6-month Internship: Dynamic SLA-aware Network Slice Monitoring

Lab:	LIP6, Sorbonne University
Duration:	4-6 months in 2026
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Keywords:	Network Slicing, SLA-aware Systems, Telemetry Budget

Background

Modern softwarized networks increasingly rely on virtualization and logical network slices, where multiple services with heterogeneous Service Level Agreements (SLAs) share the same underlying infrastructure. Ensuring compliance with these SLAs requires continuous performance monitoring. However, fine-grained monitoring incurs non-negligible overhead, making it infeasible to monitor all services with the same intensity at all times. In operational networks, excessive monitoring overhead may itself interfere with service performance.

This project studies SLA-aware performance monitoring as a closed-loop control problem. The goal is to study and implement a monitoring system that dynamically adjusts the monitoring effort allocated to different services according to their SLA criticality and observed performance dynamics, under a limited telemetry budget.

Beyond monitoring, maintaining SLA compliance ultimately requires taking corrective actions on the network itself. When SLA violations or performance degradations are detected, the system may trigger reconfiguration mechanisms such as resource reallocation, traffic steering, or slice parameter adjustment. However, reconfiguration operations are not free: they incur control overhead, operational cost, and may temporarily disrupt ongoing services. As a result, reconfiguration actions must also be carefully budgeted and selectively applied.

This introduces a second layer of decision-making in the control loop: deciding not only what to monitor and how intensively, but also when and how to reconfigure the network under limited reconfiguration budgets. Excessive or poorly timed reconfigurations may negate their intended benefits, while overly conservative strategies may fail to prevent SLA violations. The challenge therefore lies in jointly reasoning about monitoring and reconfiguration as coupled control actions, both constrained by resource budgets and driven by uncertain and dynamic network conditions.

Research objectives

Inspired by recent research on SLA-aware monitoring in softwarized networks [1, 2], the objective of this internship is to study and implement a software-based monitoring framework that enables experimental investigation of the trade-offs between monitoring accuracy, overhead, and SLA requirements in network slicing environments. Beyond monitoring, the internship further explores how monitoring outcomes can drive adaptive network reconfiguration decisions, under explicit constraints on reconfiguration cost and operational constraints. From a broader perspective, this internship is positioned within the emerging AIOps paradigm for softwarized networks, where operational data and telemetry are leveraged to enable intelligent, budget-aware monitoring and automated reconfiguration in a closed-loop manner. In particular, the internship aims to:

- Gain hands-on understanding of SLA-aware monitoring mechanisms in softwarized networks;

- Implement simple adaptive monitoring strategies under a limited telemetry budget;

- Study how monitoring information can support basic, budget-aware reconfiguration decisions to improve SLA compliance;

- Explore lightweight learning-based approaches inspired by AIOps, depending on the student's background and progress.

Requirements[1]

- Master's (M2) or final-year engineering student in Networks, Computer Science, or related fields;

- Good familiarity with Linux environments and networking systems;

- Proficiency in Python for data analysis, experimentation, and prototyping, including the use of common ML tools;

- Programming skills in C/C++ for system and data-plane development are a plus;

- Ability to read technical documentation and research papers;

- Good command of English.

References

[1] Arjun Balasingam, Manikanta Kotaru, and Paramvir Bahl. {Application-Level} service assurance with 5g {RAN} slicing. In 21st USENIX Symposium on Networked Systems Design and Implementation (NSDI 24), pages 841–857, 2024.

[2] Niloy Saha, Mina Tahmasbi Arashloo, Nashid Shahriar, and Raouf Boutaba. Dynamic sla-aware network slice monitoring. arXiv preprint arXiv:2512.12123, 2025.

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[1]This internship can serve as a preliminary step towards a PhD, depending on funding opportunities and the candidate's motivation.