FSAN & ITU-T Activities on Next-Generation PON Stage-2 (NG-PON2)

IEEE 802.3 NGEPON ad hoc meeting

(Beijing, March 2014)
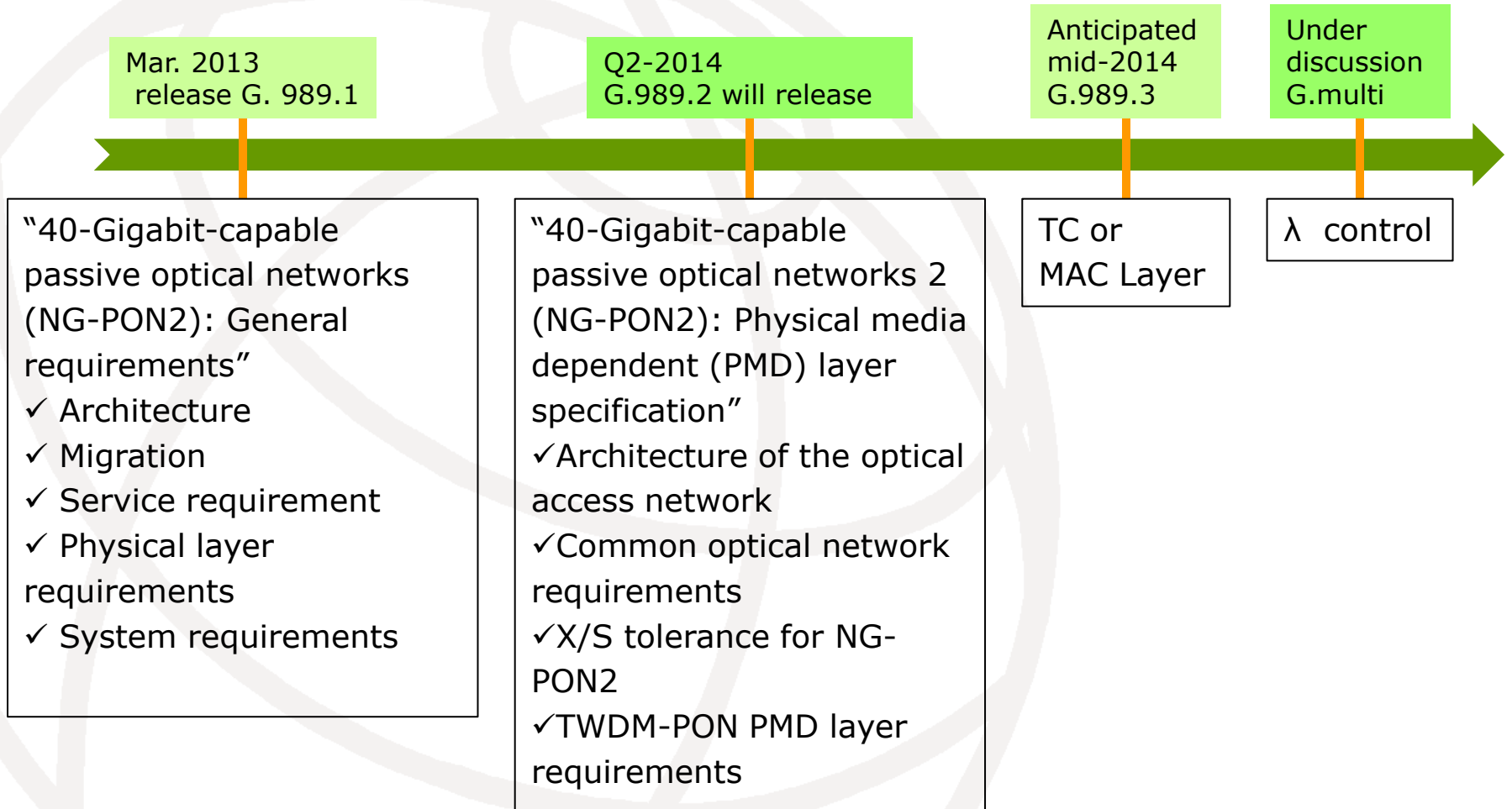
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Agenda

- ➢ FSAN/ITU-T NG-PON2 Standardization Roadmap

- ➢ TWDM-PON Baseline Architecture

- ➢ Wavelength Plan and Coexistence

- ➢ Power Budget

- ➢ TWDM-PON Key Features

- ➢ Summary

NG-PON2 Standardization Roadmap

Mar. 2013 release G. 989.1	Q2-2014 G.989.2 will release	Anticipated mid-2014 G.989.3	Under discussion G.multi

"40-Gigabit-capable passive optical networks (NG-PON2): General requirements"
- ✓ Architecture
- ✓ Migration
- ✓ Service requirement
- ✓ Physical layer requirements
- ✓ System requirements

"40-Gigabit-capable passive optical networks 2 (NG-PON2): Physical media dependent (PMD) layer specification"
- ✓ Architecture of the optical access network
- ✓ Common optical network requirements
- ✓ X/S tolerance for NG-PON2
- ✓ TWDM-PON PMD layer requirements

TC or MAC Layer

λ control

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TWDM-PON Baseline Architecture

- ➢ Time and wavelength division multiplexed PON (TWDM-PON)

- ➢ Stacked XG-PONs by multiple λs

- ➢ 4 pairs of λs, 40G (4*10G) in D/S, 10G (4*2.5G) up to 40G (4*10G) in U/S
- ➢ 40km passive reach, 1:64 split, ODN reuse
- ➢ ONUs tunable transmitters and receivers
- ➢ OAs at the OLT side to boost D/S and pre-amplify U/S
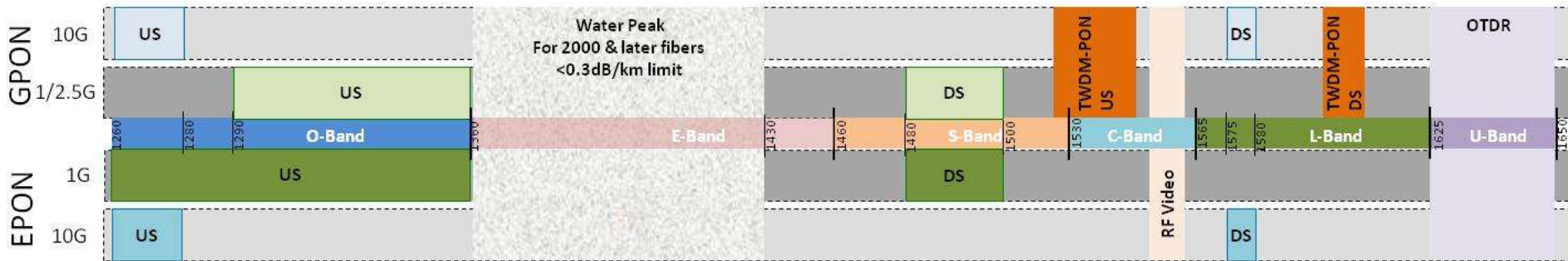- ➢ Could support 8 pairs of λs

TWDM-PON

Access Network (AN) [ITU-T G.902]
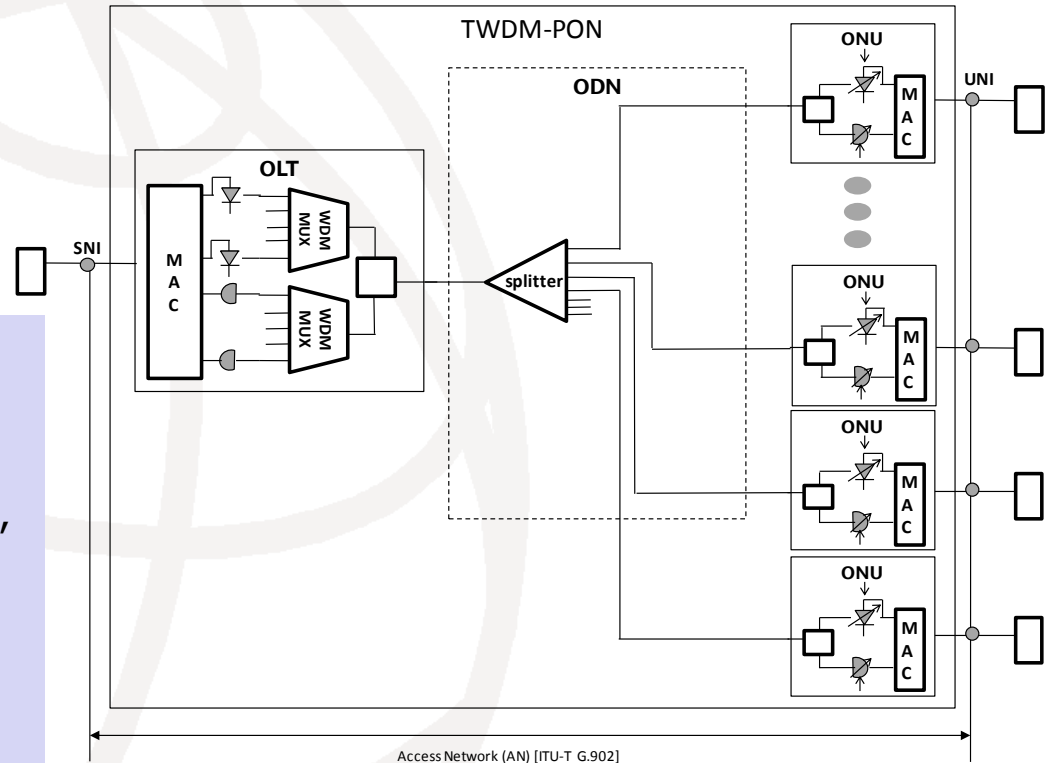
Wavelength Plan and Coexistence

- NG-PON2 defines TWDM as the primary solution, with splitter based PtP WDM overlay
- Trade-off between coexistence with legacies and performance supporting the future
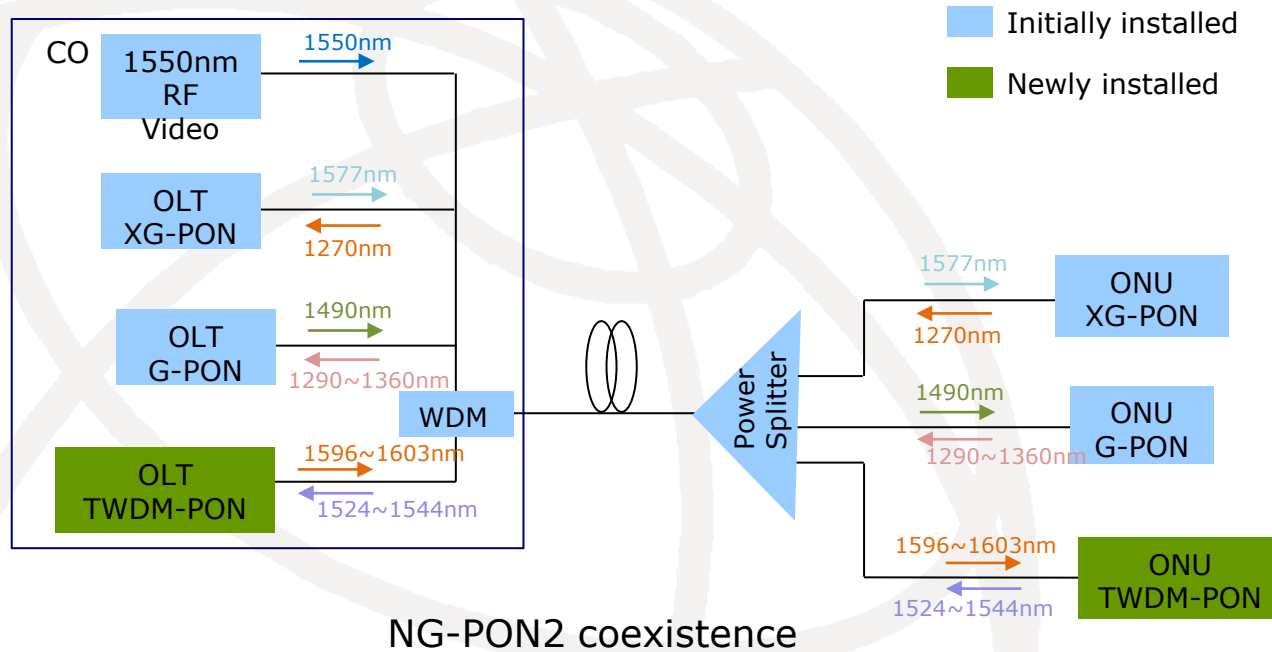- DWDM grids with 100 GHz based on cyclic WMs

Summary of NG-PON2 Wavelength Plans*

Wavelength Compatible Systems	TWDM		PtP WDM
	DS	US	US/DS
GPON, RF Video, XG-PON1	1596-1603 nm	Wide Range 1524-1544 nm Narrow Range 1524-1540 nm	Shared Spectrum 1603-1625 nm Full Spectrum 1524-1625 nm

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Wavelength Plan and Coexistence (cont.)

NG-PON2 coexistence

- WDM coexistence among different generations
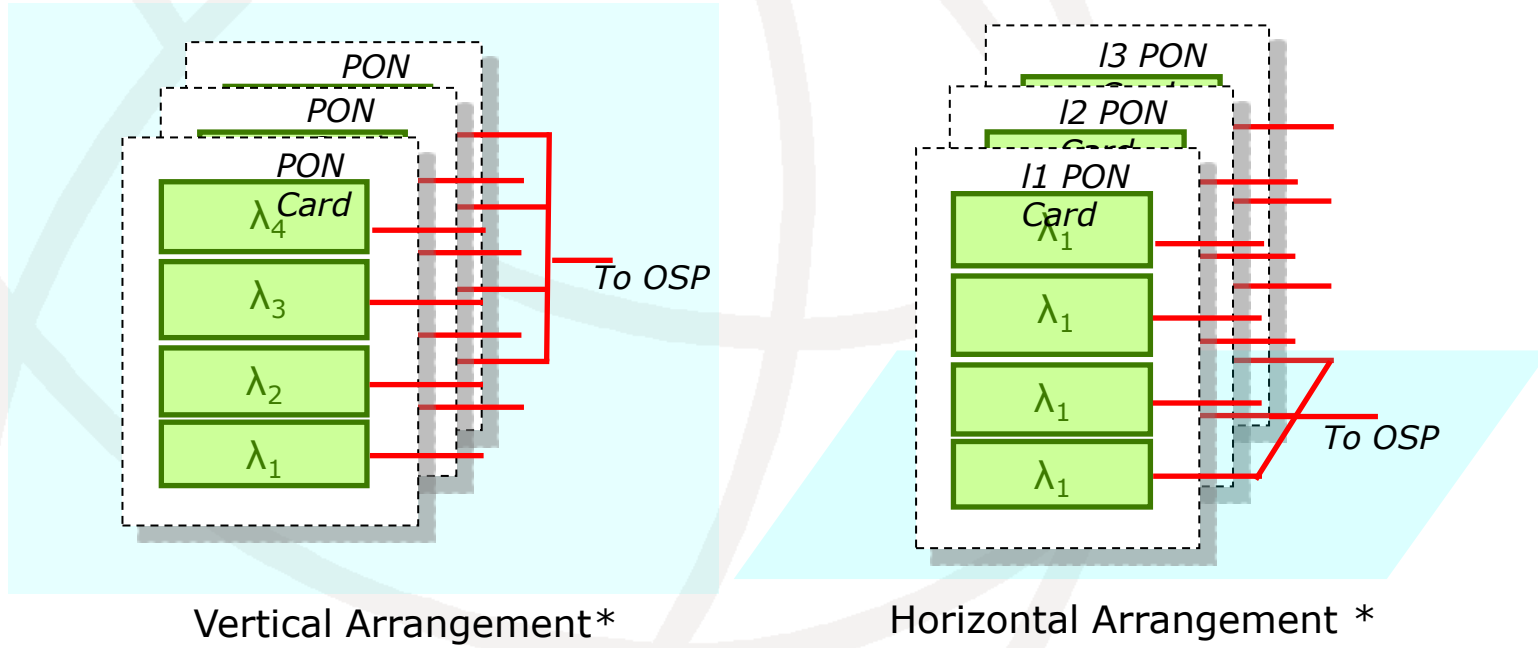- Coexistence with G-PON, XG-PON, RF Overlay and OTDR

Power Budget

Classes for optical path loss defined in NG-PON2*

	Class N1 (GPON B+, XG-PON N1 class compatible)	Class N2 (XG-PON N2 class compatible)	Class E1 (GPON C+, XG-PON E1 class compatible)	Class E2 (XG-PON E2 class compatible)
Min loss	14 dB	16 dB	18 dB	20 dB
Max loss	29 dB	31 dB	33 dB	35dB

➢ Power budget requirement directly impacts optical component selection. It is strongly correlated to the cost of system.

➢ For power budget requirement, must trade-off between channel capacity, distance and cost

Draft new Recommendation ITU-T G.989.2 Rev.2, 40-Gigabit-capable passive optical networks 2 (NG-PON2): Physical media dependent (PMD) layer specification

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TWDM-PON Key Features

- ➢ Pay-as-you-grow
  - ➢ Starting with a single wavelength pair
  - ➢ Upgraded by adding new wavelength pairs to increase the system capacity
  - ➢ Expanding the data capacity on demand

Vertical Arrangement*   Horizontal Arrangement *

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TWDM-PON Key Features (cont.)

- ➢ Spectral Flexibility
    - ➢ Multiple OLT arrangement
    - ➢ Each operator would have their own OLT, each of which would contain some set of wavelength channels
    - ➢ This scheme unbundles the shared infrastructure for multiple operators.
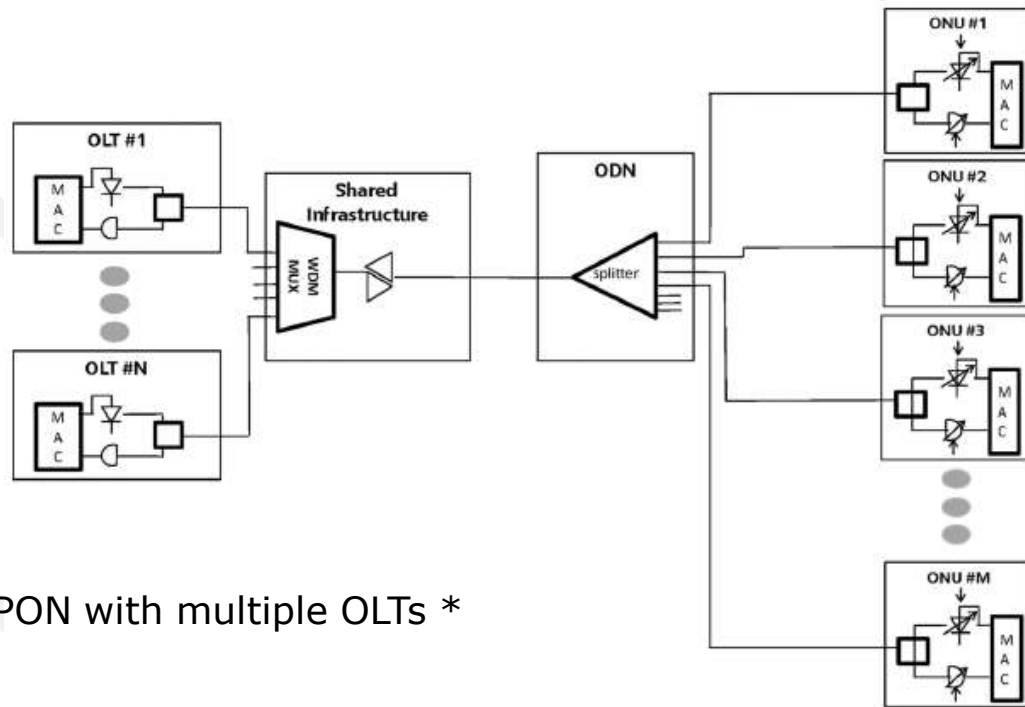
TWDM-PON with multiple OLTs *

Summary

◆ **NG-PON2 defines TWDM as the primary solution**

➢ 4 pairs of λs, 40G (4*10G) in D/S, 10G (4*2.5G) up to 40G (4*10G) in U/S

➢ 40km passive reach, 1:64 split, ODN reuse

➢ Could support 8 pairs of λs

➢ Wavelength plan, L+ band for D/S, C- band for U/S

➢ Coexistence with G-PON, XG-PON, RF Overlay and OTDR

➢ 4 classes power budget requirement, i.e., 29dB, 31dB, 33dB, 35dB

➢ 2 key features, i.e., pay-as-you-grow and spectral flexibility

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Questions?

THANK YOU