UDACITY
FOR ENTERPRISE

THE SCHOOL OF CLOUD COMPUTING

Cloud DevOps Engineer

NANODEGREE SYLLABUS

Overview

Cloud Dev Ops Engineer Nanodegree Degree Program

Companies are looking for talented DevOps engineers to remain competitive in this agile world.

Enroll now to operationalize infrastructure at scale and deliver applications and services at high velocity, an essential skill for advancing your career.

Learn to design and deploy infrastructure as code, build and monitor CI/CD pipelines for different deployment strategies, and deploy scaleable microservices using Kubernetes.

Program Information

TIME
4 months
Study 10 hours/week

LEVEL
Practitioner

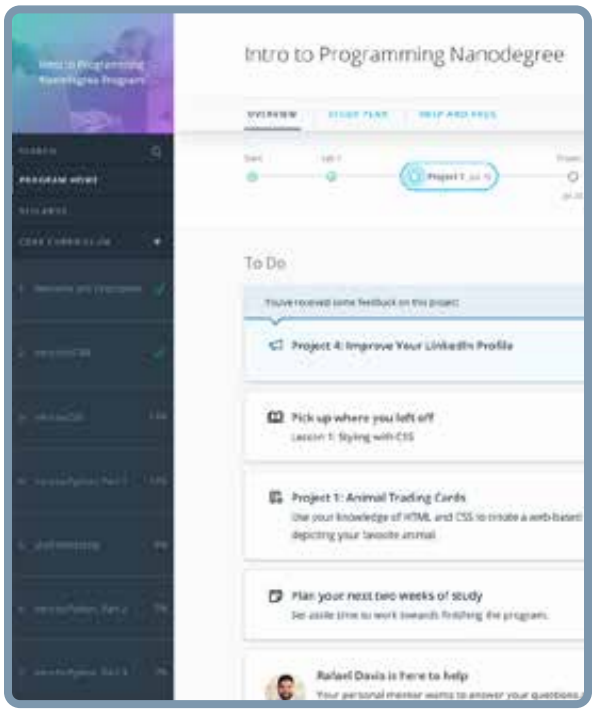
PREREQUISITES
Intermediate programming skills in Javascript and some familiarity with:

- Web development (HTML, CSS)
- Object Oriented Programming
- Linux Command Line Basics

HARDWARE/SOFTWARE REQUIRED
A computer running recent versions of Windows, Mac OS X, or Linux and an unmetered broadband Internet connection. For an ideal learning experience, a computer with Mac or Linux OS is recommended.

LEARN MORE ABOUT THIS NANODEGREE
Contact us at enterpriseNDs@udacity.com.

Our Classroom Experience



REAL-WORLD PROJECTS

Learners build new skills through industry-relevant projects and receive personalized feedback from our network of 900+ project reviewers. Our simple user interface makes it easy to submit projects as often as needed and receive unlimited feedback.

KNOWLEDGE

Answers to most questions can be found with Knowledge, our proprietary wiki. Learners can search questions asked by others and discover in real-time how to solve challenges.

LEARNER HUB

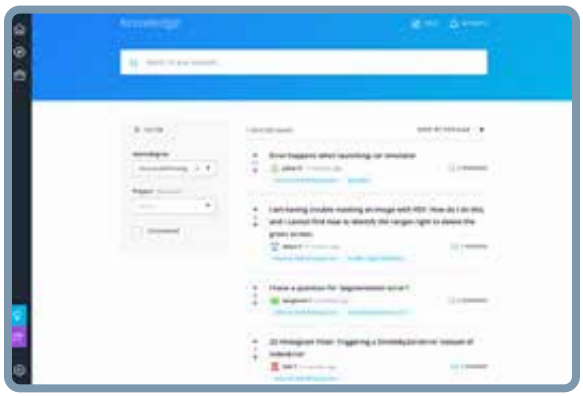
Learners leverage the power of community through a simple, yet powerful chat interface built within the classroom. Learner Hub connects learners with their technical mentor and fellow learners.

WORKSPACES

Learners can check the output and quality of their code by testing it on interactive workspaces that are integrated into the classroom.

QUIZZES

Understanding concepts learned during lessons is made simple with auto-graded quizzes. Learners can easily go back and brush up on concepts at anytime during the course.



CUSTOM STUDY PLANS

Mentors create a custom study plan tailored to learners' needs. This plan keeps track of progress toward learner goals.

PROGRESS TRACKER

Personalized milestone reminders help learners stay on track and focused as they work to complete their Nanodegree program.

Learn with the Best

Kesha Williams

INSTRUCTOR

Kesha has over 20 years experience in software development and is a software engineering manager at Chick-fil-A, routinely leading innovation teams in proving out the use of cloud services to solve complex business problems. She was recently named an Alexa Champion by Amazon.

Noah Gift

FOUNDER OF PRAGMATIC AI LABS

Alfredo Deza is a passionate software engineer, avid open source developer, Vim plugin author, photographer, and former Olympic athlete. He has rebuilt company infrastructure, designed shared storage, and replaced complex build systems, always in search of efficient and resilient environments.

Carlos Rivas

INSTRUCTOR

Carlos is a Senior Solutions Architect at Infiniti Consulting where he helps institutions move traditional data centers to the cloud. He has worked for several large telecommunication providers managing and configuring network infrastructure, using Java, Groovy, Python, Perl, and PHP.

Byron Sommardahl

CHIEF TECHNOLOGY OFFICER

Byron is co-founder and Chief Technology Officer of Acklen Avenue, an agile software development company. Byron has been developing software since he was 9 years old, and is a true believer in anything that improves software maintainability, usability, and delivery.

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: 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, CloudFron. Lastly, you will access your website in a browser using the unique S3 endpoint.

LESSON TITLE	LEARNING OUTCOMES
CLOUD OVERVIEW	• 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	• 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	• 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.

Course 1: Cloud Fundamentals, cont.

LESSON TITLE	LEARNING OUTCOMES
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 CloudWatch, CloudTrail, CloudFormation, 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: 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.

LESSON TITLE	LEARNING OUTCOMES
GETTING STARTED WITH CLOUD FORMATION	• Set up the necessary tools to get started with CloudFormation and deploy your first server using CloudFormation.
INFRASTRUCTURE DIAGRAMS	• Convert business requirements into infrastructure diagrams and understand the principles behind the design choices.
NETWORKING INFRASTRUCTURE	• Implement a 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.

Course 2: Deploy Infrastructure as Code (IAC), cont.

LESSON TITLE	LEARNING OUTCOMES
SERVERS AND SECURITY GROUPS	• Deploy a web server into an autoscaling group • Implement a load-balancer to increase the 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, configuration files, and more. • Deploy relational database and encryption services for your application.

Project Example

Deploy a High-Availability WebApp using CloudFormation

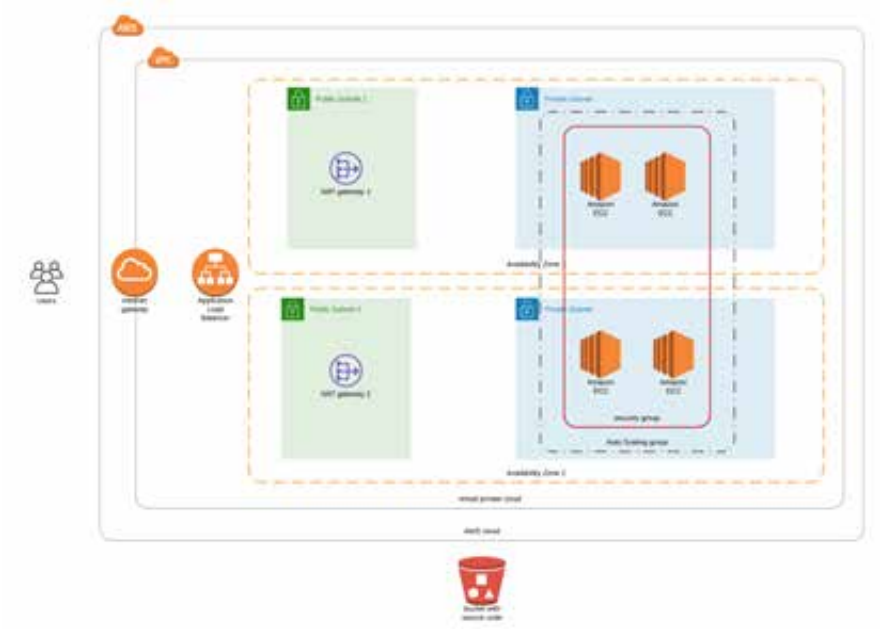


Image from an actual learner-submitted course project.

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 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: Build an Automated CI/CD Pipeline for UdaPeople

In this project, you'll demonstrate your Cloud DevOps engineer skills as a new employee at UdaPeople, an innovative new Human Resources company that depends on quick release cycles and a rock solid, high-quality product. You will help the development team deliver value continuously by building an automated CI/CD pipeline. Those new skills will also be put to the test as you set up automated monitoring and alerting to ensure the delivered value stays valuable.

LESSON TITLE	LEARNING OUTCOMES
CONTINUOUS INTEGRATION AND CONTINUOUS DEPLOYMENT	• Understand the fundamentals of CI/CD. • Give examples of business-centered benefits of CI/CD. • Examine the utility of continuous delivery in a dev team. • List best practices. • Differentiate deployment strategies. • Recognize common building blocks of CI/CD pipelines.
BUILDING A CONTINUOUS INTEGRATION PIPELINE	• Understand how and why to use configuration management tools. • Utilize a configuration management tool to accomplish deployment to cloud-based servers. • Design a complete CI pipeline.

Course 3: Build CI/CD Pipelines, Monitoring & Logging, cont.

LESSON TITLE	LEARNING OUTCOMES
ENABLING CONTINUOUS DELIVERY WITH DEPLOYMENT PIPELINES	• Know what configuration management tools are and how to use them. • Design an Ansible Playbook and control a remote machine. • Build an Ansible Inventory file. • Make various types of CD jobs in a CI/CD pipeline.
MONITORING ENVIRONMENTS	• Install and configure Prometheus as a monitoring tool. • Get various data sources into Prometheus. • Analyze monitoring data. • Set up alerts.

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: 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.

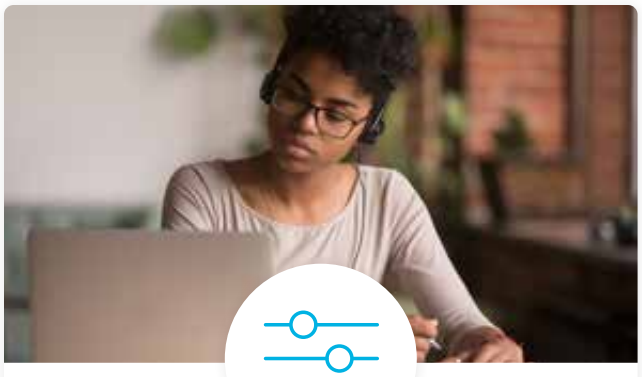
LESSON TITLE	LEARNING OUTCOMES
DEPLOY HIGH AVAILABILITY MICROSERVICE EVENT-DRIVEN APPLICATION	• Understand Serverless (AWS Lambda) concepts. • Understand which container abstraction to use: AWS Lambda or Kubernetes. • Deploy producer/consumer AWS Lambda applications. • Configure CloudWatch events.
USE DOCKER FORMAT CONTAINERS	• Understand Docker image format. • Run and modify Docker containers locally. • Deploy customized containers to Amazon ECR.
CONTAINERIZATION OF EXISTING APP	• 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 KUBERNETTES	• Understand Kubernetes concepts. • Configure monitoring, alerts, and incidence response. • Integrate CI/CD Pipeline. • Configure Autoscaling.

Project

Final 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.

Our Nanodegree Programs Include:



Pre-Assessments

Our in-depth workforce assessments identify your team's current level of knowledge in key areas. Results are used to generate custom learning paths designed to equip your workforce with the most applicable skill sets.

Dashboard & Progress Reports

Our interactive dashboard (enterprise management console) allows administrators to manage employee onboarding, track course progress, perform bulk enrollments and more.

Industry Validation & Reviews

Learners' progress and subject knowledge is tested and validated by industry experts and leaders from our advisory board. These in-depth reviews ensure your teams have achieved competency.

Real World Hands-on Projects

Through a series of rigorous, real-world projects, your employees learn and apply new techniques, analyze results, and produce actionable insights. Project portfolios demonstrate learners' growing proficiency and subject mastery.

Our Review Process

Real-life Reviewers for Real-life Projects

Real-world projects are at the core of our Nanodegree programs because hands-on learning is the best way to master a new skill. Receiving relevant feedback from an industry expert is a critical part of that learning process, and infinitely more useful than that from peers or automated grading systems. Udacity has a network of over 900 experienced project reviewers who provide personalized and timely feedback to help all learners succeed.

Vaibhav
UDACITY LEARNER

"I never felt overwhelmed while pursuing the Nanodegree program due to the valuable support of the reviewers, and now I am more confident in converting my ideas to reality."

now at
CODING VISIONS INFOTECH

All Learners Benefit From:

- Line-by-line feedback for coding projects
- Industry tips and best practices
- Advice on additional resources to research
- Unlimited submissions and feedback loops

How it Works

Real-world projects are integrated within the classroom experience, making for a seamless review process flow.

- Go through the lessons and work on the projects that follow
- Get help from your technical mentor, if needed
- Submit your project work
- Receive personalized feedback from the reviewer
- If the submission is not satisfactory, resubmit your project
- Continue submitting and receiving feedback from the reviewer until you successfully complete your project

About our Project Reviewers

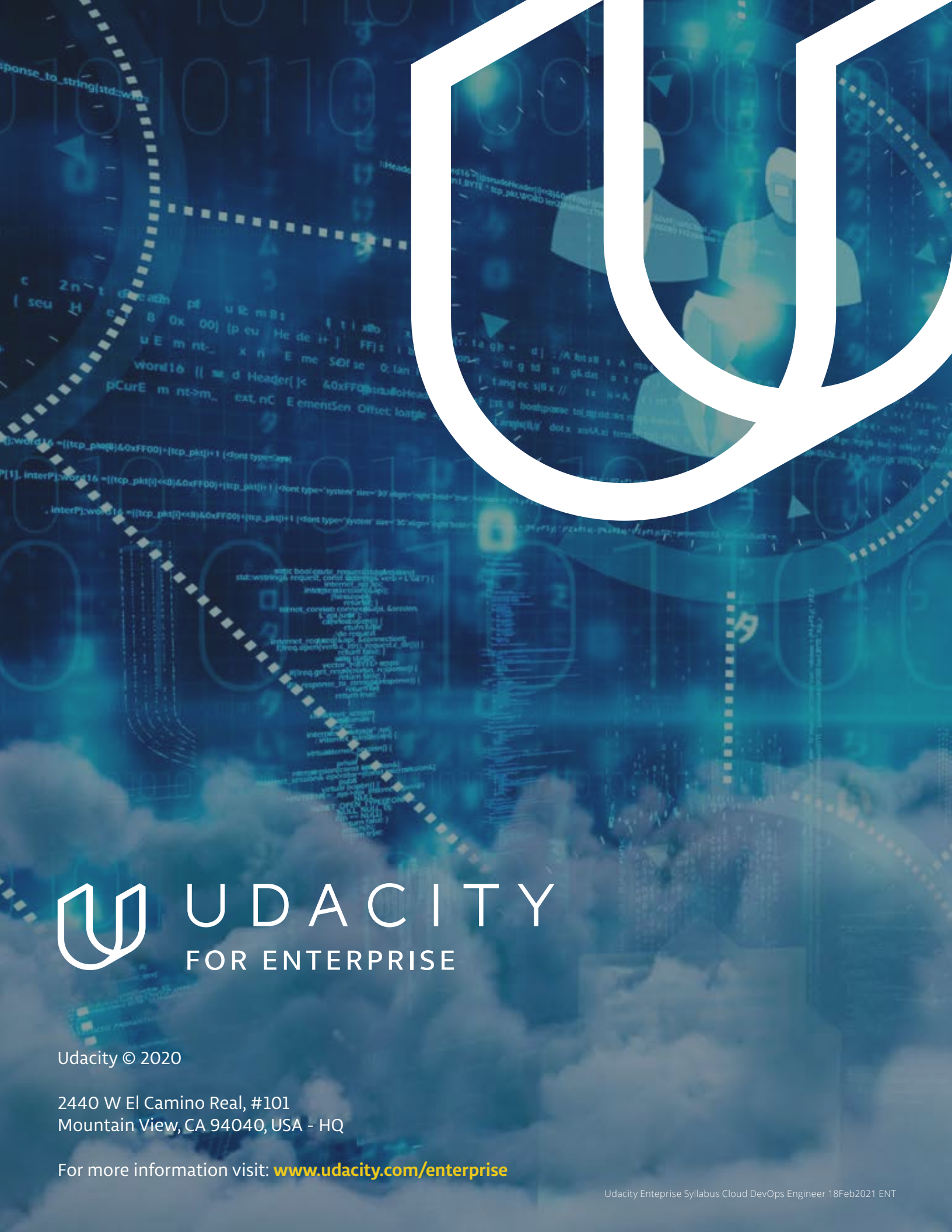
Our expert project reviewers are evaluated against the highest standards and graded based on learners' progress. **Here's how they measure up to ensure your success.**

900+
Expert Project Reviewers
Are hand-picked to provide detailed feedback on your project submissions.

1.8M
Projects Reviewed
Our reviewers have extensive experience in guiding learners through their course projects.

3
Hours Average Turnaround
You can resubmit your project on the same day for additional feedback.

4.85 /5
Average Reviewer Rating
Our learners love the quality of the feedback they receive from our experienced reviewers.



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For more information visit: **www.udacity.com/enterprise**