

# Transmode iWDM-PON: Flexible, Open Standards Based Approach

WDM-PON is emerging as a preferred long-term solution for scalable, high capacity access networks. The only way that service providers will be able to cost effectively scale to meet bandwidth requirements needed today and in the future will be to use fiber, passive plant, and the dedication of a wavelength per customer. The passive infrastructure will be required to achieve the OpEx cost efficiencies required, and to provide an easy means to achieve the high scalability, security, symmetrical bandwidth, and centralized architecture that will be needed.

Transmode's iWDM-PON solution provides an open, standards-based approach that also helps operators avoid stranding assets and embrace future standards, while retaining the flexibility to expand the solution to include more cell site backhaul and ultimately FTTH as WDM-PON technology progresses further down the cost curve.

The Transmode's Approach	
<i>Operational Simplicity</i>	<ul style="list-style-type: none"> <li>Optical transparency from access to the core reduces the need to terminate a wavelength</li> <li>Self tuning SFP eliminates manual setup</li> <li>DWDM grid end-to-end throughout the metro eliminates the need to coordinate and spare for both CWDM and DWDM channels</li> <li>Mix active and passive components</li> </ul>
<i>Open Platform</i>	<ul style="list-style-type: none"> <li>No proprietary barriers that the service provider must overcome</li> <li>Fully standards-compliant solution</li> <li>Leverages the standard ITU WDM grid and SFP interfaces</li> </ul>
<i>Investment Protection</i>	<ul style="list-style-type: none"> <li>Same WDM platform deployed in existing metro WDM and mobile backhaul solutions, providing investment protection, and additional opportunities for new iWDM-PON customers</li> <li>Compatible with installed base of third party metro DWDM equipment</li> </ul>
<i>Cost Effectiveness</i>	<ul style="list-style-type: none"> <li>Cost effective WDM-PON architecture optimized for enterprise and mobile backhaul requirements</li> <li>Extensible to encompass other solutions such as FTTH</li> </ul>
<i>Differentiated Capabilities</i>	<ul style="list-style-type: none"> <li>Dedicated, bi-directional and symmetrical bandwidth per subscriber.</li> <li>Bandwidth can be tailored and upgraded per subscriber from FE and GbE to 10G or more.</li> </ul>
<i>Flexibility</i>	<ul style="list-style-type: none"> <li>Flexibility to operators, since they can combine the use of passive and active optics on the same platform to meet a variety of distance requirements.</li> </ul>
<i>Solutions Synergies</i>	<ul style="list-style-type: none"> <li>Compatible with the existing Transmode solutions providing a passive aggregation and access, for example, mobile backhaul.</li> <li>Leverages the same Transmode management system.</li> </ul>

Table 1: Transmode's iWDM-PON design philosophy

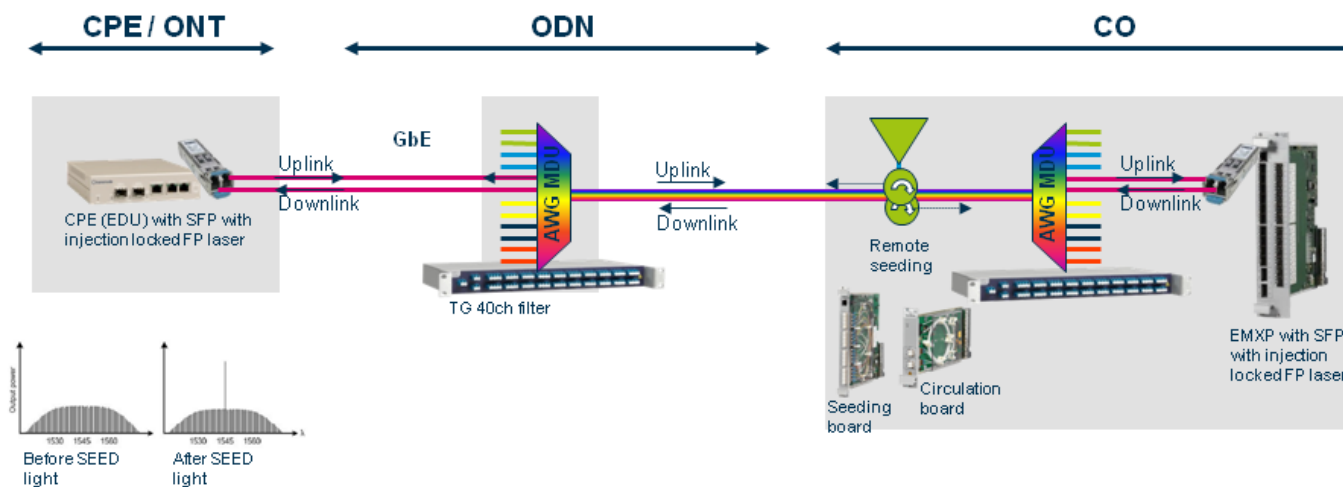


Figure 1 - The seeding board installed in the TM-Series broadcasts a broadband light source. A TG-Series filter(either 40 or 8 channel) forwards a single wavelength to the SFP, which locks on the correct frequency.

## The Transmode iWDM-PON Solution

Transmode currently delivers passive CWDM and DWDM based FTTx, and deploys this technology in mass volume. Transmode’s iWDM-PON solution leverages this experience and provides an open, flexible, standards-based approach and full optical transparency from access to the core. Transmode’s iWDM-PON solution can be provided on the TM-Series, and TG-Series using a of low cost SFP/XFPs.

Table 1 highlights the Transmode iWDM-PON philosophy, which combines simplicity, value, flexibility, and investment protection for service providers that need a cost effective means to start enjoying the benefits of WDM-PON now. Transmode iWDM-PON also provides an effective migration path to greater deployment in the future.

Transmode’s approach to its iWDM-PON solution is straightforward, cost effective, and designed to stand the test of time. By leveraging the C band DWDM grid in the access network, another 10 km of distance is added to the system reach, compared to L band based solutions. And the use of AWGs provides another 5 dB of link budget compared to TDM PON, due to lower loss than experienced when using a 1:32 splitter. This helps further bridge access distances and potentially enables an even greater consolidation of the access network for those operators pursuing that goal. In contrast to some other vendors’ approaches, Transmode’s iWDM-PON solution uses the standard ITU DWDM grid already used throughout the metro, enabling operators to leverage metro-wide transparency and avoid having to manage conversion of wavelengths.

SFP/XFP options include colorless DWDM SFPs with injection locked FP laser, fixed and tunable DWDM SFPs / XFPs, and fixed, low cost 1GbE DWDM SFPs. Figure 1 shows the operation of the colorless SFP when used in a network.

The Transmode roadmap for the iWDM-PON solution will continue to introduce innovations reducing cost further while expanding the focus from mobile backhaul and enterprise business services to FTTB and FTTC applications.

## Advantages of Transmode iWDM-PON

### A fully standards-compliant, open solution

An open, standards-compliant design is a key benefit of the Transmode iWDM-PON solution. From the service operator’s standpoint, this approach gives them the freedom to reuse the installed base and choose best of breed solutions, both now and in the future. This open, standards-compliant solution allows service providers to start enjoying the benefits of the iWDM-PON business case today where it makes sense, because they can do so without fear of stranding existing investments, and without fear that the solution will potentially affect their choices in other equipment in the future. By contrast, competitors offering proprietary solutions often impose restrictions and potential risks of stranding investment, which are factors that operators considering WDM-PON need to think about.

### Optical transparency from access to core

Transmode gives operators the ability to deploy a consistent WDM grid throughout the metro, an approach with distinct advantages. First, it enables end-to-end transparency, eliminating the need to terminate CWDM wavelengths and patch them into DWDM. Second, it reduces the complexity of planning and coordinating both CWDM and DWDM channels, and provides some additional operational simplicity in terms of sparing. Alternative WDM-PON approaches often use the L band rather than the C band, thereby forcing wavelength translation as you move from the PON network to the metro. The net impact of Transmode’s use of a standard DWDM grid end to end: reduced CapEx, lower OpEx, and a more attractive TCO. The advantages of optical transparency are shown in Figure 10.

### Options in cost optimized performance

Since Transmode leverages the existing iWDM portfolio for the iWDM-PON solution, operators using iWDM-PON have the ability to mix low cost passive interfaces and active interfaces with greater reach. This can be done wherever and whenever required, giving operators greater planning flexibility and investment protection as their access network evolves over time. Figure shows how iWDM-PON compares to other technologies.

### Synergies with the Transmode iWDM portfolio

Transmode offers an innovative, cost optimized backhaul solution, and iWDM-PON provides a very cost effective means to extend that solution into the access network while enjoying all the scalability, operations, and cost advantages of WDM-PON. Because the solution is based on the TG-Series and TM-Series platforms and Transmode standard interfaces, existing customers gain synergies with the installed base and Transmode Network Manager. In addition, an operator deploying Transmode for the first time with the iWDM-PON solution gains additional opportunity to leverage potential future operational synergies by also deploying the Transmode iWDM solutions throughout the metro.

### Symmetrical, scalable, secure bandwidth

Transmode's iWDM-PON solution enables operators to scale from 100 Mbps to 1 Gbps to 10 Gbps and beyond in the future, with 100 Gbps on the roadmap. And throughout that tremendous range of scalability, it offers bandwidth that is symmetrical, better meeting requirements from business and mobile backhaul applications, as well as the interactive requirements of emerging residential applications.

### One solution for all applications

The Transmode iWDM-PON provides one solution for mobile, enterprise and broadband applications, supporting all types of applications. This simplifies network requirements and provides flexibility for the future.

### Long reach and more splits

The long reach version of Transmode's iWDM-PON allows the deployment of fewer active nodes in the network, giving the choice to operators to serve up to 50 subscribers on a single fiber pair and to do so over greater distances.

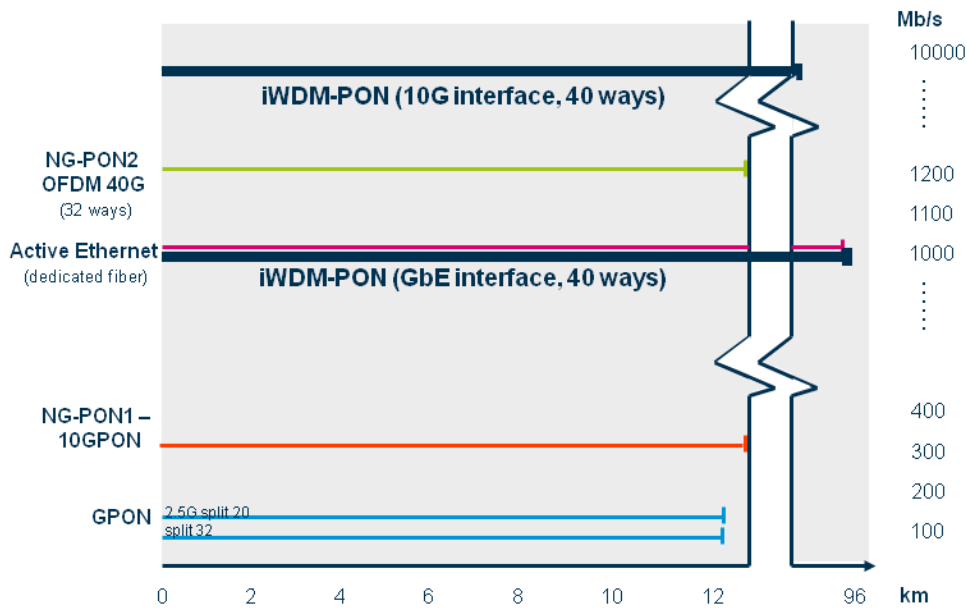


Figure 2 - iWDM-PON provides multiple levels of performance for various applications and performs very well compared to other technologies

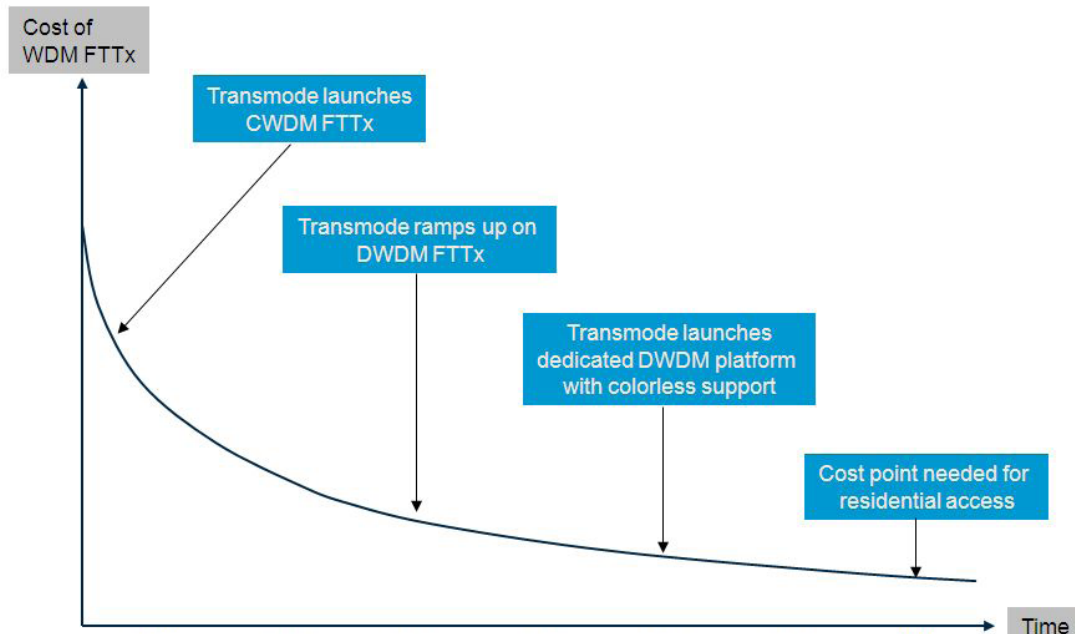


Figure 3: Transmode's roadmap for the iWDM-PON solution

## Conclusion

Transmode offers a straightforward, standards-based, flexible approach with its iWDM-PON solution. iWDM-PON enables service providers to enjoy the scalability and cost efficiencies of WDM-PON in broadband backhaul now, while supporting an effective migration path toward its use in FTTH in the future. The degree of investment protection, interoperability, and portfolio synergies offered in iWDM-PON today, coupled with the Transmode roadmap, make this solution worthy of any service operator's consideration.

Transmode's iWDM-PON solution provides a passive distribution of high bandwidth, symmetrical, and secure capacity, while reducing the constraints imposed by past PON technologies in terms of distance capabilities relative to split ratio. Based on proven and mature technologies, iWDM-PON offers a cost effective entry point to highly scalable next-generation access, while providing a roadmap that encompasses future opportunities.

Transmode's iWDM-PON solution provides a fully open, standards-based, and elegantly simple solution that provides service operators with the ideal entry point into WDM-PON. Leveraging the TG-Series and TM-Series, and fully compatible with iWDM backhaul and metro WDM solutions, iWDM-PON provides complete investment protection for the multi-vendor installed base in operator's networks today, as well as operational synergies with Transmode's own portfolio.

Low cost SFPs, the ability to mix and match passive with active interfaces where needed while leveraging the same DWDM platforms, the operational simplicity of leveraging the DWDM grid metro-wide, and the end-to-end transparency that this provides are just a few of the advantages of iWDM-PON. Transmode's roadmap includes leveraging colorless interfaces at the ONT to preserve the cost advantages of passive plant while ensuring performance and distance capabilities, and enabling FTTH solutions that make full use of the often limited single fiber asset available in the residential market.

iWDM-PON brings operators immediate relief for bandwidth demand in the enterprise and for mobile backhaul today, while providing an efficient and safe migration path to FTTH in the future. Transmode gives operators an easy entry point into WDM-PON, opening up a future of increased scalability, operational efficiency, and flexibility in meeting the next generation of broadband access requirements.

## Additional Information:

WDM-PON White Paper