



NANODEGREE PROGRAM SYLLABUS

AWS Cloud Architect



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.

A graduate of this program will be able to:

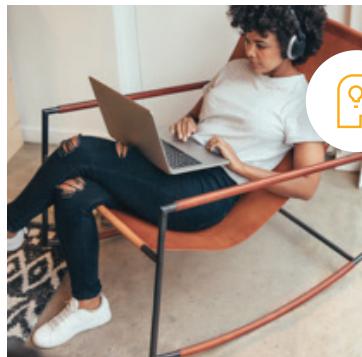
- Design and deploy a fault tolerant and resilient web service architecture in AWS.
- Monitor availability and simulate and test failure scenarios and recovery.
- Optimize cloud service infrastructure for cost and performance.
- Use Terraform to provision and configure AWS services in a global configuration.
- 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.



Estimated Time:
3 Months at
10 hours/week



Prerequisites:
Experience with
Cloud Computing,
Programming, and
AWS



Flexible Learning:
Self-paced, so
you can learn on
the schedule that
works best for you



Need Help?
udacity.com/advisor
Discuss this program
with an enrollment
advisor.

Course 1: Design for Availability, Reliability, and Resiliency

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

Course Project Recoverability in AWS

In this project, you will build a multi-availability zone, multi-region database. You will demonstrate how applications can use this distributed infrastructure and migrate your primary database from one geographical region to another. You 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 your normal operations.

LESSON ONE

LEARNING OUTCOMES

Availability Zones and 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 TWO

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 THREE

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 FOUR**Security**

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

LESSON FIVE**Monitor, React, and Recover**

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

Course 2: Design for Performance and Scalability

In this course, you 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. You 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, you will be able to provision and destroy infrastructure from the command line using the AWS CLI and Terraform.

Course Project

Design, Provision,
and Monitor AWS
Infrastructure at Scale

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

LESSON ONE

LEARNING OUTCOMES

Introduction to Design for Cost, Performance, and 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 TWO

Cost and 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 THREE**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 FOUR**Servers and 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 FIVE**Storage and 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



Course 3: Design for Security

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

Course Project Securing the Recipe Vault Application

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

LESSON ONE

LEARNING OUTCOMES

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 Identity Federation concepts in the cloud

LESSON TWO

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 THREE

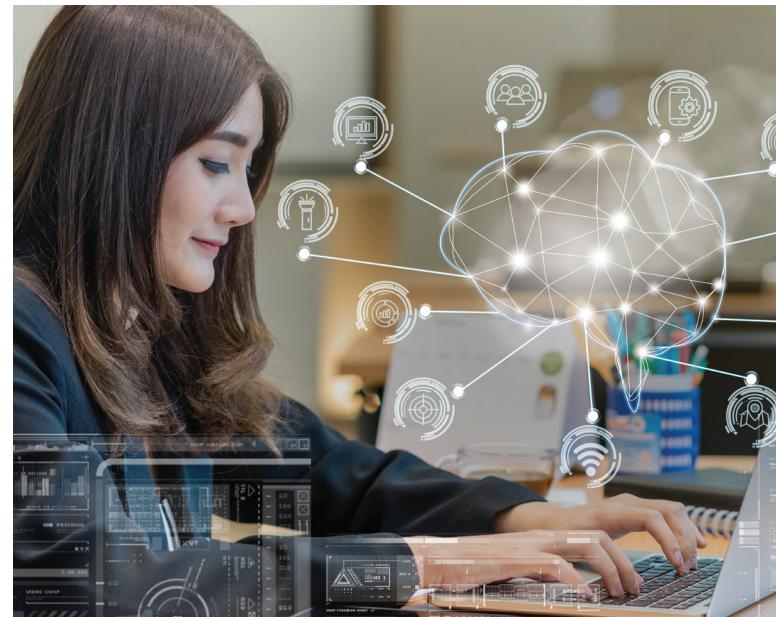
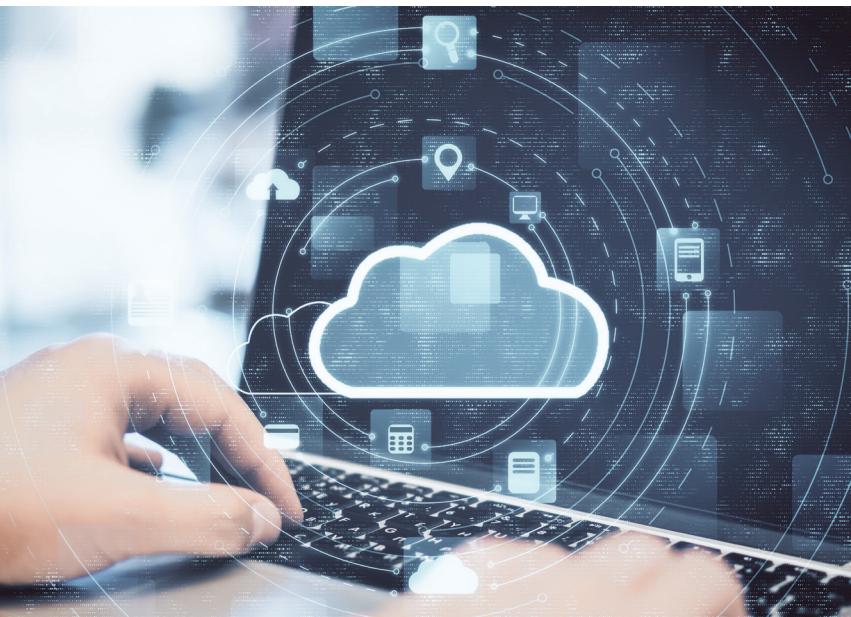
Protecting Data Stored In the Cloud

- 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

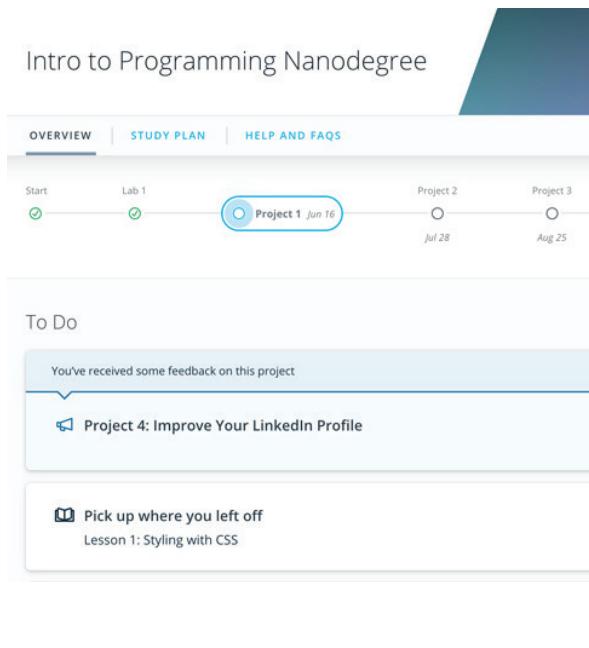
LESSON FOUR

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



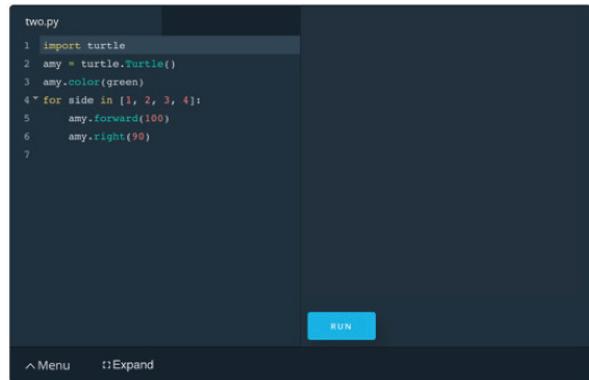
Our Classroom Experience



The screenshot shows the Udacity Intro to Programming Nanodegree dashboard. At the top, it says "Intro to Programming Nanodegree". Below that is a navigation bar with "OVERVIEW", "STUDY PLAN", and "HELP AND FAQS". The "STUDY PLAN" tab is selected. A timeline shows "Start" and "Lab 1" on June 1st, "Project 1 Jun 16" (highlighted in blue), "Project 2 Jul 28", and "Project 3 Aug 25". The "To Do" section contains a message about feedback for Project 4: Improve Your LinkedIn Profile. Below that is a "Pick up where you left off" section for Lesson 1: Styling with CSS.



The screenshot shows the "Knowledge" section of the Udacity dashboard. It features a search bar with placeholder text "Search for your question...". Below the search bar is a list of questions. The first question is "Error happens when launching car simulator" by Julian D, posted 11 months ago, with 2 answers. The second question is "I am having trouble masking an image with HSV. How do I do this, and I cannot find how to identify the ranges right to delete the green screen." by Adam V, posted 4 months ago, with 1 answer.



The screenshot shows a workspace editor with a Python script named "two.py". The code uses the turtle module to draw a square. The workspace has a "RUN" button at the bottom. At the bottom left are "Menu" and "Expand" buttons.

```

two.py
1 import turtle
2 amy = turtle.Turtle()
3 amy.color('green')
4 for side in [1, 2, 3, 4]:
5     amy.forward(100)
6     amy.right(90)
7

```

REAL-WORLD PROJECTS

Build your skills through industry-relevant projects. Get personalized feedback from our network of 900+ project reviewers. Our simple interface makes it easy to submit your projects as often as you need and receive unlimited feedback on your work.

KNOWLEDGE

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

STUDENT HUB

Leverage the power of community through a simple, yet powerful chat interface built within the classroom. Use Student Hub to connect with your fellow students in your Executive Program.

WORKSPACES

See your code in action. Check the output and quality of your code by running them on workspaces that are a part of our classroom.

QUIZZES

Check your understanding of concepts learned in the program by answering simple and auto-graded quizzes. Easily go back to the lessons to brush up on concepts anytime you get an answer wrong.

CUSTOM STUDY PLANS

Preschedule your study times and save them to your personal calendar to create a custom study plan. Program regular reminders to keep track of your progress toward your goals and completion of your program.

PROGRESS TRACKER

Stay on track to complete your Nanodegree program with useful milestone reminders.

Learn with the Best



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, from scientific research, chemical analysis, transportation, to insurance to cloud-based infrastructure.



Mehdi Razvi

SENIOR CLOUD ARCHITECT
AT NUERA AUTOMOTIVE SOLUTIONS

Carlos is a Senior Solutions Architect at Infinity 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.

All Our Nanodegree Programs Include:



EXPERIENCED PROJECT REVIEWERS

REVIEWER SERVICES

- Personalized feedback & line by line code reviews
- 1600+ Reviewers with a 4.85/5 average rating
- 3 hour average project review turnaround time
- Unlimited submissions and feedback loops
- Practical tips and industry best practices
- Additional suggested resources to improve



TECHNICAL MENTOR SUPPORT

MENTORSHIP SERVICES

- Questions answered quickly by our team of technical mentors
- 1000+ Mentors with a 4.7/5 average rating
- Support for all your technical questions



PERSONAL CAREER SERVICES

CAREER COACHING

- Personal assistance in your job search
- Monthly 1-on-1 calls
- Personalized feedback and career guidance
- Interview preparation
- Resume services
- Github portfolio review
- LinkedIn profile optimization

Frequently Asked Questions

PROGRAM OVERVIEW

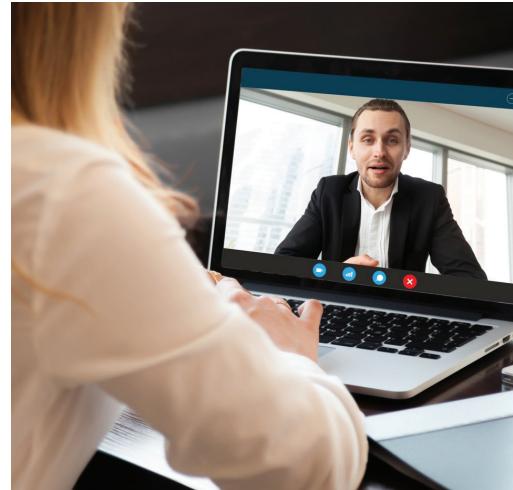
WHY SHOULD I ENROLL?

With the global public cloud computing market topping \$250 billion in 2019, and more than 80% of all organizations projected to migrate to the cloud by 2025, Cloud Computing is a massively growing business. Professionals with cloud architecture expertise, and the ability to design, build and migrate applications are in high demand, with over 13,000 open jobs in available worldwide. Cloud Architects are the drivers of an organization's cloud architecture strategy, determining the best plan to build and deploy reliable, scalable, and secure cloud services.

With Udacity's new AWS Cloud Architect Nanodegree program, you will learn to plan, design, and implement secure cloud infrastructure in AWS at scale. AWS is the world's largest systems business and a Cloud Architect earns an average salary of \$159,000!

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



WHAT JOBS WILL THIS PROGRAM PREPARE ME FOR?

This program is designed to prepare students to become AWS Cloud Architects. This includes job titles such as Cloud Infrastructure Architect, Cloud Solutions Architect, Solutions Architect, Hybrid Cloud Architect, AWS Engineer/Developer, DevOps Solutions Architect, Cloud Software Architect, and more. Cloud Architect skills are also helpful for adjacent computer systems architecture roles.

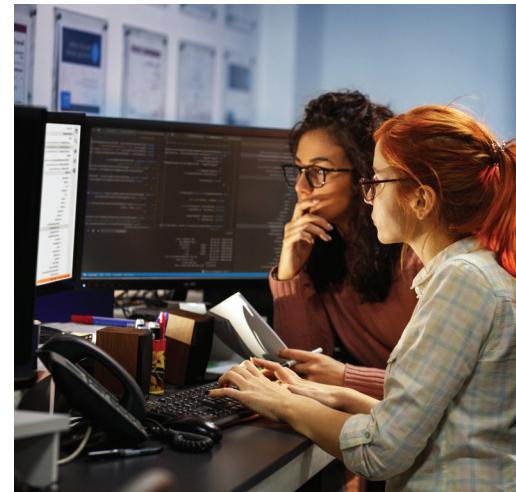
HOW DO I KNOW IF THIS PROGRAM IS RIGHT FOR ME?

If you are interested in leading the planning, designing, and implementation of secure cloud infrastructure in AWS at scale, and have a background in Cloud Computing, then this program is right for you. You'll begin by designing and

FAQs Continued

building high availability infrastructure and then move on to building scalable, secure and cost optimized architecture.

Additional job titles and backgrounds that could be helpful include Cloud Developer, Cloud DevOps Engineer, Cloud Engineer, Software Engineer/Developer and more. Roles that involve web development, cloud computing, and networking will help you have the requisite experience to succeed in this program.



ENROLLMENT AND ADMISSION

DO I NEED TO APPLY? WHAT ARE THE ADMISSION CRITERIA?

There is no application. This Nanodegree program accepts everyone, regardless of experience and specific background.

WHAT ARE THE PREREQUISITES FOR ENROLLMENT?

To be best prepared to succeed in this program, you should have experience with:

- Web Development (HTML, CSS)
- Object-Oriented Programming
- Linux Command Line Basics
- Have 1-2 years of experience in developing apps or managing cloud infrastructure that have been deployed using AWS.
- Basic understanding of and some hands on experience using compute, networking, storage, and database AWS services.
- Familiarity with concepts related to web application architecture, hosting, infrastructure, and components (e.g. web servers and databases, SSL certificates, CDN etc).
- Equivalent experience to having completed Cloud DevOps Engineer Nanodegree or Cloud Developer Nanodegree.

IF I DO NOT MEET THE REQUIREMENTS TO ENROLL, WHAT SHOULD I DO?

To best prepare for this program, we recommend the [Cloud DevOps Engineer Nanodegree program](#) or the [Cloud Developer Nanodegree program](#).

TUITION AND TERM OF PROGRAM

HOW IS THIS NANODEGREE PROGRAM STRUCTURED?

The AWS Cloud Architect Nanodegree program is comprised of content and curriculum to support three projects. Once you subscribe to a Nanodegree program, you will have access to the content and services for the length of time specified by your subscription. We estimate that students can complete the program in three months, working 10 hours per week.

FAQs Continued

HOW LONG IS THIS NANODEGREE PROGRAM?

Access to this Nanodegree program runs for the length of time specified in the payment card above. If you do not graduate within that time period, you will continue learning with month to month payments. See the [Terms of Use](#) and [FAQs](#) for other policies regarding the terms of access to our Nanodegree programs.

CAN I SWITCH MY START DATE? CAN I GET A REFUND?

Please see the Udacity Program [Terms of Use](#) and [FAQs](#) for policies on enrollment in our programs.

SOFTWARE AND HARDWARE - WHAT DO I NEED FOR THIS PROGRAM?

WHAT SOFTWARE AND VERSIONS WILL I NEED IN THIS PROGRAM?

For this Nanodegree program, you will need a desktop or laptop 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.

