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System vendor perspective to NG100GE SMF interface

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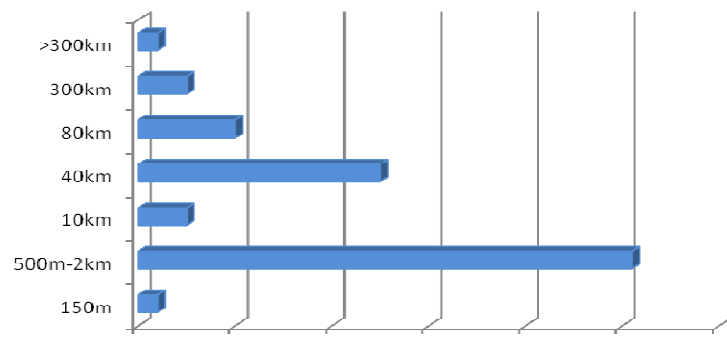
Frank Chang   Vitesse

Outline

- System vendor requirements

- Proposal

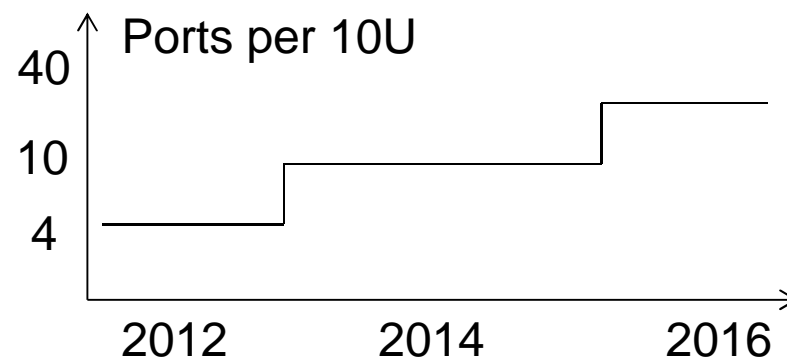- Comparison among LWDM/CWDM/PSM4

- Conclusions

Carrier IP MKT trend and system requirement

## Carrier IP Optical Interface Distribution

Note: We also found 500m-2km can cover 100% the WDM system client side and Data Center application.

Carrier IP Optical Interface Density Roadmap

Carrier IP requirements: Optimize cost, density, power consumption for Carrier IP system application:

> Low cost, close to 2.5*40GE;

> Small size & low power to support 40 ports in 10U front panel（CFP4 or QSFP etc）；

> Main Reach is 500m~2km (>50% application)

4x CFP (or 5x)

8x CFP2 (or 10x)

16x CFP4 (or 20x)

32x CFP4 (belly-to-belly) (or 40x)
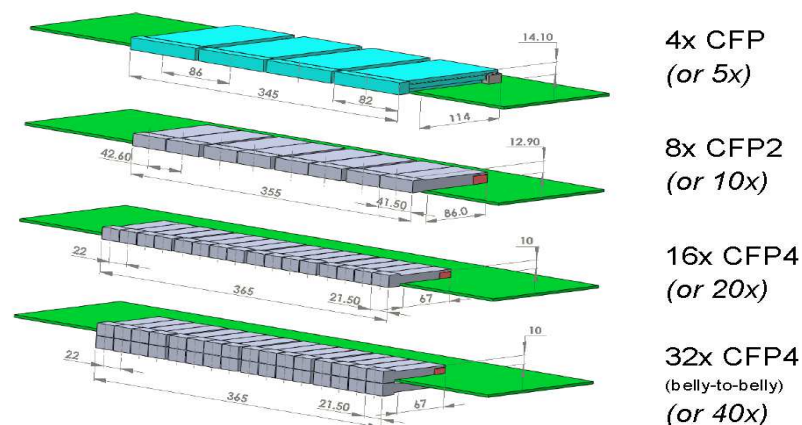
Potential Solutions: CWDM is the only practical solution for 500m~2km low cost, high density application.

	Technology Readiness	Power (<6W)*	Size (CFP4)	Cost (500m)	Remark
LWDM LR4	Y	?	?	H	1.Need TEC 2.Need hermetic package
4*25Gbps CWDM	**Y (1)**	**Y (2)**	**Y (1, 3)**	**L (4)**	1.Uncooled, no TEC; 2.CWDM filter same as 40GE 3.Can use Chip on Board (COB) and Integration tech.
1λ PAMn	N (5, 8, 9)	N (6, 7)	N	?	1.Need prove in feasibility 2.Need high gain FEC, higher power.
1λ DMT	N	N	N	?	1.Need prove in feasibility 2.Need high gain FEC, higher power
PSM4	Y	Y	Y	M	1.Expensive fiber cost 2.Need FEC, higher power

* CFP4 transceiver requires power consumption <6W.

1: http://www.ieee802.org/3/100GNGOPTX/public/nov11/palkert_01_1111_NG100GOPTX.pdf

2: http://www.ieee802.org/3/100GNGOPTX/public/mar12/plenary/palkert_01c_0312_NG100GOPTX.pdf

3: http://www.ieee802.org/3/100GNGOPTX/public/jul12/martin_01_0712_optx.pdf

4: http://www.ieee802.org/3/bm/public/sep12/martin_02_0912_optx.pdf

5: http://www.ieee802.org/3/bm/public/nov12/cole_01_1112_optx.pdf

6: http://www.ieee802.org/3/bm/public/nov12/lyubomirsky_01a_1112_optx.pdf

7: http://www.ieee802.org/3/bm/public/nov12/bhoja_01a_1112_optx.pdf

8: http://www.ieee802.org/3/100GNGOPTX/public/jul12/lewis_01a_0712_optx.pdf

9: http://www.ieee802.org/3/bm/public/sep12/lewis_01_0912_optx.pdf

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Why CWDM is a low cost and low power solution?

1. **Use uncooled packaging technology for transceiver, leading to >34% cost reduction and low power consumption (<6W)^ ;**

    ^http://www.ieee802.org/3/100GNGOPTX/public/mar12/plenary/palkert_01c_0312_NG100GOPTX.pdf

2. **Chip on Board package^ combining with hybrid integration, results in additional 28% cost reduction;**

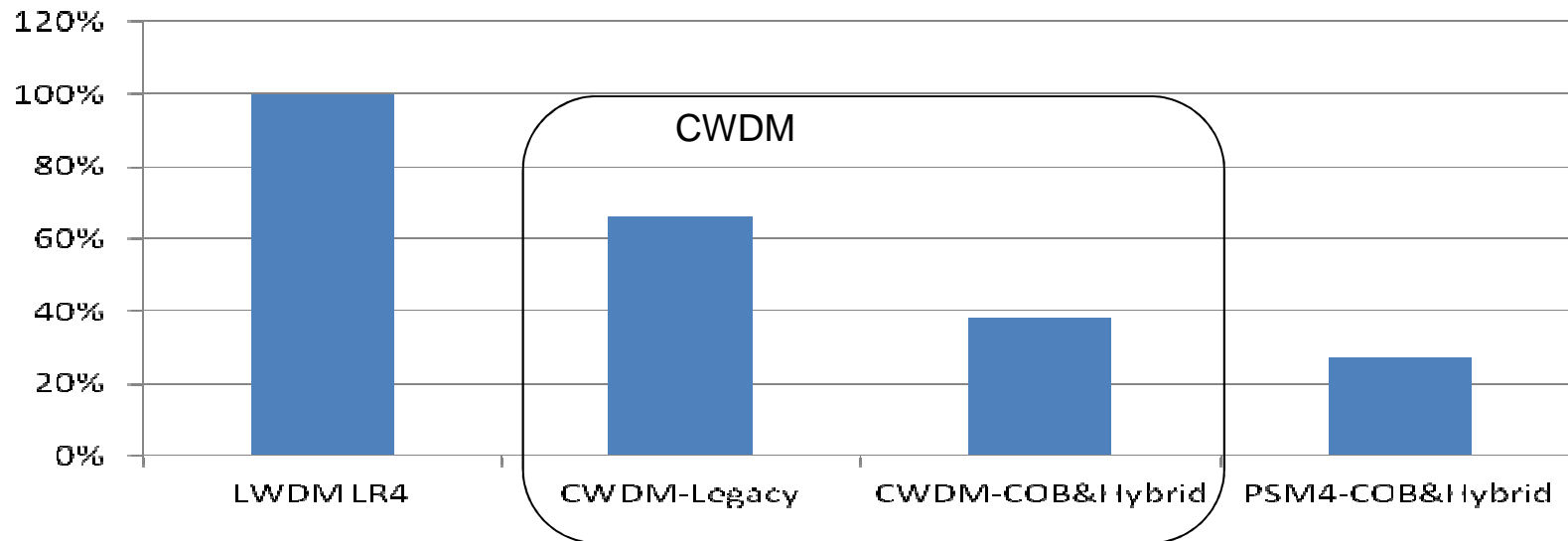   **^http://www.ieee802.org/3/bm/public/sep12/martin_02_0912_optx.pdf**

3. **Single fiber pair for low link cost.**

Comparison among LWDM/CWDM/PSM4 Transceivers
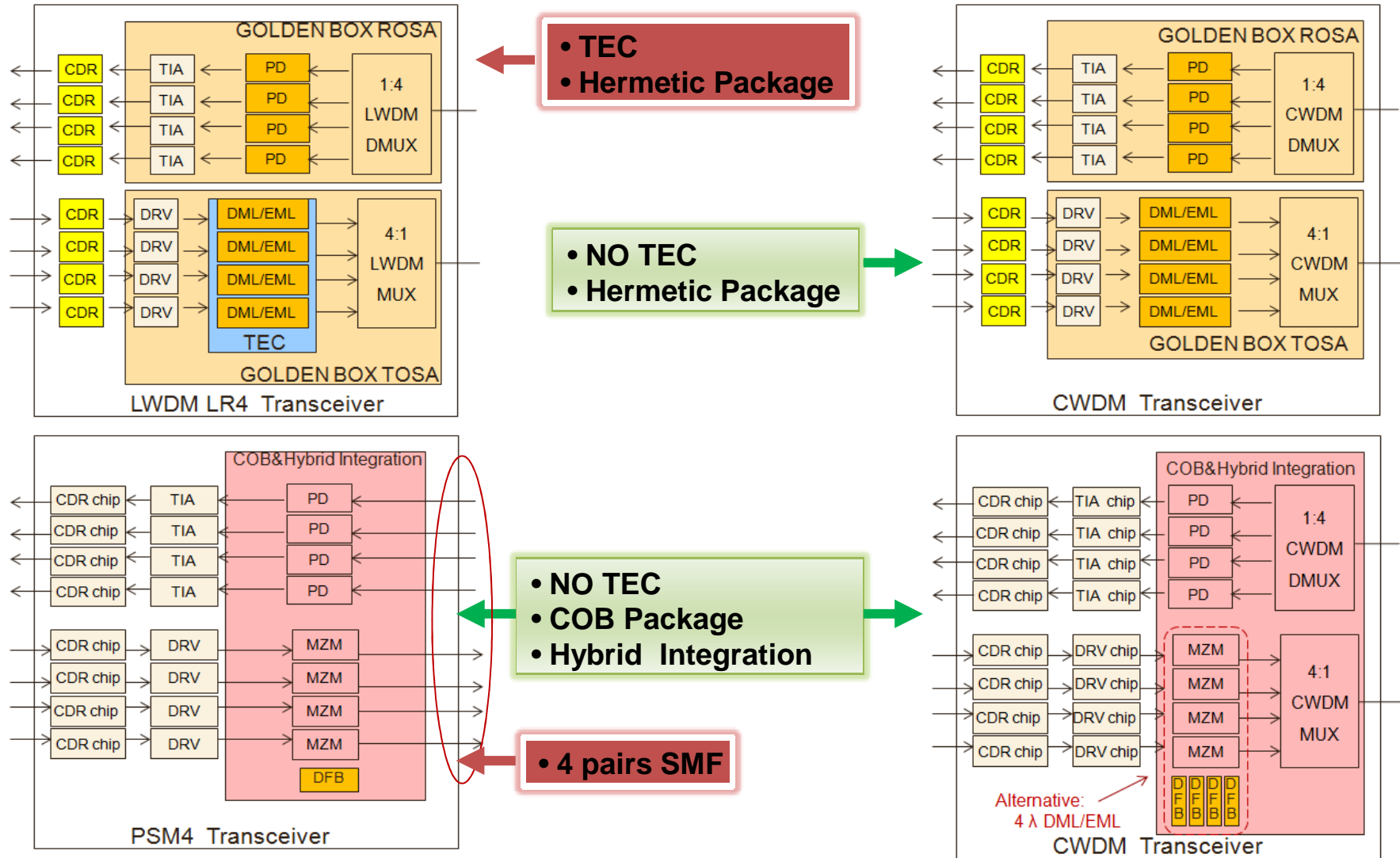
Cost Comparison of Transceivers (no link fiber)

Transceiver only

Note: CWDM/PSM4 transceiver is CFP4 form factor w CDR, LWDM LR4 transceiver is CFP2 form factor.

The analysis results show:

➢ Using uncooled hermetic packaging, is >34% cheaper than LWDM LR4 transceiver;

➢ Using hybrid integration and COB packaging, can be 62% cheaper than LWDM LR4 transceiver, which is close to the result of 67% in "vlasov_01a_1112_optx"
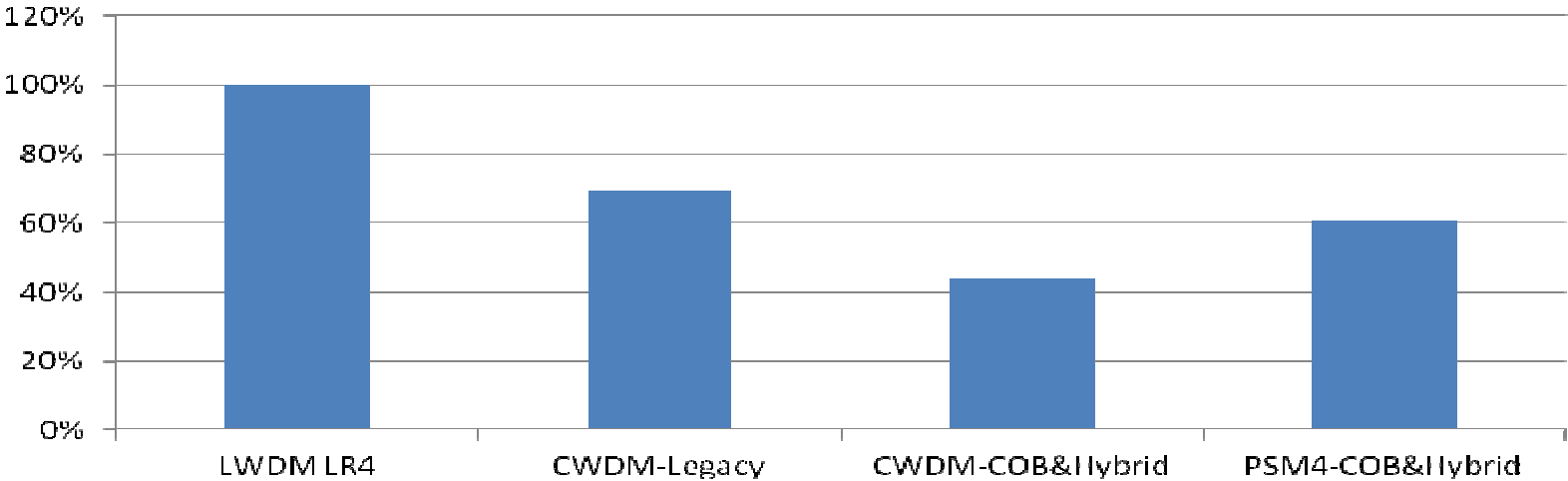
Cost Comparison of double link channel

Double-link channel Cabled Fiber Connectivity Relative Costs

Fiber Type	500m	Notes
8f OS2 SMF	10	http://www.ieee802.org/3/100GNGOPTX/public/may12/cole_01a_0512_optx.pdf
2f OS2 SMF	2.5	

Channel Cost=Fiber cabling +2*Transceiver

500m Channel Cost

Conclusions

CWDM solution is the best answer for NG100GE using

SMF at least 500m reach, offering:

➢Lowest cost;

➢Small size and low power consumption to support 40 ports in 10U

front panel（CFP4 or QSFP etc）

➢Reach is at least 500m

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Thank you

www.huawei.com

List of 100GE CWDM proposals

http://www.ieee802.org/3/bm/public/nov12/gill_01b_1112_optx.pdf

http://www.ieee802.org/3/bm/public/nov12/vlasov_01a_1112_optx.pdf

http://www.ieee802.org/3/100GNGOPTX/public/mar12/plenary/vlasov_01_0312_NG100GOPTX.pdf

http://www.ieee802.org/3/100GNGOPTX/public/nov11/anderson_01_1111_NG100GOPTX.pdf

http://www.ieee802.org/3/ba/public/mar08/traverso_03_0308.pdf

http://www.ieee802.org/3/ba/public/mar08/traverso_02_0308.pdf

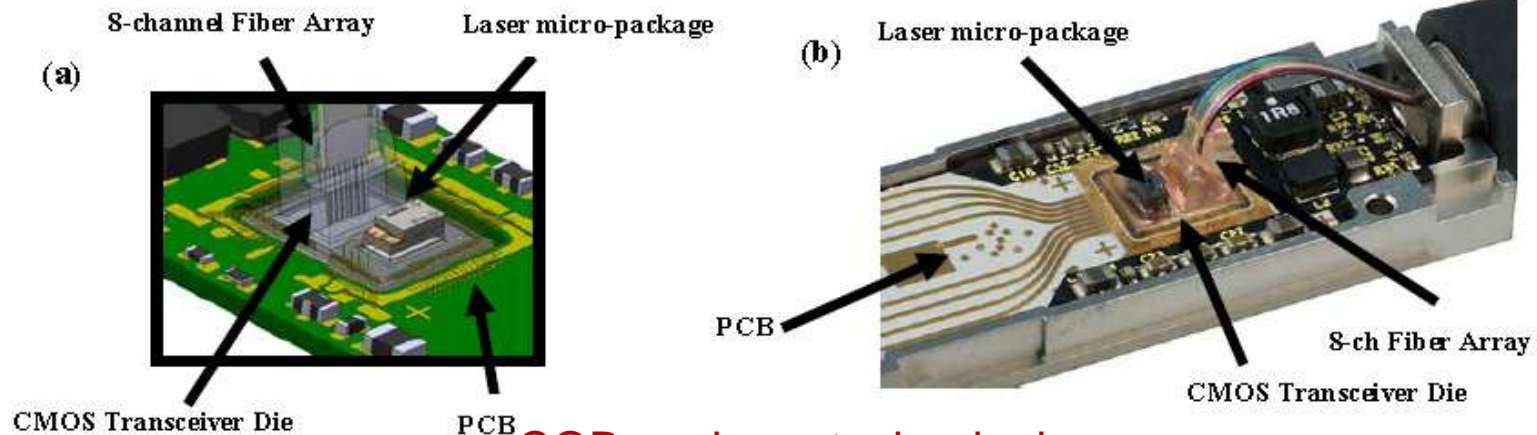**http://www.ieee802.org/3/ba/public/mar08/traverso_01_0308.pdf**

These referenced proposals demonstrated that CWDM has low cost and less power consumption compare to LWDM LR4 .

COB Has Been Proved in in Luxtera / Molex 4*10G AOC

http://www.lightreading.com/comm-chips/luxtera-marks-10g-milestone/240140721?queryText=LUXTERA

CARLSBAD, Calif. **-- Luxtera, the worldwide leader in Silicon CMOS Photonics, today announces that it has shipped its one-millionth 10Gbit channel.** This important milestone validates the growing demand for Silicon Photonics in today's mission critical data centers and computer clusters as well as reinforces Luxtera's ability to meet high performance computing (HPC) needs on a larger scale. The announcement further signifies the emergence of Silicon Photonics as the next generation interconnect with 10 Petabits of transceiver bandwidth shipped.

Luxtera is the leading IP provider and supplier of Silicon CMOS Photonics and is the only known provider of Silicon Photonics shipping in significant commercial volume. The technology continues to be a driving force that supports growing bandwidth demands of equipment in HPC, next generation datacenters and cloud computing. **Silicon Photonics offers a reliable, low cost yet high performance solution as opposed to traditional technologies such as vertical cavity surface emitting lasers (VCSELs).** Recognizing its benefits, Silicon Photonics continues to be the focus of many research labs and universities, most notably IBM and Intel. The technology has made news recently as the enabling building block in the race for building computers at an exascale (1018 byte) level, to learn more visit www.luxtera.com.

http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5465371

COB package technologies