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.

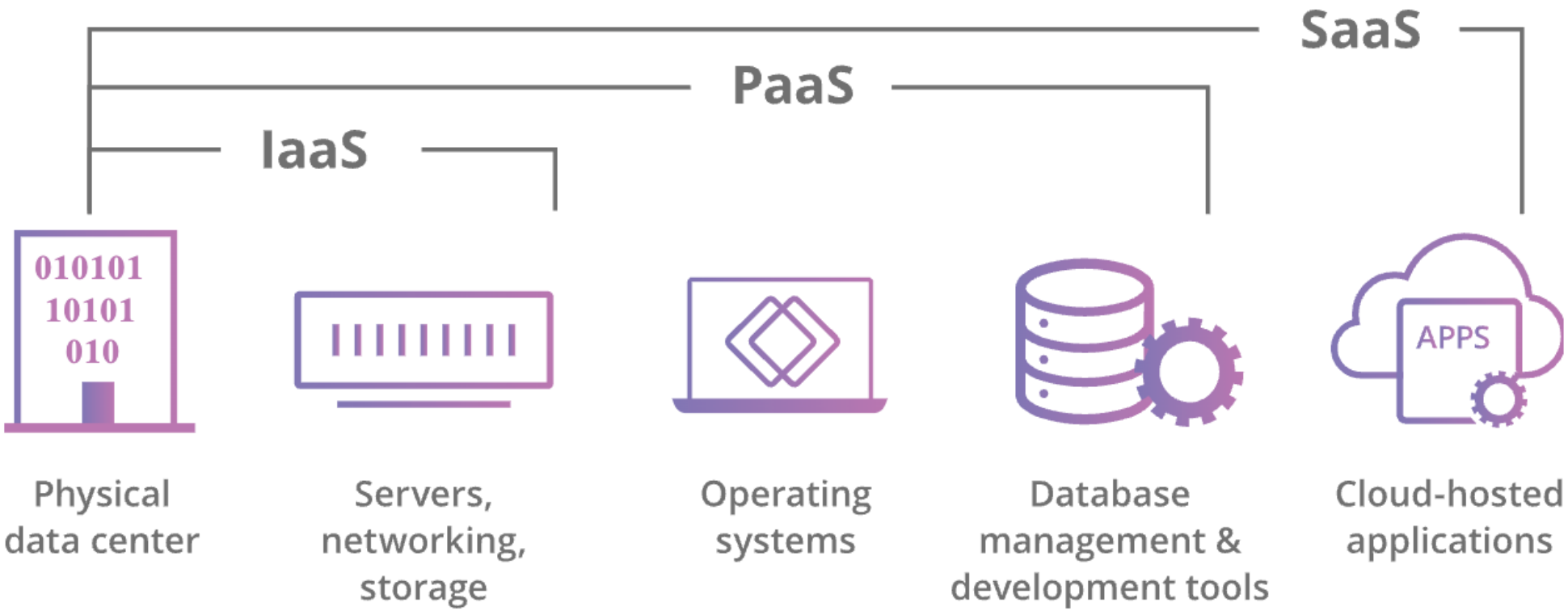
Commercial Cloud Providers

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

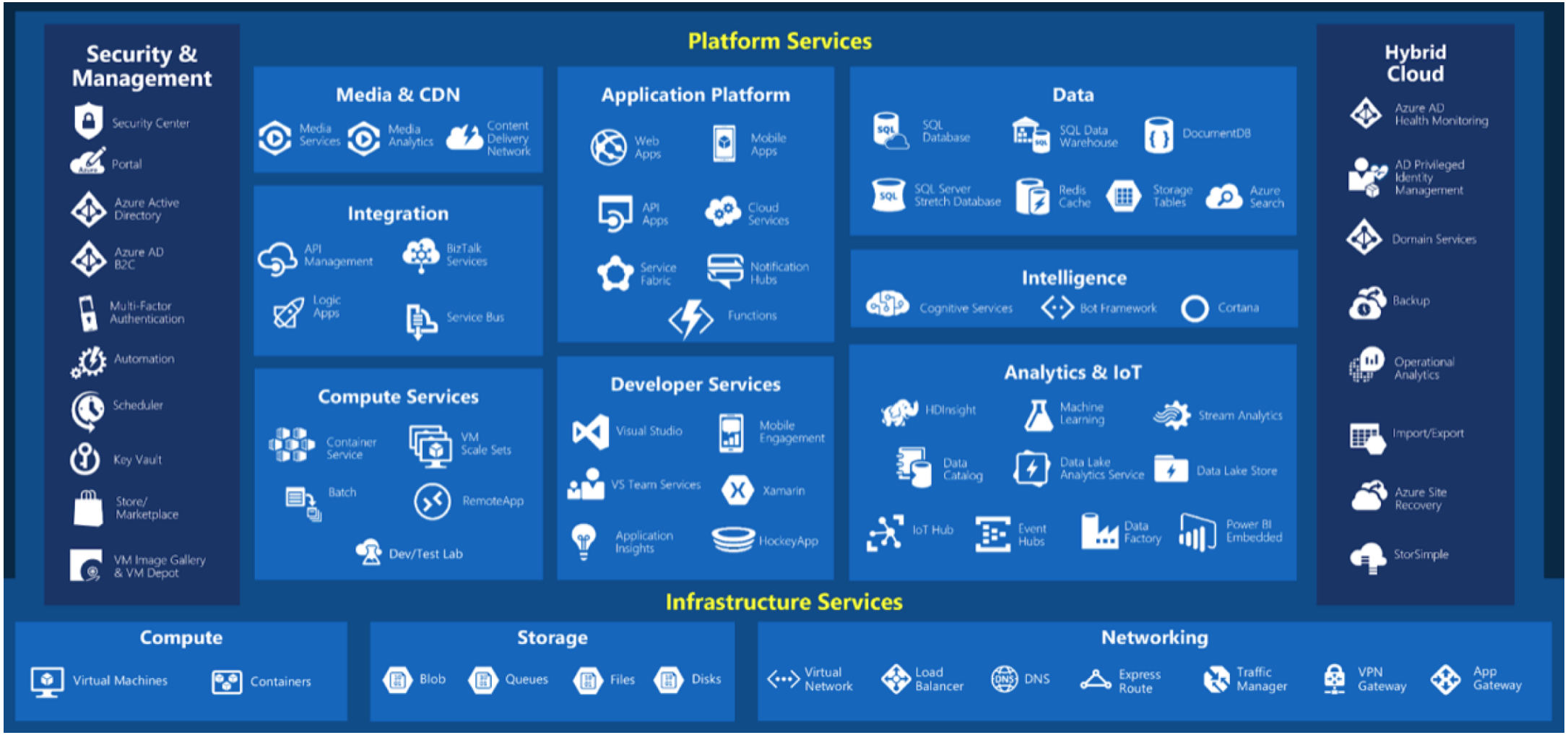
What is the Cloud?

- 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?



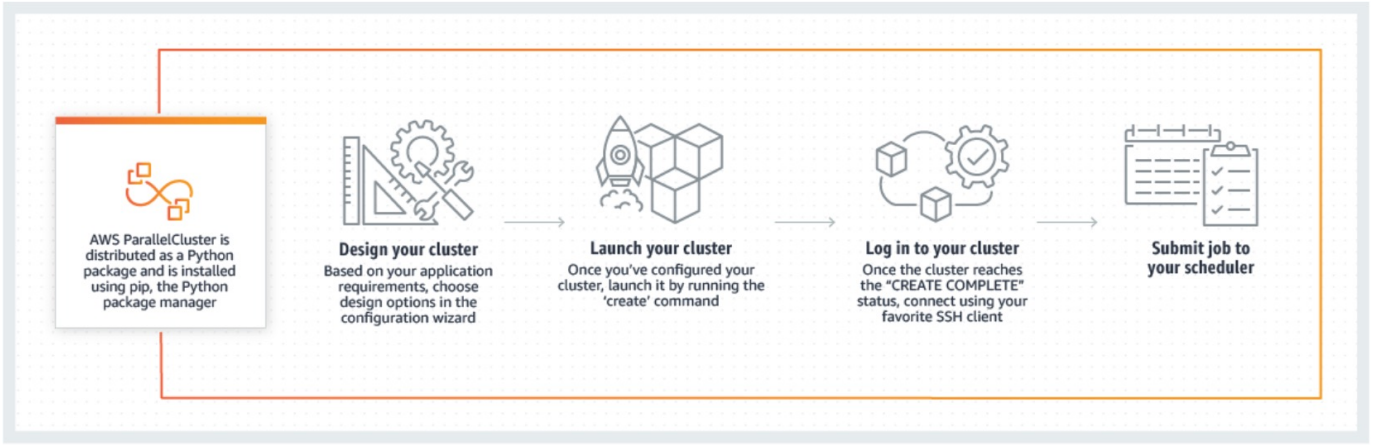
What tools are available?

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

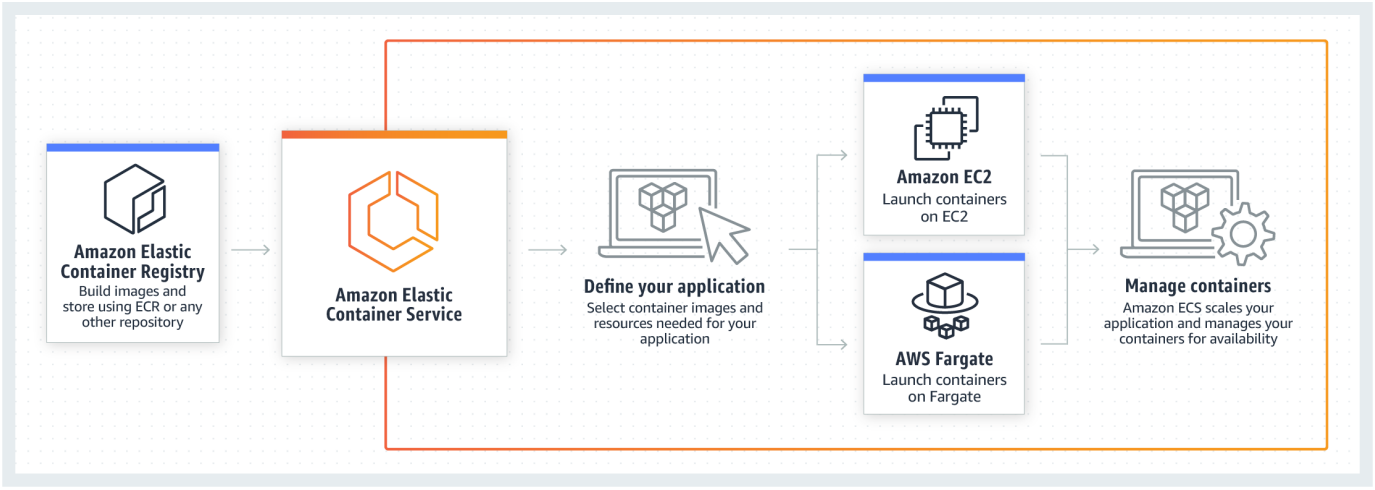
What tools are available?

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

Parallel Cluster



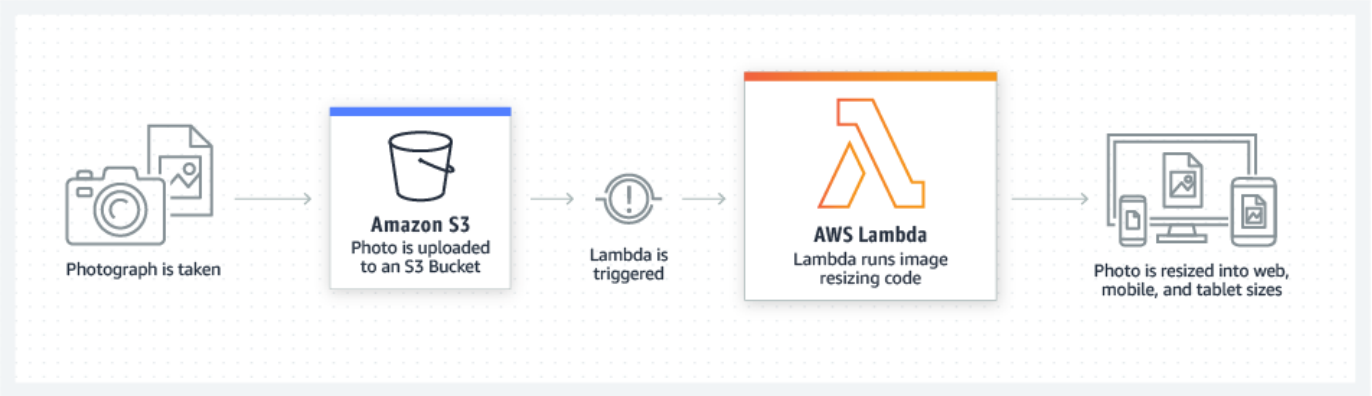
Elastic Container Service



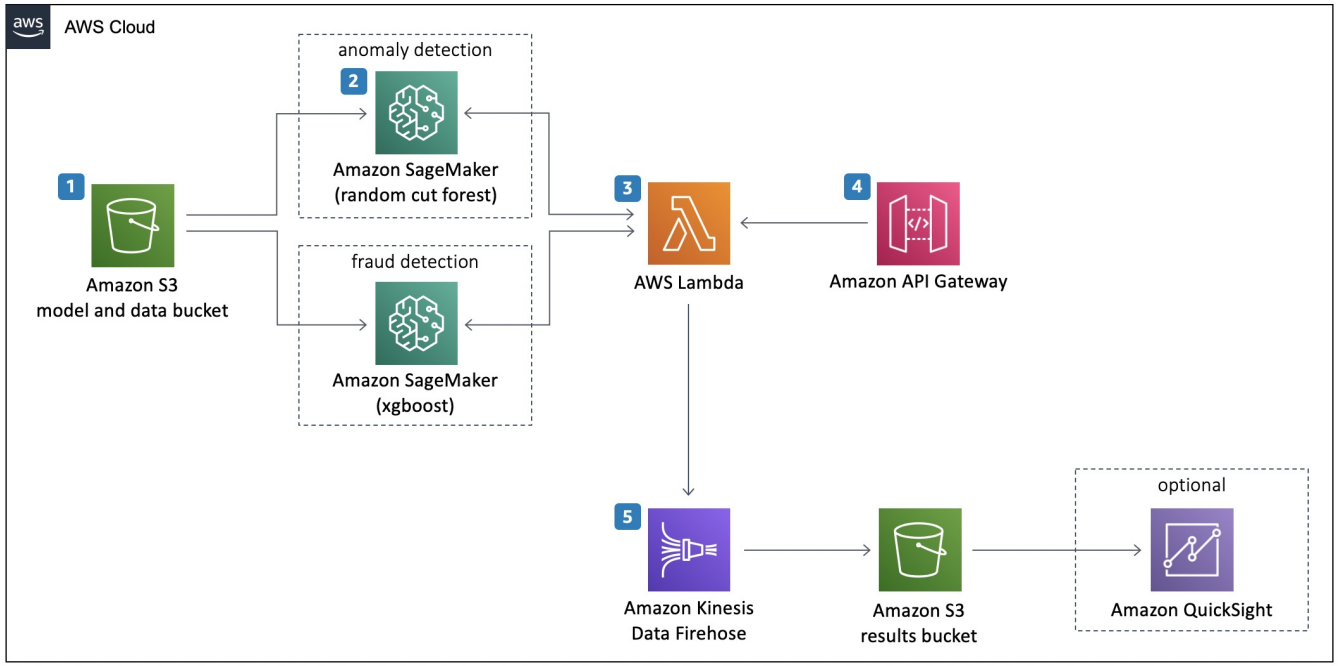
What tools are available?

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

Lambda



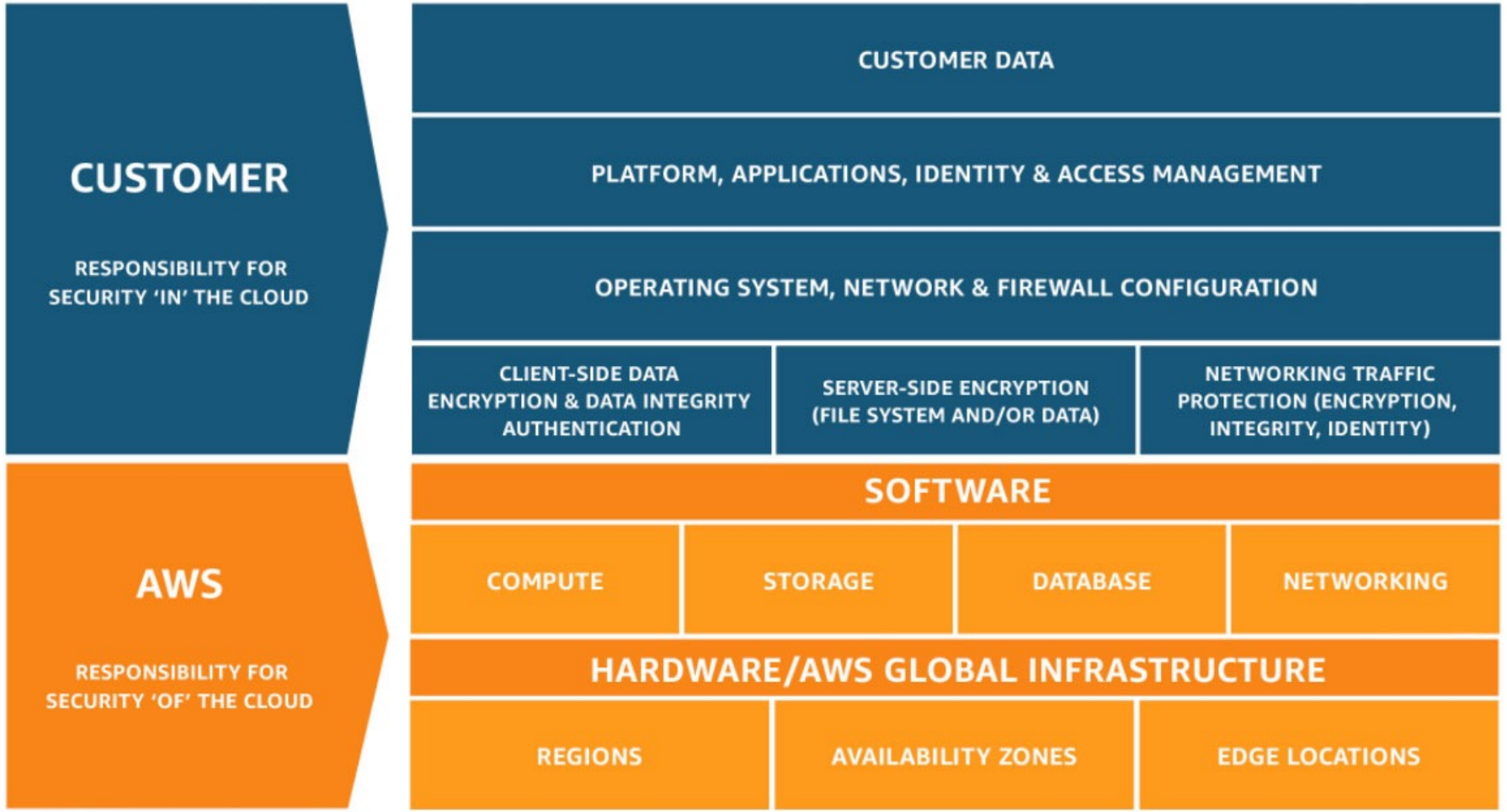
Sagemaker



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

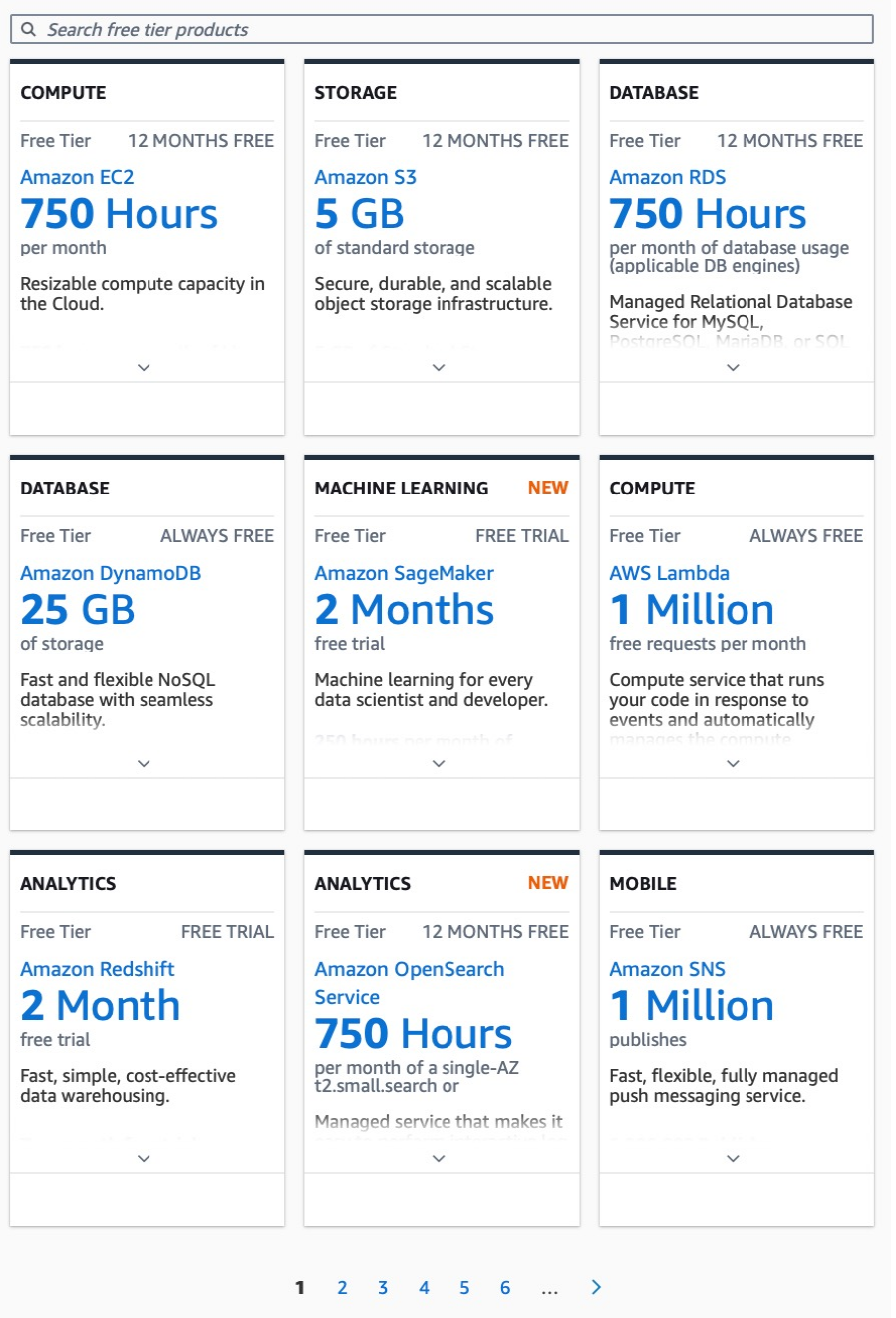
CLOUD DEMO

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]



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