



Cloud 101: Introduction to Commercial Cloud Computing

Introduction

Cloud Foundations Service – Research Computing – Office of Information Technology

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Slides:

https://github.com/ResearchComputing/cloud101_primer

Outline

- What is the Cloud?
- Services offered
- Advantages of using the Cloud
- Shared Responsibility Model
- Example Use-Cases
- Cost-Saving Considerations
- Live Demo
- Learning Materials
- How to get started

What is the Cloud?

"The cloud" refers to servers that are accessed via the Internet. This includes the Operating Systems, software, and databases that run on those servers.



Commercial Cloud Providers

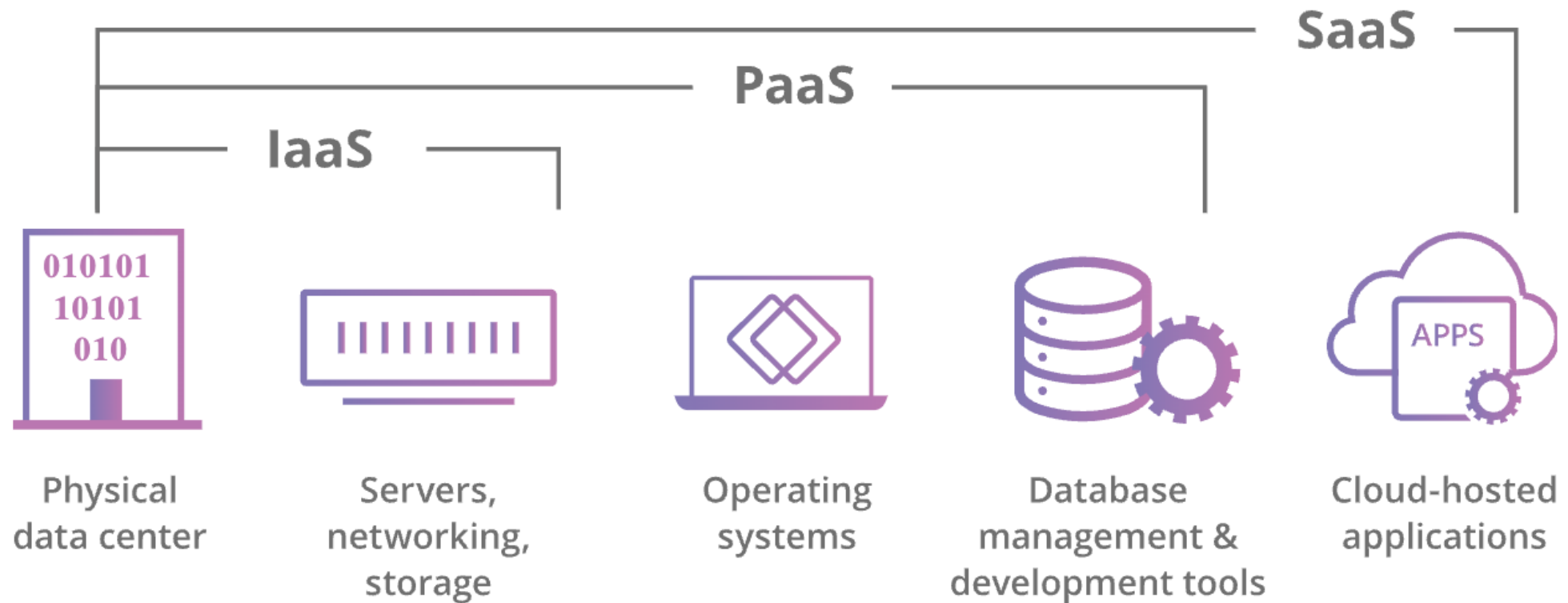
- Amazon AWS
- Microsoft Azure
- Google Cloud Provider
- Many more



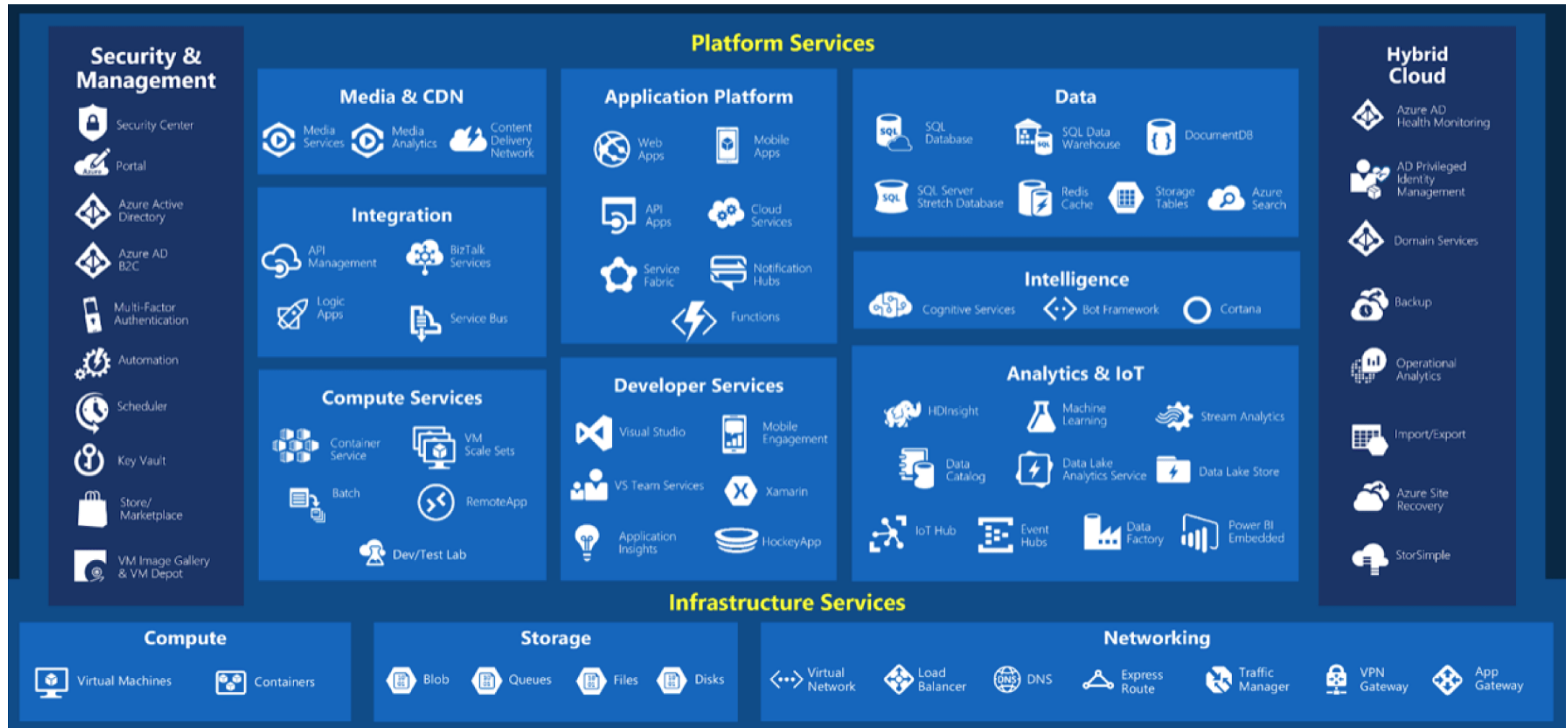
What is the Cloud?

- Anything as a Service (XaaS) – a business model (generally subscription based) in which something is provided to the customer as a service
- Infrastructure as a Service (IaaS) - Raw IT resources offered to the user by the cloud service provider
 - Most control, most advanced setup
 - Servers
 - Networking
- Platform as a Service (PaaS) – A platform that a provider offers to its customers via the internet
 - Some control, simplified setup
 - Windows Virtual Machine
 - MySQL Database
- Software as a Service (SaaS) - Software that runs on a provider's infrastructure
 - Least control, most simple setup
 - Jupyterhub
 - Wordpress Site

What is the Cloud?



What services are offered?



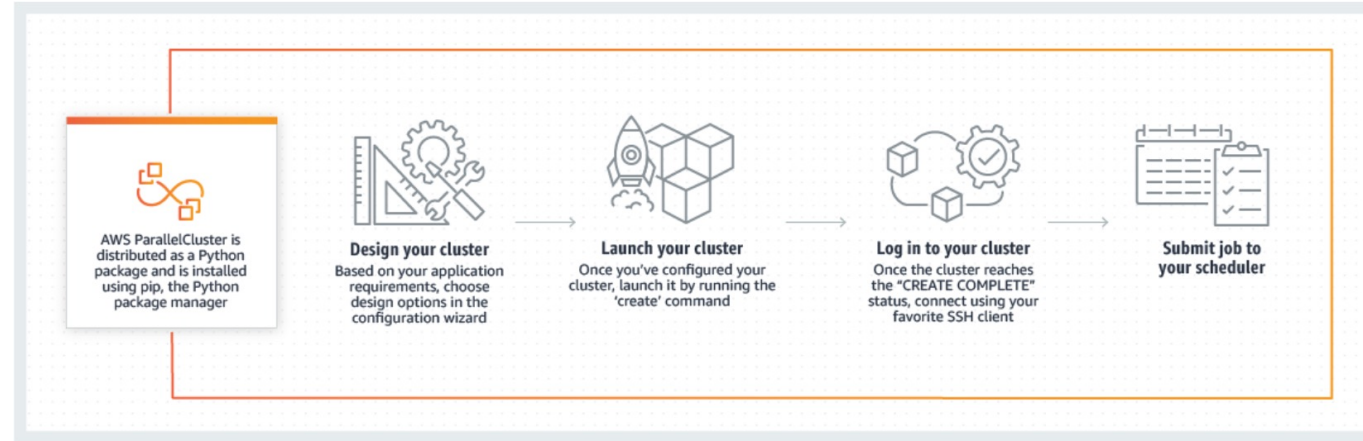
What tools are available?

- Conventional Cloud Computing Resources
 - Virtual Machines
 - Storage
 - Databases
- Quick Start Tools
 - Lightsail for Research

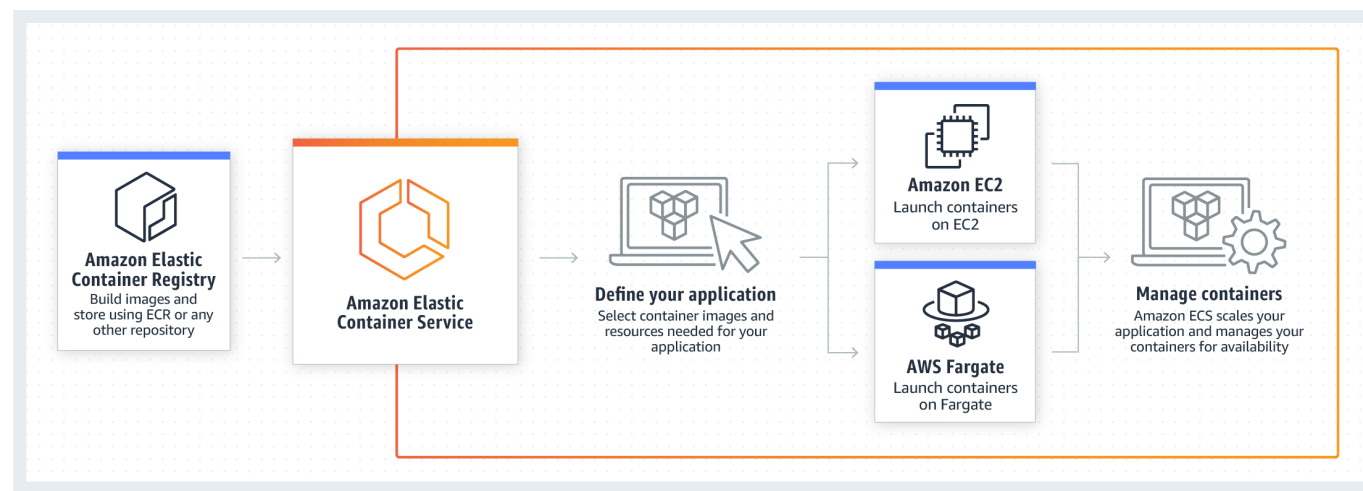
What tools are available?

- Advanced tools
 - Cluster Environments
 - Parallel cluster
 - Container Services
 - Elastic Kubernetes Service, Elastic Container Service

Parallel Cluster



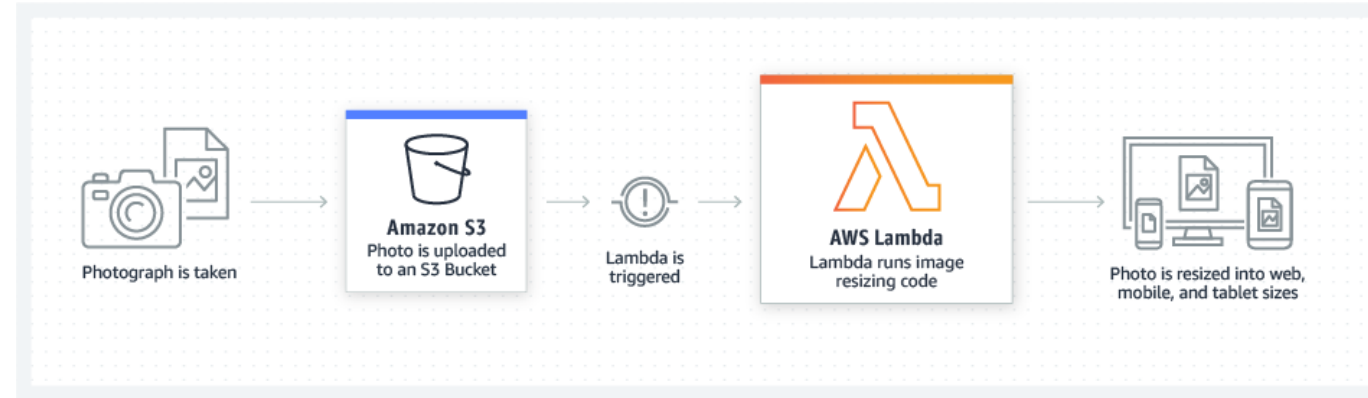
Elastic Container Service



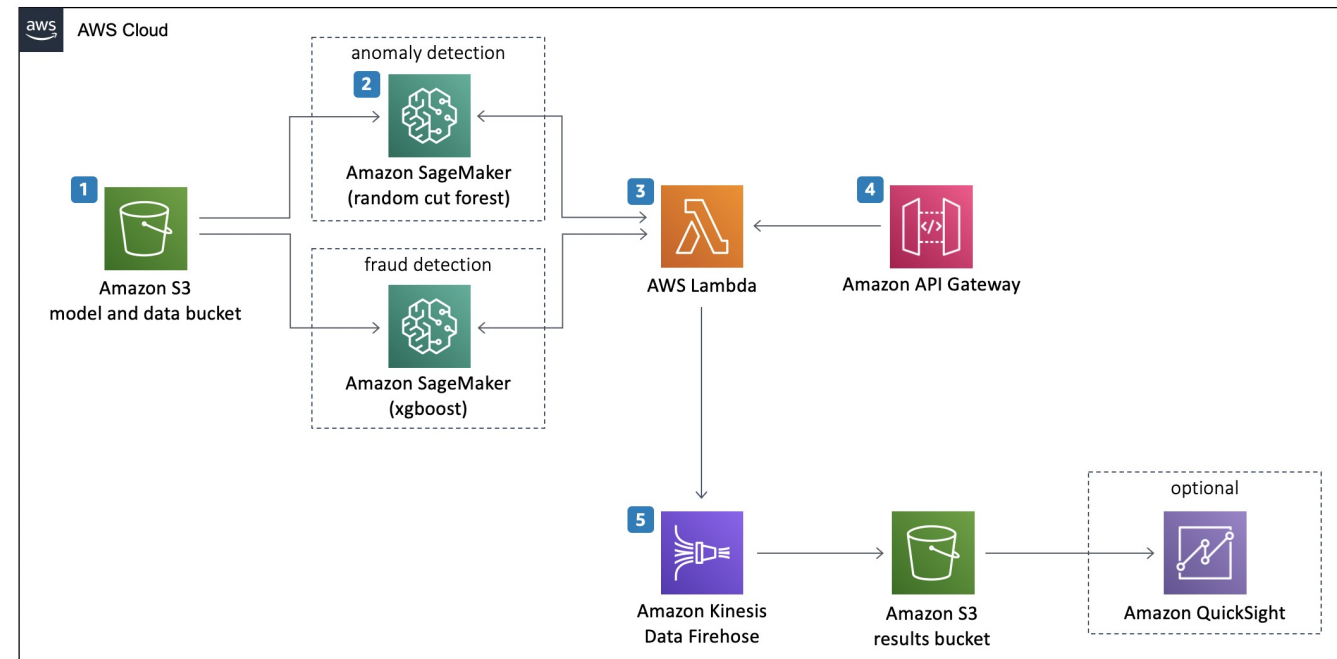
What tools are available?

- Advanced tools
 - Serverless code execution
 - Lambda
 - Machine Learning
 - Sagemaker, Rekognition, Polly, etc.

Lambda



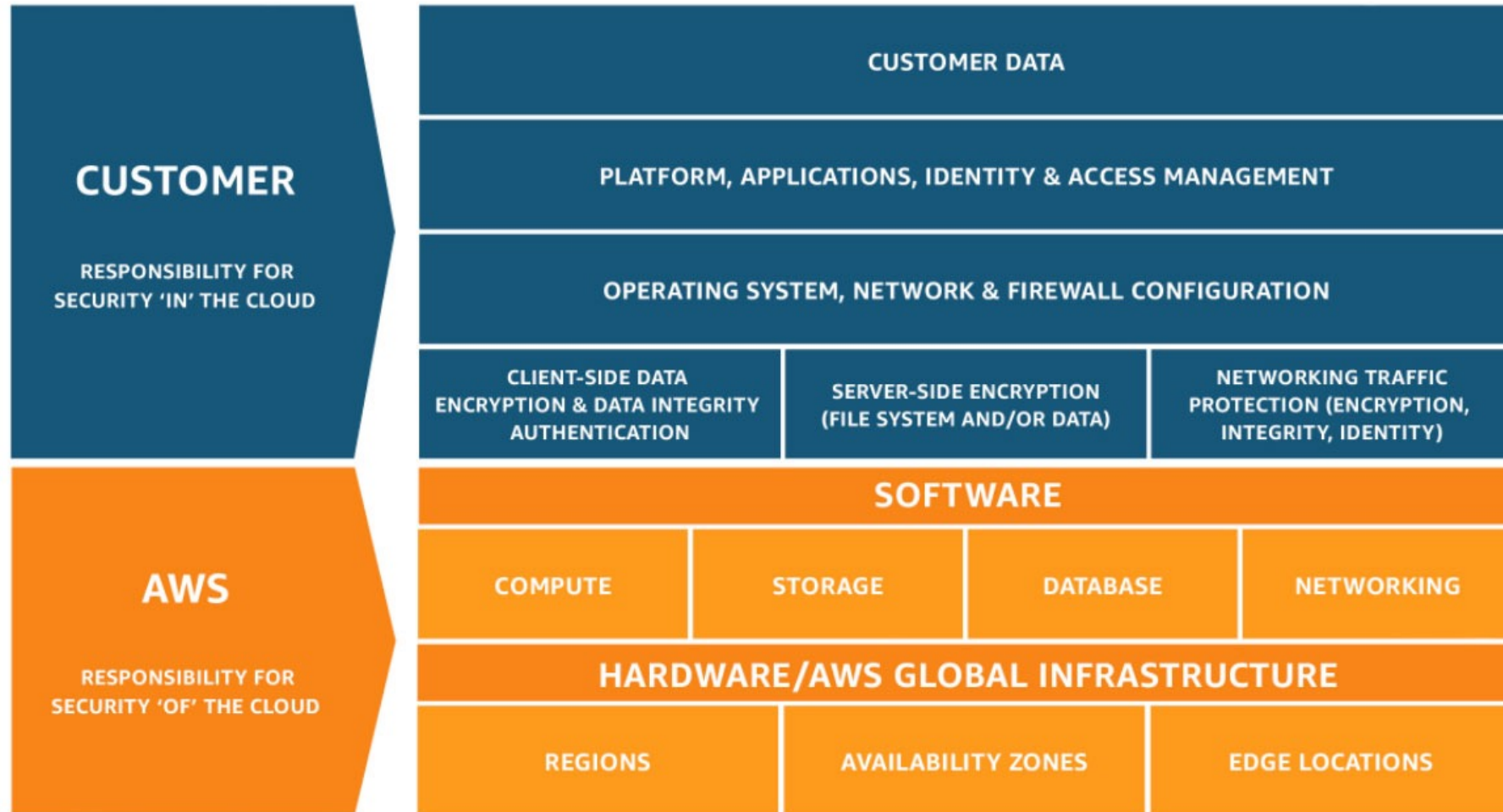
Sagemaker



Why use the cloud?

- [Availability](#)
- Data durability
 - 99.999999999% (11 9's) of data durability
 - "If you store 10,000 objects with us, on average we may lose one of them every 10 million years or so." –Jeff Barr (AWS)
- Quick and easy Scalability
- Get closer to the data
- Wide array of Computing Power
- Cost
- Alleviate operational burden

Shared Responsibility Model



Example use-cases

- Netflix
- Using cloud to meet needs for expensive or otherwise unavailable resources (e.g., specialized GPUs, huge amounts of RAM)
- Using cloud computing to be "near" huge bioinformatics or geophysical datasets that are impractical to download (because these huge datasets are often stored in the public cloud)
- Running a persistent database that mines social media feeds for patterns/phrases
- Teaching "hubs" such as Rstudio and Jupyter, which provide a common software environment for all students



WHAT SCARES
YOU ABOUT
WORKING IN
THE CLOUD?

Cost-Saving Considerations

- Budget Alerts and Actions – Alert when budget is reached and shutdown resources
- Analyze Cost Data – Understand cost on a resource level
- Spot Instances – Utilize cloud provider's unused resources at discount
- Reserved Instances – Commitment to use VM for extended period at a discount
- Autoscaling – Scale resources as demand grows
- Utilizing serverless functions – 1 million requests/month free
- Microservices - Separate monolithic applications into smaller pieces
- Appropriate Storage Options – Utilize cold storage when applicable

CLOUD DEMO



Learning Materials

- [AWS Educate](#)
- [Azure Learn](#)
- [Google Cloud Training](#)
- AWS Events on Campus
 - Research Computing AWS Immersion Session – Feb 28th
 - Machine Learning AWS Immersion Day – Apr 3rd

AWS Resources

- Free Trials offered by AWS
- [AWS Free Tier](#)

Search free tier products

COMPUTE Free Tier 12 MONTHS FREE Amazon EC2 750 Hours per month Resizable compute capacity in the Cloud.	STORAGE Free Tier 12 MONTHS FREE Amazon S3 5 GB of standard storage Secure, durable, and scalable object storage infrastructure.	DATABASE Free Tier 12 MONTHS FREE Amazon RDS 750 Hours per month of database usage (applicable DB engines) Managed Relational Database Service for MySQL, PostgreSQL, MariaDB, or SQL Server.
DATABASE Free Tier ALWAYS FREE Amazon DynamoDB 25 GB of storage Fast and flexible NoSQL database with seamless scalability.	MACHINE LEARNING NEW Free Tier FREE TRIAL Amazon SageMaker 2 Months free trial Machine learning for every data scientist and developer.	COMPUTE Free Tier ALWAYS FREE AWS Lambda 1 Million free requests per month Compute service that runs your code in response to events and automatically manages the compute resources for you.
ANALYTICS Free Tier FREE TRIAL Amazon Redshift 2 Month free trial Fast, simple, cost-effective data warehousing.	ANALYTICS NEW Free Tier 12 MONTHS FREE Amazon OpenSearch Service 750 Hours per month of a single-AZ t2.small.search or t2.micro.search instance Managed service that makes it easy to use Elasticsearch and OpenSearch.	MOBILE Free Tier ALWAYS FREE Amazon SNS 1 Million publishes Fast, flexible, fully managed push messaging service.

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Azure Resources

- [Microsoft Student](#)
 - Free \$100 credit for students
 - Free trials of services

Google Cloud Resources

- [Google Free Tier](#)
 - Free trials of services

How to get started

- Reach out to the Cloud Foundations Service at CU
 - <https://www.colorado.edu/rc/userservices/contact>
- Cloud Foundations Service
 - Amazon AWS, Microsoft Azure, & Google Cloud Platform
- The Preserve
 - CMMC and CUI compliant Azure environment
- National Science Foundation – [JetStream2](#)

Cloud Foundations Service

- What we Offer
 - Basic Security Guardrails
 - Billing against CU funds (Purchase Order / Speedtype)
 - Connection to internal CU network
 - Federated Access
 - Support & Consulting



HOW CAN YOU
USE THE CLOUD
IN YOUR
PROJECT?

Thank you!

- Questions?
- Help Desk:
 - <https://www.colorado.edu/rc/userservices/contact>
- Feedback:
 - <https://forms.office.com/r/idtDVWz7HY>

