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Geréby Kúria Lajosmizse, 2018

The future of PON Networks:
Introduction to Next-Gen PON

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Agenda

1. Market update: 10G PON is the new PON
2. PON technology review
3. Introduction to testing Next-Gen PON
4. Conclusion and remarks

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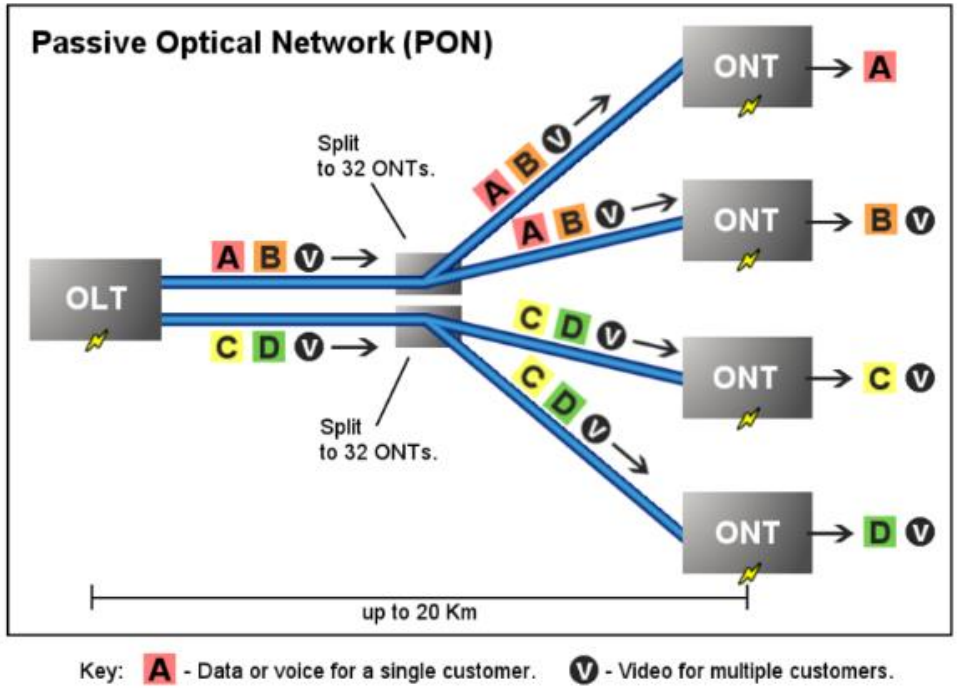
GPON status

Popular technology in place, main actor of FTTh deployment

Characteristics:

	GPON
PON rate (down/up)	2.5G/1.25G
Downstream λ (nm)	1480-1500
Upstream λ (nm)	1310 ±20
Max split ratio	1:128

So why changing…..?



Drivers for NEXT-Generation PON

Infrastructure Longevity

15 - 20 Year Investment Horizon

Reuse of already deployed fibre

Converged Infrastructure Requirements

Residential – Business – Backhaul –wireless fronthaul

Evolving Standards impacting DS & US

4K will be de facto with 8K rising

IoT will result in baseline capacity erosion

Innovation / Competition

DOCSIS 3.1/+ , 10GEPON moving to 10Gps

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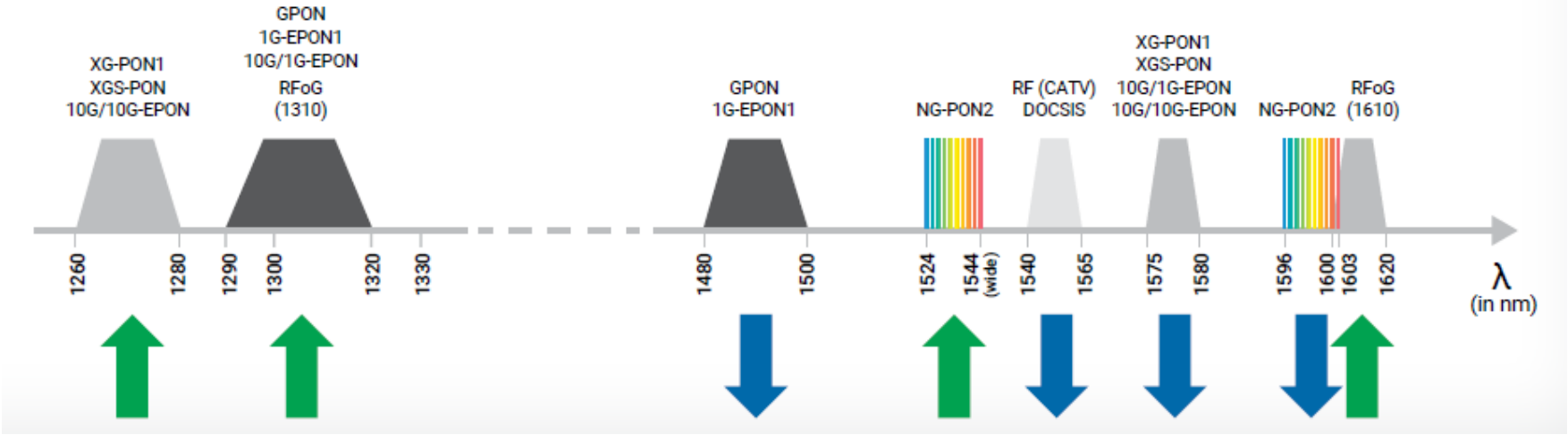
	Legacy and current				Next generation		
	GPON	1G-EPON1	XG-PON1	XGS-PON	10G/1G-EPON	10G/10G-EPON	NG-PON2
PON rate (down/up)	2.5G/1.25G	1.25G/1.25G	10G/2.5G	10G/10G	10G/1.25G	10G/10G	10G/10G
Downstream λ (nm)	1480-1500	1480-1500	1575-1580	1575-1580	1575-1580	1575-1580	1596-1603
Upstream λ (nm)	1310 ±20	1310 ±50 or 1310 ±20	1260-1280	1260-1280	1310 ±50 or 1310 ±20	1270 ±10	1524-1544 (wide)
Max split ratio	1:128	1:64	1:128	1:256	1:64	1:64	1:256



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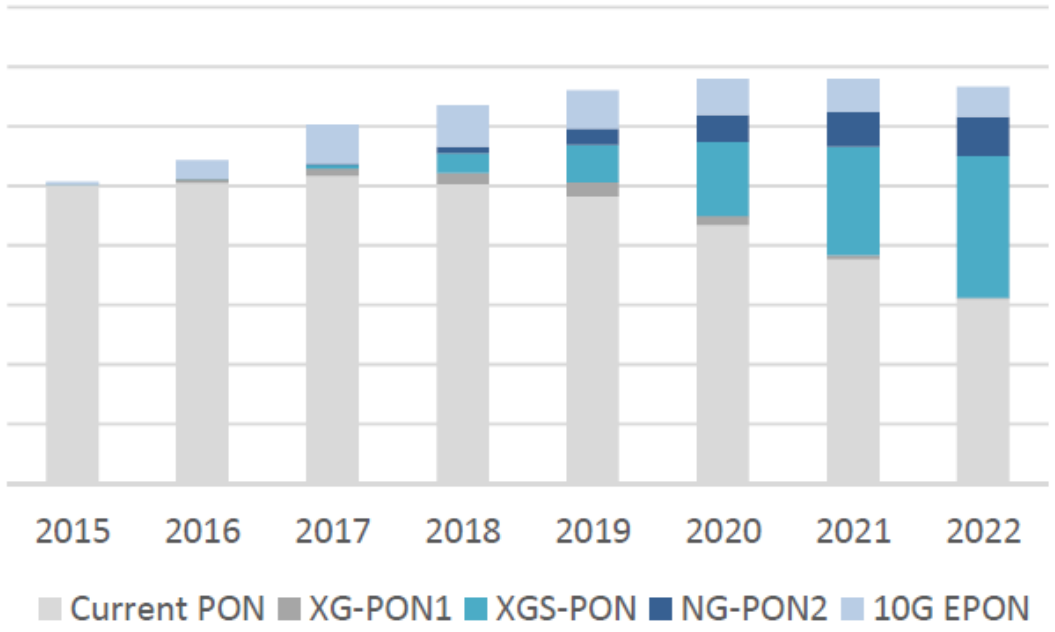
10G PON is the new PON

Operators worldwide are trialing / deploying XGS-PON and/or NG-PON2

By 2022: 10G PON may overtake current PON
(Source: Ovum 2017)



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10G PON is the new PON

XGS-PON

Single wavelength

Symmetric 10G bandwidth

Same wavelengths as XGPON1 / 10G-EPON

Some CPE already “XGS” capable or easily swappable for service upgrade

NG-PON2

Multiple wavelengths (WDM)

Ability to grow (80G/80G)

Higher cost components

Allows addition of wavelength as needed for a “pay as you grow” strategy

Enable low latency -> 5G

Table 9-1 – NG-PON2 wavelength bands

Wavelength compatible systems	TWDM PON		PtP WDM PON
	Downstream	Upstream	Upstream/downstream
GPON, RF video, XG-PON1	1596-1603 nm	Wideband option 1524-1544 nm Reduced band option 1528-1540 nm Narrow band option 1532-1540 nm	Expanded spectrum 1524-1625 nm (Note 1) Shared spectrum 1603-1625 nm (Note 2)

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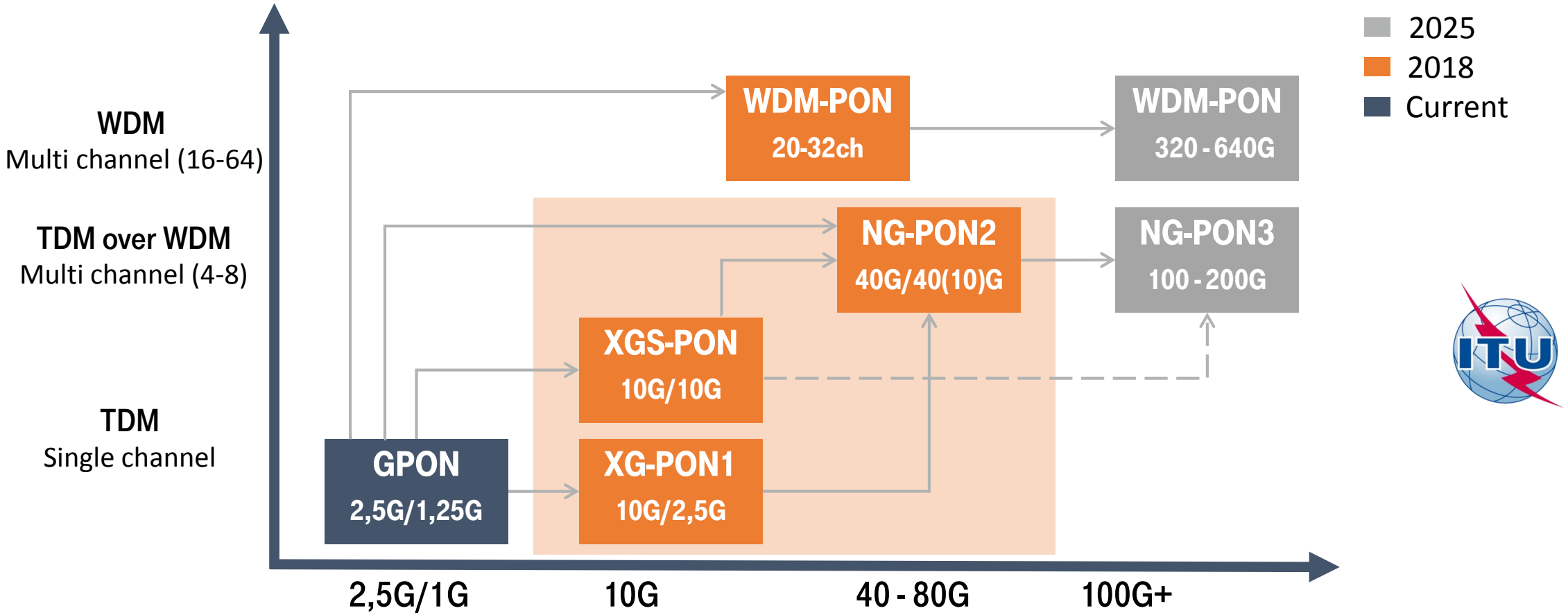
Courtesy of T-Com:



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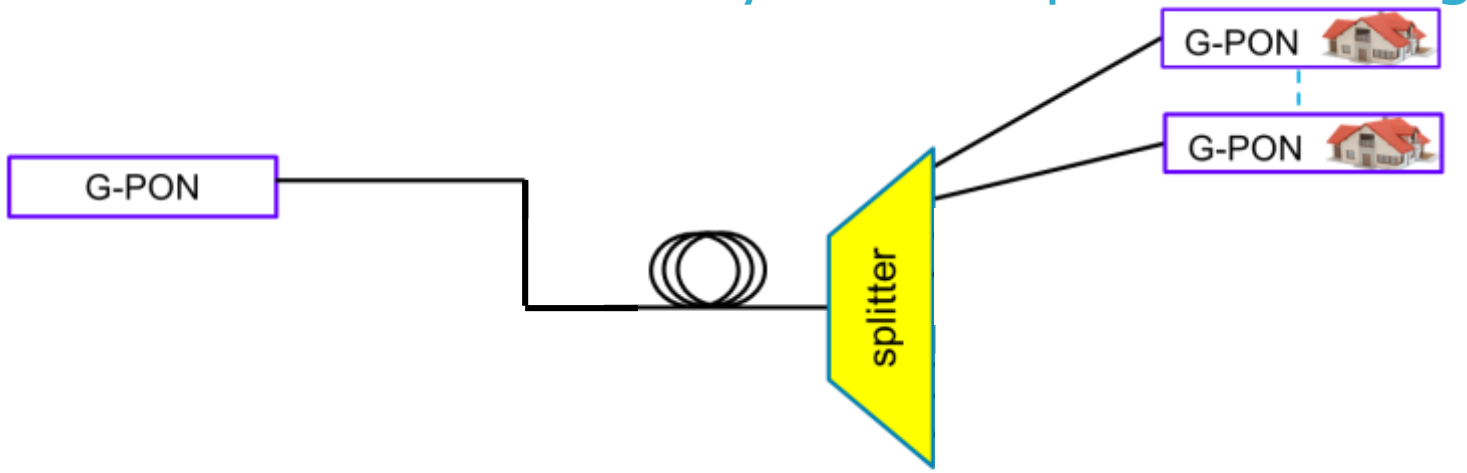
NEXT-Gen PON: an overlay of multiple technologies



New testing challenges

Using a standard power meter is no longer possible

Using current PON power meter is no longer possible

Measuring multiple transmission « types » is confusing for installers

Testing a mix of legacy and next generation PON using the same instrument

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Introducing new PPM-350D

Multi-technology: legacy and Next-Gen compliant

G-PON, E-PON, 10GE-PON, XG-PON, XGS-PON, NG-PON2 (TWDM), RF Overlay, RFoG, ALT-PON, B-PON

Compatible with triple layer networks carrying legacy & next generation PON as well as RF video overlays

Can measure upstream ONT burst light levels even at speed up to 10 Gbit/s

PON-Aware™ Technology automatically assess the P/F status of the network under test

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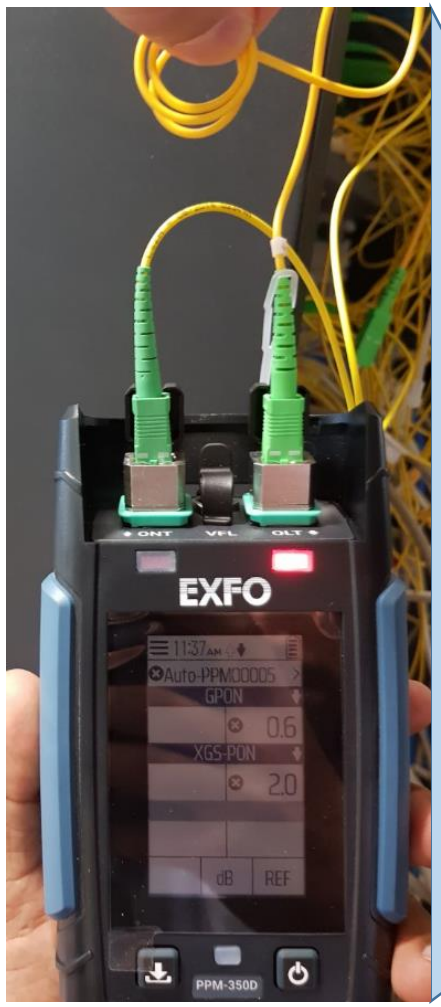
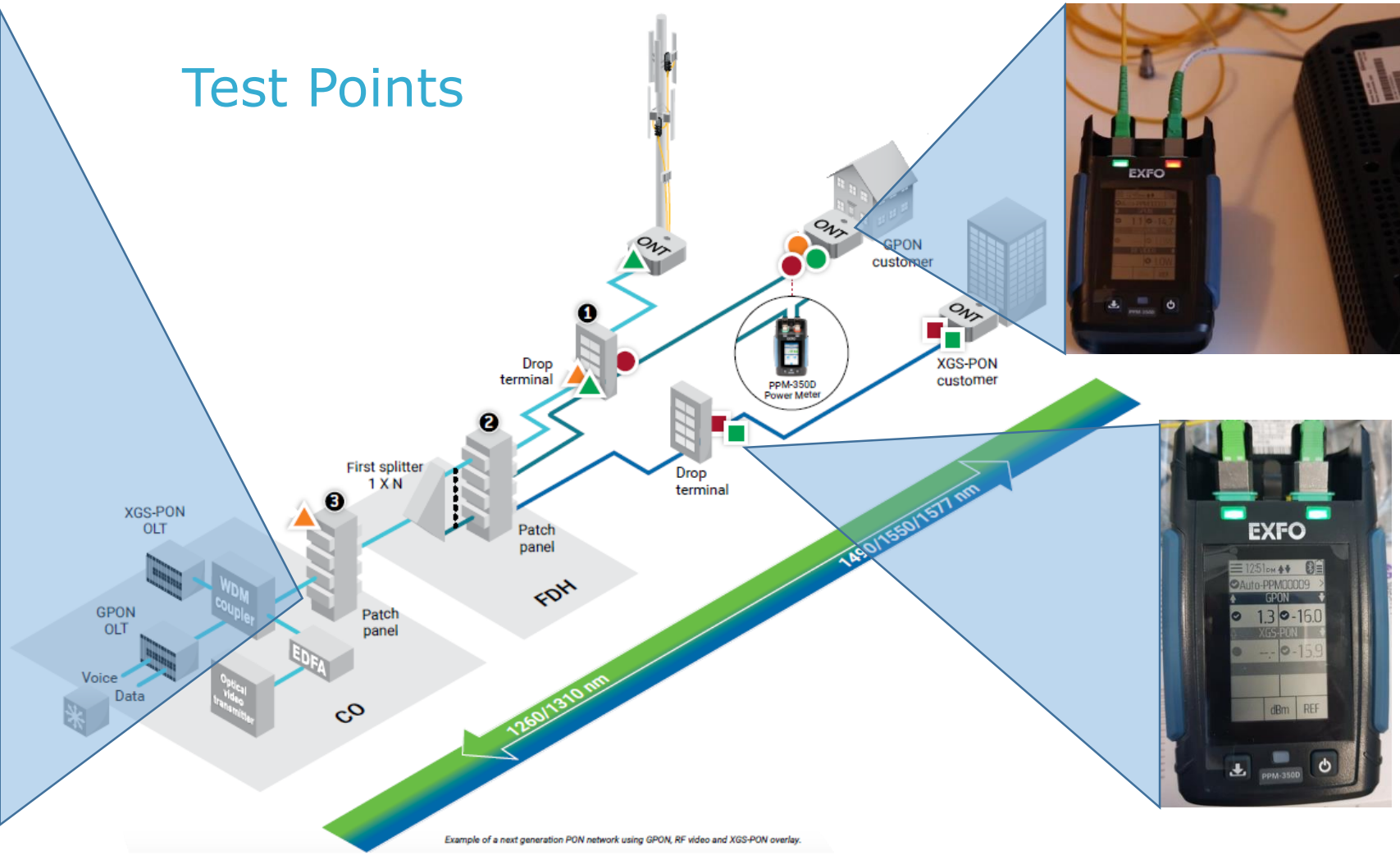


Test Points



Example of a next generation PON network using GPON, RF video and XGS-PON overlay.

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Results: 10G PON birth Certificate

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PON Power Meter Report PASS

General Information

Measurement Name: Auto-PPM0000

Job ID: TK-20171223-1234
Customer: The Greath North Radio Company, LLC.
Test Date and Time: 2017-12-23, 06:17 AM
Company: Ring-Ring-Allo Inc.
Operator: John Smith
Geolocation: 62.203325, -75.642683
Comments: Everything seems to be OK! But the equipment will require more maintenance than usual because of the temperature. It is quite cold here!

Instrument

Model: PPM-350D
Serial Number: 17-0012134
Calibration Date: 2017-12-15

Results

Test Configuration: GPON+XGS-PON+RF

Service and State		Direction (Wavelength)	Power	Thresholds		Status
				Minimum	Maximum	
GPON	Inactive	Upstream (1310 nm)	---	2.00 dBm	7.00 dBm	Inactive
		Downstream (1490 nm)	-18.61 dBm	-26.00 dBm	-4.00 dBm	PASS
XGS-PON	Active	Upstream (1270 nm)	7.73 dBm	4.00 dBm	9.00 dBm	PASS
		Downstream (1578 nm)	-13.52 dBm	-28.00 dBm	-9.00 dBm	PASS
RF-VIDEO	Active	Downstream (1550 nm)	0.32 dBm	-7.70 dBm	12.80 dBm	PASS

Comments and conclusion

10G PON is the new PON

All the drivers, the trials, the commercial offers are heading to embrace the 10G PON via XGS-PON or NG-PON2

Generate more revenue

Allow Gigabit Broadband expansion (deliver multi-Gigabit solutions, more service types, etc…)

Support more users, markets

Get more value from the network

Extend the life of network and enable new technology

Deploy on the same fiber, use the same passive and active plant but **still need to be tested!**

Decrease cost and risk

Improve operational efficiency

Converge residential and premium business services

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Thank you for your attention!