Traffic warning

Robert Winters looks at the drivers behind Ethernet Service testing and the ways in which QoS can be maximised

Ethernet services are on the increase, with carriers deploying cost effective, high bandwidth services on a worldwide basis. Some Asian countries, such as Japan and Korea, are well ahead of the curve with low price 100Mbps fibre-to-the-home Ethernet 'best effort' services already on offer for about €30 per month.

However, there is also great emphasis on premium Ethernet products that offer differentiated quality of service (QoS) business packages that command higher prices in return for guaranteed performance and reliability. Europe and North America are catching up with greater focus, initially, on high value, high quality business-oriented Ethernet services.

Despite the ubiquity, high bandwidth and inherent cost advantages of Ethernet, there is still a requirement to effectively guarantee quality of service (QoS). The usual network-based Service Level Agreement (SLA) that offers throughput, latency guarantees is now being increasingly supplemented with IP QoS guarantees, as an array of delay sensitive value added applications such as video are offered.

For Ethernet service providers and the equipment vendors supplying them, competitive advantage can be much improved by offering a combination of traditional network service quality and IP QoS guarantees. However, this requires a more structured approach to testing in order to increase confidence levels in offering such guarantees.

Drivers for Ethernet Services testing

1. The move from best effort to 'Business Class' Broadband Ethernet Services

Fundamental to the whole issue of QoS testing is the underlying movement from best effort broadband services model to 'Business Class' premium service offerings. In order to distinguish between the SoHo/SME consumers – who will generally accept a best effort service – and the more demanding market segments covering large enterprise, financial services, healthcare and government etc, guaranteed service quality parameters are offered, including fixed bandwidth, latency and high priority throughput of traffic.

Coupled with the above differentiated services, new revenue models are being derived that include value added business applications such as Multicast Video, Voice over IP (VoIP), time sensitive web services guarantees, storage area networks etc. At the end of the day, it's all about end customer QoS experience and many of these applications are very sensitive to delays. It doesn't matter what the service level claims are, if a customer CEO has a Multicast Video session to fifty branch offices on a Friday afternoon and it is not up to scratch, there'll be trouble.

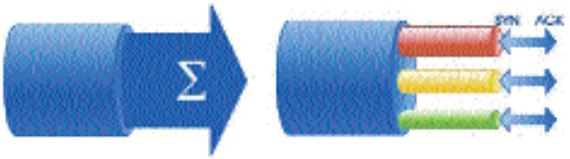
Therefore, along with traditional service level guarantees like latency and throughput, Ethernet service providers need to give themselves the best chance possible by determining any potential delay sensitive application IP QoS issues.

2. It is not just about packet blast testing anymore

During the late '90s telecom boom, building capacity into the network was key and test approaches tended to focus on packet blast methods to testing layer 2 services with stateless unidirectional packets. The approach was to fill the service pipe with varying size packets and measure throughput capabilities, latency etc, according to test standards such as RFC2544.

However, these days, pure layer 2 test methods need to be supplemented with end-to-end IP QoS testing that invokes what the real end user is expected to experience. Rather than the sum of the parts test view, it is more practical to emulate and analyse the performance of individual layer 2 services, their associated bandwidth and mixed priority settings. The IP flows that run over these services require verification too and fully stateful real applications that represent the most common internet mix, such as web, email, multicast, streaming etc.

For example, the knock on effects from dropped ▶



Unidirectional Packet blast test approach

Test individual end-end QoS with Layer 2 services varying bandwidth, priority settings and stateful IP layer traffic flow quality

packets at layer 2 can result in a large decrease in effective bandwidth caused by TCP retransmits. However, badly specified application servers can also cause TCP retransmits. The issue is how to test and effectively isolate the problem source.

3. Understanding service limitations – testing for QoS boundaries

Strictly speaking, Ethernet inherently offers Class of Service (CoS)-based service guarantees through VLAN 802.1 services with bandwidth and priority traffic settings, as opposed to specific QoS settings that are more prevalent for example, in the traditional (and expensive) ATM world. This is an important distinction that necessitates a view of what defines 'carrier grade Ethernet QoS'.

In order to guarantee carrier grade Ethernet QoS, providers need to be confident that each service, each user and each IP application flow using that service are thoroughly tested for quality. Therefore, a pragmatic approach to testing is required whereby corporate Ethernet service and application flow models can be quickly built, then emulated and analysed for quality issues throughout the network, under test with varying load and network status conditions. Using this test method, QoS boundaries can be realistically determined for both network services and application layers.

4. Convergence – Network or Application quality issues?

The overall trend for convergence of telecom and IT departments in large enterprise is blurring the distinction between pure network layer testing requirements for Ethernet services and the quality issues of applications utilising those services.

Ethernet service providers need a structured test environment, not only for pre-turn up and provisioning test but also for post-deployment capacity planning and trouble shooting test purposes.

For example, if a trouble ticket is generated from a large enterprise customer that necessitates an on site visit, then problems need to be narrowed down very quickly as the time and money clock is ticking for both parties.

Despite the Ethernet service provider opportunity to offer sophisticated value add applications, the downside is that poorly configured application servers can have a serious network layer side effect. Most of these servers are out of the control of the service provider and can lead to them being unfairly blamed for certain problems such as decreased bandwidth.

An integrated and pragmatic test approach is required that first determines whether the network is the issue and, if not, can then effectively prove whether the applications feeding into the network are at fault.

Test systems need to provide assessment capabilities as to whether dropped bandwidth is caused by packet loss on a layer 2 Ethernet Switch or caused by a high level of TCP retransmits due to a poorly configured web applications server.

In this instance, it is important to be able to decouple the application servers and instead emulate IP flows using a test approach that analyses whether the network is at fault. If not, the test system should then be turned on the actual application servers themselves and potential quality issues identified.

Customer expectations

High speed Ethernet services testing demands are intensifying as quality of service (QoS) guarantees reach a greater level of sophistication. End customer expectations are heightened, with the introduction of an array of delay sensitive value added applications such as video and VoIP. In order to improve competitive advantage, the traditional SLA is being supplemented with IP QoS guarantees. Therefore, Ethernet service providers also need to understand their overall QoS boundaries in a converged network and application environment within which premium level business class services can be guaranteed. Post deployment, trouble-shooting needs to quickly determine whether an Ethernet service issue is causing a problem or whether the applications using the service are at fault. Having an integrated network and application test approach provides the necessary test environment to meet these requirements. ■

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