Best Practices for Networking Intelligent Devices: Zone Cabling and Coverage Area Planning

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Agenda

• What is zone cabling?
• What are coverage areas?
• Positioning coverage areas and zone enclosures
• Outlet usage within coverage areas
• Outlet density planning for highly automated and conventional buildings
• Zone cabling ROI
Standards for Building System cabling

- ANSI/TIA-862-B “Structured Cabling Infrastructure Standard for Intelligent Building Systems”
- Draft ISO/IEC 11801 part 6 “Distributed Building Services”
- Zone cabling is a recognized approach to support convergence of data, voice, building device, and wireless transmission
Standards for Zone Cabling design

• Detailed design and planning guidance for zone cabling infrastructure has been lacking
• BICSI incorporated Siemon content into draft document D033, “Information Communication Technology Design and Implementation Practices for Intelligent Buildings and Premises”
What’s different about zone cabling?

- Zone cabling consists of cables run from connections in the telecommunications room (TR) to outlets typically housed in a zone enclosure (e.g., a ceiling or floor box)
- Cables are then patched from the outlets in the zone enclosure to equipment, service, or telecommunications outlets
Plenum considerations

• Components in plenum (air handling) spaces must comply with National Electric Code® (NFPA 70) and UL 2043
  – UL 2043 lists requirements for smoke and heat release in plenum spaces

• More connected devices reside in the plenum space than ever before:
  – Wi-Fi access points  – HVAC controllers  – Biometric
  – Surveillance cameras  – A/V equipment  – Alarm systems
  – LED lighting systems  – Access control  – other BAS devices
Plenum rated cables AND connectivity

- Care must be given to selecting appropriately rated cables, enclosures, connecting hardware, and equipment cords for use in plenum spaces
- Cables have long been available with plenum rating
- Metal enclosures meet plenum rating when properly installed with fire stopping
Zone enclosure connection point naming

- Terminology varies according to reference Standard and use:
  - TIA and ISO/IEC specify consolidation point (CP) for voice and data connections
  - TIA specifies horizontal consolidation point (HCP) for building device connections
  - ISO/IEC specifies service concentration point (SCP) for building device connections

“SCP” will be used for building device connections at the zone enclosure
Zone enclosure considerations

- Must be permanently affixed
- Typically located in the ceiling (70% in North American markets), under floor (70% in non-North American markets), or on the wall
- Typically 1-port to 96-port (> 96-port not recommended)
- In N.A., many applications (primarily ceiling) may require plenum-rated components
Device connections from the CP/SCP

- Terminology varies according to reference Standard and use:
  - TIA and ISO/IEC specify a telecommunications outlet (TO) for voice and data connections
  - TIA specifies an equipment outlet (EO) for building device connections
  - ISO/IEC specifies a service outlet (SO) for building device connections

“SO” will be used for outlets connecting to building devices
Important notes about TO and SO usage

• The functions of a CP and an SCP can be combined within the same zone enclosure
• The use of a TO is always mandatory whether or not a CP is present
• The use of an SO is optional if an SCP is present
• A note about direct building device connections
Structured voice/data connections

Panel(s) in TR TO
Structured voice/data connections

1. Panel(s) in TR → TO

2. Panel(s) in TR → CP → TO
Structured building device connections

Panel(s) in TR  SO
Structured building device connections

1. Panel(s) in TR — Panel(s) in TR

2. Panel(s) in TR — SCP — SO

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Structured building device connections

Panel(s) in TR ➔ SCP
Structured building device connections

3
Panel(s) in TR
SCP

4
Panel(s) in TR
SCP configured as a cross-connect (2 outlets)
Advantages of zone cabling

• Supports rapid reorganization of floor space, and deployment of new devices and applications
• MAC work costs less, is faster and less disruptive
• Factory pre-terminated and tested trunking cables can be installed from the TR to the zone enclosure for quicker deployment
What is a coverage area?

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- A zone enclosure may serve one or multiple coverage areas.
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- Multiple devices can share a coverage area.
- A zone enclosure may serve one or multiple coverage areas.
- An SO is not necessary if a building or WAP device is within 5m of the SCP.
Recommended coverage area radii

- Zone enclosures should be strategically placed throughout a building space to allow quick access to connection points.
- Overlaying coverage areas of 13m radii will facilitate 802.11ac Wi-Fi and other services.
Coverage area overlay patterns

- Different patterns may be used to lay out coverage areas, with the intent that zone enclosures will be centrally located in their associated grouping of coverage areas.
- The area comprised of multiple coverage areas and served by a zone enclosure is called the zone area.

Example of a Zone Area
Hexagon coverage area pattern

- Typically serves four to five 425m² hexagon-shaped coverage areas.
- May be most suitable for large, open spaces such as open office, industrial, retail, and warehouse environments.
Hexagon coverage area pattern

- Typically serves four to five 425m² hexagon-shaped coverage areas
- May be most suitable for large, open spaces such as open office, industrial, retail, and warehouse environments
- Each zone enclosure will ideally serve a zone area of approximately 2000m²

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Grid coverage area pattern

- Typically serves four 350m² square-shaped coverage areas
- May be most suitable for large building spaces supporting classrooms, enclosed office spaces, patient rooms, etc.
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• Each zone enclosure will serve a zone area of approximately 1400m²
Leg coverage area pattern

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Leg coverage area pattern

- Typically serves four 350m² square-shaped coverage areas
- May be most suitable for large, open spaces such as open office, industrial, retail, and warehouse environments
- May also be scaled down (i.e. smaller coverage areas) to support 2, 4, or 6 connections at the SCP for office-specific coverage
Zone enclosure location notes

- Generally, an SCP does not provide significant added benefits if it is located within 17m (56ft) of the TR unless the TR has limited accessibility.
- Therefore, it is recommended that zone enclosures be positioned at least 30m (17m + 13m) from the TR.
Coverage area sizing

- Coverage areas may range from 72m² to 7200m² to support device coverage area radii ranging from 3m to 30m.
- The number of outlets at the SCP should be selected based upon present and future needs.
- Siemon recommends an initial spare port capacity of 25% - 50% above present needs.

Coverage Area = 425m²
Coverage Area = 350m²
### Standards-based device density

<table>
<thead>
<tr>
<th>Use of Space</th>
<th>CA per Device</th>
<th>Connections (Hex-Based)</th>
<th>Connections (Grid-Based)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom, Data Center, Hospital, Hotel, Office, Retail</td>
<td>25m²</td>
<td>80 (96* for future and present needs)</td>
<td>56 (72 for future and present needs)</td>
</tr>
<tr>
<td>Indoor Parking, Manufacturing</td>
<td>50m²</td>
<td>40 (48 for future and present needs)</td>
<td>28 (36 for future and present needs)</td>
</tr>
</tbody>
</table>

* Two zone enclosures recommended for greater than 95 connections
A note about Mechanical Rooms

• Mechanical and plant rooms typically have a significantly higher coverage area per building device density of 5m²
• Device connections are recommended to be home run to the TR
• If not practical, coverage areas should be restricted to no larger than 480m²
Power over Ethernet considerations

• Today’s intelligent building devices rely on remote powering technology such as PoE
• TSB-184-A states that connecting hardware should be qualified for mating/un-mating under power load
• Heat can build-up inside cable bundles and channel length may need to be reduced to offset increased insertion loss
• Shielded cables are more thermally stable than UTP cables (e.g. TIA specifies channel length of 93m at 60°C versus 82m for UTP)
Highly Automated Building recommendations

If the total number of building devices and WAP connections to be supported is unknown in a highly automated intelligent building, two deployment configuration approaches are recommended as follows:

1) The SCP supports 96 connections and serves a grid based pattern of four square shaped coverage areas totaling 1400m², or
2) SOs/TOs supporting 3 or 6 connections are logically positioned throughout the floor or ceiling space to satisfy coverage requirements (SCPs are optional)
## Highly Automated Building recommendations

<table>
<thead>
<tr>
<th>Application</th>
<th>Number of Connections per 96-port SCP (Grid based pattern)</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.11ac Wi-Fi</td>
<td>12, (8 today + 4 spare for future)</td>
</tr>
<tr>
<td>Centralized Control</td>
<td>18, (12 today + 6 spare for future)</td>
</tr>
<tr>
<td>Advanced Security</td>
<td>36, (24 today + 12 spare for future)</td>
</tr>
<tr>
<td>Advanced Video</td>
<td>18, (12 today + 6 spare for future)</td>
</tr>
<tr>
<td>Telecommunications Outlets</td>
<td>12 spare for future use</td>
</tr>
</tbody>
</table>
Highly Automated Building recommendations

- “Flood” option - SCPs are positioned throughout the floor/office space
- Port availability at each SCP ranges from 2-6 ports
Highly Automated Building recommendations

- “Flood” option - SCPs are positioned throughout the floor/office space
- Port availability at each SCP ranges from 2-6 ports
- Device connections are provided exactly where needed
- SOs and TOs are integrated into one design
- Smart Partner support is likely required
Conventional Building recommendations

If the total number of building devices and WAP connections to be supported is unknown in a conventional building, the following three approaches are recommended:

1) The SCP supports 24 connections and serves a grid based pattern of four square shaped coverage areas totaling 1400m², or
2) The SCP supports 48 connections and serves a hexagon based pattern of four to five hexagon shaped coverage areas totaling 2000m², or
3) SOs/TOs supporting 1 to 4 connections are logically positioned throughout the wall, floor, or ceiling space to satisfy coverage requirements (SCPs optional).
### Conventional Building recommendations

<table>
<thead>
<tr>
<th>Application</th>
<th>Number of Connections per 24-port SCP (Grid based pattern)</th>
<th>Number of Connections per 48-port SCP (Hex based pattern)</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.11ac Wi-Fi</td>
<td>10, (8 today + 2 spare for future)</td>
<td>20, (14 today + 6 spare for future)</td>
</tr>
<tr>
<td>Basic Security</td>
<td>4, (3 today + 1 spare for future)</td>
<td>8, (6 today + 2 spare for future)</td>
</tr>
<tr>
<td>Advanced Video</td>
<td>4, (3 today + 1 spare for future)</td>
<td>8, (6 today + 2 spare for future)</td>
</tr>
<tr>
<td>TOs</td>
<td>6 spare for future</td>
<td>12 spare for future</td>
</tr>
</tbody>
</table>
Coverage areas for PoE lighting

- Separate and dedicated zone enclosures should be provided to support PoE lighting devices
- 96-ports should be provided to serve each 13m radius coverage area
- A grid coverage area pattern is recommended
- Additional guidance to come
Traditional versus zone cabling design ROI

- Traditional - two outlets provided to 36 work areas for a total of 72 cables or "drops"
- Zone - two outlets provided to 36 work areas and 72 connection points provided in a zone enclosure, plus an additional 24 cables pulled to the zone enclosure to accommodate future expansion
Zone cabling ROI - Plenum

Installation & Materials Costs (CAPEX)

Traditional Cabling - 72 WA drops
Zone Cabling - 72 WA/96 ZE drops
Zone cabling ROI - Plenum

Installation & Materials Costs (CAPEX)  CAPEX and OPEX after 12 moves/14 adds
Zone cabling ROI - Riser

Installation & Materials Costs (CAPEX)

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Zone cabling ROI - LS0H

- Traditional Cabling - 72 WA drops
- Zone Cabling - 72 WA/96 ZE drops

Installation & Materials Costs (CAPEX)  CAPEX and OPEX after 10 moves/13 adds

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Resources...

• “Zone Cabling and Coverage Area Planning Guide”
• “Zone Cabling for Cost Savings” papers
• ConvergeIT Zone Enclosure Payback Calculator
• Smart Partners resources