



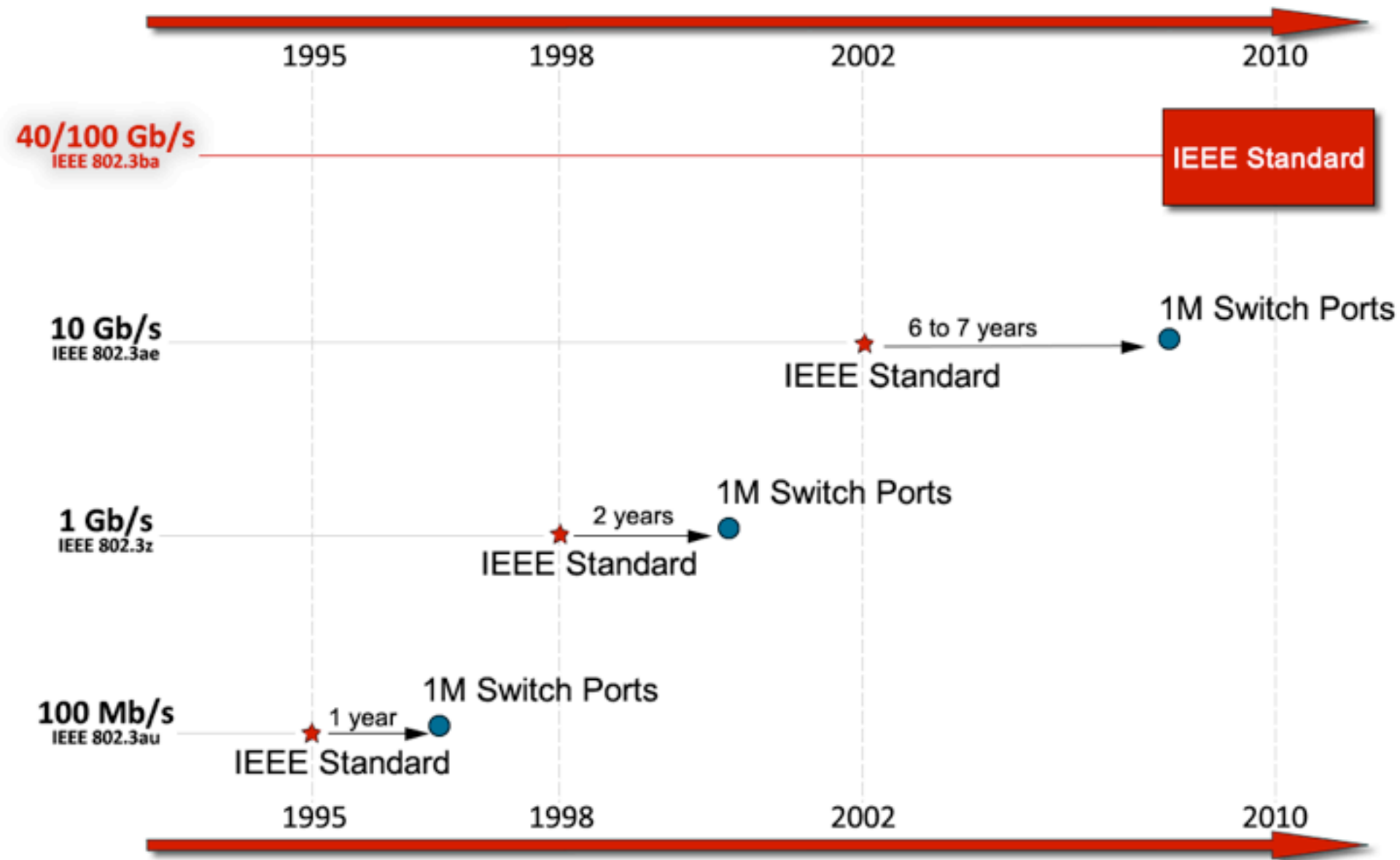
Cisco Expo
2010

2010: Year of the 40/100G Ethernet standard



Bogdan Zapca

Historical Adoption of High Speed Ethernet



From NIC to Lan On Motherboard (LOM)

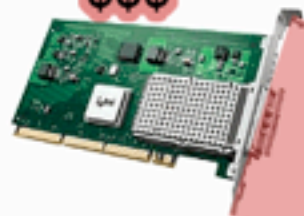
1. LOM removes the cost barrier to adopt 10G on servers.
2. Server vendors require LOM to be backward compatible, hence LOMs should support:

interoperate with 100/1000/10000 switches

support RJ45 cabling infrastructure

3. **10GBASE-T meets these requirements and is the PHY of choice for 10G LOM**

10G NIC
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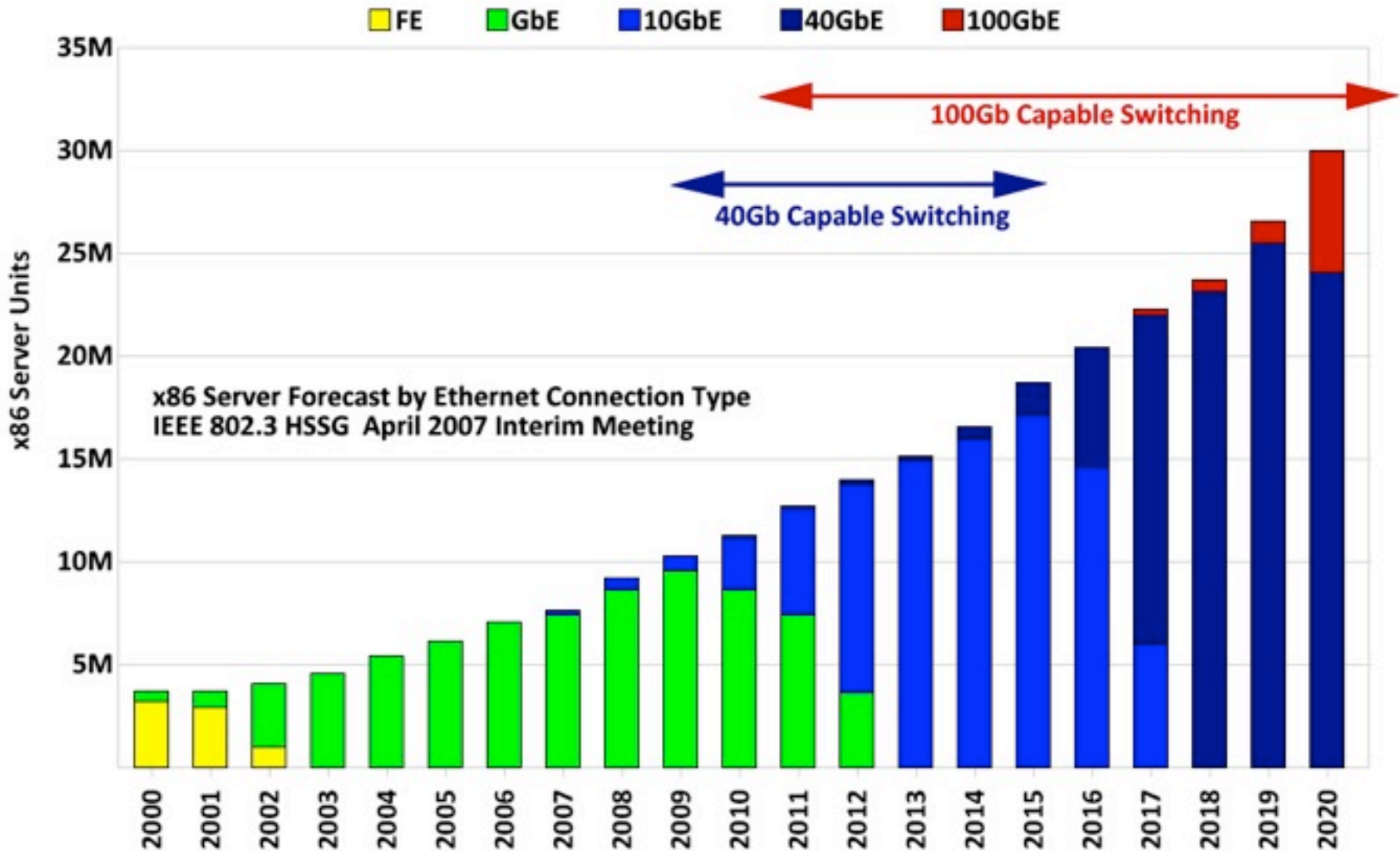


10G LOM
"Free"



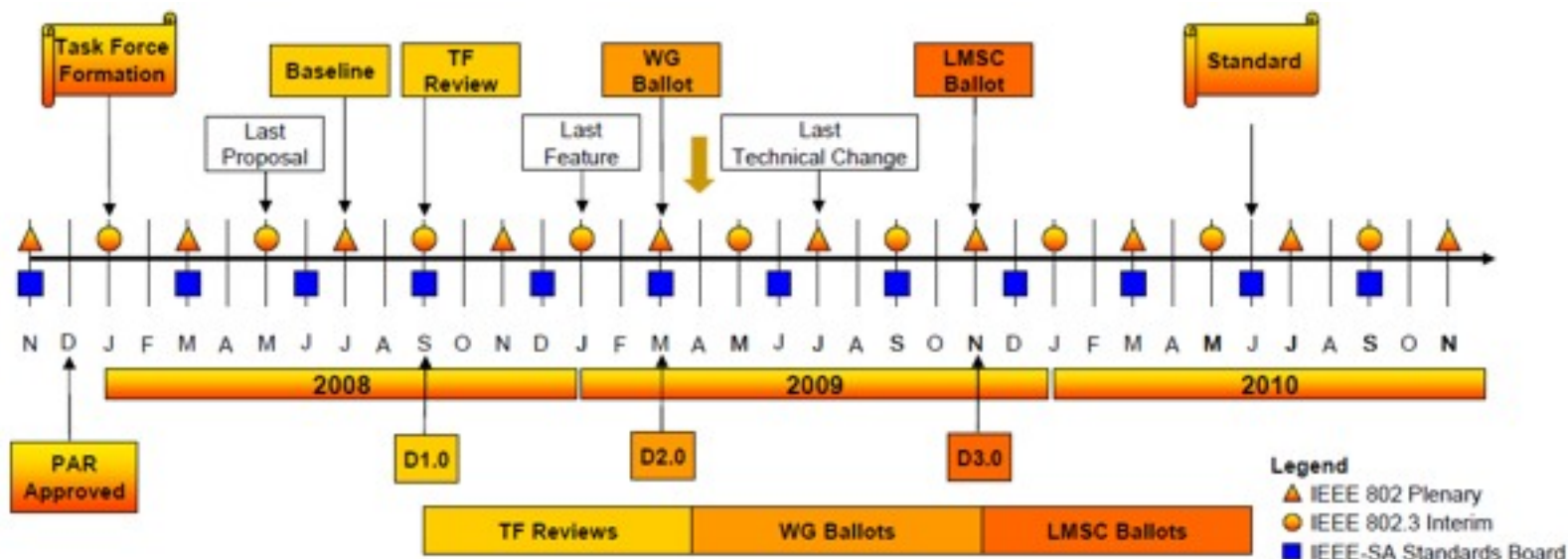
Server Motherboard

High Speed Ethernet Adoption on Servers



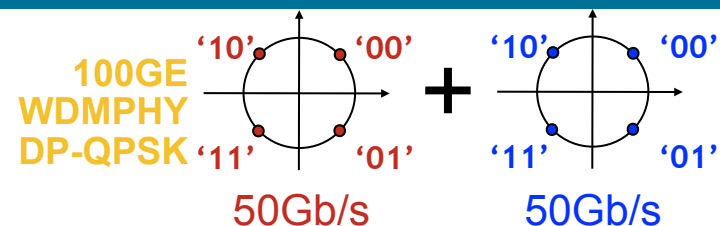
40GE & 100GE Status

- 2006 IEEE formed HSSG
- Jan 2008 IEEE 802.3ba 40Gbps & 100Gbps Ethernet Task Force.
- ITU SG15. Transport focused. OTN Mappings of 40GE & 100GE. New OTU4 for 100GE. One WDM PHY (no 10GE LAN/WAN PHY issue). One FEC.
- Optical Interworking Forum (OIF): 100GE DWDM interoperability. Agreed on DP-QPSK, single wavelength >1000km 50/100GHz ITU-T grid compatible.
- Cisco works with IEEE, ITU, OIF and on products: 100GE 2HCY10 on CRS-1, ...
- Cisco will do 40GE/100GE WDM PHY for routers (IPoDWDM) and DWDM System



IEEE P802.3ba PMD

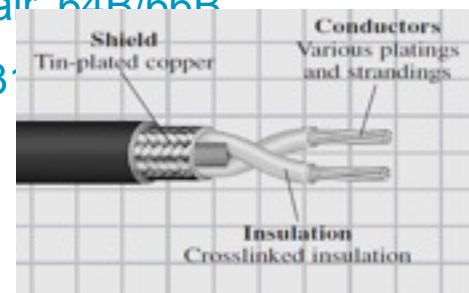
for computing and network aggregation



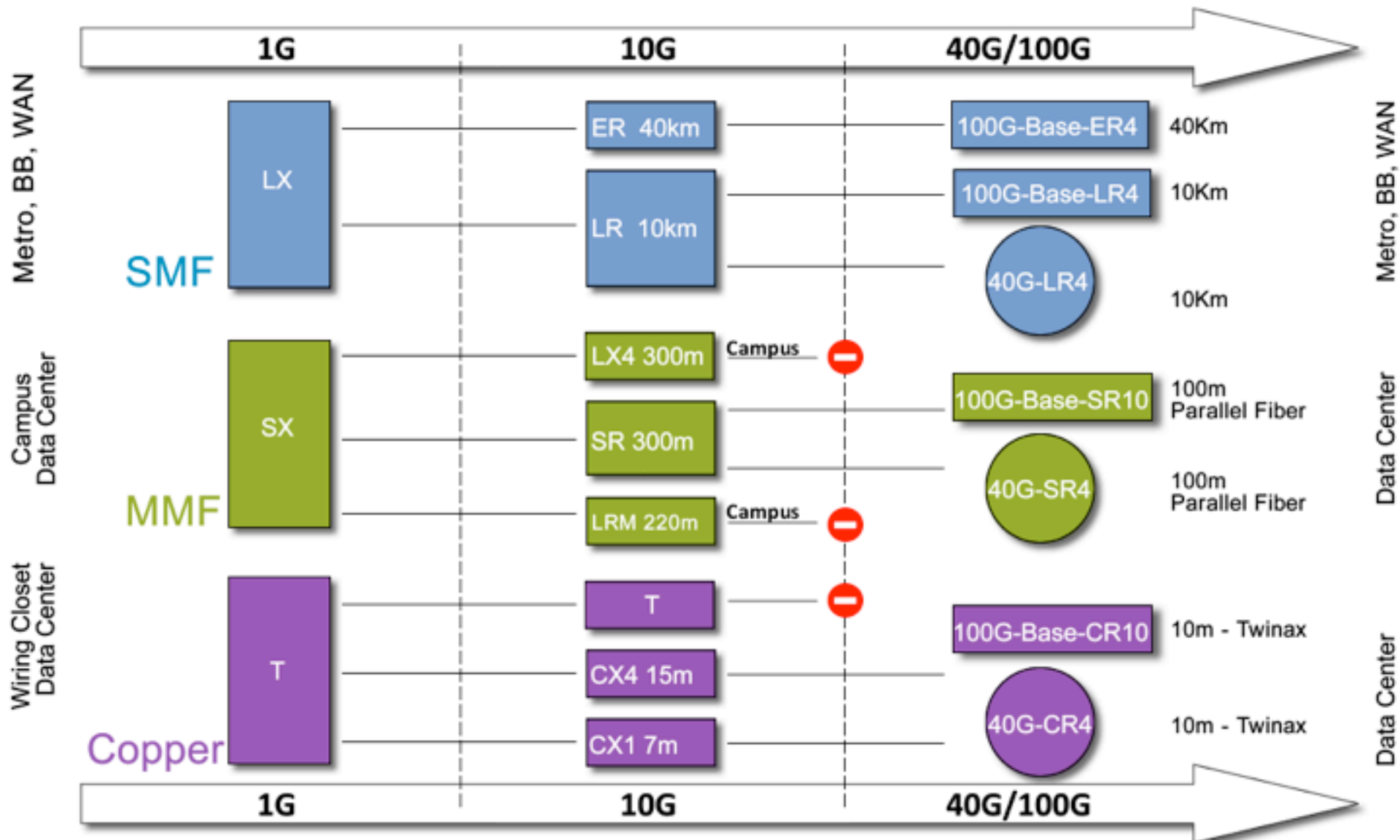
	40 Gigabit Ethernet	100 Gigabit Ethernet
At least 1m backplane	40GBASE-KR4	
At least 10m copper cable	40GBASE-CR4	100GBASE-CR10
At least 100m OM3 MMF	40GBASE-SR4	100GBASE-SR10
At least 10km SMF	40GBASE-LR4	100GBASE-LR4
At least 40km SMF		100GBASE-ER4

1. **40GBASE-KR4** – backplane transmission, 4 pairs, optional FEC
2. **40GBASE-CR4 / 100GBASE-CR10** – 4/10 pairs, twinaxial copper cable, optional FEC, QSFP module for CR4
3. **40GBASE-SR4** – 4 MM OM3 fiber pairs, 850nm, 10Gbps/pair, 64B/66B
4. **100GBASE-SR10** – 10 MM OM3 fiber pairs, 850nm, 10Gbps/pair, 64B/66B
5. **40GBASE-LR4** – 1 SMF pair CWDM, 4 lambdas (1270, 1290, 1310, 1330nm), 10Gbps/lambda, 64B/66B
6. **100GBASE-LR4 / ER4** – 1 SMF pair DWDM, 4 lambdas (1295, 1300, 1305, 1310nm), 25Gbps/lambda, 64B/66B

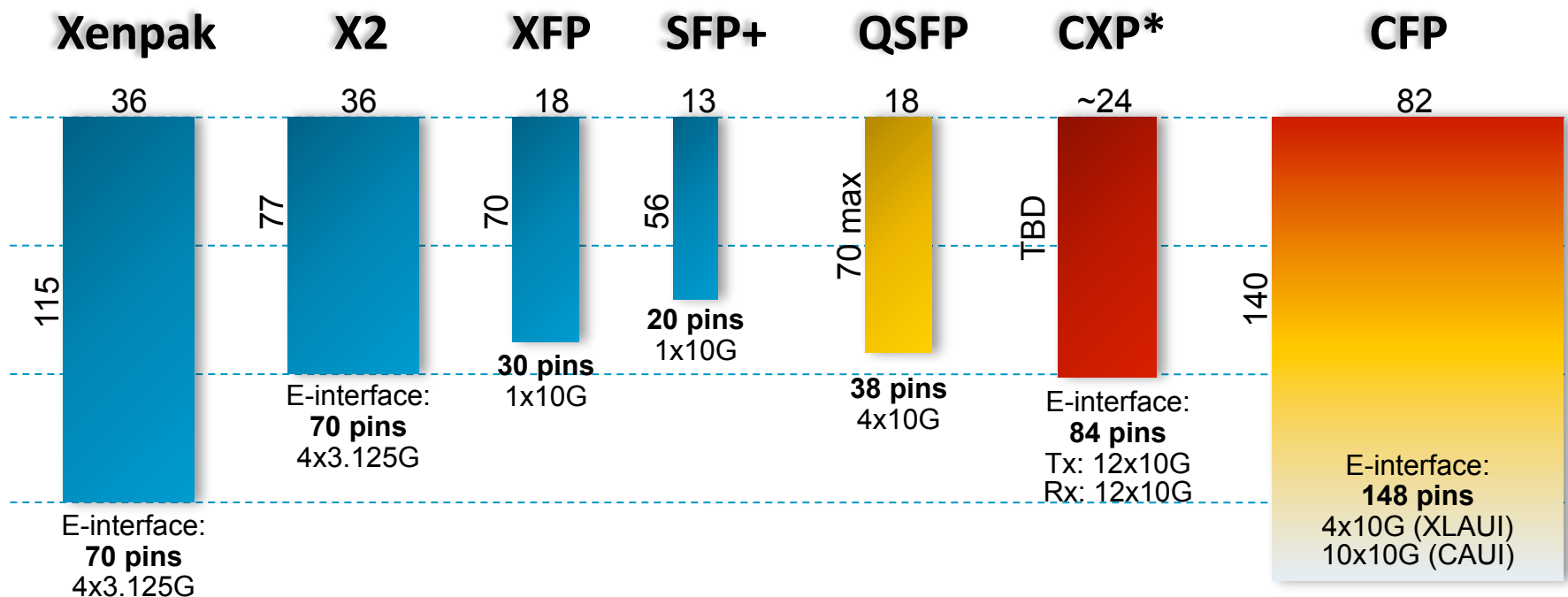
Twinaxial cable



High Speed Ethernet Standard Interfaces



High-Speed Transceivers Form Factors



All units are in millimeters and round numbers

High-Speed Ethernet Transceiver Landscape

40G/100G CFP



Applications:

Single Mode Fiber 10-40+Km
 Multimode Parallel Fiber
 Twinax Copper
 Convertible in to 4x10GbE (SFP+)

Power Consumption:

Up to 8W @ 40GbE
 Up to 25W @ 100GbE

40G QSFP



Applications:

Multimode Parallel Fiber
 Twinax Copper
 Future (?) 10 Km Single Mode

Power Consumption:

Up to 3.5W

High-Speed Ethernet Transceiver Landscape

100GbE CFP requires

“Riding HeatSink” SMF optimized



CFP features a new concept known as the riding heat sink, in which the heat sink is attached to rails on the host card and “rides” on top of the CFP, which is flat topped.

100GbE CXP

MMF/Twinax optimized

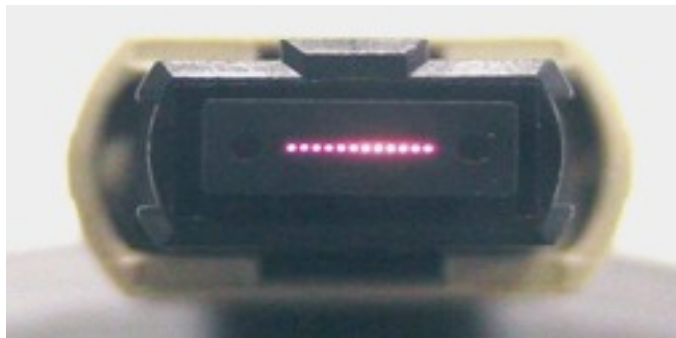


CXP was created to satisfy the high-density requirements of the data center, targeting parallel interconnections for 12x QDR InfiniBand (120 Gbps), 100 GbE, and proprietary links between systems collocated in the same facility. The InfiniBand Trade Association is currently standardizing the CXP.

40G/100G Multimode OM3 Fiber Array Cables

- Custom-length cabling delivered with factory-installed connectors on both ends
- Cable is plugged into the back of patch panels. At 40GbE/100GbE it will plug directly into QSFP/CFP

**MPO Plugs
(12-fiber array connectors)**



40G Transceiver Evolution

