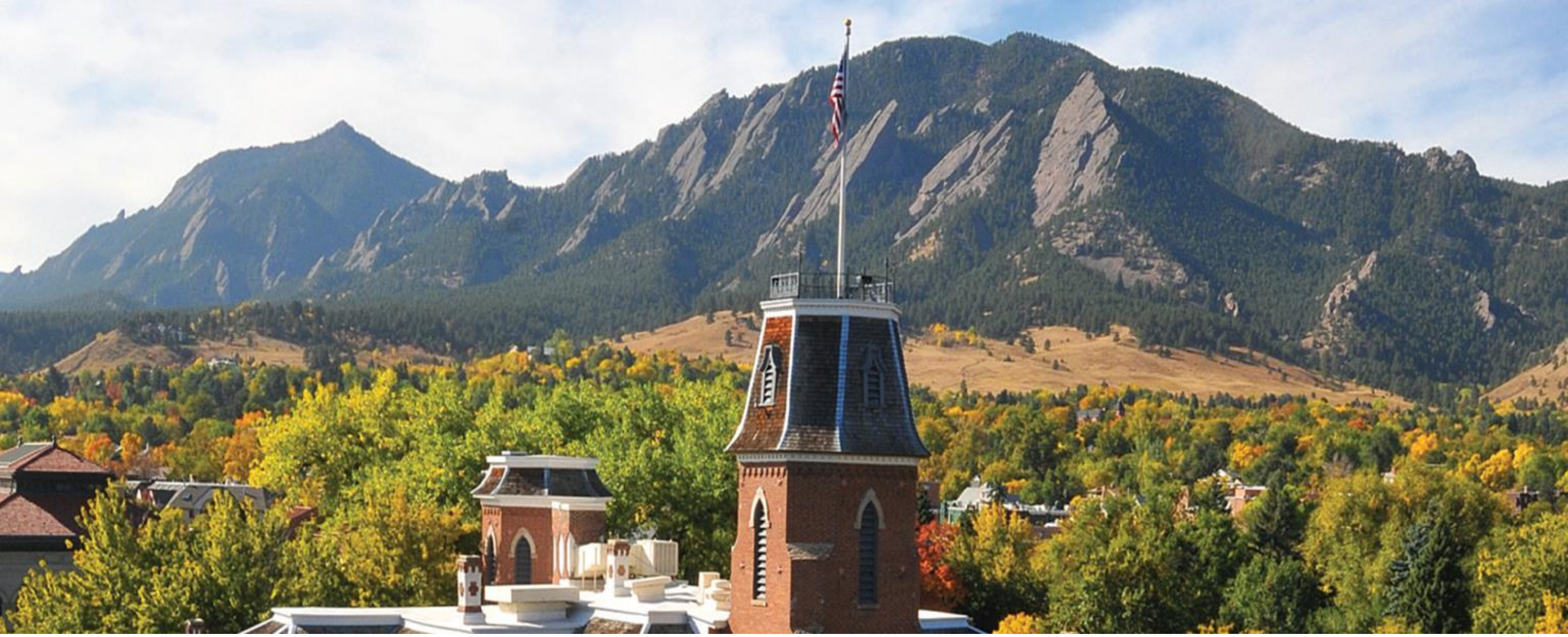


Introduction to Commercial Cloud

Research Computing
UNIVERSITY OF COLORADO **BOULDER**

Be Boulder.

Working with Cloud

Mohal Khandelwal

- Research Computing
- Website: www.rc.colorado.edu
- Helpdesk: rc-help@colorado.edu

Dylan Gottlieb

- Research Computing
- Website: www.rc.colorado.edu
- Helpdesk: rc-help@colorado.edu

Slides: https://github.com/ResearchComputing/cloud_primer
Survey: http://tinyurl.com/curc-survey18
Website: www.rc.colorado.edu/rc
Documentation: https://curc.readthedocs.io

Meet the User Support Team

Layla Freeborn

Brandon Reyes

Andy Monaghan

Michael Schneider

John Reiland

Dylan Gottlieb

Mohal Khandelwal

Ragan Lee

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.

What is Cloud Computing?

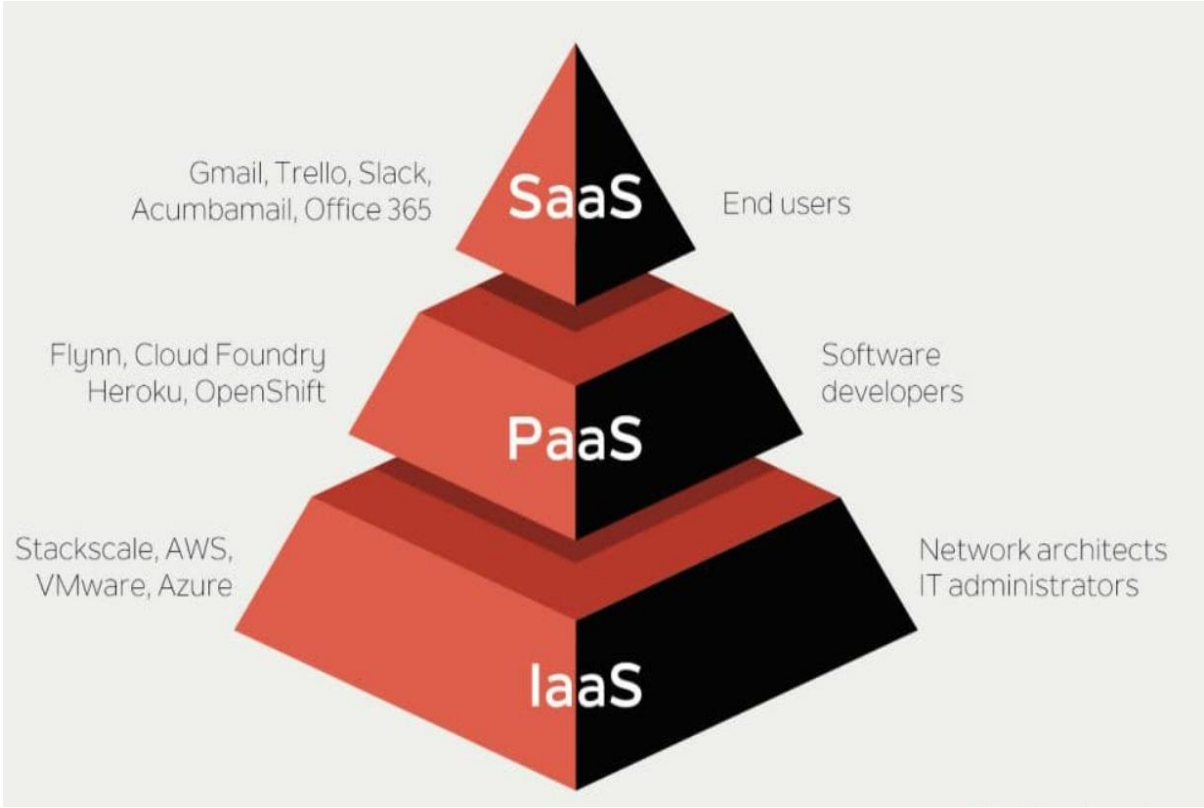
Cloud computing refers to the delivery of computing services over the internet, including storage, processing power, and software applications.

Commercial Cloud Providers

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

Cloud Service Models

- IaaS - Raw IT resources offered to the user by the cloud service provider
  - Most control, most advanced setup
  - Servers and Networking
- SaaS - Software that runs on a provider's infrastructure
  - Least control, most simple setup
  - Jupyterhub
- PaaS - A platform that a provider offers to its customers via the internet
  - Some control, simplified setup
  - Windows Virtual Machine



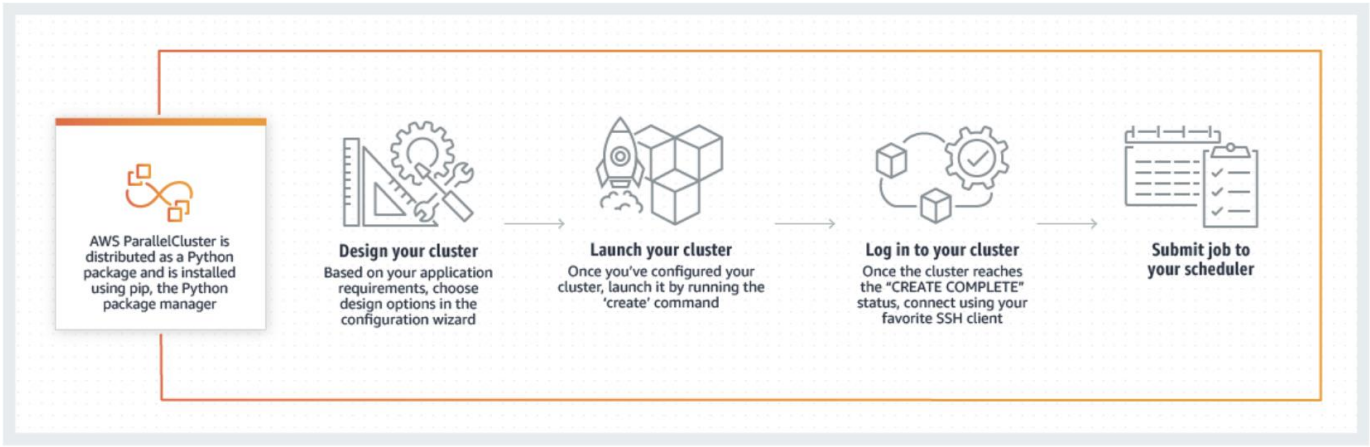
Why use the cloud?

- **Cost Savings:** Pay for what you use, with no upfront infrastructure costs.
- **Scalability:** Easily scale resources up or down based on demand.
- **Flexibility:** Access resources and applications from anywhere with an internet connection.
- **Reliability:** Cloud providers typically offer high uptime and data redundancy.
- **Collaboration:** Enable seamless collaboration and data sharing among teams.

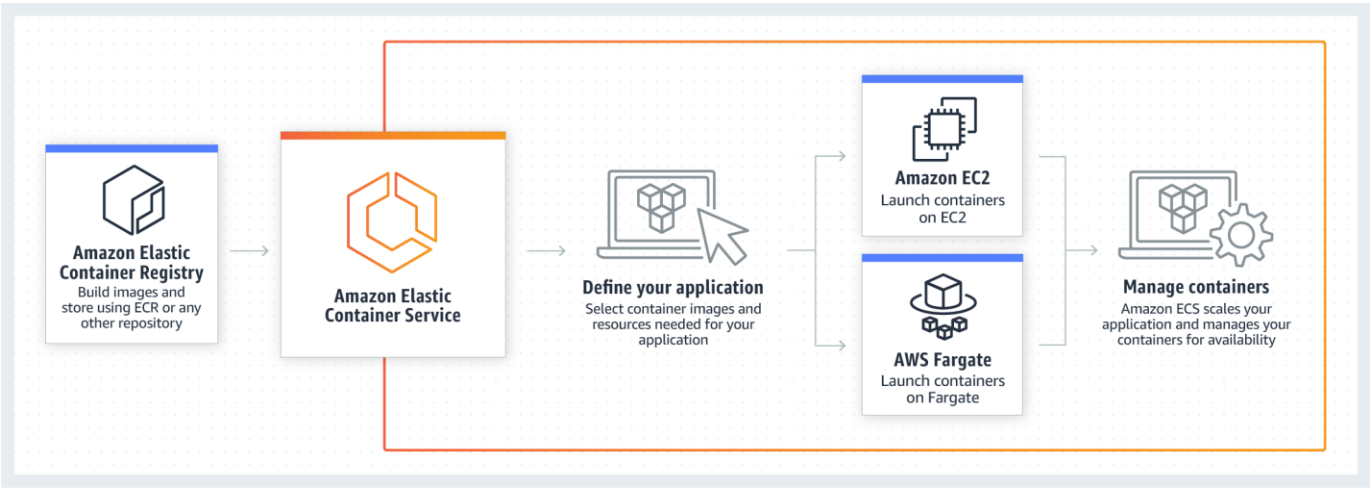
What tools are available?

- Advanced Tools
  - Cluster Environments
    - Parallel Cluster
  - Container Services
    - Elastic Kubernetes Service, Elastic Container Service

Parallel Cluster



Elastic Container Service

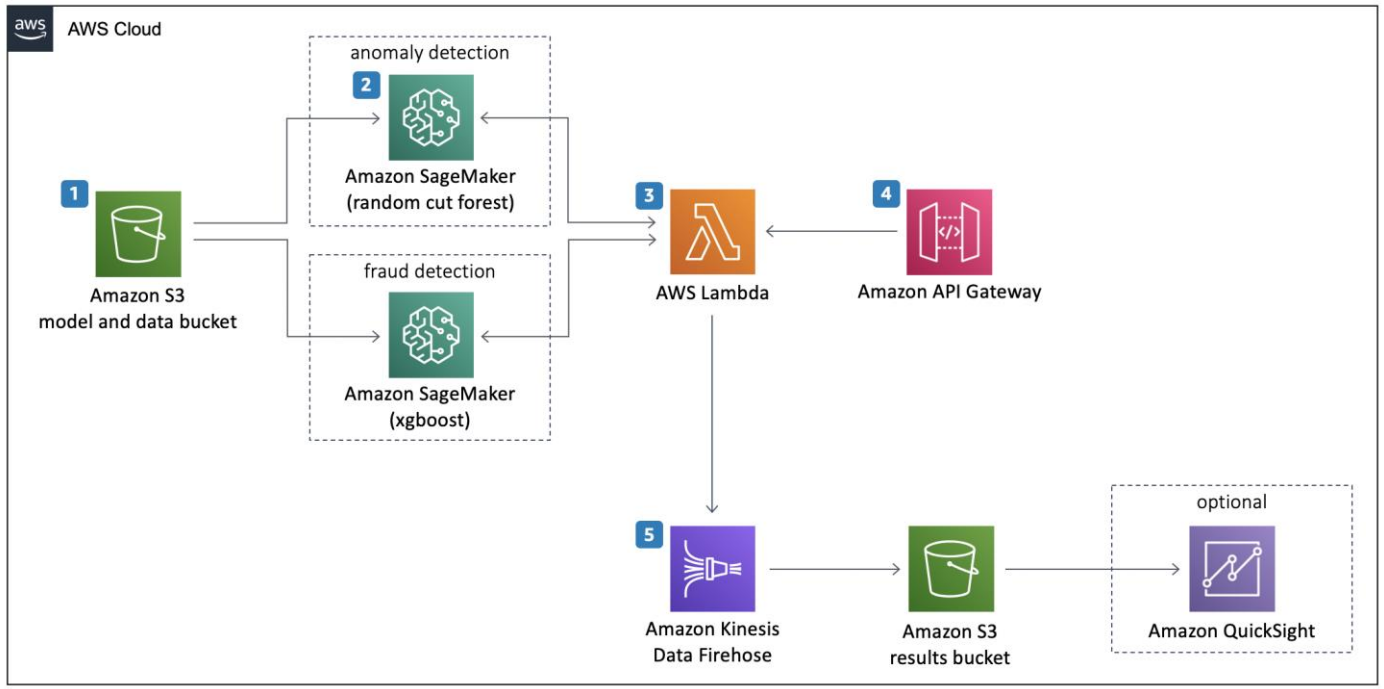


What tools are available?

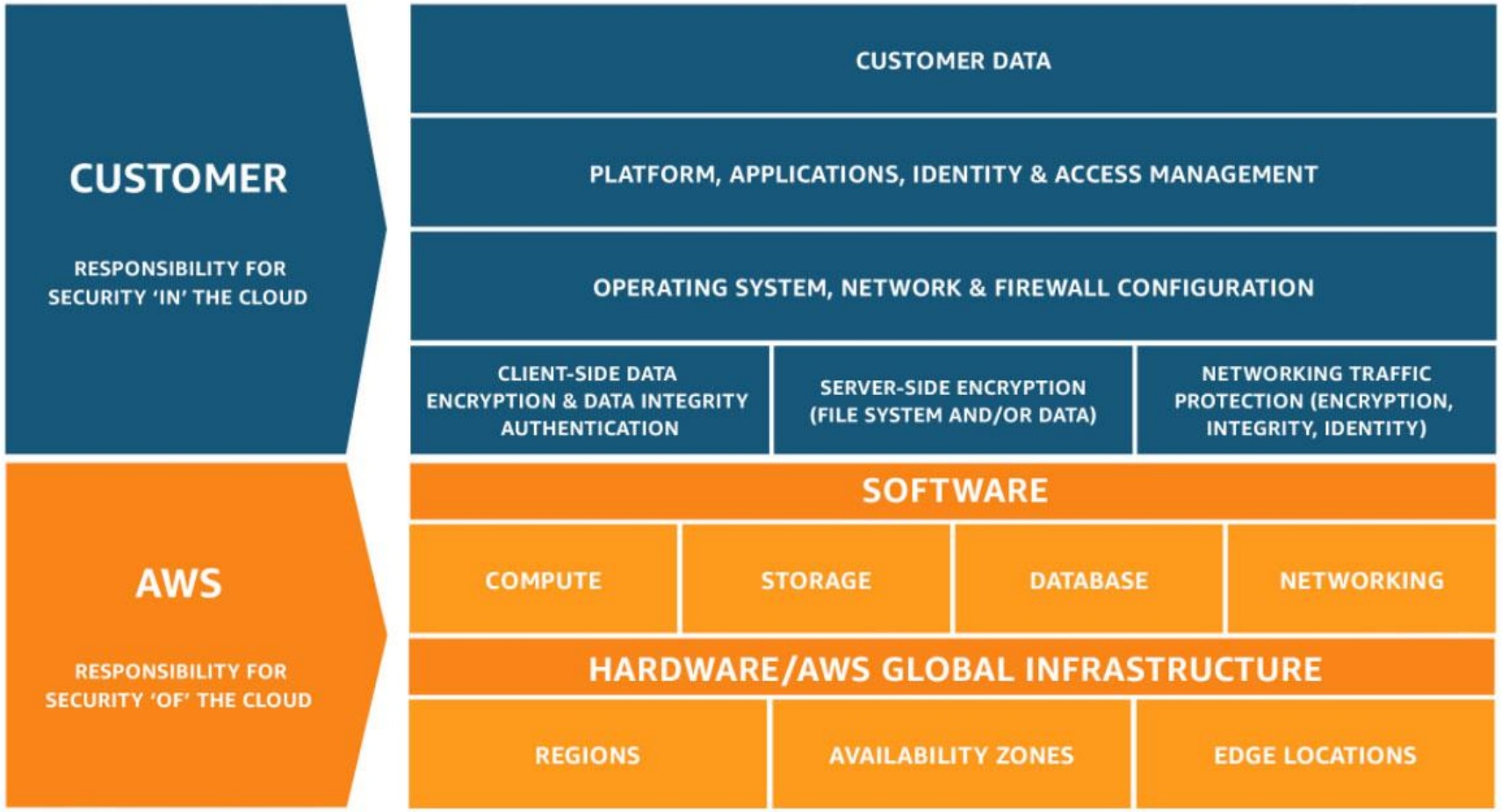
- Advanced Tools
  - Serverless code execution
    - Lambda
  - Machine Learning
    - Sagemaker, Rekognition, Polly, etc.
  - Artificial Intelligence
    - Amazon Q, Bedrock, Azure AI Foundry

Lambda

Sagemaker



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)
- 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

Cloud Resources

- AWS
  - Free Trials offered by AWS
  - AWS Free Tier
- Azure
  - Microsoft Student
  - Free $100 credit for students
  - Free trials of services
- GCP
  - 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
- National Science Foundation – JetStream2
- Cloud Foundations Service
  - Amazon AWS
  - Microsoft Azure
  - Google Cloud Platform

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

Survey and feedback

Survey: http://tinyurl.com/curc-survey18

Slides: https://github.com/ResearchComputing/cloud101_primer