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50G-PON Technology: Driving the Evolution from Gigabit to 10G+ Fixed Networks

Content

- **PON Technology Review and 50G-PON Outlook**
- Key 50G-PON Technology
- 50G-PON Application Scenario
- 50G-PON Industrial Progress
- Case Study

What Are the Requirements that Promote the 50G PON Standard?

Next-gen technology after XG(S)-PON is required

- ITU-T G.987.x (XG-PON) : 2010
- ITU-T G.9807.x (XGS-PON) : 2016
- IEEE 802.3av (10G-EPON) : 2010
- IEEE 802.3ca (25G-EPON/50G-EPON) : 2020

Supports all access application scenarios

- Residential
- Campus/Enterprise
- Mobile backhaul
- Others

Higher bandwidth providing

- Providing higher bandwidth than legacy XG(S)-PON over 10Gbit/s per channel, to ensure support of the maximum service rate of at least 40Gbit/s.

Better performance

- Meet lower delay and jitter requirements, such as Cloud VR and deterministic campus applications.
- Non-service-affecting scheduled maintenance.

Seamless and smooth migration

- Maintaining the characteristics from legacy PON as much as possible to promote backward compatibility.
- Protecting the existing investments, including ODN resources.

More system flexibility

- Support kinds of user groups in the same PON network in a more flexible way.

50G PON is the Next-Gen PON Technology After 10G PON Defined by ITU-T

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ITU-T PON standard evolution path

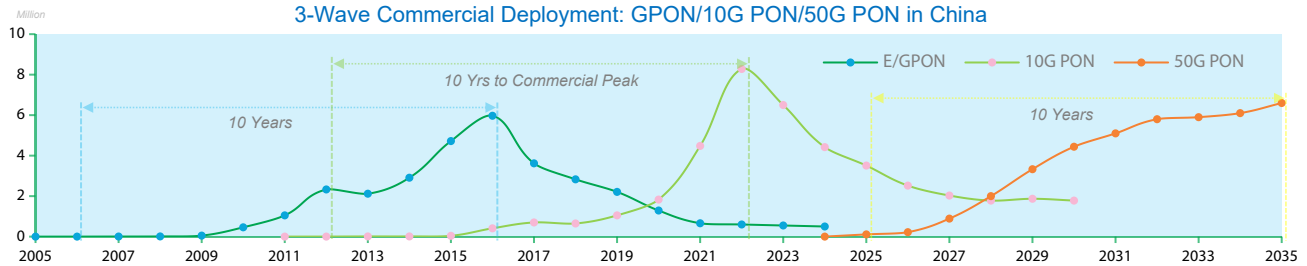
Standard released in 2021

PON Technology Evolution

	APON/BPON	GPON	XG-PON	XGS-PON	50G PON
Time of massive deployment	2008		2019	2021	
Time of standard release	2003		2010	2016	

Note: The time is the year shipment up to 1 million ports/units for commercial deployment

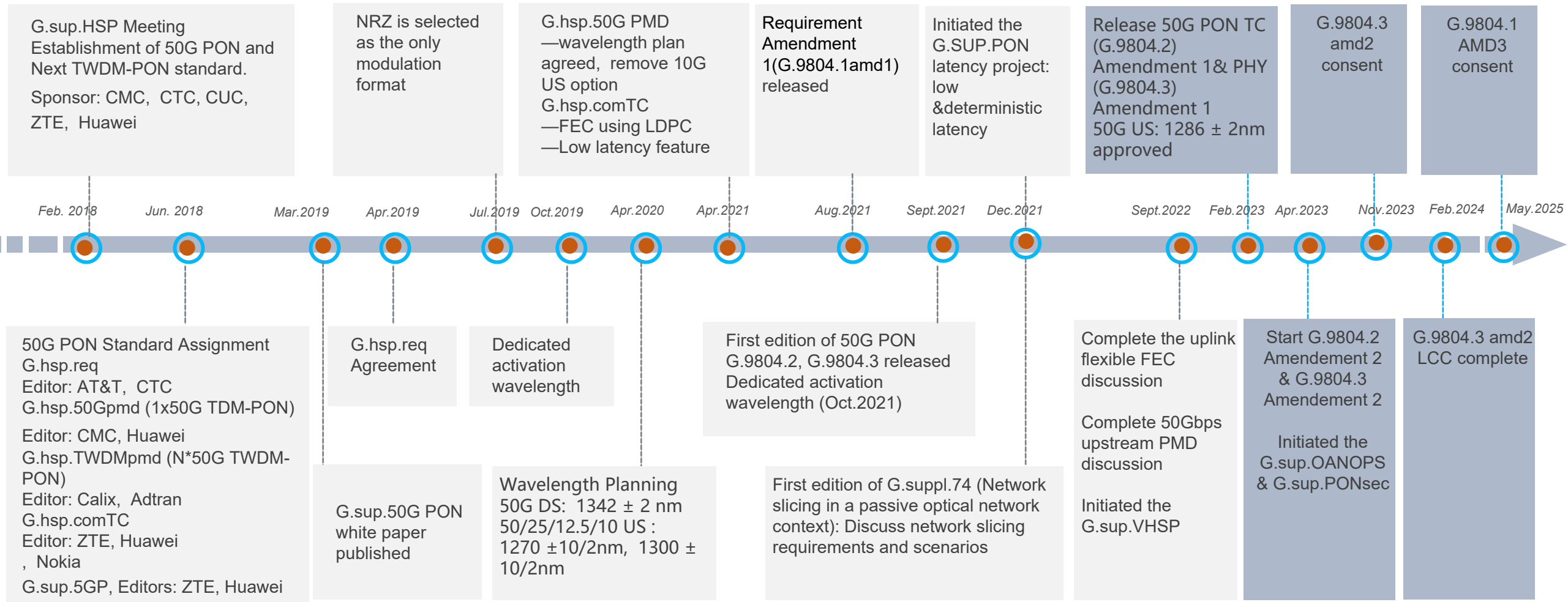
Times	**4** times	**4** times	**4** times	**5** times
Bandwidth	155Mbps	622Mbps	2.5Gbps	10Gbps	50Gbps
Technology	APON	BPON	GPON	10G PON	50G PON



China will lead 50G PON commercialization, starting in 2025 and dominating the market by 2028

Progress of the ITU-T 50G PON Standards Development

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50G PON upstream wavelength option3 (1286nm) was approved by ITU-T in Feb. 2023

Sub-standards of the 50G PON Standards

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G.9804.3 TDM PON PMD Layer

Wavelength plan: DS: 1342 nm,
US: 1270 nm, or 1300 nm or 1286nm (Option 1,2 or 3)
Power budget: 29 dB/32 dB for MPM

Nominal channel line rates of 49.7664 Gbit/s in the downstream, and the upstream line rate options are 49.7664 Gbit/s, 24.8832 Gbit/s, or 12.4416 Gbit/s.

G.9804.4 TWDM-PON PMD Layer

G.9805

GPON, XG(S)-PON, 50G PON, 10G-EPON coexistence

More powerful FEC to decrease the requirements of optical components, and smooth migration

G.9804. 2 TC Layer

Longer keys for better security

Co-DBA for bursty services

Low latency for quiet window elimination

Superior limit number of the opening window for single burst, DAW, Co-DBA, and multiple data encryptions.

G.9804.1 Requirement

50Gbit/s single wavelength, over 4 times 10G PON

Max. distance: 60 km

Max. differential distance: 40 km

3-tier uplink data rate: 10G/25G/50G

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