Public Cloud

Prepared for

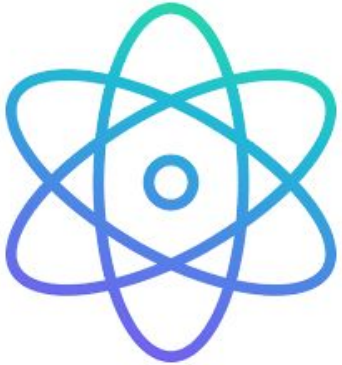
Faculty of Mathematics and Informatics (FMI)

What is the public cloud

What is the public cloud?

Several Clouds

Programmable resources



Dynamic abilities

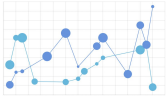
Pay as you go

Several Clouds

Several Clouds

Six advantages of cloud computing

Several Clouds



Trade capital expense for variable expense

Benefit from massive economies of scale

Stop guessing about capacity

Increase speed and agility

Focus on added value

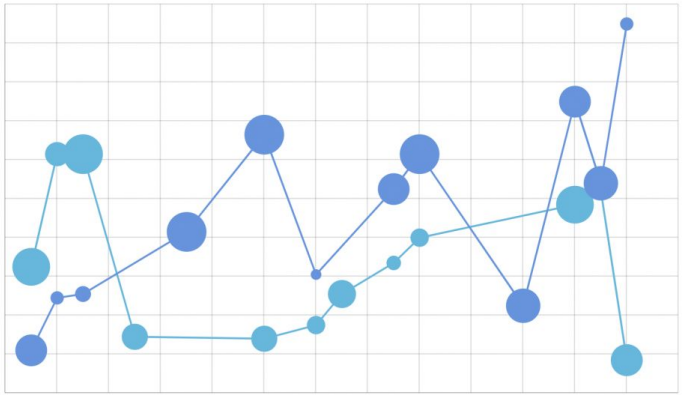
Go global in minutes

Trade capital expense for variable expense

Several Clouds

No need to buy hardware

- Pay as you consume resources
- Pay only for how much you consume



Benefit from massive economies of scale

Several Clouds

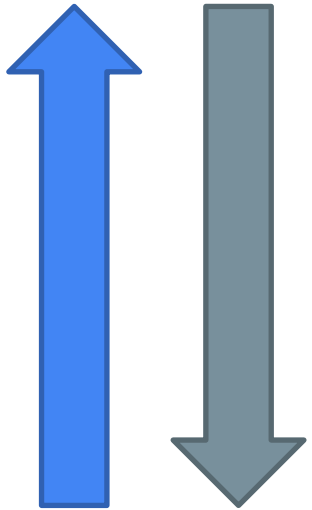
Because usage from hundreds of thousands of customers is aggregated in the cloud, providers such as AWS can achieve higher economies of scale, which translates into lower pay as-you-go prices.

Stop guessing capacity

Several Clouds

Eliminate guessing future capacity

- Scale up and down as required
- No need to overprovision



Increase speed and agility

Several Clouds

Experiment and develop faster

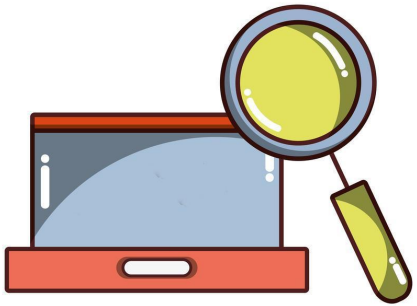
- New IT resources are only a click away
- Dramatic increase in agility for the organization

Added value

Several Clouds

Focus on projects that differentiate your business, not the infrastructure.

- Focus on work that adds value to your business
- Stop maintaining data centers



Go global in minutes

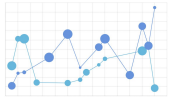
Several Clouds

Go global in minutes

- Multiple AWS Regions around the world
- Lower latency and a better experience for your customers
- Achieve high availability and disaster recovery

Six advantages of cloud computing

Several Clouds



Trade capital expense for variable expense

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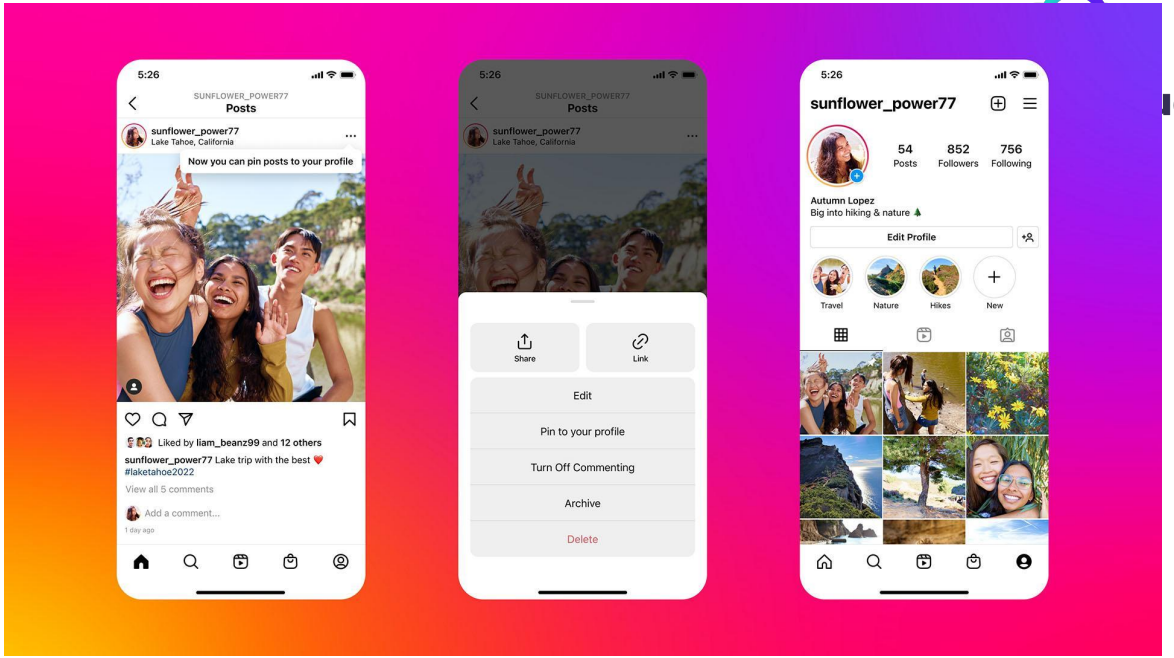
Instagram



“Instagram is a free photo sharing and social networking service for your iPhone that has been an instant success. Growing to 14 million users in just over a year (now 30 million users), they reached 150 million photos in August while amassing several terabytes of photos, and they did this with just **3 Instaneers**, all on the Amazon stack.”

Types of Cloud Computing

Cloud Computing Deployment Models

Several Clouds

Cloud

A cloud-based application is fully deployed in the cloud and all parts of the application run in the cloud. Applications in the cloud have either been created in the cloud or have been migrated from an existing infrastructure to take advantage of the benefits of cloud computing. Cloud-based applications can be built on low-level infrastructure pieces or can use higher level services that provide abstraction from the management, architecting, and scaling requirements of core infrastructure.

Hybrid

A hybrid deployment is a way to connect infrastructure and applications between cloud-based resources and existing resources that are not located in the cloud. The most common method of hybrid deployment is between the cloud and existing on-premises infrastructure to extend, and grow, an organization's infrastructure into the cloud while connecting cloud resources to internal system. For more information on how AWS can help you with your hybrid deployment, please visit our hybrid page.

On-premises

Deploying resources on-premises, using virtualization and resource management tools, is sometimes called “private cloud”. On-premises deployment does not provide many of the benefits of cloud computing but is sometimes sought for its ability to provide dedicated resources. In most cases this deployment model is the same as legacy IT infrastructure while using application management and virtualization technologies to try and increase resource utilization.

Cloud Computing Models

Several Clouds

Infrastructure as a Service (IaaS)

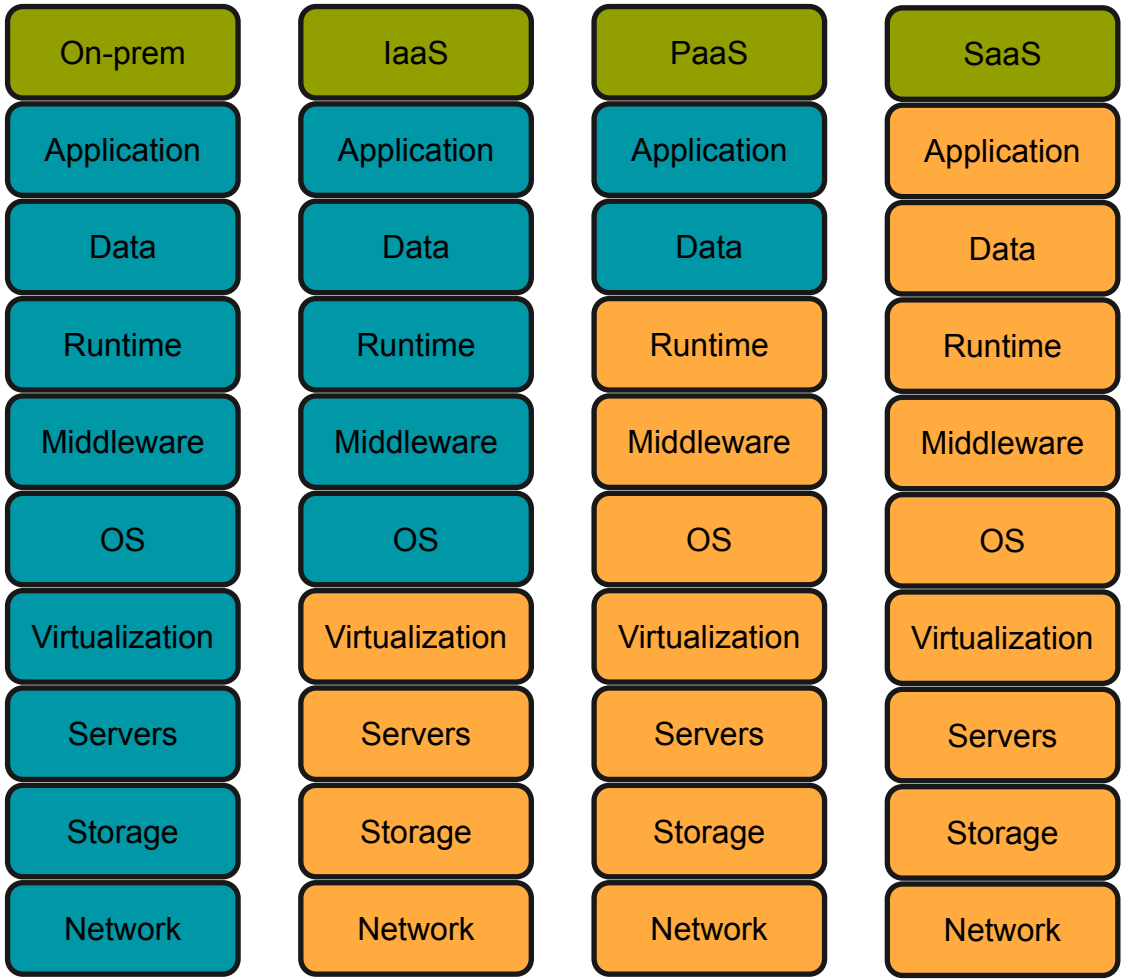
Infrastructure as a Service, sometimes abbreviated as IaaS, contains the basic building blocks for cloud IT and typically provide access to networking features, computers (virtual or on dedicated hardware), and data storage space. Infrastructure as a Service provides you with the highest level of flexibility and management control over your IT resources and is most similar to existing IT resources that many IT departments and developers are familiar with today.

Platform as a Service (PaaS)

Platforms as a service remove the need for organizations to manage the underlying infrastructure (usually hardware and operating systems) and allow you to focus on the deployment and management of your applications. This helps you be more efficient as you don't need to worry about resource procurement, capacity planning, software maintenance, patching, or any of the other undifferentiated heavy lifting involved in running your application.

Software as a Service (SaaS)

Software as a Service provides you with a completed product that is run and managed by the service provider. In most cases, people referring to Software as a Service are referring to end-user applications. With a SaaS offering you do not have to think about how the service is maintained or how the underlying infrastructure is managed; you only need to think about how you will use that particular piece of software. A common example of a SaaS application is web-based email where you can send and receive email without having to manage feature additions to the email product or maintaining the servers and operating systems that the email program is running on.



Several Clouds

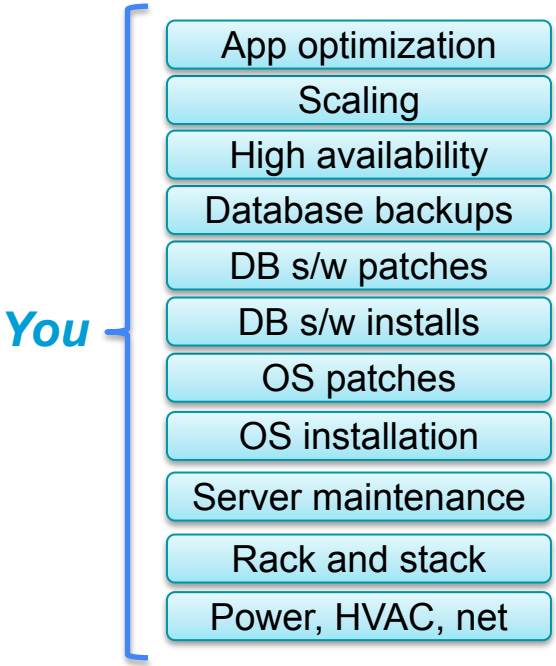
Responsibility

Yours

Public cloud vendor

Relational Database example

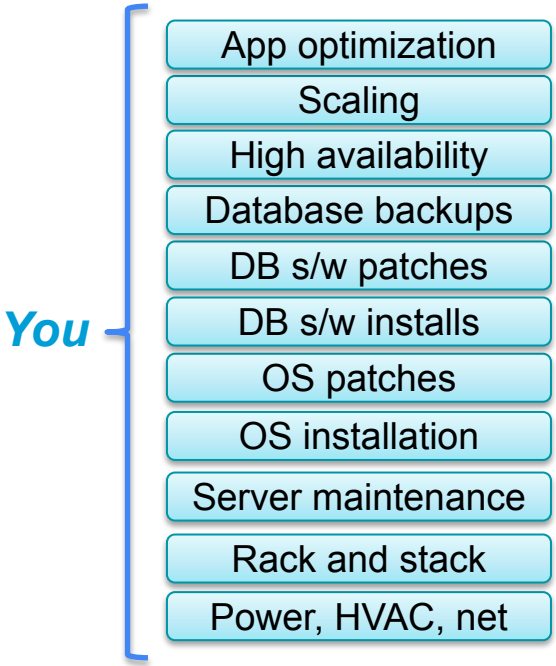
Several Clouds



If you host your databases
on-premises

Relational Database example

Several Clouds

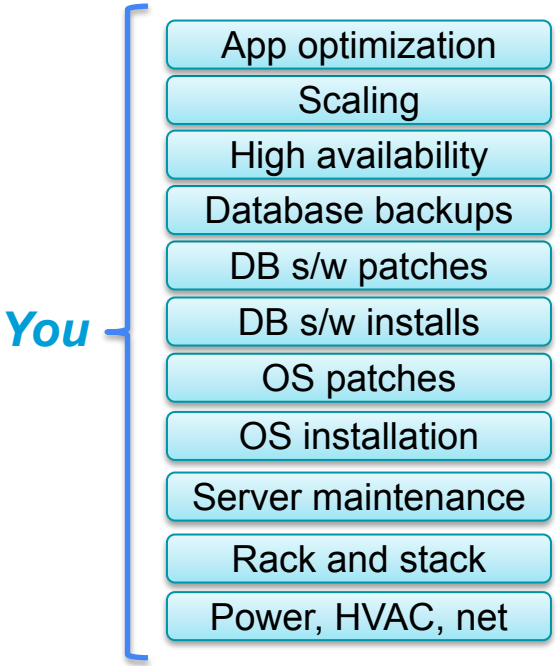


If you host your databases
on-premises

If you host your databases
in **Amazon EC2**

Relational Database example

Several Clouds



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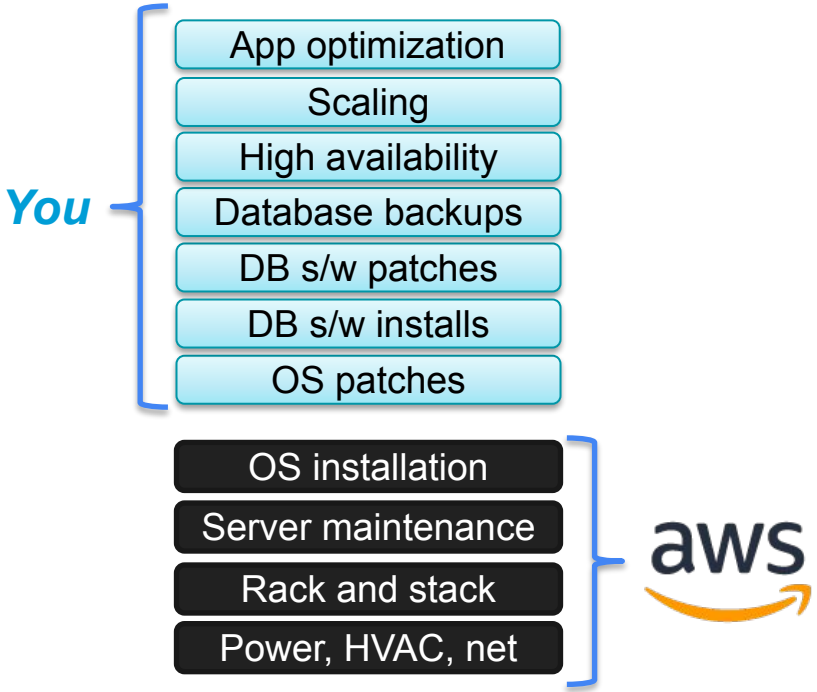

If you host your databases
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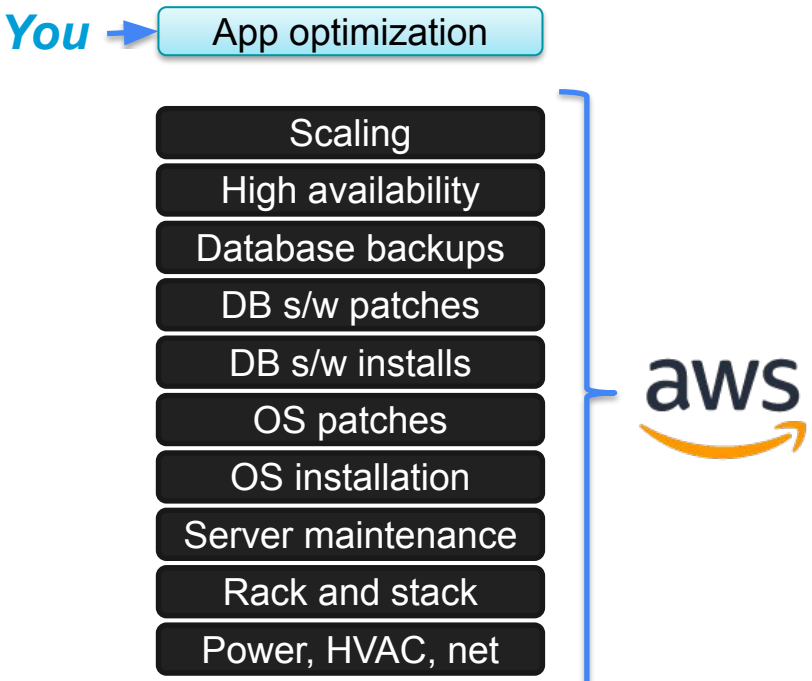
Relational Database example

Several Clouds



If you host your databases in
a managed AWS database service

AWS Well-Architected

Several Clouds

Operational Excellence Pillar

The operational excellence pillar focuses on running and monitoring systems, and continually improving processes and procedures. Key topics include automating changes, responding to events, and defining standards to manage daily operations.

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Security Pillar

The security pillar focuses on protecting information and systems. Key topics include confidentiality and integrity of data, managing user permissions, and establishing controls to detect security events.

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Reliability Pillar

The reliability pillar focuses on workloads performing their intended functions and how to recover quickly from failure to meet demands. Key topics include distributed system design, recovery planning, and adapting to changing requirements.

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Performance Efficiency Pillar

The performance efficiency pillar focuses on structured and streamlined allocation of IT and computing resources. Key topics include selecting resource types and sizes optimized for workload requirements, monitoring performance, and maintaining efficiency as business needs evolve.

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Cost Optimization Pillar

The cost optimization pillar focuses on avoiding unnecessary costs. Key topics include understanding spending over time and controlling fund allocation, selecting resources of the right type and quantity, and scaling to meet business needs without overspending.

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Sustainability Pillar

The sustainability pillar focuses on minimizing the environmental impacts of running cloud workloads. Key topics include a shared responsibility model for sustainability, understanding impact, and maximizing utilization to minimize required resources and reduce downstream impacts.

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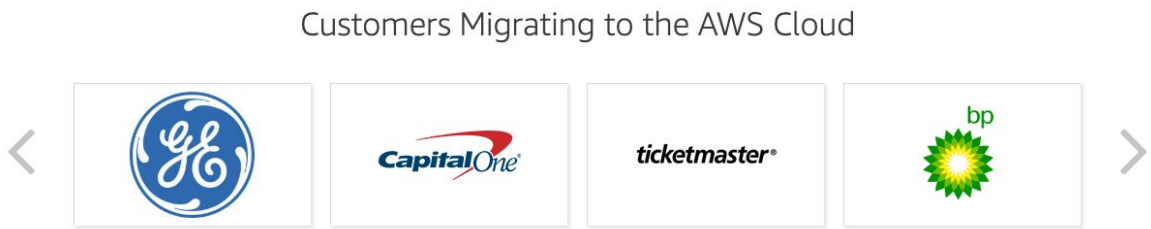
Public cloud customers

Several Clouds

AWS has millions of active customers every month and every imaginable vertical business segment in the enterprise is using AWS in a meaningful way.

- In financial services it's Capital One, Intuit, FINRA, and Barclays.
- In healthcare, we have Johnson & Johnson, Merck, Pfizer, and Bristol Myers Squibb.
- In oil and gas there is Shell, BP, and Hess.
- In manufacturing, we have customers such as GE, Philips, and Schneider Electric.
- There is also Netflix, Samsung, Adobe, and Autodesk in technology.



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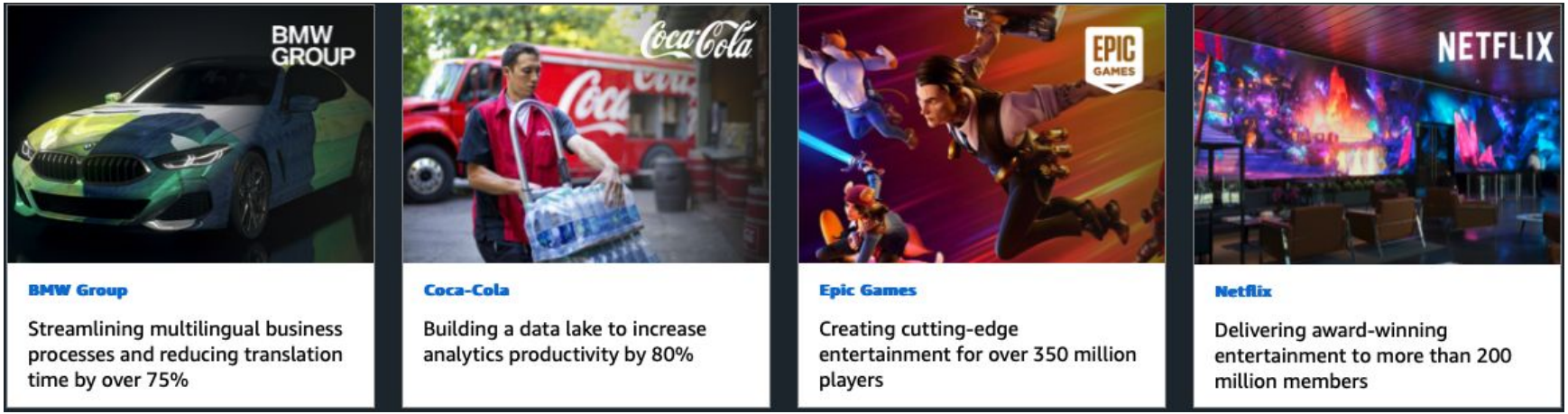


Epic Games on AWS

- Epic Games Uses AWS to Deliver Fortnite to 200 Million Players
- *Fortnite – an* online game that's seen over 15.3 million concurrent players
- Epic stores petabytes of data in an AWS data lake
- Epic scales compute capacity at optimal price performance
- Epic has reduced the physical and time-consuming barriers to creating cutting-edge entertainment

- Amazon Aurora – On Prime Day, **5,326 database** instances running the PostgreSQL-compatible and MySQL-compatible
- Amazon SQS – During Prime Day, SQS set a new traffic record by processing **70.5 million messages per second** at peak.
- DynamoDB maintained high availability while delivering **single-digit millisecond** responses and peaking at **105.2 million requests per second**.

Security and compliance

Several Clouds

CSA

Cloud Security Alliance Controls

CyberGRX

Third Party Risk Management

ISO 9001

Global Quality Standard

ISO 27001

Security Management Controls

ISO 27017

Cloud Specific Controls

CJIS

Criminal Justice Information Services

DoD SRG

Department of Defense Data Processing

FedRAMP

Government Data Standards

FERPA

Educational Privacy Act

FIPS

Government Security Standards

ISO 27701

Privacy Information Management

ISO 27018

Personal Data Protection

PCI DSS Level 1

Payment Card Standards

SOC 1

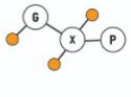
Audit Controls Report

SOC 2

Security, Availability, & Confidentiality Report

FISMA

Federal Information Security Management



GxP

Quality Guidelines and Regulations

HIPAA

Protected Health Information

HITRUST CSF

Health Information Trust Alliance Common Security Framework

ITAR

International Arms Regulations

NASA JPL

- This is the first planetary NASA mission, with mission-critical communication and transfer of telemetry data in the cloud.
- “Amazon SWF gives NASA/JPL the ability to leverage resources inside and outside its environment and seamlessly distribute application execution into the public cloud, enabling their applications to dynamically scale and run in a truly distributed manner.”

robinhood

Several Clouds

- Robinhood’s lean staff, including just two DevOps people, used AWS to create a massively scalable securities trading app with strong built-in security and compliance features that supported hundreds of thousands of users at launch. Robinhood is a startup offering no-fee securities trading. The company uses AWS to operate its online business, deliver and update its mobile trading app, securely store customer information and trading data, and perform business analytics.

Formula One Companies (Formula 1) is moving the vast majority of its infrastructure from on-premises data centers to AWS, and standardizing on AWS's machine-learning and data-analytics services to accelerate its cloud transformation. Formula 1 will work with AWS to enhance its race strategies, data tracking systems, and digital broadcasts through a wide variety of AWS services.

https://www.youtube.com/watch?v=phCSmKjBfEc

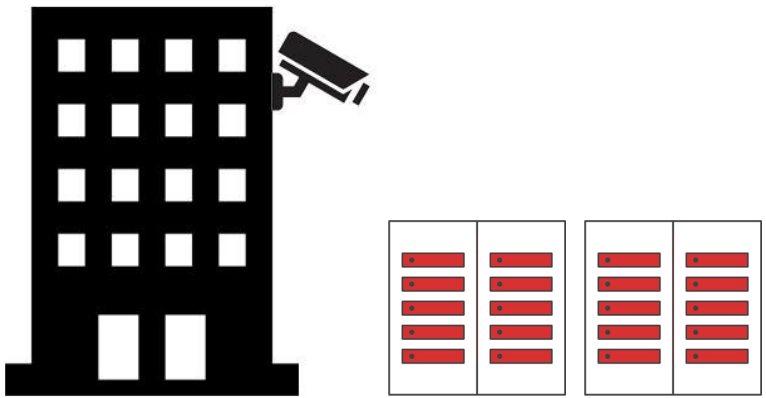
Fastest pace of innovation

Several Clouds

With AWS, you can leverage the latest technologies to experiment and innovate more quickly. AWS are continually accelerating our pace of innovation to invent entirely new technologies you can use to transform your business. For example, in 2014, AWS pioneered the **serverless** computing space with the launch of AWS Lambda, which lets developers run their code without provisioning or managing servers. And AWS built Amazon SageMaker, a fully managed machine learning service that empowers everyday developers and scientists to use machine learning–without any previous experience.

AWS data centers

- A single data center typically houses tens of thousands of servers
- All data centers are online, not “cold”
- AWS Customized network protocol stac



AWS Availability Zones

Each Availability Zone is:

- Made up of one or more data centers
- Designed for fault isolation
- Interconnected with other Availability Zones using high-speed private links

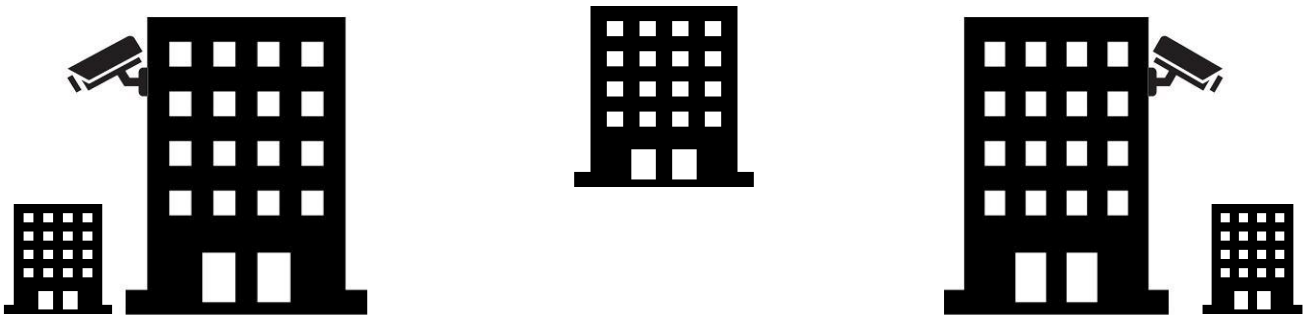
- You can choose your Availability Zones
- AWS recommends replicating across Availability Zones for resiliency

AWS Regions

Each AWS Region is made up of two or more Availability Zones.

- AWS has 24 Regions worldwide.
- You enable and control data replication across Regions.
- Communication between Regions uses AWS backbone network infrastructure.

Region



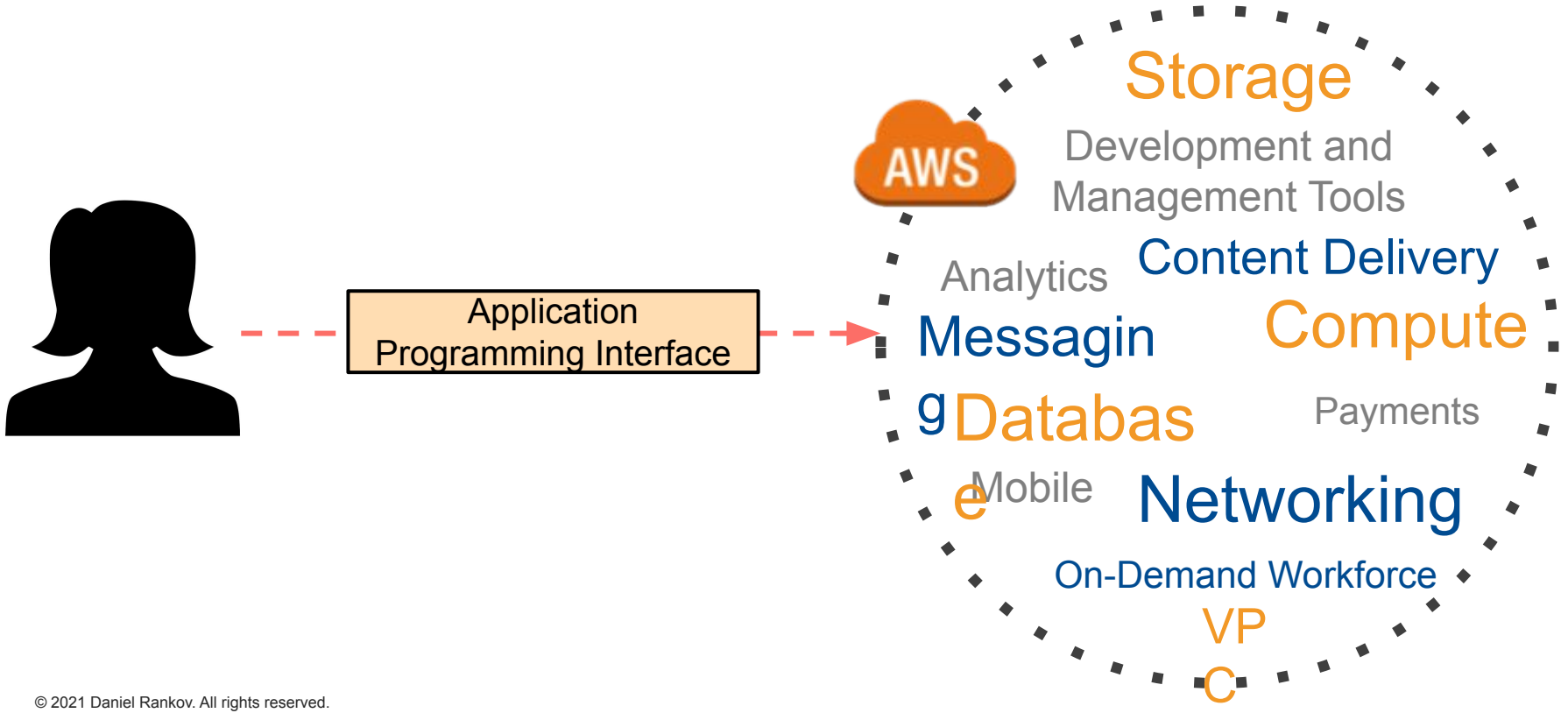
AWS global infrastructure

AWS global infrastructure

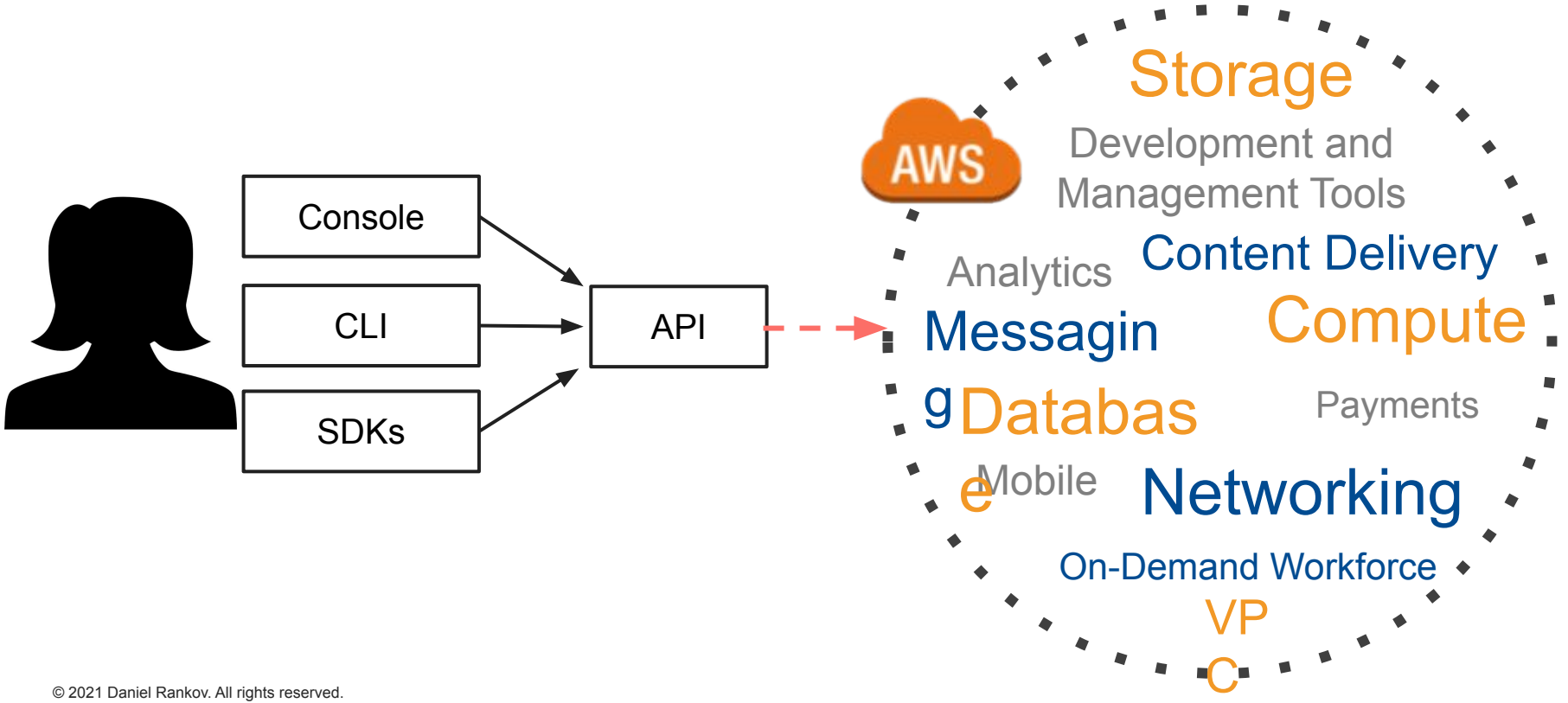
Working with AWS services

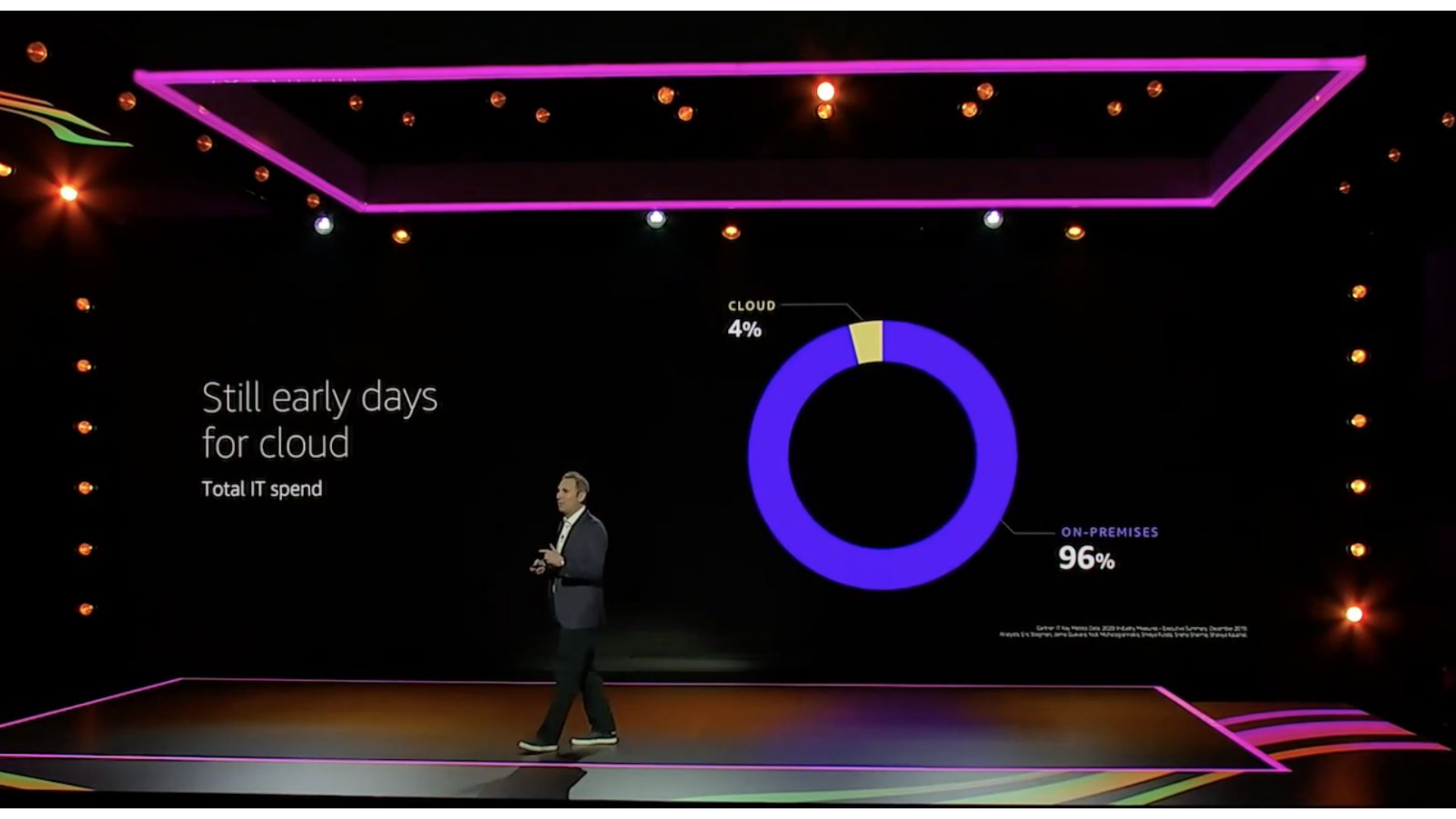
Operating an AWS Service

Operating an AWS Service



Operating an AWS Service




Still early days
for cloud
Total IT spend
CLOUD
4%
ON-PREMISES
96%


State of the cloud
Worldwide market segment share
AWS / 51.80%
Microsoft / 13.30%
Alibaba / 4.60%
Google / 3.30%
IBM / 1.90%
Other vendors / 25.0%

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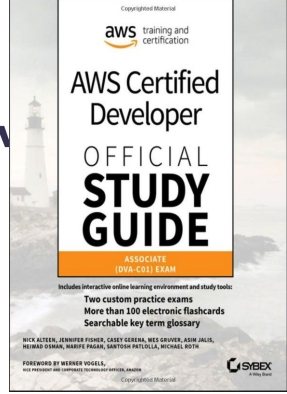
Figure 1: Magic Quadrant for Cloud Infrastructure and Platform Services

AWS Named as a Leader in the 2022 Gartner Cloud Infrastructure & Platform Services (CIPS) Magic Quadrant for the 12th Consecutive Year

Resources

- https://aws.amazon.com/what-is/cloud-native/
- https://awsstash.com/?search=%22serverless%22
- https://aws.amazon.com/serverless-workshops/
- https://aws.amazon.com/certification/certified-developer-associate/
- https://aws.amazon.com/blogs/architecture/lets-architect-serverless-architecture-on-aws/
- https://reinvent.awsevents.com/
- https://www.coursera.org/specializations/aws-nodejs-serverless-development



Thank you!

daniel@severalclouds.com

https://www.linkedin.com/in/danielrankov/

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