**Module 1**

1. Client/Server Model
2. You only pay for what you use
3. Cloud Computing
   1. On-demand deliver of IT resources over the internet with pay-as-you-go pricing

**Module 2**

1. Amazon Elastic Compute Cloud (Amazon EC2)
   1. Highly Flexible
   2. Cost Effective
   3. Quick
   4. Amazon EC2 Instance is a VM on a physical host
      1. You are responsible for patching of OS
      2. Setting up the scaling of those instances
      3. Ensuring that you've architected your solutions to be hosted in a highly available manner
   5. Multitenancy
      1. Sharing underlying hardware between virtual machines
   6. Amazon EC2 Configurations
      1. Windows
      2. Linux
      3. Internal Business Application
      4. Web App
      5. Databases
      6. Third-party Software
   7. Vertically scaling an instance
      1. Adding more system resources
   8. Horizontally scaling an instance
      1. Creating more load balanced Amazon EC2 instances to share the workload
   9. You control the networking aspect of Amazon EC2
   10. Computer as a service (CaaS)
2. Amazon EC2 instance families
   1. General Purpose
      1. Balanced resources
      2. Web servers
      3. Code repositories
   2. Computer optimized
      1. Compute intensive tasks
      2. Gaming servers
      3. High performance computing (HPC)
      4. Scientific modeling
   3. Memory optimized
      1. Memory intensive tasks
   4. Accelerated computing
      1. Floating point number calculations
      2. Graphics processing
      3. Data pattern matching
      4. Utilize hardware accelerators
   5. Storage optimized
      1. High performance for locally stored data
3. Amazon EC2 purchase options
   1. On-Demand
      1. Only pay for the time your instance is running
      2. Per Hour or Per Second depending on instance type and OS
      3. Usually for startups or testing
      4. Allows for baselining costs
   2. Savings Plan
      1. Low prices on EC2 usage in exchange for a commitment to a consistent amount of usage for 1 or 3 years
      2. Up to 72% savings over on demand
      3. Regardless of EC2 instance type, OS, or Region
      4. Applies to AWS Faregate & AWS Lambda usage
   3. Reserved Instances
      1. Predictable usage
      2. Offer up to 75% discount over on demand
      3. Three payment options
         1. All upfront
         2. Partial upfront
         3. No upfront
   4. Spot Instances
      1. Request spare AWS compute capacity
      2. AWS can reclaim instance with 2 minutes warning
      3. Good for batch jobs that can be interrupted
      4. Up to 90% off on demand
   5. Dedicated Hosts
      1. Physical Hosts dedicated to your EC2 use
      2. Usually for meeting certain compliance requirements
4. Scaling Amazon EC2
   1. Deploy additional instances of the same EC2 configuration to share the workload
   2. No single point of failure
   3. You can scale up or out
      1. Up (vertically) is adding additional resources to an EC2 instance
      2. Out (horizontally) is adding additional EC2 instances
   4. Amazon EC2 Auto Scaling
      1. Adds instances based on demand and then decommissions instances when they are no longer needed.
      2. You always have the correct number of instances
5. Elastic Load Balancing
   1. Regional Construct
   2. Automatically HA
   3. Auto scaled EC2 instances tell the ELB they are online and the ELB routes traffic to them
   4. Once Load decreases
      1. ELB stops sending traffic and waits for existing traffic to drain out
      2. ELB lets EC2 know it can terminate extra instances
   5. Can sit between the front end and back end of a dev tier
      1. Decoupled architecture
6. Messaging & Queuing
   1. Tightly coupled architecture
      1. Single component fails or changes, it causes issues for other components
   2. Loosely coupled architecture
      1. Single Failure won’t cause a cascading failure
      2. Buffer between systems
   3. Amazon SQS
      1. Send messages
      2. Store messages
      3. Receive messages
      4. Between software components
      5. At any volume
      6. Data is called a payload
   4. Amazon SNS
      1. Similar to SQS, but can send messages to end users
      2. Publish Subscribe Model
      3. SNS Topic
         1. Channel for messages to be delivered
      4. One message to all subscribers
      5. Can be delivered to end users
         1. Mobile push
         2. SMS
         3. Email
   5. Additional computer services
      1. Serverless computer options
         1. Cannot see or access the underlying infrastructure
         2. AWS Lambda
            1. Lambda function
            2. Waits for a trigger
            3. Code is run when triggered
            4. Run code (processes) in less than 15 minutes
         3. Amazon Elastic Container Service (Amazon ECS)
            1. Docker Container
            2. Manages your containers at scale for you
         4. Amazon Elastic Kubernetes Service (Amazon EKS)
            1. Docker Container
            2. Similar to EKS with different tools
         5. ECS & EKS can run on EC2
            1. If you want access to the underlying infrastructure
         6. AWS Fargate
            1. Can run ECS & EKS serverless

Where you don’t need access to the underlying infrastructure

**Module 3**

1. AWS Global Infrastructure
2. Regions are Geographically Isolated Areas
3. Regions Contain Availability Zones
   1. Physically Separated Buildings
   2. HA & DR
   3. Best Practices is to deploy across 2 or more Availability Zones
4. Edge Locations run Amazon CloudFront
5. Regional Data Sovereignty
   1. Subject to the local laws of the country
6. Each region has a different price sheet
7. Amazon Bracket
   1. Quantum Computing
8. 4 Key Factors
   1. Compliance
   2. Proximity (to customers)
   3. Feature Availability
   4. Pricing
      1. Each Region has its own price sheet
9. Edge Locations
   1. CDN - Content Delivery Networks
      1. Amazon CloudFront
   2. Cached Copies of Data
   3. Edge locations are separate from Regions
   4. DNS
      1. Amazon Route 53
   5. AWS Outposts
      1. WS Outposts is a fully managed service that offers the same AWS infrastructure, AWS services, APIs, and tools to virtually any datacenter, co-location space, or on-premises facility for a truly consistent hybrid experience.
      2. AWS Outposts is ideal for workloads that require low latency access to on-premises systems, local data processing, data residency, and migration of applications with local system interdependencies.
      3. <https://aws.amazon.com/outposts/>
10. How to Provision AWS Resources
    1. Everything in AWS is an API Call
       1. Application Programming Interface
    2. AWS Management Console
       1. Browser Based
          1. Visual
          2. Test Environments
          3. View Billing
          4. View Monitoring
          5. Work with Non-Technical Resources
    3. AWS Command Line Interface
       1. Scriptable
       2. Repeatable
       3. Less Susceptible to Human Error
       4. Automation
    4. AWS Software Development Kits (SDKs)
       1. Interact with AWS Resources through various Programming Languages
    5. Various Other Tools
       1. AWS Cloud Formation
          1. Infrastructure as Code Tool
          2. JSON or yaml Text Documents
             1. Cloud Formation Templates
          3. Declare what you want to build, not how to build it
          4. Supports Storage, Database, Analytics, Machine Learning
          5. Can run the same Cloud Formation Template across multiple accounts or Regions
       2. AWS Elastic Beanstalk
          1. Provision EC2 Environments
          2. Build & Save Environment Configurations
             1. Adjust Capacity
             2. Load Balancing
             3. Automatic Scaling
             4. Application Health Monitoring

**Module 4**

1. Amazon Virtual Private Cloud (VPC)
   1. Private Network in AWS
   2. Provision a logically isolated section of the AWS cloud
   3. Launch Resources in a virtual network that you define
   4. Can be Public or Private facing
      1. Internet Access vs No Internet Access
   5. Subnets
      1. Ranges of IP addresses in your VPC
   6. Internet Gateway (IGW) at Border of VPC
      1. Accepts Public Traffic
   7. Virtual Private Gateway
      1. Rejects Public Traffic
      2. Encrypted
      3. VPN
   8. AWS Direct Connect
      1. Dedicated Fiber Connection to AWS
      2. Dedicated Circuit
      3. Side Step Bandwidth issues
      4. Meet Regulatory Requirements
   9. One VPC may have multiple types of Gateways attached
      1. All Residing in the same VPC in different subnets
2. Subnets & Network Access Control Lists
   1. Network ACL
      1. Hardened Fortress
      2. Internet Gateway (IGW)
      3. The only technical reason to use subnets in a VPC is to control access to the gateways.
      4. Every pack that enters a subnet is checked against the Network Access Control List (Network ACL)
         1. Check permissions to leave or enter the subnet
         2. Passport Control Officers
            1. If you’re on the approve list or on the no approved list
      5. Only evaluates a packet if it crosses a subnet boundary
      6. Stateless
         1. Remembers nothing
         2. Checks every single packet that crosses it’s border
   2. Instance level Access Groups
      1. Security Groups
         1. Door Man at your Building
         2. Checks the list on the way in, but not on the way out
         3. All traffic is allowed out
         4. Stateful
            1. Memory of who to let in or out
      2. Every EC2 instance gets a security group that by default blocks all traffic
      3. Modify security group to accept a specific type of traffic
   3. Send a packet from instance A to instance B in a different subnet (same VPC)
      1. Packet hits the security group of instance A
         1. Allowed out by default
      2. Packet hits the boundary of Passport Control on instance A (network ACL)
         1. Every ingress & Egress are checked with the correct list
         2. Stateless
      3. Packet hits the boundary of Passport Control on instance B (network ACL)
         1. Every ingress & Egress are checked with the correct list
         2. Stateless
      4. Packets hits the security group of instance B
      5. Packet hits security group of instance B
         1. Allowed out by default
      6. Packet hits the boundary of Passport Control on instance B (network ACL)
         1. Every ingress & Egress are checked with the correct list
         2. Stateless
      7. Packet hits the boundary of Passport Control on instance A (network ACL)
         1. Every ingress & Egress are checked with the correct list
         2. Stateless
      8. Packet hits the security group of instance A
         1. Security group remembers the packet and doesn’t have to check again
            1. Stateful
   4. Global Networking
      1. Route 53 (DNS)
         1. Latency-based routing
         2. Geolocation DNS
            1. Based on where the customer is located
         3. Geoproximity routing
         4. Weighted round robin
         5. Can Purchase Domains
   5. Amazon Cloudfront
      1. Serving cached content as close to the customer as possible
      2. Content Deliver Network (CDN)
         1. A network that delivers edge content to users based on their geographic location
      3. Who should be allowed to communicate with each other?

**Module 5**

1. Storage & Databases
   1. Instance Stores & Elastic Block Store (Amazon EBS)
   2. Block level Storage
      1. Blocks of data on disk
      2. Only updates the data that changes
   3. Instance Store Volumes
      1. Local EC2 Storage
      2. Physically attached to hypervisor your EC2 is running on
      3. Data is deleted if you stop your EC2 instance
      4. Do not write important data to local EC2 storage
   4. Elastic Block Store (Amazon EBS)
      1. Virtual hard drives
      2. Attached to EC2 instance
      3. Persistent
      4. Incremental Backups of Data
         1. Snapshots
         2. Day 1: All data Backed Up
         3. Day 2: Only data that has changed since the most recent snapshot is backed up
2. Amazon Simple Storage Service (Amazon S3)
   1. Store & retrieve an unlimited amount of data at any scale
   2. Stores data as objects
      1. File on your hard drive
   3. Store objects in buckets
      1. Folder on your hard drive
   4. Max Object Size is 5 TB
   5. Version Objects
      1. Retain previous versions
   6. Create multiple buckets
      1. Add permissions to buckets
   7. Amazon S3 Standard
      1. Eleven 9’s
      2. Data can survive 2 concurrent loss of data in 2 storage facilities
      3. Data is stored in at least 3 storage facilities
      4. Static Website Hosting
   8. Amazon S3 Standard-Infrequent Access (S3 Standard-IA)
      1. Less frequently access
      2. Requires Rapid Access
      3. Store Backups
      4. Any object that requires long term storage
   9. Amazon S3 Glacier
      1. Archive Data
      2. Non Rapid Access
      3. Move data to it or create Vaults
      4. S3 Glacier Vault Lock Policy
         1. Compliance requirements around retaining data
         2. Write Once/Read Many (WORM)
         3. Once locked, the policy can never be changed
      5. Upload directly to Glacier or use Lifecycle Policies
      6. 3 Options for retrieval that range from minutes to hours
   10. Lifecycle policies
       1. Move data between tiers automatically
       2. Keep data in S3 Standard for 90 days
       3. Keep data in S3 Standard-IA for 30 days
       4. Move data to Glacier after 120 days
   11. Other Storage Tiers
       1. S3 Infrequent Access 1 Zone
       2. S3 Glacier deep archive
   12. Comparing Amazon EBS (Elastic Block Storage) & Amazon S3 (Simple Storage Service)
       1. EBS
          1. Up to 16 TiB
          2. Survive termination of their EC2 instance
          3. Solid State by Default
          4. HDD Options
          5. Many micro changes
          6. Stores Data in Single Availability zone
          7. Volumes attached to EC2 instances
          8. Availability Zone level resource
          9. Need to be in the same Availability Zone to attach to EC2 instances
          10. Volumes do not automatically scale
       2. S3
          1. Unlimited Storage
          2. Object Sizes up to 5TB
          3. Write Once/Read Many
          4. Occasional Changes
          5. 99.999999999% Durable for 1 year
          6. Web Enabled
          7. Regionally distributed
          8. Offers cost savings
          9. Serverless
3. Amazon Elastic File System (Amazon EFS)
   1. Managed File System
   2. Shared File System
   3. Multiple instances can access the data in EFS at the same time
   4. Linux File System
   5. Regional resource
   6. Automatically scales
4. Amazon Relational Database Service (Amazon RDS)
   1. Features
      1. Automated Patching
      2. Backups
      3. Redundancy
      4. Failover
      5. Disaster Recovery
   2. Relational database management system (RDBMS)
   3. Amazon Aurora
      1. Enterprise-class relational database. It is compatible with MySQL and PostgreSQL relational databases. It is up to five times faster than standard MySQL databases and up to three times faster than standard PostgreSQL databases.
      2. MySQL
      3. PostgreSQL
      4. 1/10 the cost of commercial databases
      5. Data replication
         1. 6 copies at any time
      6. Deploy up to 15 read replicas of database
      7. Continuous Backups to Amazon S3
         1. Point-in-time recovery
   4. AWS supported databases
      1. MySQL
      2. PostgreSQL
      3. Oracle
      4. Microsoft SQL Server
   5. Lift-and-shift migration of DB
      1. Control over the database and the hardware it runs on
   6. Amazon DynamoDB
      1. Serverless Database
      2. You create tables
         1. Tables contain Items
            1. Items have Attributes
      3. Millisecond response time
      4. Stores data redundantly across availability zones
      5. Mirrors data across multiple drives
      6. Does not use SQL for queries
         1. Can’t run complex sql queries
      7. Non-Rigid Schema
      8. Simple Schema
      9. Non-Relational Databases (No SQL)
      10. Purpose Built
      11. Fully Managed
      12. Highly Scalable
      13. Primeday 2019
          1. 7.11 Trillion calls to DynamoDB API
             1. 48 Hours
          2. Peaking at 45.4 million request per second
   7. Amazon RDS vs Amazon DynamoDB
      1. Amazon RDS
         1. Automatic High Availability
         2. Recovery provided
         3. Customer Ownership of Data
         4. Customer Ownership of Schema
         5. Customer Control of Network
         6. Been Around Forever
         7. Complex Analysis of Data
            1. Built for Complex Data Analytics
      2. Amazon DynamoDB
         1. Key-Value Pair
         2. Massive Throughput Capabilities
         3. PB Size Potential
         4. Granular API Access
         5. Non Complex Data
            1. Lookup Tables
         6. Employee Lookup
            1. Single Table
   8. Amazon Redshift
      1. Data Warehousing for Big Data Analytics
         1. Good for looking back at historical data
      2. Data Warehousing as a Service
      3. Multiple PB Sizes
      4. 10 times higher performance than traditional DB’s
      5. Can get started with a single API call
   9. AWS DB Migration Service
      1. Amazon DMS
      2. Source DB remains fully operational during migration
         1. Minimizing downtime
      3. Source and Target DB’s don’t have to be the same type
      4. Homogenous Databases
         1. MySQL -> Amazon RDS for MySQL
         2. MS SQL -> Amazon RDS for SQL Server
         3. Oracle -> Amazon RDS for Oracle
         4. Schema Structures, Data Types, Database Code are compatible
         5. Source DB
            1. On-Prem
            2. Amazon EC2
            3. Amazon RDS
         6. Target DB
            1. Amazon EC2
            2. Amazon RDS
         7. Create migration task with connections to source and target
            1. Amazon Database Migration Service (DMS)
      5. Heterogeneous Databases
         1. Source & Target are different DB Types
         2. 2-Step process
         3. Schema Structures, Data Types, & Database Code are different
         4. Requires AWS Schema Conversion tool as intermediary
            1. Converts Schema Structure & Database Code to Match Target
         5. Use Amazon DMS to migrate the data
      6. Amazon DMS can be used to
         1. Development & Test Database Migrations
            1. Test against Prod without affecting Prod
         2. Database Consolidation
            1. Consolidate multiple DB’s into one DB
         3. Continuous Database Replication
            1. Continuous Replication for Disaster Recovery
            2. Geographic Separation
5. Choosing the Right Database
   1. No one size fits all
   2. Amazon DocnmentDB
      1. CMS System
      2. MongoDB Compatibility
   3. Amazon Neptune
      1. Graph Database
      2. Engineered for Social Networking
      3. Fraud Detection
   4. Amazon Quantum Ledger Database (Amazon QLDB)
      1. Immutable Ledger
      2. No Entry can be Removed
   5. Amazon Managed Blockchain
   6. Amazon ElastiCache
      1. Improve Read times of Common Requests
      2. From milliseconds to microseconds
      3. Memcached & Redis Flavors
   7. Amazon DynamoDB Accelerator (DAX)
      1. Native Caching Layer
      2. Improves read times for non-relational Database
6. Summary
   1. Elastic Block Store
      1. Amazon EBS
      2. Attached to EC2
      3. Not Local Storage to EC2
      4. Persistent between EC2 instances
   2. Amazon Simple Storage Service
      1. Amazon S3
      2. Buckets
   3. Relational Database Options
      1. Amazon RDS
   4. Non-Relational Database Options
      1. DynamoDB
   5. Amazon Elastic File System
      1. Amazon EFS
   6. Amazon RedShift
      1. Data Warehouse
   7. AWS Database Migration Service
      1. AWS DMS
   8. Amazon DocumentDB
   9. Amazon Neptune
   10. Amazon QLDB
       1. Amazon Quantum Ledger Database
   11. Amazon Managed Blockchain
   12. Amazon Elasticache
   13. Amazon DynamoDB Accelerator
       1. DAX

**Module 6**

1. AWS Shared Responsibility Model

Timeline

Description automatically generated

* 1. AWS
     1. Responsible for Security “of” the cloud
     2. Infrastructure of the cloud
  2. Customer
     1. Responsible for security “in” the cloud
     2. Customer Workloads
  3. Who is responsible for security
     1. Both Parties
     2. The House Builder built a house with 4 walls and a door
     3. Homeowner has to close and lock the doors
     4. OS is the dividing line between AWS & the Customer in EC2

1. User Permissions & Access (IAM)
   1. AWS Root user
      1. Keys to the Kingdom
      2. **Enable MFA as soon as you log in with Root Account**
   2. AWS Identity & Access Management (AWS IAM)
      1. Tool to manage access
      2. Create IAM Users
         1. By default, has no permissions
            1. Cannot log into AWS Account by default
            2. All actions are denied by default
      3. Least Privilege
         1. Only grant the access necessary
      4. Assign IAM policy to IAM User
         1. Way to grant access
         2. IAM Policy – JSON Document
            1. Defines API Calls a user can or cannot make
            2. Text

               Description automatically generated

Effect = Allow or Deny

Action = Any AWS API Call

Resource the API Call is for

User can only view Coffee Shop Reports

* 1. IAM Groups
     1. Attach Policy to Group
     2. Root User
        1. God
     3. Users
        1. Can be members of Groups
     4. Groups
        1. Have Policies applied to them
     5. Policies
        1. Can be applied to users or groups
        2. Allow or deny a specific action in AWS
     6. Role
        1. Temporary in nature
        2. Set amount of time
        3. Associated permissions
        4. Allow or Deny
        5. Assume for Temporary amounts of time
        6. Similar to user with no username and password
        7. Identity to gain temporary permissions
        8. Grant access to
           1. AWS Resources
           2. Users
           3. External Identities
           4. Applications
           5. Other AWS Services
           6. Abandons all previous permissions when it assumes that role
        9. Federate users into AWS
           1. Using corporate account using Role Based Access
           2. Single Sign On (SSO)
     7. **Enable MFA for users**

1. AWS Organizations
   1. Separation of Duties
   2. Central location to manage multiple AWS Accounts
      1. Hierarchical Fashion
   3. Centralized Management
   4. Consolidated Billing
   5. Hierarchical groupings of Accounts
      1. Organizational Units
      2. Business Units
   6. AWS Service & API Actions Access Control
      1. Service Control Policies (SCP)
      2. Specify maximum permissions for member accounts
2. Compliance
   1. Uses 3rd party Auditors
   2. Region you operate out of can help you meet compliance requirements
   3. AWS will not replicate data that needs to stay in a “home” country
   4. You own your data in AWS
   5. Build your compliance on top of AWS or Use Built in AWS Features in many services
   6. AWS Artifact
      1. Compliance Documents done by 3rd parties
   7. AWS Compliance Center
      1. Compliance Info all in one place
      2. Displays compliance enabling services
      3. AWS Risk & Security White Paper
3. Denial-of-Service Attacks
   1. Distributed Denial-of-Service (DDos)
      1. UDP Flood
         1. Spoofs the return address of system to flood target with data
         2. Brute Force Attack
         3. Security Groups
            1. Only allows proper request traffic
            2. Operates at the AWS Network Level
            3. You’d have to overwhelm the entire AWS Region to succeed
      2. HTTP Level Attacks
         1. Looks like legit traffic
         2. Performs complex queries of your products
      3. Slowloris Attack
         1. Attacker pretends to have a slow connection and take up resources
         2. Elastic Load Balancer
            1. Handles HTTP Traffic Request First
            2. Waits for entire message
            3. You’d have to overwhelm the entire AWS Region to succeed
   2. AWS Shield with AWS Web Application Firewall (WAF)
      1. Web Application Firewall to filter incoming traffic
      2. Machine Learning
      3. Recognize new threats as they evolve
      4. Proactively help defend against an ever-growing list of destructive vectors
   3. Already defended against most attacks
   4. AWS Shield Standard
      1. Automatically protects all AWS Customers at no cost
   5. AWS Shield Advanced
      1. Paid service that provides detail3ed attack Diagnostics
      2. Ability to detect & mitigate traffic in real time
      3. Automatically Mitigates
4. AWS Key Management Service (AWS KMS)
   1. Encryption
      1. Only authorized parties can access it
   2. Encryption at Rest
      1. Data Idle (being stored)
      2. At Rest Encryption is enabled on all DynamoDB Tables
   3. Encryption in Transit
      1. Data traveling between 2 points
5. Amazon Inspector
   1. Automated Security Assessment against your infrastructure
   2. Deviations of security best practices
   3. 3 Pieces
      1. Network Configuration Reachability Piece
      2. Amazon Agent
         1. Installed on EC2 Instance
      3. Security Assessment Service
         1. Brings everything together
6. Amazon GuardDuty
   1. Analyzes streams of meta data from your account & Network Activity
   2. Integrated Threat Intelligence
      1. Known Malicious IP Addresses
   3. Anomaly Detection
   4. Machine Learning
   5. Runs Independently from other AWS Services

**Module 7**

1. Amazon CloudWatch
   1. Web service that enables you to monitor & manage various Metrics
   2. Configure alarm actions based on data from those metrics
   3. Integrated with SNS & can send SMS
   4. Custom Alarms for all different types of AWS resources
   5. Dashboard feature to aggregate all those metrics
   6. Access to all your metrics from a central location
      1. Cloud & On Prem
   7. Gain visibility into your applications, infrastructure, & services
   8. Reduce MTTR & improve TCO
      1. Mean Time To Resolution
      2. Total Cost of Ownership
   9. Drive insights to optimize applications and operational resources
      1. Aggerate metrics from a fleet of EC2 instances
2. AWS CloudTrail
   1. Trust but verify
   2. API Auditing Tool
   3. Every request gets logged in CloudTrail engine
   4. Vault Lock can show absolute provenance of all these critical security audit logs
3. AWS Trusted Advisor
   1. Evaluate Resources vs 5 Pillars based on AWS Best Practices
      1. Cost Optimization
      2. Performance
      3. Security
      4. Fault Tolerance
      5. Service Limits
   2. Examples of checks
      1. Lack of MFA for Root user
      2. Underutilized EC2 Instances
      3. EBS Volumes not backed up in awhile
   3. Some are free, and some depend on your support plan

**Module 8**

1. AWS Free Tier
   1. Always Free
      1. Does Not Expire
   2. 12 months free
      1. From date you created your AWS account
   3. Trials
      1. Short Term Free Trial
   4. AWS Lambda
      1. Free for 1 million free invocations per month
      2. Up to 3.2 million seconds of computer time per month
   5. AWS S3
      1. Free for 12 months for up to 5 gb of standard storage
   6. AWS Lightsail
      1. 1 month trial of up to 750 hours of usage
   7. AWS Free Tier Services
      1. Amazon SageMaker
      2. Amazon Comprehend Medical
      3. Amazon DynamoDB
      4. Amazon SNS
      5. Amazon Cognito
2. Pricing Concepts
   1. Pay for what you use
   2. Pay less when you reserve
   3. Pay less with volume-based discounts when you use more
   4. [AWS Pricing Calculator](https://calculator.aws/#/)
      1. Can save estimate
3. Billing Dashboard
4. Consolidated Billing
   1. Part of AWS Organizations
   2. Usage is rolled up to the Organization level
      1. Useful because of bulk pricing
   3. Reserved instances of EC2 can be shared across AWS Accounts
5. AWS Budgets
   1. Set alert when you’ve used a % of your budgeted amount
6. AWS Cost Explorer
   1. Displays Spending
   2. Has 12 months worth of data
   3. Grouping costs
      1. Can group by Tag
         1. User defined key value pair
         2. Tag resources by project name
   4. Can save custom reports
7. AWS Support Plans
   1. Basic (All customers receive this)
      1. 27/7 Customer Service
      2. Documentation
      3. Whitepapers
      4. Support Forums
      5. AWS Trusted Advisor
      6. AWS Personal health Dashboard
         1. Personalized View
   2. Developer
      1. Basic Support
      2. Email Access to Customer Support
         1. 24 hour response time for questions
         2. 12 hour response time for impaired systems
      3. Great for non production workloads
   3. Business
      1. Previous Tiers
      2. AWS Trusted Advisor provides full set of best practice checks
      3. Direct phone access to cloud support engineers
         1. 4 hour SLA if your production system is impaired
         2. 1 hour SLA if your production system is down
      4. Infrastructure event management
         1. Help plan for massive events like brand new launches
            1. For a fee
   4. Enterprise
      1. Previous Tiers
      2. 15 minute SLA for business critical workloads
      3. Dedicated Technical Account Manager (TAM)
      4. TAM’s are concierge support team that comes with enterprise
         1. Proactively monitor your environment
         2. Assisting with optimization
         3. Infrastructure event management
         4. Well-Architected reviews
            1. Work with customers to review architecture using the Well-Architected framework
            2. Checked against

Operational Excellence

Security

Reliability

Performance Efficiency

Cost Optimization

* + - 1. Operational reviews
  1. [Pricing Structures for Plans](https://aws.amazon.com/premiumsupport)

1. AWS Marketplace
   1. Digital Catalog
      1. Find, deploy & manage 3rd party software
      2. Range of payment options
      3. Rapidly & Securely deploy solutions
      4. Reduce Total Cost of Ownership (TCO)
   2. One Click Deployment
   3. Pay-as-you go options from vendors
   4. Enterprise focused features
      1. Custom terms & pricing
      2. Private marketplace
         1. To meet legal or security standards
      3. Integration into your procurement systems
      4. Cost management tools

**Module 9**

1. AWS Cloud Adoption Framework (AWS CAF)
   1. 6 Perspectives based types of people you will need
      1. Business
         1. Focused on Business Capabilities
         2. Finance Analyst
      2. People
         1. Focused on Business Capabilities
         2. HR
      3. Governance
         1. Focused on Business Capabilities
      4. Platform
         1. Focused on Business Technologies
         2. Cloud Architect
      5. Security
         1. Focused on Business Technologies
      6. Operations
         1. Focused on Business Technologies
      7. Used to identify gaps in skills and processes
         1. Recorded as inputs
            1. Used to create AWS Cloud Adoption Framework Action Plan

Guide’s change management

1. 6 R’s of Migration
   1. Every Application/Application Group will fall into one of these for migration
      1. Rehosting
         1. Lift & Shift
         2. Not making changes
         3. Save up to 30% by rehosting
         4. Easier to optimize applications after
      2. Replatforming
         1. Lift, Tinker, & Shift
         2. Not 1 to 1
         3. No Code Changes
         4. On Prem MySQL -> RDS MySQL or Aurora
         5. High initial cost
      3. Refactoring/re-architecting
         1. Write new code
         2. Business need to add features or performance
         3. Highest initial cost
      4. Repurchasing
         1. Abandon legacy software vendors
         2. End licensing with out of date DB vendor in favor of cloud native DB offerings
      5. Retaining
         1. Need to run for another X amount of time
         2. Nearing EOL
      6. Retiring
         1. No longer needed
         2. 10 – 20% of Application portfolios are no longer needed
   2. Each option is judged against
      1. Time
      2. Cost
      3. Priority
      4. Criticality
2. AWS SNOW Family
   1. Collection of physical devices that help physically transport up to exabytes of data in & out of AWS
   2. AWS Snowcone
      1. Up to 8 tb of data
      2. Contains edge computing
         1. Amazon EC2 Instances
         2. AWS IoT Greengrass
      3. Migration Path
         1. Order Device
         2. Amazon ships device
         3. Attach device to network & copy data
         4. Ship device back
         5. Amazon copies data to S3 bucket that you own
      4. Use Case
         1. Analytics data
         2. Video Libraries
         3. Image Collections
         4. Backups
         5. Even tape replacement data
   3. AWS Snowball
      1. Snowball Edge Compute Optimized
      2. Snowball Edge Storage Optimized
         1. 80 tb capacity
      3. Fit into server racks
      4. Can be clustered
      5. Can run Amazon Lambda
      6. Can run Amazon EC2 compatible AMI’s
      7. AWS IoT Greengrass
      8. Usually shipped to remote locations
      9. Use Case
         1. Capturing of streams from IoT devices
         2. Image Compression
         3. Video Transcoding
         4. Industrial signaling
   4. ASW Snowmobile
      1. 45 foot Shipping Container
         1. Data center in a box
      2. Houses 100 petabytes
         1. 100,000 terabytes
      3. Appears as a network attached storage device
      4. Ideal for large migrations or data center shutdowns
      5. Weatherproof
      6. Temperature Controlled
      7. Fire suppression
      8. GPS Tracking
      9. 24/7 video surveillance
      10. Security while in transit
   5. AWS SNOW devices are designed
      1. Secure & Tamper-resistant
      2. 2560bit encryption keys owned and managed by you
      3. AWS Key Management Service can generate and manage keys
3. Innovation with AWS
   1. VMWare Cloud on AWS
   2. Machine Learning & AI
      1. AWS has the Broadest & Deepest set of ML & AI services
      2. Pre-trained AI
         1. Computer vision
         2. Language recommendations
         3. Forecasting
      3. Amazon SageMaker
         1. Quickly build, train, & deploy machine learning models at scale
      4. Custom models with support for all popular open-source frameworks
         1. Amazon SageMaker
         2. Amazon Augmented AI
         3. Amazon Augmented AI2
      5. Ready-to-go AI Solutions
         1. Amazon Lex
            1. Heart of Alexa
            2. Helps you build chat bots
         2. Amazon Textract
            1. Optical Character Recognition
            2. Extracts text & data from documents
         3. AWS DeepRacer
            1. Allows developers to

**Module 10**

1. Each AWS service is a building block for your solution
   1. String together services
   2. Well Architected Framework
      1. Operational Excellence
      2. Security
      3. Reliability
      4. Performance Efficiency
      5. Cost Optimization
2. Well Architected Framework
   1. Designed to enable architects, developers, and users of AWS to build secure, high-performing, resilient, and efficient infrastructure for their applications
   2. Five Pillars (consistent approach to reviewing & designing architectures)
      1. Operational Excellence
         1. Running & monitoring systems to deliver business value, and with that, continually improving processes and procedures
         2. Automating changes with deployment pipelines, or responding to events that are triggered
      2. Security
         1. Checking integrity of data and, for example, protecting systems by using encryption
      3. Reliability
         1. Recovery planning
      4. Performance Efficiency
         1. Using IT and computing resources efficiently
      5. Cost Optimization
         1. Controlling where money is spent
   3. AWS Well Architected Tool
      1. Accessed via AWS Management Console
      2. Run against AWS Account
         1. Generate report showing areas that should be addressed
      3. RAG Chart Design
         1. Red
         2. Amber
         3. Green
   4. Benefits of the AWS Cloud
      1. AWS Services are building blocks
      2. AWS Terminology
      3. 6 Main Benefits of using the AWS Cloud
         1. Trade upfront expense for variable expense
            1. On-prem data center costs

Physical space

Hardware

Staff for racking & stacking

Overhead for running the data center

Fixed cost of static data center

* + - * 1. Save money with AWS

Turn off unused instances

Delete old resources

Optimize your applications

Receive recommendations from AWS Trusted Advisor

* + - 1. Benefit from massive economies of scale
         1. Lower variable cost than you could running a data center on your own
      2. Stop guessing capacity
         1. You have to own enough hardware to cover your capacity

Over or under estimating

* + - * 1. Provision the resources you need now
        2. Scale resources up or down

Scaling can take minutes, not weeks or months

* + - 1. Increased speed & agility
         1. Spin up test environments
         2. Run experiments
         3. Delete resources
         4. Stop incurring costs
         5. Flexibility drives innovation
      2. Stop sending money running & maintaining datacenters
         1. Unless you are a datacenter company, why run a datacenter
         2. Focus on what makes your business valuable

What makes you better than your competitors

* + - 1. Go global in minutes
         1. Replicate architecture to another region

Can be automated with AWS CloudFormation