Trends and Standards In Cabling Systems
Agenda

Trends and Standards in Intelligent Buildings And Data Center
RJ45 supports 10BASE-T to 40GBASE-T

DID YOU KNOW

~there are almost~

3 BILLION

RJ45 CONNECTORS IN CIRCULATION!

That’s enough to more than circle the earth.
Enterprise LAN trends
BYOD (Bring Your Own Device)

**PROS**
- Reduced expense for employer
- Improved employee morale/productivity

**CONS**
- Security
- Configuration costs
- Increased wireless coverage required

- BYOD seen as inevitable based on proliferation of new devices
- Developing MDM (Mobile Device Management) policy is key
Intelligent building trends
Convergence on IP networks

LEGACY
Disparate Building Networks

TODAY
Open Standards Building Network

- Electric
- Water
- Gas
- WAN

4th Utility

Network Infrastructure

COMMSCOPE®

BICSI
Convergence
Need for In-Building Wireless (IBW)

Why is there no signal?
Infrastructure Management

“a common, real-time monitoring and management platform for all interdependent systems across IT and facility infrastructures”
(Data Center Knowledge DCIM article, Jan 2011)

Automated Infrastructure Management (TIA/EIA 606B)
Recommended for more complex installations, where staffing attributes make the use of automated systems more effective and efficient, and to meet regulatory compliance requirements.
Intelligent Infrastructure Process Automation - AIM

- **Automated Infrastructure Management**
  - Chapter 13 of TIA 606-B
  - Amendment to ISO/IEC 14763-2

- **Recommended Usage**
  - Large or complex installations
  - Shortage of staff or expertise
  - Remote sites

- **Recommended Functions**
  - Automated documentation & records
  - Automated discovery switches/devices
  - Track device movement
  - Integrate with CAD facility drawings
  - Generate electronic work orders
  - Managing/monitoring power & environment
Data Center Trends
Trends affecting in DC network design

- **Discrete Data Center**
  - Discrete Networks
  - Multi-port I/O
  - 1Gb Ethernet

- **Virtualized Data Center**
  - Unified Network
  - I/O Virtualization
  - 10Gb Ethernet
  - Resource Pools

- **Cloud Data Center**
  - Network Virtualization
  - Software Defined Networks
  - 10Gb/40GbE Low Latency

**Bandwidth Drivers** – Virtualization, Unified Data and Storage Networks, new Storage architectures
Traditional 3 tier Architecture
Limited ability to Scale and support Network latency
The Spine – Leaf Bridge Topology
Global Ethernet Switch market

Global Ethernet switch revenue grew 3% in the final quarter of 2013, to $5.4 billion.

Multimode Fiber QSFP+
Extended Reach 40GBASE-T

- Complies to 40GE and 10GE specs – 300m (OM3) / 400m (OM4)
  - Delivers 1 x 40GbE
  - Delivers 4 x 10GbE

- Alternative to more expensive singlemode 40GBASE-LR4 QSFP
  - Lower CAPEX: <1/4 price
  - Lower OPEX: <1/2 power dissipation

- 2.5X panel density increase on switches for 10GBASE-S

16 SFPs = 16 x 10G = 160G

10 QSFPs = 40 x 10G = 400G or 10 QSFPs = 10 x 40G = 400G
Data Center Tools

- Budget constraints are nothing new
- Main tools to date have been:
  - Data Center Consolidation
  - Server Virtualization
- Good tools but not enough, more optimization needed
- New “consolidated” facility will one day be inefficient and/or hit the wall
- Intelligent management platform needed to extend life
Standards Update
Increasing use of WiFi

**WiFi expectations**

- 5% expect wired networks to remain dominant
- 37% expect to replace wired networks within 5 years
- 58% feel wireless and wired networks will be used in “fairly constant proportions”

**The IEEE 802.11ac**

supports speeds of up to 6.9 Gbps for backhaul

**WiFi is poised to be the first application to exceed Category 6 performance**

**Cabling standards define an overlay grid with two or more outlets per WAP**

**TIA-162 recommends Category 6A cabling to the WAP**

Wi-Fi infrastructure for increased corporate data mobility

<table>
<thead>
<tr>
<th>Wireless</th>
<th>802.11a</th>
<th>802.11b</th>
<th>802.11g</th>
<th>802.11n</th>
<th>802.11ac</th>
<th>802.11ad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Data Rate (Mbps)</td>
<td>54 (30)</td>
<td>11 (5)</td>
<td>54 (30)</td>
<td>600 (300) 3x3 MIMO</td>
<td>1000 (500) 3x3 MIMO</td>
<td>7000 (3500) 8x8 MIMO</td>
</tr>
<tr>
<td>Frequency Band (GHz)</td>
<td>5</td>
<td>2.4</td>
<td>2.4</td>
<td>40 MHz @ 2.4 or 5</td>
<td>5</td>
<td>60</td>
</tr>
<tr>
<td>Interference Sources</td>
<td>Cordless phones</td>
<td>Bluetooth, microwave ovens, baby monitors, etc</td>
<td>Bluetooth, microwave ovens, baby monitors, etc</td>
<td>Same as 802.11b/g @ 2.4 GHz</td>
<td>Same as 802.11a @ 5 GHz</td>
<td>Same as 802.11a @ 5 GHz</td>
</tr>
</tbody>
</table>

“..by 2015, 80% of recently installed corporate wireless networks will become obsolete because of poor infrastructure planning” - Gartner
## Power over Ethernet

**Increased power levels and device support**

<table>
<thead>
<tr>
<th>Year</th>
<th>Technology</th>
<th>Output Voltage (Vdc)</th>
<th>Output Current, Normal Mode (mAdc)</th>
<th>Output Current, Startup Mode (mAdc)</th>
<th>Power (Watts)</th>
<th>Pairs Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>IEEE 802.3af</td>
<td>36-57</td>
<td>350</td>
<td>400</td>
<td>12.95 (max)</td>
<td>2-pr</td>
</tr>
<tr>
<td>2003</td>
<td>IEEE 802.3at</td>
<td>42.5-57</td>
<td>600</td>
<td>400</td>
<td>25.5 (ave)</td>
<td>2-pr</td>
</tr>
<tr>
<td>2009</td>
<td>Cisco UPoE</td>
<td>42.5-57 (implied)</td>
<td>1200 (implied)</td>
<td>51 (max)</td>
<td>4-pr</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- **IEEE 802.3af** supports 15W PoE.
- **IEEE 802.3at** supports 30W PoE.
- **Cisco UPoE** supports 60W PoE.

**Image:**
- Early systems deployed 7W.
- First systems deployed 2000.
- 2003: IEEE 802.3af 15W PoE.
- 2009: IEEE 802.3at 30W PoE.
- 2011: Cisco UPoE 60W.

**Source:**
- [BicSI](https://www.bicsi.org)
Infrastructure standards

ISO/IEC 11801: Information technology – Generic cabling for customer premises

TIA 568C: Commercial Building Telecommunication Cabling Standard

EN 50173-1: Information technology Generic cabling systems - Part 1: General requirements

ISO/IEC TR 24704: Information technology - Customer premises cabling for wireless access points

TIA TSB-162: Telecommunications Cabling Guidelines for Wireless Access Points

prEN 50173-6: Information technology Generic cabling systems - Part 6: Distributed building services


prEN 50173-6: Information technology Generic cabling systems - Part 6: Distributed building services
<table>
<thead>
<tr>
<th>Enterprise Cabling</th>
<th>Cabling for Power over Ethernet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ISO/IEC 11801:</strong> Information technology – Generic cabling for customer premises</td>
<td><strong>ISO/IEC TR 29125:</strong> Information technology -- Telecommunications cabling requirements for remote powering of terminal equipment</td>
</tr>
<tr>
<td><strong>TIA 568C:</strong> Commercial Building Telecommunication Cabling Standard</td>
<td><strong>TIA TSB-184:</strong> Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling</td>
</tr>
<tr>
<td><strong>EN 50173-1:</strong> Information technology Generic cabling systems - Part 1: General requirements</td>
<td></td>
</tr>
</tbody>
</table>
40GBASE-T Link Segment Objective

- 40G BASE-CR4 “Direct Attach” reach is limited to adjacent cabinets
- Cost effective solution needed for End-of-Row (EOR) / Middle-of-Row (MOR) topologies
- 40G BASE-T (Category 8) solution proposed for this application

ISO/IEC agreement on Category 8 naming convention
## Data Center Infrastructure Standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>TIA/EIA-942-A</th>
<th>EN 50173-5</th>
<th>ISO 24764</th>
</tr>
</thead>
<tbody>
<tr>
<td>Published</td>
<td>2012</td>
<td>2010</td>
<td>2010</td>
</tr>
<tr>
<td>Fiber</td>
<td>OM4</td>
<td>OM3</td>
<td>OM3</td>
</tr>
<tr>
<td></td>
<td>OS1</td>
<td>OS1</td>
<td>OS1</td>
</tr>
<tr>
<td>Fiber Conn.</td>
<td>LC / MPO</td>
<td>LC / MPO</td>
<td>LC / MPO</td>
</tr>
<tr>
<td>Copper</td>
<td>Cat 6A</td>
<td>Class E&lt;sub&gt;A&lt;/sub&gt;</td>
<td>Class E&lt;sub&gt;A&lt;/sub&gt;</td>
</tr>
</tbody>
</table>
TIA-942A Recommends Energy Efficient Lighting

- Added new section on lighting
- Recommends 3 level lighting policy based on occupancy
- Recommends LED fixtures
Today’s Data Center and Emerging Trends and Technologies

Cabling Infrastructure impacts the success of implementation
Thank You