



Orchestration, Automation and Virtualisation Maturity Model Workshop

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& the whole Network eAcademy Team!

Orchestration, Automation and Virtualisation Maturity Model Workshop
8 November 2023



Welcome to the Workshop!

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Agenda

Start	End	Title	Duration
09:00	09:10	Welcome to the workshop	10 min
09:10	09:30	Orchestration, Automation and Virtualisation Maturity Model (OAV MM): Introduction	20 min
09:30	10:00	OAV MM - Architecture & Technology	30 min
10:00	10:30	OAV MM - Processes & Services	30 min
10:30	11:00	Discussion on Architecture, Technology, Processes and Services	30 min
11:00	11:30	Coffee break	30 min
11:30	12:00	OAV MM - Vision & Strategy	30 min
12:00	12:30	OAV MM - People & Organisation	30 min
12:30	13:15	Discussion on OAV solutions, current and future plans	45 min
13:15		Lunch	Open

OAV Maturity Model – In short



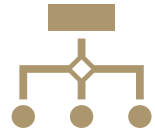
**Self-assessment
survey**



31 questions



**Data used for
analytical
purposes only**



**Report sent to
the person
defined in
survey**

Today, we are going to explore the OAV MM

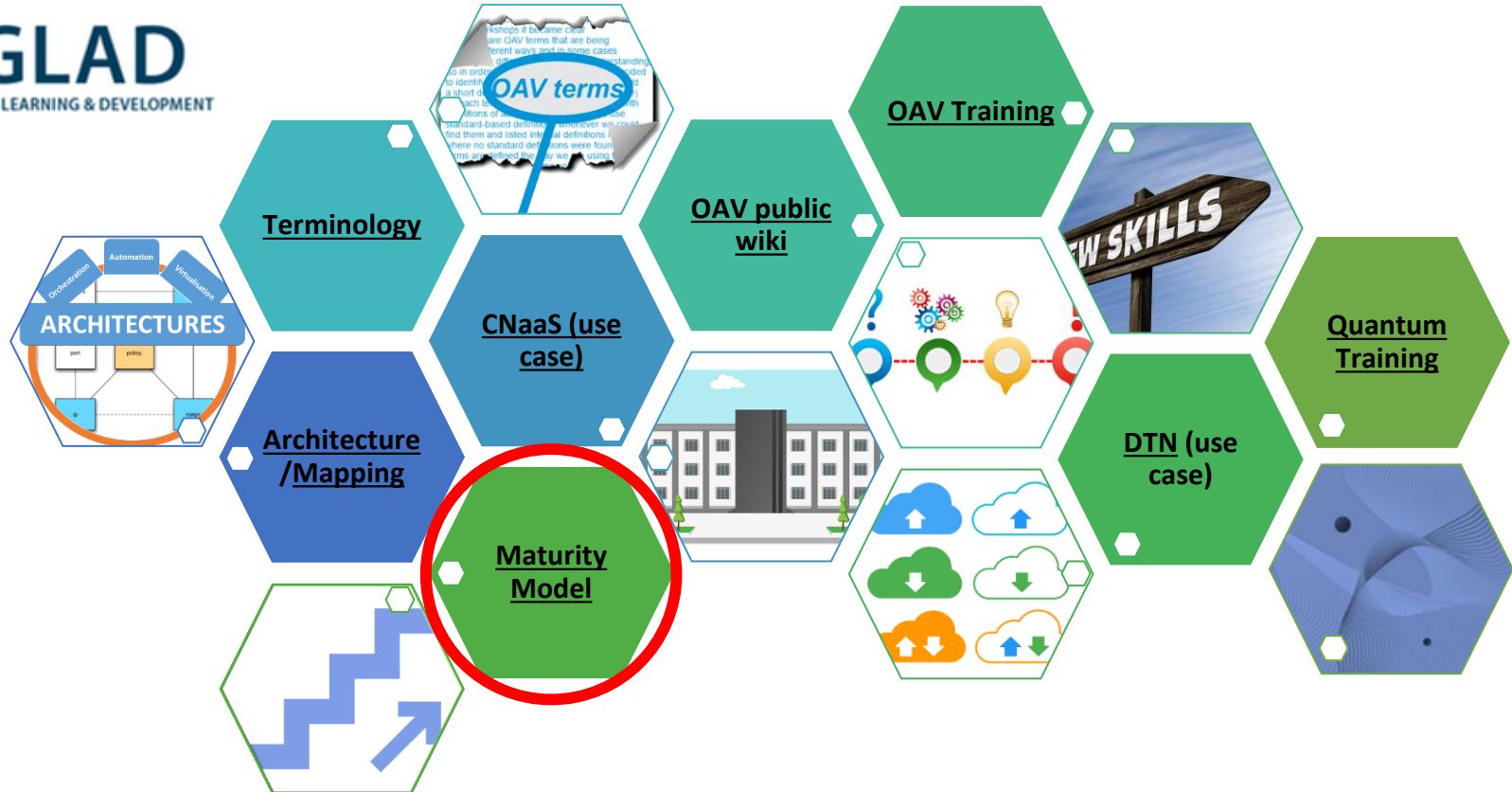


Orchestration, Automation and Virtualisation Maturity Model (OAV MM): Introduction

Orchestration, Automation and Virtualisation Maturity Model Workshop
8 November 2023

The Network eAcademy

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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

Why OAV MM?



Provide a common OAV progress indicator for the community



Help organisations on their OAV journey

Building the OAV MM



Adopted a MM development methodology based on design science



Defined OAV as the MM application area



Analysed over 15 existing MMs related to some aspect of OAV



Developed the OAV MM iteratively



Evaluated usefulness, quality and effectiveness



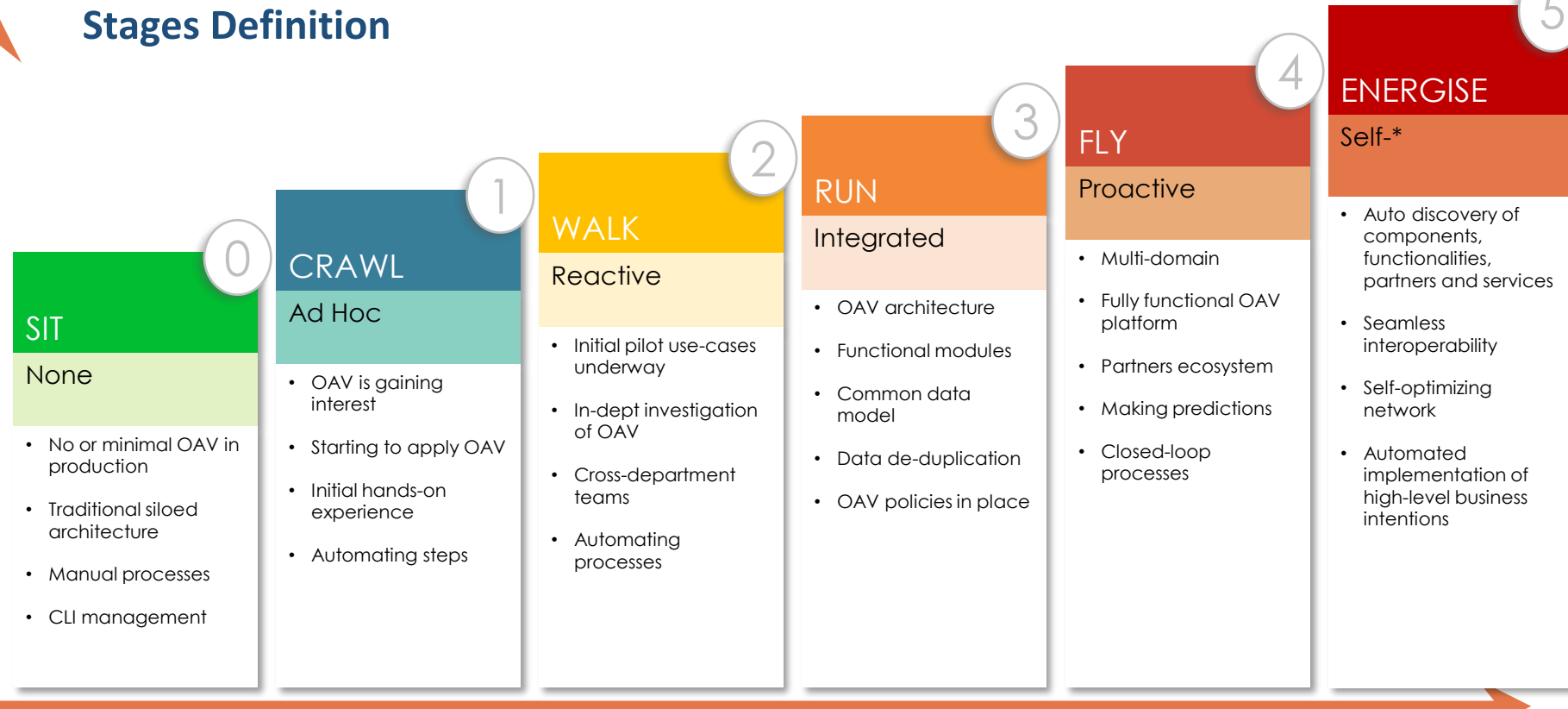
Prepared a questionnaire to support the self-assessment process

OAV Maturity Model - Stages



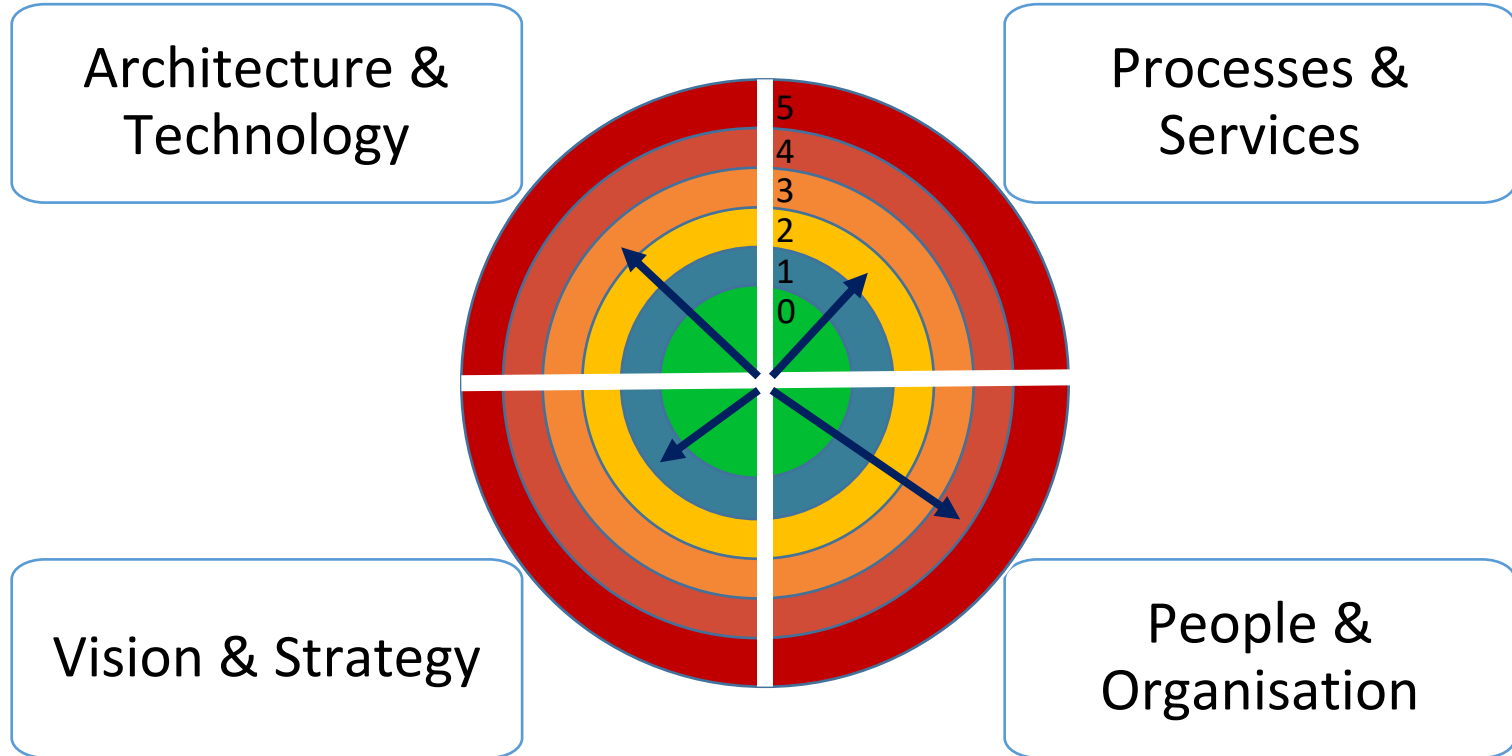
Stages Definition

ORGANISATION REACH



MINDSET ADOPTION

OAV Maturity Model - Dimensions



Dimensions definition

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

Architecture
& Technology

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

Processes &
Services







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

Vision &
Strategy

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

People &
Organisation

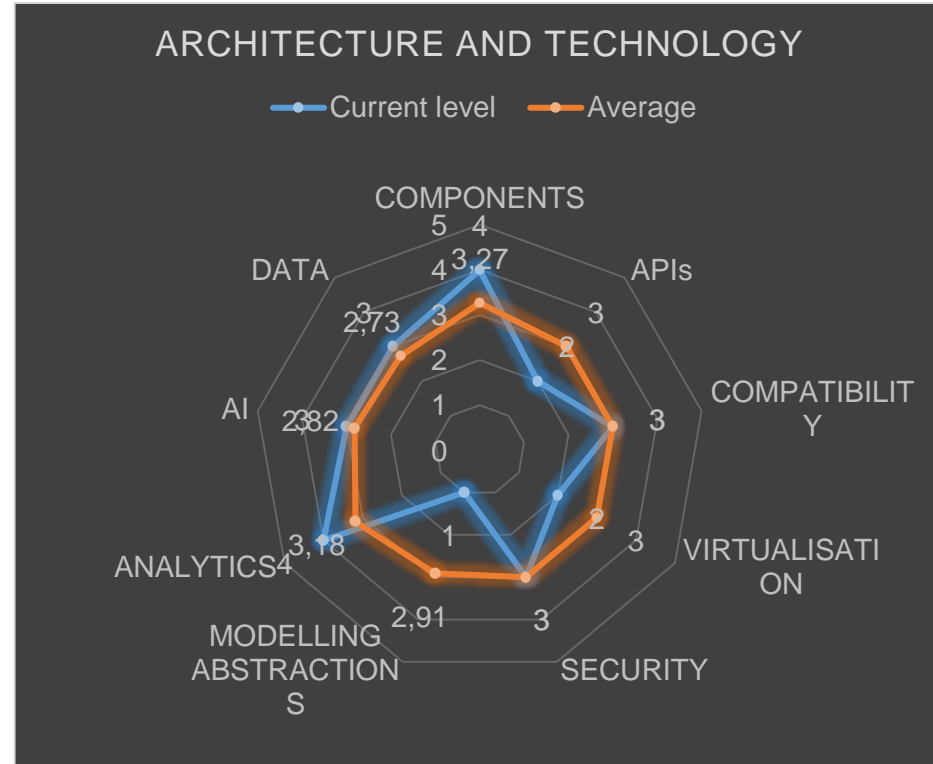
OAV Maturity Assessment

			Architecture & Technology	Processes & Services	Vision & Strategy	People & Organisation
Level 5		Self-*				
Level 4		Proactive				
Level 3		Integrated				
Level 2		Reactive				
Level 1		Ad Hoc				
Level 0		None				

OAV Wiki and Whitepaper

Detailed information about the Maturity Model can be found on:

1. The Wiki pages:
<https://wiki.geant.org/display/NETDEV/OAV+Maturity+Model>
2. The OAV MM Whitepaper:
https://resources.geant.org/wp-content/uploads/2023/11/GN5-1_White-Paper_OAV-Maturity-Model.pdf



Conducting a Maturity Assessment



Three-phase approach

It can help you check your OAV progress through stages and dimensions

Tips & Tricks

Choose

Choose the best answer by collaborating with relevant parties

- Avoid personal views and opinions
- Try to define strict measurable criteria relevant for your organisation

Consolidate

Consolidate the results and define your to-be stages

Achieve

Keep in mind that future state objective does not need to be to achieve the highest level in all areas

- Depends on goals, expenses, applicability...

Important to remember!



Assessing your maturity isn't a one-time exercise

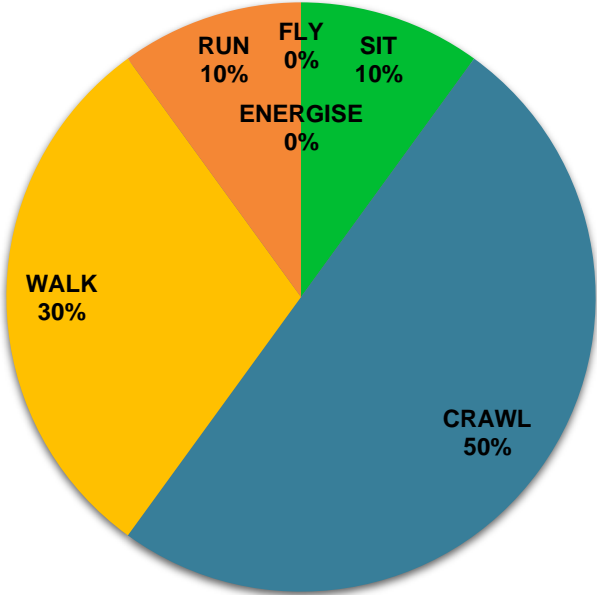


You need to measure your progress toward your desired to-be state

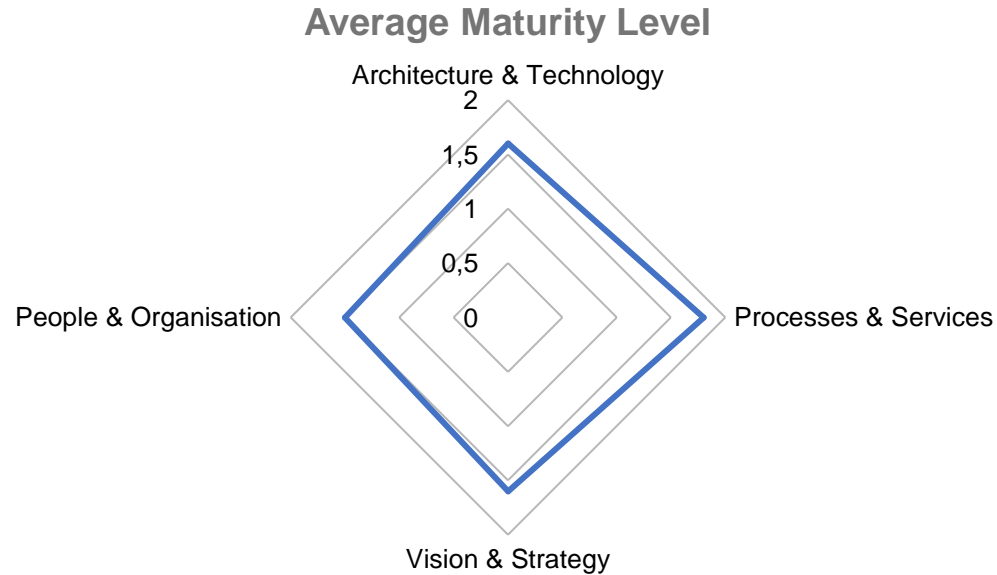


Re-assessing your maturity levels helps review if changes are leading to the right direction

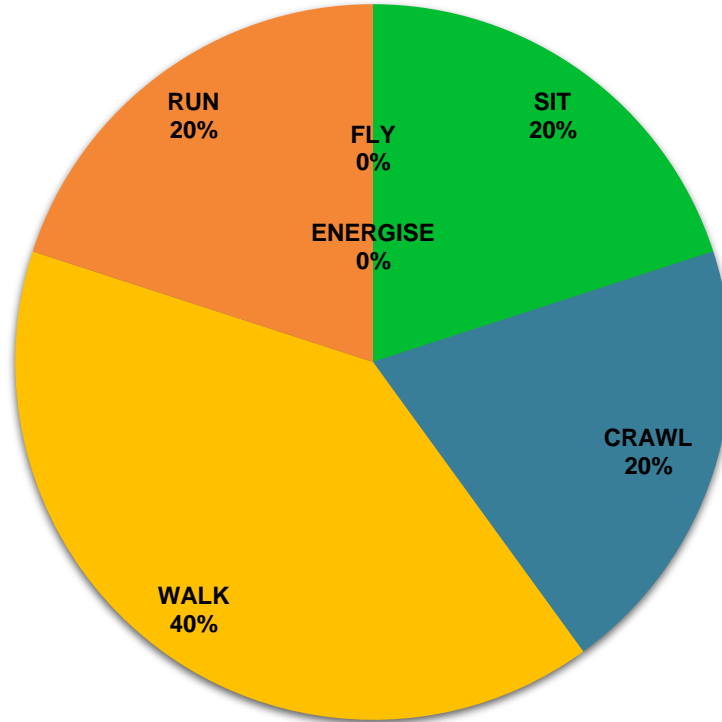
Some Results - Current OAV Community Scores



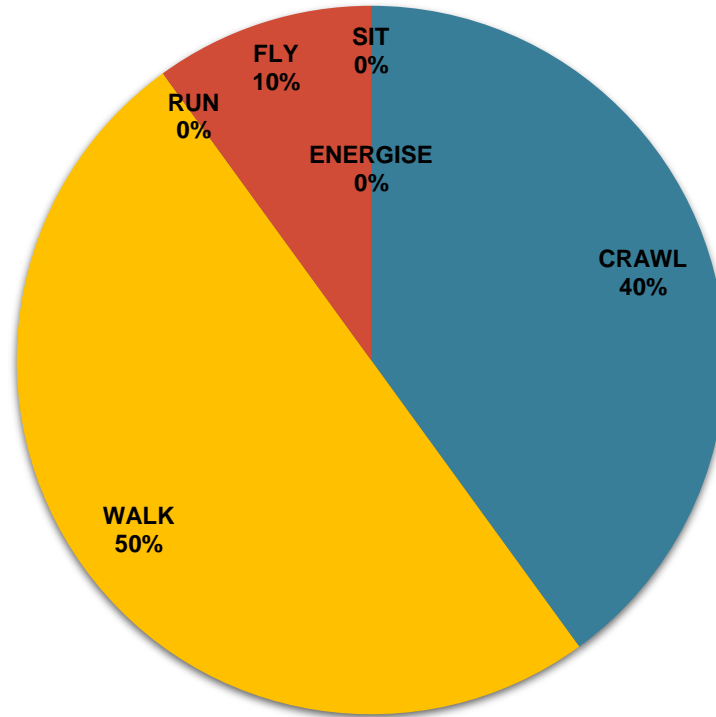
Some Results – Average Maturity Level



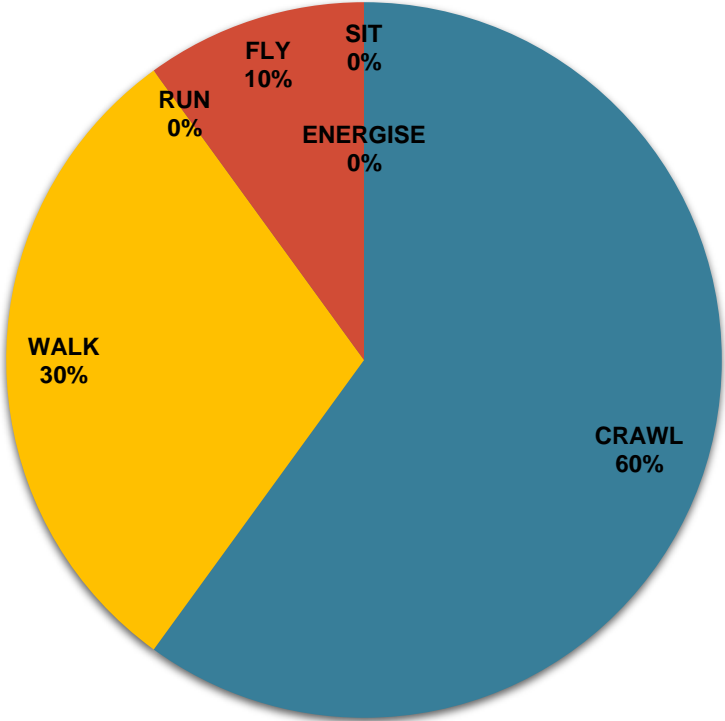
Architecture and Technology



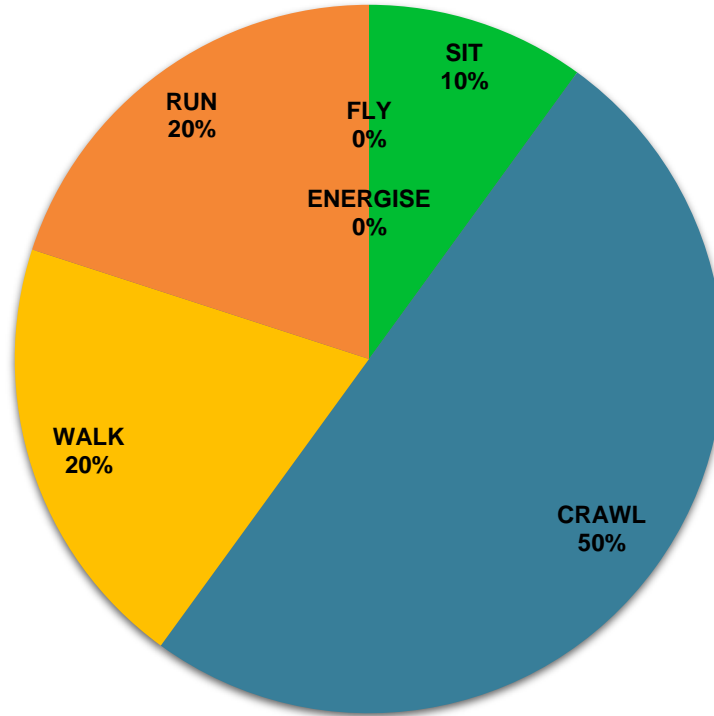
Processes and Services



Vision and Strategy



People and Organisation



OAV MM Survey

Please, go to:

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

and let's start!

You can start answering Q1-Q4...no mystery there 😊



OAV-MM: Architecture and Technology

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Subdimension: Components integration in an OAV architecture

A component is a functionally independent part of any system. It performs some function and may require some input or produce some output.

Q5: How would you describe the level of integration of the components that are used in your operating and business support systems (O/BSS) environment?

Components



None

Totally independent - Different services and types of devices are managed independently using vendor-issued or service/device specific tools. This creates some functional and data overlaps between our components.



Ad-hoc

Very little integration - We use or refer to data from one component in other components, but this type of integration is on a small scale and there are only a few examples.



Reactive

Limited to specific use cases - For certain projects or use cases all of the used components can easily exchange information and data duplication is avoided. We strive to use vendor-neutral approaches.



Integrated

Basic integration level - All our components have well defined functions and data ownership (single source of truth). They are used to manage all services and devices. We don't have any siloed solutions.



Proactive

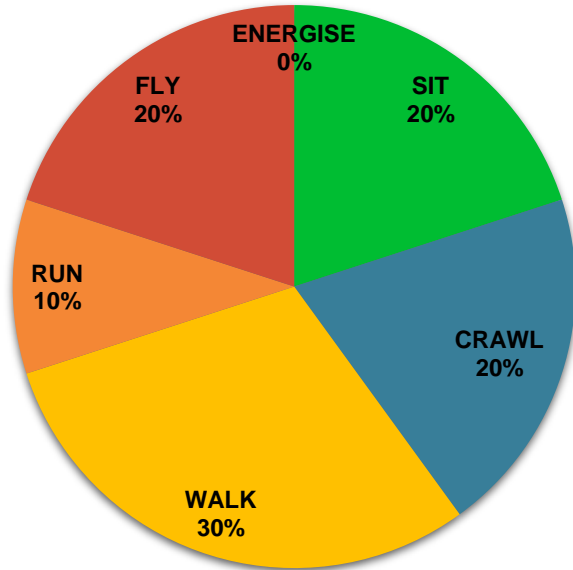
Advanced integration level - All our components can be used as services and are described in a specialised service catalogue. All our functional components can be flexibly used just like puzzle pieces, complex operations using an orchestrator.



Self-*

Federated integration - We support on-the-fly discovery of relevant information stored in federated catalogues and inventories. All of our components are easily discoverable by internal and external parties supporting intelligent self-discovery when in need of specific functionality.

Subdimension: Components integration in an OAV architecture – Previous Results



Some ideas:

- Re-use components
- Include them as services in a service catalogue
- Approach them as Lego blocks or puzzle pieces that communicate through APIs
- Make them provide well-defined functionalities (e.g. single source of truth)
- Try to avoid vendor-locked tools
- Start working for self-discovery

Subdimension: APIs (Application Programming Interfaces)

An API is a set of commands, functions, protocols, and objects that programmers can use to create software or interact with an external system. Any data can be shared with an application program interface.

Q6: What is your organisation's approach to APIs?

APIs



None

No APIs exposed - Many of our components do not expose APIs at all; only readily available GUIs and exporting/importing facilities are in place.



Ad-hoc

Only for simple tasks - We use some existing APIs for small automated tasks. Available APIs may be of different nature (REST, SOAP, etc.).



Reactive

Starting to use APIs - Our organisation is becoming aware that a standardised approach (like a common API definition guide) is needed and we are performing an API analysis for the components; in some cases we may need to develop additional APIs or API extensions/wrappers for certain components to facilitate automation and data exchange.



Integrated

Used inside the organisation - All our components are exposing standardised (preferably open) APIs that are based on a common data model and support southbound and northbound workflows.



Proactive

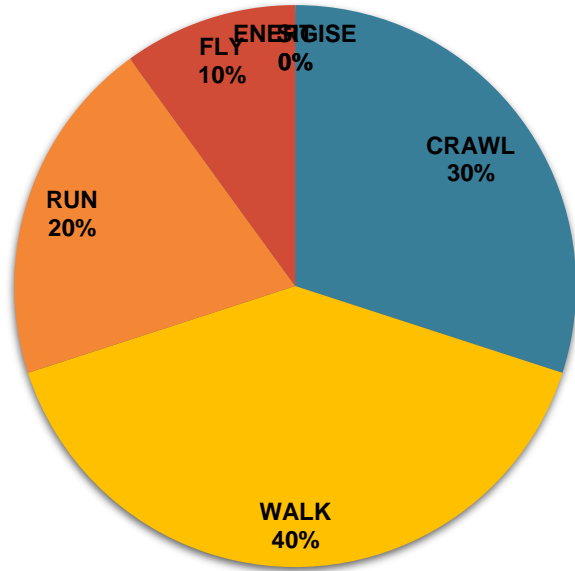
Used inside and outside the organisation - We use standardised open East-West API specifications when interacting with customers and partner organisations. The access control and accountability is achieved via an API gateway that redirects the calls to our internal APIs.



Self-*

Dynamic APIs - We use adaptive APIs that are semantically interoperable, supporting programmable dynamic interfaces and fully automated API contract changes negotiation with dynamic systems mapping; machine-to-machine communication is fully supported.

Subdimension: APIs– Previous Results



Some ideas:

- Use a standardised approach to APIs
- Use APIs based on a common data model
- Develop an API definition guide
- Make your APIs support your workflows
- Work with your customers and partners to use your external APIs
- Work to make machine-to-machine communications possible

Subdimension: Compatibility

Compatibility is defined as the ability of software and hardware from different sources to work together without having to be altered to do so.

Q7: What is your organisation's current status regarding compatibility and interoperability?

Compatibility



None

Not considering it - Compatibility between our tools or management components is not a requirement, nor is it being investigated in our organisation at the moment.



Ad-hoc

Starting to think about it - We do experience some compatibility issues, which are solved using workarounds. This experience has made us wary when considering new hardware and software purchases.



Reactive

Some work done - As we work on automating the processes in our organisation, compatibility and interoperability issues between the involved components, along with the use of common models and data duplication issues, are being addressed in a consistent manner.



Integrated

Solved within the organisation - All components and tools that are used to run processes are fully compatible and interoperable using standard approaches and models.



Proactive

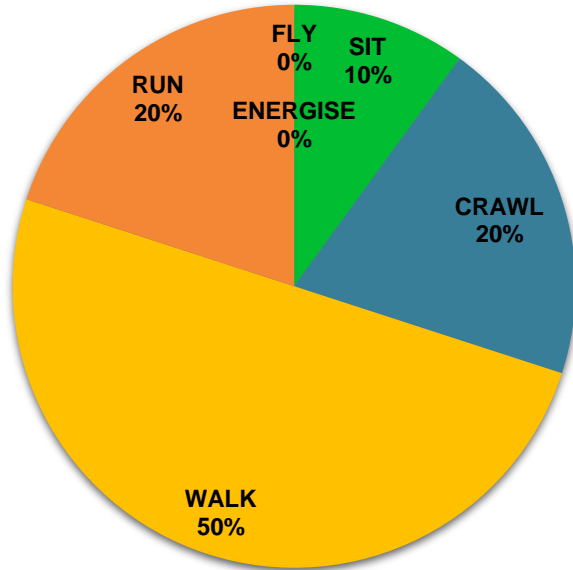
Solved within and outside the organisation - Our organisation can collaborate with other partners and easily exchange information in a standardised automated fashion .



Self-*

Adaptive approach - Our organisation can establish interoperability agreements with a selected partner on-the-fly, intelligently adapting the communication channel between the organisations supporting new technologies such as smart contracts

Subdimension: Compatibility – Previous Results



Some ideas:

- Make all your tools and components interoperable
- Chose standards and models to ensure compatibility with development efforts in progress or future procurements.
- Start working to be interoperable with partners

Subdimension: Virtualisation

Virtualisation is the abstraction of network or service objects to make them appear disassociated from the underlying hardware implementation specifics.

Q8: To what extent does your organisation take advantage of the use of virtualisation technologies?

Virtualisation



None

Minimal use of virtualisation - The use of virtualisation technology in our organisation is minimal. We may have some VPNs in place, a few proprietary vertically integrated boxes available in our network, or individually managed VMs hosting a few services.



Ad-hoc

Standalone virtualized deployments - We are aware of the need to choose common virtualisation platforms. We have a number of isolated virtual deployments of standalone VMs, containers and/or VNFs.



Reactive

Basic virtualisation environment - We support multi-vendor VNFs and horizontal scalability of virtual objects. Some of our services are transferred to virtual based hosting.



Integrated

Intermediate-level virtualisation environment - Our physical and virtual components are interoperable and hybrid services can be implemented. Network function chaining is fully operational in our network.



Proactive

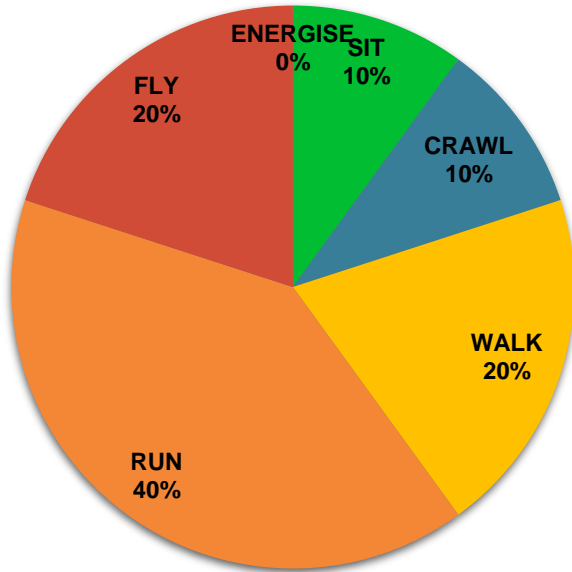
Fully virtualised environment - We have a common virtual layer that provides a complete e2e network visibility overarching different technologies and implementation. Our organisation has a fully virtualised environment with auto-scaling support: desktop, application, network, storage, and data virtualisation.



Self-*

Federation with other virtualised environments - A common virtualisation layer transcends our organisation's domain and federates with other virtual infrastructures that belong to partner organisations in a fully transparent manner using next-gen virtualisation technologies.

Subdimension: Virtualisation – Previous Results



Some ideas:

- Have a common virtual layer to provide end-to-end network visibility, overarching different technologies and implementations (VMs, containers, NFV, SDN...).
- Go for a fully virtualised environment with auto-scaling support: desktop, application, network, storage, and data visualisation.
- Start working to be able to federate with virtual infrastructures from partner organisations in a fully transparent manner.

Subdimension: Security

Set of measures, systems, solutions, tools and procedures designed to combat threats against networked systems and applications, whether those threats originate from inside or outside of an organisation.

Q9: How would you describe the security architecture of your organisation?

Security



Manual and independent configuration - We use manual configuration of our security tools and focus mostly on network security.



Centralised data storage - We have a centralised location where we store and analyse log data and security events from different devices. Our security efforts are focused on both network and endpoints.



Automatic centralised configuration and analysis - We have a centralised system for logs and security events. We use automation when configuring security tools and enforcing policies. We perform forensics analysis of past incidents for the network and servers.



AI-based centralised configuration and analysis - We have an automatically configured centralised security architecture based on threat and risk assessment. We perform security analytics with event correlation as well as complete forensics when necessary.

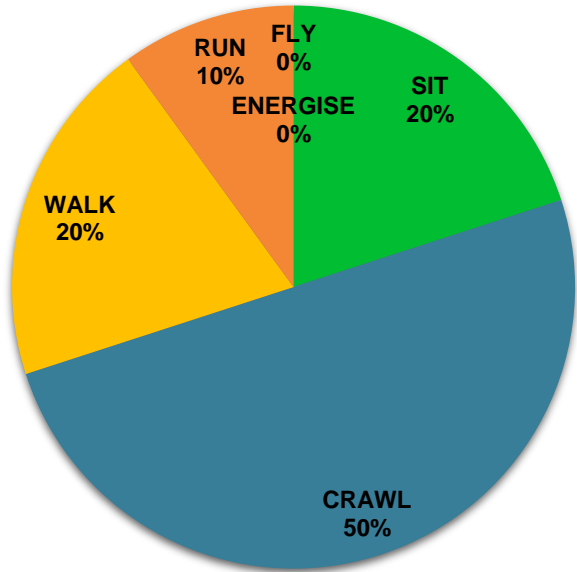


AI-based decentralised architecture - We have a decentralised security architecture in place with distributed security devices and advanced machine analytics that enables proactive security behaviour.



Advanced self-configurable architecture - We have an advanced decentralised security architecture that supports advanced analytics based on indicators of attack (IOA) using AI/ML and federated learning. Our security equipment setup is self-configurable.

Subdimension: Security – Previous Results



Some ideas:

- Use distributed security devices.
- Have a Security Information and Event Management (SIEM) in place to analyse the distributed log events data based on Indicators of Attack (IOA) and Indicators of Compromise (IOC)
- Have proactive capabilities for threat prediction and threat hunting.
- Have a resilient and efficient compliance posture.
- Towards self-configurable security equipment.

Subdimension: Data Modelling / Object Abstractions

A data model (or datamodel) is an abstract model that organises data elements of data and standardises how these relate to one another. Modelling abstractions refers to the process of simplifying complex real-world data structures into more manageable, often simpler, conceptual representations.

Q10: How would you describe modelling of services and resources in your organisation?

Data Modelling / Object Abstractions



None

No standard models - We have no standard specifications or abstract models of resources/objects of interest (services, devices, metrics, etc.). If any, we use the models provided in our tools with very little or no customisation.



Ad-hoc

Separate data models - We use several data models for some of our components as needed using a flat design for resources and services.



Reactive

Common modular object modelling - Our organisation has adopted a common approach to object modelling based on modularity. We are investigating the benefits of introducing hierarchy and additional abstraction layers in our models.



Integrated

Common standardised data modelling - We have a fully functional standardised data model that can be used to describe physical and logical objects and their relationships.



Proactive

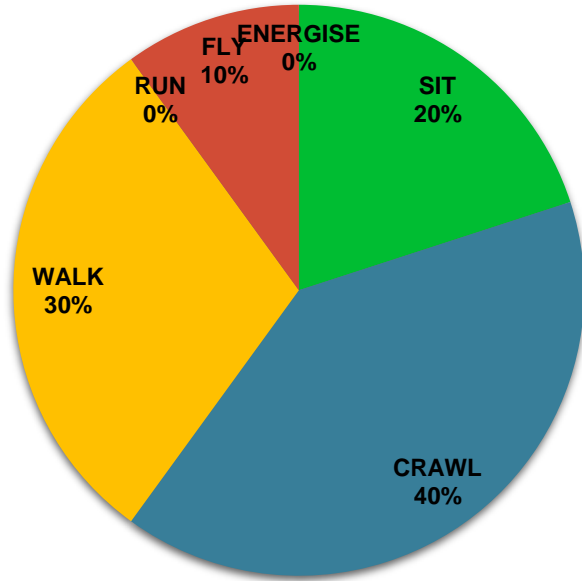
Modular and multi-layered data modelling - New objects can be easily constructed using fine grained modules that we have defined. We also support module hierarchy and multi-layered abstractions.



Self-*

Dynamic and self-optimised data modelling - Our data model is flexible and organic. Its definition can be dynamically learned and self-optimised by our intelligent system components.

Subdimension: Data Modelling / Object Abstractions – Previous Results



Some ideas:

- Make your data model easily extensible with custom object parameters.
- Build your objects by using hierarchically arranged modules.
- Work to be able to extend object models on-the-fly.
- Auto-generate new abstraction layers based on a mix of intentions and controls (make the model definition something that can be learned and optimised by the system).

Subdimension: Analytics

Analytics uses mathematics, statistics, and machine learning to find meaningful patterns in data. Through the use of analytics, organisations describe, diagnose, predict and prescript, and are being able to make well-informed decisions on the allocation of resources, optimisation of processes, and configuration of systems.

Q11: What type of analysis/analytics do you perform in your organisation?

Analytics



None

No specific analytics tools - We have no specific analytics tools in use. We only use what is readily available in our standard off the shelf monitoring/reporting tools.



Ad-hoc

Basic analytics - We perform only basic analysis on historical data gathered from different sources.



Reactive

Advanced statistical analytics - We are able to do more advanced statistical data analysis and get information on the past and current status and performances of the network



Integrated

Automated root cause analytics - Our organisation supports automated root cause analysis. We are able to perform deep analytics and understand why something is happening. Our analytics process includes data discovery, data mining, drilling down and drilling through.



Proactive

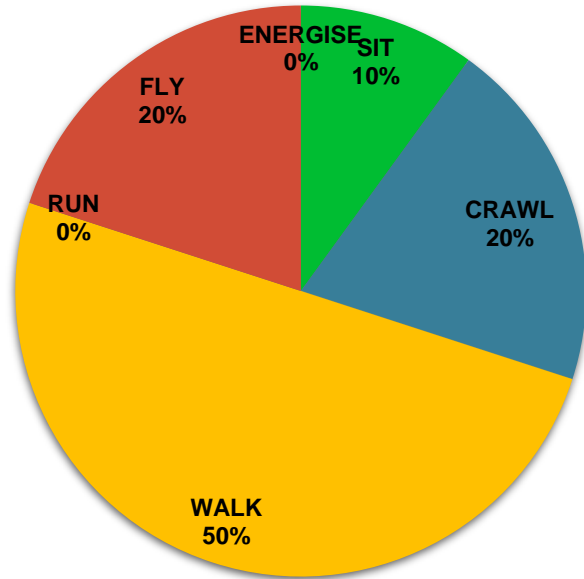
Predictive analytics - We use the historical data to train learning models that are used to analyse trends and patterns. Thus we are able to get predictions based on real time data.



Self-*

Analytics for automated decision making - We have smart engines that can make decisions by analysing what actions are the best choice that will lead to the desired outcomes.

Subdimension: Analytics – Previous Results



Some ideas:

- Use historical data to feed learning models to analyse trends and patterns and to be able to make predictions when combining the model with the real-time data.
- Work to allow engines to make smart decisions by analysing what actions can be taken to affect the forecasted outcomes.
- Use predictive data to automatically generate options on different courses of actions (prescriptions) together with an impact analysis of applying each option.

Subdimension: Artificial Intelligence (AI)

Ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. It is a the system's ability to correctly interpret external data, to learn from such data, and to use that learning to achieve specific goals and tasks through flexible adaptation.

Q12: How is AI applied to decision making across your organisation processes?

Artificial Intelligence (AI)



None

No AI used - We do not use AI at all, and no AI algorithms are in place for detection, classification or predictions.



Ad-hoc

Isolated basic AI modules - Initial, ad-hoc AI implementations are being put in place in our organisation for some specific operations such as reporting.



Reactive

AI for classification - We are piloting the use of AI in some projects. Some of our processes are coupled with AI-based solutions that change the behaviour based on classification results.



Integrated

AI for pattern recognition - We have integrated AI in several cross-department processes. We use AI to be able to generate intelligent alarms based on recognition of hidden patterns using unsupervised learning.



Proactive

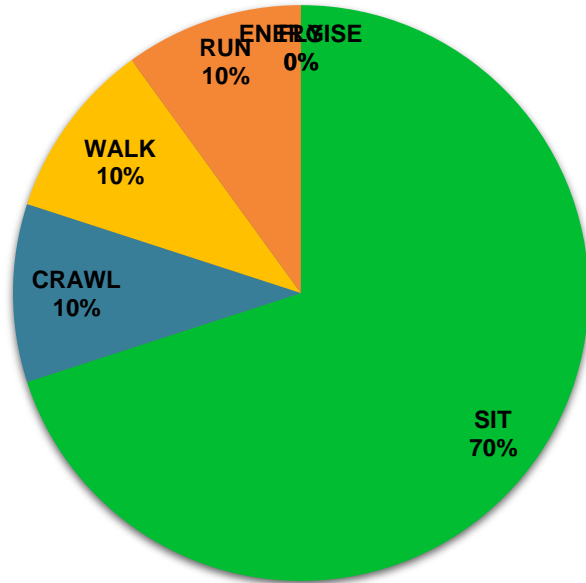
AI for decision making - We use AI for smart decision making across our organisation processes. The lifecycle of all AI deployments is managed by a central AI platform, and we use a standardised approach to AI development.



Self-*

AI for fully autonomous systems - We use AI in fully autonomous systems that implement predefined intents. Our AI deployments are characterised with self-learning and auto-optimisation behaviours.

Subdimension: Artificial Intelligence (AI) – Previous Results



Some ideas:

- Use AI for your processes.
- Use AI for intelligent decision-making.
- Make AI the innovation driver leading to fully autonomous systems that work according to pre-defined intents.
- Work towards self-learning and auto-optimisation.

Subdimension: Data

Facts and statistics collected together for reference and analysis

Q13: What is your approach to data collection and management?

Data



None

Different data formats - We collect data in a number of different files or databases, with different formats, without naming standards.



Ad-hoc

Starting to define naming standards - Our naming standards and storage structures are being developed. Metadata attributes are defined on a group/department basis.



Reactive

Mainly structured data used - We use data warehouse(s), but we struggle with data quality aspects. Our organisation primarily uses structured data, but we may make use of unstructured data in some cases.



Integrated

Data lake used - We share data across our organisation using a data lake, and we have a solid data management and governance plan in place. We have a unified information architecture and/or organisation-wide analytics platform.



Proactive

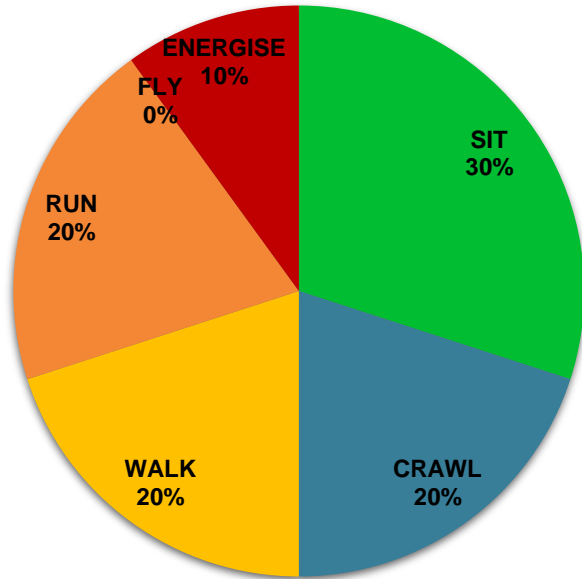
Data quality and strong governance policies - We have integrated data quality across systems. Archival and job scheduling tasks are performed automatically, and we use an intelligent lake overarching structured and unstructured data stores. We have strong data governance policies, minimising the risk of data siloing.



Self-*

Federated data lakes with external partners - There exists a data mesh with federated data lakes, where data is shared not only across our organisation but with other partners as well. We have fully automated data quality checks and scalability mechanisms in place.

Subdimension: Data – Previous Results



Some ideas:

- From structured to unstructured and raw data
→ From data warehouses to data lake and data mesh.
- Automate the data lifecycle, supporting self-service data ingestion and provisioning.
- Appoint a data steward
- Use fully automated and orchestrated tools that adapt to the needs of business users.



OAV-MM: Processes and Services

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Subdimension: Automation of processes

Automation refers to processing tasks in a repeatable manner to yield the same result every time, without human intervention. Process automation refers to the usage of technology to automate processes.

Q14: In terms of process automation in general, which answer best describes your situation?

Automation of processes



None

No automation at all - All steps are done manually in our organisation using available element management interfaces. Their integrity depends on the network engineers.



Ad-hoc

Some independent automation scripts - We have a number of independent automation scripts that are task based and run when necessary.



Reactive

Some fully automated processes - We have a number of processes fully automated for the purposes of specific use cases (projects).



Integrated

Orchestration engine used - All of our processes are automated and run using an orchestration engine. Configuration of any element by an engineer is not allowed. We ensure integrity by using a "single source of truth" and "input validation."



Proactive

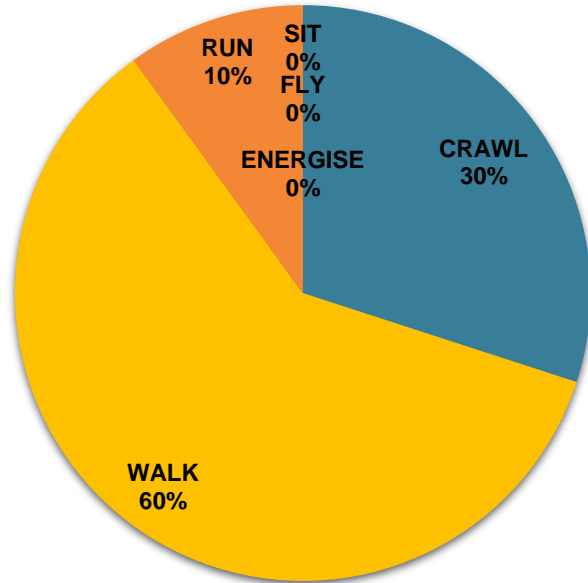
Dynamic adaptation with closed control loops - Our automated processes are implemented using closed control loops, where automated adjustments are made based on the feedback information.



Self-*

Based on decision engines - Our processes are auto triggered based on high-level business goals. Decision engines automatically initiate relevant processes including automated self-configuration.

Subdimension: Automation of processes– Previous Results



Some ideas:

- Use prediction information to make automated adjustments.
- Automatically trigger processes based on the high-level business intentions.
- Let decision engines initiate automated self-configuration/adjustment processes.
- Towards closed control loops.

Subdimension: Service lifecycle management (provisioning / change / termination)

Service lifecycle management is the process of managing and optimising the complete life cycle of a service, from its conception stage to its retirement.

Q15: Related to service lifecycle management, which answer best describes your current status?

Service lifecycle management (provisioning / change / termination)



None

All are done manually - All service lifecycle management actions (device configuration, inventory record keeping, ticket updates, billing, etc.) are done manually.



Ad-hoc

Some steps are automated - To save time or increase fidelity some steps are automated in our organisation, but not full processes.



Reactive

Certain services are automated - Some of our management processes for certain subset of services are fully automated, but we still depend on manual steps as well.



Integrated

All are fully automated - All our services are fully automated using well understood common processes. Our self-service portal for end-users provides key information related to service instances.



Proactive

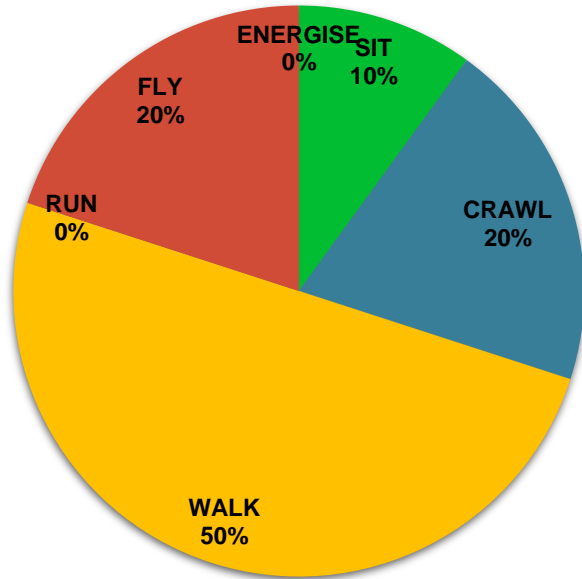
The services adapt dynamically - Our automated service lifecycle management processes are able to dynamically adapt to the current network supporting advanced features such as trying alternative ways to complete the process successfully before giving up and reporting a failure.



Self-*

Fully-fledged self-service management - We have implemented an intention based fully-fledged self-service management using process orchestration, intelligent inferring and advanced analytics.

Subdimension: Service lifecycle management – Previous Results



Some ideas:

- Work to make Service lifecycle management processes able to adapt to the current network state.
- Make self-service management available where users only need to express their high-level intentions and everything else is inferred by the system.
- Base your orchestration processes on gathered information and analytic inputs.

Subdimension: Monitoring and reporting

Monitoring is the observation and measurement of several parameters (from the link status or traffic on an interface or line to physical parameters such as like temperature, humidity, etc). Reporting is the representation of data sources for the purposes of reference and statistics .

Q16: Which statement describes best your advancements in terms of monitoring and reporting?

Monitoring and reporting



None

Manual setup - We have a multitude of monitoring tools that are used as stand alone solutions with manual setup.



Ad-hoc

Some degree of automation - We have dedicated monitoring tools for each networking technology. We use some degree of automation to produce regular reports.



Reactive

Full automation of some pilot services - We are consolidating our monitoring tools and reporting processes. Start/end of monitoring and reporting are fully automated for a number of pilot services.



Integrated

Reporting fully automated - We have a monitoring platform where every service and resource is registered and classified automatically. This provides a single unified view of all infrastructure with fully automated reporting.



Proactive

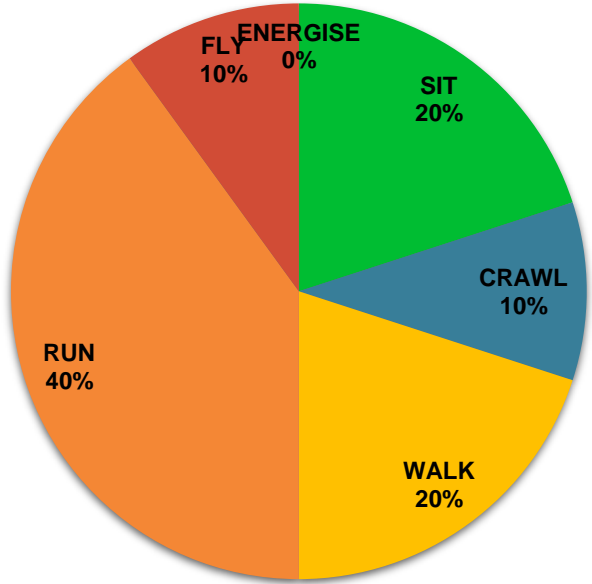
Context-aware monitoring and predictions - We have a real-time context-aware monitoring platform that also incorporates predictions of possible future alarms.



Self-*

Self-triggered fully automated - Our monitoring system is fully automated and self-triggered. It provides early anomaly detection, and is constantly learning about the multi-user, multi-domain environment. Our system can automatically generate customised user reports.

Subdimension: Monitoring and reporting – Previous Results



Some ideas:

- Try to trigger predictive alarms (based on AI).
- Make instant detailed reporting automatic. Customise it.
- Make your monitoring system learn from multi-user and multi-domain datasets.
- Towards no human intervention for monitoring and reporting.

Subdimension: Troubleshooting (incident and problem management)

Troubleshooting is a systematic approach to solving an incident or a problem.

Q17: How well do you troubleshoot incidents and problems?

Troubleshooting (incident and problem management)



None

Manual troubleshooting - We are experiencing problems with alarm storms and find it difficult to isolate critical alarms from the rest. Combining and correlating information from multiple systems requires a lot of effort and time.



Ad-hoc

Basic automation - We analyse the information from multiple tools and datasets in order to perform troubleshooting. We correlate information manually, so sometimes root cause identification is slow. We mostly use automation in ticket management procedures.



Reactive

Automatic alarm correlation - We use dashboards to view all relevant service information. We are able to automatically combine related alarms and identify affected services in some cases.



Integrated

Automatic troubleshooting workflows - We have a single data pool used for troubleshooting of all services. All of our troubleshooting workflows are automated, including root cause analysis, but we don't use any prediction modules.



Proactive

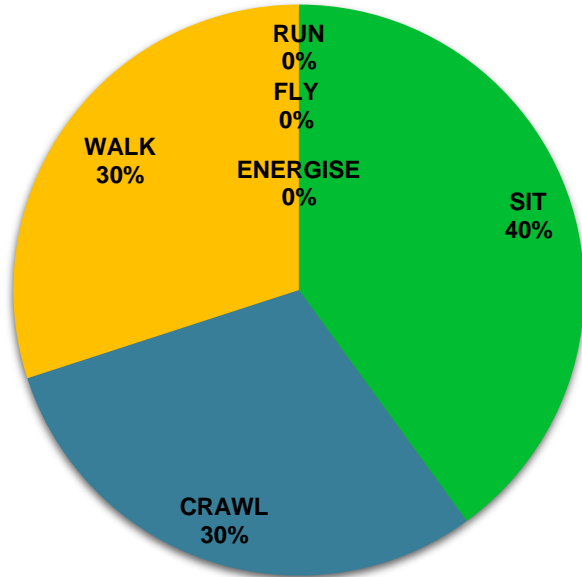
Automatic remediation - We use machine learning to get insights from the available operational data and to make predictions or propose mitigation actions. Both root cause analysis and remediation are automated.



Self-*

Self-healing system in place - We have a self-healing system that analyses data and repairs issues proactively with automated failover whenever needed.

Subdimension: Troubleshooting (incident and problem management) – Previous Results



Some ideas:

- Automate Root cause analysis and remediation.
- Use machine learning/AI to extract essential insights from large pools of operational data
- Make predictions regarding potential issues and take mitigative steps to avoid degradation.
- Solve issues without user input.
- Use data and rules for self-healing algorithms.

Subdimension: Security management

Security management is a continuous process that describes the structured implementation of security within an organisation.

Q18: How would you describe the security management processes in your organisation?

Security management



None

Manual threat analysis - Security logging exists in some functional areas. Threats are recognised reactively and analysed manually.



Ad-hoc

Simple scripts in place - We don't have formal incident response or security-compliance violation-management processes. Some security activities are automated using simple scripts. We are aware of some threats, but we do not follow advanced persistent threats (APTs) or all threats.



Reactive

Basic security compliance monitoring - We have minimum monitoring of security compliance and response. We implement processes to manage security compliance violations, although we do not follow all threats and we have no automated incident response process.



Integrated

Reactive and manual threat intelligence lifecycle - We have established a reactive and manual threat intelligence lifecycle. We have automated basic monitoring and response processes together with a basic incident response process and good visibility of all threats.



Proactive

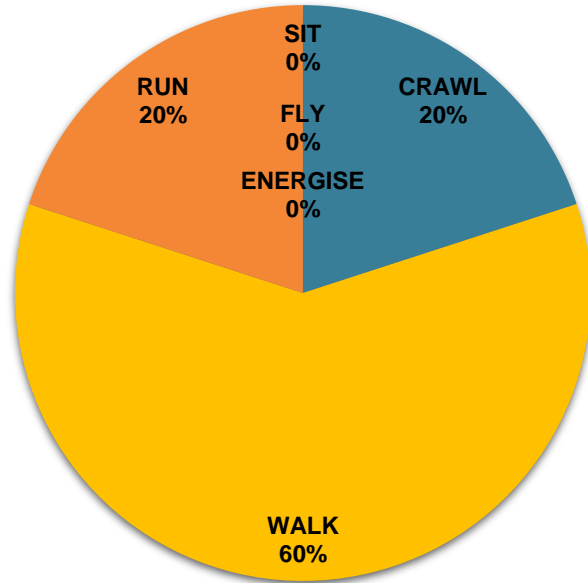
Advanced response processes - We have formal and mature monitoring and response processes with standard playbooks for most common threats. We have targeted automation of investigation and mitigation workflows. We do proactive threat hunting and we are leveraging automation to improve the efficiency and speed of threat investigation and incident response processes.



Self-*

Fully autonomous automation - We have established, documented, and mature response processes with standard playbooks for advanced threats. We have an extensive automation of the investigation and mitigation workflows. Fully autonomous automation - qualification to mitigation.

Subdimension: Security management – Previous Results



Some ideas:

- Do automated checks with proactive controls / access lists, configurations and updates.
- Be proactive in the response to attacks, using specific equipment (such as Intrusion Prevention Systems (IPS)).
- Leverage automation to improve the efficiency and speed of threat investigation and incident response processes.
- Use standard playbooks for common and advanced threats.
- Towards a self-management of monitoring, access lists and security equipment.

Subdimension: Service design (service specification)

Service design provides guidelines and best practices for designing new IT processes and services and preparing them for a live environment.

Q19: Which option best describes the service specification and design activities in your organisation?

Service design (service specification)



None

Basic service specifications - We have service configuration procedures available outlining service-specific actions that need to be taken to manage a service. Our portfolio describes services in a text format. The service descriptions and specifications are not standardised.



Ad-hoc

Technical service specifications - The technological aspects of our services are described in technical service specifications. We are investigating data modelling languages to create a formal service specification definition. We are exploring service design practices (e.g. customer journey).



Reactive

Data models - We have defined some chosen pilot services using adopted service design practices. We build data models around these services and define their programmable service parameters (for example using YANG or XML)



Integrated

Machine readable service specifications - Service design embedded in day-to-day activities. Our service catalogue contains only parameterised machine-readable service specifications ready to be consumed by different functional blocks. RFS / CFS differentiation.



Proactive

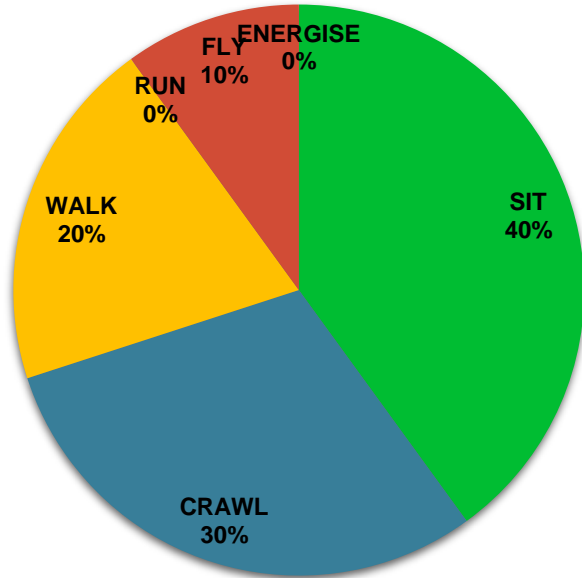
Highly-granular service specifications - Our service specifications are defined as a combination of highly-granular puzzle pieces that represent different parts of a resource-facing or customer-facing service. Our new services can be designed by combining readily available puzzle pieces.



Self-*

Automated service design - Our users are active participants in the service design. They are able to create their own custom service by putting together available service puzzle pieces. Our service design process is fully automated and streamlined to optimise the customer experience.

Subdimension: Service design (service specification) – Previous Results



Some ideas:


- Design services as the combination of highly granular puzzle pieces that represent different parts of a resource-facing or customer-facing services.
- Design new services using readily available puzzle pieces.
- Allow users to flexibly build their own custom services automatically.
- Automate the service design process.



Discussion on Architecture, Technology, Processes and Services


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Menti Time!



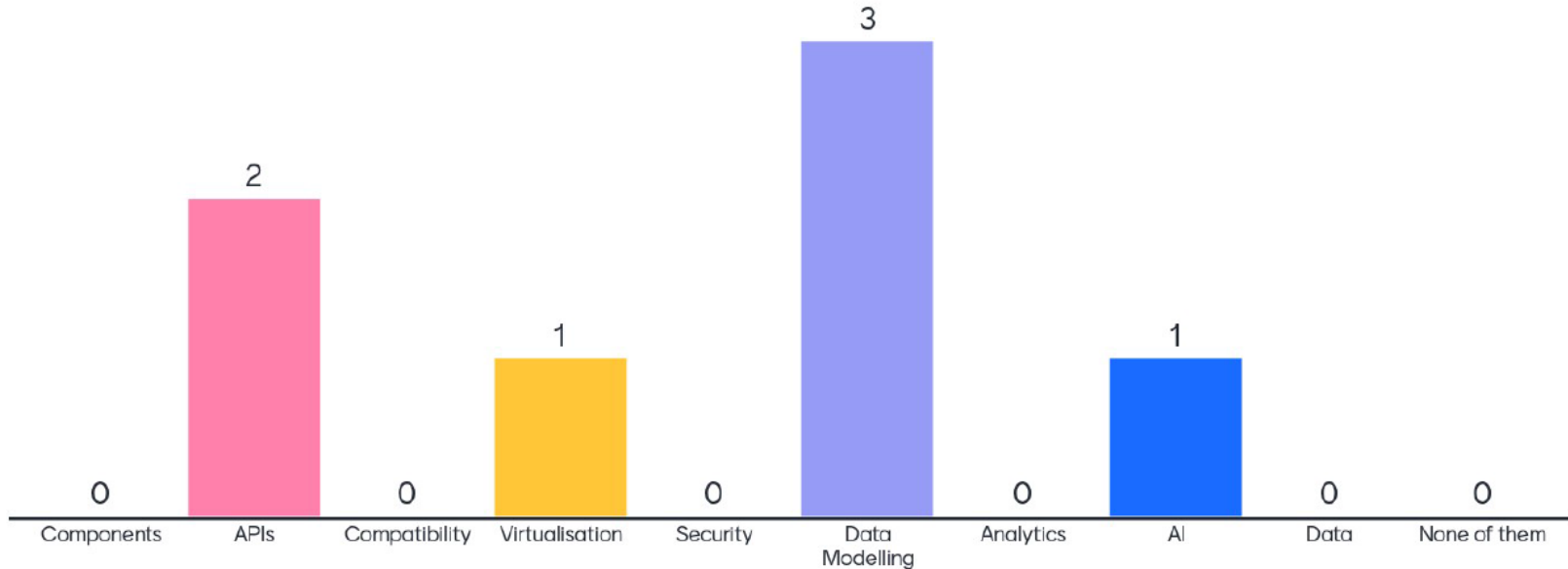
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Where are you going to focus in the next 6 months for Architecture and Technology?



Describe some quick wins for Architecture and Technology

incident response
orchestration

ZTP

Workflow Orchestrator
(SURF) Containerisation

API support

network behaviour
prediction

Fast control and provision

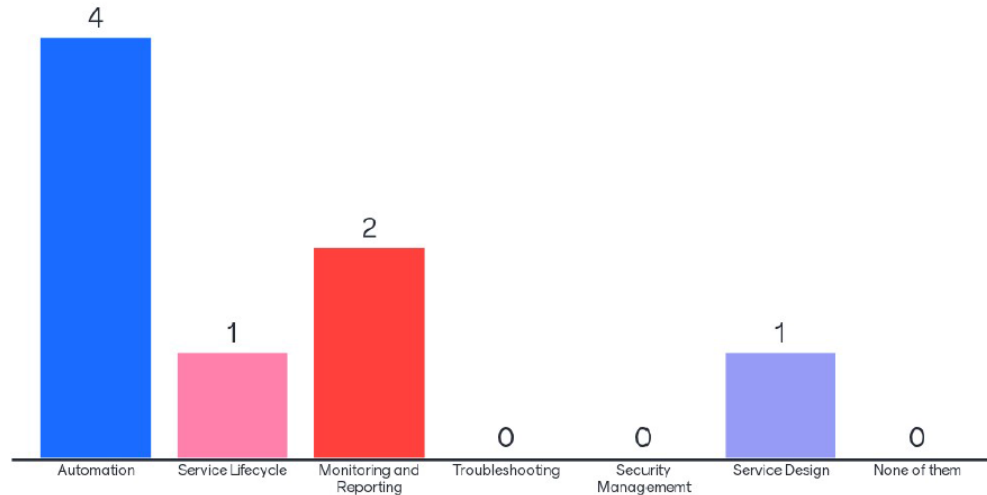
Automate repetitive tasks

Focus on the simplest and
most repeated tasks

Automation of service
monitoring

Move from vendor lock in

Where are you going to focus for Processes and Services in the next 6 months?



Describe some quick wins for Processes and Services

Service templating

Documenting current processes!

Move from CLI

Standardize processes

Again, focus on the simple tasks

Define source(s) of truth

Fully define services.

Simplification and easy troubleshooting



Coffee-Break

Orchestration, Automation and Virtualisation Maturity Model Workshop
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OAV-MM: Vision and Strategy

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Subdimension: OAV development and implementation policies (incl. security policies)

An OAV policy is a statement of intent regarding OAV and is implemented as a procedure or protocol.

Q20: To what extent have you developed and implemented your OAV related policies?

OAV development and implementation policies



None

No policies - We do not have formal policies regarding OAV development and implementation.



Ad-hoc

Initial policies - The definition of our OAV development and implementation policies is currently ongoing. We already use a minor set of OAV policies in our operating activities.



Reactive

Use-case-based policies - We have developed OAV policies, but they are used operationally only in selected projects and activities when deemed necessary.



Integrated

Consistent policy implementation - We have implemented common, aligned OAV management policies throughout the organisation in a consistent manner. We continue to increase automation of all policies.



Proactive

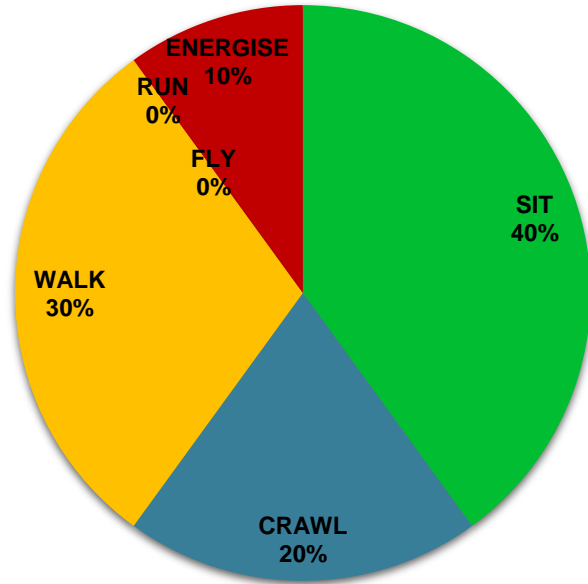
Automated policy development cycle - We have fully developed OAV management policies with automated implementation. They are operational throughout the ecosystem (with all stakeholders including users and partners). We work on adding continuous improvement to the policy development cycle.



Self-*

Optimised policies - We have optimised our complete set of OAV management policies. Controls and procedures are put in place to make sure that excellence is maintained even if strategic leadership or direction changes. The work on policy improvements is ongoing.

Subdimension: OAV development and implementation policies – Previous Results



Some ideas:

- Consistently implement common and aligned organisation-wide OAV management policies.
- Deploy and automate OAV management policies through the whole ecosystem.
- Optimise OAV management policies.
- Implement controls to sustain achieved excellence regardless of changes in leadership or direction.

Subdimension: Data/information governance

Data governance is everything that is done to ensure data is secure, private, accurate, available, and usable. It includes the actions people must take, the processes they must follow, and the technology that supports them throughout the data life cycle .

Q21: How do you govern data/information in your institution?

Data/information governance



No governance - In our organisation information is fragmented and inconsistent across different systems and applications.



Governance silos - Our organisation is addressing data quality issues, information inconsistency and data ownership on a group/department level only.



Reactive data governance across organisation - In our organisation data/information is shared across systems with different ownership and across departments. Our information quality procedures are reactive.



Consistent simple data governance - We make use of data for decision making on different management levels, and information owners and data stewards are assigned to manage this asset. All organisation owned data is being governed in a consistent way.

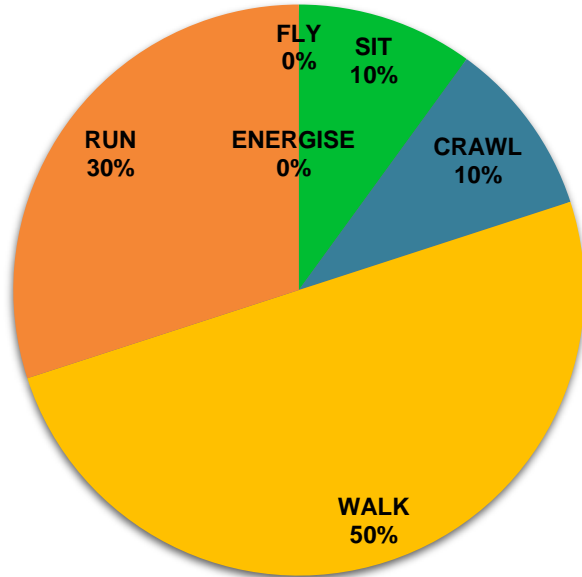


Consistent advanced data governance - We have organised a high-level governance body that addresses the data management issues/challenges and ensures proper data governance across different departments and standardised data sharing with external parties. We develop, implement and improve best practices regarding data policy.



Data-supported decision making - Our information management strategies are tied to lowering risks and meeting/improving our productivity targets. Our information management activities are well formalised and coordinated with all partners and other relevant stakeholders.

Subdimension: Data/information governance– Previous Results



Some ideas:

- Use stored data for decision making on different management levels.
- Establish an organisation-wide consistent way of governing data.
- Establish a high-level governance body to ensure proper data governance across different departments.
- Ensure standardised data sharing with partners within the ecosystem.
- Support information management as the key ingredient for value creation and risk management.

Subdimension: Strategic approach / vision development

Methodical plan designed to achieve specific long-term goals and objectives. A strategic approach can apply to a variety of topics.

Q22: Which best describes the strategic approach or vision development in your organisation?

Strategic approach / vision development



None

No interest in OAV strategic planning - In our organisation there is little or no interest in strategic planning related to OAV activities. We use a traditional strategic management style.



Ad-hoc

Ad-hoc OAV activities - Ad-hoc OAV activities are gaining interest with some colleagues, but there is still low involvement. The OAV goals are unclear on the business level (no OAV vision).



Reactive

Creating a strategic OAV roadmap - In our organisation OAV goals and their impact on the business are known and communicated. We are in the process of creating a strategic roadmap to OAV enablement. Although there is an attempt to coordinate efforts, we still need alignment between technical and non-technical departments.



Integrated

An innovative approach to OAV - The formal OAV development strategic plan is being implemented in a coordinated way so that an innovative approach to OAV is supported across all departments. We have developed metrics (KPIs) as indicators for future efforts.



Proactive

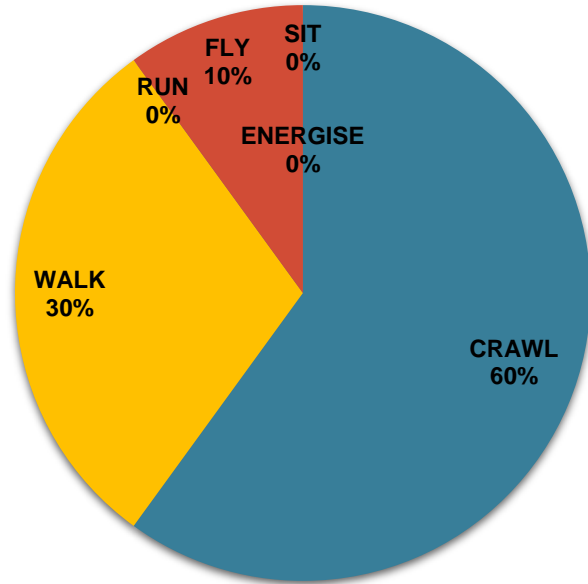
Fully adopted vision - OAV is part of an all-encompassing strategy and vision development for value creation in our organisation. The strategy is shared and the vision is fully adopted across our whole organisation.



Self-*

Business-OAV alignment - Our organisation has a long term vision in place focusing on continuous innovation using OAV organisation-wide and has developed clear strategic alliances. Business and OAV are also fully aligned not just within our organisation, but also across the ecosystem with all our partners.

Subdimension: Strategic approach / vision development– Previous Results



Some ideas:

- Deploy an OAV development vision and long-term strategic plan first for all departments and then organisation-wide.
- Define indicators and metrics (KPIs) and consistently track it at the organisation level.
- Achieve business - OAV aligned both within the organisation and with all partners.

Subdimension: Service management capability

Implementation and management of quality IT services that meet the needs of the business.

Q23: How does your organisation address Service Management?

Service management capability



None

No formal service management - In our organisation, there is no implementation of a formal approach to service management.



Ad-hoc

Ad-hoc service management - We have some teams and colleagues who are implementing service management, but it is in an isolated manner and with various levels of maturity.



Reactive

Siloed service management - In our organisation, service management is being established using separated frameworks across teams; these frameworks' implementations are independently governed and measured. Practices being developed include service catalogue, service level management, change management, change configuration and request fulfilment.



Integrated

Centralised governance - We have a common service management approach across our organisation based on a single service management framework. We adopt a proactive approach to problem management and have a centralised governance.



Proactive

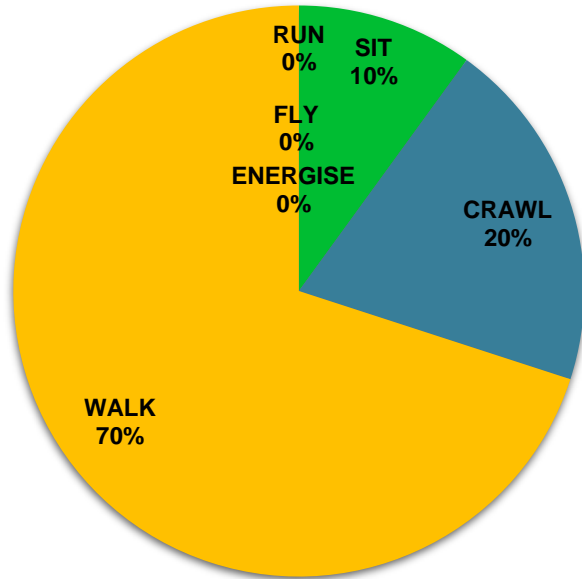
Federated service management governance - We have federated service management governance supporting service management for bundled multi-domain multi-party services in addition to the common service management of single-party services.



Self-*

Optimised service governance - Our service management functions have optimised governance and metrics are automated. Change management is integrated in all aspects and automated as much as possible.

Subdimension: Service management capability– Previous Results



Some ideas:

- Apply a single, organisation-wide service management framework.
- Establish centralised service governance.
- Apply service management for federated and multi-domain services.
- Provide automated reports and dashboards across all service management domains.
- Automate and optimise service management functions.
- Integrate change management in all aspects and automate it.
- Implement continuous improvement.

Subdimension: Agility

Ability to adapt and respond to change.

Q24: How would you describe your Agile capability within the organisation?

Agility



None

No agile practices - We have not yet started to adopt agile practices regarding OAV management and software development in our organisation.



Ad-hoc

Limited use of agile practices - Some of our employees or teams have decided to use chosen agile practices in their work



Reactive

A small set of agile practices throughout the organisation - We adopted a small set of agile practices throughout the whole organisation. Some of our teams are more advanced in agile adoption compared to others.



Integrated

Governance and adoption of agile practices - We have systematically adopted agile practices in a consistent manner with the appropriate agile governance. We are now focusing on implementing lean portfolio management.



Proactive

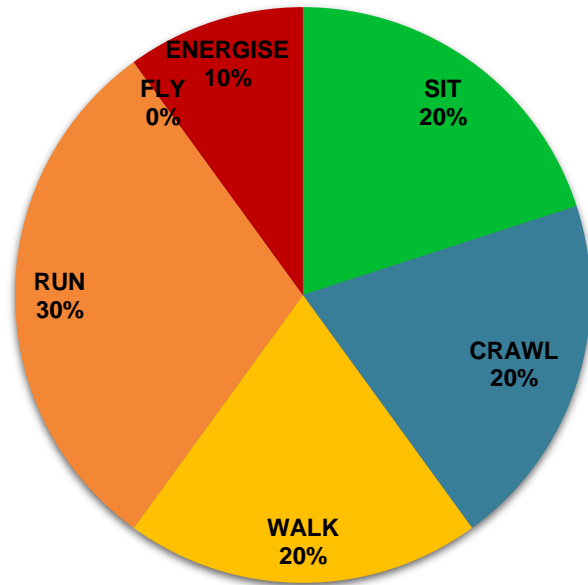
Agile practices throughout the whole organisation and external partners - We are already experienced in all agile practices across all teams with measurable success. We also use the agile methodology when collaborating with other distributed or partner teams.



Self-*

Agile practices as an integral part of the organisational culture - Lean and Agile are part of our organisational culture. While working on each project our aim is to eliminate waste and inefficiency and achieve a sustainable pace of innovation.

Subdimension: Agility – Previous Results



Some ideas:

- Implement an organisation-wide lean portfolio management.
- Systematically implement Agile practices and Agile governance.
- Use Agile with distributed teams.
- Systematically measure and track business values delivery.
- Dedicate to waste and inefficiencies reduction.
- Infiltrate organisational learning and optimisation in all work actions.

Subdimension: Standardisation

Establishment of a set of rules governing how a given task or sequence of tasks are completed in an organisation.

Q25: How important is standardisation to your organisation while you are working on your OAV improvement?

Standardisation



None

Standards are negligible - When working on OAV related projects we are not considering standardised approaches. It is more important that the solution fulfils our requirements.



Ad-hoc

Standards are investigated and used when needed - During the implementation of important OAV aspects we aim to at least investigate existing OAV related standards. We adhere to them if this helps our work.



Reactive

Development of OAV standardisation strategy - We are in the process of developing an OAV standardisation strategy. Some of our teams are striving to adhere to existing OAV related standards even if this will increase the complexity in the beginning.



Integrated

Well defined and complete OAV standardisation approaches - Our organisation has a well defined internal OAV standardisation strategy and approaches. We follow standards during all stages (from design to production).



Proactive

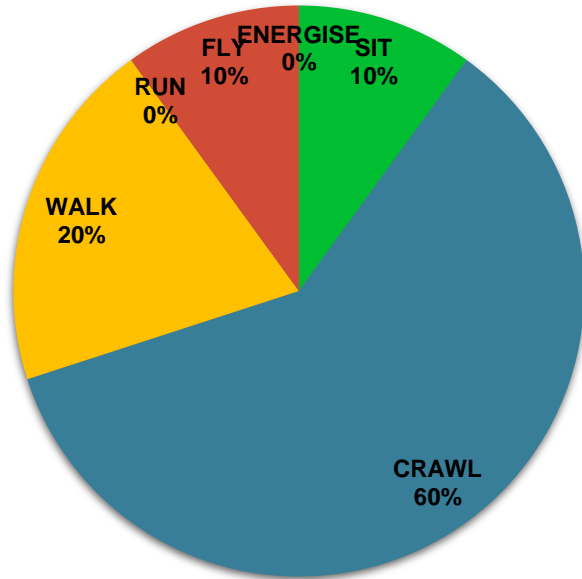
OAV standardisation approaches applied internally and externally - We have adopted common OAV standardised approaches that are aligned with our other partners in the community/ecosystem.



Self-*

Maintenance and improvements of standardised OAV approaches - Our organisation makes proactive improvements while maintaining high performing standardised OAV approaches both internally and externally.

Subdimension: Standardisation– Previous Results



Some ideas:

- Implement an organisation-wide OAV-related standardisation approach.
- Set up compliance measures to follow standards in all life-cycle stages.
- Standardise all activities related to external partners.
- Enforce and support interoperability, compatibility and openness.
- Maintain and proactively improve your high performing standardised OAV approaches

Subdimension: Investments

Act of committing capital for an asset or a service, with the expectation of generating future value. In the OAV MM, it refers to OAV-related investments.

Q26: When it comes to investments in your organisation, which answer best describes your situation?

Investments



None

OAV not considered - When it comes to capital planning or to other related resource budgeting processes, our organisation does not consider OAV-related investment requirements.



Ad-hoc

Ad hoc requests - In our organisation, we do have some ad hoc individual requests for resources or skills development investments related to OAV.



Reactive

OAV capital planning - In our organisation the importance of investments in OAV is recognised when it comes to capital planning and investment control. The traditional approach to budgeting is redesigned to accommodate for any requirements that are needed to kick start the work on OAV.



Integrated

OAV is high priority - All OAV related financial implications are considered as high priority and are part of the capital planning and investment control in our organisation.



Proactive

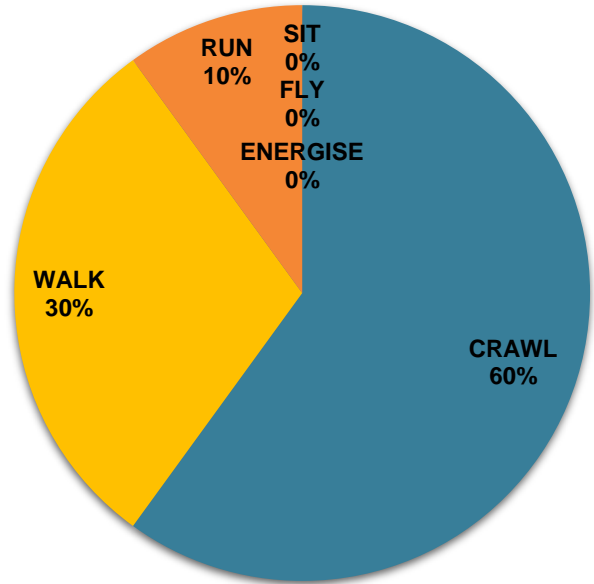
Flexible OAV planning - In our organisation we now have flexible capital planning and investment control in place that is directly related to the outputs from OAV activities.



Self-*

Using OAV metrics - We use OAV metrics to optimise and drive future organisation investments on a large scale. The investment planning we have in place supports flexible continuous process improvements of OAV.

Subdimension: Investments– Previous Results



Some ideas:

- Recognise OAV costs and benefits and raise the priority and its financial implications for OAV.
- Include OAV investments in the capital planning and investment control.
- Regularly update investment plans based on the OAV supported business drivers.
- Use OAV metrics as future organisation investments drivers.



OAV-MM: People and Organisation

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Subdimension: Teams development

A team is a group of people who perform interdependent tasks to work toward accomplishing a common mission or specific objective. As a subdimension, it looks at how work is organised in an organisation to work on OAV capabilities.

Q27: What is the structure of your teams working on OAV capabilities?

Teams development



None

No OAV teams - At the moment, we don't have any teams working on OAV capabilities in our organisation. We may have a few individuals that are interested in employing OAV.



Ad-hoc

Ad hoc OAV groups - We have internal OAV groups formed around common interests or goals, sharing knowledge and working together on-demand.



Reactive

Initial OAV teams - We have one or more specialised OAV teams that are working on specific projects. Inter-team communication and joint development is on a department level only.



Integrated

High-performing OAV teams - We have several high-performing OAV teams located in different departments in the organisation. Each team is focused on different aspects of the OAV architecture and they all collaborate efficiently.



Proactive

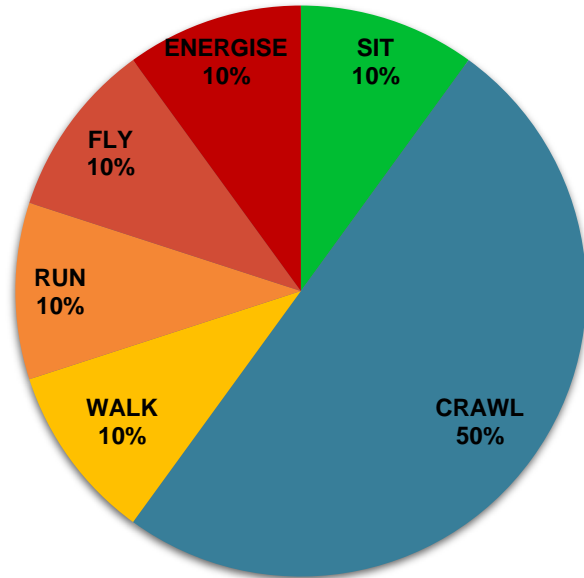
Multidisciplinary OAV teams - Our organisation has multidisciplinary cross-functional teams that work together on OAV topics. We have open communication and cooperation with other teams in the ecosystem.



Self-*

Self-organising OAV teams - We have a number of experienced agile OAV teams that are formed on-demand when we collaborate with other partners from our ecosystem on common projects (i.e. joint service development).

Subdimension: Teams development– Previous Results



Some ideas:







- Establish open and trusted communication and collaboration within all teams in the organisation.
- Develop and support multidisciplinary cross-functional teams with a holistic approach to their OAV work.
- Establish and support self-organising agile teams based on common objectives and tracked results.

Subdimension: Stakeholders involvement

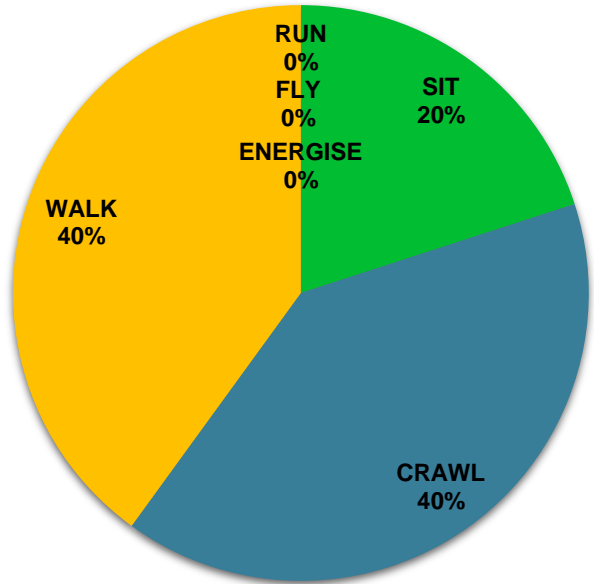
Party that has an interest in a company and can either affect or be affected by the business. It can be internal and external (including individuals and groups outside of the organisation).

Q28: Related to stakeholders, which answer describes your current status?

Stakeholders involvement

 <p>None</p>	<p>Some initial interest in implementing OAV - A handful of engineers that may or may not work together in the same department are interested in implementing OAV without coordination in our organisation.</p>
 <p>Ad-hoc</p>	<p>Initial discussions about OAV implementation routes - OAV is discussed at a department level, and the potential benefits and possible routes for implementation are being considered.</p>
 <p>Reactive</p>	<p>All internal stakeholders are involved in OAV strategic management - The strategic potential of OAV is taken into account, and all internal key stakeholders who are directly involved in the implementation of OAV are brought on board. This includes not only operations and IT, but also upper management, and other departments.</p>
 <p>Integrated</p>	<p>OAV is adopted across all departments - All management levels and all departments have successfully adopted OAV, and the needs of OAV users are being taken into account as the organisation moves toward a customer-centred approach.</p>
 <p>Proactive</p>	<p>Multi-domain bundled services can be provided through OAV - Partner organisations that work with us are seen as key stakeholders because OAV makes it possible to build a flexible, dynamic ecosystem to meet the needs of users for bundled services that extend beyond a single domain.</p>
 <p>Self-*</p>	<p>OAV is adopted for open, external collaboration - Our organisation engages in collaboration with external stakeholders on various topics (design of new services, extending the user base, etc.) by embracing open OAV collaboration both internally and externally.</p>

Subdimension: Stakeholders involvement – Previous Results



Some ideas:

- Ensure OAV is successfully adopted by the whole organisation, including management and all departments.
- Collaborate with partners using OAV in building a dynamic and flexible ecosystem.
- Engage in open collaboration with external stakeholders on various service lifecycle aspects and stages.

Subdimension: Learning, building skills/expertise – Building OAV skills

Skills are the knowledge, expertise, talent, and understanding needed to do a job or task.

Q29: How would you describe the ability to learn and build skills and expertise related to OAV in your organisation?

Learning, building skills/expertise



None

Sporadic OAV learning and skills development - We have traditional network management expertise, but there are no formal opportunities for learning and building OAV skills. Only sporadic OAV learning and skills development efforts exist on an individual basis with unpredictable results.



Ad-hoc

Some OAV skilled individuals and increasing training demand - Most of our efforts are on the level of self-upskilling. Our learning needs are being recognised by our organisation.



Reactive

Formally established and structured OAV training program - We have a formally established OAV training programme and upskilling and expertise development are available in a structured manner. Our organisation is investing in our staff recognising the value of OAV talent. Our network / DevOps / OAV iengineers showcase the potential of building OAV expertise.



Integrated

Effective internal talent management approach for OAV continuous learning - OAV skills are considered essential and there is a well-defined programme for continuous learning and upgrading. Effective internal talent management approach for successful talent acquisition and development.



Proactive

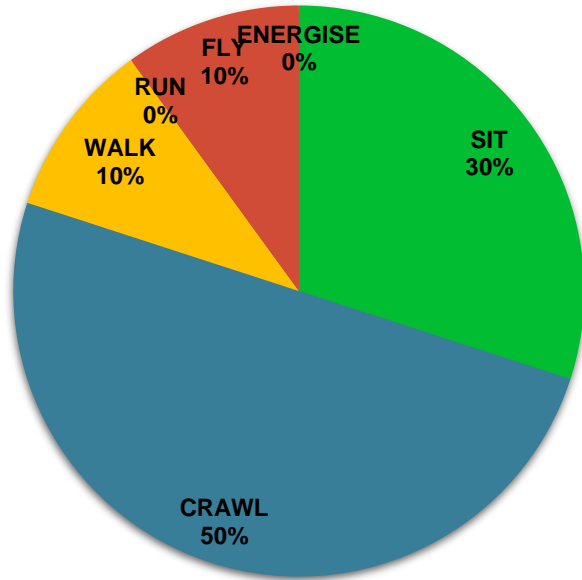
Effective joint-ecosystem talent management approach for OAV talent development - We have an effective talent management approach that supports OAV talent acquisition and development across the ecosystem. Joint effort in upskilling and expertise building with partners.



Self-*

Optimised training programme according to long-term OAV strategy - Upskilling and talent management efforts fully aligned with the organisation and ecosystem business drivers. OAV training programmes optimised according to the innovation requirements and OAV strategies.

Subdimension: Learning, building skills/expertise – Previous Results



Some ideas:

- Develop and enforce well-defined programme for continuous learning of OAV skills.
- Support OAV talent acquisition and development.
- Provide and enforce a joint effort in upskilling and expertise building among partners in the ecosystem.
- Optimise training programmes according to the innovation requirements and long-term strategies.

Subdimension: Culture

In this context, culture includes rules, values, beliefs, and philosophy that dictate team members' behaviour in an organisation.

Q30: How advanced is your organisation culture regarding OAV?

Culture



None

No trust in OAV - Our organisational culture is traditional. OAV is considered as something new, not to be trusted or embraced.



Ad-hoc

Little trust in OAV - Our organisation is considering to shift towards OAV but we have no concrete steps to change the traditional mindset. Culture-wise there is little trust in OAV based methods and tools.



Reactive

Limited OAV adoption - Our organisation has started embracing OAV and we have team(s) that have changed their internal culture to fully adopt and trust OAV. However, we still have some traditionalists that do not adopt any new initiatives.



Integrated

OAV embraced - Everyone in our organisation accepts the changes brought by OAV adoption and understands the related benefits.



Proactive

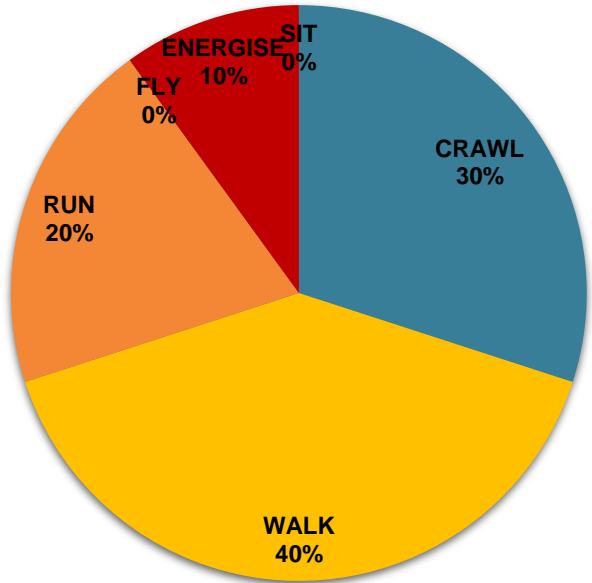
OAV adopted in the organisation - OAV is the core philosophy of our organisation culture. OAV based solutions and approaches are proposed in all efforts. We have adopted openness and collaboration organisation-wide.



Self-*

OAV adopted in the ecosystem - There is deep trust and open communication about OAV not only within the organisation, but with all our partners in the ecosystem. We aim to nurture all OAV innovation and continuous improvement efforts ecosystem-wide.

Subdimension: Culture – Previous Results



Some ideas:

- Expand trust in OAV organisation-wide.
- Use OAV approaches in all projects, development and implementation and by all involved parties.
- Expand trust and open collaboration towards external partners and all stakeholders
- Apply fully coordinated OAV innovation and continuous improvement

Subdimension: User/customer experience

Overall perception and impression a user/customer has of a brand or company based on their interactions and experiences across various touchpoints. It encompasses all interactions, from initial awareness and engagement through to purchase and ongoing support, and it includes factors like customer service, product quality, convenience, and the emotional connection between the customer and the brand.

Q31: What is your approach to customer experience, and to what extent do you apply your digital capabilities to enhance it?

User/customer experience



None

No customer experience management - Our organisation does not implement any customer experience management activities.



Ad-hoc

Traditional communication channels - We use traditional channels for customer communication. Customer engagement is a shared responsibility throughout our organisation.



Reactive

Partially proactive customer experience management - Our organisation is invested in customer experience. Our approach to customer engagement is partially proactive.



Integrated

Unified approach - Our organisation is using its connected systems and unified processes to heighten customer experience. Customer experience is one of the main business drivers for our organisation.



Proactive

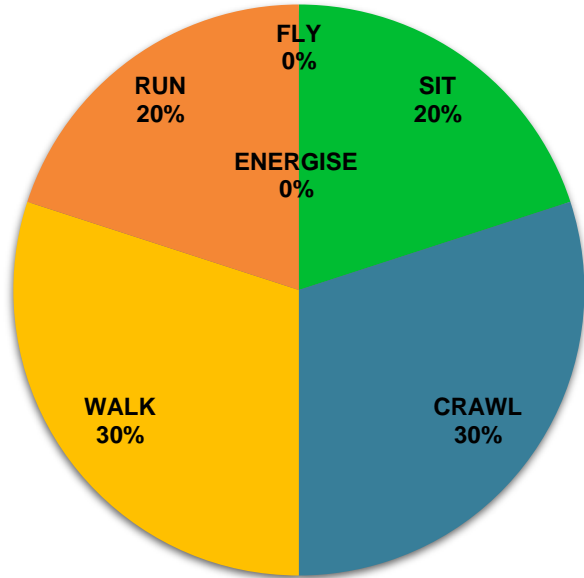
360-degree customer view - Our organisation has a 360-degree customer view, and digital presence with cross channel capabilities is provided to our users. Customer experience drives our organisation's decisions.



Self-*

Omnichannel experience - Our organisation exhibits omnichannel capabilities. We use integrated and smart systems to provide customer self-actions with zero contact.

Subdimension: User/customer experience – Previous Results



Some ideas:

- Proactively engage with users about any actions of potential impact.
- Regularly gather feedback from users.
- Automate standard actions and processes for fast request fulfillment with minimum human intervention.
- Enforce omni-channel digital presence.
- Explore and harvest from 360-degree customer view.
- Make customer experience the main driver for all organisational strategic decisions.

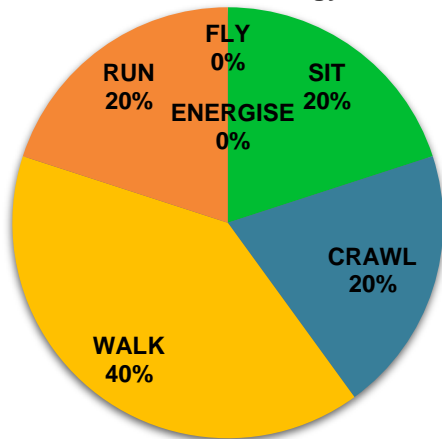
Maximum and Minimum Scores (in Average!)

- Per dimension:
 - Highest score: 1,8 Processes & Services
 - Lowest score: 1,5 People & Organisation

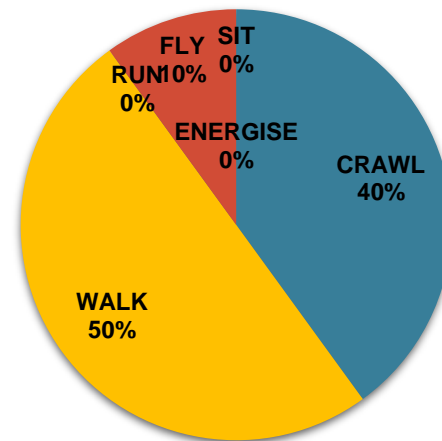
- Per sub-dimension (both for Architecture & Technology):
 - Highest score: 3,5 Virtualisation
 - Lowest score: 1,6 AI

Maturity Level Distribution per Dimension

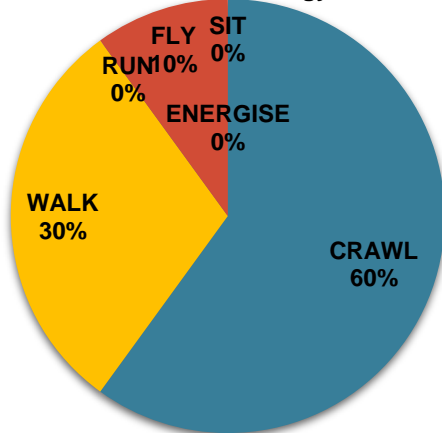
Architecture & Technology



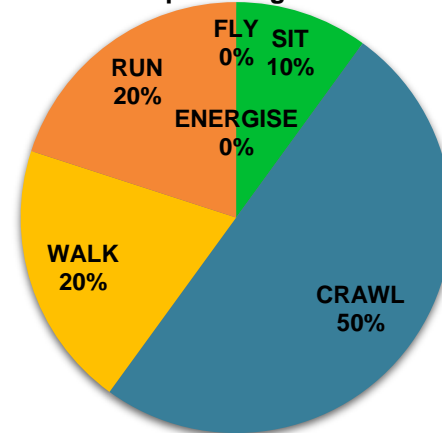
Processes & Services



Vision & Strategy



People & Organisation






NREN discussion on OAV solutions, current and future plans


Orchestration, Automation and Virtualisation Maturity Model Workshop
8 November 2023

Menti Time!



GO TO
menti.com

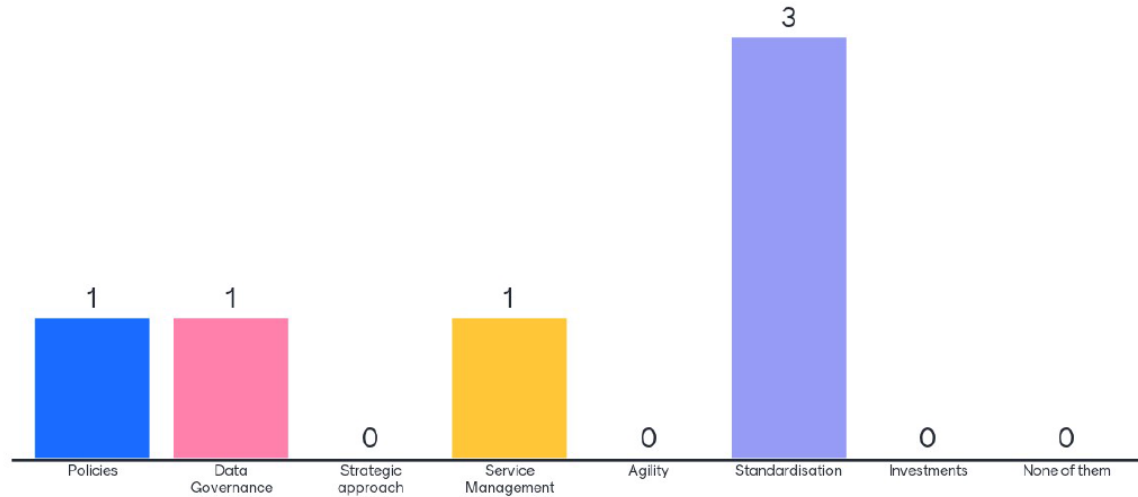
ENTER THE CODE
5542 3043

 0

X

The image shows a Menti poll interface. On the left is a large QR code. On the right, the text reads: 'GO TO menti.com', 'ENTER THE CODE 5542 3043', and a user icon followed by the number '0'. A close button 'X' is in the top right corner.

Where are you going to Focus for Vision and Strategy in the next 6 months?



Describe some quick wins for Vision and Strategy?

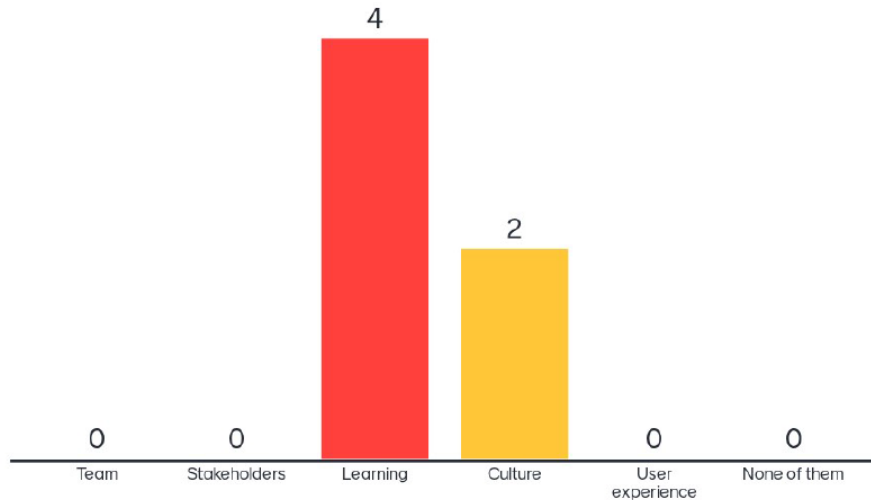
make data-driven decisions

Engage with management about the alignment of OAV to business strategy

have a common path/goal for all teams

prepared for OAV alignment with other NRENS for collaboration

Where are you going to focus for People and Organisation in the next 6 months?



Describe some quick wins for People and Organisation

NREN collaboration with those that are already FLYING

Clearly showing benefits for employees.

improve support and troubleshooting, achieve high-quality of services

Provide opportunities for training and development

find new goals to motivate people to grow

What would you do to improve the OAV Maturity Model?

Present or make available
the descriptions slides with
the survey

Nothing! It is perfect!! :)



Thank you!

netdev@lists.geant.org



Lunch time!

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