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
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
Who is using NMaaS?

• Managed NMaaS service operated by the GÉANT Project (access Portal at [https://nmaas.eu](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
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

= Implemented        = In Development
Virtual Labs in Action
Visual walkthrough of the new NMaaS features
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

More information: https://docs.nmaas.eu/use-cases/virtual-lab/domain-groups/
Deploying an Applications as a Trainee

More information: https://docs.nmaas.eu/use-cases/virtual-lab/vlab-introduction/
Deploying Applications in Bulk as a Trainer

More information: https://docs.nmaas.eu/use-cases/virtual-lab/bulk-application-deployment/
Exploring Additional Scenarios

More information: https://docs.nmaas.eu/use-cases/virtual-lab/vlab-introduction/
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/