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

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SIEMON

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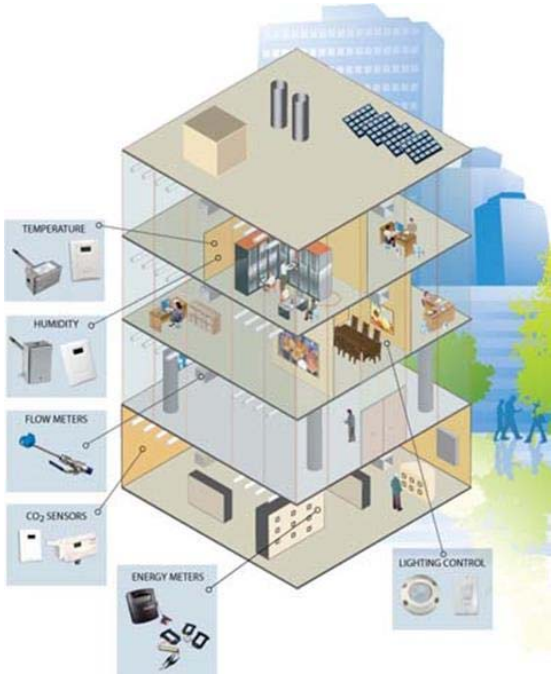
Agenda

- 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

Patch Panel(s) in TR

Outlets housed in a Zone Enclosure

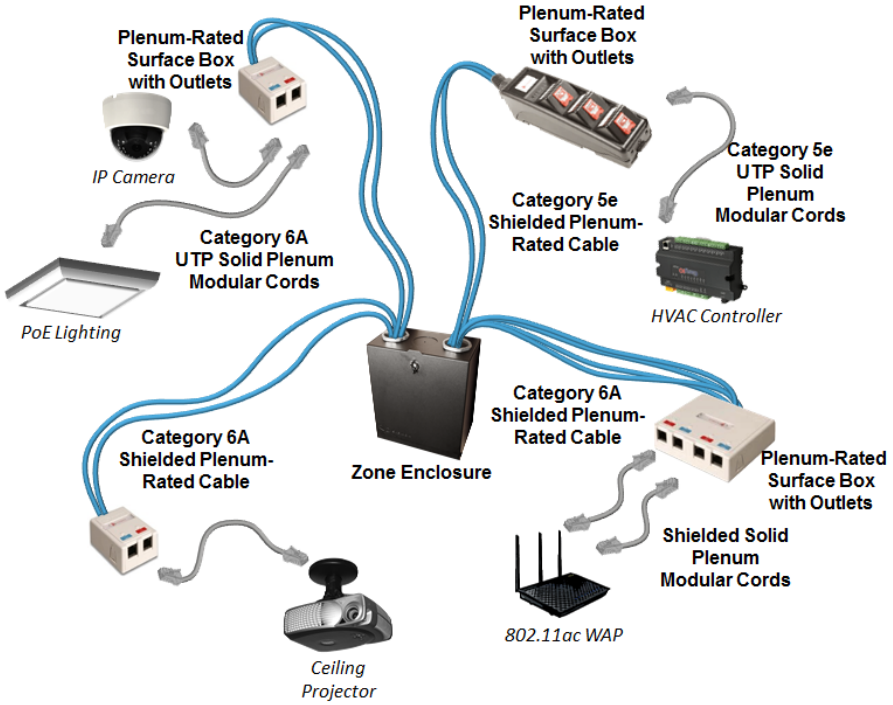
Device Outlet

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
  - Surveillance cameras
  - LED lighting systems
  - HVAC controllers
  - A/V equipment
  - Access control
  - Biometric
  - Alarm systems
  - other BAS devices

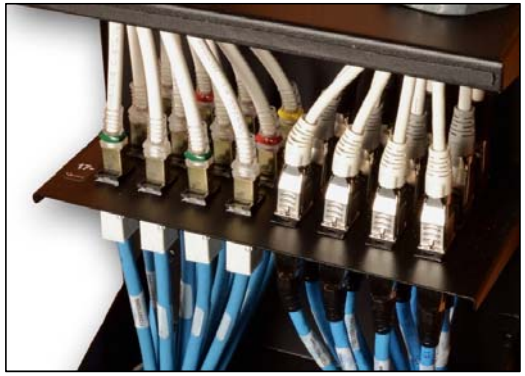
Plenum rated cables *AND* connectivity

- 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

MuTOA

Surface Mount Box

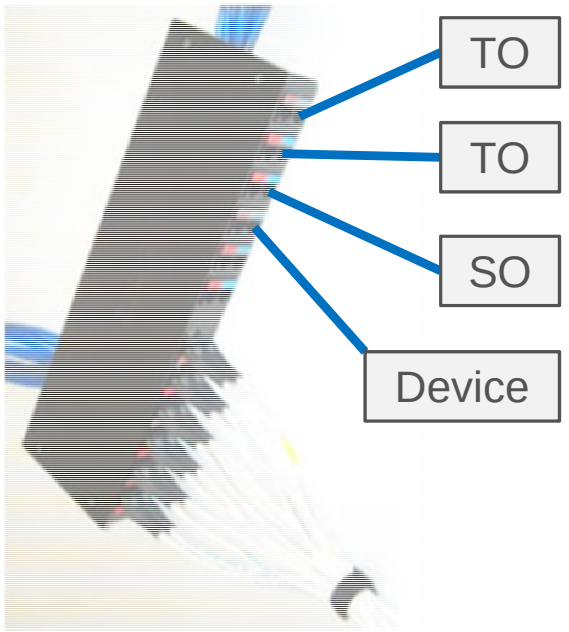
Device connections from the CP/SCP

- 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

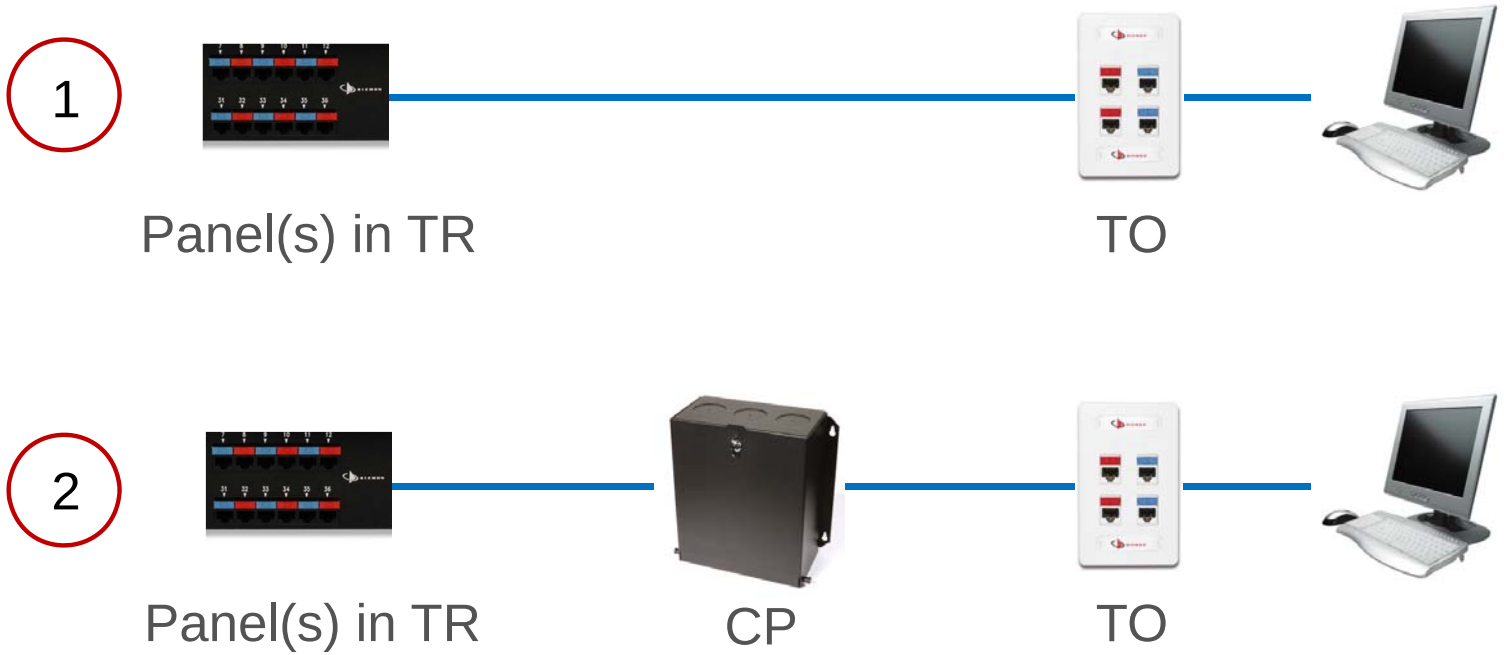
- The functions of a CP and an SCP can be combined within the same zone enclosure
- The use of a TO is always mandatory whether or not a CP is present
- The use of an SO is optional if an SCP is present
- A note about direct building device connections



24-port Enclosure

Structured voice/data connections

Structured voice/data connections



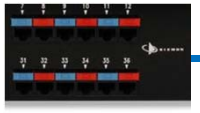
Structured building device connections

Panel(s) in TR

SO

Structured building device connections

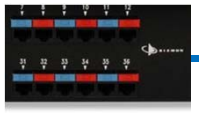
1



Panel(s) in TR

SO

2



Panel(s) in TR

SCP

SO

Structured building device connections

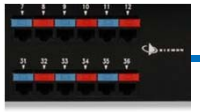
3

Panel(s) in TR

SCP

Structured building device connections

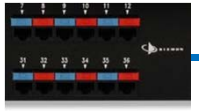
3



Panel(s) in TR

SCP

4



Panel(s) in TR

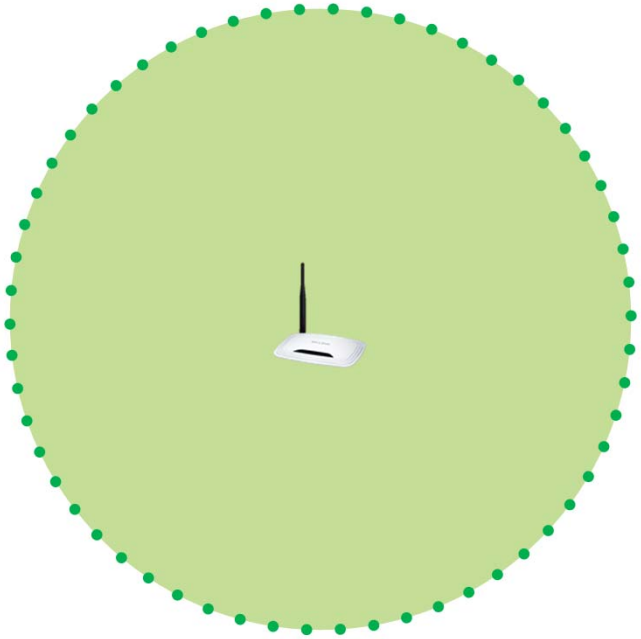
SCP configured as a cross-connect (2 outlets)

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?

- The area served by a device is called the coverage area



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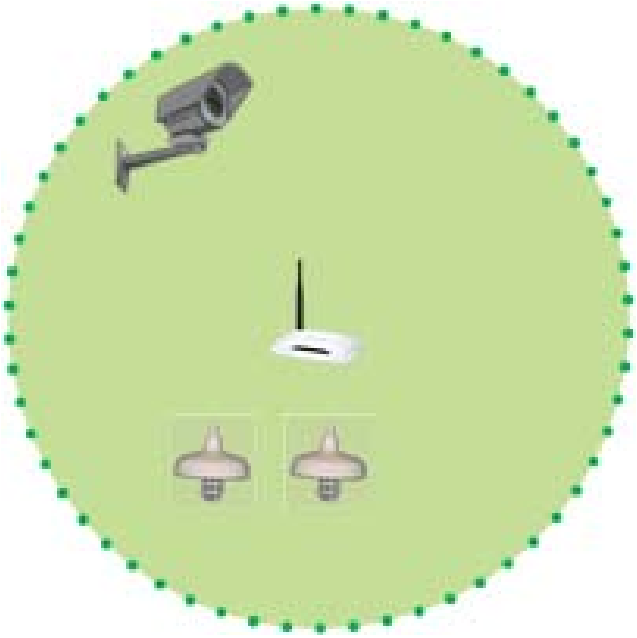
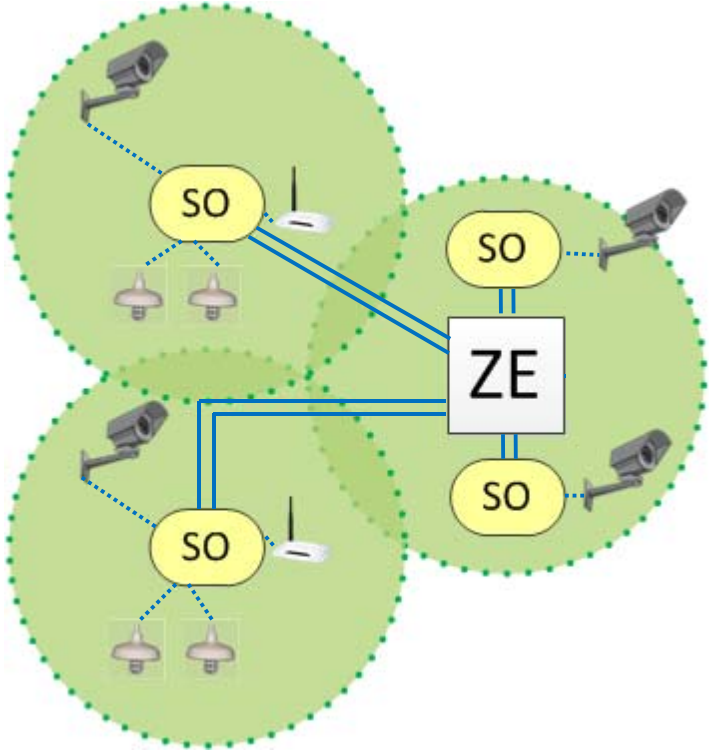
- Multiple devices can share a coverage area



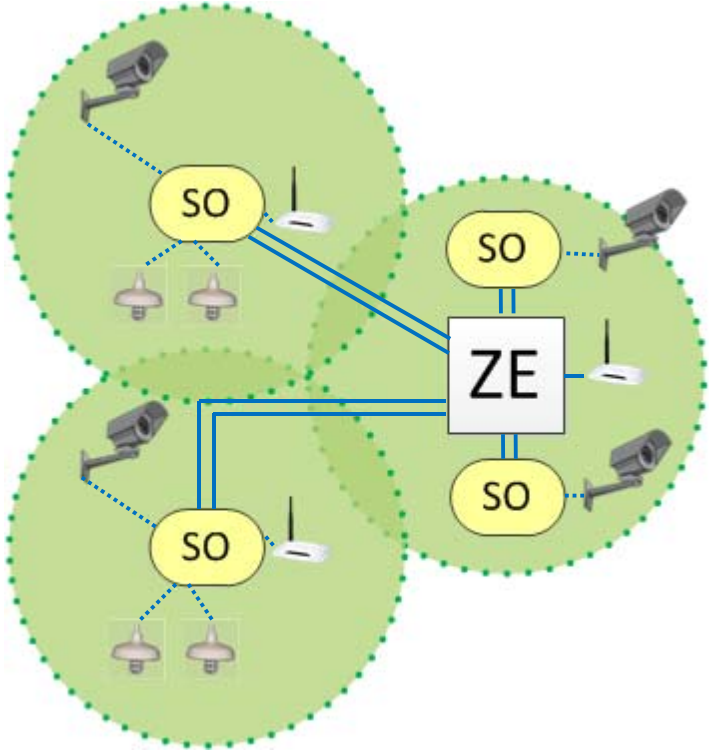
What is a coverage area?

- The area served by a device is called the coverage area
- Multiple devices can share a coverage area
- A zone enclosure may serve one or multiple coverage areas



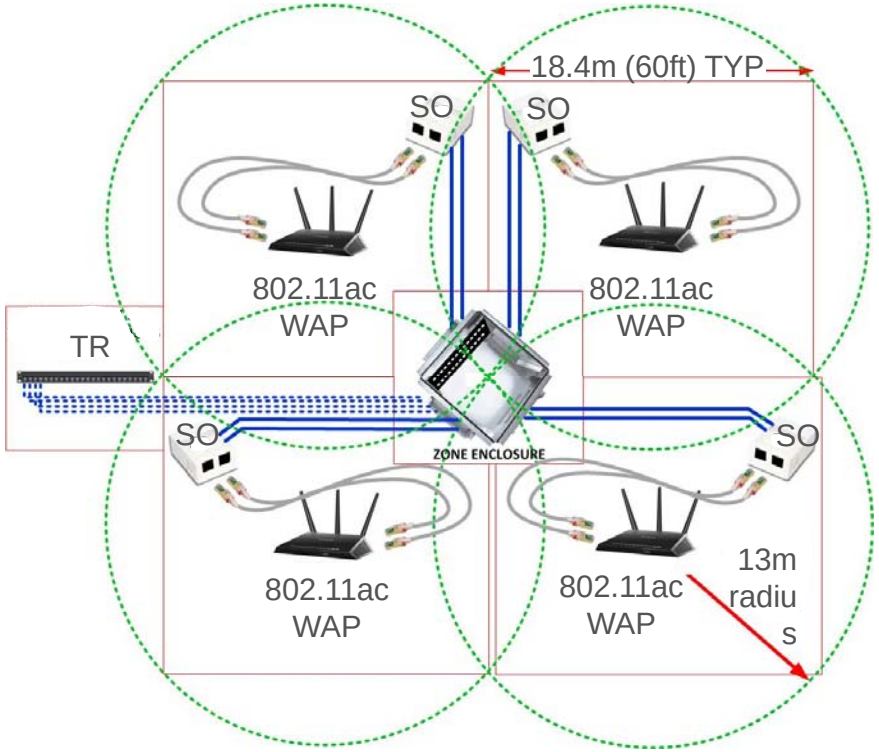
What is a coverage area?

- The area served by a device is called the coverage area
- 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

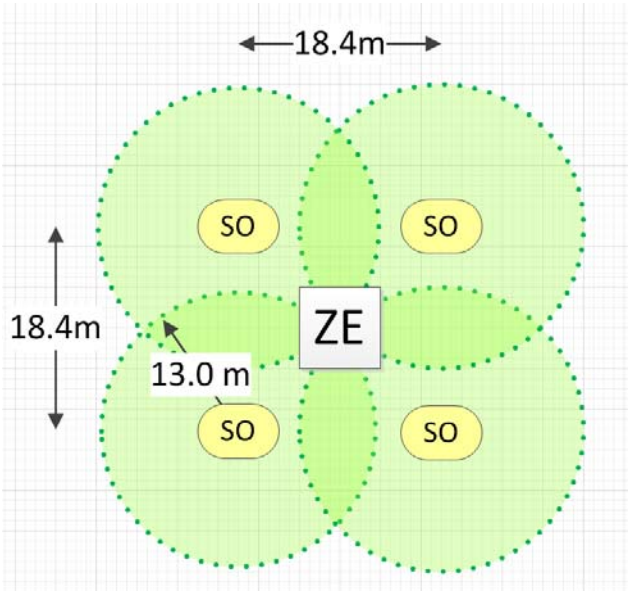


Recommended coverage area radii

- 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

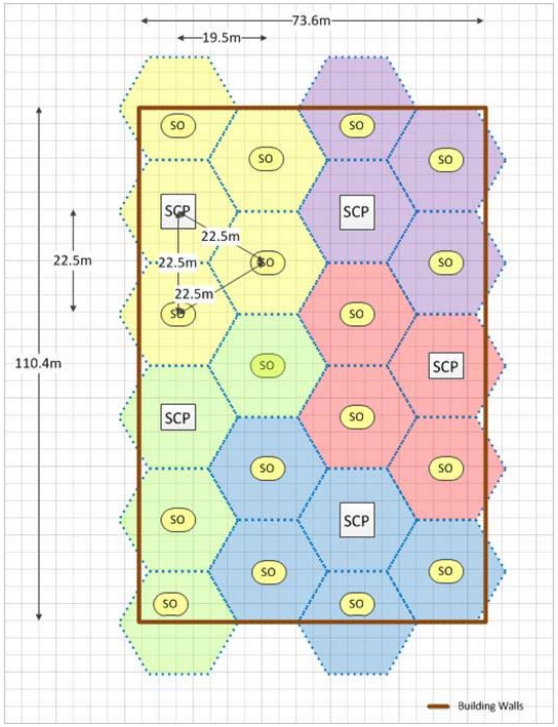


Example of a Zone Area

- 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

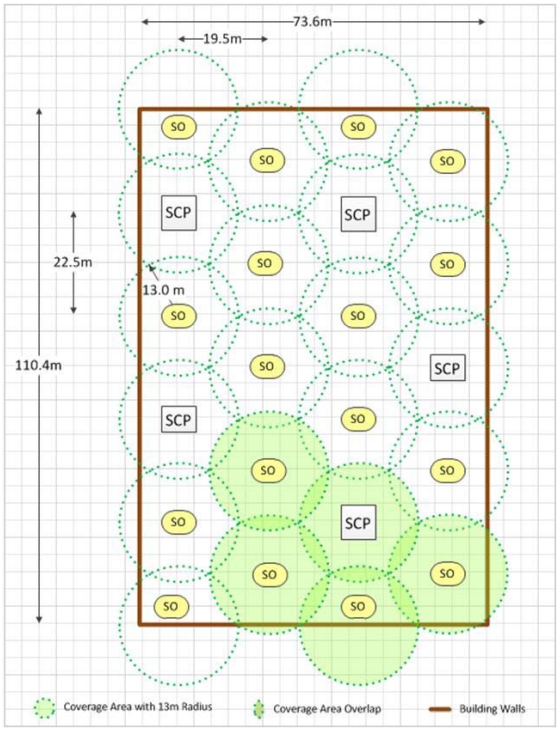
Hexagon coverage area pattern

- Typically serves four to five 425m^2 hexagon-shaped coverage areas
- May be most suitable for large, open spaces such as open office, industrial, retail, and warehouse environments



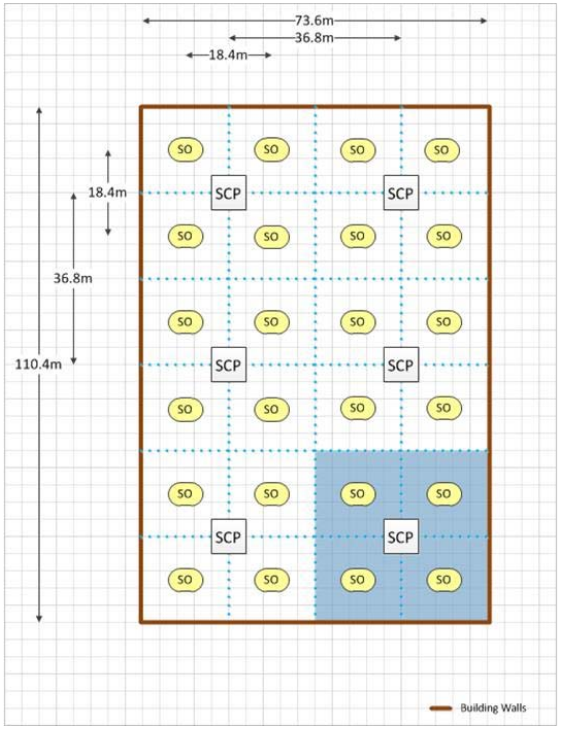
Hexagon coverage area pattern

- Typically serves four to five 425m^2 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 2000m^2



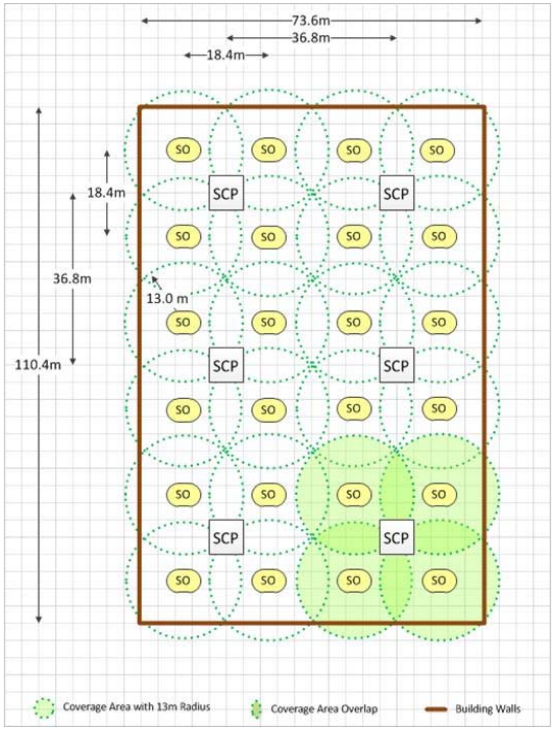
Grid coverage area pattern

- Typically serves four 350m^2 square-shaped coverage areas
- May be most suitable for large building spaces supporting classrooms, enclosed office spaces, patient rooms, etc.



Grid coverage area pattern

- Typically serves four 350m^2 square-shaped coverage areas
- May be most suitable for large building spaces supporting classrooms, enclosed office spaces, patient rooms, etc.
- Each zone enclosure will serve a zone area of approximately 1400m^2



Leg coverage area pattern

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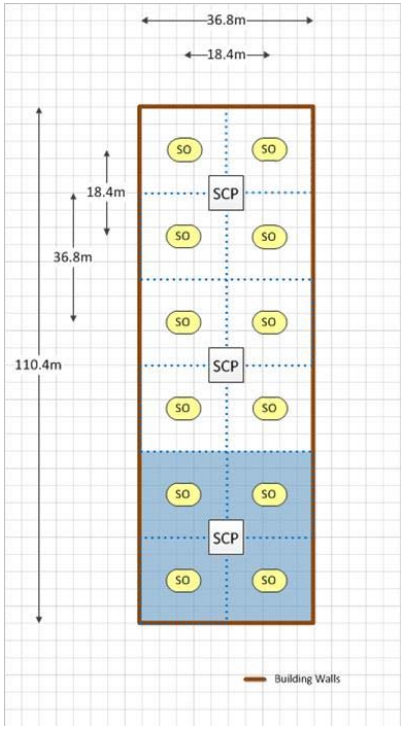
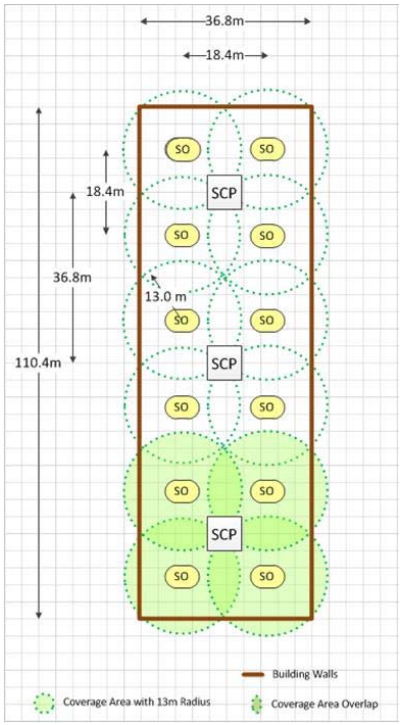


Leg coverage area pattern

- Typically serves four 350m^2 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

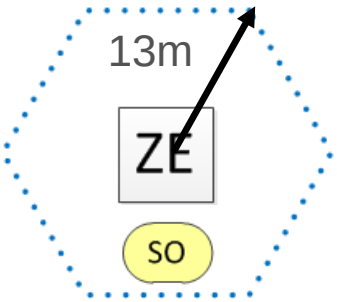


Zone enclosure location notes

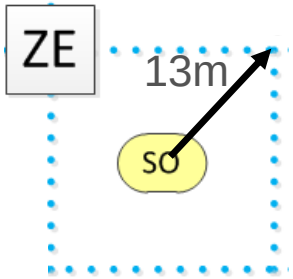
- Generally, an SCP does not provide significant added benefits if it is located within 17m (56ft) of the TR unless the TR has limited accessibility
- Therefore, it is recommended that zone enclosures be positioned at least 30m (17m + 13m) from the TR

Coverage area sizing

- Coverage areas may range from 72m^2 to 7200m^2 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 = 425m^2



Coverage Area = 350m^2

Standards-based device density

Use of Space	CA per Device	Connections (Hex-Based)	Connections (Grid-Based)
Classroom, Data Center, Hospital, Hotel, Office, Retail	$25m^2$	80 (96* for future and present needs)	56 (72 for future and present needs)
Indoor Parking, Manufacturing	$50m^2$	40 (48 for future and present needs)	28 (36 for future and present needs)

* 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 5m^2
- Device connections are recommended to be home run to the TR
- If not practical, coverage areas should be restricted to no larger than 480m^2

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:

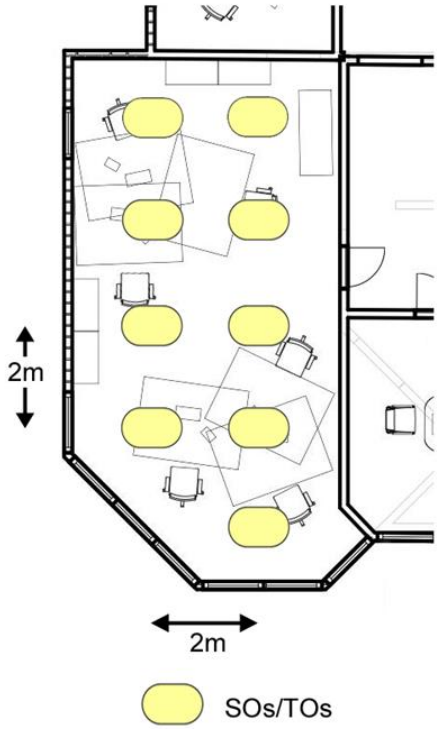
1) The SCP supports 96 connections and serves a grid based pattern of four square shaped coverage areas totaling 1400m^2, or
2) SOs/TOs supporting 3 or 6 connections are logically positioned throughout the floor or ceiling space to satisfy coverage requirements (SCPs are optional)

Highly Automated Building recommendations

Application	Number of Connections per 96-port SCP (Grid based pattern)
802.11ac Wi-Fi	12, (8 today + 4 spare for future)
Centralized Control	18, (12 today + 6 spare for future)
Advanced Security	36, (24 today + 12 spare for future)
Advanced Video	18, (12 today + 6 spare for future)
Telecommunications Outlets	12 spare for future use

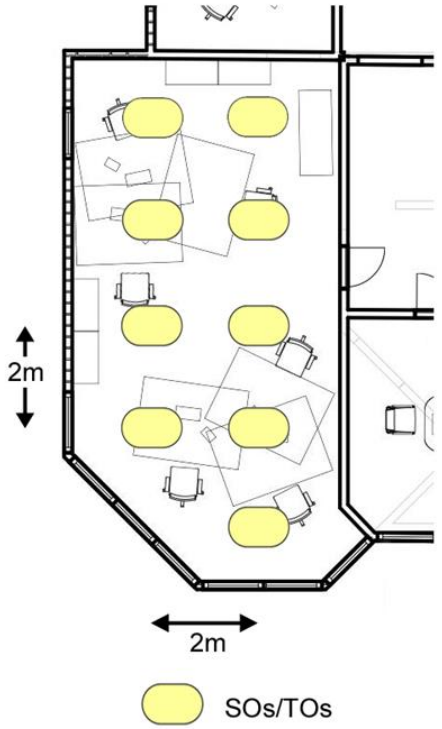
Highly Automated Building recommendations

- “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:

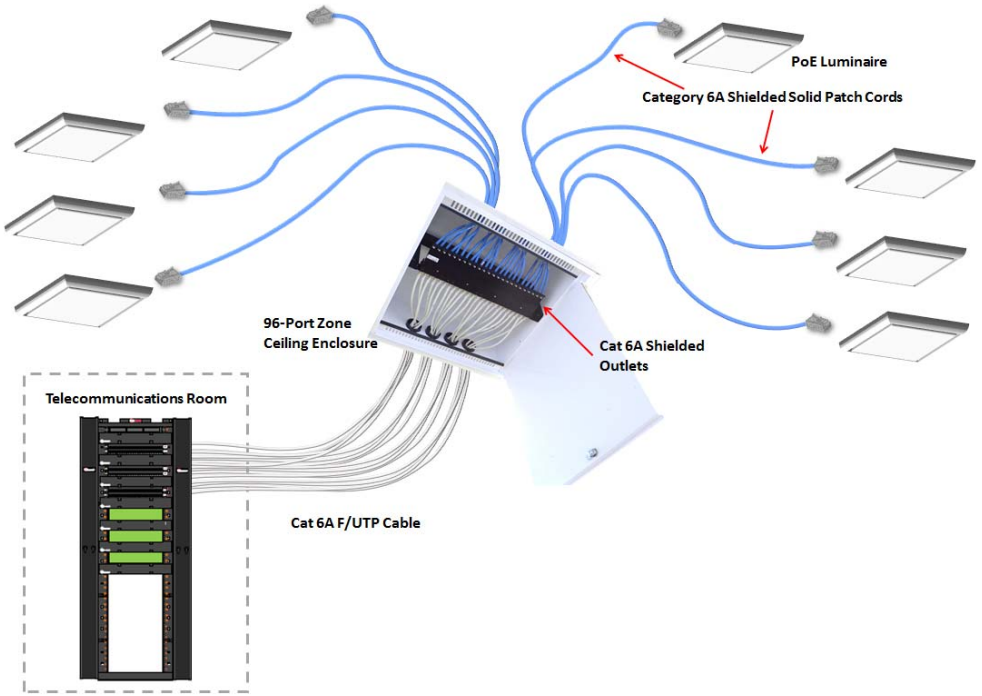
1) The SCP supports 24 connections and serves a grid based pattern of four square shaped coverage areas totaling 1400m^2, or
2) The SCP supports 48 connections and serves a hexagon based pattern of four to five hexagon shaped coverage areas totaling 2000m^2, or
3) SOs/TOs supporting 1 to 4 connections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

Conventional Building recommendations

Application	Number of Connections per 24-port SCP (Grid based pattern)	Number of Connections per 48-port SCP (Hex based pattern)
802.11ac Wi-Fi	10, (8 today + 2 spare for future)	20, (14 today + 6 spare for future)
Basic Security	4, (3 today + 1 spare for future)	8, (6 today + 2 spare for future)
Advanced Video	4, (3 today + 1 spare for future)	8, (6 today + 2 spare for future)
TOs	6 spare for future	12 spare for future

Coverage areas for PoE lighting

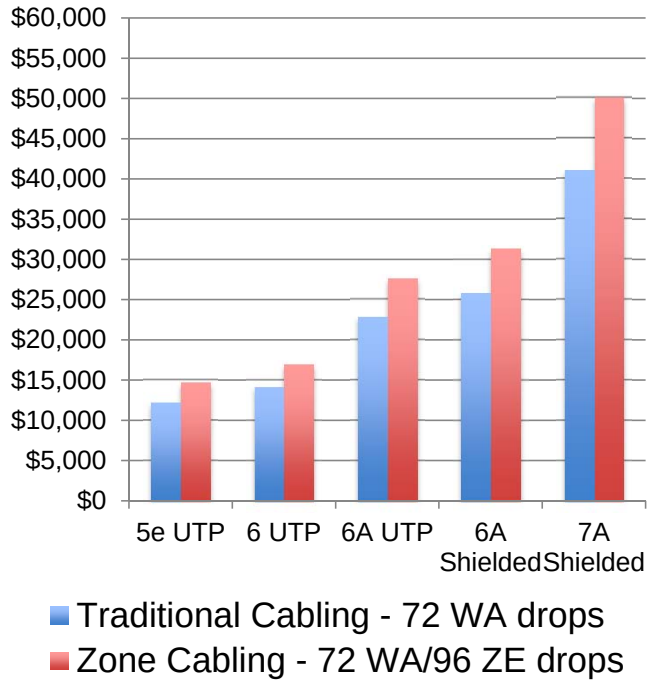
- Separate and dedicated zone enclosures should be provided to support PoE lighting devices
- 96-ports should be provided to serve each 13m radius coverage area
- A grid coverage area pattern is recommended
- Additional guidance to come



Traditional versus zone cabling design ROI

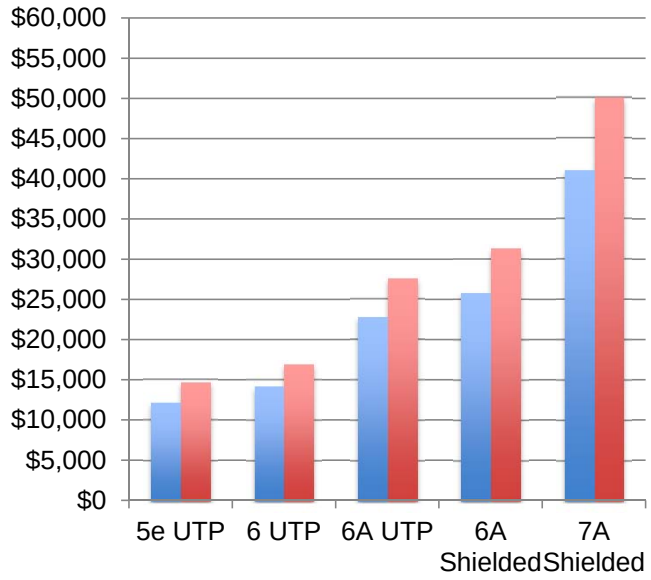
- Traditional - two outlets provided to 36 work areas for a total of 72 cables or “drops”
- Zone - two outlets provided to 36 work areas and 72 connection points provided in a zone enclosure, plus an additional 24 cables pulled to the zone enclosure to accommodate future expansion

Zone cabling ROI - Plenum



Installation & Materials Costs (CAPEX)

Zone cabling ROI - Plenum



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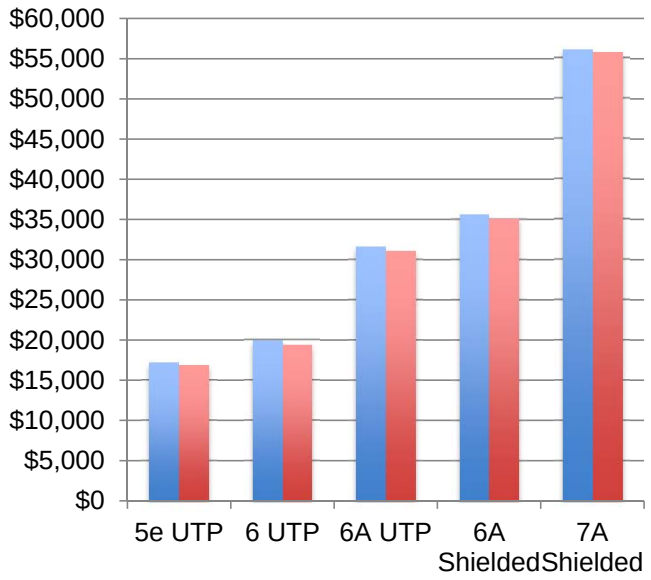
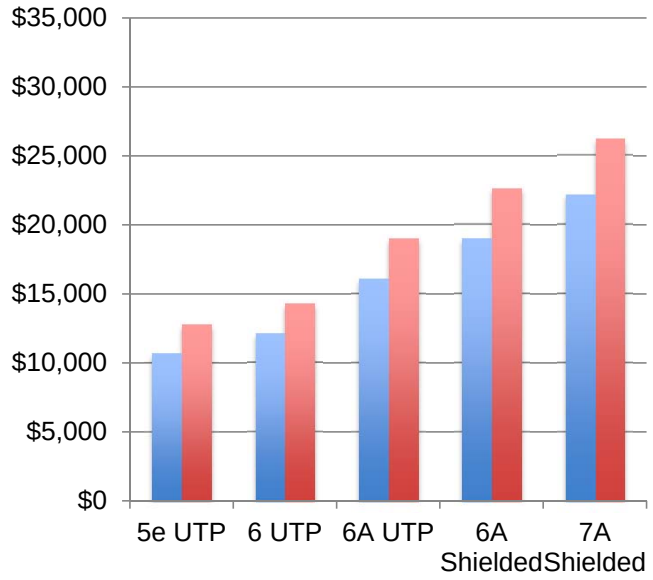
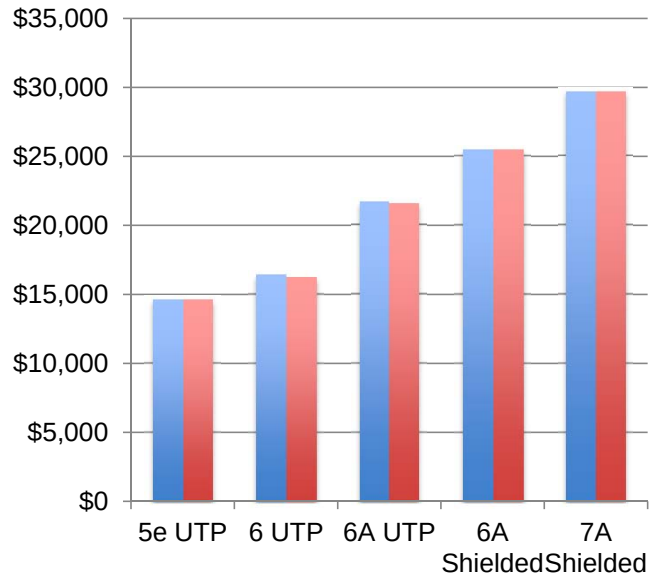


CAPEX and OPEX after 12 moves/14 adds

Zone cabling ROI - Riser

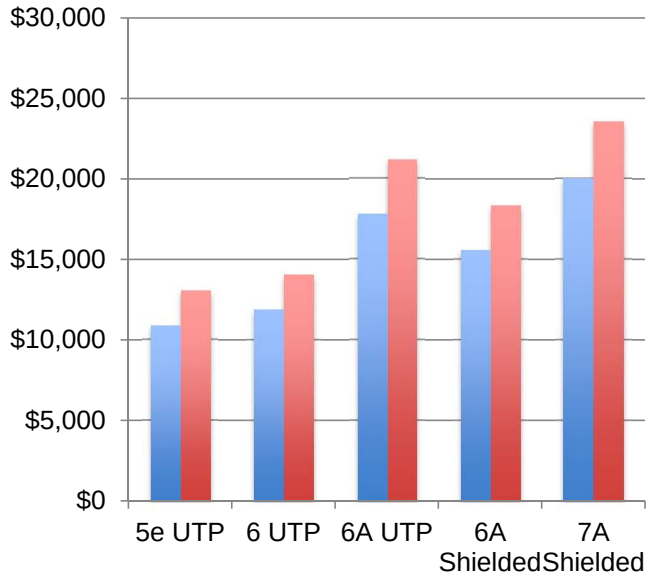


Installation & Materials Costs (CAPEX)



CAPEX and OPEX after 10 moves/13 adds

Zone cabling ROI - LS0H



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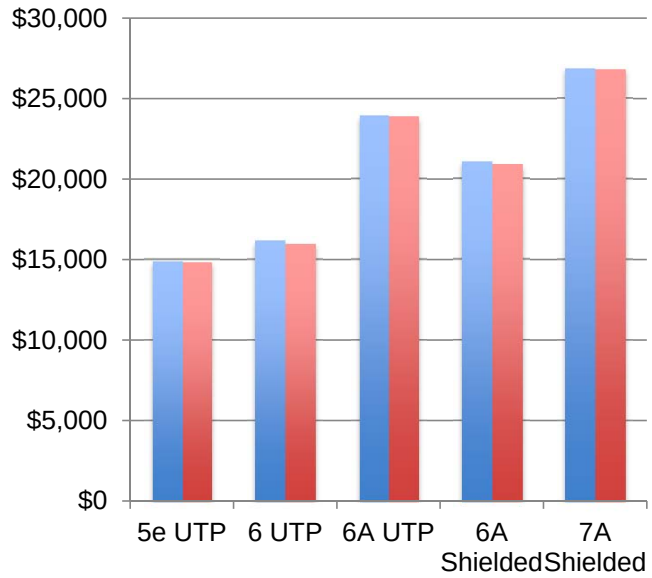

CAPEX and OPEX after 10 moves/13 adds

Resources…

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