

Deploying & Managing Infrastructure at Scale Section

What is Cloud Formation?

- CloudFormation is declarative way of outlining your AWS infrastructure, for any resources (most of them are supported).

- for ex. within a cloudformation template you say:

① I want security group

② I want 2 EC2 instances using this security group

③ I want an S3 bucket

④ I want load balancers (ELB) in front of these

EC2 instances.

Imp + Then cloudformation creates these for you, in the right order, with the exact configuration.

Benefits of AWS Cloudformation

① Infrastructure as code :-

- No resources are manually created, which is excellent for control

- Changes to the infrastructure are reviewed through code review.

② Cost :-

- Each resource within the stack is tagged with identifier so you can easily see how much a stack costs you.

- You can estimate the cost of your resources using the cloudformation template.

- Saving Strategy: In Dev, you could automation deletion of templates at 5 PM & recreated at 8 PM, safely.

③ Productivity :-

- Ability to destroy & re-create an infrastructure on the cloud on the fly.

- Automated generation of diagram for your templates.

- Declarative programming (no need to figure out ordering & orchestration).

④ Don't re-invent the wheel :-

- Leverage existing templates on the web
- Leverage the documentation.

⑤ Supports (almost) all AWS Resources :->

- Everything we'll see in this course is supported.
- You can use "custom resources" for resources that are not supported.

ex: CloudFormation + Application Composer

ex: Wordpress + CloudFormation stack

- We can see all resources
- We can see the relations between the components

AWS Cloud Development Kit (CDK)

- Define your cloud infrastructure using a familiar language:
JavaScript, TypeScript, Python, Java & .Net
- The code is "compiled" into a CloudFormation template (JSON/YML)
- You can therefore deploy infrastructure & application runtime code together.
 - Great for Lambda functions
 - Great for Docker containers in ECS/EKS.

15 * Elastic Beanstalk managed service:-

- ① Instance configuration / os is handled by Beanstalk.
- ② Deployment strategy is configurable but performed by Elastic Beanstalk.
- ③ Capacity provisioning
- ④ Load Balancing & Auto Scaling
- ⑤ Application health - monitoring & responsiveness.

25 Just the application code is the responsibility of the developer.

AWS Elastic Beanstalk - Overview →

- Elastic beanstalk is a developer centric view of deploying an application on AWS.

- It uses all the components we've seen before: EC2, ASG, ELB, RDS, etc.

- But it's all in one view that's easy to make sense of.

- We still have full control over the configuration.

- Beanstalk = Platform as a Service

- Beanstalk is free but you have to pay for underlying instances.

* Three Architecture models:-

- ① Single instance deployment :- good for dev
- ② LB + ASG :- Great for production or pre-production web applications
- ③ ASG only :- Great for non-web apps in production (workers, etc....)

Elastic Beanstalk - Health monitoringImp

① Health agent pushes metrics to Cloudwatch

② Checks for app health, publishes health events

AWS CodeDeploy :-

- We want to deploy our application automatically

+ works with EC2 instance

+ works with on-premises servers

+ Hybrid service

- Servers/Instances must be provisioned & configured ahead of time with code deploy agent.

AWS Code Commit

- Before pushing the applications code to servers, it needs to be stored.
- Developers usually store code in repo, using the Git technology.
- A famous public offering is GitHub, AWS' competitor product is **Code Commit**.

- Code Commit :-

① source-control service that hosts Git-based repos
 ② makes it easy to collaborate with others on code.

③ The code changes are automatically versioned

- Benefits :- Fully managed

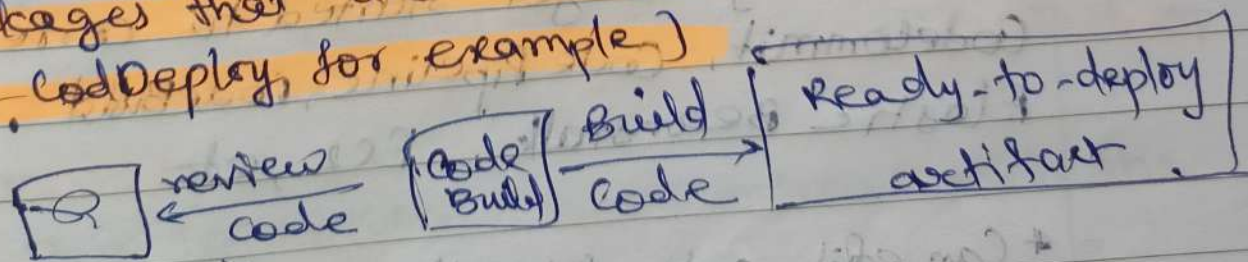
scalable & highly available,

private, secured, Integrated with AWS.

AWS CodeBuild

- Code building service in the cloud (name is obvious)
- Compiles source code, run tests & produces packages that are ready to be deployed

(by CodeDeploy for example)



CodeCommit

AWS Code Artifact

- Software packages depend upon each other to be built (also called code dependencies), & new ones are created.
- Storing & retrieving these dependencies is called artifact management.
- Traditionally, you need to setup your own artifact management system.
- CodeArtifact is a secure, scalable & cost effective artifact management for software development.
- Works with common dependency management tools such as Maven, Gradle, npm, yarn, twine, pip & NuGet.
- Developers & CodeBuild can then retrieve dependencies straight from CodeArtifact.

AWS CodeStar / CodeCatalyst

- Unified UI to easily manage software development activities in one place.
- "Quickway" to get started to correctly set-up CodeCommit, CodePipeline, CodeBuild, CodeDeploy, Elastic Beanstalk, EC2, etc.

25 # Can edit code "in-the-cloud" using AWS Cloud9

* Cloud 9 :->

AWS Cloud9 is cloud IDE (Integrated Development Environment) for writing, running & debugging code.

- "A Cloud IDE can be used withing web browser, meaning you can work on your proj. from your o/c, home or anywhere with internet with no setup necessary.
- AWS Cloud9 also allows for code collaboration in real-time (pair programming)

* AWS Systems Manager (SSM)

- Hybrid AWS Service
- Helps you manage your EC2 & on-premises systems at scale.
- Another operational insight about the state of your infrastructure.
- suite of 10+ products.
- Most important features are:
 - ① Patching automation for enhanced compliance
 - ② Run commands across an entire fleet of servers
 - ③ Store parameter configuration with the SSM parameter store.
- Works for Linux, Windows, MacOS, & Raspberry Pi OS (Raspbian)

AWS CodePipeline

- Orchestrate the different steps to have the code automatically pushed to production.

Code → Build → Test → Provision → Deploy
 - Basic for CI/CD (Continuous Integration & Continuous delivery)

* Benefits:-

- ① Fully managed, compatible with Code Commit, Code build, Code Deploy, Elastic Beanstalk, CloudFormation, GitHub, 3rd-party services (GitHub) & custom plugins.

* How System Manager (SSM) Works.

- ① We need to install the SSM ^{agent} onto systems we control.
- ② Installed by default on Amazon Linux AMI & some functions- Ubuntu AMI.
- ③ If instance can't be controlled by with SSM, it's probably an issue with SSM agent!
- ④ Thanks to SSM agent, we can run commands, patch & configure our servers.

System Manager - SSM / Session Manager

- Allows you to start secure shell on your EC2 & on-premises servers.

- No SSH access, bastion hosts, or SSH keys needed.

- No port 22 needed (better security)

- Supports Linux, macOS, & windows

- send session log data to S3 or CloudWatch logs.

Systems Manager - Parameter Store

- Secure storage for configuration & secrets
- API keys, passwords, configurations --
- Serverless, scalable, durable, easy SDK..
- Control access permissions using IAM.
- Version tracking & encryption (optional)

Deployment - Summary

① CloudFormation :- (AWS only)

- Infrastructure as a code, which works with almost all of AWS resources.
- Repeat across Regions & Accounts.

② Beanstalk :- (AWS only)

- Platform as a Service (PaaS), limited to certain programming languages or Docker.
- Deploy code consistently with known architecture

③ architecture

ex: ALB + EC2 + RDS.

④ CodeDeploy (hybrid) :- deploy & upgrade any application onto servers.

⑤ Systems Manager (hybrid) :- patch, configure & run commands at scale.

Developer Services - Summary

- ① **CodeCommit** :- Store code in private git repository (version controlled)
- ② **CodeBuild** :- Build & test code in AWS.
- ③ **CodeDeploy** :- Deploy code onto servers.
- ④ **CodePipeline** :- Orchestration of pipeline (from code to build to deploy)
- ⑤ **CodeArtifact** :- Store software packages/dependencies on AWS.
- ⑥ **CodeStar** :- Unified view ~~for~~ allowing developer developers to do CI/CD & code.
- ⑦ **Cloud9** :- Cloud IDE with collab (pair programming)
- ⑧ **AWS CDK** :- Define your cloud infrastructure using a programming language.