WAVESTONE

THE CHANGING FACE OF GLOBAL DATA NETWORK TRAFFIC

AROUND THE TURN OF THE 21ST CENTURY, MPLS VERY RAPIDLY BECAME THE NETWORKING PROTOCOL OF CHOICE FOR LARGE NATIONAL AND INTERNATIONAL INSTITUTIONS. THIS INSIGHT LOOKS AT THE CHANGING FACE OF MPLS DEPLOYMENTS AND HOW THE IMPORTANCE OF TRAFFIC CATEGORISATION, AND SPECIFICALLY THE CHANGING NATURE OF THE DATA FLOWING ACROSS THESE NETWORKS, NEEDS TO BE MANAGED AND DISTRIBUTED EFFECTIVELY ACROSS AN ORGANISATION'S CLASS OF SERVICE SCHEME.

INSIGHTS

1 MPLS BACKGROUND

Multiprotocol Label Switching (MPLS) is a high-performance telecommunications networks mechanism that directs data from one network node to the next using short path labels rather than long network addresses, avoiding complex lookups in a routing table. The labels identify virtual links (paths) between distant nodes rather than endpoints. MPLS can encapsulate packets of various network protocols, and supports a range of access technologies.

MPLS operates at a layer that is generally considered to lie between traditional definitions of layer 2 (data link layer) and layer 3 (network layer).

2 TRAFFIC CLASSIFCATION MODEL DEVELOPMENTS

CoS (Class of Service) categorises network traffic according to various parameters (e.g. port number or protocol) into a number of traffic classes. Each resulting traffic class is treated differently to differentiate the service implied for the user. Three broad types of network traffic can be defined: Sensitive, Best-Effort, and Undesired.

- *Sensitive traffic is traffic the provider expects to deliver on time e.g. ERP (Enterprise Resource Planning) applications, voice, and video conferencing. Traffic management schemes are typically tailored so that the quality of service of these selected uses is guaranteed, or at least prioritized over other classes of traffic;*
- *Best effort traffic is all other kinds of non-detrimental traffic e.g. email applications, and web browsing. This is traffic that isn't sensitive to QoS (Quality of Service) metrics (jitter, packet loss, latency).*
- *Undesired traffic is generally limited to the delivery of spam and traffic created by worms, botnets, and other malicious attacks. In some networks, this definition can include such traffic as non-local voice (for example, Skype) or video streaming services to protect the market for the 'in-house' services of the same type*

More recently, some providers have extended the CoS model to 6 classes to address the growing trend of multiple application use by clients which includes:

- *increasing use of multiple ERP applications to support critical business processes;*
- *greater use of IP telephony and video streaming applications, with local area networks becoming more sophisticated; and*
- *QoS mechanisms being introduced in client networks.*

A 6 CoS model provides greater granularity in bandwidth prioritisation and partitioning. Mission critical applications can be prioritised into distinct prioritisation data classes allowing multiple applications to run simultaneously. In addition, multimedia applications can be run as well as voice, enabling a high level of convergence on a global platform. Changes to the network can be kept to a minimum to support the CoS model with end to end transparency ensuring configurations occur easily and swiftly across multiple sites.

However, while the 6 CoS model provides high flexibility and scalability, and enables organisations to easily burst between classes without the need for complicated configurations; the 6 CoS model has yet to become an industry-wide standard and may result in interoperability issues between network service providers. As a result, 3 CoS models are still often encountered in practice.

3 NETWORK TECHNOLOGY USAGE TRENDS

Initially, global network providers were constrained by the number of available POPs (Points Of Presence) serviced by MPLS, so additional locations not serviced by a POP, or located a long way away from a POP, were commonly connected to the corporate network via alternative means such as an Internet connection.

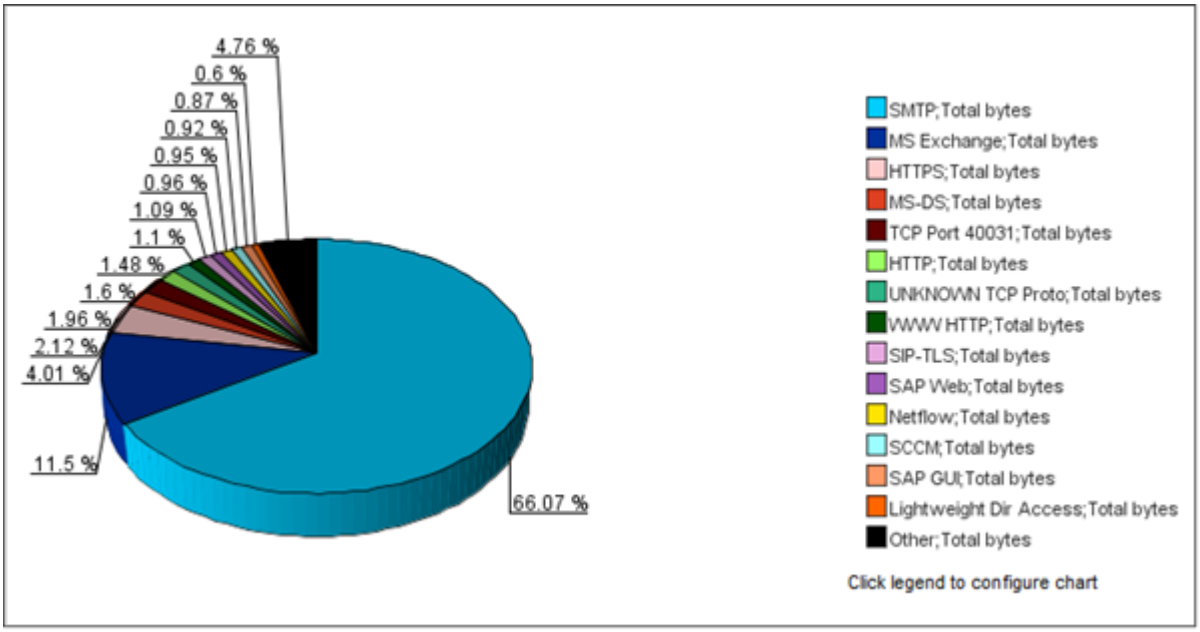
These early MPLS networks were primarily deployed to support corporate transactional traffic such as that generated by the ERP applications mentioned above. Remaining bandwidth was utilised to support email and some internet browsing, although their use was commonly restricted.

Overtime, the proportion of traffic generated by email and internet services has increased dramatically. In addition, new types of traffic were introduced into the network; such as VoIP (Voice over IP) services and videoconferencing, telepresence (immersive videoconferencing) and broadcast/ multicast content.

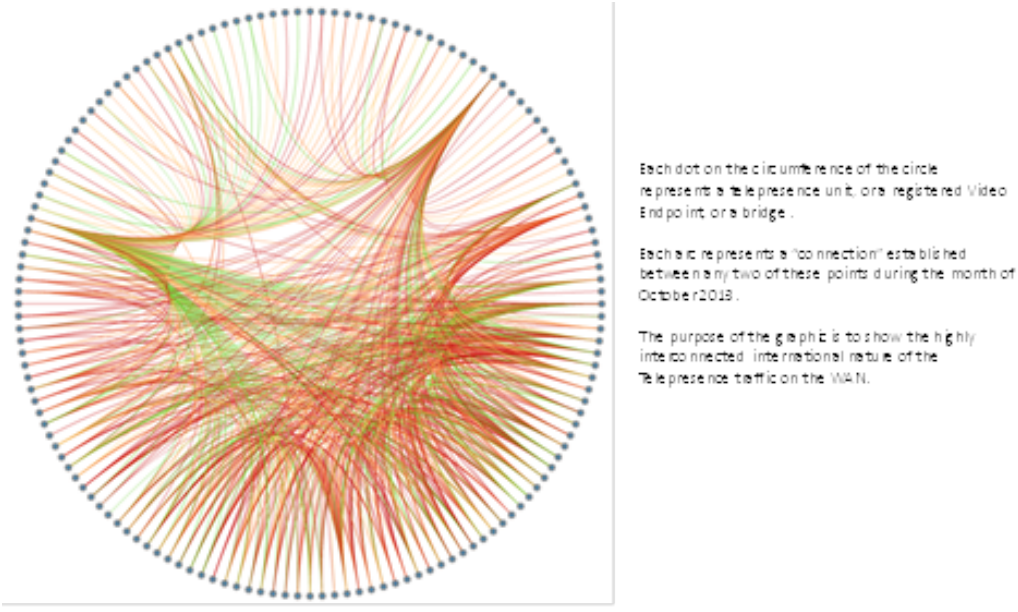
Figure 1 illustrates a typical traffic profile observed over a global MPLS network within a major multinational company, prior to its global rollout of unified communications.

This profile was derived from a data traffic analysis over a 24 hour period in November 2013:

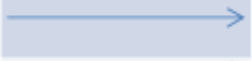
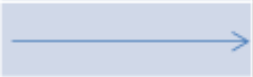
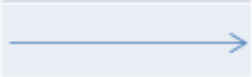
H.323 traffic supporting videoconferencing is captured under the Other label. Further analysis of the traffic flows showed that a very high proportion of the SMTP (Simple Mail Transfer Protocol) and Exchange data in Figure 1 (both types of email traffic) stayed within a region e.g. Europe or the Americas. Very little email traffic flowed between the regions. From this chart alone, it is possible to extract why there is so much SMTP traffic; which may be a function of the network design (e.g. whereby the Exchange servers are not co-located with the Internet gateways and external mail is being transported around MPLS rather than routed straight to the internet.



However, a very different traffic profile has evolved for telepresence and videoconferencing traffic which is much more highly interconnected and international in nature. The following figure illustrates this trend as observed over the same global MPLS network within the same major multinational company as before. Each dot on the circumference of the circle represents a telepresence unit, or a video end point or bridge:



The transformation of legacy videoconferencing and audio conferencing services onto MS Lync or Cisco OCS UC (Unified Communications) is expected to stimulate further growth, much of which shall be global, rather than intra-regional. These new data types are likely to be characterised as being both critical to the business and sensitive to changes in network performance, as illustrated in the following chart which uses a three level model of business criticality and network sensitivity.

Application	Business Criticality	Network Sensitivity	Growth Profile
UC Instant Msging	Medium	Low	
UC Voice	High	High	
UC Video	Medium	High	
UC Audio Conf	Medium	High	
Telepresence	Medium >> High	High	
VoIP / IPT	Medium >> High	High	

Over time, the providers' MPLS network capability has grown; both through reaching an increasingly large number of - in-country and global POPs. Organisations have sought to develop end to end MPLS networks over the extended services, and some sites previously connected using alternative technologies were migrated onto MPLS.

Wavestone has observed many client networks in which increasing traffic rates have been generated by greater use of existing and new services. In turn, this has resulted in demand for ever more bandwidth at each site. However, organisations have struggled to ensure that sufficient bandwidth is in place to address continually rising traffic levels, and have found the increasing associated costs to be a further cause for concern. Furthermore, forecasts indicate that with organisations embracing the global rollout of unified communications solutions and provisioning additional digital services, the need to increase the bandwidth capability will continue unabated … unless there is another way of delivering corporate data communications more cost effectively and efficiently. This concern has led organisations to start to question the "One Size Fits All" solution provided by a single MPLS network.

4 WHAT ARE THE ISSUES FACING END TO END MPLS NETWORKS?

- *MPLS networks are a premium service and as such not always the most cost efficient means of connecting sites – specifically in locations remote from the nearest MPLS POP in countries where the provider has only limited domestic infrastructure in place. These costs are not welcome when many ICT departments are operating under very stringent cost controls.*
- *Traffic growth patterns. As mentioned above, traffic volume has been advancing impressively year on year. However, as is recognised by the CoS model, not all data traffic has the same business criticality. Indeed, evidence taken from a recent traffic analysis exercise in Figure 1highlighted that 75% of network utilisation can be made up of SMTP or Exchange traffic; with additional usage associated with web browsing. However, this data is not business critical and could reasonably be transported away from the MPLS network.*
- *Future unified communications applications. This traffic is time sensitive, and viewed as business critical in a way that email and web browsing is not. It is expected to grow very rapidly in many organisations, as they pursue global rollouts of MS Lync or Cisco CMS solutions. This will demand greater investment in bandwidth in the main backbone network unless a means can be found whereby this new traffic could replace email and web browsing that is no longer routed over the MPLS network. Some organisations have identified offloading some of this non-business critical data and distributing it over the Internet by means of local Internet breakouts as just such a solution.*

5 INTERNET OFFLOAD

Internet offload is a mechanism whereby traffic is routed to the Internet via local breakouts rather than being directed over the organisation's backbone network. It is a technique typically best suited to non-business critical traffic e.g. email and web browsing.

6 CONCLUSION

There is little doubt that WAN traffic has evolved and that existing trends for increased data usage, different traffic profiles and greater globalisation of data can be expected. The following table looks to summarise the key conclusions that can be drawn from these trends:

Trend	Insight and recommendation
Truly global communications	An incredibly high degree of international connectivity has developed and evolved over the last 12 years enabled by any-to-any WAN topologies.
Telepresence and videoconferencing	Successful telepresence and videoconferencing projects lead to a dynamic global mesh of connections with high numbers of international telepresence segments initiated per month.
International connectivity will increase	As the rollout of global unified communications solutions progresses, further increases in international flows of network sensitive traffic are forecast. International connectivity is important now and will increase in importance in future.
SMTP explosion	The largest single traffic type is commonly email traffic (for example from the company's servers to the outside world). In some circumstances a large proportion of SMTP traffic may be generated by multifunction printer scanners sending very large scanned image files over the network. This is not network sensitive traffic and could be, where the server architecture can be arranged securely, a candidate for offloading to the public Internet.
MS Exchange email	Typically, the second largest traffic type is Microsoft Exchange traffic generated between Microsoft Outlook clients on WAN sites and consolidated Microsoft Exchange servers in data centres. Again this traffic is not 'network sensitive' and would be a good candidate for offload to the public Internet.
Internet browsing	The next largest traffic flow, on sites with no direct Internet connection of their own is Internet browsing traffic routing through secure Internet gateway nodes. Again, this is a traffic flow which is not network sensitive and destined for the public Internet so can be offloaded at site level.
Release existing capacity	Moving part of these large-volume traffic flows to the public Internet and off the private WAN could free significant WAN capacity and allow private network infrastructure, with essential CoS support, to be used for key business critical and network sensitive traffic flows that exist today or are expected to grow in the future, namely: ERP applications (mission critical), Telepresence (network sensitive), Voice (network sensitive), UC Video (network sensitive), UC Voice (network sensitive), and UC Audio Conferencing.
Prioritising and protecting traffic	Class of Service principles enable prioritisation of mission critical ERP traffic flows over the growing amount of traffic of lower importance. CoS and strong network engineering principles are fundamental to the prioritisation of highly sensitive traffic over an international WAN.
Real-time traffic needs CoS	When a large UC deployment is rolled out very close attention must be paid to the CoS support and network engineering needed to underpin the large amounts of network sensitive UC voice and UC video traffic that will be loaded onto the WAN. For example, SIP traffic flows are expected to increase enormously as UC voice and UC video roll out around the world.
The WAN is critical to business success	As the WAN becomes ever more critical to business success, resilience and disaster recovery become ever more important considerations.

Wavestone recommends that organisations undertake their own detailed network traffic analysis. The raw data can be provided by the incumbent network provider or indeed by the organisation itself where it has suitable installed devices and applications. The critical step is to then identify the appropriate conclusions from such traffic analysis and formulate a network traffic plan to address data growth, evolution and WAN offload requirements.

While many network traffic analyses will result in the re-engineering of the MPLS network to ensure it is optimised to the evolving business need and technical requirements, it is recommended that organisations remain aware that MPLS is never the only networking solution answer and should always be exploited as part of an updated overall WAN technology strategy.

ABOUT US

Wavestone is an international consultancy that provides connected thinking, insight and capability to industry leading organisations. We work collaboratively with our clients to plan strategic business transformation and seamlessly turn strategy into action.

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