

Agile Network Management: The Impact of Automation and Orchestration

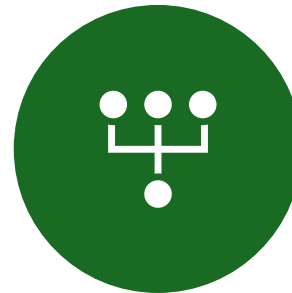
Prof. Sonja Filiposka, UKIM, GN5-1

How well are we performing today?

*Uptime report 2024



Network-related issues are the largest single cause of IT service outages



Could have been prevented with better management, processes and configuration



Significant, serious or severe outage cost more than \$100,000



Human error, whether directly or indirectly, contributes to a significant majority (2/3 – 4/5) of all downtime incidents

The Shift



**Rigid and
Manual
Processes**



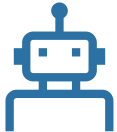
**Difficulty
Scaling**



**Static and
Reactive**



Agility



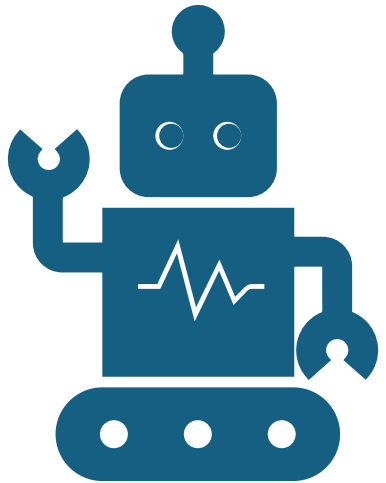
Intelligence



Flexibility



Essential ingredient required:
Single Source of Truth



Translating intent...

Activating...

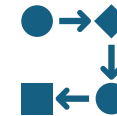


Network as you imagined it

Building a responsive and efficient network architecture



Task automation



Workflow automation



End-to-end orchestration



API-driven networks



Self-*
Zero-Touch

Tackling Issues

Lack of Trust

Need for a cultural shift



Heterogeneous Environments & Legacy Systems

Interoperability challenges

Limited capabilities and compatibility



Get up



Security risks

Increased attack surface



Graceful fail management

Robust error handling

Proactive error detection

Automated recovery procedures



Moving Beyond A&O

The Journey Continues...



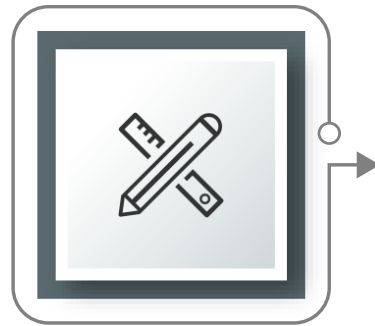
Foundation

- ✓ Automation
- ✓ Orchestration



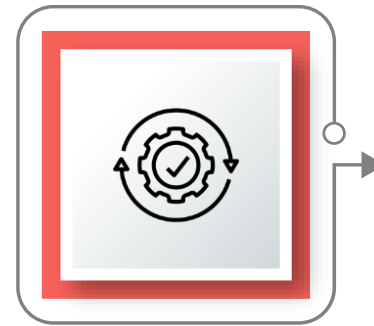
Integrate

- ✓ Continuous integration
- ✓ Continuous Deployment



IaC

- ✓ Version control
- ✓ Consistency
- ✓ Rollback



Real-time

- ✓ Monitoring
- ✓ Logging
- ✓ Adaptability



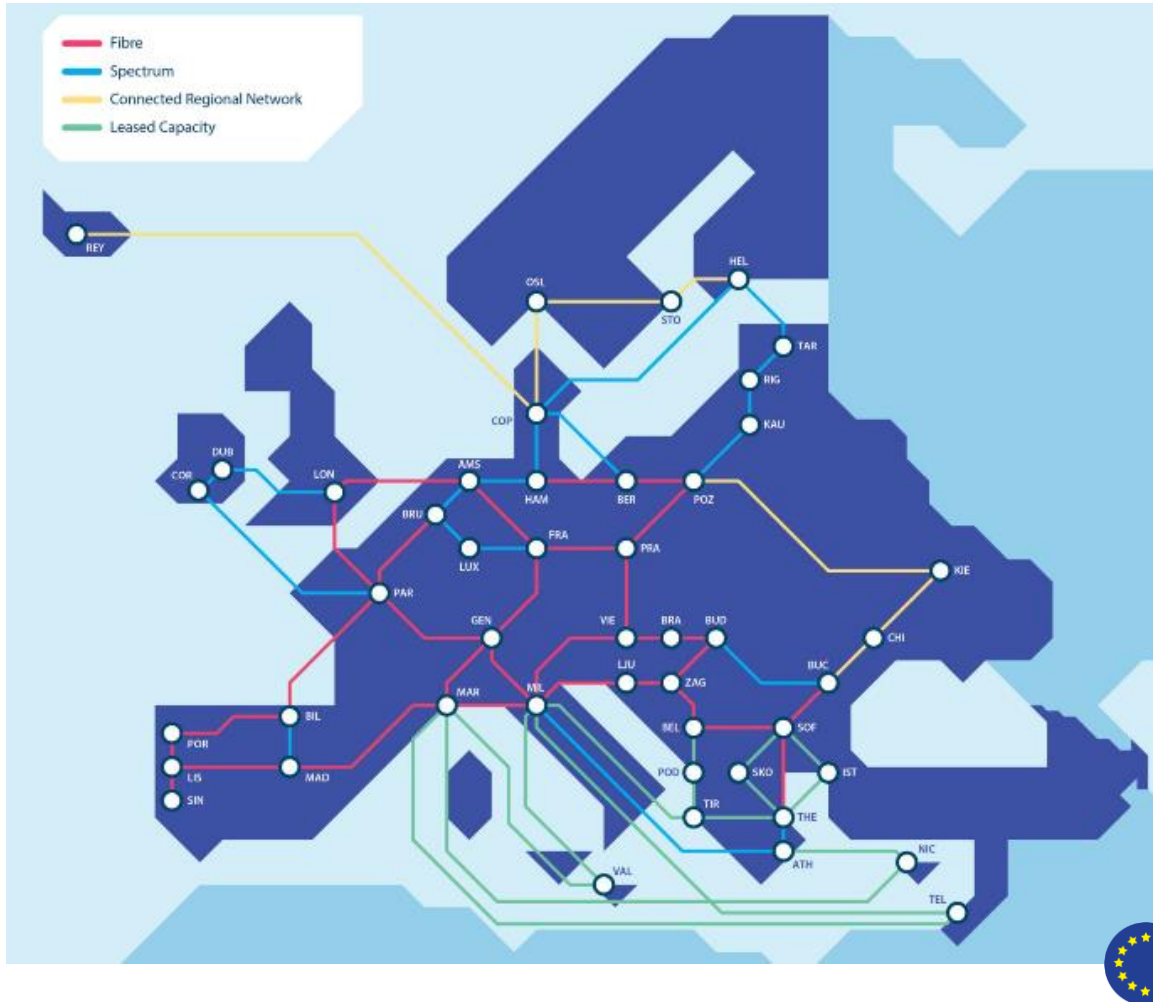
NetDevOps

- ✓ Network engineering
- ✓ Software development
- ✓ Network operations

The Case of GP4L

in the GÉANTs GN5-1project

The GÉANT Network



- 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 Global Platform for Lab (GP4L)

01

GP4L Experimental Testbed

A P4 distributed infrastructure for researchers to run network experiments

GP4L Digital Transformation Use Cases

Automation and orchestration solutions that underpin agile networks

02

03

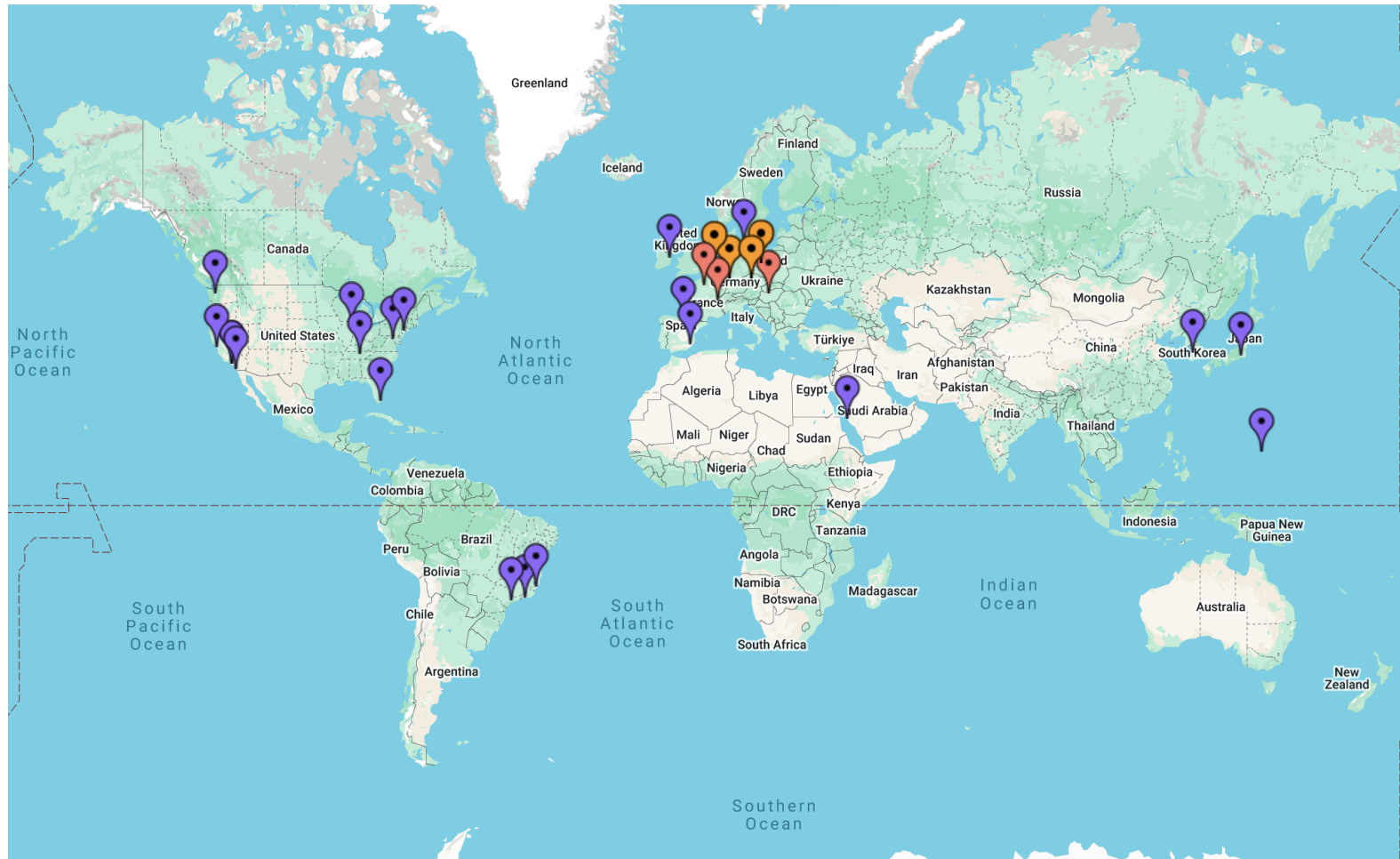
GP4L Community Collaboration

Open discussion and collaboration on pilots

- Service Provisioning Pilot for PIONIER

GP4L Experimental Testbed

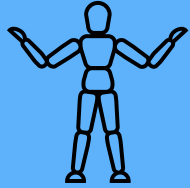
A programmable network infrastructure that can be used to run cutting-edge network experiments.





Heterogeneous Environments

Escape vendor lock-in



Single Source of Truth

Design reusable data models



Implementation Complexity and Validation

Test, test, go



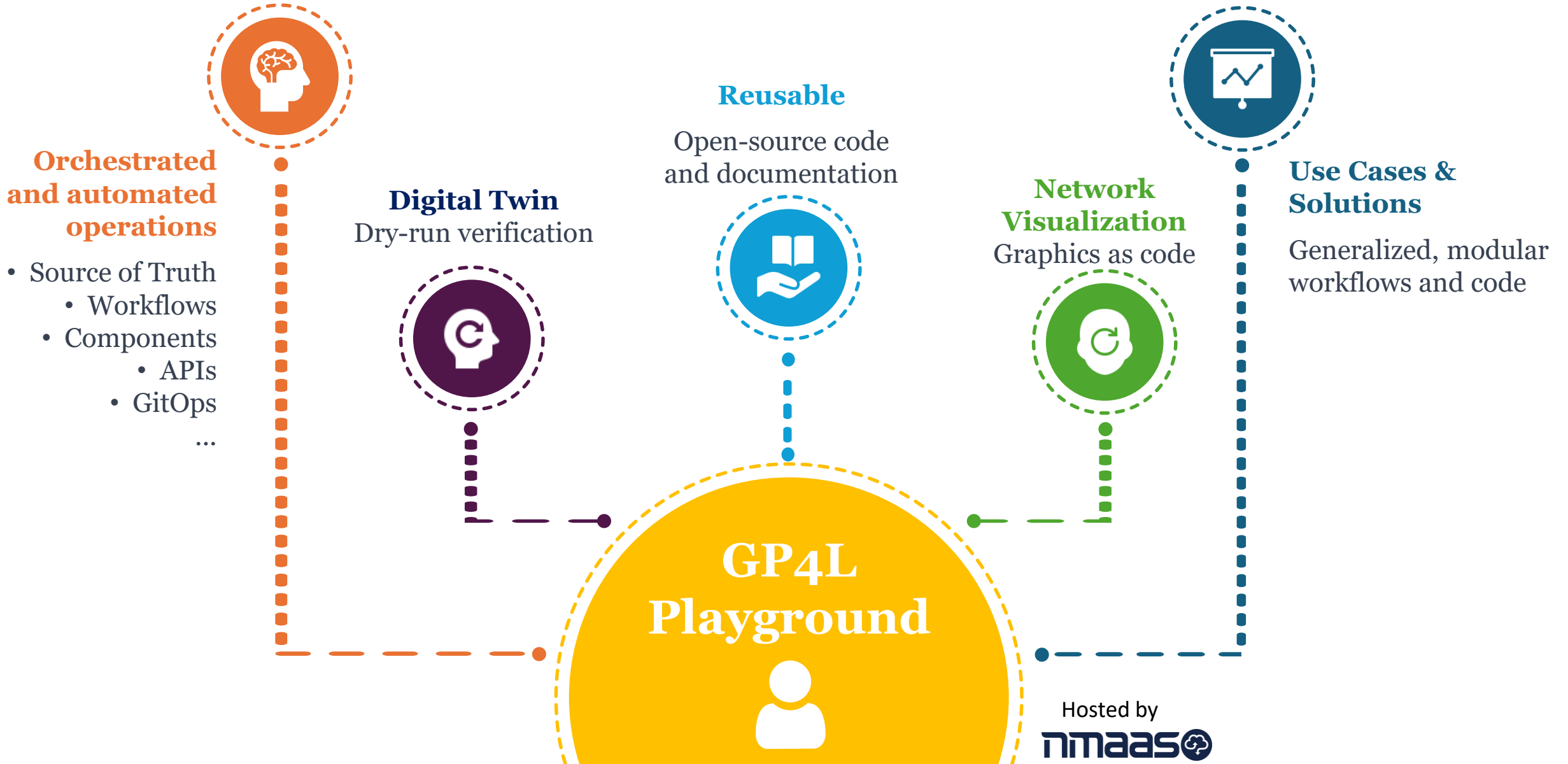
Standardization and Flexibility

Provide well-defined building pieces

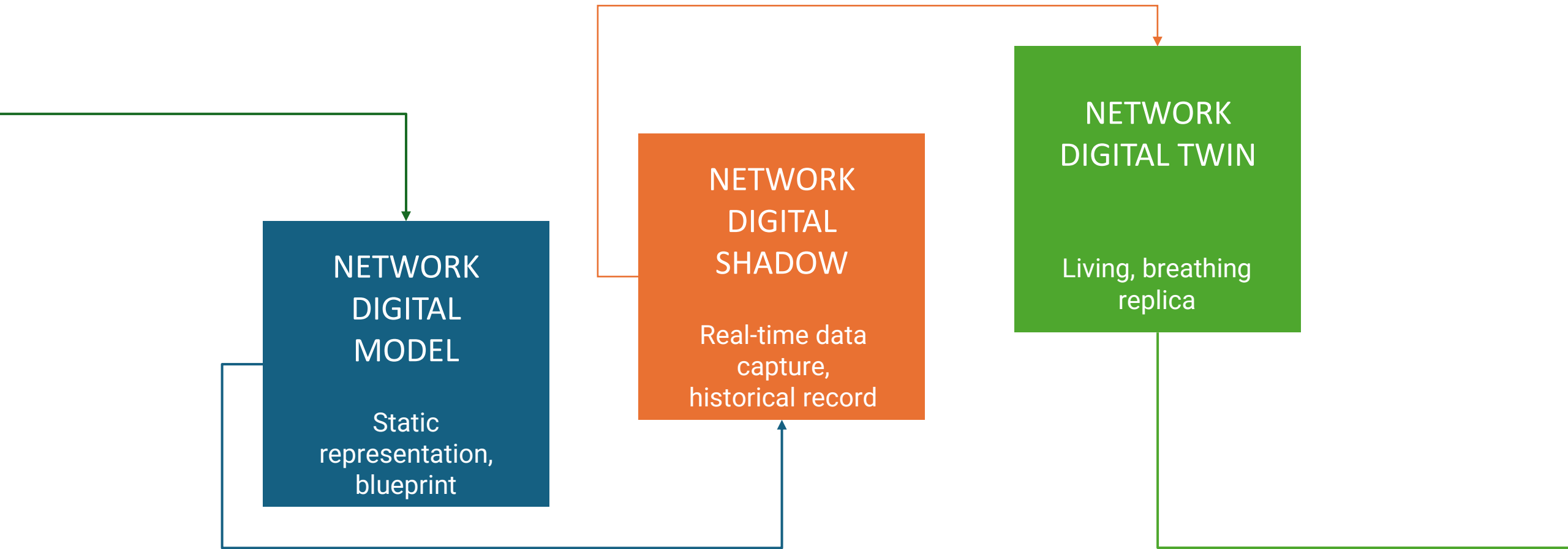
GP4L's Approach

Overcoming
common challenges
in the community

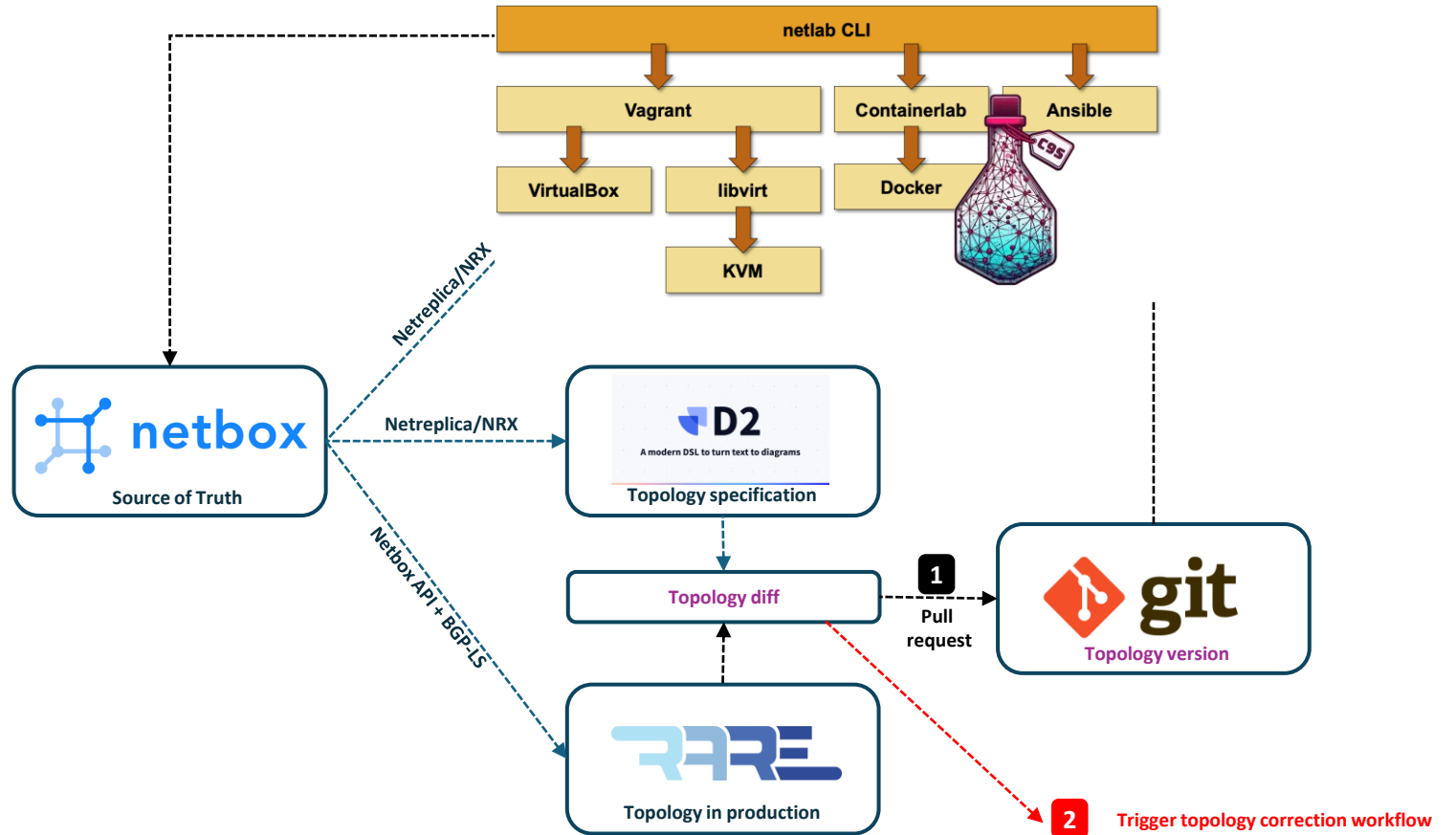
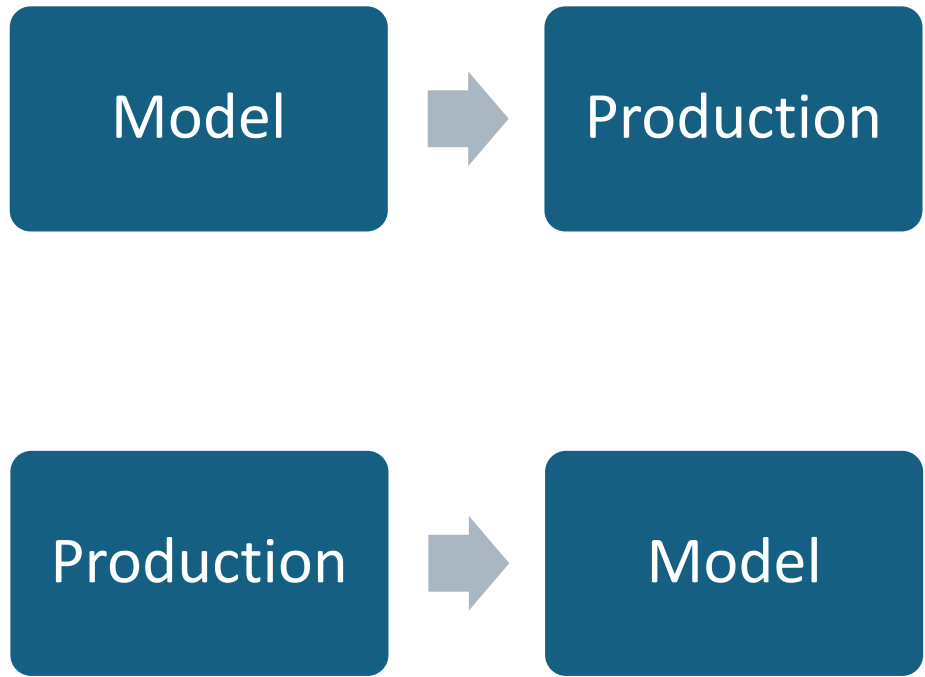
GP4L principles and activities



Towards a dynamic replica



Tools conception “around” the network ecosystem



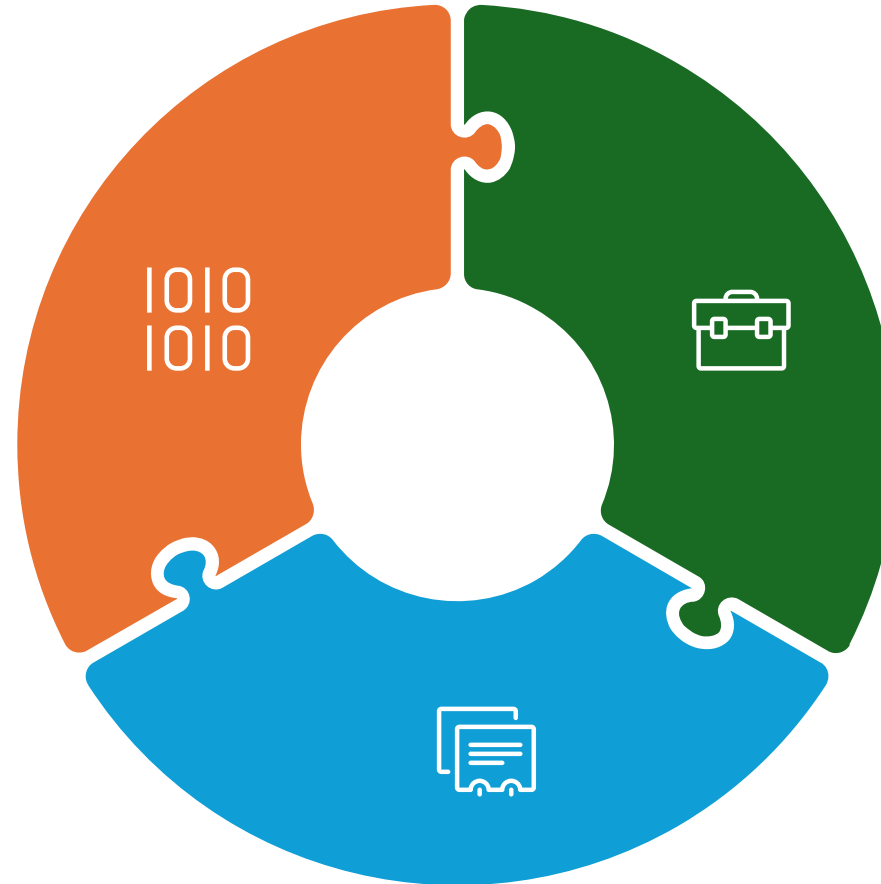
via GP4L Automation & Orchestration

Leaves something to be desired

High quality data

Powerful modelling

Correct up-to-date
information



Always available NOS

Mismatching

VMs vs containers

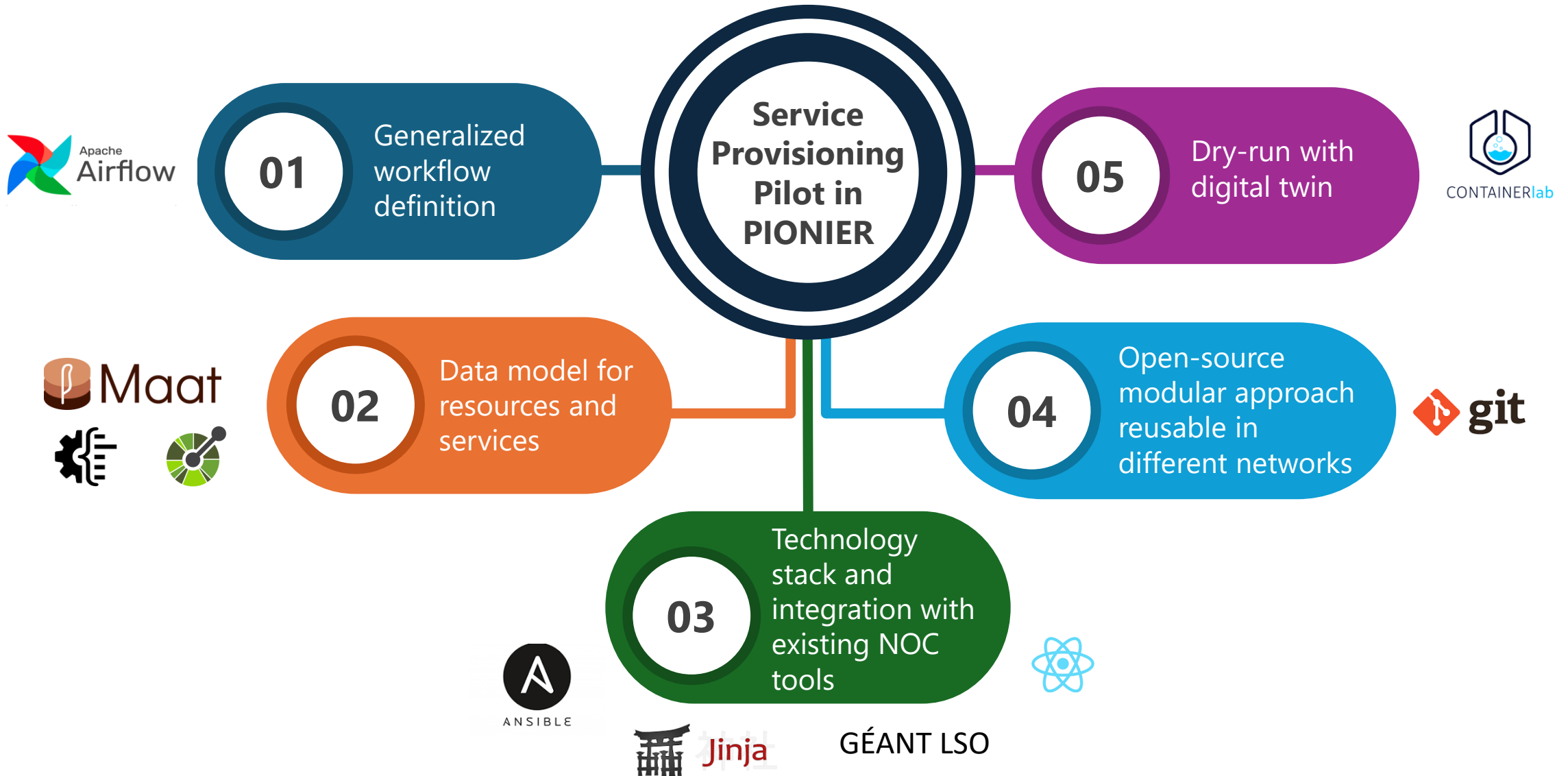
Identical replica

Unexpected hardware behavior

Full control plane

Scope of events

GP4L Joint Collaboration



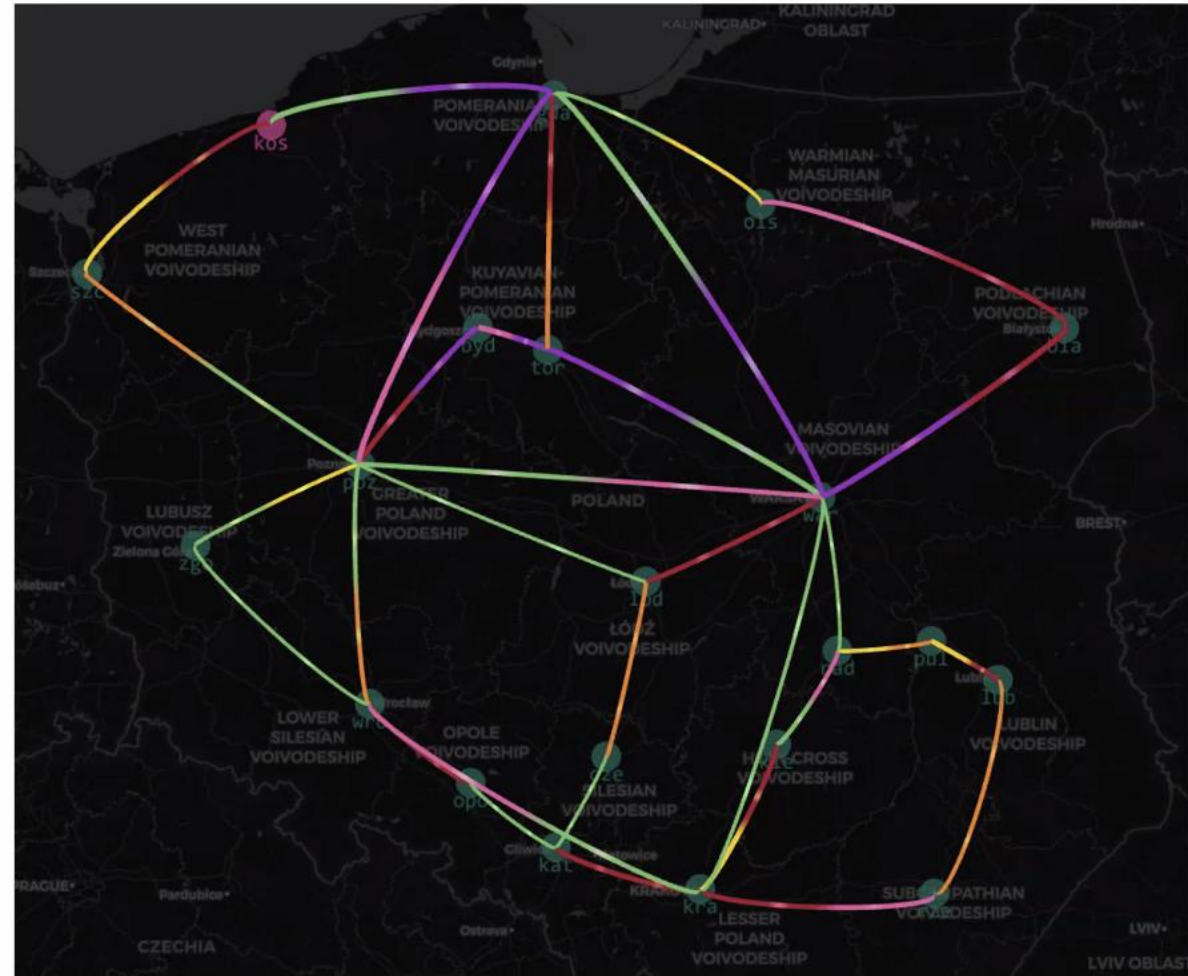
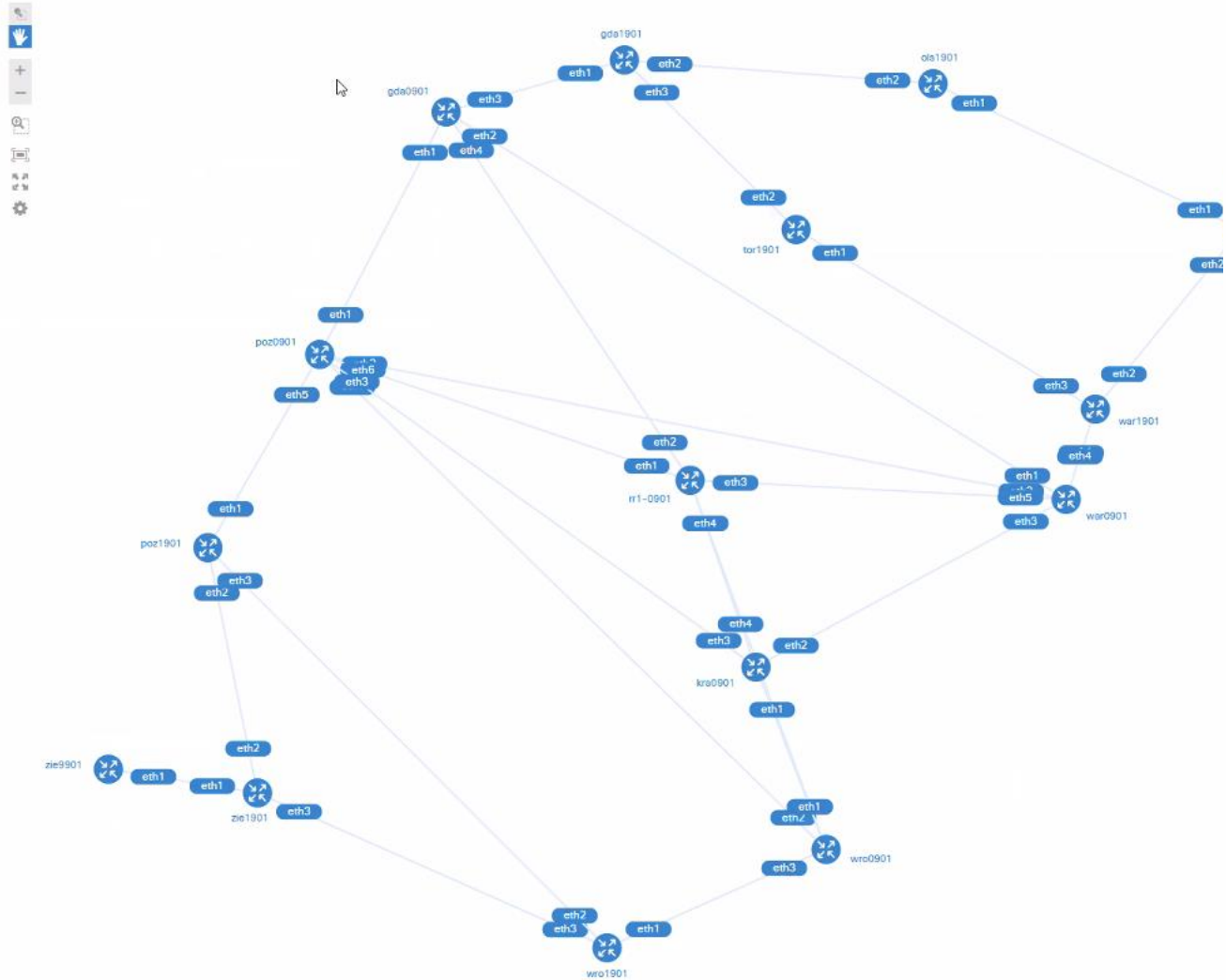
Generalized service provisioning implementation (PIONIER)

ContainerLab Topology PIONIER-CORE-FREERTR

Horizontal Layout

Vertical Layout

Vizualization panels



Benefits of a Standardized Approach



System-Level Integration

- facilitates wider system integration
- network setup becomes part of a broader picture

Enhanced Collaboration and Reuse

- interoperable solutions allow components to be reused
- implementations are easily shared across organizations

Challenges and The Future

The Era of
Self-Everything

Strong Security
and Privacy



Real-Time
Operations
Adaptation

Operational
Reliability



Thank You

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