

ONE Project - A Techno-Economic Assessment of GMPLS

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연구과제명: ONE-Towards Automated Interactions between the Internet and the Carrier-Grade Management Ecosystem

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1. Research Background & Goal

Rapid technological change combined with increasing demand for data communication encourages transport service providers to move from a centralized and manually operated network in the management plane to a more flexible and dynamic network by migrating some functionalities to the control plane. The need for this dynamic and automatically operated network management system (NMS) becomes the major reason for a strong effort of standardization bodies, research support organization, and vendors to develop new network management and network control mechanisms for today's multi-layer, multi-domain network environment.

The major results of these efforts are two main standards for the control plane: GMPLS and ASON. They have been introduced by IETF and ITU-T, respectively, and gained the attention of network providers, vendors, and scholars. The influence of the GMPLS control plane on the operational cost of network operator quantitatively has been studied intensively. The finding of these studies suggests that the operational cost of GMPLS control plane enabled networks are 50% less than those of traditional networks despite the fact that the operational processes in both networks are similar. Verbrugge et al. suggest that the main difference in operational expenditure (OPEX) of traditional networks and GMPLS-

enabled networks comes from the savings in being able to handle a larger number of service offerings and service provisions. The ASON framework impact on network OPEX has been discussed in literature. The authors found a significant impact of the control plane framework on resilience and the service provisioning process. It is the result of less human intervention through UNI signaling.

Besides the positive findings of Pasqualini et al. and Chahine et al. that predict a 50 percent reduction of operational cost through the deployment of a control plane framework, the findings of Verbrugge et al. that indicate a significant impact of control plane frameworks on the network operation processes, and the network operators' interest in the technical features of the control plane frameworks, the migration towards these control plane enabled network is slower than expected.

When studying the causes for the slow take-up of the control plane frameworks, it becomes clear that researchers mostly focused on analyzing the technical challenges. The economic challenges of the GMPLS control plane, which have a strong impact on the adoption of technologies are underestimated in the existing studies.

2. Research Outcome

The objective of the ONE project is to investigate the economic challenges and the cost of the deployment of the GMPLS control plane framework in production networks through a techno-economic analysis. Moreover, the objective is to provide network operators with a tool that supports them in their decision making on when to migrate to a GMPLS-enabled network.

To achieve the objectives, we start with highlighting the current challenges of IP providers and transport providers and a description on how the frameworks of standardization organizations (IETF and ITU-T) address these challenges. In a second step, we identify the cost factors for deploying new technologies in a brown field scenario. Based on these cost factors, a cost model is developed. It allows estimating the economic impact of the deployment of a GMPLS control plane framework in a network. In the next step, a study on GMPLS advantages over its cost is performed for production network. Finally, a decision support tool is developed based on a comparison of the cost of the service provisioning process in GMPLS-enabled networks with the cost of the service provisioning process in traditional networks, taking into account the frequency of service provisioning requests.