Physical Infrastructure trends and certification requirements for Datacenters

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Psiber's Global Village

London   Munich
Paris   Milano
Boston
San Diego
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Hubs providing R&D, Infrastructure and Service

Sales Offices

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Moving towards Higher Speeds
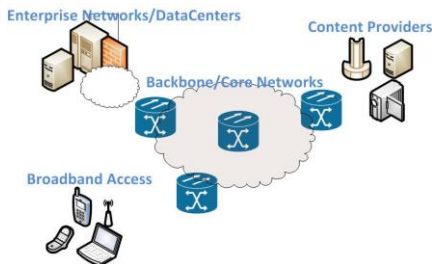
Demand

Source: Psiber Data Pte Ltd

❑ Increased Users
  ❑ Broadband, NBN penetration

❑ Increased Access rates
  ❑ Multiple Access schemes,
     Wi Fi, FTTH, LTE

❑ Increased Services
  ❑ Social Media explosion, Content on Internet
  ❑ Massive data requirements due to video traffic, Gaming,


Forecast Global data center traffic

● Annual **global data center IP traffic will reach 6.6 zettabytes** by the end of 2016. By 2016, global data center IP traffic will reach 554 exabytes per month (up from 146 exabytes per month in 2011).

● Global data center IP traffic will nearly quadruple over the next 5 years. Overall, data center IP traffic will grow at a compound annual growth rate (CAGR) of 31 percent from 2011 to 2016.

Global cloud traffic:
● Annual global cloud IP traffic will reach **4.3 zettabytes by the end of 2016**. By 2016, global cloud IP traffic will reach 355 exabytes per month (up from 57 exabytes per month in 2011).
● Global cloud IP traffic will increase six-fold over the next 5 years. Overall, cloud IP traffic will grow at a CAGR of 44 percent from 2011 to 2016.

● Global cloud IP traffic will account for nearly two-thirds of total data center traffic by 2016.
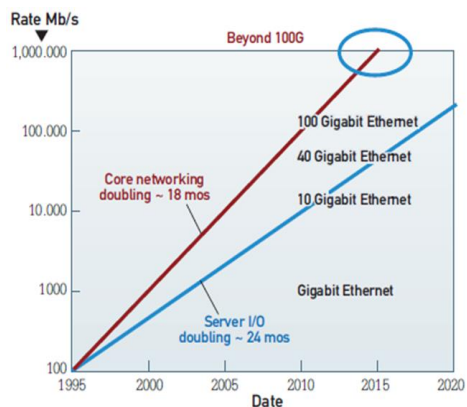
Source: IEEE802.3 Bandwidth Assessment Report, July 2012

Big Data

- Higher Speed for better Quality of service per datacenter/customer profile.

Figure 8. Sample Business and Consumer Cloud Service Categories

Figure 2. Global Data Center Traffic by Destination

Source: Cisco

802.3bq: Why ?

The **IEEE 802.3bq Task Force** is chartered to extend the Ethernet protocol to operating speeds of **40 Gb/s over 4-pair balanced twisted-pair copper** with a reach of up to at least **30 meters**.

The project was substantiated on the market need for a low cost 40 Gb/s solution **backward compatible to IEEE 802.3 BASE-T family of technologies** for data center applications

40GBASE-T will enable **network managers to scale their networks to 40 Gigabit speeds while maintaining backward compatibility with 1000BASE-T and 10GBASE-T** leveraging the cost-effectiveness and plug-and-play simplicity of copper structured cabling. Ethernet BASE-T port types support auto-negotiation allowing the transceivers to exchange capabilities and agree on the highest speed that both can support.

Infrastructure: Copper

Achieving 40Gbps in copper

For < 7m Standard exists (CR4) (used within Racks)

- ❑ Occupies a lot of space per Gbps compared to BASE-T
- ❑ Short reach mostly intra-rack connectivity

But most commonly used lengths are between 10 and 30m

- ❑ Evolving CAT8 Standard.(30m, capable of EoR)

Data Rate	Category	No. of pairs	per pair	encoding	Symbol Rate	Bandwidth	SNR
10 Mb/s	3	2	10 Mb/s	Manchester	20 Mbaud	16 MHz	15 dB
100 Mb/s	5	2	100 Mb/s	MLT3	125 Mbaud	100 MHz	18 dB
1000 Mb/s	5e	4	250 Mb/s	4D-PAM 5	125 Mbaud	100 MHz	21dB
10 Gb/s	6A	4	2500 Mb/s	PAM 16/DSQ 128	800 Mbaud	400 MHz	26 dB
40 Gb/s	?	4	10 Gb/s	PAM 16/DSQ 128	3200 Mbaud	1600 MHz	26 dB
40 Gb/s	?	4	10 Gb/s	PAM 32/DSQ 512	2400 Mbaud	1200 MHz	32 dB

Bandwith – Today and Future
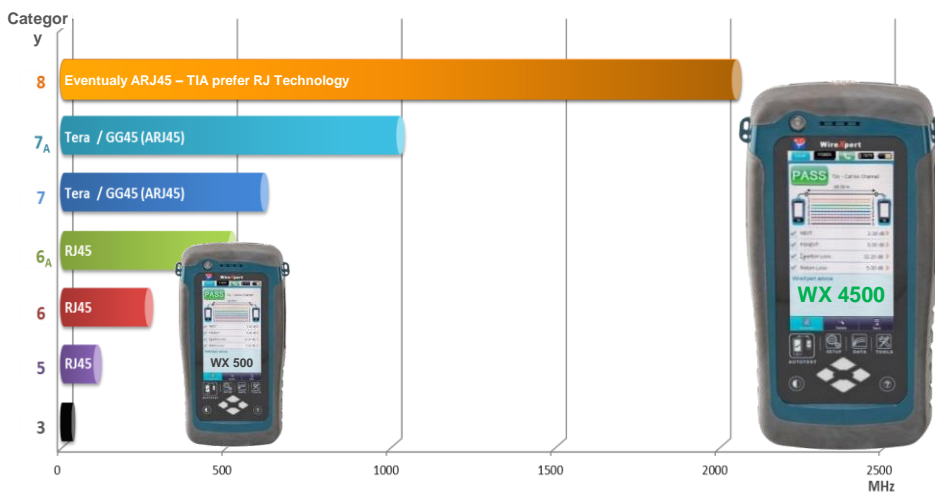
Required Measurements

Measurement	Description
Dynamic Wiremap	Accurately detects Open/Short and "Distance to Fault" from both ends of the cable
Loop Resistance	The resistance between the two conductors of a twisted pair which is looped back at the far end
Cable Length	The length of the cable under test
Near End Crosstalk (NEXT)	The interference at the near end of a pair caused by signal on another pair
PowerSum NEXT	The sum of the individual NEXT effects on each pair by the other three pairs
Insertion Loss (Attenuation)	The decrease in signal strength from one end of the cable to the other
ACR-N	The difference between insertion loss and near-end crosstalk (NEXT)
PowerSum ACR-N	The sum of the individual ACR-N effects on each pair by the other three pairs
Return Loss (RL)	Signal loss caused by structural imperfections in the cable
ACR-F (ELFEXT)	The interference at the far end of a pair caused by signal on another pair, with the insertion loss subtracted
PowerSum ACR-F	The sum of the individual ACR-F effects on each pair by the other three pairs
Propagation Delay	Time it takes for a signal to travel from one end of a cable to the other
Delay Skew	The difference in time between the fastest and slowest pairs within a cable

Wire**x**pert

Most Advanced Cable Certifier

- Capable of certifying Category 5e, 6, 6A, 7, 7A as well as tomorrow's 2 GHz Category 8 standard currently being worked on by TIA.
- Fastest Category 6A Autotest time (9 seconds) and fastest fiber optic test time (8 seconds).
- MPO/MTP test adapter option provides the most advanced and user friendly MPO/MTP testing solution.
- Fastest patch cord test solution; 9 seconds with one page customizable test report versus competitors > 1 min minute with a two page report.
- Color graphic touch screen allows our engineers to add features through simple firmware updates. Similar to a smartphone.

Dual control system - dcs

- Dual Control System (DCS) - Local unit and Remote unit are identical, which means the test can be performed from either end of the cable and results can be saved or analyzed at either end. Dramatically improves operator efficiency.
- Reduce time walking by 50%
- Certification can be carried out by just one technician.
- 2 sets of WireXperts can be configured as 1 main unit with three remotes.
- Memory is locked on Remote units so all test results are stored in one location on the Local device.

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Infrastructure: Fiber

Achieving 40 Gbps on Fiber

❑ Use of Parallel Optics through QSFP connectors
   and MPO arrays IEEE 40G BASE-SR4

❑ Mostly Multi-mode preferred for Datacenter applications
   ❑ TIA 942-A requires use of OM3 Fiber
   ❑ Needs 8 ports of the MPO array

❑ Parallel optics already in use in backplanes today

Connecteur
12-fibres MPO/MTP®
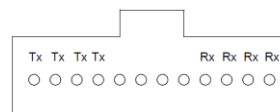
Tx Tx Tx Tx   Rx Rx Rx Rx

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Certifying 10G/40G on Fiber

As the optical budget is becoming tighter and tighter for bigger Data rate, testing tools must be more accurate with less uncertainty !
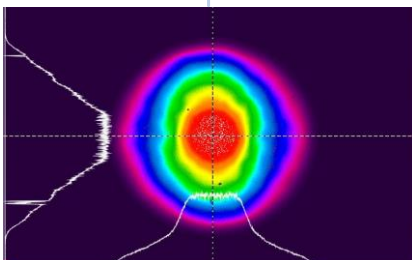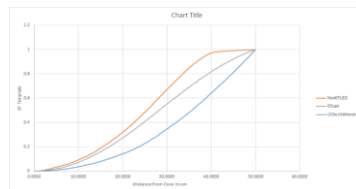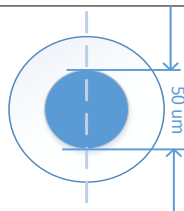
❑ EF compliance required by ISO 11801 document for multimode sources
❑ TIA adopting a similar standard specified
    ❑ Requirement on Light source for Multimode certification
❑ What is Encircled Flux?
    ❑ Amount of light coupled to a MM Fiber

What is Encircled Flux?

Near Field Pattern of EF Compliant LED
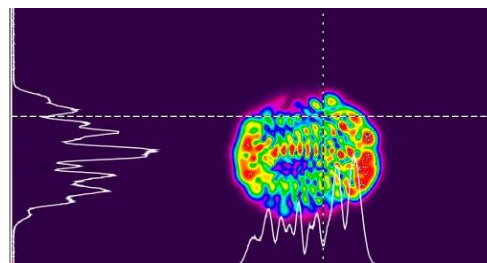
Near Field Pattern of 850nm VCSEL

Optical modules Multimode Encircled Flux

• Encircled Flux
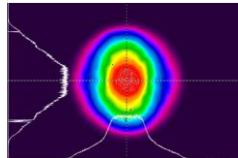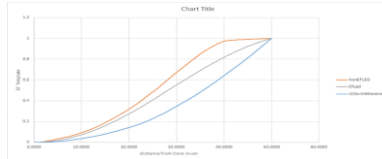
• EF compliant

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Optical modules Multimode Encircled Flux

➢Interchangeable connector system (SC/ST/LC)

➢Faults detection (VFL)

Specifications
(light source 850 nm &1300 nm)

Power:	-16 ~ -20 dBm
Spectral Width:	±15 nm
EF Compliance:	IEC 61280-4-1
Source Type:	LED
Receiver	
Dynamic Range:	12 dB
Power Meter sensitivity:	-40dB
Power Meter resolution:	0.1 dB

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MPO Testing Solution WireXpert 4500.

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Kit Contents

1. **Local Adapter (To be plugged into the local unit). Power Meter**
2. **Remote Adapter (To be plugged into Remote unit) Light source**
3. **2 Type A(Key up-Key down) pinned to unpinned cords**
4. **1 Type A unpinned to unpinned cord**
5. **1 Type B unpinned to unpinned cord**
6. **1 one-click MPO cleaner**
7. **2 MPO mating adapters**

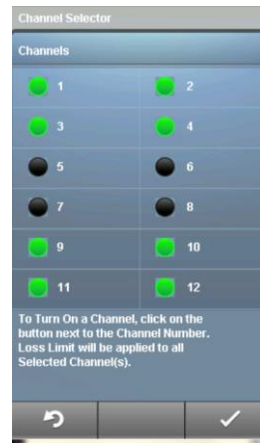**PROFESSIONAL NETWORK TESTING & PROTOCOL ANALYSIS**

MPO Testing: Limit Selection
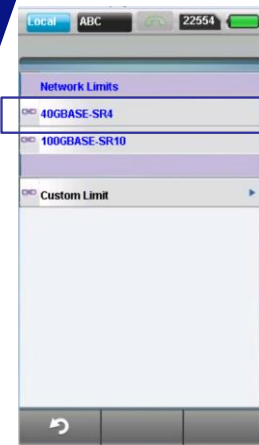
Select 40G/100G limit

Based on the fiber type, OM3/OM4 and the application selected, the loss limit is applied.

The channels are appropriately selected when the test limit is selected.

Testing with premise limits and MTP light source/ Power Meter – Testing Results

Tests absolute power, loss and polarity

MPO Connection table

MPO Connection map

Questions ?

- Ďakujem za pozornosť.

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