



# GÉANT Network Services

## GÉANT Network Management as a Service

Presentation

**NMaaS team**

October 2021



# Why do we need NMaaS?

Today's network services are complex:

- Heterogeneous network infrastructures
- Increasing numbers of value-added services and features
- Services are becoming mission critical

The **cost and complexity** of developing and integrating in-house network management **may be too high** for many NRENs and Institutions



Out-of-the-box solutions might not be suitable and might be costly

NMaaS aims to support these users to provide an **effective, efficient** network and service **management platform**

# What NMaaS offers

NMaaS **simplifies** intra-domain **network management** by providing the infrastructure and tools via a **cloud-based**, network management **system**.

It enables management and monitoring of client networks through **on-demand deployment** of network management tools in the cloud infrastructure.

Using a **multi-tenant approach**, each NREN or Institution has **private access** to their network and services from a highly available cloud based platform.



# Who is NMaaS for?

## Small and Emerging NRENs

- Smaller NRENs may have **limited resources** to develop their own NMS
- By using a **shared and supported platform**, NRENs can focus on the monitoring and management of their service components

## Campuses

- NMaaS platform is ideally suited for **Campus Network Management**

## Small Organisations

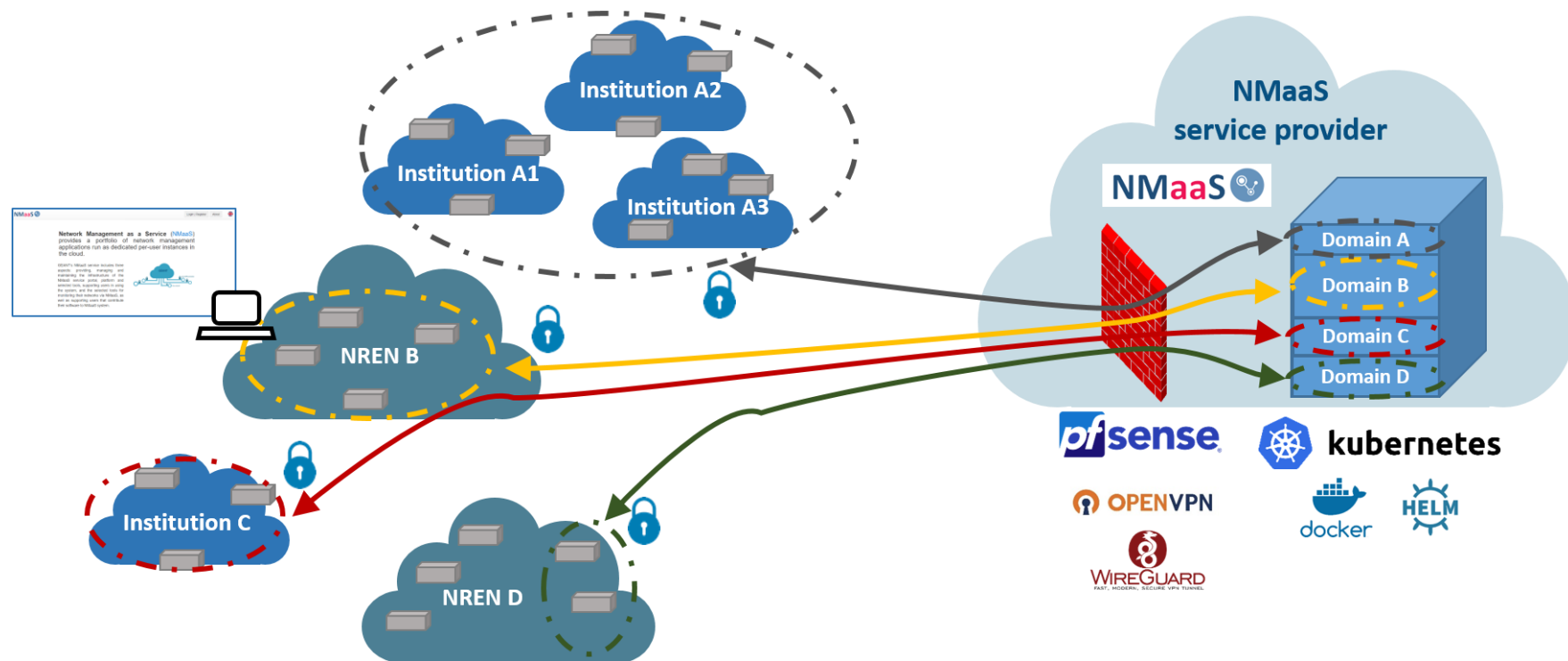
- NMaaS supports the needs of institutional users,
- Either on an NREN managed NMaaS platform or a centralised GÉANT platform

## Distributed research projects

- By using a **managed platform**, projects can focus on their core research and development activities.



# NMaaS – How it works (1)



## NMaaS – How it works (2)

- NMaaS uses a secure shared cloud platform managed by the GÉANT Project
- Each user has a isolated tenant environment connected over a VPN to his network
- Users can deploy and access network management applications via a web portal




# NMaaS Architecture

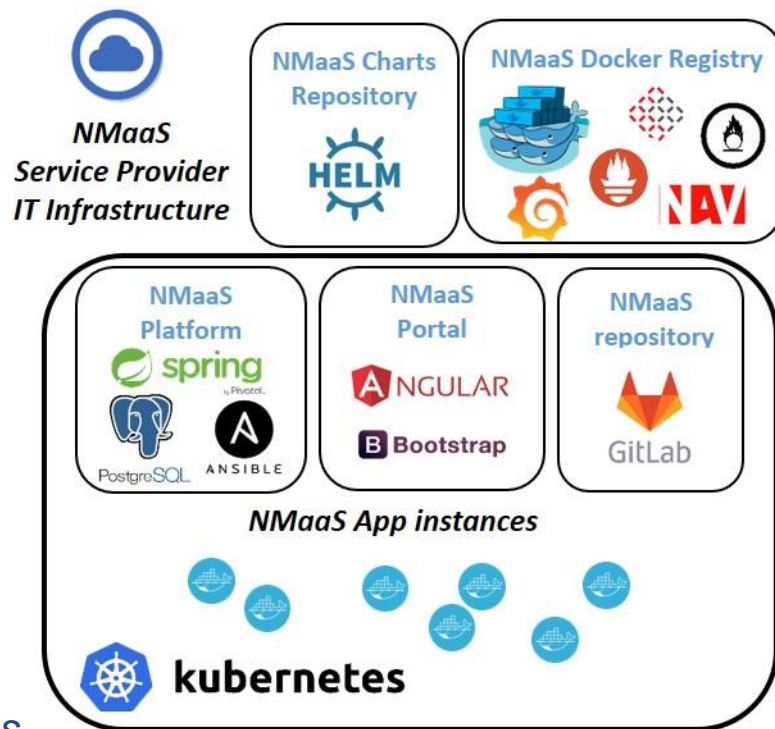
## NMaaS components

- **NMaaS Platform:** Tool deployment process
- **NMaaS Portal:** Web-based user front-end
- **NMaaS Tools:** Packaged applications

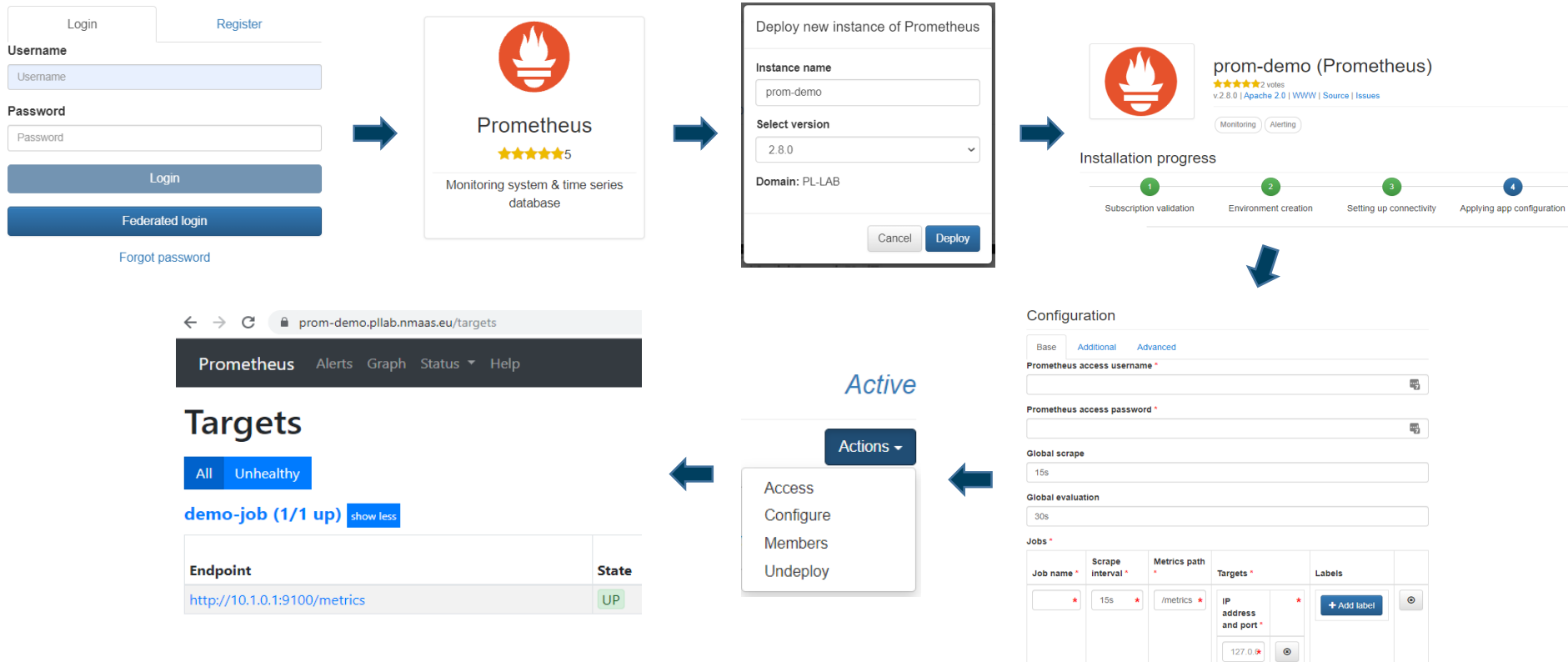
## Goals

- Easy to install and use
- Easily extendable with more tools
- Federated login 

*Both tools and NMaaS components are run in Kubernetes  
Secure connectivity provided by OpenVPN*



# NMaaS tool deployment process

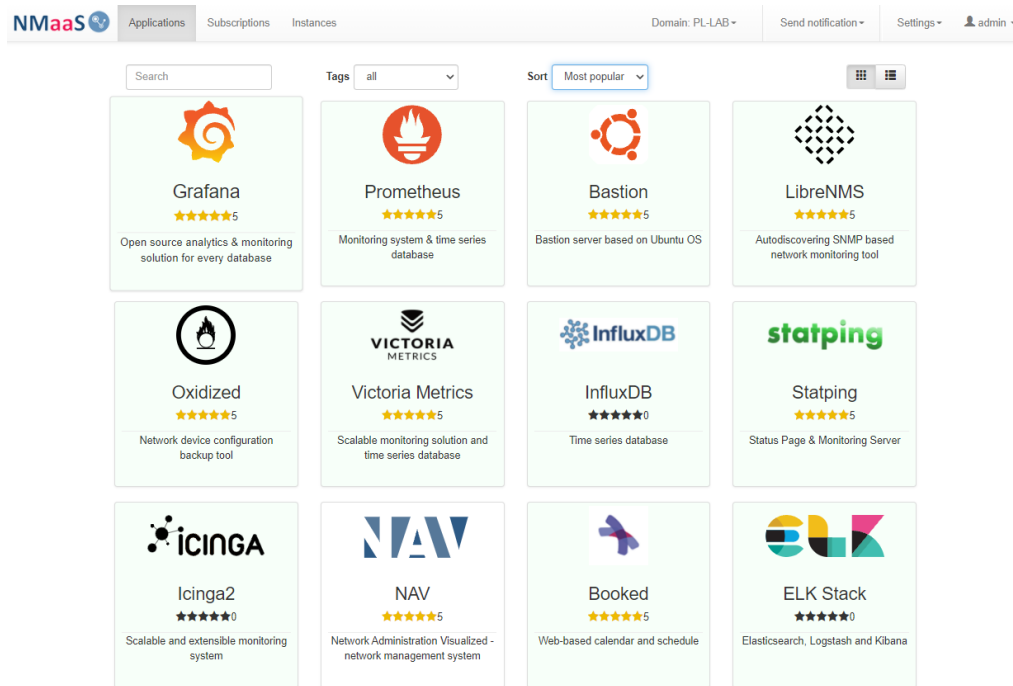




Tools portfolio available via NMaaS application market place

NMaaS provides a range of modular tools to support network management needs

A web-based portal provides the user front end



**Users can select the tools required for their purposes and create a customised toolset tailored for their network**

# NMaaS Tools Portfolio (1)

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



**LibreNMS** - LibreNMS is an auto-discovering PHP/MySQL/SNMP based network monitoring system which includes support for a wide range of network hardware and operating systems



**NAV** - Network Administration Visualized (NAV) is an advanced software suite to monitor large computer networks. It automatically discovers network topology, monitors network load and outages, and can send alerts on network events by e-mail and SMS.



**Prometheus** - Prometheus is an open-source systems monitoring and alerting toolkit.



**Grafana** - Grafana is an open source, feature rich metrics dashboard and graph editor for Graphite, Elasticsearch, OpenTSDB, Prometheus and InfluxDB.



**Bastion** - Ubuntu-based bastion server deployed in a customer domain has VPN access to all the monitored devices.



**Statping** - An easy to use Status Page for websites and applications.



**Debian repository** - Debian repository based on Reprepro is a tool for managing APT repositories.



**SPA Inventory** - A database for storing information about topology resources and service instances that offers TMF Open APIs for standardised access (developed within the GÉANT project).



## NMaaS Tools Portfolio (4)

**InfluxDB** - InfluxDB is an open-source time series database (TSDB) developed by InfluxData.



**Jenkins** - Jenkins is a self-contained, open source automation server which can be used to automate all sorts of tasks related to building, testing, and delivering or deploying software.



**ELK Stack** - "ELK" is the acronym for three open source projects: Elasticsearch, Logstash, and Kibana.



## NMaaS Tools Portfolio (5)

**Icinga2** - Icinga is a monitoring system which checks the availability of your network resources, notifies users of outages, and generates performance data for reporting.



**VictoriaMetrics** - VictoriaMetrics is a highly scalable high-performance database that can be used as an external long-term storage for Prometheus metrics.



**Routinator** - Routinator is a full-featured software package that can perform RPKI validation as a one-time operation and produce the result in multiple formats, or run as a service that periodically downloads and verifies RPKI data.



**CodiMD** - CodiMD lets you collaborate in real-time with markdown. It is an open-source version of the popular HackMD software, letting you host and control your team's content with speed and ease.



**Synapse** - Matrix is an open and secure instant messaging protocol providing rich functionality. Synapse is an open-source server implementing the Matrix protocol.



**Booked** – Booked is a web-based calendar and resource scheduling system that allows administered management of reservations on any number of resources.





## perfSONAR Central Management components

- **pSConfig Web Admin** - a web-based UI for perfSONAR administrators to define and publish MeshConfig/pSConfig meshes.
- **MaDDash** - a tool for collecting large amounts of inherently two-dimensional data and presenting it in visually useful ways.
- **Esmond** - a system for collecting, storing, visualizing and analysing large sets of timeseries data.



**WiFiMon** - a WiFi network monitoring and performance verification system



# Is NMaaS reliable?



- Kubernetes cluster
  - Node redundancy: 3x master, 8x worker and 2 route reflectors
  - In case of a worker failure services are spawned on different worker (minimum downtime)
  - NMaaS tools data kept in external *persistent volumes*
- Data stored in a CEPH cluster
  - Components redundancy: 3x monitor, 2x metadata server, 12x OSD (over multiple physical servers)
  - Data replication
- Backup strategy in place
  - Scheduled VM backups
  - Additional file and directory backups

# Is NMaaS secure?

- **Client-to-Site VPN** – secure user web-access to the UI of deployed NMaaS tools
- **Site-to-Site VPN** – secure data exchange between the devices being monitored and NMaaS tools running in the cloud
- **Routing and firewall** settings on a central PfSense Firewall VM



Set up based on domain name and IP addresses of monitored devices provided by the user

# NMaaS Key Benefits



**PLUG  
AND PLAY**

Cloud based platform reduces start-up costs and management overhead



**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

# How can NMaaS be used?

## Option 1 Organisation implementation

Each participating organisation offers a platform for their participating institutions

GÉANT Project co-ordinates development and standards and provides 2<sup>nd</sup> level support for the software usage



## Option 2 GÉANT Project implementation

GÉANT Project offers a centralised platform for participating NRENs and/or their institutions (“white labelled”)

GÉANT Project co-ordinates development and standards and provides the 1<sup>st</sup> and the 2<sup>nd</sup> level support for NMaaS use

## More Information

Main GÉANT web page: <https://geant.org/NMaaS>

NMaaS wiki (general information, user guides, FAQ):  
<https://wiki.geant.org/display/NMAAS>

NMaaS blog: <https://wiki.geant.org/x/i5nTC>

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

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

Contact e-mail address of NMaaS team: **[nmaas@lists.geant.org](mailto:nmaas@lists.geant.org)**

## Any Questions? Contact us

## NMaaS team:

**nmaas@lists.geant.org**

