Clouds

CS398 - ACC

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Announcements

- Project folders available on HDFS for your final project dataset
  - Suggested workflow:
    - SCP data to cluster, then to copy into HDFS
- Final project Gitlab repos created
  - See Piazza for details
- Course Clusters will be consolidated to a single cluster
  - Move any data you care about off the current “primary” cluster
  - The “backup” will be the one used from now on

Clouds

- **“Private” Clouds**
  - Used for a company’s internal services only
  - Example: Internal datacenters of companies like Facebook, Google, etc.

- **“Public” Clouds**
  - Anyone can purchase resources
  - You can build your own company on top of another company’s cloud
  - Example: AWS, GCP, Azure

Why use a cloud?

- **Reliability**
  - It's someone else's responsibility to fix broken machines
- Cheap and On-Demand **Scalability**
  - Pricing is per hour or second instead of sunk hardware cost
  - Can create and destroy nodes on a *per second* basis
    - Many clouds (GCP and AWS) recently switched to per-second billing
- **Hardware** Abstraction
  - Don't have to care about underlying hardware, just the specs of your VM
- "Special Sauce"
  - Proprietary features (i.e. AWS DynamoDB or Google BigQuery)


S3
Service is operating normally
S3

Cloud Providers

The Giants

The Giants

amazon web services

Google Cloud Platform

Microsoft Azure

The Giants

Google Cloud Platform

Amazon Web Services (AWS)

- The largest by far of the public clouds
  - You use it every day and don't even know it
  - Netflix, Reddit, Spotify, and millions others

- When it goes down, the half of the internet goes down
  - Example: The infamous S3 outage in February 2017

AWS Offerings

Compute
- EC2
- Lightsail
- Elastic Container Service
- Lambda
- Batch
- Elastic Beanstalk

Storage
- S3
- EFS
- Glacier
- Storage Gateway

Database
- Relational Database Service
- DynamoDB
- ElastiCache
- Amazon Redshift

Migration
- AWS Migration Hub
- Application Discovery Service
- Database Migration Service
- Server Migration Service
- Snowball

Networking & Content Delivery
- VPC
- CloudFront
- Route 53
- API Gateway
- Direct Connect

Developer Tools
- CodeStar
- CodeCommit
- CodeBuild
- CodeDeploy
- CodePipeline
- Cloud9
- X-Ray

Management Tools
- CloudWatch
- AWS Auto Scaling
- CloudFormation
- CloudTrail
- Config
- OpsWorks
- Service Catalog
- Systems Manager
- Trusted Advisor
- Managed Services

Media Services
- Elastic Transcoder
- Kinesis Video Streams
- MediaConvert
- MediaLive
- MediaPackage
- MediaStore
- MediaTailor

Machine Learning
- Amazon SageMaker
- Amazon Comprehend
- AWS DeepLens
- Amazon Lex
- Machine Learning
- Amazon Polly
- Rekognition
- Amazon Transcribe
- Amazon Translate

Analytics
- Athena
- EMR
- CloudSearch
- Elasticsearch Service
- Kinesis
- QuickSight
- Data Pipeline
- AWS Glue

Security, Identity & Compliance
- IAM
- Cognito
- GuardDuty
- Inspector
- Amazon Macie
- AWS Single Sign-On
- Certificate Manager
- CloudHSM
- Directory Service
- WAF & Shield
- Artifact

Mobile Services
- Mobile Hub
- AWS AppSync
- Device Farm
- Mobile Analytics

AR & VR
- Amazon Sumerian

Application Integration
- Step Functions
- Amazon MQ
- Simple Notification Service
- Simple Queue Service
- SWF

Customer Engagement
- Amazon Connect
- Pinpoint
- Simple Email Service

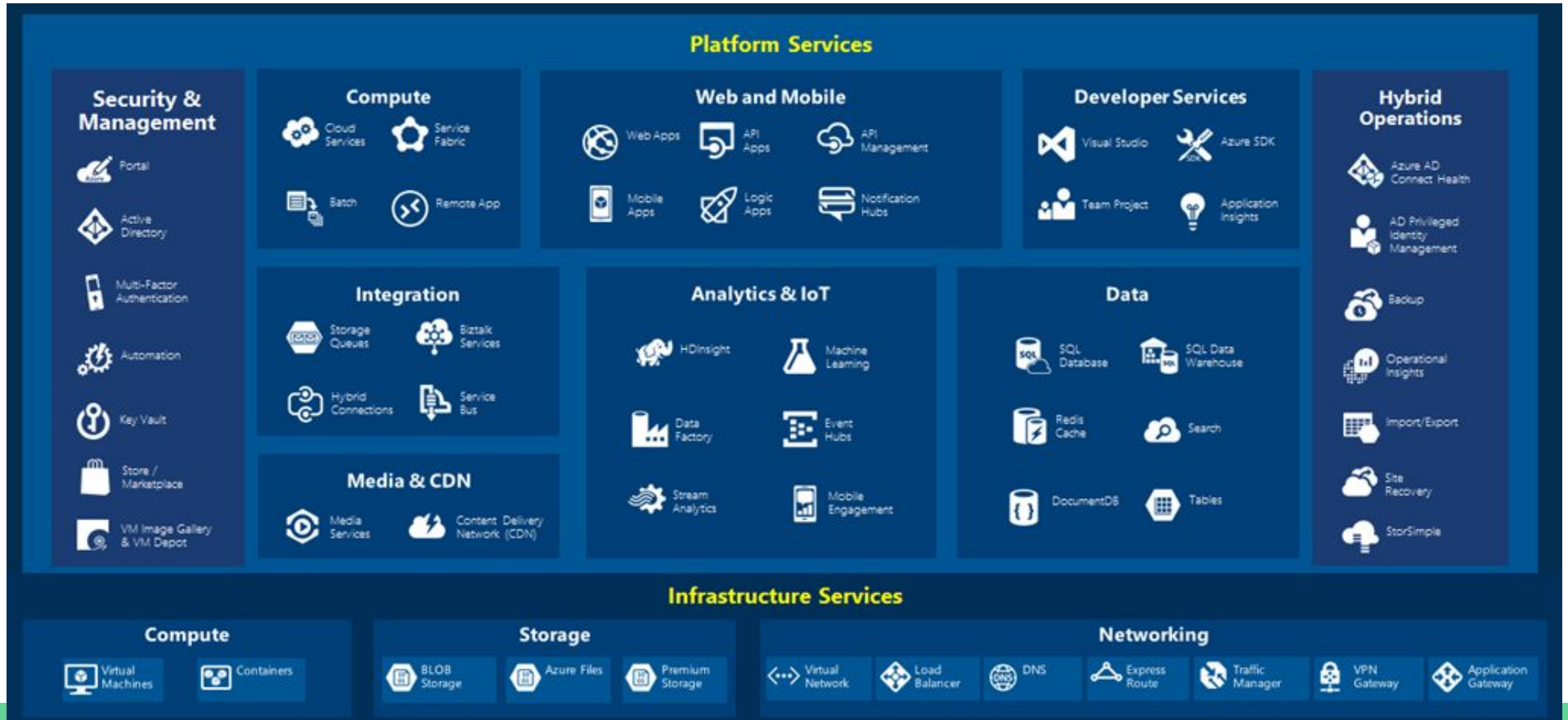
Business Productivity
- Alexa for Business
- Amazon Chime
- WorkDocs
- WorkMail

Desktop & App Streaming
- WorkSpaces
- AppStream 2.0

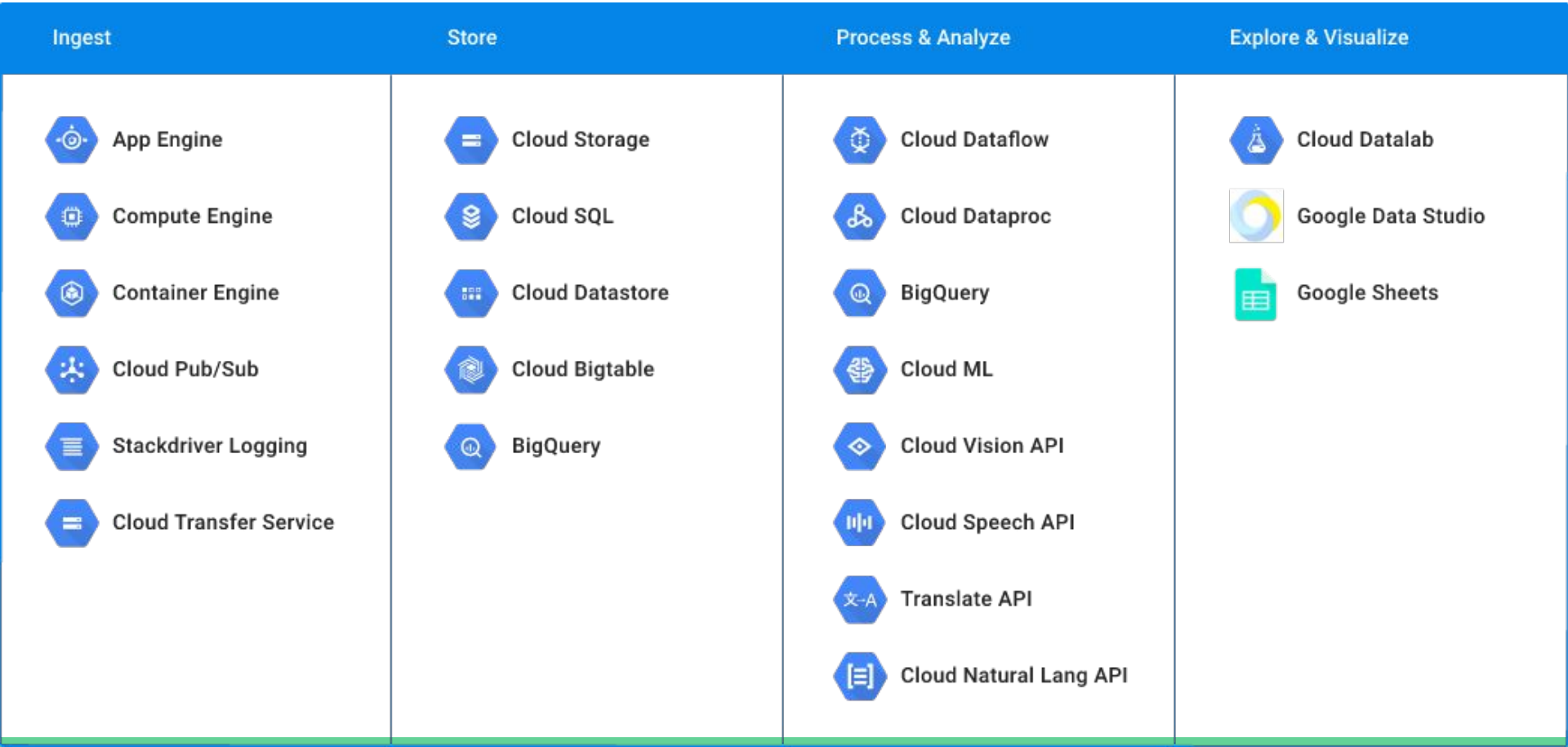
Internet Of Things
- IoT Core
- IoT Device Management
- IoT Analytics
- Greengrass
- Amazon FreeRTOS

Game Development
- Amazon GameLift

Azure Services



Google Cloud Platform



Feature Parity

- All clouds try to compete on features so they all end up having extremely similar feature sets

Virtual Machines

AWS Elastic Compute Cloud (EC2)

- The basic one which all of these clouds provide are Virtual Machines
- AWS has everything from the tiny to gigantic
  - T2.Nano: 1 VCPU 512 MB Ram
  - X1.32xlarge: 128 VCPU 2000 GB Ram
- They have GPUS!
  - Useful for deep learning
- Priced per-second; Options for On-Demand and “Spot Instances”
  - Spot instance: Auction for unused EC2 capacity; generally much cheaper than On-Demand
    - Caveat: Your VM may be given a notice to shut down at any point

Azure Virtual Machines

- Similar to AWS
- GPUs
- Not as many CPUs (Max is 32 currently)
- Not as much ram (Max 800 GB currently)
- But you probably will not hit these limits

Google Compute Engine

- Provides VMs
- Largest server is 96 VCPU, 624 GB Ram
- Provides custom sized machines
- Cost is per second

Storage

Storage

- AWS Simple Storage Service (AWS S3)
  - Massive storage, a ton of the internet stores all their content here.
    - For example: Imgur
- Google Cloud Storage
- Azure Storage

Hosted Data Processing

- Hosted Hadoop, Spark, HBase, Presto, Hive clusters
- Performs all necessary cluster scaling / provisioning automatically

- Amazon Elastic Map Reduce
- Microsoft HDinsight
- Google Dataproc

Databases

- Let the clouds manage your database hosting
  - Does create tables and stuff for you, just the stuff below it
- AWS
  - DyanamoDB
  - Relational Database Server (RDS)
- GCP
  - BigTable
  - BigQuery
  - CloudSQL
  - Spanner
- Azure
  - MSSQL
  - DocumentDB

Unique Features

- GCP
  - CloudSpanner
    - A planet distributed database
    - CP System
  - Tensor Processing Unit
    - Do deep learning in hardware
- AWS
  - Absurdly large feature set
  - FPGAs
- Azure

Cloud Security

Cloud Security

- Data Storage
  - Regulatory Standards for confidential data.
  - Compliance
- Data Migration
  - How to move sensitive data across data centers?
- Cloud Permissions
  - Easier permission setup within organizations
    - Students don’t get sudo access!
- DDoS Mitigation
  - Fleet of cluster, network security, etc.
- High Scalability
  - Scale with security setting

AWS Government, Education, & Nonprofits Blog

Announcing the New AWS Secret Region

on 20 NOV 2017 | in Government*, Public Sector* | Permalink | Share

We are pleased to announce the new AWS Secret Region. The AWS Secret Region can operate workloads up to the Secret U.S. security classification level. The AWS Secret Region is readily available to the U.S. Intelligence Community (IC) through the IC's Commercial Cloud Services (C2S) contract with AWS. The AWS Secret Region also will be available to non-IC U.S. Government customers with appropriate Secret-level network access and their own contract vehicles for use of the AWS Secret Region. These contract vehicles will not be part of the IC's C2S contract.

With the launch of this new Secret Region, AWS becomes the first and only commercial cloud provider to offer regions to serve government workloads across the full range of data classifications, including Unclassified, Sensitive, Secret, and Top Secret. By using the cloud, the U.S. Government is better able to deliver necessary information and data to mission stakeholders.

No MP this week

Wednesday:

Final Project Office Hours.