

# Transmode Switched Video Transport: New transport network features enable cost effective video distribution

Transmode’s Switched Video Transport Solution is built on Transmode’s Native Packet Optical architecture, including the TM-Series Ethernet Muxponder (EMXP) family. With the Switched Video Transport Solution, Transmode has extended the functionality of the EMXP to address a specific issue that some cable TV operators are facing in their networks.

As these operators migrate from Standard Definition TV to High Definition and 3D TV, the traffic within the network increases considerably, often by a factor of 10, while revenues do not. These companies are looking for methods to optimize their distribution of video traffic so that they can better manage their network and add new services and revenue. Transmode offers unique capabilities in the transport network that can help cable TV operators meet these goals.

## Technology Background

IP multicast enables the efficient transfer of data from a set of sources to a dynamically created set of receivers. Typical multicast enabled applications include Internet TV/radio, online games, and webinars.

In these applications, IP packets are normally sent as unicast packets, from one source to one destination. When multiple receivers require the same data, replicating the data from the source to all receivers increases the network load, resulting in network congestion and loss of quality. Multicast provides the more efficient communication required.

## IGMPv3

The Internet Group Management Protocol (IGMP) is a communications protocol used by hosts and adjacent routers on IP networks to establish multicast group memberships.

IGMP is an integral part of the IP multicast specification. IGMP can be used for online streaming video and gaming, and allows more efficient use of resources when supporting these types of applications.

IGMP is used between the client computer and a local multicast router. Switches featuring IGMP snooping derive useful information by observing these IGMP transactions. IGMP operates above the network layer, though it does not actually act as a transport protocol.

There are three versions of IGMP, as defined by the Internet Engineering Task Force (IETF). IGMPv1 is defined by RFC 1112, IGMPv2 is defined by RFC 2236 and IGMPv3 was initially defined by RFC 3376 but has since been superseded by RFC 4604. IGMPv2 improves over IGMPv1 by adding the ability for a host to signal desire to leave a multicast group. IGMPv3 improves over IGMPv2 mainly by adding the ability to listen to multicast originating from a set of source IP addresses only.

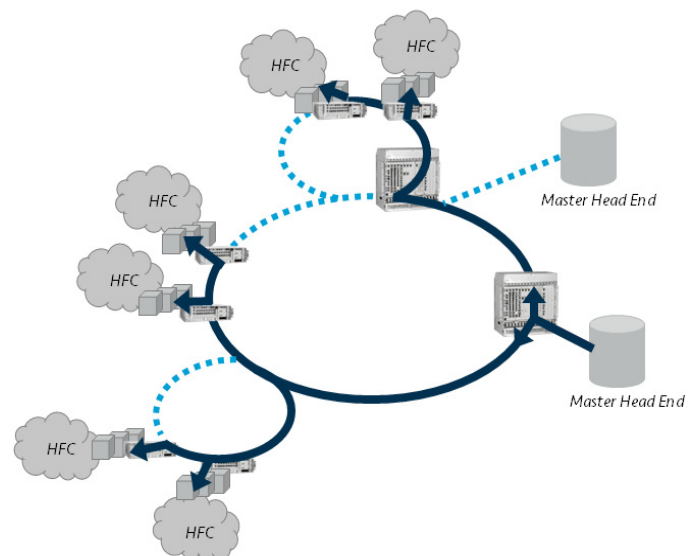


Figure 1 – A typical multicast distribution network for video distribution

## Source Specific Multicast

Source-Specific Multicast (SSM) is a method of delivering to a receiver, only those multicast packets originating from a specific source address that they have requested. By limiting the source, SSM reduces demands on the network and improves security. SSM requires that the receiver specify the source address, which is possible only in IGMPv3.

Source-Specific Multicast is best understood in contrast to any-source multicast (ASM). In the ASM service model a receiver expresses interest in traffic being sent to a multicast address. In the SSM service model, the receiver also expresses interest in receiving traffic from only one specific source sending to that multicast address.

SSM relieves the network of discovering many multicast sources and reduces the amount of multicast routing information that the network must maintain.

SSM is a necessity in broadcast style applications because of its advantages over the ASM model. The ability to provide Internet broadcast services through SSM without the need for unique IP multicast addresses allows content providers to easily offer the service. IP multicast address allocation is problematic for content providers and there are no good solutions to the problem in the ASM model.

The prevention of attacks is an important factor for Internet broadcast services because, with their exposure to a large number of receivers, they are the most common targets for such attacks. ASM does not prevent unwanted sources from easily disturbing the actual Internet broadcast source by simply sending traffic to the same multicast group. On the other hand SSM insures better security by only delivering packets to the specific source address.

SSM requires support in last-hop routers and in the receiver. SSM support is not required in other network components, including routers and even the sending host. Interest in multicast traffic from a specific source is conveyed from hosts to routers using IGMPv3 as specified for SSM (RFC4607).

The ease of installation and operation of SSM makes it ideal for network operators, especially in those cases where content needs to be forwarded between multiple independent domains. SSM does not require the network to maintain information about which active sources are sending to multicast groups.

## IGMP Snooping

IGMP snooping is the process of listening to IGMP network traffic. IGMP snooping is a feature that allows a network switch to listen in on the IGMP conversation between hosts and routers. By listening to these conversations the switch maintains a map of which links need which IP multicast streams.

Devices supporting IP Snooping learn the ports on which the routers are reachable and the ports on which the hosts are reachable. When a report is received on a port, it is forwarded on the port attached to the router. The report is not forwarded on the other ports containing hosts since this could cause the other hosts to suppress their report generation for the multicast group.

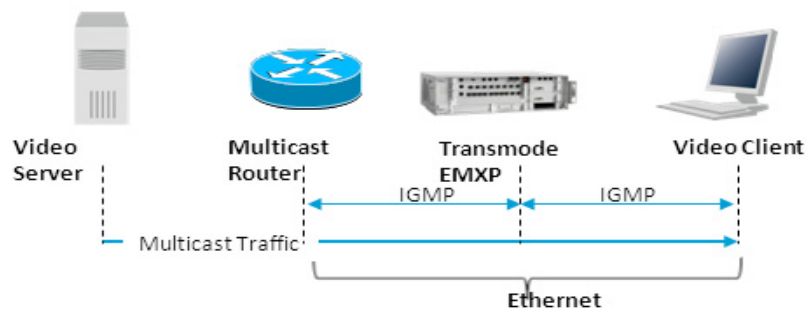


Figure 2 - A typical video distribution network includes these components. Multicast traffic is sent from the video server using UDP/RTP messages. IGMP messages are passed between the local router and video clients.

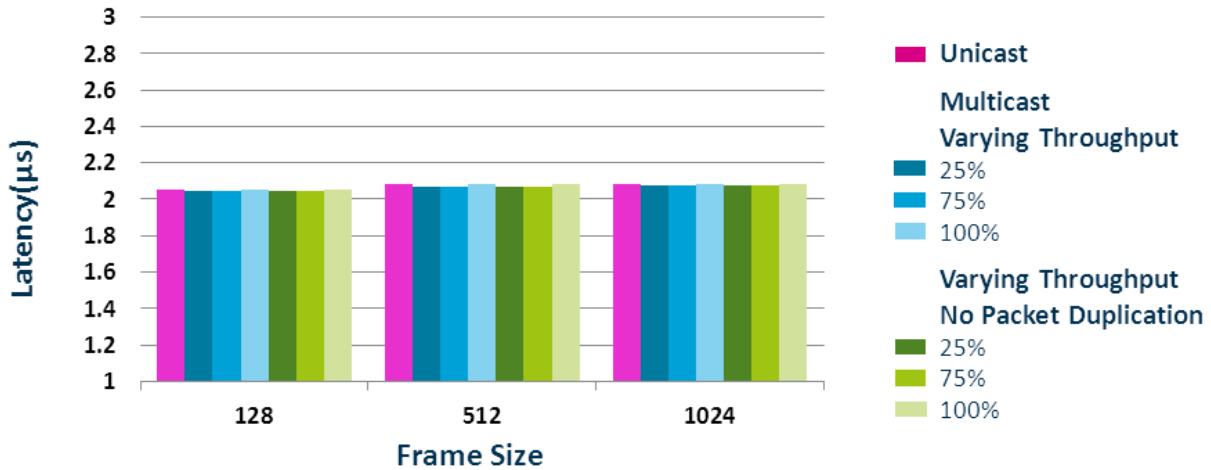


Figure 3 – Switched Video Transport provides stable, ultra low latency at varying throughput levels and levels of packet replication

### Switched Video Transport

Transmode’s Switched Video Transport Solution is built on the Transmode Native Packet Optical architecture and Transport Ethernet capabilities. Transport Ethernet enables the integration of Layer 1 WDM transport and Layer 2 Ethernet into the Ethernet Muxponder (EMXP). This approach combines the aspects of Carrier Ethernet associated with demarcation, aggregation and transport with WDM transport. It is focused on the transport of Ethernet within backhaul networks and is a key element of Transmode’s Native Packet Optical architecture

With Transport Ethernet, Transmode does not try to address the full functionality of Carrier Ethernet, such as complex any port to any port switching across the chassis via a centralized switch. Therefore, the solution is able to provide very cost effective Ethernet demarcation, aggregation, switching and transport and can also excel at certain functions that are very important in transport networks. For video distribution networks, Switched Video Transport can provide stable, ultra low latency for services such as video distribution, financial services and mobile backhaul.

Switched Video Transport moves the EMXP another step, from a Layer 1 and Layer 2 device into one with Layer 3 visibility. As shown in Figure 3, the EMXP uses SSM and IGMP snooping to listen to Layer3 flows, determine what actions to take and to then perform a Layer 2 switch. This enables the traffic to be optimized as required, but also maintains the “transport performance” that was desired for video traffic.

Transmode’s EMXP uses the latest available Ethernet switching modules with an architecture that is highly suitable for video distribution applications. This architecture provides tangible benefits to customers such as 100% throughput and very low latency at any throughput level.

The implementation on the EMXP supports full IGMPv3 and IP snooping. Alternative approaches to Switched Video Transport would involve deployment of expensive routing solutions to rollout IGMPv3 and SSM to all nodes or to forego IGMP and accept significantly higher traffic levels with the associated higher cost.

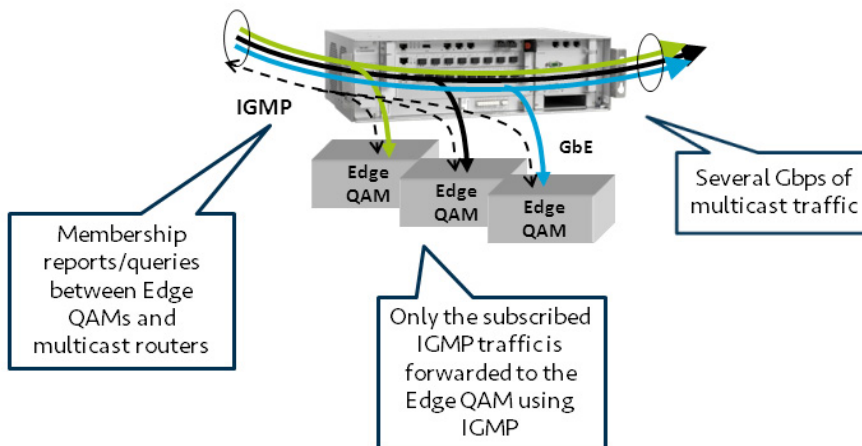


Figure 4 – Switched Video Transport using the EMXP

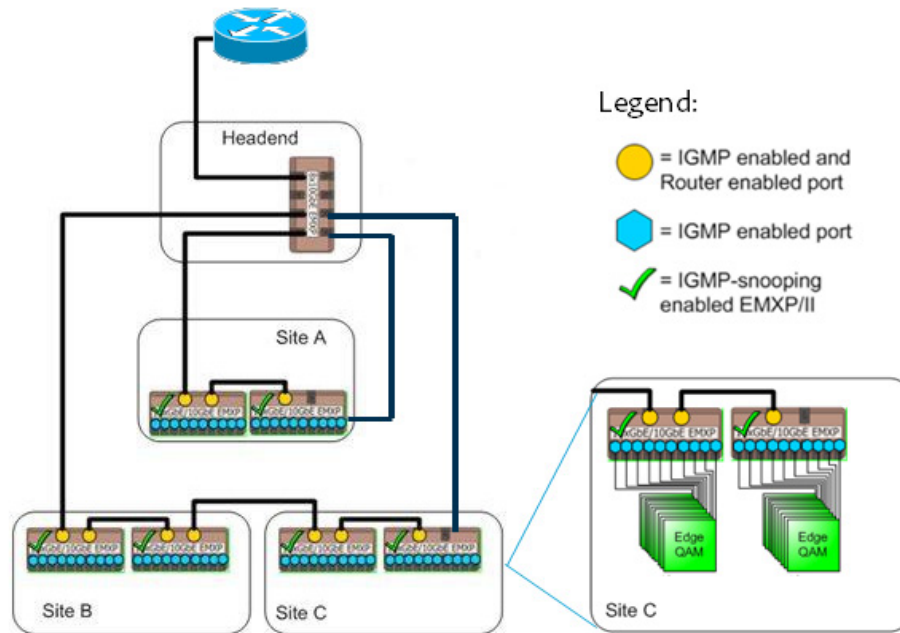


Figure 5- Sample E-Tree configuration

## Supported Configurations

Switched Video Transport can support a number of network architectures, including E-Line, E-tree and E-LAN service architectures. Figure 5 shows an EMXP80 in the headend configured to provide an E-Tree service.

## Transmode's Switched Video Transport Solution Benefits

- **Cost-effectively scale video distribution networks:** Cable TV operators can cost effectively grow and optimize multi-cast traffic as they move from Standard Definition TV to 3D and High Definition TV.
- **Common transport platform:** Optimized Multi-cast traffic, Unicast traffic (either via Layer 1 WDM or via standard Layer 2 Ethernet), wholesale services such as mobile backhaul and broadband backhaul are supported, all at the per wavelength level over the same infrastructure and under the same management platform.
- **Performance:** Switched Video Transport is ideal for video distribution with industry leading latency and jitter performance. The TM-Series Ethernet Muxponders have near zero jitter, and less than 2 microseconds latency, which is far better than a router based solution. The TM-Series 2.5G and 10G Multi-rate Transponders provide only 4 to 10 nanoseconds latency per Transponder pair.
- **Highly simplified network operation:** The operator simply enables the feature in the necessary nodes and it will listen to IGMP traffic and optimize the network

accordingly without any complex procedures. IP functionality is being brought into a transport platform that is typically managed by a transport team within the operator without the typical complexity required for IP networks.

- **Local insertion of traffic:** In countries where multiple languages are used and some regions require additional local language channels, these can be added locally without the need for distribution across the whole network.

## Conclusion

Transmode's Switched Video Transport solution helps cable TV operators overcome video distribution challenges. Operators can deliver new services demanded by their customers by more effectively using their transport network investment. The video distribution function is integrated into the transport network, eliminating more complex management and higher expenses. This application is another example of the power of Transmode's Native Packet Optical architecture.

### For further reading:

For more information regarding Transmode's Switched Video Transport solution and Native Packet Optical architecture please take a look at:

- Switched Video Transport Solution Brief
- Native Packet Optical Whitepaper

The specifications and information within this document are subject to change without further notice. All statements, information and recommendations are believed to be accurate but are presented without warranty of any kind. Contact Transmode for more details.

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