

Quality of Service and Traffic Engineering in Consolidated Core and Metro Networks

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Abstract

The extraordinary success of the Internet and the introduction of new services such as VoIP have motivated the selection of a single packet network (IP) as the common core and metro architecture by service providers. The challenge for this consolidated network is to provide a predictable behavior of the network for the mixture of legacy and new services in order to fulfill the user's expectations. Complexity increases when it is required to extend the predictability of services across multiple service providers regardless of the different technologies and administration policies involved. In brief, the ultimate challenge is providing end to end quality of service in consolidated core networks.

The objective of the network consolidation project was to build a comprehensive understanding and assessment of network consolidation drivers, strategies and enabling technologies of this next generation architecture. In this context, this report discusses quality of service and traffic engineering implementation in service provider's networks and in the Internet backbone to achieve end to end predictable behavior. The approach followed was to exchange our views of the issues detected and possible solutions with network architects of different Canadian service providers in order to set a more realistic context of the problem.

The report starts by providing a context within network consolidation for quality of service in relation with the evolution of core and metro architectures. Next, an overview of what is quality of service is provided in terms of drivers, inhibitors and standard bodies approach to QoS. Then a generic QoS architecture is introduced to understand the interaction of the different mechanisms in each Integrated Services, Differentiated Services and MPLS. To enable the discussion these three technologies are analyzed in terms of their challenges, limitations, and evolution but most importantly in terms of how they complement each other and interoperate to build a comprehensive QoS model for the core network. For each technology, implementation examples in the context of service providers are given.

The discussion continues with an overview of MPLS traffic engineering for quality of service followed by a six steps approach for service providers to implement quality of service and traffic engineering in their core network with the combination of extended routing protocols, DiffServ, MPLS, and RSVP-TE.

Finally, the report presents an example of end to end QoS provisioning in a single service provider domain. Then, two possible high level solutions for achieving end to end QoS paths across multiple domains regardless of the different QoS technologies are presented. Interdomain traffic engineering issues are also discussed in the context of providing predictability in the backbone.