Network (Automation) eAcademy

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WP6-T2

GNA-G VC

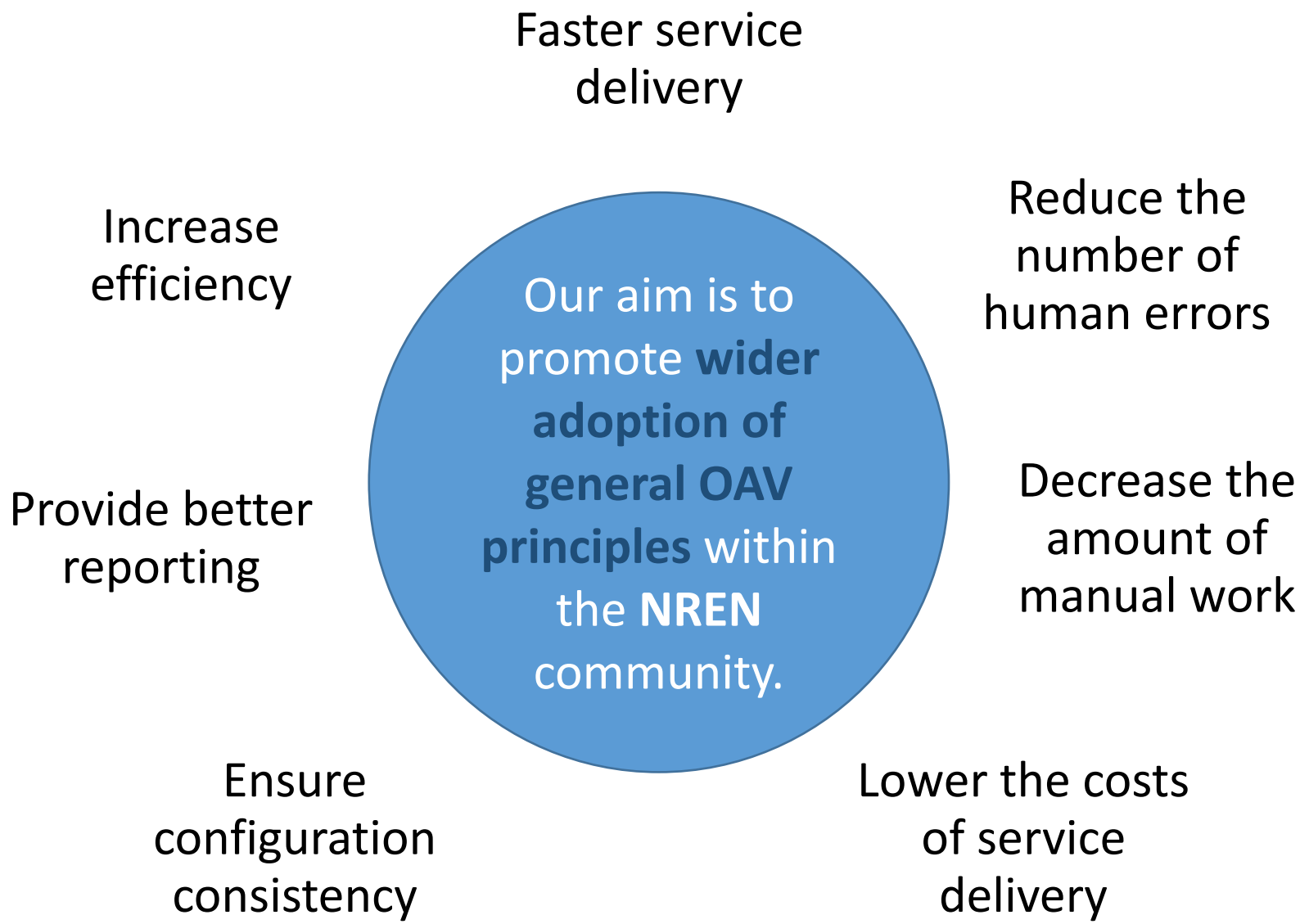
Online, 23 November 2022

www.geant.org

Agenda: Network (Automation) eAcademy

- Introduction: Orchestration, Automation and Virtualisation in GN4-3
- Architecture/Mapping
- Training
- Terminology
- Maturity Model
- Wiki and dissemination
- What next?

OAV: Orchestration, Automation and Virtualisation



Why Architecture, Training, Terminology, Maturity Model...?

- OAV Survey to the NRENs (published in Sep 19):

  https://www.geant.org/Projects/GEANT_Project_GN4-3/GN43_deliverables/D6-2_Automation-and-Orchestration-of-Services-in-the-GEANT-Community.pdf

- Several discussions and workshops around the topic:
  - GN4-3 Future Service Strategy Workshop, May 19
  - BoF session at TNC, June 19
  - STF17, July 2019
  - Network Management and Monitoring Workshop (NEMMO), Oct 19

Collaborative approach to OAV in the GÉANT Community

- Strong need for collaboration and exchange of knowledge and expertise
- Knowledge as a gap
- We speak different languages
- A generally accepted architecture blueprint needed
- NRENs are willing to share experiences and learn from others

Network Automation eAcademy

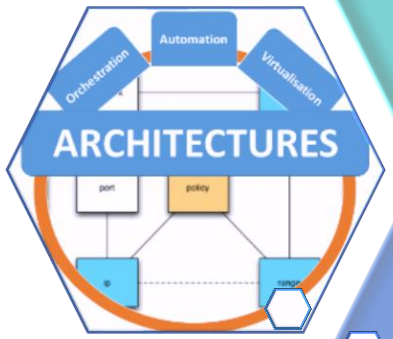
Powered by:

GLAD
GÉANT LEARNING & DEVELOPMENT

Terminology

OAV public wiki

Training

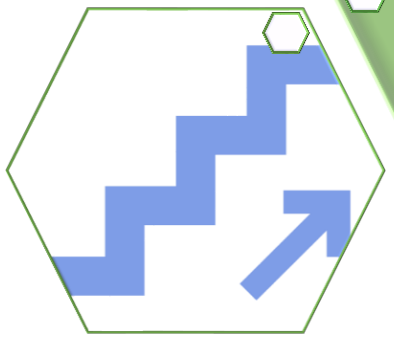


CNaaS (use case)

Architecture /Mapping

DTN (use case)

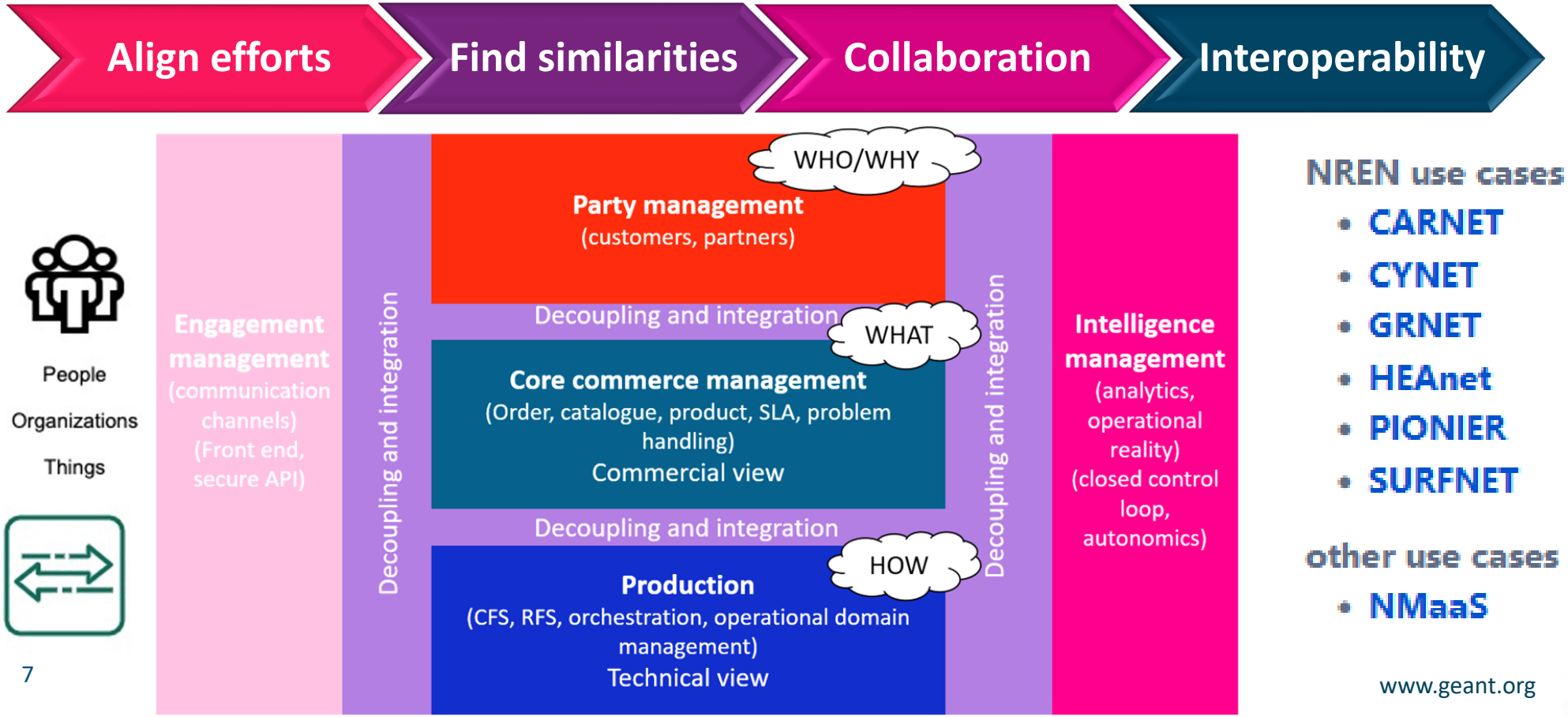
Maturity Model



GÉANT

Architecture & Mappings

- Mapping NREN & use cases architectures to a common blueprint, the TM Forum Open Digital Architecture (functional architecture).



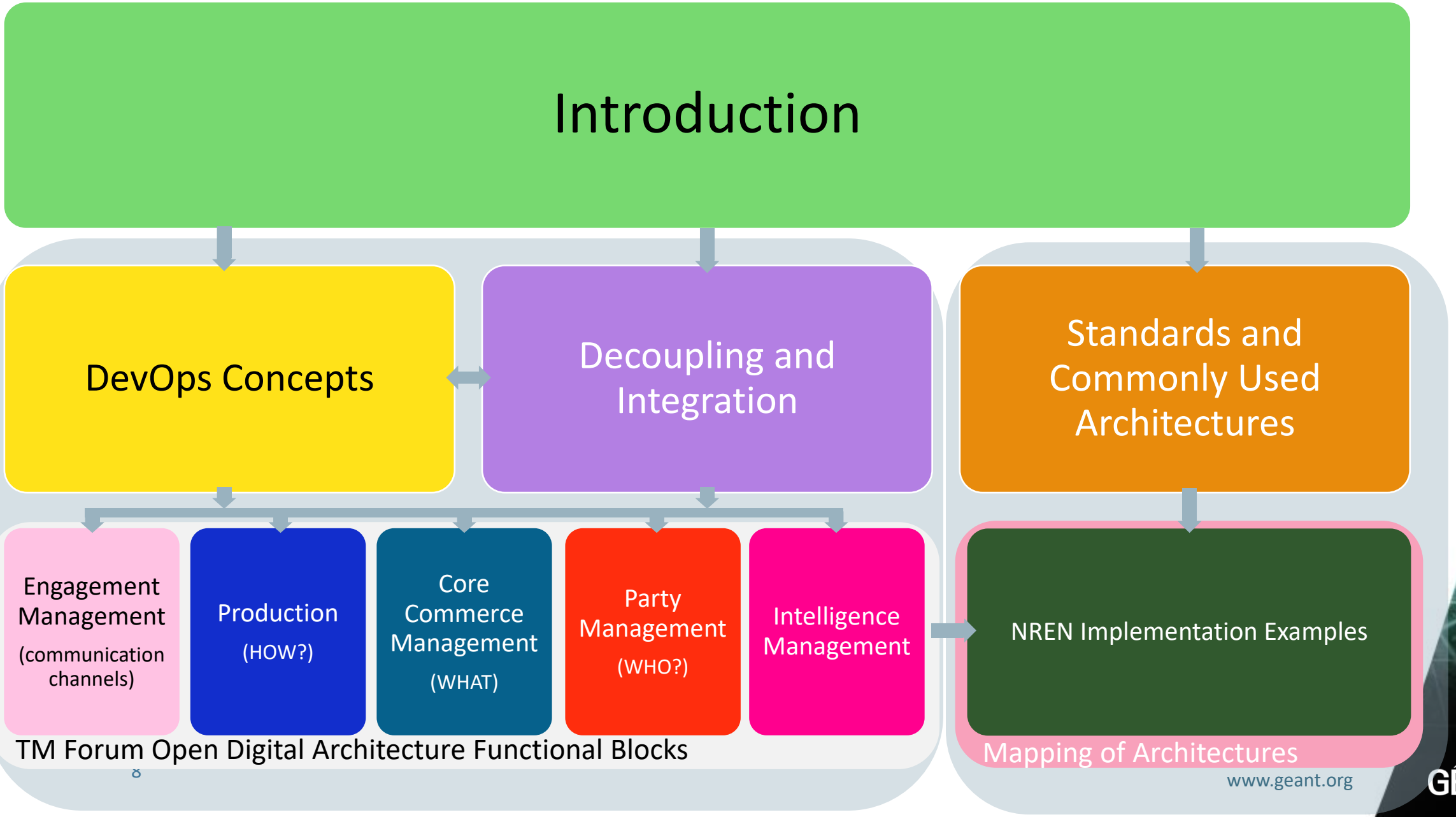
NREN use cases

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

other use cases

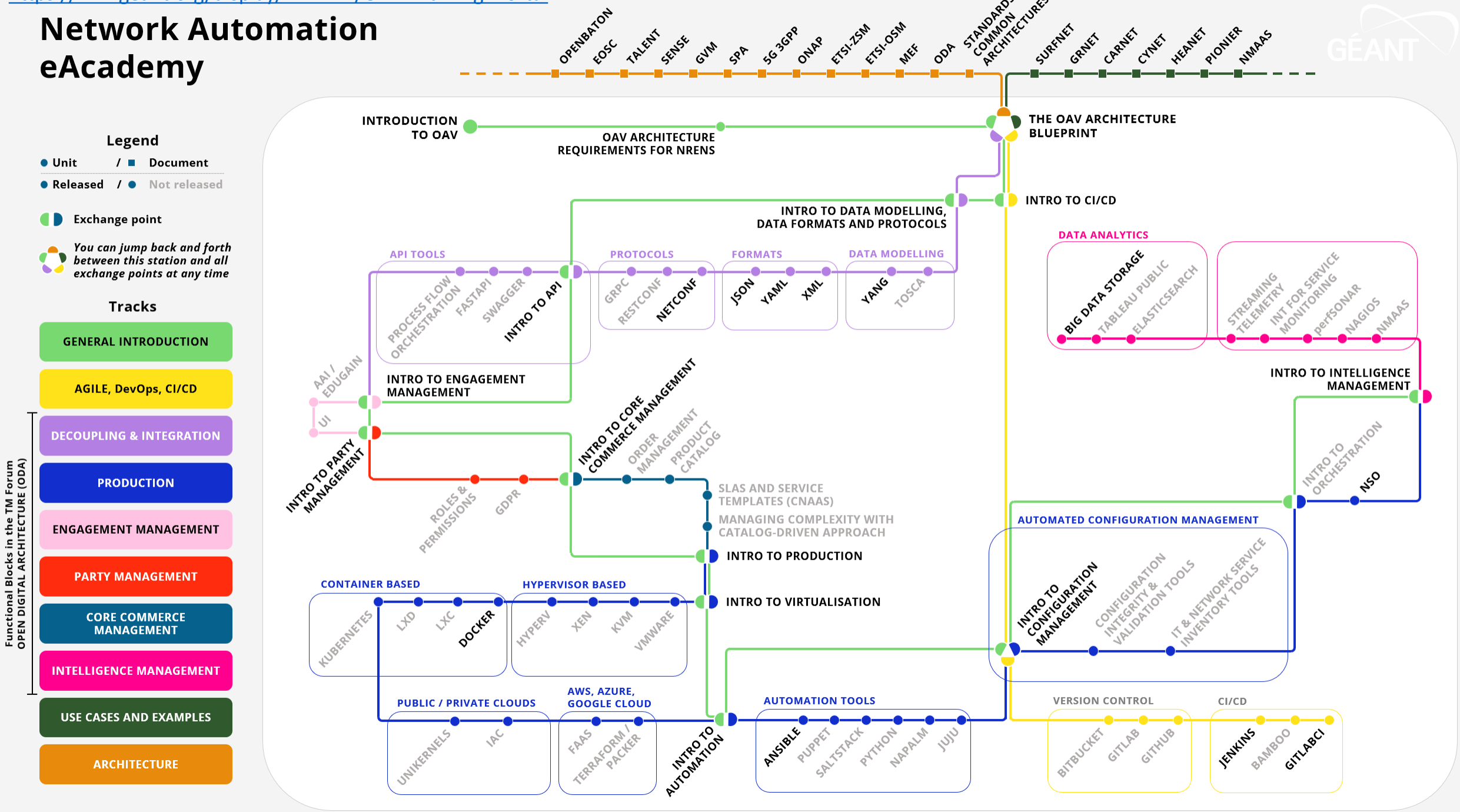
- NMaaS

Knowledge Map for the Training



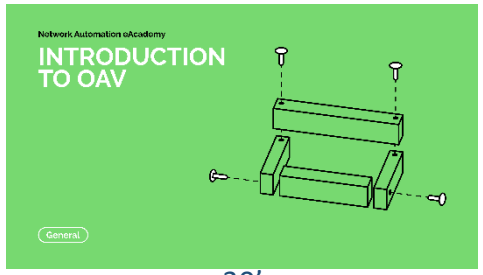
https://wiki.geant.org/display/NETDEV/OAV+Training+Portal

Network Automation eAcademy



Training

General Introduction Line



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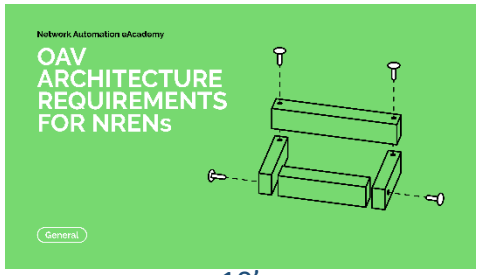

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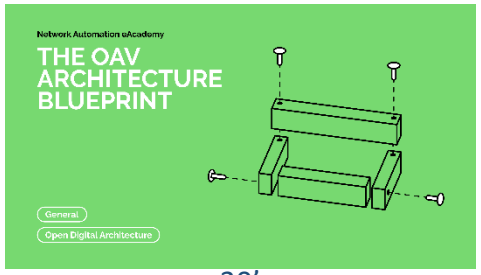

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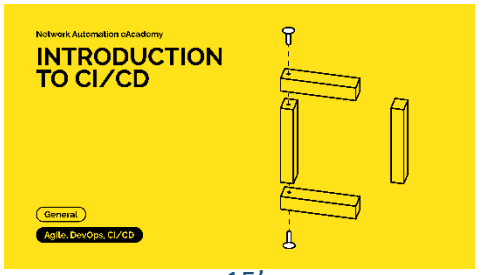

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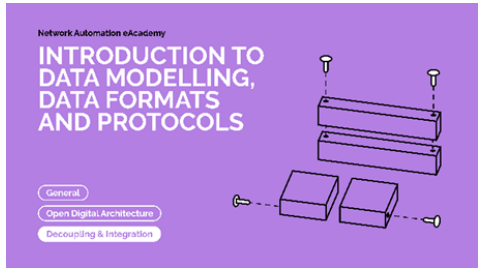

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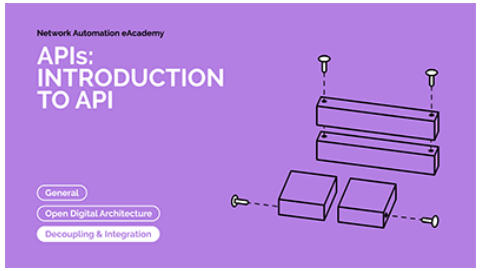

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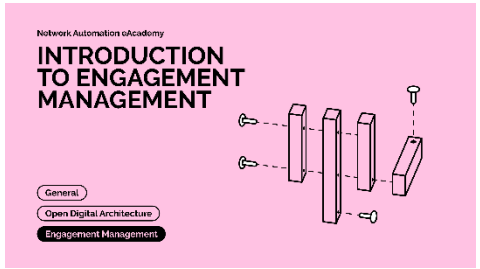

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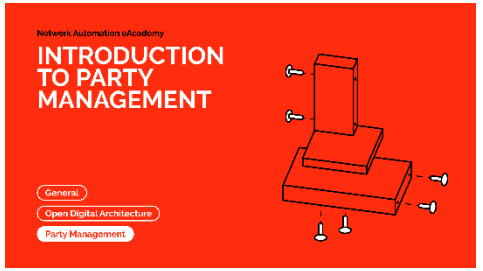

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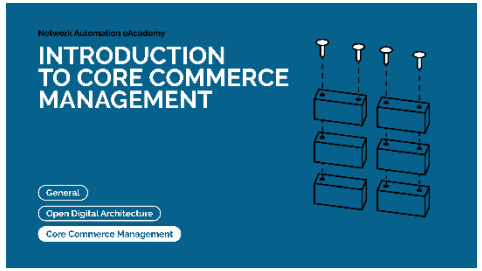

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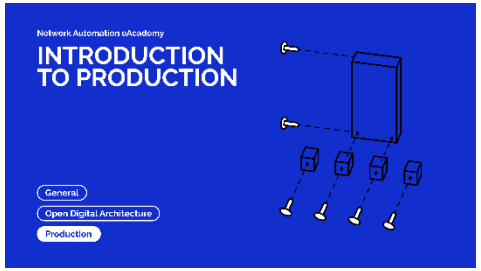

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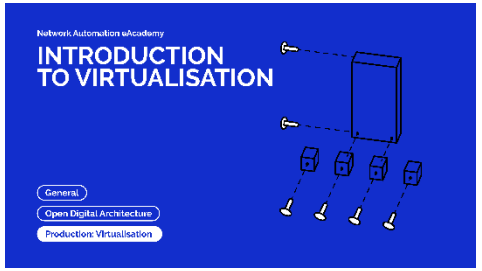

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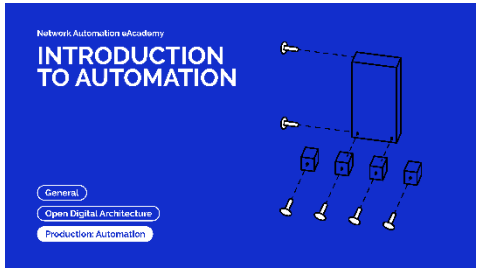

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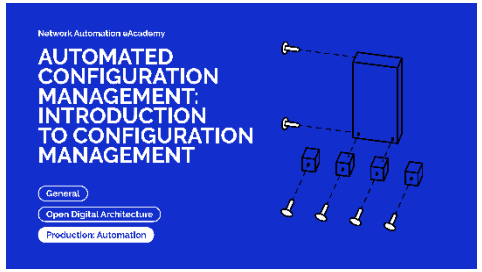

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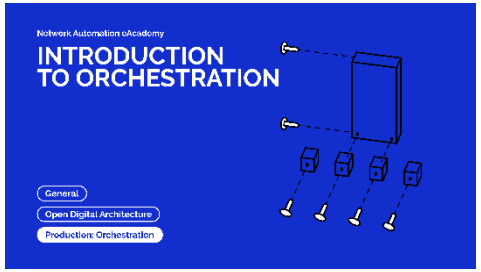

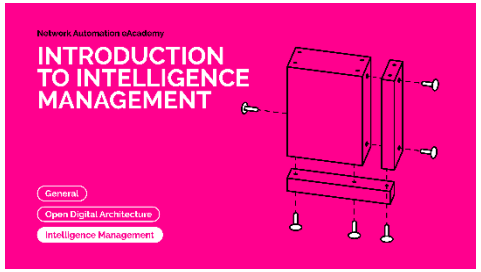

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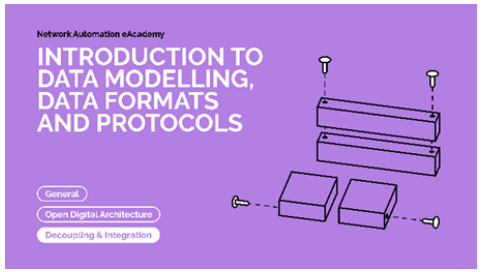
Decoupling and Integration (Data Models, Formats, Protocols, APIs)



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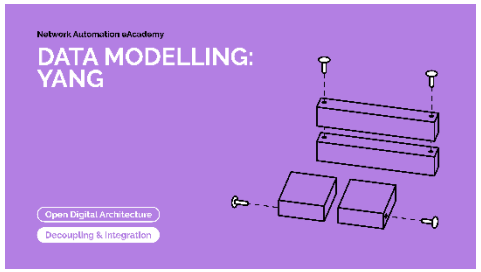

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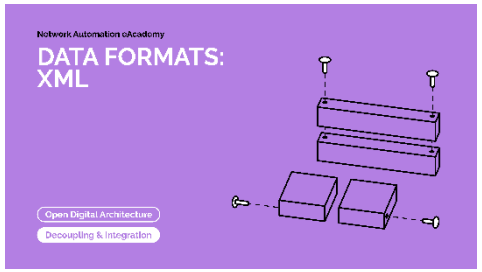

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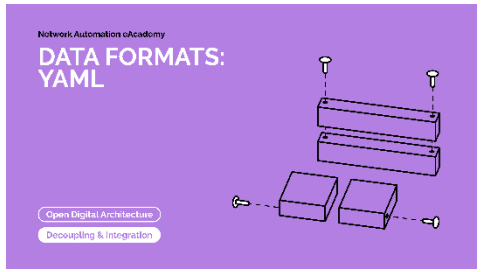

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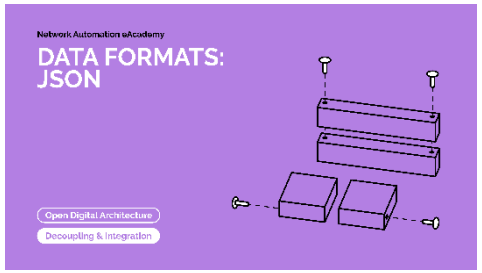

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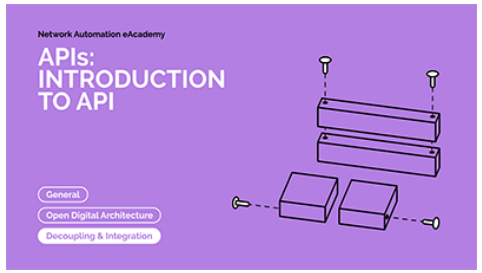
4h (including installation)



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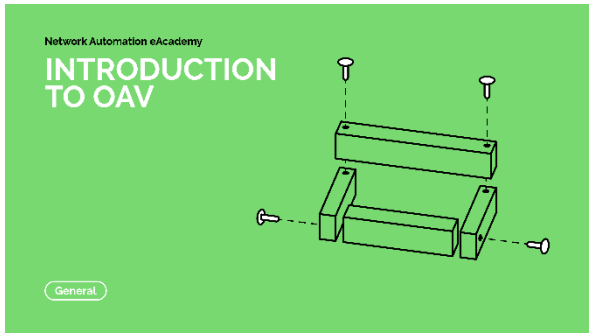
Ansible



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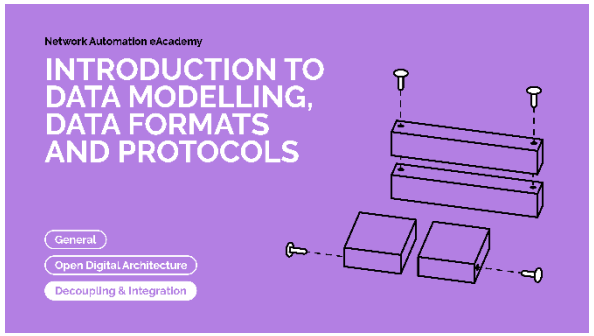

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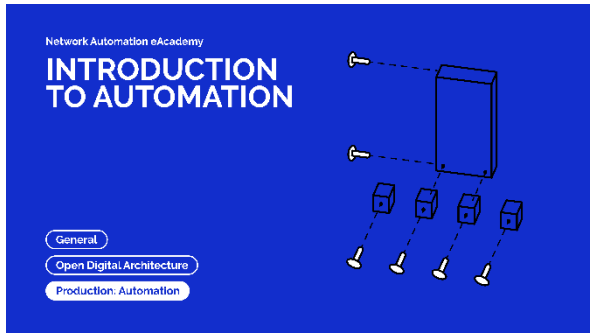

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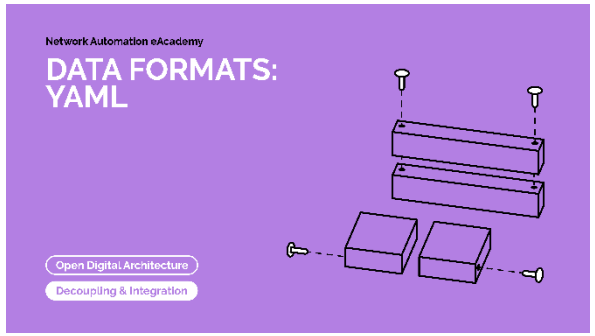

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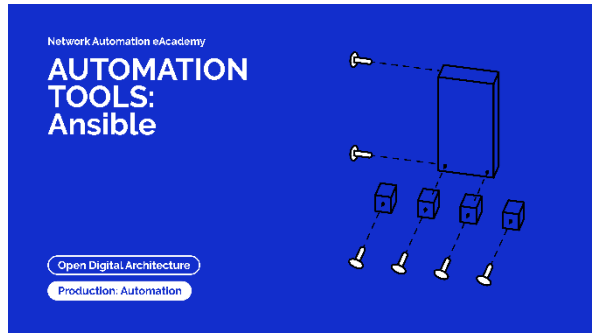


60’ + lab time

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

Current Courses in the Network Automation eAcademy

Training

Introduction

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

DevOps

- **Introduction to CI/CD** (15')
- **CI/CD: Jenkins** (5h)
- **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')
- **Container-Based Virtualisation: Docker / Swarm** (3h)
- **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')
- **Big Data Storage** (1.5h)

ADDITIONAL READING

Architecture Mappings

NREN use cases

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

other use cases

- **NMaaS**

Architectures

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

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

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

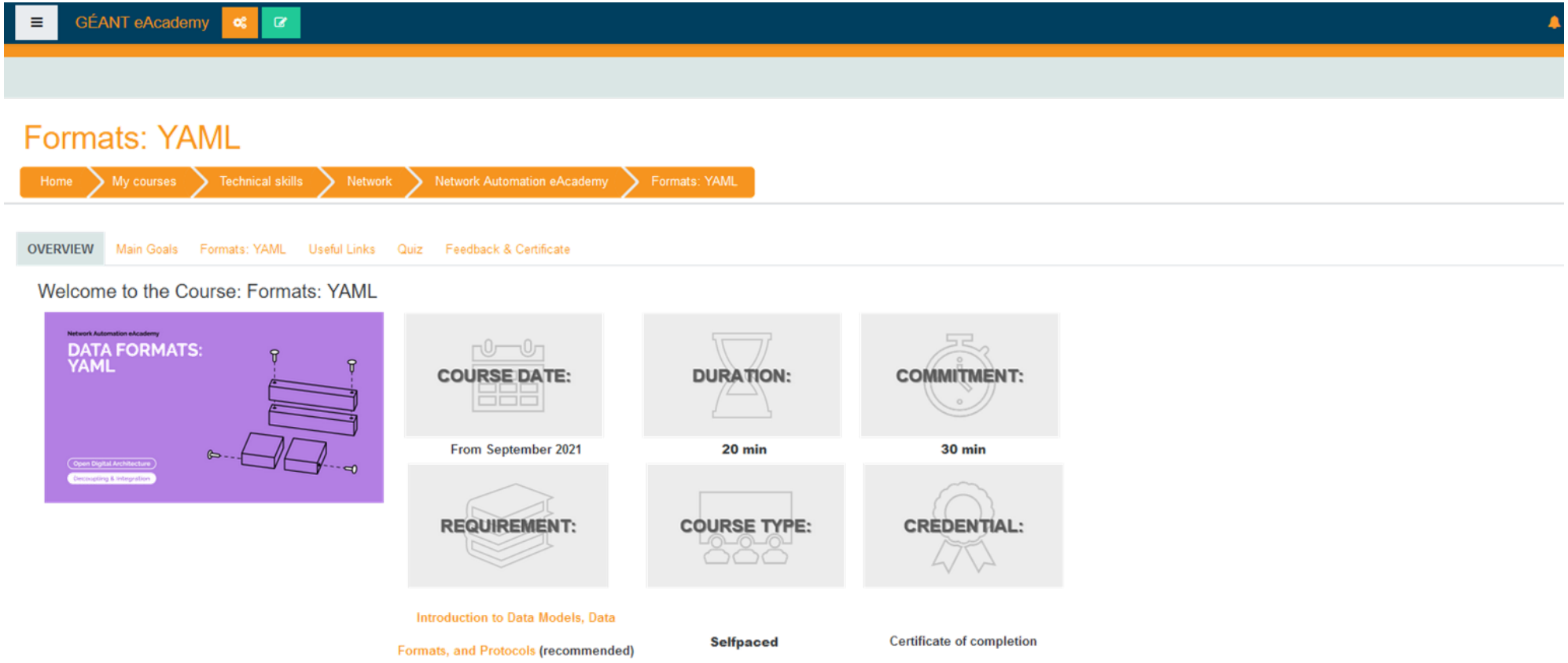
Learning path:	OAV Training Portal
Prerequisite:	Formats: YAML
Preceded by:	Introduction to Automation
Followed by:	Puppet (not yet published)
Next available:	Configuration Management

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?



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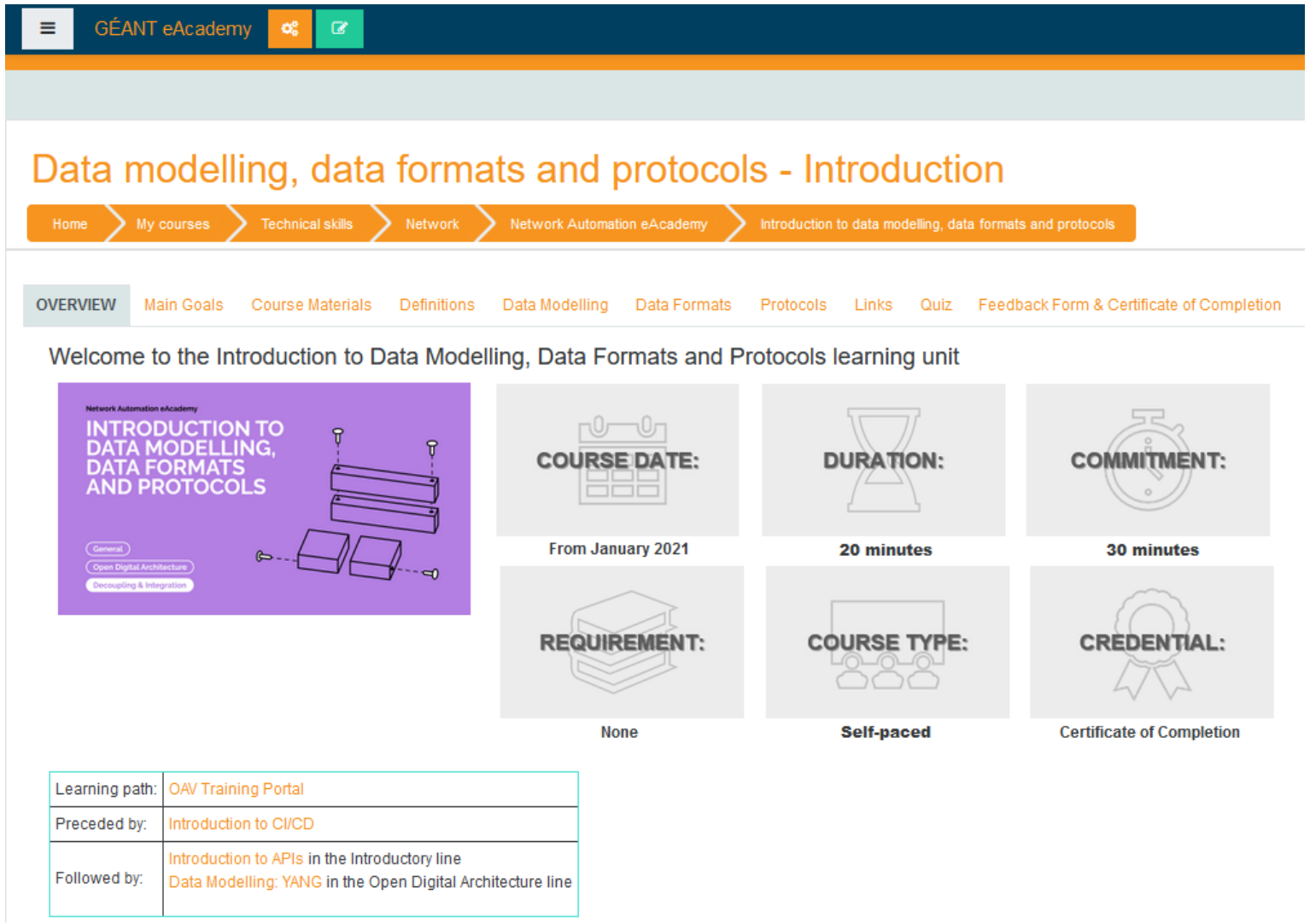
Ansible ← YAML ← Data models, Data Formats, and Protocols



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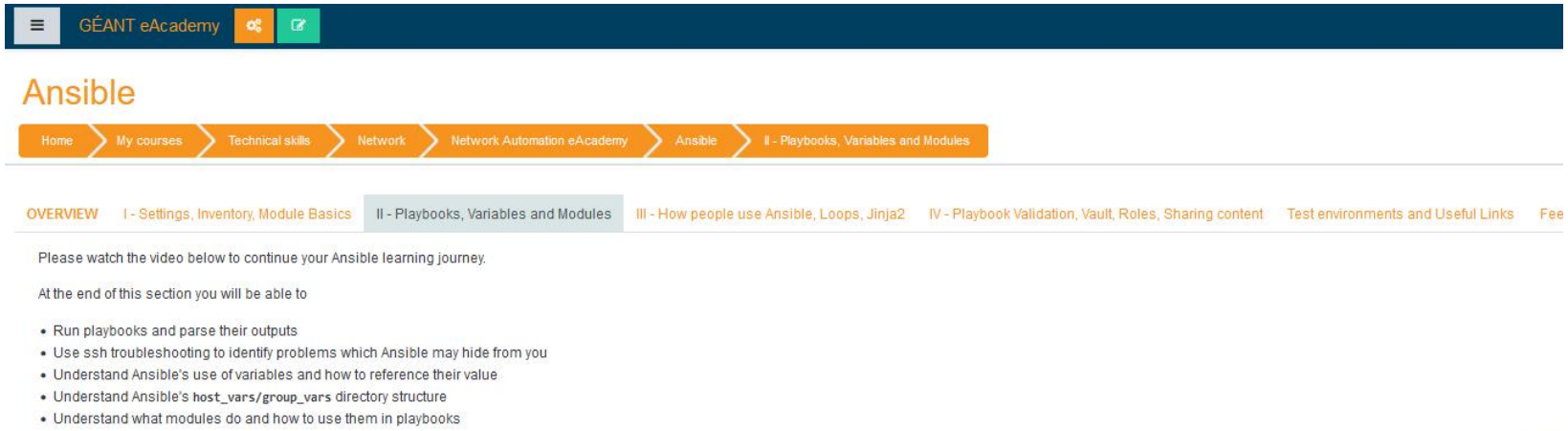
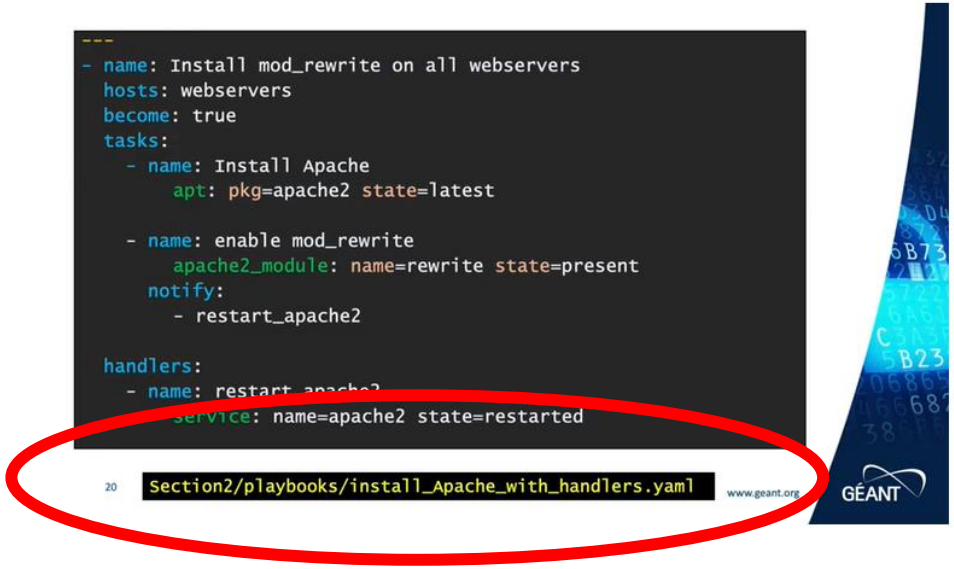
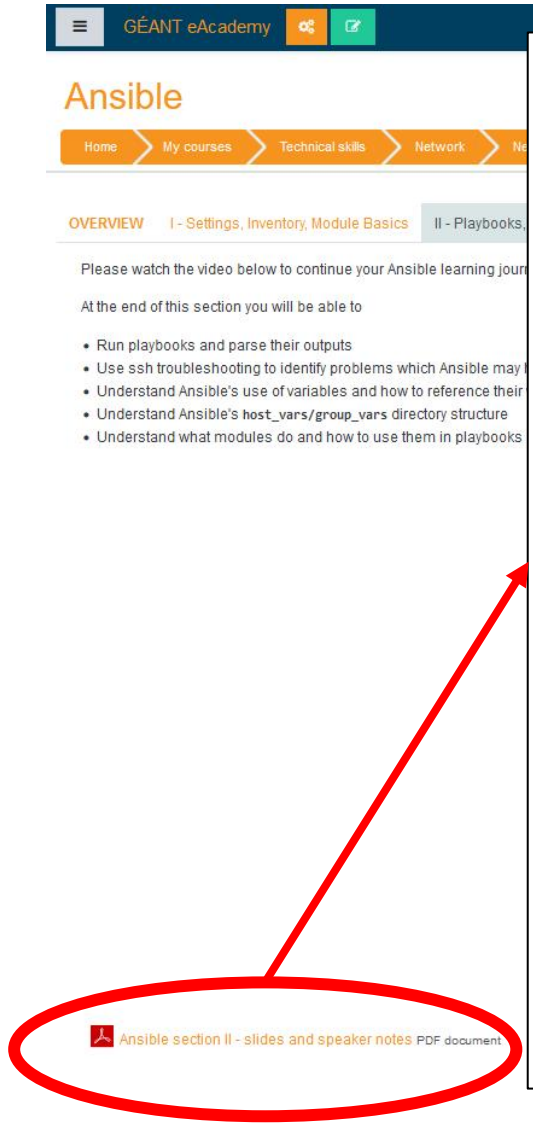
Ansible: Video with Subtitles

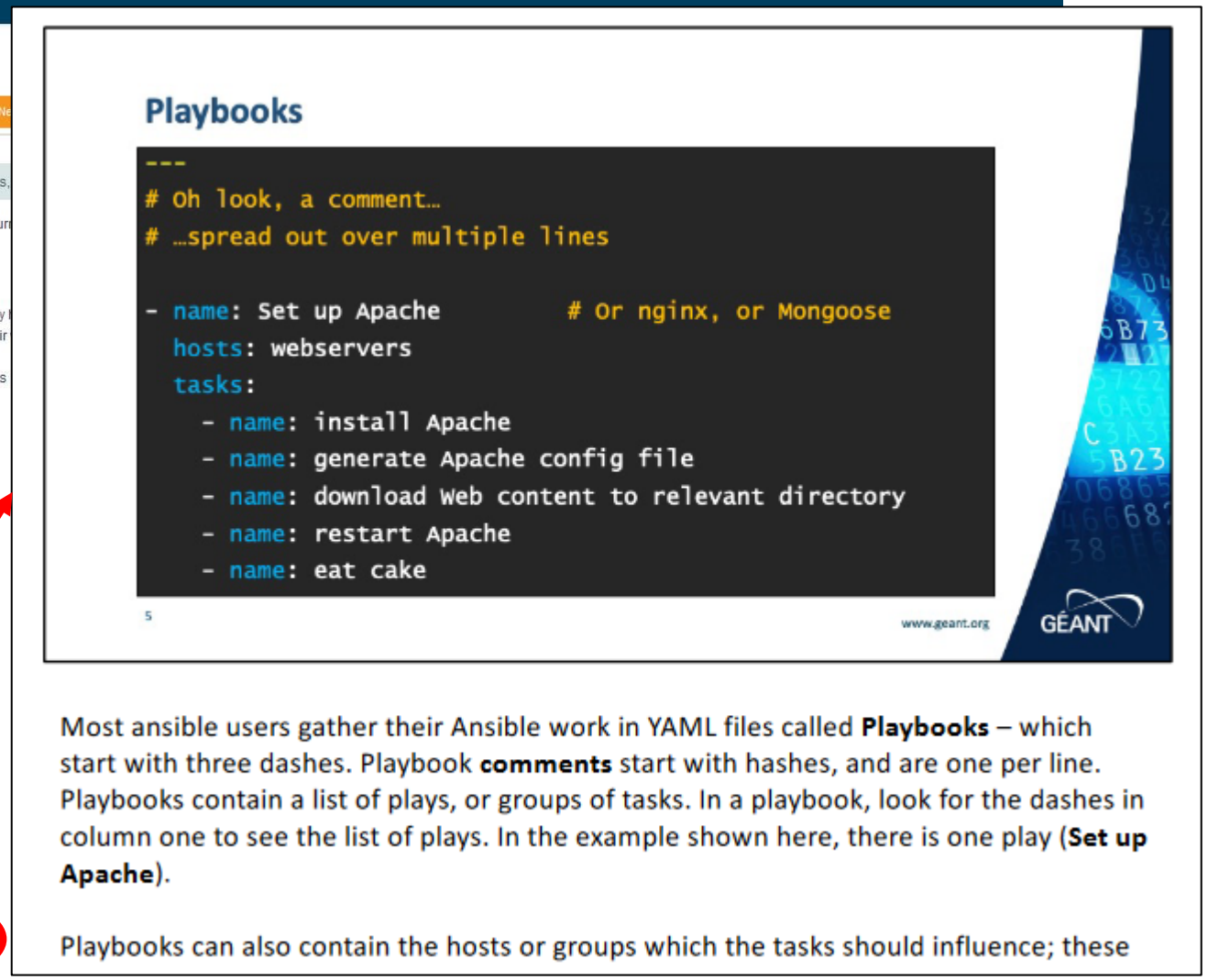




Ansible section II - slides and speaker notes PDF document

Ansible: Slides with Speaker Notes





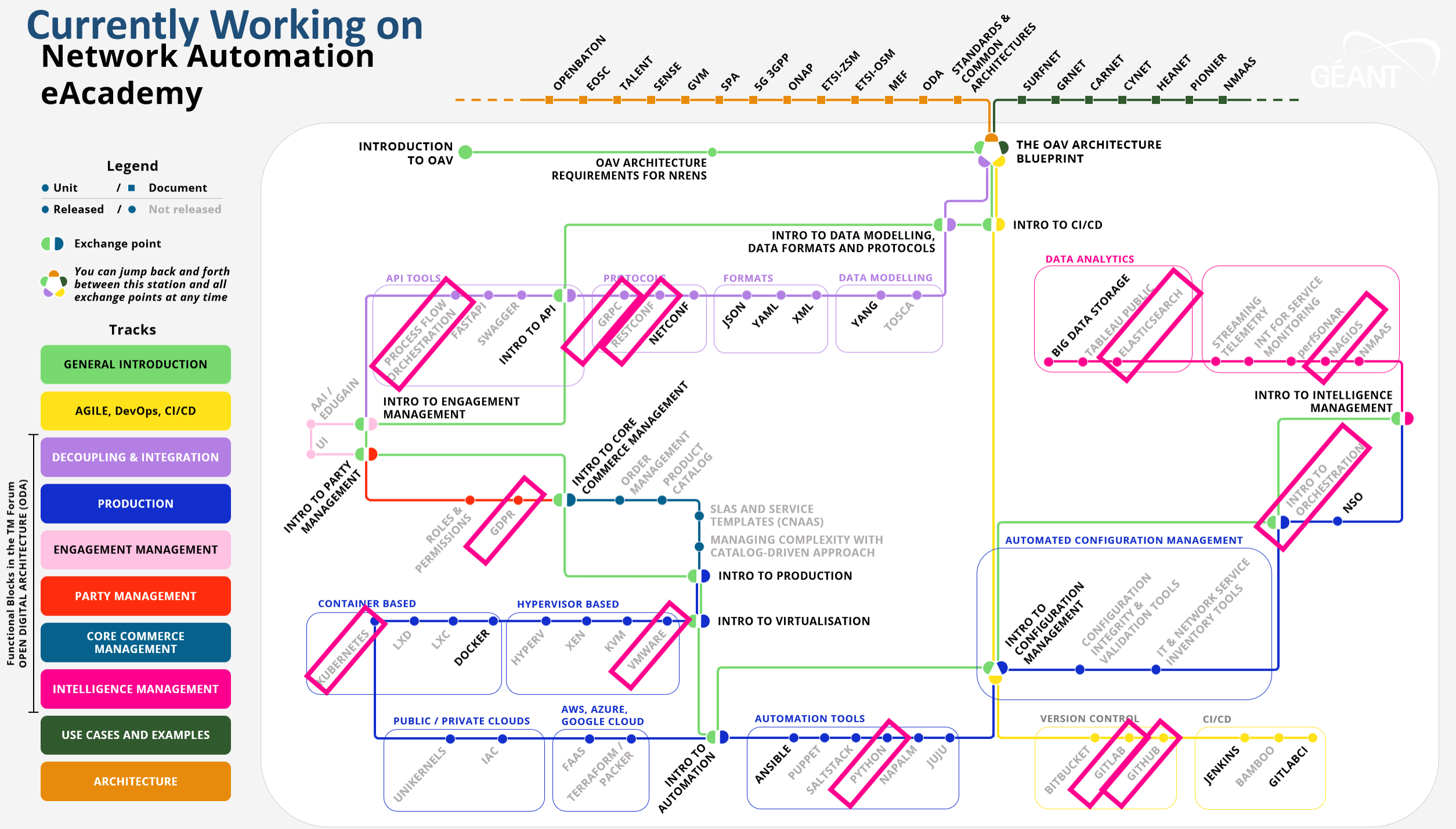
Most ansible users gather their Ansible work in YAML files called **Playbooks** – which start with three dashes. Playbook **comments** start with hashes, and are one per line. Playbooks contain a list of plays, or groups of tasks. In a playbook, look for the dashes in column one to see the list of plays.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

Practical Examples

- Ansible:
  - Git repository with the examples in the unit.
  - Mini-Lab: Vagrant testing environment with a Unix server and a JunOS box.
- NETCONF:
  - Installation guide with a virtual environment in GNS3.
  - Adding a static route to a router, step-by-step.
- NSO:
  - Installation of free trial version.
  - Implementing a Radius server configuration over multiple devices.
  - Deploying an ACL on multiple devices, and/or interfaces on a device.

Currently Working on
Network Automation eAcademy



Terminology and Glossary of OAV Terms

- Published version 1.1
- Accepted by the GNA-G Automation Working Group
- New version to follow soon with additional terms about **AI** and **Maturity Model**

OAV Common Terms

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Glossary

OAV Terms	Definition and reference
Architecture component	***An architecture component is a nontrivial, nearly independent, and replaceable part of a system tha well-defined architecture.*** • TM Forum Reference, TMF071 ODA Terminology, TMF071, Release 19.0.1, October 2019
Architecture principles	***Architecture principles define the underlying general rules and guidelines for the use and deployme organisation. They reflect a level of consensus among the various elements of the enterprise, and fo decisions.*** • based on https://pubs.opengroup.org/architecture/togaf8-doc/arch/chap29.html

https://wiki.geant.org/display/NETDEV/OAV+Terminology

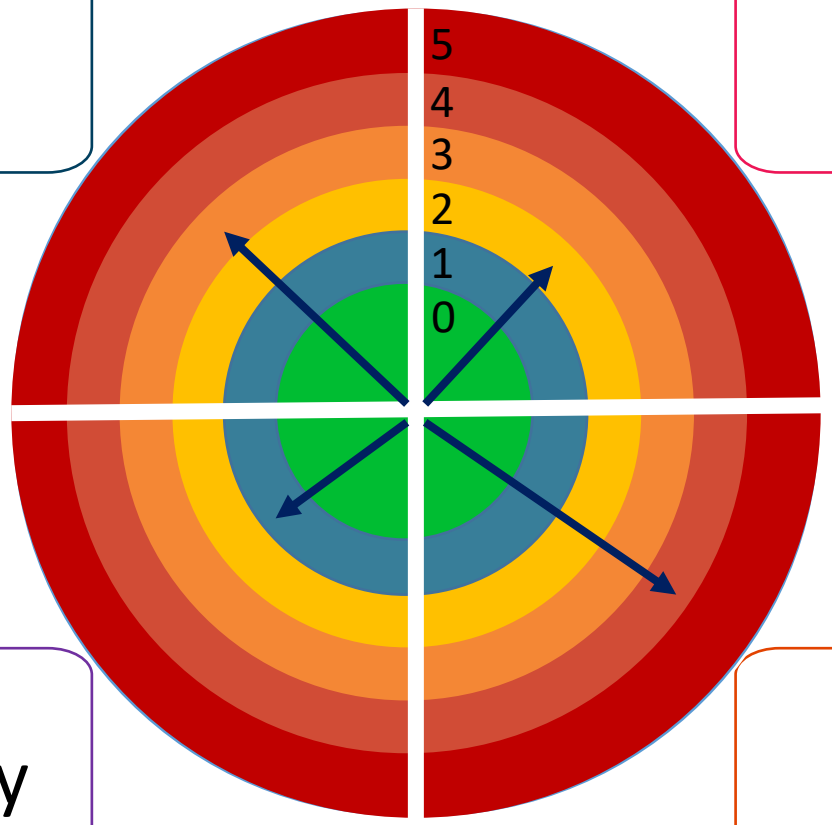
OAV Maturity Model

Measure	Measure the current OAV capabilities in a meaningful way
Identify	Enable clear identification of strengths and improvement points, be aware of threats and opportunities
Prioritise	Help prioritise what to do in order to advance and improve
Journey	Identify gaps between the current and future state and how to get there

OAV Maturity Model - Dimensions

Architecture & Technology

Processes & Services



Vision & Strategy

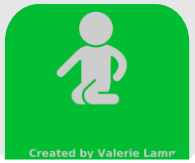
People & Organisation

OAV Maturity Model - Stages

Level 0

Sit

None



Level 1

Crawl

Ad Hoc

Level 2

Walk

Use Case / Project-based / Reactive

Level 3

Run

Integrated

Level 4

Fly

Proactive

Level 5

Energise

Self-*

The Maturity Model

Survey (31 questions)*:
https://www.surveymonkey.com/r/SPYDQVB

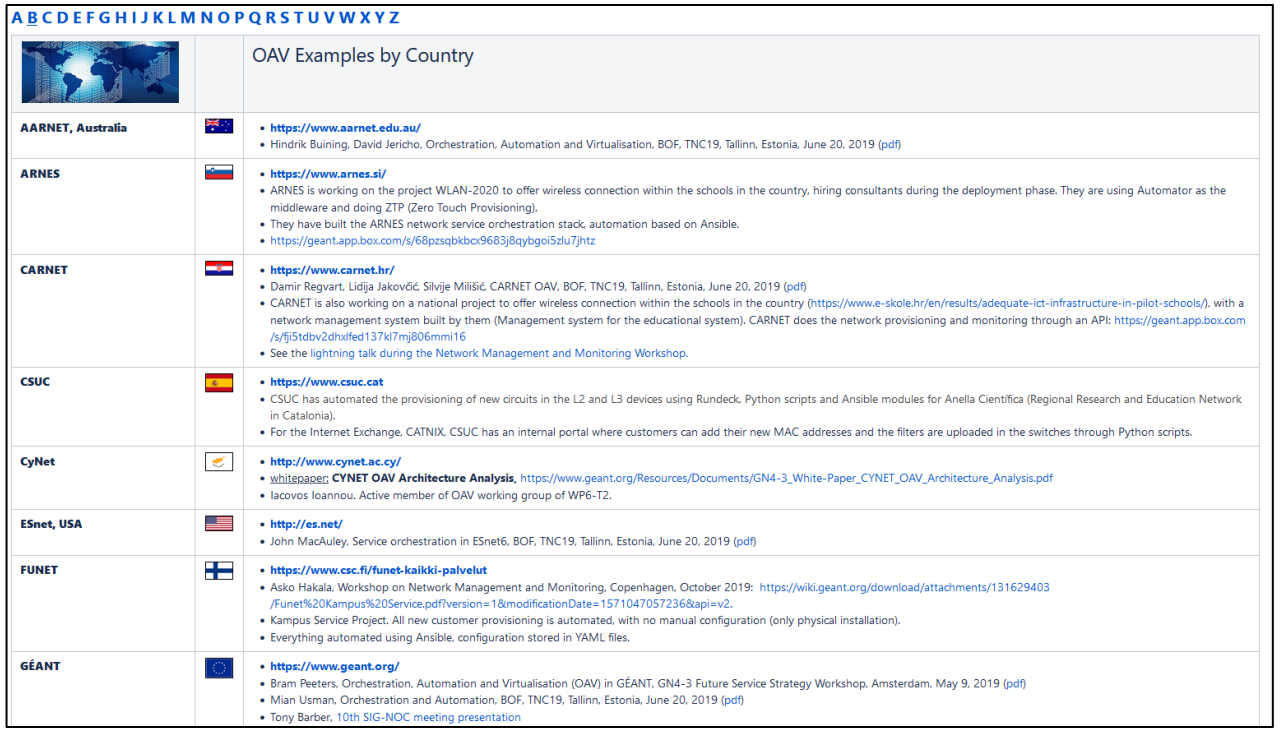
Information to help you check your progress through stages and dimensions:
https://wiki.geant.org/display/NETDEV/OAV+Maturity+Model

Presentations of the OAV MM Infoshare:
https://events.geant.org/e/OAV-MM

* Data will be used for analytical purposes only (we will not publish data for individual institutions)
The report will be sent to person defined in survey

Wiki

- Community Portal
- Sections for OAV:
  - Architecture
  - Training
  - Maturity Model
  - Terminology
  - Literature
  - Examples of usage: CNaaS, DTN
  - Dissemination: Deliverables, Infoshares, Presentations, Articles...



A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

OAV Examples by Country

AARNET, Australia	• **https://www.aarnet.edu.au/** • Hindrik Buining, David Jericho, Orchestration, Automation and Virtualisation, BOF, TNC19, Tallinn, Estonia, June 20, 2019 (pdf)
ARNES	• **https://www.arnes.si/** • ARNES is working on the project WLAN-2020 to offer wireless connection within the schools in the country, hiring consultants during the deployment phase. They are using Automator as the middleware and doing ZTP (Zero Touch Provisioning). • They have built the ARNES network service orchestration stack, automation based on Ansible. • https://geant.app.box.com/s/68pzsqbkbcx9683j8qybgoi5zlu7jhtz
CARNET	• **https://www.carnet.hr/** • Damir Regvart, Lidija Jakovčić, Silvije Milišić, CARNET OAV, BOF, TNC19, Tallinn, Estonia, June 20, 2019 (pdf) • CARNET is also working on a national project to offer wireless connection within the schools in the country (https://www.e-skole.hr/en/results/adequate-ict-infrastructure-in-pilot-schools/), with a network management system built by them (Management system for the educational system). CARNET does the network provisioning and monitoring through an API: https://geant.app.box.com/s/fji5tdbv2dhxlfed137kl7rmj806mmi16 • See the lightning talk during the Network Management and Monitoring Workshop.
CSUC	• **https://www.csuc.cat** • CSUC has automated the provisioning of new circuits in the L2 and L3 devices using Rundeck, Python scripts and Ansible modules for Anella Científica (Regional Research and Education Network in Catalonia). • For the Internet Exchange, CATNIX, CSUC has an internal portal where customers can add their new MAC addresses and the filters are uploaded in the switches through Python scripts.
CyNet	• **http://www.cynet.ac.cy/** • whitepaper: **CYNET OAV Architecture Analysis**, https://www.geant.org/Resources/Documents/GN4-3_White-Paper_CYNET_OAV_Architecture_Analysis.pdf • Iacovos Ioannou. Active member of OAV working group of WP6-T2.
ESnet, USA	• **http://es.net/** • John MacAuley, Service orchestration in ESnet6, BOF, TNC19, Tallinn, Estonia, June 20, 2019 (pdf)
FUNET	• **https://www.csc.fi/funet-kaikki-palvelut** • Asko Hakala, Workshop on Network Management and Monitoring, Copenhagen, October 2019: https://wiki.geant.org/download/attachments/131629403/Funet%20Kampus%20Service.pdf?version=1&modificationDate=1571047057236&api=v2. • Kampus Service Project. All new customer provisioning is automated, with no manual configuration (only physical installation). • Everything automated using Ansible, configuration stored in YAML files.
GÉANT	• **https://www.geant.org/** • Bram Peeters, Orchestration, Automation and Virtualisation (OAV) in GÉANT, GN4-3 Future Service Strategy Workshop, Amsterdam, May 9, 2019 (pdf) • Mian Usman, Orchestration and Automation, BOF, TNC19, Tallinn, Estonia, June 20, 2019 (pdf) • Tony Barber, 10th SIG-NOC meeting presentation

What Next?

Network Automation eAcademy → Network eAcademy

With Many Thanks to our Trainers!

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Maria Isabel Gandia (RedIRIS / CSUC)	Your name here?
Eduardo Jacob (RedIRIS / UPV/EHU)	
Iacovos Ioannou (CyNet)	

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.

Thank you

With special thanks to the trainers,

the GLAD and the Comms teams!

Any questions?

Find us here:

oav@lists.geant.org

www.geant.org

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