

Switch Designs for 50GbE and 200GbE

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kipp_50GE_NGOATH_01_0116.pdf

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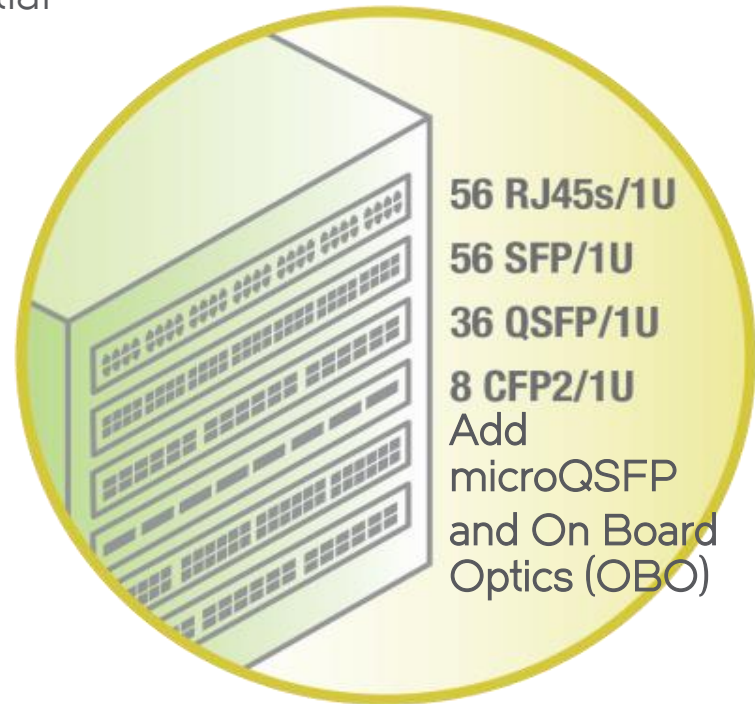
Supporters

- Rob Stone, Broadcom
- Vittal Balasubramanian, Dell
- Mike Dudek, QLogic
- Ali Ghiasi, Ghiasi Quantum
- Scott Sommers, Molex
- Nathan Tracy, TE
- Tom Palkert, Molex

50G Lanes are Part of the Bigger Picture

50G technology has Broad Market Potential

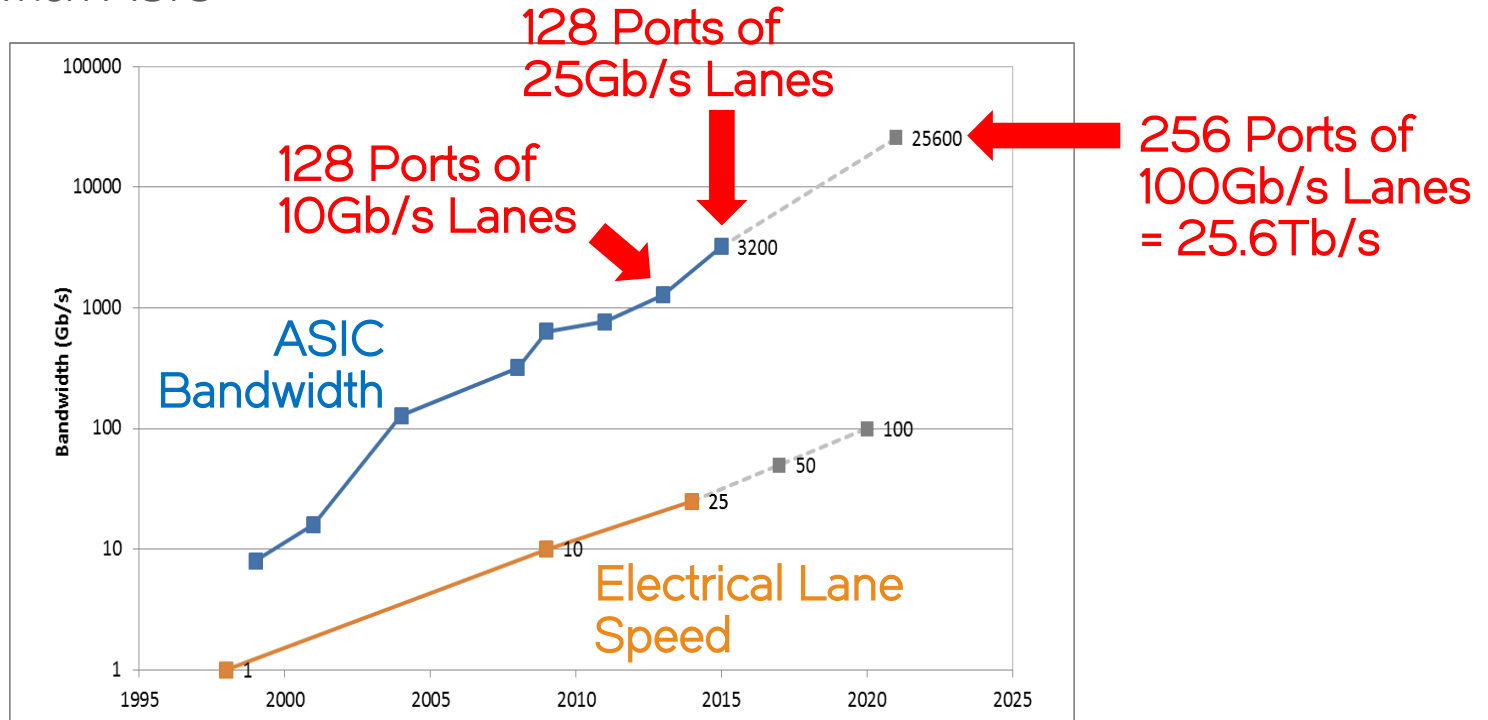
- In addition to going faster, the industry is developing 128+ ports on switch ASICs
- QSFP supports only 144 lanes in 1U
- The industry will move to higher lane density than the QSFP can support in the 50G era



 ethernet alliance

More Ports at Higher Speeds

25Tb/s Switch ASIC



SOURCE: BROADCOM PRESENTATION
FROM ETHERNET ALLIANCE TEF'2014

Modules Types and Lane Counts

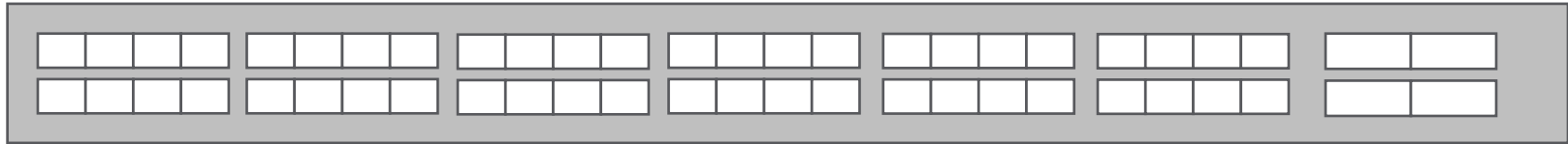
- SFP = 1 lane/module
- QSFP, CFP4, microQSFP, CFP2 = 4 lanes/module
- CFP2, QSFP-DD, On Board Optics = 8 lanes/module
- On Board Optics = 12 lanes/module

ASIC Port Count	4X	8X	12X
64	16	8	5 + 4
128	32	16	10 + 8
192	48	24	16
256	64	32	21 + 4

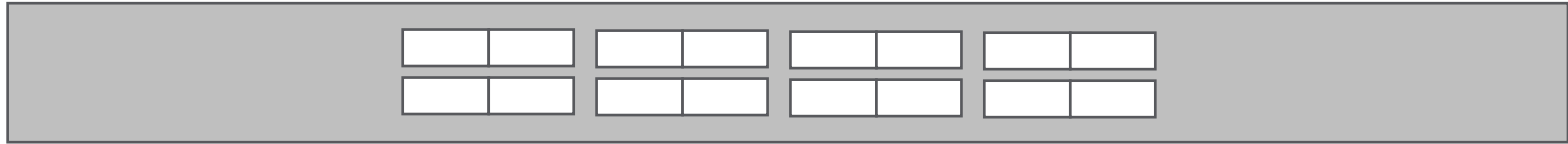
64 Port Switch Designs

640Gb/s of Throughput with 10G Lanes ~2008

48 SFP + 4 QSFP



16 QSFP

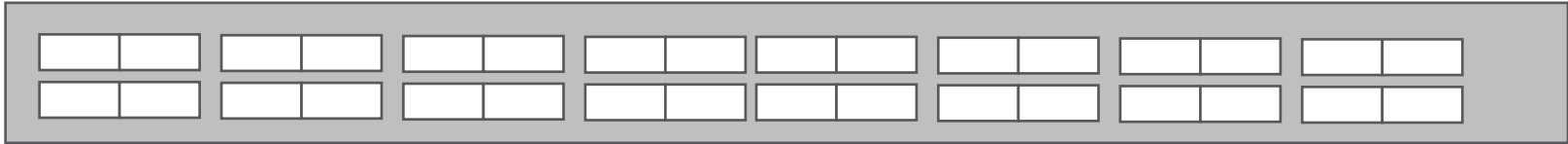


QSFP is ~3X the
lane density of SFP

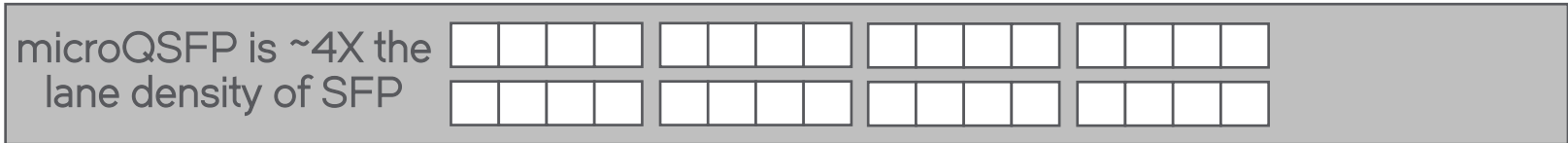
128 Port Switch Designs

1.28Tb/s of Throughput at 10G. 3/2 Tb/s at 25G ~2015

32 QSFP



32 microQSFP



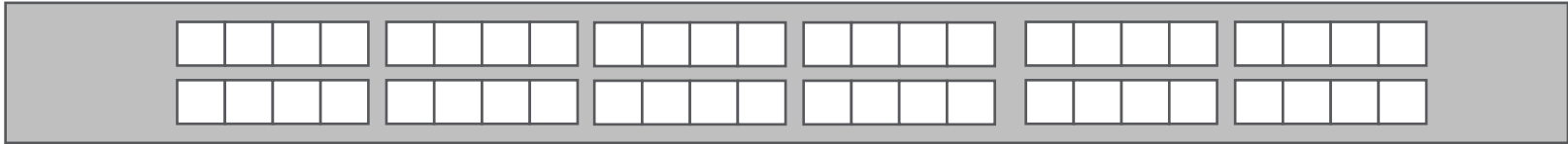
8 SFP + 10 12-lane On Board Optics



192 Port Switch Designs

4.8 Tb/s at 25G, 9.6 Tb/s at 50G ~2017?

48 microQSFP



16 12-lane On Board Optics



16 24-fiber MPO Receptacles

24 8-lane On Board Optics



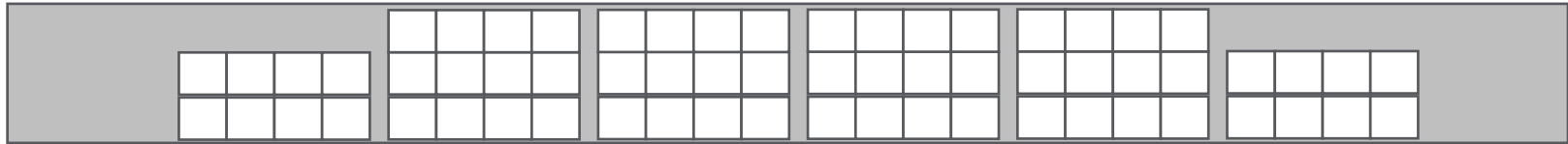
24 16-fiber or 24-fiber MPO Receptacles

256 Port Switch Designs

12.8 Tb/s at 50G. 25.6Tb/s at 100G >2020?

64 microQSFP

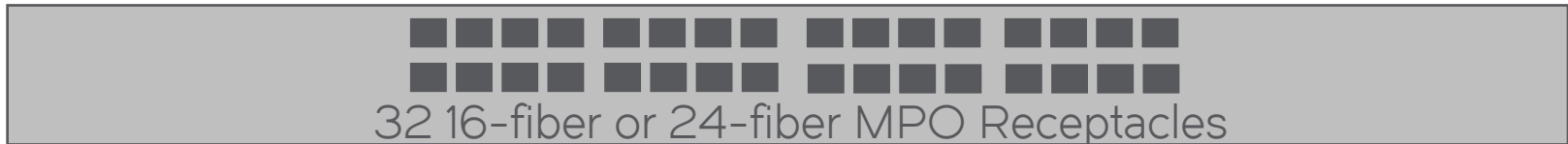
*All these design will be very challenged thermally and by board real estate. microQSFP has enhanced thermal properties compared to SFP and QSFP.



24 QSFP + 16 12-lane On Board Optics



32 8-lane On Board Optics



32 16-fiber or 24-fiber MPO Receptacles

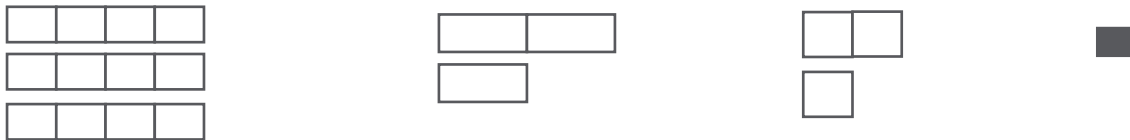
Module Tradeoffs

Flexible Solutions are mixing On Board Optics (OBO) and Pluggable Optics

- SFP to QSFP to microQSFP to 8-lane OBO

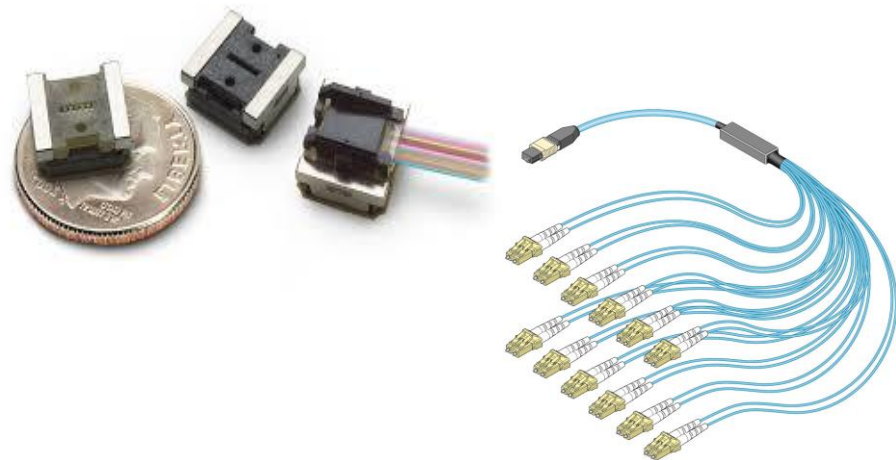


- SFP to QSFP to microQSFP to 12-lane OBO



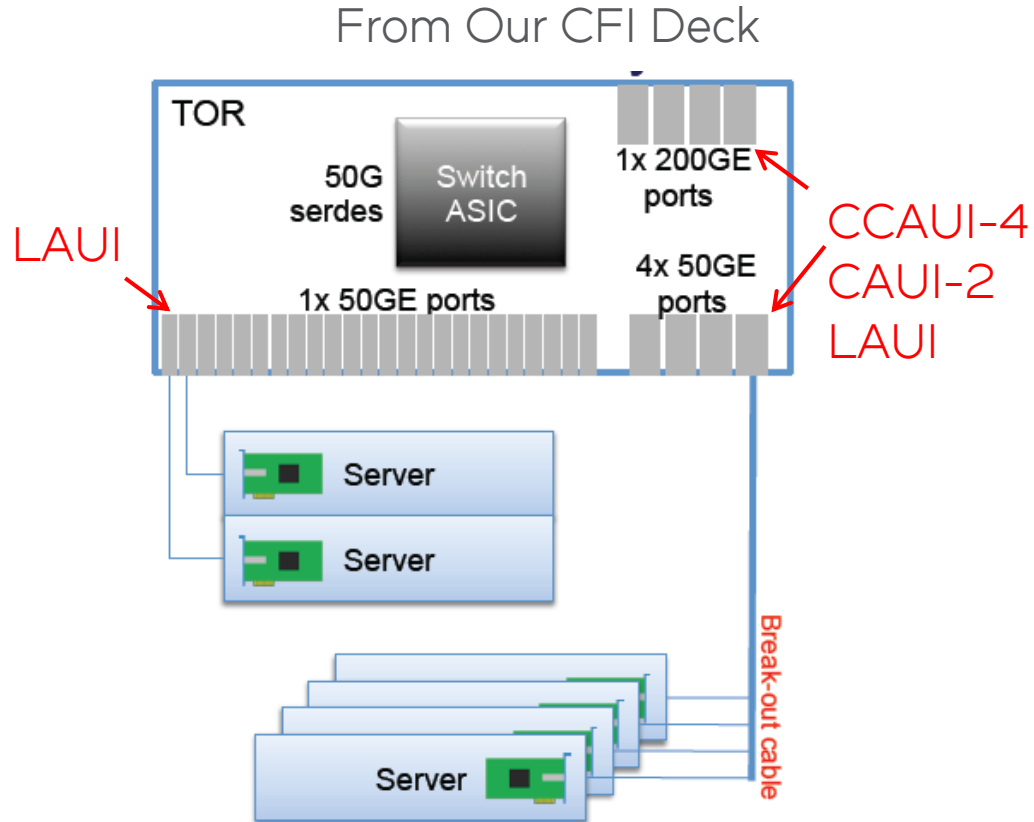
Implications of High Port Count Switches

- Switches are going away from SFP (50GbE) modules to QSFP and microQSFP to OBO depending on the port count
- Not all switches will be based on the highest port count ASIC, but most switches are expected to be 128 ports or more for high density
 - Thus not SFP+
- The 50G Study Group needs to consider that switch designs will be based on multi-lane ports that will be broken out



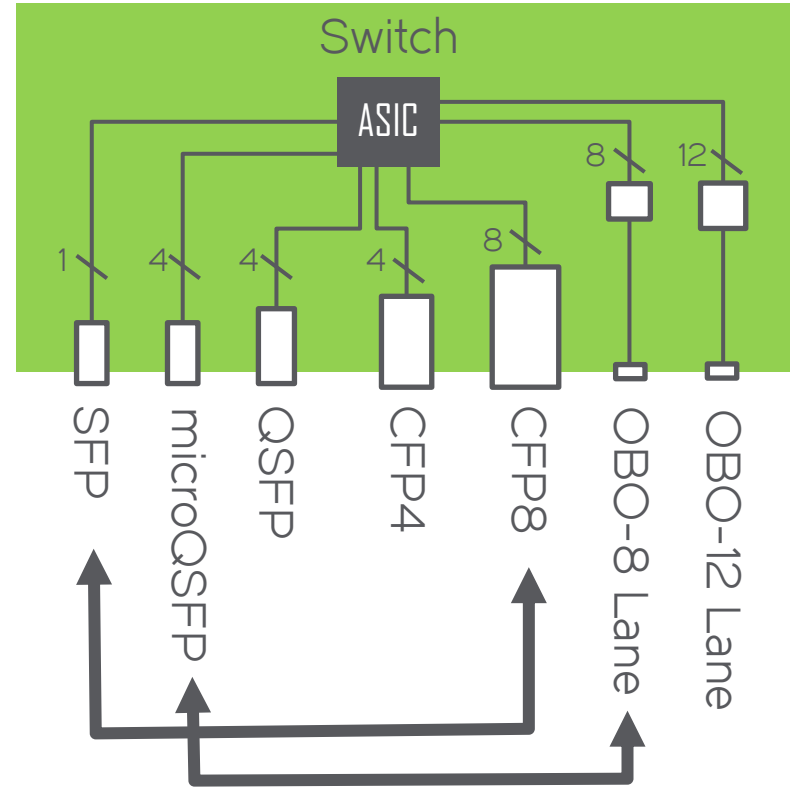
Electrical Interface Implications

- High port count switch ASICs are scaling to meet the needs of hyperscale data centers
- Multi-Lane ports and OBO must support multiple electrical interfaces and FEC scenarios
 - CCAUI-4
 - CAUI-2
 - LAUI



Interoperability Challenges

- We need to define the PMDs (CR, SR, LR, ...) to support interoperability between many module form factors and OBO
- This presentation shows how 50/100/200/400G technology will be used in a wide variety of products that expands the broad market potential of the technology



Thank you!