Overcoming the challenges of video-over-IP transport

BY BENGT HELLSTROM

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Telecommunications is shifting towards IP-based solutions and many operators are consolidating their infrastructure towards packet-centric networks. As reliable SDH-type of connections will be more difficult to obtain or will be priced at a high level, IP/Ethernet transport is also becoming a more widespread way of carrying media services.

The operational benefits of transporting all traffic over a common IP/MPLS network can be large. However, for media services it is critical to select an IP transport solution that delivers the required quality of service and manageability with a minimum of complexity so that the overall operational savings will not disappear.

QoS challenges

In IP networks, packets are transported using resources (such as communication links and buffer space in switches and routers) that are statistically shared with traffic from other sources through the network, giving a flexible utilisation of the network resources. However, as the resources are shared, it is quite difficult to guarantee the transport.

One solution is then to apply over provisioning of bandwidth, that is, high-priority media traffic is only allowed to occupy a certain percentage of the total IP/Ethernet bandwidth. However, over-provisioning is normally a very costly way of addressing the issue, since a substantial cost of a network is the optical infrastructure and low utilisation means that more fibres/wavelengths and more ports are needed.

Another common approach to the quality of service (QoS) issue is to apply forward error correction (FEC) as defined, for example, in the SMPTE 2022 standard. By adding checksums per column and/or per row in a matrix of transmitted IP packets, lost packets may be recovered by the receiver to a certain extent. The FEC checksums will add significant overhead to the bit stream though, and the network still has to be engineered to an acceptable packet-loss level for the FEC to deliver the required quality for media services.

Net Insight's Nimbra solution

For years, Net Insight's Nimbra platform has been the preferred choice of telecom operators and broadcasters to provide flexible transport of media services with guaranteed 100% QoS in optical networks. Upon request from these network operators and to meet the increasing demand for IP transport, the Nimbra platform was further developed to also carry media services in an IP environment with guaranteed quality and carrier-class network management features.

The channelisation of bandwidth successfully employed for Nimbra SDH and PDH trunk interfaces has also been applied to IP trunk interfaces. Whereas in traditional IP networking all traffic is sent over a single large pipe and services are treated and routed in order of priority, Net Insight's channelised IP trunk interface strictly reserves the bandwidth needed for a certain service, with any mix and any size of channels allowed.

As the same channelisation technology is used regardless of the type of trunk interface, the Nimbra platform enables a unified media transport solution over any network infrastructure. Services, either unicast or multicast, can be provisioned seamlessly end-to-end across a mix of IP/Ethernet/SDH/PDH/WDM networks. In case of network failures, services will be automatically rerouted or protection-switched across infrastructure boundaries. Performance monitoring is available both per service end-to-end as well as per link to support SLA validation and fast fault location.

The traditional approach to video-over-IP transport is to put network adapters at the edge of the IP network and then rely on IP/MPLS routers do deliver sufficient quality. In larger networks, this has proven to be unsuccessful in many cases. With Net Insight's solution, Nimbra switches are placed not only at the edge but also at strategic locations within the IP cloud. This provides several benefits both in terms of QoS and network control. Effectively, a synchronous overlay for QoS-demanding services is implemented on top of the IP/MPLS network, with the same deterministic and well-known QoS properties as in SDH/SONET networks but with IP as bearer.

Each intermediate Nimbra node will recover the clock signal and regenerate the traffic in the TDM domain. By deploying Nimbra switches within the IP cloud, there will be less packet hops between Nimbra regeneration points, and the probability of packet loss therefore significantly reduced. The IP trunk interface implements best-in-breed clock generation for lowest jitter and wander. For lower-quality IP links, it is also possible to use an external clock reference for traffic regeneration.

Together with a set of network design guidelines for the IP network connections, the unique QoS characteristics of Net Insight's video-over-IP solution will enable operations to guarantee highest-grade SLAs for their end-customers.

Operator deployments

Several major operators in Europe, Asia and North America have deployed Net Insight's IP trunk solution. In Asia the solution was initially deployed by telcos in Hong Kong, Singapore and India. Typically, IP trunking has been implemented in the last-mile access network between the operator core site/PoP and customer premises, while the core media network for interconnection of cities is still SDH-based in many cases. APB

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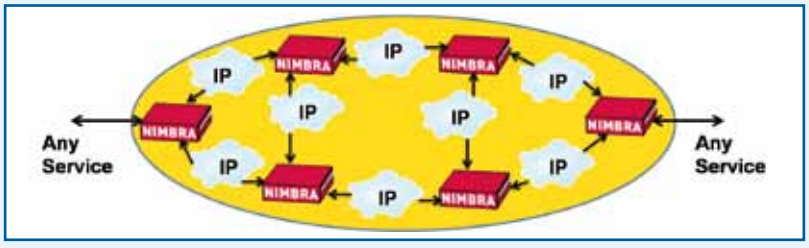
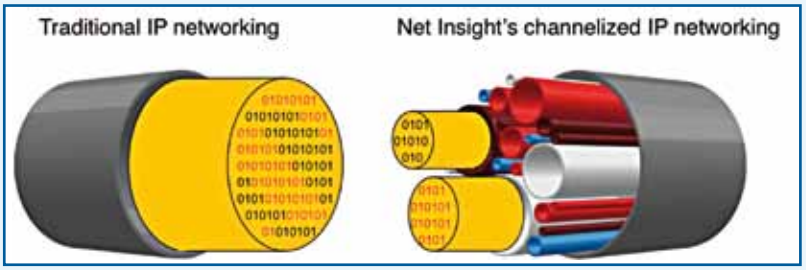


Net Insight's switched IP network provides a unique QoS solution and allows the operator to reclaim traffic control.



Net Insight's channelised IP trunk interface allows strict reservation of bandwidth for media services.