Python for Network Automation

- 5 Day Course
- Lecture and Lab

Course Overview
Managing networks can be repetitive and error-prone, but Python can make incredible changes to how you automate with all major (and most minor) network vendors! This course is driven by lessons and labs designed to utilize Python libraries designed to interact with and configure your network devices. At the conclusion of this course, you’ll be empowered with the tools and skills necessary to take your network to the next level. This class is a combination of live demonstrations and hands-on labs with virtual network devices and endpoints as targets for your configuration.

What You’ll Learn
- Sending HTTP Requests to APIs with builtin and 3rd party libraries
- Opening Telnet Sessions with builtin libraries
- Automating SSH commands with Paramiko
- Performing ICMP Pings
- Transforming Data between JSON, YAML, and Python
- Retrieve and Push network device configuration via Netmiko and Napalm
- Use Pandas to manipulate data in a variety of formats (CSV, Excel, JSON)
- Database manipulation
- Capturing and Parsing Network Traffic

Course Outline
1. Reviewing Python Essentials
   - Version Controlling Code
   - Up and running with Python (installing on various platforms)
   - Lists
   - Dictionaries
   - File Input and Output
   - Functions
   - Methods
   - Review of the Standard Library
   - Using pip and pypi.org

2. Python and Data translation
   - JSON
     - Reading from files
   - Reading from API
   - YAML
     - Reading from files CSV
3. Python and RESTful APIs
   - RESTful APIs decoded
   - Reading attachments
   - API keying
   - Passing credentials securely
   - Standard Library Solution
   - 3rd party library solutions

4. Automating SMTP and Extended SMTP (Email)
   - SMTP
   - Extended SMTP
   - Automating Email solutions
   - Setting headers and creating a body
   - Attachments
   - Google Gmail considerations
   - Microsoft considerations

5. Python and Telnet
   - RFC 854 - Telnet Protocol
   - Standard Library Solution

6. Python and SSH
   - Standard Library Solution
   - Paramiko
     - SSH Agents
     - Key exchange and authorization
     - Securing dealing with passwords
     - Configuration
     - SFTP
   - Passing commands and capturing responses
   - Parsing remote logs

7. Automating Switches and Routers with Python
   - Netmiko
   - Push / Pull Configuration
   - Retrieve information about devices
   - Manage the devices configuration
   - Connecting and Running a Command on a Networking Device
   - Enable & Global Config Mode
   - Configure a Networking Device from a File
   - Configuration Backup using Netmiko
   - VLAN & VXLAN management
   - BGP & OSPF Management
   - Solutions for HSRP, VRRP, and GLBP

8. Automating Networks with Python NAPALM
   - Installation
   - Tutorials
   - Validating deployments
- Supported Devices
- Command Line Tool
- NetworkDriver
- YANG
- napalm-logs
- Integrations

9. Python and Network Captures
   - Wireshark
   - TCPDump
   - Decoding network captures with Python
   - *.pcap files
   - *.pcap-ng files
   - Parsing network captures
   - Regular Expression Library

10. Optimizations and Security
    - Multiprocessing and Multithreading
    - Examples of running in parallel
    - Cost and Benefit Considerations
    - Secure hashes and digests
    - MD5, SHA, and OpenSSL Options
    - Encrypting content
    - Considerations for credentials
    - Securely passing input

11. Overview of Ansible (optional)
    - Relationship of Ansible and Python
    - Overview and Installing
    - Where YAML fits
    - Modules for Cisco, Juniper, Arista, and other major vendors
      - shell, raw, copy, file, apt, service, cli_command, cli_config
    - Constructing the playbook
    - Applications of Python versus Ansible

Hands On Labs:

1. Using vim
2. Making a Github account
3. Working with Local Files
4. JSON
5. YAML
6. Interacting with APIs
7. APIs, pip, and requests
8. Restful Open APIs
9. List and Dict Modeling
10. Python and Excel, csv, json
11. Automating SMTP (Email)
12. Exploring Network Interfaces
13. Python Telnet Client
14. Introducing Paramiko
15. Automating Commands Across SSH
16. Paramiko and SFTP
17. Using Argparse
18. Performing ICMP checks (ping)
19. Installing Switch Configuration
20. Netmiko for Router and Switch Automation
21. Switch Validation and NAPALM
22. Lightweight Database Interactions
23. Cisco Switch Configuration
24. Building APIs with Python
25. Python for Network Captures and Wireshark
26. Python and Regular Expression for Searching
27. Working with Threads
28. Introduction to Ansible Playbooks
29. Retrieving Switch Config with Ansible
30. Using Agnostic Networking Modules

Prerequisites:
Keyboard proficiency, and some basic understanding of network concepts is the only hard requirement. Students with some previous exposure to Python, any other scripting experience, will take the most from the course. In lieu of any scripting experience, Alta3 Research's Python Basics course is recommended.

Recommended Prerequisite:
- Python Basics (5 days)

Who Should Attend:
This course was written for networking professionals looking to expand their capabilities by automating their workload with Python. This includes: Network Engineers, Network Architects, System Admins, DevOps Engineers, Cisco Certified Professionals (CCNA, CCNP, CCIE), and developers interested in network programmability with Python.

Follow-on Courses:
- APIs and API Design with Python (5 days)
- Python and Ansible for Network Automation (5 days)