

# Orchestration, Automation and Virtualisation Architectures

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Public (PU)

## 30 years of **Poznań Supercomputing** and Networking Center

#### Center of e-Infrastructure

- National Research and Education Network PIONIER
- Research Metropolitan Area Network POZMAN
- **HPC Center**
- Data repositories and Digital Libraries Federation

#### **Center of Research & Development**

- New Generation Networks
- HPC, Grids & Clouds
- Grand challenge applications
- New media and visualization technologies
- Knowledge Platforms
- Future Internet Technology, Applications and Services for IS
- Cyber Security
- Quantum Communication and Computing use cases and practical scenarios

## https://www.psnc.pl/

#### **PSNC** in numbers













507 employees

laboratories

years of operation

16+ fields of activity

65 current projects

103 projects in H2020,

Horizon Europe, Digital Europe Programme



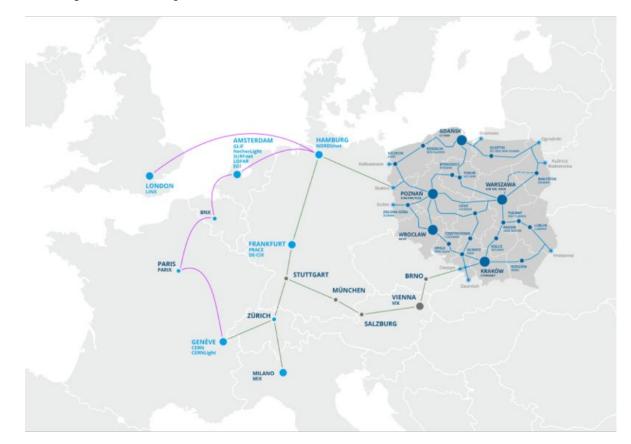
## **PSNC Network - PIONIER in Poland**



Type of connected unit	Number of units			
Research institutions	221			
Universities	196			
Post-secondary schools	21			
High schools, secondary schools, primary schools and vocational schools	234			
Healthcare	59			
Public safety	27			
Goverment administration	27			
Provincial administration	59			
District, municipality and city administration	73			
Other administration	9			
Court and public prosecutor's office	26			
<b>Cultural institutions</b>	104			
Other educational	27			

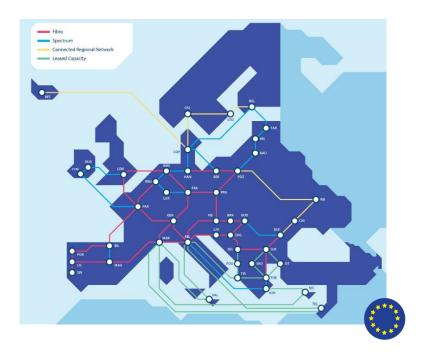
~10 000 km of fiber in total

## **PIONIER Connectivity in Europe**





## **GÉANT – European Network Infrastructure, Services and Community**



The GÉANT-5 project is under Horizon Europe Research and innovation funding programme until 2027



- High bandwidth, high speed and highly resilient pan-European backbone
- Interconnecting European NRENs
- over 20 years of support for Europe's research and education communities
- 37 partners
- 500 contributors
- 50M users

## The GÉANT Project



**GÉANT's vision** is to ensure equal network access for all scientists across Europe to the research infrastructures and the e-infrastructure resources



The GÉANT Project is a part of the European Union's Horizon Europe research and innovation programme under the seven-year Framework Partnership Agreement (FPA)



500 contributors from 37 partners - European R&E Institutions



50 M users



GÉANT 5-1 (GN5-1) Project duration: 1 Jan 2023 - 31 Dec 2024

## The GÉANT 5-1 Project Structure

W/P2 WP3 WP5 WP4 WP6 WP1 Network Core Marcomms, Events User and Trust & Identity WP8 WP9 Project Above-the-Net-Network Infrastructure and Core Stakeholder and Policy Services Evolution Security Operations Support Service Evolution and Services Development Management Engagement Engagement and Delivery Operations Task 1: Project Task 1: Task 1: User-Facing Task 1: Operations Task 1: Network Task 1: Operations Governance, Task 1: Partner Task 1: Security Communications Service Delivery and Enhancement Task 1: Technology Engineering and Centre including Management & Relations Management of eduroam and Design Chain Implementation CERT Coordination Task 2: Task 2: Supporting Task 2: Operations Task 2: Network Task 2: Software Task 2: Services Vendor-Facing Task 2: Human Task 2: Finance International User and Enhancement Task 2: Platform Infrastructure and Governance and Marketing Service Delivery Factor Groups of eduGAIN Services Evolution Support Chain Task 3: Network Task 3: Task 3: AAI Core Task 3: Security Task 3: External Management, Task 3: Service Task 3: ICT Task 3: Events Infrastructure Cloud platform and Task 3: Monitoring Products and Relationships Automation and Management Procurement eduTEAMS Services Services Orchestration Task 4: GÉANT Task 4: Research: Task 4: Above Net Task 4: Community Task 4: Policy Task 4: Packet Layer Security for Software Task 4: PLM Services Strategic Task 4: InAcademia Task 4: Academy Engagement Programme Renewal High-Speed Development and Planning Networks Operations Task 5: Human Task 5: Above Net Task 5: T&I Capital Services Incubator Development Developments

Task 6: Procurement & Supplier Management

Task 6: T&I Enabling Communities

Task 7: Distributed Identities

WP9

Operations Support

Task 1: Operations

Centre including

CERT

Support

Task 3: Service

Management

## The GÉANT 5-1 Project Structure

WP1 Project Management

Task 1: Project Governance, Management & Coordination

Task 2: Finance

Task 3: ICT

Task 4: PLM

Task 5: Human Capital Development

Task 6: Procurement & Supplier Management

W/P2 Marcomms, Events and Policy Engagement

Task 1: Communications and Design

Task 2: Services Marketing

Task 3: Events

Task 4: Policy Engagement

WP3 User and Stakeholder Engagement

Task 1: Partner Relations

Task 2: Supporting International User Groups

Task 3: External Relationships

Task 4: Community Programme

Task 5: Above Net Services Developments

WP4

Above-the-Net-

Services

Task 1: User-Facing

Service Delivery

Chain

Task 2:

Vendor-Facing

Service Delivery

Chain

Task 3:

Infrastructure Cloud

Procurement

Task 4: Above Net

Services Strategic

Planning

WP5 Trust & Identity Services Evolution and Delivery

Task 1: Operations and Enhancement of eduroam

Task 2: Operations and Enhancement of eduGAIN

Task 3: AAI Core platform and eduTEAMS Services

Task 4: InAcademia

WP6 Network Development

Task 1: Technology

Task 2: Platform

Task 3: Monitoring

Task 4: Academy

Task 5: T&I Incubator

Network Core Infrastructure and Core Service Evolution and Operations

Task 1: Network Engineering and Implementation

Task 2: Network Infrastructure and Services Evolution

Task 3: Network Management,

Automation and Orchestration

Task 4: Packet Laver Renewal

WP8 Security

Task 1: Security Management

Task 2: Software Task 2: Human Governance and Factor

Task 3: Security Products and Services

Task 4: Research: Security for High-Speed Networks

Task 4: GÉANT Software Development and Operations

**NETDEV** 

Task 6: T&I Enabling Communities

Task 7: Distributed Identities

WP Leaders: Ivana Golub (PSNC), Pavle Vuletić (UoB/AMRES)

WP6 budget: > 3,1 mil EUR

31 R&E organisations from 25 countries 85 team members

https://wiki.geant.org/display/netdev

## The GÉANT 5-1 Project Structure

WP1 Project Management

> Task 1: Project Governance, Management & Coordination

Task 2: Finance

Task 3: ICT

Task 4: PLM

Task 5: Human Capital Development

Task 6: Procurement & Supplier Management

W/P2 Marcomms, Events and Policy Engagement

> Task 1: Communications and Design

Task 4: Policy

Engagement

Task 2: Services Marketing

Task 3: External Task 3: Events Relationships

Task 4: Community Programme

WP3

User and

Stakeholder

Engagement

Task 1: Partner

Relations

Task 2: Supporting

International User

Groups

Task 5: Above Net Services Developments

WP4

Above-the-Net-

Services

Task 1: User-Facing

Service Delivery

Chain

Task 2:

Vendor-Facing

Service Delivery

Chain

Task 3:

Infrastructure Cloud

Procurement

Task 4: Above Net

Services Strategic

Planning

WP5 Trust & Identity Services Evolution and Delivery

Task 1: Operations and Enhancement of eduroam

Task 2: Operations and Enhancement of eduGAIN

Task 3: AAI Core platform and eduTEAMS Services

Task 4: InAcademia

Task 5: T&I Incubator

WP6 Network Development

Task 1: Technology

Task 2: Platform

Task 3: Monitoring

\* Task 4: Academy

**NETDEV** 

Network Core Infrastructure and Core Service Evolution and Operations

Task 1: Network Engineering and Implementation

Task 2: Network Infrastructure and

Services Evolution

Task 3: Network Management,

Automation and Orchestration

Task 4: Packet Laver Renewal

WP8 Security

Task 1: Security Management

Task 2: Human Factor

Task 3: Security Products and Services

Task 4: Research: Security for High-Speed Networks

WP9 Operations Support

Task 1: Operations Centre including CERT

> Task 2: Software Governance and Support

Task 3: Service Management

Task 4: GÉANT Software Development and Operations

Task 6: T&I Enabling Communities

Task 7: Distributed Identities

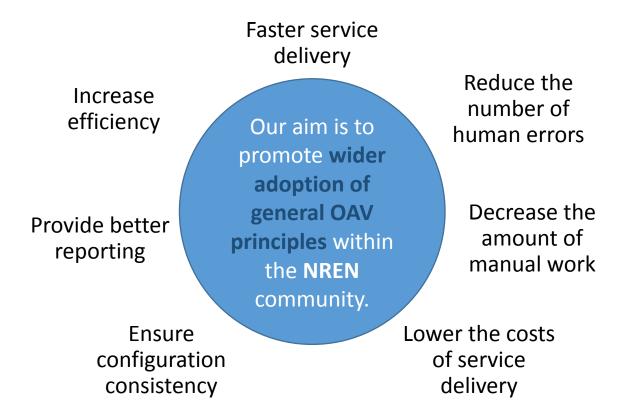
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## **OAV: Orchestration, Automation and Virtualisation**



## 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

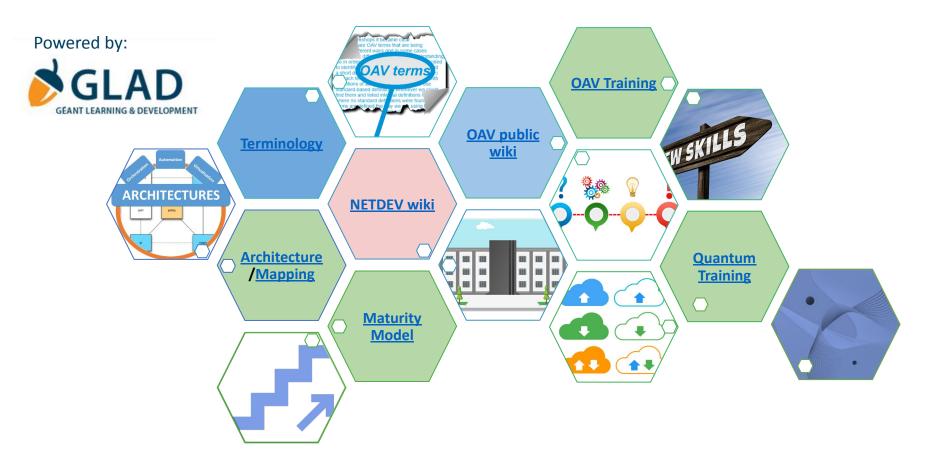


A generally accepted architecture blueprint needed



NRENs are willing to share experiences and learn from others

## **Network eAcademy**



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



## **TMForum Open Digital Architecture as a Reference Architecture**

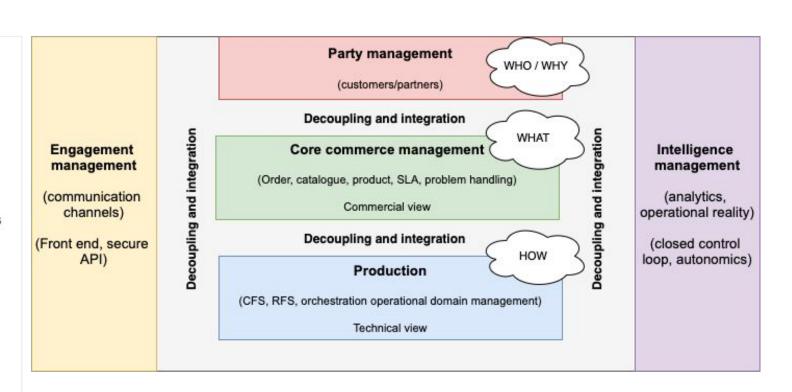


People

Organisations

Things





## **Digital Architecture Analysis**

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

**Align efforts** 

**Find similarities** 

Collaboration

Interoperability

#### **NREN Architectures**

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

## **NETDEV Architectures**

- Argus
- <u>NMaaS</u>
- SPA

#### **Other Use Cases**

- <u>5G</u>
- EOSC
- ETSI GANA
- ETSI OSM
- ETSI ZSM
- GVM
- MEF LSO
- Open Baton

- ONAP
- <u>SENSE</u>
- <u>TALENT</u>

## NMaaS - Network Management as a Service

A portfolio of network management applications run as dedicated, cloud-based per-user instance

28 applications available, easy to add new tools

#### Use cases:

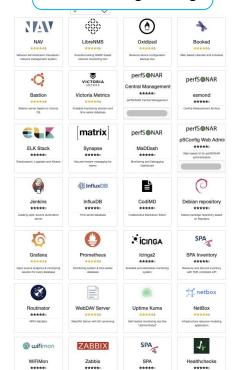
- Network/Equipment Management for Small/Medium size networks/ institutions
- Project-owned equipment
- NMaaS Virtual Lab NEW!

#### How to use NMaaS?

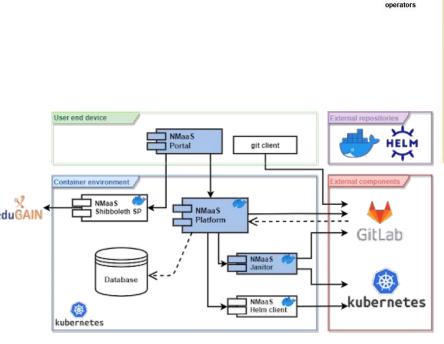
- Managed service
  - Production NMaaS instance: https://nmaas.eu
  - Sandbox instance: https://nmaas.geant.org
- Self-hosted
  - On your own NMaaS instance: <a href="https://docs.nmaas.eu/install-guide">https://docs.nmaas.eu/install-guide</a>
  - On a local machine: https://docs.nmaas.eu/local-vm



nmaas.eu nmaas@lists.geant.org

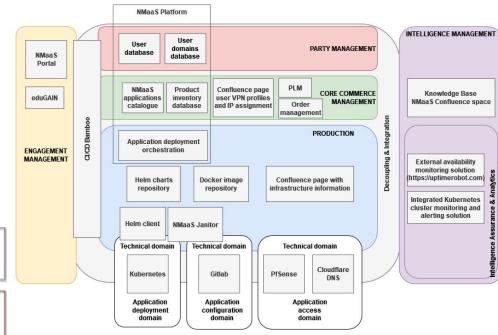


## **NMaaS Architecture**



Users

Network



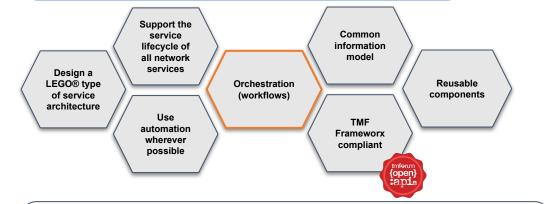
NMaaS-OAV-Architecture-Analysis

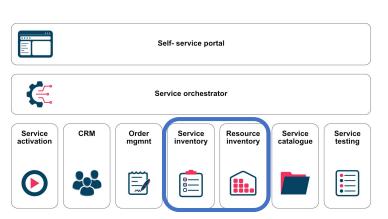




**SPA** is a modular distributed platform to orchestrate and automate network services in the GÉANT and NREN network infrastructures.



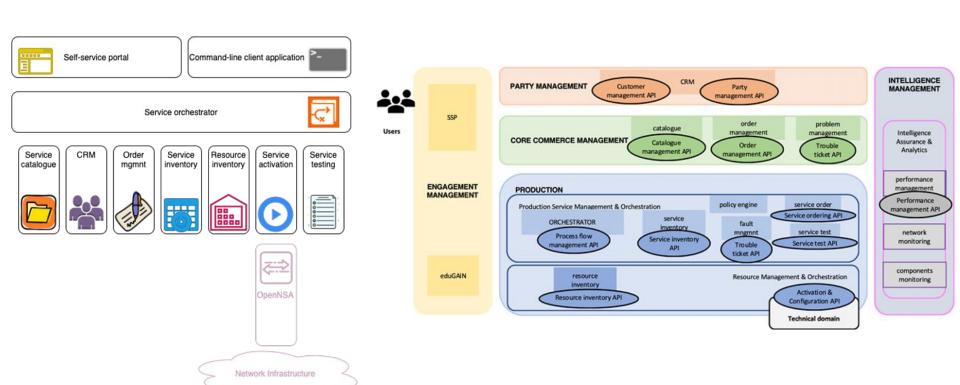




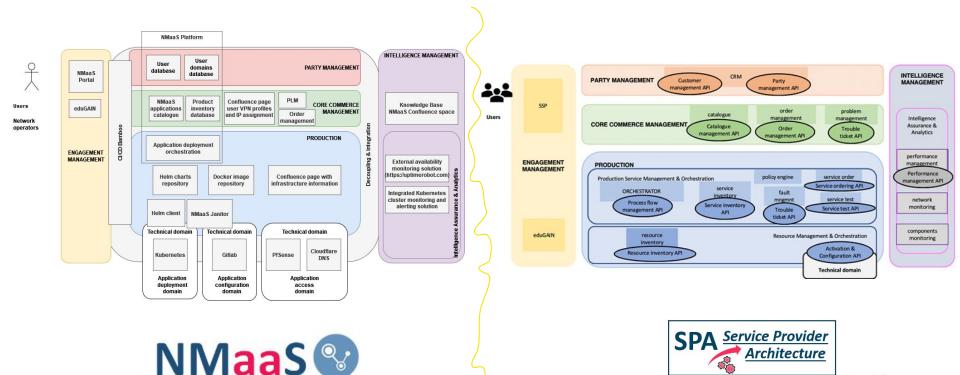
- Process and service orchestration and automation in action
- Used for the GÉANT Connection Service (GCS)
- Test service instance available in NMaaS

spa@lists.geant.org
https://wiki.geant.org/display/NETDEV/SPA

## **Service Provider Architecture**

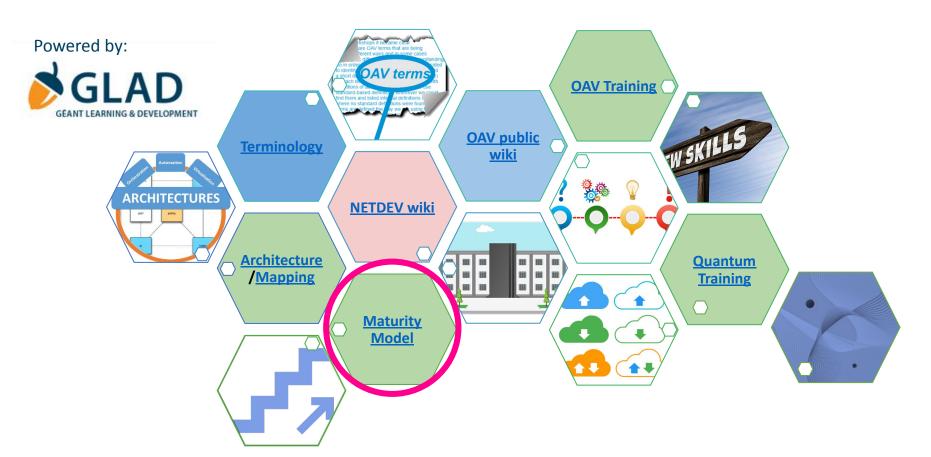


## **NMaaS and SPA Architectures**





## **Network eAcademy**





Provide a common OAV progress indicator



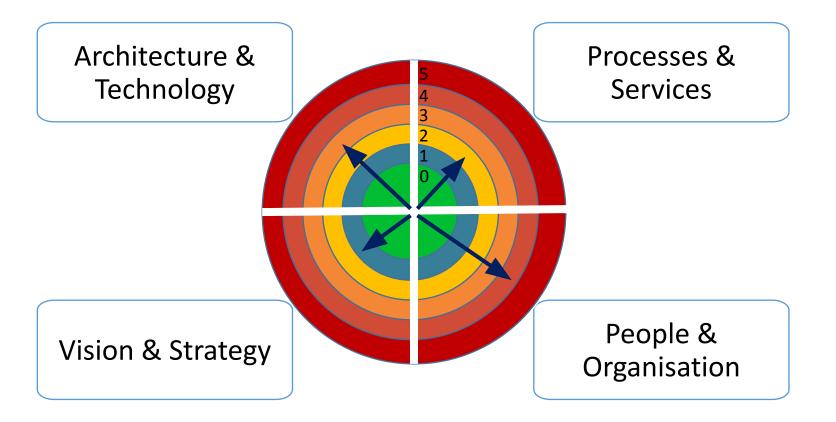
Help organisations on their OAV journey



## **Maturity Model Goals**

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**



## **Dimensions definition**

- architectural and technological capabilities
- necessary to develop, establish and continue to evolve an OAV environment

Architecture & Technology

Processes & Services

People & Organisation

- process management
- service lifecycle management
- OAV activities needed to achieve successful digital services

Vision &

Strategy

- organisational culture that supports the adoption and advancement of OAV
- all stakeholders
- open, innovative, agile and flexible collaboration

- aligning OAV with corporate objectives
- defining corresponding priorities across the organisation

## **OAV Maturity Model - Stages**



Created by Valerie Lamm

## **Stages Definition**

## 0

## SIT

#### None

- No or minimal OAV in production
- Traditional siloed architecture
- Manual processes
- CLI management

## CRAWL

#### Ad Hoc

- OAV is gaining interest
- Starting to apply OAV
- Initial hands-on experience
- Automating steps

#### WALK

#### Reactive

- Initial pilot use-cases underway
- In-dept investigation of OAV
- Cross-department teams
- Automating processes

#### **RUN**

#### Integrated

- OAV architecture
- Functional modules
- Common data model
- Data de-duplication
- OAV policies in place

#### **FLY**

#### Proactive

- Multi-domain
- Fully functional OAV platform
- Partners ecosystem
- · Making predictions
- Closed-loop processes

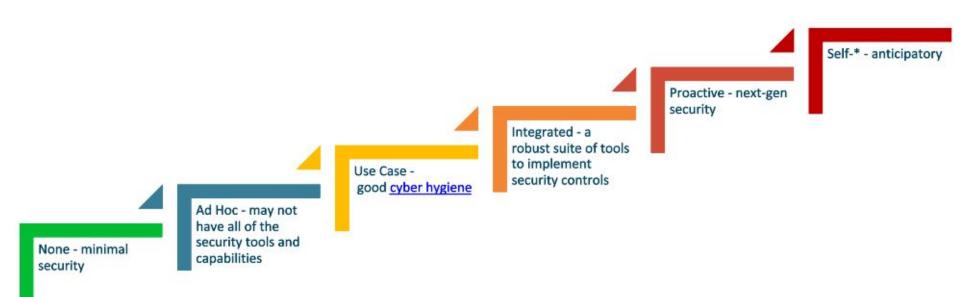
#### **ENERGISE**

Self-\*

- Auto discovery of components, functionalities, partners and services
- Seamless interoperability
- Self-optimizing network
- Automated implementation of high-level business intentions

MINDSET ADOPTION

## **Example for Security**



Granular OAV Maturity Assessment	Architecture & Technology			Processes & Services			Vision & Strategy		People & Organisation	
	Components	Virrtualisation	Data modeling	Service design	Monitoring and reporting	Security management	Policies development	Standardisation	Culture	Training
Level 5 Self-*										
Level 4 Proactive										
Level 3 Integrated										
Level 2 Reactive										
Level 1 Ad Hoc										
Level 0 Rone										

Assess

Analyse

Address

Three-phase approach

More information: <a href="https://wiki.geant.org/display/NETDEV/OAV+Maturity+Model">https://wiki.geant.org/display/NETDEV/OAV+Maturity+Model</a>



Assessing your maturity isn't a one-time exercise



You need to measure your progress toward your desired to-be state



Re-assessing your maturity levels helps review if changes are leading to the right direction

#### **OAV Assessment**

https://www.surveymonkey.com/r/SPYDQVB

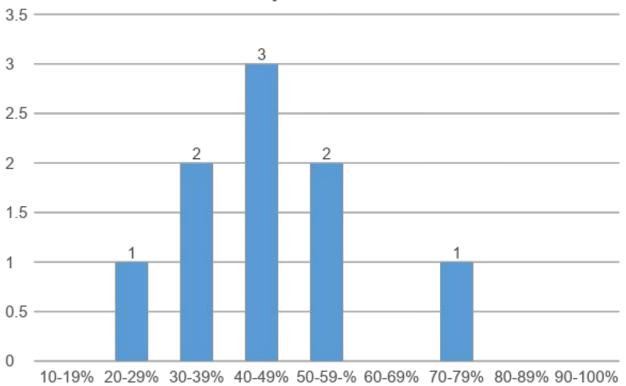
•31 questions

- Data is used for analytical purposes only
  - we do not publish data for individual institutions

Report is sent to the person defined in survey



## Current Community OAV Score Distribution\*





<sup>\* 9</sup> NRENs analysed so far

## **Summary**

## OAV Architecture Analysis and Mapping for

- Consistent and systematic approach
- Understanding different digital architectures
- Systems' advancements, federation, integration
- Want to map your Digital Architecture? <a href="network-eacademy@lists.geant.org">network-eacademy@lists.geant.org</a>

## **OAV Maturity Model**

- Self-assessment tools
- Provides a consistent and systematic roadmap
- Assess Analyse Address. Repeat!

To fill in the OAV MM Survey: <a href="https://www.surveymonkey.com/r/SPYDQVB">https://www.surveymonkey.com/r/SPYDQVB</a>

Any questions / comments: network-eacademy@lists.geant.org





## **Thank You!**

https://wiki.geant.org/display/NETDEV/NeAnetwork-eacademy@lists.geant.orgnetdev@lists.geant.org

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