

Next Generation Service Control for Next Generation Networks

Dan Ionescu, Cristian Lambirl, Ibrahim Gedeon,
School of Information Technology and Engineering
University of Ottawa, Canada

Maike Miller: National Capital Institute of Telecommunications, Ottawa, Canada

It is no secret that the downturn in the global economy was triggered, in part, by the unfounded expectations set by many players in the communication industry. Consequently, the new services that were expected to revolutionize the world through the availability of high quality information, at any time, and any place, disappointed not only consumers due to their high price and limited utility but also a multitude of businesses who foresaw enhanced revenue opportunities well into the new millennium.

It is therefore, to be expected that we ask ourselves whether turning the present data communications network from a public information tool into a personalized one is indeed possible. Moreover, this in turn begs the question as to the price to pay for this transformation.

As it stands now the data communication network was largely engineered using empirical rules of thumb that have used very little of the knowledge accumulated during the design and operation of connection oriented communications networks. Despite the new networking paradigms focused on ensuring dependable and differentiated qualities of service, network design remains based on loosely coupled and analyzed protocols instead of the solid results obtained in the probabilistic theory of demand, capacity, and performance.

On the other hand, there is no doubt that this emerging communication network with its ability of conveying very high amounts of traffic also becomes the dominant means for launching new more pragmatic services. In doing so, rests the prospect of the telecommunication industry returning to profitability. Certainly, one aspect of this is witnessing the old telephony system

transition to a data network using the Voice-over-IP paradigm and the more frequent requests for applications of videoconferences and multimedia applications. Clearly, a data communications network in which connectivity and quality of the service are the key factors is the only infrastructure, which can support the above requests. Moreover, networks that ensure these features are considered in the design, implementation, and operation of many other new applications like tele-robotics and haptics.

In this paper we establish the principles for providing connectivity-based services in packet-oriented networks. It is shown that there are several major issues to consider, all of which demonstrate the critical nature of quality of service. It is also shown that a major indicator of the quality of service is the packet loss measure and that this packet loss parameter has to be controlled end-to-end. Furthermore, it is shown that to endow a network with quality of service one needs to consider two sides of the network control mechanism. On one side is the need to calculate properly the users end-to-end path ensuring no wasted resources. On the other side, there is a need to control the load of each node, i.e. the traffic produced by each source such that the network does not over commit its available resources.

The paper relates to the control of Next Generation Services in data communication networks with a real-world example of leading-edge technologies as used in high capacity Metropolitan Area Networks, where the Ethernet framework is extended to WAN frontiers and above. In this context, Transparent LAN Services (TLS) have to be dynamically defined, created, activated, supervised and controlled over Ethernet and WDM networks and mapped onto the IP world as well.

Results on introducing the above service control mechanisms on a production network, will highlight the inherent service control features related to TLS running over the NCIT*net a High Capacity Gigabit Ethernet and WDM network. The above results illustrate in a certain detail service control mechanisms like traffic admission control, real-time service provisioning,

bandwidth management, traffic engineering, and more.

The paper presents the effects of service control mechanisms on live multiple flows carrying VoIP and video data which then has to compete for the same network resources with a traffic generator capable of generating up to 100% bandwidth utilization.