Intermediate Python for Network Engineers (IPYNE)

What you'll learn on this course

The Intermediate Python for Network Engineers (IPYNE) training is tailored for network professionals seeking to expand their skills in network programmability and automation using Python. Ideal for those looking to deepen their knowledge, this training emphasizes practical applications that enhance network efficiency and reduce repetitive tasks through automation. Participants will gain hands-on experience with real-world use cases, such as automating device configurations, managing network inventories, and integrating with Cisco products such as IOS XE, Meraki, and ThousandEyes using REST APIs. The training introduces intermediate programming concepts such as creating modular and reuseable code with object-oriented programming, building simple web interfaces with Flask, and leveraging large language models for intelligent automation workflows. Upon completion, you will be able to design and implement Python-based automation solutions that interact with network infrastructure and streamline operational tasks.

This training also earns you 29 Continuing Education (CE) credits toward recertification

Course duration

- Instructor-led training: 5 days with hands-on lab practice
- Virtual instructor-led training: 5 days of web-based classes with hands-on lab practice
- E-learning: Equivalent of 5 days of instruction with hands-on lab practice

How you'll benefit

This training will help you:

- Gain hands-on experience using Python to automate, configure, and monitor network devices, increasing efficiency and reducing manual errors
- Develop practical skills in leveraging modern tools and libraries—such as Netmiko, PyATS, and REST APIs—for scalable and reliable network automation
- Learn to build and deploy reusable automation solutions, including scripts, web interfaces, and API wrappers, to streamline network operations
- Acquire foundational knowledge in integrating advanced technologies like CI/CD, telemetry, and large language models (LLMs) to enhance and future-proof network management
- Earn 29 CE credits toward recertification

Who should enroll

- Network Engineers with little or no programming or Python experience
- Network Administrators
- Network Managers
- Systems Engineers

Technology areas

- Networking, Automation

Course Objectives

After taking this course, you should be able to:

- Describe Python's versatility and suitability for network programmability and automation
- Explain why network programmability is needed and how it enables modern network automation
- Describe programmatic interaction with network devices and the benefits of network automation for scaling from traditional to programmable networks
- Identify practical examples and existing Python tools for network automation
- Write and run basic Python scripts, demonstrating foundational syntax, elements (variables, data types, operators), and logic (decisions and loops)
- Introduce standard and third-party libraries, the import statement, and using the Python interpreter
- Demonstrate hands-on interaction with Python, including accepting input and performing basic network tasks (e.g., connectivity checks)
- Emphasize code styles, readability, and development environment setup, including Python installation, VS Code, virtual environments, Docker, and Git
- Implement Python tools for automating device inventory, including data storage with variables, grouping devices with lists and dictionaries, iterating and filtering device data, and file operations (load/save)
- Organize code with functions and develop scripts for inventory management
- Use external libraries (e.g., Netmiko) for SSH connections and scaling network configurations with Python and templates
- Parse and analyze device output, handle exceptions, and build CLI applications for device management
- Implement tools for testing and validating device state using PyATS and Genie, including retrieving and verifying configuration data
- Demonstrate Python context managers, parsing outputs, performing compliance validation, and running scripts on Cisco IOS-XE devices (Guest Shell)
- Create tools for backing up device configs, automating backup storage with Git, comparing configs, and periodic backups with logging
- Use PyATS for configuration comparison and automate backup processes
- Describe HTTP REST API fundamentals, interactive documentation, and creating API requests in Python
- Parse JSON data, automate interactions with APIs (e.g., Cisco Meraki Dashboard, ThousandEyes), and manage authentication securely
- Demonstrate creating, configuring, and analyzing network tests and monitoring data with API scripts
- Explain the importance of debugging, logging, unit testing, and integrating scripts with CI/CD pipelines
- Handle API errors, implement rate limiting/retries, and introduce telemetry collection with OpenTelemetry

Course Outlines

- Python Programming for Network Engineers
- Write Your First Python Scripts
- Python Development Environment Setup
- Device Inventory Automation
- Scale Configuration of Network Devices
- Network Monitoring and Validation
- Device Configuration Backup Automation
- HTTP API Fundamentals
- Cisco ThousandEyes Network Insights with HTTP API Automation
- Network Automation Debugging and Testing
- HTTP API Automation Wrapper
- Build a Web Interface for Network Automation
- Large Language Models for Network Automation

Lab Outlines

- Parse API Data Formats with Python
- Interact with Python Using the Interpreter
- Run Your First Script
- Install Python and Setup Developer Environment
- Create a Device Inventory Tool
- Create a Network Device Configuration Tool
- Monitor and Validate Device Configurations
- Create a Backup Tool for Network Configurations
- Retrieve Data from Cisco Meraki Dashboard API
- Create and Monitor ThousandEyes Network Tests
- Write Unit Tests for Network Automation Scripts
- Harden Automation Scripts with Logging and Error Handling
- Build a Reusable Cisco ThousandEyes API Automation Wrapper
- Build a Web Interface for Network Device Management
- Build a Web Interface for Network Automation
- Build a Network Automation Tool with Ollama

Prerequisites

There are no prerequisites for this training. However, knowledge and skills you are recommended to have before attending this training are:

- Familiarity and basic understanding of core networking concepts
- Familiarity with Cisco IOS-XE software or other Cisco network device configuration and operation skills
- Cisco CCNA certification or equivalent knowledge

These skills can be found in the following Cisco Learning Offerings:

- Implementing and Administering Cisco Solutions (CCNA)