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Networks • Services • People

Automation and Orchestration

TNC19: Orchestration, Automation and Virtualisation (OAV) BoF

20th June 2019

www.geant.org

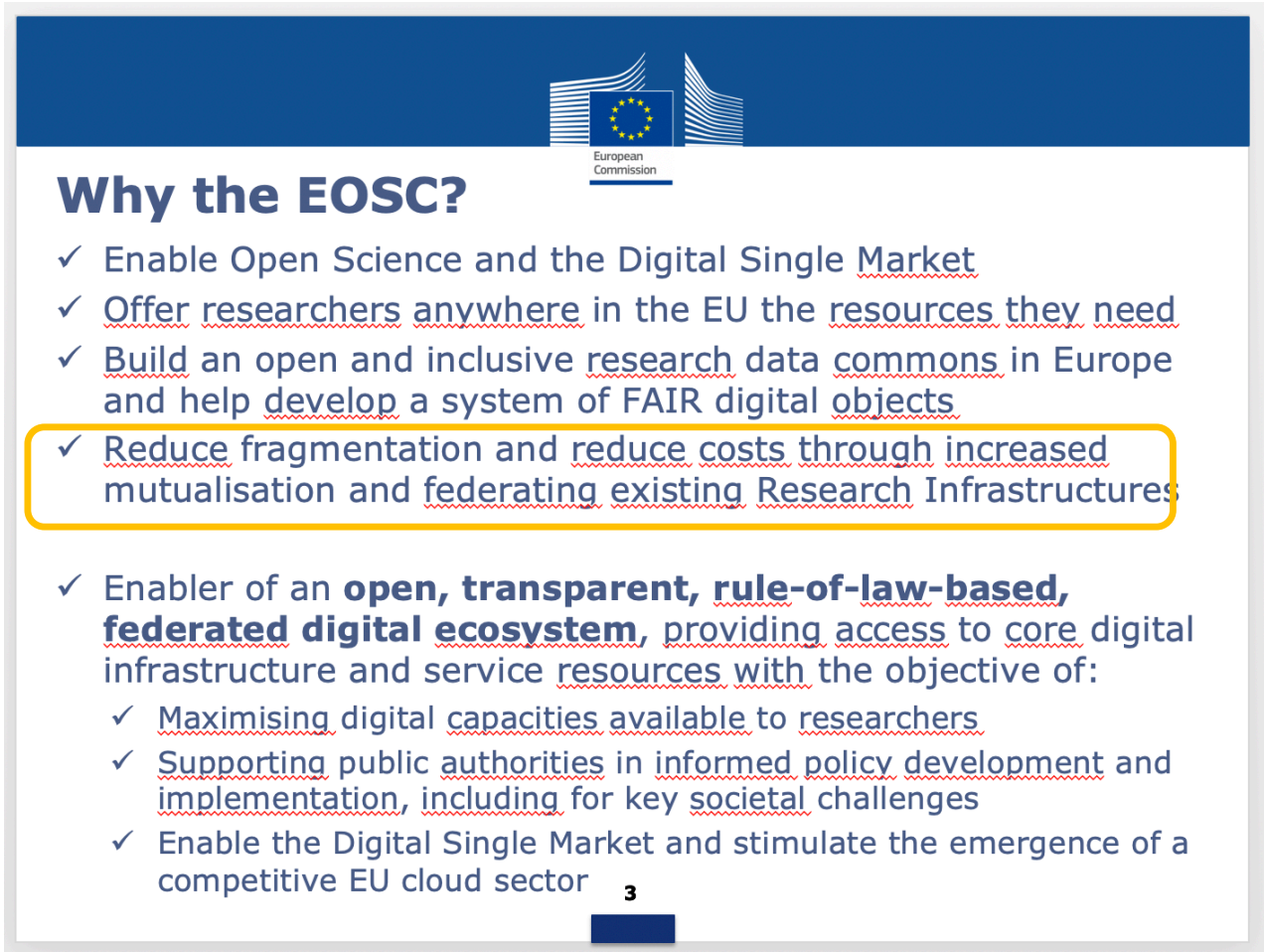
Why Automation and Orchestration (leave the V for now)

- **Automation**
  - for efficiency
  - for quality assurance
  - for reactiveness (service)

- **Orchestration**
  - For complexity in operational management
  - For complexity in service creation
  - For complexity in multi-X

  X = vendor, domain, technology,…

EOSC – federating and “mutualising” infrastructures



Challenges – the GÉANT context

1. Our network
   - Relatively small number of nodes, limited service standardization
   - Limited number of changes

2. Operational
   - Small operational team
   - High reliability requirements

3. Service
   - GÉANT network does always exist between other networks
   - “Services” will be composed

A good solution – the Organization Perspective

For any solution:

- Correctly featured
- Integrates easily
- Long term solid/flexible, can be developed further

- Affordable
- Low maintenance (cost)

A Use Case: Internal: Testbed Automation: *Efficiency and Quality Assurance*

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1 Lab replicates production network

- MPLS
- IS-IS
- Multicast
- IPv4 & IPv6
- Netflow v9
- MDVPN
- RSVP
- QoS
- Elephant flows
- MBGP
- Logical systems
- BFD
- L2 circuits
- EVPN
- NSR/GRES
- DWDM
- 1/10/100G & LAGs
- LDP

2 Load: Traffic generation, full routing table

- 1.8m routes
- 50Gbps flows
- Simulation of 8 NRENs
- Simulation of Internet exchange points
- Enough load to test convergence and protocols

3 Verify behaviour through a series of tests

200+ tests

- Physical flapping
- Protocol behaviours
- Route propagation
- Interoperability
- Stability
- Memory leaks

Test suite automated using Python and Robot framework, **saving three man months per iteration**. Tests can be run nightly in lab. Any variation in results is highlighted. Robot keeps track of configuration changes as a reference

Testing can also be used to verify that new services/features do not interfere with existing services on GÉANT network

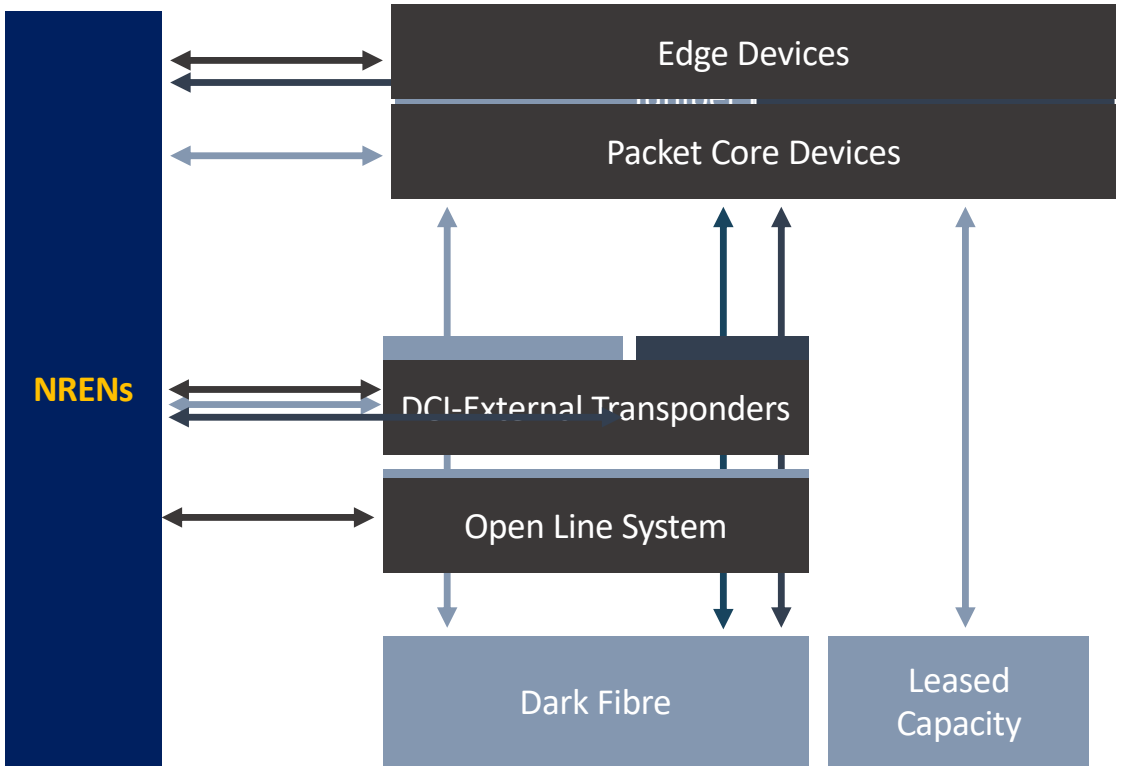
4 Troubleshoot exceptions – report to vendor

5 Repeat tests until all pass

6 Certify code for release into network

Outcome: No service-affecting bugs have been introduced into the network for the last four years

A use case: Internal Orchestration: Network Evolution "disaggregation"

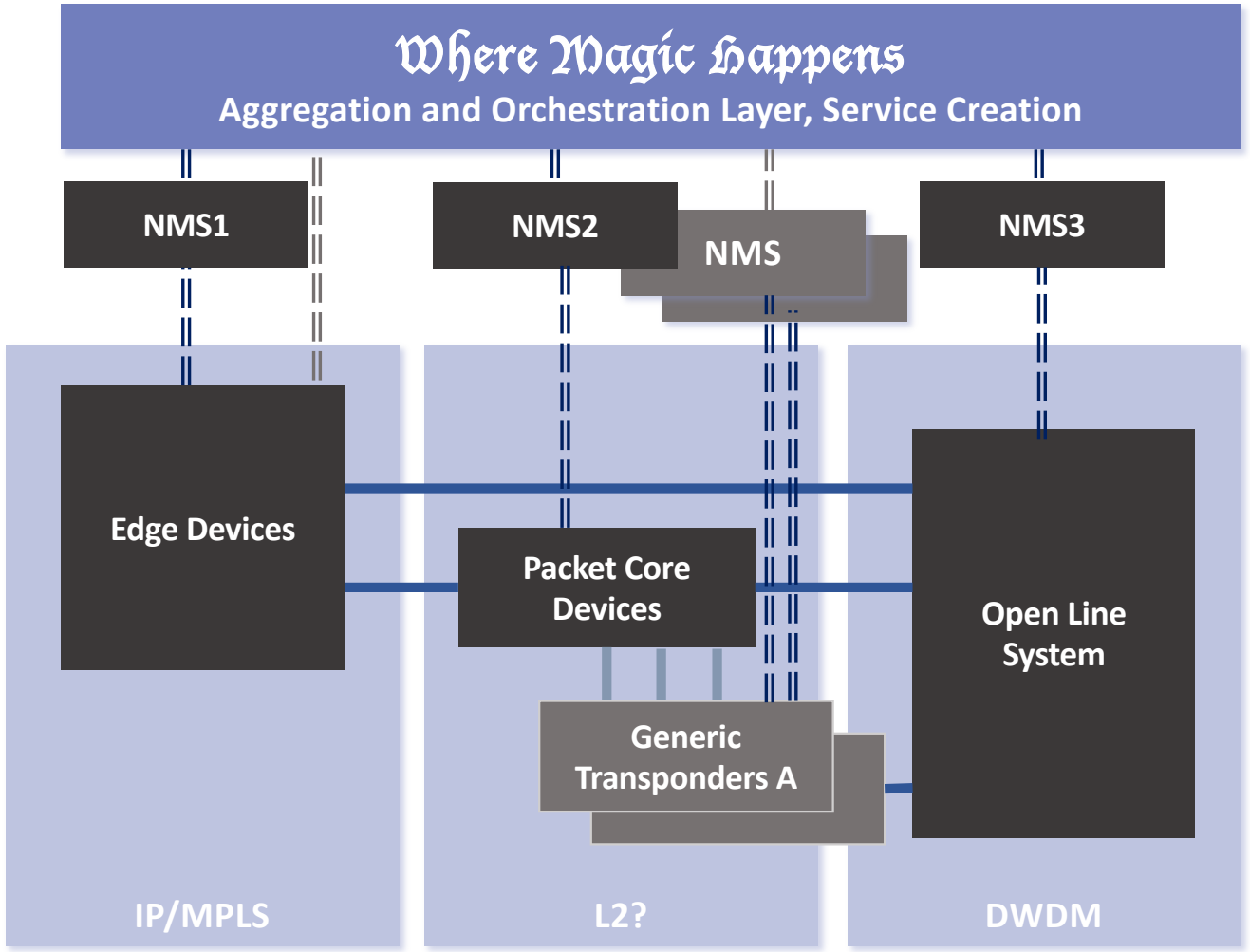


Flexibility in equipment

Rich service portfolio

Management complexity
- Service provisioning
- Service assurance
- Service

Managing a Disaggregated Network?



Monitoring

CRM

CMDB/Inventory

Reporting

External Service Orchestration?
Scale and diversity

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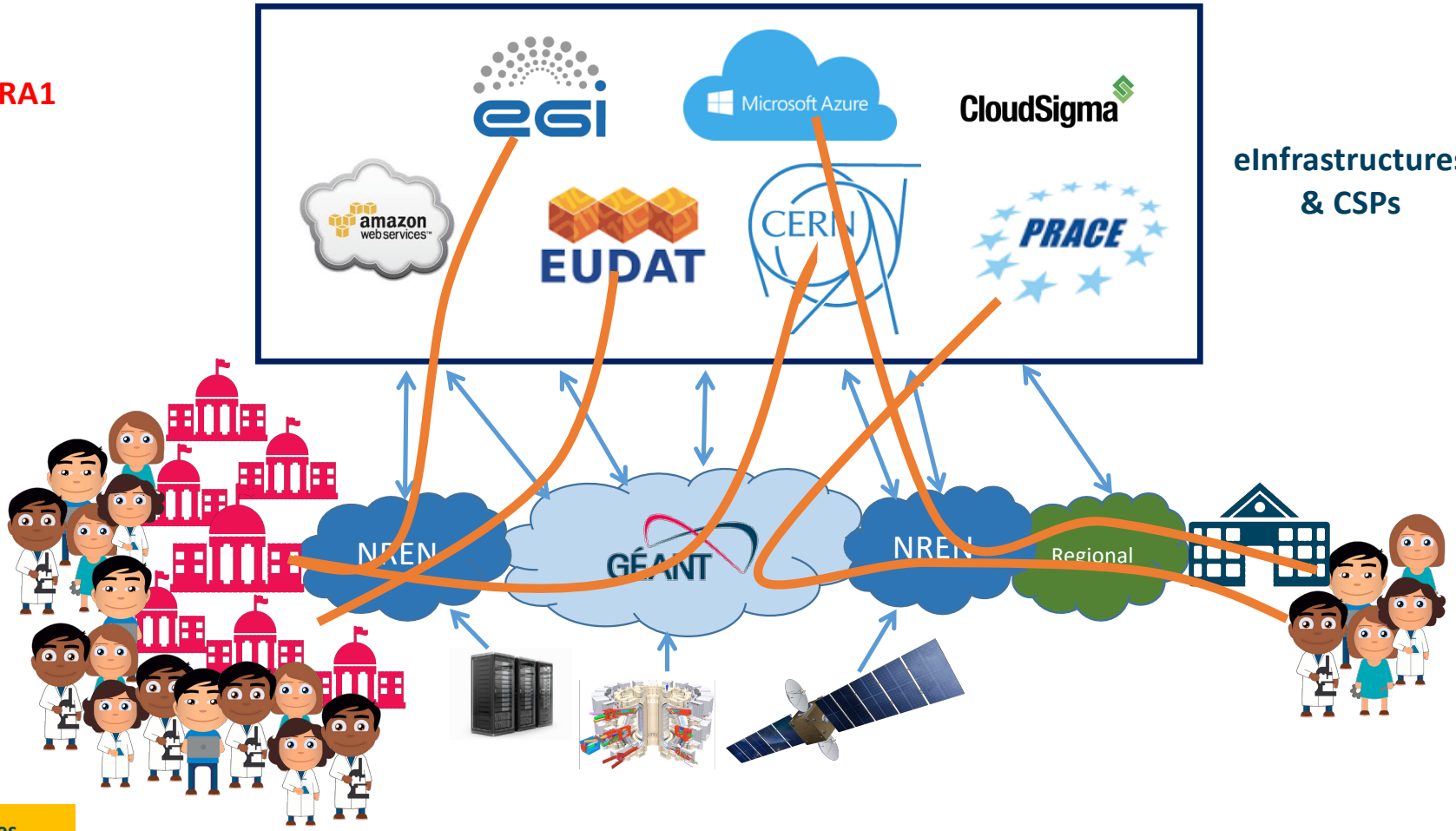
GN4-2 JRA1

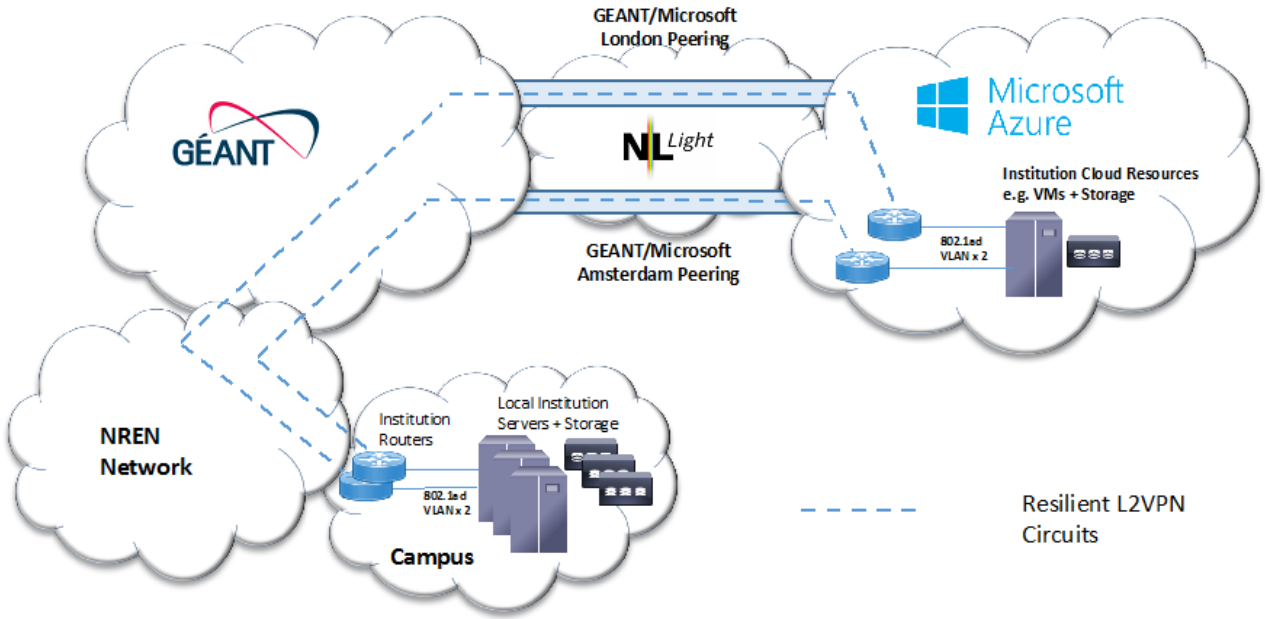


eInfrastructures & CSPs

Objectives

A Practical Example

Microsoft ExpressRoute Connectivity



Source: D7.2 GN4-2 – Systems and Processes. Architecture for e-Infrastructure Integration

More than Networks

Step	Description	Domain	Responsible Party	Expected Time
1	Check availability at your local NREN (optional but recommended).	Business	Institution	1 week
2	Request S-key from Microsoft Azure portal.	Operational	Institution	1 hour
3	Fill out the application form and send it to your NREN.	Business	Institution	1 hour
4	Determine request and configure end-to-end service.	Operational	NREN & GÉANT	1 week
5	Configure layer3 connectivity with Microsoft.	Operational	Institution	1 day
6	Test connectivity with the Azure platform.	Operational	Institution	1 day

[1] This first check is performed to see whether the preconditions for quickly setting up the connection have been met. If the conditions have been met, the Microsoft S-key can be requested.

Source: D7.2 GN4-2 – Systems and Processes. Architecture for e-Infrastructure Integration

Scope of interest?

- Internal orchestration and automation
  - We all have work to do (some more than others)
  - Sharing knowledge/tools/insights/experience
- External orchestration
  - Need to get this sorted (or don't we?)
  - Understand and deliver shared challenge