DiffServ over MPLS

A method to guarantee the QoS in a IP network is the one based on introduction of some Class of Service (CoS) defined in the framework of the DiffServ over MPLS architecture that was implemented on the test bed. In a DiffServ network all the packets in each traffic flow are marked with a Diffserv Code Point (DSCP) consisting of six bits that allows us to distinguish 64 CoS's according to the RFC2474 and RFC2475 standards. Packets containing the same code point receive identical forwarding treatment by routers and switches placed along the path. The DiffServ technique is improved by MPLS since packet forwarding is treated similar to a circuit switching network by means of the Label Switched Path (LSP). In particular when an IP packet, labelled in a DiffServ approach, reaches an edge MPLS router a MPLS label is added to the packet and such label contains a field that allows to define CoS's with a correspondence about the DCSP field. In particular we use the experimental inferred Label Switched Path (E-LSP), that permits to distinguish 8 CoS's according to the value of the three bits contained in the EXP field. However, for our purposes, we considered only three CoS since we consider them as sufficient to represent the main service behaviour in a network. Our three CoS correspond to: a *Gold* one that is conform to very high performance traffic (for example real-time flows), a *Silver* one that is suitable for performance application like streaming video, fast downloading etc. and a *Bronze* one that is adapt for application that have not particular requirements in terms of bandwidth. In our DiffServ-MPLS architecture the Gold corresponds to the Expedited Forwarding (EF), the Silver to the Assured Forwarding (AF) and the Bronze to the Best Effort (BE). We remember that the EF Per Hop Behaviour (PHB) is suggested for applications that require a hard guarantee on the delay and jitter, in particular in a service with attributes similar to a "leased line". AF PHB is suggested for applications that require a better reliability than the Best-Effort.

The overloading traffic, labeled in various way and in agreement with the DiffServ architecture, is generated by the Gigabit Ethernet optical interfaces and the FastEthernet interfaces of the traffic generator, and it is addressed for saturating the link under test.

It has to be pointed out that in the AF class we can distinguish four subclasses, and within each subclass there are three different drop precedence. As a consequence CoS performance could be improved by optimizing the packet queue procedure in the routers. In fact, the capability of the routers to configure multiple forwarding classes gives the possibility to define the packets that are placed into a chosen output queue. To schedule the transmission service level for each queue we used WRR (Weighted Round Robin) algorithm and to manage congestion we used a Random Early Discard (RED) algorithm. Two parameters can be configured to control the congestion at the output stage. The first parameter defines the delay-buffer bandwidth, which provides packet buffer space to absorb burst traffic up to the specified duration of delay. Once the specified delay buffer becomes full, packet with 100 percent drop probability are dropped from the head of the buffer. The second parameter defines the drop probabilities across the range of delay-buffer occupancy, supporting RED process. Details on the performance of such subclassed can be found in test bed description reported in www.iscom.gov.it