ADTRAN®

DEPLOYING 10 GIGABIT ACCESS NETWORKS

Using the Emerging NG-PON2 and XGS-PON Standards

Converging Multiple Services over a Common Access Services Architecture

The primary value of NG-PON2 is the ability to serve a mix of residential, business and backhaul services over a common Optical Distribution Network (ODN) using a mix of point-to-point and point-to-multipoint technologies. The biggest challenge facing NG-PON2 is coming up with a single system that meets the scale and flexibility needs of premium business and backhaul services while also delivering on the price points needed for mass market residential applications.

Flexible Optics Balance Cost and Scale

Realizing that the major cost component of any NG-PON2 system is the cost of the optical transceivers (both at the OLT and ONT), ADTRAN® has developed a flexible optics approach to NG-PON2 that allows for a single NG-PON2 OLT system to utilize multiple types of optical transceivers, allowing the service provider to better align the cost with the target application. The flexible optics range from low cost fixed optics for residential, business and small cell broadband applications to fully-tunable optics for premium enterprise, datacenter, fronthaul and backhaul services. Through further innovation in the ONT optics design, ADTRAN has developed a fixed optics 10/10G ONT solution compliant to NG-PON2, XGS-PON, and GPON standards that allows for the immediate support of NG-PON2 ONTs for business and backhaul services as well as being able to seed the residential market with less complex NG-PON2 ONTs nearing the price level of today's mainstream GPON ONTs.

This flexible optics approach allows for mass market 10/10G NG-PON2/XGS-PON adoption for all broadband applications (Figure A) while maintaining flexibility for the future overlay of an additional fixed optics 10/10G business PON and/or multiple TDWM PONs using higher capability tunable optics (Figure B).

The ADTRAN NG-PON2 system elegance offers the ability to benefit from mass market price points without having to wait for large volumes to be reached in the 10G PON market. This approach gives service providers confidence that they can move forward with a 10G PON strategy today, without the risk of depending on a future worldwide volume ramp of 10G and tunable optics to make it cost-effective. On the OLT side, any mix of optics can be used on a single OLT, allowing for maximum flexibility without compromising on future capabilities. Leveraging the additional capacity available through the disruptive ADTRAN NG-PON2 solution set, service providers can extract an additional five to ten years of revenue from this year's residential PON deployments, maximizing future service flexibility and minimizing risk of subscriber churn.

Solution Programmability and a Commitment to Open Interfaces Simplifies Converged Operations

Additionally, the operational cost and complexity to connect a FTTH subscriber can be further reduced to accelerate the expansion of Gigabit broadband services. ADTRAN's solution supports provisioning through modern, open APIs, facilitating the deployment in next-generation SDN-based management systems. Both the ADTRAN OLT and ONTs support open, standard-based, physical interfaces allowing for the support of best-in-breed network design and the delivery of universal CPE across a multi-vendor network. This in concert with accelerated mass market electronics and optics pricing ensures that cost-sensitive residential broadband will be viable using NG-PON2/XGS-PON technology.

XGS-PON is a fast developing standard supported by the leading service providers and vendors around the world for 10 Gbps (XG) Symmetric fixed wavelength PON over the already established GPON/NG-PON2 infrastructure.

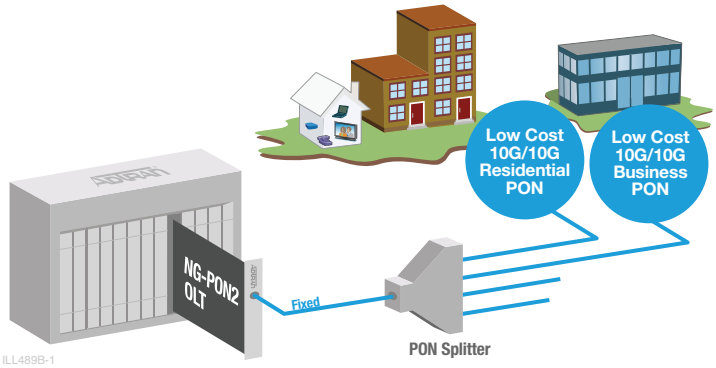


Figure A: Deploy mass market Gigabit or multi-Gigabit converged broadband services using low cost fixed 10/10G optics (XGS-PON)

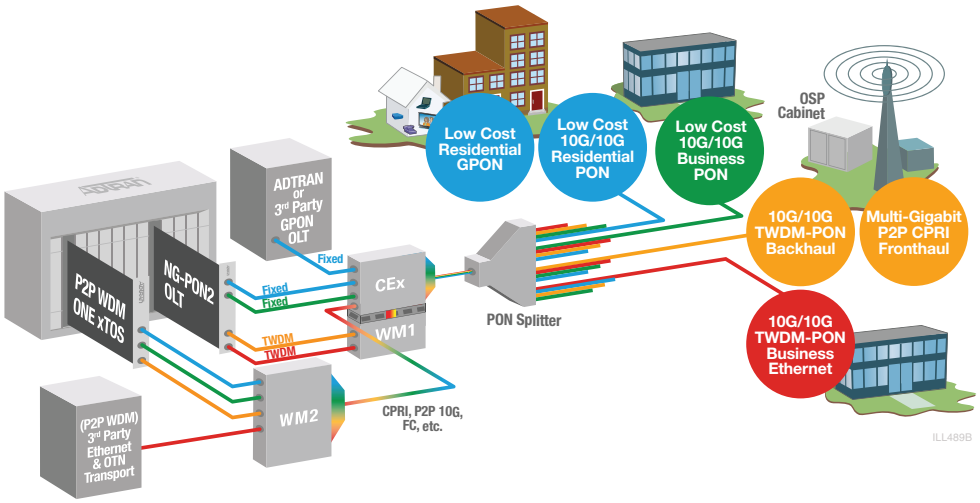
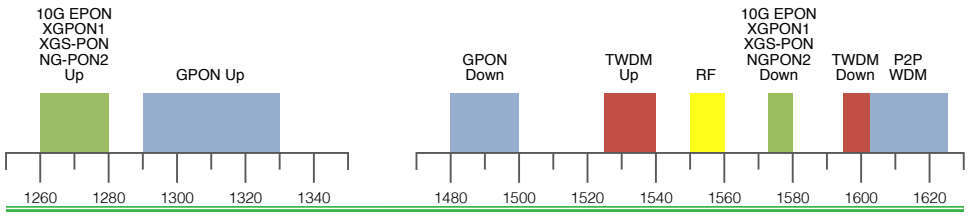


Figure B: Overlay premium optical services with the deployment of higher capability Nx10/10G tunable optics



ADTRAN, Inc.
Attn: Enterprise Networks
901 Explorer Boulevard
Huntsville, AL 35806
P.O. Box 140000
Huntsville, AL 35814-4000

256 963-8000
256 963-8699 fax

General Information
800 9ADTRAN
info@adtran.com
www.adtran.com

International Customer Service
+1 256 963 8716

Pre-Sales Technical Support
888 423-8726
application.engineer@adtran.com
www.adtran.com/presales

Post-Sales Technical Support
888 423-8726
www.adtran.com/supportcase

Where to Buy
888 423-8726
channel.sales@adtran.com
www.adtran.com/where2buy

Training
888 423-8726
training@adtran.com

Global Inquiries
256 963-8000
256 963-6300 fax
international@adtran.com

Canada Headquarters—Toronto, Ontario
+1 877 923 8726
+1 905 625 2515
sales.canada@adtran.com

Canada—Montreal, Quebec
+1 877 923 8726
+1 514 940 2888
sales.canada@adtran.com

Mexico and Central America
+1 256 963 3321
+1 52 55 5280 0265 Mexico
sales.cala@adtran.com

South America
+1 256 963 3185
sales.brazil@adtran.com
sales.latam@adtran.com

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ADTRAN is an ISO 9001, ISO 14001, and a TL 9000 certified supplier.

Acronym	Description
10/10G	10 Gbps Upstream/ 10 Gbps Downstream Rate
AE	Active (or Point to Point) Ethernet
AON	Active Optical Network
BBF	Broadband Forum
BPON	Broadband Passive Optical Networks
CATV	Community Access or Cable Television
CEx	Coexistence Element
CO	Central Office
CPRI	Common Public Radio Interface
DOCSIS	Data Over Cable Service Interface Specification
DWDM	Dense Wavelength Division Multiplexing
EPON	Ethernet Passive Optical Network
ETOS	Ethernet Transport Optical Switch
FC	Fibre Channel
FSAN	Full Service Access Network
FTTH	Fiber to the Home
GPON	Gigabit Passive Optical Network
IPTV	Internet Protocol Television
ITU	International Telecommunications Union
LTE-A	Long Term Evolution - Advancced
Mbps	Megabits Per Second
MDU	Multi-Dwelling Unit
NGPON 2	Next Generation PON (4 to 16 wavelengths)
ODN	Optical Distribution Network
OEM	Original Equipment Manufacturer
OLT	Optical Line Terminal
ONE	Optical Network Edge

Acronym	Description
ONT	Optical Network Terminal
OTDR	Optical Time-Domain Reflectometer
OTOS	OTN Transport Optical Switch
OTT	Over the Top
P2P	Point to Point
PON	Passive Optical Networking
P-OTS	Packet Optical Transport System
RF	Radio Frequency
RFoG	Radio Frequency over Glass
RG	Residential Gateway
ROI	Return on Investment
RUS	Rural Utilities Service
SBU	Small Business Unit
SFP+	Enhanced Small Form-factor Pluggable
SFU	Single Family Unit
SLA	Service Level Agreement
SM40	ADTRAN Switch Module 40 Gbps MSAN Module
TWDM	Time and Wavelength Division Multiplexing
VDSL2	Very-high-bit-rate Digital Subscriber Line 2
VoIP	Voice over Internet Protocol
WDM	Wavelength Division Multiplexing
WDM PON	Wavelength Division Multiplexing Passive Optical network
WM	Wavelength Multiplexer
XFP	10 Gigabit Small Form-factor Pluggable
XGS-PON	10 Gigabit (XG) Symmetric Fixed Wavelength PON
XGPON 1	10 Gigabit Passive Optical Network