As the software-defined networks developed along the years, different network components were developed by several communities. The primary component, SDN controllers were developed to provide control rules and centralised management commands for the network devices in the infrastructure layer, which further allows inter-working configurations between the interfaces. By means of this objective, several SDN controllers were developed. They might show similarities as well as differences in terms of functionality and development of their framework. Numerous challenges were faced by the early released versions of these SDN controllers. The goal was to study these different SDN controllers in terms of their development, functionality and managing capabilities of the underlying network devices.

Several applications were developed to assist the SDN controller for implementation network services. Along with this, different network components such as software switches, protocols utilised in the SDN infrastructure are available today. Therefore, the aim of this Master Thesis was to research and study these different components related to the software-defined networks in terms of their functionality with services.

**SDN-IP**

**Single-point to single-point intents**

These are uni-directional intents used to establish the BGP peering session between the external routers and the SDN BGP speakers. Each Intent connects two single attachment points in the SDN network. Each attachment point contains the following information: SDN switch DPID and switch port, and the MAC address of the attached BGP speaker/router.

**Multi-point to single-point intents**

These are uni-directional intents used to connect the hosts of the external networks together. Each intent is associated with an IP prefix (the IP destination) and connects the ingress attachment points of the SDN network with a single egress attachment point - the best next-hop router toward the destination IP prefix. At the ingress edge of the SDN network, an IP packet is matched on the IP destination address. The forwarding entry for the best (longest network prefix) match is selected to forward the packet toward the corresponding egress attachment point. In addition, right before the packet is forwarded, the “change destination MAC address” action is applied such that the data packet will contain the MAC address of the egress IP router toward the destination.