Data Center Telecom Cabling Standards – Justification & Update

Jonathan Jew
J&M Consultants, Inc.
Vice-chair TIA TR-42.6 Telecom Administration
Editor ISO/IEC TR 14763-2-1 Telecom Identifiers
Co-editor TIA-942-A Data Centers Telecom Infrastructure
Co-chair BICSI Data Center Subcommittee
www.j-and-m.com
WHY USE DATA CENTER TELECOM STANDARDS?
Point-to-Point Non-Standard Cabling
Unorganized, Single-Use

INSTALL A CABLE WHEN YOU NEED IT
(SINGLE-USE, UNORGANIZED CABLES)
Structured Standards Based Cabling
- Organized, Reusable, Flexible

STRUCTURED CABLING SYSTEM (ORGANIZED, REUSABLE, FLEXIBLE CABLING)
Standard/Structured vs. Proprietary/Pt-to-Pt Cabling

- Cabling can be used for multiple applications rather than installed for one application and then removed (or probably just left under the floor)
  - Saves money
  - Flexibility to deploy connections quickly
  - Helps minimize under floor mess
- Multiple sources vs. single source
- Support for future high speed protocols
- Simpler troubleshooting & administration (improves availability)
WHAT ARE THE DATA CENTER TELECOM STANDARDS?
Data Center Telecom Standards

- **ISO/IEC 24764** Information Technology – Generic Cabling for Data Centre Premises (approved 2/2010 Intl)
- **CENELEC EN 50173-5** Information Technology – Generic Cabling Systems Part 5: Data Centres (2007 - Europe)
- **NMX- I- xxx-NYCE 2010** Telecommunications - Data Centers Sustainability and High Performance (7/2010 - Mexico)
- **ANSI/BICSI-002** Data Center Design and Implementation Best Practices (2nd half 2010 - Intl)
ANSI/TIA-942

• ANSI/TIA-942 *Telecom Infrastructure Standard for Data Centers* (2005)
• Revision is ANSI/TIA-942-A (2011/2012)
• Telecom cabling (topologies, cable types, distances)
• Telecom spaces (design requirements – height, lighting, doors, floor loading, HVAC, finishes, power, grounding, etc.)
ANSI/TIA-942

- Telecom pathways
- Redundancy
- Annexes
  - Application distances for circuits
  - Access provider coordination
  - Administration (labeling)
  - Site selection
  - Data center reliability tiers (telecom, architectural, electrical, mechanical)
ISO/IEC 24764

- ISO/IEC 24764 Information technology – Generic Cabling for Data Centre Premises approved Feb 2010
- Based on CENELEC EN 50173-5
- Telecommunications cabling only
- Data Center planning, telecommunications pathways, spaces, and administration to be included in ISO/IEC 14763-2 Information technology – implementation and operation of customer premises cabling – Part 2 Planning and Installation (2011/2012)
CENELEC EN 50173-5

- CENELEC EN 50173-5 Information Technology – Generic Cabling Systems Part 5: Data Centres (2007)
- Telecommunications cabling only
- Amendment 1 to include high density connecting hardware for optical fiber and balance pair cabling (2nd half 2010)
- Data Center planning, telecommunications pathways, spaces, and administration to be included in EN 50174-2 amendment 1 (2nd half 2010)
NMX (México) Data Center Standard

- NMX- I- xxx-NYCE 2010  Data Centers Sustainability and High Performance
- Expected to be published July 2010
- Main text - Governance /sustainability
- Focused on: Design, Construction & Operation
- Annex
  - Architecture
  - Cooling
  - Energy
  - Transport Systems
  - Safety
  - Security
NMX Data Center Scheme Drivers

- Governance
  - Business Continuity Management (BCM) concepts
  - Four DC types – tiers – by system, so each one has a classification.
  - Historical bldgs. projects
- Sustainabiliy
  - Three levels (accomplish efficiency, excellency)
  - Based on ideas from: EUROPEAN COMMISSION Institute for Energy; CoNUEE, EPA, LBL, GreenGrid, Uptime Institute
  - Energy using PUE concept (parámetro de uso eficiente de energía)
  - Cooling hybrid (active, passive, liquid)

Based on ISO (38500, 27000, 24764) + NOM+NMX+IMEI+NYCE+ ITIL + SOX+NFPA+ASIS+ASHRAE+TIA and BICSI (10 RCDDs involved)
NMX DC ranking per TIPOS (tier)
## Differences between standards

<table>
<thead>
<tr>
<th></th>
<th>TIA</th>
<th>ISO/IEC</th>
<th>CENELEC</th>
<th>NMX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balanced Pair</td>
<td>Cat 3 min, Cat 6A recomm</td>
<td>Cat 6A, 7, 7A</td>
<td>Cat 6, 6A, 7, 7A</td>
<td>Cat 6A (recomm shielded)</td>
</tr>
<tr>
<td>Multimode Fiber</td>
<td>OM1 min</td>
<td>OM3 min</td>
<td>OM2 min</td>
<td>OM3 min</td>
</tr>
<tr>
<td>Coaxial cable</td>
<td>734/735 coax</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Horizontal cable</td>
<td>100 m</td>
<td>100 m copper 300+ m for fiber</td>
<td>100 m copper 300+ m for fiber</td>
<td>100 m copper 300+ m for fiber</td>
</tr>
<tr>
<td>MMF connector</td>
<td>Multiple</td>
<td>LC or MPO</td>
<td>LC or MPO</td>
<td>LC or MPO</td>
</tr>
<tr>
<td>SMF connector at EDA</td>
<td>Multiple</td>
<td>LC for 1 or 2 MPO for 3+</td>
<td>LC-PC</td>
<td>LC or MPO</td>
</tr>
<tr>
<td>SMF connector at Entrance Rm</td>
<td>Multiple</td>
<td>Angled-LC</td>
<td>Angled-LC</td>
<td>LC or MPO</td>
</tr>
</tbody>
</table>
ANSI/BICSI-002 - Scope

• ANSI/BICSI-002 Data Center Design and Implementation Best Practices Standard
• An international standard, not just U.S.
• Meant to supplement, not replace existing data center cabling standards such as TIA-942 and CENELEC EN 50173-5
• Large committee of experts (150)
• Large document (~500 pages) covering a wide range of subjects
BICSI-002 Subjects Covered

- Site Selection
- Architectural and Structural Design
- Electrical Systems
- Mechanical Systems (i.e., HVAC)
- Fire Protection and Security
- Building Automation Systems
- Commissioning
- Maintenance
BICSI-002 Subjects Covered

- Telecommunications
  - Access Providers & Entrance Facilities
  - Telecom Spaces
  - Cabinets & Racks
  - Cabling Pathways
  - Telecom Cabling
  - Field Testing
  - Telecom Administration

- Information Technology
TIA-942-A Changes

- Compatibility with 568-C series (references, terms, cabling infrastructure description)
- Incorporate TIA-942 Addendum 1 (coaxial cables and E1, T1, E3, T3 circuit distances)
- Incorporate TIA-942 Addendum 2 (RF interference, lighting levels, revised temperature & humidity, addition of Cat 6A, revised Tiering)
- Labeling superseded by TIA-606-A-1
- Grounding to be superseded by TIA-607-B
- Cabinets to be moved to TIA-569-C
**COMMON STANDARDS**

- ANSI/TIA-568-0 Generic Telecommunications Cabling for Customer Premises
- ANSI/TIA-569-C Standard for Telecommunications Pathways and Spaces
- ANSI/TIA-606-A Administration Standard for Commercial Telecommunications Infrastructure
- ANSI/TIA-607-B Telecommunications Grounding and Bonding for Customer Premises
- ANSI/TIA-758-B Customer-owned Outside Plant Telecommunications Infrastructure Standard
- ANSI/TIA-862-A Building Automation Systems Cabling Standard

**PREMISES STANDARDS**

- ANSI/TIA-942-A Telecommunications Infrastructure Standard for Data Centers
- ANSI/TIA-568-C.1 Commercial Building Telecommunications Cabling Standard
- ANSI/TIA-570-B Residential Telecommunications Infrastructure Standard
- ANSI/TIA-1005 Telecommunications Infrastructure Standard for Industrial Premises
- ANSI/TIA-1179 Healthcare Facility Telecommunications Infrastructure Standard

**COMPONENT STANDARDS**

- ANSI/TIA-568-C.2 Balanced Twisted-Pair Telecommunications Cabling and Components Standard
- ANSI/TIA-568-C.3 Optical Fiber Cabling Components Standard

**TIA CABLING STANDARDS STRUCTURE**

Note red text indicates standards that are not yet published but that are active projects
TIA-942-A Changes

- Energy efficiency
- Remove Cat 3 and 5e horizontal cabling
- Remove 62.5/125 (OM1) and add OM4
- Recommend LC for 1 or 2 SM or MM fibers and MPO for more than 2 fibers
- Remove 100 m horizontal cabling length for optical fiber cabling
- Larger data center topologies
- Telecom redundancy at various tiers
New Intermediate Distribution Area (IDA)
Energy Efficiency – Temperature & Humidity

• Computer Rooms, Equipment Rooms, Access/Service Provider Spaces
  – Temperature: 18 – 27 °C (64 – 81 °F)
  – Max Relative Humidity: 60%
  – Max dew point: 15 °C (59 °F)
  – Min dew point: 5.5 °C (42 °F) to control ESD
  – Dew point temperature to which air must be cooled to reach saturation
  – Old values 68 to 77 °F with 40% to 55% RH for computer rooms
Energy Efficiency – Temperature & Humidity

- TRs, Common TRs, TEs, Entrance Rooms
  - Temperature: 5 – 35 °C (41 – 95 °F)
  - Relative Humidity: 8 - 80%
  - Max dew point: 28 °C (82 °F)
  - TR original requirements were to ‘maintain a temperature the same as the adjacent office area’. Other spaces had no requirements other than those required by the active equipment.
Energy Efficiency - Lighting

• 3 Level lighting protocol by zone for data centers depending on human occupancy
  – Level 1 – no occupants - just high enough for monitoring by surveillance cameras
  – Level 2 – motion detectors used to initiate higher level access to provide safe passage & ID by cameras
  – Level 3 – 500 lux (1 m/3 ft AFF in aisle) when space is occupied for working on equipment
Energy Efficiency - Pathways

• Overhead cabling is a best practice where ceiling heights permit (reduces losses due to airflow obstruction and turbulence)

• If cabling is under floor consider smaller diameter cables or alternative network architectures to reduce cabling volumes

• Avoid blocking airflow to/from cabinets, ventilated tiles, A/C, IT, and telecom equip

• Minimize loss of air thru tile cuts
Energy Efficiency - Spaces

• Consider using enclosures or enclosure systems that improve cooling efficiency
• Cabling and cabling pathways should not compromise efficiency of enclosure system
• Blanking panels & no unused cabinet positions that compromise hot/cold aisles
• Segregate equip with different environmental requirements
• Build in modules/phases
• Remove equipment that is no longer needed
• Monitor power levels
TIA-606-A-1 Computer Room Administration

- Identification/labeling scheme in TIA-606-A Addendum 1 will replace administration guidelines in TIA-942
- Provides guidance for identifiers and labeling in computer rooms and equipment rooms
# Cabinet Naming Scheme

The diagram illustrates the cabinet naming scheme with a grid layout. The coordinates are as follows:

- **"X" COORDINATE**
  - AA, AB, AC, AD, AE, AF, AG, AH, AI, AJ
  - Each row is numbered from 01 to 13.

- **"Y" COORDINATE**
  - The "Y" coordinate is marked at the right side of the cabinet, facing outward.

- **Legend**
  - Red dot: cabinet corner used for grid location ID

The columns are labeled **HOT AISLE (CABINET REAR)**, **COLD AISLE (CABINET FRONTS)**, and **HOT AISLE (CABINET REAR)**. The grid locations are indicated with numbers and letters, such as AD02, AG03, and so on.

- **Note**
  - The "Y" coordinate is used for the right front facing the cabinet.
At minimum label patch panel with ID of patch panel and 1st or last port of every subpanel.

Identifier of cable on port 1 is:

AG03-35:01 / AD03-35:01
• Jonathan Jew
• President J&M Consultants, Inc.
• Website: www.j-and-m.com
• Email: jew@j-and-m.com

• Vice-Chair TIA TR-42.6 telecom administration subcommittee
• Editor ISO/IEC TR 14763-2-1 telecom administration identifiers
• US National Committee Project Manager ISO/IEC 24764 data center standard
• Data Center & Administration Section Editor – ISO/IEC 14763-2 cabling planning & installation
• Co-chair BICSI data center subcommittee
• Co-editor TIA-942-A
EXTRA MATERIAL AS TIME PERMITS
Equipment Cabinets

- Front rails of cabinets must be recessed to provide adequate room for patch cables and wire managers
- Adequate space for cable management
- Arrange switches and patch panels to minimize patching between cabinets & racks
- Perforated tiles at front of cabinets
- One edge of cabinets placed at edge of tile
Plan for growth & consider airflow

SAMPLE HDA FOR 20 SERVER CABINETS
(24 UTP and 36 pair MMF per cabinet)
Space impact of cabling systems

- Allocate adequate space and carefully plan location of Telecommunications areas MDA HDAs, Entrance Rooms, Telecom Rooms
- Provide adequate space and coordinate location of cabling pathways
- Space in server cabinets for patch panels and cable management
- Distance restrictions affect the dimensions of the computer room, location of telecom spaces, and location of equipment
Spacing between trays not 12” in this data center in Tokyo
These electrical trays commonly used in Europe have sharp edges that damage cables.
More than 40% fill and more than 6” depth of cable tray in these solid bottom trays in Sydney
Unshielded Power Cables
(and non-locking plugs in this data center in Sydney)
Cable ties instead of listed hardware for SRG, non-locking receptacles in this Paris DC.