Optical Ethernet

Prepared By:

www.egtoget.com

contact@egtoget.com

THE WORLD OF STUDY...
Introduction

• Optical Ethernet: combination of two technologies -
  ETERNET & OPTICS

• It combines the flexibility and simplicity of Ethernet with
  the reliability and speed of optics.

• Optical Ethernet attributes – simplicity, speed, and
  reliability. It removes the bandwidth bottleneck between the
  LAN and the WAN
Optical Ethernet simplifying Network

<table>
<thead>
<tr>
<th>Key network attribute</th>
<th>Today’s network</th>
<th>Optical ether</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complexity</td>
<td>Higher</td>
<td>Lower</td>
</tr>
<tr>
<td></td>
<td>Multiple protocols from LAN to WAN</td>
<td>Ethernet from LAN to WAN</td>
</tr>
<tr>
<td>Access bandwidth</td>
<td>Fractional T1s, T3s Weeks to months to provision</td>
<td>Up to 10Gbps, 1MBps at a time Hours to provision</td>
</tr>
<tr>
<td>Performance</td>
<td>Higher latency</td>
<td>LAN performance end-to-end</td>
</tr>
<tr>
<td></td>
<td>Higher jitter</td>
<td></td>
</tr>
<tr>
<td>Staffing</td>
<td>Network specialists for each protocol</td>
<td>Network generalists</td>
</tr>
</tbody>
</table>
Optical Ethernet Building Blocks

- **Ethernet Over Fibre (EoF):** electrical to optical translation over dark fiber.[Point-to-Point & Mesh topology]
- **Ethernet Over Resilient Packet Ring (EoRPR):** it solves the traditional problem of SONET bandwidth ‘waste’. [RING topology]
- **Ethernet Over DWDM (EoDWDM):** utilizes DWDM as its core transport. EoDWDM is byte rate and protocol independent that allows into work in almost any network scenario.[Ring, Mesh, Point-to-Point topology]
- **HYBRID:** The above blocks merged together.
Ethernet Technologies

Three data rates are currently defined for operation over optical fiber and twisted-pair cables:

- 10 Mbps—10Base-T Ethernet
- 100 Mbps—Fast Ethernet
- 1000 Mbps—Gigabit Ethernet
Ethernet Network Elements

Data terminal equipment (DTE)—Devices that are either the source or the destination of data frames. DTEs are typically devices such as PCs, workstations, file servers, or print servers that, as a group, are all often referred to as end stations.

Data communication equipment (DCE)—Intermediate network devices that receive and forward frames across the network. DCEs may be either standalone devices such as repeaters, network switches, and routers, or communications interface units such as interface cards and modems.
Basic IEEE 802.3 MAC Data Frame

Transmission order: left-to-right, bit serial

<table>
<thead>
<tr>
<th>PRE</th>
<th>SFD</th>
<th>DA</th>
<th>SA</th>
<th>Length/Type</th>
<th>Data</th>
<th>Pad</th>
<th>FCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>1</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td>46-1500</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Field length in bytes:

- PRE = Preamble
- SFD = Start-of-frame delimiter
- DA = Destination address
- SA = Source address
- FCS = Frame check sequence
Optical Ethernet Fiber

Fiber optic cable offers two main advantages over twisted pair cable.

– data may be carried much further over fiber.
– fiber is immune to electromagnetic interference.

Two basic types of fiber: Multimode and Single Mode.

Multimode fiber is used extensively in the data communications industry. Fast Ethernet carried over multimode fiber is known as 100BASE-FX.

Single mode fiber is used extensively in the telecom industry. Single mode fiber allows much greater run lengths than multimode fiber.
Recent Trends

- **Optical Ethernet Switches**
- **GBIC Modules**—also known as the small form-factor pluggable multisource agreement (SFP MSA) module. The mini–GBIC is only about half the size, effectively doubling the available capacity that can be designed into the face of an equipment shelf.
- **Resilient Packet Rings (RPR)**—to define a high-performance, high-availability optical transport suitable for carrier networks in metropolitan service areas.
10-Gigabit Ethernet Proposed Standards

• 1st: very-short-reach optics, to be implemented as parallel data streams over a fiber-optic ribbon containing 12 multimode fibers.

• 2nd: uses a very compact package (about 1" x 0.75" x 3") containing a coarse WDM device, four receivers, and four lasers operating approximately 25 nm apart in wavelengths near 1300 nm. Each transmitter/receiver pair operates at 3.125 gigabaud (data stream at 2.5 Gbps).
10-Gigabit Ethernet Proposed Standards Contd..

- 3rd: a serial interface using 64B/66B encoding (instead of the 8B/10B used in gigabit Ethernet), a data stream of 10.000 Gbps, and a resulting clock rate of 10.3 Gbps.
- 4th: a SONET OC–192 compatible stream, which is therefore clocked at 9.953 Gbps
Future Expectations

• Optical Ethernet to the Consumer
• Optical Ethernet Area Networks
• Beyond 10 Gigabits
Conclusion

• Optical Ethernet transforms the corporate network into a key competitive advantage.
• Optical Ethernet also provides network versatility to meet a wide range of customer needs