¿Cómo estar al día en tecnologías de red?

Maria Isabel Gandia Carriedo, CSUC/RedIRIS

Jornadas Técnicas de RedIRIS

21 Mayo 2024, Academia de Infantería del Ejército de Tierra (Toledo)

Public (PU)

El proyecto GÉANT

Colaboración de las redes nacionales de investigación y educación (NRENs) y la Comisión Europea

La misión del proyecto es proveer acceso seguro a los científicos, investigadores y estudiantes a los servicios más avanzados de conectividad y colaboración del mundo, habilitando una colaboración efectiva y segura con comunidades virtuales de investigación de todo el mundo.

38 Miembros

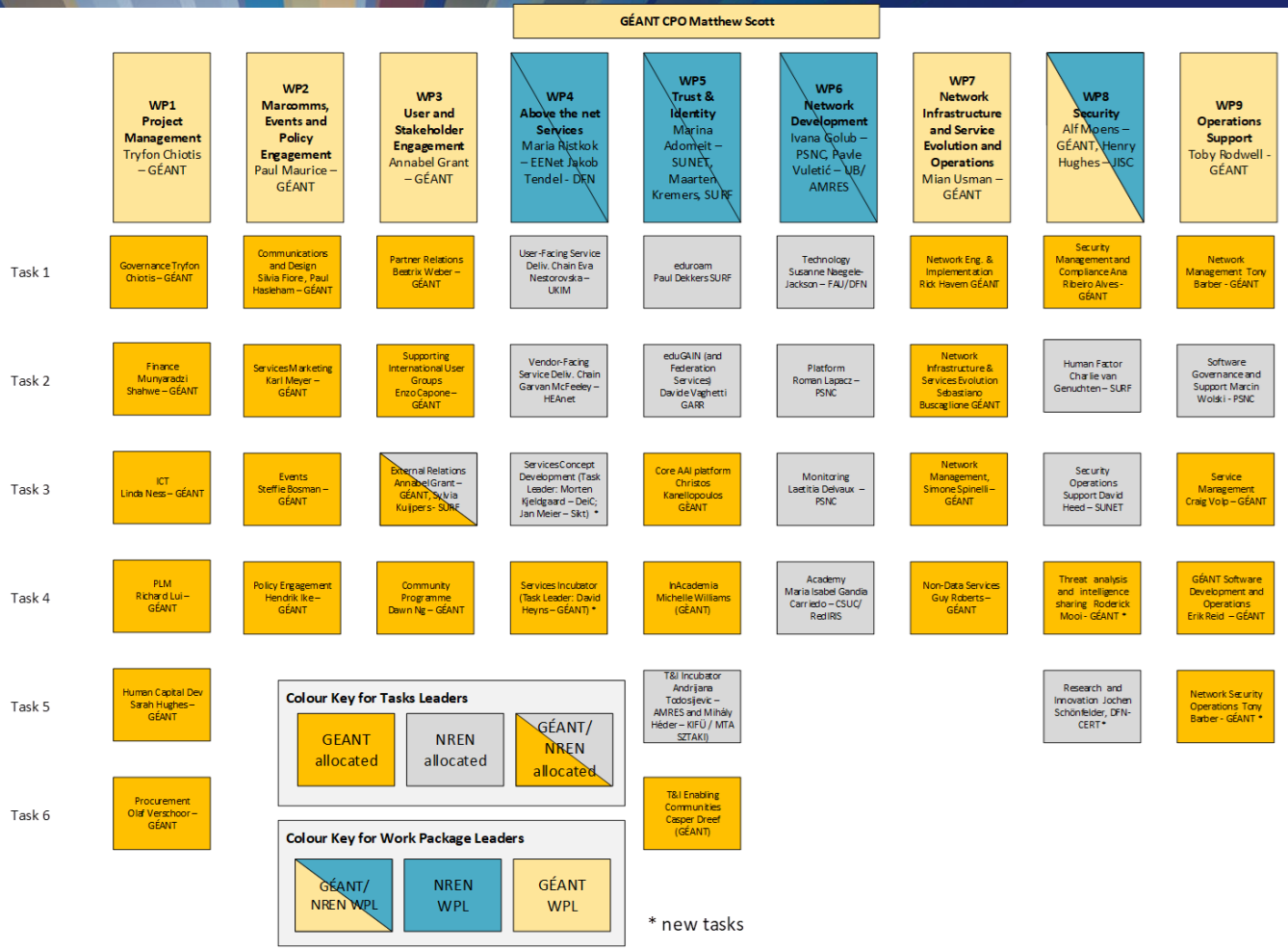
1 Miembro asociado

43 Países

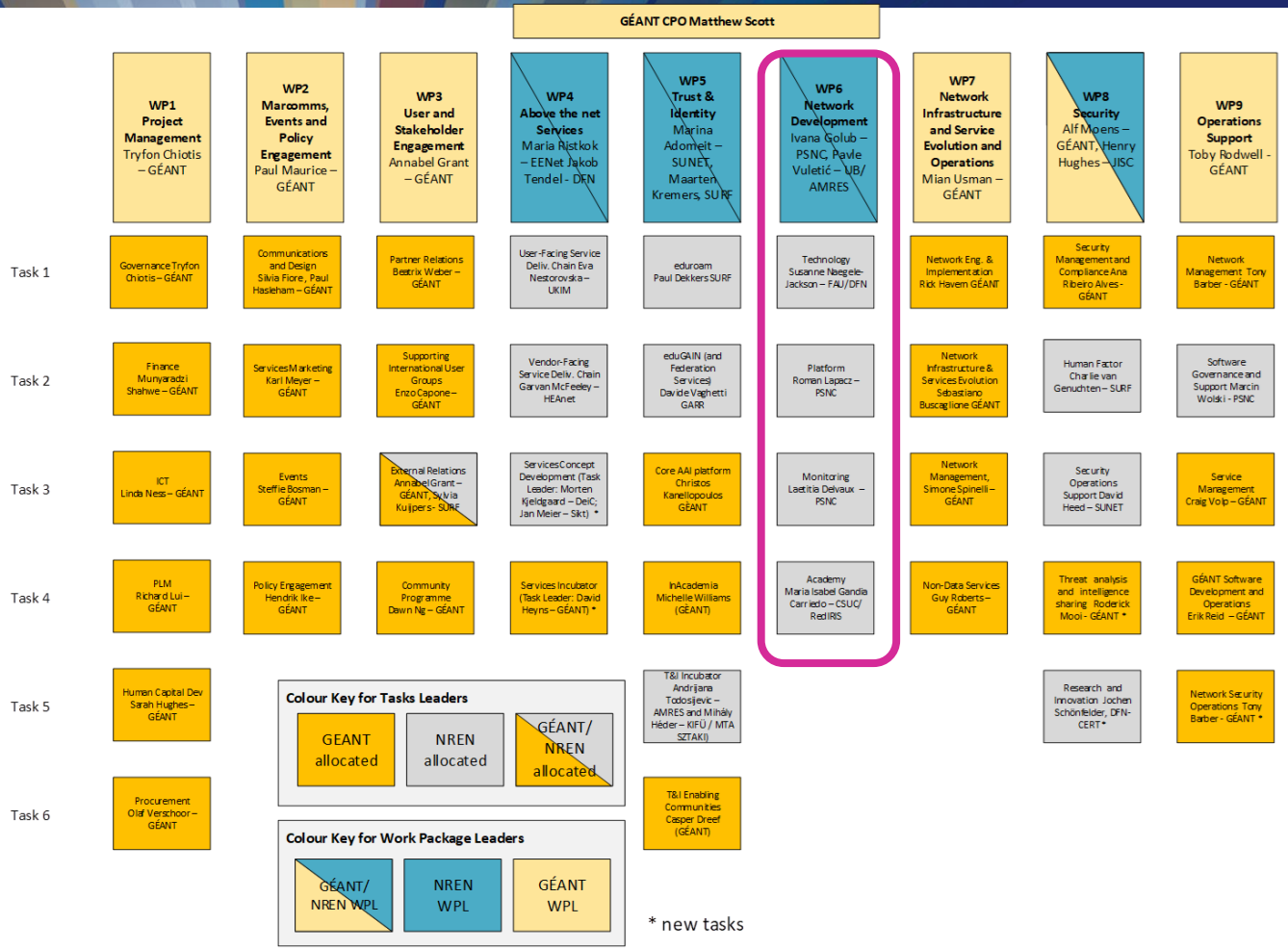
80 Mil EUR Presupuesto

9 Work Packages

Estructura del proyecto GN5-2



Estructura del proyecto GN5-2



NETDEV en tres pinceladas

¿Por qué?

Para hacer avanzar la infraestructura de red y los servicios de la comunidad GÉANT

¿Cómo?

Testeo, pilotos, desarrollo de productos y servicios

Servicios en producción

Incubadora

Colaboración con los *partners*

¿Qué?

Tecnologías,

Plataformas,

Monitorización,

eAcademy

20+ temas

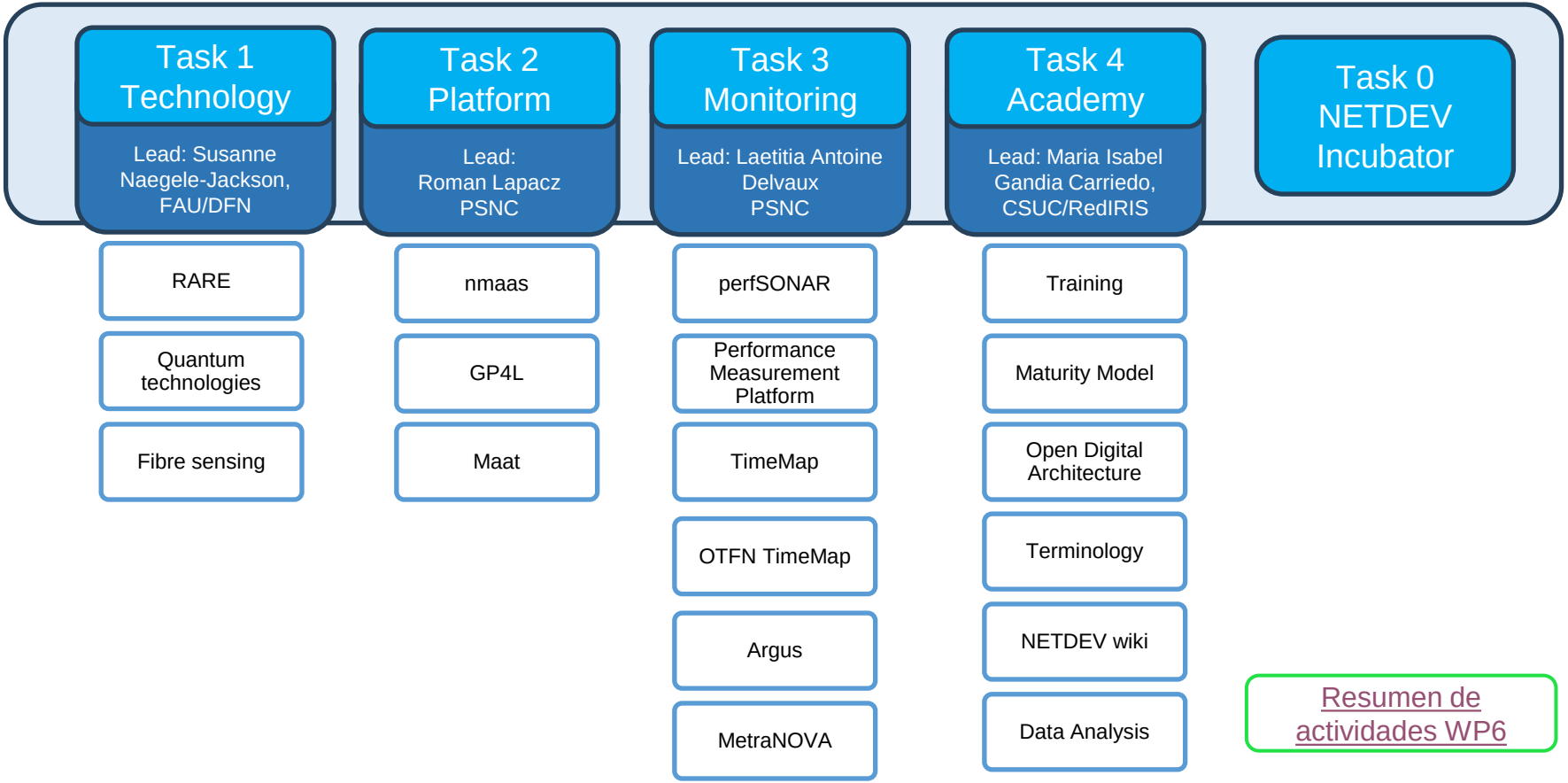
25 organizaciones

>100 personas

5,6 MEUR

28,1 FTE

WP6 en 3 pinceladas



Resumen de actividades WP6

Operaciones de red y gestión con IA. Hacia las redes autónomas.

SELF

- Self-service
- Self-fulfilling
- Self-assuring
- Self- planning
- Self-ordering
- Self-organising
- Self-governing
- Self-healing / Self-repairing
- Self-optimising

ZERO

- Zero-wait
- Zero-touch
- Zero-trouble
- Zero-downtime
- Zero-trust

Ejemplos de detección de anomalías *closed-loop* (Traffic Flow Optimization , Security violations, Performance Prediction, Alert Correlation, etc):
https://www.tmforum.org/resources/introductory-guide/ig1219-ai-closed-loop-automation-anomaly-detection-and-resolution-v2-1-0/

Automatización – Procesar tareas de forma repetible para dar **el mismo resultado** cada vez sin intervención humana.

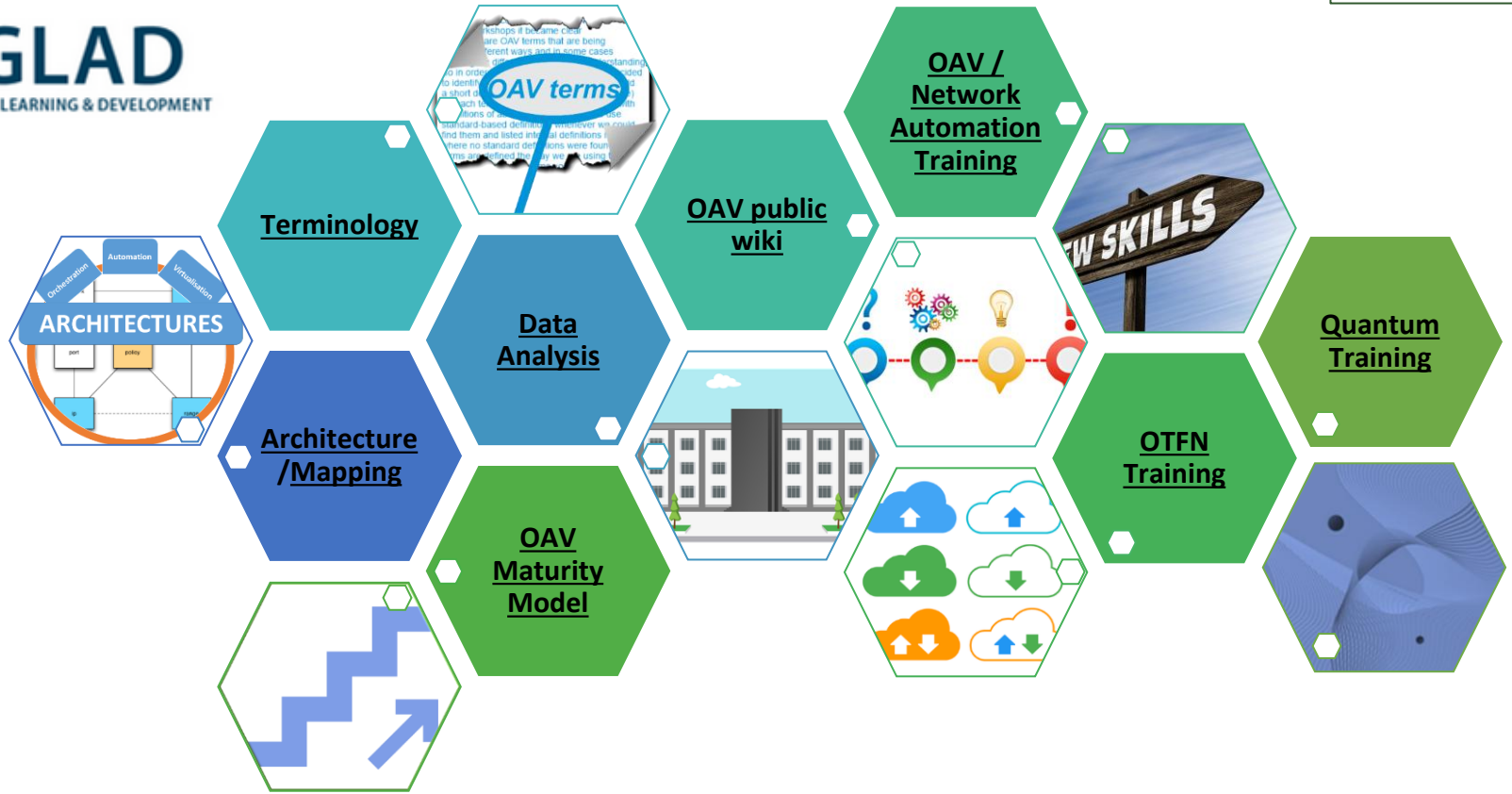
Redes Autónomas – Conjunto de plataformas de software y hardware que pueden **sentir su entorno y adaptarse** sin intervención humana

Network eAcademy

Network eAcademy

Powered by:

GLAD
GÉANT LEARNING & DEVELOPMENT



NETDEV

Páginas

Blog

ÁRBOL DE PÁGINAS

- Argus
- Dissemination
- Fibre Sensing
- NETDEV Incubator
- **Network eAcademy**
  - Highlights
  - Network eAcademy Training Portal
    - Network Automation Training
    - Quantum Technology Training
    - Time and Frequency Networks Training
  - OAV Architectures
    - Architecture Investigation
    - Introduction to Digital Platforms
    - Mapping Use Cases
    - ODA - Open Digital Architecture (TM Forum)
    - Requirements for an Automated Digital Framework
  - OAV Community Portal
  - OAV Maturity Model
    - Architecture and Technology
    - People and Organisation
    - Processes and Services
    - Vision and Strategy
  - OAV Terminology
- QT
- TimeMap
- WP6 Archive
- WP6 Events

Panel / NETDEV Home

Network eAcademy

Creado por Susanne Nägele-Jackson, modificado por última vez en abr 22, 2025

The Network eAcademy (NeA) offers knowledge sharing and exchange between GÉANT, NRENs, and organisations and is intended to serve as a platform to discuss strategies, common use cases and ideas related to a variety of topics. One of our main focus areas are network and service orchestration, automation and virtualisation (OAV) in our GÉANT community (including an OAV maturity model, information on OAV terminology and OAV architectures). Applied OAV can be found as part of our OAV community portal and with the example of the SPA Service Provider Architecture. Another major focus area of NeA is the Network eAcademy Training Portal with on-demand training courses ranging from Network Automation to Quantum Technology.

Network eAcademy Training Portal

Network Automation	Quantum Technology	Time & Frequency Networks

OAV Maturity Model

Our model defines four main dimensions that describe different aspects of OAV, each further specified using subdimensions that highlight the important OAV areas of each dimension. The short and long descriptions of stages for each subdimensions help quickly identify the current status in the organisation and the main tasks that need to be accomplished in order to advance to the next level. *Read more...*

OAV Architectures

A high-level architectural blueprint (the TM Forum Open Digital Architecture, or ODA), provides R&E institutions with an easy way to understand and compare the architectures of their Network Management (NMS), Operations and Business Support Systems (OSS/BSS) and helps guide community efforts towards the creation of interoperable systems and operations. *Read more...*

OAV Terminology

During our discussions with NRENs it became clear that there are OAV terms that are being used in different ways and in some cases with slightly different meaning and understanding. In order to have a common basis we decided to identify a list of relevant OAV terms and add a short definition with a reference link (source) for each term as well as an acronym table. *Read more...*

OAV Community Portal

Applied OAV examples by country. Follow our community portal to see what NREN are implementing in their own environments. *Read more...*

GNA-G Network eAcademy WG

Research and Education Networks and institutions around the globe are facing the same challenges as in the GÉANT community. As Artificial Intelligence strikes in all areas, new tools arise, others disappear or stop being used, and with the daily operations of the network, an up-to-date training programme with inputs from actors in all the regions of the world is a must. Therefore a new GNA-G Network eAcademy Working Group was formed with the objective to make the current contents and tools of the Network eAcademy available to the entire research and education community. *Read more...*

Infoshares ++ Events

- **all events**
- NEW **GNA-G Network eAcademy Working Group**
- NEW Infoshare: How to create learning units for the Network eAcademy and beyond, May 12, 2025
- NEW Infoshare: Network eAcademy, May 7, 2025
- RARE/FreeRTR Use Case: Open-Source Implementation of 5G User Plane Function (UPF), Dec.19, 2024
- AI Chatbot for the GÉANT eAcademy, Dec. 18, 2024
- What's New in the Network eAcademy?, Dec. 17, 2024
- NREN Fibre Infrastructure for Sensing, Dec. 5, 2024
- Telemetry Module for the Workflow Orchestrator, Nov. 5, 2024
- 4th European perfSONAR User Workshop, May 14-16, 2024
- OAV Architecture Workshop, April 18, 2024
  GÉANT Infoshare - NETDEV Incubator, March 29, 2023
- GÉANT Infoshare: Maturity Model for Orchestration, Automation and Virtualisation, March 29, 2023
- GÉANT Infoshare: Tools for Campus Network Management as a Service (CNaaS), April 28, 2021
- Orchestration, Automation and Virtualisation in the NRENs. Ready, Steady, Go!, December 16, 2020
- **Highlights**
- **Standardisation Bodies**

Network eAcademy Expands, Connect Magazine, Issue 47, 2024, p. 22

Network Automation eAcademy, Connect Magazine, Issue 38, 2021, p. 19

https://wiki.geant.org/display/NETDEV/Network+eAcademy

NETDEV

- Pages
- Blog
- Calendars
- Analytics

PAGE TREE

- Argus
- Dissemination
- Fibre Sensing
- NETDEV Incubator
- Network eAcademy
  - Highlights
  - **Network eAcademy Training Portal**
    - Network Automation Training
    - Quantum Technology Training
    - Time and Frequency Networks Training
  - OAV Architectures
  - OAV Community Portal
  - OAV Maturity Model
  - OAV Terminology
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- TimeMap
- WP6 Archive
- WP6 Events

Network eAcademy Training Portal

Created by Susanne Nägele-Jackson, last modified on Dec 17, 2024

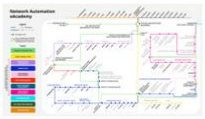
Network Training

This Training Portal is offering courses focused on the research and education community, with external references that can be useful for us and examples that can be closer to our use cases. It is training by the community for the community. We will be publishing new classes regularly; all classes are online courses that you can follow and complete at your own pace.

Info | Infosharing ++ Events

- **all upcoming and past events**
- **New in Network Automation: Process Flow Orchestration, Hypervisor-based Virtualisation: KVM, Nagios**

Network Automation



Take network automation classes to learn about orchestration, automation and virtualisation of networks. Get started with network architecture, data modeling, data formats and protocols and CI/CD and then move on towards intelligent networks using data analytics and AI.

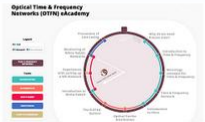
Learn more about Network Automation....

Quantum Technology

Follow our Quantum technology track to learn about basics such as QuBits, Qubit Entanglement and Teleportation. Find out about Quantum Key Distribution and quantum simulation. Or learn the latest on standards and APIs.

Learn more about Quantum Technology....

Time and Frequency Networks



Follow our track for Time and Frequency Networks to learn about the basic metrology concepts of time and frequency, or find out about working with White Rabbit in networks. Other learning units will offer an insight into Optical Carrier Distribution, or the ELSTAB system, which is which is used for Time and Frequency dissemination via optical fibers.

Learn more about Time and Frequency Networks....

Meet us on the first Tuesday of every month
One hour for questions & answers
Just drop us an email at

network-eacademy@lists.geant.org

and we will send you the link.

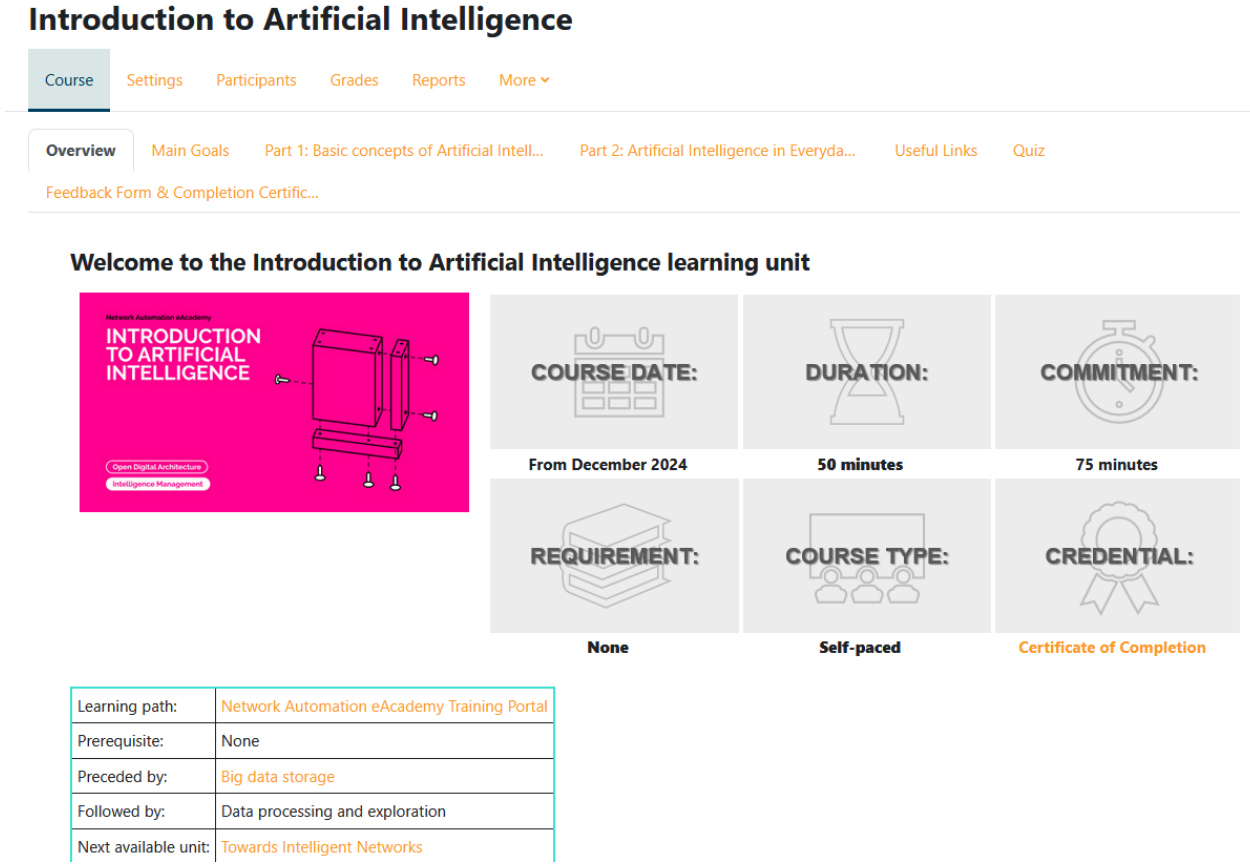
Watch our video:

Towards Service Automation for Research and Education

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

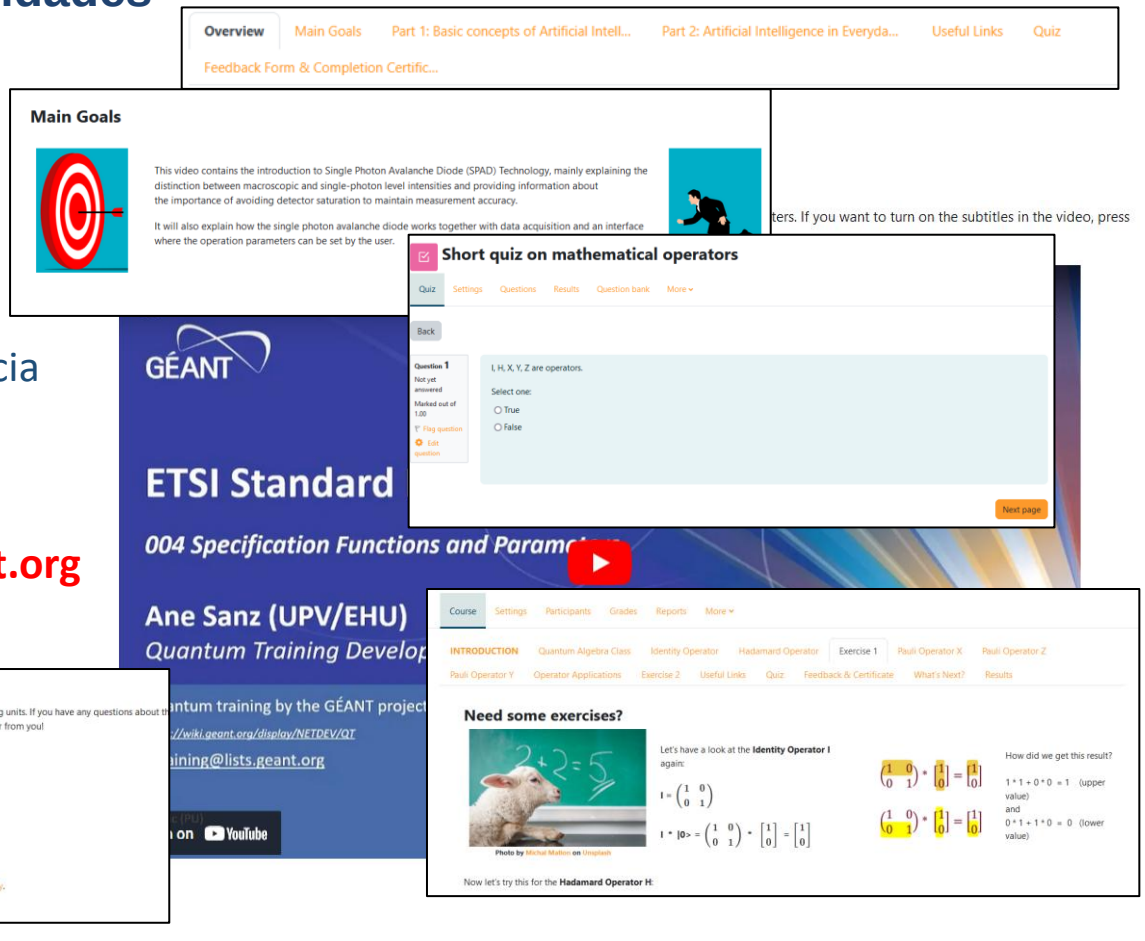
Estructura general de las unidades

- **Descripción general (overview)**
  - Fecha desde la que está disponible / bajo demanda.
  - Indicadores de duración y compromiso
  - Prerequisitos (si los hay)
  - Certificado de finalización

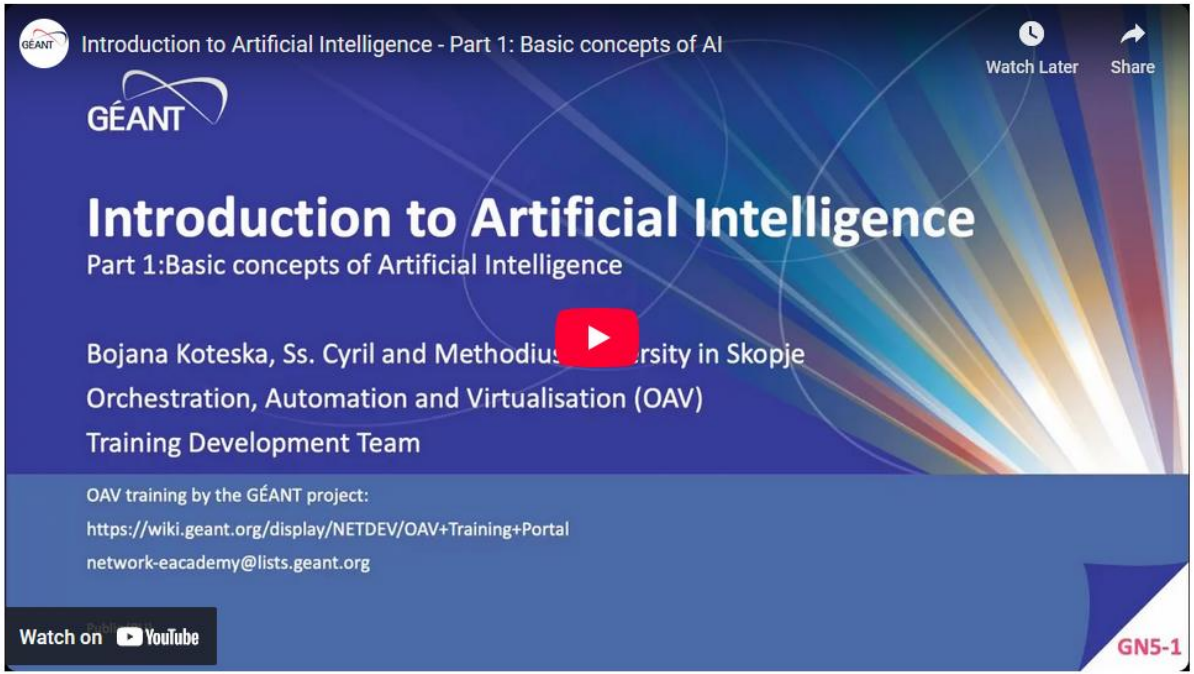


Estructura general de las unidades

- Main Goals
- Video (s) + pdf
- Enlaces útiles
- Quiz
- Feedback & Certificado de asistencia
- What's Next?
- En caso de dudas, contactad con **network-eacademy@lists.geant.org**



Estructura general de las unidades: contenido



Vídeo con subtítulos (en inglés, pero se pueden traducir)

PDF con script

Network Automation Training

Created by Susanne Nägele-Jackson, last modified by Leonardo Marino on May 16, 2025

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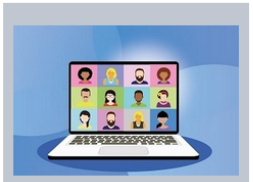
See more training...

Info | Infosharing ++ Events
- **all upcoming and past events**
- **New in Network Automation: Automated Configuration Management: NetBox, Neural Networks & Deep Learning, Introduction to AI**
- **Infoshare: Network eAcademy, May. 7, 2025**



Meet us on the first Tuesday of every month
One hour for questions & answers
Just drop us an email at

network-eacademy@lists.geant.org

and we will send you the link.

Introduction

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

DevOps

- **Introduction to CI/CD** (15')
- **New: Version control: Bitbucket** (40')
- **Version control: Gitlab** (40')
- **Version control: GitHub** (2h)
- **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')
- **Protocols: RESTCONF** (2h)
- **Process Flow Orchestration** (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')
- **Hypervisor-based Virtualisation: KVM** (50')
- **Hypervisor-based Virtualisation: XEN** (90')
- **Container-Based Virtualisation: Docker / Swarm** (3h)
- **Container-Based Virtualisation: Kubernetes** (4h - including lab)
- **Introduction to Automation** (30')
- **Automation Tools: Ansible** (60'+lab time)
- **Automation Tools: Python** (90')
- **Introduction to Configuration Management** (20')
- **New: Automated Configuration Management: NetBox** (25')
- **Introduction to Orchestration** (30')
- **Orchestration: NSO** (6h - including lab)

Intelligence Management

- **Introduction to Intelligence Management** (15')
- **Introduction to Automated Monitoring: Nagios** (2h)
- **Big Data Storage** (1.5h)
- **Elasticsearch** (30')
- **New: Introduction to AI** (50')

ADDITIONAL READING

Architecture Mappings

NREN use cases

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

other use cases

- **Argus**
- **NMaaS**
- **PMP**
- **SPA**

Architectures

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

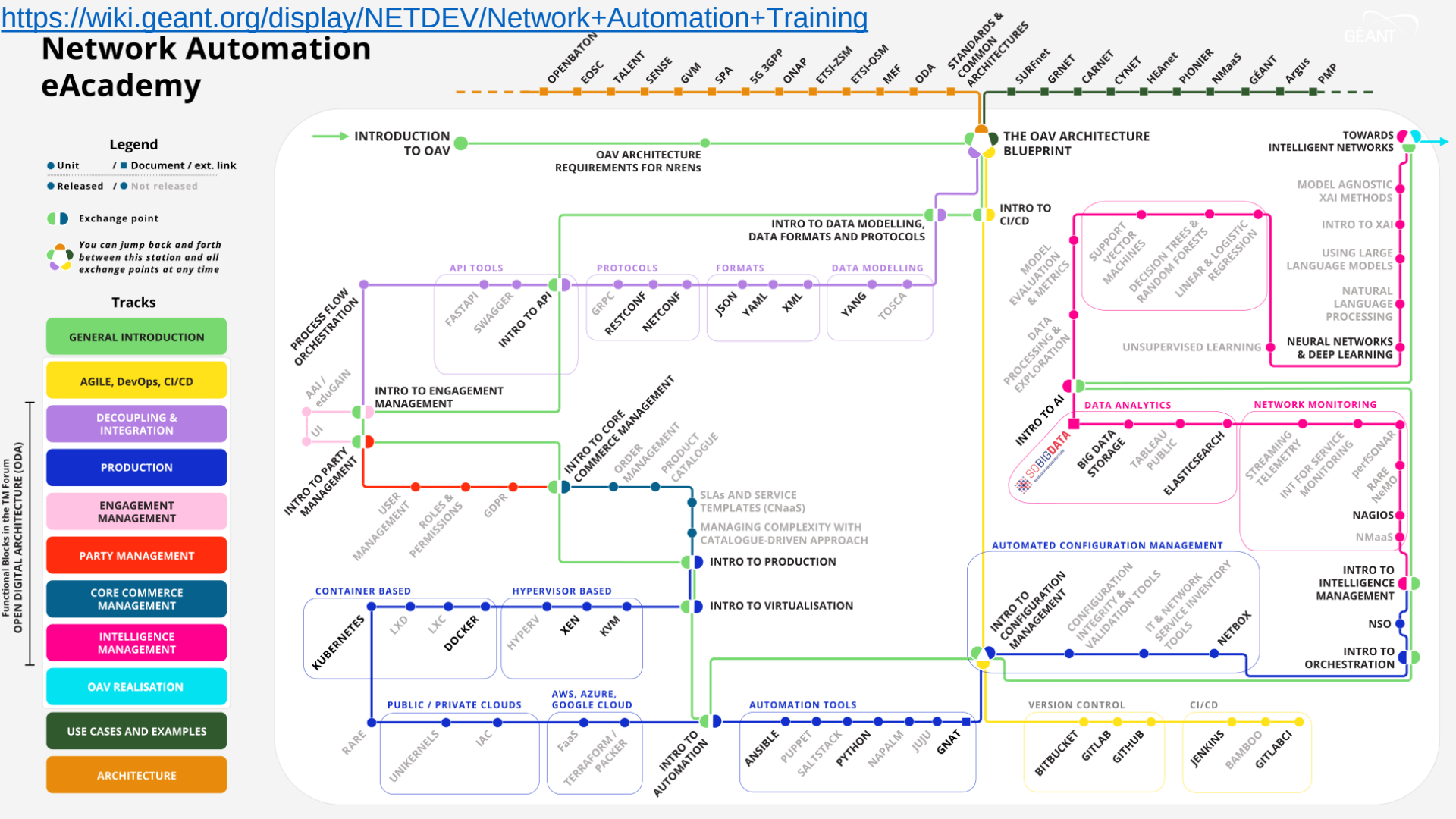
External Collaborations

- **Automation tools: GNAT** (GNOC)
- **Database** (SoBigData Academy)
- **Data Analysis** (SoBigData Academy)
- **Legal and Ethical aspects of Data Science** (SoBigData Academy)
- **Information Retrieval** (SoBigData Academy)
- **Data Mining & Machine Learning** (SoBigData Academy)

https://wiki.geant.org/display/NETDEV/Network+Automation+Training

https://wiki.geant.org/display/NETDEV/Network+Automation+Training

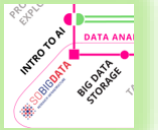
Network Automation eAcademy



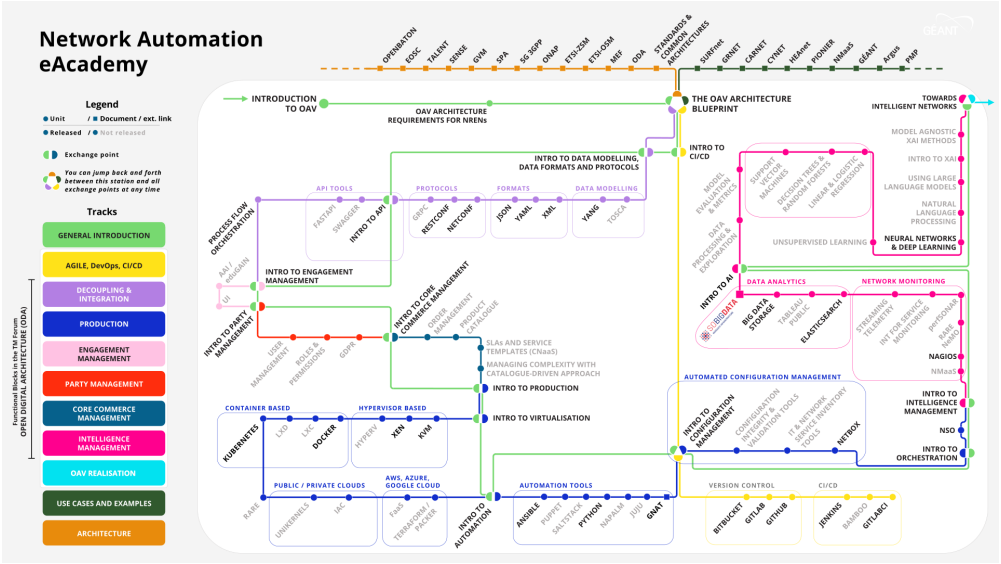
Network Automation eAcademy: Mapa

- https://wiki.geant.org/display/NETDEV/Network+Automation+Training

- Estaciones:
  - Negro → unidades publicadas
  - Gris → unidades previstas
  - Círculos: unidad en Moodle
  - ■ Cuadrados: documentos / enlaces externos



- Líneas:
  - Verde claro: cursos introductorios
  - Amarillo: Agile, DevOps, CI/CD
  - Lila*: Decouplig & Integration
  - Azul*: Production
  - Rosa*: Engagement Management
  - Rojo*: Party Management
  - Océano*: Core Commerce Management
  - Fúcsia*: Inteligence Management
  - Turquesa: OAV Realisation
  - Verde oscuro: Casos de uso y ejemplos
  - Marrón: mapeo de arquitecturas



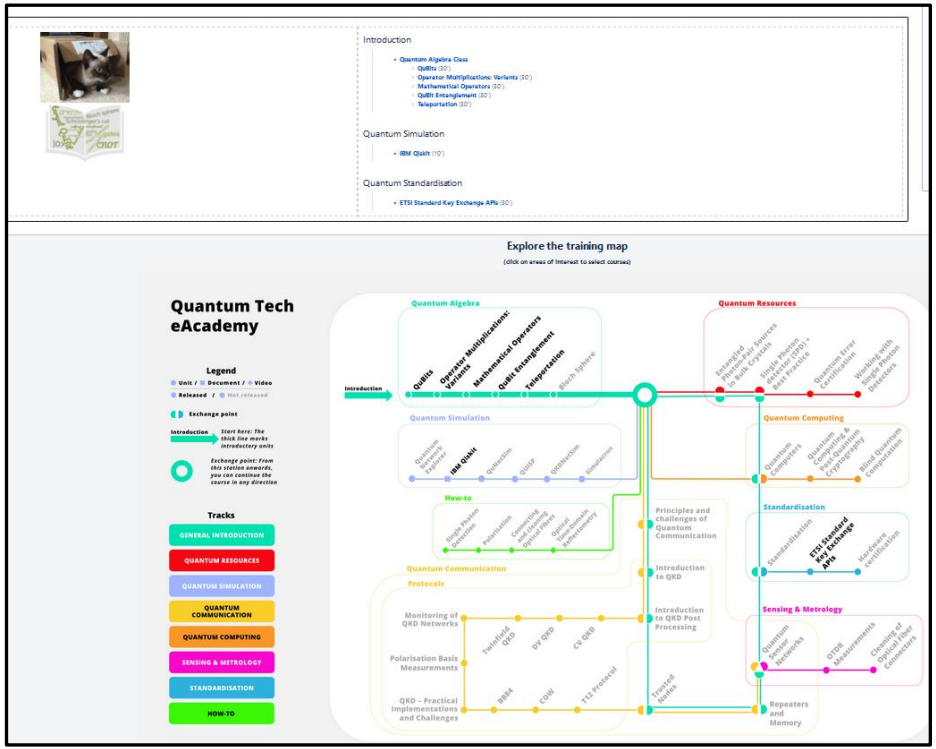
* Las líneas corresponden a los bloques funcionales de la arquitectura ODA (Open Digital Architecture) del TM Forum

Formación en automatización: Acceso vía GLAD

- https://e-academy.geant.org/
  - ➢ All courses
    - ➢ Technical Skills
      - ➢ Network
        - ➢ **Network Automation eAcademy**

Formación en tecnologías cuánticas

- https://wiki.geant.org/display/NETDEV/Quantum+Technology+Training



Enlaces texto

Mapa de metro

Formación en tecnologías cuánticas: Mapa

- https://wiki.geant.org/display/NETDEV/Quantum+Technology+Training

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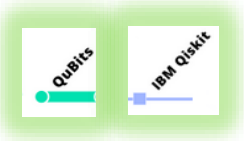
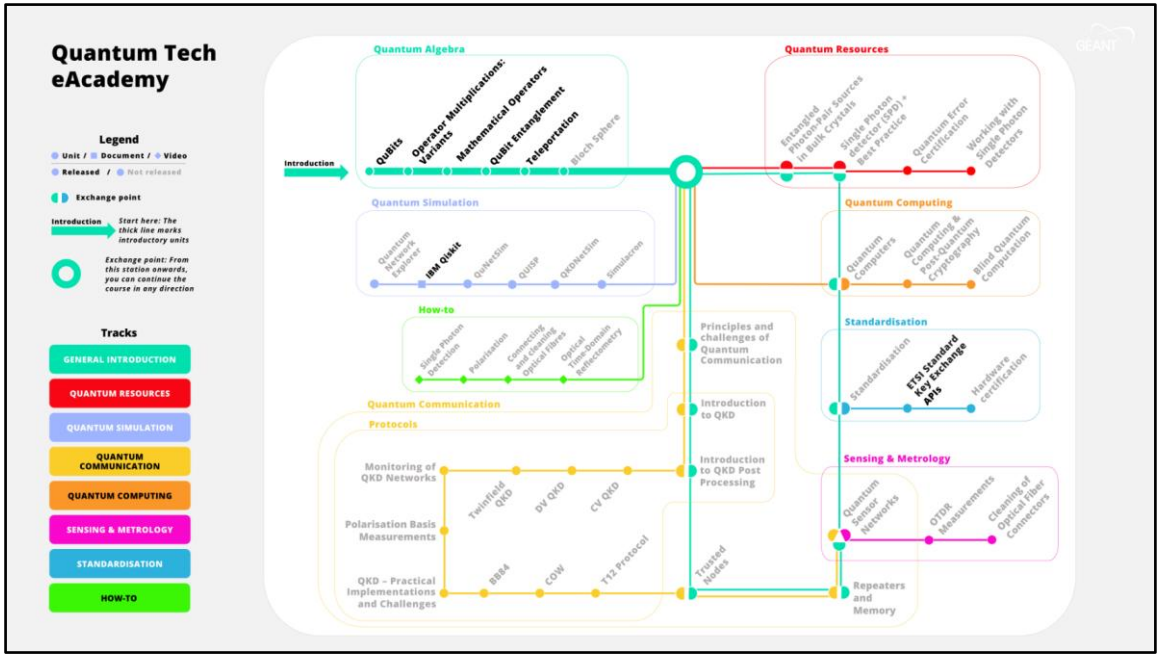


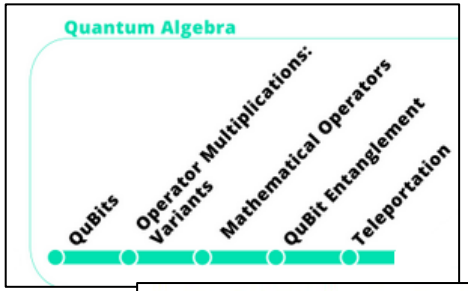
- Líneas:
  - Verde: cursos introductorios.
  - Verde: How-to videos
  - Rojo: Quantum Resources
  - Azul liloso: Simulacron
  - Amarillo: Quantum Communication
  - Naranja: Quantum Computing
  - Fúcsia: Sensing & Metrology
  - Azul verdoso: Estandarización



Formación en tecnologías cuánticas

- **Clase de álgebra cuántica**

5 unidades para entender cómo funcionan el entrelazamiento y el teletransporte (*entanglement and teleportation)*

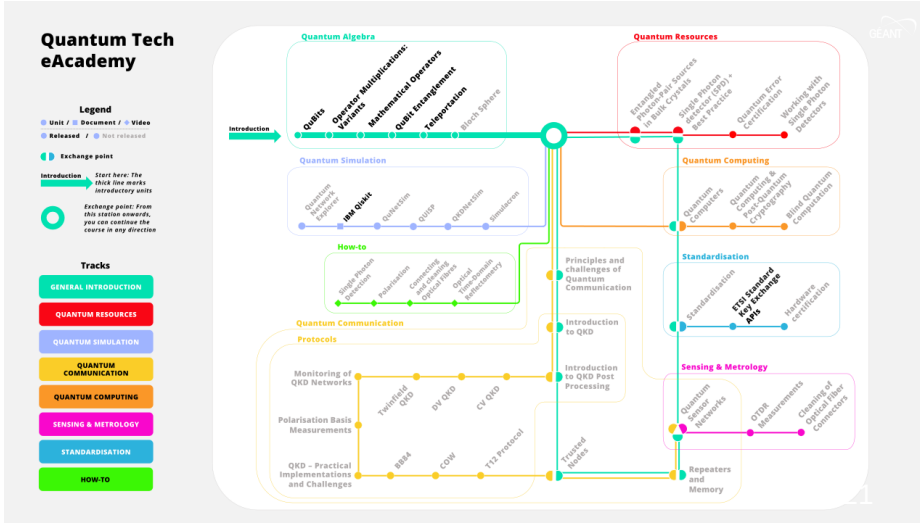


Introduction to QuBits, Quantum Algebra, Entanglement and Teleportation

(by Peter Kaufmann (DFN) and the Quantum Training Development Team)

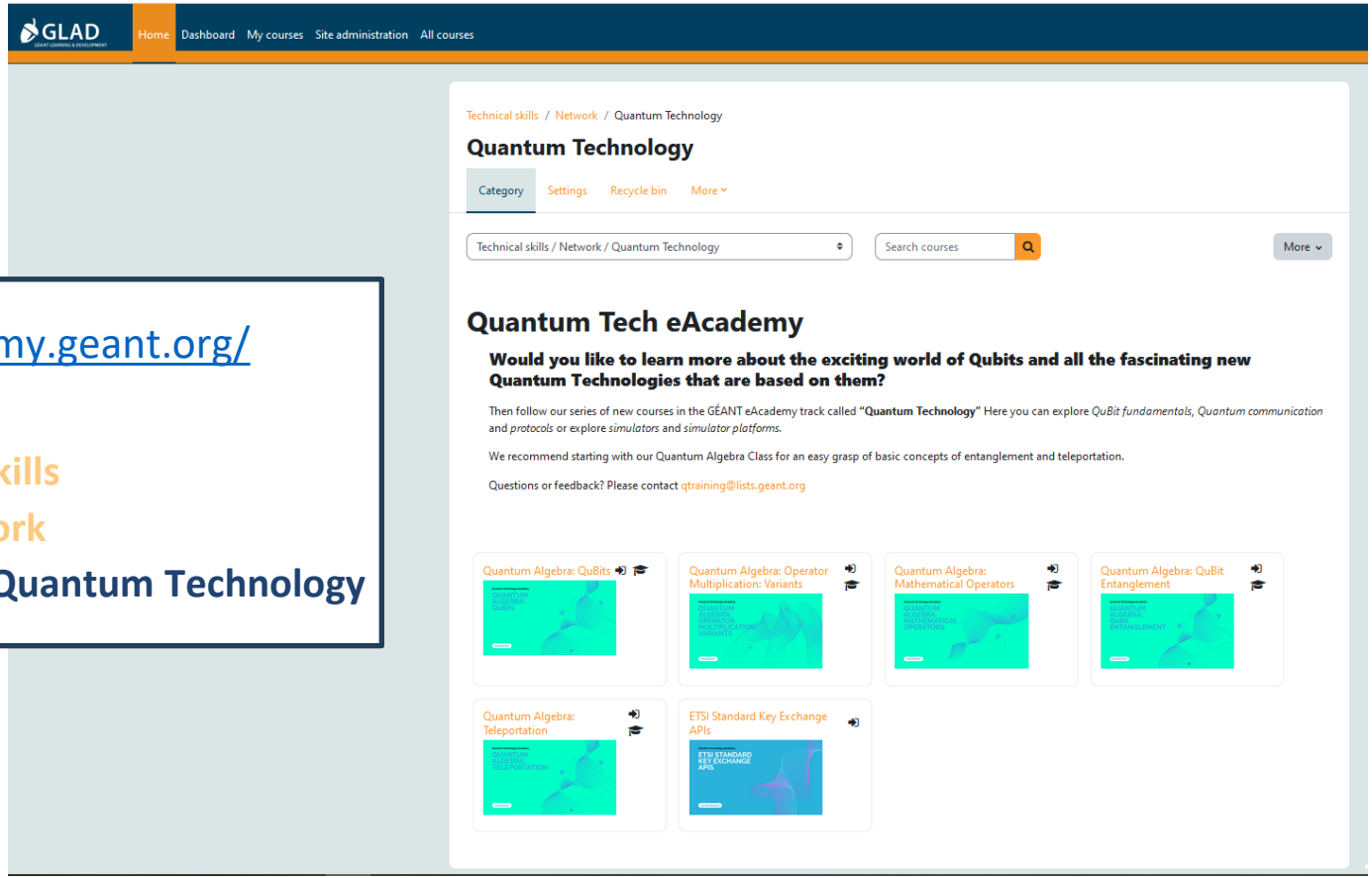
Welcome to this learning unit which is the third in a sequence of units covering the topic of Quantum Algebra. The purpose of the Quantum Algebra class is to introduce the basic theoretical principles of QuBits, their quantum entanglement and the process of teleportation. These aspects are the fundamentals used in quantum computers, quantum networks and quantum security. For the understanding of the physics, some mathematical background aspects from the area of "Operator Algebra" are required.

- **En breve:**
  - Introduction to QKD
  - Simulacron
  - Entangled-Photon-Pair Sources in Bulk Crystals
  - Introduction to QKD Post Processing
  - **Nuevo:** Cuatro How-to-videos:
    - Connecting and Cleaning Optical Fibres
    - Single Photon Detection
    - Polarisation
    - Optical Time-Domain Reflectometry



Formación en tecnologías cuánticas: Acceso vía GLAD

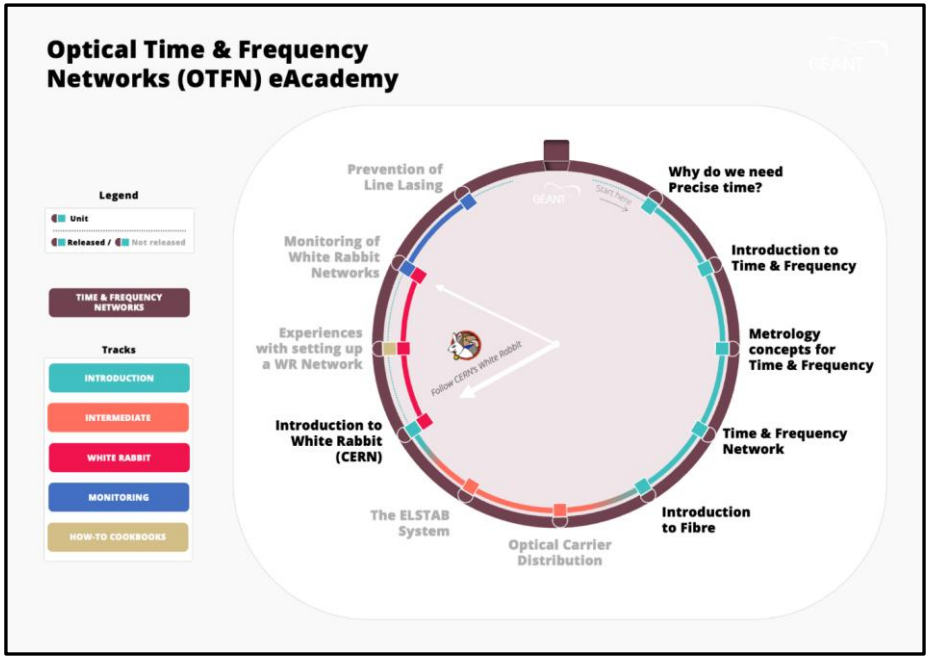
- https://e-academy.geant.org/
  - All courses
    - Technical Skills
      - Network
        - **Quantum Technology**



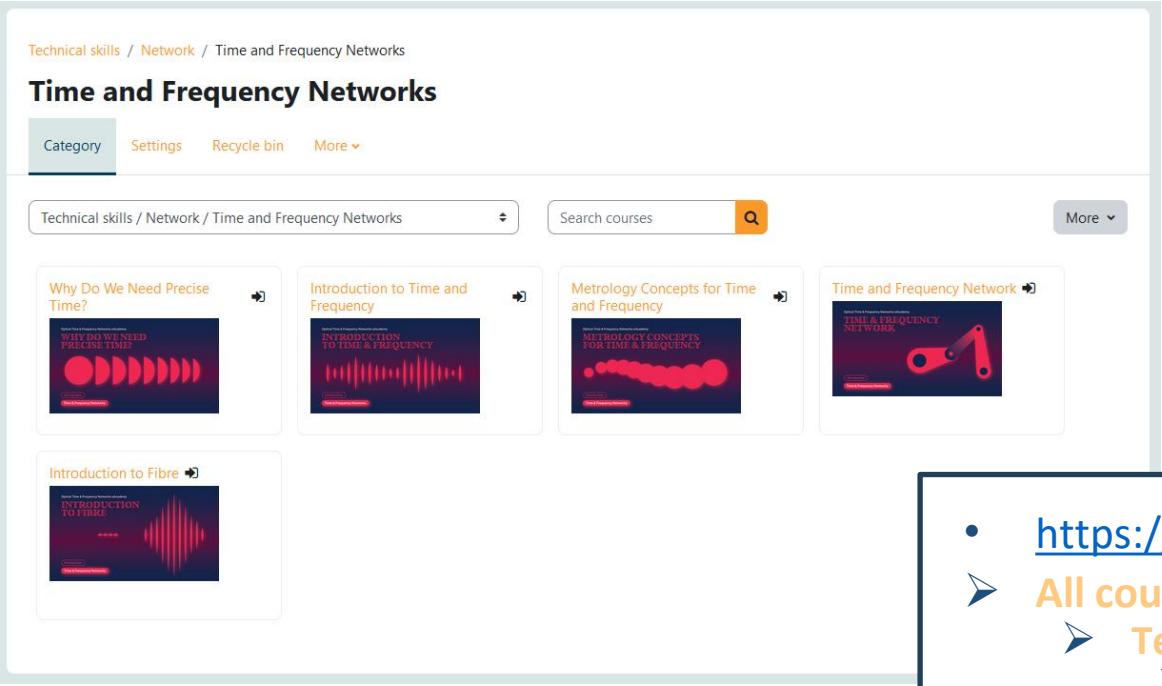
Formacíón en Optical Time and Frequency Networks (OTFN): Mapa

- https://wiki.geant.org/display/NETDEV/Time+and+Frequency+Networks+Training

  - Estaciones:
    - Negro → unidades publicadas
    - Gris → unidades previstas
  - Líneas:
    - Verde: cursos introductorios.
    - Naranja: avanzados
    - Roja: White Rabbit
      - NeA para material GÉANT
      - Más detalles vía enlace al CERN
    - Azul: monitorización
    - Beige: How-to Cookbooks



Formación en OTFN: Acceso vía GLAD

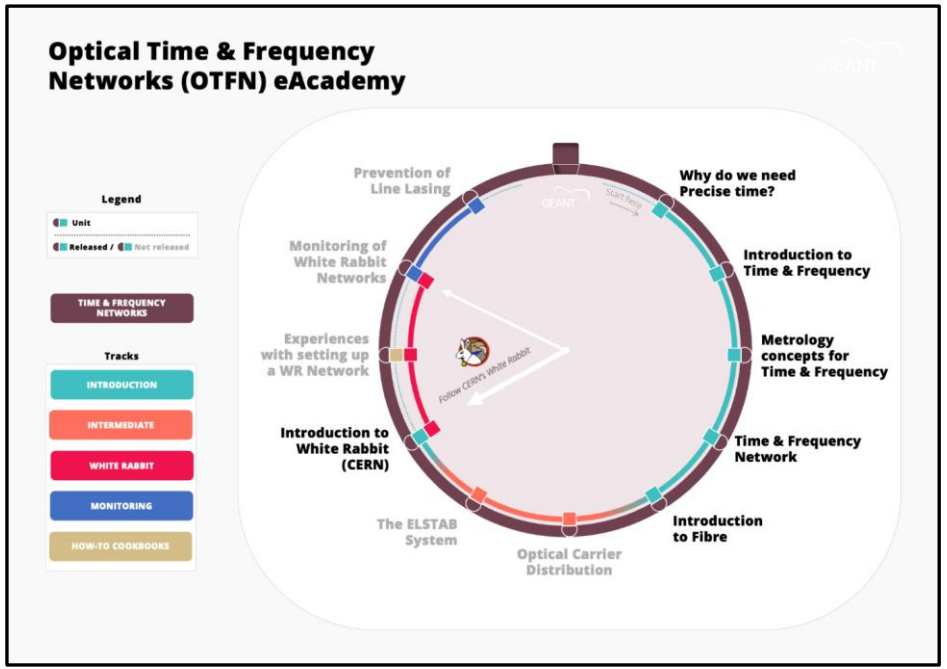


- https://e-academy.geant.org/
  - All courses
    - Technical Skills
      - Network
        - **Time and Frequency Networks**

Formación en OTFN

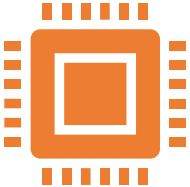
- https://wiki.geant.org/display/NETDEV/Time+and+Frequency+Networks+Training

- **En breve:**
  - Experiences with Setting Up a WR System
  - The ELSTAB System
  - Monitoring of White Rabbit Networks

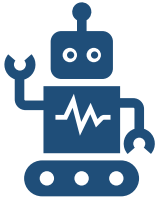


Objetivos del Working Group de la Network eAcademy en GNA-G

Hacer que los contenidos y herramientas de la Network eAcademy estén **disponibles para toda la comunidad de investigación y educación** y sean conocidos mediante reuniones, VCs de la Comunidad GNA-G y otras reuniones.



Ser una herramienta para las instituciones de Investigación y educación el todo el mundo para ayudarles a **comprobar su madurez y comparar su arquitectura** en Orquestación, Automatización y Virtualización con otras organizaciones parecidas



Ser una plataforma para **compartir conocimientos y debatir** para mejorar el contenido de la Network eAcademy en las áreas de Automatización, Inteligencia Artificial, Tecnologías Cuánticas y otras áreas de Desarrollo de red.

Más información en: https://www.gna-g.net/join-working-group/network-eacademy-wg/

Thanks all!

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!Gracias!

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