Higher Speed Copper Ethernet

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Objective

• Overview of selected existing and developing physical layer higher speed copper specifications for considerations of applicability for higher speed copper Ethernet.
## Summary: Infiniband and PCIe express lane widths

<table>
<thead>
<tr>
<th>InfiniBand Protocol</th>
<th>Signaling (Gbd) single data rate (SDR)</th>
<th>Signaling (Gbd) dual data rate (DDR)</th>
<th>Signaling (Gbd) quad data rate (QDR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>serial</td>
<td>1 x 2.5</td>
<td>1 x 5</td>
<td>1 x 10</td>
</tr>
<tr>
<td>parallel</td>
<td>4 x 2.5</td>
<td>4 x 5</td>
<td>4 x 10</td>
</tr>
<tr>
<td>parallel</td>
<td>8 x 2.5</td>
<td>8 x 5</td>
<td>8 x 10</td>
</tr>
<tr>
<td>parallel</td>
<td>12 x 2.5</td>
<td>12 x 5</td>
<td>12 x 10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PCI Express</th>
<th>Signaling (Gbd) 2.5</th>
<th>Signaling (Gbd) 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>serial</td>
<td>1 x 2.5</td>
<td>1 x 5</td>
</tr>
<tr>
<td>parallel</td>
<td>4 x 2.5</td>
<td>4 x 5</td>
</tr>
<tr>
<td>parallel</td>
<td>8 x 2.5</td>
<td>8 x 5</td>
</tr>
<tr>
<td>Parallel</td>
<td>16 x 2.5</td>
<td>16 x 5</td>
</tr>
</tbody>
</table>
Small form factor (SFF)- 8470 – multilane shielded connector

4x Connector Type and Application Usages

**Screw Type**
- FC-PI-2
- SAS-4x
- Infiniband

**Latch Lock Type**
- FC-PI-2
- Infiniband
- 10GBASE-CX4

10GBASE-CX4 - IEC 61076-3-113 connector
Infiniband Copper - Cable Board Connector – 38 ckt

- Annex A5: Pluggable Interfaces: CATx, Copper and Optical

- Pluggable QSFP FOR 4x, 8x and 12x

  - Multiple 4x QSFP pluggables used for 8x or 12x links

QSFP Module

QSFP Connector: 38-contact, right angle surface mount connector

SFF-8436

IEEE 802.3 HSSG
Small form factor (SFF)- 8470 – multilane shielded connector

- 12x (24 differential pair)

- Infiniband copper
PCI express 8x Cable Assembly
PCI express 16x Cable Assembly
SFF-8088 - Mini Multilane Series: Shielded – 28 ckt

4x Connector Type and Application Usages

- Mini SAS 4x
- PCI express 4x – specified in PCIe External Cable Specification – 38 ckt
Conclusions

• There are a number of existing and developing physical layers copper specifications that should be considered for higher speed copper Ethernet.