New Trends in Structured Cabling

Dewald Burger
Business Development Manager
Molex Premise Networks
Agenda

• Plug and Play Cabling
• FTTE
• The power of Optical Fibre
Plug and Play Cabling

• What is it?
• The main Drivers
• Cost analysis
• The verdict
Plug and Play Cabling

– Assemblies factory pre-manufactured and tested under controlled conditions
  • Eliminates need for field testing
  • Quality is improved
– Eliminates need to install individual cables
– Quick installation (± 80% less time)
Plug and Play Cabling

– Compact – uses much less space

– Assists with improved thermal management

– Allows for high density interfaces in racks

– Ideal for Data Centre applications
Plug and Play Cabling

• Supports cross-connect and interconnect architectures
• Modular cassettes snap in & out of panels for quick installation in switch/server apps.
• Modular Cassette design enables mixing of copper & fibre within same panel
Plug and Play Cabling

- Ideal for comms rooms, test labs, MUTOA & high density cable apps.
- Cable assemblies are easily routed in cable trays
- MACs changes between LAN switches, servers & patch panels are simple
Copper Plug ‘n Play System

- Cable assemblies feature high-density iPass connector with robust die cast housings
- Common length cable assemblies available ex stock
- Custom cable assembly length increments from 1m to 90m
Plug and Play Cabling

Copper PnP systems

• Easily accommodates up to 48 RJ-45 ports in 1U
• Modular cassette design allows easy installation
• Cassettes offer reliable Gigabit performance
• Cassette design allows for fast future upgrades
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Optical Fibre PnP systems (MPO/MTP)

• MPO allows up to 72 fibres in one connector
• MPO type Connector is specified in IEC-61754-7 and TIA-604-5 (FOCIS 5)
• Proven technology with excellent performance
• Alignment is through guide pins - Does not rely on adapter sleeve mating/ mid-coupler design
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MPO/MTP® Connector Overview

– Density

MPO = 95mm$^2$
12 to 72 fibres

SC = 82mm$^2$
1 fibre

Same design used for 24 to 72 fibres!
Plug and Play Cabling

MPO/MTP® Connector Overview

12 Fibre MPO

72 Fibre MPO
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- OEM systems have limited front panel space
  - Traditional LC interfaces provide limited density
  - MT interface provides 12 to 72 times greater density than Simplex LC connectors
- OEM and Data Center installations have migrated to the MT interface to take advantage of increased density
  - Optical performance and reliability has improved significantly

LC Duplex  MTP/MPO
Plug and Play Cabling

MPO/MTP® Technology Trends

- 12 fibre predominant, but 24f
- 72f use is growing
- Parallel optics are moving from intra-equipment use to card edge via recently formed QSFP MSA
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MPO/MTP® Technology Trends

– Field termination is becoming widely available

– Insertion loss is being driven down for 10G Ethernet links and equipment interface applications

<table>
<thead>
<tr>
<th>Fiber Type/Grade</th>
<th>Max IL (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MM</td>
<td>0.50 → 0.35</td>
</tr>
<tr>
<td>standard SM</td>
<td>0.75 → 0.50</td>
</tr>
<tr>
<td>low loss SM</td>
<td>0.35 → 0.15</td>
</tr>
</tbody>
</table>
# Plug and Play Cabling

<table>
<thead>
<tr>
<th>Cables</th>
<th>Cat6a U/UTP</th>
<th>Cat6 F/UTP</th>
<th>Cat6 U/UTP</th>
<th>Cat5e U/UTP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approx. Diameter (mm) 48 cables Bundle</td>
<td>65mm</td>
<td>55mm</td>
<td>45mm</td>
<td>40mm</td>
</tr>
<tr>
<td>Approx. Weight (g) 48 cables bundle 500mm long</td>
<td>1750g</td>
<td>1300g</td>
<td>1050g</td>
<td>750g</td>
</tr>
</tbody>
</table>

- **8 x 12 Fibre Indoor Loose Tube or Ribbon**
  - Dia. ~13mm
  - Wt. ~15g

Plug and Play Cabling
Plug and Play Cabling

Disadvantages and Limitations

• Component costs are high
• Made to order, thus lead times involved
• Managing and storing cable slack
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Cost Models

Copper Cabling Cost Model
• Compares pre-terminated to traditional punchdown installations

Optical Fiber Cabling Cost Model
• Compares pre-terminated to traditional epoxy/polish and ‘crimp & cleave’ installations
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Copper Cabling Cost Model

Plug n Play model:
• i-Pass with 6 x 4-pr links constructed with one trunk cable and two cassettes

Traditional model:
• Punchdown of 6 x 4-pr links constructed with six 4-pr cables and 12 x RJ-45 patch panel ports
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Copper Cost Model Summary

• Relative costs of pre-terminated solutions got lower as density became higher and jobs got larger

• Savings less dramatic with small jobs with low labour rate & efficient installers

• Installation time requirement differs significantly
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Fibre Cabling Cost Model

**MPO Example 1:**
- 12 duplex links with one 24-fibre trunk cable and 2 LC cassettes

**MPO Example 2:**
- 36 duplex links constructed with one 72-fibre trunk cable and 6 LC cassettes
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Fibre Cabling Cost Model

Field Termination Example 1:
• 12 duplex links with one 24-fibre cable and 24 duplex connectors and adapter plates

Field Termination Example 2:
• 36 duplex links with one 72-fibre cable and 72 duplex connectors and adapter plates
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Fibre Backbone Scenario Summary:

- MPO solutions reduced installed cost by ± 60% compared to epoxy/polish
- ± 10% cost premium over ‘crimp & cleave’
- Installation time reduced by ± 10h compared to epoxy/polish
- Reduced installation time by 3h compared to ‘crimp & cleave’
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**Fibre Data Centre Scenario Summary:**

- MPO solutions reduced installed cost by ± 10% compared to epoxy/polish
- ± 15% cost premium over ‘crimp & cleave’
- Installation time reduced by ± 10 days compared to epoxy/polish
- Reduced installation time by ± 2 days compared to ‘crimp & cleave’
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Traditional method used ‘home run’ method, where cables are run directly from the crossconnect to the TO (TIA 568 1991)
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Features of home run method:

- MACs very expensive
- Lacks flexibility
- Simple design
- Minimum connection points in link
- Easy administration
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With zone cabling (TSB 75) open office spaces are connected via MUTOA or CP.
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Features of zone cabling method:

• Improved flexibility

• MACs easier

• More complicated administration

• More connection points per link
TIA 568-B.1 also allows another model to make optimum use of optical fibre’s extended distance capability: Centralized Fibre Design

When using a pull-through design, the fibre cable can be up to 300m long!
2005: TIA 569-B & 568-B.1, Addendum 5 supports “Telecom Enclosure” (TE)

“A telecommunications enclosure (TE) can serve as a second (or third or more) telecommunications room (TR) in certain implementations as described in TIA/EIA 568-B.1 Addendum 5, approved in February 2004”
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What does this mean to us?

- Introducing the next level of flexibility and convenience: Fibre to the Telecoms Enclosure (FTTE)
  - Allows extended distances - $\leq 300m$
  - Capable of 10G Ethernet and likely 100G Ethernet
  - With Plug and Play cabling technology compact design is possible
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• **Definition: (TE) 1.** A case or housing for telecommunications equipment, cable terminations, and cross-connect cabling. (TIA).

• **2.** A telecommunications space that differs from equipment rooms and entrance facilities in that this space is generally considered a floor-serving or tenant-serving (as opposed to building- or campus-serving)
  
• space that provides a connection point between backbone and horizontal cabling.
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What’s next?

• PoE offers many advantages in terms of flexibility, convenience and ease of use
• Unfortunately, it is limited to metallic cables
• It cannot be used with optical fibre cables where electrical isolation exists between the cable ends
• Or can it…
Introducing Power over Fibre!

- New generation of high power VCSEL lasers can transmit enough optical power that can be converted back into low power electricity at the far end
- Low power devices can be directly powered of this energy
- Cost effective in specialized applications
Plug and Play Cabling

- When used in conjunction with FTTE Power over Optical Fibre becomes very attractive
- Expands on the Plug and Play theme
- Is more than just a dream. – products are already available
- With ever decreasing cost of VCSEL optics, will become a very viable option
Laser – Up to 5 W of light is launched into the optical fiber

Optical Fiber – Multimode and single mode; distances up to 10 km

Remote Device – Drives electronic circuitry, biasing of MEMS and modulators

Electrical power is converted to light

Driver Board – A support assembly to drive the laser; easily configured as a daughterboard for placement on the main printed circuit board (PCB)

Light is converted back to electrical power

PPC – Converts light from the optical fiber into electrical power
Thank You!

Any Questions?