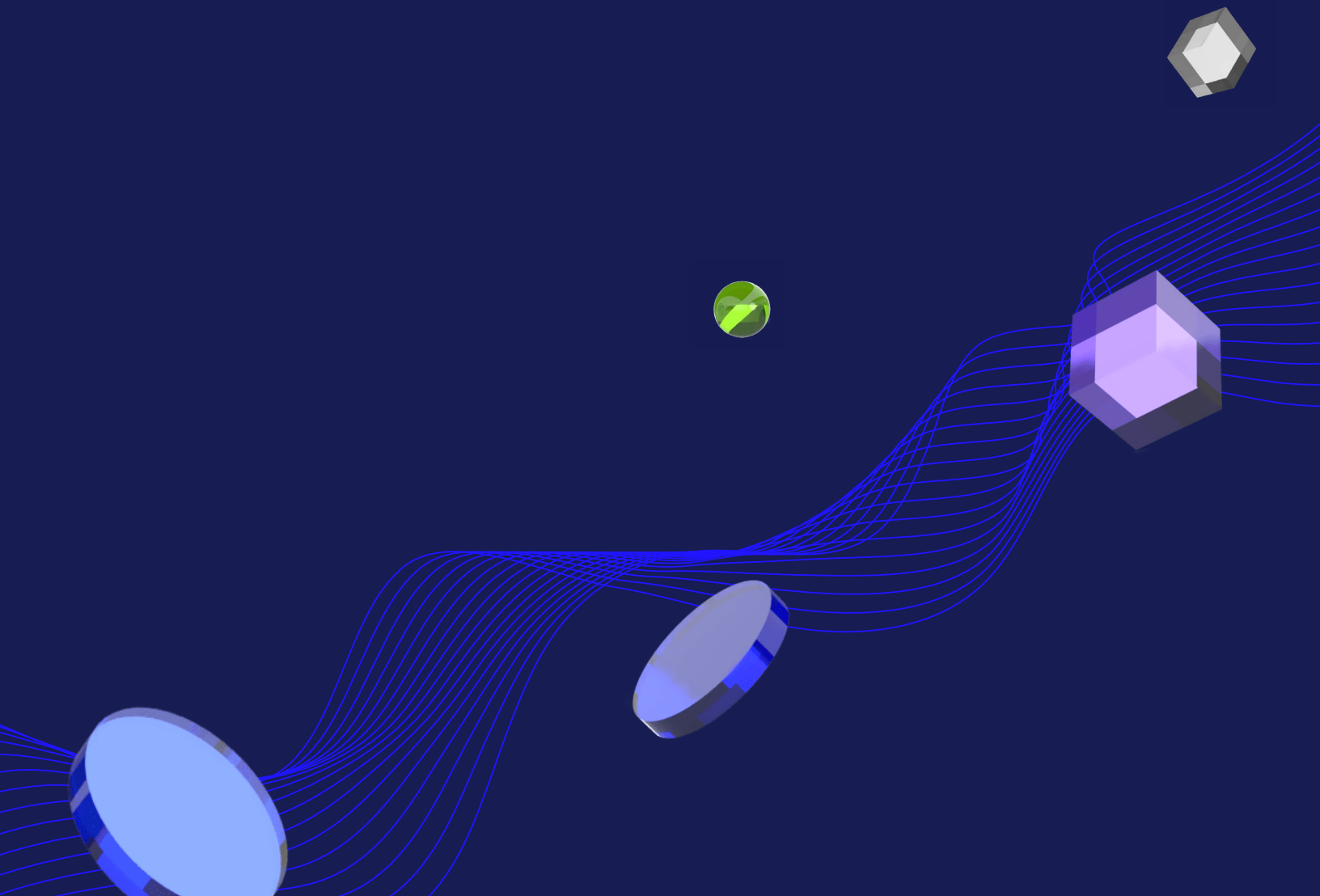U UDACITY

SCHOOL OF CLOUD COMPUTING

AWS Cloud Architect

Nanodegree Program Syllabus

Overview

Play a critical role in an organization's cloud computing strategy as an AWS cloud architect. Learn to plan, design, and implement secure cloud infrastructure in AWS at scale. Begin by designing and building high-availability infrastructure and then move on to building scalable, secure, and cost-optimized architecture. Finally, explore and execute best practices and strategies around securing access to cloud services and infrastructure.

Learning Objectives

A graduate of this program will be able to:

- Design and deploy a fault-tolerant and resilient web service architecture in AWS.

- Monitor availability and simulate and test failure scenarios and recovery.

- Optimize cloud service infrastructure for cost and performance.

- Use Terraform to provision and configure AWS services in a global configuration.

- Evaluate a cloud environment's security vulnerabilities.

- Apply best practices in cloud security to harden and secure the environment.

- Design a DevSecOps pipeline that will scan infrastructure as code, AMI and containers, and AWS cloud configuration for vulnerabilities.

Program information

🕐 **Estimated Time**	📊 **Skill Level**
3 months at 10hrs/week*	Advanced

Prerequisites

A well-prepared learner should have experience with cloud computing, programming, and AWS.

Required Hardware/Software

Learners need access to 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. Learners will use AWS CLI, AWS CloudFormation, Terraform, Lucidchart, or other diagramming software, and Github in this Nanodegree program.

*The length of this program is an estimation of total hours the average student may take to complete all required coursework, including lecture and project time. If you spend about 5-10 hours per week working through the program, you should finish within the time provided. Actual hours may vary.

Design for Availability, Reliability & Resiliency

In this course, learners will use the highly available constructs within AWS to create highly available and resilient systems and networks. Then, learners will build with AWS services and understand their redundant capabilities. Learners will explore the connection between the technical aspects of these systems and business operations and objectives. Finally, learners will practice what to do when things fail and how to handle these situations.

Course Project

Recoverability in AWS

In this project, learners will build a multi-availability zone, multi-region database. They will demonstrate how applications can use this distributed infrastructure and migrate their primary database from one geographical region to another. Learners will also create a versioned website and demonstrate how it is protected from accidental or malicious disruption, with an ability to turn back the clock when something disrupts normal operations.

Lesson 1

Availability Zones & Regions

- Build on the AWS global infrastructure.
- Take advantage of the multiple availability options on AWS.
- Build multiple AWS VPCs to suit requirements.
- Create custom isolated networks to meet business needs.

Lesson 2

Building for Resiliency

- Take advantage of different high availability options on AWS.
- Create multi-AZ services.
- Create multi-region services.
- Identify what availability options exist for which AWS services.
- Take advantage of resilient features in AWS services.

Lesson 3

Business Objectives

- Calculate availability in terms of up and down time.
- Set reasonable business metrics for RTO and RPO.
- Make determinations on what types of DR plans a company needs.
- Implement a DR plan.

Lesson 4

Security

- Learn the importance of security in the cloud.
- See identity and access management (IAM) in action.
- Secure applications using IAM users, groups, and policies.

Lesson 5

Monitor, React & Recover

- Monitor AWS applications.
- Alert on problems in applications.
- Recover failures in your platform.
- Understand testing and tradeoffs in automating recovery from failure.

Design for Performance & Scalability

In this course, learners will use AWS tools to identify and implement best practices for cost, and identify and understand the elements required to design and architect scalable infrastructure. Learners will be able to modify traditional infrastructure for performance and identify architectures and workloads where serverless infrastructure should be considered to meet cost and performance goals. Finally, learners will be able to provision and destroy infrastructure from the command line using the AWS CLI and Terraform.

Course Project

Design, Provision & Monitor AWS Infrastructure at Scale

In this project, learners will plan, design, provision, and monitor infrastructure in AWS using industry-standard and open-source tools. Learners will practice the skills they have learned throughout the course to optimize infrastructure for cost and performance. Learners will also use Terraform to provision and configure AWS services in a global configuration.

Lesson 1

Introduction to Design for Cost, Performance & Scalability

- Recognize the major differences between traditional data centers and cloud.
- Understand how cloud infrastructure offers scalability and elasticity with potentially reduced costs.
- Understand the objectives of the cloud infrastructure team.

Lesson 2

Cost & Monitoring

- Understand the power of cloud computing.
- Estimate and calculating cloud costs.
- Use workload knowledge and planning factor to reduce costs.
- Adapt infrastructure to meet budget and performance requirements.
- Select the optimal DB type when migrating to the cloud.
- Use file retention policies to reduce storage costs and management overhead.

Lesson 3

High Performance

- Define and document performance goals.
- Identify and resolve performance bottlenecks.
- Understand elasticity and scalability.
- Select the best instance for your performance goals.
- Leverage archiving options for cost and performance.

Lesson 4

Servers & Security Groups

- Compare cloud migration vs. cloud native strategies.
- Identify expected obstacles when re-architecting a solution for the cloud.
- Understand the benefits of serverless architecture.
- Analyze the tradeoffs between traditional and serverless architectures.
- Explain the benefits of containers.

Lesson 5

Storage & Databases

- Identify how automation can reduce error and effort.
- Understand the benefits of IaC.
- Explain the tradeoffs using different provisioning tools.
- Provision infrastructure using the AWS CLI and Terraform.
- Manage Terraform State and Terraform using best practices.

Design for Security

In this course, learners will explore best practices and strategies around securing access to cloud services and infrastructure. Learners will also use the tools and methods available with public cloud ecosystems—such as AWS—to ensure that data stored in the cloud is protected. Finally, learners will investigate security practices around monitoring and defending cloud based applications and environments.

Course Project

Securing the Recipe Vault Application

In this project, learners will deploy and assess a simple web application environment's security posture. Learners will have a chance to test the security of the environment by simulating an attack scenario and exploiting cloud configuration vulnerabilities. Learners will also set up monitoring to identify suspicious behavior and vulnerable configurations and will remediate the identified misconfigurations. Finally, learners will tie it all together by proposing a DevOps build pipeline that includes security best practices.

Lesson 1

Securing Access to Cloud Services

- Apply identity and access management best practices.

- Use identity and access management roles to access cloud services.

- Fine-tune least privilege identity and access management policies.

- Understand and identity federation concepts in the cloud.

Lesson 2

**Securing Access to
Cloud Infrastructure**

- Compare techniques to set up secure access to cloud servers.
- Understand options available to establish secure connectivity to cloud networks.
- Investigate methods for controlling network ingress and egress in the cloud.
- Assess the network access points of your environment.

Lesson 3

**Protecting Data Stored
in the Cloud**

- Understand options available in the cloud for encrypting data at rest.
- Use cloud SDKs to encrypt data from within the application code.
- Use server-side encryption to ensure data is protected by cloud services.
- Apply best practices for securing S3 storage.
- Structure roles and responsibilities around key usage.

Lesson 4

**Defensive Security
in the Cloud**

- Identify vulnerabilities within infrastructure as code and OS configuration.
- Use cloud native tools to identify insecure and out of compliant configurations in your environment.
- Leverage methods to defend against and detect exploits and intrusion-related behavior.
- Incorporate "shift-left" security practices into a DevOps deployment pipeline.

Meet your instructors.

Tom Verbiscer

Director of Engineering at Current Media

Tom is a coach and builder specializing in creating, running, and advancing highly scalable, reliable, and flexible platforms. He is AWS Certified at the professional tier as both an AWS solutions architect and DevOps engineer.

Leslie Bell

Technical Trainer at AWS

Leslie Bell is a senior solutions architect specializing in IT governance and disaster recovery. She has worked in technology across a number of industries including scientific research, chemical analysis, transportation, insurance, and cloud-based infrastructure.

Mehdi Razvi

Senior Cloud Architect at Nuera Automotive Solutions

Mehdi is a senior cloud architect and consultant based out of the Chicago area. He loves helping companies large and small build, deploy, and run their applications in the cloud. Most recently, he has worked with companies such as 2ndWatch and GuidePoint Security.

Udacity's learning experience
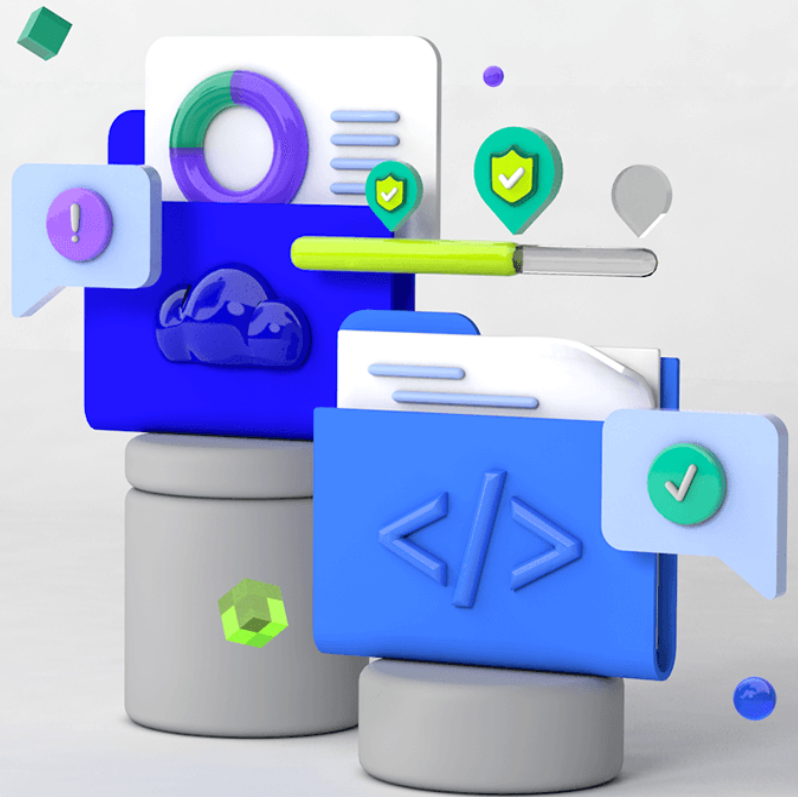
Hands-on Projects

Open-ended, experiential projects are designed to reflect actual workplace challenges. They aren't just multiple choice questions or step-by-step guides, but instead require critical thinking.

Quizzes

Auto-graded quizzes strengthen comprehension. Learners can return to lessons at any time during the course to refresh concepts.

Knowledge

Find answers to your questions with Knowledge, our proprietary wiki. Search questions asked by other students, connect with technical mentors, and discover how to solve the challenges that you encounter.

Custom Study Plans

Create a personalized study plan that fits your individual needs. Utilize this plan to keep track of movement toward your overall goal.

Workspaces

See your code in action. Check the output and quality of your code by running it on interactive workspaces that are integrated into the platform.

Progress Tracker

Take advantage of milestone reminders to stay on schedule and complete your program.

Our proven approach for building job-ready digital skills.
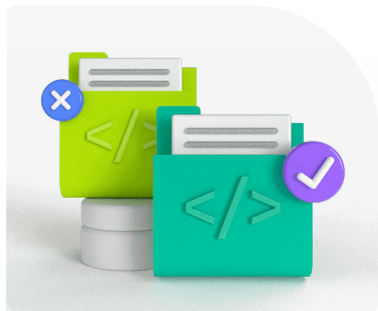
Experienced Project Reviewers

Verify skills mastery.

- Personalized project feedback and critique includes line-by-line code review from skilled practitioners with an average turnaround time of 1.1 hours.
- Project review cycle creates a feedback loop with multiple opportunities for improvement—until the concept is mastered.
- Project reviewers leverage industry best practices and provide pro tips.
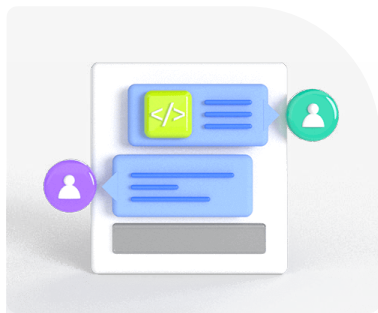
Technical Mentor Support

24/7 support unblocks learning.

- Learning accelerates as skilled mentors identify areas of achievement and potential for growth.
- Unlimited access to mentors means help arrives when it's needed most.
- 2 hr or less average question response time assures that skills development stays on track.
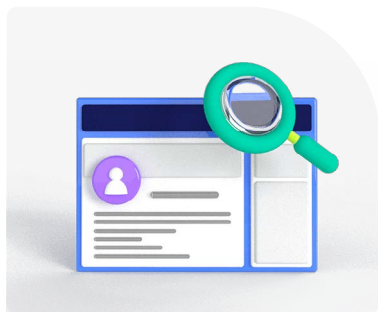
Personal Career Services

Empower job-readiness.

- Access to a Github portfolio review that can give you an edge by highlighting your strengths, and demonstrating your value to employers.*
- Get help optimizing your LinkedIn and establishing your personal brand so your profile ranks higher in searches by recruiters and hiring managers.
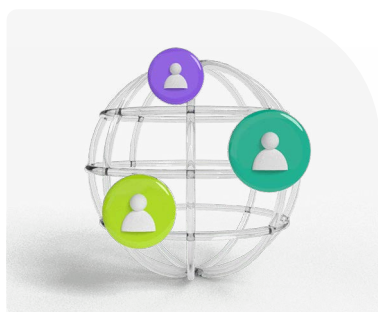
Mentor Network

Highly vetted for effectiveness.

- Mentors must complete a 5-step hiring process to join Udacity's selective network.
- After passing an objective and situational assessment, mentors must demonstrate communication and behavioral fit for a mentorship role.
- Mentors work across more than 30 different industries and often complete a Nanodegree program themselves.

*Applies to select Nanodegree programs only.

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Learn more at