Deployment of Virtual Labs with NMaaS

Streamlining the Organization of Hands-On Educational Exercises

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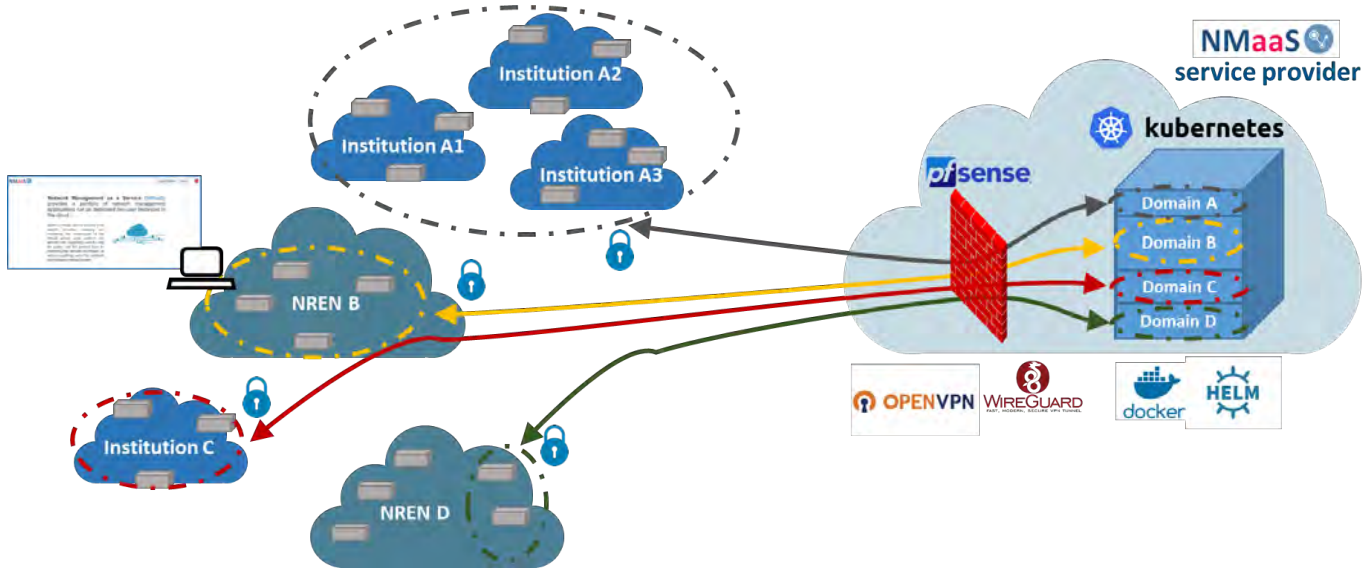
Agenda

- Introduction to NMaaS
- How can I use NMaaS?
- Adapting NMaaS for Virtual Labs
- Virtual Labs in Action
- Conclusion and plans for the future

Introduction to NMaaS

NMaaS is an open-source framework for orchestration of on-demand deployment of applications in a cloud environment

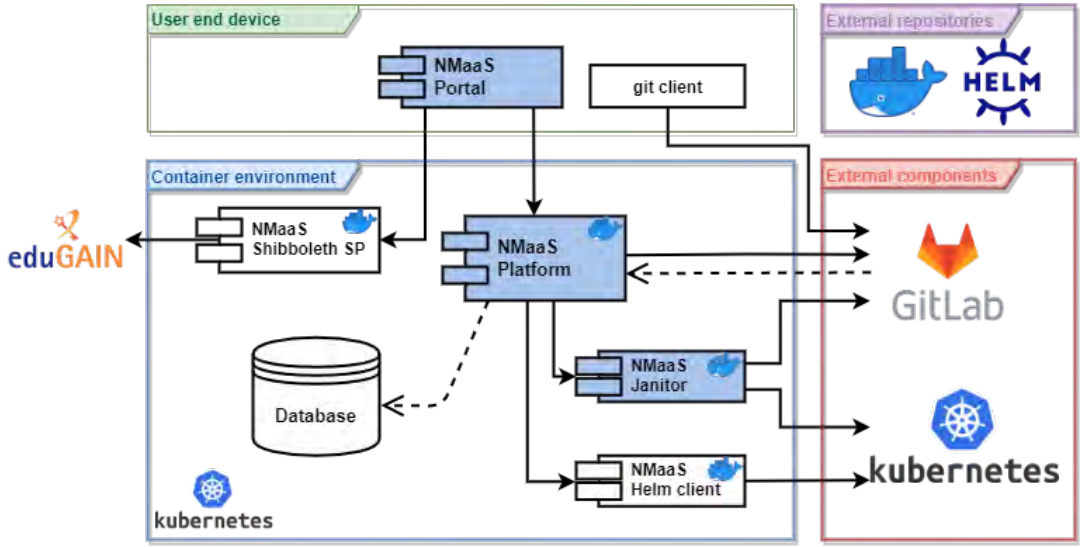
- Kubernetes-based infrastructure
- Multi-tenant architecture
- Software based VPNs
- Simple application deployment process
- GitOps approach for application instance configuration management
- Wide and easily extendable portfolio of applications



ZABBIX Uptime Kuma netbox

Introduction to NMaaS

- Developed within the GÉANT Project
- 3 major NMaaS components
  - **NMaaS Platform** – main back-end module exposing a REST API for user and application management
  - **NMaaS Janitor** – supporting module interacting with external services
  - **NMaaS Portal** – web-based front-end application
- Official Helm chart available

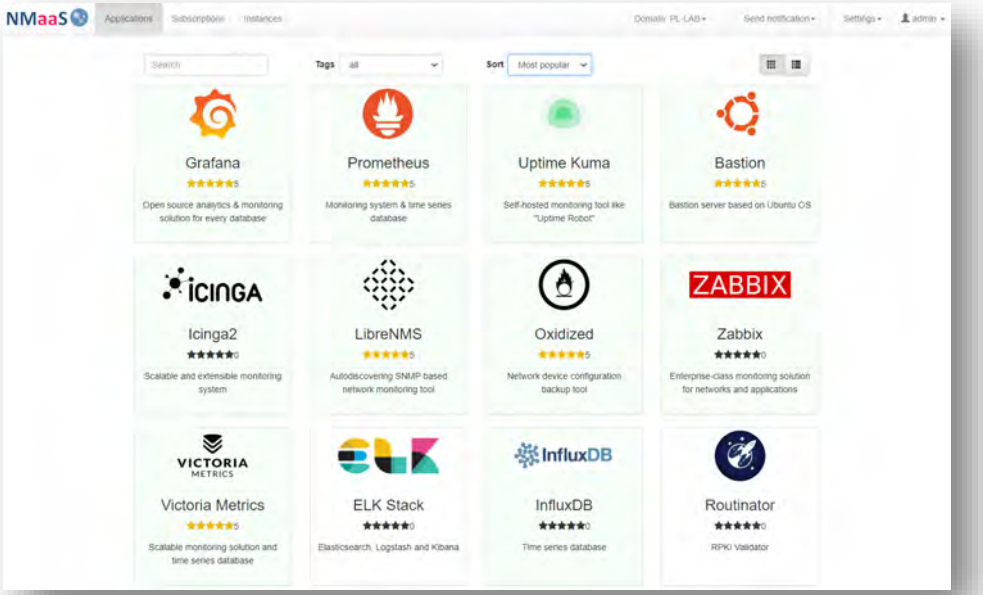


- All development is done via https://github.com/nmaas-platform
  - Apache 2.0 License
  - Contributions are welcome along with issue reports and feature requests
- New documentation page available at https://docs.nmaas.eu

Co-funded by the European Union

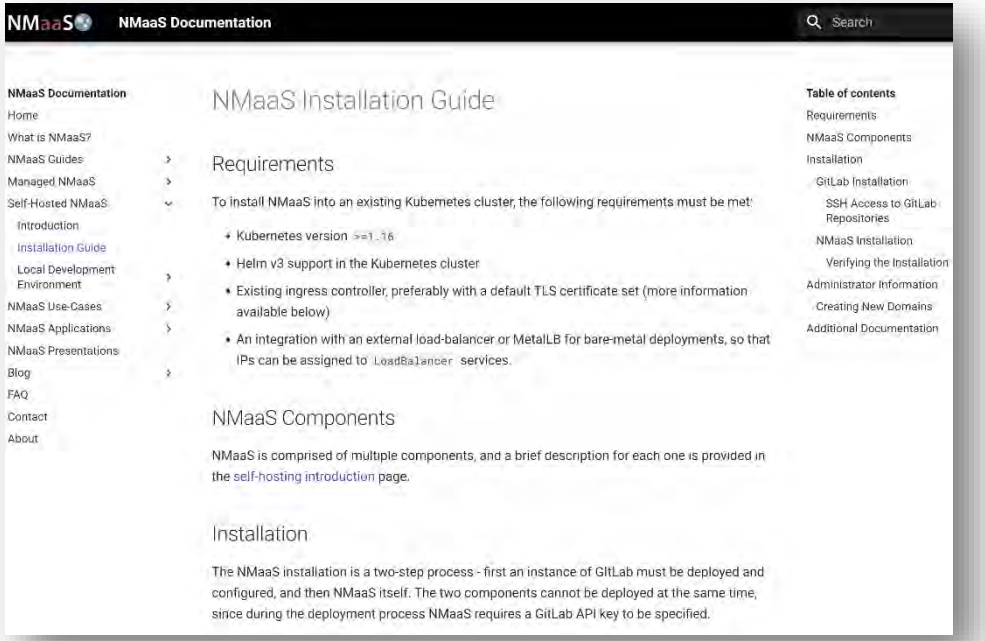
Who is using NMaaS?

- Managed NMaaS service operated by the GÉANT Project (access Portal at https://nmaas.eu)
  - Production service since 2019
- Current NMaaS users
  - NRENs
  - R&D Institutions and Projects
  - Project Teams (e.g. RARE team for GP4L monitoring)



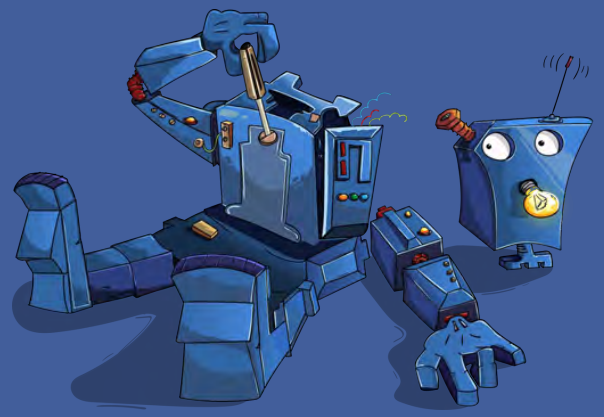
How can I use NMaaS?

- Run your own self-hosted NMaaS instance
  - On an existing full-fledged Kubernetes cluster
  - Local evaluation environment on a single node cluster
  - Complete guide available
- Request a dedicated domain on the GÉANT managed instance
- Contact the NMaaS Team: nmaas@lists.geant.org
- Subscribe to NMaaS users list: nmaas-users@lists.geant.org



Adapting NMaaS for Virtual Labs

A New NMaaS Use-Case



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NMaaS for Virtual Labs in a Nutshell

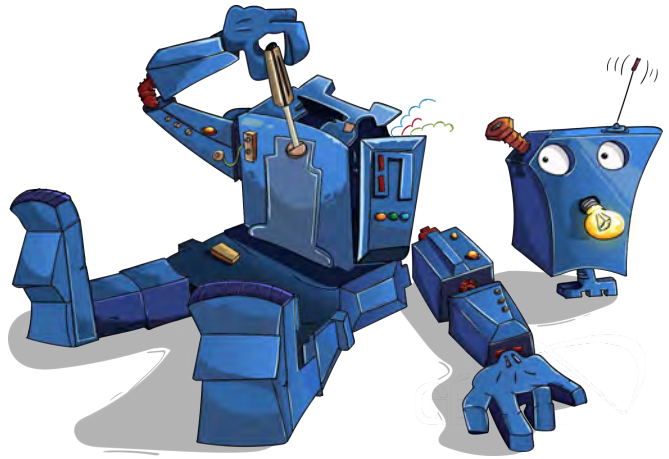
- The challenge of organizing hands-on educational exercises
  - Formal learning
  - Informal learning
- NMaaS as a **general-purpose application catalog**
- **Core idea:** Deployment of educational exercises not fundamentally different from network management applications
  - Same underlying concept and technologies
  - Containerization, orchestration, isolation, multi-tenancy

What Does NMaaS Bring to the Table?

Benefits for educational staff	• **Reusable infrastructure** across multiple courses, or even institutions • Granular management of users and scenarios • Tight access control
Benefits for end-users	• Deployment of complex applications, bypassing hardware requirements • Eliminating configuration overhead • Playground for testing new software
Diverse set of applications, from different science domains	• Not limited only to computer science!

Extending NMaaS for Virtual Labs (1)

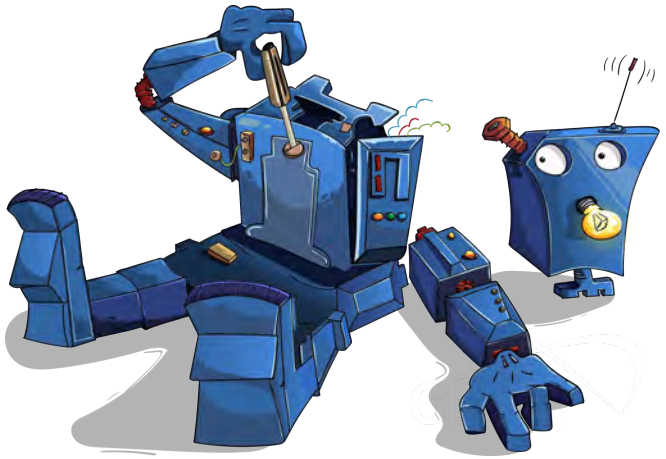
- Adapting existing and adding new features:
- Domains
  - Individual users, optional creation of shared domains (e.g., collaboration)
- Domain groups
  - Domain groupings, facilitating application deployment restrictions
  - The problem of personalized catalogs
- On-demand applications
  - Utilize the available hardware to its maximum



= Implemented = In Development

Extending NMaaS for Virtual Labs (2)

- Bulk domain creation
  - Batch enrolment of large groups of users into the platform
- Bulk application deployments
  - Hiding NMaaS from end-users
- Application log viewing
  - Highly requested feature, easier troubleshooting



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Virtual Labs in Action

Visual walkthrough of the new NMaaS features

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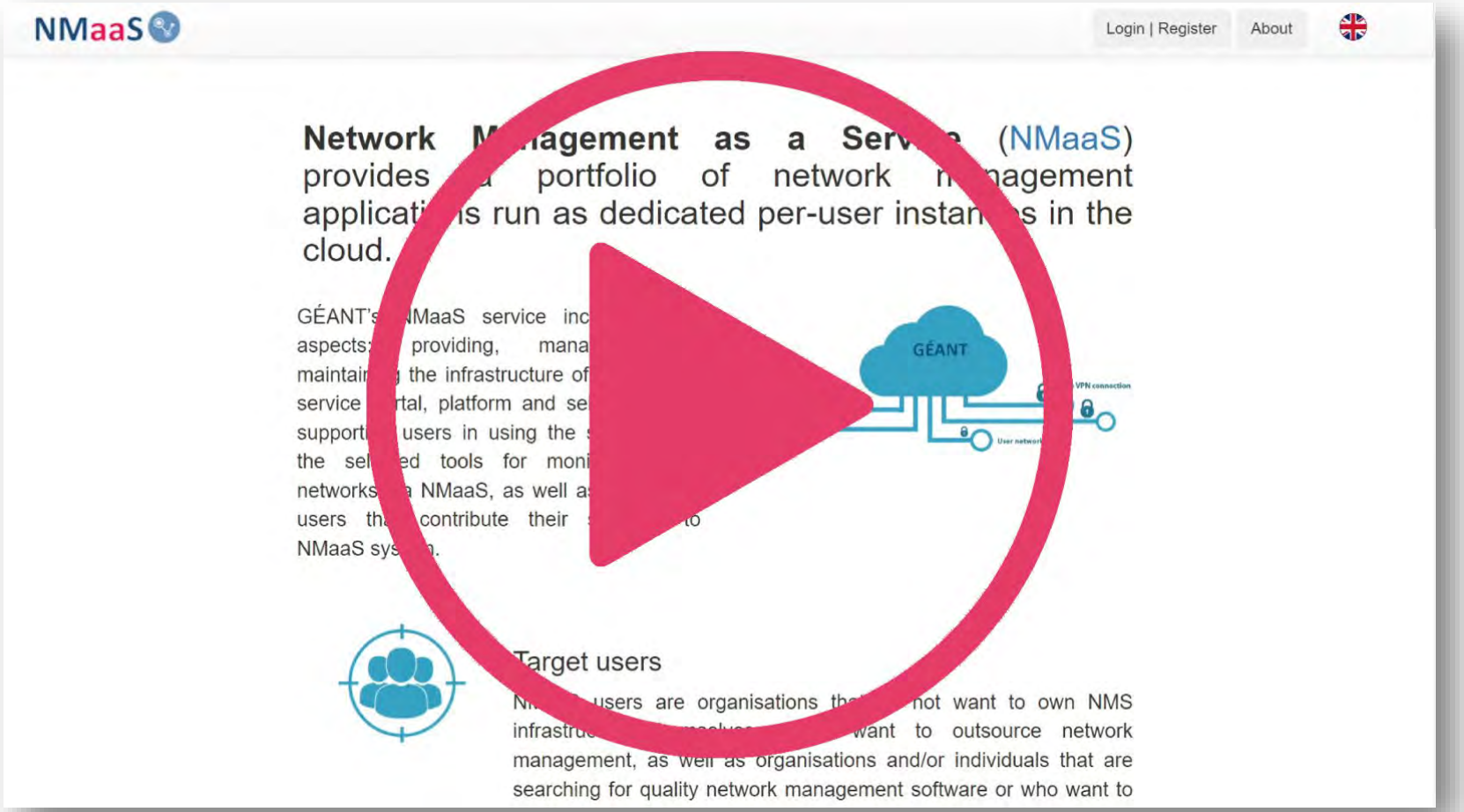
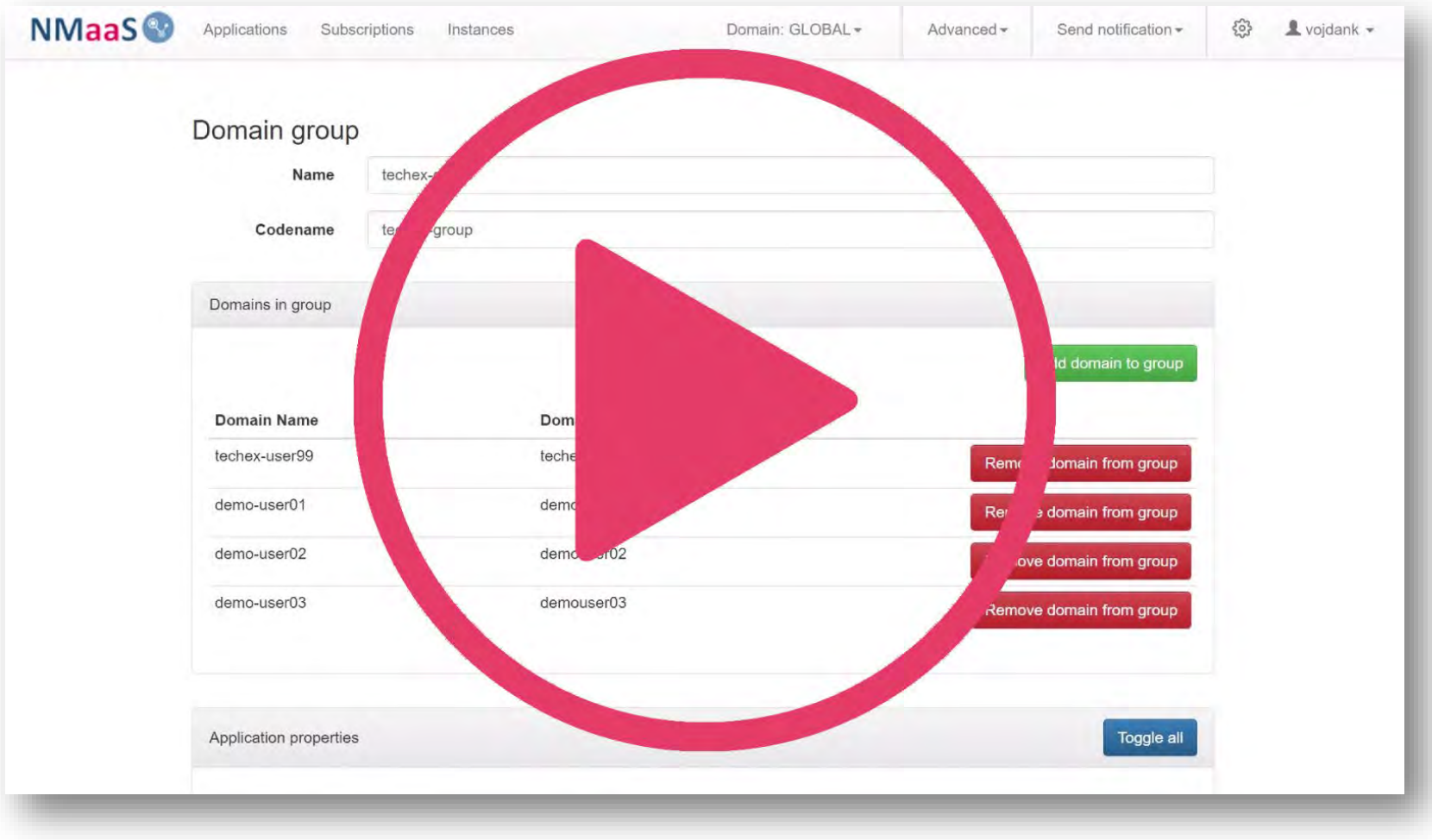
Deploying New Domains in Bulk as a Trainer



More information: https://docs.nmaas.eu/use-cases/virtual-lab/bulk-domain-deployment/

Restricting Available Applications with Domain Groups



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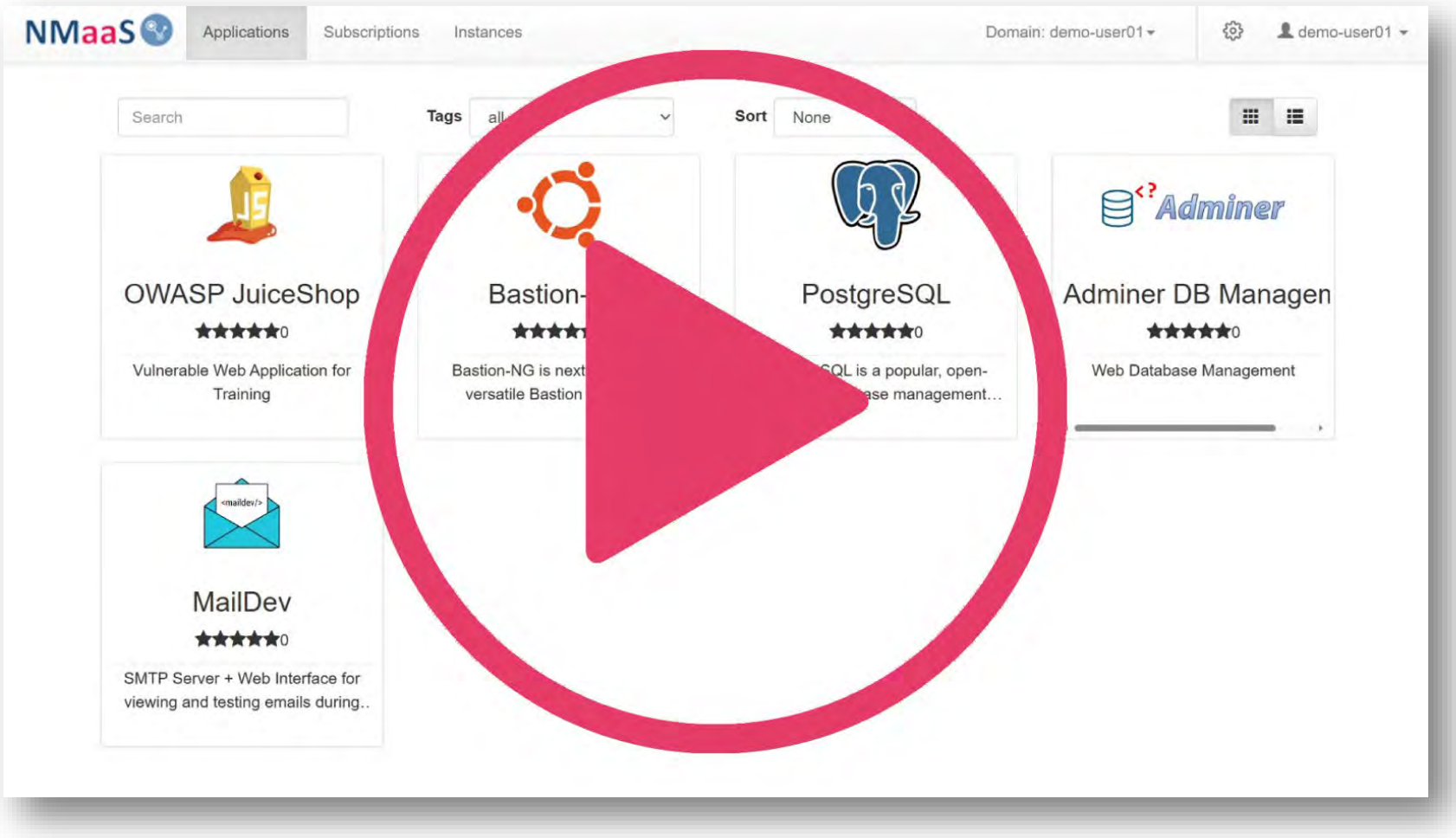
Deploying an Applications as a Trainee



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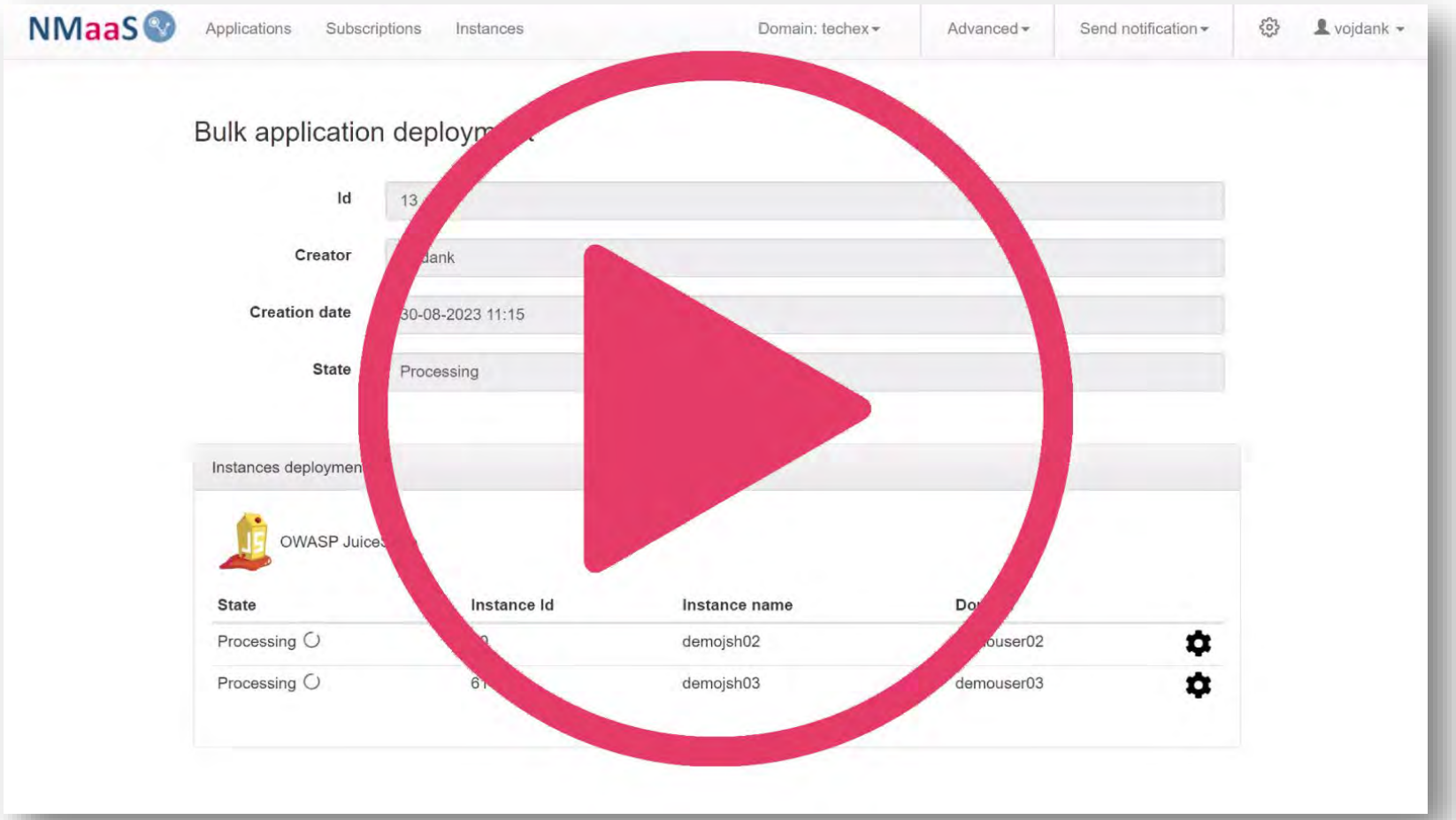
Deploying Applications in Bulk as a Trainer



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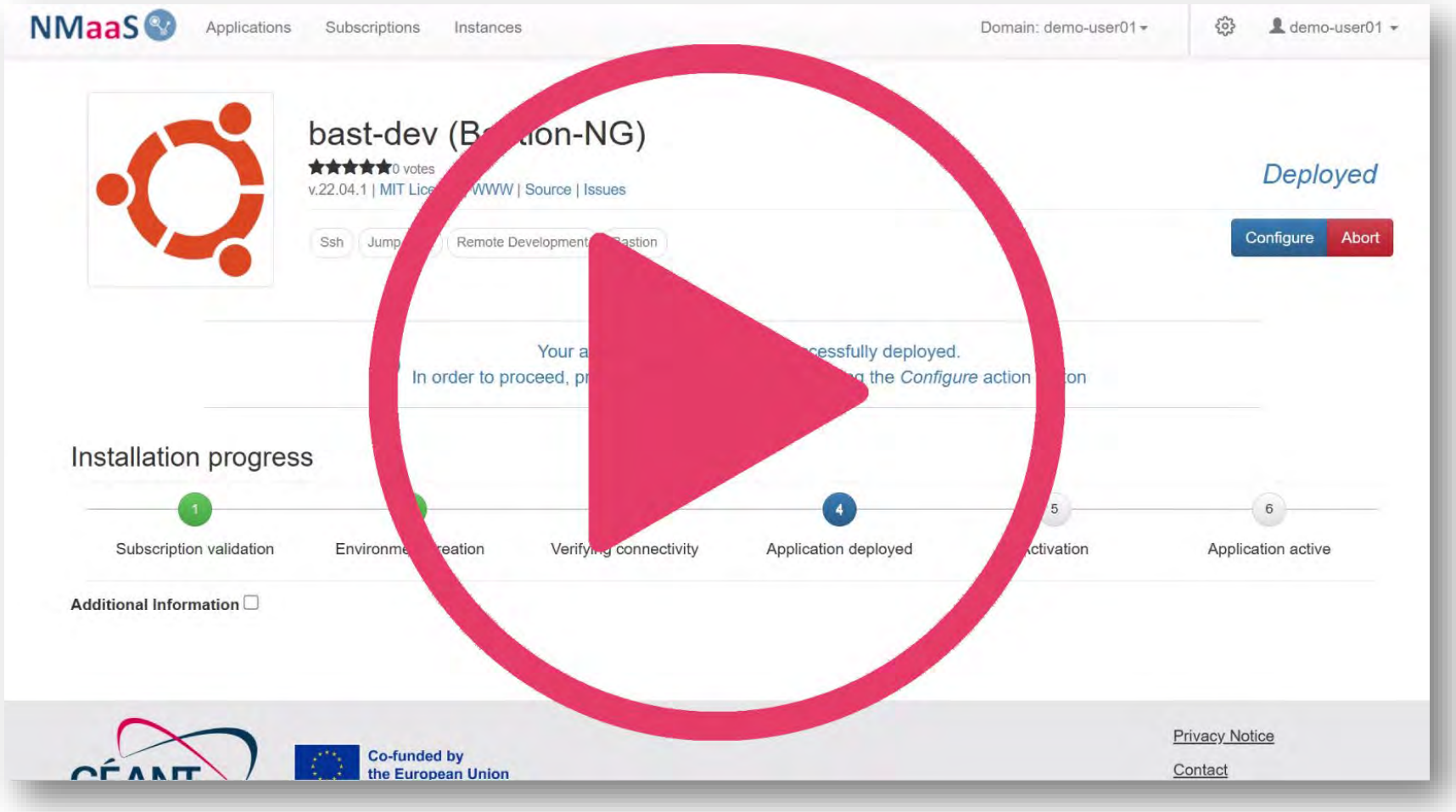
Exploring Additional Scenarios



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Conclusion and Plans for the Future

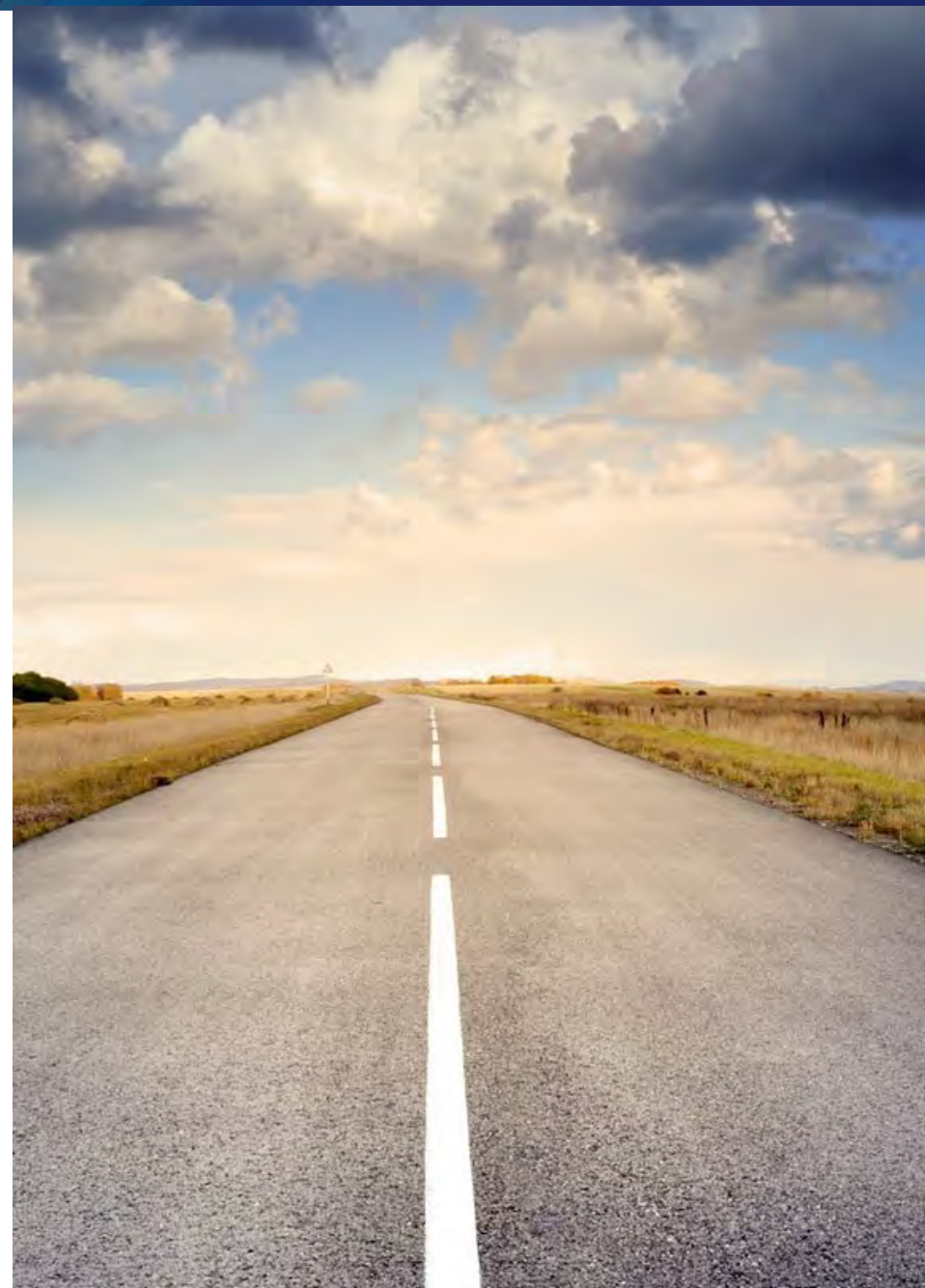
Additional features, more use-cases…

Conclusion

- Versatile orchestration platform
- Option to host diverse set of applications
  - Not limited to a single problem domain
- Open-source
- Based on popular and well-known technologies
- Virtual Lab pilots underway as part of various university courses
  - Cybersecurity
  - IT Management
  - Web Development

Plans for the Future

- Additional virtual lab scenarios
  - JupyterLab
  - More vulnerable applications for CTF training
- Open-sourcing both the NMaaS catalog and the related course materials
- Building a community around NMaaS
- Exploring additional use-cases
  - Deployment of virtual machines (not only containers)
  - Use for scientific computing, leveraging specialized hardware (i.e., GPUs)



Thank You

Contact email *nmaas@lists.geant.org*
Documentation *https://docs.nmaas.eu/*

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