Single Interface for Automated Inter-domain Path Provisioning

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New generation of services such as VoIP, VoD, triple play etc. require networking paradigms with strict QoS guarantees that cannot be provided by the current Internet. New age carrier grade transport technologies such as MPLS-TP and carrier Ethernet can facilitate the provisioning of these services on-demand with QoS guarantees, but their scope is currently limited to single administrative domains. In the current scenario, multi-domain service provisioning requires manual interaction coordinated among carriers by email or fax. The heterogeneity of control and management plane architectures used by different network providers in their administrated domains is the main reason for this complex and cumbersome setup procedure. In addition carriers like to exercise control over their domain. Today, the setup process of an end-to-end service, which spans more than one provider, lasts weeks or even months.

Providers could instead deploy both the control plane and the management plane architectures to provision a multi-domain service. The management plane approach has been traditionally preferred by network providers and operators and is widely adopted. Recently, standardized interfaces for communication between management entities inside the same domain have also been developed by the TMForum in their interface specification MTOSI [1]. However, no significant standardization activity has been undertaken for development of standardized inter-domain interfaces. On the other hand, significant standardization activities in the control plane realm have led to the development of standardized control planes such as GMPLS and ASON, and most notably, inter-domain interfaces for the control planes such as the E-NNI [2]. The adoption of the control plane however has been slow and limited to large providers, often due to the CAPEX involved in upgrading technologies to support a control plane.

On the other hand, the E-NNI implementation based on RSVP-TE supports many needed operations for inter-domain service management: Service setup, change, and teardown, negotiation of QoS parameters and setup of maintenance points for in-band OAM functions. So why should we define another inter-domain interface for management systems, when we could also use the E-NNI for inter-domain management?

For such an approach we identified in our Celtic subproject 100GET-E3 [3] the need for a proxy between the control plane (CP) and the management plane (MP) world. Figure 1 shows the proxy concept. This proxy's main tasks are the translation between control plane and management plane addresses and to translate between CP and MP configuration change commands.

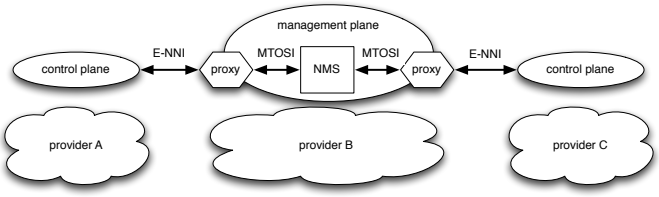

Fig. 1. Proxy between control plane and management plane

Concerning address translation we also face one big problem: For global scope inter-provider service realization we need also globally routable addresses inside the CP/E-NNI. As long as each provider runs its CP on its own, the used addresses in the CP do not matter, but if we want to interconnect the providers, we need unambiguous addresses. As a solution we suggest to use IPv6 addresses and deploy them in the same manner as in the Internet to make sure that no address is used twice. A fixed prefix for the use of IPv6 addresses in CPs would make it easy to distinguish between Internet-IPs and CP-IPs and to avoid routing of Internet traffic through CPs and vice versa.

The mapping between CP IP addresses and MP addresses has only to be done at the provider to which the address belongs to. So as often the MP addresses reflect the networks structure, with the mapping to IP addresses for inter-domain addressing, a provider can hide its internal network structure. The mapping could be done with a directory service like LDAP, which can easily be mapped to a management systems management information tree, gives fast and reliable answers, and is very scalable.

REFERENCES

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