802.3ca PHY Names

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802.3ah PHY Naming

- 802.3ah 10G-EPON has defined the following PMDs:

	OLT PMD (D-Type)	ONU PMD (U-Type)
Symmetric	1) 1GBASE–PX10–D 2) 1GBASE–PX20–D 3) 1GBASE–PX30–D 4) 1GBASE–PX40–D	1) 1GBASE–PX10–U 2) 1GBASE–PX20–U 3) 1GBASE–PX30–U 4) 1GBASE–PX40–U

Dissecting a .3ah PHY Name

1G	Downstream and upstream line rates (rounded).
BASE	Baseband Signal (Some PHYs use BROAD or PASS)

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P	PON medium
X	PCS type: X – 8b/10b line coding
nn	Power class = {10, 20, 30, 40}

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D	D – Downstream-facing PMD (i.e., in the OLT) U – Upstream-facing PMD (i.e., in the ONU)

802.3av PHY Naming

- 802.3av 10G-EPON has defined the following PMDs:

	OLT PMD (D-Type)	ONU PMD (U-Type)
Asymmetric	1) 10/1GBASE–PRX–D1 2) 10/1GBASE–PRX–D2 3) 10/1GBASE–PRX–D3 4) 10/1GBASE–PRX–D4	1) 10/1GBASE–PRX–U1 2) 10/1GBASE–PRX–U2 3) 10/1GBASE–PRX–U3 4) 10/1GBASE–PRX–U4
Symmetric	1) 10GBASE–PR–D1 2) 10GBASE–PR–D2 3) 10GBASE–PR–D3 4) 10GBASE–PR–D4	1) 10GBASE–PR–U1 2) 10GBASE–PR–U3 3) 10GBASE-PR–U4

Dissecting a .3av PHY Name

10	Downstream line rate (rounded).
[/1]	Upstream line rate (rounded). Only shown for asymmetric PMDs
G	Gigabit/s rate (in reference to the above numbers)
BASE	Baseband Signal

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P	PON medium
R	PCS type: X – 8b/10b, R – 64b/66b, RX means R down and X up

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D	D – Downstream-facing PMD (i.e., in the OLT) U – Upstream-facing PMD (i.e., in the ONU)
1	Power class = {1, 2, 3, 4}

PHY Naming is Flexible

- PHY naming structures in .3ah and .3av were similar, but not identical
  - Power classes in .3ah: PX10-U, PX20-D, etc.
  - Power classes in .3av: PR-U1, PRX-D2, etc.
  - The difference in naming reflects the fact that in .3av a single ONU PMD was paired with two different OLT PMDs to provide two power budgets.

Table 75–3—PMD – power budget mapping for symmetric-rate PR–type power budgets

		OLT PMDs			
		10GBASE–PR–D1	10GBASE–PR–D2	10GBASE–PR–D3	10GBASE–PR–D4
ONU PMDs	10GBASE–PR–U1	PR10	PR20	N/A	N/A
	10GBASE–PR–U3	N/A	N/A	PR30	N/A
	10GBASE–PR–U4	N/A	N/A	N/A	PR40

- PHY naming format is not set in stone, but may be adjusted to specific circumstances of each project.

PHY Definitions

- In July 2016, we considered several methods to name .3ca PHYs:

DS Lanes	US Lanes	Method 1	Method 2	Method 3 (Selected)
1	1	25GBASE-PR	SS25GBASE-PR	25/10GBASE-PR
2	1	DS25GBASE-PR	DS25GBASE-PR	25GBASE-PR
2	2	D25GBASE-PR	DD25GBASE-PR	50/25GBASE-PR
4	1	QS25GBASE-PR	QS25GBASE-PR	50GBASE-PR
4	2	QD25GBASE-PR	QD25GBASE-PR	100/25GBASE-PR
4	4	Q25GBASE-PR	QQ25GBASE-PR	100/50GBASE-PR
		S = single, D = double, Q = quadruple		

- Unfortunately, the selected naming does not address .3ca special circumstances (see next slide)

.3ca special circumstances

.3ca PHY naming should clearly indicate

1) **Line rate** (not the aggregated MAC rate)
   - "25G" for symmetric lanes, or "25G/10G" for asymmetric lanes
   - Leave "50G" designation for potential future PHYs for 50Gb/s over single wavelength
2) **Number of lanes / wavelengths** used in each direction
3) **Wavelength plan** used
   - Option A or Option B?

Not well addressed in the current scheme

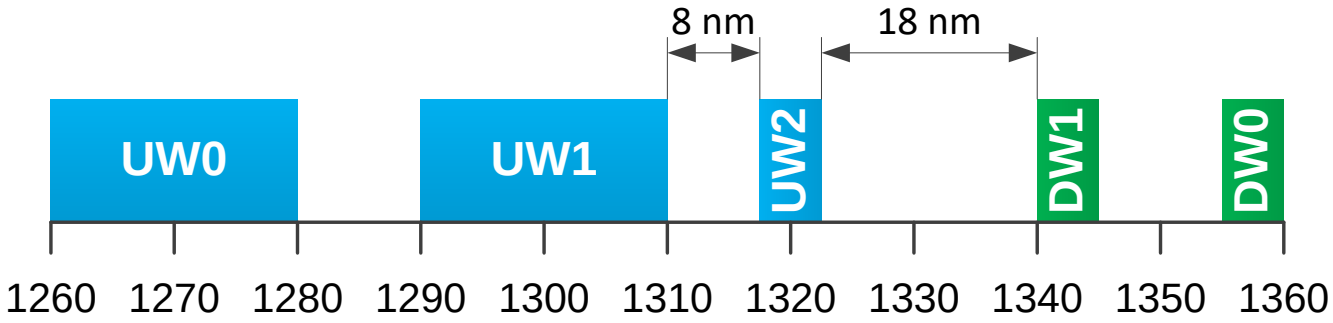
4) **Power class**
   - .3av approach is more flexible as it allows the same OLT or ONU PMD to support multiple power budgets

- These PHY names are also used to label optical modules, so they need to be complete, precise, and extensible.

Wavelength indication

- The number of lanes used in each direction as well as the wavelength coexistence option (Plan A or B), can be expressed using two digits

	First digit - Downstream				Second Digit - Upstream			
Bit position	3	2	1	0	3	2	1	0
Mapped to	-	-	DW1	DW0	-	UW2	UW1	UW0



- The bit value is 1 if the corresponding wavelength is supported in the PHY, 0 otherwise.

Proposed naming .3ca PHY

25	Downstream line rate. This is the rate of individual lane, not the aggregated MAC rate.
[/10]	Upstream line rate. Only shown for asymmetric lanes
G	Gigabit/s rate (in reference to the above numbers)
BASE	Baseband Signal

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P	PON medium
Q	PCS type: How about Q for 256b/257b?
k	Power class = {1, 2} or {2, 3}?

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D	D – Downstream-facing PMD (i.e., in the OLT) U – Upstream-facing PMD (i.e., in the ONU)
m	Bitmap of supported downstream wavelengths = {1, 3}
n	Bitmap of supported upstream wavelengths = {1, 2, 5, 6}

Some naming examples

One downstream / **one** upstream wavelength (25G/25G and 25G/10G)		
Wavelength option A **(DW1 / UW1)**	Symmetric:	25GBASE-PQ2-D**11**
	Asymmetric:	25/10GBASE-PQ3-U**11**
Wavelength option B **(DW1 / UW2)**	Symmetric:	25GBASE-PQ2-D**12**
	Asymmetric:	25/10GBASE-PQ3-U**12**
Two downstream / **one** upstream wavelength (50G/25G and 50G/10G)		
Wavelength option A **(DW1+DW2 / UW1)**	Symmetric:	25GBASE-PQ2-D**31**
	Asymmetric:	25/10GBASE-PQ3-U**31**
Wavelength option B (**DW1+DW2 / UW2**)	Symmetric:	25GBASE-PQ2-D**32**
	Asymmetric:	25/10GBASE-PQ3-U**32**
Two downstream / **two** upstream wavelength (50G/50G)		
Wavelength option A **(DW1+DW2 / UW1+UW3)**	Symmetric:	25GBASE-PQ2-D**35**
Wavelength option B **(DW1+DW2 / UW2+UW3)**	Symmetric:	25GBASE-PQ3-U**36**

Power Budget Names

- Power budgets:
  - **PQ20**: medium power budget, compatible with PRX20 and PR20 power budgets defined in clause 75.
  - **PQ30**: high power budget, compatible with PRX30 and PR30 power budgets defined in clause 75.

- The PQ20 power budget is achieved by pairing PQ2-D PMD with PQ2-U PMD.

- The PQ30 power budget is achieved by pairing PQ3-D PMD with PQ3-U PMD.

Exhaustive List of 25G PMDs

25G/10G-EPON	25G/25G-EPON
25/10GBASE-PQ2-D11	25GBASE-PQ2-D11
25/10GBASE-PQ2-U11	25GBASE-PQ2-U11
25/10GBASE-PQ3-D11	25GBASE-PQ3-D11
25/10GBASE-PQ3-U11	25GBASE-PQ3-U11
25/10GBASE-PQ2-D12	25GBASE-PQ2-D12
25/10GBASE-PQ2-U12	25GBASE-PQ2-U12
25/10GBASE-PQ3-D12	25GBASE-PQ3-D12
25/10GBASE-PQ3-U12	25GBASE-PQ3-U12

Number of PMDs in each column:

{OLT, ONU} ×

{PQ2, PQ3} ×

{Plan A, Plan B} = 8

Exhaustive List of 50G PMDs

50G/10G-EPON	50G/25G-EPON	50G/50G-EPON
25/10GBASE-PQ2-D31	25GBASE-PQ2-D31	25GBASE-PQ2-D35
25/10GBASE-PQ2-U31	25GBASE-PQ2-U31	25GBASE-PQ2-U35
25/10GBASE-PQ3-D31	25GBASE-PQ3-D31	25GBASE-PQ3-D35
25/10GBASE-PQ3-U31	25GBASE-PQ3-U31	25GBASE-PQ3-U35
25/10GBASE-PQ2-D32	25GBASE-PQ2-D32	25GBASE-PQ2-D36
25/10GBASE-PQ2-U32	25GBASE-PQ2-U32	25GBASE-PQ2-U36
25/10GBASE-PQ3-D32	25GBASE-PQ3-D32	25GBASE-PQ3-D36
25/10GBASE-PQ3-U32	25GBASE-PQ3-U32	25GBASE-PQ3-U36

Thank You