



# INFRASTRUCTURE AUTOMATION FOR ENTERPRISE

## OVERVIEW:

### Python Network Programming for Network Engineers (Python 3)

Learn Network Programmability and Network Automation using GNS3, EVE-NG, and Python version 3.

This course was created for network engineers. There are too many other Python courses out there that try to make network engineers software developers. Instead of teaching network automation, they teach you Python theory. This course is different.

This course is practical. I won't talk about programming in abstract terms and make you wait before you can start automating networks. I will show you how you can quickly and easily start network programming by using GNS3, Cisco IOS and Python.

You will see demonstrations of the configuration of both Cisco routers and switches in GNS3. EVE-NG For example, how to configure multiple VLANs on a multiple switches, or how to configure OSPF on a router and more.

This course shows you practical examples of using Python to programmatically configure Cisco network devices rather than just talking about it.

The days of configuring Cisco networks only with the command line interface (CLI) are drawing to a close. You need to add network programmability using Python and APIs to your skill set.

- Learn how to automate networks using:

- - Telnet
- - SSH
- - Paramiko
- - Netmiko
- - NAPALM
- Tools such as NAPALM and Netmiko make it easy to configure and interact with network devices using an API such as NETCONF or using SSH. Don't reinvent the wheel. Use the tools available to you to quickly and easily automate your networks.

## Linux for Network Engineers

It is important for you as a network engineer to learn Linux! Why? There are many reasons including:

- A lot of network operating systems are based on Linux, or have a Linux shell you can access, or use Linux type commands. I'll show you an example using Cisco, Arista and Cumulus Linux.
- Network Automation tools such as Ansible don't run the command node on Windows. You are probably going to use Linux with tools such as Ansible, Netmiko, NAPALM and other network automation tools.
- SDN controllers such as OpenDaylight, ONOS, RYU and APIC-EM run on Linux. You will find that many SDN tools require Linux.
- DevOps tools such as git work best with Linux.
- IoT devices typically run Linux
- A new breed of network devices from companies like Facebook, Microsoft and Cumulus Linux use Linux.

There are even more reasons, but make sure you don't get left behind! You as a network engineer start learning Linux.

This course teaches foundational Linux knowledge without assuming that you have any Linux experience. Learn practically with GNS3!

Learn how to configure Linux networking, how to create users and assign permissions, how to install and run Linux services such as DNS and DHCP.

The course uses various GNS3 topologies with devices such as:

- 1) Linux Docker containers
- 2) Linux GNS3 QEMU virtual machines
- 3) Traditional Linux virtual machines
- 4) Network devices - you could use Cisco, Arista, Cumulus Linux or others

### Training Course Titles:

- **Programming for Network Engineers using Python3**
- **Linux for Network Engineers**

### Estimated Time to Completion:

- 8 weeks (2 months)

### Technology areas:

- Python3, Linux Distros etc

## **Course Outline: Programming for Network Engineers using Python3**

- **GNS3 and EVE-NG Setup**
- **Quick Start Guide to Network Automation**
  - GNS3 Lab Setup and IDEs

- Telnet Script creation
- Telnet Script Test
- Telnet to a switch and create VLANs
- Loops
- PEP8: Python Style Guide
- Configure switch VLANs using loops
- Create a multiple switch network
- Open a file of switch IP Addresses
- Configure multiple switch with a loop
- Loops within loops
- Backup Network Device Configurations
- **Netmiko: Use SSH for Network Automation**
  - Introduction
  - Enable SSH on switches in network
  - Netmiko SSH Script
  - Script for multiple switches
  - Run script and configure multiple devices
  - File of multiple Cisco commands
  - Program multiple switches with file of commands
  - Script to program entire network
  - Run script to program entire network
- **NAPALM**
  - Introduction
  - Python 3 versus 2.7
  - Install NAPALM
  - Connect to switch
  - JSON and more commands
  - Mac address table, ARP cache
- **NAPALM and BGP**
  - Use NAPALM to retrieve BGP neighbor information

- NAPALM: Multiple BGP neighbors
- NAPALM and bigger BGP Network Part
- Use NAPALM for device configuration audit and changes
- Use NAPALM to configure Access lists
- Check if ACL already exists and add if missing
- Use NAPALM for auditing device configs
- NAPALM to add multiple config files
- NAPALM: Multiple config files, multiple devices
- **Iteration Examples: Netmiko scripts**
  - Netmiko Iteration: Script Overview
  - Netmiko Iteration (Script 1): Basic Script
  - Netmiko Iteration (Script 2): Open a file of commands
  - Netmiko Iteration (Script 3): Configure multiple devices using a file of devices
  - Netmiko Iteration (Script 4): Remove passwords from script
  - Netmiko Iteration (Script 5): Except (Error) Handling
  - Netmiko Iteration (Script 6): Determine device types and run specific device type
  - Netmiko Iteration (Script 7): Iterate device type script
- **Netmiko Scaling**
  - Encrypted Password File
  - Sequential
  - Multithreading
  - Thread Pools
- **Python Theory**
  - Objects, Variables and Data Types
  - Python Theory: Numbers
  - Python Theory: Strings
  - Get version information from a switch
  - Comparisons
  - Lists
  - Code Structures

- if / else / elseif logic
- While Loops
- For Loops
- Ranges
- Dictionaries
- Functions

## Course Outline: Linux for Network Engineers

- **Getting Started**
  - NOS Linux shells - Cisco, Arista, Cumulus Linux
  - Linux Network Operating systems: Cisco, Arista and more
  - Cisco IOS Linux commands
  - CLI
  - Rise of the machines
- **GNS3 Linux Networks**
  - DHCP Server
  - DHCP Client
  - NAT and Internet testing
  - Static Linux Docker Container PC
  - Network Testing: DHCP, Static, DNS, Internet
  - Ubuntu Desktop QEMU VM
  - Ubuntu Server Download and VMware import
  - Ubuntu Server installation
  - Integrate Ubuntu Server Virtual Machine with GNS3
  - Ubuntu Server: Manual IP address configuration and testing
- **Linux Fundamentals: Which Linux distro?**
  - Red Hat, CentOS and Fedora
  - Debian, Ubuntu, Mint
- **Text Editors**
  - Nano and VI

- **Linux Fundamentals**
  - Root = power
  - Linux Prompt Basics
  - Clear the screen
  - Get Help! And Version determination
  - Fix GNS3 issue
  - ifconfig deprecated
- **Linux Fundamentals: File Systems**
  - File Systems
  - tree and directories
  - Linux Directory Hierarchy Part 1
- **Linux Fundamentals: Files, tools, owners, permissions**
  - ls, help, man, grep, more and less
  - Abbreviated and long arguments, owners, groups and permissions
  - Owners, groups and basic permission example
  - Linux is about choice: cat, less, more
- **Linux Fundamentals: Copy, move, delete**
  - StartCopy, move and delete
- **Linux Fundamentals: Users, Groups, Passwords**
  - Shells, Home Directories, Groups
  - bash, home directories and permissions
  - Add users
  - Modify users
  - Groups
  - Passwords
  - Password Settings
- **Linux Fundamentals: Permissions**
  - Linux Permissions
  - Absolute Permissions
  - Relative Permissions

- **Processes**
  - Linux Processes
- **Linux Fundamentals: Software Installation**
  - Software Install
- **DNS Server**
  - Dnsmasq introduction
  - Dnsmasq install and configuration
  - Testing and Wireshark captures
  - Cisco Router using dnsmasq DNS server
- **DHCP Server**
  - Configure and test Linux DHCP server
  - Test network with extra host
  - View address leases
- **Linux Switch**
  - Replace GNS3 switch with a Linux Switch
- **GNS3, Docker, Open vSwitch, SDN, OpenDaylight and OpenFlow**
  - SDN Linux networks
  - Docker, Open vSwitch, SDN and OpenFlow
  - Ubuntu Docker Container, OpenDaylight, Python
  - Create a Docker based network using OVS and Linux Containers
  - OpenFlow captures using Wireshark, Docker containers, OpenDaylight
  - OpenFlow FLOW MOD, PACKET IN, PACKET OUT & more captures using Wireshark
- **GNS3 Setup**
  - GNS3 GUI install and troubleshooting (12:55)
  - Local server network. GNS3 GUI, VPCS, Hub n (7:46)
  - Cisco Network using local GNS3 Server (14:33)
  - GNS3 VM integration using VMware workstatio (8:33)
  - GNS3 VM, Dynamips, VIRT IOSv router (11:03)
  - Network Automation Container Part 1 (6:10)
  - Ubuntu Docker Container



- Ubuntu Docker Container not getting DHCP IP address troubleshooting
- Nexus 9K import and configuration
- Cumulus Linux import and configuration
- Arista import and configuration
- Ubuntu Desktop Qemu VM appliance
- GNS3 NAT Node

## About the Instructor:

**ALIYU Azeez Omotayo**

PRINCIPAL CONSULTANT|CEO (SEC-CONCEPTS NETWORKS LTD)

With over 18 years of experience in networking and security, including Cisco networks, Linux, and Windows Server environments, which includes the planning, designing, implementation, troubleshooting of large IP networks and vast experience on Routing, Switching, Security, Service provider, Wireless, Multicast and Quality of Service, VoIP (Voice over IP) / IPT (IP Telephony), Operating Systems and Protocols worldwide, including in Nigeria, South Africa, France and the United States. He holds degrees in Mathematics and Information Networks, and System Security all from the USA. He is a member of Computer Society of Nigeria (CPN), and an Accredited Management Trainer (CMD). He currently holds more than 150 International IT certifications but not limited to: CCIE R&S, MCSE: Server Administration, CompTIA Network+ and Security+ etc.

He had trained over 15 CCIEs, many CCNPs and a lot students in both Networking and Security.