

# Cloud Computing Architecture for Artificial Intelligence (人工智慧雲端運算架構)

Host: 閔立中, TKU AI創智社社長

Time: 18:00-20:00, May 24, 2022 (Tuesday)

Place: TKU AI Club, [MS Teams](#)

戴敏育 副教授

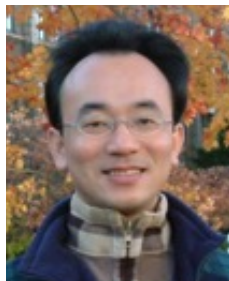
Min-Yuh Day, Ph.D, Associate Professor

國立臺北大學 資訊管理研究所

Institute of Information Management, National Taipei University

<https://web.ntpu.edu.tw/~myday>

2022-05-24





# 戴敏育 博士

## (Min-Yuh Day, Ph.D.)

aws educate | Cloud Ambassador

2020 Cohort

**國立臺北大學 資訊管理研究所 副教授**  
**中央研究院 資訊科學研究所 訪問學人**  
**國立臺灣大學 資訊管理 博士**

Publications Co-Chairs, IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM 2013- )

Program Co-Chair, IEEE International Workshop on Empirical Methods for Recognizing Inference in Text (IEEE EM-RITE 2012- )

Publications Chair, The IEEE International Conference on Information Reuse and Integration for Data Science (IEEE IRI)

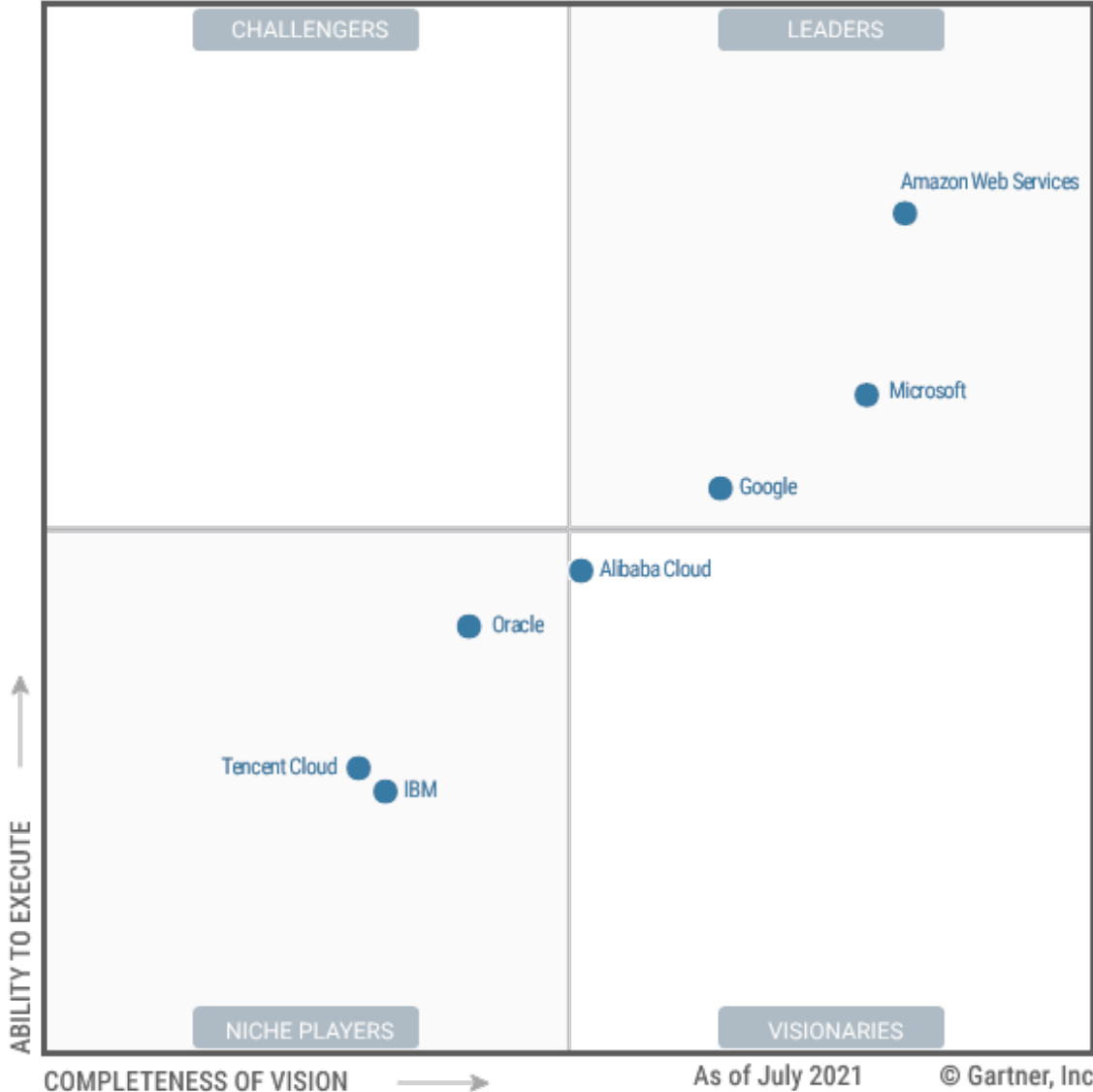


# Outline

- **Cloud Computing Architecture for AI**
- **AWS Certifications Roadmap for Machine Learning**
- **AWS Serverless Architecture**

# Cloud Computing Architecture

# Gartner Magic Quadrant for Cloud Infrastructure and Platform Services



Amazon Web Services

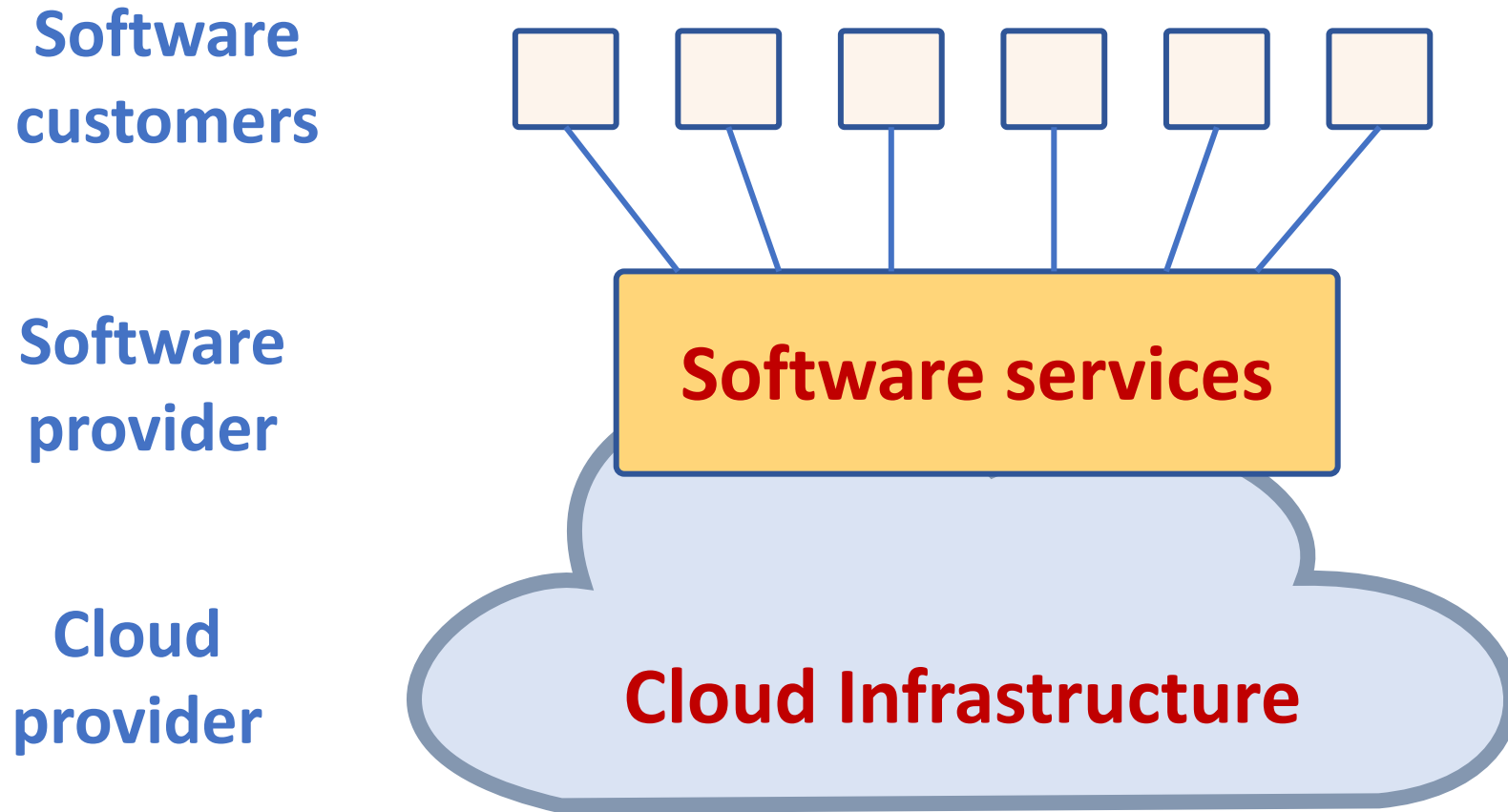
Microsoft

Google

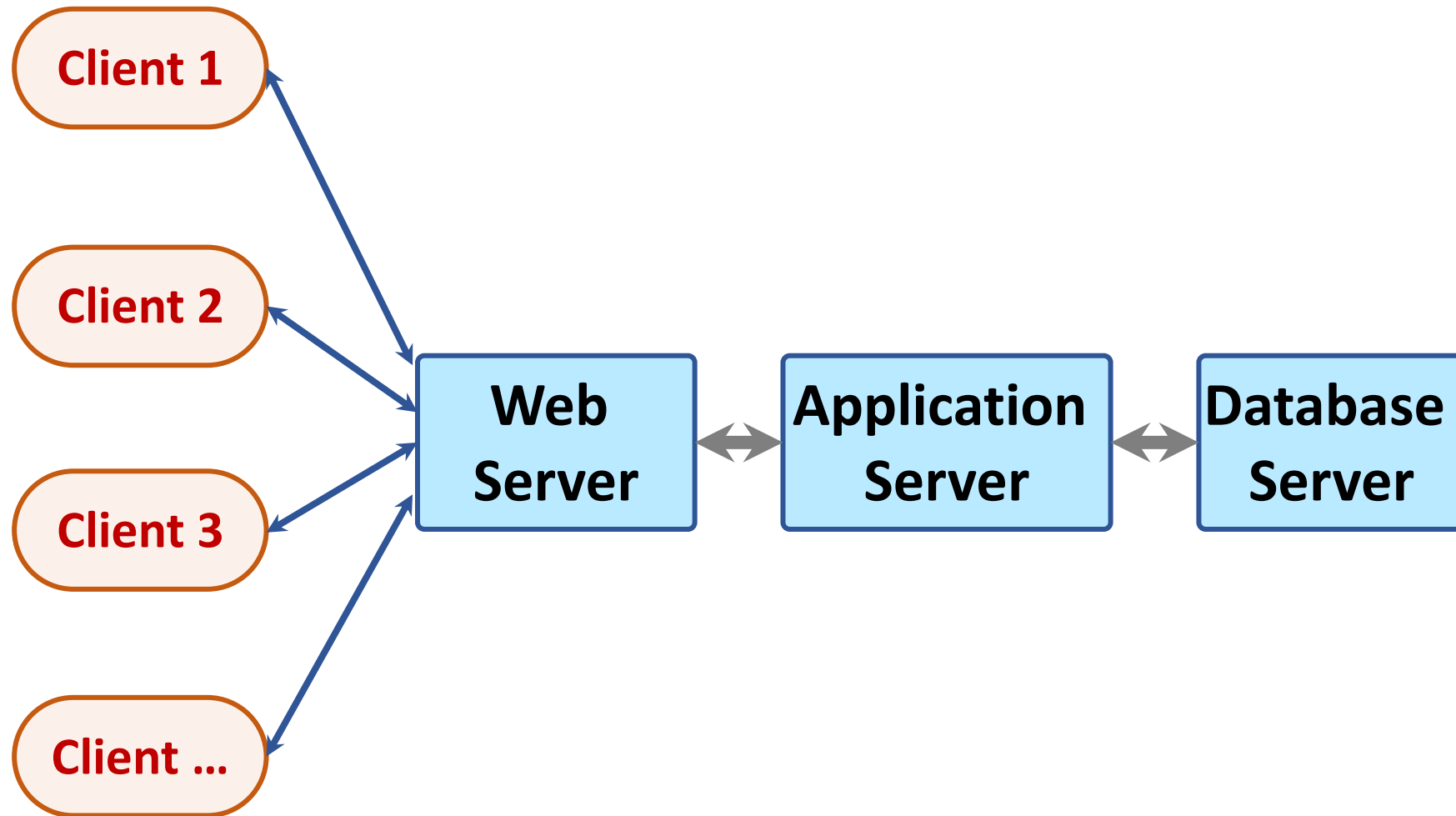
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Gartner.

Source: <https://www.gartner.com/doc/reprints?id=1-2710E4VR&ct=210802>

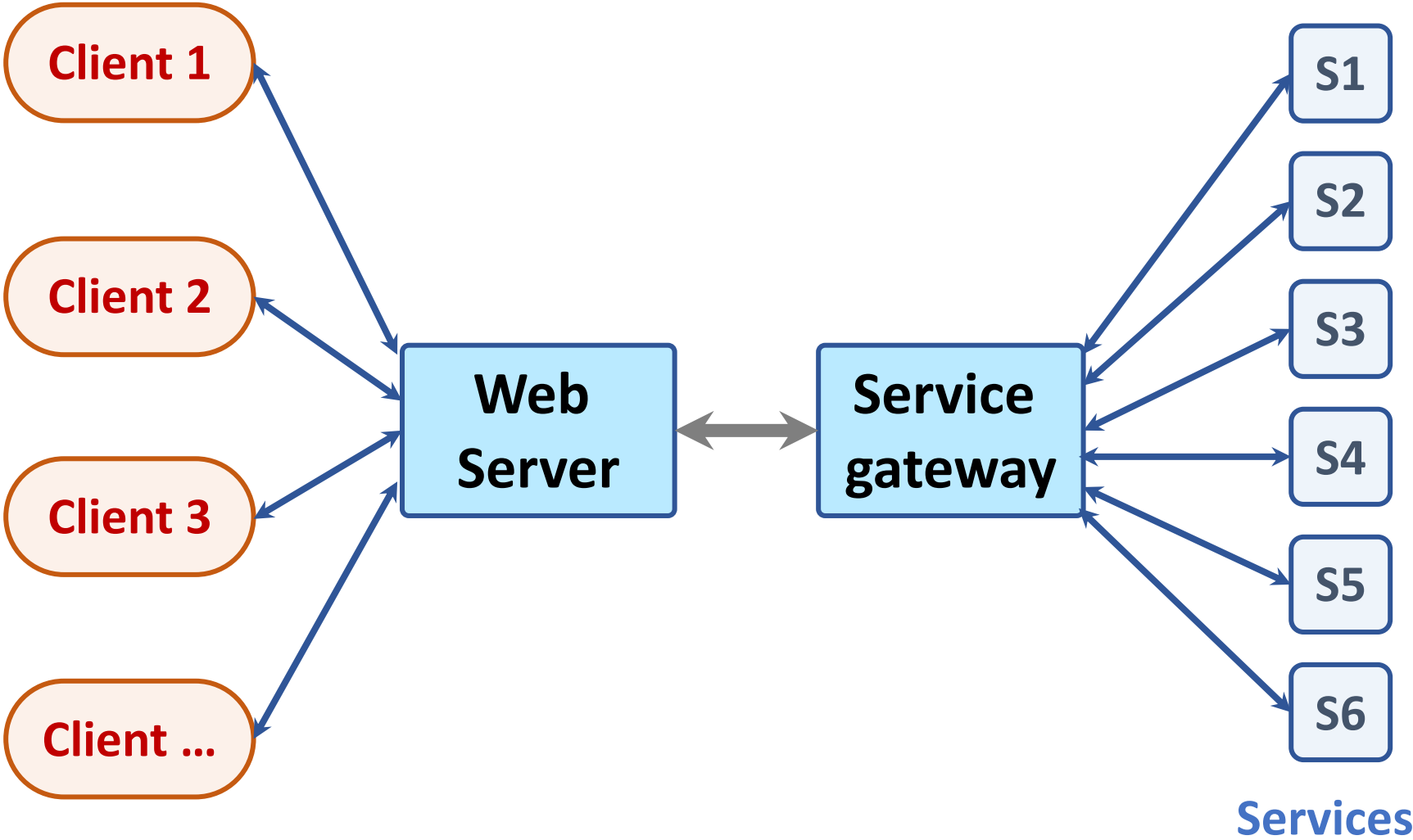
# Software as a service



# Multi-tier client-server architecture

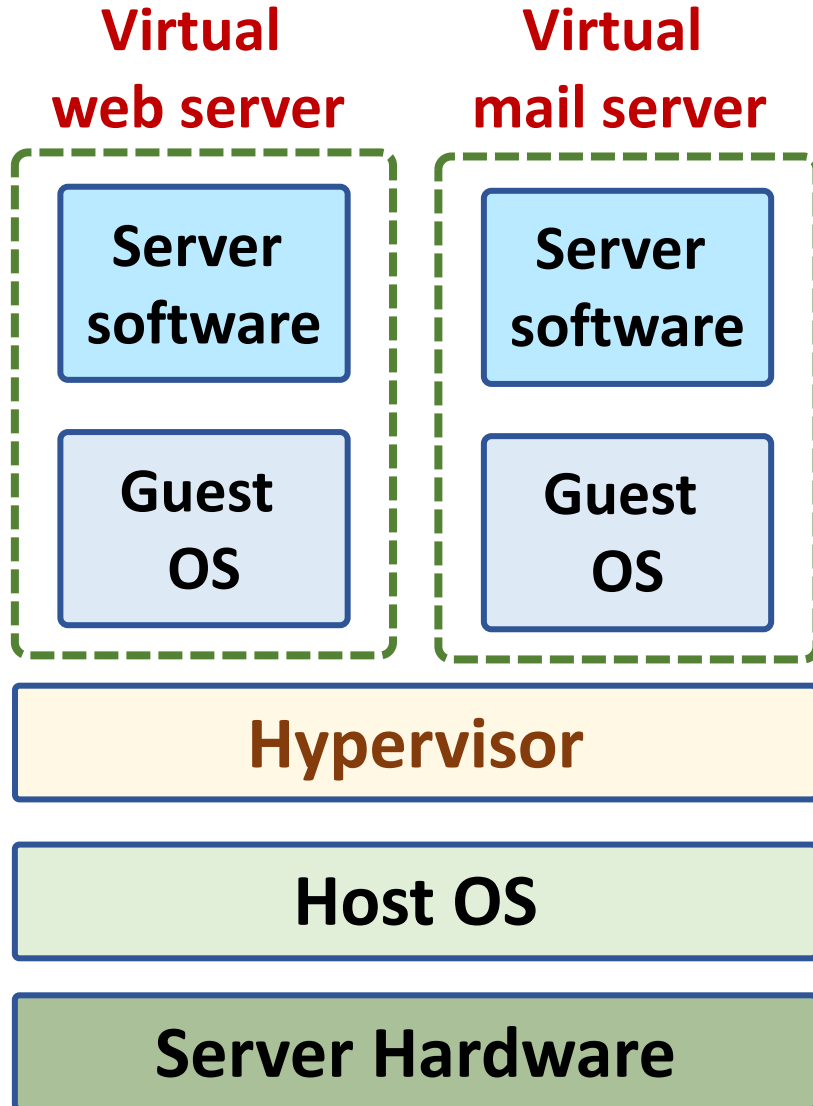


# Service-oriented Architecture

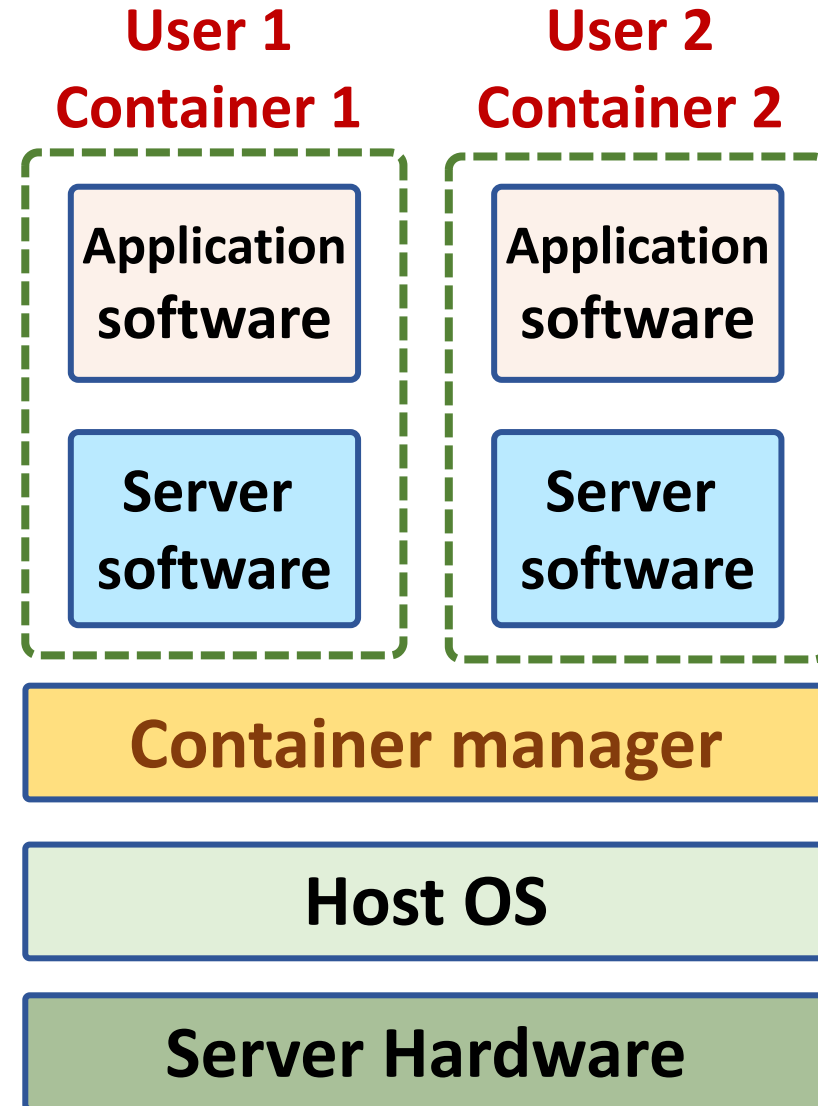




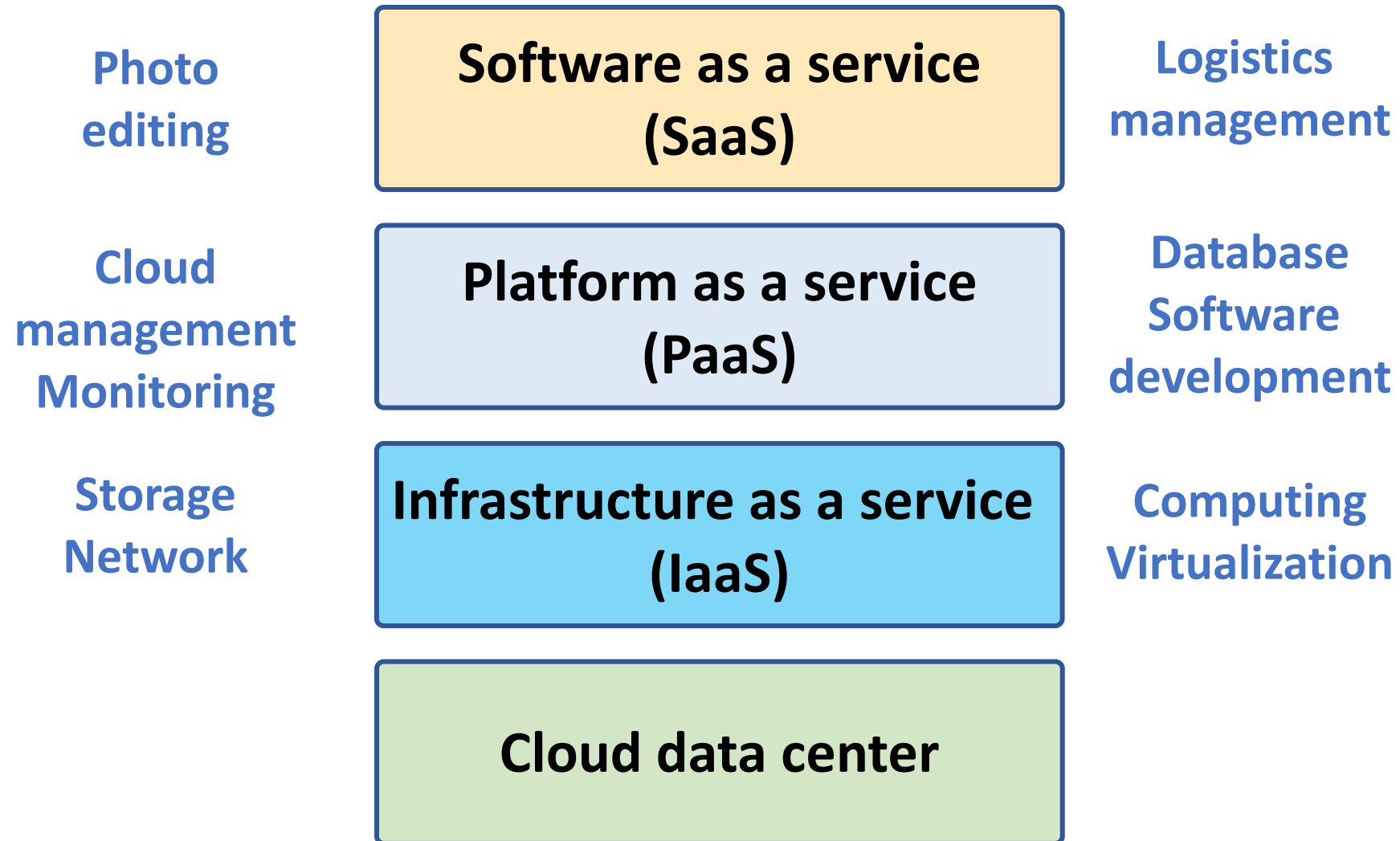
# VM



# Container

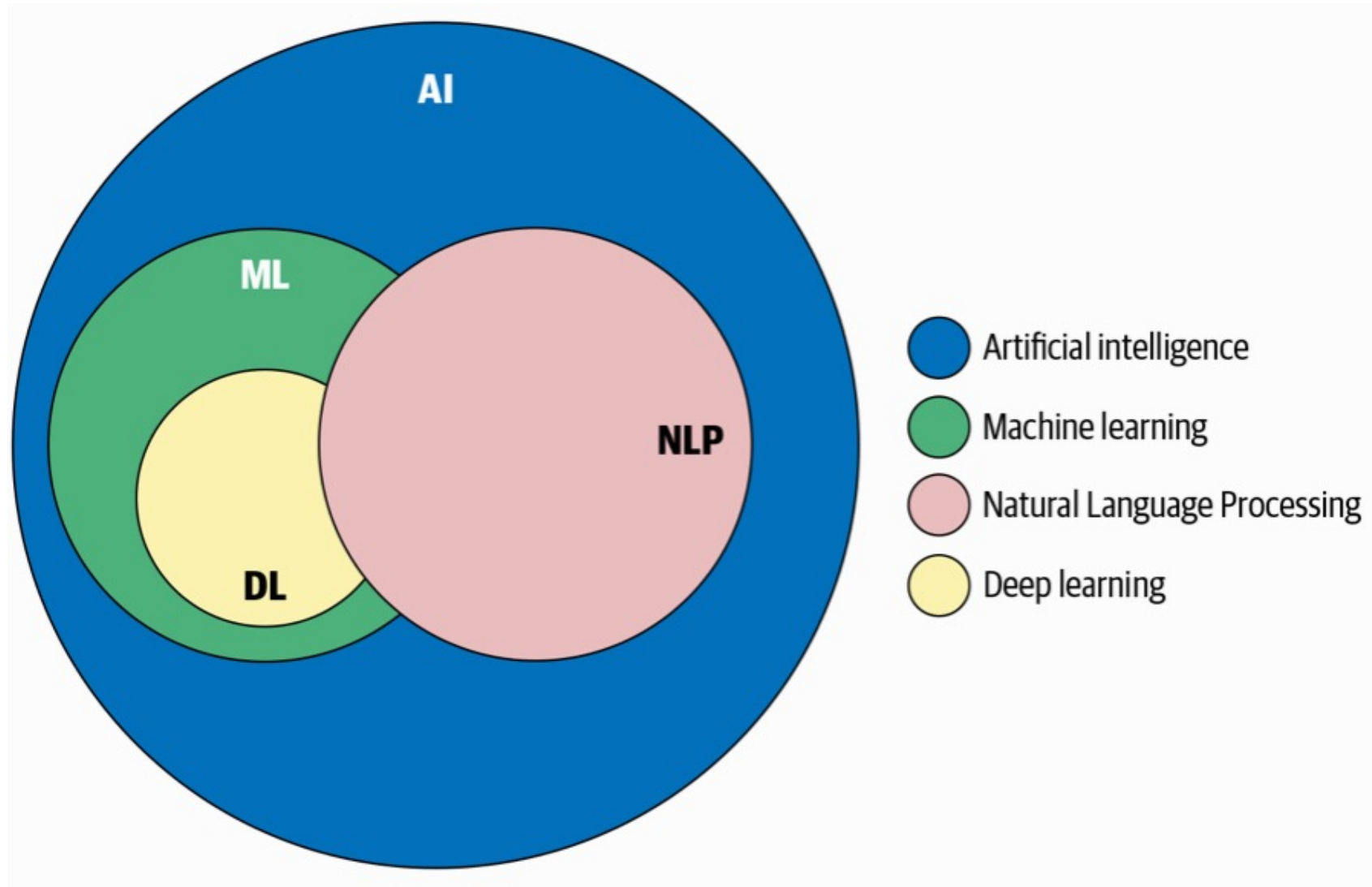


# Everything as a service

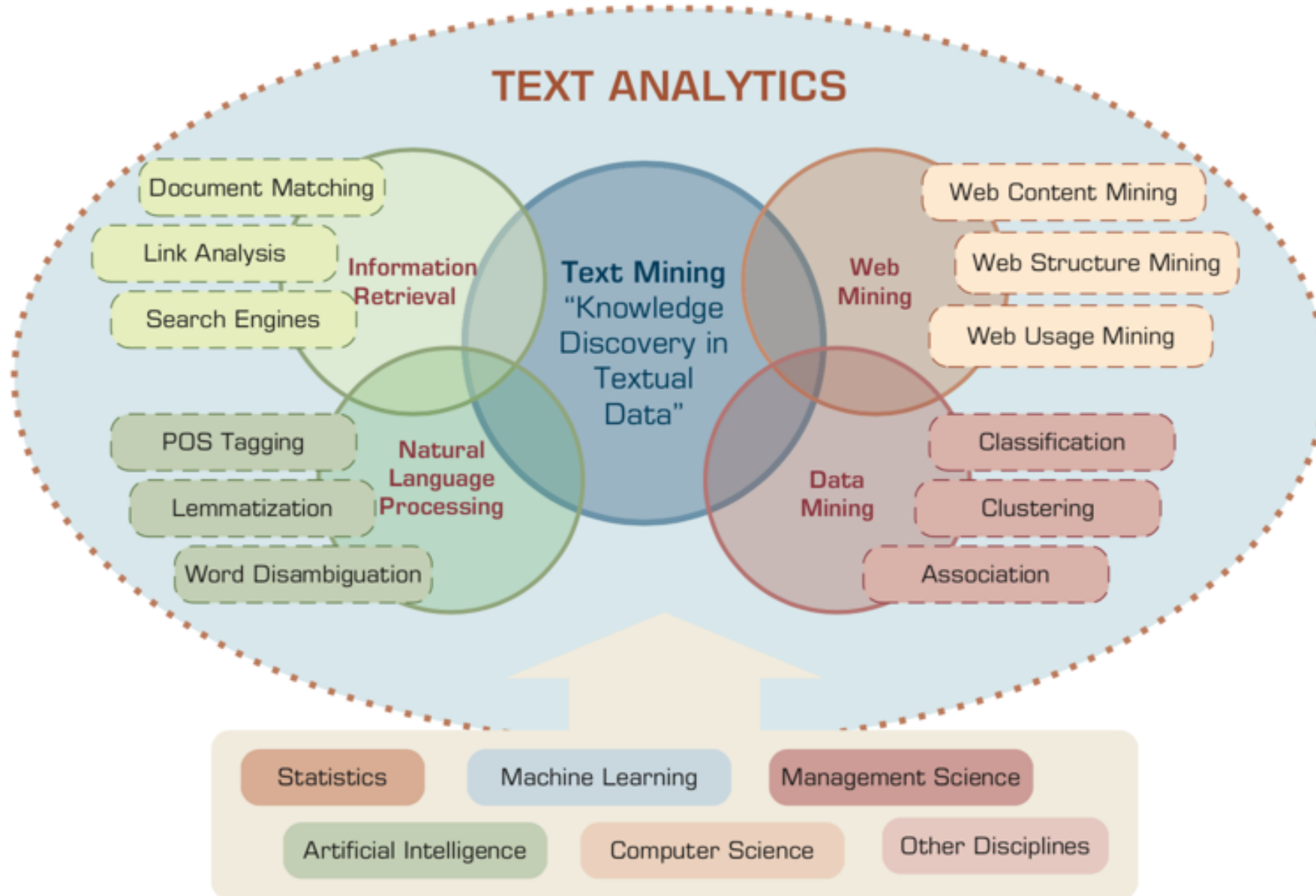


# Artificial Intelligence (AI)

# AI, NLP, ML, DL

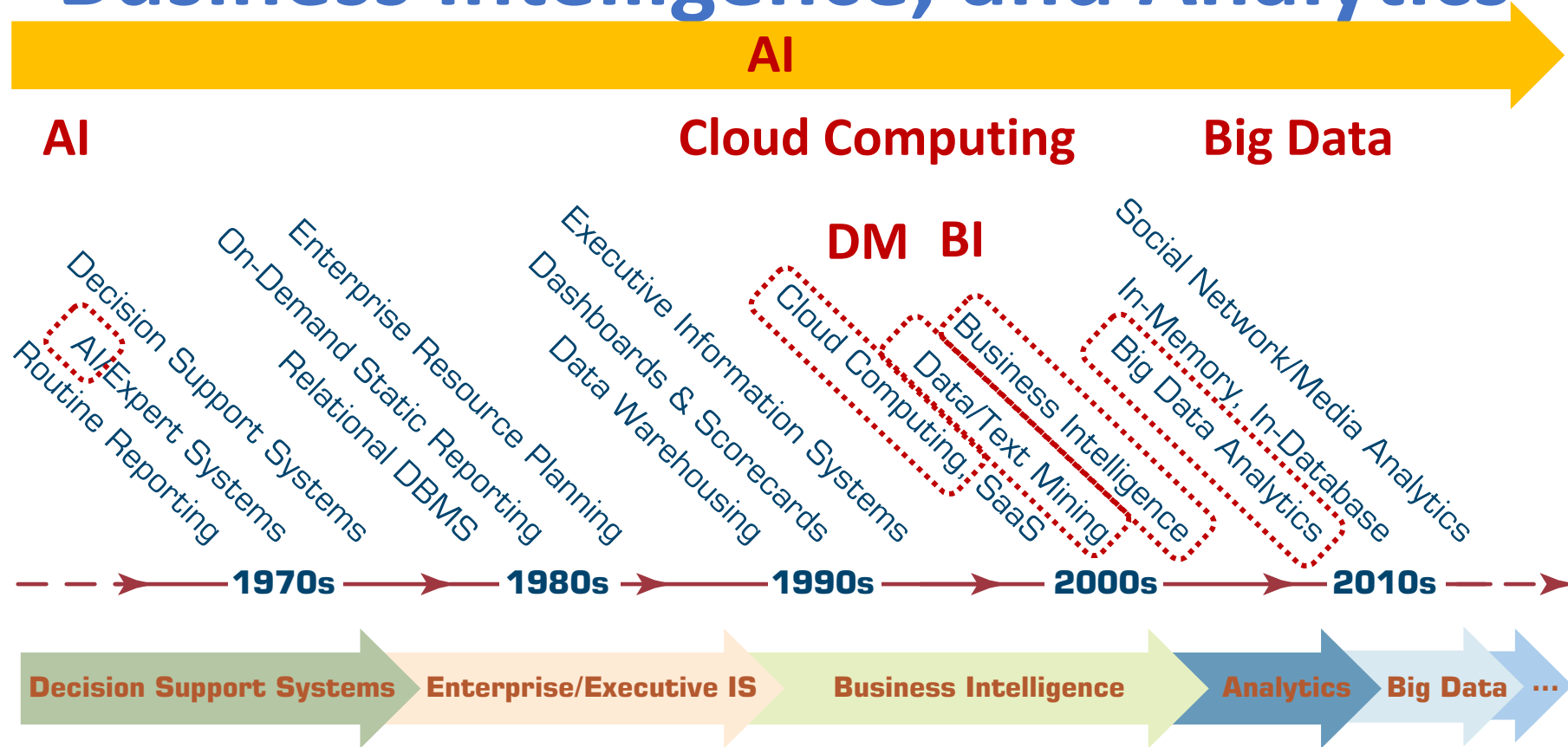


# Text Analytics and Text Mining

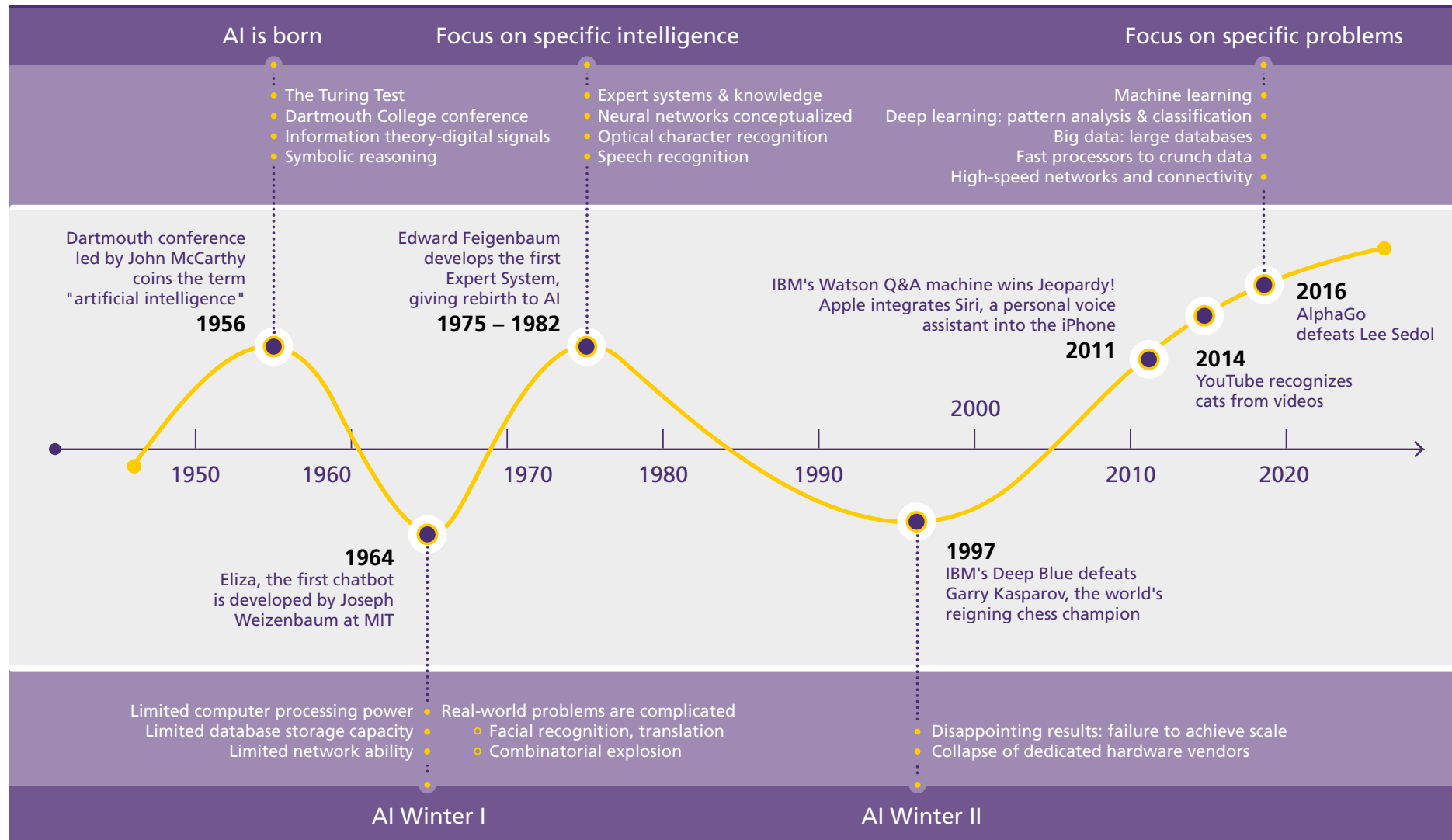


# AI, Big Data, Cloud Computing

## Evolution of Decision Support, Business Intelligence, and Analytics



# The Rise of AI



# **Definition of Artificial Intelligence (A.I.)**



# Artificial Intelligence

**“... the science and  
engineering  
of  
making  
intelligent machines”**

**(John McCarthy, 1955)**

# Artificial Intelligence

**“... technology that  
thinks and acts  
like humans”**

# Artificial Intelligence

**“... intelligence  
exhibited by machines  
or software”**

# 4 Approaches of AI

<b>Thinking Humanly</b>	<b>Thinking Rationally</b>
<b>Acting Humanly</b>	<b>Acting Rationally</b>

# 4 Approaches of AI

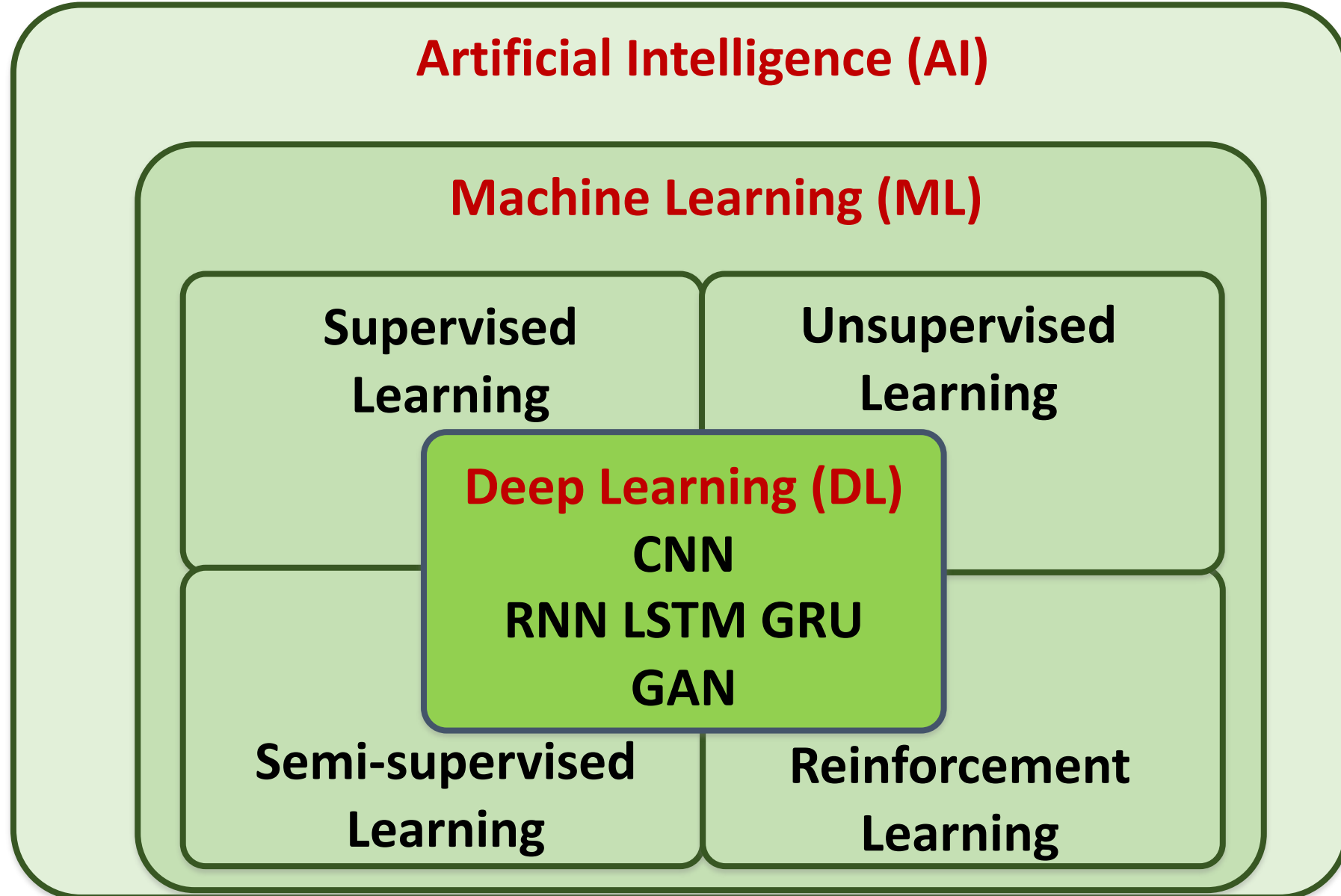
<p><b>2.</b> <b>Thinking Humanly: The Cognitive Modeling Approach</b></p>	<p><b>3.</b> <b>Thinking Rationally: The “Laws of Thought” Approach</b></p>
<p><b>1.</b> <b>Acting Humanly: The Turing Test Approach</b> (1950)</p>	<p><b>4.</b> <b>Acting Rationally: The Rational Agent Approach</b></p>

# AI Acting Humanly: The Turing Test Approach

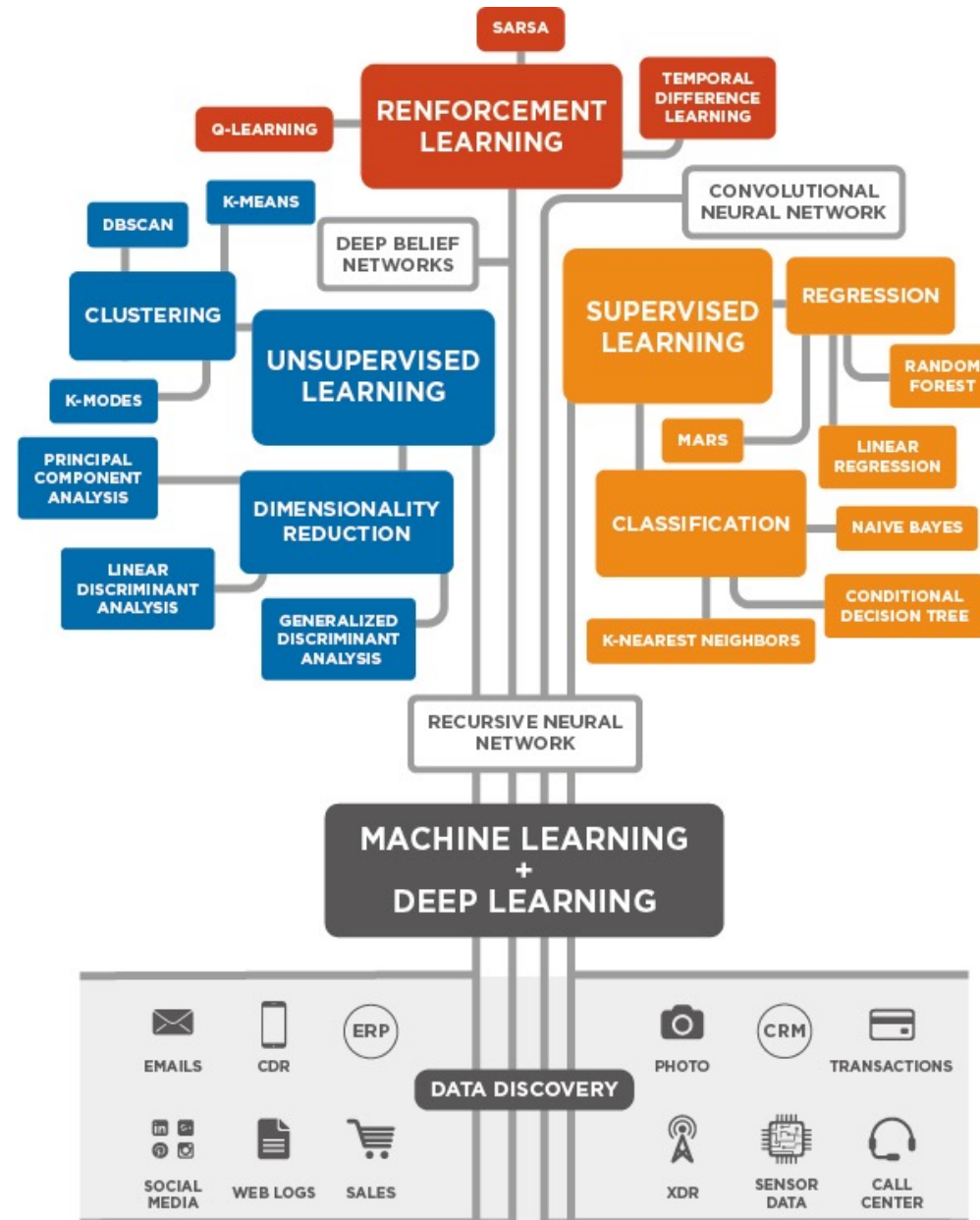
(Alan Turing, 1950)

- Knowledge Representation
- Automated Reasoning
- Machine Learning (ML)
  - Deep Learning (DL)
- Computer Vision (Image, Video)
- Natural Language Processing (NLP)
- Robotics

# AI, ML, DL

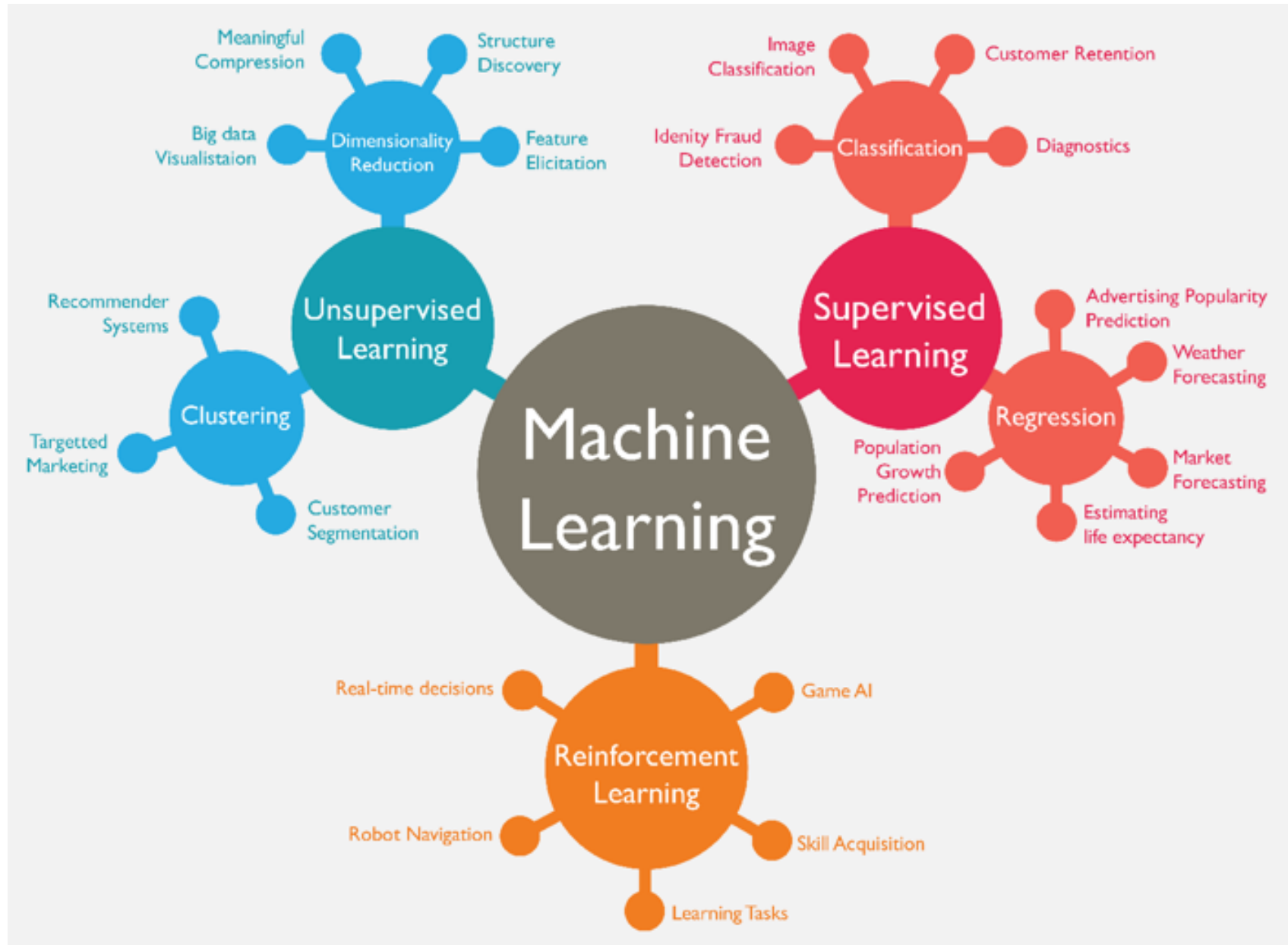


# 3 Machine Learning Algorithms





# Machine Learning (ML)

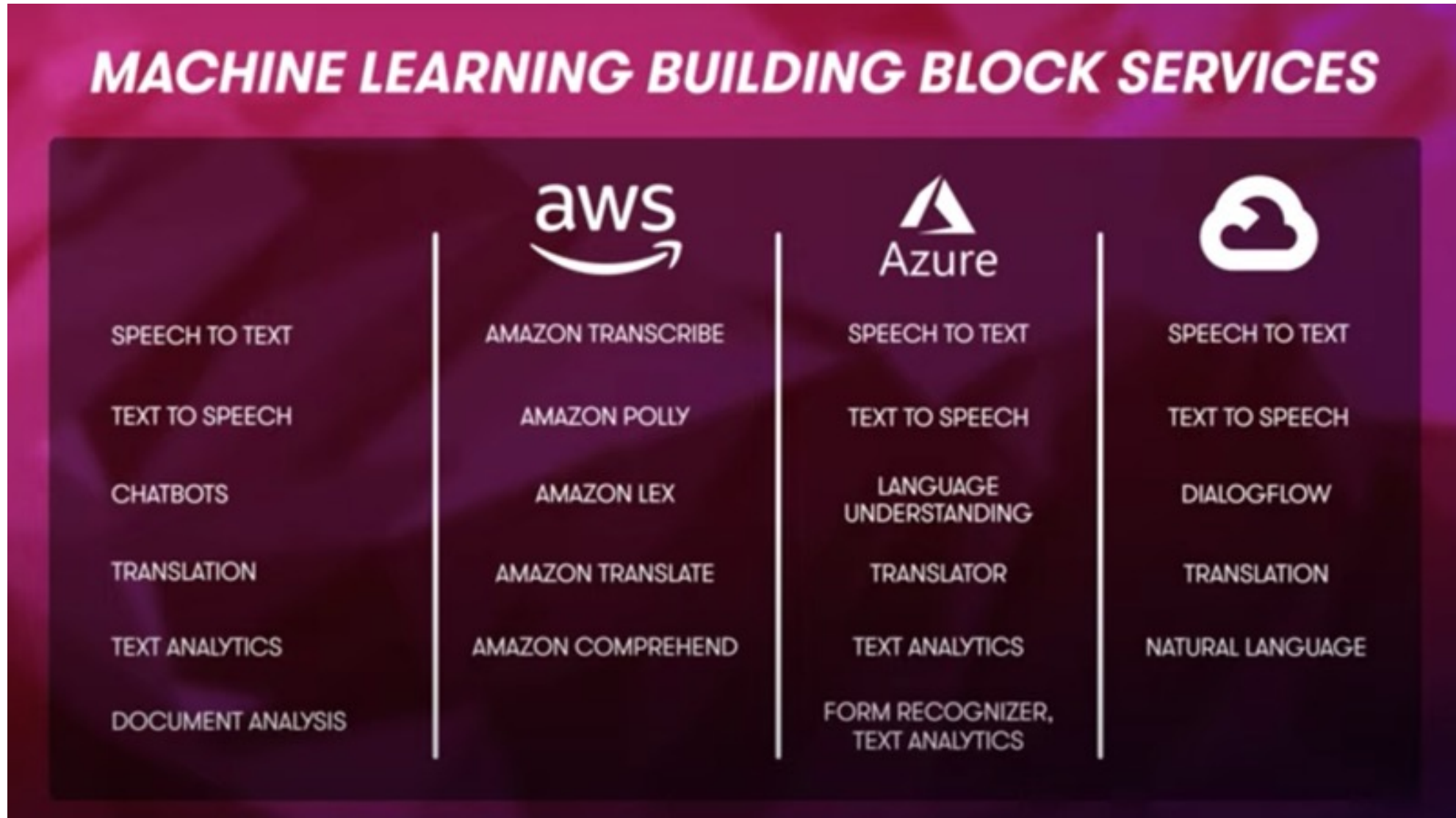


# **Cloud Computing Architecture for Artificial Intelligence**

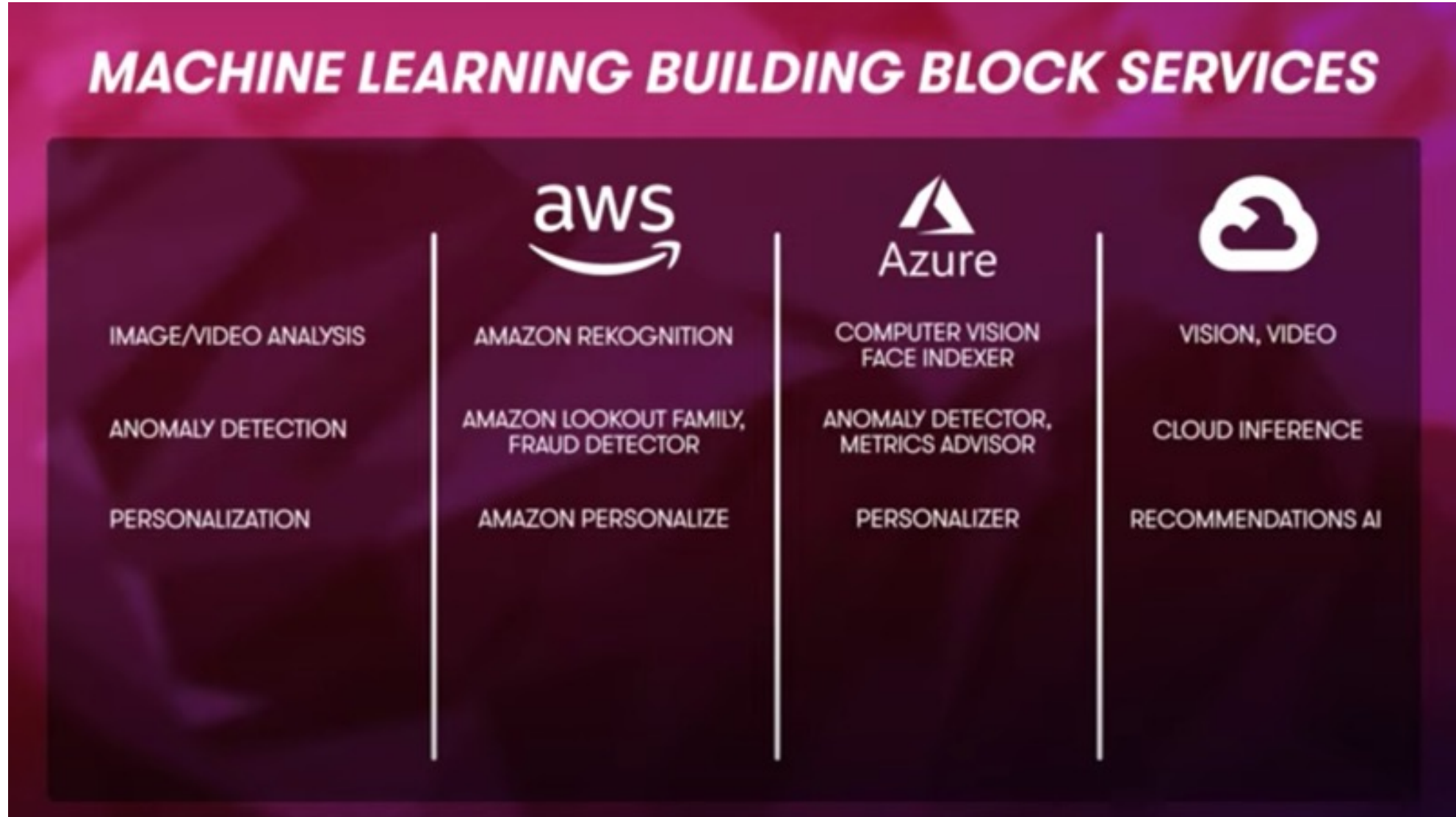
# Cloud Computing Architecture for AI Machine Learning

- **Lots of data**
- **Computation / Algorithms**
- **Knowledge**


# Artificial Intelligence and Machine Learning: AWS vs Azure vs GCP



# Artificial Intelligence and Machine Learning: AWS vs Azure vs GCP

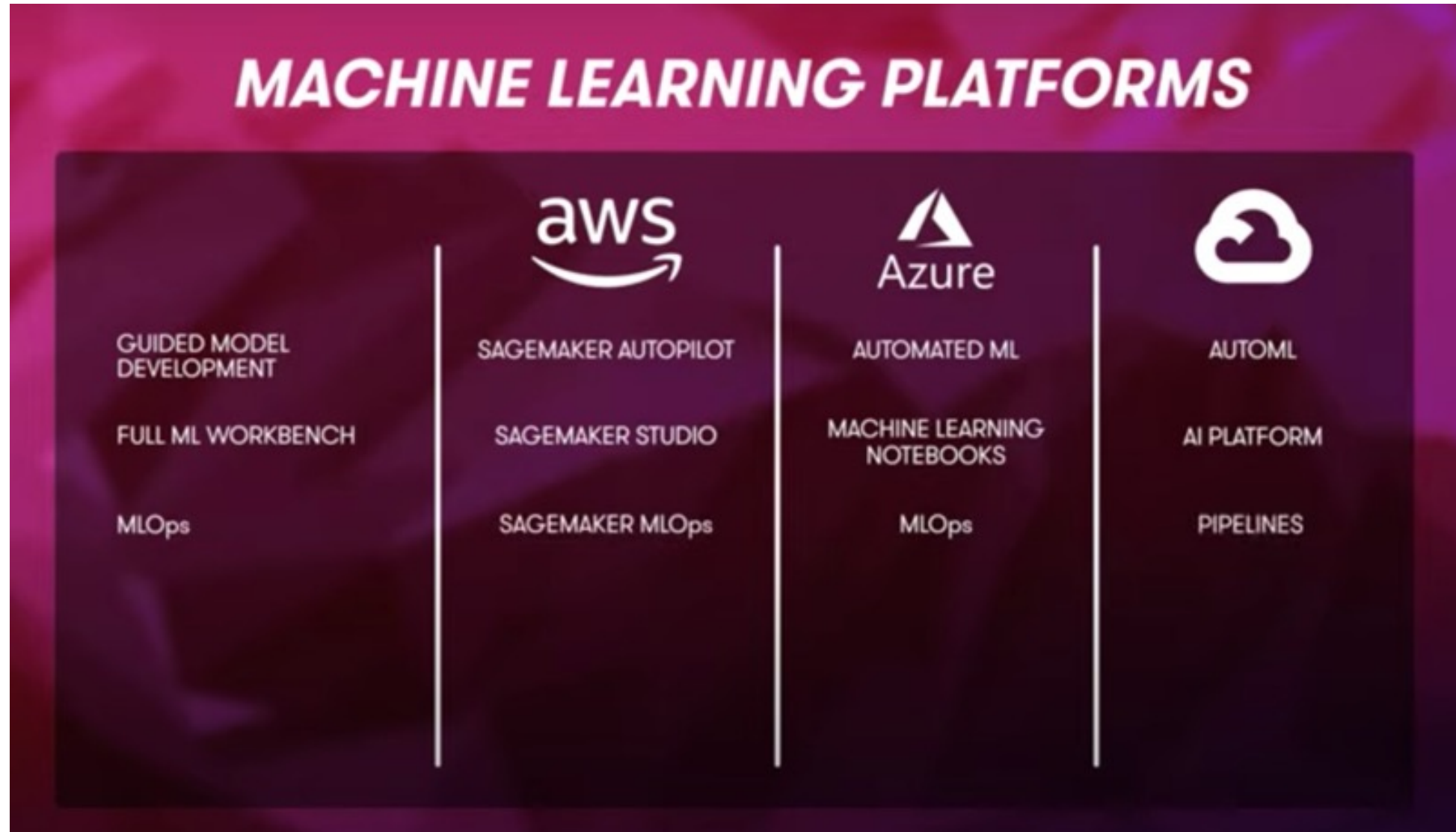


# Artificial Intelligence and Machine Learning: AWS vs Azure vs GCP

MACHINE LEARNING PLATFORMS			
	aws	Azure	
JUPYTER NOTEBOOK	✓	✓	✓
EXTENSIVE FRAMEWORK SUPPORT	✓	✓	✓
SECURITY, COLLABORATION, DATA MANAGEMENT	✓	✓	✓



# Artificial Intelligence and Machine Learning: AWS vs Azure vs GCP



# Machine learning building block services

- **Speech to text and text to speech**
- **Chatbots**
- **Translation**
- **Text Analytics**
- **Document Analysis**
- **Image and video analysis**
- **Anomaly detection**
- **Personalization**



# Machine learning platforms

- **Guided model development**
- **Full ML workbench**
- **MLOps**
- **Augmented AI**
  - **AWS Augmented AI (Amazon A2I)**
    - The power of real, living, breathing humans to help improve your machine learning service

# Machine Learning Infrastructure

- **Hardware**
  - **AWS: Habana Gaudi ASIC** instances, custom processor **AWS Trainium**, optimized for model training.  
**Inferentia** for machine learning inferences.
  - **Azure: FPGA-based virtual machines** tuned specifically for machine learning workloads.
  - **GCP: Tensor Processing Unit (TPU)**, ASIC-optimized for the TensorFlow framework.
- **Machine learning explainability and bias**
  - **AWS: SageMaker Clarify**
  - **Azure: Responsible ML and Fairlearn SDK**
  - **GCP: AI Explanations**



# AWS Machine Learning

aws

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## Machine Learning on AWS

Innovate faster with the most comprehensive set of AI and ML services

Make accurate predictions, get deeper insights from your data, reduce operational overhead, and improve customer experience with AWS machine learning (ML). AWS helps you at every stage of your ML adoption journey with the most comprehensive set of artificial intelligence (AI) and ML services, infrastructure, and implementation resources.

**Build with a proven leader**

**Tailor ML to your business needs**

**Accelerate your ML adoption**

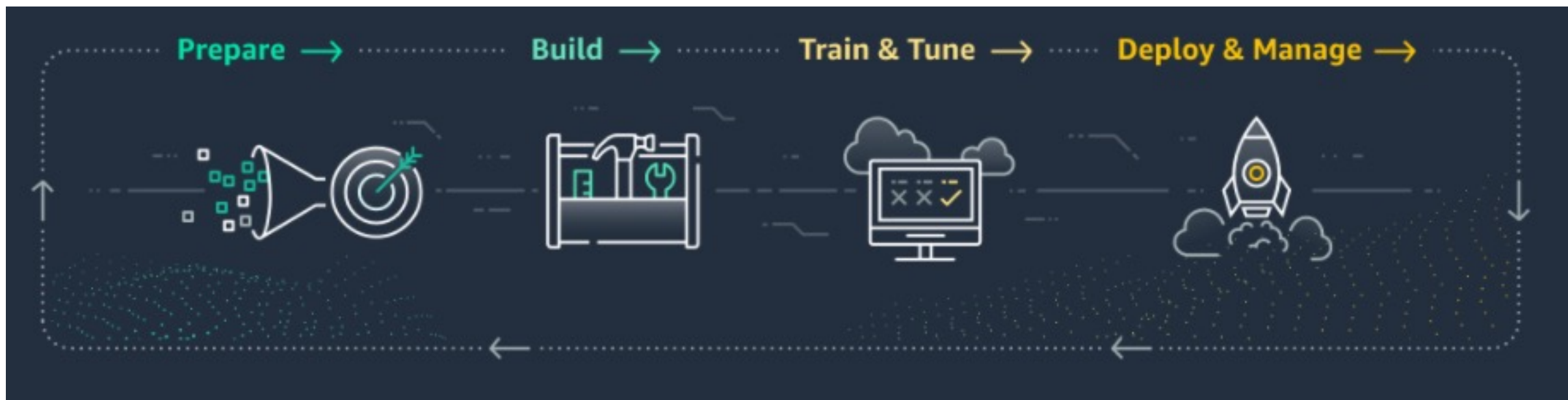




# AWS Machine Learning

## Amazon SageMaker

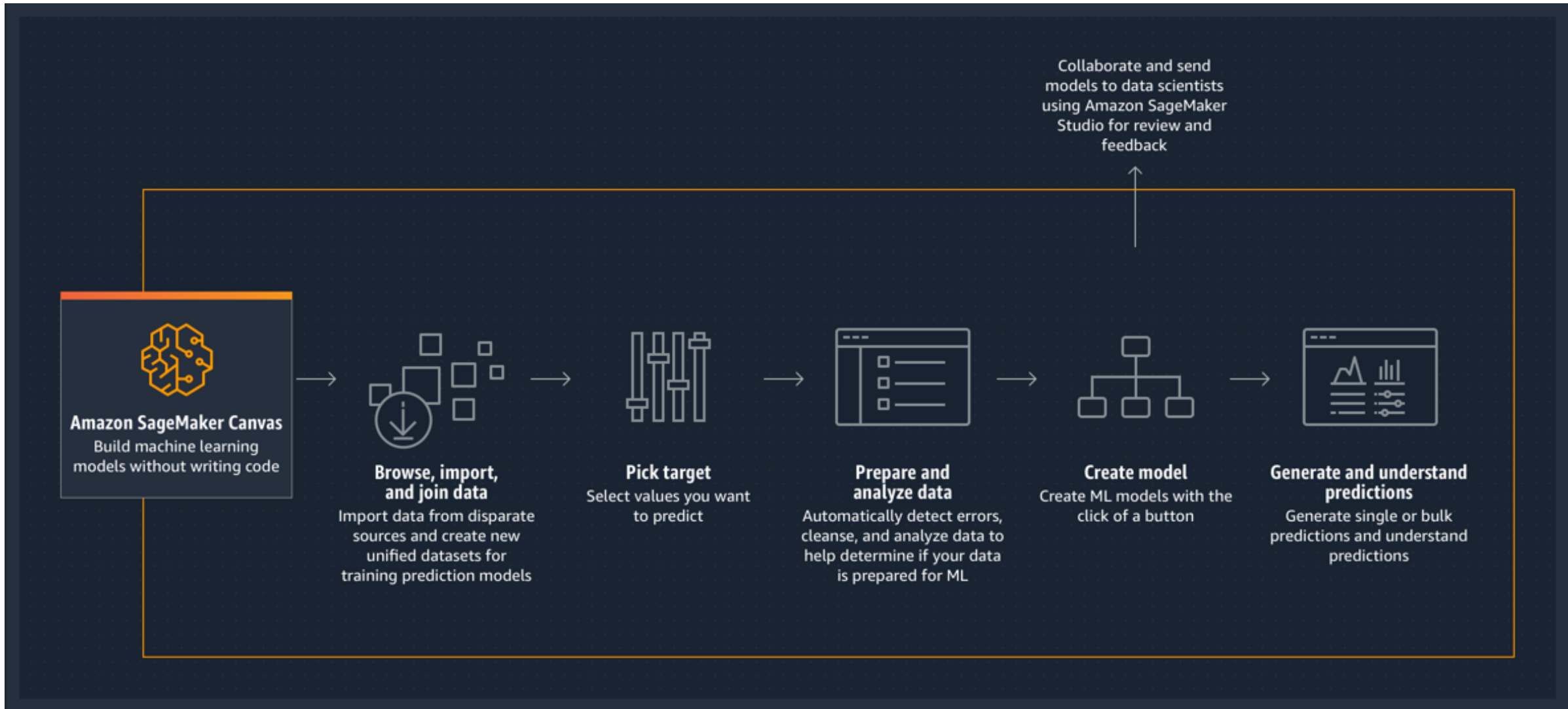
Amazon SageMaker is an ML service enabling data scientists, data engineers, MLOps engineers, and business analysts to build, train, and deploy ML models for any use case, regardless of ML expertise.





# Amazon SageMaker for Business Analysts

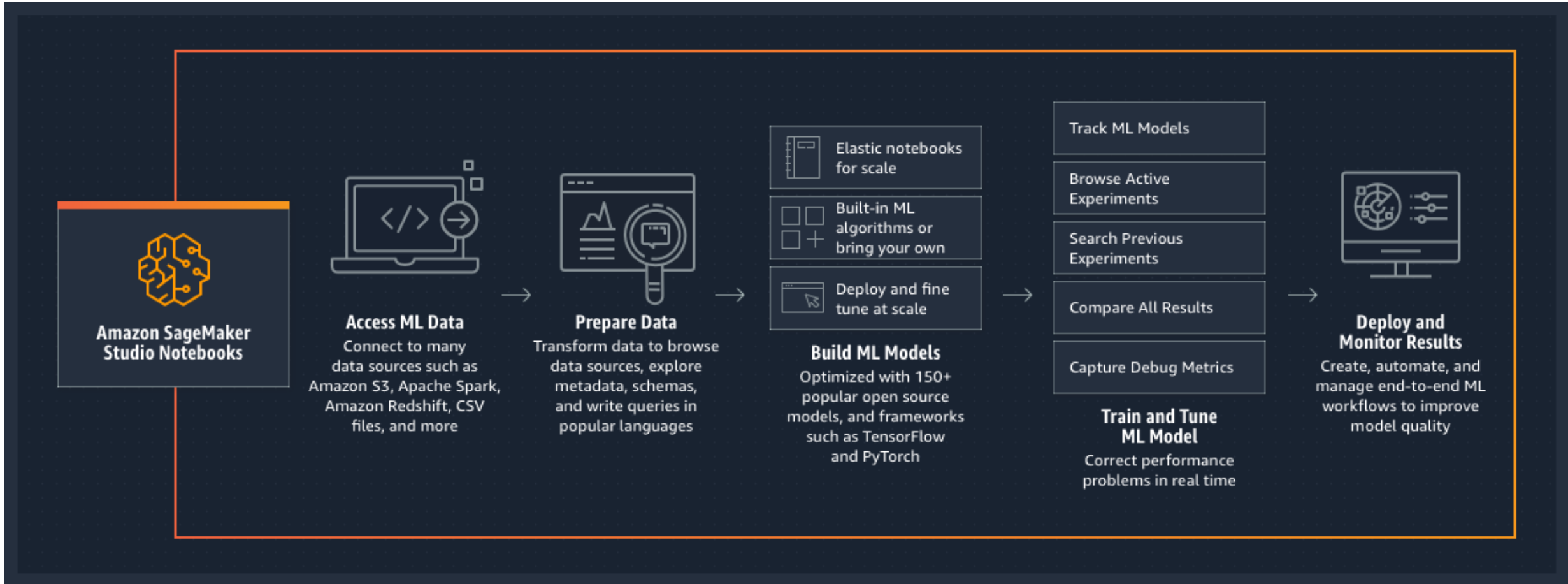
## Amazon SageMaker Canvas





# Amazon SageMaker for Data Scientists

## Amazon SageMaker Studio Notebooks

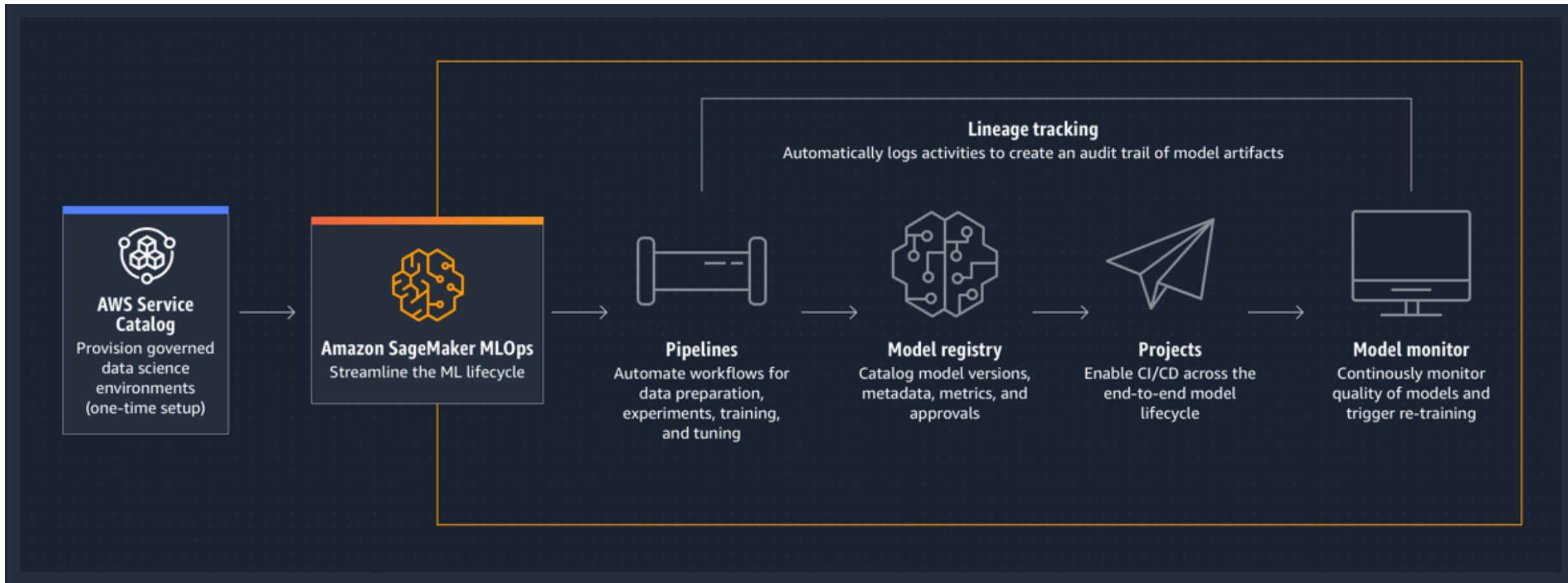






# Amazon SageMaker for ML Engineers

## Amazon SageMaker MLOps





# AWS Machine Learning AI Services

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## Easily add intelligence to your applications

No machine learning skills required

Free AWS Training | Focus on the cloud skills most relevant to you—choose from 500+ digital courses across 30+ AWS solutions »

## Explore AWS AI services

AWS pre-trained AI Services provide ready-made intelligence for your applications and workflows. AI Services easily integrate with your applications to address common use cases such as personalized recommendations, modernizing your contact center, improving safety and security, and increasing customer engagement. Because we use the same deep learning technology that powers Amazon.com and our ML Services, you get quality and accuracy from continuously-learning APIs. And best of all, AI Services on AWS don't require machine learning experience.



# aws AWS Machine Learning AI Services

## Computer vision



### Analyze images and videos

Catalog assets, automate workflows, and extract meaning from your media and applications.

[Amazon Rekognition »](#)



### Detect defects and automate inspection

Identify missing product components, vehicle and structure damage, and irregularities for comprehensive quality control.

[Amazon Lookout for Vision »](#)



### Utilize computer vision at the edge

Improve operations with automated monitoring to find bottlenecks and assess manufacturing quality and safety.

[AWS Panorama »](#)

# AWS Machine Learning AI Services

## Automated data extraction and analysis



### Extract text and data

Pull valuable information from millions of documents at speed.

[Amazon Textract »](#)



### Acquire insights

Maximize the value of unstructured text with natural language processing (NLP).

[Amazon Comprehend »](#)



### Control quality

Add humans to the review process to ensure accuracy and compliance of sensitive data.

[Amazon A2I »](#)



# AWS Machine Learning AI Services

## Language AI



### Build chatbots & virtual agents

Create automated conversation channels to improve customer service.

[Amazon Lex »](#)



### Automate speech recognition

Enhance your applications and workflows with automatic speech recognition.

[Amazon Transcribe »](#)



### Give your apps a voice

Convert text into life-like speech, improving user experience and accessibility.

[Amazon Polly »](#)



# AWS Machine Learning AI Services

## Improve customer experience



### Find accurate information faster

Enhance websites and applications with natural language speech to help users quickly search for what they need.

[Amazon Kendra »](#)



### Personalize online experiences

Use ML to customize applications and websites to each individual user.

[Amazon Personalize »](#)



### Engage audiences in every language

Expand your reach and accessibility with fast, accurate, and customizable translation.

[Amazon Translate »](#)

# aws AWS Machine Learning AI Services

## Business metrics



### Forecast business metrics

Harness unique data types and time series data to create accurate end-to-end prediction models.

[Amazon Forecast »](#)



### Detect online fraud

Stop adversaries and identify potential attacks with technology honed through years of use on Amazon.com.

[Amazon Fraud Detector »](#)



### Identify data anomalies

Detect and identify root causes of unexpected changes in metrics such as revenue and retention.

[Amazon Lookout for Metrics »](#)



# AWS Machine Learning AI Services

## Code and DevOps



### Improve application availability

Simplify operational performance measurement and reduce application downtime.

[Amazon DevOps Guru »](#)



### Automated code reviews

Detect bugs and assess critical issues and vulnerabilities fast for higher quality code.

[Amazon CodeGuru Reviewer »](#)



### Eliminate costly inefficient code

Use runtime behavior analysis to improve application performance and decrease compute costs.

[Amazon CodeGuru Profiler »](#)



# AWS Machine Learning AI Services

## Industrial AI



### Detect abnormal machine conditions

Automatically detect abnormal machine conditions by analyzing sensor data

[Amazon Lookout for Equipment »](#)



### Predictive maintenance

End-to-end predictive maintenance system that includes sensors, gateway, anomaly detection service and end-user application

[Amazon Monitron »](#)



# AWS Machine Learning AI Services Healthcare



## Store and analyze health data

Securely store, transfer, query, and analyze health data to offer a complete view of a patient's medical history

[Amazon Healthlake »](#)



## Extract health data

Extract information from unstructured medical text accurately and quickly

[Amazon Comprehend Medical »](#)





# AWS Products and Services



Analytics



Application Integration



AR & VR



AWS Cost Management



Blockchain



Business Applications



Compute



Customer Engagement



Database



Developer Tools



End User Computing



Game Tech



Internet of Things



Machine Learning



Management & Governance



Media Services



Migration & Transfer



Mobile



Networking & Content Delivery



Quantum Technologies



Robotics



Satellite



Security, Identity & Compliance



Storage



# AWS Services

- **Amazon EC2**
  - Virtual servers in the cloud
- **Amazon Simple Storage Service (S3)**
  - Scalable storage in the cloud
- **Amazon Aurora**
  - High performance managed relational database
- **Amazon DynamoDB**
  - Managed NoSQL database
- **Amazon RDS**
  - Managed relational database service for MySQL, PostgreSQL, Oracle, SQL Server, and MariaDB



# AWS Services

- **AWS Lambda**
  - Run code without thinking about servers
- **AWS Elastic Beanstalk**
  - Run and manage web apps
- **Amazon VPC**
  - Isolated cloud resources
- **Amazon Lightsail**
  - Launch and manage virtual private servers
- **Amazon SageMaker**
  - Build, train, and deploy machine learning models at scale

# Available AWS Certifications

3

## Professional

Two years of comprehensive experience designing, operating, and troubleshooting solutions using the AWS Cloud

**SAP**



2

## Associate

One year of experience solving problems and implementing solutions using the AWS Cloud

**SAA**



1

## Foundational

Six months of fundamental AWS Cloud and industry knowledge

**CLF**

Cloud Practitioner



## Specialty

Technical AWS Cloud experience in the Specialty domain as specified in the exam guide



**DA**



**ML**



# Available AWS Certifications

3

## 專業級

兩年使用 AWS 雲端設計、操作及疑難排解解決方案的廣泛經驗

SAP



## 專家級

考試指南中指定的專業領域中的 AWS 雲端技術經驗

2

## 助理級

一年使用 AWS 雲端解決問題和實作解決方案的經驗

SAA



架構師



營運



開發人員



DA



ML

1

## 基礎

六個月的基礎 AWS 雲端和產業知識

CLF

雲端從業人員





# AWS Certification

The screenshot shows the AWS Certification landing page. At the top left is the AWS logo. To its right are links for 'Contact Us', 'Support', 'English', and 'My Account', followed by an orange 'Sign In to the Console' button. Below this is a navigation bar with links for 'Products', 'Solutions', 'Pricing', 'Documentation', 'Learn', 'Partner Network', 'AWS Marketplace', 'Customer Enablement', 'Events', and 'Explore More' with a search icon. A secondary navigation bar includes 'Training and Certification', 'Get Trained', 'Get Certified', 'Develop Your Team', 'AWS Partner Training', 'Education Programs', and 'Blog'. The main content area features the AWS training and certification logo, the heading 'AWS Certification', and the subtext 'Validate technical skills and cloud expertise to grow your career and business.' Below this are two buttons: 'Schedule an exam' (orange) and 'Prepare for an exam' (white).

## Get started

### Certification exam guides and details

Explore our role-based certifications and our Specialty certifications in specific technical areas. Select an exam to learn more:

Select ▼

### Options for taking your exam

Curious about how to take your AWS Certification exam? We offer flexible, convenient options for taking exams so you can select what works best for you.

[Learn more »](#)

### Access your AWS Certification Account

Schedule and take exams from your AWS Certification Account. You can also access your AWS Certified benefits, such as your digital badge and 50% discount voucher for a future exam.

<https://aws.amazon.com/certification/>





# AWS Certification

The screenshot shows the top navigation bar of the AWS website with the AWS logo on the left and links for '聯絡我們', '支援', '中文(繁體)', '我的帳戶', and '登入主控台' on the right. Below this is a secondary navigation bar with links for '產品', '解決方案', '定價', '文件', '了解', '合作夥伴網路', 'AWS Marketplace', '客戶支援', '事件', and '進一步探索'. A search icon is also present. The main content area features the 'aws training and certification' logo, the title 'AWS Certification', and the text '參與技術、技能、雲端專業知識和能力的驗證，以拓展您的職業和業務發展。'. Two buttons are visible: '安排考試' (orange) and '準備考試' (white).

## 入門

### 認證考試指南和詳細資訊

探索我們以角色為基礎的認證和我們在特定技術領域的專家級認證。選取考試以進一步了解：

選取 ▼

### 參加考試的選項

想知道如何參加 AWS Certification 考試嗎？我們提供靈活、便利的考試選項，以便您可以選擇最適合您的選項。

### 存取您的 AWS Certification 帳戶

從 AWS Certification 帳戶安排及參加考試。也可以存取您的 AWS Certification 權益，例如數位徽章和日後考試費用 5 折優惠券。

<https://aws.amazon.com/certification/>



# AWS Certification

## Professional

Two years of comprehensive experience designing, operating, and troubleshooting solutions using the AWS Cloud



## Associate

One year of experience solving problems and implementing solutions using the AWS Cloud



## Specialty

Technical AWS Cloud experience in the Specialty domain as specified in the exam guide



2

**SAA**

1

## Foundational

Six months of fundamental AWS Cloud and industry knowledge

Cloud Practitioner



**CLF**

<https://aws.amazon.com/certification/>





# AWS Certification



## Format

65 questions; either multiple choice or multiple response



## Type

Foundational



## Delivery Method

Testing center or online proctored exam



## Time

90 minutes to complete the exam



## Cost

100 USD (Practice Exam: 20 USD)



## Language

Available in English, Indonesian (Bahasa), Japanese, Korean, and Simplified Chinese

## Foundational

Six months of fundamental AWS  
Cloud and industry knowledge

Cloud  
Practitioner





# AWS Certification



## Format

65 questions; either multiple choice or multiple response



## Type

Associate



## Delivery Method

Testing center or online proctored exam



## Time

130 minutes to complete the exam



## Cost

150 USD (Practice exam: 20 USD)



## Language

Available in English, Japanese, Korean, and Simplified Chinese

## Associate

One year of experience solving problems and implementing solutions using the AWS Cloud



Architect



Operations



Developer



# AWS Certification

**Professional**

Two years of comprehensive experience designing, operating, and troubleshooting solutions using the AWS Cloud



**Format**  
75 questions; either multiple choice or multiple response



**Type**  
Professional



**Delivery Method**  
Testing center or online proctored exam



**Time**  
180 minutes to complete the exam



**Cost**  
300 USD (Practice Exam: 40 USD)



**Language**  
Available in English, Japanese, Korean, and Simplified Chinese



# AWS Certification



### Format

65 questions; either multiple choice or multiple response



### Type

Associate



### Delivery Method

Testing center or online proctored exam



### Time

130 minutes to complete the exam



### Cost

150 USD (Practice exam: 20 USD)



### Language

Available in English, Japanese, Korean, and Simplified Chinese

## Associate

One year of experience solving problems and implementing solutions using the AWS Cloud



Architect



Operations



Developer



# AWS Certification



## Format

65 questions; either multiple choice or multiple response



## Type

Associate



## Delivery Method

Testing center or online proctored exam



## Time

130 mins to complete the exam



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150 USD (Practice exam: 20 USD)



## Language

Available in English, Japanese, Korean, and Simplified Chinese

## Associate

One year of experience solving problems and implementing solutions using the AWS Cloud



Architect



Operations



Developer



# AWS Certification

**Professional**

Two years of comprehensive experience designing, operating, and troubleshooting solutions using the AWS Cloud



### Format

75 questions; either multiple choice or multiple response



### Type

Professional



### Delivery Method

Testing center or online proctored exam



### Time

180 minutes to complete the exam



### Cost

300 USD (Practice exam: 40 USD)



### Language

Available in English, Japanese, Korean, and Simplified Chinese





# AWS Certification

## Specialty

Technical AWS Cloud experience in the Specialty domain as specified in the exam guide



### Format

65 questions; either multiple choice or multiple response



### Type

Specialty



### Delivery Method

Testing center or online proctored exam



### Time

180 minutes to complete the exam



### Cost

300 USD (Practice exam: 40 USD)



### Language

Available in English, Japanese, Korean, and Simplified Chinese

# AWS Certified Cloud Practitioner



- Level: **Foundational**
- Length: **90 minutes** to complete the exam
- Cost: **100 USD**
- Format: **65 questions**;  
either multiple choice or multiple response
- Delivery method: **Pearson VUE** and PSI;  
testing center or online proctored exam



# AWS Certified Solutions Architect – Associate



- Level: **Associate**
- Length: **130 minutes** to complete the exam
- Cost: **150 USD**
- Format: **65 questions**;  
either multiple choice or multiple response
- Delivery method: **Pearson VUE** and PSI;  
testing center or online proctored exam

# AWS Certified SysOps Administrator - Associate



- Level: **Associate**
- Length: **180 minutes** to complete the exam
- Cost: **150 USD**
- Format: **65 scoring** opportunities that may be multiple choice, multiple response, or exam lab
- Delivery method: **Pearson VUE** and PSI; testing center or online proctored exam

# AWS Certified Solutions Architect – Associate



- Level: **Associate**
- Length: **130 minutes** to complete the exam
- Cost: **150 USD**
- Format: **65 questions**;  
either multiple choice or multiple response
- Delivery method: **Pearson VUE** and PSI;  
testing center or online proctored exam

# AWS Certified Solutions Architect - Professional



- Level: **Professional**
- Length: **180 minutes** to complete the exam
- Cost: **300 USD**
- Format: **75 questions**; either multiple choice or multiple response
- Delivery method: **Pearson VUE** and PSI; testing center or online proctored exam

# AWS Certified DevOps Engineer - Professional



- Level: **Professional**
- Length: **180 minutes** to complete the exam
- Cost: **300 USD**
- Format: **75 questions**; either multiple choice or multiple response
- Delivery method: **Pearson VUE** and PSI; testing center or online proctored exam

# AWS Certified Security - Specialty



- Level: **Specialty**
- Length: **170 minutes** to complete the exam
- Cost: **300 USD**
- Format: **65 questions**; either multiple choice or multiple response
- Delivery method: **Pearson VUE** and PSI; testing center or online proctored exam

# AWS Certified Database - Specialty



- Level: **Specialty**
- Length: **180 minutes** to complete the exam
- Cost: **300 USD**
- Format: **65 questions**; either multiple choice or multiple response
- Delivery method: **Pearson VUE** and PSI; testing center or online proctored exam

# AWS Certified Machine Learning – Specialty



- Level: **Specialty**
- Length: **180 minutes** to complete the exam
- Cost: **300 USD**
- Format: **65 questions**; either multiple choice or multiple response
- Delivery method: **Pearson VUE** and PSI; testing center or online proctored exam



# AWS Certified Data Analytics - Specialty



- Level: **Specialty**
- Length: **180 minutes** to complete the exam
- Cost: **300 USD**
- Format: **65 questions**; either multiple choice or multiple response
- Delivery method: **Pearson VUE** and PSI; testing center or online proctored exam

# AWS Certified Advanced Networking - Specialty



- Level: **Specialty**
- Length: **170 minutes** to complete the exam
- Cost: **300 USD**
- Format: **65 questions**; either multiple choice or multiple response
- Delivery method: **Pearson VUE** and PSI; testing center or online proctored exam

# AWS Certifications Roadmap



# AWS Certifications Roadmap

## Cloud Architect



# AWS Certifications Roadmap

## Cloud Developer



# AWS Certifications Roadmap

## DevOps



# AWS Certifications Roadmap

## Data Analytics / Machine Learning



# AWS Certifications Roadmap

## Security





# AWS Certified Cloud Practitioner (CLF-C01)





# AWS Certified Cloud Practitioner

- **This certification provides individuals in a larger variety of cloud and technology roles with a way to validate their AWS Cloud knowledge and enhance their professional credibility.**
- **This exam covers four domains, including cloud concepts, security, technology, and billing and pricing.**



# AWS Certified Solutions Architect – Associate (SAA-C02)





# AWS Certified Solutions Architect – Associate

- **This certification validates your ability to effectively demonstrate knowledge of how to architect and deploy secure and robust applications on AWS technologies.**
- **This exam is for anyone with at least one year of hands-on experience designing available, cost-efficient, fault-tolerant, and scalable and distributed systems on AWS.**



# AWS Academy and Certifications

- **AWS Academy Cloud Foundations (ACF)**

- **AWS Certified Cloud Practitioner (CLF-C01)**

- <https://aws.amazon.com/certification/certified-cloud-practitioner/>

- **AWS Academy Cloud Architecting (ACA)**

- **AWS Certified Solutions Architect – Associate (SAA-C02)**

- <https://aws.amazon.com/certification/certified-solutions-architect-associate/>

<https://aws.amazon.com/training/awsacademy/>

1



2





# AWS Certified Cloud Practitioner (CLF-C01)

Domain	% of Examination
Domain 1: Cloud Concepts	26%
Domain 2: Security and Compliance	25%
Domain 3: Technology	33%
Domain 4: Billing and Pricing	16%
TOTAL	100%



# AWS Certified Solutions Architect – Associate (SAA-C02)

Domain	% of Examination
Domain 1: Design <b>Resilient</b> Architectures	30%
Domain 2: Design <b>High-Performing</b> Architectures	28%
Domain 3: Specify <b>Secure</b> Applications and Architectures	24%
Domain 4: Design <b>Cost-Optimized</b> Architectures	18%
TOTAL	100%

# AWS Certified Cloud Practitioner (CLF-C01)







# AWS Certified Cloud Practitioner (CLF-C01)

- **Domain 1: Cloud Concepts**
  - **1.1 Define the AWS Cloud and its value proposition**
  - **1.2 Identify aspects of AWS Cloud economics**
  - **1.3 List the different cloud architecture design principles**



# AWS Certified Cloud Practitioner (CLF-C01)

- **Domain 2: Security and Compliance**
  - **2.1 Define the AWS shared responsibility model**
  - **2.2 Define AWS Cloud security and compliance concepts**
  - **2.3 Identify AWS access management capabilities**
  - **2.4 Identify resources for security support**



# AWS Certified Cloud Practitioner (CLF-C01)

- **Domain 3: Technology**
  - **3.1 Define methods of deploying and operating in the AWS Cloud**
  - **3.2 Define the AWS global infrastructure**
  - **3.3 Identify the core AWS services**
  - **3.4 Identify resources for technology support**



# AWS Certified Cloud Practitioner (CLF-C01)

- **Domain 4: Billing and Pricing**
  - **4.1 Compare and contrast the various pricing models for AWS**
  - **4.2 Recognize the various account structures in relation to AWS billing and pricing**
  - **4.3 Identify resources available for billing support**

# AWS Certified Solutions Architect – Associate (SAA-C02)





# AWS Certified Solutions Architect – Associate (SAA-C02)

- **Domain 1: Design Resilient Architectures**
  - **1.1 Design a multi-tier architecture solution**
  - **1.2 Design highly available and/or fault-tolerant architectures**
  - **1.3 Design decoupling mechanisms using AWS services**
  - **1.4 Choose appropriate resilient storage**



# AWS Certified Solutions Architect – Associate (SAA-C02)

- **Domain 2: Design **High-Performing** Architectures**
  - **2.1 Identify elastic and scalable compute solutions for a workload**
  - **2.2 Select high-performing and scalable storage solutions for a workload**
  - **2.3 Select high-performing networking solutions for a workload**
  - **2.4 Choose high-performing database solutions for a workload**



# AWS Certified Solutions Architect – Associate (SAA-C02)

- **Domain 3: Design **Secure** Applications and Architectures**
  - **3.1 Design secure access to AWS resources**
  - **3.2 Design secure application tiers**
  - **3.3 Select appropriate data security options**





# AWS Certified Solutions Architect – Associate (SAA-C02)

- **Domain 4: Design **Cost-Optimized** Architectures**
  - **4.1 Identify cost-effective storage solutions**
  - **4.2 Identify cost-effective compute and database services**
  - **4.3 Design cost-optimized network architectures**



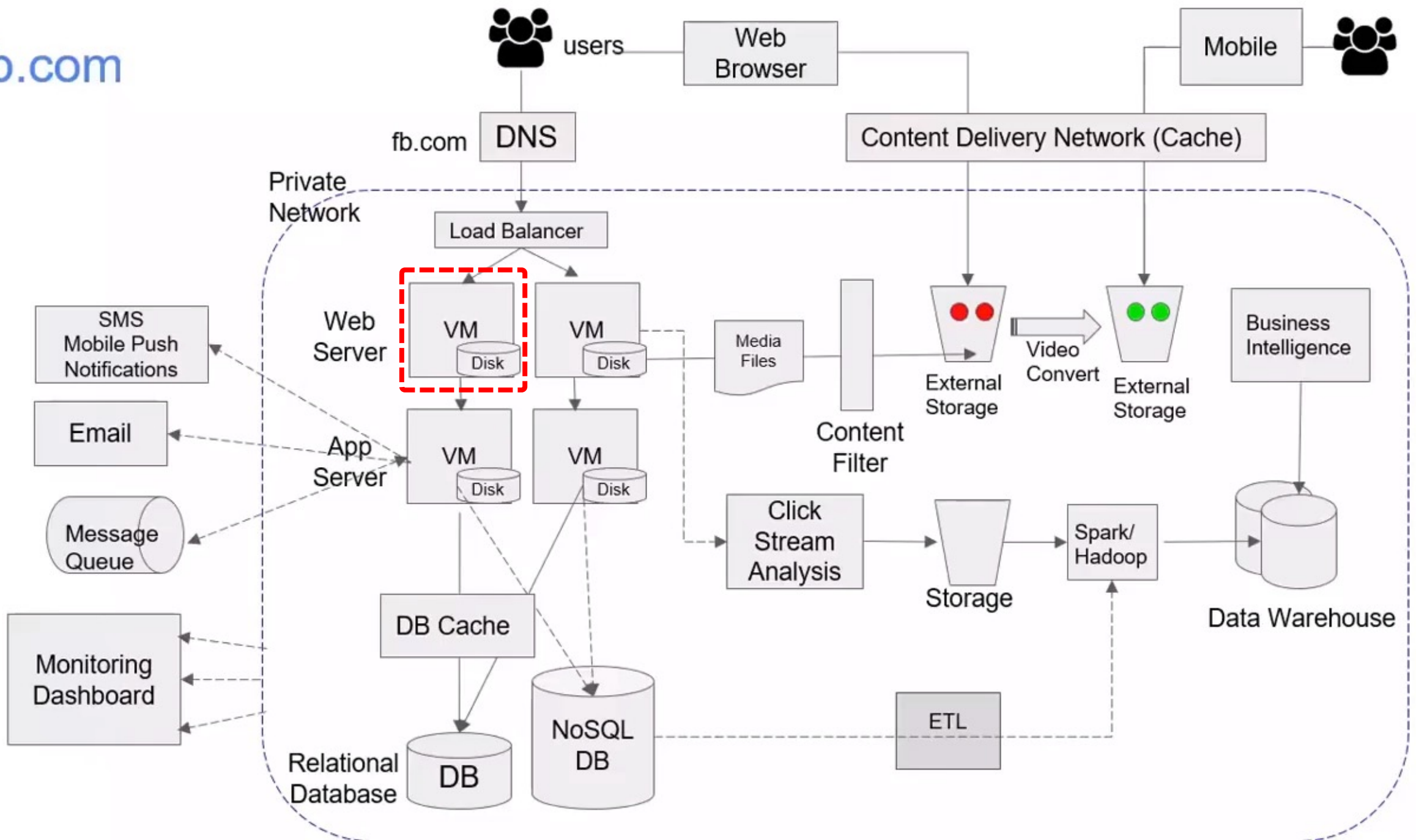
# AWS Certifications

## Exam Pricing

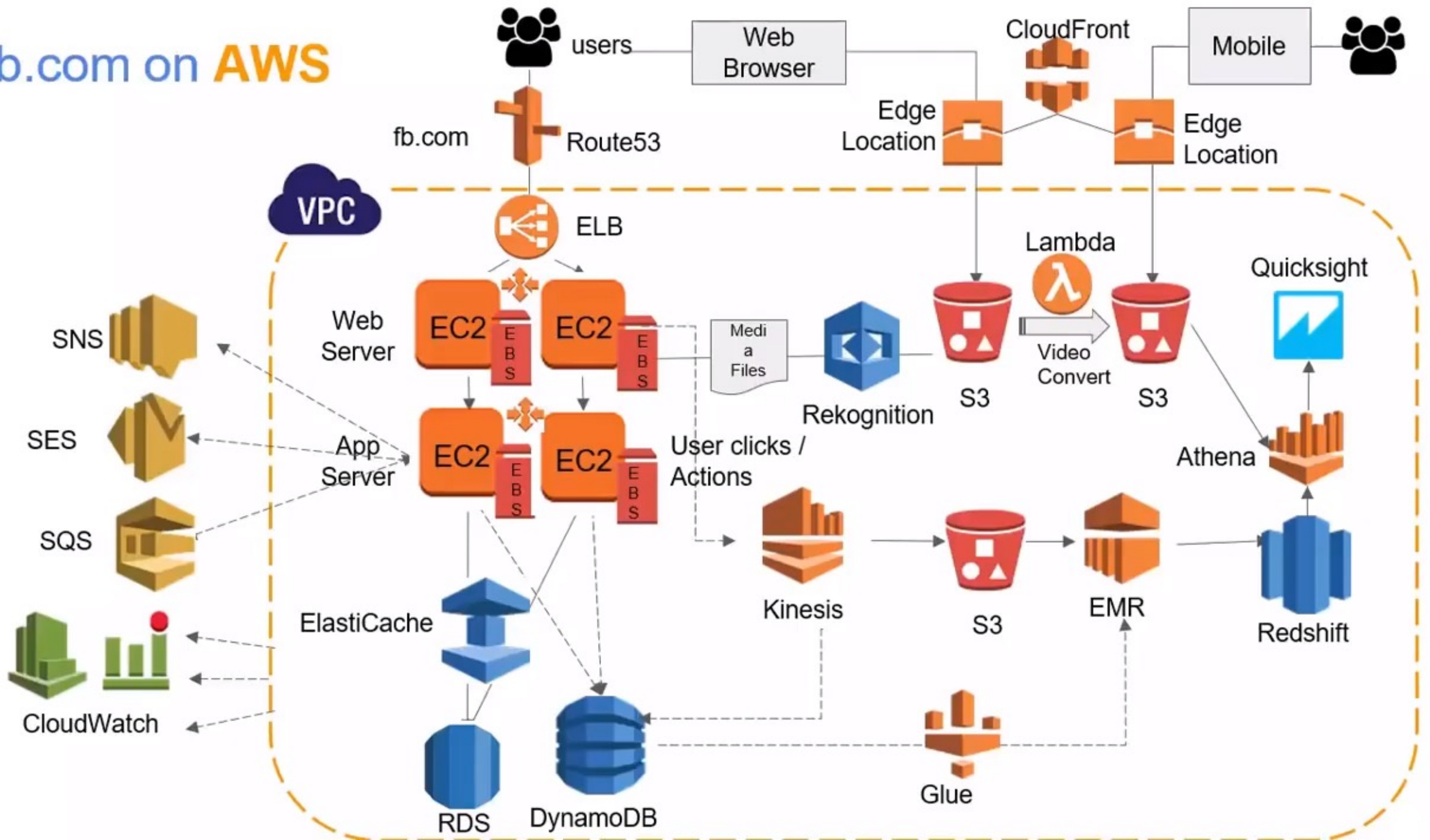
<b>Exam Type</b>	<b>Price in USD</b>
<b>Foundational</b>	<b>\$100</b>
<b>Associate</b>	<b>\$150</b>
<b>Professional</b>	<b>\$300</b>
<b>Specialty</b>	<b>\$300</b>



# **Web Application with AWS Core Services**

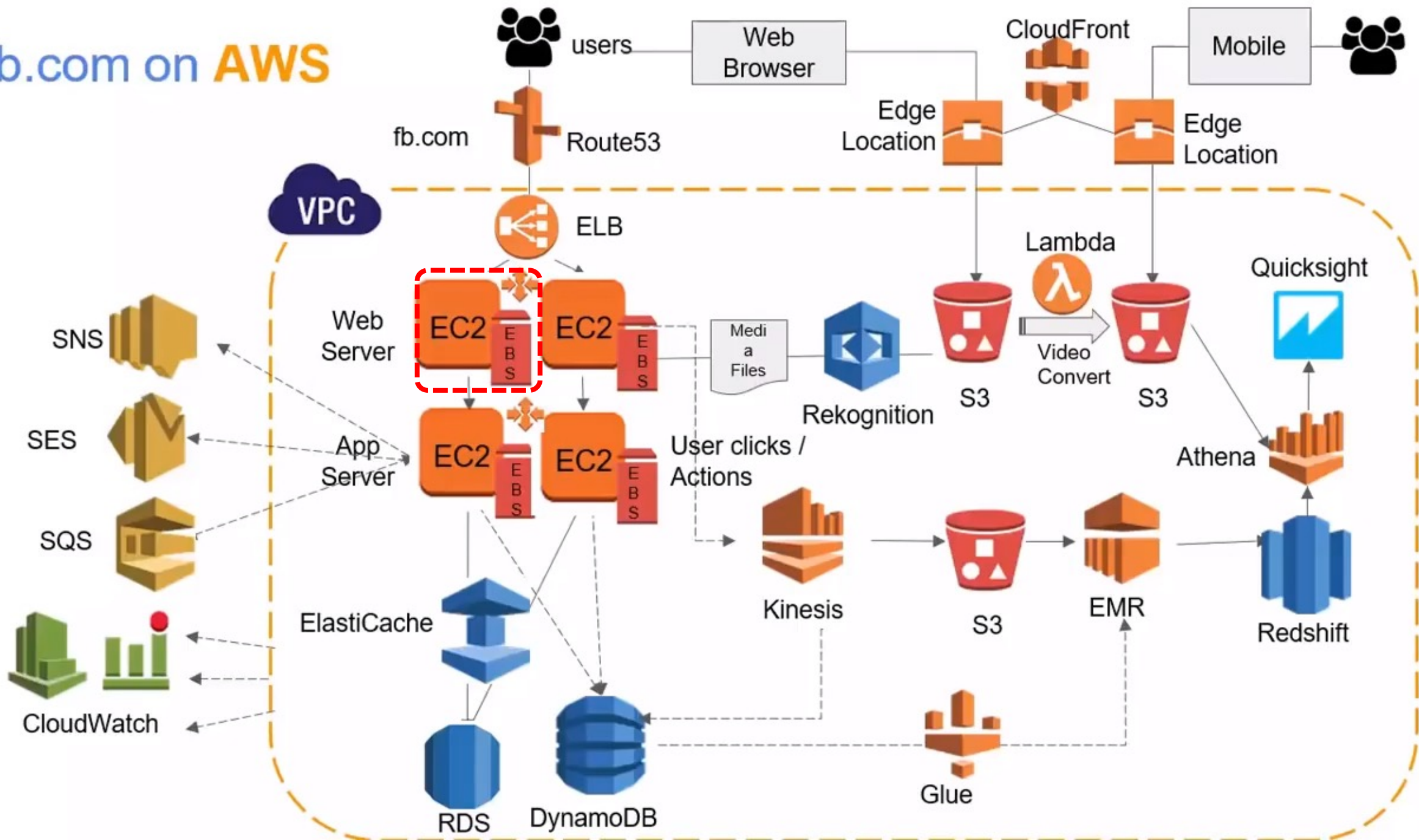


# fb.com on AWS

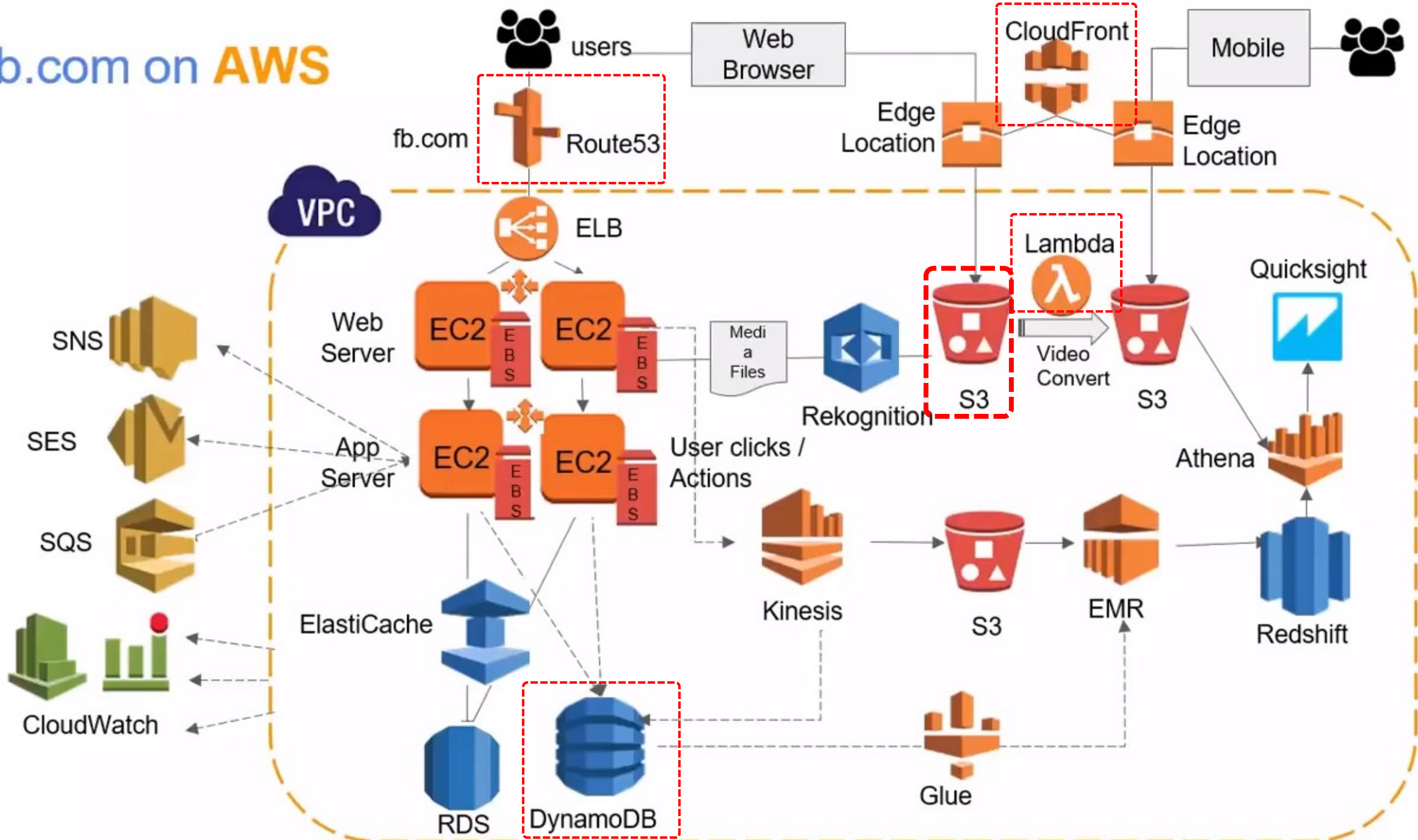




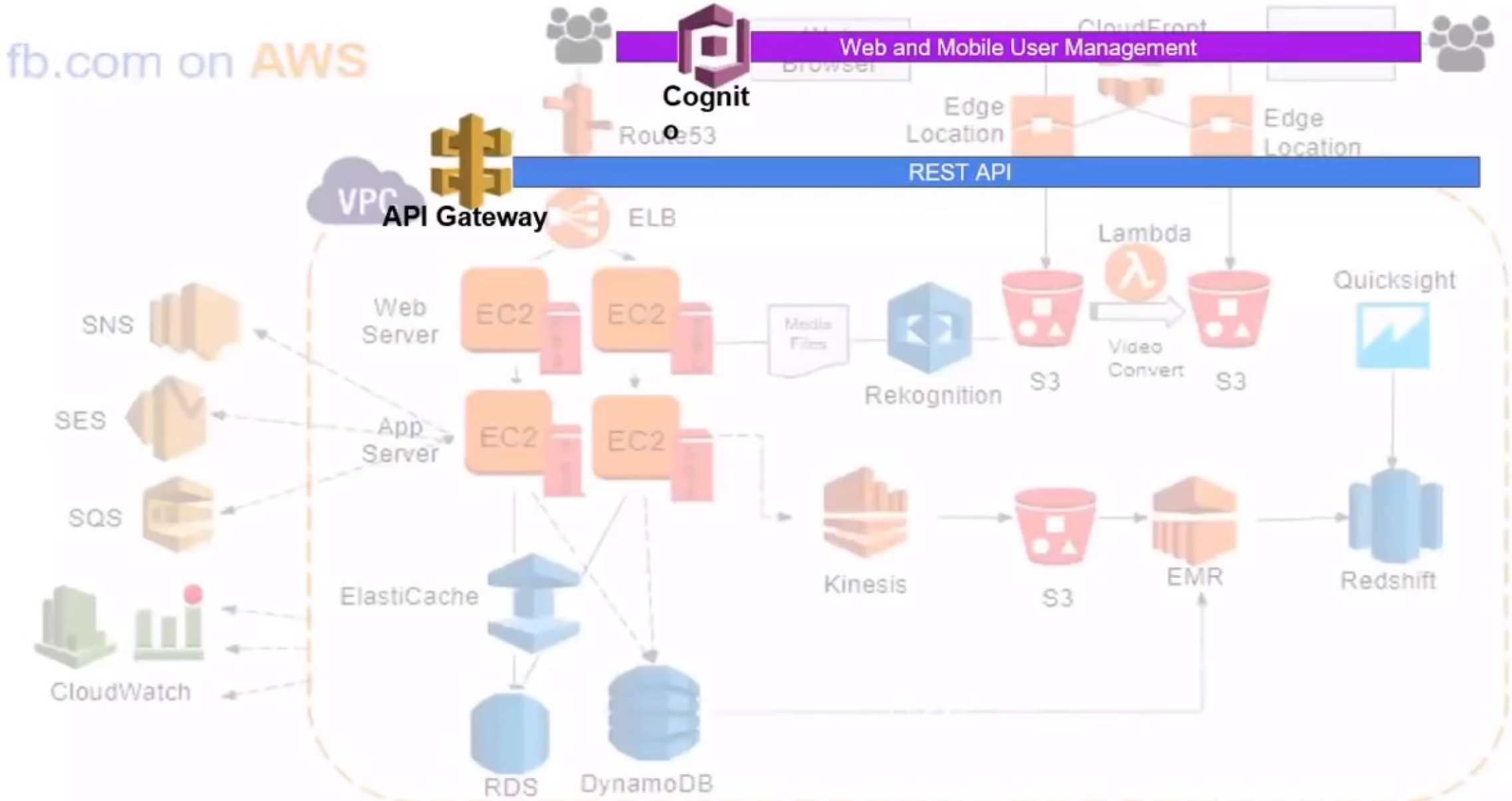
# fb.com on AWS



# fb.com on AWS



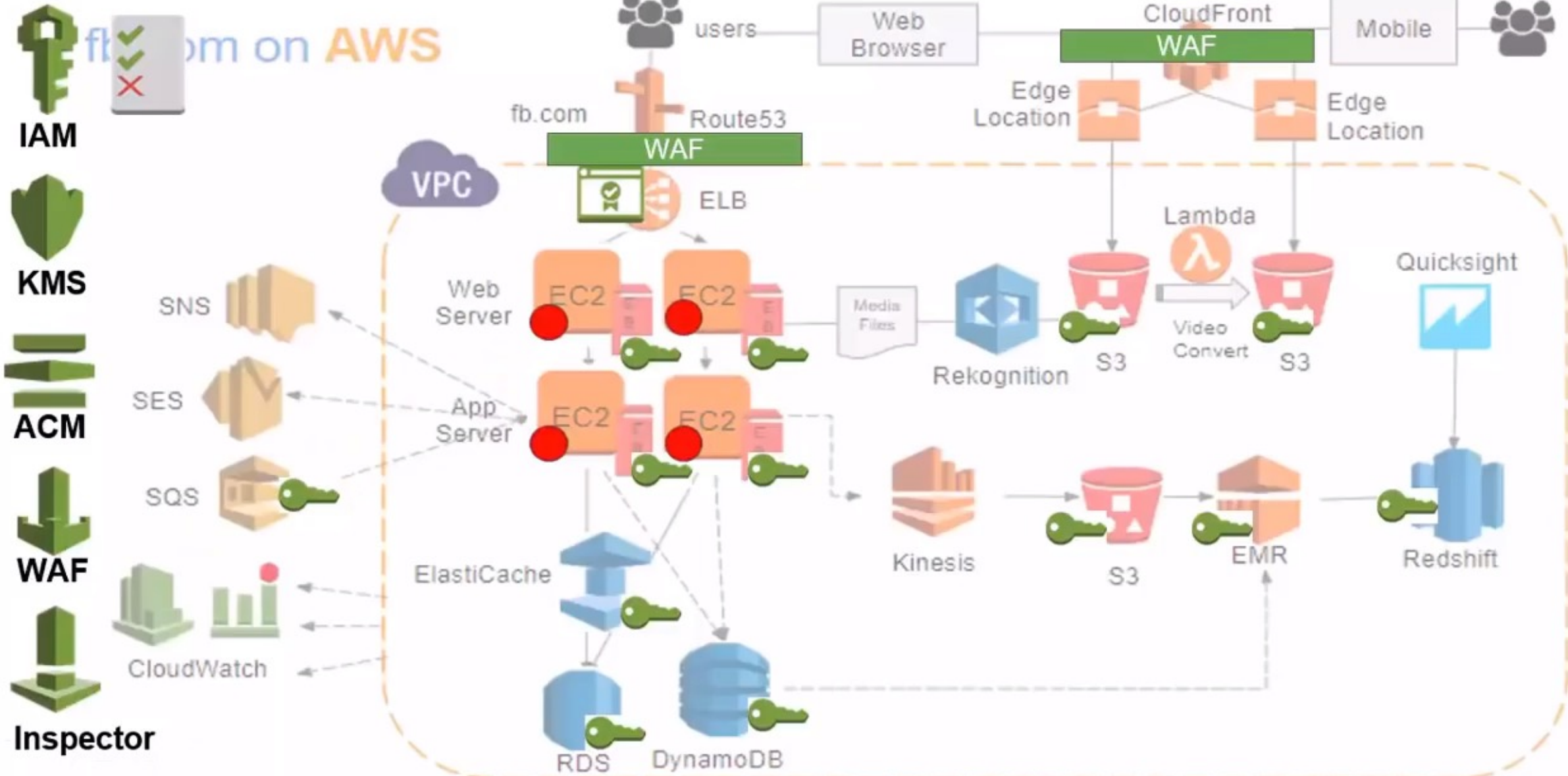
# AWS Application Services



Source: AWS Training Center (2019), Introduction to AWS Services, <https://youtu.be/Z3SYDTMP3ME>

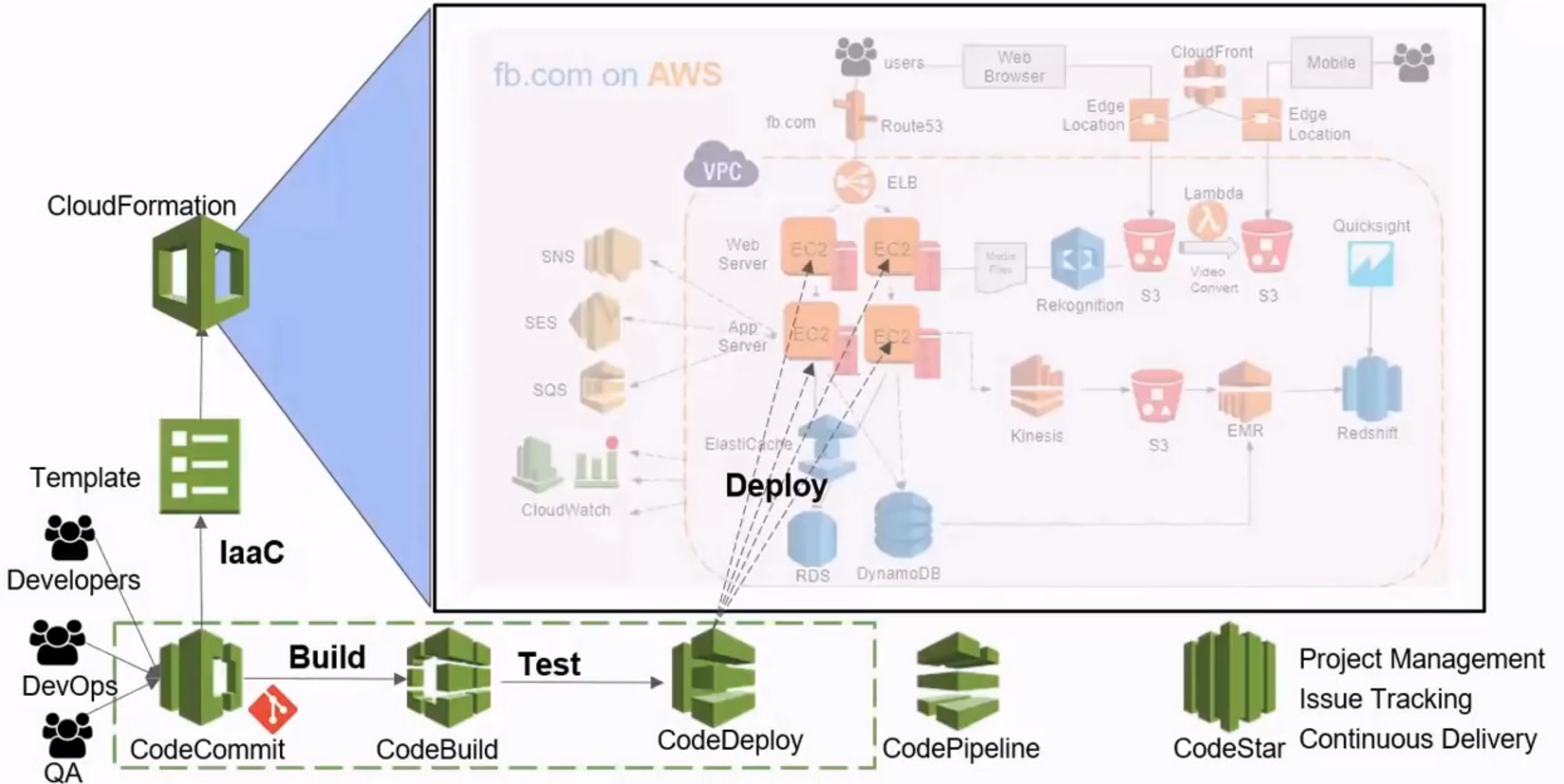


# AWS Security Services



# AWS Development and DevOps Services

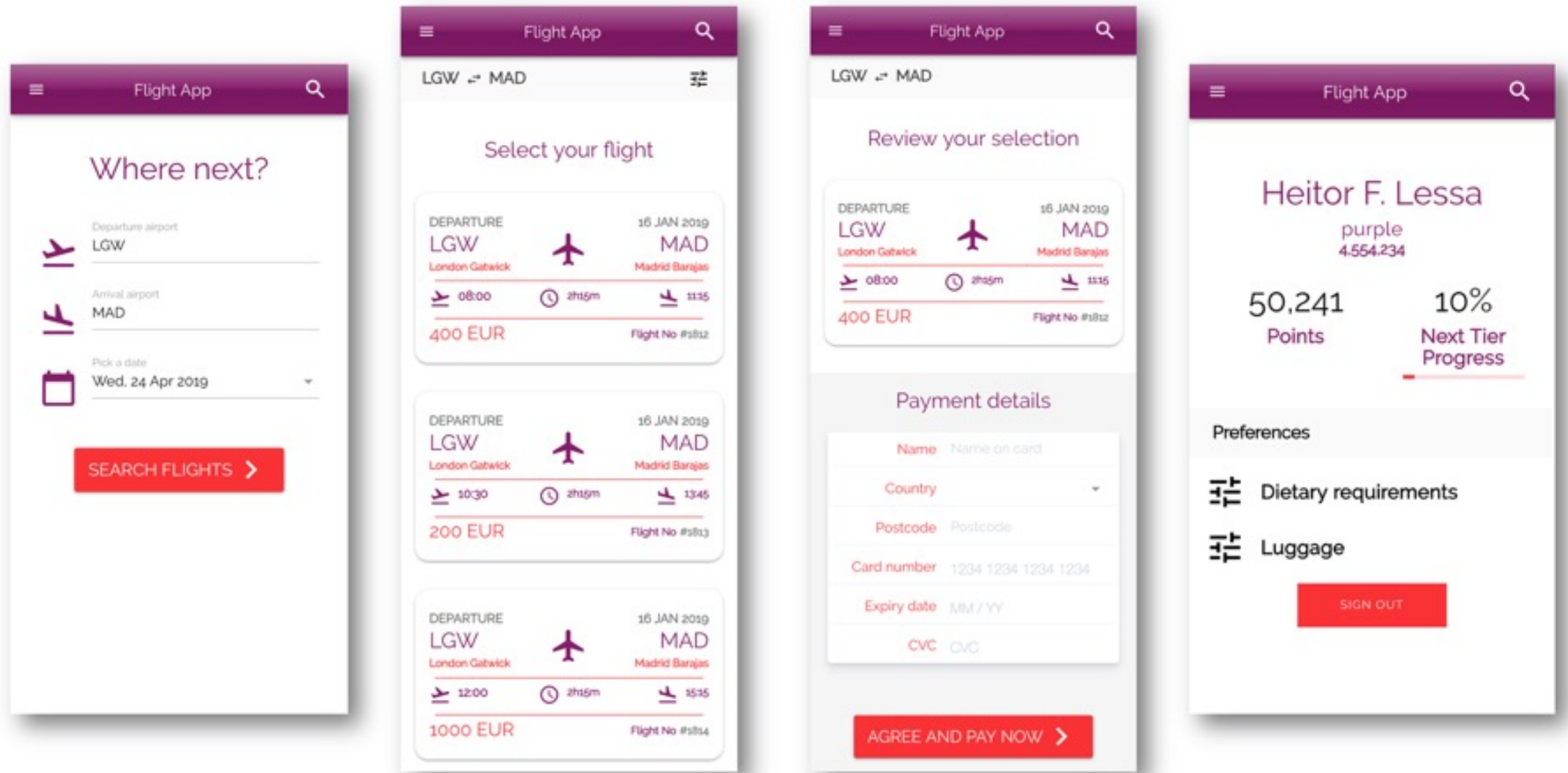
AWS Region





# AWS Serverless Architecture

# aws AWS Serverless Airline Booking







# AWS Serverless Airline Booking Stack

## UI/UX



Quasar framework



Vue.js

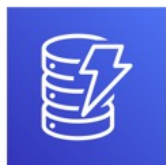


AWS Amplify



Stripe Elements

## Data/Lang



Amazon DynamoDB



Python

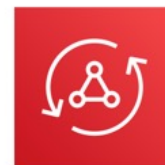


Typescript



JavaScript

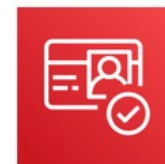
## API/Auth



AWS AppSync

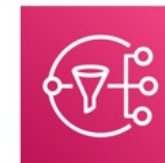


Amazon API Gateway



Amazon Cognito

## Messaging



Amazon SNS

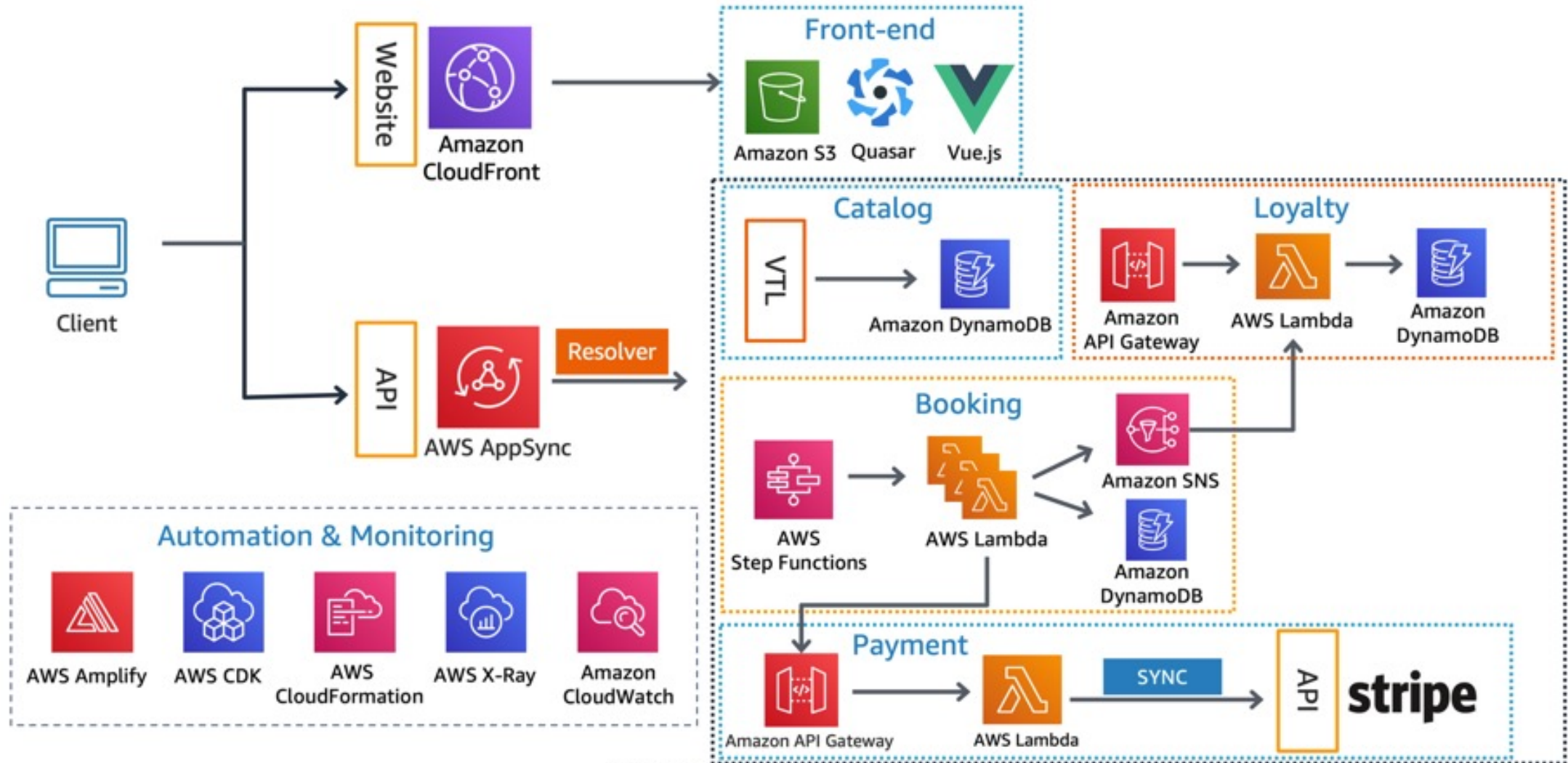


AWS Step Functions



# AWS Serverless Airline Booking

## High level infrastructure architecture

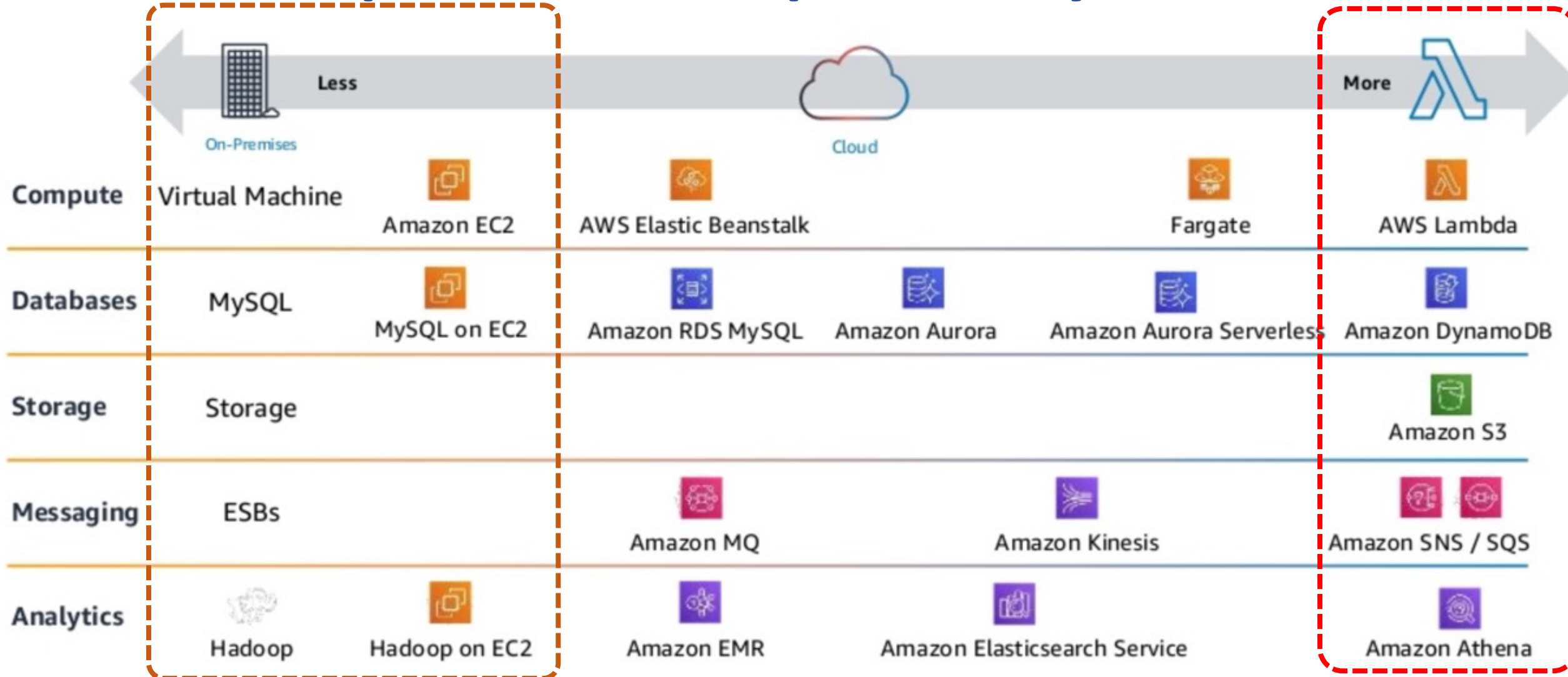


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# AWS Serverless Architecture

## AWS Operational Responsibility Models





# Build a Serverless Web Application

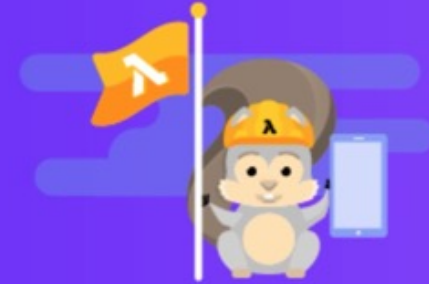


# aws Build a Serverless Web Application

Projects on AWS:

## Build a Serverless Web Application

with AWS Lambda, Amazon API Gateway, Amazon S3, Amazon DynamoDB, and Amazon Cognito



Introduction

1

Host a static website

2

Manage users

3

Build a serverless backend

4

Deploy a RESTful API

5

Terminate resources

## Overview

In this tutorial, you'll create a simple serverless web application that enables users to request unicorn rides from the [Wild Rydes](#) fleet. The application will present users with an HTML based user interface for indicating the location where they would like to be picked up and will interface on the backend with a RESTful web service to submit the request and dispatch a nearby unicorn. The application will also provide facilities for users to register with the service and log in before requesting rides.

## Application Architecture

**AWS Experience:** Beginner

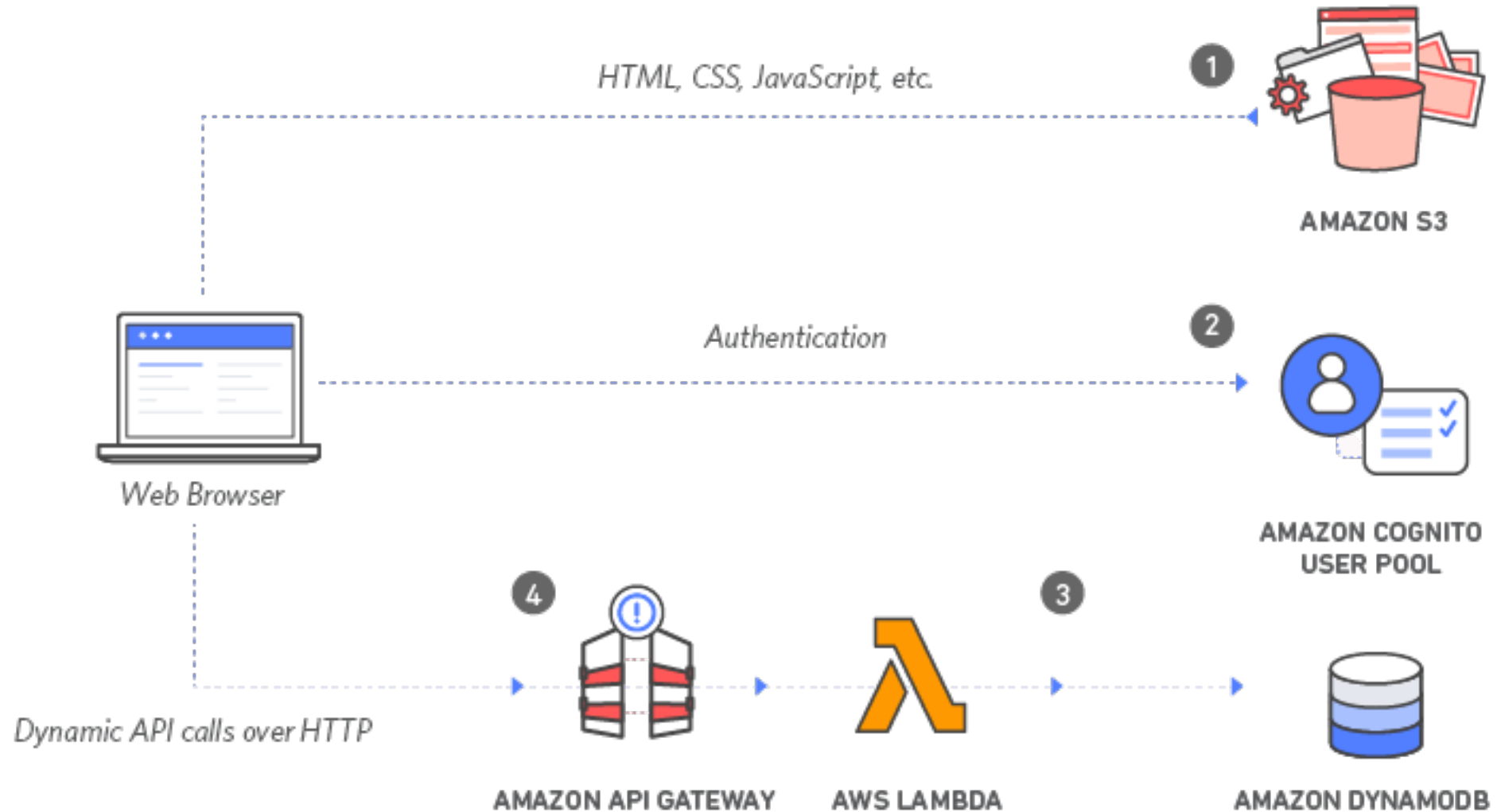
**Time to complete:** 2 hours

**Cost to complete:** Each service used in this architecture is eligible for the [AWS Free Tier](#). If you are outside the usage limits of the Free Tier, completing this tutorial will cost you less than \$0.25\*.



# Build a Serverless Web Application

with Amazon S3, AWS Lambda, Amazon API Gateway, Amazon DynamoDB, and Amazon Cognito

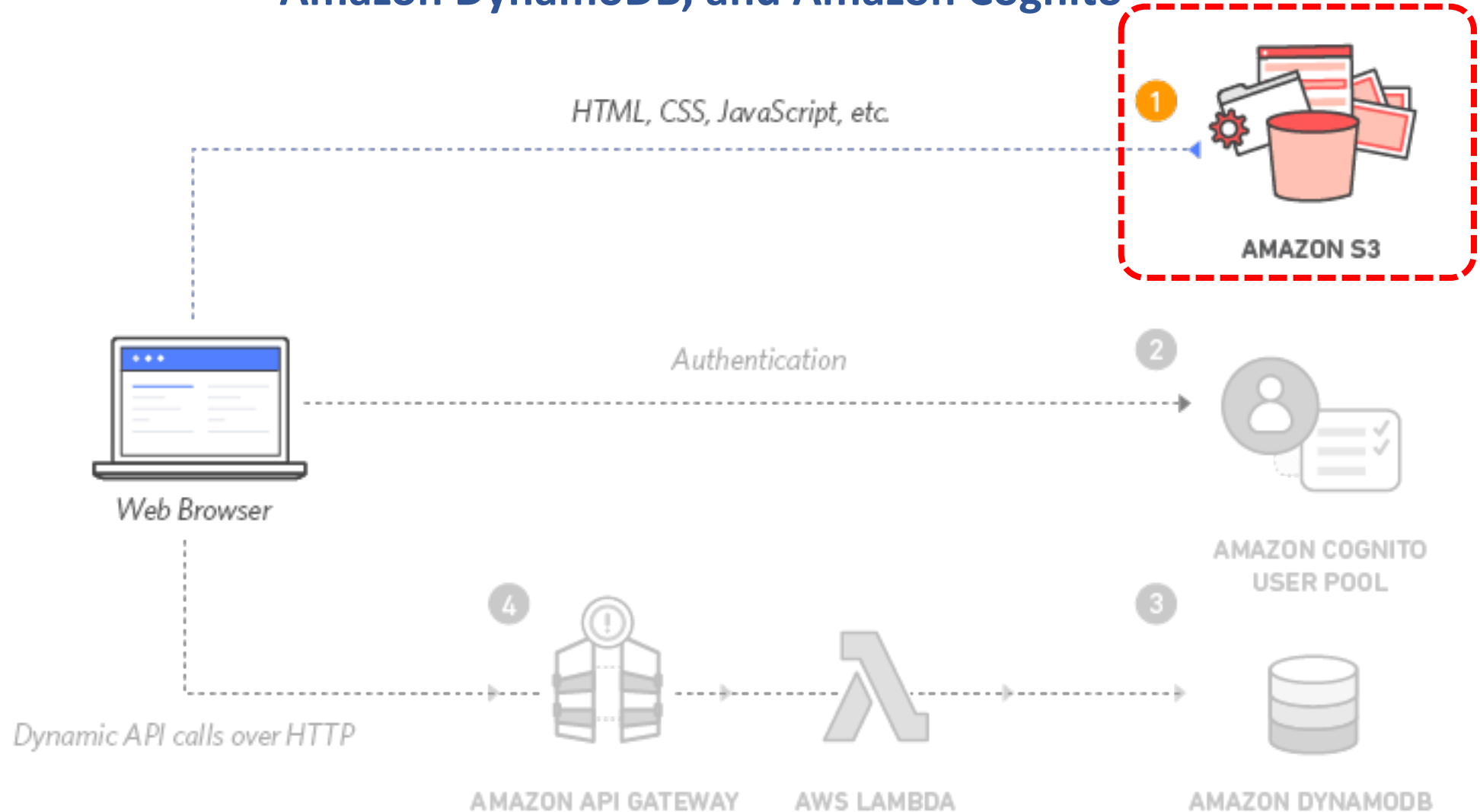




# Build a Serverless Web Application

with Amazon S3, AWS Lambda, Amazon API Gateway, Amazon DynamoDB, and Amazon Cognito

1





# Build a Serverless Web Application

with Amazon S3, AWS Lambda, Amazon API Gateway, Amazon DynamoDB, and Amazon Cognito

# 1

## Static Web Hosting

**Amazon S3** hosts static web resources including HTML, CSS, JavaScript, and image files which are loaded in the user's browser.

HTML, CSS, JavaScript, etc.

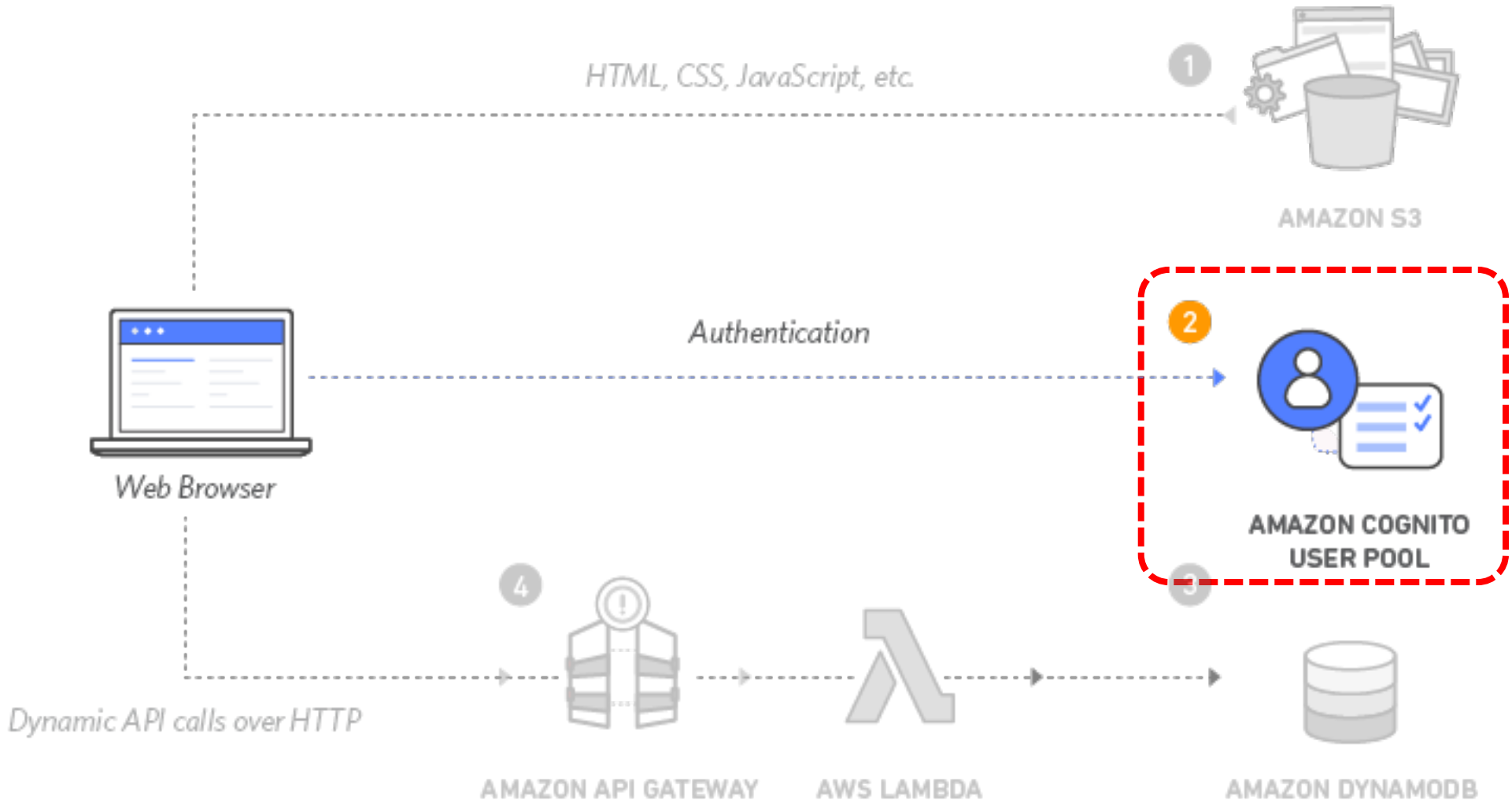




# Build a Serverless Web Application

with Amazon S3, AWS Lambda, Amazon API Gateway, Amazon DynamoDB, and Amazon Cognito

2





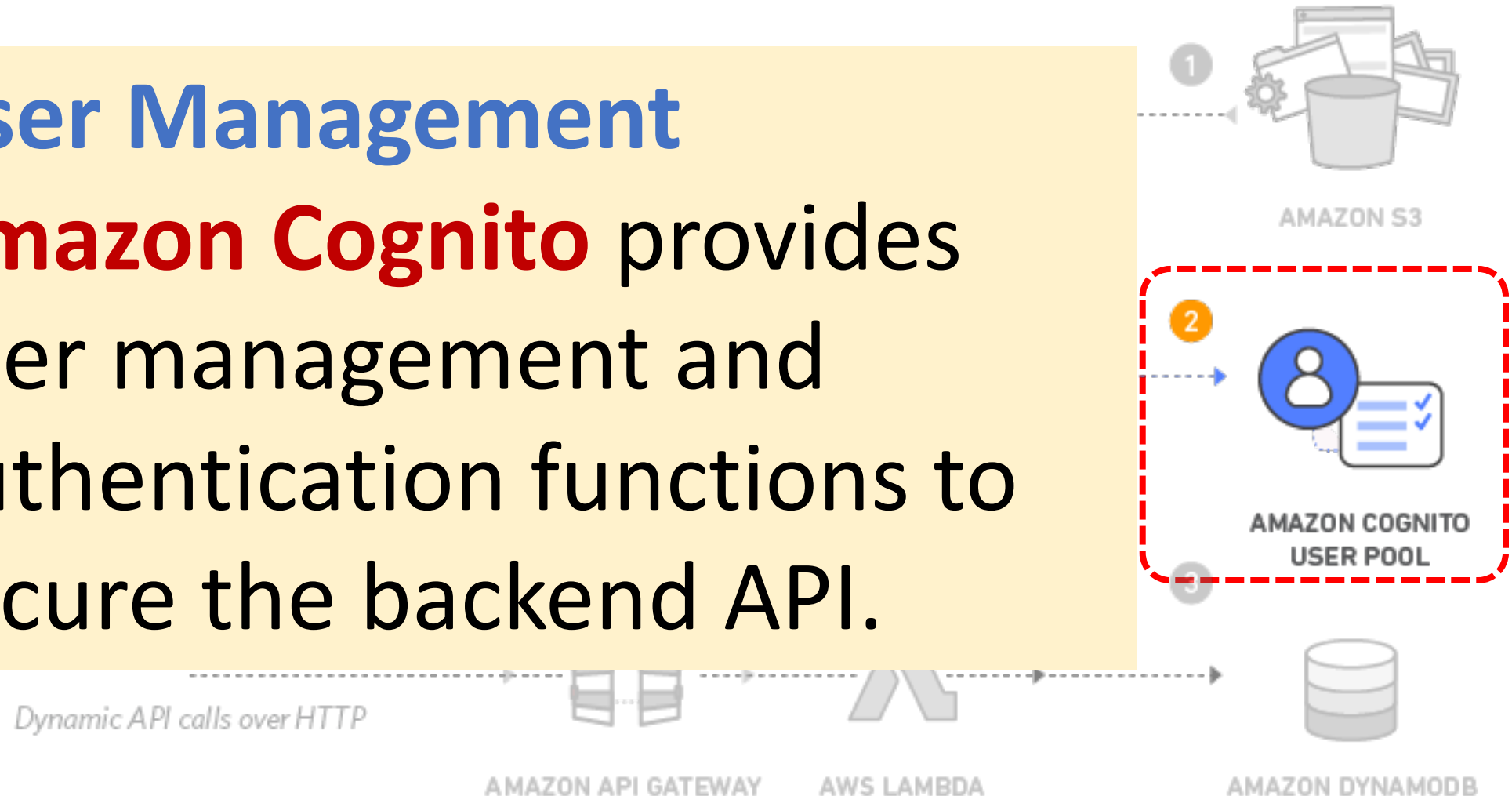
# Build a Serverless Web Application

with Amazon S3, AWS Lambda, Amazon API Gateway, Amazon DynamoDB, and Amazon Cognito

## 2

## User Management

**Amazon Cognito** provides user management and authentication functions to secure the backend API.

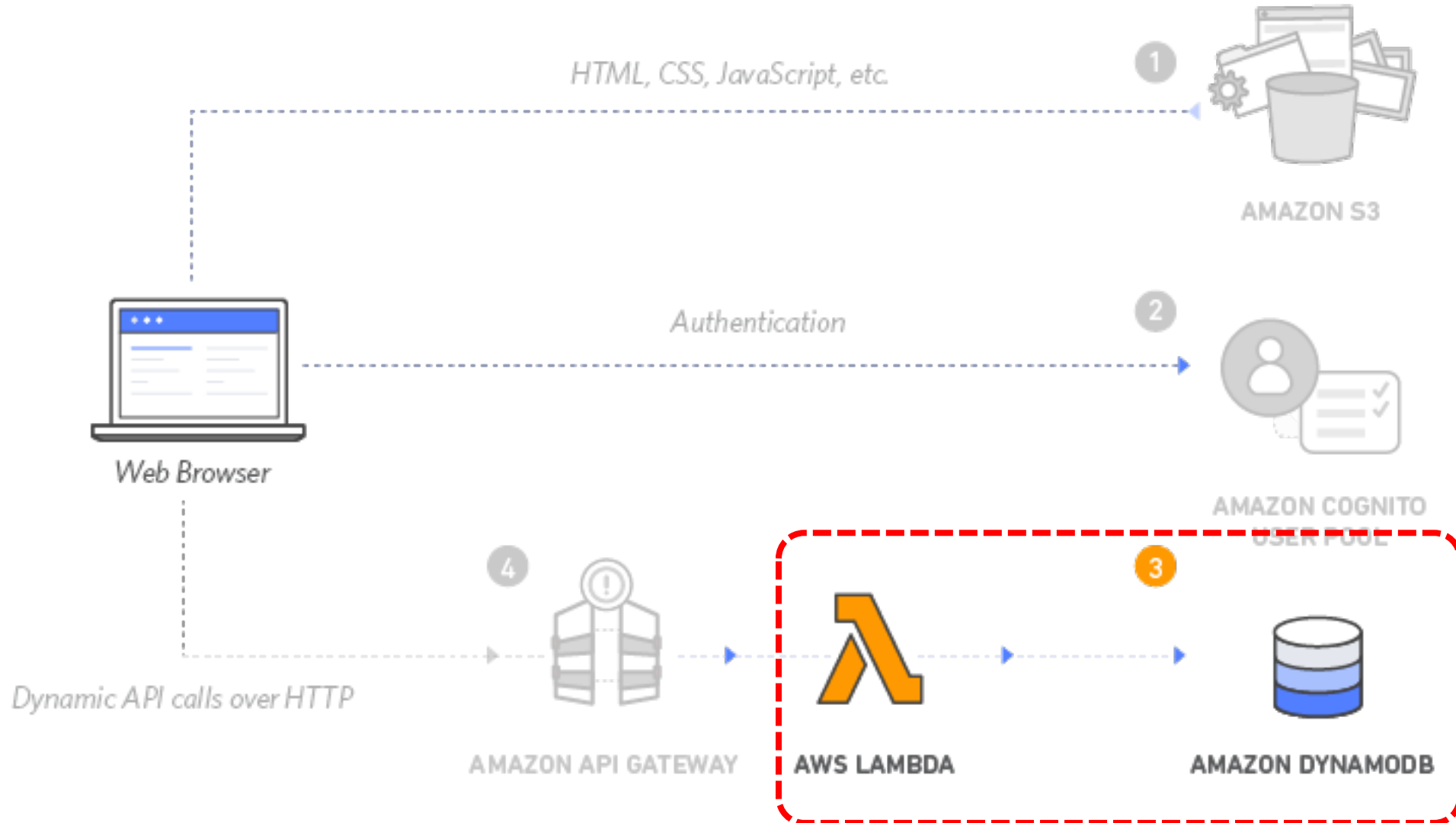




# Build a Serverless Web Application

with Amazon S3, AWS Lambda, Amazon API Gateway, Amazon DynamoDB, and Amazon Cognito

3





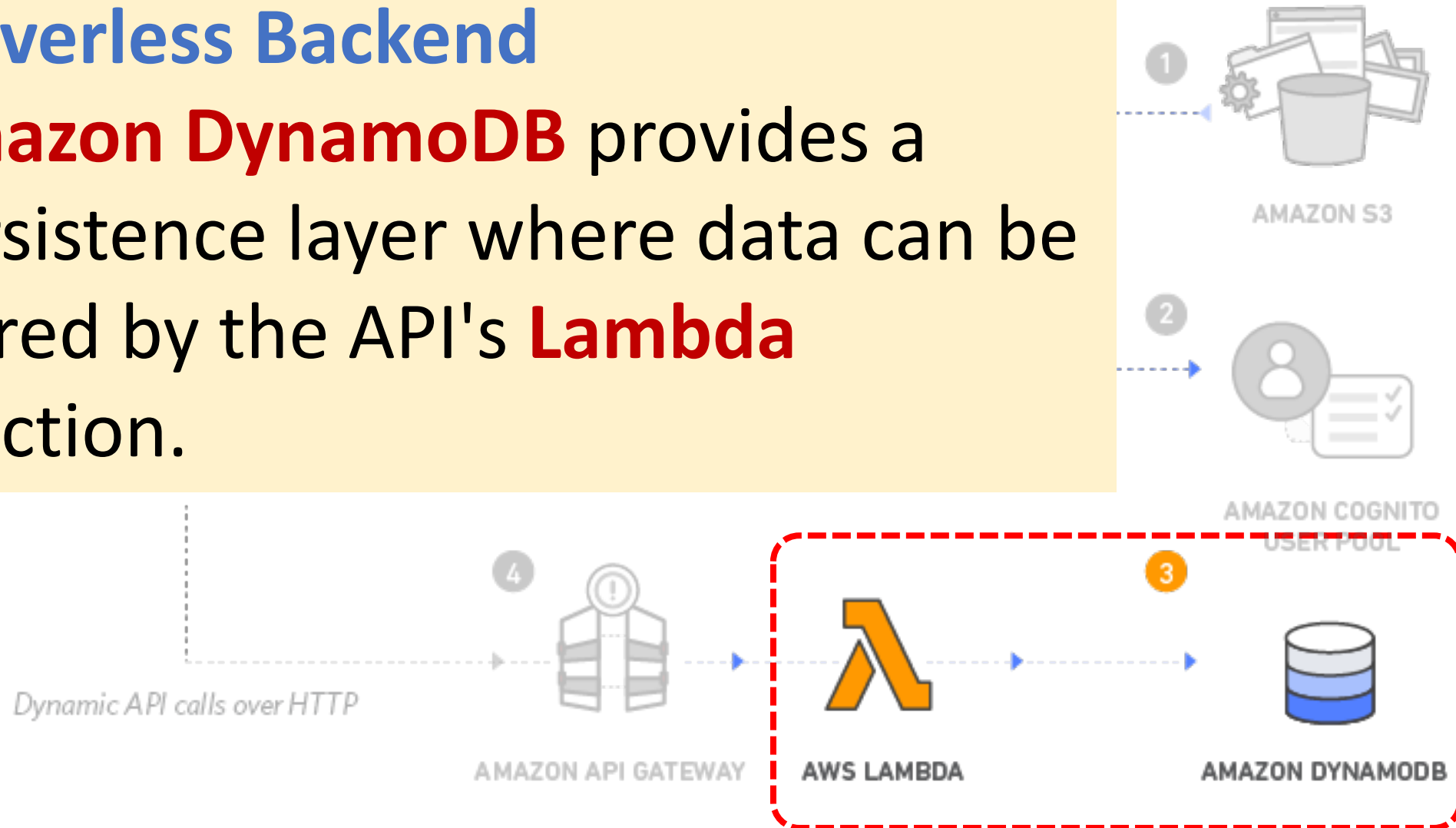
# Build a Serverless Web Application

with Amazon S3, AWS Lambda, Amazon API Gateway, Amazon DynamoDB, and Amazon Cognito

# 3

## Serverless Backend

**Amazon DynamoDB** provides a persistence layer where data can be stored by the API's **Lambda** function.



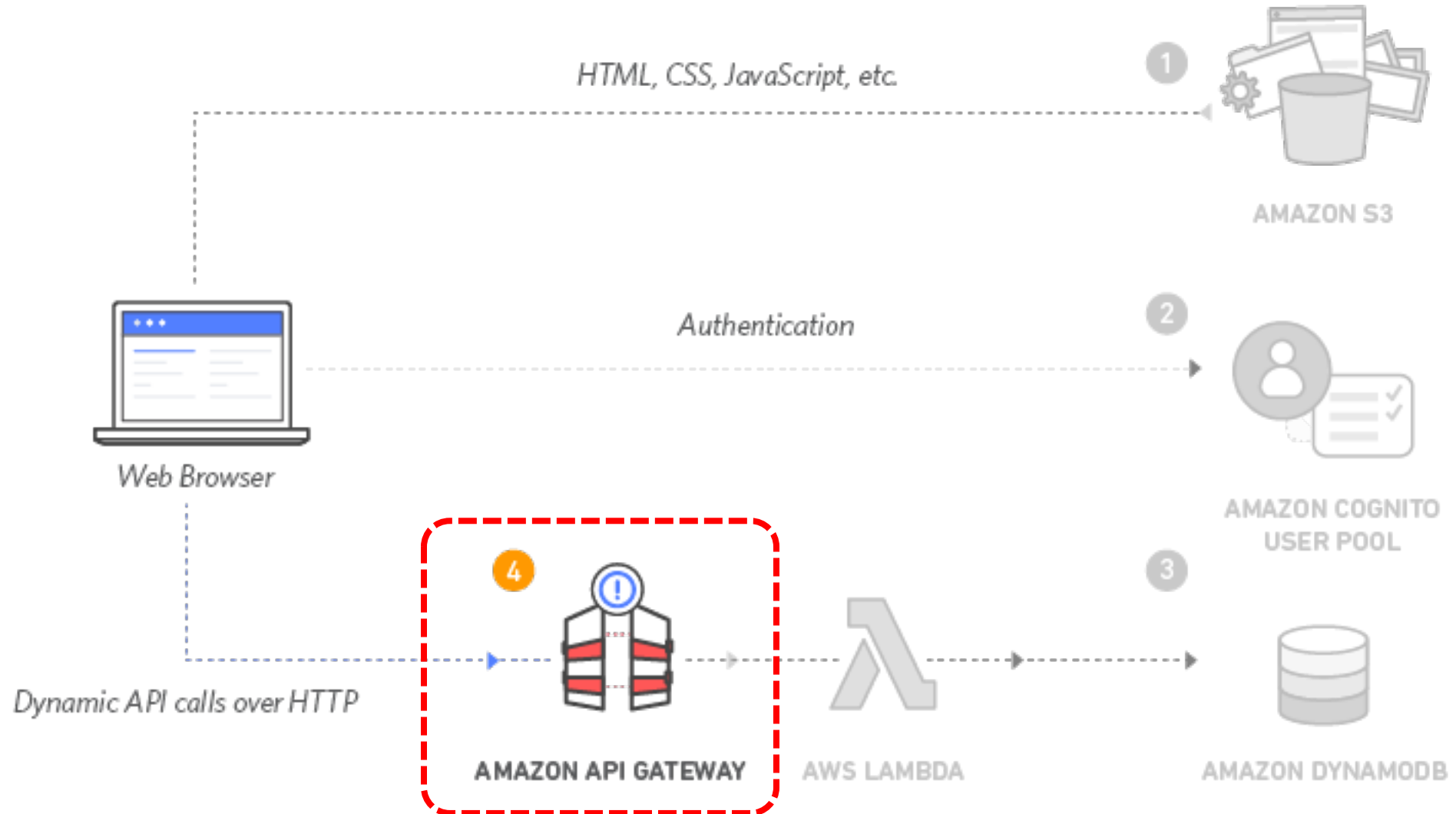




# Build a Serverless Web Application

with Amazon S3, AWS Lambda, Amazon API Gateway, Amazon DynamoDB, and Amazon Cognito

4





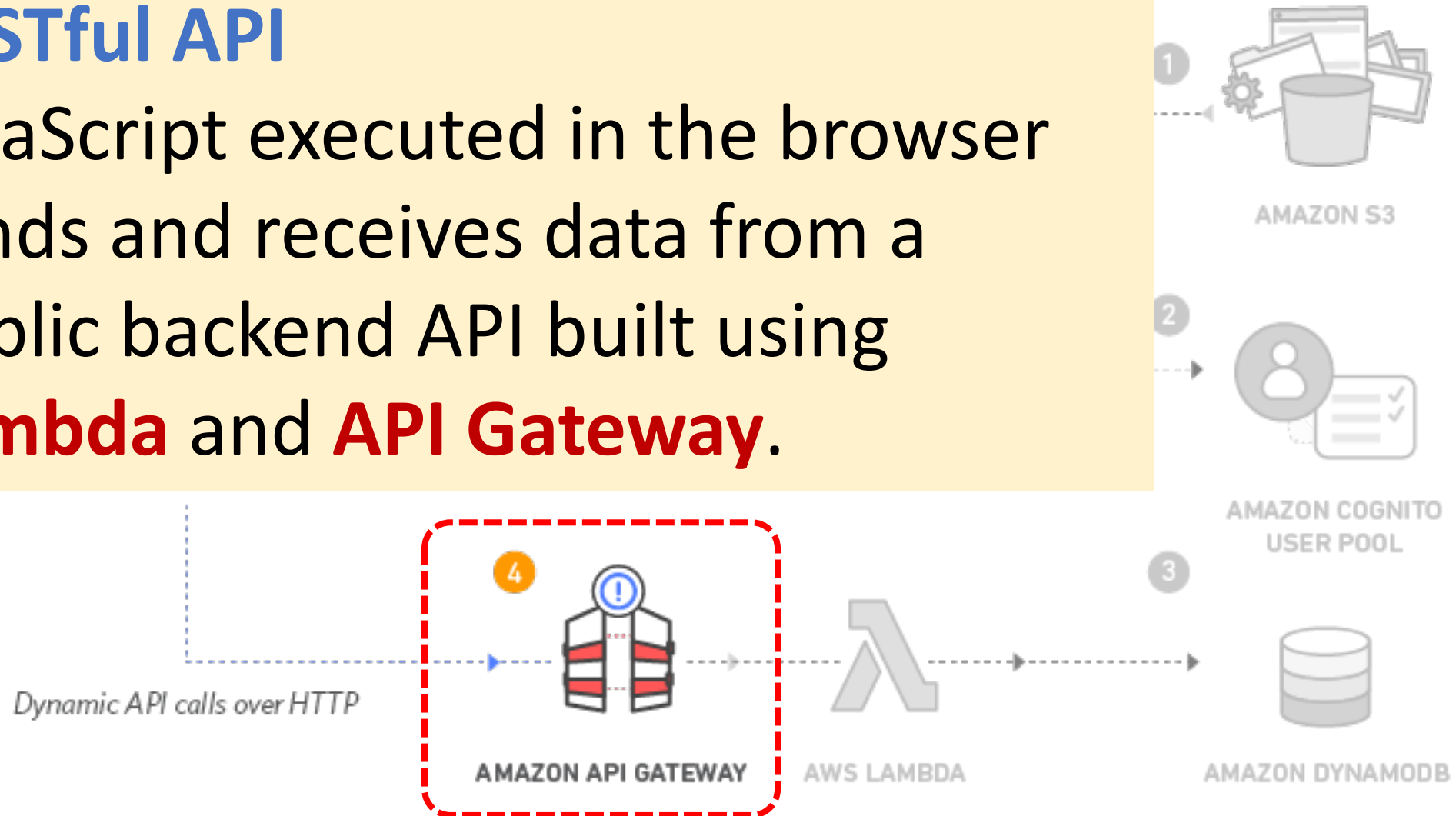
# Build a Serverless Web Application

with Amazon S3, AWS Lambda, Amazon API Gateway, Amazon DynamoDB, and Amazon Cognito

## 4

### RESTful API

JavaScript executed in the browser sends and receives data from a public backend API built using **Lambda** and **API Gateway**.





# Build a Serverless Web Application

with Amazon S3, AWS Lambda, Amazon API Gateway,  
Amazon DynamoDB, and Amazon Cognito

## 5 Terminate resources

### Resource Cleanup

You will terminate an **Amazon S3** bucket, an **Amazon Cognito** User Pool, an **AWS Lambda** function, an **IAM** role, a **DynamoDB** table, a **REST API**, and a **CloudWatch** Log.

It is a best practice to **delete resources** you are no longer using to avoid unwanted charges.

# Summary

- **Cloud Computing Architecture for AI**
- **AWS Certifications Roadmap for Machine Learning**
- **AWS Serverless Architecture**

# References

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- <https://www.aws.training/>
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- **AWS Certified Cloud Practitioner**
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  - <https://aws.amazon.com/certification/certified-solutions-architect-associate/>
- **AWS Cloud Practitioner Essentials (Second Edition)**
  - <https://aws.amazon.com/training/course-descriptions/cloud-practitioner-essentials/>
- **Architecting on AWS**
  - <https://aws.amazon.com/training/course-descriptions/architect/>

Q & A

# Cloud Computing Architecture for Artificial Intelligence (人工智慧雲端運算架構)

Host: 閔立中, TKU AI創智社社長

Time: 18:00-20:00, May 24, 2022 (Tuesday)

Place: TKU AI Club, [MS Teams](#)

戴敏育 副教授

Min-Yuh Day, Ph.D, Associate Professor

國立臺北大學 資訊管理研究所

Institute of Information Management, National Taipei University

<https://web.ntpu.edu.tw/~myday>

2022-05-24

