Proposal for Extended EPON PMD

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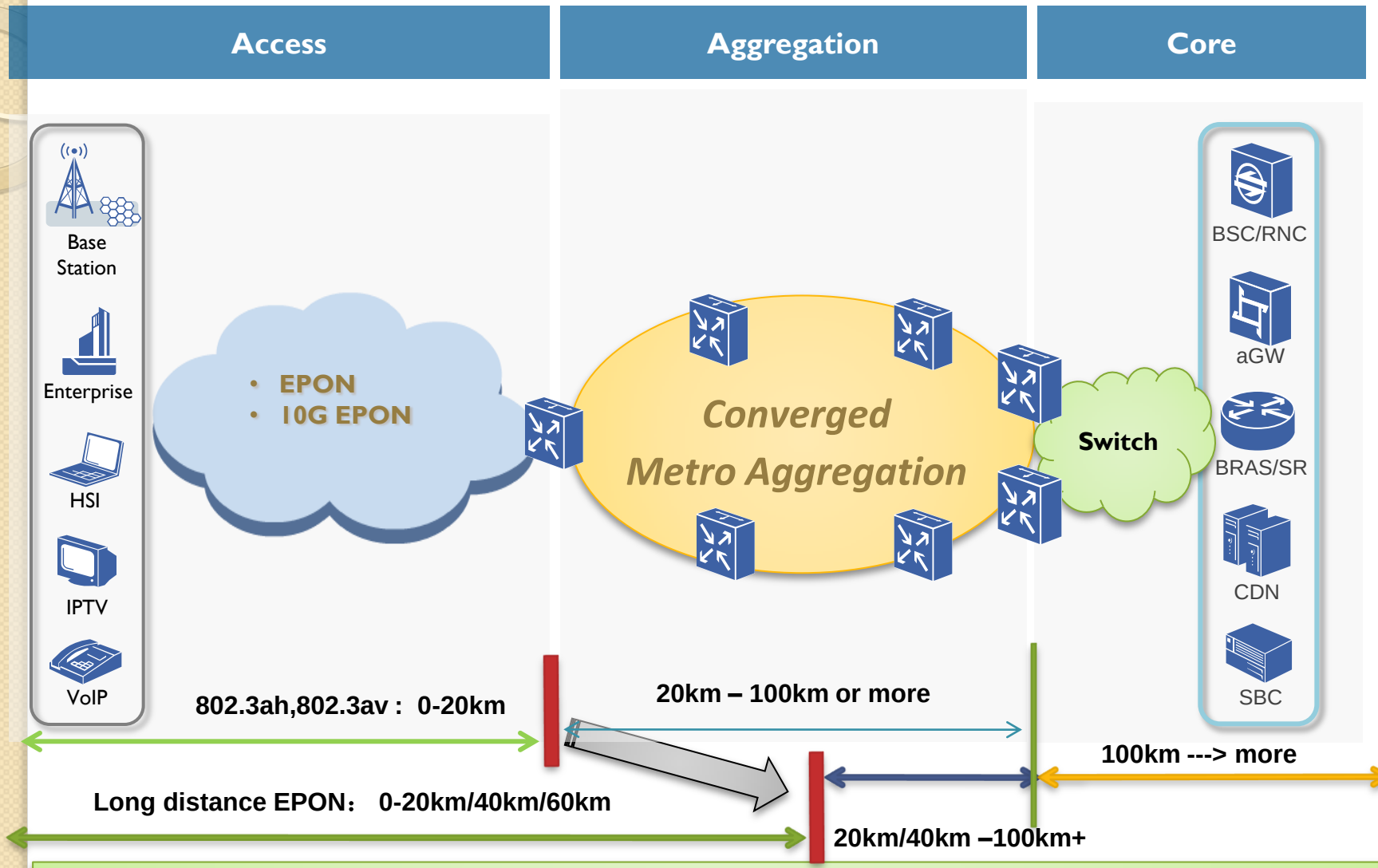
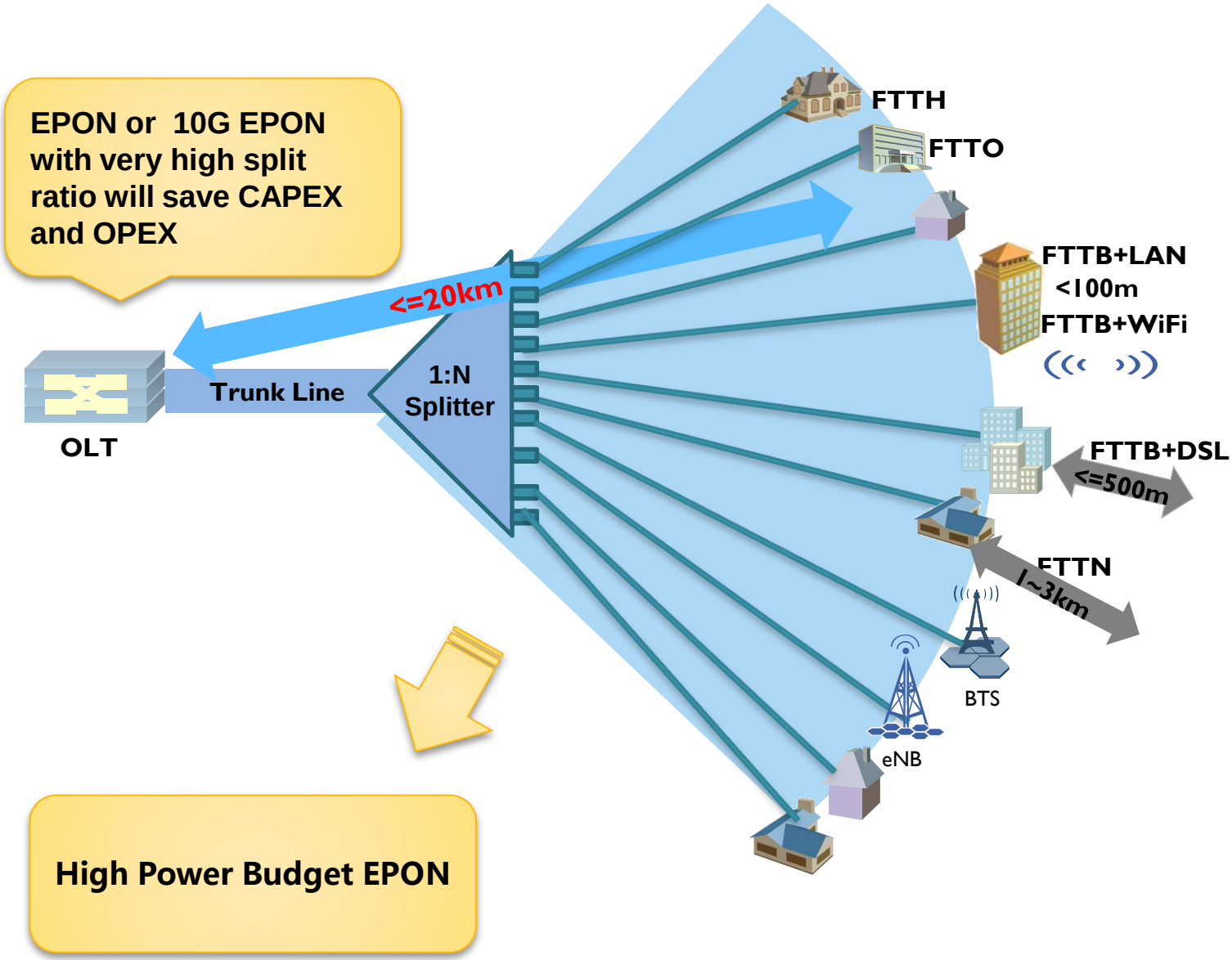
Agenda

- Market Requirements
- Power Budget Overview
- Proposal for Extended EPON PMD

Market Requirement 1: Long Distance EPON



Market Requirement 2: High split Ratio EPON



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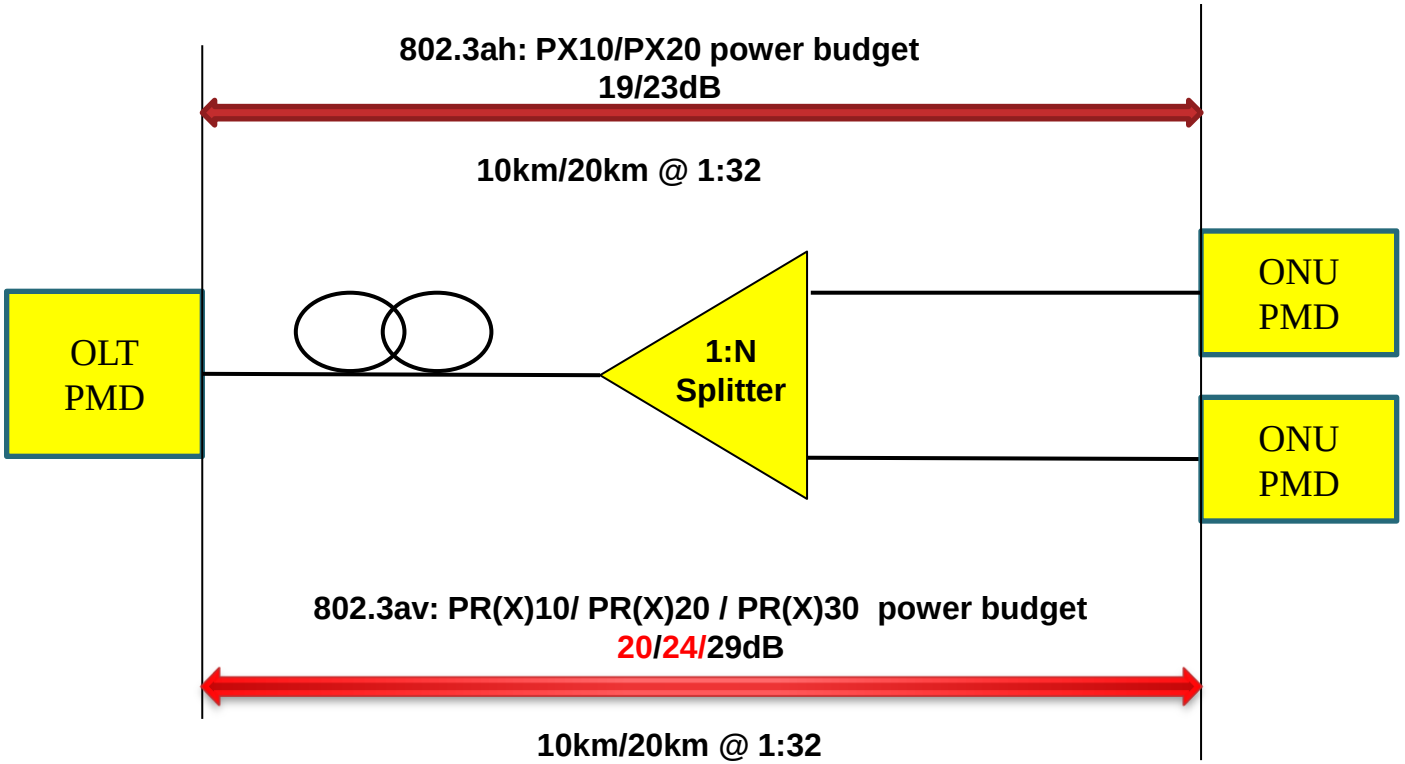
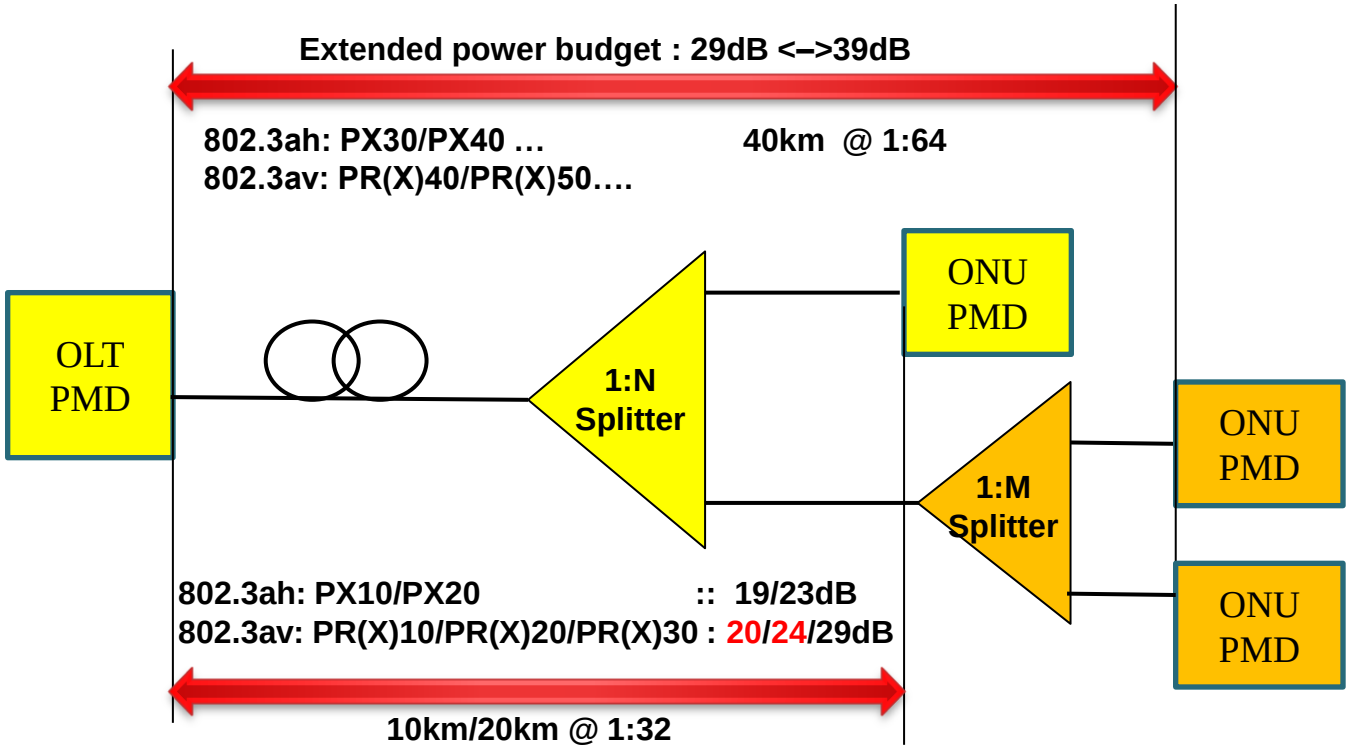
Current EPON Status



- 802.3ah and 802.3av support the PON distance up to 20km and maximum 1:32 split ratio only;
- High split ratio 1:64 or 1:128 ONLY apply for very short distance;
- In order to save CAPEX , Most carriers have deployed high power budget PX20 or PR(X)30 PON;
- Carriers require high power budget to support long distance and high split ratio (1:256)@10km.

EPON with Extended PMD



- Extended PMD of EPON has a lot of benefits
  - Easy to support long distance up to 40 km without reach extended amplified box;
  - Easy to support high split ratio 1:128 or more @ 20 km;
  - For very short distance (inside 2km) , It can support very high split ratio 1:256;
  - Saving CAPEX for Carriers.

PON Engineering specification

Parameters.	unit	Value
Upstream optical fiber loss	dB/km	0.4
Downstream optical fiber loss	dB/km	0.3
Connector loss	dB/pair	0.5
Maximum connector number	-	7
1:16 Splitter loss	dB	14
1:32 Splitter loss	dB	17.4
1:64 splitter loss	dB	20.3*
1:128 splitter loss	dB	23.5*
1:256 splitter loss	dB	27.0*
Transmitter and dispersion penalty (max)	dB	2
* It is a typical average value		

*

The power budget requirements based on engineering specification

Splitter Ratio	5km		10km		20km		40km	
	US(dB)	DS(dB)	US(dB)	DS(dB)	US(dB)	DS(dB)	US(dB)	DS(dB)
1x16	21.5	21	23.5	22.5	27.5	25.5	35.5	31.5
1x32	24.9	24.4	26.9	25.9	30.9	28.9	38.9	34.9
1x64	27.8	27.3	29.8	28.8	33.8	31.8	41.8	37.8
1x128	31	30.5	33	32	37	35	45	41
1x256	34.5	34	36.5	35.5	40.5	38.5	48.5	44.5

PR(X)30 support

Extended requirement

Future requirement

- In 802.3av, the maximum power budget of PR(x)30 is 29dB, and it can only support 1:32@20km or 1:64@10km under engineering specification.
- Carriers require higher power budget to support long distance PON (1:32@40km) and very high split ratio PON (1:256@10km)

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The Proposed new power budget classes PX30/PX40 for 1G EPON

Items	Extended Budget 1	Extended Budget 2	Units
	PX30	PX40	
Number of Fiber	1		-
Down stream line rate	1.25		GBd
Upstream line rate	1.25		GBd
Downstream Wavelength	1490		nm
Downstream Wavelength tolerance	±10		nm
Upstream wavelength	1310		nm
Upstream wavelength tolerance	±50		nm
Maximum Reach	≥20	≥20	km
Maximum Channel insertion loss	28	33	dB
Minimum Channel insertion loss	10	18	dB

- The new power budget classes will enable 1G EPON to reach longer distance(up to 40km or more)without RE box;
- Good for rural area.

The Proposed new power budget classes PR(X)40 / PR(X)50 for 10G EPON

Items	Extended Budget 1		Extended Budget 2		Units
	PRX40	PR40	PRX50	PR50	
Number of Fiber	1				-
Down stream line rate	10.3125				GBd
Upstream line rate	1.25	10.3125	1.25	10.3125	GBd
Downstream Wavelength	1577				nm
Downstream Wavelength tolerance	-2~+3				nm
Co-existent Downstream Wavelength	1490				nm
Co-existent Downstream Wavelength tolerance	-10 ~+10				nm
Upstream wavelength	1310	1270	1310	1270	nm
Upstream wavelength tolerance	±50	±10	±50	±10	nm
Maximum Reach	≥40		≥40		km
Maximum Channel insertion loss	33		37		dB
Minimum Channel insertion loss	18		21		dB

- The new power budget classes PR(X)40 and PR(X)50 will support longer distance(Up to 40km or more) ;
- For short distance, it can support very high split ratio ODN, up to 1:256 or more

Summary

- Current 802.3ah and 802.3av can only supported up to 20km and 1:32 split ratio
- EPON with higher Power budget can support long distance and high split ratio
- New Power budget class proposal:

  EPON - PX30 / PX40

  10G EPON - PR(X)40 / PR(X)50

Thank You!

Deliver the future-extended EPON for better life and greener earth