End-to-end SDN orchestration in optical multi-technology and multi-domain scenarios

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I. Extended Abstract

The STRAUSS project [1] proposes a future software defined optical Ethernet transport network architecture (Fig. 1), composed of four layers: A data plane layer to support Ethernet transport beyond 100 Gb/s, combining the high-capacity flexi-grid OCS and OPS systems; a transport network virtualization layer that virtualizes the heterogeneous data plane resources; a Virtual Infrastructure control plane, employing GMPLS and customized network control based on OpenFlow, that sits over each virtual transport infrastructure, providing independent control functionalities in order to handle both covered switching technologies (i.e., OPS and flexi-grid OCS) and, finally, a Service and network orchestration layer, using SDN-based orchestrator to enable the seamless interworking between the control planes for the automatic provisioning of end-to-end Ethernet transport services spanning the targeted multi-layer, multi-domain network.

Most of the solutions for SDN are based on single domain and mono vendor solutions. However, network operators usually have in place multiple technologies (provided by different vendors) in their networks and multiple domains to cope with administrative and regional organizations. A single SDN controller cannot configure the whole network of an operator for scalability and reliability issues. This is even more complicated when considering and architecture that should deal with OpenFlow and GMPLS domains at the same time.

The network orchestrator follows the Application-Based Network Operations (ABNO) architecture, which is being defined in IETF based on standard building blocks [2]. Fig. 2 presents the main four building blocks of the ABNO architecture. The ABNO Controller runs the workflows and it can to talk with the different blocks, while the PCE computes the paths between the different domains. The view of the PCE

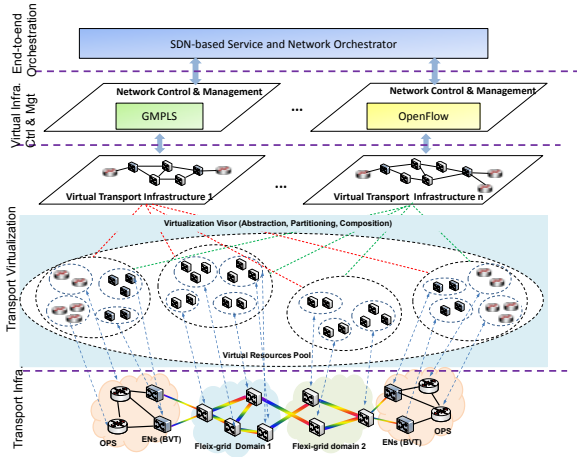

Fig. 1. STRAUSS network architecture

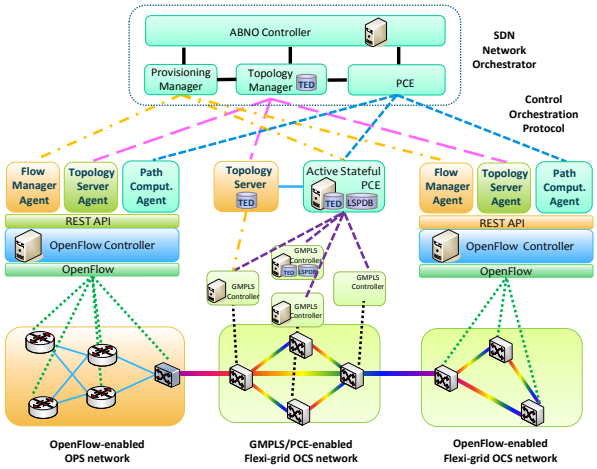

Fig. 2. Proposed SDN network orchestration for multiple domains with heterogenous transport and control planes technologies

can be the physical network or an abstracted network. Moreover, the PCE is able to talk with each of the PCEs in the domains to build an end-to-end path. The Topology Module is in charge of retrieving the information of the network status. Finally, the Provisioning Manager configures the network elements depending on the control plane technology that the device supports.

Regarding the relation between the controllers, a hierarchy of controllers is used, where there are multiple SDN controllers interacting with a SDN orchestrator hierarchically placed on top of them. The Control Orchestration Protocol (COP) abstracts a set of control plane functions used by an SDN Controller, allowing the interworking of heterogeneous control plane paradigms (i.e., OpenFlow, GMPLS/PCE). Each controller requires having a method to ask for connections and provide topological information. The users may not be able to request for paths to a SDN controller, but this functionality is required between controllers to enable end-to-end path optimization.

Acknowledgments

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References

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