transmode

White paper

Business Challenges for the MSO

With continued deregulation across the globe and the introduction of triple play services from traditional telco's and ISPs, MSO operators are seeing increasing competition in their core markets but also increased opportunities in the broader residential and business markets.

Cable TV penetration varies widely across the globe and this leads to a variety of market dynamics. In some countries cable TV penetration is very high leading to a strong market position for MSOs. In other countries penetration is lower but in those with large enough overall markets this can still lead to very strong MSOs. As examples some countries have cable TV penetration of approximately 70 to 90%+, for example Belgium, the Netherlands, Switzerland and Canada. Therefore in these countries the MSOs are in a very strong position to expand capacity and services to cover the spectrum of triple play services.

Towards the other end of the Cable TV penetration figures are France, United Kingdom and Spain. However, due to the size of the markets within these countries MSOs are still a very dominant force in these markets.

Of course the USA in the middle of the table also has a very strong MSO sector due to the size of the market.

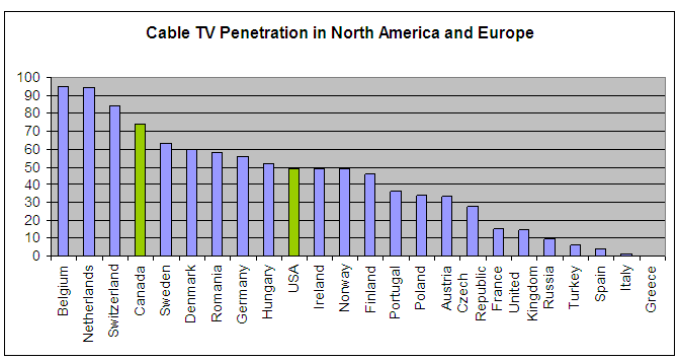

Figure 1: North American and European Cable TV penetration. Source: Screen Digest/Cable Europe Yearbook

This differing level of penetration leads to differing strategies to address the migration towards triple play, which we will return to later in this paper.

This paper will discuss the market advantages of MSOs and the business challenges they must address moving forward. The paper will look at the explosion in 2nd mile bandwidth and requirements to revamp the 2nd mile to support economic and flexible capacity growth whilst also considering the possibility of additional revenue generating services.

MSO Advantages

MSOs have many distinct advantages over other alternative carriers entering the triple play market. Firstly broadcast TV and to some extent Video on Demand are well known and understood within the MSO environment. Not only does the technology exist to deliver this content, but also the MSO has existing contracts for content and the business relationships to economically manage these. These are major but not insurmountable hurdles for telecoms operators and ISPs looking to expand into IPTV and Video on Demand triple play services. A good example of a successful DSL based triple play operator who has built the necessary relationships etc is Fastweb in Italy. Fastweb is widely held as one of the leading triple play over DSL operators in Europe. However, as shown in figure 1, cable TV penetration is very low in Italy and therefore there is little competition from MSOs and an unfulfilled market for Video on Demand services that Fastweb has addressed. Other countries with strong Cable TV industries appear to fulfil this initial demand via the MSOs although traditional telecoms operators are also now pushing Triple play services.

On the technical front, cable access appears to offer further advantages over copper based DSL access utilised by telcos and ISPs. The latest cable access standard DOCSIS 3.0 extends the potential capacity per user to well over 100 Mbps, which greatly exceeds the capacity available from current DSL over copper technologies. Current DOCSIS 2.0 based networks currently support similar capacity levels to the currently deployed DSL technologies with most networks of either type offering somewhere between 8 and 20 Mbps for premium services. But cable enjoys a big advantage over a 20 Mbps DSL competitor because the data rates drop off rapidly over ADSL2+ and VDSL beyond a 9,000 foot (approximately 2.7 km) loop distance. Therefore cable technology has the potential to offer these services to a wider range of customers. To address this competitive threat some incumbent operators are now considering fibre to the home (FTTH) or fibre to the curb (FTTC) solutions, at considerable cost.

Typical Cable TV network infrastructure:

Cable TV networks are typically architected in a branch manner: Super Head Ends feed Regional Head Ends, these Regional Head Ends feed Hubs and these connections are typically delivered over optical long haul and metro Wavelength Division Multiplexing (WDM) systems, shown as the Transport Network in figure 2.

Hubs in turn feed Nodes which in turn feed Distribution Points which in turn feed Homes. Typically the CMTS (Cable Modem Termination System) are placed at Hubs and Hybrid Fibre Coax (HFC) networks connect the Hubs to Nodes, Distribution Points and then Homes over the 1st Mile Access Network in figure 2.

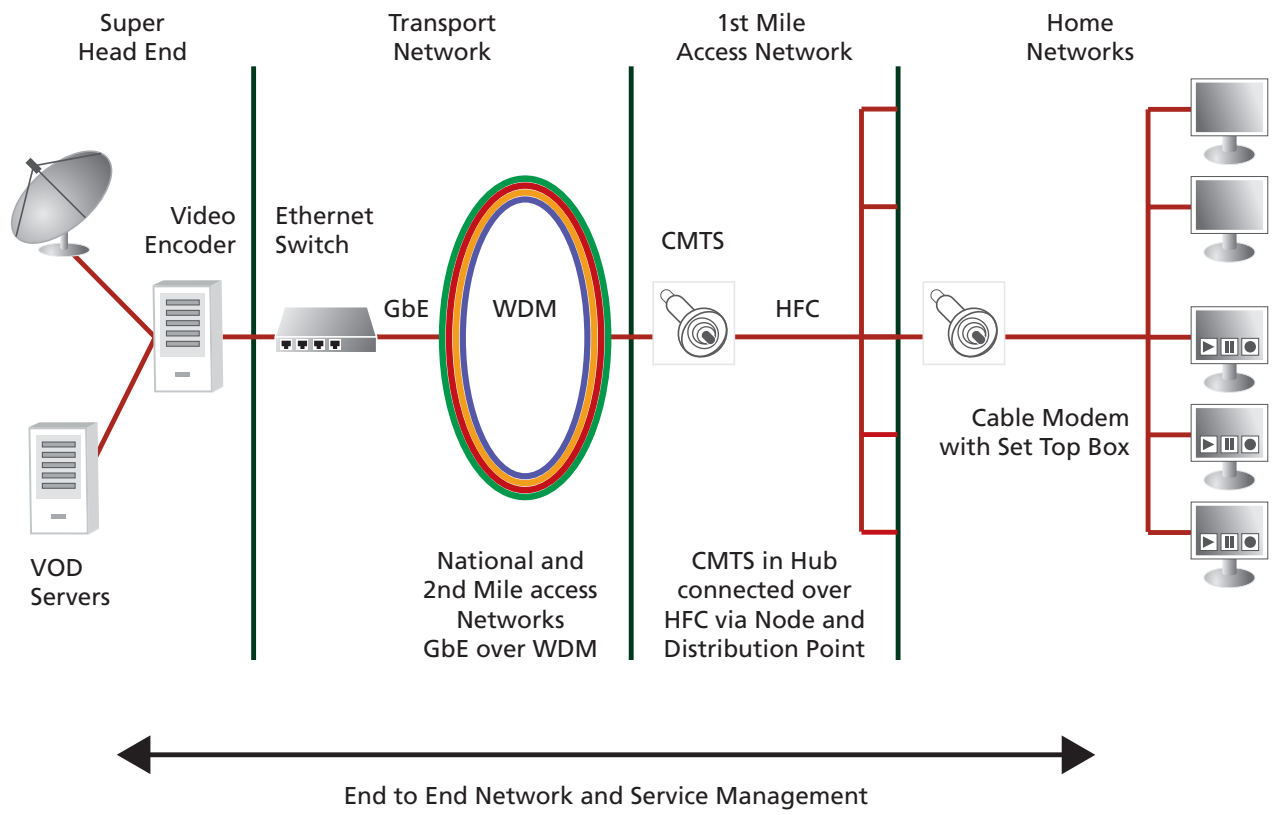

Figure 2: Simplified Cable TV network

The Bandwidth Explosion

As previously mentioned, the migration to DOCSIS 3.0 and Euro-DOCSIS 3.0 in Europe offers substantial increases in the available capacity per user. For example UPC announced the first field trial of EuroDOCSIS 3.0 in September 2007, where they had deployed 120 Mbps to customers on the existing COAX network in Amsterdam. Virgin Media in the UK, is also testing high capacity "wideband" services to some customers in Kent in the UK using four channel bonding to achieve 200 Mbps to the service area and up to 50 Mbps per subscriber.

In the US, numerous Cable MSOs are trialling or deploying DOCSIS 3.0 services. For example MSOs such as Comcast, Time Warner Cable, Videotron, Rogers, and Cox now provide DOCSIS 3.0 based services with up to 50 Mbps to the user.

This explosion in capacity in the first mile leads to an interesting dilemma in the optical transport network. This network can be segmented into 2 distinct areas; Super Head End to Regional Head End traffic and Super/Regional Head End to Hub traffic. As a new service is added, a new video to the Video-on-Demand library, a new channel to the TV service etc only one copy of this is required from the Super Head End to the Regional Head End. However as the rollout of triple play services and Video-on-Demand in particular increases the volume of traffic from the Super/Regional Head End increases rapidly as multiple copies of the service are downloaded by individual customers. Therefore whilst all parts of the optical backhaul network see rapid capacity growth, the metro 2nd Mile network can see substantially greater growth and can quickly become the new bottleneck in the network.

Revamping the 2nd Mile

To address this potential new bottleneck in the cable TV network, MSOs are reconsidering their 2nd mile networks in addition to their core transport networks. MSOs are taking advantage of the latest WDM technology to provide low cost and scaleable Gigabit Ethernet (GbE) over WDM networks.

Depending on the exact service requirements of the 2nd mile, the MSO will need to network flexibility as strong requirement for economic growth. Before we consider all the aspects of flexibility let us first consider some of the additional business opportunities for the MSO and the impact these may have on network flexibility and design.

Business Opportunities for the MSO

As discussed earlier cable TV penetration varies considerably across Europe and the globe. Local Loop Unbundling (LLU) not only presents the MSO with a competitive threat but also in some regions with lower cable TV penetration it provides the opportunity to expand off-net capabilities. This leads the MSO to consider a number of alternatives for metro network expansion; build out to LLU for their own use and also the opportunity to offer wholesale GbE services to other operators.

Both these scenarios add further capacity requirements to both the metro and the regional networks as well as further architecture decisions for the optical network design.

Furthermore as MSOs continue to expand network infrastructure some will consider expansion into business services for enterprises, including small to medium sized enterprises situated on smaller business parks closer to residential areas that may be below the radar of the alternative carriers that are focused entirely on the business market.

These scenarios lead the MSO to consider the network infrastructure as a true multi-service infrastructure. All MSOs will have differing competitive environments, financing and business plans and regulatory environment. This will impact which, if any, of these additional business opportunities to address and this in turn has an impact on network design and flexibility.

Network Flexibility

As the MSO revamps the second mile there are a number of aspects of "flexibility" to consider. Overall flexibility implies the ability to change to the network with minimal incremental cost. However, from a network architecture point of view, this flexibility can be broken down further. Firstly the MSO must consider service flexibility. The WDM platform chosen as the underlying optical layer must support a broad range of service types and service architectures. Whilst the majority of today's DSL or Triple Play traffic is Gigabit Ethernet, the MSO must consider TDM aggregation for efficiency, 10G Ethernet LAN and WAN PHY services, legacy services and possibly additional future services. As mentioned above, the MSO may wish to capitalise on their extensive residential access network to offer LLU backhaul services to alternative carriers. This leads to the issue of Ethernet service demarcation. This could be addressed through additional network elements or via layer 2 aware optical solutions, a further aspect of service flexibility. See Transmode's Ethernet Demarcation white paper for further details.

Secondly, the MSO should consider geographic flexibility. Naturally any operator will initially build its network in the areas that offer the highest return on investment with the lowest capital outlay. Typically for MSOs this is in areas with the highest density of their target audience and generally the areas of highest population density. As the network expands into secondary regions with lower population density, the optical platform must adapt to still offer the best economics over larger distances or with lower capacity per node. This can be addressed through the use of a variety of optical architectures – distributed OEO regeneration, single fibre working etc to push the unamplified envelope as much as possible to maintain lowest cost and maximum flexibility. Should amplification become unavoidable then the solution should provide a range of metro optimised EDFA and Raman Amplifiers.

Finally, the MSO must consider optical flexibility. The most obvious aspect of optical flexibility is bandwidth on demand via Reconfigurable Optical Add Drop Multiplexer (ROADM) technology. This allows any operator to remotely provide bandwidth on demand for any application. Metro ROADMs are optimised for the metro network and add great value in creating a "future-proof Add/Drop node".

Transmode's Solutions for MSOs

Transmode has considerable experience supporting MSOs in Europe and North America including a number of the biggest European MSOs. Transmode's solutions have been deployed in a wide number of network scenarios ranging from core networks to collector rings and 2nd Mile CMTS backhaul networks and even street cabinet applications.

These networks are primarily Gigabit Ethernet networks and Transmode's strengths in Ethernet over Optical Networking are well established. As a leader in Metro and Regional optical networking Transmode's portfolio is highly suited to the challenges faced by MSOs. At a high level, the challenges faced by MSOs in the optical arena are very similar to those faced by most other carriers, namely to economically and flexibly scale their networks for the migration to Ethernet over optical networking, whilst maintaining support for legacy protocols where necessary. However, the MSO does face some additional challenges unique to the industry, as described above.

The Transmode portfolio comprises of:

- TS-Series – provides MSOs with the easiest WDM system in the market to design, install and operate, ideal for smaller or 2nd Mile networks.
- TM-Series – provides the MSOs with the widest range of functionality for any metro/regional WDM system in the market. The TM-Series is thus an ideal platform for the MSO who requires a wide range of solutions from core to 2nd mile access, from CMTS backhaul to business and wholesale Ethernet services.
- TG-Series – a family of passive WDM components ideally suited for street cabinet or man-hole applications with either passive optical networks or to extend TS-Series or TM-Series networks closer to the customer premise.

Benefits of particular interest in the Cable TV industry are:

- Layer 2 awareness – Transmode's Layer-2 aware Ethernet Muxponders (EMXP) and Ethernet Demarcation Units (EDU) allow MSOs to economically add additional services to their portfolios. The EDU enables the MSO to offer business Ethernet services and wholesale Ethernet services without the need for additional third party demarcation devices or customer premise Ethernet switches and the EMXP allows cost efficient Ethernet aggregation
- Broadcast GbE – Triple play traffic comprises of a large proportion of broadcast/multicast IPTV/Cable TV traffic that is often uneconomically delivered over multiple unicast optical wavelengths. The TM-Series allows MSOs to deliver broadcast GbE signals to all nodes around a 2nd Mile optical ring over a single wavelength thereby providing lower cost transport for this portion of the service bundle.
- Broad Ethernet support – Transmode support a very wide range of Ethernet Transport options – GbE, 10 GbE WAN PHY, 10 GbE LAN PHY and TDM multiplexing to give 2x, 4x or 9x GbE over 2.5G, 4G or 10G wavelengths. This provides the MSO with a broad range of options for applications such as CMTS backhaul (2x or 9x GbE) and Core/Regional switch to switch backbone traffic (10 GbE WAN/LAN PHY).
- Broad network architecture support – The Transmode portfolio has been deployed in MSO networks in a wide range of architectures – rings, rings with street cabinet add/drop sites, point to point core links and bus networks. These include amplified and unamplified networks. Unamplified CWDM

and DWDM networks is a particular strength of Transmode's where the unamplified single fibre DWDM architecture pushes the envelope and reduces cost where other platforms would have to migrate to amplified solutions.

- Dynamic networking – Transmode's ROADM is optimised for flexibility within metro networks and allows MSOs to future-proof add/drop nodes and dynamically change network bandwidth.
- Passive WDM solutions – The TG-Series allows the MSO to extend their WDM closer to the end customer, for example to street cabinets, thereby reducing the distance to the customer and increasing the available capacity per user.

Conclusions

The current changes in the converged telecommunications and media industries present MSOs with significant opportunities and challenges. Transmode to date has enjoyed considerable success in the MSO sector with a large number of MSO customers, including a number of the largest MSOs in Europe and others across the globe. This is due to the highly adaptable Transmode portfolio which addresses the challenges faced by MSOs in a very economic and flexible manner.

MSO migration to higher bandwidth DOCSIS 3.0 services creates a new network bottleneck in the second mile and Transmode is uniquely positioned to assist MSOs with removing this bottleneck whilst also supporting the potential rollout of new services to business and wholesale Ethernet customers.

For further details on Transmode please visit www.transmode.com or contact your sales representative and we would be happy to show you how Transmode can address the challenges MSOs face.

Abbreviations
CMTS – Cable Modem Termination System
CWDM – Core Wavelength Division Multiplexing
DWDM – Dense Wavelength Division Multiplexing
EDFA – Erbium Doped Fiber Amplifier
EDU – Ethernet Demarcation Unit
FTTC – Fibre to the curb
FTTH – Fibre to the home
GbE – Gigabit Ethernet
HFC – Hybrid Fibre Coax
ISP – Internet Service provider
LAN – Local area network
LLU – Local Loop Unbundling
MSO – Multiple System Operator
NID – Network Interface Device
PHY – Physical (Layer 1) specification for Ethernet
ROADM – Optical Add Drop Multiplexer
SLA – Service level agreements
TDM – Time Division Multiplexing
VOD – Video On Demand
WAN – Wide Area Network
WDM – Wavelength Division Multiplexing