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Networks · Services · People

Orchestration, Automation and Virtualisation (OAV)
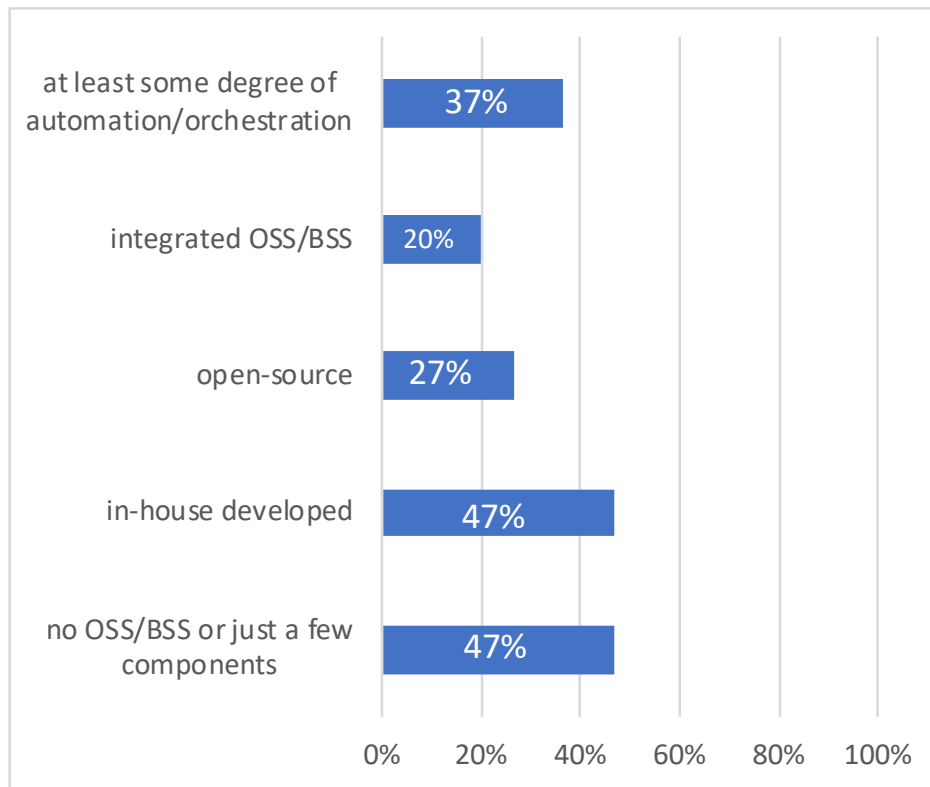
The Survey Results, by Topic

Susanne Naegele-Jackson, DFN/FAU
Roman Lapacz, PSNC

NREN Strategic Consultation Workshop
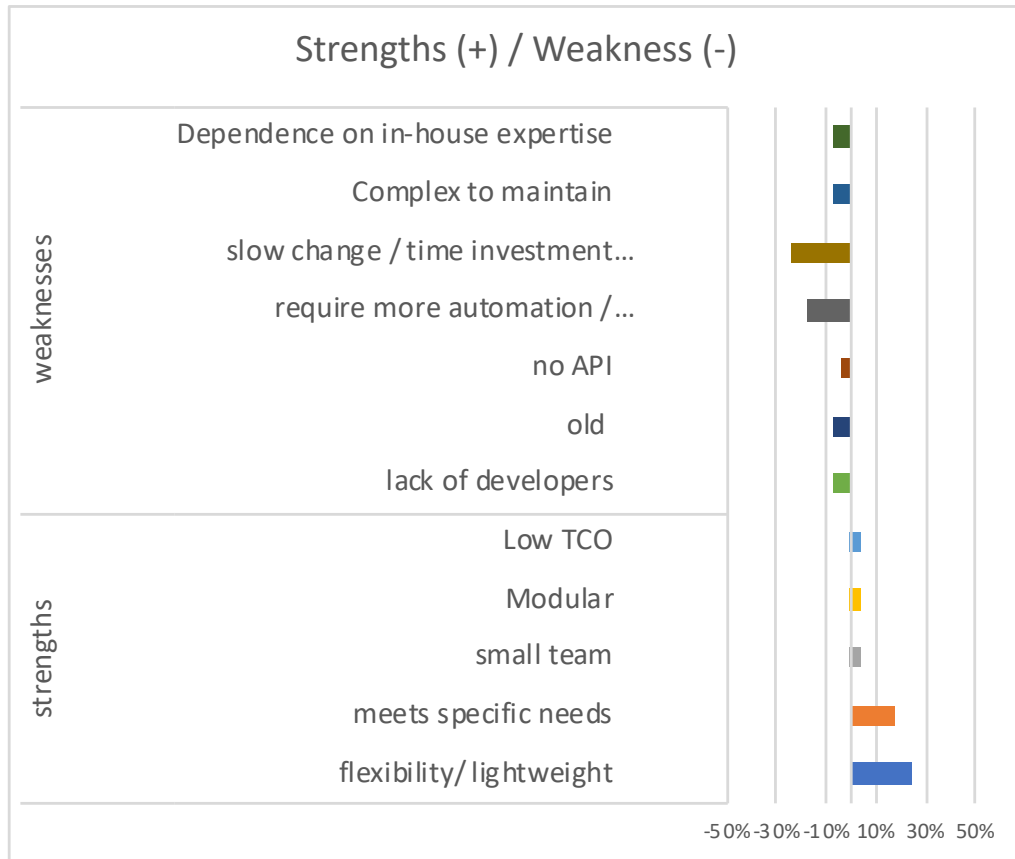
Amsterdam, 9 May 2019

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Your Existing Network and Services Platform

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Q4 OSS/BSS Components

Bar chart showing:
- at least some degree of automation/orchestration: 37%
- integrated OSS/BSS: 20%
- open-source: 27%
- in-house developed: 47%
- no OSS/BSS or just a few components: 47%

- Many NRENs have no OSS/BSS

- At least 37% NRENs have some automation capability

- Majority do not have a fully integrated OSS/BSS solution

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Q4 OSS/BSS Components

- Large variety of components in use
- Many are old and not OAV focused
- OTRS, Ansible, Cacti, JIRA were mentioned multiple times

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Q4 OSS/BSS Strengths and Weaknesses

Strengths (+) / Weakness (-)

weaknesses
- Dependence on in-house expertise
- Complex to maintain
- slow change / time investment…
- require more automation /…
- no API
- old
- lack of developers

strengths
- Low TCO
- Modular
- small team
- meets specific needs
- flexibility/ lightweight

-50% -30% -10% 10% 30% 50%

- Existing systems are flexible, well understood and do the job

- Because of lack of resources NRENs report that they are slow to change/adapt to the need for more automation
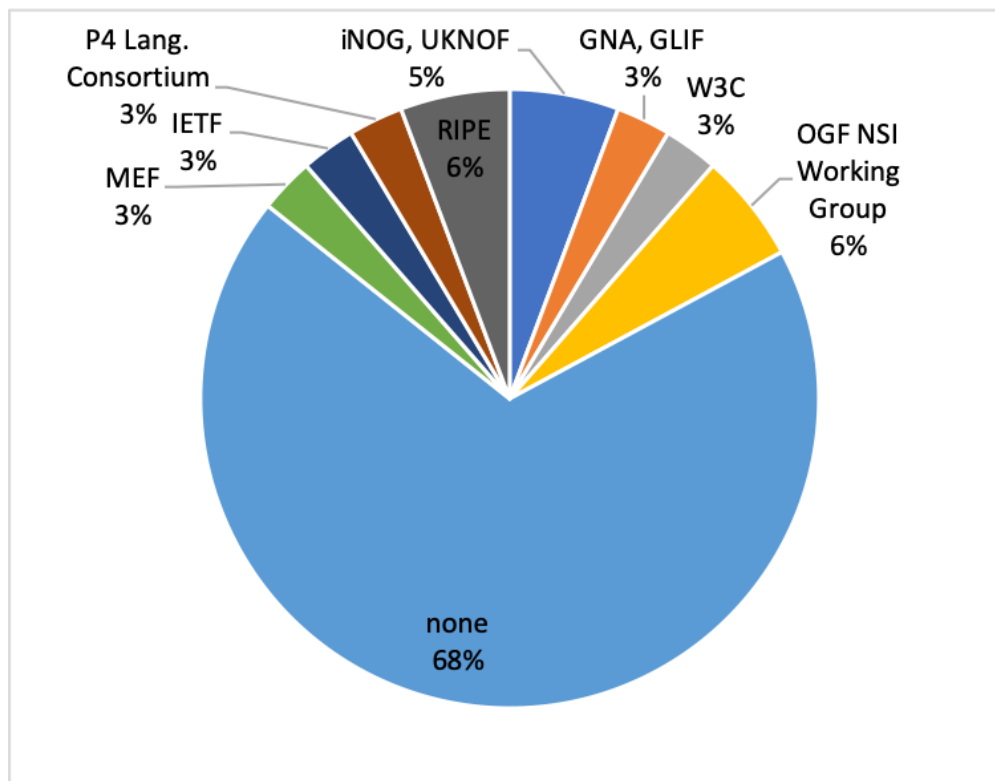
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Q5 Use of Data Models
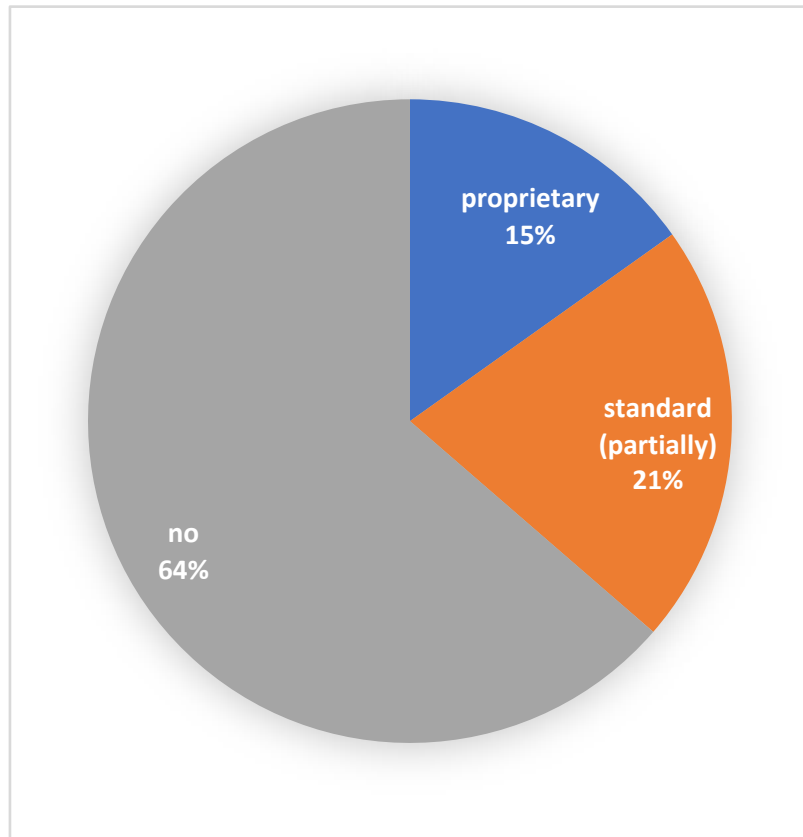
- Majority of NRENs are not using data models.

- Those that do are only using them partially and use proprietary models

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Q6 Follow Standards, Guidelines, Best Practices

Pie chart:
- ITIL 30%
- ISO27000 30%
- no 25%
- TMF 5%
- MEF 2%
- BPM 2%
- ITSM 3%
- MANRS 3%
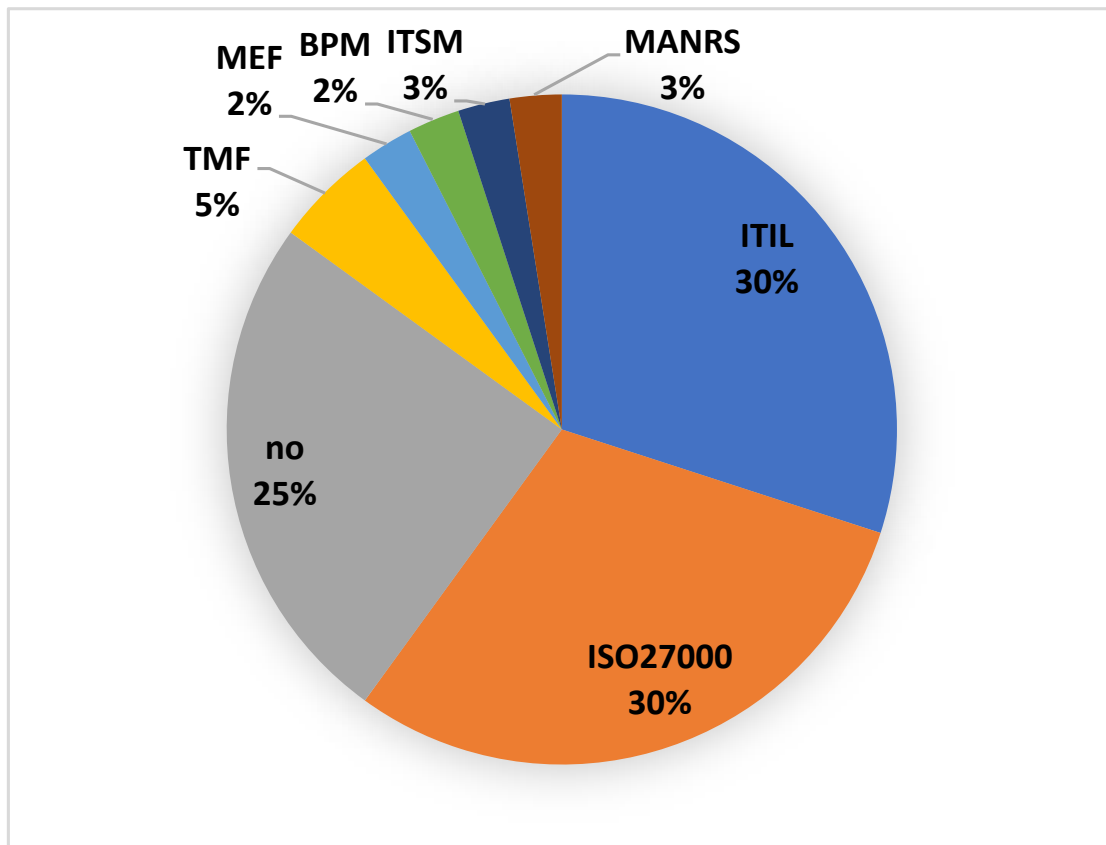
- Most mentions were of ITIL and ISO 27000 series
- Not necessarily concerned with OAV

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Q7 Participation in Standardisation / Operator Fora

P4 Lang. Consortium 3%
IETF 3%
MEF 3%
iNOG, UKNOF 5%
RIPE 6%
GNA, GLIF 3%
W3C 3%
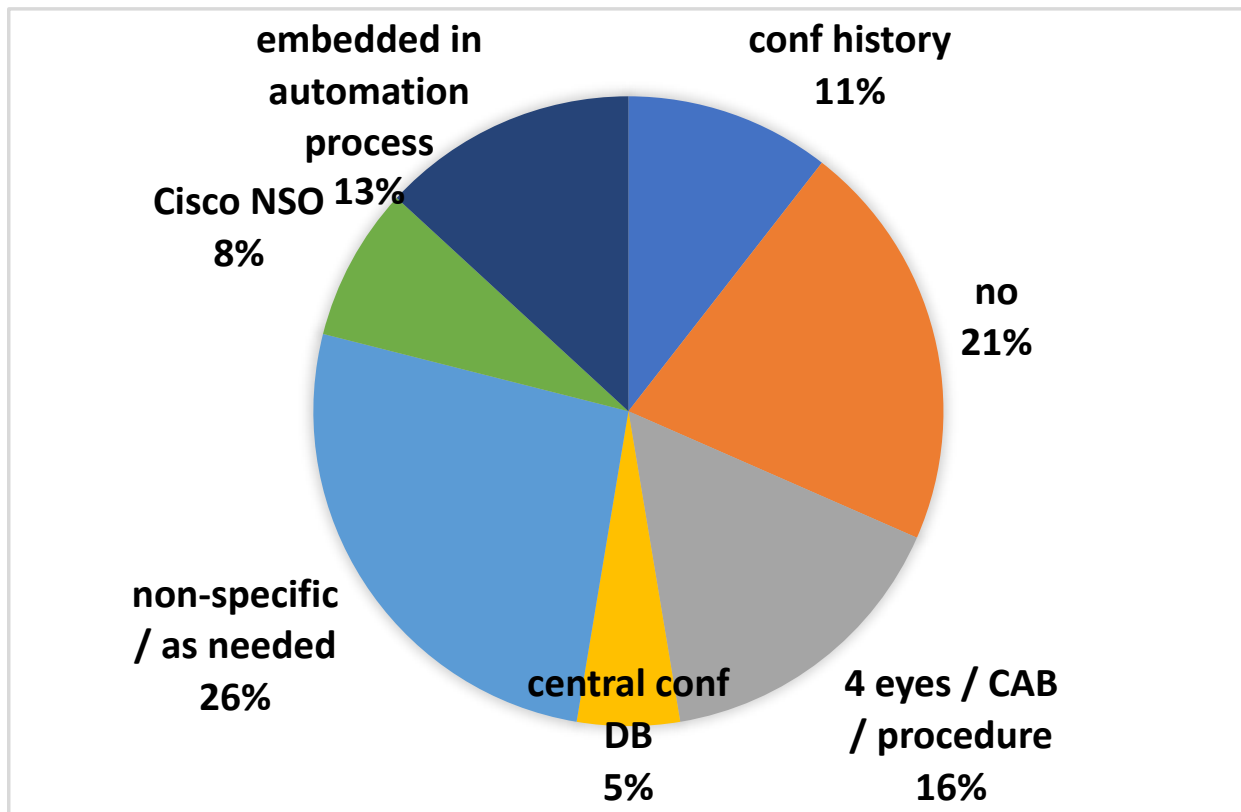OGF NSI Working Group 6%
none 68%

- Majority of NRENs do not participate

- Most popular bodies are OGF NSI, iNOG, UKNOF and RIPE

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Q8 Use of standard APIs for interoperation
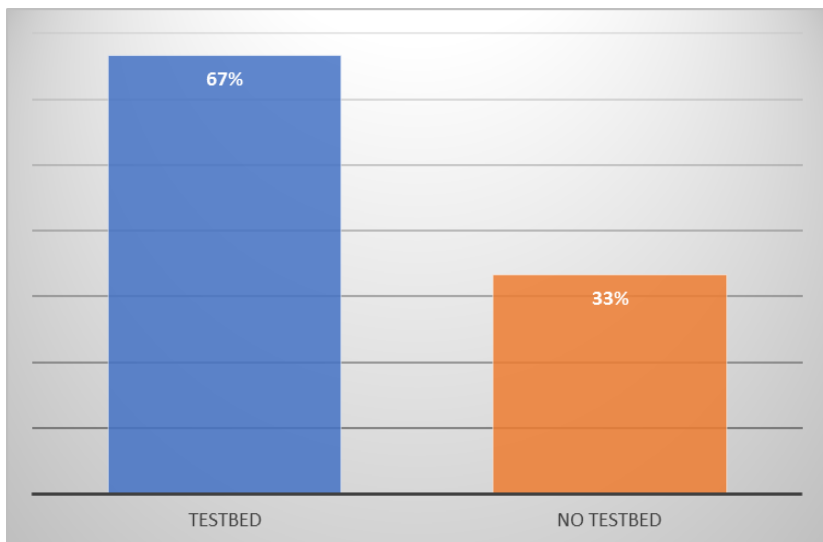
MTOSI
3%

TMF
7%

RESTful API
21%

no
69%
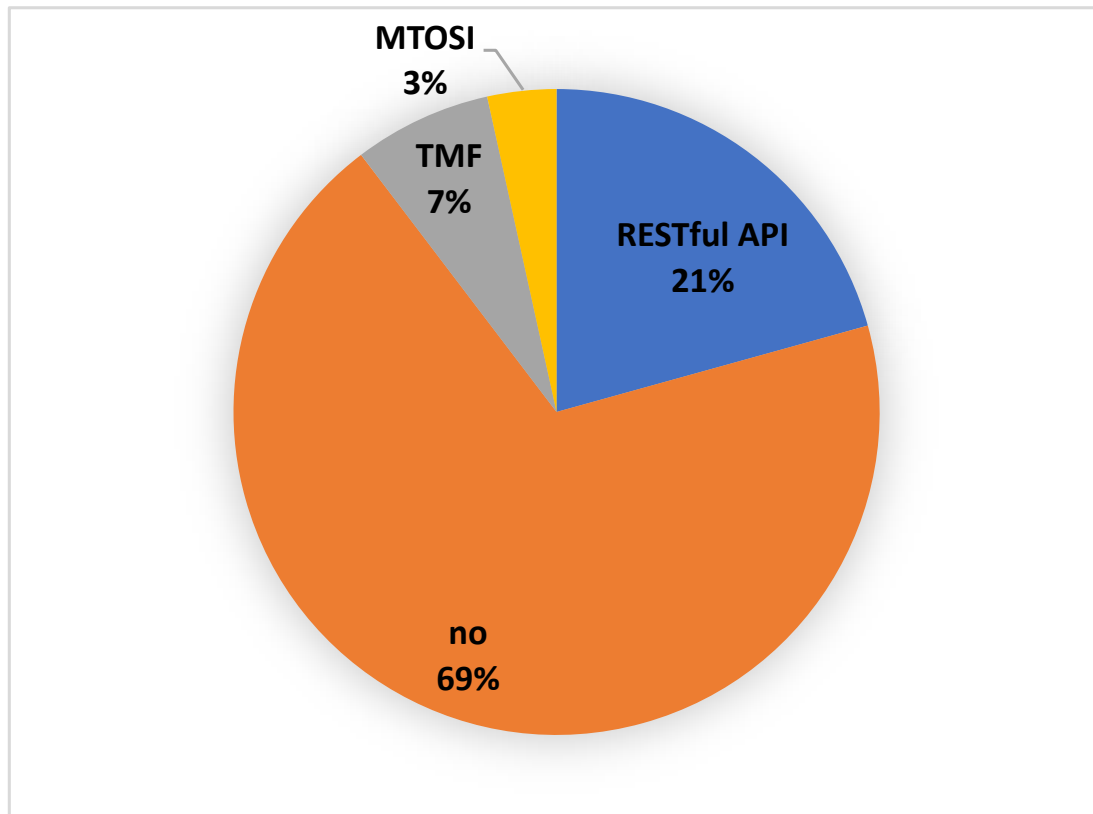
- Most NRENs not using APIs
- RESTful are the most used
- Very few standard APIs (e.g. TMF, MTOSI) being used

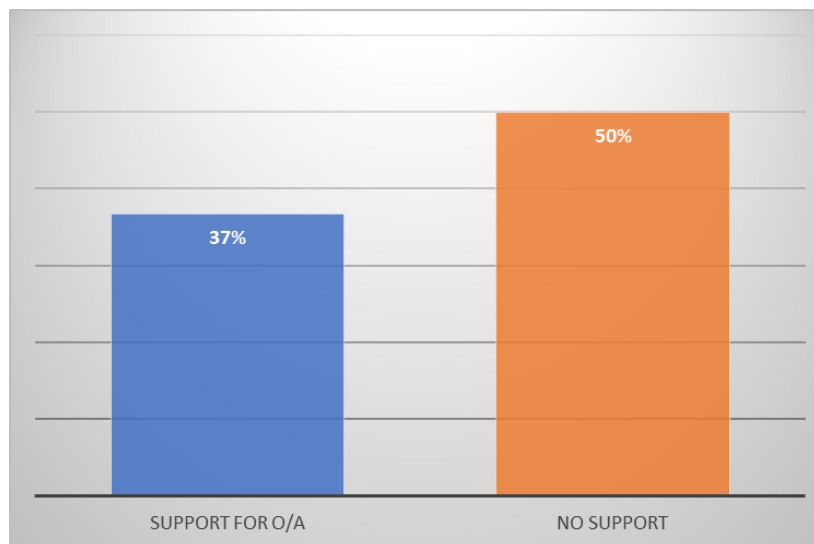GÉANT

Q9 Control and Management Policies

- Only a few NRENs have policies embedded in their automation systems

- A large number of NRENs report having no policies at all.

Q10 Use of Testbeds

- Most NRENs have some Testbed capability
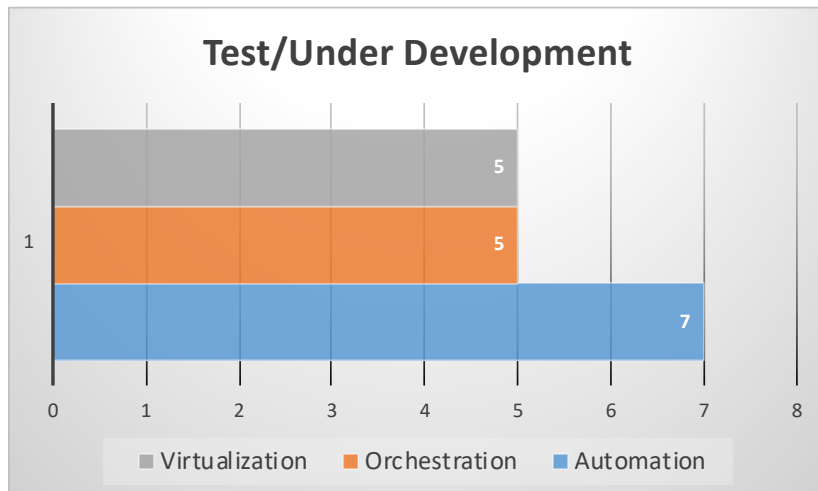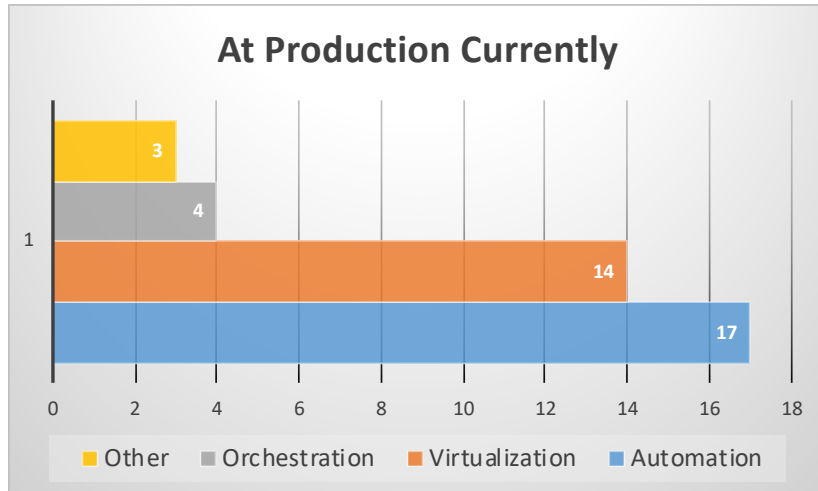- 37% of NRENs mentioned OAV capability in their testbed

Summary of Existing Network and Services Platform

- Wide variety of components and systems in use now

- No obvious common single direction or best practice for OAV

- Clear that there is scope for increased use of OAV within the community

- Little use of standard data models and APIs that facilitate OAV

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Your Current OAV Use Cases and Services

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Q11:What OAV work is taking place in NRENs

At Production Currently

	Value
Other	3
Orchestration	4
Virtualization	14
Automation	17

Legend: ■ Other ■ Orchestration ■ Virtualization ■ Automation

Test/Under Development

	Value
Virtualization	5
Orchestration	5
Automation	7

Legend: ■ Virtualization ■ Orchestration ■ Automation

Production:

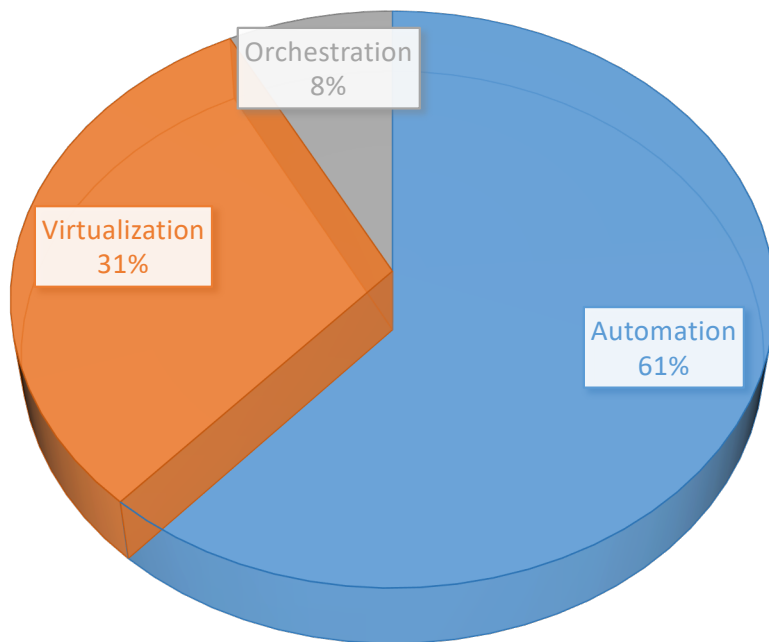Automation is first, followed by Virtualization and then Orchestration

Under Development:

Automation is first, followed by Orchestration and then Virtualization.

Strategy:

60% do not have or do not mention any strategy concerning OAV

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Q12:Which Work is implemented first

WHAT WORK IS IMPLEMENTED FIRST

Orchestration
8%

Virtualization
31%

Automation
61%

Automation is implemented first as most important, then Virtualization and then Orchestration
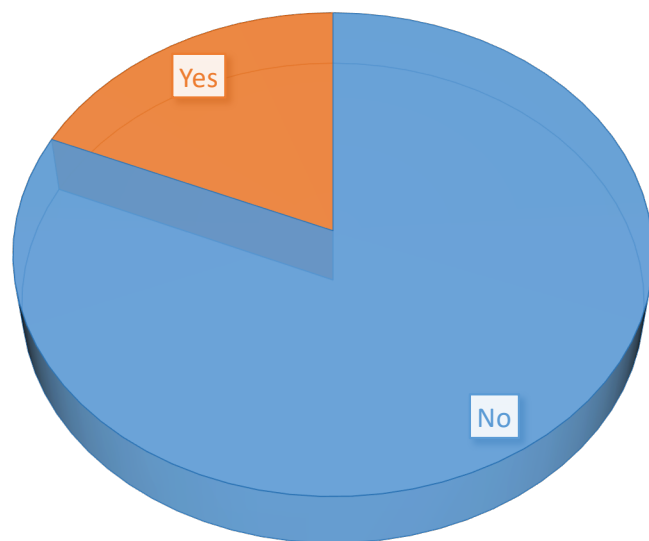
Use cases:

(V) virtual resource allocation, hardware consolidation

(A) monitoring, alerting, checks, configuration, automatic provisioning, BGP peering policies, services based on IP/MPLS layer

(O) intelligent management of systems, deployment of package service

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Q13:Which software are NRENs using for orchestration, automation, and virtualization.

Popular tools/software:

- (O) Kubernetes and NSO
- (A) Ansible
- (V) Vmware and Zen
- (Cloud) OpenStack

43% list in-house software

40% list open-source SW

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Q14:NRENs implemented any inter-domain orchestration or automation

**IMPLEMENTED INTER-DOMAIN AUTOMATION / ORCHESTRATION**

Yes

No

Most NRENs do not have any inter-domain OA. (73%)

27% listed inter-domain OA.

Use cases:

MDVPN, DDoS, OpenNSA, Bandwidth-on-Demand provisioning, multi-cloud deployment and automation strategies.
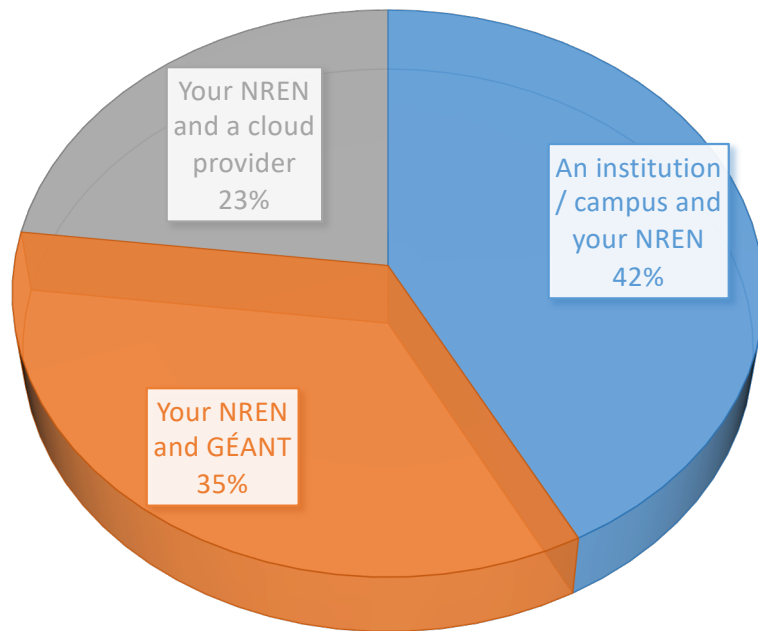
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Q15: Priority of the following orchestration, automation and virtualization use cases.

Priority of the orchestration, automation and virtualisation use cases
(left: highest priority)
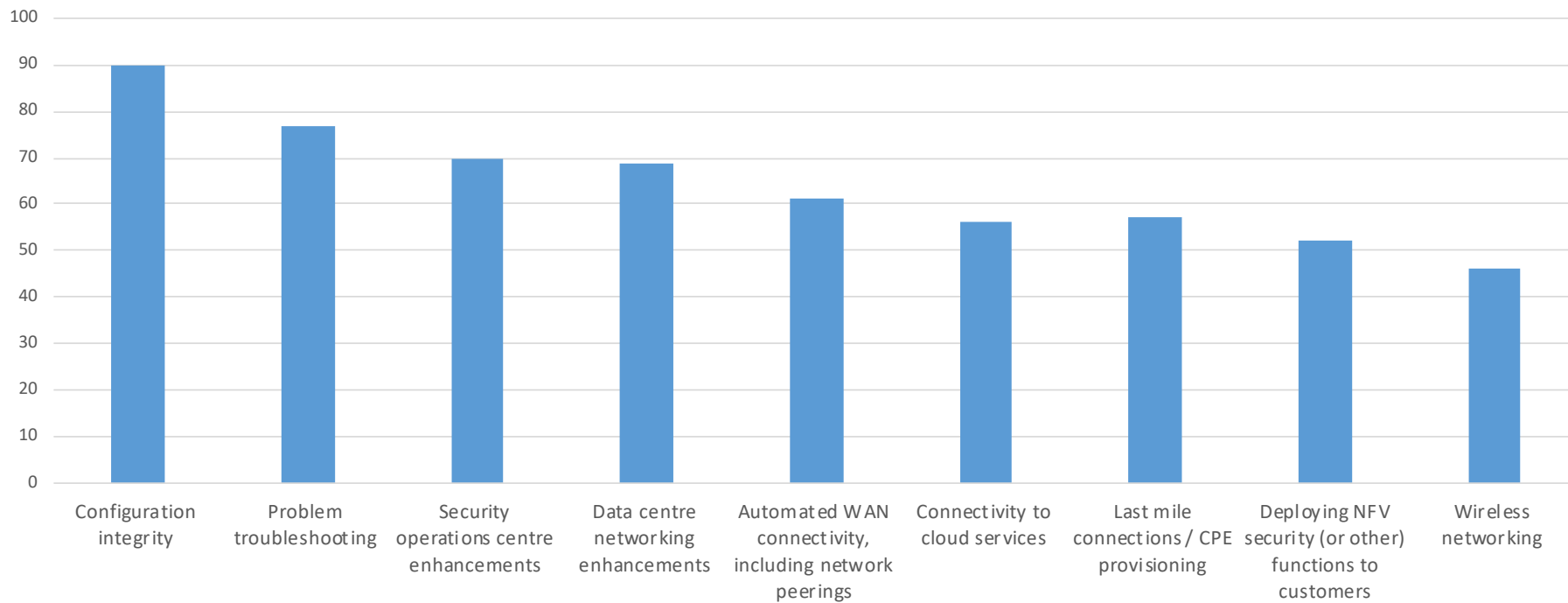
Q16: Multi-domain OAV use cases of NRENs' interest

MULTI-DOMAIN USE CASES

Your NREN and a cloud provider
23%

An institution / campus and your NREN
42%

Your NREN and GÉANT
35%

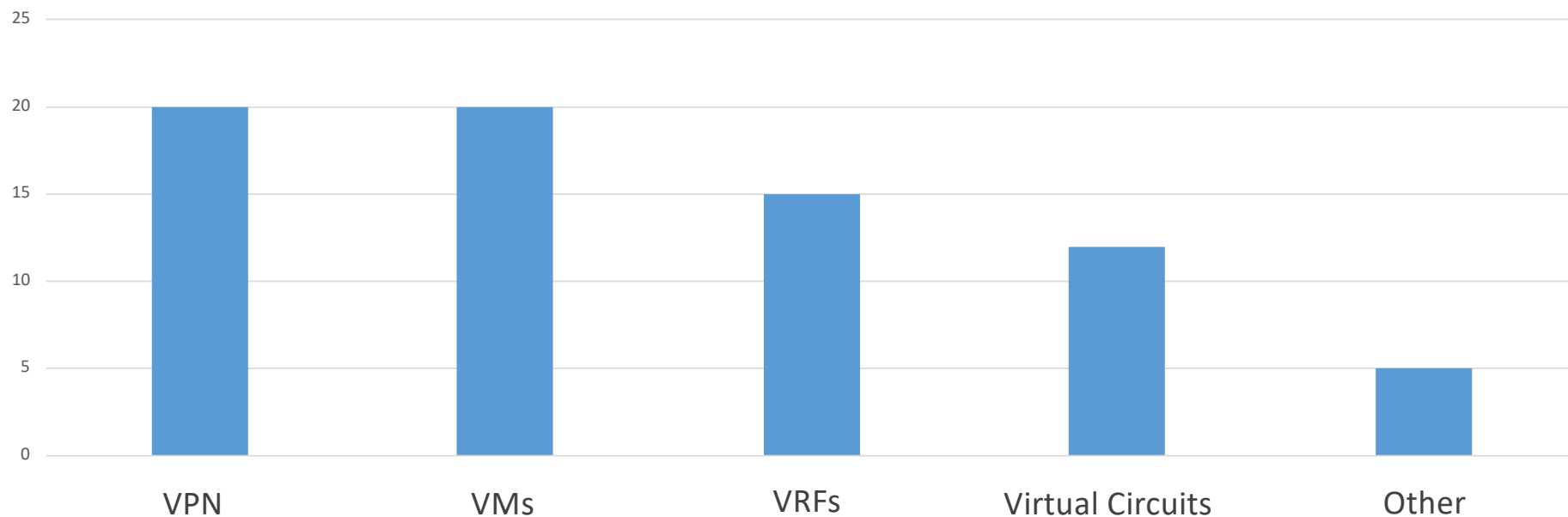30% of NRENs listed multi-domain OAV use cases

Not always clear from the answers if current use cases were reflected or if interest in future plans / use cases was meant

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Use cases of interest

- Between institution/campus and NREN
  - managed CPE service delivery, VPN, calendar, monitoring, Firewall, DDoS, Federated Identity Management/SSO, VoIP, WiFi as a service

- Between NREN and GÉANT
  - MD-VPN, GÉANT Testbeds Service (GTS), connecting to research projects/cloud, FoD, DDoS, AAI, monitoring, exchange of operational stats, events

- Between NREN and cloud provider
  - global connectivity, any direct access services, ANA, CAE1, GNA, support for big science users/mirror sites

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Q17: Virtual Services that NRENs Offer

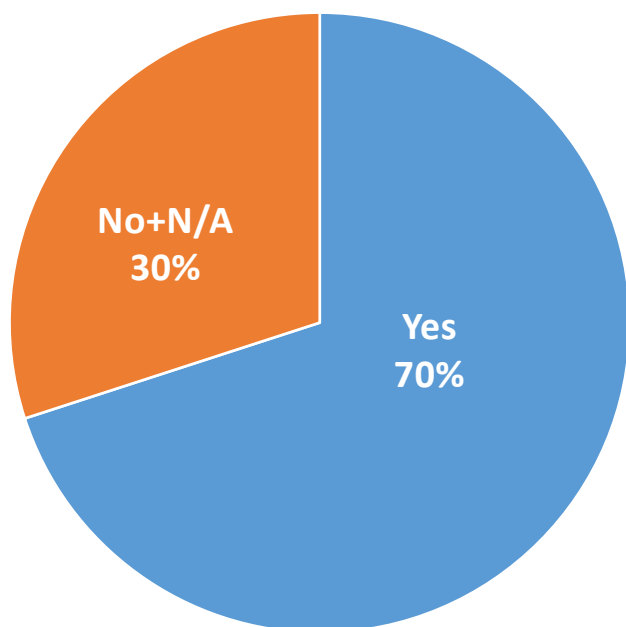Virtual Services NRENs Offer

VPN and Virtual machines are the most popular services offered.

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Summary of Current OAV Use Cases and Services

- Most NRENs do not have inter-domain OA.

- Automation is most important for NRENs (most popular tool for implementation: Ansible).

- Most important OAV use cases for NRENs are Configuration integrity, Problem troubleshooting and Security operations centre enhancements

- Most multi-domain use cases are between institution and NREN

- VPN and Virtual Machines are the most popular services offered by NRENs.

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Your OAV Challenges and Priorities

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Q18. Operational priorities and major pain points

Wide array of answers, clustered around:

- Speeding up processes (delivery time / automation of duties / less field trips / reduced manual labour / efficiency / less repetition)

- Desire for a single point of truth

- Monitoring / alerting / telemetry, troubleshooting

- Support of outdated equipment / hardware agnostic

- Human error reduction / configuration consistency / integrity

- Service bundling / service unification / more services

- Other priorities: Service redundancy, cybersecurity, continuous upgrades, wider connectivity, automated maintenance notification, resource sharing, standardised interfaces

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Q19. Challenges in widening your OAV work

- Lack of human resources
  (in particular developers / DevOps)

- Other patterns:
  - various technical considerations
    (interworking and integration of
    different network components,
    equipment with no virtualization
    support)
  - vendor support considerations

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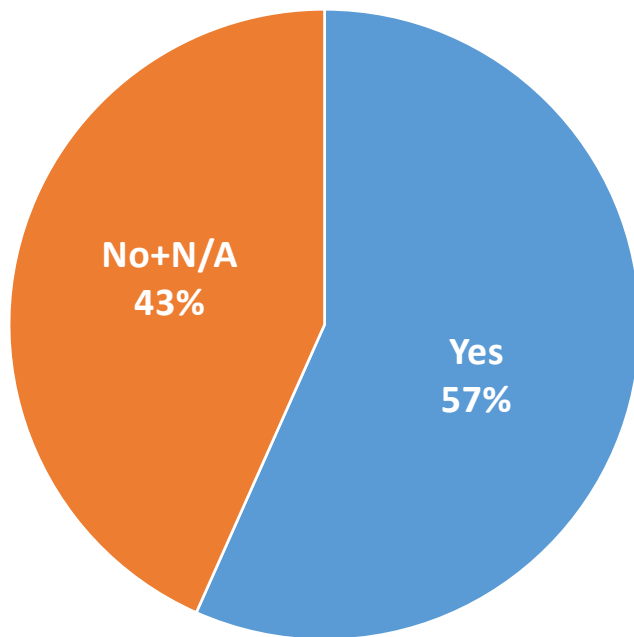# Q20. Service areas where OAV principles are expected to be applied in the next two years

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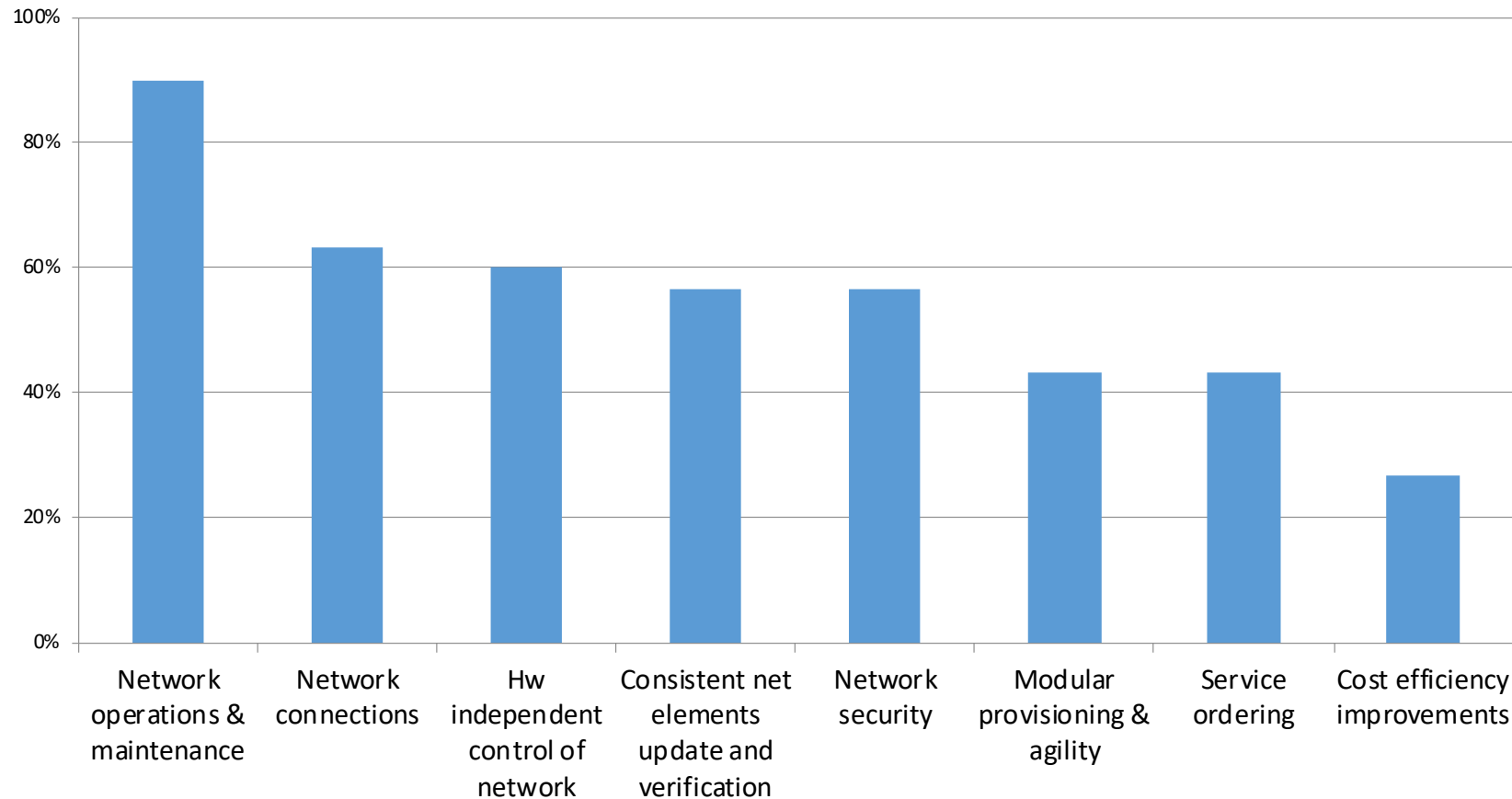
Q21. Skills needed for OAV and whether people in NRENs have them

- Software development skills
- Software development and networking skills (unicorns?)
- Additional personnel

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Q22. Concerns by NOC teams around increased automation

No+N/A
43%

Yes
57%

- Concerns more widely reported are related to:
  - Automating failures due to mistakes / inadequate software / reduced troubleshooting capabilities
  - Lack of ability for tailor-made services / lack of flexibility
  - Lack of appropriate employee skills / need for training / lots of required effort to setup

- However they are mostly not considered blockers and most NRENs seem willing to move forward if right conditions are met

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Q23. Tools used (or planned) for ensuring automation robustness/correctness/verification

Some tool mentioned 40%

No tools 60%
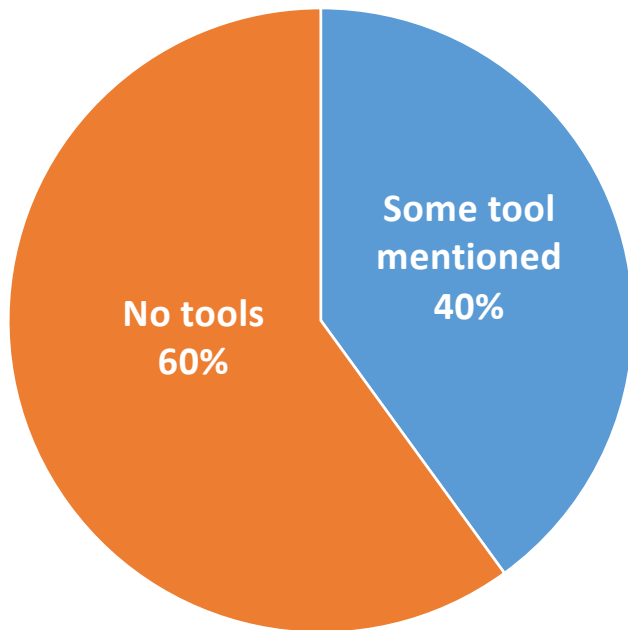
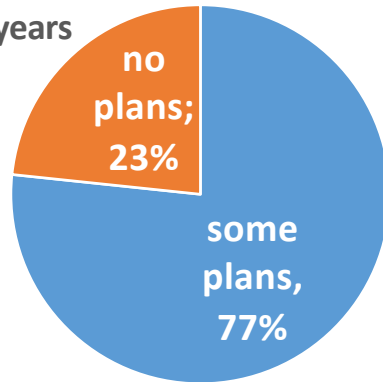GitLab CI/CD was the only tool mentioned by multiple NRENs.

Summary of OAV challenges and priorities

- NRENs have many operational priorities and pain points, not least a desire to be able to deliver services more quickly

- The most popular area for OAV to be applied is network operations & maintenance

- There is a lack of human resources with networking and software development skills

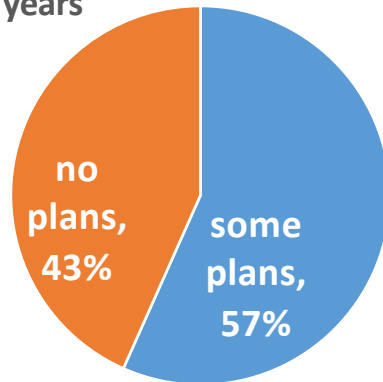- Despite having concerns, NRENs are open for new OAV solutions

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Your Future OAV Use Cases and Services

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Q24. Future OAV Use Cases and Services

Within two years

no plans; 23%

some plans, 77%

Beyond two years

no plans, 43%

some plans, 57%
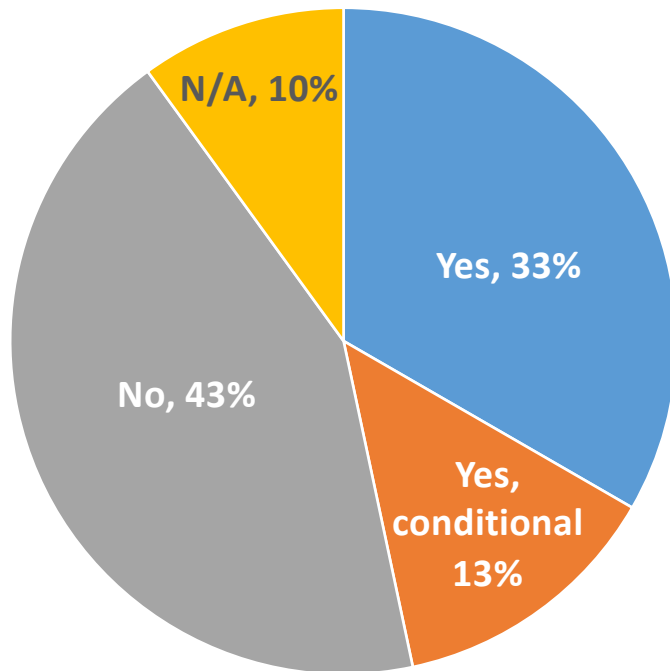
- The majority have short term plans
- Beyond two years, fewer NRENs have plans, and they are less specific in their planning
- The initial focus is automation; orchestration comes next

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Q25. Plans to implement inter-domain OA

Pie chart:
- Yes, 33%
- Yes, conditional 13%
- No, 43%
- N/A, 10%

- Fairly even: having plans or not
- Own domain is addressed first, then inter-domain
- Cloud access consistently mentioned (when specific, MD-VPN as conduit to Azure ExpressRoute)
- DDoS mitigation and inter-domain circuits follow

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Q26. Allow changes requested from external organisation

Pie chart:
- No, 13%
- Yes, conditional 63%
- Yes, 17%
- N/A, 7%
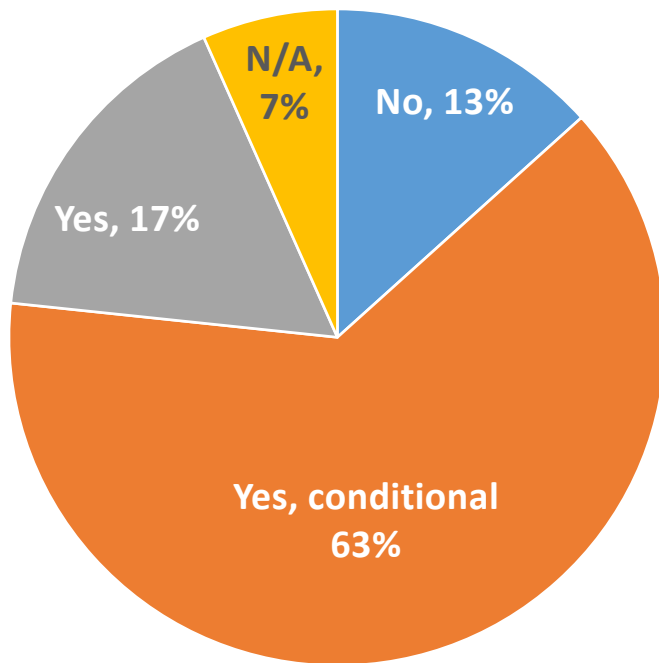
- Wide majority (80%) would in principle accept changes initiating with an externally request

- But most are dependent though that conditions (67%) are met

- Conditions: processes, procedures and – importantly – AAI

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Q27. AAI required for external requests

Pie chart:
- N/A, 37%
- Federated, as is 23%
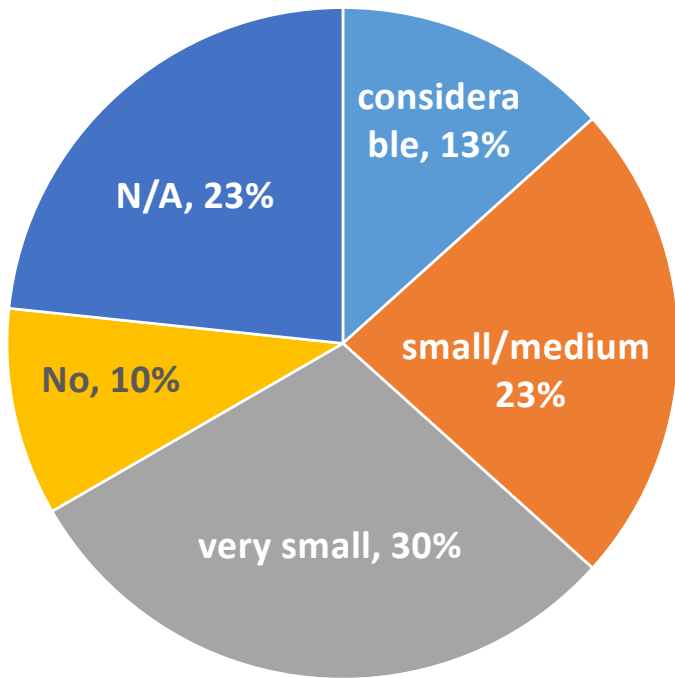- Federated, extended 30%
- Other, 10%
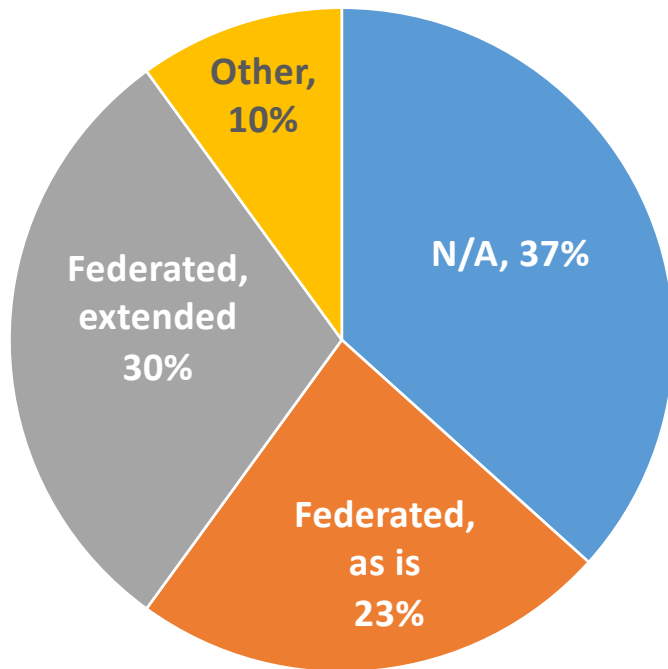
- Federated AAI is the most mentioned approach (55%)
- eduGAIN consistently mentioned
- Common requirement to satisfy all is authorisation.
- Reusing existing tools, building on them, and extending to handle authorisation should satisfy the wider community

Q28. Use of "wrapper" for interoperability
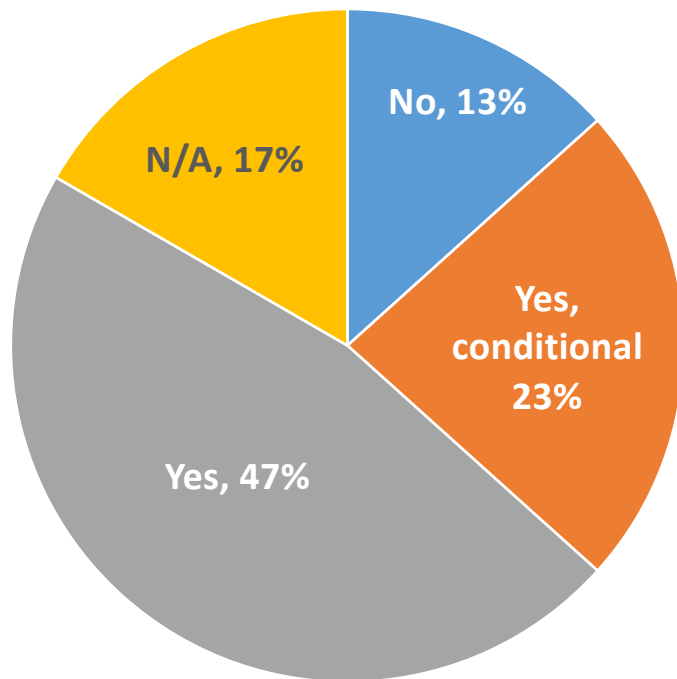
- Wide acceptance (66%) to use of a wrapper for third party interoperability
- Conditional comments related to standards compliance, maintainability, and level of risk

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Q29. Disaggregation in next 2-4 years

Pie chart:
- considerable, 13%
- small/medium 23%
- very small, 30%
- No, 10%
- N/A, 23%

- A consideration for the majority, but quite low priority.

- Explicitly positioned in the data centre or edge, to try to see the approach, sections of network, trials, etc.

- Explicitly not included in the backbone, due to perception of risk (sustainability, complexity, maturity…)

Summary of future OAV use cases and services

- Majority have short term plans, with fewer thinking long term

- Half of NRENs plan to implement some inter-domain orchestration or automation in the future

- A large majority would accept externally originated changes to their network configuration, but in a secure and controlled way
  - Federated AAI is considered important

- A majority interested in (secure) wrappers offering standardised APIs for inter-domain services

- Disaggregation is not yet widely considered, and then only mainly in data centres and the edge

How can the GÉANT Community / the GÉANT Project help you?

# Q30. Collaboration with GÉANT or other NRENs on OAV
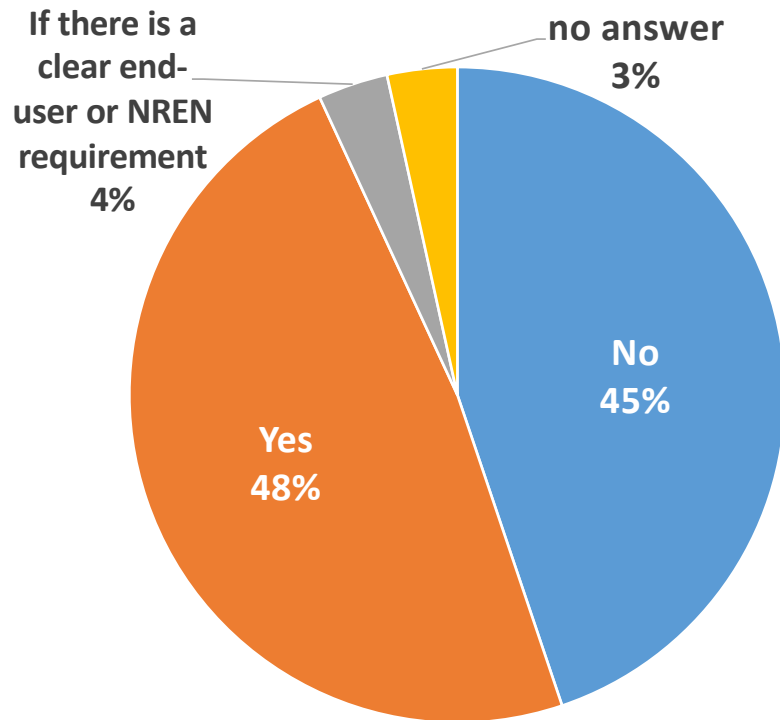
If there is a clear end-user or NREN requirement 4%

no answer 3%

No 45%

Yes 48%

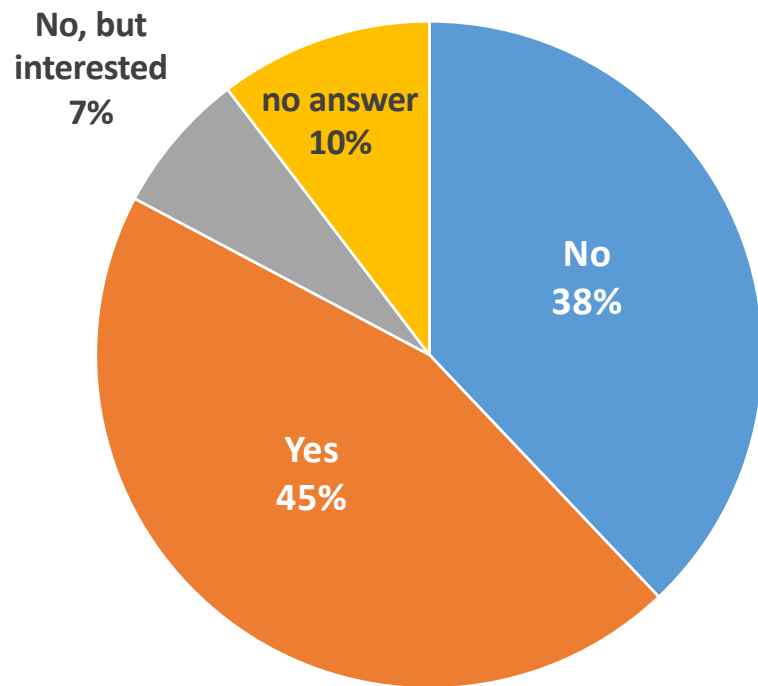Half of NRENs collaborate with GÉANT or other NRENs on network and service orchestration and automation

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Q31. NRENs as good examples of best OAV practice

- SURFnet (6 mentions), GRNET (5), HEAnet (2) and ESnet (2) are recognised by other NRENs as active / expert organisations in the area of OAV

- 41% of responses – no answer or "not enough knowledge"

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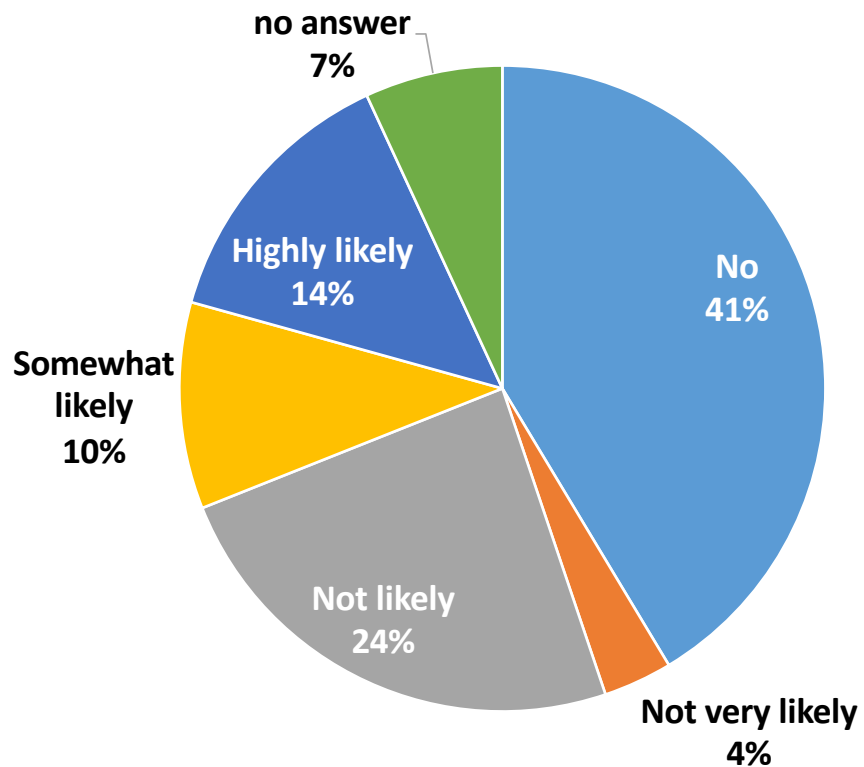# Q32. How can the GÉANT project assist?
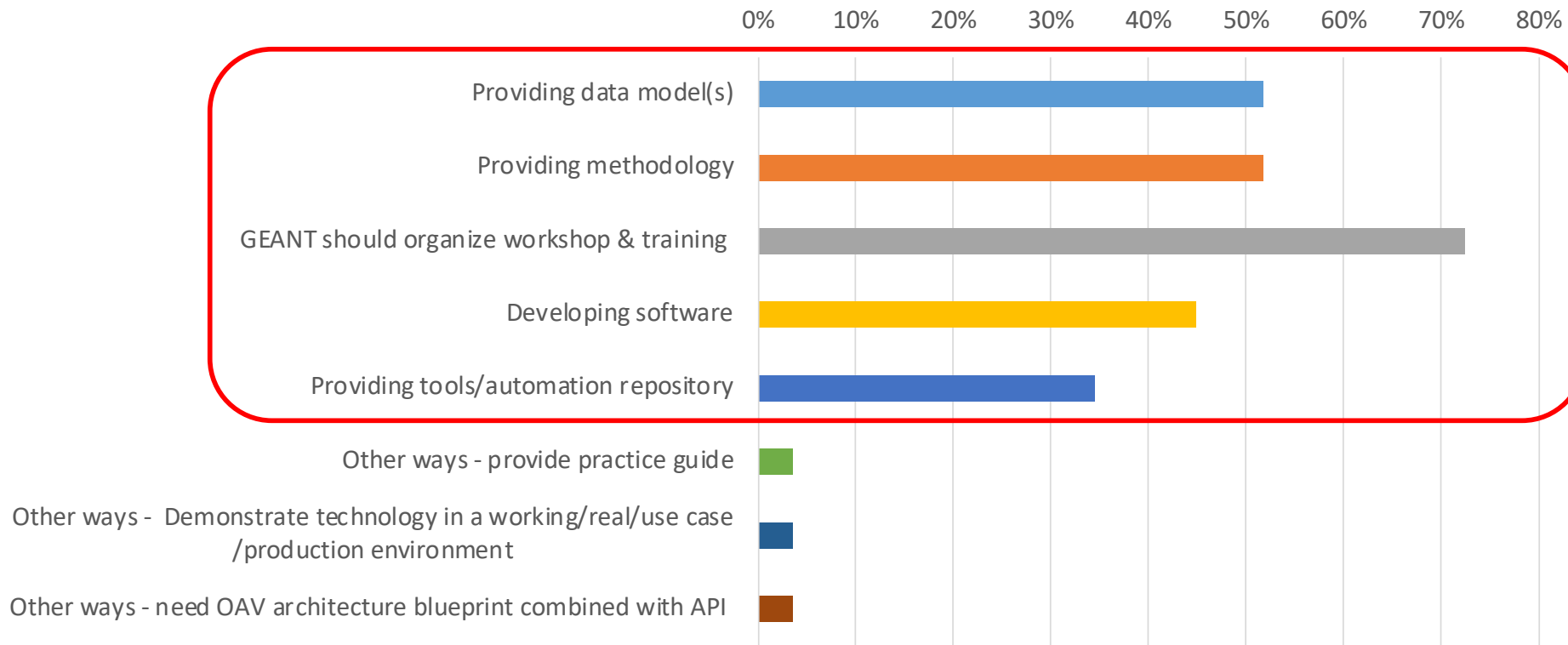
Q33. Possible participation in inter-domain pilots

About half the NRENs would consider taking part in an inter-domain pilot use case

Q34. Interest in use of a new 3rd party OSS/BSS solution?

The majority of NRENs (69% + 7% N/A) are not interested in using a new 3rd party OSS/BSS solution

Summary of how can the GÉANT Community / the GÉANT project help

- Half of NRENs collaborate with GÉANT or other NRENs on network and service orchestration and automation

- NRENs expressed their need for workshops and training events

- NRENs are interested in standards (data models, methodologies) for interoperability

- Half the NRENs are interested in joining an inter-domain pilot

- Most NRENs are not interested in using a new 3rd party OSS/BSS solution

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Thank you

Any questions?

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