

Segment Routing Service Programming

A dynamic solution for steering traffic over the most suitable services in a provider network.

Graduate



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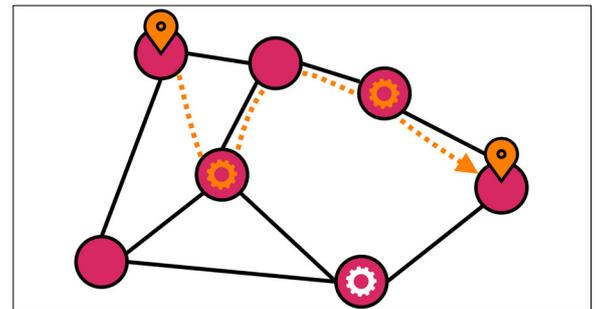
Introduction: In the last few years, the IT network domain has changed fundamentally. New approaches and technologies were introduced, which has changed and is changing the future of this area radically. The results are modern and dynamic networks that close the gap between networks, applications, and end-users. It permits creating applications that work closely with the underlying network and create a network that fulfills customer needs entirely. Network services like firewall systems or intrusion detection/prevention systems have become indispensable and are firmly anchored in computer networks. Nowadays, these services are not to assume away yet have also a massive disadvantage: they are consumed in a static manner. Service Programming is one of the outcomes in future networks and solves the problem of static service consumption. It allows configuring the network dynamically so that network services can process customer traffic according to their necessities. Following network services can be placed universally in the network - the service programming application will find the best services according to the traffic characteristics. Hence, networks with integrated service programming become more intelligent, economic and are prepared for future needs.

Objective: This thesis is a follow-up thesis from the Service Chaining Path Calculation thesis written in the autumn term of 2020, which introduced a way to calculate service chains in a Segment Routing network. This bachelor thesis aimed at finding a solution that can help program so-called steering policies in the network to steer the traffic according to the needs of the customer networks over the most suitable services. In order to achieve this goal, the network protocol Segment Routing with the IPv6 data plane (SRv6) was used. The goal was to deliver an application that can calculate and program the best suitable path according to specified parameters from the customer. The application should react dynamically to changes in the connected network and deliver consistently the best policy that fits the altered topology. As a consequence, the user can always rely on the data on which he is working. Hence, the application always had to know the present network topology and has to be informed about network changes. An external system is used to get the actual topology data; the system aggregates and processes all the topology information, which can be used in so-called Segment Routing applications.

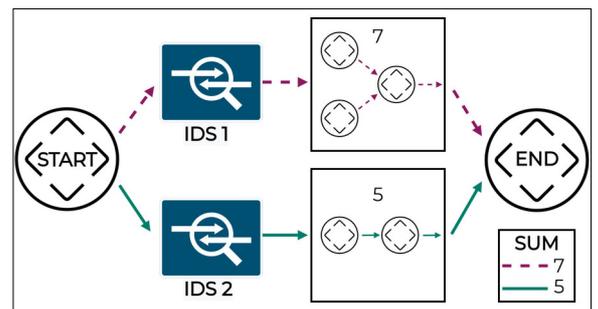
Conclusion: During the bachelor thesis, a complete Service Programming application could be developed. The application is developed entirely in a cloud-native way in order to be highly scalable and available. The application consists of different services, which communicate with each other over a dedicated messaging system. A polling service handles all the update messages from the topology and informs the

backend service automatically about changes. The backend service uses the topology data to perform path calculations, deploy policies to the underlying network, and deliver the topology data so that the frontend can easily visualize the network and paths. The frontend was developed in collaboration with the Institute for Networked Solutions and provides the customer an easy-to-use way to create and manage policies.

Service programming overview
Own presentation



Subpath calculation
Own presentation



Frontend graph result
Own presentation

