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Network Automation eAcademy

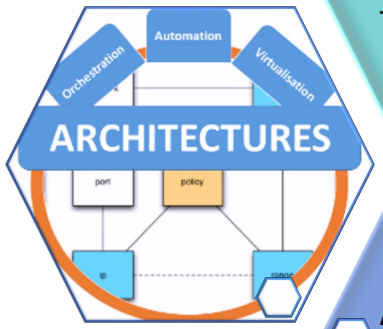
Maria Isabel Gandia, CSUC/RedIRIS
WP6-T2

16th SIG-NOC Meeting

Cambridge

www.geant.org

Orchestration, Automation and Virtualisation



Terminology

OAV public wiki

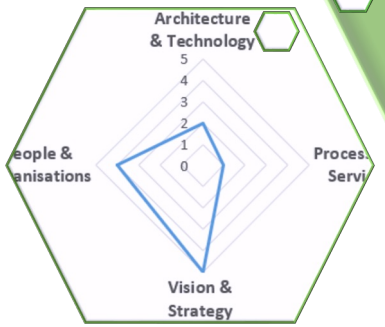
Network Automation eAcademy

CNaaS (use case)

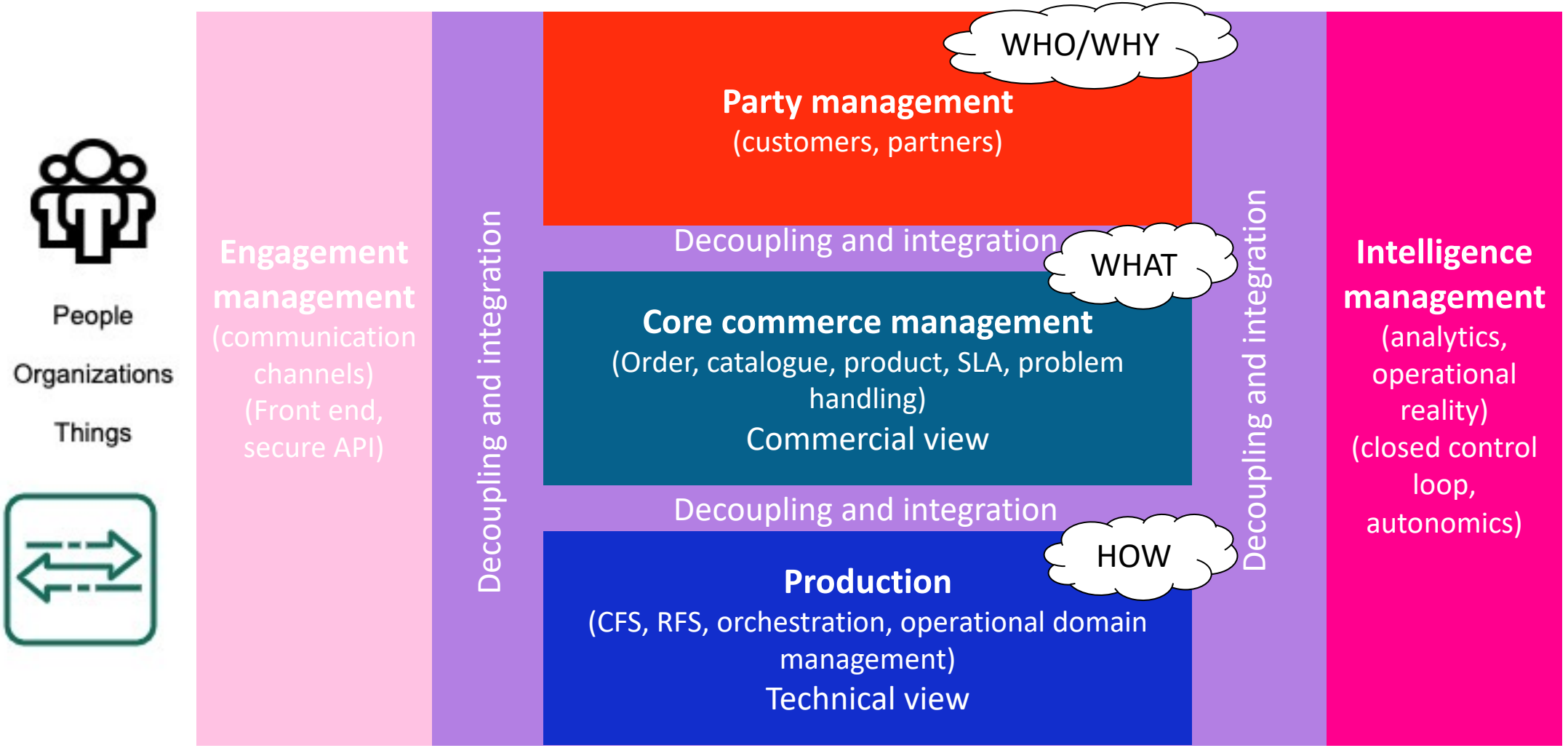
Architecture /Mapping

DTN (use case)

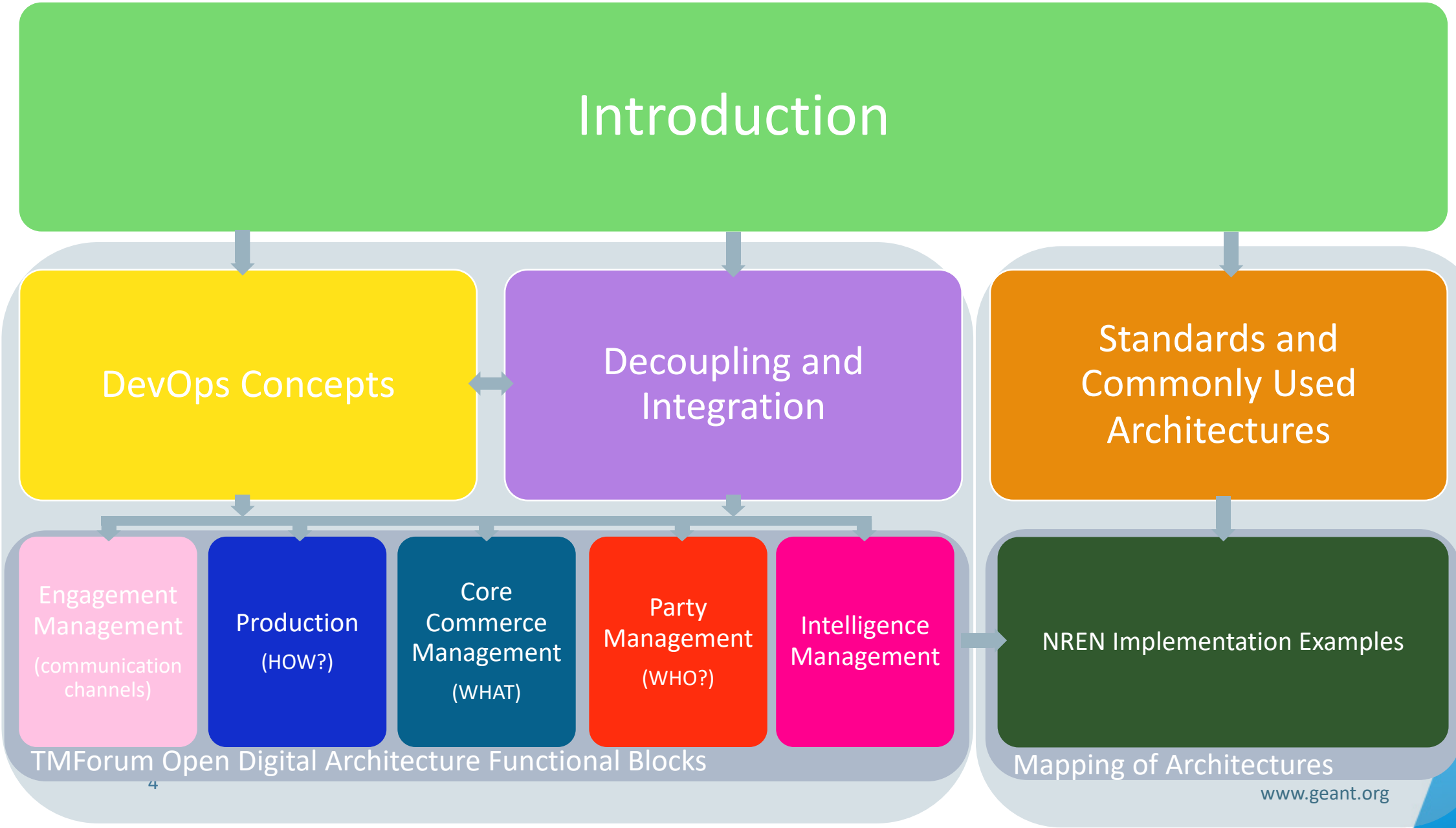
Maturity Model



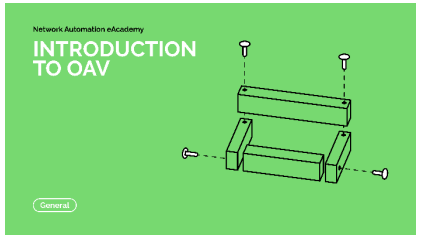
Architecture Blueprint: TM Forum Open Digital Architecture

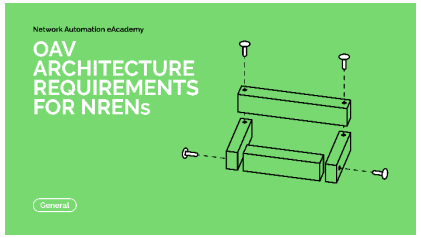


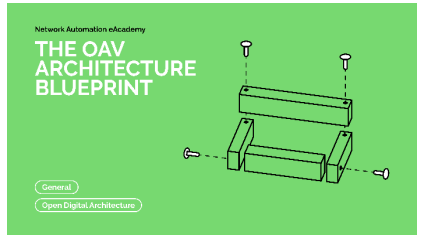
Knowledge Map

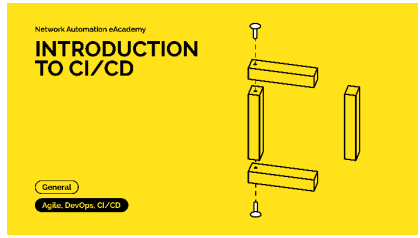


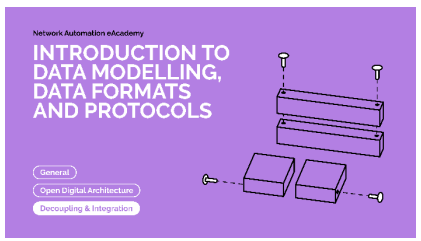
Current Courses in the Network Automation eAcademy

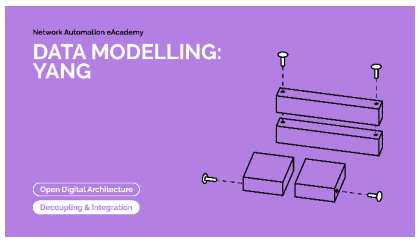


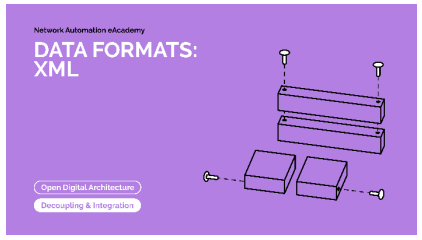


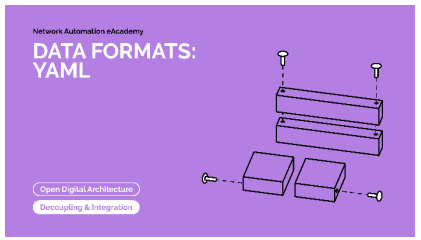


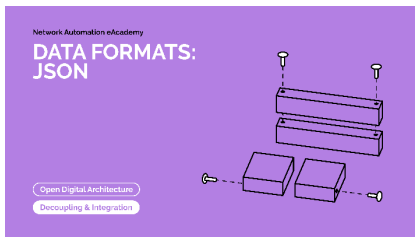


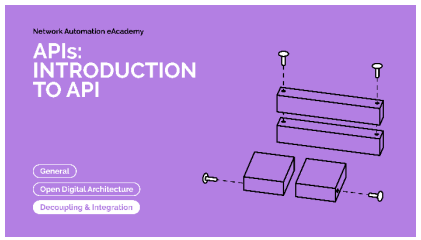


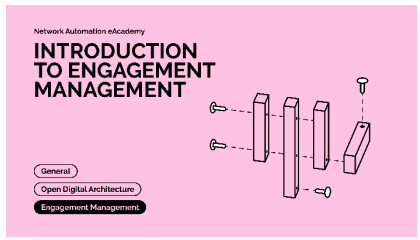


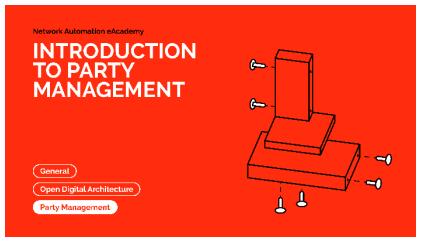


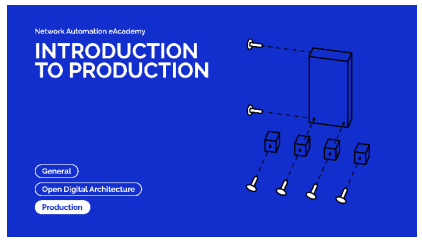


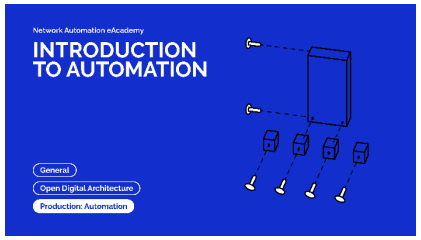


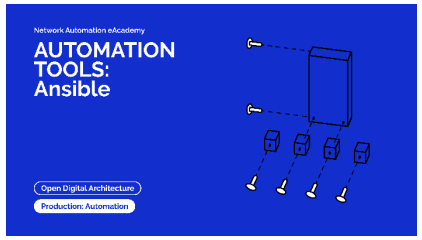


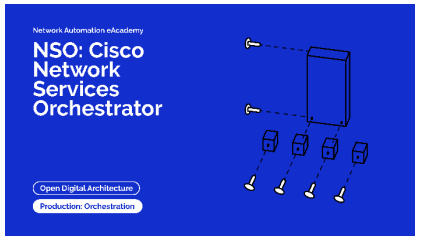


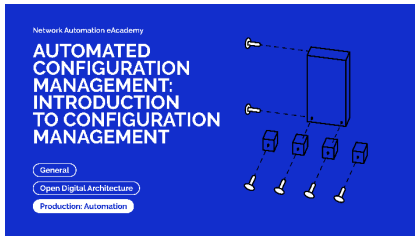


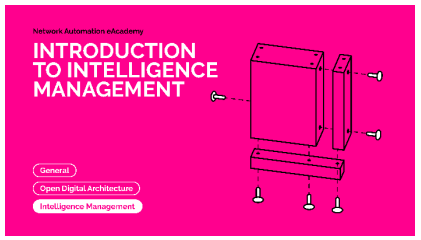












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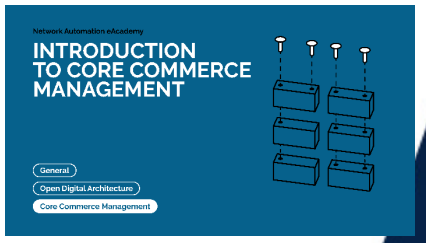
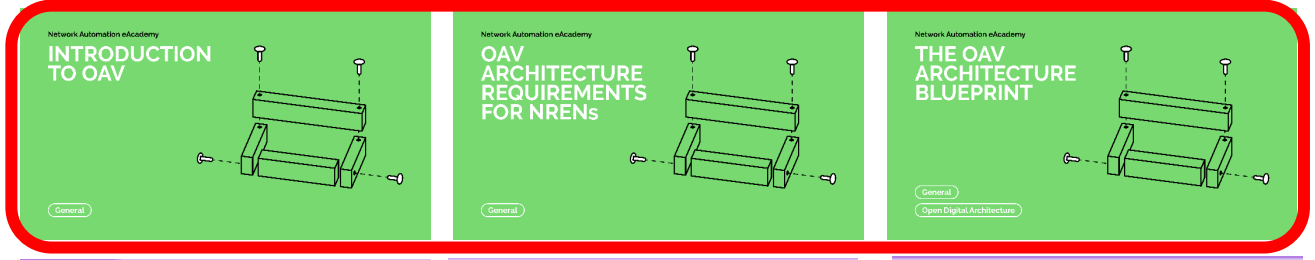
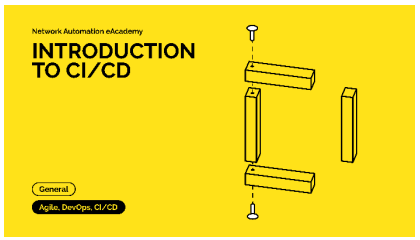
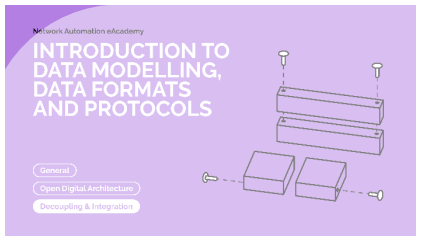


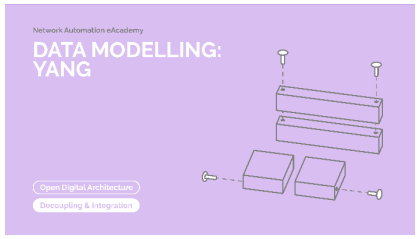
Training Packages

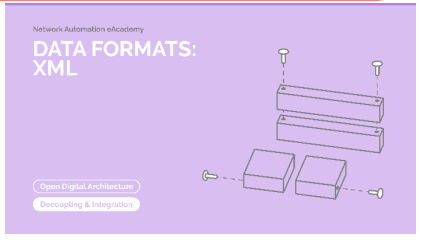
General Intro

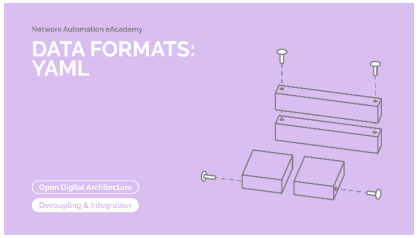


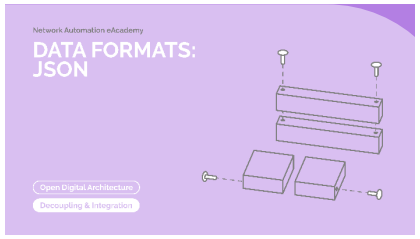


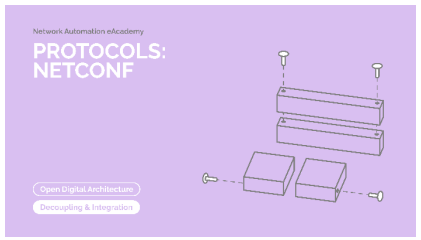


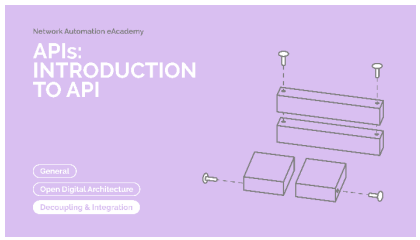


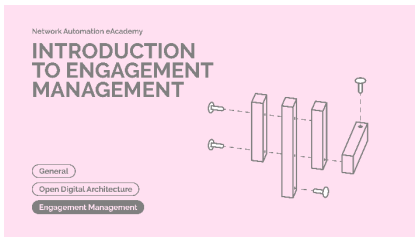


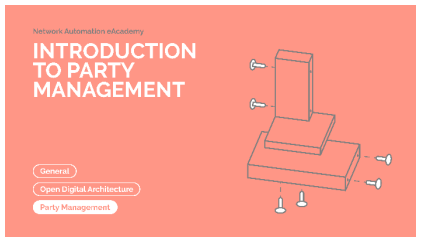


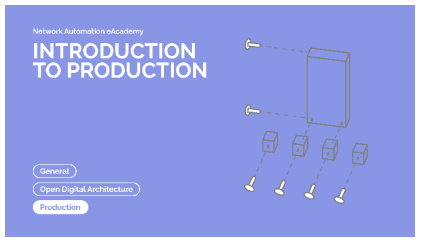


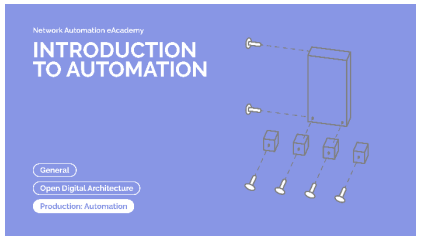


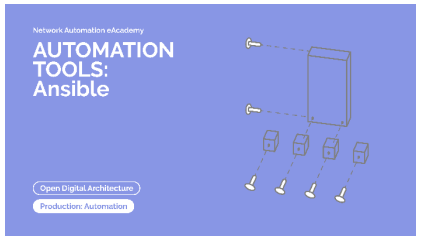


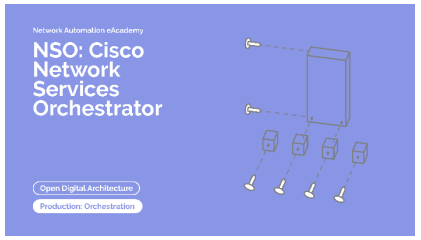


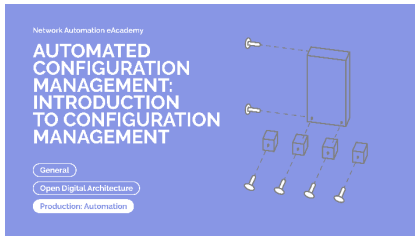


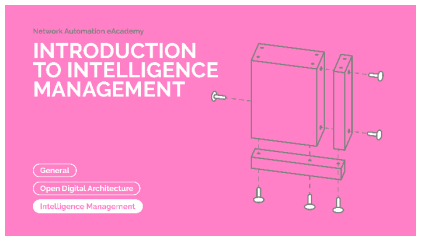


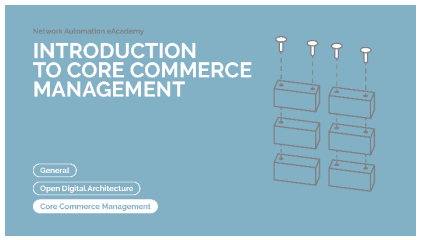




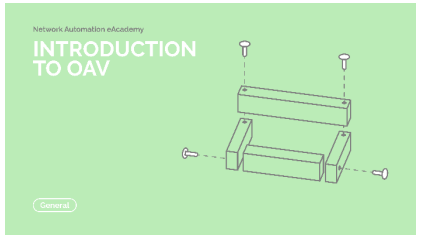


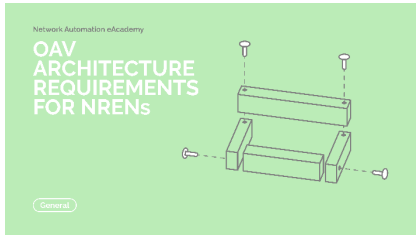


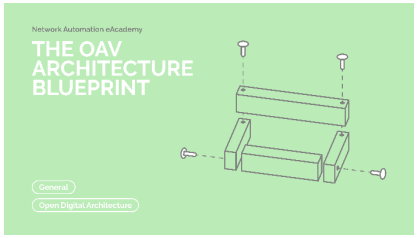


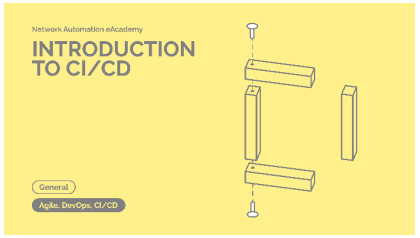


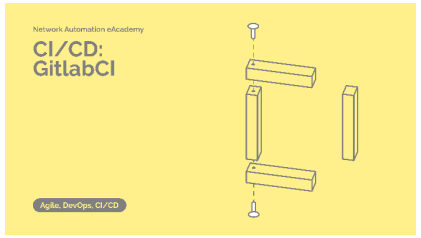
Training Packages

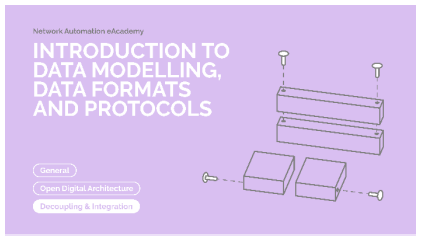


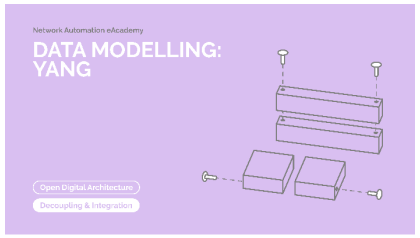


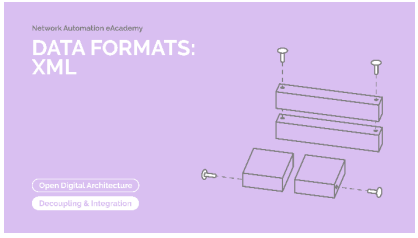


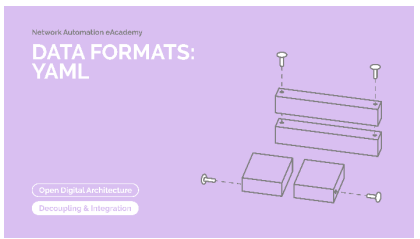


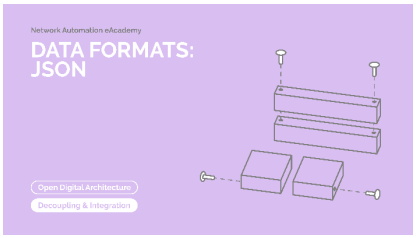


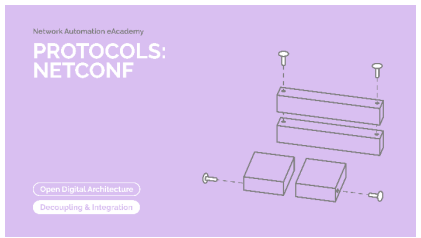


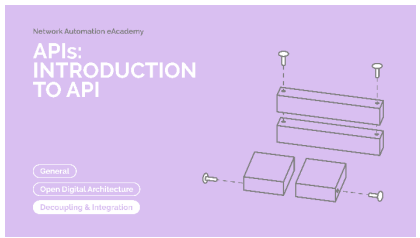


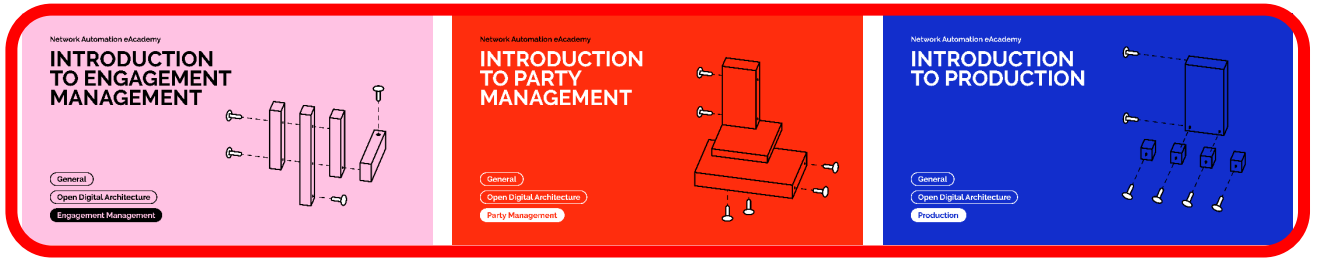


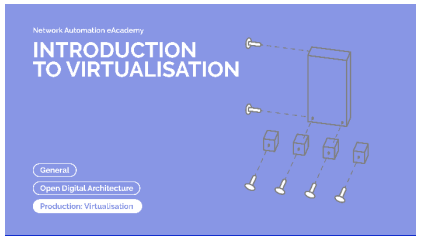


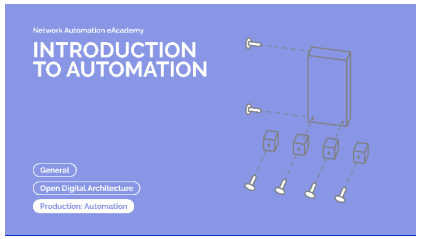


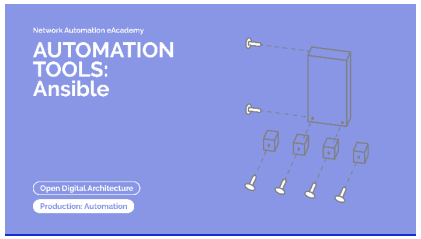


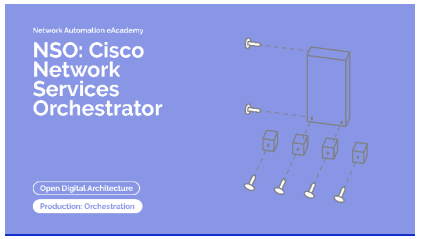


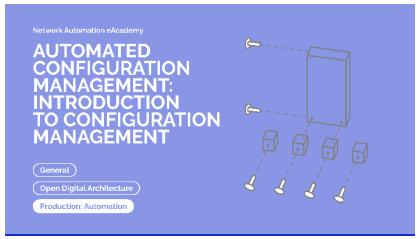


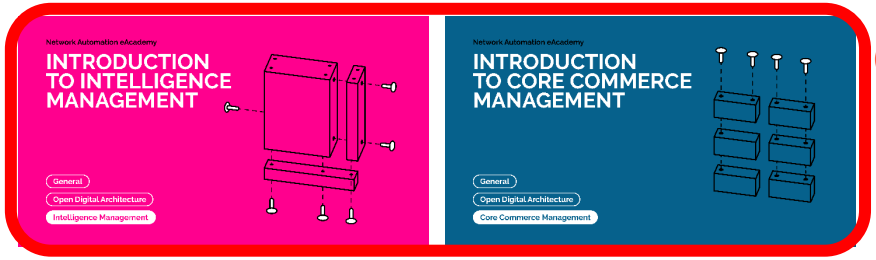






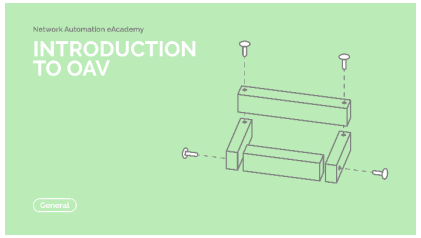


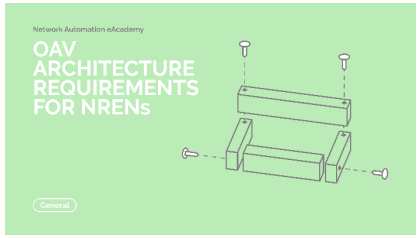


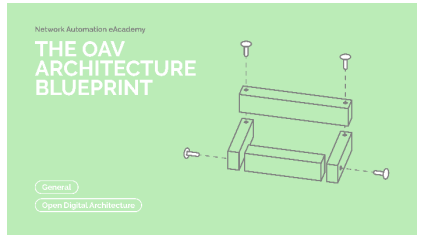


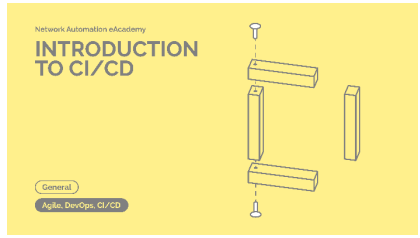
Open Digital Architecture Intro

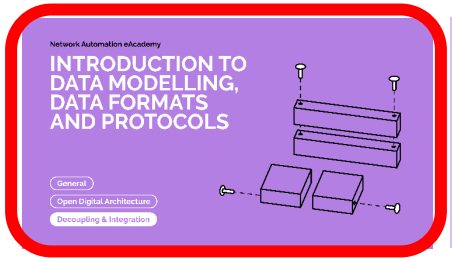
Training Packages

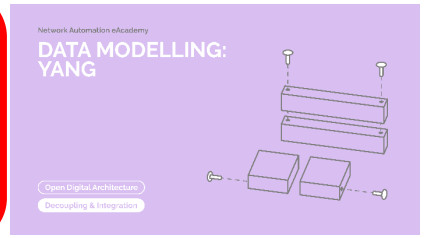


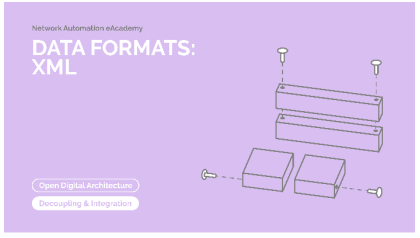


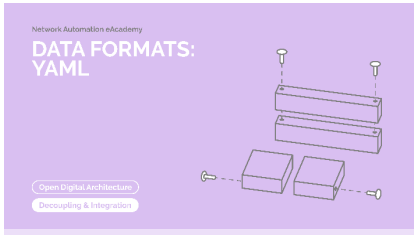


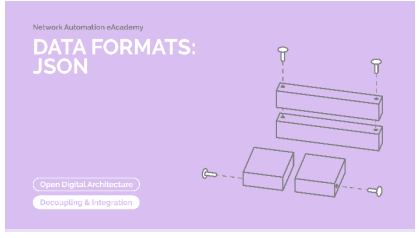


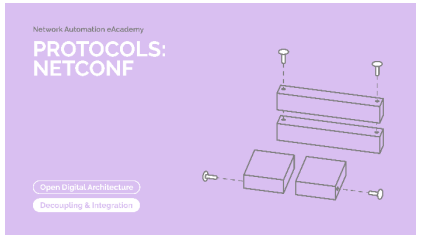


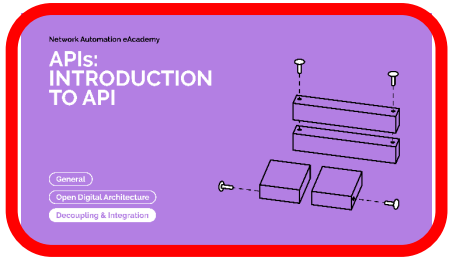


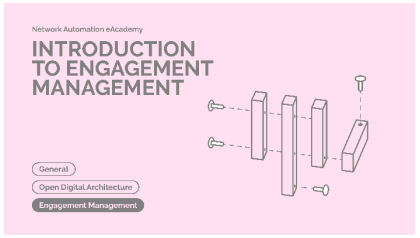


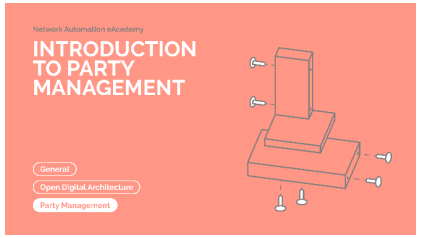


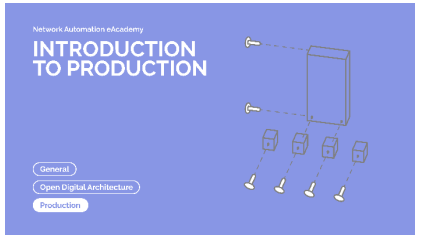


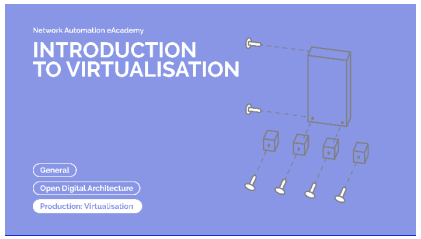


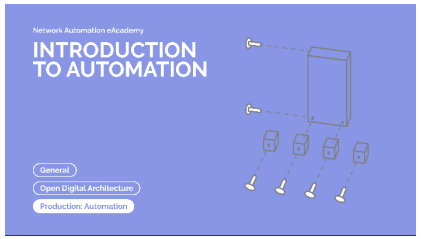


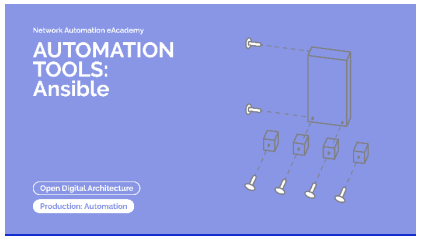


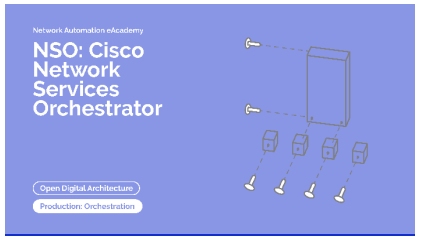


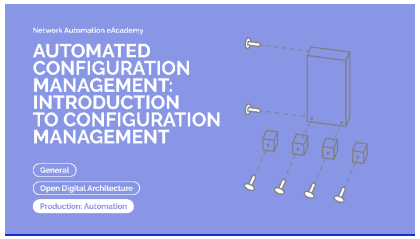


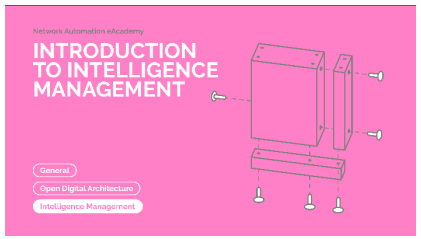


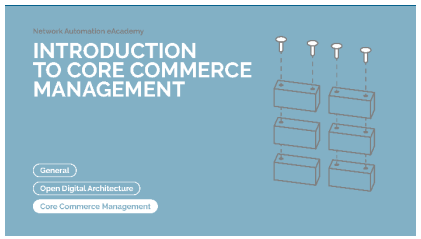








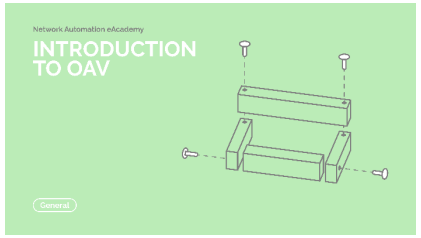


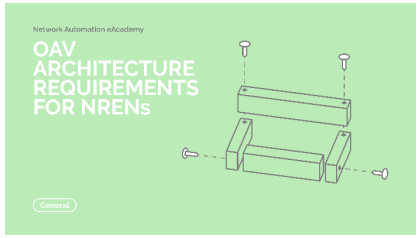


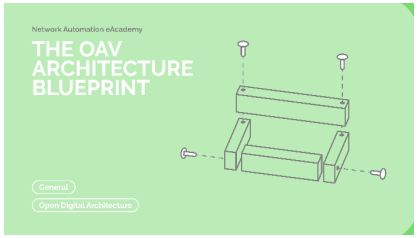
Decoupling and Integration Intro

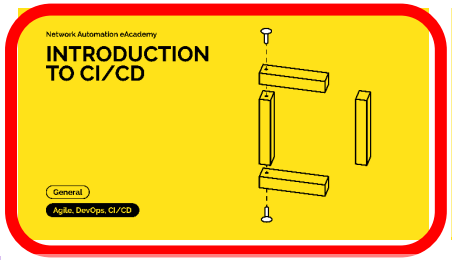
Training Packages

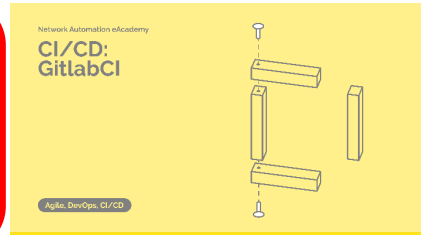
DevOps Intro

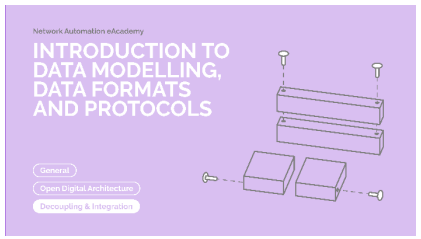


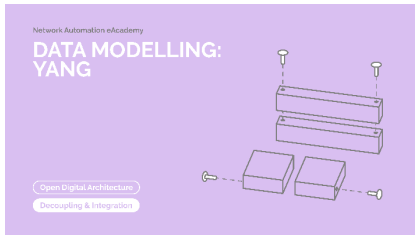


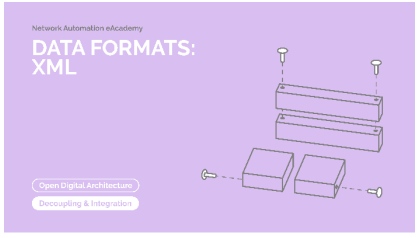


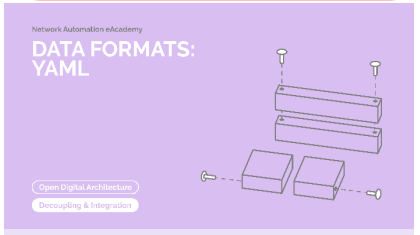


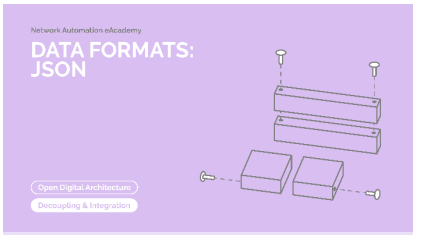


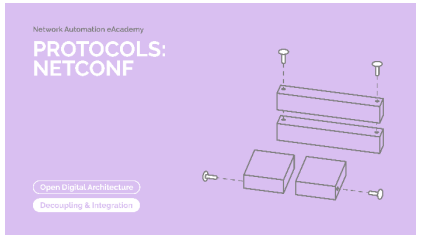


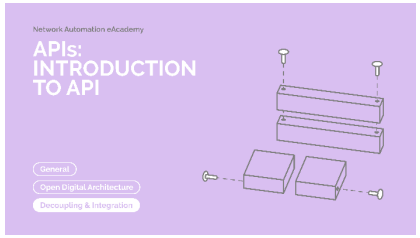


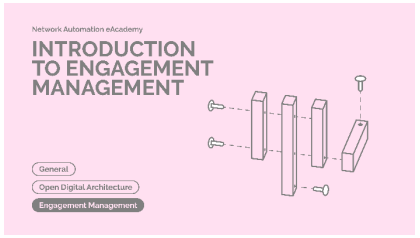


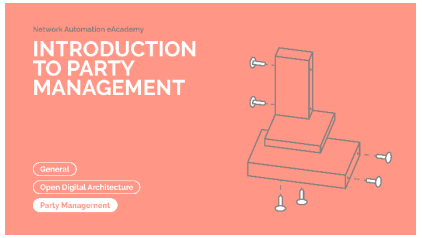


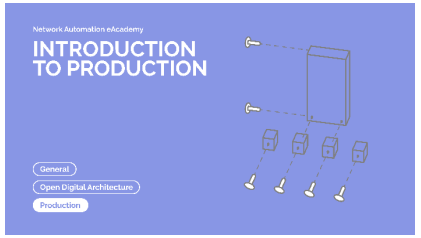


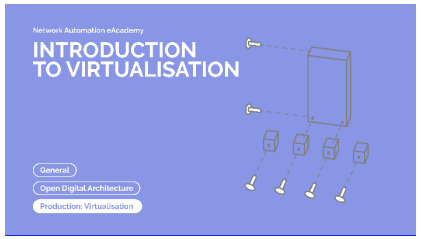


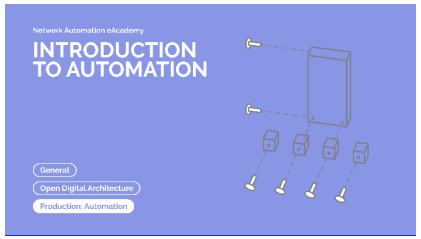


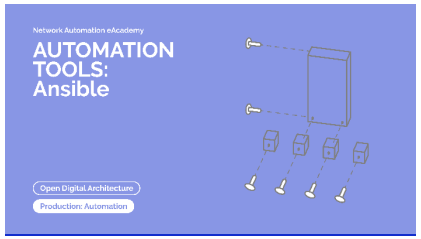


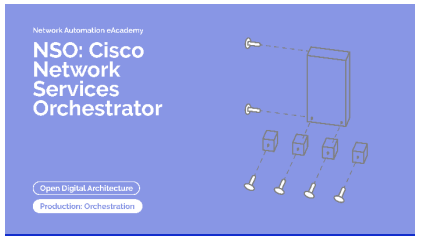


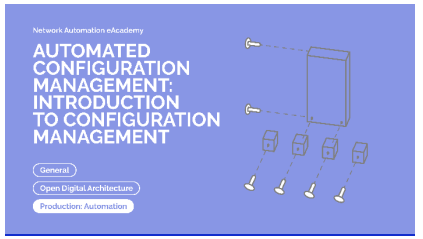


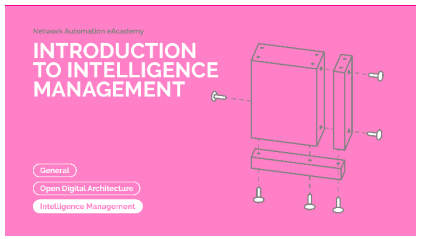


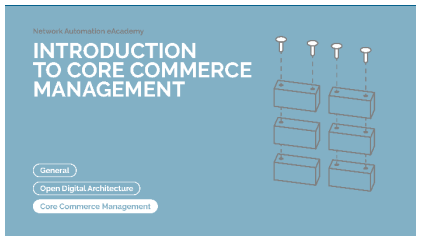






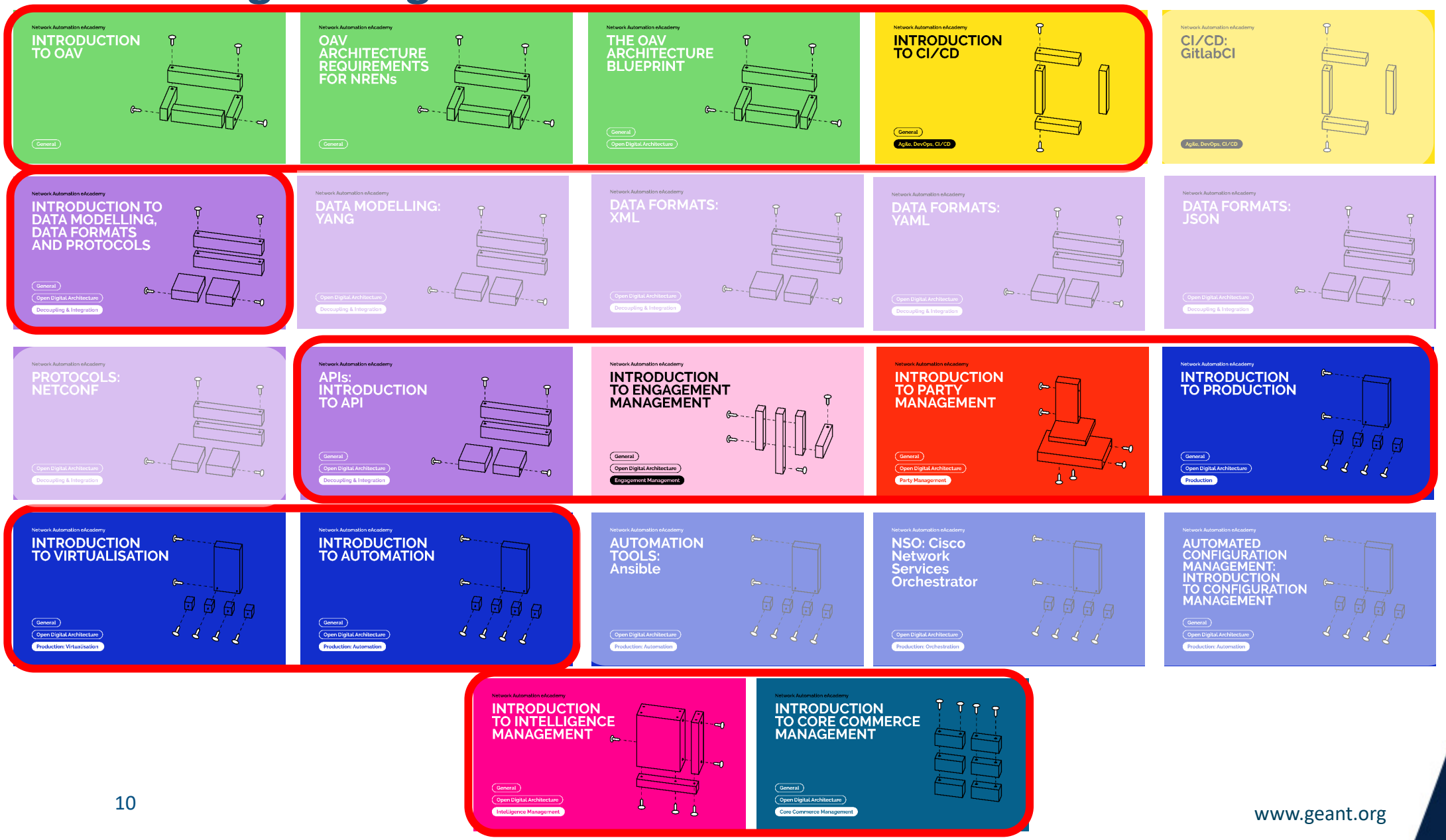




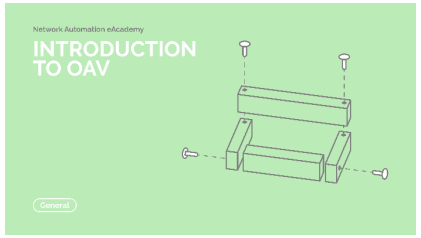


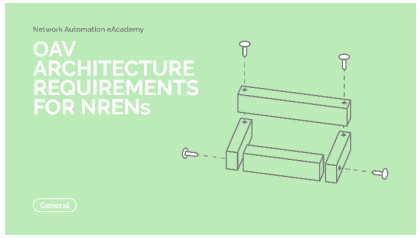
Training Packages

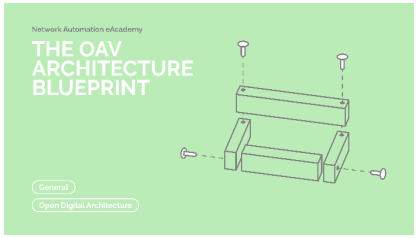
Broader Intro

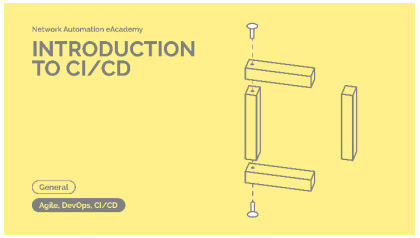


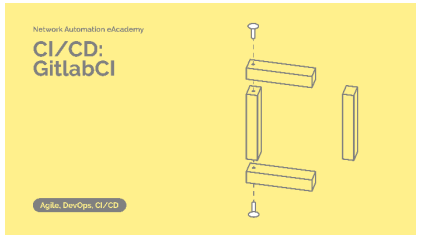
Hands-on units

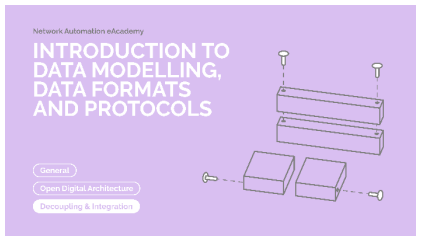


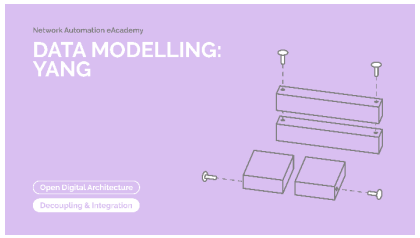


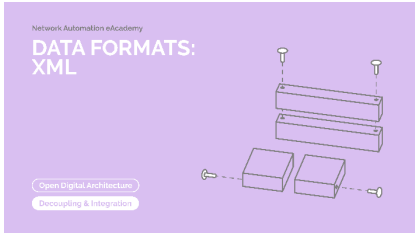


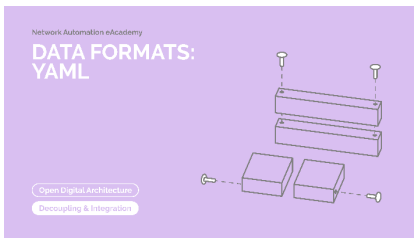


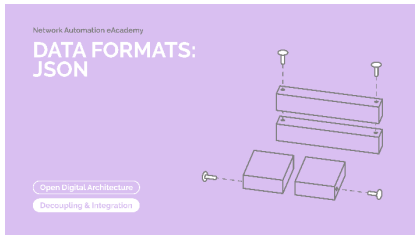


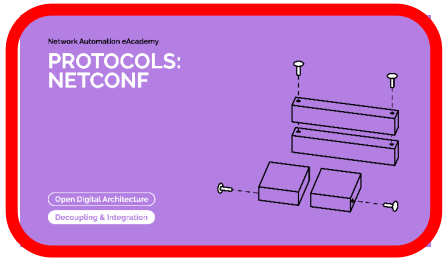


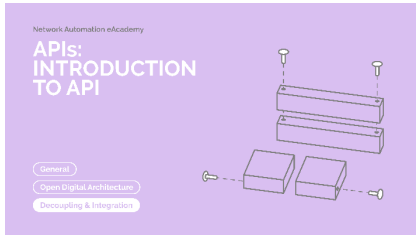


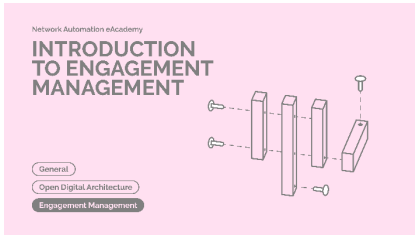


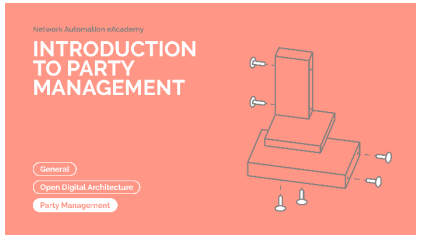


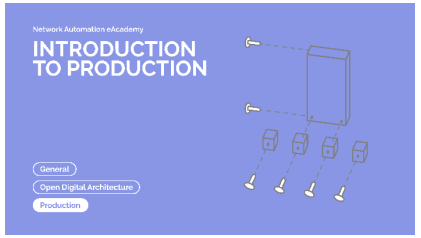


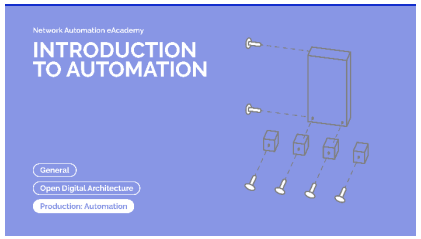


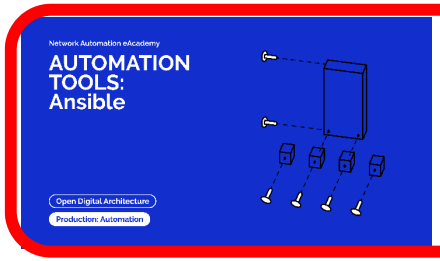


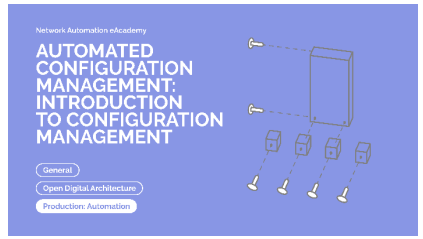


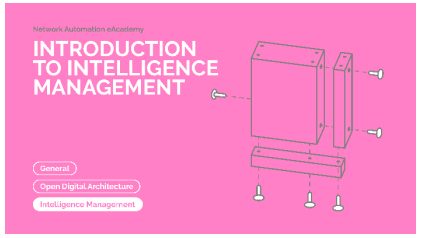


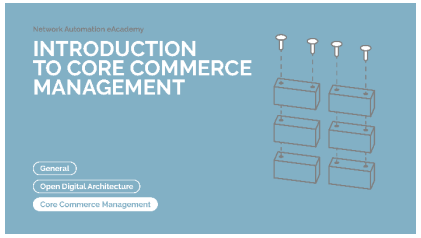




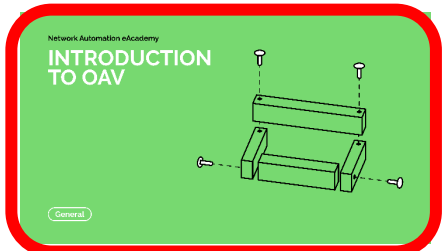


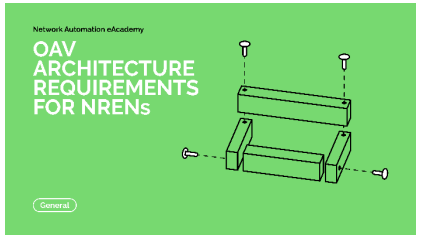


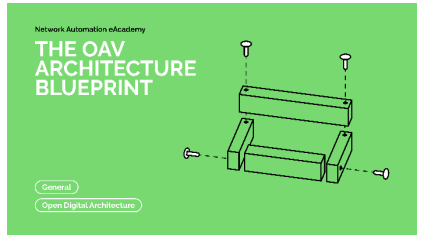


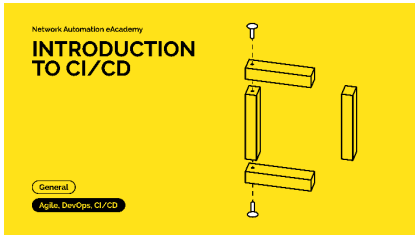


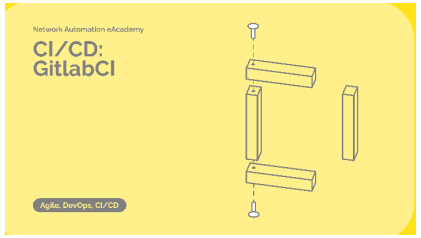
Ansible

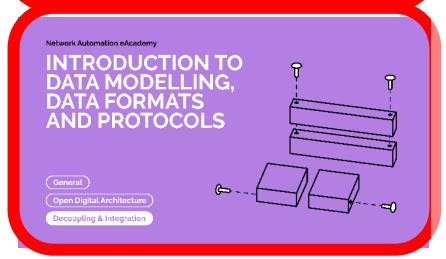

Network Automation eAcademy
INTRODUCTION TO OAV
General

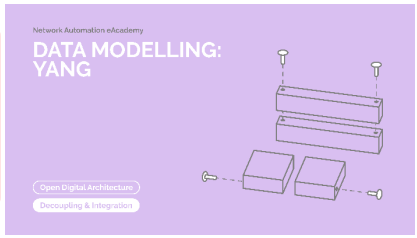

Network Automation eAcademy
OAV ARCHITECTURE REQUIREMENTS FOR NRENs
General

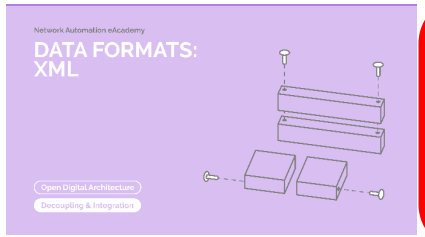

Network Automation eAcademy
THE OAV ARCHITECTURE BLUEPRINT
General
Open Digital Architecture

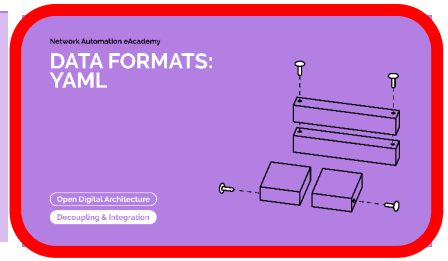

Network Automation eAcademy
INTRODUCTION TO CI/CD
General
Agile, DevOps, CI/CD

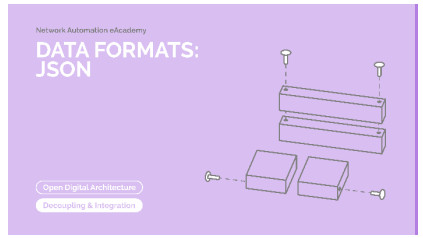

Network Automation eAcademy
CI/CD: GitlabCI
Agile, DevOps, CI/CD

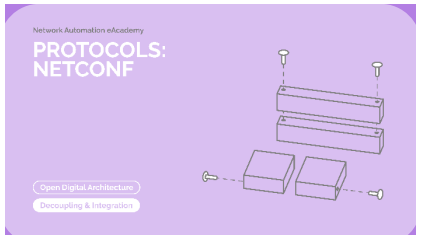

Network Automation eAcademy
INTRODUCTION TO DATA MODELLING, DATA FORMATS AND PROTOCOLS
General
Open Digital Architecture
Decoupling & Integration

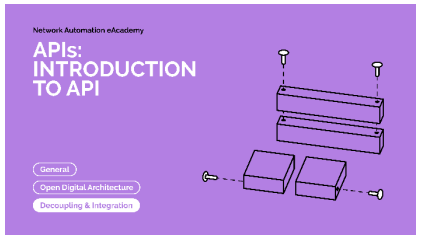

Network Automation eAcademy
DATA MODELLING: YANG
Open Digital Architecture
Decoupling & Integration

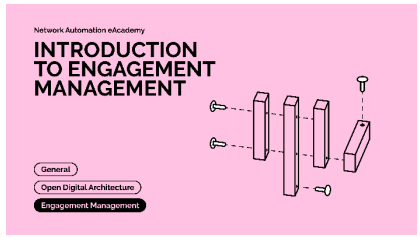

Network Automation eAcademy
DATA FORMATS: XML
Open Digital Architecture
Decoupling & Integration

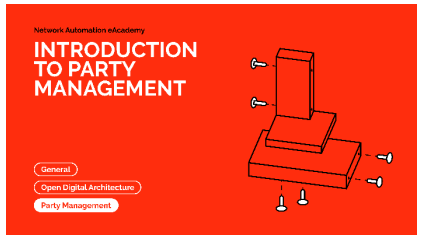

Network Automation eAcademy
DATA FORMATS: YAML
Open Digital Architecture
Decoupling & Integration

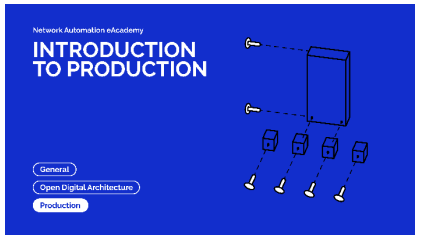

Network Automation eAcademy
DATA FORMATS: JSON
Open Digital Architecture
Decoupling & Integration


Network Automation eAcademy
PROTOCOLS: NETCONF
Open Digital Architecture
Decoupling & Integration

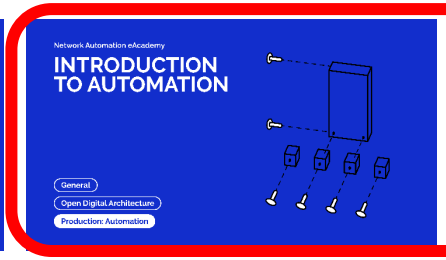

Network Automation eAcademy
APIs: INTRODUCTION TO API
General
Open Digital Architecture
Decoupling & Integration

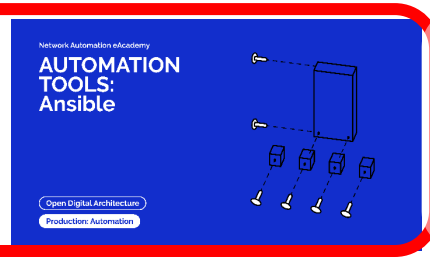

Network Automation eAcademy
INTRODUCTION TO ENGAGEMENT MANAGEMENT
General
Open Digital Architecture
Engagement Management


Network Automation eAcademy
INTRODUCTION TO PARTY MANAGEMENT
General
Open Digital Architecture
Party Management

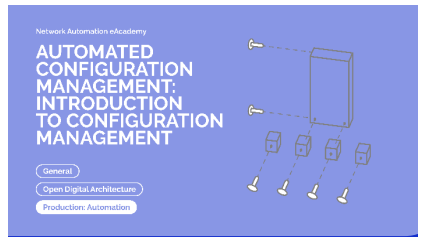

Network Automation eAcademy
INTRODUCTION TO PRODUCTION
General
Open Digital Architecture
Production

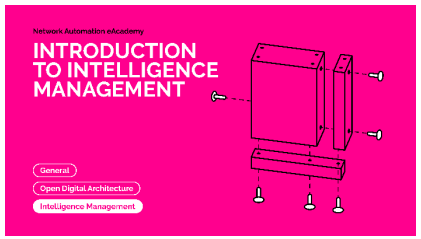

Network Automation eAcademy
INTRODUCTION TO VIRTUALISATION
General
Open Digital Architecture
Production: Virtualisation

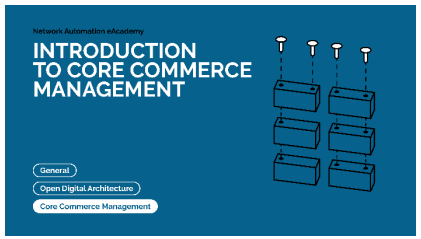

Network Automation eAcademy
INTRODUCTION TO AUTOMATION
General
Open Digital Architecture
Production: Automation


Network Automation eAcademy
AUTOMATION TOOLS: Ansible
Open Digital Architecture
Production: Automation


Network Automation eAcademy
NSO: Cisco Network Services Orchestrator
Open Digital Architecture
Production: Orchestration


Network Automation eAcademy
AUTOMATED CONFIGURATION MANAGEMENT: INTRODUCTION TO CONFIGURATION MANAGEMENT
General
Open Digital Architecture
Production: Automation


Network Automation eAcademy
INTRODUCTION TO INTELLIGENCE MANAGEMENT
General
Open Digital Architecture
Intelligence Management


Network Automation eAcademy
INTRODUCTION TO CORE COMMERCE MANAGEMENT
General
Open Digital Architecture
Core Commerce Management

Ansible

GÉANT eAcademy

Ansible

Home > My courses > Technical skills > Network > Network Automation eAcademy > Ansible

OVERVIEW | I - Settings, Inventory, Module Basics | II - Playbooks, Variables and Modules | III - How people use Ansible, Loops, Jinja2 | IV - Playbook Validation, Vault, Roles, Sharing content | Test environments and Useful Links | Feedback and Completion Certificate

Welcome to the Course: Ansible

COURSE DATE:	DURATION:	COMMITMENT:
On Demand	60 minutes	60 minutes + lab time

REQUIREMENT:	COURSE TYPE:	CREDENTIAL:
YAML Learning Module	Self-paced	Certificate

Learning path:	OAV Training Portal
Prerequisite:	Formats: YAML
Preceded by:	Introduction to Automation
Followed by:	Puppet (not yet published)
Next available:	Configuration Management

Course summary

Ansible is an automation framework which allows users to manage services, the servers on which they run and the network devices which interconnect them. This course has several sections which should be taken in order;

https://e-academy.geant.org/moodle/course/view.php?id=120

Ansible Requirement: YAML, YAML Requirement?

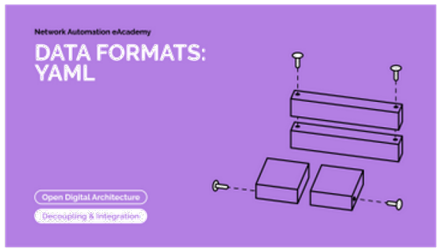
GÉANT eAcademy

Formats: YAML

Home > My courses > Technical skills > Network > Network Automation eAcademy > Formats: YAML

OVERVIEW | Main Goals | Formats: YAML | Useful Links | Quiz | Feedback & Certificate

Welcome to the Course: Formats: YAML



COURSE DATE:	DURATION:	COMMITMENT:
From September 2021	20 min	30 min

REQUIREMENT:	COURSE TYPE:	CREDENTIAL:
Introduction to Data Models, Data Formats, and Protocols (recommended)	Selfpaced	Certificate of completion

Learning path:	OAV Training Portal
Preceded by:	Formats: XML
Followed by:	Formats: JSON

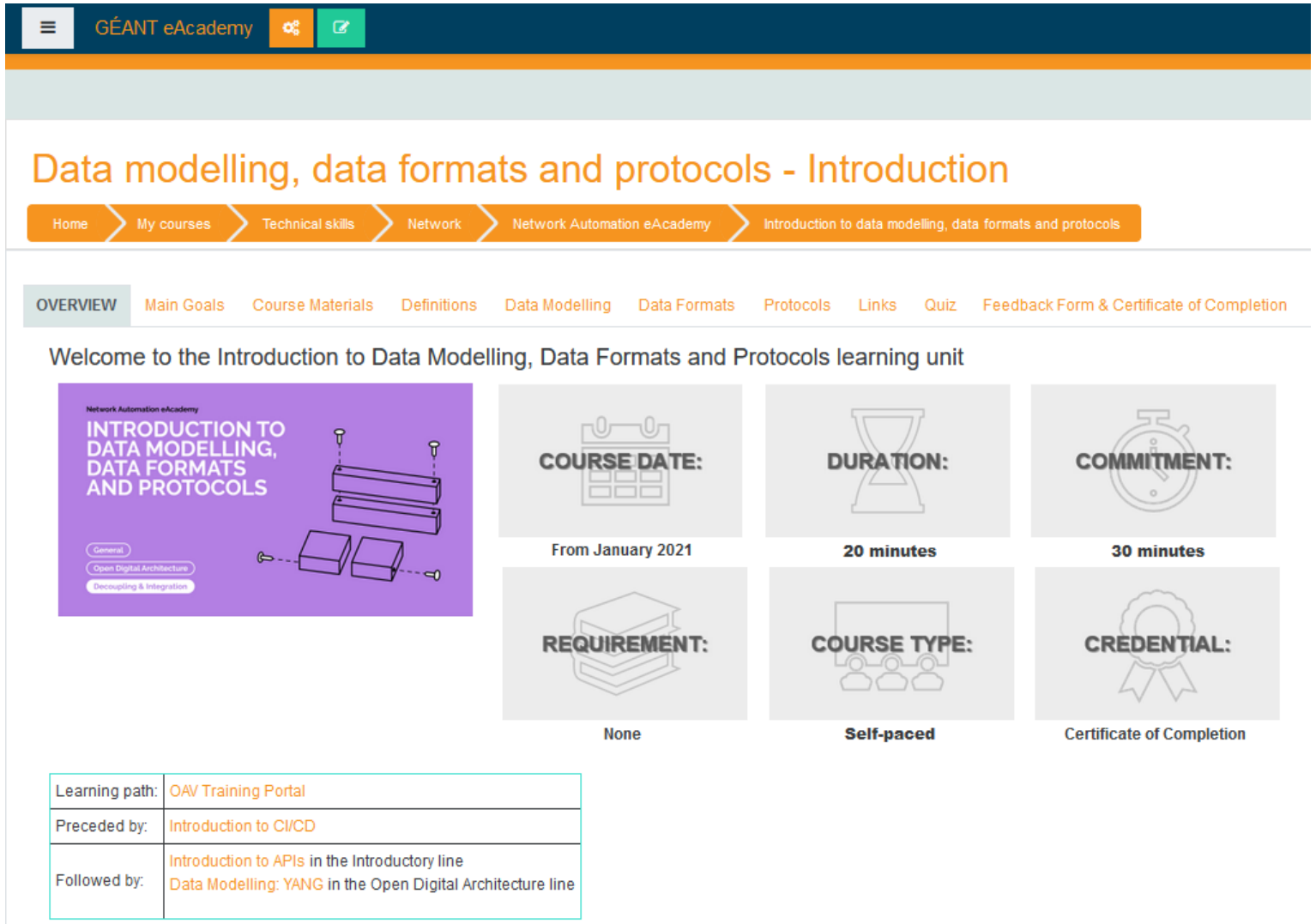
Course summary

YAML is a human-friendly data serialisation standard broadly used in Orchestration, Automation and Virtualisation (OAV). This course offers a quick overview of the YAML syntax and some examples from the real world in a single video, with useful tips and references and a quiz.

In more detail, the learning unit discusses the following topics:

https://e-academy.geant.org/moodle/course/view.php?id=129

Ansible ← YAML ← Data models, Data Formats, and Protocols



https://e-academy.geant.org/moodle/course/view.php?id=61

Ansible: Contents

- What is Ansible?, How Ansible works, Installing Ansible, Settings, Inventories and Module basics
- Playbooks, Variables and Modules
- How to use Ansible, Loops and templating with Jinja2
- Playbook Validation, Ansible Vault, Roles and sharing/using Ansible content

https://e-academy.geant.org/moodle/course/view.php?id=120

Ansible: Video and Slides with Speaker Notes

GÉANT eAcademy

Ansible

Home > My courses > Technical skills > Network > Network Automation eAcademy > Ansible > II - Playbooks, Variables and Modules

OVERVIEW | I - Settings, Inventory, Module Basics | II - Playbooks, Variables and Modules | III - How people use Ansible, Loops, Jinja2 | IV - Playbook Validation, Vault, Roles, Sharing content | Test environments and Useful Links | Fee

Please watch the video below to continue your Ansible learning journey.

At the end of this section you will be able to

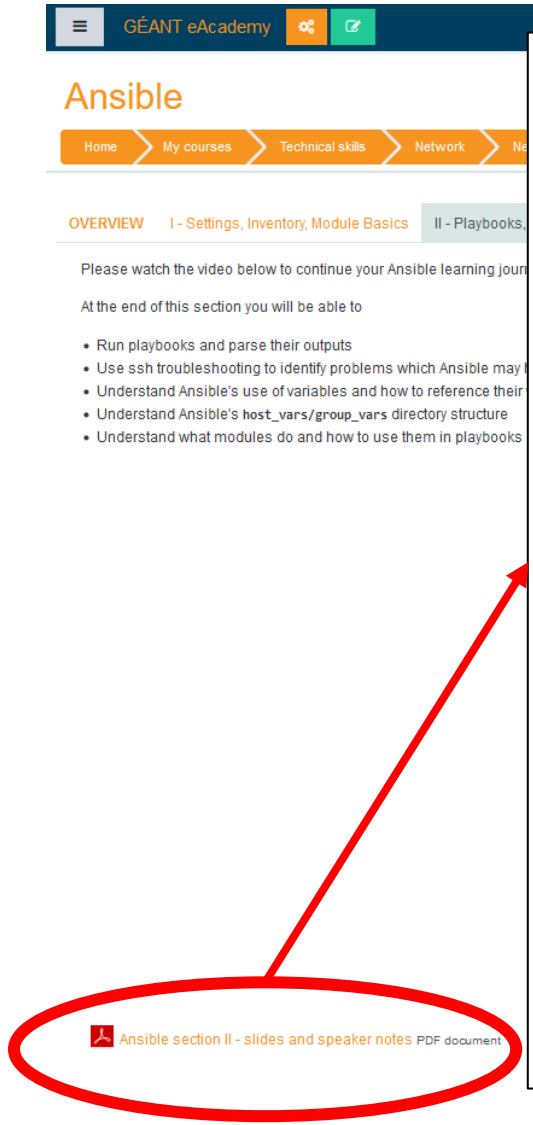
- Run playbooks and parse their outputs
- Use ssh troubleshooting to identify problems which Ansible may hide from you
- Understand Ansible's use of variables and how to reference their value
- Understand Ansible's `host_vars/group_vars` directory structure
- Understand what modules do and how to use them in playbooks

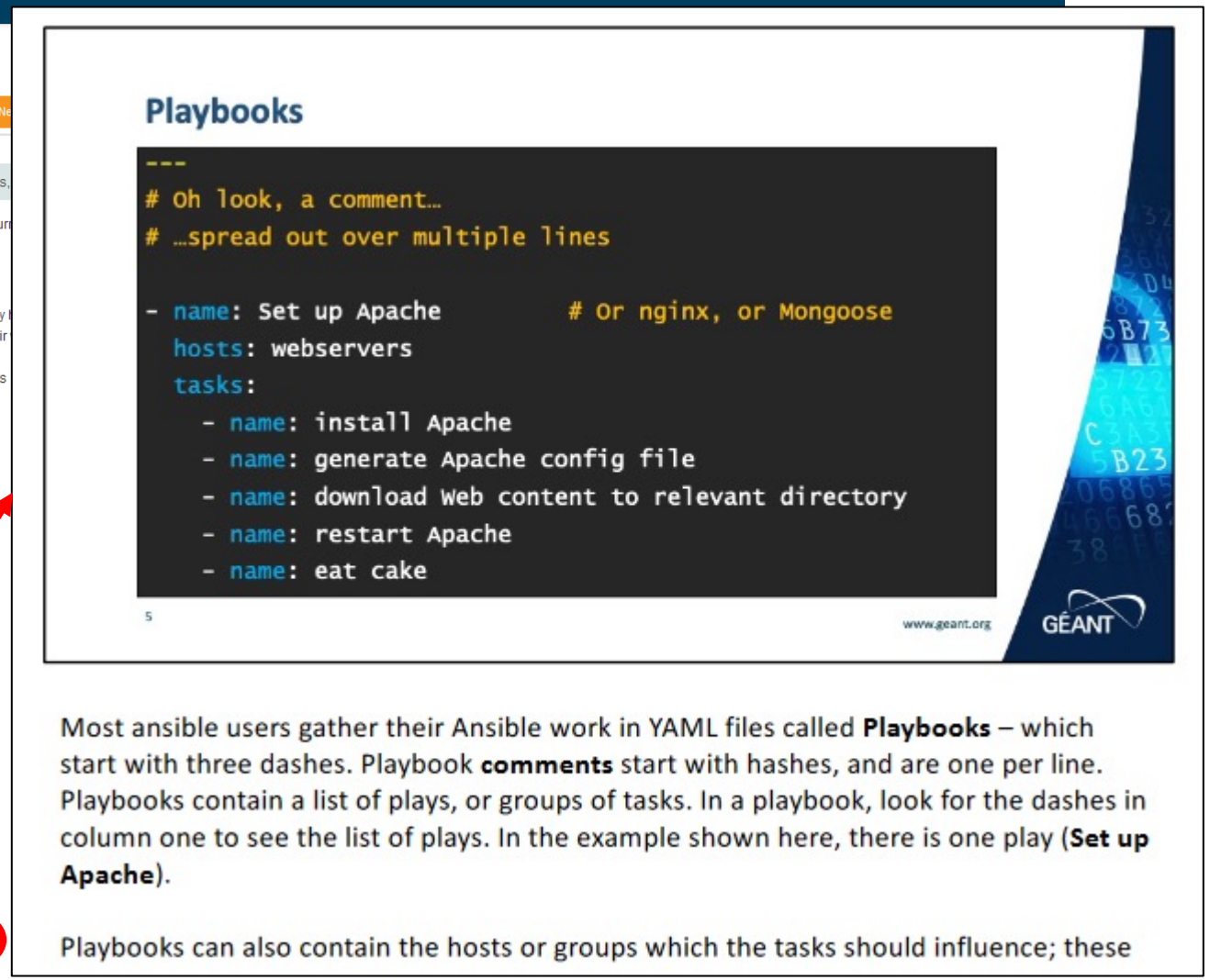
```yaml
---
- name: Install mod_rewrite on all webservers
  hosts: webservers
  become: true
  tasks:
    - name: Install Apache
      apt: pkg=apache2 state=latest

    - name: enable mod_rewrite
      apache2_module: name=rewrite state=present
      notify:
        - restart_apache2

  handlers:
    - name: restart apache2
      service: name=apache2 state=restarted
```

20 Section2/playbooks/install_Apache_with_handlers.yaml www.geant.org

Ansible section II - slides and speaker notes PDF document

Ansible: Speaker Notes

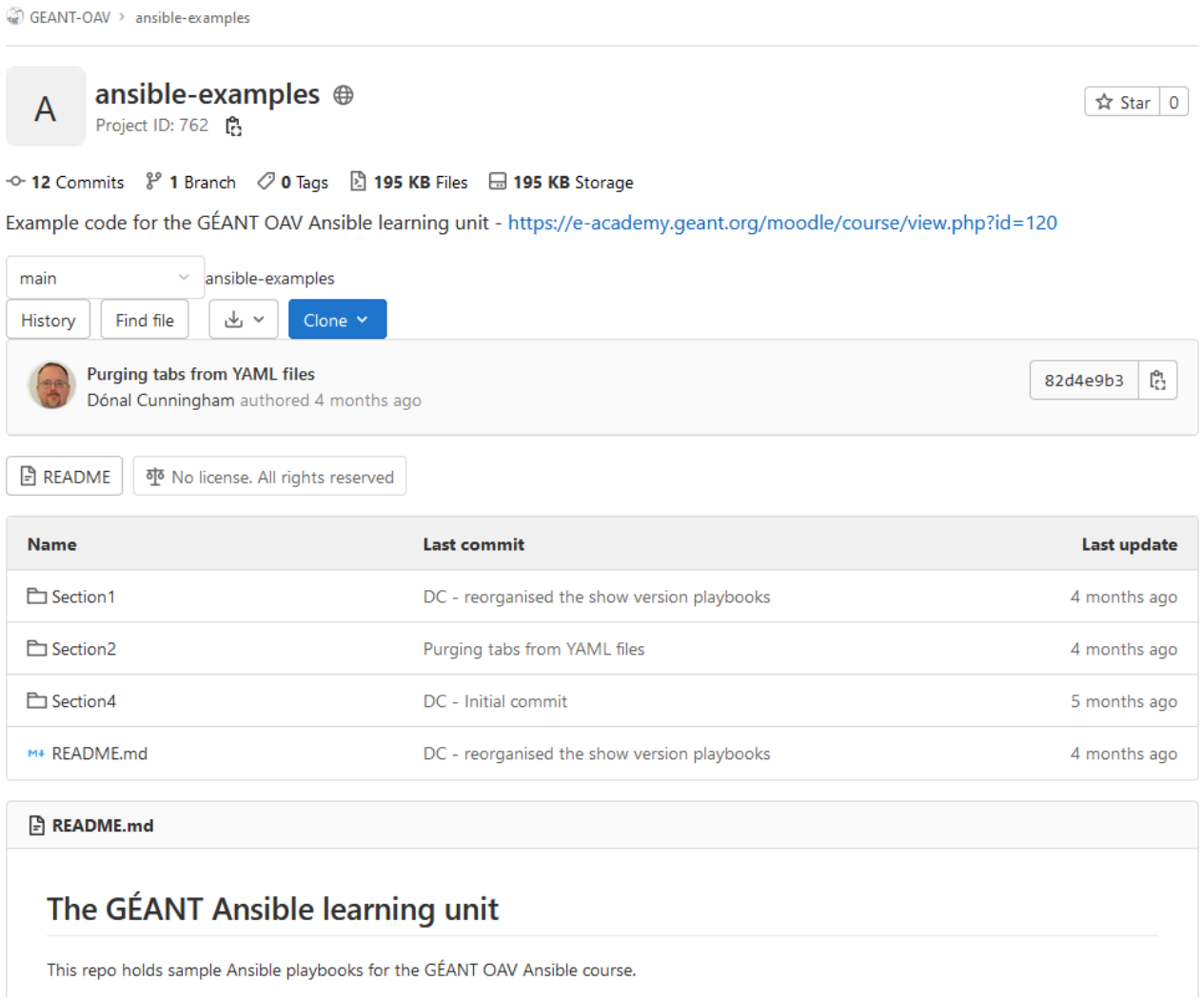




Most ansible users gather their Ansible work in YAML files called **Playbooks** – which start with three dashes. Playbook **comments** start with hashes, and are one per line. Playbooks contain a list of plays, or groups of tasks. In a playbook, look for the dashes in column one to see the list of plays. In the example shown here, there is one play (**Set up Apache**).

Playbooks can also contain the hosts or groups which the tasks should influence; these

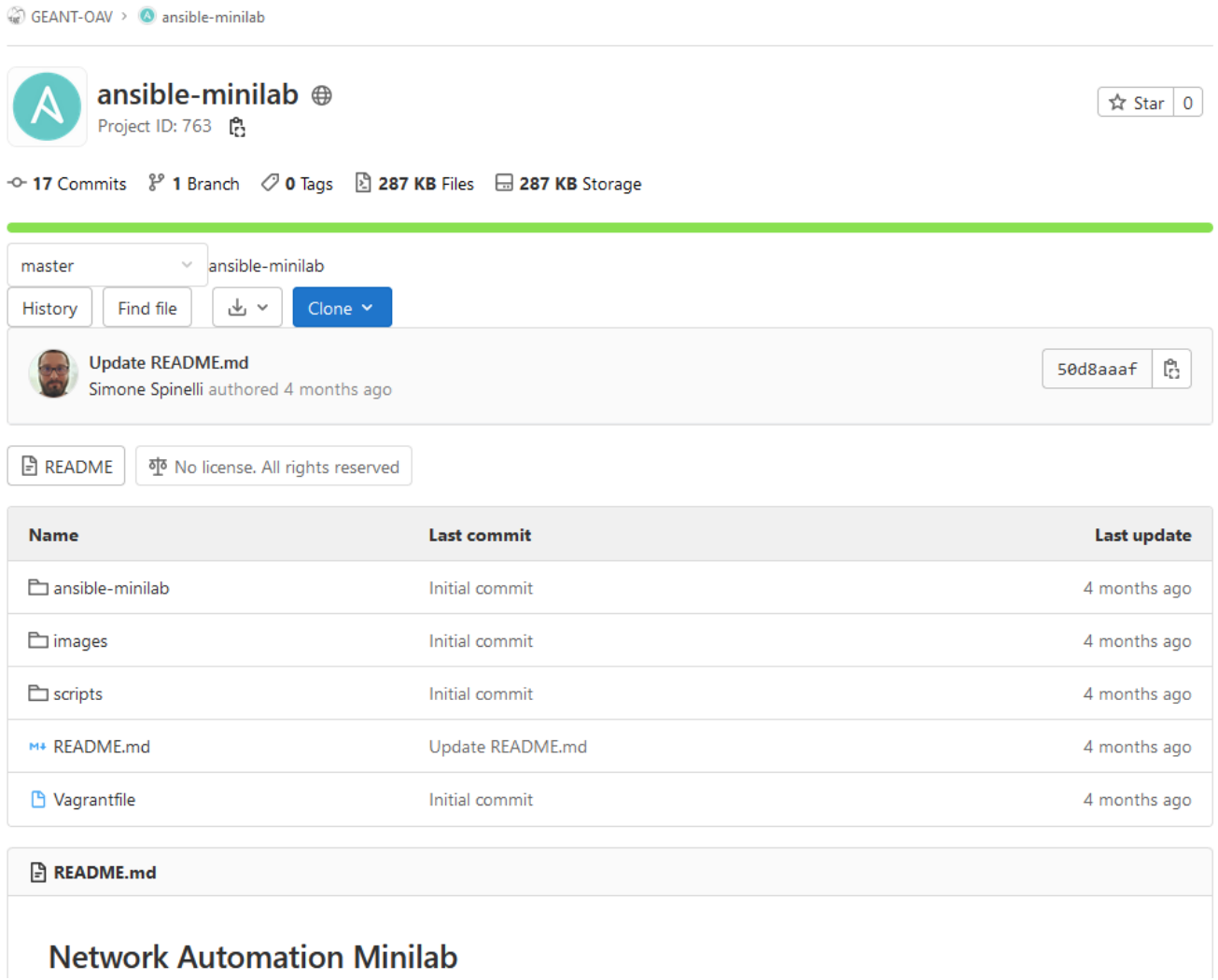
Ansible Examples



Example code used in the unit

https://gitlab.geant.org/geant-oav/ansible-examples

Ansible Mini-Lab

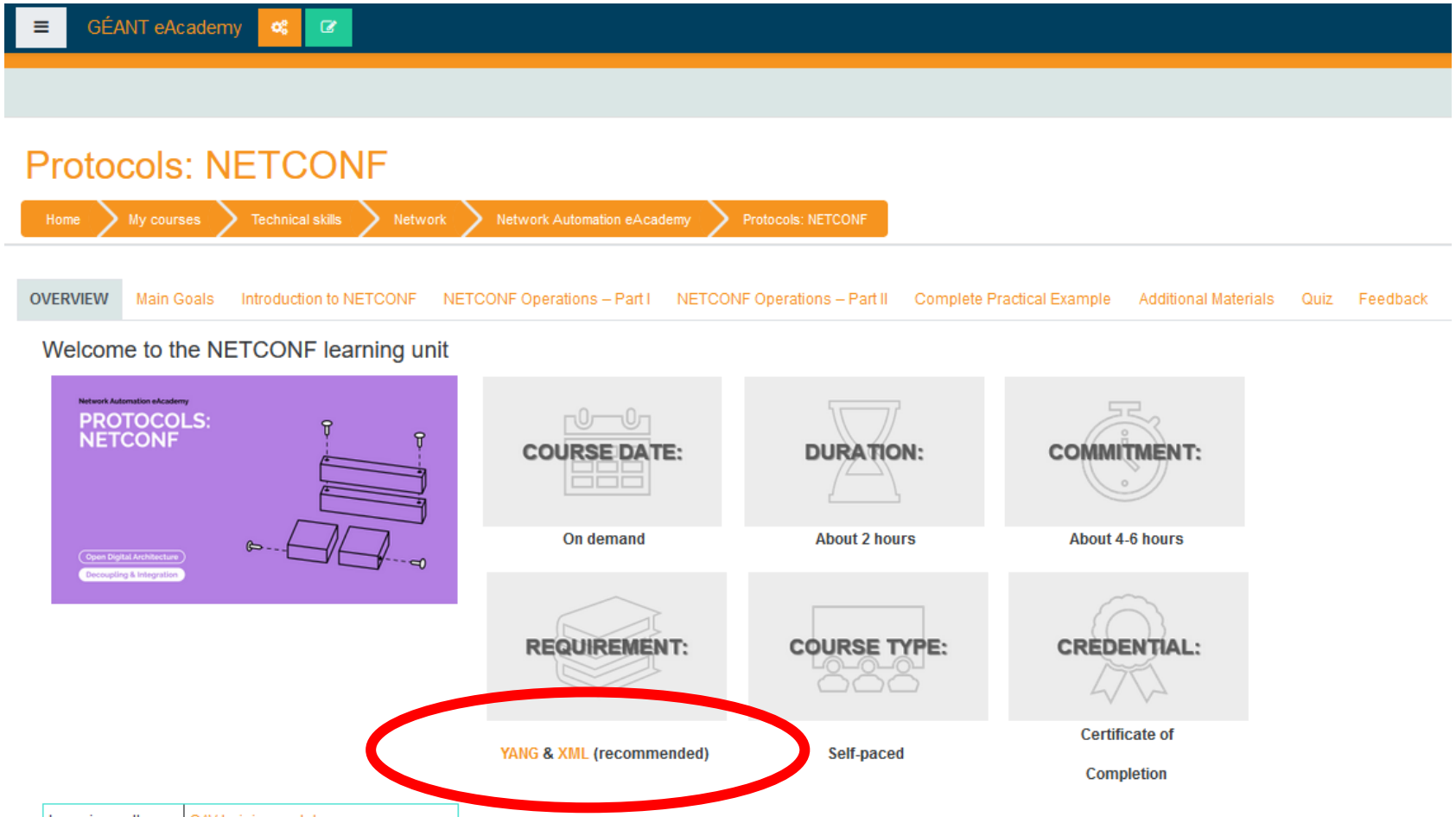


The mini-lab consists of:

- 1 Ubuntu VM (for the Ansible control node)
- 3 fully-interconnected Juniper vSRXs
- VM specifications:
  - The vSRXs each have 2 vCPUs and 4GB RAM
  - The Ansible control node has 2 vCPUs and 1GB RAM

https://gitlab.geant.org/geant-oav/ansible-minilab

NETCONF: Requirements, YANG & XML (and Data Models, Formats...)



Learning path:	OAV training portal
Preceded by:	Formats: JSON
Followed by:	Protocols: RESTCONF (coming soon)
Next available unit:	API Tools: Introduction to APIs

YANG: https://e-academy.geant.org/moodle/course/view.php?id=63
XML: https://e-academy.geant.org/moodle/course/view.php?id=132

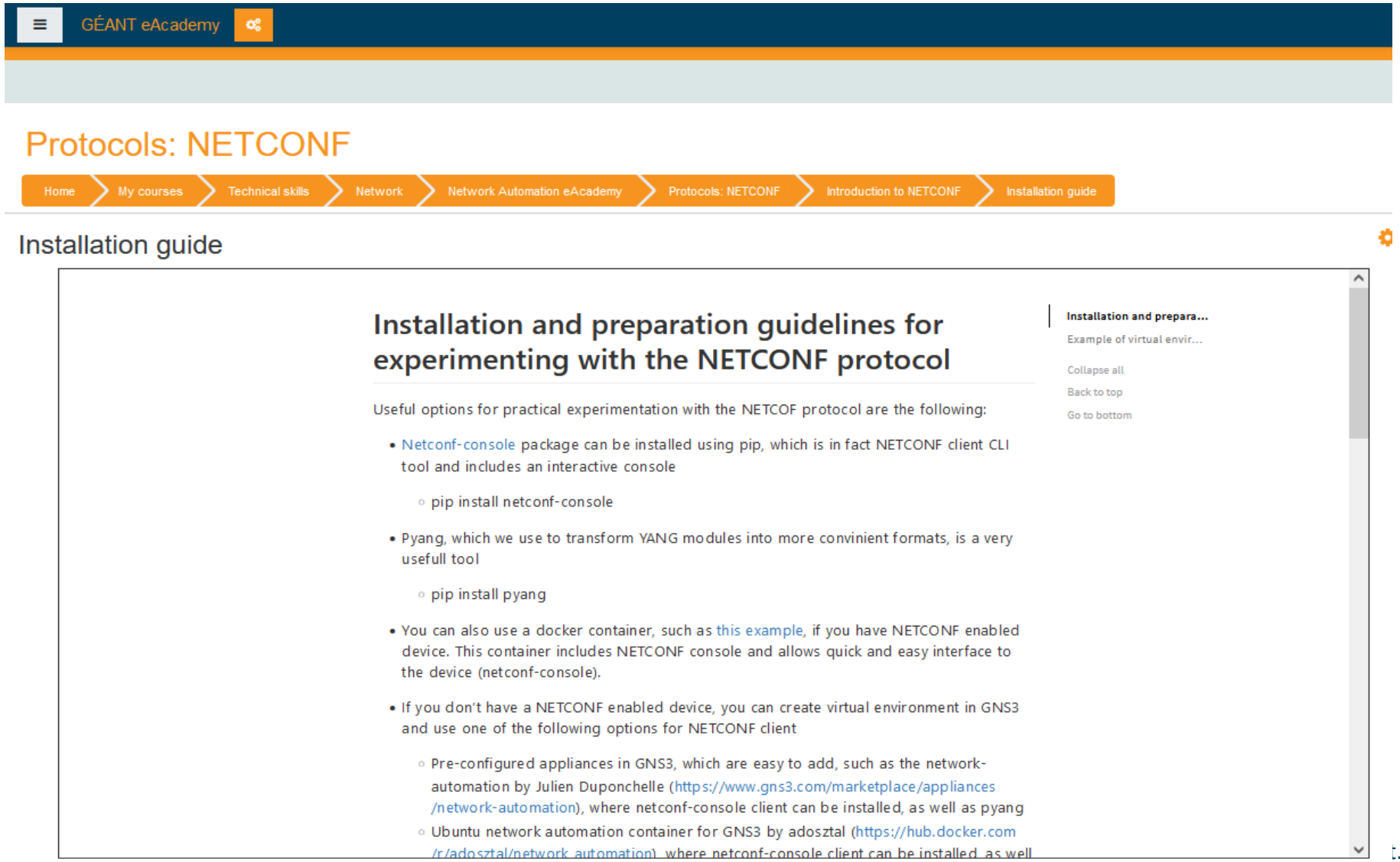
https://e-academy.geant.org/moodle/course/view.php?id=126

NETCONF: Contents

- Introduction to NETCONF (fundamentals, protocol layers, secure transport, NETCONF session, message framing, Remote Procedure Call (RPC), XML and datastores).
- NETCONF operations (hello, get-config, get and edit-config, lock, unlock, close-session, get-schema, commit, ...).
- Practical example.

https://e-academy.geant.org/moodle/course/view.php?id=126

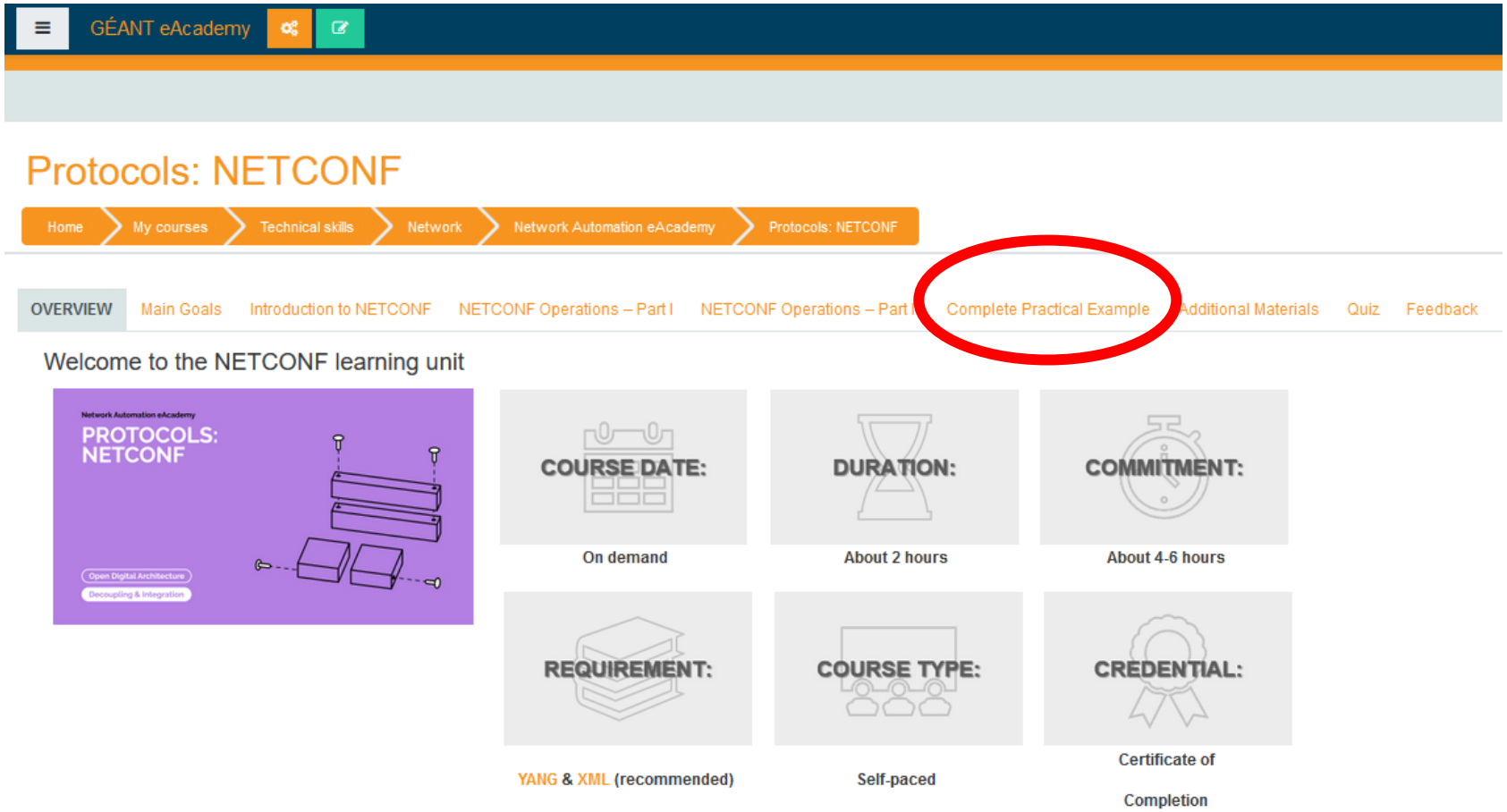
NETCONF: Installation guide



HTML document

A virtual environment in GNS3 is used

NETCONF: Practical Example



Learning path:	OAV training portal
Preceded by:	Formats: JSON
Followed by:	Protocols: RESTCONF (coming soon)
Next available unit:	API Tools: Introduction to APIs

https://e-academy.geant.org/moodle/course/view.php?id=126

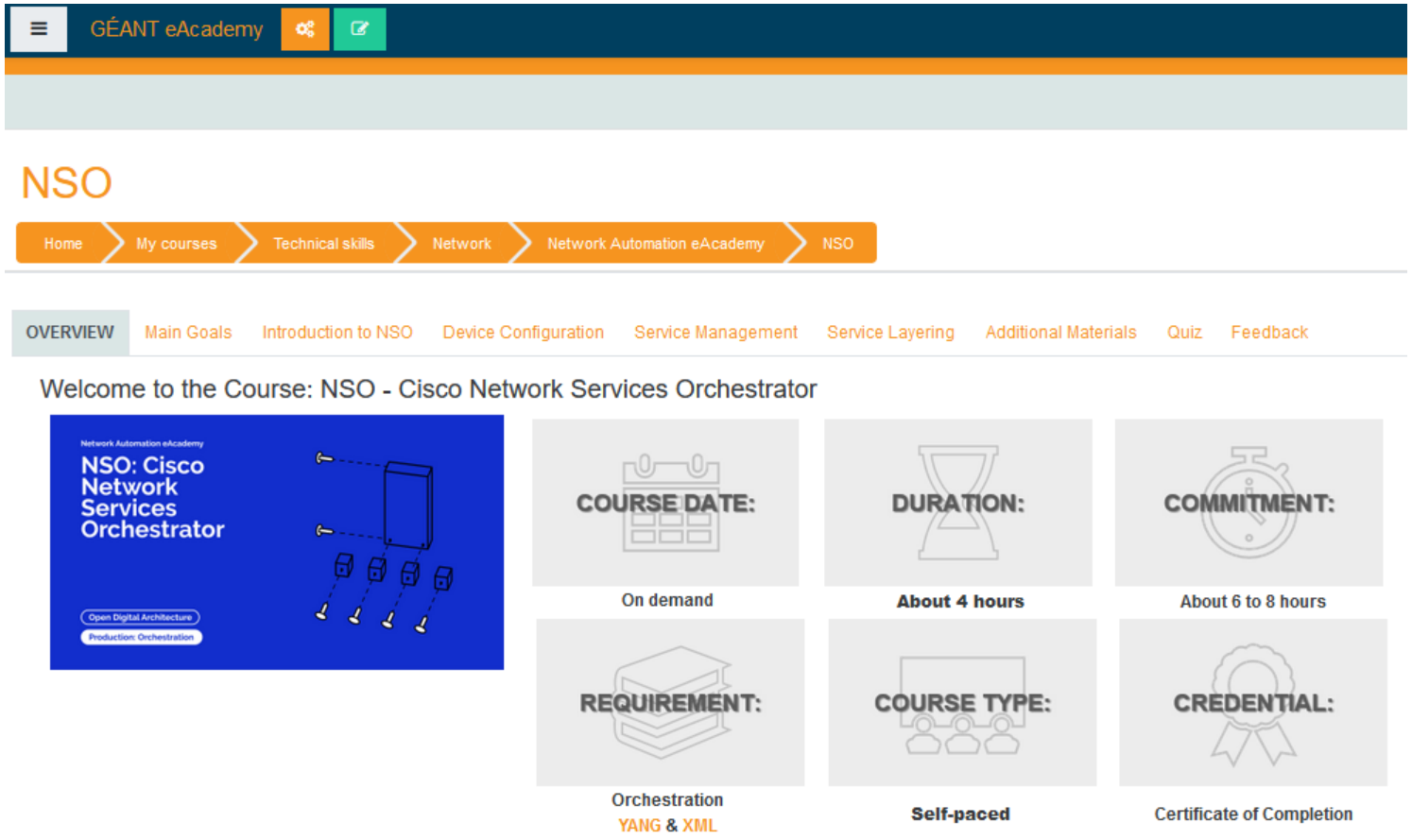
NETCONF: Practical Example

Adding a static route to a router, step-by-step and with the guidance of the trainer:

1. Choosing the right YANG module
2. Downloading and viewing the YANG module
3. Getting the current operational and configuration data from the router
4. Copying the running configuration to the candidate datastore
5. Creating an XML file for making the required configuration
6. Applying the changes to the router
7. Checking the configuration
8. Copying the running configuration to the startup datastore

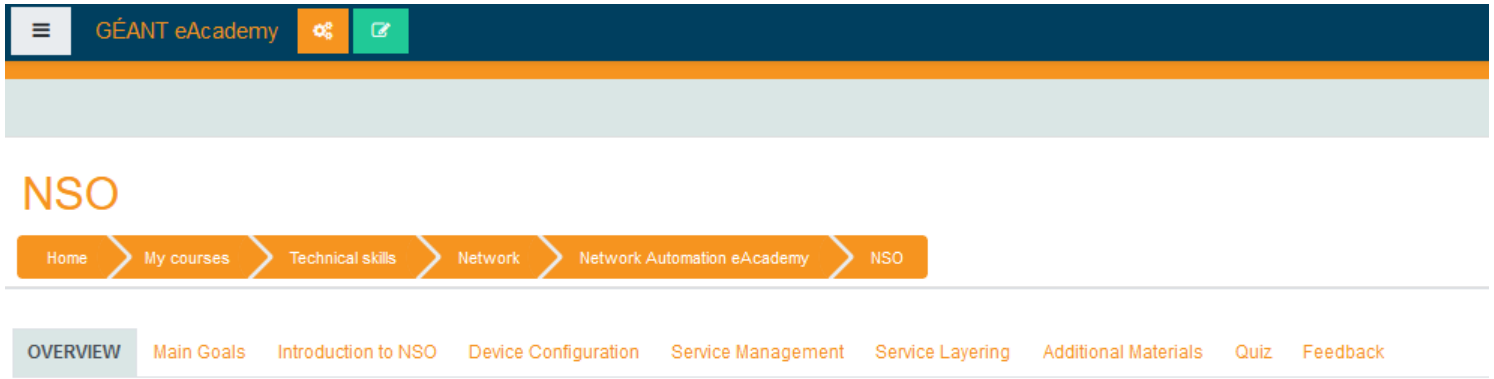
https://e-academy.geant.org/moodle/course/view.php?id=126

NSO



https://e-academy.geant.org/moodle/course/view.php?id=114

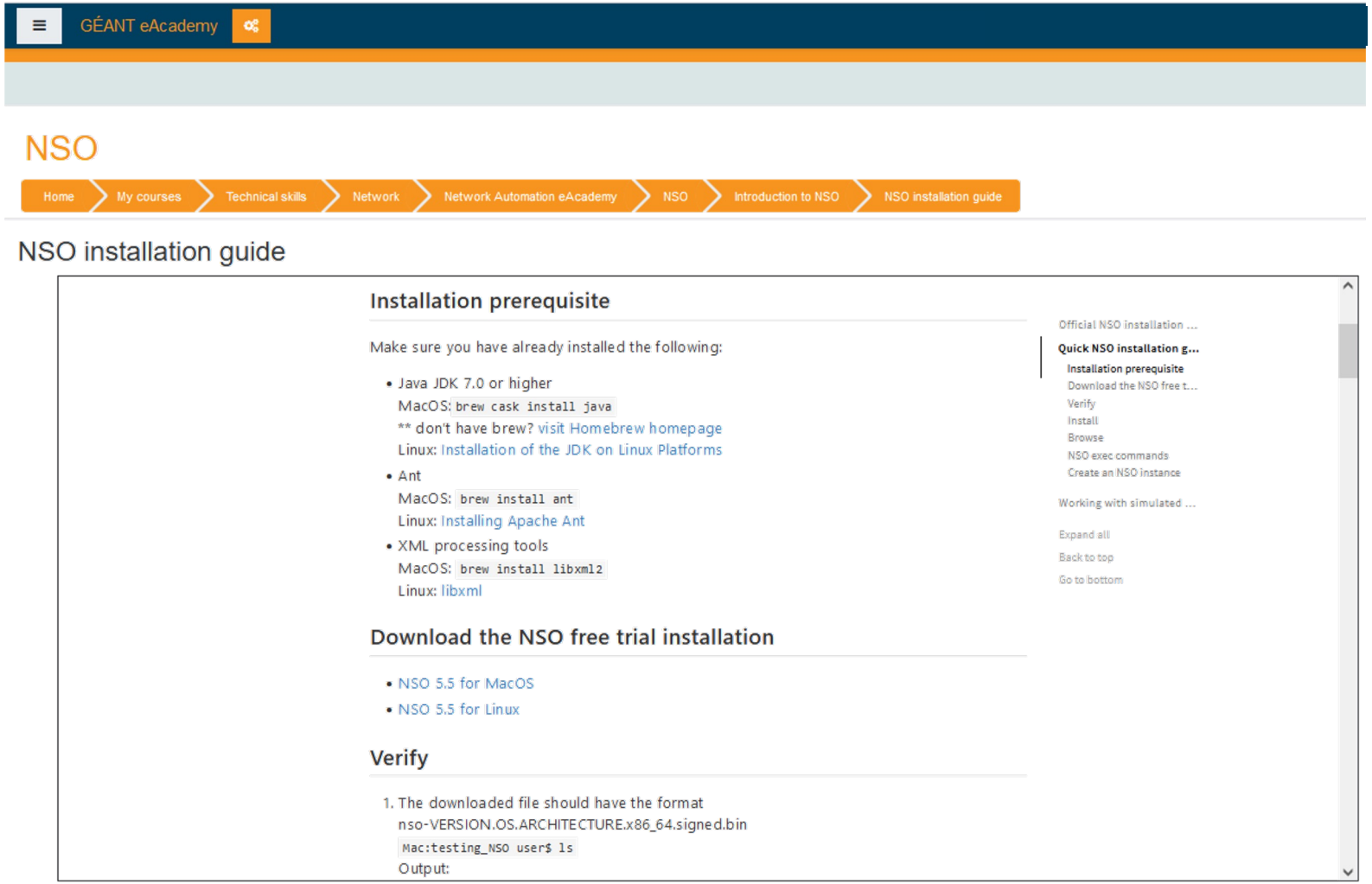
NSO: Contents



- Introduction to NSO and its use for automation and orchestration
- NSO functionalities
- NSO components
- Device configuration management using NSO
- Service management using NSO
- Layered Service Architecture
- How to install and use NSO
- Practical examples for device configuration and service management

https://e-academy.geant.org/moodle/course/view.php?id=114

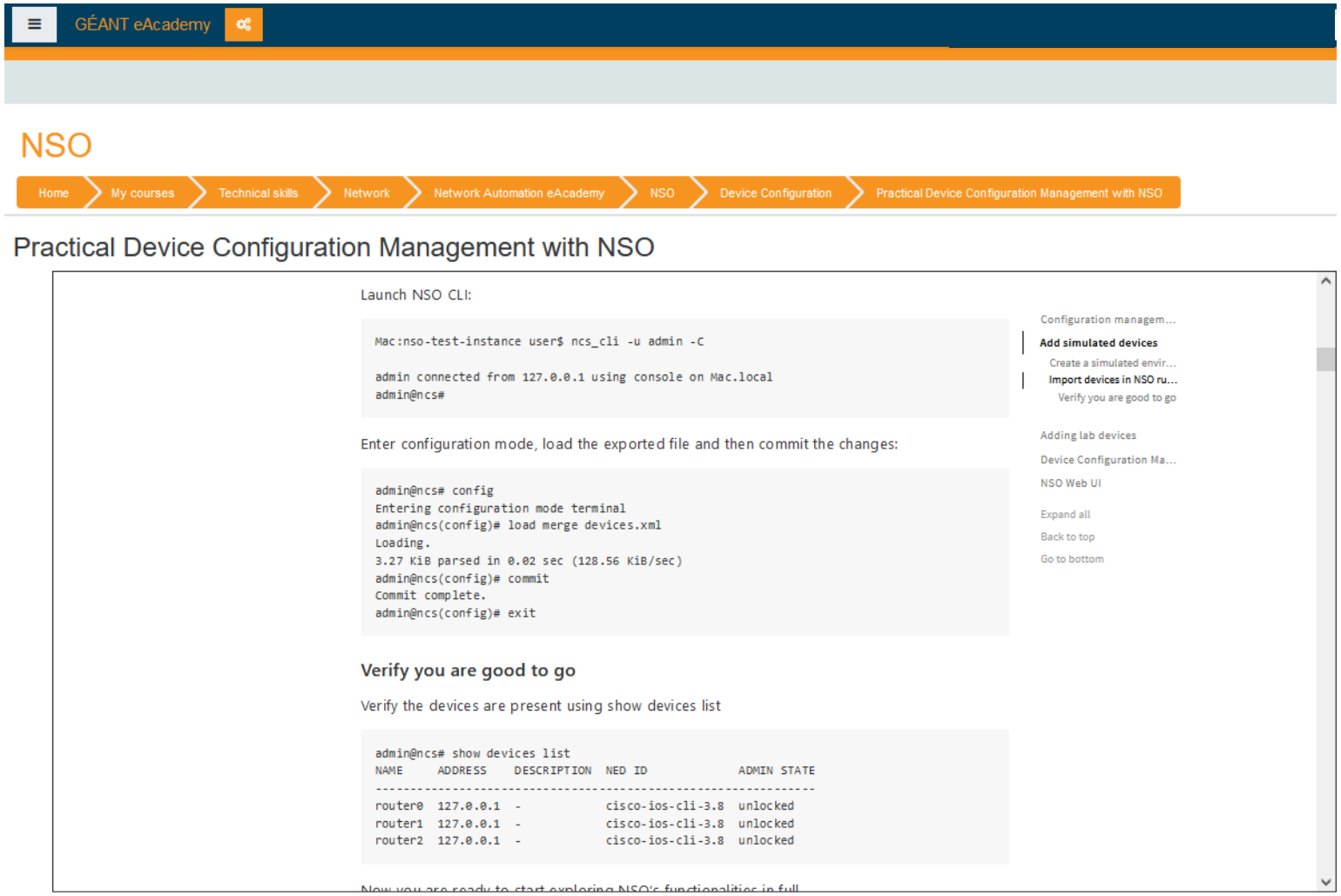
NSO: Installation Guide



Detailed guideline on how to install an NSO evaluation version and setup a simulated network environment using NETSIM.

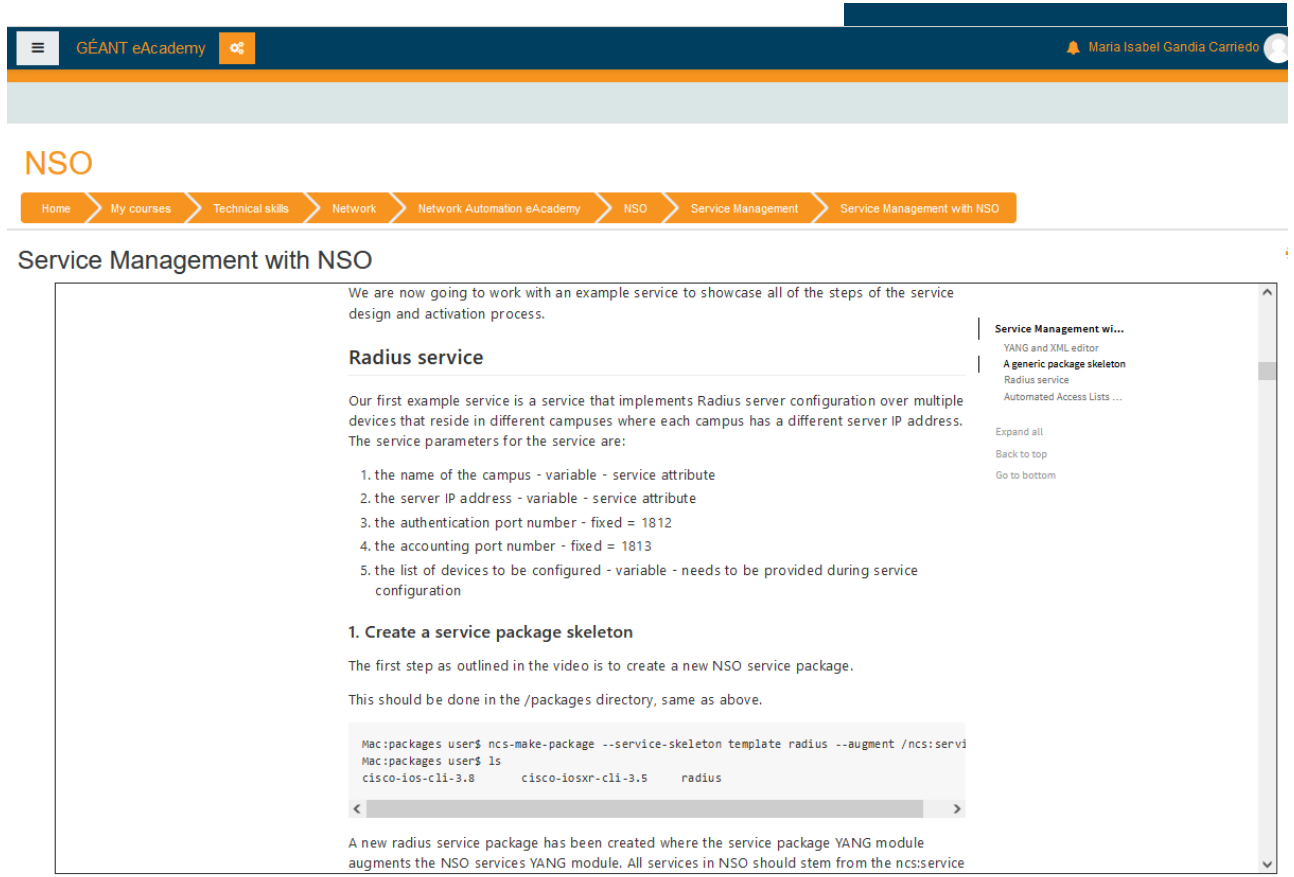
https://e-academy.geant.org/moodle/course/view.php?id=114

NSO: Practical Device Configuration Management with NSO



Simple practical examples showcasing the power of transactions in NSO.

NSO: Two Practical Examples



Simple practical examples showcasing the power of service orchestration in NSO.

1. Implementing a Radius server configuration over multiple devices in different campuses.
2. Deploying the same access list (ACL) to multiple devices, and/or multiple interfaces on one device.

Accessing the Network Automation eAcademy (Moodle)

Introduction

- **OAV - Introduction** (30')
- **OAV Architecture Requirements for NRENS** (10')
- **The OAV Architecture Blueprint** (30')

DevOps

- **Introduction to CI/CD** (15')
- **CI/CD: GitlabCI** (40')

TM Forum Open Digital Architecture

Decoupling & Integration

- **Introduction to Data Modelling, Data Formats, and Protocols** (30')
- **Data Modelling: YANG** (10')
- **Formats: XML** (60')
- **Formats: YAML** (30')
- **Formats: JSON** (45')
- **Protocols: NETCONF** (4 h - including installation)
- **Introduction to API** (45')

Engagement Management

- **Introduction to Engagement Management** (15')

Party Management

- **Introduction to Party Management** (15')

Core Commerce Management

- **Introduction to Core Commerce Management** (15')

Production

- **Introduction to Production** (30')
- **Introduction to Virtualisation** (30')
- **Introduction to Automation** (30')
- **Automation Tools: Ansible** (60'+lab time)
- **Introduction to Configuration Management** (20')
- **Orchestration: NSO** (6h - including lab)

Intelligence Management

- **Introduction to Intelligence Management** (15')

https://wiki.geant.org/display/NETDEV/OAV+Training+Portal

https://e-academy.geant.org/moodle/course/index.php?categoryid=20

More on Architectures in the Network Automation eAcademy

Architectures

- Standards & Common Architectures
- TM Forum ODA
- SPA
- MEF
- ETSI-OSM
- ETSI-ZSM
- ONAP
- 5G 3GPP
- GVM
- SENSE
- TALENT
- EOSC
- OpenBaton

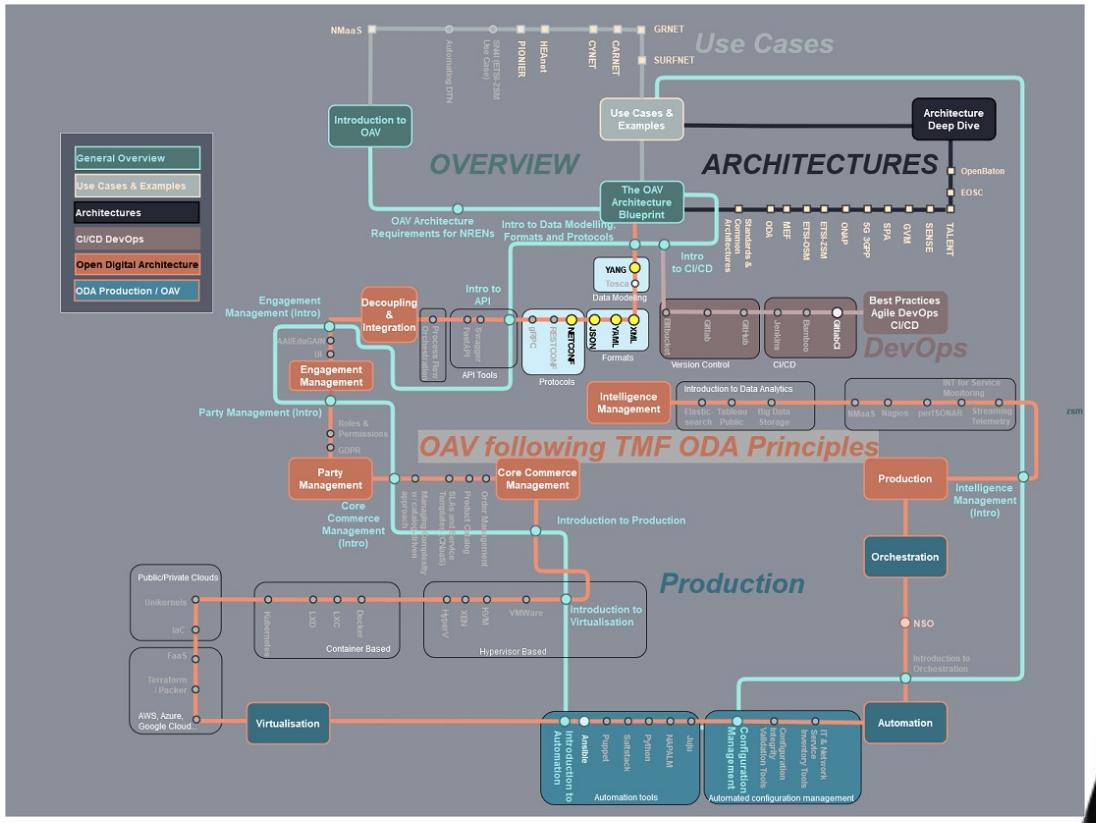
Architecture Mappings

NREN use cases

- CARNET
- CYNET
- GRNET
- HEAnet
- PIONIER
- SURFNET

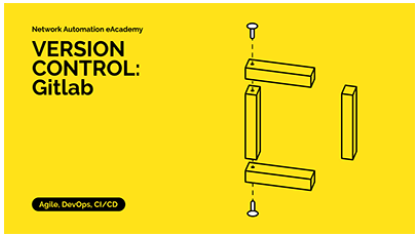
other use cases

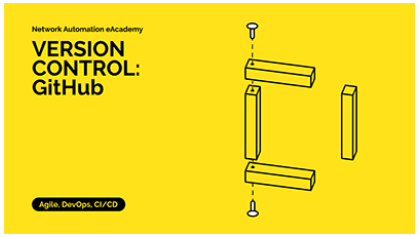
- NMaaS

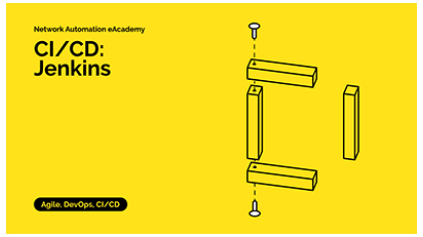


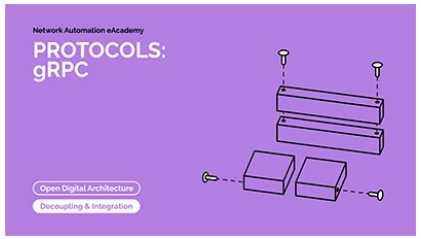
https://wiki.geant.org/display/NETDEV/OAV+Training+Portal

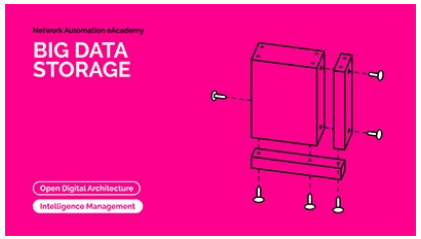
What Next? Currently Working on...

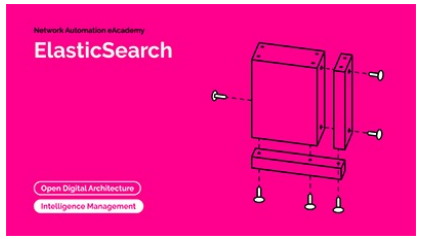








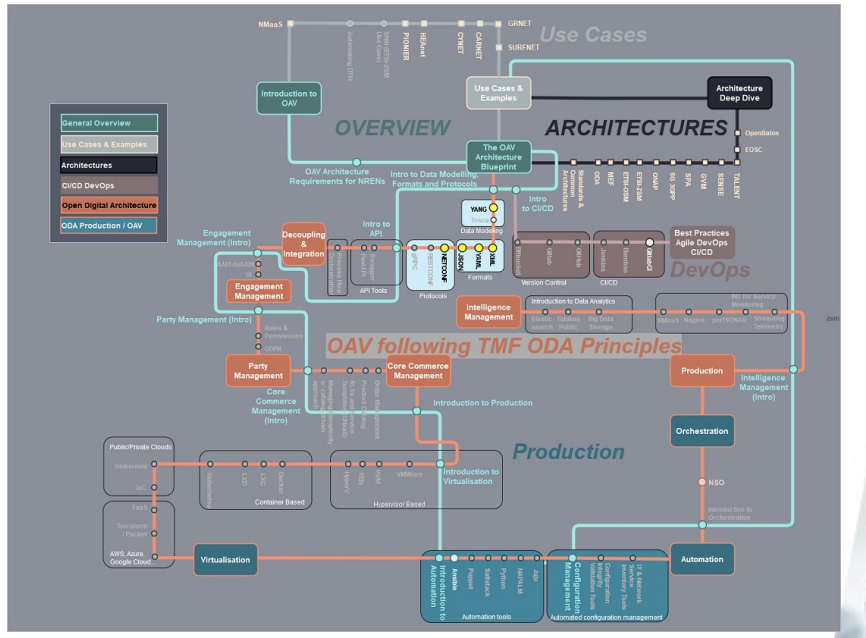




+ Towards Intelligent Networks

What Next?

- More units:
  - CI/CD: Bamboo
  - FastAPI
  - User Management
  - Product Catalog
  - Order Management
  - KVM
  - XEN
  - LXC
  - Tableau Public
  - Bitbucket
  - SWAGGER
  - UI
  - HyperV
  - LXD
  - Terraform/Packer (AWS, Azure, Google Cloud...)
  - Juju
  - Configuration integrity Validation tools
  - AAI
  - Roles&Permissions
  - SLAs and Service Templates
  - Unikernels (Public / Private clouds)
  - Saltstack
  - NAPALM
  - Performance measurement with perfSONAR
  - Streaming Telemetry



With Many Thanks to our Trainers!

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Iacovos Ioannou (CyNet)	Your name here?

And the WPL, the GLAD team and the Communications team at GÉANT!

Contact us at oav@lists.geant.org

For any questions, you can join us the first Tuesday of every month.

Do you want to know more?

... enjoy our training packages!

Photo by Tim Chown

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Thank you

Any questions?

Or email us:

oav@lists.geant.org

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