Everything you Wanted to Ask About Orchestration, Automation and Virtualisation (OAV): Time to Ask

Maria Isabel Gandia, CSUC/RedIRIS
Susanne Naegele-Jackson, FAU/DFN

WP6-T2 / Consensus Building

GÉANT Infoshare - Orchestration, Automation and Virtualisation in the NRENs. Ready, Steady, Go!

16 December 2020

www.geant.org
The Need for OAV Training

By the community for the Community

Survey implied many NRENs need knowledge

Examples grounded in R&E

Many NRENs not really started yet

Tailored training for R&E networks

Powered by:
OAV Training: Knowledge Map

Introduction

DevOps Concepts
Decoupling and Integration
Standards and Commonly Used Architectures

Engagement Management
Production
Core Commerce
Party Management
Intelligence Management

NREN Implementation Examples
Mapping of Architectures

TMForum Open Digital Architecture Functional Blocks

www.geant.org
**Your Trainers**

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<th>Name</th>
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<tr>
<td>Jasone Astorga</td>
<td>RedIRIS / UPV/EHU</td>
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<tr>
<td>Xavier Jeannin</td>
<td>RENATER</td>
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<td>Dónal Cunningham</td>
<td>HEAnet</td>
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<td>Hamzeh Khalili</td>
<td>RedIRIS/i2CAT</td>
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<td>Yuri Demchenko</td>
<td>SURFnet / UvA</td>
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<td>Roman Łapacz</td>
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<td>Martin Dunmore</td>
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<td>Sonja Filiposka</td>
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<td>Simone Spinelli</td>
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<td>Maria Isabel Gandia</td>
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<td>Kostas Stamos</td>
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<td>RedIRIS / UPV/EHU</td>
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<td>Pavle Vuletić</td>
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<tr>
<td>Iacovos Ioannou</td>
<td>CyNet</td>
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Open Window to the Trainers

• By video conference on the first Tuesday every month.
• Just drop us an e-mail: oav@lists.geant.org, we will send you the link.
The Phases (2+5)
Introduction

DevOps Concepts
- Version Control: Gitlab
- CI/CD: GitlabCI
- CI/CD: Jenkins

Decoupling and Integration
- Data Modelling: TOSCA
- Data Modelling: YANG
- Protocols: NETCONF

Standards and Commonly Used Architectures
- Formats: XML
- Formats: YAML
- TMForum ODA

Engagement Management
- Docker Swarm
- Ansible
- Python
- NSO

Production

Core Commerce

Party Management

Intelligence Management

TMForum Open Digital Architecture Functional Blocks

Mapping of Architectures

NREN Implementation Examples
Welcome to the Introduction to OAV

Course summary

Many things that historically were handcrafted and done manually are now compulsory automated. The evolution to automated tasks helps making processes and service delivery faster, agile, flexible, scalable and more economical.

Network management is not an exception and there are many examples of companies embracing automation. But automating network tasks is not just replacing something you used to do manually with something automated, done in the same way. Automating network tasks requires a complete mindset change at all levels - from the company management to the network and software engineers.

Users in the Research and Education world demand different services today than they did not ask for before. e.g. Campus Network Management as a Service (CNaaS), Firewall on Demand, cloud services, self-service of circuits, multi-domain services, etc. Orchestration, Automation and Virtualisation (OAV) techniques allow these services to be delivered in a sustainable manner.

Some NRENs have already started working on implementing these techniques and/or applying their own ad-hoc solutions. Others, have not yet started this transition.

To make it short it is important to have a common ground for understanding what is required today, how to make it happen and then to standardise the many different services in this modern process.

https://e-academy.geant.org/moodle/course/view.php?id=50
OAV Wiki - Knowledge Sharing and Global Exchange

Orchestration, Automation and Virtualisation (OAV)

Created by Frank Koeberl, last updated by Daniel, 10 August 2017

Introduction

Welcome to the open GÉANT project wiki area for orchestration, automation and virtualisation (OAV).

This wiki area is for knowledge sharing and exchange between GÉANT NRENs and organisations interested in applying OAV principles to their network operations. It is also intended to serve as a platform to discuss strategies, common use cases and ideas related to network and service orchestration, automation and virtualisation in our GÉANT community and beyond.

More material will be added on a continuous basis.

Current focus

OAV Terminology

It became evident during a number of discussions with the NRENs community that there were different usages and understanding of various terms in the context of orchestration, automation and virtualisation (OAV). As a result, a Focus Group (FG) on Terminology was established in OAV-MIR to identify a list of relevant OAV terms and acronyms and provide short definitions for these terms. It was agreed that the definitions should be based on documents of standardisation bodies whenever possible. In all other cases the FG provided definitions based on internal discussions and surveys within the OAV-TC consensus building team. The work was concluded with a document (PDF) that can serve as a guideline to members of the community in the ongoing effort to find commonality and strategic vision for further OAV work in GÉANT. All terms can also be found at OAV Terminology & Glossary.

Contact Us

We are very interested to hear from members of the community working on OAV, whether you wish to share your knowledge or find out more about OAV principles. You can email the OAV secretariat at:

oav@lists.geant.org

Important Links and Information

- OAV Literature - references to OAV related literature
- OAV Terminology - a list of common OAV terms and abbreviations
- OAV Glossary - list of OAV terms and abbreviations
- OAV Standards - list of standardisation bodies and their OAV material
- OAV Report - OAV reports and whitepapers

Towards Collaborative Digital Services

Facilitating collaboration and interoperability via common principles and guidelines

https://wiki.geant.org/display/OAV/
# OAV Wiki: Terminology

## Glossary

<table>
<thead>
<tr>
<th>Abbreviation/Acronym</th>
<th>Description/Definition</th>
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<tbody>
<tr>
<td>ABE</td>
<td>Aggregate Business Entity</td>
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<tr>
<td>AI</td>
<td>Artificial Intelligence</td>
</tr>
<tr>
<td>AMC</td>
<td>Autonomic Management and Control</td>
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<tr>
<td>AWS</td>
<td>Amazon Web Services</td>
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<tr>
<td>BPMN</td>
<td>Business Process Model and Notation</td>
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<tr>
<td>BC</td>
<td>Business Support System</td>
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<tr>
<td>Ciena Blue Planet</td>
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<tr>
<td>Component Description</td>
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<tr>
<td>CDN</td>
<td>Content Delivery Network</td>
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<tr>
<td>CN</td>
<td>Cloud Native Application</td>
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<tr>
<td>Container Network Interface</td>
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<tr>
<td>CSP</td>
<td>Communications Service Provider</td>
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<tr>
<td>D&amp;M</td>
<td>Decoupling &amp; Integration</td>
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<tr>
<td>DC</td>
<td>Data Centre</td>
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<tr>
<td>DCN</td>
<td>Data Communication Network</td>
</tr>
<tr>
<td>DE</td>
<td>Decision Element</td>
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<tr>
<td>DPA</td>
<td>Digital Platform Reference Architecture</td>
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<td>DTN</td>
<td>Data Transfer Node</td>
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<tr>
<td>EACM</td>
<td>Enterprise Architecture Content Metamodel</td>
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<td>EGIM</td>
<td>Engagement Management</td>
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<td>ETSI</td>
<td>European Telecommunications Standards Institute</td>
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## OAV Wiki: Architecture

**Initial list of identified architectures related to G4**

<table>
<thead>
<tr>
<th>Standardization body, organization, association, forum</th>
<th>Agent</th>
<th>Identity</th>
<th>Architecture</th>
<th>Architecture reference</th>
<th>Link to project info</th>
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**Summary:**

The document provides an overview of various architectures related to G4, including ITU-T, ISO, IETF, and IEEE standards. Each section includes links to project information for further details.

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**Further resources:**

- [Link to OAV+Architectures page on the OAV Wiki](https://wiki.geant.org/display/OAV/OAV+Architectures)
- [GEANT website](www.geant.org)
# OAV Wiki: Training

## OAV Training Portal

**INTRODUCTION**
- Introduction to OAV
- OAV Architecture Requirements
- The ODA Blueprint

**DevOps Concepts**

**Decoupling and Integration**

**Standards and Commonly Used Architectures**

**TM Forum Open Digital Architecture Functional Blocks**
- Engagement Management
- Privacy Management
- Core Commerce Management
- Production
- Intelligence Management

**Mapping of Architectures**
- NREN Implementation Examples
The OAV Community Portal

- Each NREN or connected institution may present their OAV work or provide links.
- NRENs willing to share information or find out more about OAV can reach the team at oav@lists.geant.org.
FROM A TRADITIONAL OSS/BSS
- Analyse components and functionalities
- De-couple & de-duplicate
- Expose components via APIs
- Automate manual tasks per component
- Use orchestrators to implement complex processes spanning multiple components

VIA A DIGITAL PLATFORM
- Agree on common terminology to understand each other
- Common service abstraction definition
- Interoperable interfacing via common Open APIs
- Federate with other NRENs or commercial providers

TO AN INTEROPERABLE COMMUNITY
- On-demand provisioning of multi-domain services using common APIs and data models
Digital Platform Concepts and Principles *

* based on the TMForum Open Digital Architecture

Architecture building blocks

De-couple functionalities into separate components.
Use the single source of truth approach to data storage.
Implement DevOps to develop/maintain each component.

open APIs

Promote a multi-vendor environment where each component has a well-defined API.
Ensure interoperability with open API specifications.
Same APIs for intra- and inter-domain integration.

Orchestration and Automation

Start incrementally: automate repetitive daily tasks first.
Orchestrate multiple components using processes.
Innovate: don’t improve existing manual processes or compromise - invent new, more efficient workflows.

Service abstraction

Define abstracted service representations.
Describe services and resources using catalogues.
Re-use components for all services.
TOWARDS COLLABORATIVE DIGITAL SERVICES

The delivery of modern network services is evolving from services that were traditionally provisioned via heavily manual processes that were based on classic CSS/SSS platforms. Today's users demand self-service environments where they can make changes at a time that suits them. NIRNs and their clients are reacting to this demand by embracing a digital transformation process - seeking to use digital platforms in an agile way - where that process mandates automation, modularity and flexibility. The drivers for automation are clear, including more efficient provisioning, and configuration consistency. It is also important to consider how a collaborative approach for the GEANT community can bring additional benefits.

As NIRNs and R&I organisations embrace their digital transformation, it is important to foster such collaboration through the sharing of knowledge and experience within the GEANT community. Agreeing to implement Orchestration, Automation and Virtualisation (OAV) using a shared vocabulary and a common high-level architecture blueprint helps to ensure interoperability and potentially facilitate future inter-domain services as NIRNs converge towards a shared objective for their users: the provision of true on-demand, self-service environments.

The search for such a blueprint led to the selection of the TM Forum’s Open Digital Architecture (ODA), adopted by and driving the digital transformation of most communication providers. ODA is a reference framework which provides a common understanding and generality in an environment where each NIRN is free to choose its own path towards OAV - including architecture, design and implementation.

Fostering collaboration and interoperability via common principles and guidelines

| Modular architecture approach | Loosely coupled components that work together in an orchestrated manner. |
| Discrete, functional building blocks | Each component exposes well-defined functional capabilities. |
| Open APIs | Each component is accessed via an Open API that fosters interoperability, supports multi-vendor environments, and is the basis for automation and orchestration. |
Leveraging ODA to build interoperable (multi-domain) digital services

The ODA modular architecture supports efficient automation, data integrity and a streamlined approach to workflows with a template- and catalogue-based “single source of truth”.

Within the GEANT community, the federated approach of supporting interoperable discrete functional building blocks translates to agreeing to a minimum set of common APIs - used both internally and externally - and a common description of composable abstract services and resources in the corresponding catalogues. In this way, the nodes are able to implement the “in a box” (“what happens in the domain stays in the domain”), meaning that each node remains in control of how it implements its own platforms, and decides what and how much information (or level of abstraction) is exposed to other parties or systems via open APIs.

ODA Benefits

- Agile development of new services
- Independent evolution of components
- Multi-domain and federated services via standardised patterns
- Technology agnostic blueprint
- Integrates related standards
- Faster support and troubleshooting
- Change management support
- Zero-touch orchestration
- Multi-vendor Interoperability
- Stepwise evolution
- Model-driven service management
- Support for autonomous networks
- AI/ML ready

OAV Wiki Knowledge Base

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- Want to align your architecture with ODA?
- Have an OAV use case you would like to share and work on with us?
- Looking for a particular component or an open API specification?
- Seeking/offering to provide OAV training?

Contact us at oav@lists.geant.org

Download it here: https://wiki.geant.org/display/OAV/?preview=/123792049/188907541/OAV_Arch_text_and_infographics.pdf
Thank you

Any questions?

Email us:
oav@lists.geant.org

www.geant.org
More information: GÉANT White Papers and OAV Wiki:

https://www.geant.org/Resources/#white

and

https://wiki.geant.org/display/OAV
Presentations from today's infoshare are available at the events page:

https://events.geant.org/e/OAV/
Future WP6 Events – see https://events.geant.org

20 January 2021 – GÉANT Infoshare
• Quantum Technologies - Principles, Challenges and Applications

10 March 2021 - Workshop
• European Time and Frequency services - Principles, Challenges and Use cases

24 March 2021 - Workshop
• Workshop on Network Management and Monitoring Tools

14 April – 15 April 2021 - Workshop
• European perfSONAR User Workshop
Thank you

Any questions?

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oav@lists.geant.org

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