

Technical Feasibility of 10Gb/s EPON

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Agenda

❑ 10G Asymmetric EPON

- Application
- Backward compatibility
- 29 dB Optical Link Budget

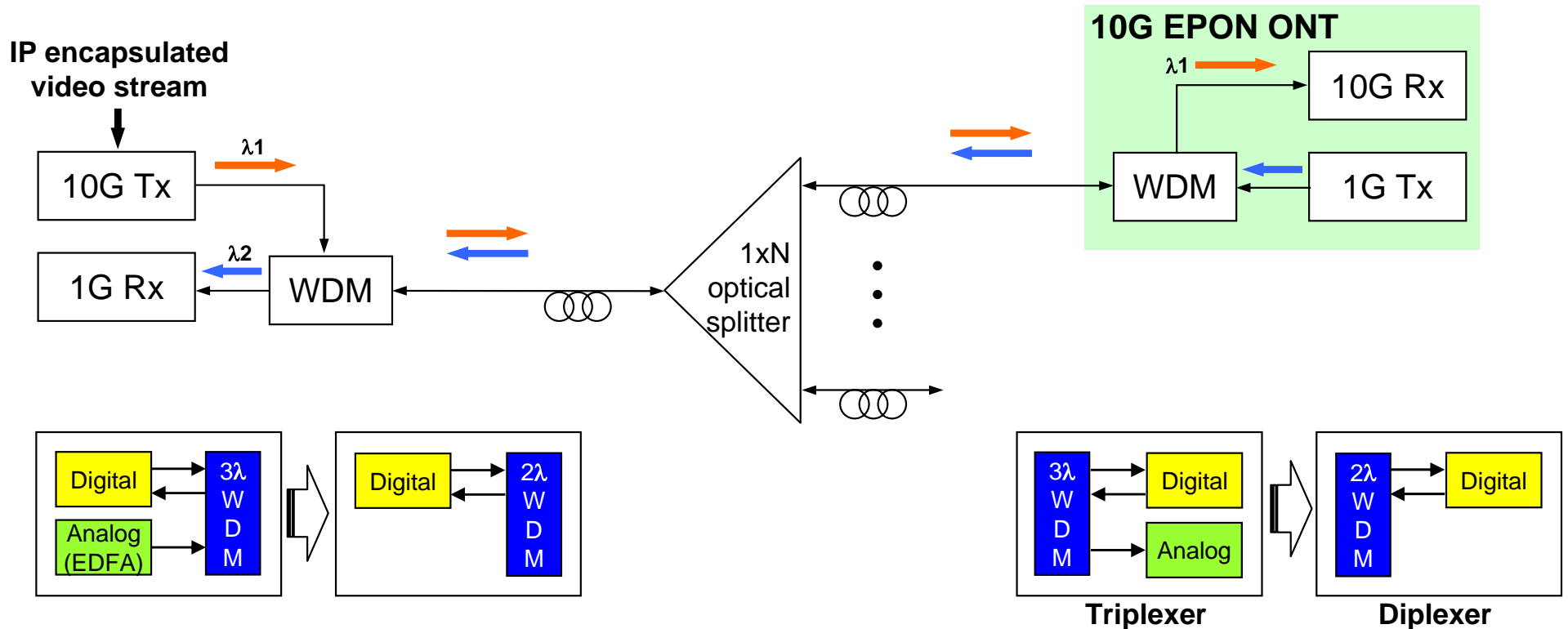
❑ 10G Symmetric EPON

- Application & Backward compatibility
- 29 dB Optical Link Budget

❑ Summary

10G Asymmetric EPON - Application

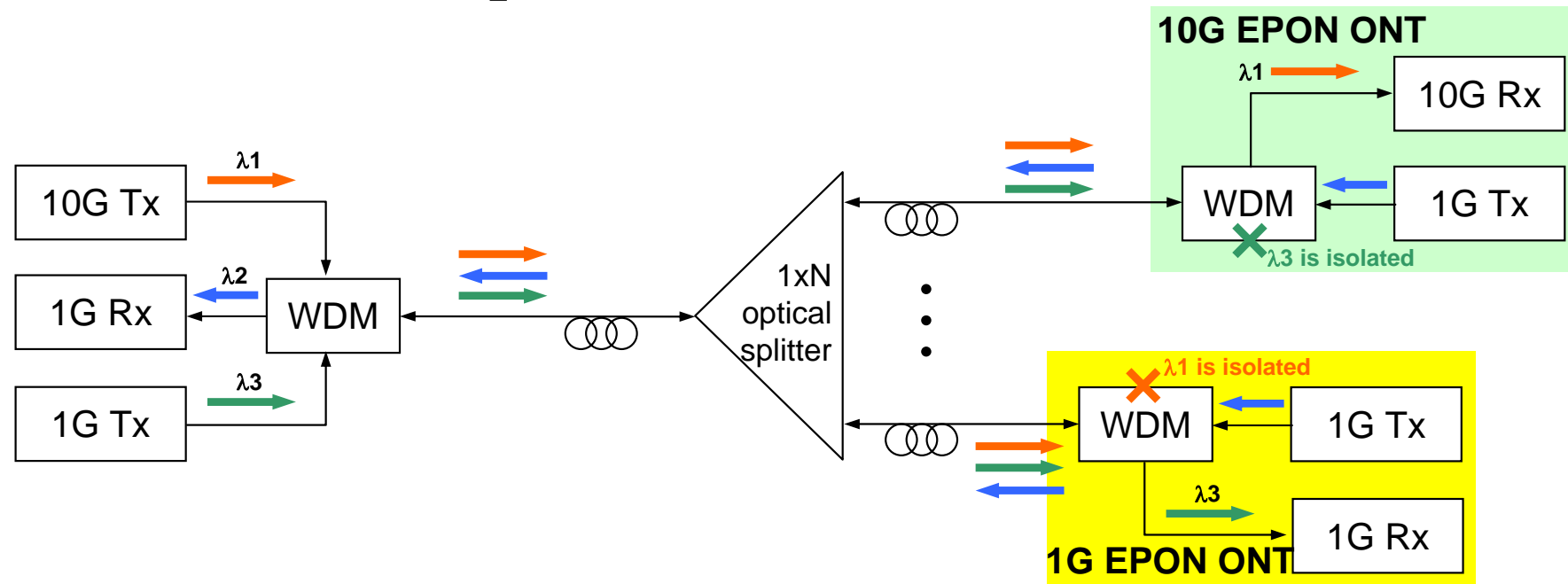
10G-down / 1G-up



- **10G EPON is a simplified and cost-effective solution for video delivery**
 - No need of a third wavelength for video
 - Provide the capability to construct All-IP networks for video delivery
 - No need of expensive QAM modulation and EDFA for analog RF signals

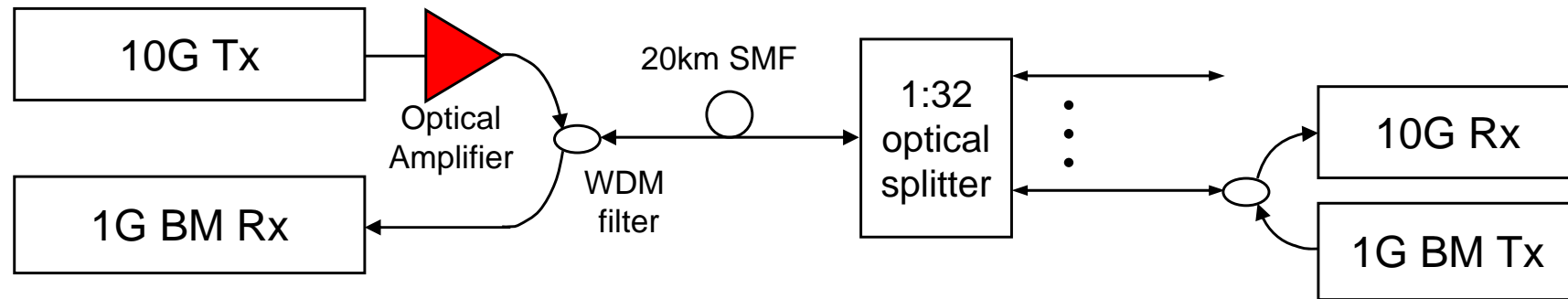
10G Asymmetric EPON –Compatibility

□ 10G-down / 1G-up



- Without video overlay, 10G EPON can be compatible with 1G EPON
 - Link budget for 10G EPON is required similar to 1G EPON for downstream only
 - Upstream 1G EPON link is shared with 10G asymmetric EPON
- No need to reconstruct the wavelength plan

10G Asymmetric EPON – 29dB Link Budget



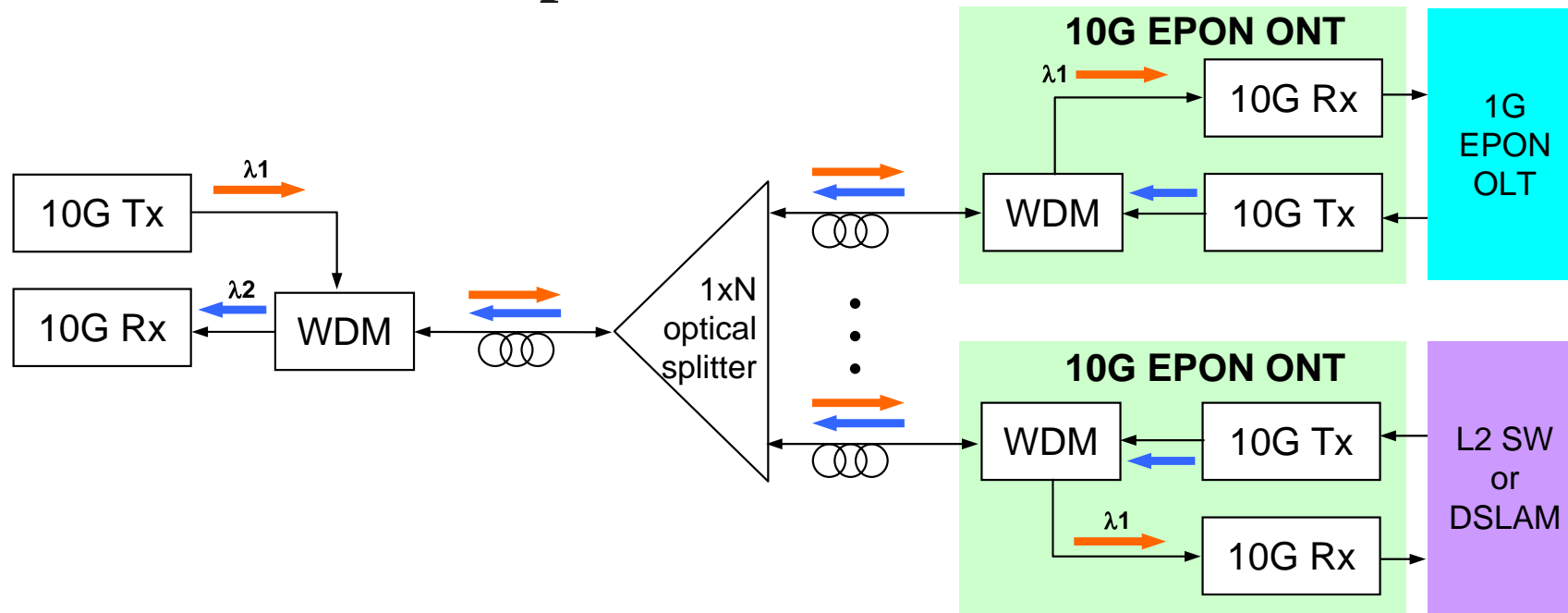
Stream	Tx Launch Power		Rx Performance			Available Link Budget
	Source	Amplifier	Sensitivity ¹⁾	Amplifier	FEC	
10G Down	+1 dBm (EML)	9 dB Gain (SOA)	-15 dBm (pin-PD)	N/A	4dB	29 dB
	+1 dBm (EML)	13 dB Gain (SOA)	-15 dBm (pin-PD)	N/A	N/A	29 dB
1G Up	-1 dBm (DFB LD)	N/A	-30 dBm (APD)	N/A	N/A	29 dB

¹⁾ in a typical case

- SBS threshold: +17 dBm with frequency dithering
- SOA gain for continuous-mode downstream: 20 dB (typical)

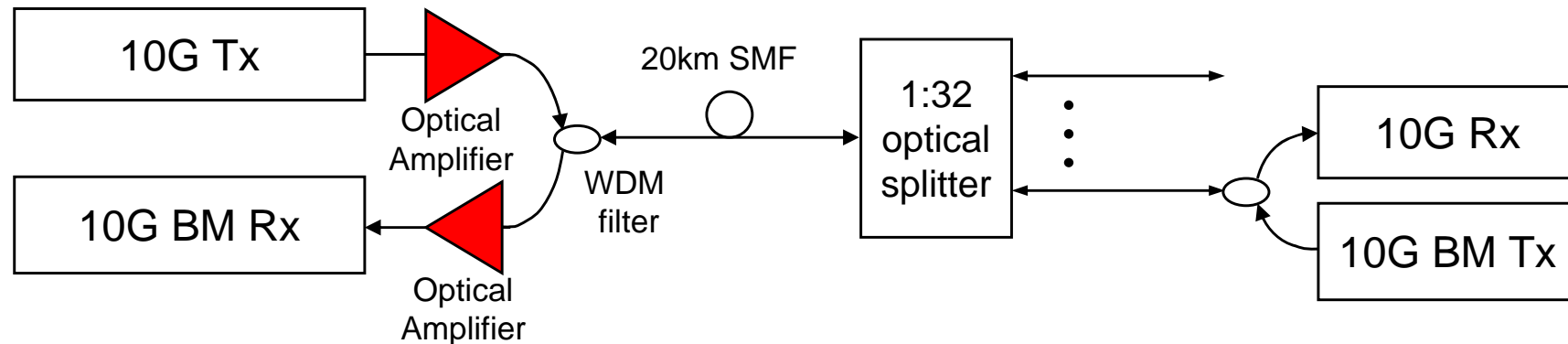
10G Symmetric EPON – Application & Compatibility

□ 10G-down / 10G-up



- In the first stage, 10G symmetric EPON provides a backhaul for multi-access networks
 - For 1G EPON OLTs, VDSL systems, wireless systems, and ...
 - Different application domain with the existing 1G EPON link
 - No requirement for backward compatibility with 1G EPON
 - It is able to reuse the existing wavelength plan

10G Symmetric EPON – 29 dB Link Budget



Stream	Tx Launch Power		Rx Performance			Available Link Budget
	Source	Amplifier	Sensitivity ¹⁾	Amplifier	FEC	
10G Down	+1 dBm (EML)	9 dB Gain (SOA)	-15 dBm (pin-PD)	N/A	4dB	29 dB
	+1 dBm (EML)	13 dB Gain (SOA)	-15 dBm (pin-PD)	N/A	N/A	29 dB
10G Up	-1 dBm (DFB LD)	N/A	-21 dBm (APD)	9 dB Gain (PDFA or SOA)	N/A	29 dB

- Shared optical amplifier gain for burst-mode upstream ^{1) in a typical case}
 - ~10 dB for PDFA, reported by K. Suzuki, et al., at ECOC 2005
 - ~20 dB for SOA, reported by N. Suzuki, et al., at ECOC 2005

PDFA: praseodymium-doped fiber amplifier,

Summary

□ 10G Asymmetric EPON is

- simplified and cost-effective for video delivery
- able to coexist with 1G EPON in a same fiber
- technically feasible with 29 dB optical link budget by using SOA at OLT transmitter

□ 10G Symmetric EPON is

- applied to a backhaul for existing 1G EPON OLTs, VDSL systems, wireless systems, and so on
- technically feasible with 29 dB optical link budget by using PDFFA or SOA at both OLT transmitter and receiver.