

Maximising the Benefit of an MPLS Network

An Opteq Systems Technology Primer

MPLS Overview

Multi Protocol Label Switching (MPLS) originated from "Tag Switching" a proprietary Cisco development. The technology was originally developed as a mechanism to improve the performance of core Routers. Today those efficiencies gained in core router performance have been negated due to vastly improved hardware technology, however the benefits of MPLS as a service prevail.

Why do organisations elect to implement an MPLS wide area network? In ninety percent of cases it is down to one thing alone, **Quality of Service (QoS)**. MPLS enables the consolidation of applications onto a single network whilst providing the mechanism to prioritise the latency of individual applications within Application Classes. Organisations can optimise their wide area network usage based upon the types of applications communicating across it. The number of application classes varies upon the implementation offered by the service provider but is typically acknowledged as being 3. Each class has a different priority eg. high priority is for the traffic that requires the lowest latency such as VOIP, medium priority for business critical applications that are not so latency critical and low for those that are unclassified.

Organisations purchase an MPLS service as a base rental cost with supplements proportional to their specified bandwidth for each application class. In return the service provider will provide a performance SLA for each application class.

An MPLS service offers organisations that need to prioritise mission critical/time sensitive applications a measurable benefit over traditional leased line configurations in terms of performance. Traditionally the latency over the WAN is a combination of the distance and leased line speed. eg A 2 Mb/s leased line would be lower latency than a 1Mb/s leased line. With an MPLS based service although the purchased connection bandwidth could still be 2 Mb/s the actual latency for the highest class will be considerably less as the core network bandwidth and router speeds are much greater. If a latency level lower than a leased line is needed, then an MPLS service should be considered. However, for 99% of the cases, reduced latency is not the reason why an organisation selects MPLS. Rather, it is the ability to not increase existing latency levels on time sensitive and mission critical applications by guaranteeing each has sufficient bandwidth.

Given that most organisations select MPLS as a mechanism to avoid increased delays on critical applications across the WAN, the following areas must also be considered:

Application class saturation:

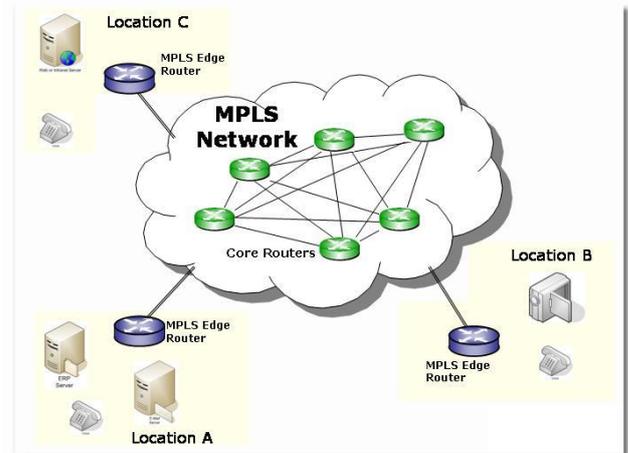
At purchase, an organisation will specify the class bandwidth allocation required for each class. If a bandwidth allocation is exceeded, then the latency guarantees offered by the MPLS service no longer apply. Buffers in the router fill, packets are moved into a lower class or are dropped. If this occurs, critical applications can become affected. Unfortunately there is no inherent mechanism within MPLS to dynamically re-define the bandwidth allocations or control which session, application, user etc. data packets are moved into a lower class or are dropped. To overcome this limitation, organisations often attempt to over specify their bandwidth requirement in the high priority classes. This approach still cannot cater for all eventualities and proves to be a costly waste of the connection pipe.

Application classification:

Organisations need to classify business critical and time sensitive applications into the high and medium priority classes. Correctly defining apps/users/systems etc. into the relevant classes is essential in order to obtain the highest benefits from the purchased service. This involves analysis of traffic patterns and the ability to accurately set the correct definitions. Just specifying voice/video traffic into a particular class is not always sufficient. For instance, if during a web based video conference another individual starts viewing a video cast from an external web server, disruption to the important conference call could well occur. The granularity offered in application classification within an MPLS edge router/cpe used in an MPLS service is limited. These routers are not designed to perform traffic analysis or extensive application/user classification and lack the granularity to correctly utilise the class prioritisations offered by MPLS.

Application latency guarantees:

In order for a router or a switch to perform QoS operations it inherently introduces latency. This is a fact. Both switches and routers queue incoming packets into memory buffers where packets are re-organised constantly based upon priorities. Every time a packet enters a queue, delay is imposed. At intersection points between disparate bandwidths as in the case of the MPLS router's WAN interface and the LAN a queue will form. Service providers offer latency guarantees over the core internal network however latency introduced within the customer's own premises are not part of this guarantee.



ExtendedMPLS – Increasing the benefits of MPLS

Avoiding application class saturation, accurately classifying traffic into appropriate classes and the avoidance of additional latency at the MPLS edge must be addressed in order to obtain a cost effective and reliable MPLS service that delivers on the business needs of an organisation.

Opteq Systems International is the only Network Application Management developer that can offer a solution which satisfies all of these requirements. The **Opteq iQ** solution appliance is a modular platform on which a complete portfolio of optional, performance enhancing and security applications can be run. Within the WAN optimisation application (**Bandwidth iQ**), Opteq have developed and incorporated an advanced new "**ExtendedMPLS**" capability.



Bandwidth iQ provides organisations with the ability to accelerate application performance over any network infrastructure. **Bandwidth iQ** incorporates **Realtime iQ** traffic analysis and monitoring software together with a sophisticated traffic shaping, control and optimisation capability. **ExtendedMPLS** technology, incorporated free of charge within the **Bandwidth iQ** application module offers extended functionality for MPLS networks.

Application class saturation avoidance:

ExtendedMPLS provides the unique ability to dynamically manage the bandwidth allocation of each of the MPLS application classes. An **Opteq iQ** unit with **Bandwidth iQ** enabled is installed between the MPLS edge router and the LAN network. This offloads the router of all packet classification decisions and continually monitors the MPLS application class utilisation and re-directs packets based upon administrator defined rules prior to bandwidth thresholds being exceeded. For example, when a high priority application class's bandwidth reaches saturation, further high priority traffic (in total or per user/application/session etc. dependent upon predefined rules) will be automatically re-classified into free capacity in the next available class. This avoids the inherent problem of increased latency at peak traffic points when an application class's pre-defined bandwidth limit is exceeded and discards, router queuing etc occurs.

Accurate application classification:

Traffic analysis and sophisticated application/user classification etc. are inherent functions contained within **Bandwidth iQ**. By installing the **Opteq iQ** appliance together with **Bandwidth iQ** between the MPLS edge router and the LAN an organisation can accurately monitor traffic usage and develop customised and much more granular application classification policies e.g. By Application, user, user group etc. The router makes no decisions on packet classification, rather the **Opteq iQ** appliance decides and instructs the router accordingly. Decisions are based upon pre-defined rules set by the administrator and offer the ability to classify traffic into an almost infinite number of sub classes within each MPLS application class. For example, if in the high priority application class VOIP traffic types are classified, then additional rules can prioritise individual VOIP sessions over others if desired. This whole process allows the router to operate more efficiently and provides an administrator with much greater intelligence and control.

End-to-End application latency control:

Queuing packets within memory buffers introduces latency. The most effective mechanism to remove queues from within the router is to make the in-bound (LAN) connection bandwidth the same size as the outbound. The "Host Pacing" technology within the **Bandwidth iQ** module will not only stop queues from forming, it will make the router operate more efficiently and remove queues from all of the network switches and routers for all protocols (including VOIP) for any communication session which passes through it. "Host Pacing" effectively extends the MPLS network across the LAN infrastructure to each host/device communicating across the MPLS service. This unique ability does not impact local LAN traffic, places no additional traffic onto the network and does not require any additional software on the hosts.

"MPLS in isolation provides just part of the promise of an application optimised WAN infrastructure. Now with the ExtendedMPLS capability of the Opteq iQ solution, an organisation can fully leverage the benefits of MPLS and implement a complete network infrastructure that recognises and delivers on the organisations needs."



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