

Categorization of 5 Criteria Responses Update

IEEE 802.3df Beyond 400 Gb/s Study Group

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Introduction

- 3/20/21 802.3 >400G SG presentation used 10, 40, 100, 200 & 400GbE timelines to make 200, 400, 800 & 1600GbE predictions
https://www.ieee802.org/3/B400G/public/21_03/cole_b400g_01b_210322.pdf
- Commitment was made to the SG to present GbE optical port shipment data for all of 2020, when it became available, to verify prediction accuracy
- Predictions are meant to help industry optimize R&D and Deployment
- To maximize accuracy, predictions were made during the **Vernal Equinox** (3/20/21); then astrologically most favorable moment
- To continue maximizing accuracy, predictions were verified during **Summer Solstice** (6/20/21); recently astrologically most favorable
<https://exploreddeeply.com/live-your-purpose/tag/Ritual>



200 & 400GbE SMF Optics Predictions from 3/20/21

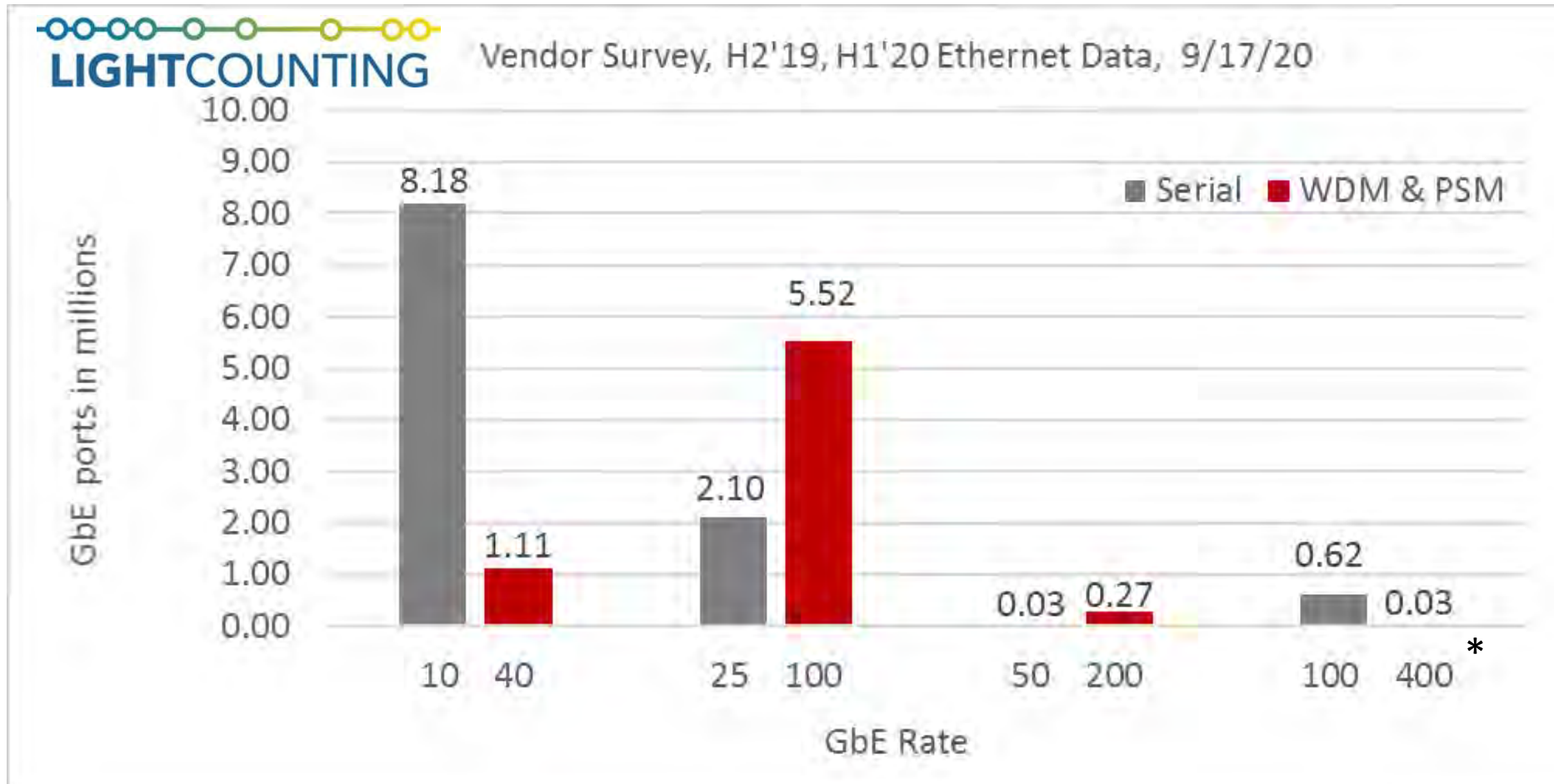
1 st 802.3 Project	designation	ae	ba		bs			
	GbE Rate	10	40	100	200		400	
	start	1999	2007	2006	2015		2013	
	published	2002	2010	2010	2017		2017	
1 st shipment	year	1998	2009	2011	2017	2018	2017	2019
	type	SONET LR	LR4	OTN LR4	Mobile LR4		LR8	
	wavelength	1x10	4x10	4x25	4x50		8x50	
	I/O	16x0.622	4x10	10x10	8x25	4x50	16x25	8x50
	form factor	300-pin	CFP	CFP	CFP	QSFP	CFP8	QSFP-DD
1 st million shipment	year	2008	2014	2016	2021		2023	
	type	LR	LR4	CWDM4	FR4		FR4	
	wavelength	10	4x10	4x25	4x50		4x100	
	I/O	10	4x10	4x25	2x4x50	4x50	2x4x100	4x100
	form factor	SFP	QSFP	QSFP	OSFP	QSFP	OSFP	QSFP

Ethernet SMF Optical Transceivers Grouped by MAC Rate

Gb/s/λ	10		25		50		100	
GbE	10	40	25	100	50	200	100	400
code	LR	LR4	LR	CWDM4	FR1, LR1	FR4	DR1, FR1	FR4, LR4
module	SFP+	QSFP+	SFP28	QSFP28	SFP56	QSFP56	QSFP28	QSFP-DD
code	PSM4	PSM4	PSM4	PSM4		2xGR4	DR4	DR4
module	QSFP+	QSFP+	QSFP28	QSFP28		OSFP	QSFP-DD	QSFP-DD
code				LR4		<i>LR4</i>		LR8*
module				QSFP28		<i>QSFP56</i>		QSFP-DD

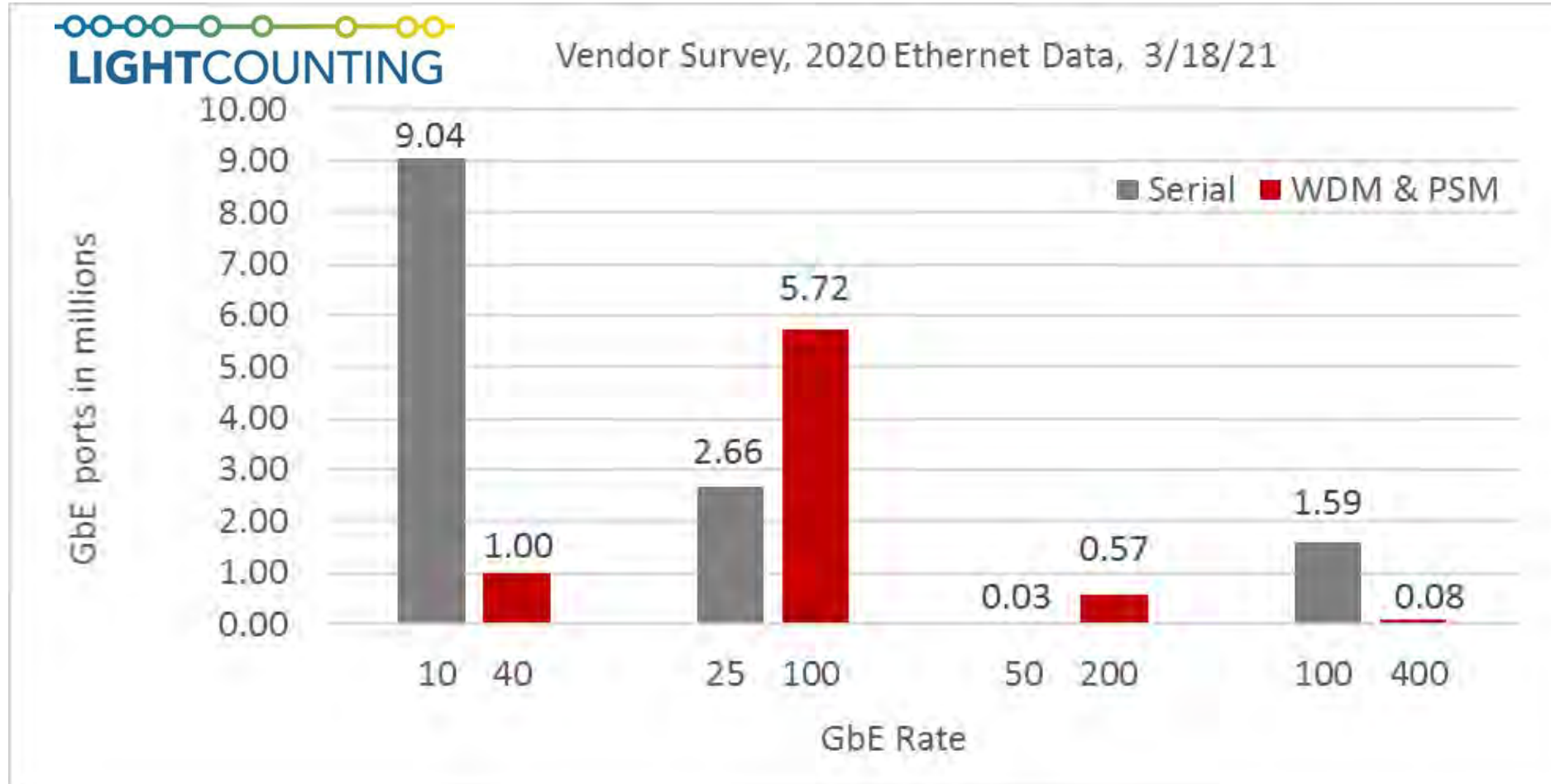
* LR8 uses 50Gb/s/λ

Ethernet SMF Optics Annual Port Shipments from 3/20/21

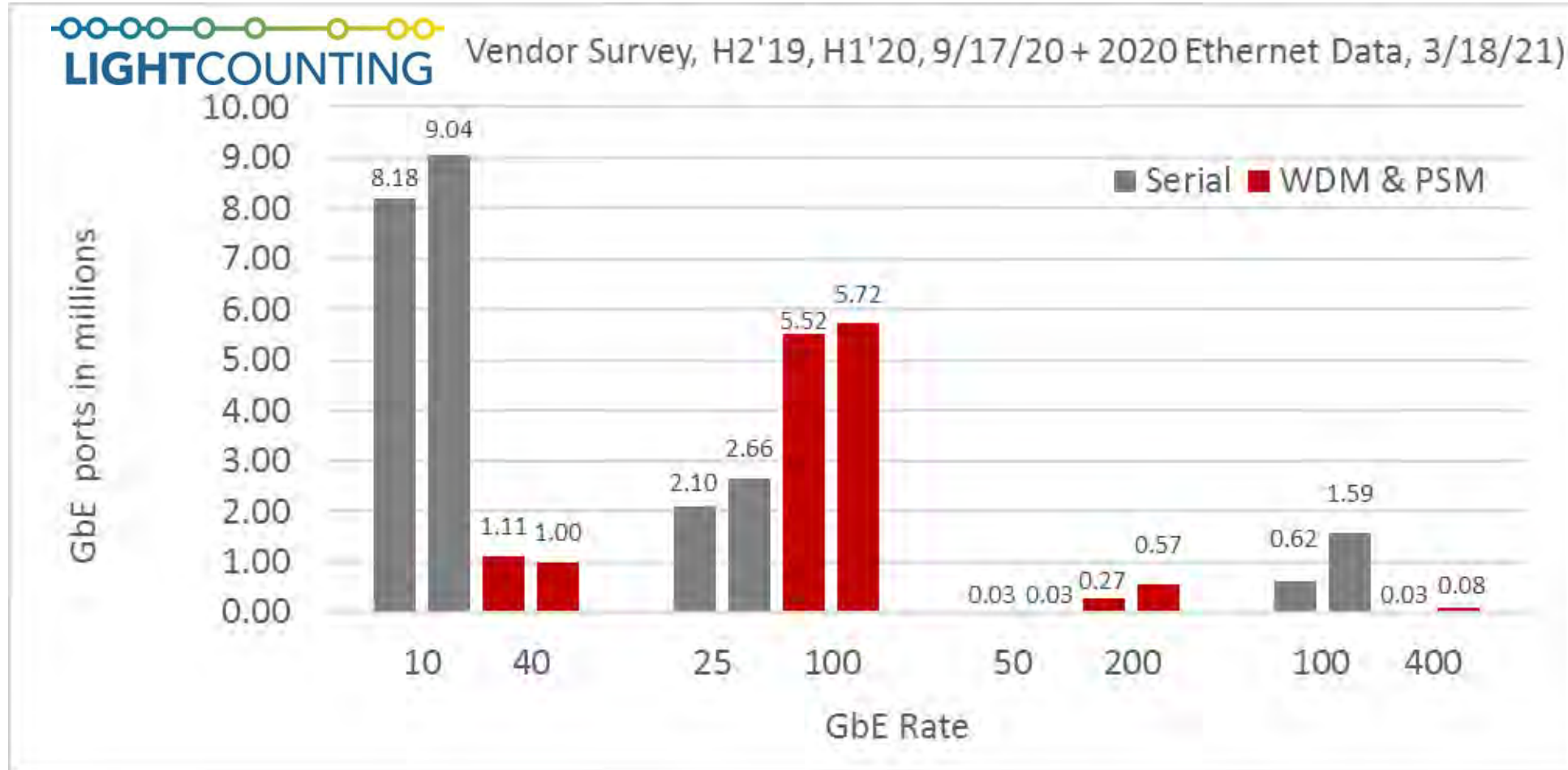


* 100Gb/s/ λ split updated from 3/20/21 presentation

Ethernet SMF Optics Annual Port Shipments in all of 2020



Ethernet SMF Optics Annual Port Shipments Combined



LightCounting H1'21 estimated port shipments (6/17/21) are consistent with above trends

200 & 400GbE SMF Optics Predictions Verified on 6/20/21

1 st 802.3 Project	designation	ae	ba		bs			
	GbE Rate	10	40	100	200		400	
	start	1999	2007	2006	2015		2013	
	published	2002	2010	2010	2017		2017	
1 st shipment	year	1998	2009	2011	2017	2018	2017	2019
	type	SONET LR	LR4	OTN LR4	Mobile LR4		LR8	
	wavelength	1x10	4x10	4x25	4x50		8x50	
	I/O	16x0.622	4x10	10x10	8x25	4x50	16x25	8x50
	form factor	300-pin	CFP	CFP	CFP	QSFP	CFP8	QSFP-DD
1 st million shipment	year	2008	2014	2016	2021		2023	
	type	LR	LR4	CWDM4	FR4		FR4	
	wavelength	10	4x10	4x25	4x50		4x100	
	I/O	10	4x10	4x25	2x4x50	4x50	2x4x100	4x100
	form factor	SFP	QSFP	QSFP	OSFP	QSFP	OSFP	QSFP

800 & 1600GbE SMF Optics Predictions with select Updates

1 st 802.3 Project	designation	ae	ba		bs				df		
	GbE Rate	10	40	100	200		400		800	1600	
	start	1999	2007	2006	2015		2013		2019	2021	
	published	2002	2010	2010	2017		2017		2025	2025	
1 st shipment	year	1998	2009	2011	2017	2018	2017	2019	2022	2025	2027
	type	SONET LR	LR4	OTN LR4	Mobile LR4		LR8		LR8	LR8	
	wavelength	1x10	4x10	4x25	4x50		8x50		8x100	8x200	
	I/O	16x0.622	4x10	10x10	8x25	4x50	16x25	8x50	8x100	16x100	8x200
	form factor	300-pin	CFP	CFP	CFP	QSFP	CFP8	QSFP-DD	OSFP	OSFP-XD	OSFP
1 st million shipment	year	2008	2014	2016	2021		2023		2029	2031	
	type	LR	LR4	CWDM4	FR4		FR4		FR4	FR8	
	wavelength	10	4x10	4x25	4x50		4x100		4x200	8x200	
	I/O	10	4x10	4x25	2x4x50	4x50	2x4x100	4x100	2x4x200	4x200	2x8x200
	form factor	SFP	QSFP	QSFP	OSFP	QSFP	OSFP	QSFP	OSFP	QSFP	OSFP-XD

+4

+6

Ethernet Milestones Predictions Summary & Discussion

1 st 802.3 Project	designation	ae	ba		bs				df		
	GbE Rate	10	40	100	200		400		800	1600	
	start	1999	2007	2006	2015		2013		2019	2021	
	published	2002	2010	2010	2017		2017		2025	2025	
Shipment	1st	1998	2009	2011	2017	2018	2017	2019	2022	2025	2027
	1 st million	2008	2014	2016	2021		2023		2029	2031	

What is the same:

- 800GbE is likely to follow similar timeline to 40 & 200GbE
- 1.6TbE is likely to follow similar timeline to 10, 100 & 400GbE

What is different:

- 1st million 100GbE Serial shipment is preceding 400GbE WDM 1st million by ~3 years
- This is reverse of 25 & 50GbE Serial, which followed 100 & 200GbE WDM
- Is this a new paradigm? Will 1st million 200GbE Serial shipment precede 800GbE WDM?

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Thank you