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Week 9 - Lab #6

Automation with CloudFormation

**Introduction**

Automation with CloudFormation is a lab that teaches how to use AWS CloudFormation to automate AWS infrastructure deployments. The purpose is to obtain hands-on experience in defining, deploying, and maintaining cloud resources using a CloudFormation template. CloudFormation ensures infrastructure consistency and dependability by automating the process, reducing human error and making on-demand or scheduled installations easier. This lab investigates the building of a CloudFormation stack, including resources like as VPCs, security groups, S3 buckets, and EC2 instances, as well as the stack's lifecycle from deployment to termination.

**Lab Report – Questions**

**Question1:** What are CloudFormation Templates?

CloudFormation templates are JSON or YAML files used by AWS to define and manage cloud infrastructure as code (IaC). These templates explain the resources required to build an application or infrastructure stack in AWS, including EC2 instances, VPCs, S3 buckets, security groups, and more. Each template defines the resources' properties and configurations, allowing CloudFormation to automatically build, update, or delete them in a consistent and repeatable manner.  
  
CloudFormation templates enable infrastructure to be version-controlled, reused, and deployed across many environments with no manual involvement, resulting in dependable and uniform application configurations.

**Question2:** Describe a use case where CloudFormation templates can be beneficial

**Use Case: Configuring a Multi-Tier Web Application**

In this scenario, a corporation plans to implement a multi-tier web application with a load balancer, web servers, and a back-end database. They want to assure consistency, scalability, and reproducibility in their deployment process.  
  
**Components:**

* The Elastic Load Balancer (ELB) distributes incoming traffic across many web servers.
* The Auto Scaling Group of EC2 Instances hosts the application and allows for demand-based scaling.
* The RDS Database is responsible for managing the back-end database.

**How CloudFormation Templates Help**  
  
**1. Automation and consistency:**  
  
Benefit: CloudFormation templates streamline the construction and maintenance of AWS resources. This ensures that each deployment is consistent and reduces manual errors.  
  
For example, the template can define ELB, Auto Scaling Group, and RDS instances. Each deployment will generate the same set of resources using the same configuration.  
  
**2. Infrastructure as Code:**  
  
Benefit: Templates allow infrastructure to be version controlled alongside application code. This makes it easier to track and revert changes as needed.  
  
For example, any infrastructure upgrade, such as altering instance types or adding new resources, can be made in the template and committed to version control.

**3. Scalability and flexibility:**  
  
Benefit: Templates can specify scaling policies for the Auto Scaling Group, guaranteeing that the application can handle variable loads effectively.  
  
For example, a template could specify that the Auto Scaling Group should scale out when CPU utilization exceeds 70% and scale in when it falls below 30%.  
  
**4. Reusability and Efficiency:**  
  
Benefit: Templates can be reused across several environments (e.g., development, staging, and production), guaranteeing that each environment is configured similarly.  
  
For example, the same CloudFormation template that was used to build up the production environment can also be used to set up the staging environment.

**Reflection**

Working through this CloudFormation lab was both informative and challenging, as it gave me firsthand experience with the power and efficiency of Infrastructure as Code. I learned how CloudFormation templates codify infrastructure setup to improve deployment consistency and reliability. Defining resources in YAML, such as VPCs, security groups, S3 buckets, and EC2 instances, needed meticulous attention to detail, which was initially difficult but gratifying as I realized how components interacted with one another. I found it especially intriguing that CloudFormation templates may be utilized across environments, saving time and decreasing errors. Troubleshooting syntax problems and dependency difficulties was a wonderful experience that taught me the value of accuracy and thoroughness in IaC. This lab demonstrated how CloudFormation streamlines complex installations, making automation more accessible and reliable for large-scale cloud infrastructure management.

**Lab Report – Screenshots**

**Deploying the CloudFormation Stack - showing the stack being deployed**

A screenshot of a computer

Description automatically generated

A screenshot of a computer

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A screenshot of a computer

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A screenshot of a computer

Description automatically generated

**Adding S3 bucket – showing the updated YAML template / updated template**

A screenshot of a computer

Description automatically generated

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**Adding EC2 instance - showing the updated stack with EC2 instance added**

A screenshot of a computer

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A screenshot of a computer

Description automatically generated

**Delete Stack – showing the stack deleted or deletion in progress to remove resources**

A screenshot of a computer error message

Description automatically generated

A screenshot of a computer

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A screenshot of a computer

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**References**

1. Qa. (2023, February 28). *AWS CloudFormation Overview: Concepts, benefits, use cases, pricing, and more*. <https://www.qa.com/resources/blog/aws-cloudformation-overview/>
2. Singh, A. (2023, November 21). *Unveiling the magic of AWS CloudFormation Templates*. dzone.com. <https://dzone.com/articles/unveiling-the-magic-of-aws-cloudformation-template>
3. *What is AWS CloudFormation? - AWS CloudFormation*. (n.d.). <https://docs.aws.amazon.com/AWSCloudFormation/latest/UserGuide/Welcome.html>