



Cloud DevOps Engineer Nanodegree Program

Become an AWS Cloud Devops Engineer

COURSE 1: Cloud Fundamentals

The cloud has become a key enabler for innovation with beneficial features like high availability, unlimited capacity, and on-demand scalability and elasticity. Learn the fundamentals of cloud computing while being introduced to compute power, security, storage, networking, messaging, and management services in the cloud. While learning the fundamentals, you will explore tools and services offered by Amazon Web Services (AWS) through interactive hands-on exercises. By the end of the course, you will have deployed your first website to AWS, and you will be prepared to continue your learning journey in the Cloud Developer nanodegree program.

PROJECT 1: Deploy Static Website on AWS

The cloud is perfect for hosting static websites that only include HTML, CSS, and JavaScript files that require no server-side processing. In this project, you will deploy a static website to AWS. First, you will create a S3 bucket, configure the bucket for website hosting, and secure it using IAM policies. Next, you will upload the website files to your bucket and speed up content delivery using AWS's content distribution network service, CloudFront. Lastly, you will access your website in a browser using the unique S3 endpoint.

SUPPORTING LESSON CONTENT

Lesson Title	Learning Outcomes
Cloud Overview	<ul style="list-style-type: none">→ Learn the basics of cloud computing including cloud deployment models, benefits, and popular options→ Explore services provided by Amazon Web Services(AWS)
Foundational and Compute Services	<ul style="list-style-type: none">→ Learn why we need servers, compute power, and security→ Explore AWS compute services like Elastic Cloud Compute (EC2), Virtual Private Cloud (VPC), Lambda for serverless framework, and Elastic Beanstalk in action→ Launch a secure EC2 instance, create and execute a Lambda, and deploy an application to Elastic Beanstalk
Storage and content delivery	<ul style="list-style-type: none">→ Learn why we need storage and content delivery in the cloud→ Learn storage services like S3, DynamoDB, Relational Database Service (RDS), and CloudFront

→ Create a DynamoDB table, launch a MySQL database instance, and create a CloudFront distribution

Security

→ Learn the importance of security in the cloud
→ See Identity & Access Management (IAM) in action
→ Secure applications using IAM users, groups, and policies

Networking & Elasticity

→ Learn the basics of networking and elasticity in the cloud
→ Examine services like Route 53, EC2 Auto Scaling, and Elastic Load Balancing
→ Add an auto scaling policy to your EC2 instance

Messaging & Containers

→ Learn the basics of messaging and containers in the cloud
→ Explore services like Simple Notification Service (SNS), Simple Queue Service (SQS), and Elastic Container Service (ECS)
→ Create cloud notifications using SNS

AWS Management

→ Learn why we need logging, auditing, and resource management in the cloud
→ Understand services like Cloud Watch, Cloud Trail, Cloud Formation, and the AWS Command Line Interface (CLI)
→ Explore the CLI

COURSE 2: Deploy Infrastructure as Code (IAC)

With the advent of cloud computing, along came several tools that enabled us to deploy the underlying infrastructure components that provide security and services to our servers by writing scripts. In this course, you'll learn how to deploy this infrastructure using CloudFormation, AWS' tool for Infrastructure as Code.

You will use CloudFormation to deploy Infrastructure patterns that are used in the industry broadly and can be readily used to deploy any cloud application. Like in the real world, you will begin with initial business requirements that you will turn into Cloud Architecture Diagrams. Then you will deploy this architecture using CloudFormation.

PROJECT 2: Deploy a high-availability web app using CloudFormation

In this project, you'll deploy web servers for a highly available web app using CloudFormation. You will write the code that creates and deploys the infrastructure and application for Instagram-like app from the ground up. You will begin with deploying the networking components followed by servers, security roles and software. The procedure you follow here will become part of your portfolio of cloud projects. You'll do it exactly as it's done on the job: following best practices and scripting as much as possible.

SUPPORTING LESSON CONTENT

Lesson Title	Learning Outcomes
Getting started with cloud formation	→ Set up the necessary tools to get started with cloud formation and deploy your first server using cloudformation
Infrastructure Diagrams	→ Convert business requirements into infrastructure diagrams and understand the principles behind design choices
Networking Infrastructure	→ Implement virtual private network and subnets and learn how to provide inbound and outbound internet access to your public and private subnets inside your VPC → Use routing table to route the traffic within our virtual private cloud
Servers and security groups	→ Deploy a web server into an autoscaling group → Implement load-balancer to increase capacity of your app → Implement security groups and understand the concept of least-privilege as it applies to network traffic
Storage and Databases	→ Deploy S3 storage for images, config files etc. → Deploy relational database and encryption service for your application

COURSE 3: Build CI/CD Pipelines, Monitoring & Logging

In this course, you'll learn the process of taking software from source code to deployment and beyond. You'll learn about automated testing, choosing the right deployment strategy for your business needs and deploying an appropriate CI/CD pipeline. You'll also learn about monitoring and logging to ensure that your application is running at peak performance and stays that way.

You'll also learn to manage and make changes to your servers in an automated way, using Ansible, a leading Configuration Management tool.

PROJECT 3: Build CI/CD Pipeline for Blue/Green Deployment

In this project, you will build on the skills acquired during this course. You will first create a pipeline that spins up three servers and uses Ansible to deploy an application on the servers. Once those servers are running, you will create another pipeline to confirm that servers were configured as expected. You'll then use the "Blue/Green" deployment strategy to deploy additional features to those servers.

SUPPORTING LESSON CONTENT

Lesson Title	Learning Outcomes
Configuration Management with Ansible	<ul style="list-style-type: none">→ Install software automatically with a tested and repeatable process that can be executed across your entire server fleet→ Apply patches to your infrastructure without having to manage servers individually
Build CI/CD Pipelines with Jenkins on AWS	<ul style="list-style-type: none">→ Select the appropriate deployment strategies to avoid downtime→ Create pipelines that include automated testing to ensure software packages are delivered with quality in mind→ Identify and create pipelines for Development and Production
Logging	<ul style="list-style-type: none">→ Use CloudWatch to aggregate Logs→ Setup log agents to collect data directly from the source and send it to a centralized location for analysis
Monitoring & Alarms	<ul style="list-style-type: none">→ Identify and monitor meaningful metrics→ Setup alarms that will alert you of potential server issues→ Create dashboards to visualize your server metrics

COURSE 4: Microservices at Scale using Kubernetes

In this course, you will learn to create and deploy a Kubernetes cluster, configure Kubernetes autoscale, and load test a Kubernetes application. You'll learn to operationalize both existing and new microservices and apply containers best practices. You'll learn to deploy Machine Learning microservices that are elastic and

fault tolerant. You'll learn to pick the appropriate abstraction for microservices: Serverless (AWS Lambda) or Container Orchestration (Kubernetes).

PROJECT 4: Operationalize a Machine Learning Microservice API

In this project, you will continue your work on operationalizing microservices by deploying an elastic and fault-tolerant Machine Learning inference API using Kubernetes. You'll configure this microservice to be highly available by using Kubernetes best practices. You will validate your design by load testing the service and verifying the application architecture performs as designed.

SUPPORTING LESSON CONTENT

Lesson Title	Learning Outcomes
Deploy High-availability Microservice Event Driven application	<ul style="list-style-type: none">→ Understand Serverless (AWS Lambda) concepts→ Understand which container abstraction to use: AWS Lambda or Kubernetes→ Deploy producer/consumer AWS Lambda applications→ Configure cloudwatch events
Use Docker format containers	<ul style="list-style-type: none">→ Understand Docker image format→ Run and modify Docker containers locally→ Deploy customized containers to Amazon ECR
Containerization of existing app	<ul style="list-style-type: none">→ Use the appropriate Docker base image→ Install packages into Docker image→ Copy application into Docker image→ Configure Application setup and start in Docker image
Operationalize & Orchestrate Kubernetes	<ul style="list-style-type: none">→ Understand Kubernetes concepts→ Configure monitoring, alerts and incidence response→ Integrate CI/CD Pipeline→ Configure Autoscaling

Capstone Project

The purpose of the cloud devops capstone project is to give you a chance to combine what you've learned throughout the program. This project will be an important part of your portfolio that will help you achieve your cloud development-related career goals.

In the capstone project, each project is unique to the student. You'll build a CI/CD pipeline for a microservices application for different deployment strategies. Students define the scope of the project and select the right deployment strategy based on different business requirements.