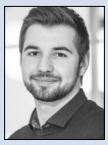
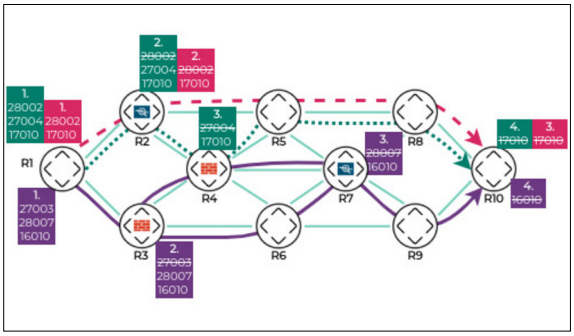
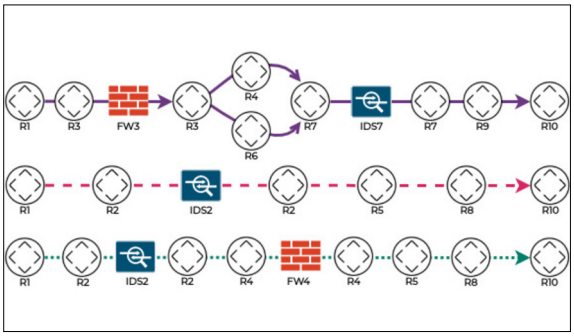

Severin Dellsperger


Julian Klaiber

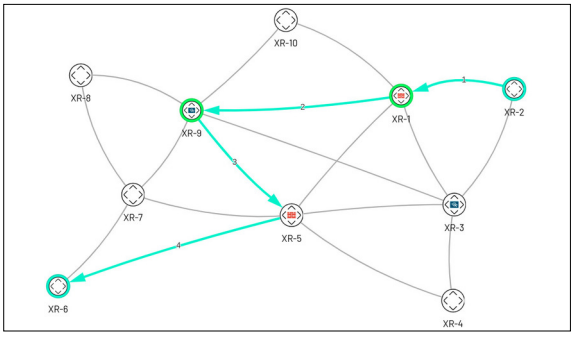
Service Chaining Path Calculation



Packets are steered through various paths and processed by different services on the basis of the required intent.
Own presentment



The best Service Chain is selected according to application requirements.
Own presentment



The total path is visible in the frontend application developed by the INS.
Own presentment

Initial Situation: Today's networks often use traditional routing protocols and approaches, which have their fundamentals often before the millennium turn. In recent years, the network area has not seen such rapid changes as in other sectors of IT. With the growth of the digital world and the introduction of new fields and technologies, such as 5G and cloud computing, the amount of data that today is sent over networks is enormous and will increase in the future. Modern networks not only have to deal with the new incredible number of data transfers, but in addition to this, they have also to face new challenges to satisfy customer needs. One of these requirements is the concatenation of network services, such as firewalls, IDS systems, DDoS protection, load balancers, and more similar services. This mechanism is known as service chaining and cannot be easily accomplished by conventional networks.

Objective: This thesis aims to find a solution, that can help to calculate and find the best service chain according to defined parameters. The whole solution is based on the Segment Routing protocol, which follows the source-based routing paradigm. The best path is the total path, which has the requested services included and has minimum costs. The goal is to deliver a result, that informs the Segment Routing Ingress PE, which network path a packet is steered through. An application should display information about the best path and about which specific service instances are in this path. This data of the Segment Routing network that is used for the calculation is aggregated in an external system called Jalapeno and provided by the industrial partner.

Approach / Technology: During this project thesis, a Service Chain Path Calculation software has be developed. The application consists of different microservices. The central part of the solution is a backend based on Python Django, which offers a standardized REST-API to perform calculations, handle the topology information, and more. One of the backend's crucial tasks is to maintain a graph representing the network with its nodes and edges. On this graph, the requested calculations are performed. This part of the application was optimized using a library that is written in C++ in its core. To ensure the correctness of the graph in the backend, a polling service written in Python was introduced to process the necessary network data and provide it to the backend. It uses a caching system to handle the volatile network items. In collaboration with the Institute for Networked Solutions, a modern and easy to use web frontend was developed, using the introduced API developed in this thesis. The user can view the topology, perform calculations, and view the results via the frontend.