



NETWORK NUTS

DEVOPS MASTER PROGRAM

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DevOps Master Program

OVERVIEW

This program features the perfect mix of theory, case studies, and extensive hands-on practice to prepare you for a fast-growing field that bridges the gap between software developers and operations. This Program, designed for graduates in any discipline and experienced professionals from programming and non-programming backgrounds, offers a blend of live virtual classes, hands-on projects, and labs. Students also have access to mentorship sessions, providing a high engagement learning experience and real world applications to help master essential DevOps skills. Students also will get hands-on experience in continuous deployment using current configuration management tools like Ansible. At the end of this course, learners will be able to write and master front-end deployment and back-end codes and manage hosts for both monitoring and scaling. This program will enable students to demonstrate their knowledge of automating workflow and getting products to market more efficiently and effectively with tools such as Ansible, Jenkins, Docker, Kubernetes, and GIT. Learners will also get practical experience with the development and operational activities of teams, continuous code releases, integration, and deployment processes.

DevOps Master Program

LEARNING PATH

01LINUX
Basics to Advanced**02**ANSIBLE
Linux
Automation**03**AWS
Amazon Cloud**04**TERRAFORM
Cloud Automation**05**DOCKER
Containerization**06**KUBERNETES
Container
Orchestration**07**GIT & JENKINS
Version Control
& Pipelines**08**Python
Programming for
Automation**09**GRAFANA
Monitoring**10**DEVOPS
Open PracticesProjects
+
Interview
Preparation

01

LINUX
Basics to
Advanced



- Getting started with Red Hat Enterprise Linux
- Access the command line
- Manage files from the command line
- Get help in Red Hat Enterprise Linux
- Create, view & edit text files
- Manage local users & groups
- Control access to files
- Monitor & manage Linux processes
- Control services & daemons
- Configure & secure SSH
- Analyze & store logs
- Manage networking
- Archive & transfer files
- Install & update software
- Access Linux file systems
- Improving command line productivity using shell scripts
- Schedule future tasks
- Tune system performance
- Control access to files with Access Control Lists
- Manage SELinux security
- Maintain basic storage
- Manage logical volumes
- Implement advanced storage features like vdo & stratis
- Access network-attached storage
- Control the boot process
- Manage network security using firewalld
- Install Red Hat Enterprise Linux
- Run Containers



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02

ANSIBLE
Linux
Automation



- Introduction to Ansible
- Using Ansible ad-hoc commands
- Writing an Ansible Playbook
- Simple webserver deployment via Ansible
- Using Ansible variables and facts
- Iterating tasks using an Ansible loop
- Managing tasks using Ansible conditions
- Handling errors in Ansible
- Handling task execution using Handlers
- Connecting Ansible to AWS for dynamic provisioning
- Introduction to jinja2 in Ansible
- Advanced jinja2 concepts for dynamic content delivery
- Managing multiple playbooks and complexity
- Creating Ansible roles
- Loadbalancer configuration deployment via Ansible
- Using Ansible Galaxy for roles
- SSH hardening via Ansible
- Common use cases for Ansible modules
- Ansible-lint and industry standards
- Working with Ansible collections



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AWS
Amazon Cloud



- Introduction to Cloud Computing
 - Cloud Computing and Virtualization
 - Cloud Computing Architecture
 - Cloud Computing Optimization
 - The AWS Cloud
 - AWS Platform Architecture
 - AWS Reliability and Compliance
 - The AWS Shared Responsibility Model
 - The AWS Service Level Agreement
 - Working with AWS
 - AWS Organizations
 - AWS Control Tower
 - AWS Service Catalog
 - AWS License Manager
 - AWS Artifact
 - The AWS CLI
 - AWS SDKs
 - Technical Support and Online Resources
 - Support Plans
 - Other Support Resources
 - Migrating Existing Resources to AWS
 - AWS Migration Hub
 - AWS Application Migration Service
 - AWS Database Migration Service
 - AWS Application Discovery Service



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- Compute Services
 - Introduction
 - EC2 Instances
 - Provisioning Your Instance
 - Configuring Instance Behavior
 - Placement Groups
 - Instance Pricing
 - Instance Life Cycle
 - Resource Tags
 - Service Limits
 - EC2 Storage Volumes
 - Elastic Block Store Volumes
 - Instance Store Volumes
 - Accessing Your EC2 Instance
 - Securing Your EC2 Instance
 - Security Groups
 - IAM Roles
 - NAT Devices
 - Key Pairs
 - EC2 Auto Scaling
 - Launch Configurations
 - Launch Templates
 - Auto Scaling Groups
 - Auto Scaling Options
 - AWS Systems Manager
 - AWS Systems Manager Inventory
 - Running Containers
 - Amazon Elastic Container Service
 - Amazon Elastic Kubernetes Service



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- AWS Storage
 - Introduction
 - S3 Service Architecture
 - Prefixes and Delimiters
 - Working with Large Objects
 - Encryption
 - Logging
 - S3 Durability and Availability
 - Durability
 - Availability
 - Eventually Consistent Data
 - S3 Object Life Cycle
 - Versioning
 - Life Cycle Management
 - Accessing S3 Objects
 - Access Control
 - Presigned URLs
 - Static Website Hosting
 - Amazon S3 Glacier
 - Storage Pricing
 - Other Storage-Related Services
 - Amazon Elastic File System
 - Amazon FSx
 - AWS Storage Gateway
 - AWS Snow Family
 - AWS DataSync



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 - Introduction
 - VPC CIDR Blocks
 - Secondary CIDR Blocks
 - IPv6 CIDR Blocks
 - Subnets
 - Subnet CIDR Blocks
 - Availability Zones
 - IPv6 CIDR Blocks
 - Elastic Network Interfaces
 - Primary and Secondary Private IP Addresses
 - Attaching Elastic Network Interfaces
 - Enhanced Networking
 - Internet Gateways
 - Route Tables
 - Routes
 - The Default Route
 - Security Groups
 - Inbound Rules
 - Outbound Rules
 - Sources and Destinations
 - Stateful Firewall
 - Default Security Group
 - Network Access Control Lists
 - Inbound Rules
 - Outbound Rules
 - Using Network Access Control Lists & Security Groups Together



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AWS
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- CloudTrail, CloudWatch, and AWS Config
 - Introduction
 - CloudTrail
 - Management Events
 - Data Events
 - Event History
 - Trails
 - Log File Integrity Validation
 - CloudWatch
 - CloudWatch Metrics
 - Graphing Metrics
 - Metric Math
 - CloudWatch Logs
 - CloudWatch Alarms
 - Amazon EventBridge
 - AWS Config
 - The Configuration Recorder
 - Configuration Items
 - Configuration History
 - Configuration Snapshots
 - Monitoring Changes



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AWS
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- Amazon Route 53 and Amazon CloudFront
 - Introduction
 - The Domain Name System
 - Namespaces
 - Name Servers
 - Domains and Domain Names
 - Domain Registration
 - Domain Layers
 - Fully Qualified Domain Names
 - Zones and Zone Files
 - Record Types
 - Alias Records
 - Amazon Route 53
 - Domain Registration
 - DNS Management
 - Availability Monitoring
 - Routing Policies
 - Traffic Flow
 - Route 53 Resolver
 - Amazon CloudFront
 - AWS CLI Example



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TERRAFORM
Cloud Automation



- Introduction to IaC
- Different IaC tools
- Introduction to Terraform
- Working with Terraform CLI
- Locking Terraform versions
- Exploring Terraform commands
- Terraform graphs
- Terraform modules
- Terraform workflow
- Planning & Writing in Terraform
- Creating complete vpc network
- Terraform state management
- Terraform taints, destroy & import
- Using local & remote provisioners
- Terraform state on a local backend
- Terraform state on S3 buckets
- Terraform refresh
- Terraform authentication methods
- Using Variables
- Available configurations in Terraform
- Functions in Terraform
- Enterprise Terraform - Terraform Cloud
- Terraform Sentinel
- Integrating Terraform cloud with github



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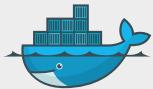
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DOCKER
Containerization



- Introduction to Containers and Containerization
- Introduction to Docker
- Setting up a Docker node - On-premise & Cloud
- Installing Docker
- Docker Architecture
- Docker Engine
- Docker Images & Containers
- Docker Hub
- Introduction to Docker commands
- Creating Docker containers
- Exposing container ports
- Limiting resource utilization by containers
- Docker logging
- Networking in Docker environments
- Introduction to Dockerfile
- Creating Dockerfiles from scratch
- Docker image history
- Inspecting container processes
- Docker events
- Automating container deployments
- Introduction to Docker compose
- Docker compose CLI
- Creating Docker compose files
- Introduction to Docker Swarm
- Running Docker in swarm mode
- Working with Docker security
- Docker content trust
- Working with secrets in Docker



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06

KUBERNETES
Container
Orchestration



- Introduction to Kubernetes
- Understanding Kubernetes components
- Understanding Kubernetes architecture
- Installing Kubernetes cluster
- How to access cluster in production environment
- Managing cluster using visual code studio
- Difference between containers & pods
- Running applications as pods
- Understanding importance of labels
- Controlling pods resources using QoS
- Pod scheduling - node selector/affinity/taints
- Understanding pod priorities
- Understanding deployments & replicaset
- Deploying applications as deployments
- Implementing kubernetes probes
- Understanding replicaset features
- Scaling application - manual & automatic
- Understanding deployment strategies
- Upgrading / rollback application
- Understanding kubernetes services
- Implementing namespaces
- Implementing quota & limit ranges
- Network Policies
- Understanding persistent volume subsystem
- Attaching external storage to kubernetes cluster
- Understanding secrets & configmaps
- Using daemonsets
- Controlling access to cluster using RBAC
- Monitoring cluster using prometheus/grafana
- Upgrading Kubernetes cluster
- Running cluster in HA



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KUBERNETES
Container
Orchestration



- Understanding kubernetes topology spread
- Kubernetes Security Primitives
- Image Security using trivy
- Service Networking - how kube-proxy works
- Kubernetes cluster automation using Ansible
- Kubernetes cluster deployment on the Cloud



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GIT
Source Control



- Introduction to continuous integration and continuous deployment (CI/CD)
- Describe the principles of DevOps and the role of Jenkins.
- Integrate source code with version control
- Manage source code changes with Git version control.
- Test applications
- Describe the foundational principles behind comprehensive application testing and implement unit, integration, and functional testing.
- Build applications with test-driven development
- Implement and build application features with TDD.
- Author pipelines
- Create basic pipelines to run Jenkins jobs.
- Deploy applications with pipelines
- Safely and automatically deploy applications to Red Hat OpenShift Container Platform.
- Implement pipeline security and monitoring
- Manage the security and monitor the performance of pipelines.
- Consume pipelines
- Work with and troubleshoot CI/CD pipelines for automated deployment and automated testing.



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08

Python
Programming for
Automation



- Introduction to Python
 - Understanding the need for Python
 - Why is Python the preferred language?
 - Python 2 vs Python 3
 - Strings and string manipulation in Python
 - Python lists and how to use them
 - Python dictionaries and how to use them
 - Data integrity using Tuples in Python
 - Python comparison operators
- Basic Python Fundamentals
 - For Loops in Python
 - While Loops in Python
 - Which loop to use when?
 - If, Else & Elif in Python
 - List Comprehension for advanced lists understanding
 - Using Python methods
 - Understanding and creating your own functions
 - Error and Exception Handling
 - Object Oriented Programming in Python
 - Python Decorators
 - User Input in Python



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Python
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- File Input & Output in Python
 - Reading files using Python
 - Writing and appending to files via Python
 - Downloading files via Python
 - Reading CSV files in Python
 - Manipulating CSV files using Python
 - Reading JSON files using Python
 - Manipulating JSON files using Python
 - Working with PDFs and Images using Python
 - Using Regular Expressions to find data in log files
 - Redirecting Regular Expression outputs
 - Listing files using Python
 - Finding files using Python
 - Reading & Extracting ZIP files
 - Reading & Extracting TAR files
- OS Module in Python
 - Performing basic Operating System tasks via Python
 - Managing files & directories using OS.PATH
 - Walking directory tree structures using OS.WALK
- Requests Module in Python
 - Making HTTP GET requests via Python
 - Making HTTP PUT requests via Python
 - Manipulating output by HTTP status codes



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Python
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- Argument Parser in Python
 - Need of robust Python + Linux CLI
 - Creating interactive CLI - 1
 - Creating interactive CLI - 2
- Networking in Python
 - Running remote commands using Python & SSH via Paramiko
 - Working with Python & FTP Servers
 - Copying files between servers using Python
 - Using Python Fabric Module for easy interaction
- Security in Python
 - Port Scanning a server using Python
 - Banner grabbing available ports using Python
 - Capturing transmitting packets through Python
 - Creating a TCP Server using Python
- Python integration with AWS
 - Why integrate Python with AWS?
 - Creating an AWS SSH Key
 - Creating AWS instances with Python
 - Listing AWS instances with Python
 - Stopping & Terminating instances
 - Modifying AWS Instances via Python
 - Downloading files from S3 Buckets
 - Uploading files to S3 Buckets



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Python
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- Python virtual environments
 - Why create Python virtual environments?
 - Using Pipenv to source Python virtual environments
- Multithreading vs Multiprocessing in Python
 - What is multithreading?
 - When to use multithreading?
 - Multithreading in Python Requests
 - Multithreading and checking Linux PIDS
 - What is multiprocessing?
 - When to use multiprocessing?
 - Multiprocessing in Python Requests
 - Multiprocessing and checking Linux PIDS



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GRAFANA
Monitoring



- Introduction to Grafana
- Installing Grafana on Linux
- Installing Grafana on Docker
- Grafana User Interface Overview
- Creating Grafana dashboards
- Monitoring URLs using Grafana
- Monitoring Docker containers using Grafana
- Monitoring Kubernetes clusters using Grafana
- Installing plugins for advanced visualizations
- Managing Grafana permissions using Role-Based Access Control
- Embedding Grafana panels on HTML websites
- Upgrading Grafana versions



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10

DEVOPS
Open Practices



- Getting started with DevOps culture and practices
- Introducing the Open Practice Library
- Visualizing work
- Facilitating practices with teams
- Fostering culture and collaboration
- Team forming and ice breakers
- Social contracts
- Conducting retrospectives
- Establishing fundamental technical practices
- Continuous integration and delivery
- Everything as code
- Security automation
- The big picture
- Driving team alignment with discovery practices
- Metrics-based process mapping
- Target outcomes
- Priority sliders
- Setting direction with options pivot practices
- Impact and effort prioritization
- Value slicing
- Delivering value with Agile methodologies
- Agile ceremonies
- Kanban



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**PROJECT
+
INTERVIEW
PREPARATION**



Project #1 - Infrastructure Automation

Example company is using Cloud for one of their application hosting. The project uses modular components, multiple frameworks and want the components to be developed by different teams or by 3rd-party vendors. The company's goal is to deliver the product updates frequently to production with High quality & Reliability. They also want to accelerate software delivery speed, quality and reduce feedback time between developers and testers. As development progressed, they are facing multiple problems, because of various technologies involved in the project. Some of the challenges are:

- Building Complex builds is difficult
- Incremental builds are difficult to manage, and deploy
- Creating infrastructure on AWS manually is time consuming and prone to errors
- Creating kubernetes cluster on AWS manually is taking time and more resources
- Code created/modified by one team member is not visible to other team members
- There must be a graphical interface to measure performance of application / cluster

To solve these problems, they need to implement Continuous Integration & Continuous Deployment with DevOps using following tools:

- 1.Terraform: For provisioning kubernetes infrastructure on AWS. State file should be stored either in S3 or terraform cloud
- 2.Git: For version control for tracking changes in the code files of terraform, ansible, docker etc
- 3.Jenkins: For continuous integration and continuous deployment
- 4.Docker: For deploying containerized applications
- 5.Ansible: Configuration management tool which will be used to create kubernetes cluster on aws and configuring servers
- 6.AWS: should be used as our platform to build HA infrastructure
- 7.Grafana / Prometheus: For monitoring cluster / application performance



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PROJECT
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Your basic work flow should be like this:

Step #1 - You should have a separate git repository for terraform configuration

Step #2 - Terraform team will write the code to create a vpc with complete network and push it on their git repo

Step #3 - Jenkins, which is already running on AWS should pick the code from git and create infrastructure in your AWS account

Step #4 - You should then have a separate git repository for ansible playbooks which will install kubernetes cluster using Jenkins pipeline

Step #5 - Installing prometheus/grafana on kubernetes cluster

Note: additional configuration settings like IP / vpc etc will be shared in classroom.



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**PROJECT
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INTERVIEW
PREPARATION**



Project #2 - Application Automation

Now, once Example company's infrastructure is setup on cloud. They want to sell their products online. Company wants a solution that can reduce the time and effort it needs to enhance its website functionality on a regular basis. They are looking for an automated way to deploy the new code (for new features) to the production website whenever they want.

Steps to follow:

- The team of developers working on new features will merge their code to a GitHub repo
- As soon as the code is pushed on GitHub, using a CI (Continuous Integration) pipeline, setup in Jenkins, an automated build will be triggered
- The automated build will frequently deploy new features to the production website
- Every build will prepare a Dockerfile and push docker images to company's docker-hub repository
- Every docker image will be deployed (Continuous Deployment) to a kubernetes-cluster

Your basic work flow should be like this:

Step #1 - Developer will push the application code into github repo

Step #2 - Jenkins should pick the changes in website application code & build a new image out of it

Step #3 - The new image should be pushed to company's dockerhub repository

Step #4 - As soon as a new image is available, Jenkins, should pick the new image and start building new version of application

Note: additional information about application / branches will be shared in classroom



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