



Network Management as a Service

NMaaS

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Agenda

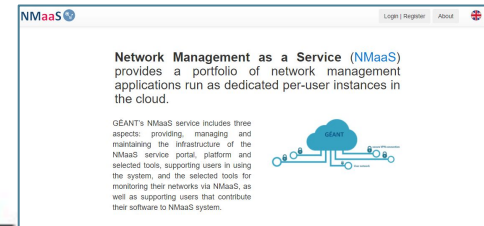
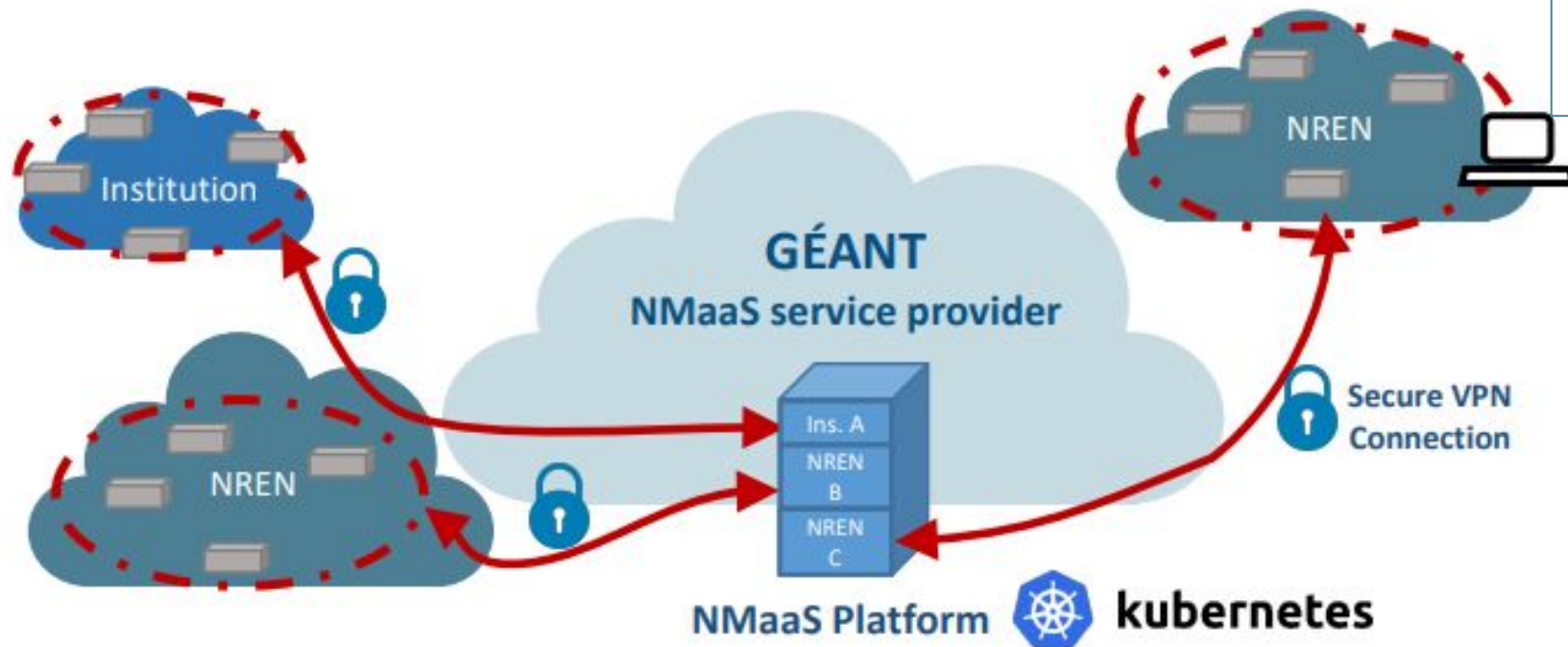
- What is NMaaS
- Who can use (and benefit) from NMaaS
- Who is using NMaaS
- How NMaaS works
- NMaaS under the hood
- How to use NMaaS
- NMaaS use-cases
- Conclusion and contact details

What is NMaaS

- NMaaS (Network Management as a Service) was developed within the GÉANT project as an **effective** and **efficient open-source network and service management platform in the cloud**
 - Enables management and monitoring of user networks through **on-demand deployment** of network management tools **in a cloud infrastructure**
 - A **catalog** (“central marketplace”) of **open-source applications** focused on network management
 - Application deployment and access via a **web portal**
 - Uses **VPN connections** for traffic between the **NMaaS** and the **network devices**
- Open source framework for orchestration of on-demand deployment of applications in a Kubernetes-based cloud environment
 - **Apache 2.0 License**

What is NMaaS service

- Production service offered by the GÉANT Project since December 2018.
 - Offered **free of charge** within current project phase GÉANT 5-1 (with expected extension for the duration of upcoming GÉANT Projects)



Who can use and benefit from using NMaaS?

WHO

- All who have limited resources to develop and/or maintain their own NMS infrastructure or planned to outsource these activities
 - Smaller and emerging NRENs, NREN end institutions, small organisations, distributed research projects, ...
 - Organisations and/or individuals that are searching for quality network management software or who want to share their software within the community

WHY

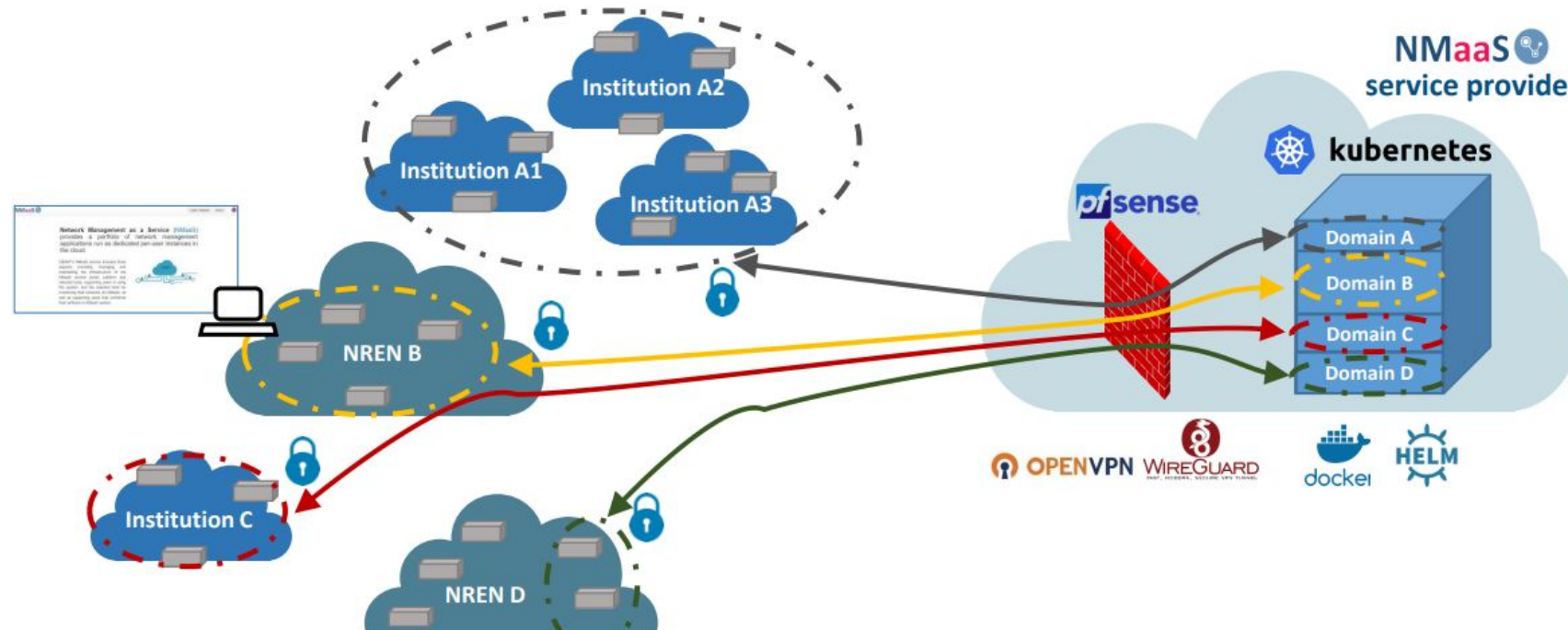
- To ease network management and monitoring software deployment, configuration and maintenance
- By using a shared and supported platform, institutions can focus solely on the monitoring and management of their service components

Who is using NMaaS

- **NRENs**
 - CYNET
 - HEANET
 - ARNES
 - PSNC / PIONIER
 - RENATER
 - SURFnet
 - URAN
- **End institutions**
 - GÉANT
 - From: France, Germany, Slovenia, Ireland, Brazil, Spain, Serbia, North Macedonia, Italy, Cyprus
- **GÉANT Project teams**
 - Performance Measurement Platform (PMP)
 - RARE project
 - MP-LS domain
 - perfSONAR development team
- **Tool developers**
 - perfSONAR
 - WiFiMon
 - SPA Inventory

How NMaaS Works

- Shared **cloud platform** managed by the GÉANT Project or another entity
- Each user gets **an isolated tenant environment (domain)** connected over a **secure VPN** to his network
- Users can deploy and access **network management** applications via a **web portal**



How NMaaS works for end-user

- A web portal which acts as a catalog for (selection and) deployment of various types of applications within an isolated tenant environment (domain) assigned to a given institution or team

Login Register

Username

Password

Login


Federated login


Forgot password





NMaaS Applications Subscriptions Instances Domain: PL-LAB Send notification Settings admin


Search Tags: all Sort: Top rated



Oxidized
 ★★★★★
Network device configuration backup tool



Booked
 ★★★★★
Web-based calendar and schedule



LibreNMS
 ★★★★★
Autodiscovering SNMP based network monitoring tool



Grafana
 ★★★★★
Open source analytics & monitoring solution for every database



Statping
 ★★★★★
Status Page & Monitoring Server



Prometheus
 ★★★★★
Monitoring system & time series database



Bastion
 ★★★★★
Bastion server based on Ubuntu OS


esmond
 ★★★★★
Central Measurement Archive


perfsONAR
 ★★★★★
perfsONAR Central Management


SPA Inventory
 ★★★★★
Topology database with TMF-compliant API


ELK Stack
 ★★★★★
Elasticsearch, Logstash and Kibana


WiFiMon
 ★★★★★
Wireless Crowdsourced Performance Monitoring and...



Oxidized is a simple open-source device configuration backup tool exposing a web-based GUI

Oxidized Stats Migration Search in Configs

nodes / stats Show / hide columns Refresh

Show 50 entries Search:



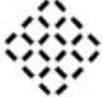









Name	Total Failures	Failure Rate	Average Run Time	Last Status	Last Update	Last Failure
11.11.11.11	0	0.00%	4.83s	Green	2017-08-18 07:37:31 UTC	never
22.22.22.22	0	0.00%	3.85s	Green	2017-08-18 07:37:35 UTC	never
33.33.33.33	0	0.00%	4.34s	Green	2017-08-18 07:37:40 UTC	never

Showing 1 to 3 of 3 entries

Previous 1 Next

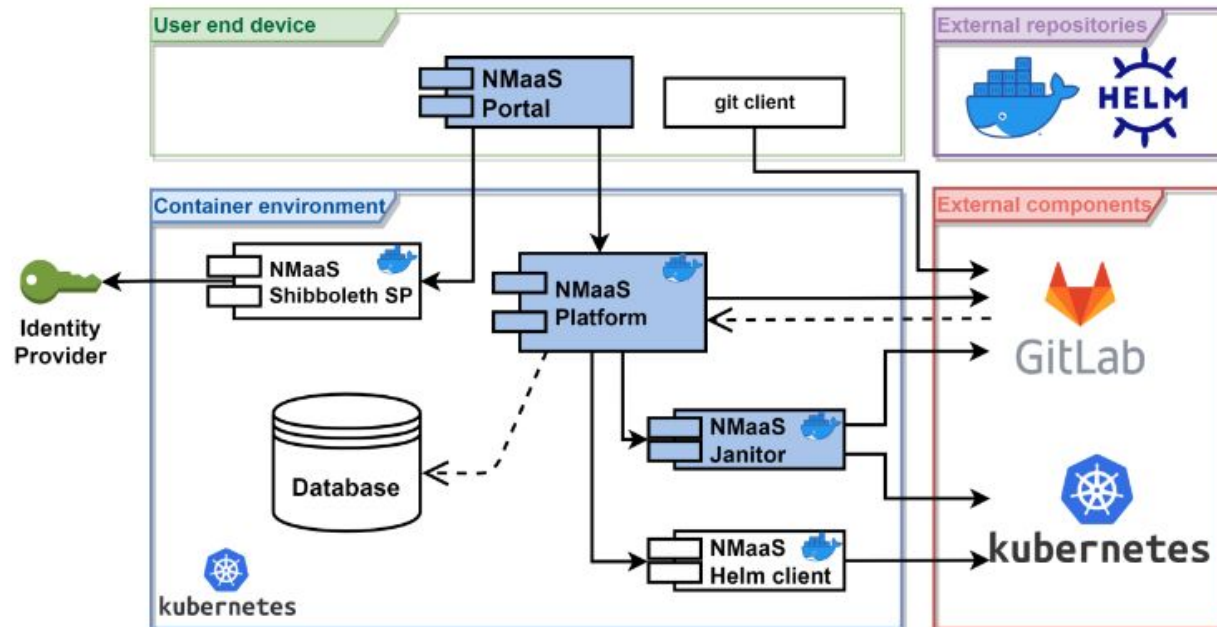
NMaaS application portfolio

- Offers about **30 applications** to support network management
 - List of supported applications as available at <https://network.geant.org/nmaas-tools>

 <p>Oxidized ★★★★★5 Network device configuration backup tool</p>	 <p>Booked ★★★★★5 Web-based calendar and schedule</p>	 <p>LibreNMS ★★★★★5 Autodiscovering SNMP based network monitoring tool</p>	 <p>Grafana ★★★★★5 Open source analytics & monitoring solution for every database</p>
 <p>Statping ★★★★★5 Status Page & Monitoring Server</p>	 <p>Prometheus ★★★★★5 Monitoring system & time series database</p>	 <p>Bastion ★★★★★5 Bastion server based on Ubuntu OS</p>	 <p>esmond ★★★★★0 Central Measurement Archive</p>
 <p>Central Management ★★★★★0 perfSONAR Central Management</p>	 <p>SPA Inventory ★★★★★0 Topology database with TMF-</p>	 <p>ELK Stack ★★★★★0 Elasticsearch, Logstash and Kibana</p>	 <p>WiFiMon ★★★★★0 Wireless Crowdsourced</p>

NMaaS Under the Hood

- Kubernetes container orchestrator
- Applications added to the NMaaS catalog are represented by Helm charts
- GitOps principle for configuring deployed applications



NMaaS Under the Hood

- The primary components:
 - **NMaaS Platform**
 - the central NMaaS component
 - exposes a REST API consumed by the NMaaS Portal
 - stores the application catalog, the users and information about any deployed applications
 - **NMaaS Portal**
 - The Angular based front-end application that runs in user's browser
 - **NMaaS Janitor**
 - a helper service that interacts with the self-hosted GitLab API and deploys the boilerplate configuration templates within the Kubernetes cluster
 - also used to retrieve the status of Kubernetes services and load balancer IPs assigned to them

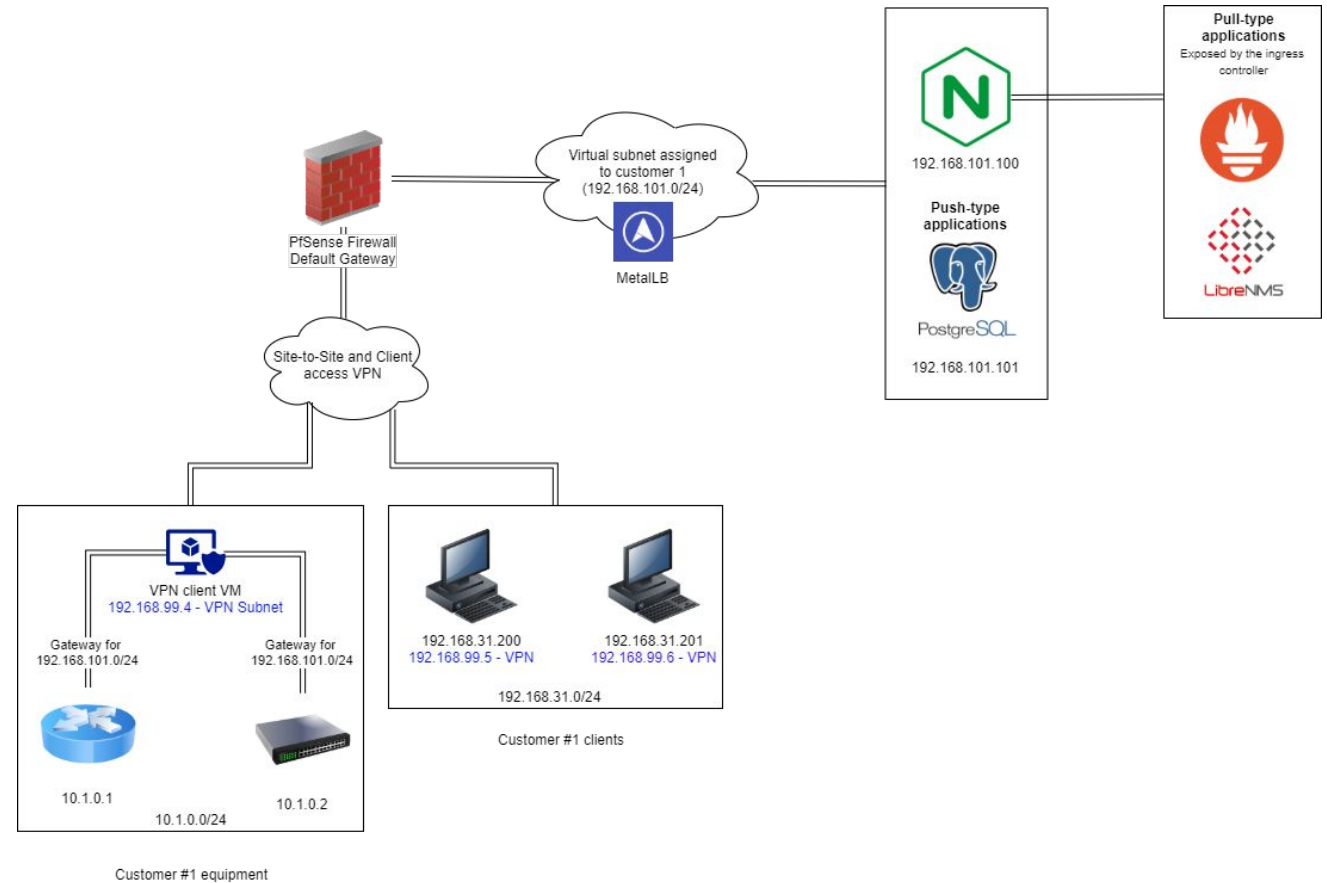
NMaaS Under the Hood

- Helper components:
 - **NMaaS Helm**
 - manages the Kubernetes cluster through the Helm v3 client
 - whenever a new application is deployed, the NMaaS Platform opens an SSH connection to NMaaS Helm and executes the required Helm command
 - **NMaaS Postfix**
 - in-cluster mail server used by any deployed applications to send emails to external destinations
 - it can either be configured as a standalone mail server or it can use a smart host, routing all outgoing emails through some other email server (e.g. Gmail)
 - **NMaaS Service Provider (SP)**
 - in-cluster SAML Proxy which enables SSO user login with eduGAIN accounts
 - can be customized to work with any Identity Provider

NMaaS Under the Hood

NMaaS VPN setup

- **Client-to-Site VPN** – secure user web-access to the UI of deployed NMaaS tools
 - OpenVPN
- **Site-to-Site VPN** – secure data exchange between the devices being monitored and NMaaS tools running in the cloud
 - OpenVPN and WireGuard
- Routing and firewall settings on a central PfSense **Firewall VM**
- VPN set up is based on domain name and IP addresses of monitored devices provided by the user



NMaaS roles

- **Application Manager role**
 - manages applications supported by given NMaaS instance
 - NMaaS portal has dedicated wizard composed of several forms to ease management operations and guide the user through the process of adding new or updating existing application information. managed from the NMaaS Portal level
 - guide is available at <https://docs.nmaas.eu/guides/application-manager-guide/>
- **Domain Administrator role**
 - NMaaS domain is a dedicated and isolated tenant environment created within the system for particular institution, project, team or a group of users
 - before being able to deploy and/or access application instances via the NMaaS Portal user needs to be assigned to a NMaaS domain
 - guide is available at: <https://docs.nmaas.eu/guides/domain-admin-guide/>
- **User roles**
 - guide is available at <https://docs.nmaas.eu/guides/user-guide/>

NMaaS user roles

- User roles
 - **Global level roles**
 - **Operator** - allows the user to view domain details and update status of particular DCN network upon its manual configuration or de-configuration
 - **Application manager** - allows the user to add new applications and/or application versions to the offer through dedicated form built in the Portal as well as manage applications for which the System administrator assigned user as an owner
 - **System administrator** - gives the user the complete system administration rights in the Portal (including user, domain and application management)
 - **Domain level roles**
 - **Guest** - a basic role in given domain that allows the user to view the list of subscribed applications and currently deployed application instances however user is not allowed to view details any of running application instances
 - **User** - with this role user is allowed to view details of running application instances including the access and configuration options
 - **Domain administrator** - gives full control over the application subscriptions and application instances (including deployment, configuration and access) within given domain, also allows for user role management (within the scope of particular domain)

How to use NMaaS?

- **GÉANT project managed NMaaS service**
 - Shared infrastructure managed by GÉANT project
 - Easier option
- **Self-hosted NMaaS**
 - User infrastructure: Kubernetes cluster is a must
 - More control over infrastructure
 - More options for tuning and tweaking

How to use NMaaS (easy option)?

GÉANT project managed NMaaS service

- **Production instance** is available at <https://nmaas.eu>
 - Can be used by GÉANT project participants
- **Playground instance** is available at <https://nmaas.geant.org>
 - Can be used by anyone interested in testing latest versions of NMaaS.
 - It is important to note that the NMaaS Playground is tailored to enable users to browse and deploy NMaaS tools right away without any unnecessary overhead. However, this implies that the user isolation, access and data security rules applied on this NMaaS installation are not so strict as in the case of the official NMaaS production service (e.g. no dedicated VPNs are deployed)

How to use NMaaS (on own infrastructure)?

Self-hosted NMaaS

- Interested users can run NMaaS on their **own infrastructure** (Kubernetes cluster required)
- Two installation options:
 - The [production installation guide](#) - provides instructions on installing NMaaS on a full-fledged Kubernetes cluster involving multiple cluster nodes
 - The [local installation guide](#) - provides instructions on installing NMaaS for evaluation purposes in smaller environments, consisting even of a single Kubernetes node
- Guides are available at <https://docs.nmaas.eu/self-hosted-nmaas/install-guide/>

NMaaS use-cases

- Network Management use-case
- E-learning virtual lab use-case
 - new use-case aimed at educational communities
 - NMaaS is not limited to network management: can be considered as a **general-purpose application catalog**

NMaaS - elearning virtual lab use-case

WHO

- By developing and implementing virtual lab use-case NMaaS is trying to support educational communities
 - Universities, schools, training and certification providers, ...

WHY

- To easily organize hands-on exercises where all students can participate in isolated and/or shared environments/workspaces
- To minimize hardware requirements and isolate needed technical know-how
- Benefits for educational staff
 - Reusable infrastructure across multiple courses or even institutions
 - Granular management of users and scenarios
 - Tight access control
- Benefits for students
 - Deployment of complex applications, bypassing hardware requirements
 - Eliminating configuration overhead
 - Playground for testing new software

Conclusion

NMaaS Key Benefits and Features

- **PRIVATE**
 - Each management instance is separated within the platform by design to maintain isolation
 - Allows institutions and projects to manage separate infrastructure
- **SECURE**
 - Uses VPN technology to incorporate management platform instance into the network instance
- **PLUG AND PLAY**
 - Cloud based platform reduces start-up costs and management overhead
- **NOT LIMITED TO ONE DOMAIN**
 - Network management use-case
 - E-learning virtual lab use-case
- **OPEN SOURCE**
 - Apache 2.0

NMaaS contact and further information

Contact us via NMaaS mailing lists:

- nmaas@lists.geant.org - to reach NMaaS core team members
- nmaas-users@lists.geant.org - for discussions related to NMaaS usage and development
- nmaas-announce@lists.geant.org - for announcements shared by the NMaaS team with the community

Request a domain creation: https://nmaas.eu/about?type=NEW_DOMAIN_REQUEST

Check out the latest NMaaS documentation: <https://docs.nmaas.eu/>

NMaaS github repository: <https://github.com/nmaas-platform>

NMaaS production instance: <https://nmaas.eu>

NMaaS playground instance: <https://nmaas.geant.org>



Thank You

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