct	Data analytics introduction	1-nov	no class
8	4-nov	4-nov	Spark intro	8-nov	Spark tutorial
9	11-nov	11-nov	Data analytics	15-nov	Spark lab
10	18-nov	18-nov	Spark lab	22-nov	Spark lab
15	11-dic	11-dic	exam		

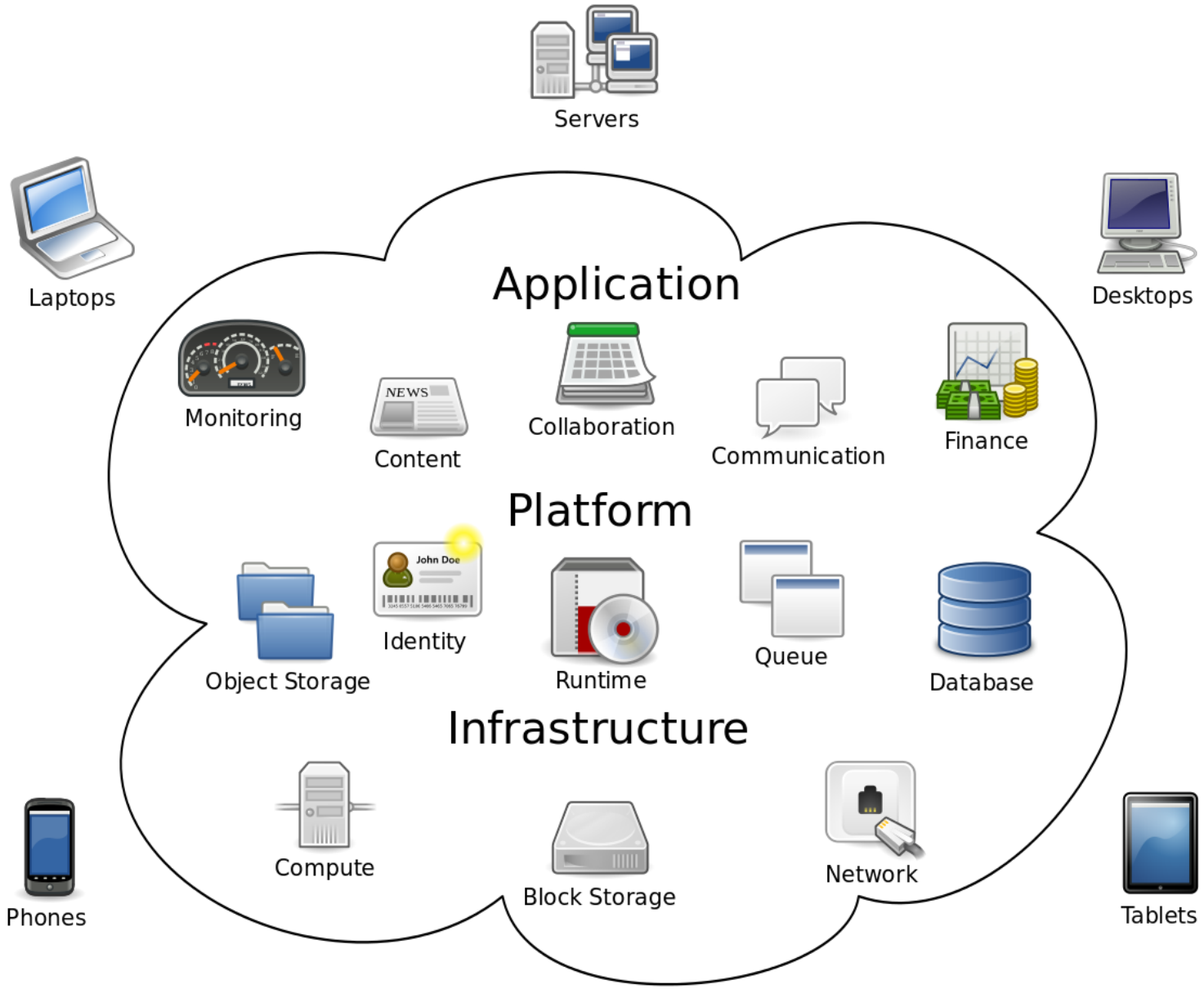
Introducing Cloud Computing

Cloud Services

Cloud computing

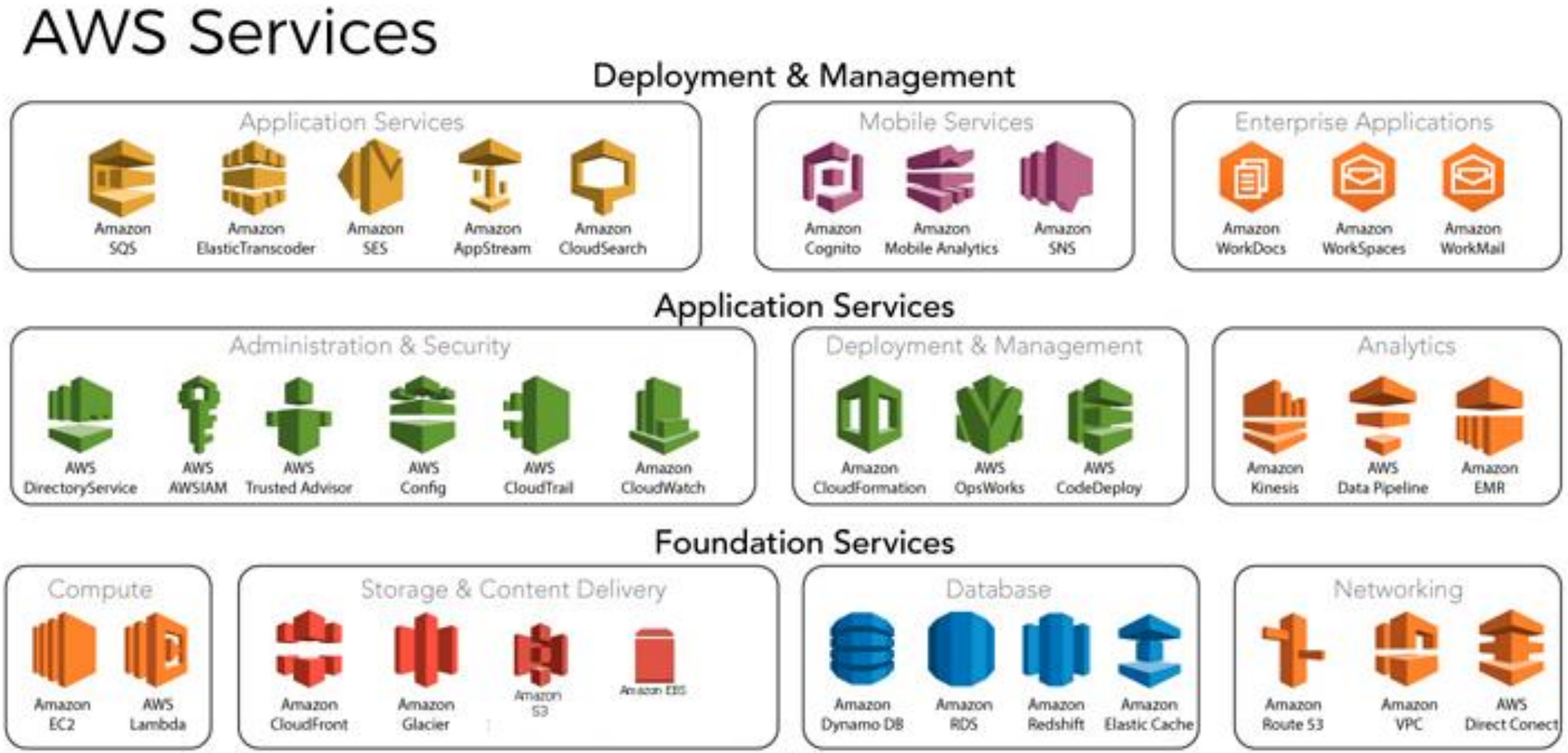
- On-demand availability of computer system resources
- Especially data storage and computing power
- Without direct active management by the user





Cloud computing services

Amazon web services



AWS foundational services

Applications

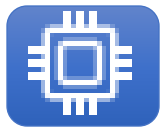
 Virtual desktops

 Collaboration and sharing

Platform Services

Databases	Analytics	Application services	Deployment and management	Mobile Services
Relational	Cluster computing	Queuing	Containers	Identity
NoSQL	Real-time	Orchestration	DevOps tools	Sync
Caching	Data warehouse	App Streaming	Resource templates	Mobile Analytics
	Data workflows	Transcoding	Usage tracking	Notifications
		Email	Monitoring and logs	
		Search		

Foundation Services

 Compute (virtual, automatic scaling, and load balancing)

 Networking

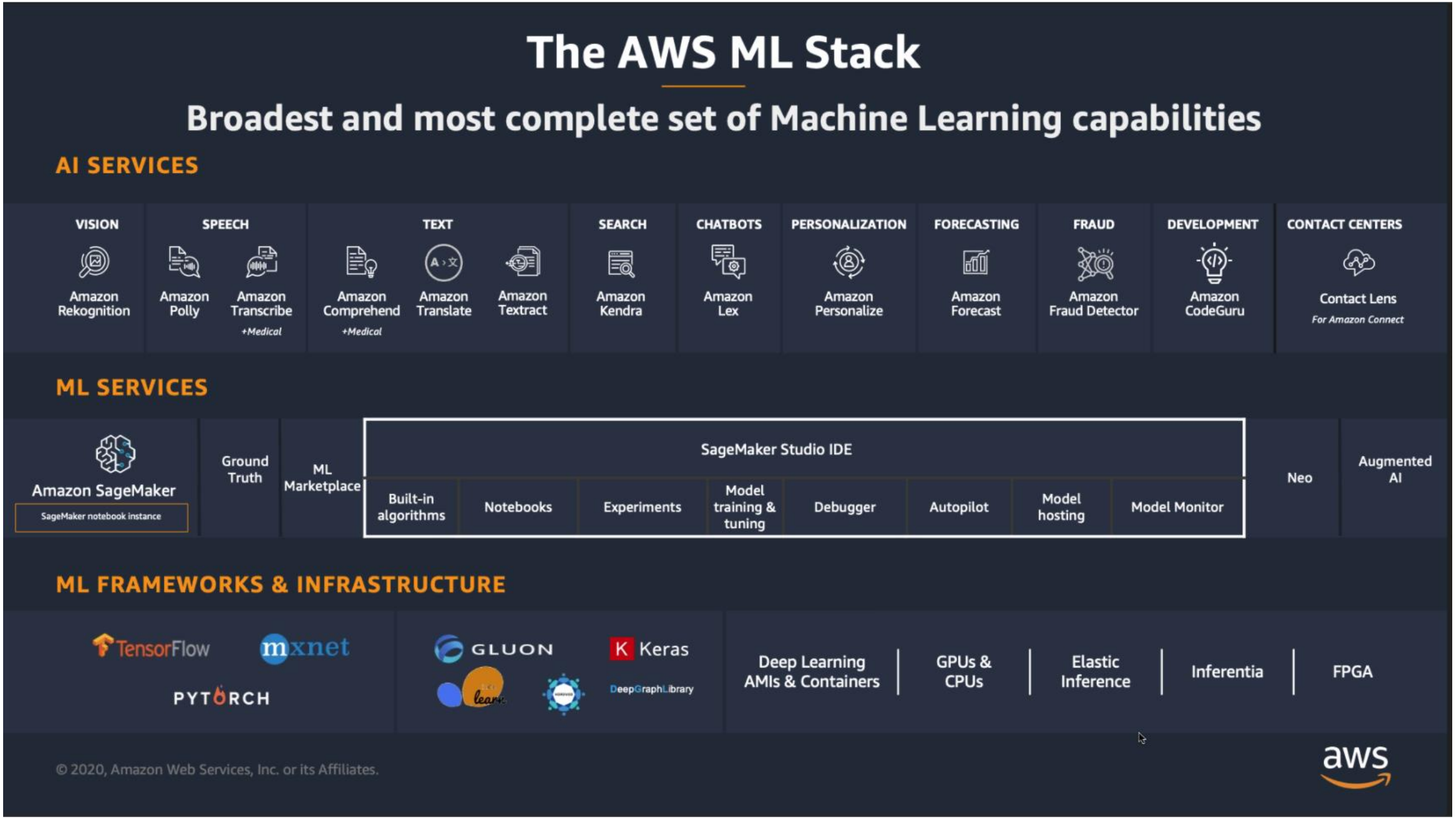
 Storage (object, block, and archive)

Infrastructure

Regions

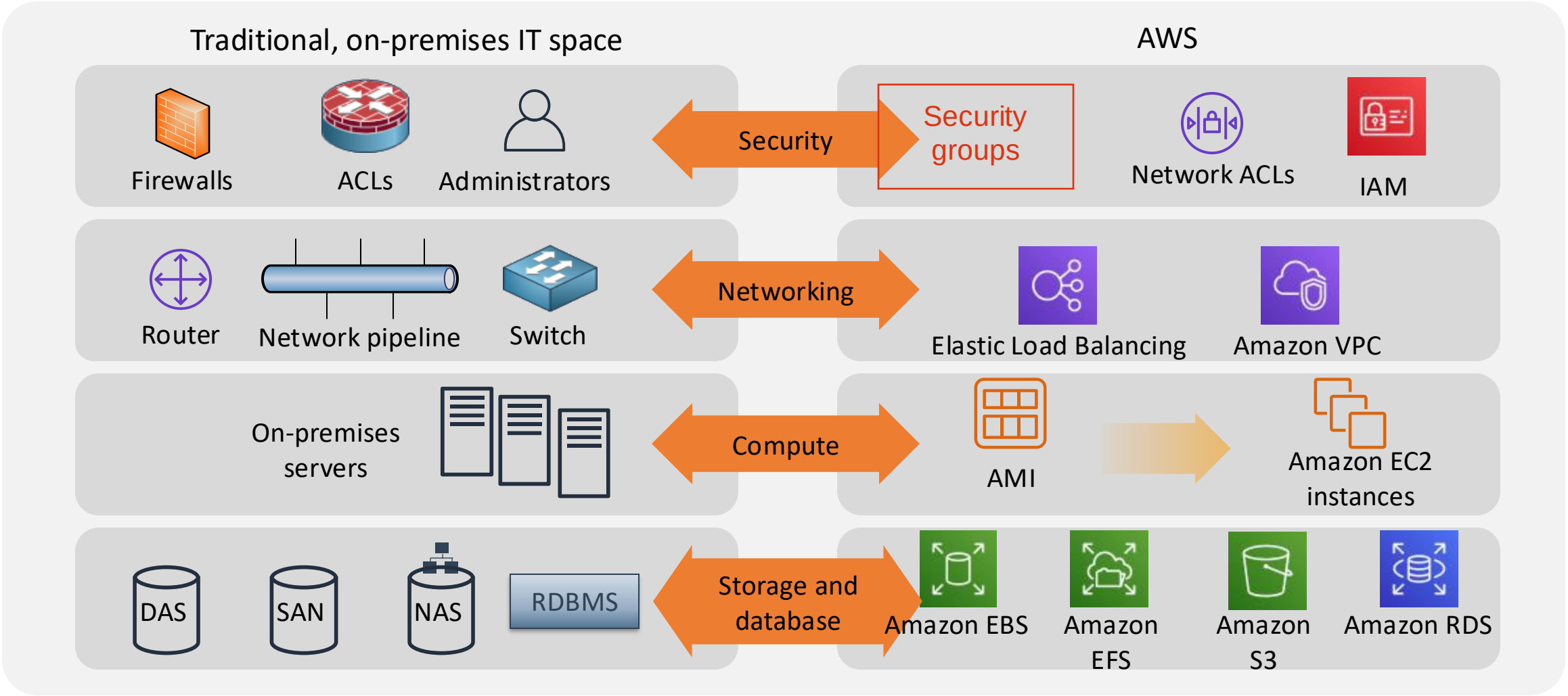
Availability Zones

 Edge locations



https://www.forbes.com/sites/moorinsights/2020/03/04/surprise-aws-leads-in-cloud-ai-services-ranking/

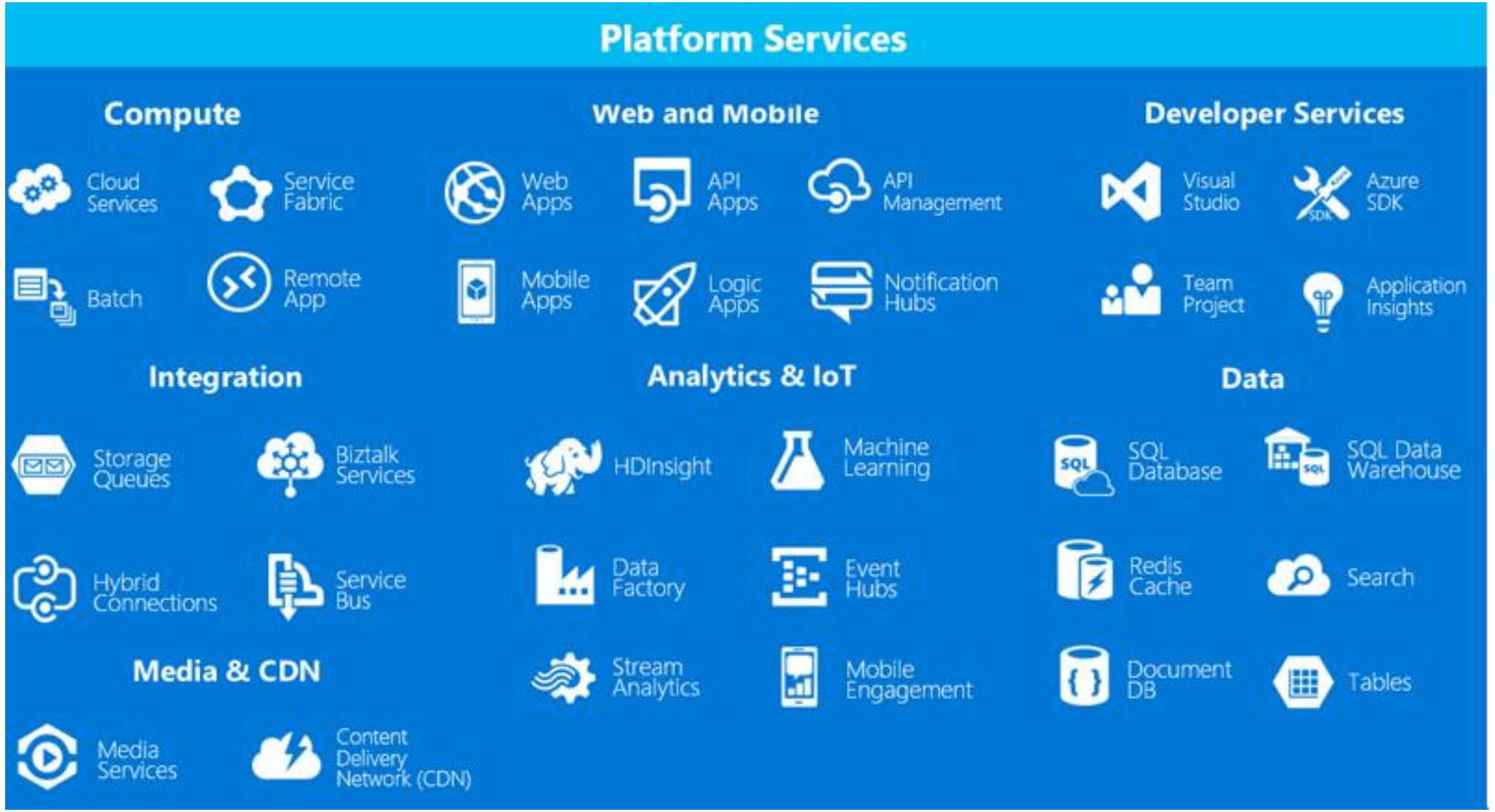
Similarities between AWS and traditional IT



Main Cloud Providers

- Amazon Web Services (AWS)
- Microsoft Azure Cloud
- Google Cloud

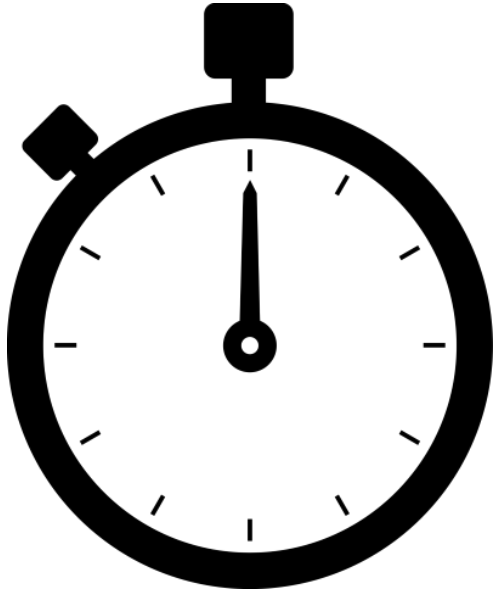
Microsoft Azure web services



Advantages of cloud computing

Trade capital expense for variable expense

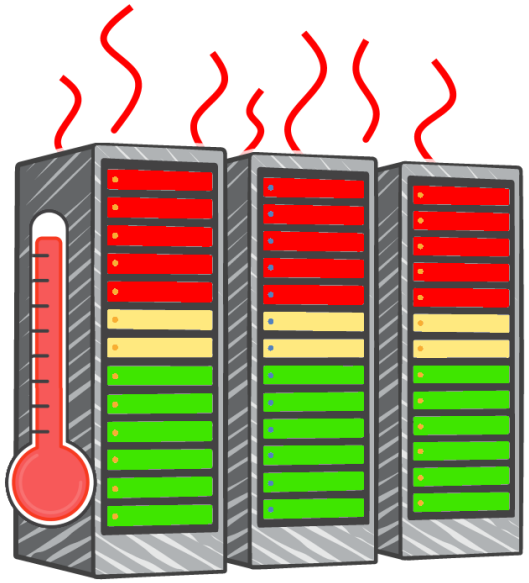
Data center investment based on forecast



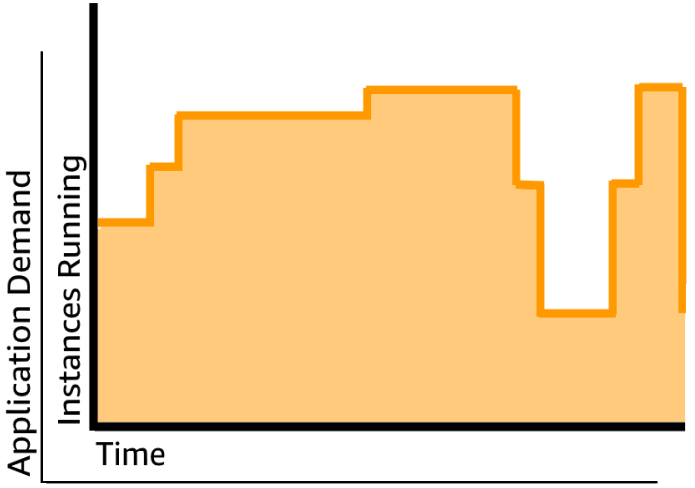
Pay only for the amount you consume

Stop guessing capacity

Overestimated server capacity



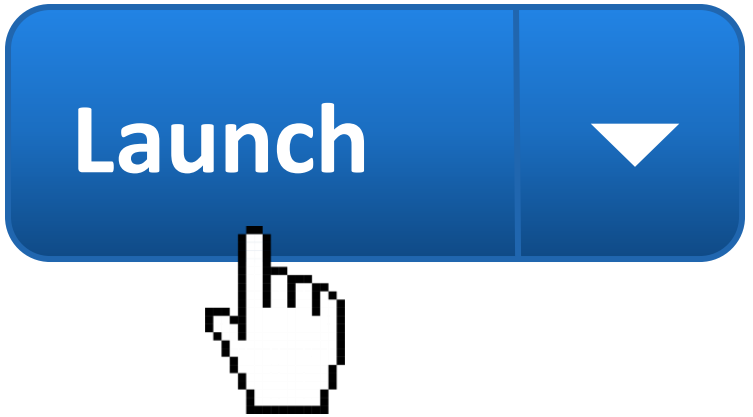
Underestimated server capacity



Scaling on demand

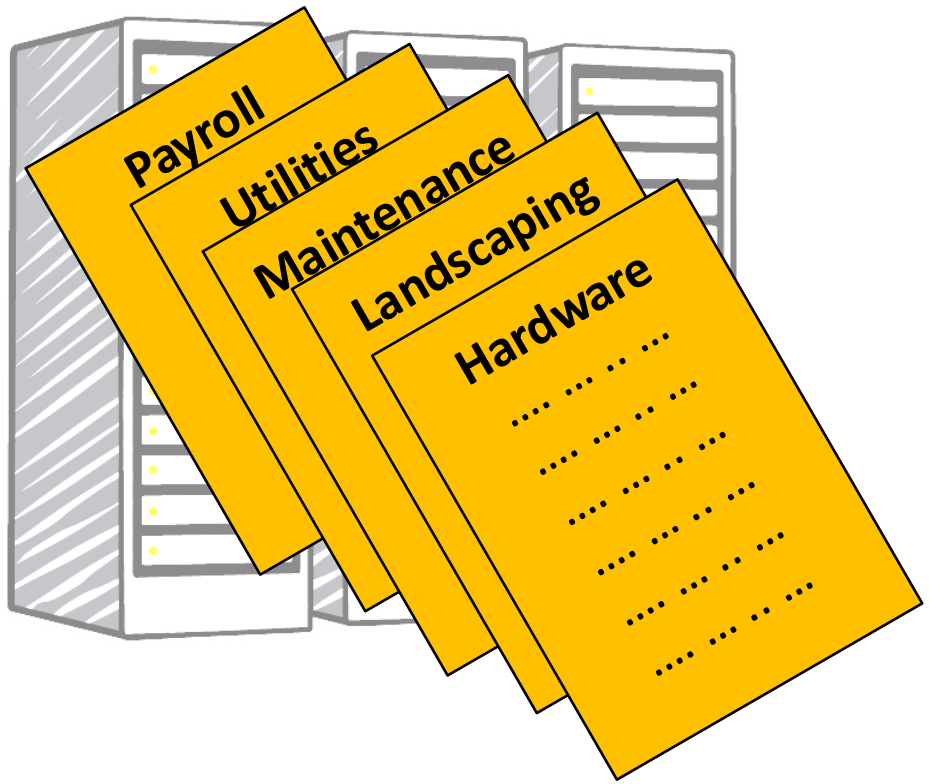
Increase speed and agility

Weeks between wanting resources and having resources

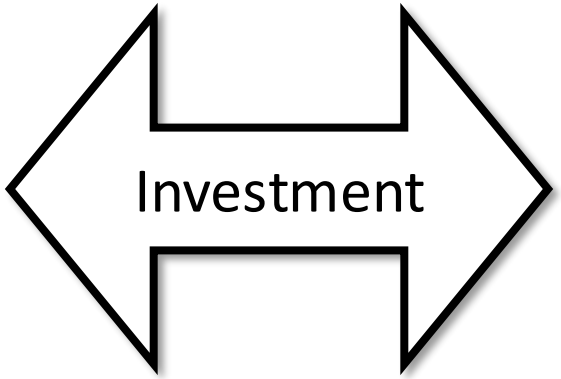


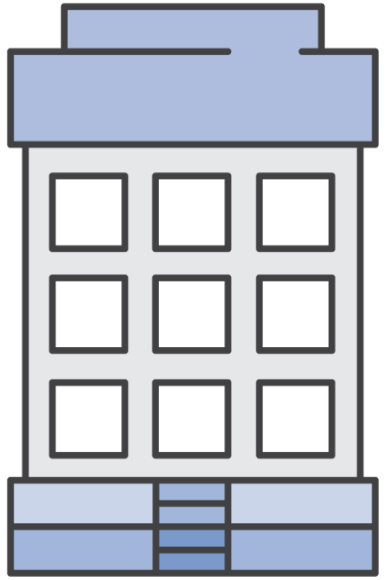
Minutes between wanting resources and having resources

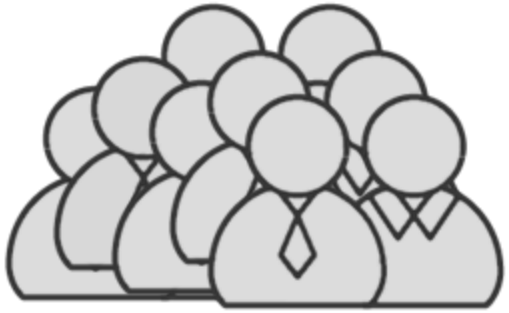
Stop spending money on running and maintaining data centers



Running data centers







Business and customers

Cloud service models

IaaS
(infrastructure as a service)

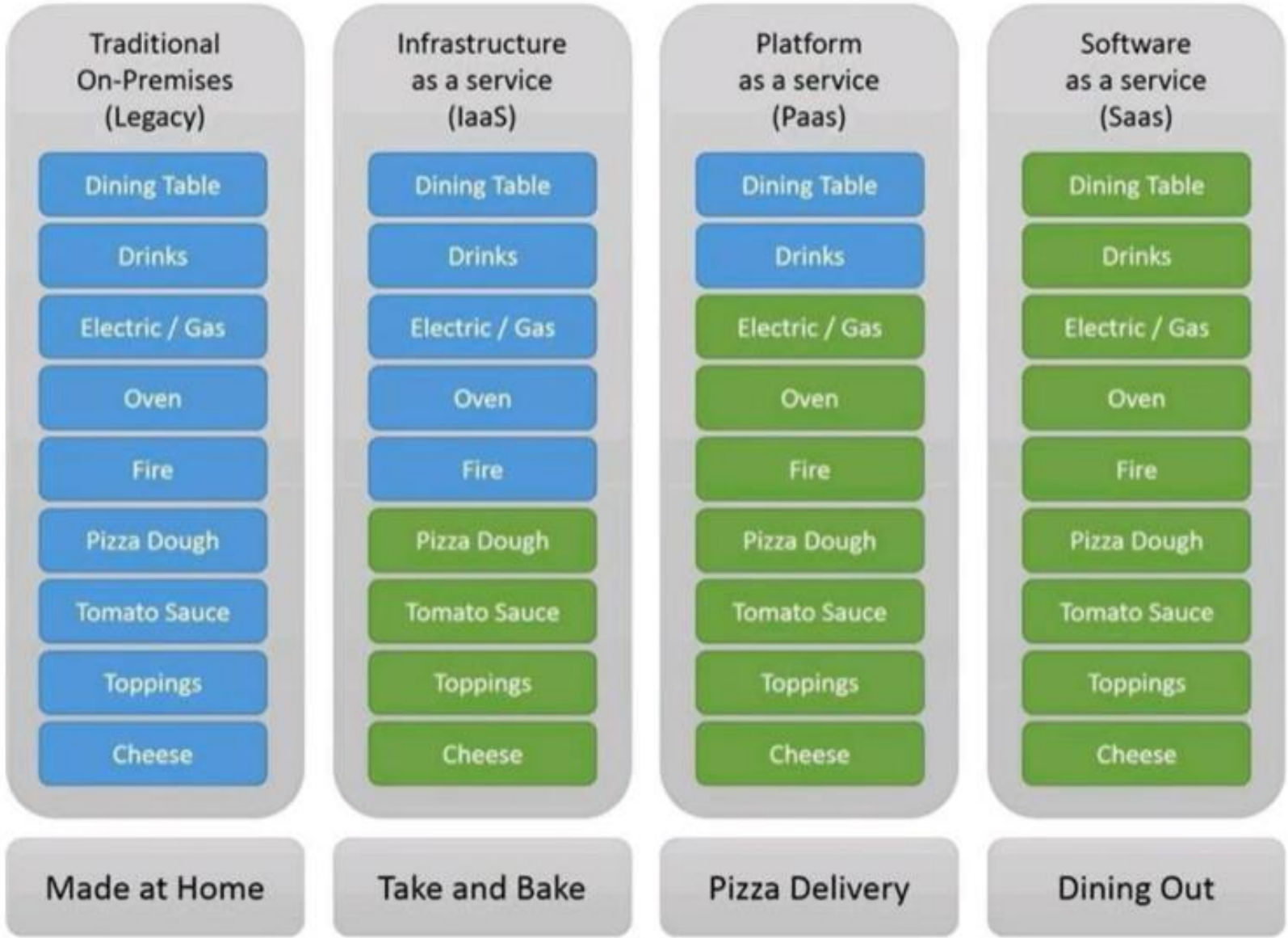
PaaS
(platform as a service)

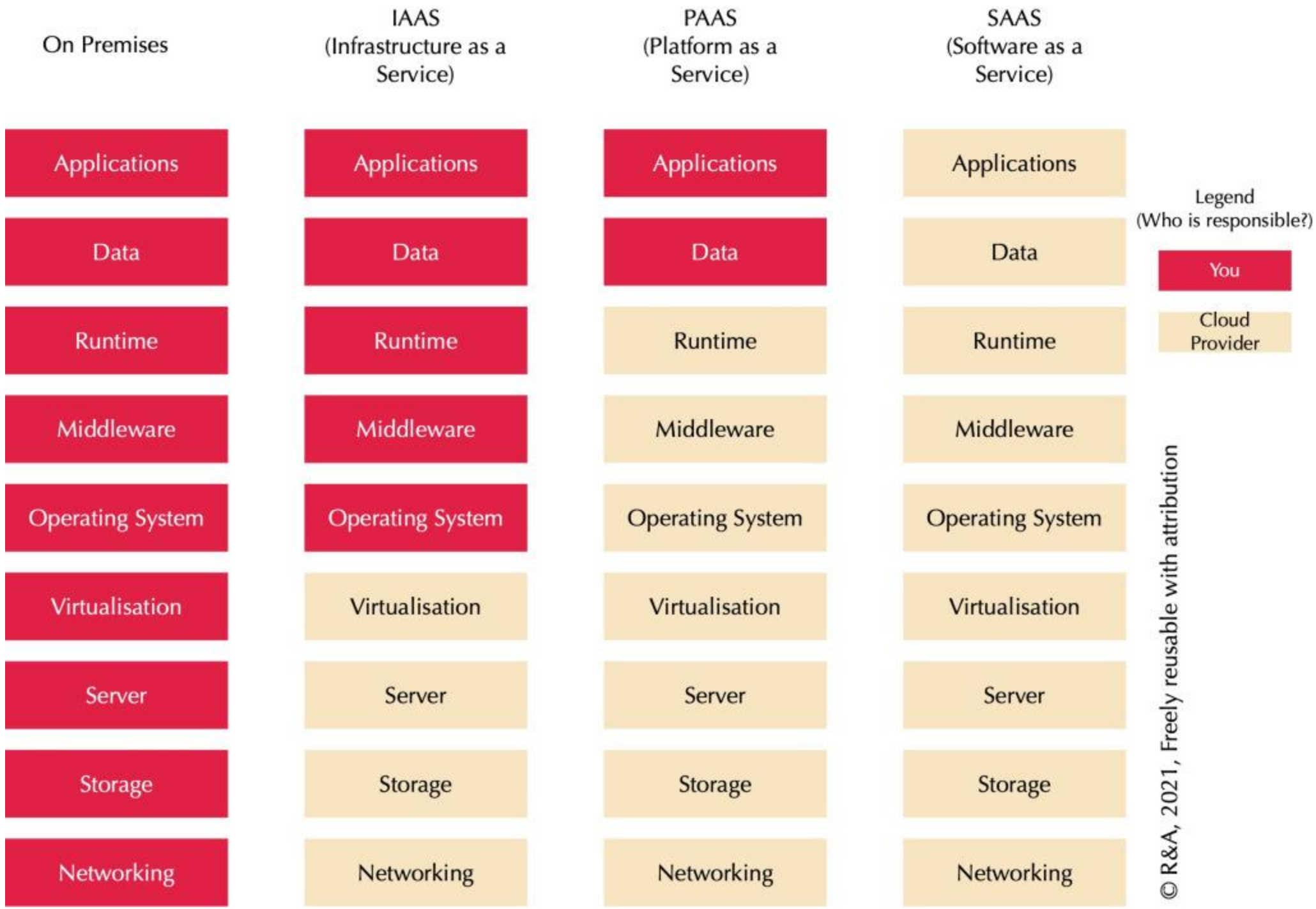
SaaS
(software as a service)

More control
over IT resources

Less control
over IT resources

Pizza as a Service

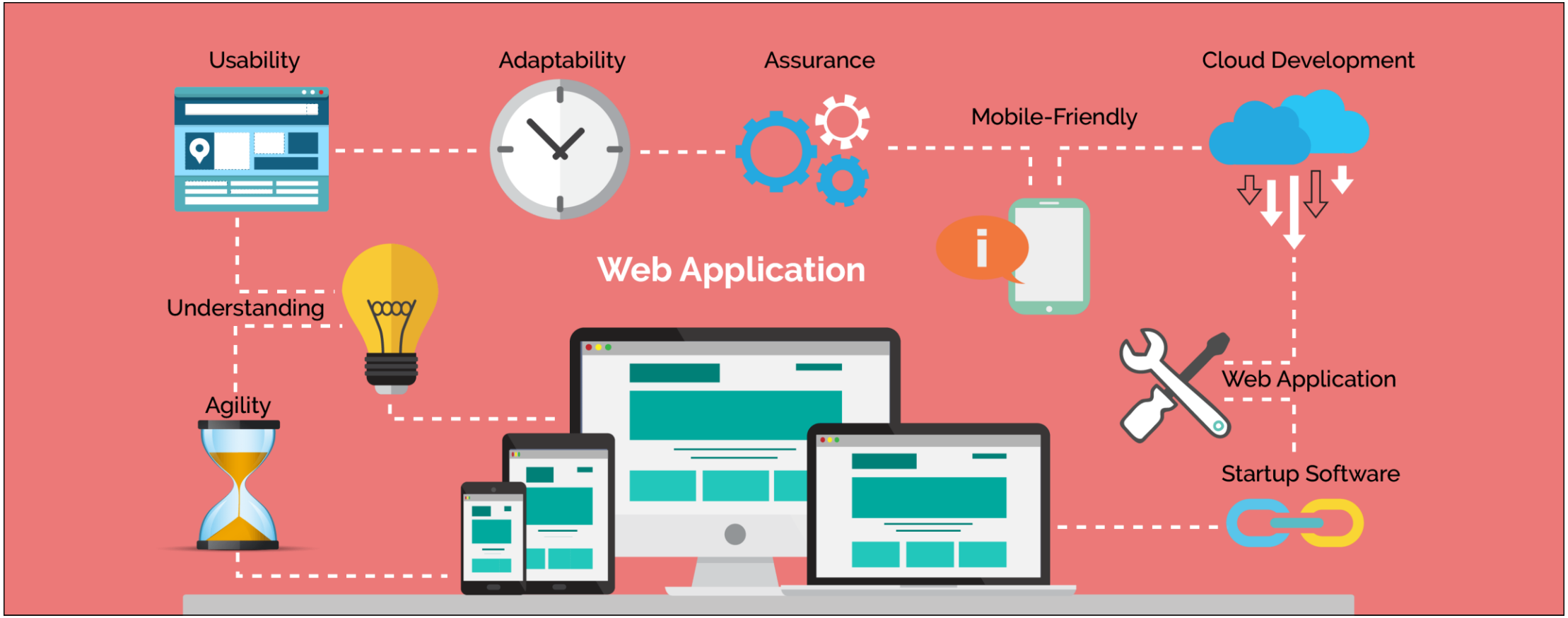




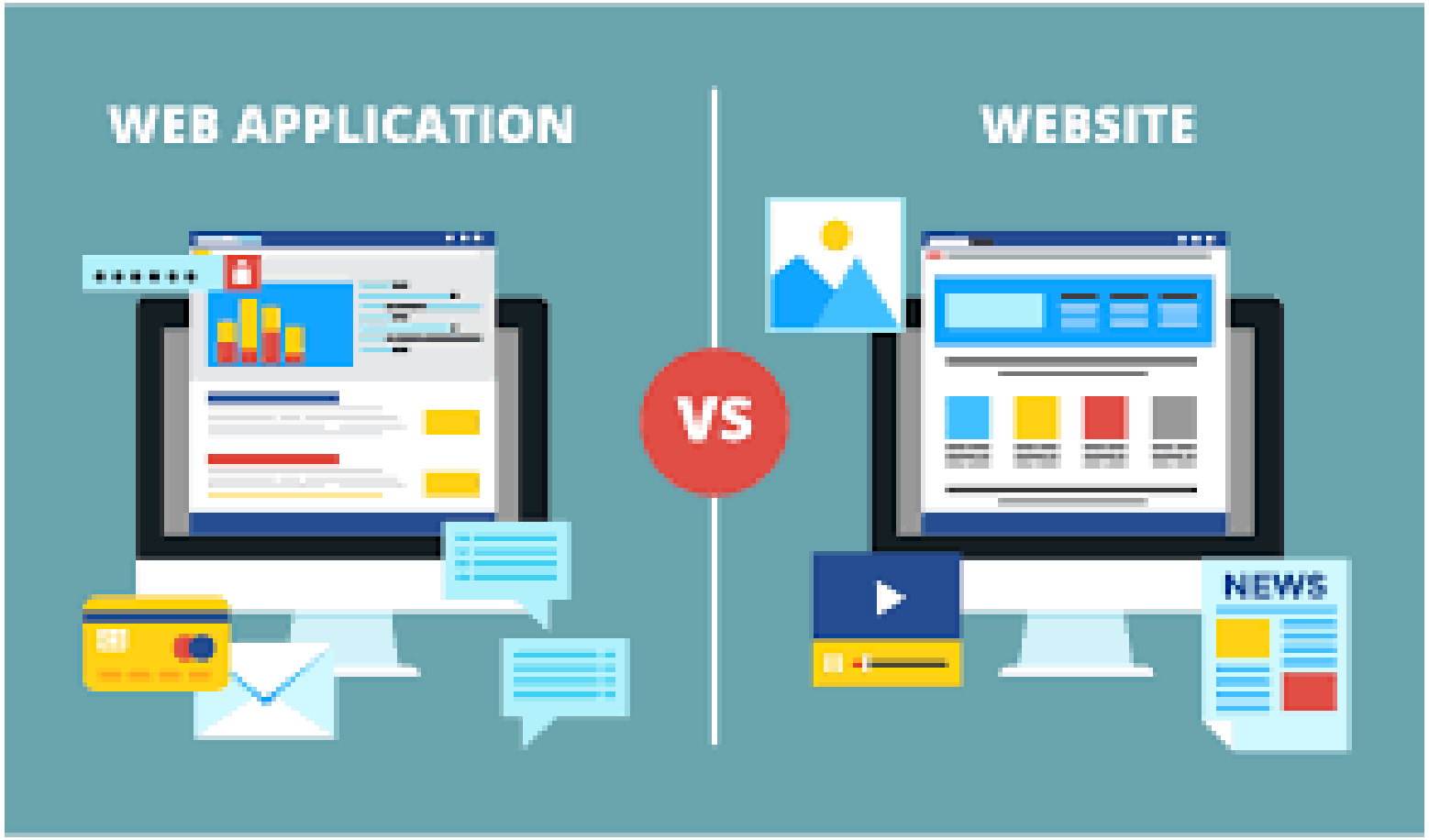
Creating Cloud Services

Web Development

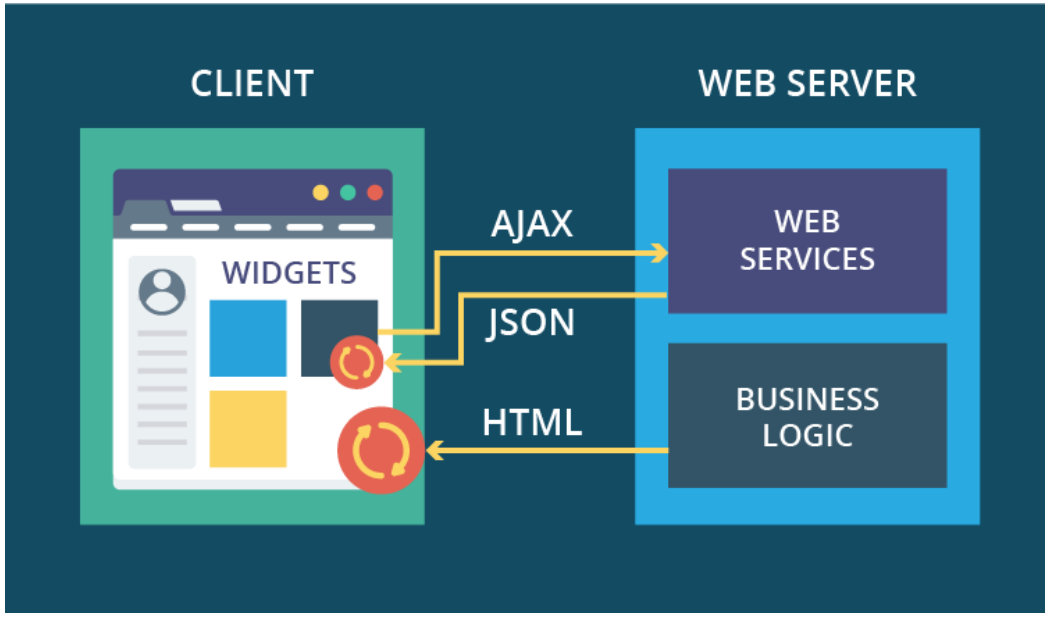
Web applications

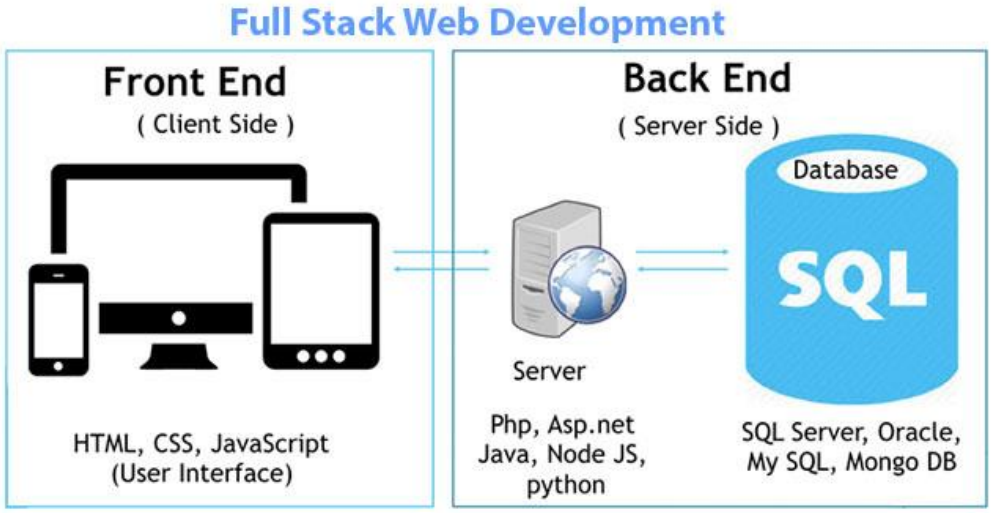


Web App vs. Web Page

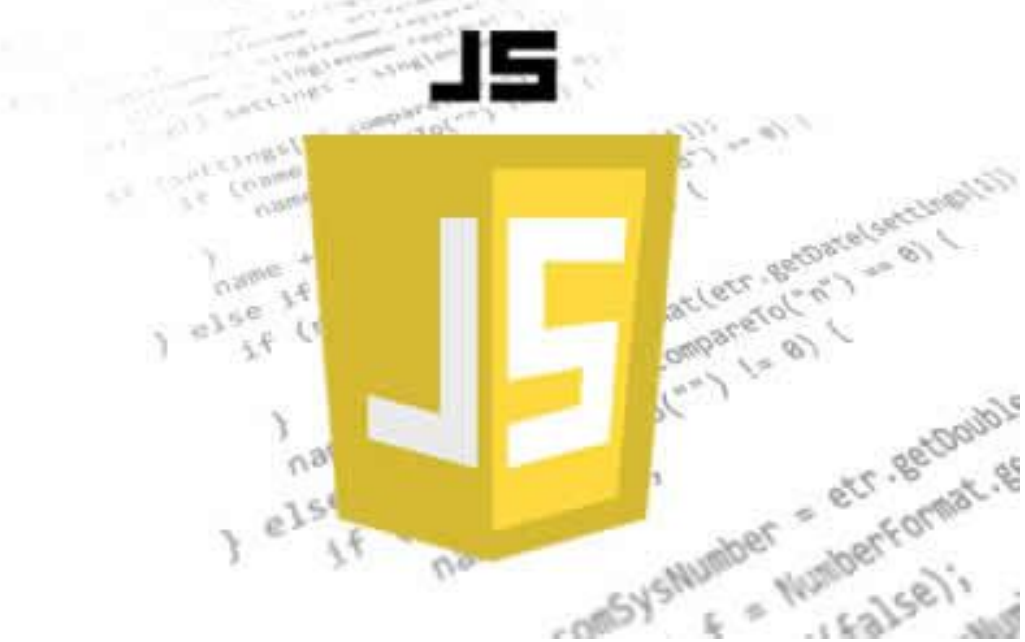


Web development



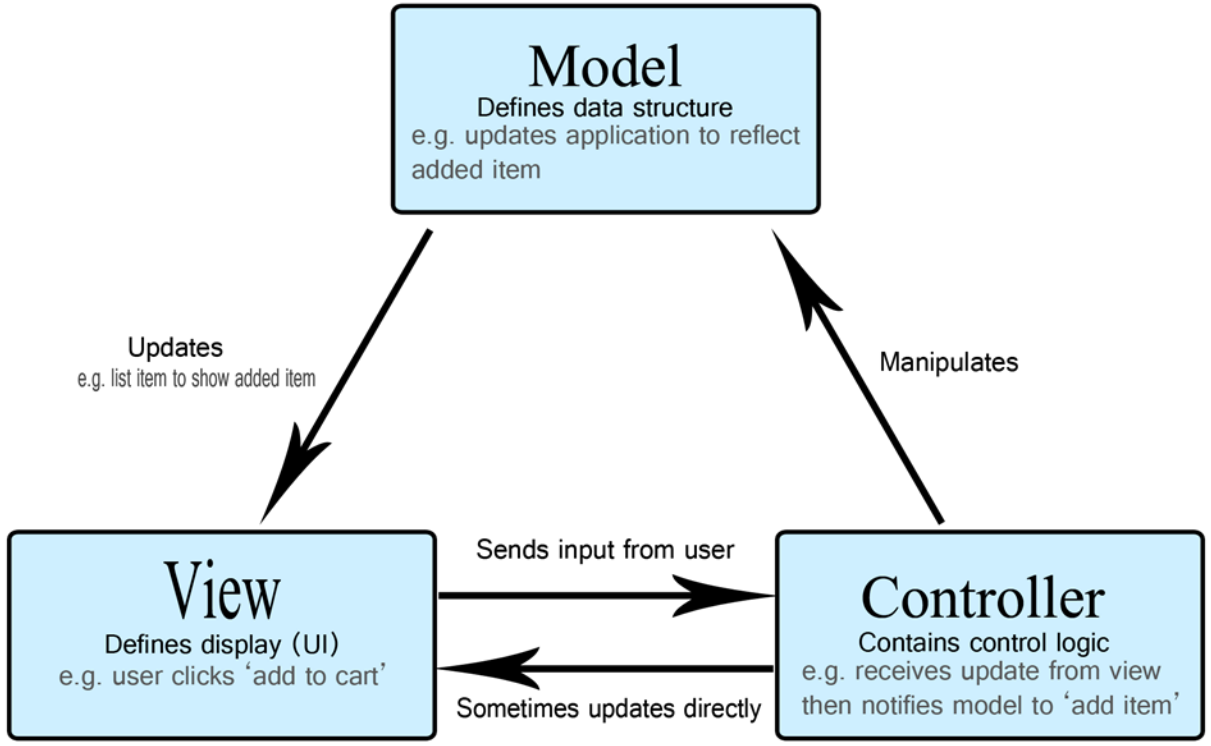


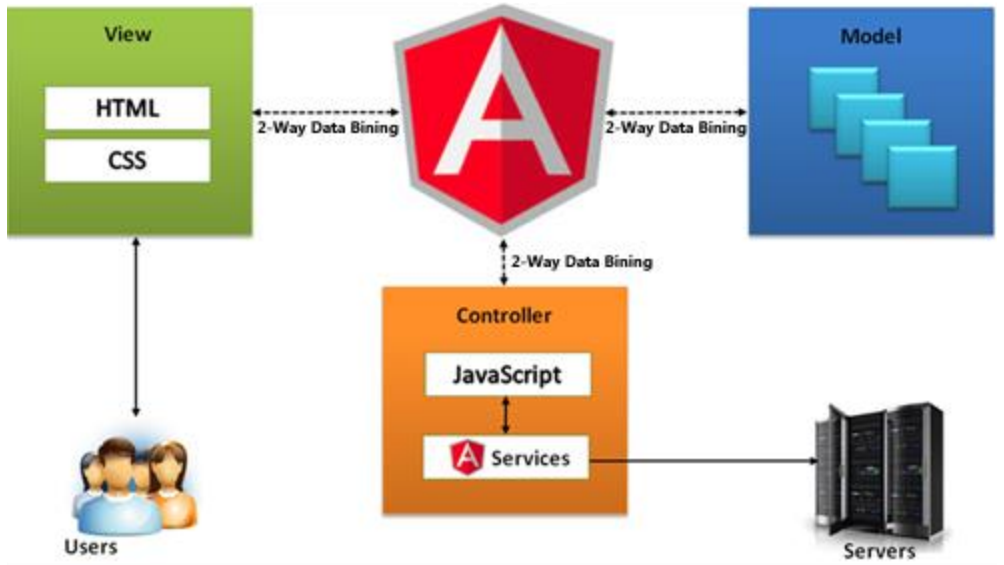
Web development: Front-end



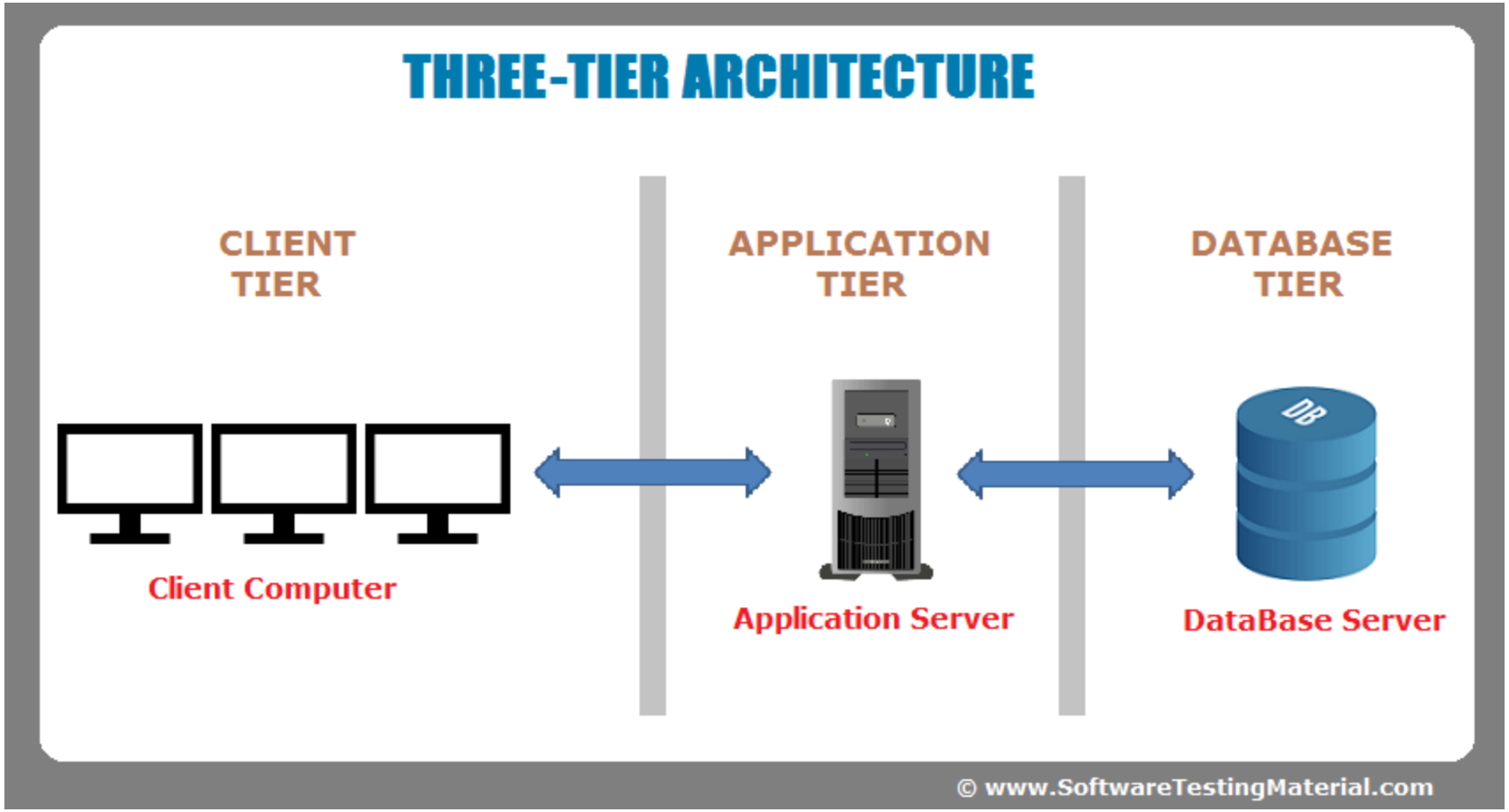
Web development: Back-end

Model View Controller (MVC)





Three Tier Architecture



Web Development Frameworks

Using appropriate framework is essential for a developer because it saves an important time and efforts for building an app