



Network Management as a Service

Łukasz Łopatowski

GN4-3 WP6 T3 / NMaaS Team

18th STF, Copenhagen, 22 October 2019

www.geant.org

Why do we need NMaaS?

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 for building 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

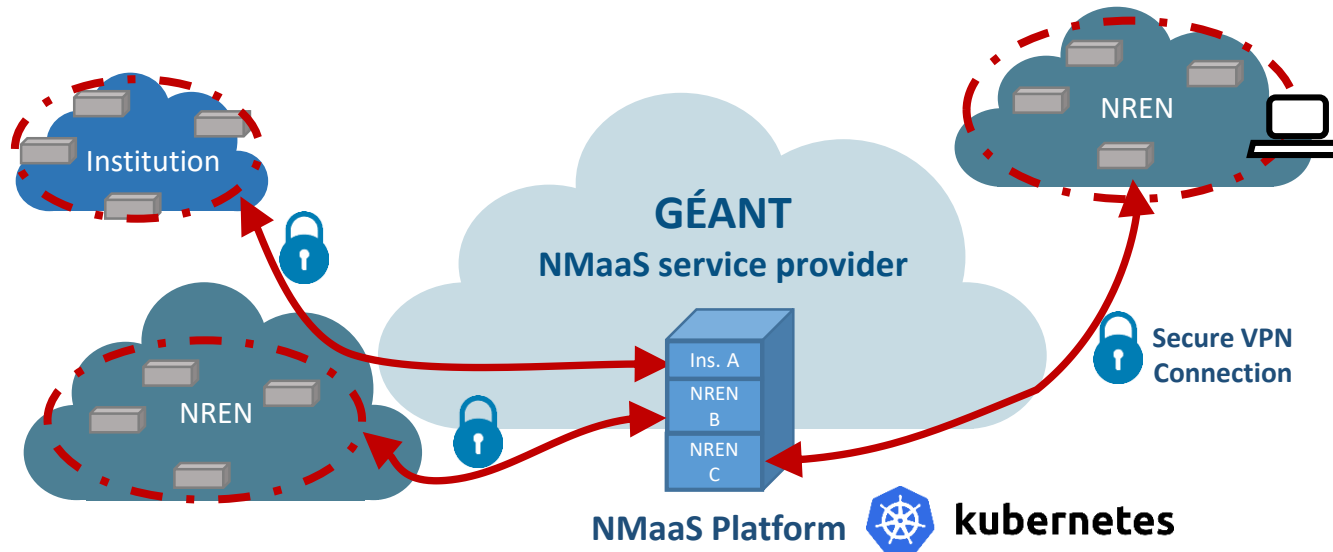
Campuses

Small Organisations / End institutions

Distributed research projects

Other teams within the GÉANT Project

How NMaaS works?



- 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

How can NMaaS be used?

Option 1: Organisation implementation

- Each organisation offers a platform for their participating institutions
- GÉANT Project co-ordinates development and standards and provides 2nd level support for the software usage

NMaaS instance in RENATER

How can NMaaS be used?

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, standards and provides the 1st and the 2nd level support for NMaaS use

<https://nmaas.eu>

NMaaS production instance (hosted in PSNC)

<https://nmaas.geant.org>

NMaaS test / playground instance (hosted in GÉANT)

Who is using NMaaS?

- NRENs
 - CYNET (with intent to offer the service to end institutions)
 - PSNC (distributed research infrastructure)
- End institutions
 - Franja Malgaja Primary School (OSFM) / ARNES
 - Friedrich-Alexander-University (FAU) / DFN
- GÉANT Project Team
 - PMP: Performance Measurement Platform (central servers and particular nodes)

availability *network performance* *server resources* *configuration backups* *alerting*

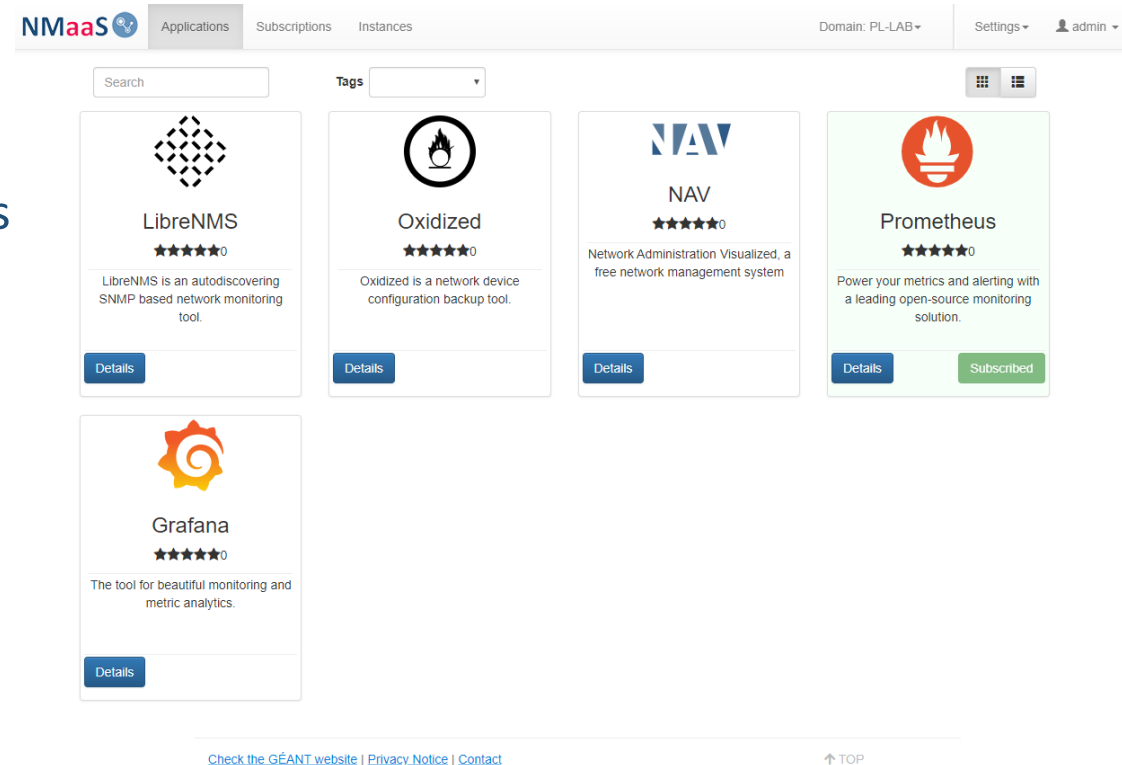
NMaaS Architecture

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

Login Register


Username

Password

Login

Login with eduGAIN




Prometheus
 ★★★★★5

Power your metrics and alerting with a leading open-source monitoring solution.

Details Deploy




Deploy new instance of Prometheus

Instance name

Domain: PL-LAB

Close Deploy



 **prom-demo (Prometheus)**
 ★★★★★2 votes
 v.2.8.0 | Apache 2.0 | WWW | Source | Issues

Monitoring Alerting

Installation progress

1 2 3 4
 Subscription validation Environment creation Setting up connectivity Applying app configuration



Configuration

Base Additional Advanced

Prometheus access username *

Prometheus access password *

Global scrape

Global evaluation

Jobs *

Job name *	Scrape interval *	Metrics path *	Targets *	Labels
<input type="text" value="*"/>	<input type="text" value="15s *"/>	<input type="text" value="/metrics *"/>	<input type="text" value="IP address and port *"/> <input type="text" value="127.0.0.1 *"/>	<input type="button" value="+ Add label"/> <input type="button" value="⊙"/>

← → ↻ prom-demo.pllab.nmaas.eu/targets

Prometheus Alerts Graph Status Help

Targets

All Unhealthy

demo-job (1/1 up) show less

Endpoint	State
http://10.1.0.1:9100/metrics	UP



Go to app Update Undeploy

5 6
 App container deployment App running



NMaaS Tools Portfolio

Oxidized



LibreNMS



NAV



Prometheus



Grafana



Work in progress ...

perfSONAR

- esmond
- MaDDash
- pSConfig Web Administrator

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



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

NMaaS instance monitoring

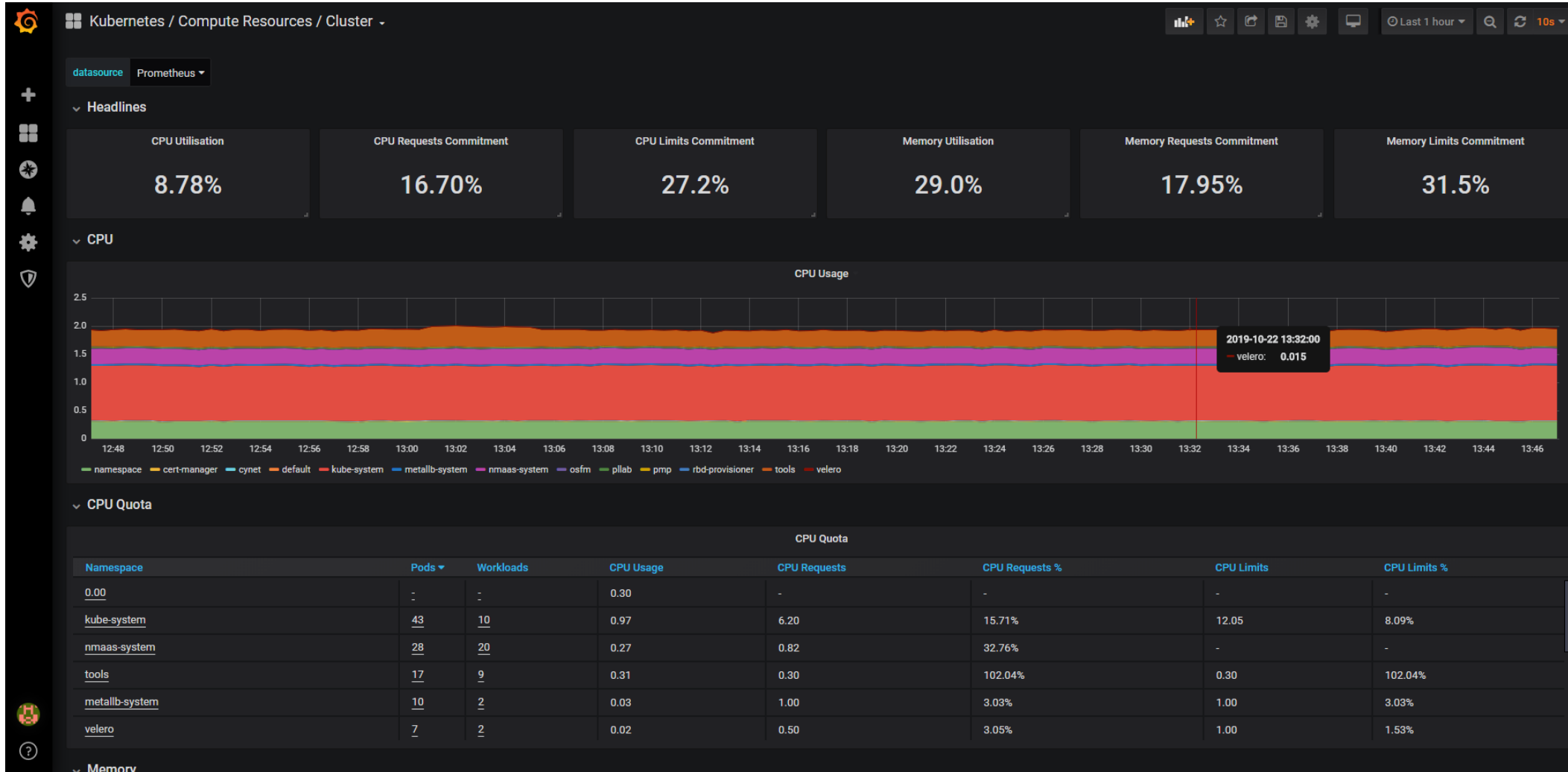
- Infrastructure monitoring
 - VM level resource utilization
 - Ceph storage cluster available capacity
- Kubernetes cluster and services
 - NMaaS components availability
 - NMaaS tool instances availability
 - Service level resource utilization
- VM and Kubernetes service logs monitoring
 - Retrieval – Fluentd, Rsyslog
 - Parsing, analysis and visualization – Graylog (+ Grafana)
 - Storage – Elasticsearch



Prometheus Operator

- *Prometheus*
- *Alertmanager*
- *Grafana*

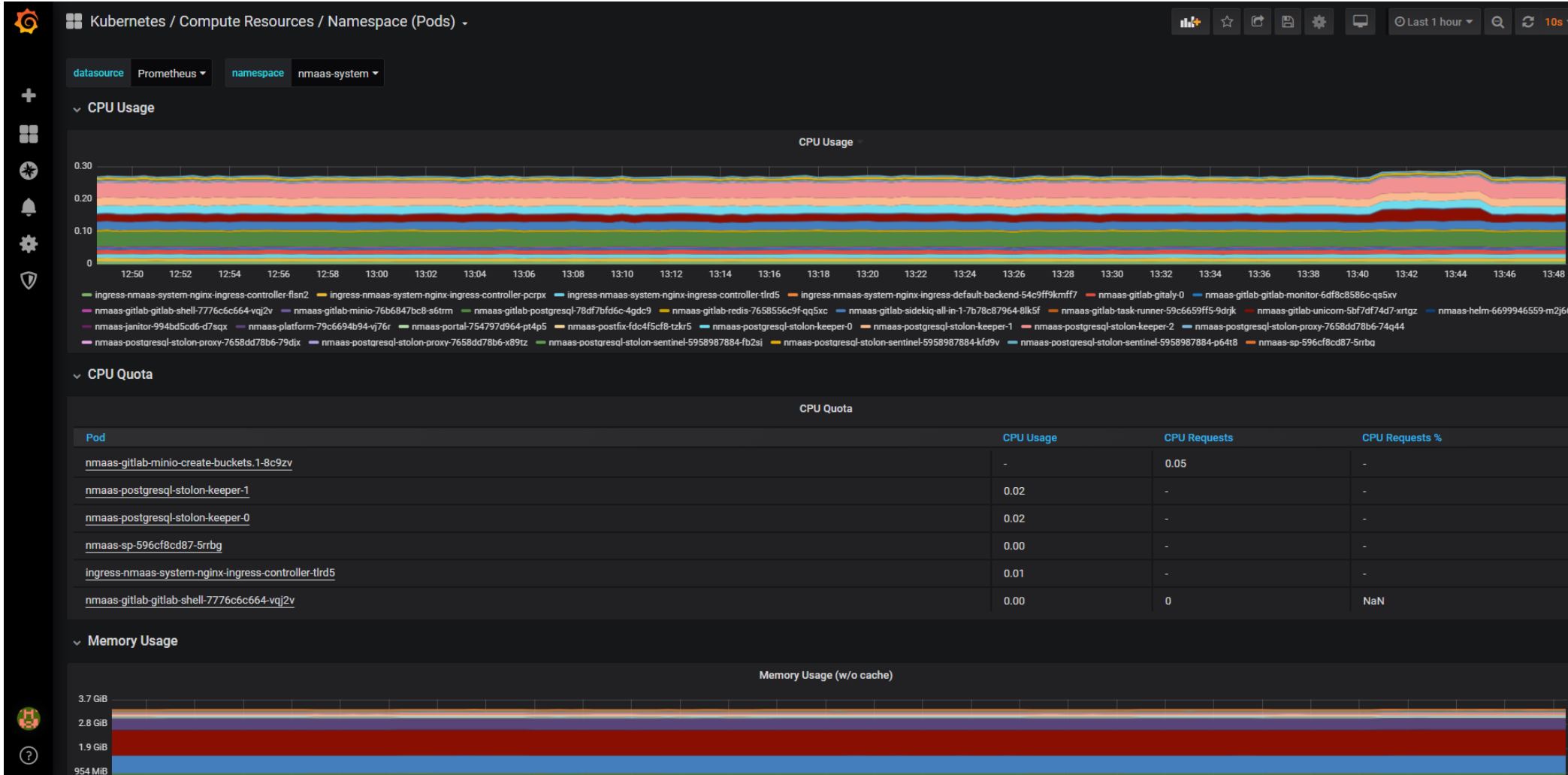
K8s monitoring: Cluster



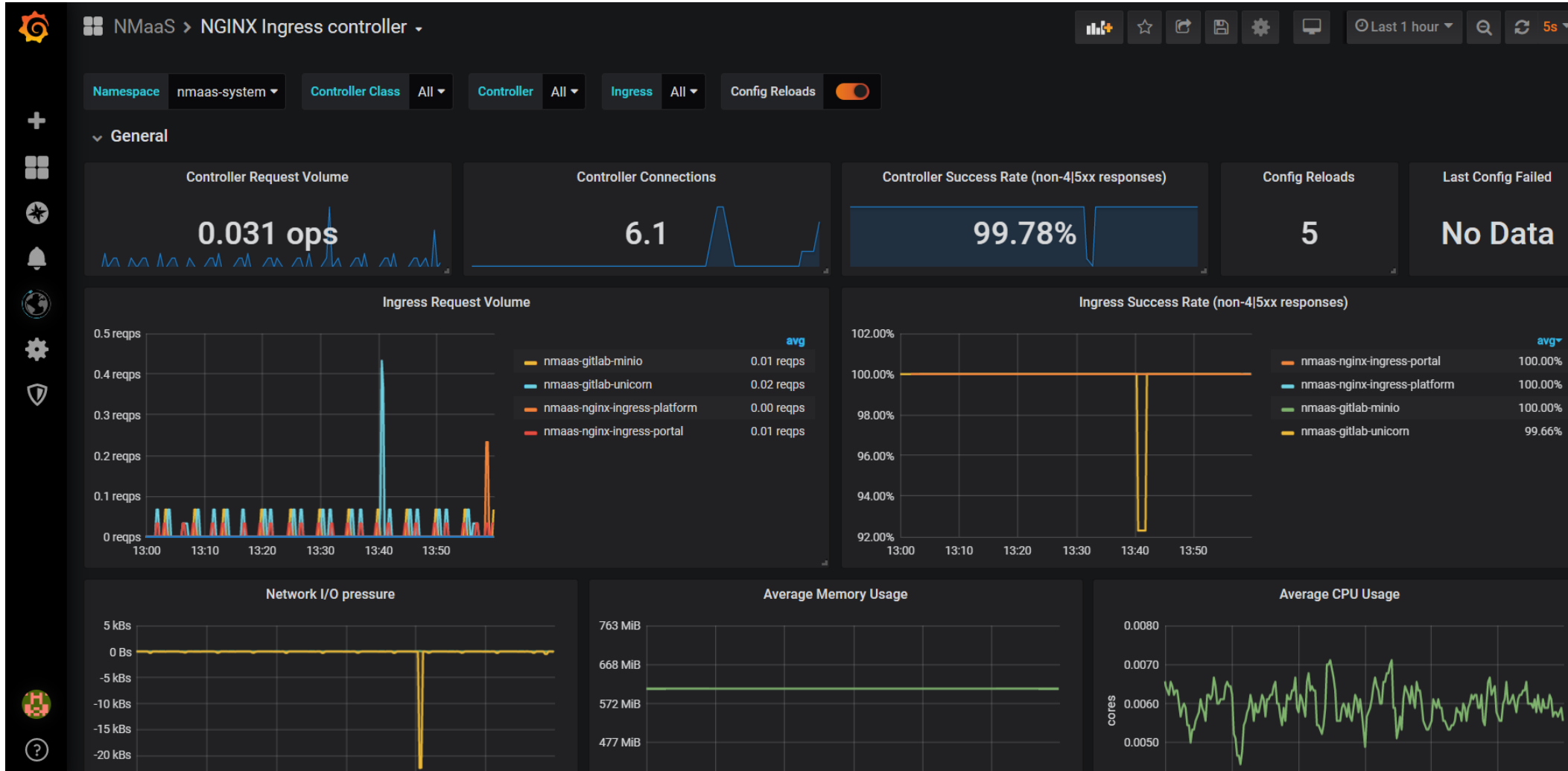
K8s monitoring: Node / VM



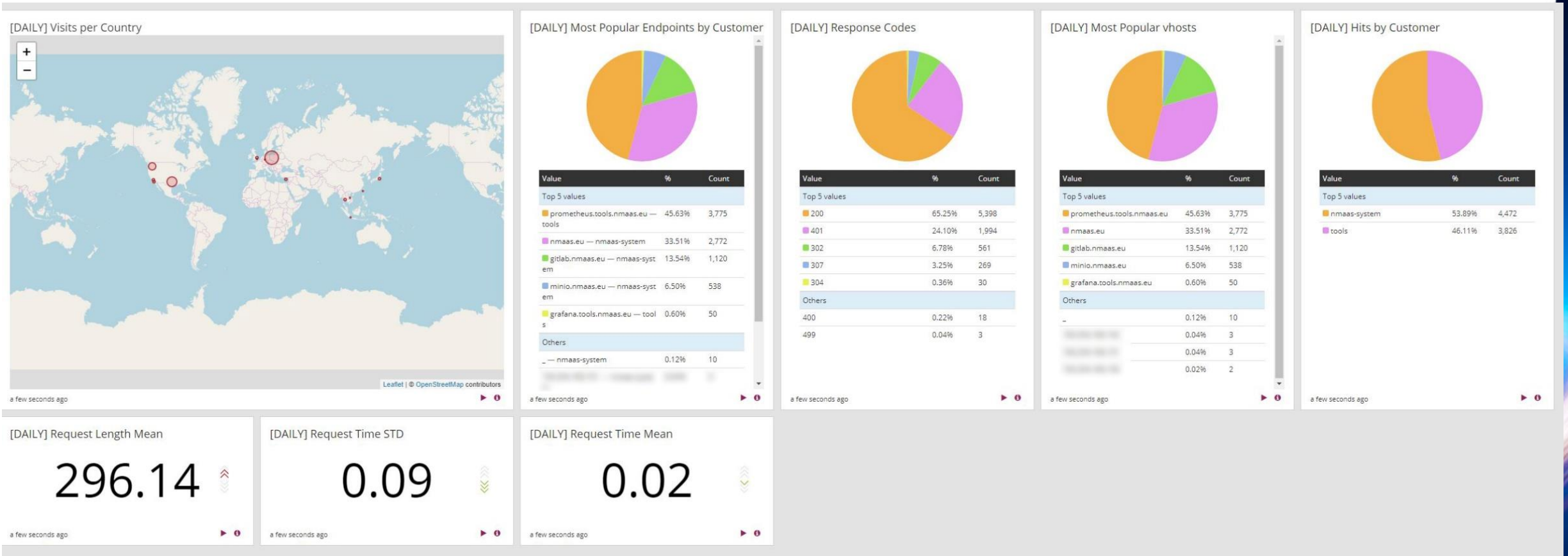
K8s monitoring: Namespace / User



K8s monitoring: Ingress controller



Graylog ingress logs from PfSense



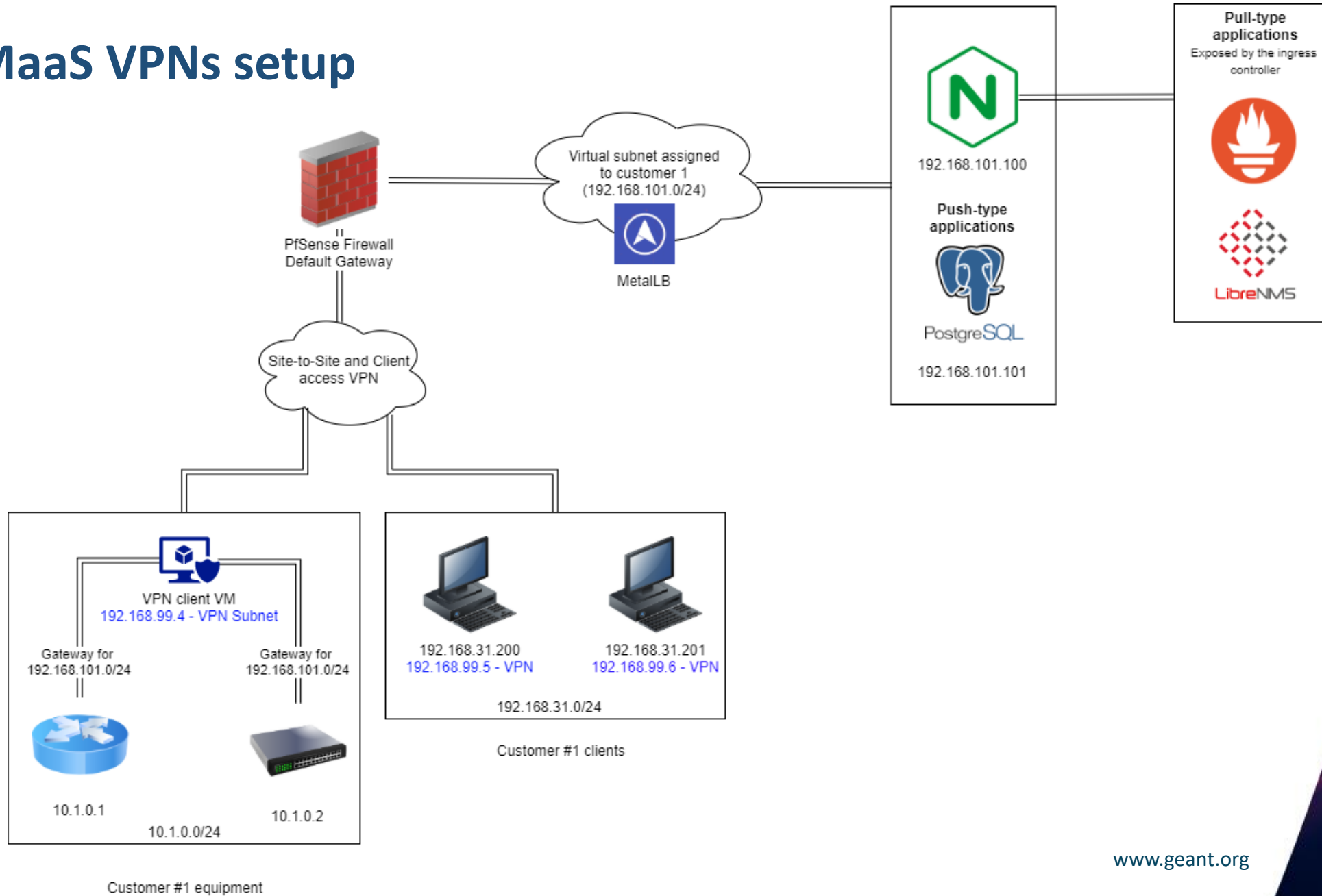
Is NMaaS secure?

- **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

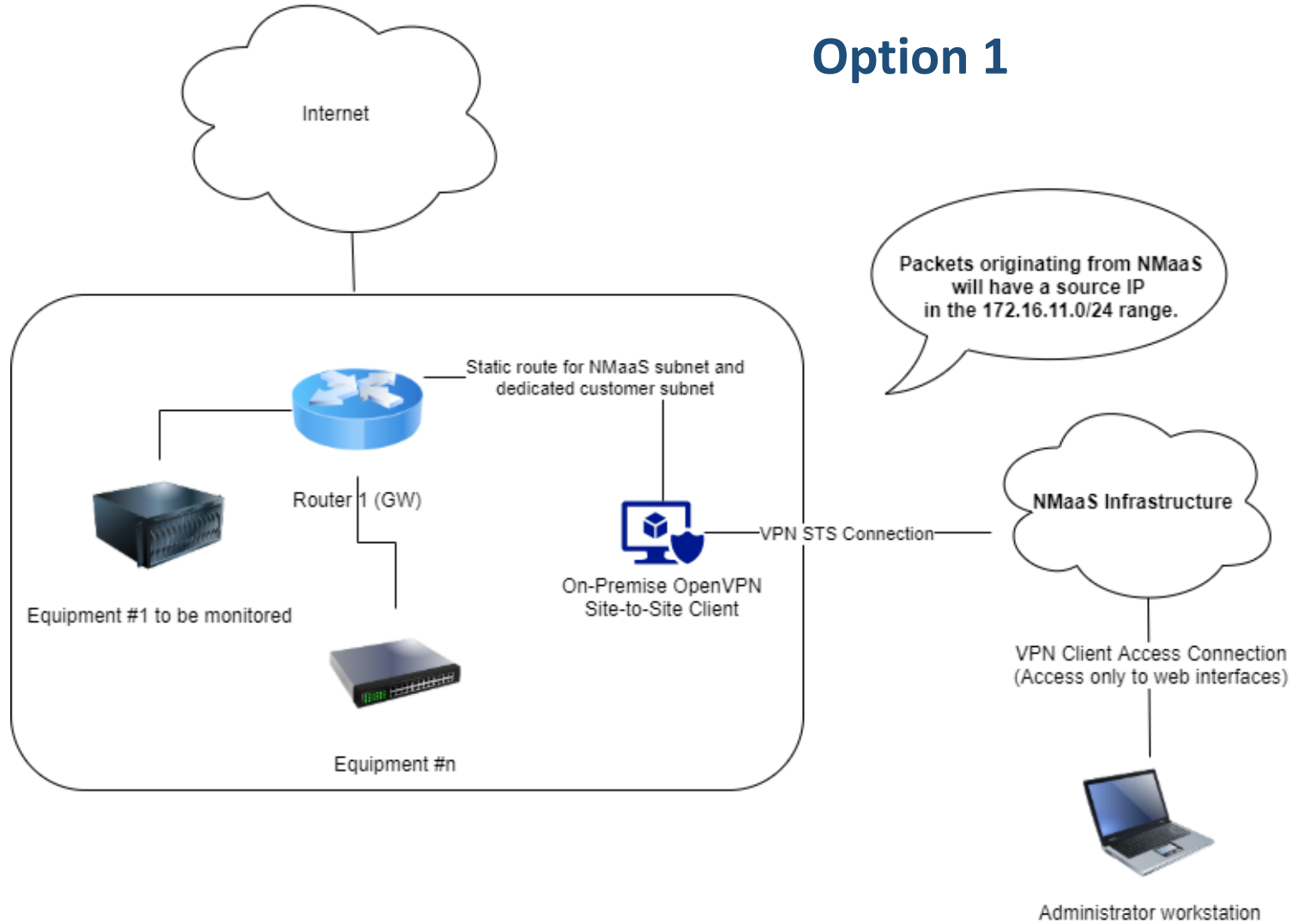


NMaaS VPNs setup



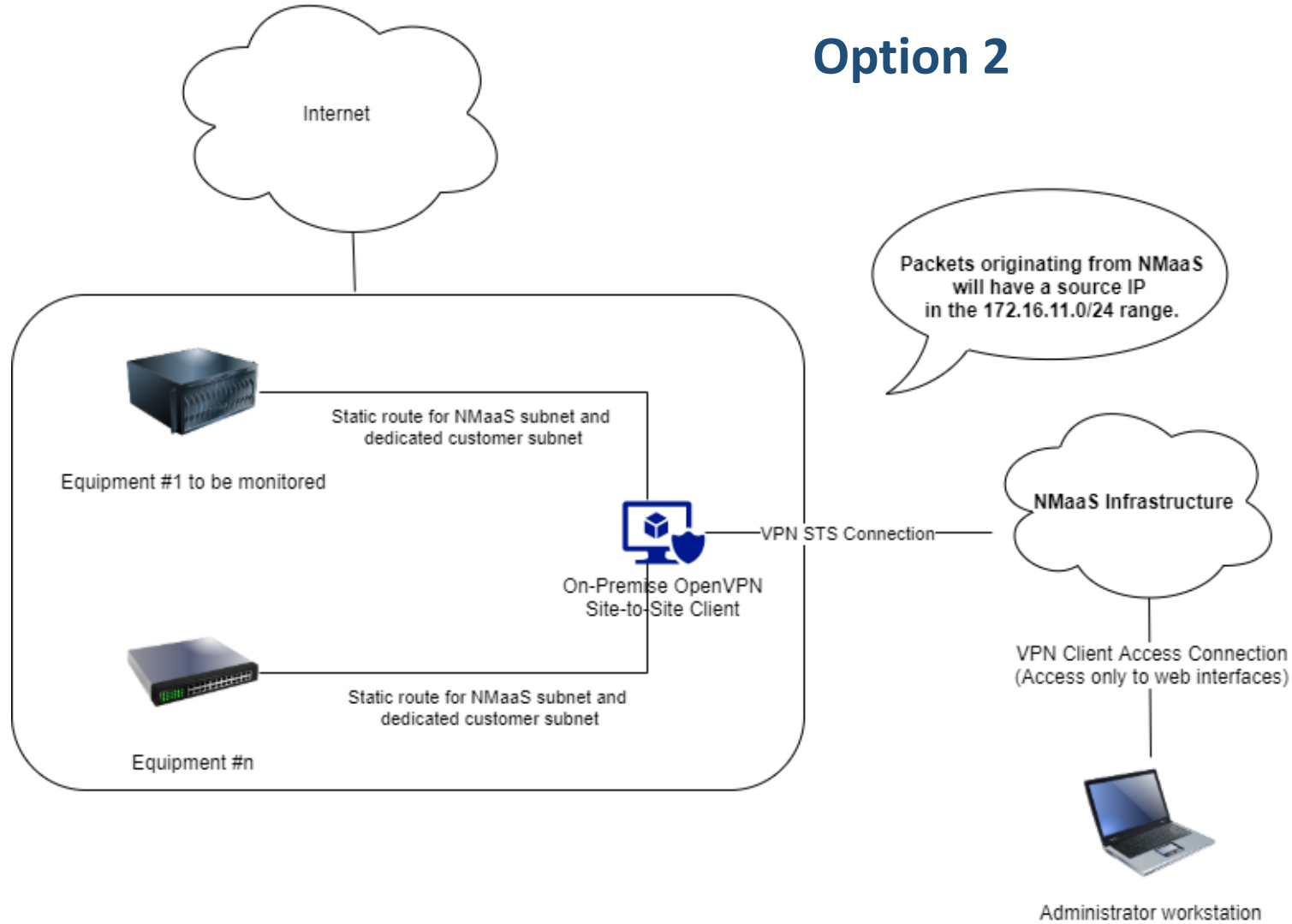
NMaaS Site-to-Site VPN on the user side

Option 1



NMaaS Site-to-Site VPN on the user side

Option 2



More Information

Main GÉANT web page:

- geant.org/NMaaS

Contact e-mail address of NMaaS team:

- nmaas@lists.geant.org

NMaaS production instance:

- <https://nmaas.eu>



Your feedback is very welcome

- Other use cases?
- New tools?
- Additional features?

Would you like to try NMaaS out?

Any questions?



Thank you

Any questions?

Łukasz Łopatowski / PSNC

email: llopat@man.poznan.pl

www.geant.org

