Application Note

>> D-5008

Ethernet Transport Solutions

Introduction

High-bandwidth applications in both business and residential markets are creating tremendous data demands in carriers' networks. Especially the access and metro parts of the networks have to scope with it. To ensure ubiquitous delivery of services across legacy technologies and modern services, carriers are choosing Ethernet as the preferred data-link protocol. Almost all data equipment in the network generates Ethernet frames, regardless of the service or content that has to be carried in higher layers. To maintain speed and simplicity, it is far easier to use one data protocol from the network core to the customer premise, removing the need for data conversion.

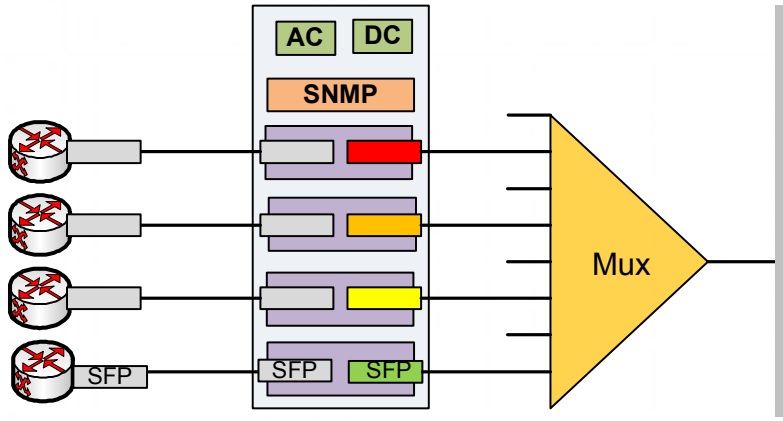
Ethernet in the access and metro network presents a compelling case to both end users, enterprise customers and service providers. It is a scalable and cost-effective technology, optimized to support high-bandwidth applications, including LAN extension, virtual private networks (VPNs), Voice-over-Internet Protocol (VoIP), multicasting, remote storage and distributed work sharing.

However, as prices on service deliveries such as Ethernet connections for enterprise customers are under high pressure and are constantly driven down further, the CAPEX and OPEX for transporting Ethernet is the key factor for every carrier. So the need for lowest cost Ethernet backhaul and transport is evident. On the other hand legacy services (e.g. SDH) have to be maintained.

Solution

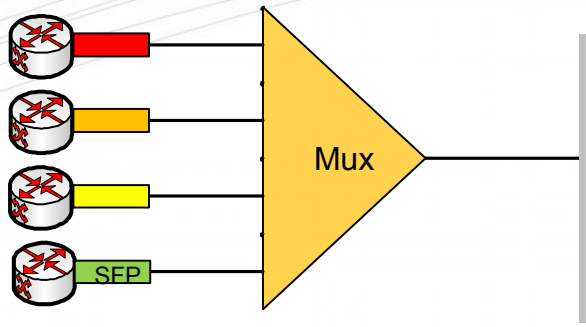
Traditional and costly means of Ethernet solutions are based on so called active transport systems. Here signal generation (e.g. Ethernet Switch) and signal transport is physically separated on two equipments. The Ethernet signal will then be send via a local (client) transceiver to the transport system. This then has the same counterpart of transceiver to communicate locally to the Switch.

The transport system is then based on transponder cards hosting the local (client) transceivers from which the Ethernet signal will be O-E-O (Optic-Electronic-Optic) concerted to line side transceivers. If more than one line signal is generated the line side transceiver signals are then multiplexed via an Optical CWDM or DWDM mux to the transport fiber. Since transponder cards and transceivers need to be hosted and powered a costly chassis with redundant power supplies is necessary. As this active equipment may not be operated "blind" monitoring and control through a Management Software (e.g. SNMP) addressing the elements via an integrated Management Card becomes inevitable.



Active Transport System: A chassis, powered by redundant DC or AC power supplies hosts transponder cards. Those then feature client and line side transceivers (SFP) so a local signal is O-E-O converted e.g. to CWDM and then muxed to the transport fiber. Control is provided over SNMP management card.

A much simpler and therefore, inherently CAPEX and OPEX saving form of transport is to do this passive. Here signal generation and signal transport is done with the same equipment, e.g. an Ethernet Switch. Since signal conversion by itself does not add any benefits but only tremendous costs, risk of failure and in the best case only maintains the signal quality (but does not approve it) it is avoided. So instead of using local transceivers and converting their signals in a rather complicated manner via transponder cards to the line transceivers, the line transceivers are directly plugged into the terminal equipment (e.g. the Ethernet Switch). Doing so makes everything but the line transceivers and the passive optical multiplexers obsolete and is therefore, taken out.



Passive Transport: Here a separated transport system is avoided by using the line side „coloured" transceivers (SFP) directly in the Terminal equipment and muxing them via a passive optical multiplexer to the transport fiber

It is evident that this mean of transport not only saves >50% of CAPEX by eliminating mandatory parts (chassis, power supplies, transponder cards etc.) but that savings on the OPEX side are even bigger: No software (SNMP management) needs to be integrated, operated, maintained and updated, much fewer electronic parts exponentially increase MTBF (Meantime Between Failure) numbers reducing down times and costly maintenances and support services. Least but not least , today's OPEX factor number – Electric power consumption – can be reduced by easily >50%,. First of all as there is no extra transport system to power, second since there is no extra heat generated which then needs to be extracted costly air-conditioning.

Since there is no extra monitoring of the transport system, the remaining active parts (the "colored" line side transceivers) are managed via existing monitoring (e.g. SNMP) in the terminal equipment. The passive Muxes, inherently without electric circuits, remain un-monitored like in most active transport solutions anyway. They are in the same manner monitored as the passive ODFs, connectors, patch cables, transport fibers or any other passive element in the network – in an indirect manner.

Summary

Passive WDM Solutions not only provide the lowest cost option for providing Ethernet Services but also proofed a much higher relieability than the active counterparts. The passive WDM systems are indirectly monitored via the Ethernet Terminal equipment (e.g. Switch) without loosing network management options. In contrast the absences of additional software reduces OPEX as well as the lower maintenance efforts needed. Last but not least, a passive WDM solution drastically reduces energy consumption as it needs no additional active parts but most of all since it makes air-conditioning obsolete.

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