



nmaas: Simple Application Deployment Across Kubernetes Environments

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Agenda

- Introduction
- Technical overview
- Use-Cases
- Support for Remote K8s Clusters
- Demo
- Future plans and conclusions

nmaas enabled ...

- Simple cloud deployment of application for testing
- Basic webservice uptime monitoring
- Database backup to remote location
- Metrics collection, storage and visualization
- Complete remote development environment setup for students
- Network infrastructure monitoring with well known tools

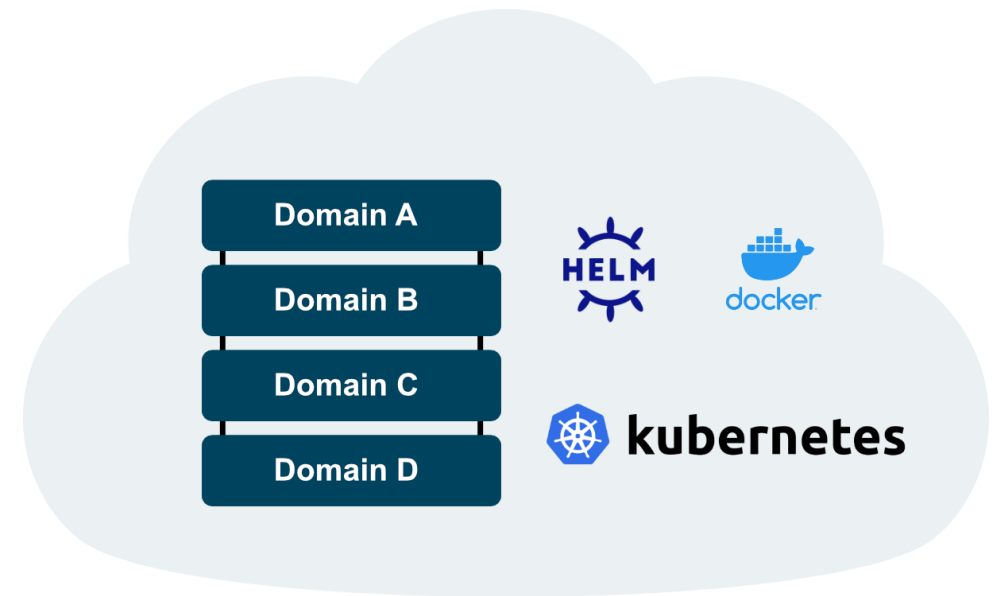
and more...

Introduction to nmaas

nmaas is an open-source platform for orchestrated on-demand deployment of applications in a cloud environment

- Kubernetes-based infrastructure
- Multi-tenant architecture
- Wide and easily extendable catalog of applications
- Simple application deployment and upgrade process
- GitOps approach for application instance configuration management
- Easy troubleshooting via integrated log viewing

nmaas 





How does it work...?

The technical details behind the platform

Self-service Portal

- **User space**
 - Application catalog browsing
 - Guided application instance deployment
 - Application access information
 - Application log and shell access
- **Admin space**
 - Platform settings
 - Domain and user management
 - Information dashboard

The image displays three screenshots of the nmaas self-service portal interface, illustrating the user and admin experiences.

Top Screenshot: Application Catalog
 This view shows a grid of application cards available for deployment. Each card includes an icon, the application name, and a brief description. The applications listed are:

- Adminer**: Web Database Management
- Apache Airflow**: Platform to author, schedule, and monitor workflows
- Bastion**: Bastion server based on Ubuntu OS
- Bastion Web Server**: Bastion server coupled with a web server, based on Ubuntu OS
- Booked**: Web based calendar and schedule
- changedetectionio**: Web site Change Detection, Restock monitoring and notifications
- CheckCicd**: CheckCicd is an open-source tool for real-time monitoring
- CoolMD**: Collaborative Markdown Editor

 The interface includes a search bar, filters for tags and sort order, and a sidebar with navigation options like 'Applications' and 'Instances'.

Middle Screenshot: Application Instance Details
 This view shows the details for a specific application instance named 'Maat' (maat-r-pS1). It indicates the instance is 'Active' and provides version information (v1.6.12-1 | Apache 2.0 | WWW | Source | Issues). A navigation menu includes 'Source Of Truth', 'Inventory', 'Management', and 'Resources'. An 'Actions' dropdown menu is visible, containing options such as 'Access', 'Enable auto upgrades', 'Upgrade', 'Manual version update', 'View logs', 'Pause', and 'Undeploy'. Below the details, an 'Installation progress' bar shows the steps: Subscription validation, Environment creation, Verifying connectivity, Application deployed, Activation, and Application active.

Bottom Screenshot: Admin Dashboard
 This view shows the admin dashboard with key metrics and deployment data. The metrics are:

- Current number of users: 295
- Current number of domains: 43
- Current number of deployed applications: 1085

 Below the metrics, there is a table for 'Application deployments from 03.11.2025 to 13.11.2025' and a bar chart for 'Most popular applications'.

Name	Version	Domain
Prometheus	3.7.2	PKP Anomaly Detection
Zabbix	7.0.16	Ireland OCI
Uptime Kuma	2.0.1	SURF-NetDev
Telegraf	1.35.3	Ireland OCI

The bar chart shows the count of deployments for various applications: Grafana, OpenStack, Grafana Dashboard, Prometheus, Uptime Kuma, InfluxDB, Docker, Bastion, Zabbix, and Grafana.

Application Orchestration Aspects

- Deployed applications running in a **container-based** environment
- **Kubernetes** cluster as the underlying orchestrator
- Each **application** represented by a **Helm chart**
 - Simplifies maintenance and allows for easy reuse of existing applications in a new context (e.g., application bundles)
 - No strict requirements for Helm charts – enables easy integration of new applications using official/community supported charts
- **Application instance customization** during deployment via Helm parameter overriding (web-based wizard)
- Automatic and manual **application upgrades** based on semantic versioning of the charts



Artifact **HUB**

Networking Aspects

- Two “problems” to be solved:
 - Connectivity between the application instance (running on nmaas) and the remote infrastructure being monitored
 - Remote access to the remote interface of the deployed applications
- **Site-to-site VPN** – access to the remote infrastructure being monitored
 - **Wireguard** site-to-site tunnel(s) between nmaas and customer infrastructure
 - Strict access policies and firewall rules in place
 - Each tenant receives dedicated network ranges
- **Client-Access VPN** – remote access to deployed applications
 - **eduVPN**, fully compatible with both OpenVPN and Wireguard
 - Self-service portal, with options to generate multiple profiles
- **Dual stack support** (IPv4 + IPv6)
- Each tenant receives a **dedicated subdomain** for application deployment
 - E.g., *app.domain.nmaas.eu* and HTTPS protected



Multitenancy

- Concept of a “**domain**”
 - Logical grouping of applications
 - Many-to-many relationship with users
- **Applications** deployed in one domain are **isolated** from others
 - Kubernetes namespaces + firewall rules + Kubernetes network policies
- Authentication via **OpenID Connect** or local auth
- Integration with **eduGAIN** possible
 - *vnoc.nmaas.eu* integrated with eduGAIN via Keycloak acting as a proxy



Integration with External Systems

- Integration with 3rd party systems via **webhooks**
 - Domain creation and removal
 - User addition to and removal from a domain
 - Application provisioning/deprovisioning
- Provides flexibility to use existing services. Examples:
 - **Provision a new VPN profile** when a user is added to a domain
 - **Add** a newly deployed application to an **external HTTP monitoring service**
 - **Assign attributes to an IdP** once a user is added to a domain





nmaas Use-Cases Overview

...One Click to Launch. Infinite Ways to Use...

Support for many use-cases

- nmaas as a versatile **open-source orchestration platform**
- Support for multiple use-cases by providing relevant software features and deployable applications
- Currently supported use-cases:
 - **nmaas for Virtual NOC** (virtual Network Operations Center)
 - **nmaas for Virtual Lab** (online hands-on exercises in an educational context)





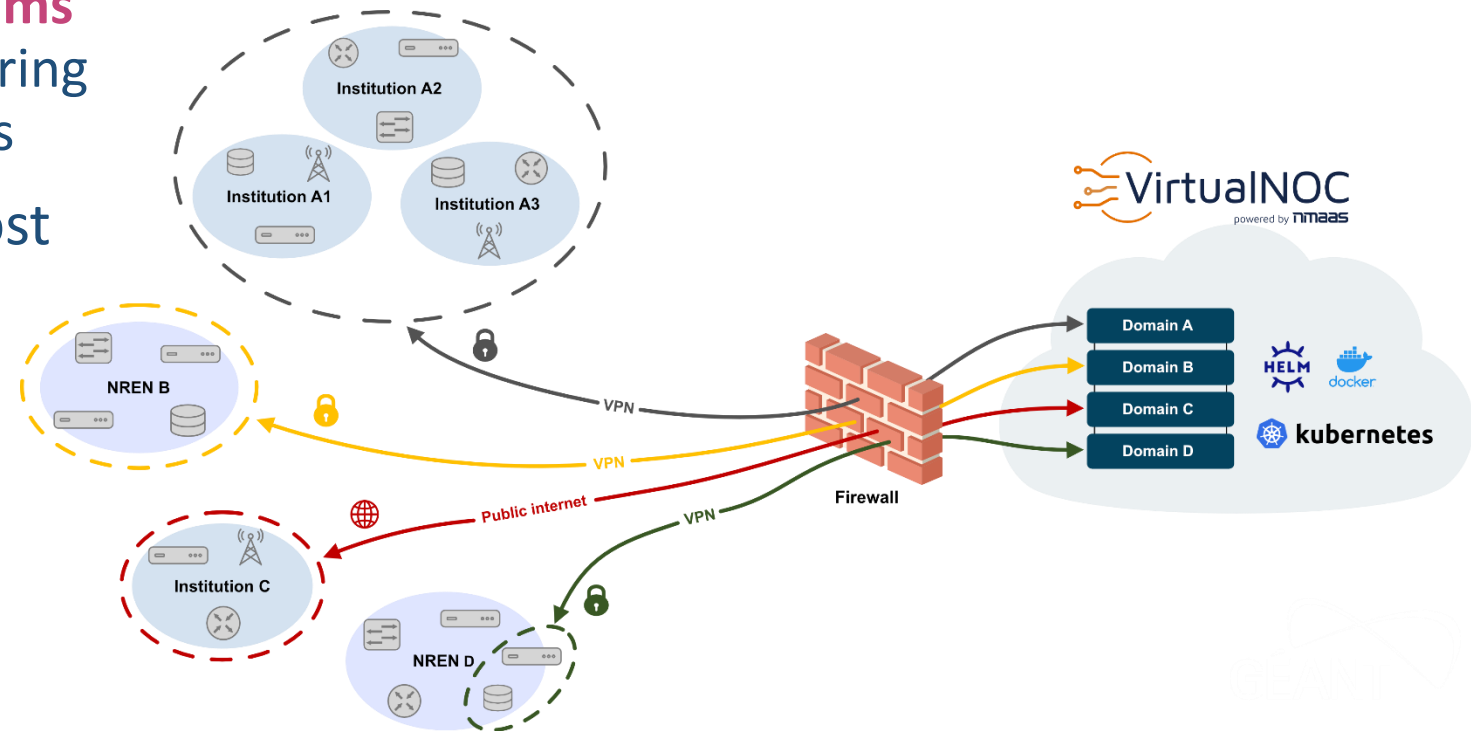
nmaas Virtual NOC

Run your network monitoring application stack in the cloud

nmaas for Virtual NOC



- Target groups
 - **NRENs or end institutions** with limited capacity for in-house network management
 - Universities, high schools, primary schools
 - International **research projects** with (distributed) hardware resources
 - **Development/infrastructure teams** requiring external health monitoring and alerting for their applications
- Application catalog containing most popular network management applications
- **Production service** offered within the GÉANT project
 - <https://vnoc.nmaas.eu>



Virtual NOC Success Stories



IRELANDQCI

- National project
- Distributed team



PCSS projects

- Distributed laboratory Infrastructure
- Software services monitoring and database backups



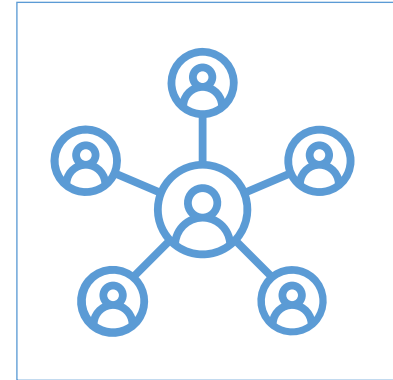
GP4L

- Global testbed
- Automation of user access



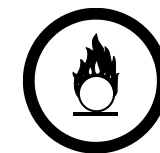
perfSONAR

- Public statistics dashboard
- stats.perfsonar.net



Others

- 20+ domains





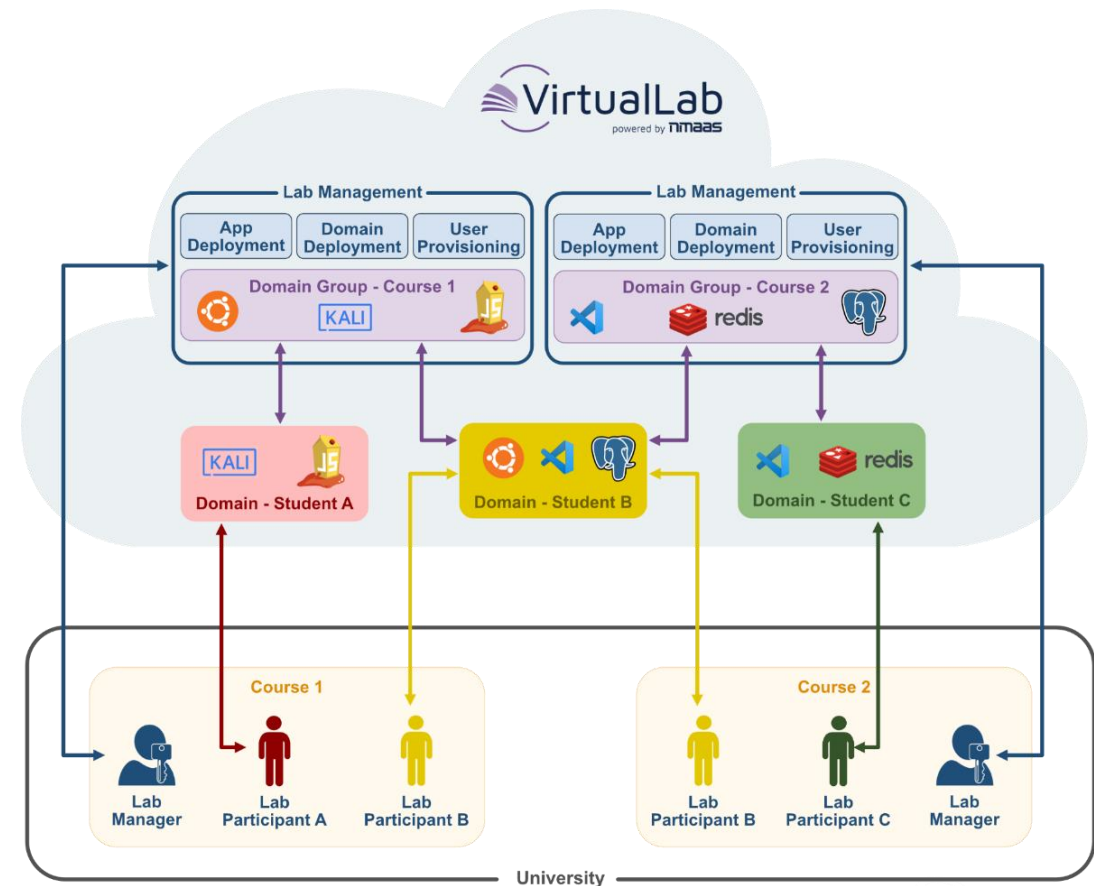
nmaas Virtual Lab

Organization of online hands-on exercises made easy

nmaas for Virtual Lab

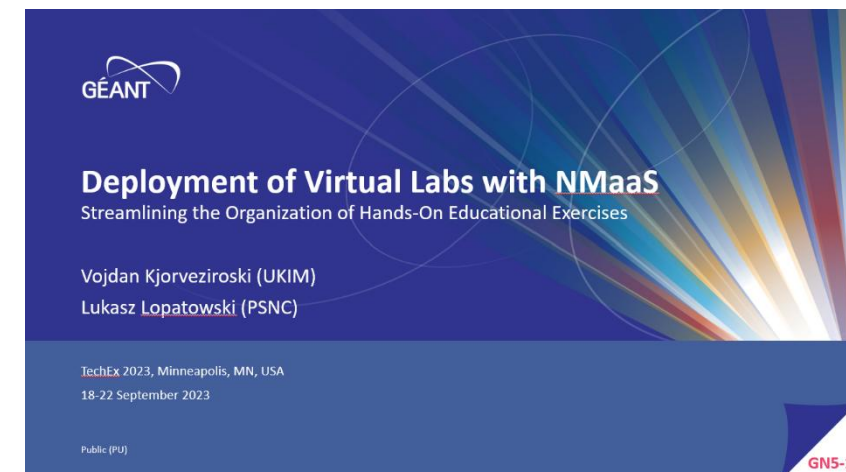


- nmaas as a general-purpose application orchestrator
- Adapted to an **educational context**
 - Formal education
 - Informal education
- nmaas for educational exercises
 - **Focus on software use**, not deployment
 - Applications executed on a central infrastructure
 - **Equal opportunities** for each lab participant
- Advantages:
 - Multitenancy
 - Collaboration
 - Lab managers' control



Virtual Lab Pilots and Real-World Use

- **3 pilots** with around **80 students** in total
 - 2 pilots at UKIM (**Ss. Cyril and Methodius University, Skopje**)
 - Ethical Hacking and IT Service Management courses
 - 1 pilot at NTUA (**National Technical University of Athens**)
 - Network Management course
- Test environment available for demo and small-scale exercise deployment
 - <https://vlab.dev.nmaas.eu>
- Presented at TechEx23
 - <https://docs.nmaas.eu/nmaas-presentations/>



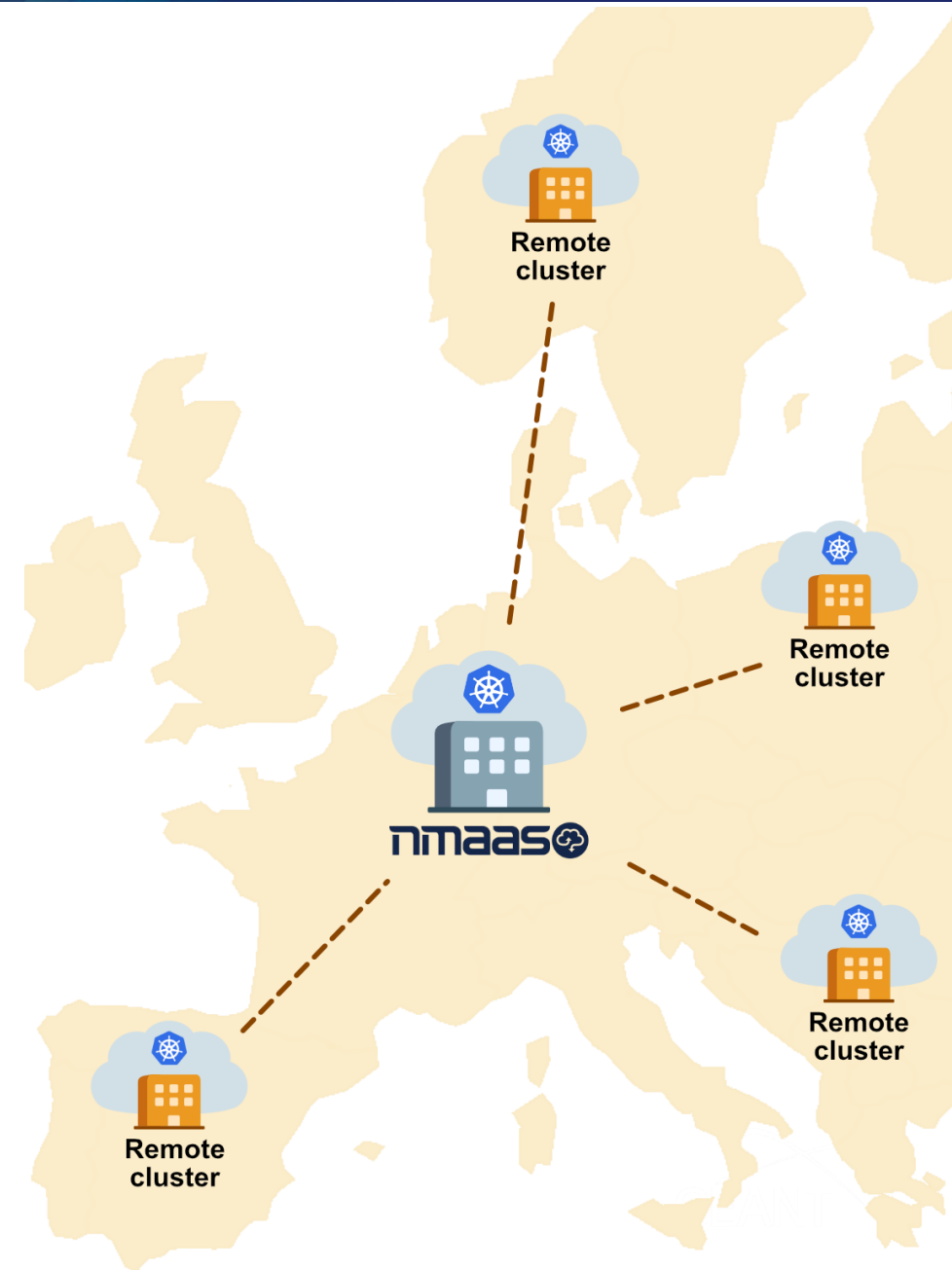


Support for Remote K8s Clusters

New nmaas Use-Case

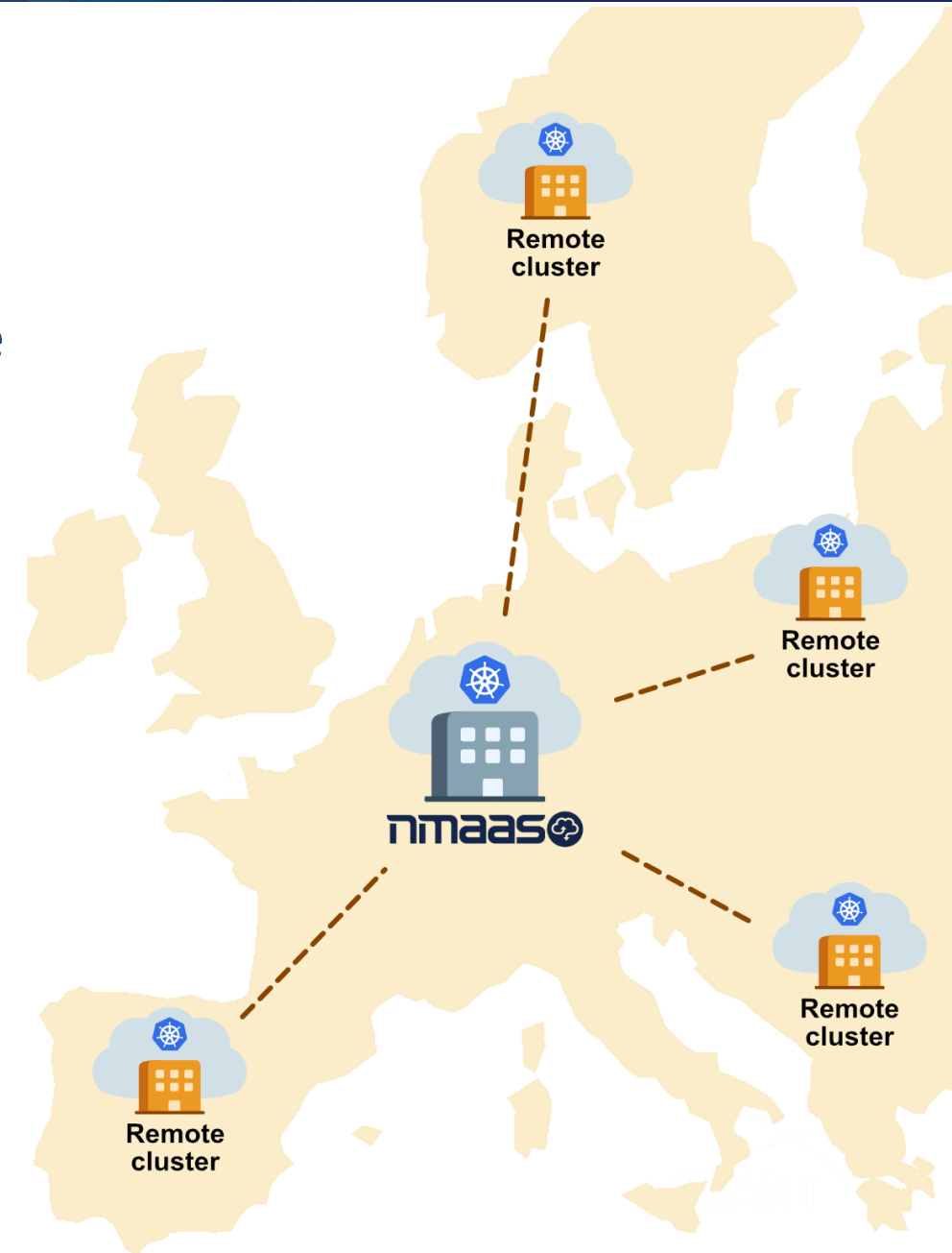
Remote K8s Cluster Support

- New use-case, under active development, first set of features available
- **Core idea:** a central nmaas instance manages distributed Kubernetes clusters
- **Remote** Kubernetes **cluster(s)** associated with existing nmaas domains
- Solves the problem of managing many diverse environments
- Enables applications deployment at the network **edge**
- nmaas catalog applications deployable on any of the on-boarded clusters



Remote K8s Cluster Support Benefits

- Applications run **on-premise**
- No need for complex connectivity to a central instance
 - Eliminates the need for a site-to-site VPN
- Can use existing infrastructure for (remote) access to applications
 - Dedicated nmaas client access VPNs not needed
- **Full control over data**
- Applications can be deployed at **multiple locations**
 - **Local and external network visibility**





Demo

Example use of the remote cluster feature



SQL database backup

Secure data backup on the central infrastructure



VirtualNOC

powered by **nmaas**

Run your network monitoring application stack
in the cloud with the nmaas Platform

[Learn more](#)



Remote cluster provisioning


Adding user cluster as a target location for application deployment

```
root@nmaas-remote-cluster-01:~#
```





Local monitoring toolset deployment


Keeping monitoring data within user infrastructure

nmaas Demo 


 Applications

 Instances

 nmaas Demo

 Admin panel

Tags

Search 

all 

Sort

Name 

Show subscribed only



Adminer

Web Database Management



Apache Airflow

Platform to author, schedule, and monitor workflows



Bastion

Bastion server based on Ubuntu OS



changedetectionio

Web Site Change Detection, Restock monitoring and notifications



CheckCle

CheckCle is an open-source tool for real-time monitoring




CodiMD


Colaborative Markdown Editor





Running application configuration


GitOps configuration process

nmaas Demo 


 Applications

 Instances

 nmaas Demo

 Admin panel

Tags

Search 

all 

Sort

Name 

Show subscribed only



Adminer

Web Database Management



Apache Airflow

Platform to author, schedule, and monitor workflows



Bastion

Bastion server based on Ubuntu OS



changedetectionio

Web Site Change Detection, Restock monitoring and notifications



CheckCle

CheckCle is an open-source tool for real-time monitoring



CodiMD

Colaborative Markdown Editor



CLI and logs access

Interacting with a running application



nmaas Demo

Applications

Instances

nmaas Demo

Admin panel



grafana (Grafana)

Active

v12.2.1-1 | Apache 2.0 | WWW | Source | Issues

Actions

Monitoring Visualization



Your application is now active. You can access it using the *Access* option from the *Actions* menu. Use the *Configure* and *Members* options to update the configuration and the list of application users respectively.

Installation progress



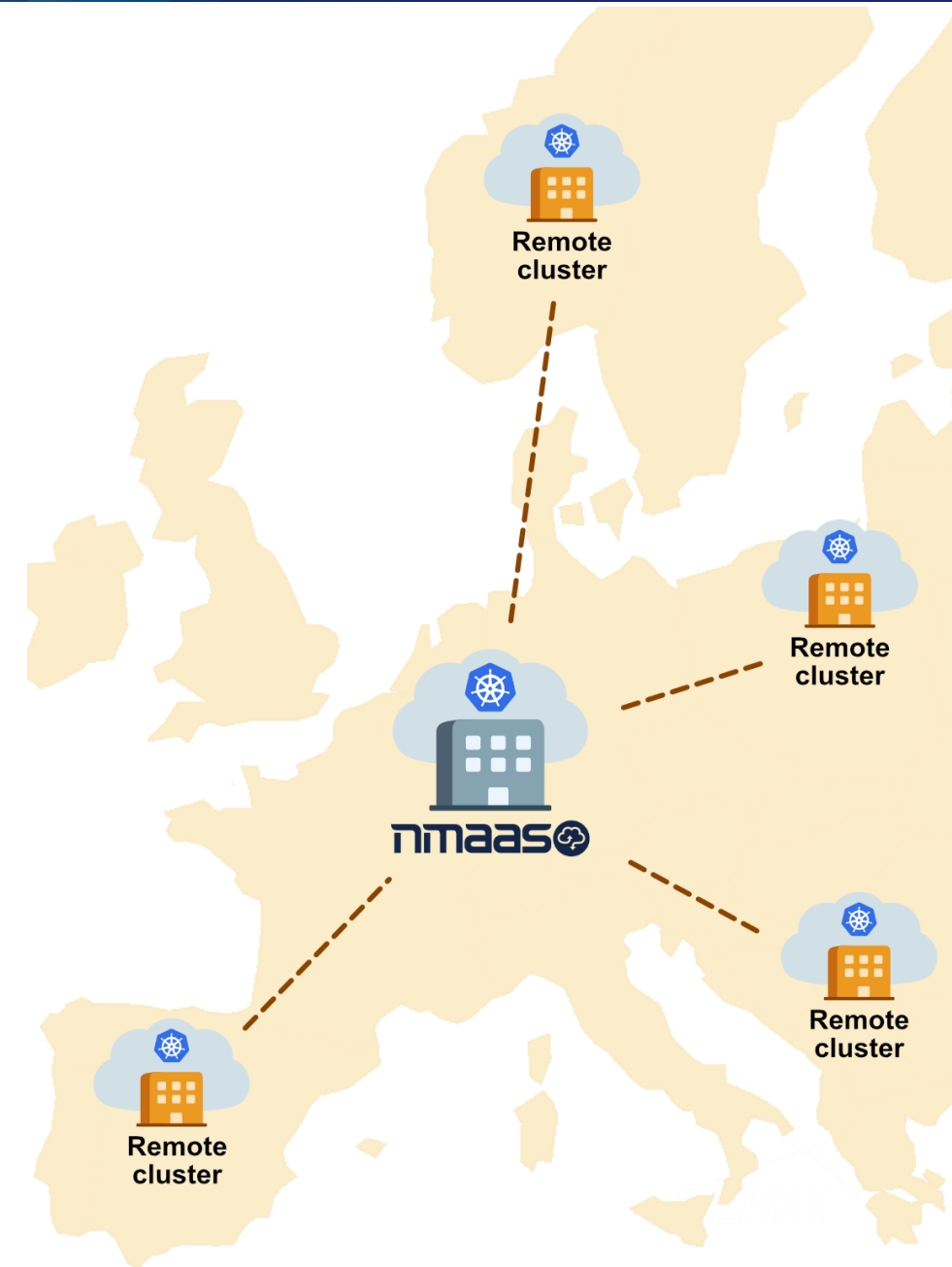
Additional Information



Distributed Active Network Monitoring with nmaas at RENATER

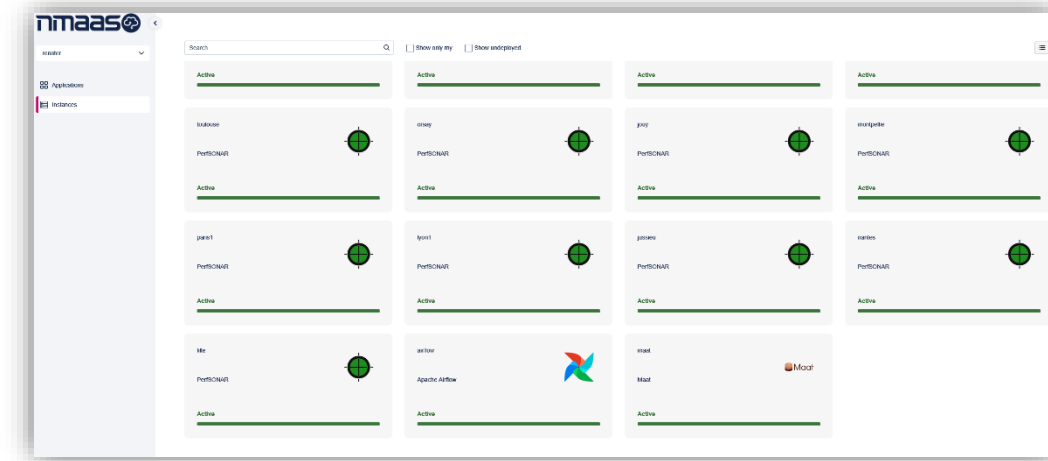
Pilot Usage of Remote K8s Cluster Features

- Monitoring tools deployed from a **single nmaas** instance across Kubernetes clusters in **multiple locations**
- **Piloted by RENATER** for deploying network monitoring tools across different PoPs



Pilot Usage of Remote K8s Cluster Features

- RENATER integrated nmaas with its internal automation stack to automate the rollout of **perfSONAR Testpoint** nodes across France
- Full lifecycle control from a central nmaas instance deployed on premise
- Custom automation stack for K8s clusters onboarding
 - Tinkerbell
 - Talos Linux OS
 - Flux



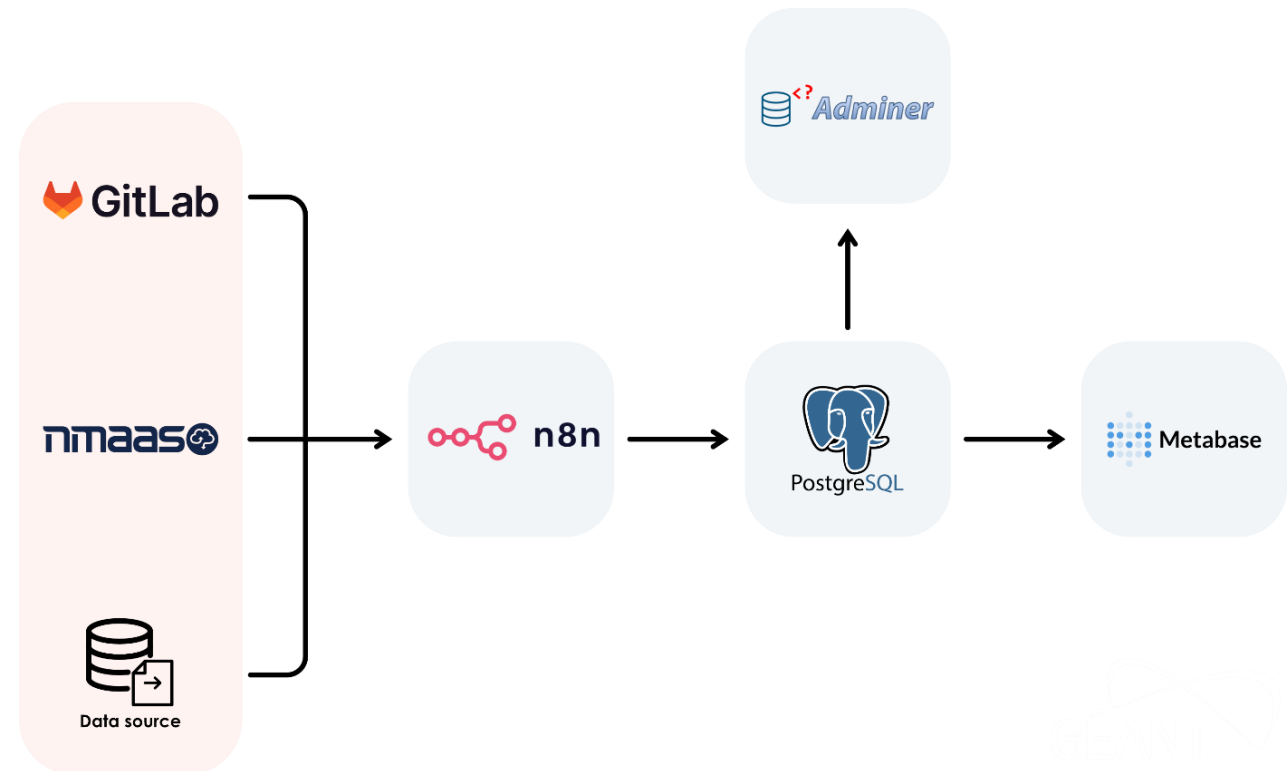


Ideas and Plans for the Future

Use-Cases, Features, AI

KPI Monitoring

- Tracking of **key performance indicators** for teams/projects
- **Aggregation** of information from multiple sources – N8n orchestrator
- **Visualization** of aggregated data – Metabase
- Historical **comparison**, progress tracking
- Optional interaction with **LLMs**
- All components already on nmaas
 - PostgreSQL
 - N8n
 - Metabase
 - Adminer



Sharing of Costly Resources using Remote K8s Clusters

- Pooling of distributed scarce resources (GPUs)
 - **nmaas as an enabler for AI workloads**
 - Not limited only to network management
- AI ready application support in the catalog
- Direct application access to GPUs
- Time-sharing using implemented pause/resume mechanisms



nmaas Use and Deployment Options

Running nmaas on your own infrastructure

How you can use nmaas?

- nmaas can be used either as a **self-hosted or managed** solution
- <https://vnoc.nmaas.eu> is the managed production instance for the Virtual NOC use-case
- <https://vlab.dev.nmaas.eu> is the managed demo instance for Virtual Lab pilots
- User can request their domain and support from our team using the contact form

Contact us

Join the mailing list of your interest:

- [nmaas-announce](#) - for nmaas-related announcements sent out by the nmaas Team members,
- [nmaas-users](#) - for discussions and message exchange between nmaas users and the nmaas Team.

Contact form offers an easy way to get in touch with the nmaas team. Choose the type of form that is most suitable for your request.

Select form type:

Domain name

Proposed name for the new domain (up to 30 characters)

Domain codename

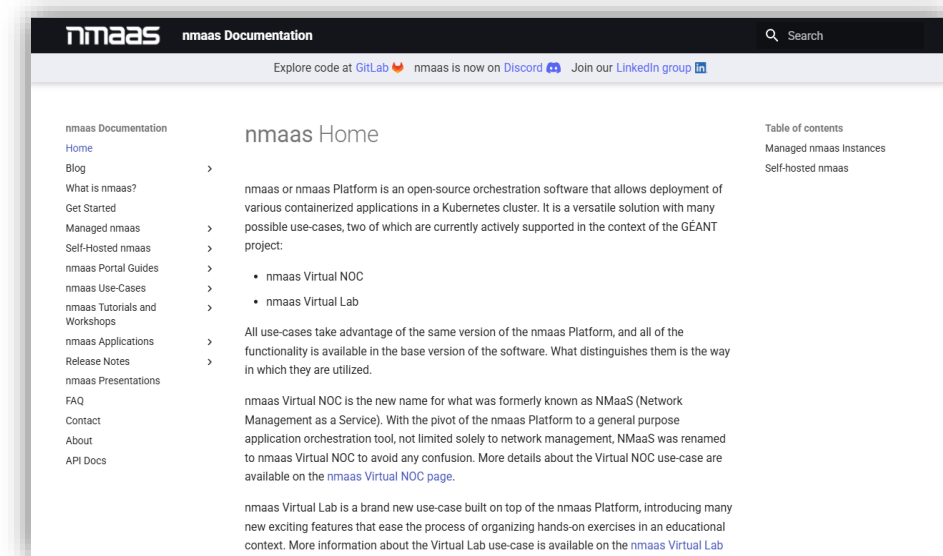
Abbreviated version of the domain name (up to 12 characters)

Request justification

Brief justification of the request including intended use of the nmaas service

Running nmaas on your own

- Two options for running a **self hosted instance of nmaas**
 - Local evaluation environment on a single node cluster (non-production workloads only)
 - On an existing full-fledged Kubernetes cluster (suitable for both Virtual NOC and Virtual Lab)
- Complete guide available at <https://docs.nmaas.eu>
- **The nmaas team will provide all required support**



Contact the nmaas Team: nmaas@lists.geant.org

Subscribe to the nmaas users list: nmaas-users@lists.geant.org





Conclusion

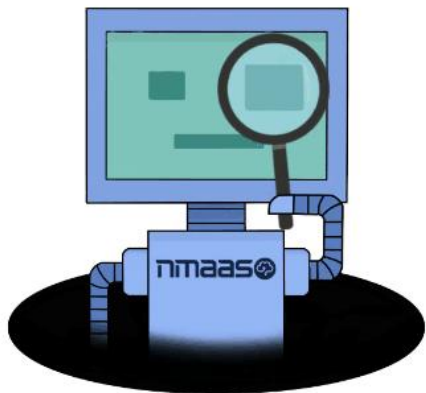
Key takeaways

- nmaas as a versatile orchestration platform supporting various user-cases
- Based on popular and well-known technologies
- Open source (Apache 2.0, <https://gitlab.software.geant.org/nmaas>)
- Used in production environments
- Suitable for central management of applications on remote Kubernetes cluster



Stay informed

- **Discord** server – <https://discord.gg/CZzvZH2TAe>
 - General discussion, announcements, troubleshooting, and help
- **LinkedIn** nmaas user group – <https://linkedin.com/groups/10068131/>
 - nmaas related news, events, blog posts
- **Blog** posts – <https://docs.nmaas.eu/blog/>
 - Featuring new catalog applications and tutorials





Thank You

Documentation
Contact the nmaas team

*<https://docs.nmaas.eu>
nmaas@lists.geant.org*



www.geant.org



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