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Passive Transport Solutions

Introduction

Thanks to bandwidth hungry devices and applications for private and business customers data traffic in metro networks is still exploding. Whether the metro network is used to backhaul mobile data (UMTS, 3G, LTE etc), residential broadband connections (FTTx, xDSL, Active Ethernet etc), connecting data centers, transporting enterprise customer's traffic or a mixture of all, the bottleneck in the metro core network is an increasing challenge for the operator. Regardless of data rate and protocol the transport of this data over "typical" metro distances, which can be some kilometers in some areas to hundreds in others, can be done by either an Active or a Passive Transport solution.
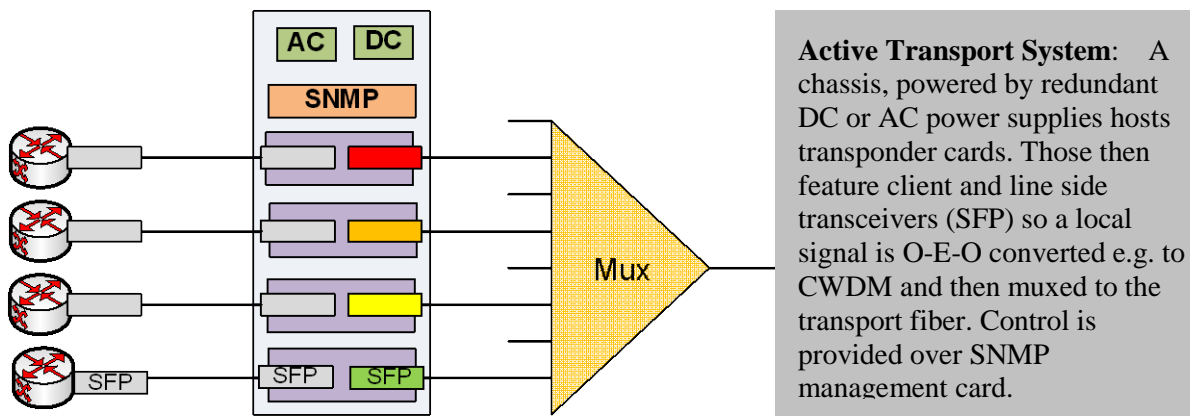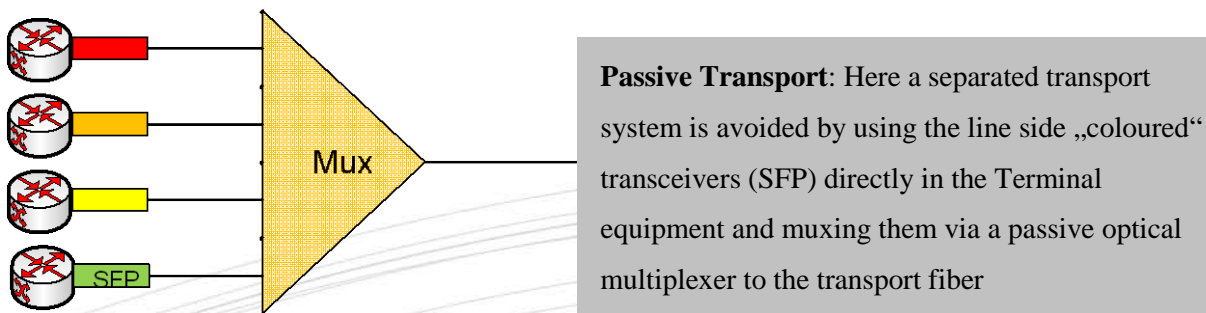
Active Transport Systems

The "classic" but higher cost means of transport solutions are based on active transport systems. Here the signal generation (e.g. Ethernet Switch or DSLAM) and signal transport is physically separated on two platforms. The data signal will then be send via a local (client) transceiver to the transport system. This then has the same counterpart of transceiver (in terms of protocol, data rate and media type) to communicate locally to the terminal equipment.

The transport system is based on transponder cards hosting the local (client) transceivers from which the data 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.

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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.

Passive Transport Systems

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 within 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 transport equipment 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. Last but not least, 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 cooling through air-conditioning can be largely reduced.

As 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

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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.

Apart from CAPEX and OPEX savings aspects a Passive Transport Solution inherently also reduces latency times in the network and will provide a better network performance than the active counteparts.

Summary

Passive WDM Solutions not only provide the lowest cost option for data transport but also proofed a much higher reliability than the active counterparts. The passive WDM systems are indirectly monitored via the Ethernet Terminal equipment (e.g. Switch) without losing network management options. In contrast the absence of additional software reduces OPEX as well as lower maintenance efforts are 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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