

Why should be one by 50Gb/s in P802.3ca

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- In Berlin meeting, a joint contribution proposed to compare the solutions for 50G EPON, the main focus is on 2*25G vs 1*50G, which solution is the best way for 50G EPON.

Motion #6

The Task Force should analyze and compare the following solutions for 50G PON and choose the best one for 50G EPON: 1) Single wavelength TDM-PON with 50Gb/s line rate, 2) Two-wavelength TDM/WDM-PON with 25Gb/s line rate per lane.

The Task Force calls for contributions on these topics.

Moved: Dekun Liu Second: Liquan Yuan

For: 22 Against: 0 Abstain: 4

Procedural (> 50%) Motion Passed

- This contribution shows why it should be 1* 50G in P802.3ca.

Why should be 1X50G (1)

100G → EPON

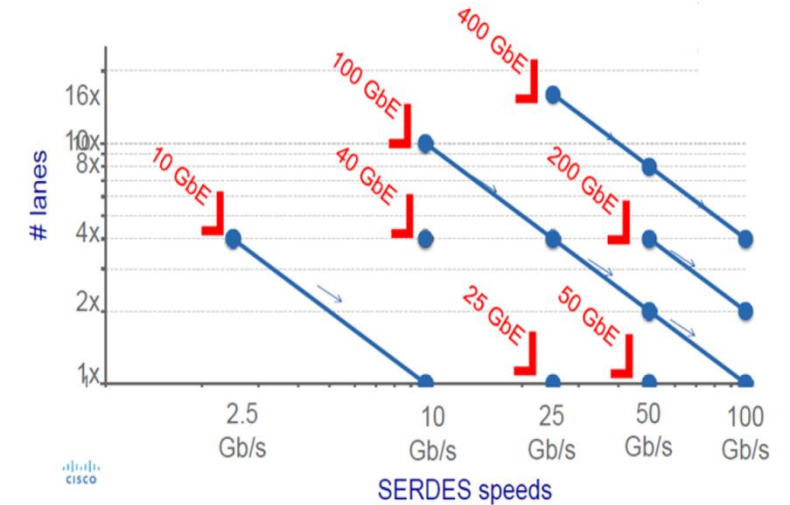
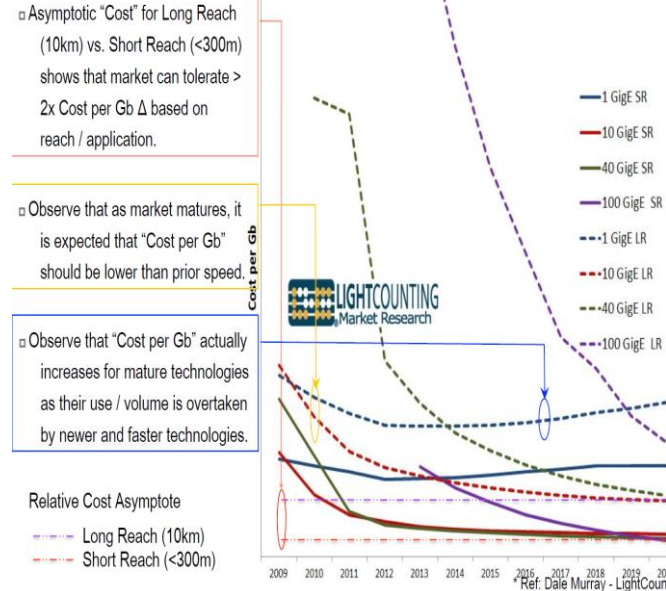
□ 1X50G is the future proof and has the cost advantage

Cost comparison

liu_3ca_2a_1117

solution	Key cost components		Total cost by weigh*
	OLT	ONUs	
1 *25G NRZ	one 25G EML+SOA* one 25G APD 25G EML driver+25G BTIA&BCDR	one 25G uncooled DML one 25G APD 25G LDD+25G TIA&CDR	1
2*25G	two 25G EML+SOA two 25G APD mux & demux Two 25G EML driver+two 25G BTIA&BCDR	two cooled 25G DML two 25G APD mux & demux Two 25G LDD+25G TIA&CDR	2.15
1*50G NRZ based on DSP	one 25G EML+SOA one 25G APD+pre-SOA 25G EML driver+25G TIA oDSP chip*	one uncooled 25G DML one 25G APD 25G LDD+25G TIA oDSP chip	1.2
1*50G based on PAM4	one 25G EML+enhanced SOA* one 25G APD+pre-SOA PAM4 driver+25G linear TIA PAM4 encoder and Decoder	one uncooled 25G DML one 25G APD PAM4 driver+25G linear TIA PAM4 encoder and Decoder	1.3

Source: dove_400_01a_0114.pdf



https://www.eiseverywhere.com/file_uploads/c7e1ba72c398a54dac106dcc26106781_9_BuildingtheNextGenerationAccessNetwork_Eckard.pdf

- 1X50G has the cost advantage compared with 2X25G
- 1X50G can maintain the same OLT ports density with current 10G EPON, and has lower maintenance cost than multiple channel systems.
- Multiple channels can never lower down the cost per bit compared with single channel, while higher bit rate single channel can!
- PON is not likely to require more than what serial rates can deliver, PON system should try to reach the serial rate limitation with TDM first, and then do WDM

Why should be 1X50G (1)

100G-EPON

- ❑ More cost effectiveness per bit than previous PON (such as GPON, 10G PON) will be the driven force for next generation PON deployment, not the standard and technology
- ❑ 50G EPON should choose the solution with the lowest cost and based on the technology when it's volume deployed, rather than the solution can be defined in the quickest way

Keep your eyes on the prize

- ❑ Must keep 100G-EPON simple
- ❑ Must keep the cost low. Given the choice, always defer the cost to a later generation.
- ❑ If 100G-EPON technology fails, it won't be because of low performance. It will be because of high cost and/or being too late.

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Rushed
standard
development

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- Reliable technology
- Cost-efficient product
- Fast time to market

Why should be 1X50G (2)

100G EPON

Do 1X50G is a good convergence with ITU PON

Work item	Question	Status	Timing	Approval process	Subject / Title	Base text(s)	Editor(s)
G.hsp.req	Q2/15	Under study	2018-10	AAP	Higher Speed Passive Optical Networks: Requirements	TD 154 WP1-Annex B	Dezhi Zhang, Kent McCammon
G.hsp.com TC	Q2/15	Under study	2019-06	AAP	Higher Speed Passive Optical Networks: Common Transmission Convergence layer	TD 154 WP1-Annex C	Yuanqiu Luo, Dan Geng, Tim Williams
G.hsp.50G pmd	Q2/15	Under study	2020-10	AAP	Higher Speed Passive Optical Networks: 50G PMD	TD 154 WP1-Annex D	Lei Wang, Dekun Liu

- ITU-T SG15 has approved the new project on 50G single channel PON systems in Feb 2018 plenary meeting in Geneva (no multiple channels on 25G)

T17-SG15-180129-TD-WP1-0194!!MSW-E in 2018 Feb plenary
SG15-TD194/WP1

Annex A

Question:	2 /15	Proposed new ITU-T Recommendation	Jan 2018
Reference and title:	G.hsp.50Gpmd : Higher Speed Passive Optical Networks: 50G PMD		
Base text:	tbd	Timing:	2020
Editor(s):	Lei Wa, Dekun Liu	Approval process:	AAP
Scope (defines the intent or object of the Recommendation and the aspects covered, thereby indicating the limits of its applicability):			
Recommendation provides the specifications of the physical medium dependent (PMD) layer for 50G single channel PON systems. This includes the ODN characteristics, the wavelength plan, the power budget, and interfacing to the converged transmission convergence layer.			
Summary (provides a brief overview of the purpose and contents of the Recommendation, thus permitting readers to judge its usefulness for their work):			
Recommendation provides the specifications of the physical medium dependent (PMD) layer for 50G single channel PON systems. This includes the ODN characteristics, the wavelength plan, the power budget, and interfacing to the converged transmission convergence layer.			
Relations to ITU-T Recommendations or to other standards (approved or under development):			
This could relate to the G.9807 series.			
Liaisons with other study groups or with other standards bodies:			
Related with IEEE P802.3ca.			
Supporting members that are committing to contributing actively to the work item:			
ADTRAN, AT&T, Calix, China Mobile, China Telecom, China Unicom, Huawei Technologies, Nokia, Vodafone, ZTE			

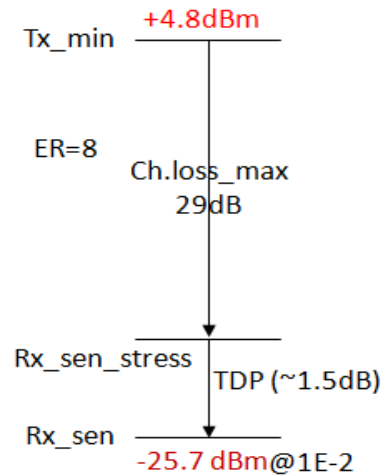
Why should be 1X50G (3)

100G → EPON

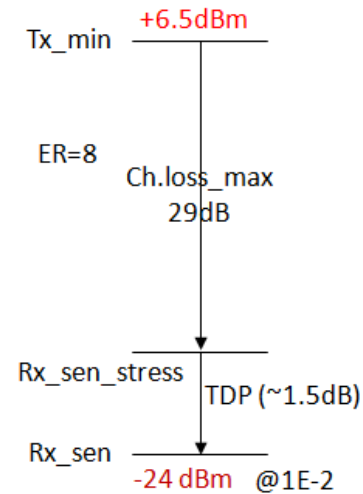
□ 1X50G can be standardized in our time line

- 50G serial technology is going to be mature in the following few years due to the fast development in datacenter (200GE, 400GE)
- 29dB power budget is definitely feasible for downstream , it's only 3~4dB harder than 25G.
- The feasibility of 50G per wavelength has been analyzed in several contributions(wangbo_3ca_2_0717, liu_3ca_2_0917, Houtsma_3ca_1_0917, zhang_3ca_1_1107, liu_3ca_2a_1117), several base line proposals have been shown, there is no distinct gap for downstream

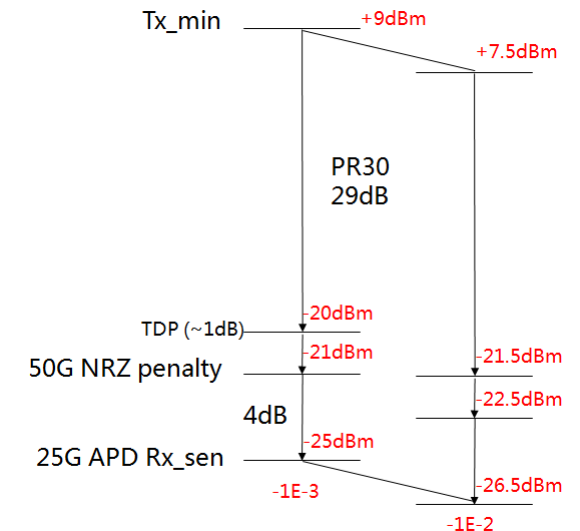
25Gb/s base line we agreed in Geneva



50Gb/s base line in liu_3ca_2_1117



50Gb/s base line in Guo_3ca_x_0318



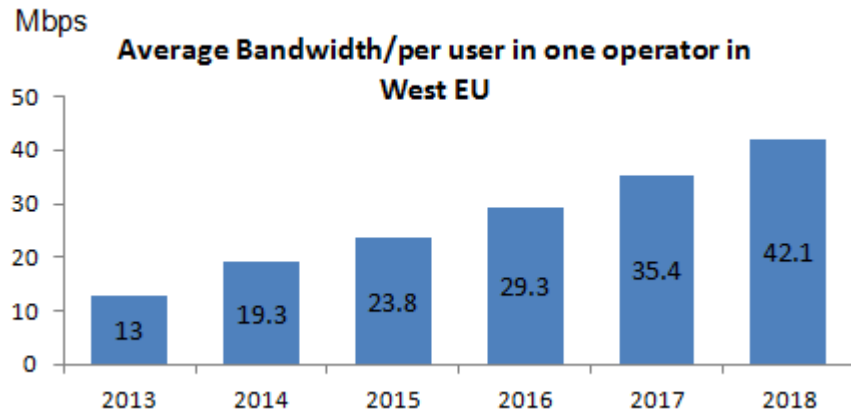
Why should be 1X50G (3) 100G EPON

- 50G EPON upstream also can be handled with several ways:
 - 50G symmetric PON will only be used for very few high-end users, so higher cost is acceptable. Such as which can bear booster amplifier in ONU side.
 - 50G/25G PON is a very good asymmetric system which can also provide a lot of symmetric service (Down/Up ratio is only 2:1), so maybe 50/50G is not necessary (urgent) in this stage

Why should be 1X50G (4)

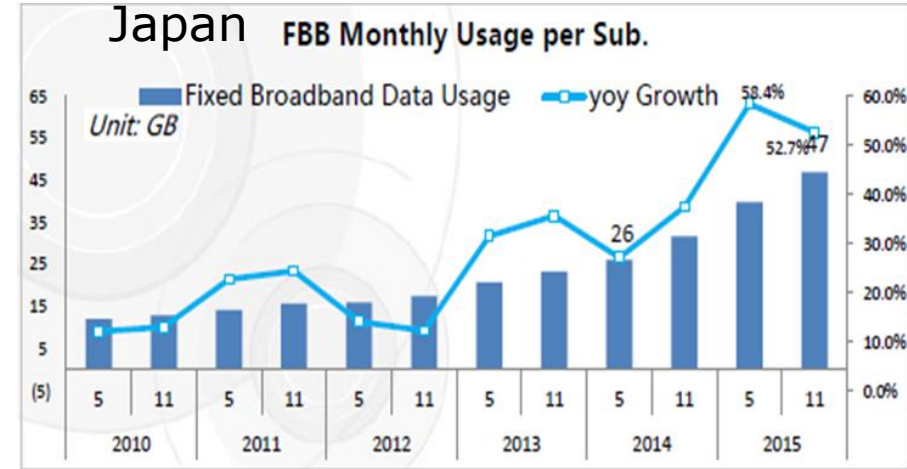
100G > EPON

- There is still relative a long enough period for 50G PON goes to the market in large volume, it should be standardized based on the lowest cost solution by then



China

Broadband Subscriber Status by 2017.06	Total Subscribers	FTTH ratio	Subs Bandwidth Structure
China Telecom	128.10M	91.5%	Providing 50M and more for 57% subscribers
China Unicom	76.8M	74%	Providing 50M and more for 52% subscribers



Source: MIC, report Japan 2015

Year	Peak Speed Projection	Event
2014	1 Gbps (Actual)	Industry Connection
2015	2 Gbps (Actual)	CFI and SG
2016	3 Gbps	TF
2017	5 Gbps	TF and Samples
2018	7 Gbps	Standard and Trials
2019	10 Gbps	Initial Deployments
2020	15 Gbps	Year 2
2021	22 Gbps	Year 3
2022	33 Gbps	Year 4
2023	50 Gbps	Year 5
2024	75 Gbps	Year 6
2025	>100 Gbps	Year 7

US

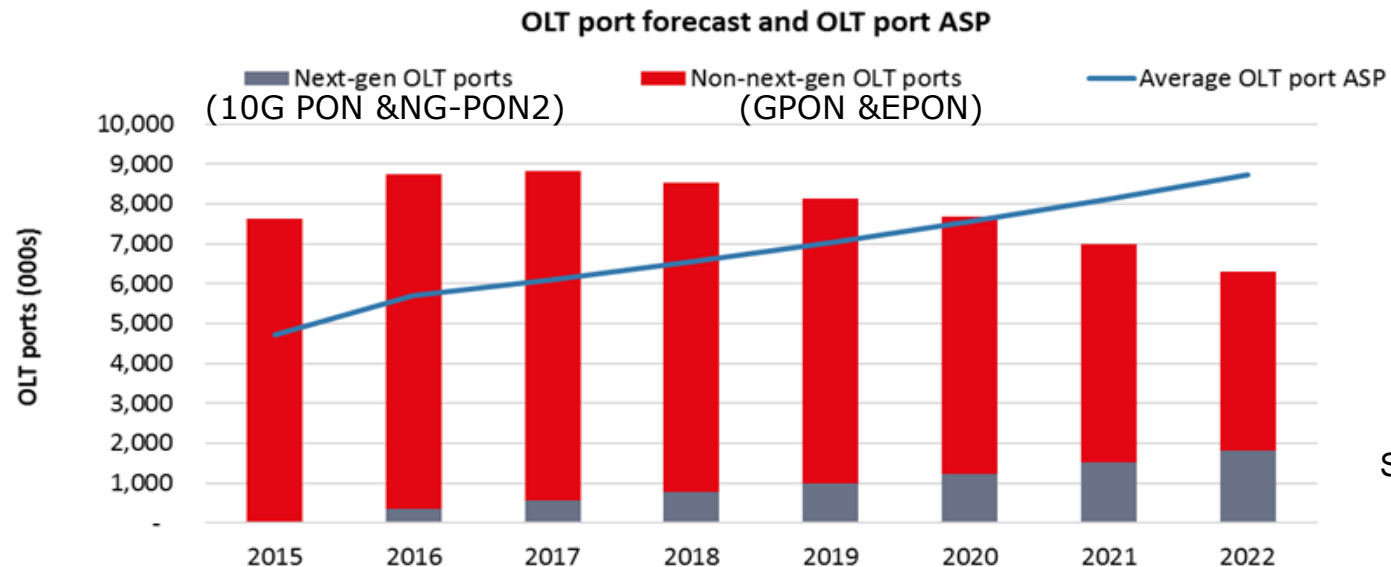
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Why should be 1X50G (4)

100G > EPON

- There is still relative a long enough period for 50G PON goes to the market in large volume, it should be standardized based on the lowest cost solution by then



Source : OUVN 2017 June

- Non-NG-PON(mainly GPON) is still the main stream deployment in next few years, GPON just reached the peak and will decline slowly in volume.
- 10G PON will be the major step after GPON&EPON, and there are still some years for 10G PON to exceed 1G PON to be the majority.
- The requirement of 50G PON in mass volume will need even longer time.

- ❑ 1X50G is the future proof and has the cost advantage compared with 2X25G
- ❑ Do 1X50G is a good convergence with ITU PON
- ❑ 1X50G can be standardized in current time line, 50G serial is feasible in technology
- ❑ There is still enough time period for 50G EPON to be deployed in volume, it should be standardized based on the lowest cost solution by then
- ❑ P802.3ca should define 50G EPON based on 1X50G!

Thank you