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System For Practical Evaluations of Network Administration Course

Diogo Nunes[1] | Rui Prior[1]

[1]Faculdade de Ciências da Universidade do Porto

Introduction

- **Training network administrators** requires effective methods, but creating physical environments is costly, and scaling manual evaluations is challenging.
- Automating **the evaluation of network topologies** can alleviate instructor workload while ensuring consistent and fair assessments.

Figure 1 – Hands-on Networking

Objective(s)

- Develop a **scalable system.**
- **Automate the evaluation of network topologies.**
- Provide students with **virtualized work environments.**
- **Allow students to build and configure networks.**

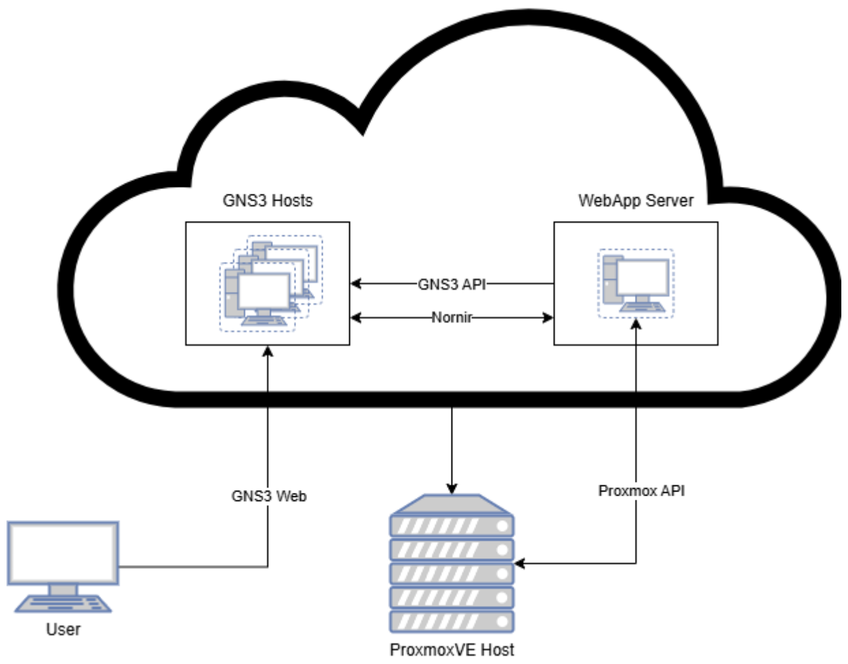

Figure 2 – System architecture

State-of-the-Art

- **Methodology –** Built upon a previous student's work, which already performed an extensive analysis. Main focus was on practical implementation and expansion to achieve the project's objectives.
- **Promising Findings –** The key finding from prior work was the successful use of an automation library to send commands to virtualized GNS3 devices, detect vendors at runtime, and validate configurations.
- **Decisions Made –** Integrated and extended the loose components, unifying them into a cohesive system. Flask was chosen for web interactions, and non-Python components were migrated for better extensibility and maintainability.

Workplan

- Key tasks include **Flask App Development** and **Component Integration** to connect Flask, ProxmoxVE, and GNS3**, Concurrent I/O Optimization** to enhance performance, **and GNS3 Work VM Deployment** to streamline automated student environments.

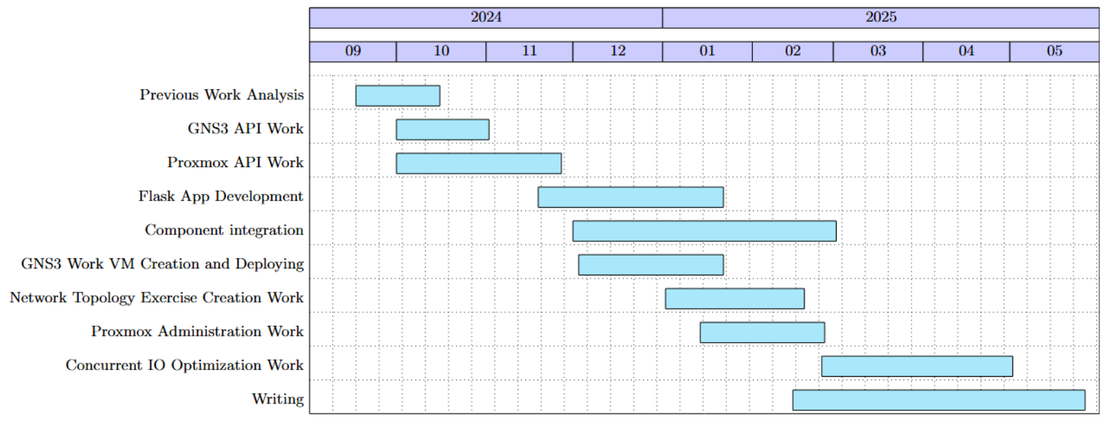

Figure 3 – Gantt chart

Preliminary results

- **From Components to Cohesion -** Started with a few loose components and successfully integrated them into a fully functional system.
- **Scalable VM Deployment -** Deploy virtual machines at scale with high storage efficiency using LVM-thin volumes and linked clones.
- **Cross-Vendor Command Execution -** Flask app sends commands to devices from multiple vendors and validates configurations to ensure correctness.
- **Intuitive GNS3 Web UI -** Provides students with a seamless, browser-based environment to design, deploy, and test network topologies without needing local installations.

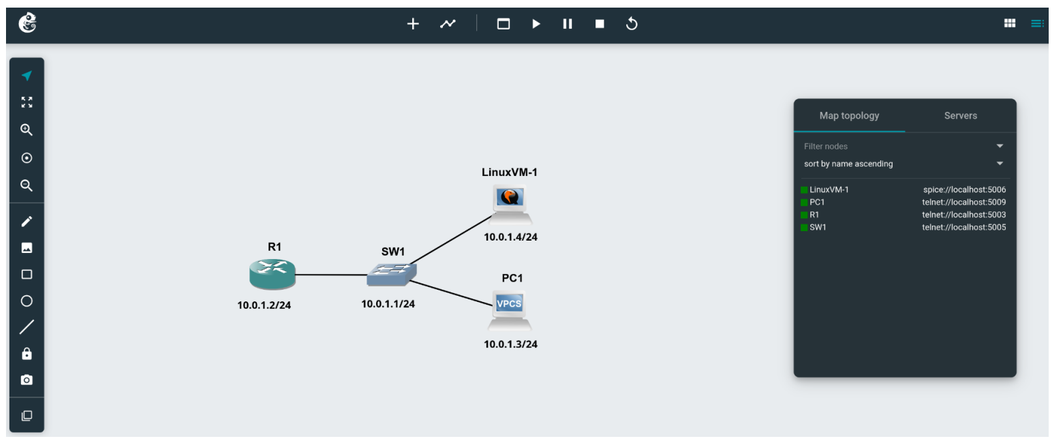

Figure 4 – An example of a student's work environment.

References

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