

IoT and Intelligent Building Infrastructure Planning

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Agenda

- Intelligent Building Trends & Challenges
- Planning the Network Architecture and Infrastructure
- Convergence of Power (PoE) and Data
- Standards' Updates
- A Digital Building Deployment Use Case



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IoT/IP Applications in Building Networks



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Trends and Challenges

Building Networks



Intelligent Buildings



Data & Power
Convergence



Building
Wireless



Edge Computing,
IoT Gateways
and Data Security

Data Centers



Cloud vs.
Building Enterprise



Micro Data Centers



Control/DCIM



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Today's Infrastructure: How will IoT change the Infrastructure?









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Network Architecture Design Decision



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Hybrid Architecture

-  PoE Lighting
-  PoE Light Switch
-  CCTV Camera
-  Network Jacks
-  Wireless Access Points
-  Twisted Pair
-  AC Power



-  Telecom Room
-  Pathways
-  Cabling
-  Consolidation Point
-  Wall-mount Cabinets
-  Device Termination
-  Workstation Outlets
-  WAP Enclosures & Connection Points

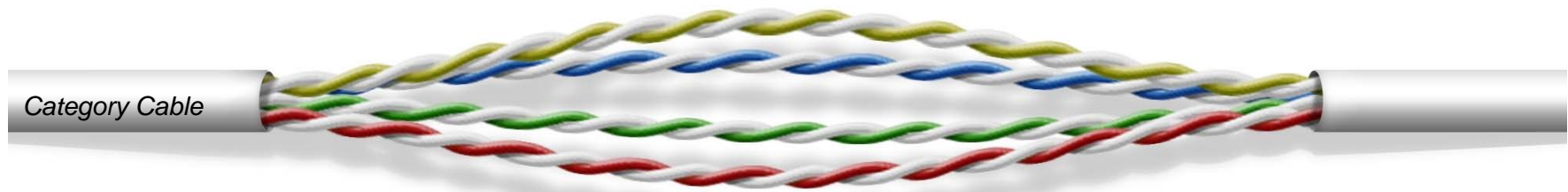
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PoE and Data

Using Twisted-Pair Copper Cable for Data & Power Transmission



- Energy Savings
- Labor Savings
- Increase Safety
- Simplifies Installation
- Flexibility
- Ease of Maintenance

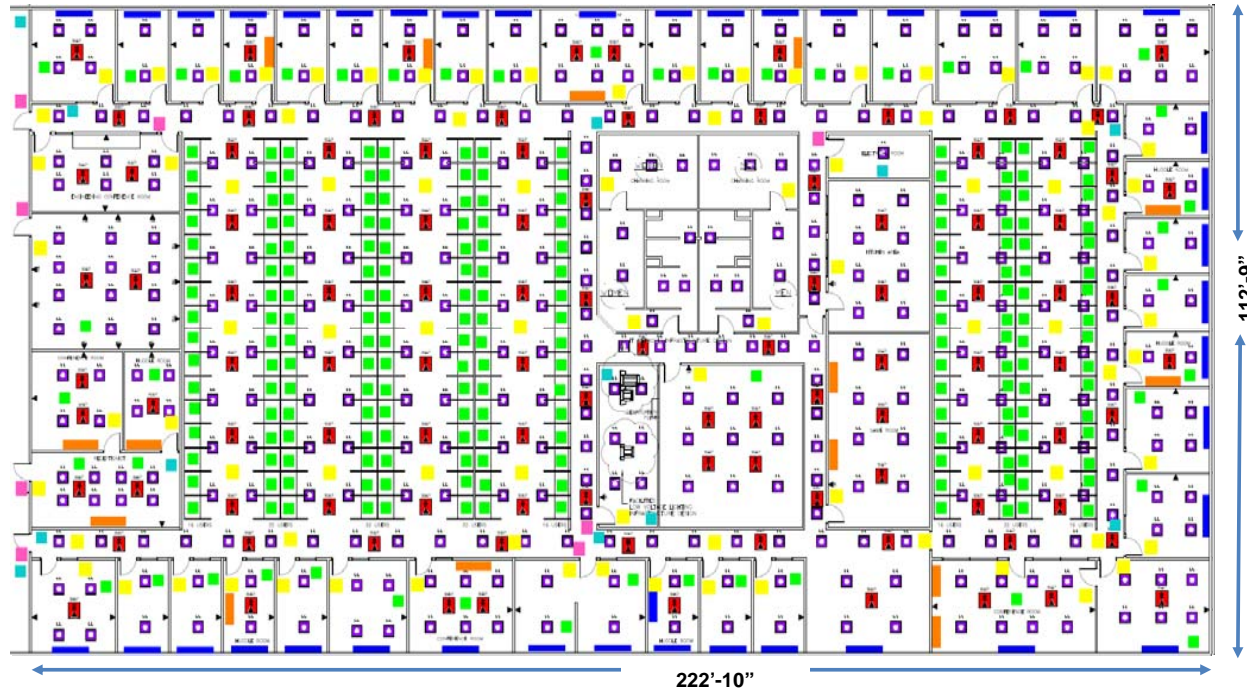


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PoE - Commercial Building Applications

25,000 SQ Feet

PoE Infrastructure	
LED Lighting	389
Phone, Client, Monitor	470
Display	15
Occupancy Sensors	89
WAP	102
Shade Control	40
Security Camera	12
Access Controls	8
Total	1125



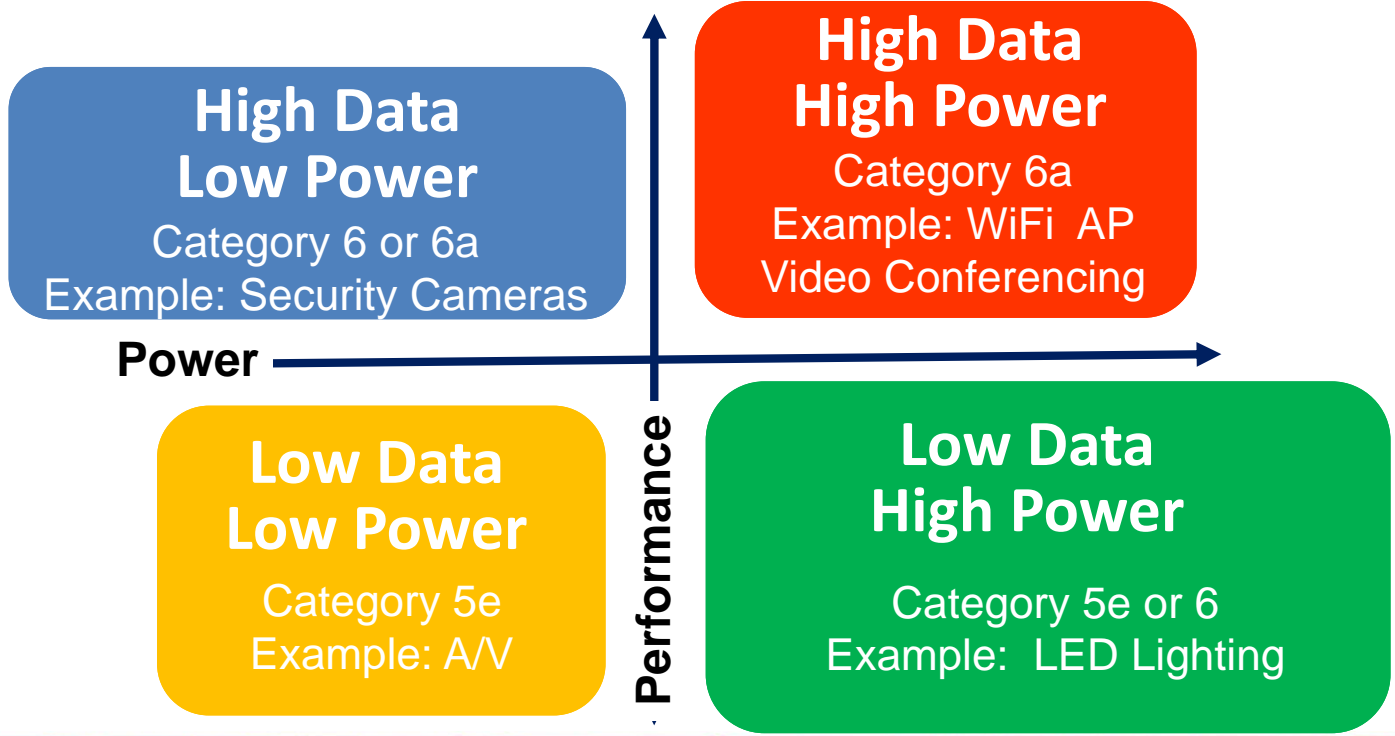
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Power Over Ethernet Standards



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Application-based Cable Selection for PoE

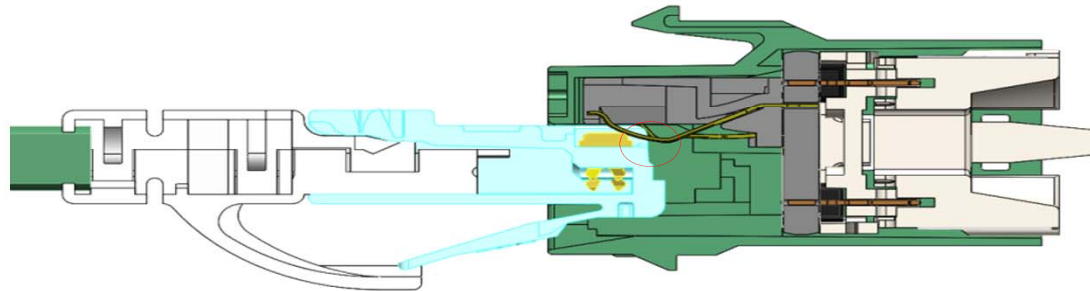


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Connectivity Concerns

Spark Gap Concerns When Un-mating Under PoE Load

Connectivity designs that locate the last point of contact away from the fully mated connection protected area of the mated connection from any arc damage



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Rising Power over Ethernet Heat Effect



As more current flows through a copper conductor in the twisted pair cable, the conductor gets hotter

Temperature



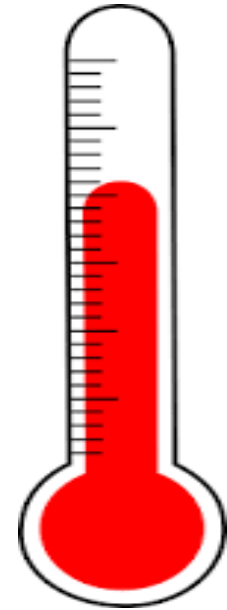
Resistance



Insertion Loss

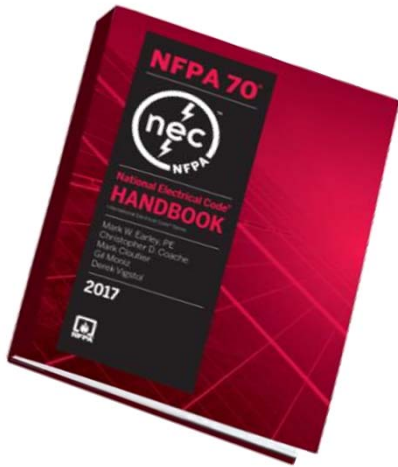


Network Performance



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References for Supporting PoE over Twisted Pair Cabling



NEC 2017 Handbook

- Cable Ratings (60°C) and Markings for Safety
- Ampacity Table for Bundles
- LP (Limited Power) Cables

TIA -TSB-184-A

- Copper Cable Installation Requirements for PoE
- Bundle Size & Max. Temperature rise (+15°C)
- De-rating of cable



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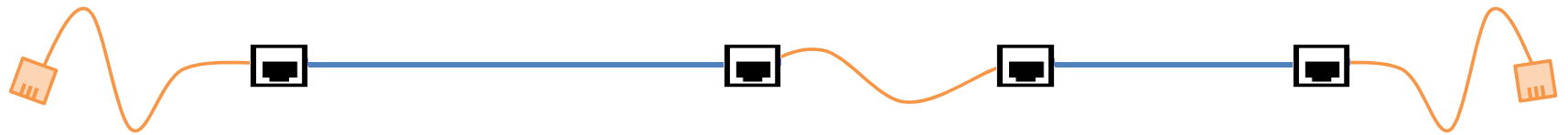
Cabling Subsystem Components for Intelligent Buildings



Patch Cords + Cables + Connectors



1



2



3



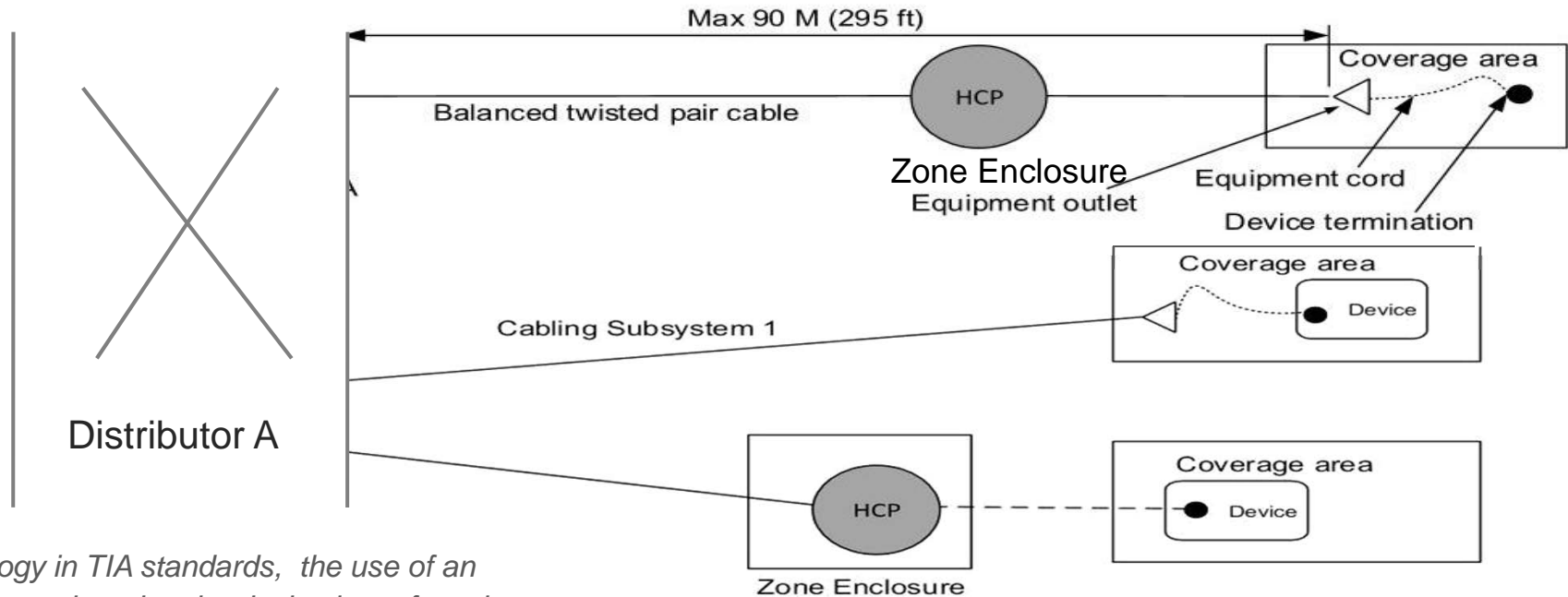
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New Standards Addressing Infrastructure Planning



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TIA-862B Structured Cabling – Star Topology* Horizontal Termination Examples



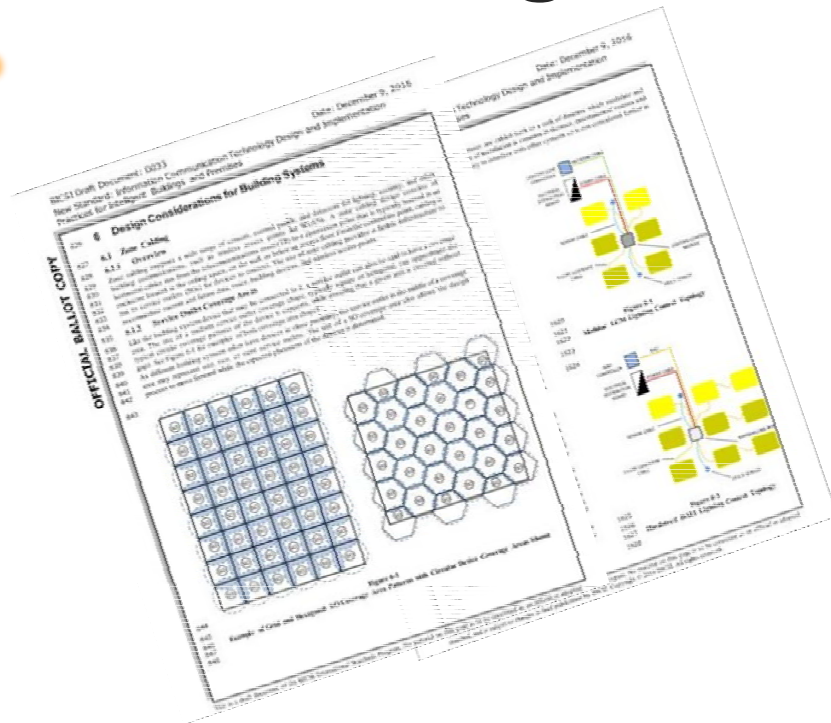
* In a star topology in TIA standards, the use of an equipment outlet and cord to the device is preferred



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Introducing ANSI/BICSI-007



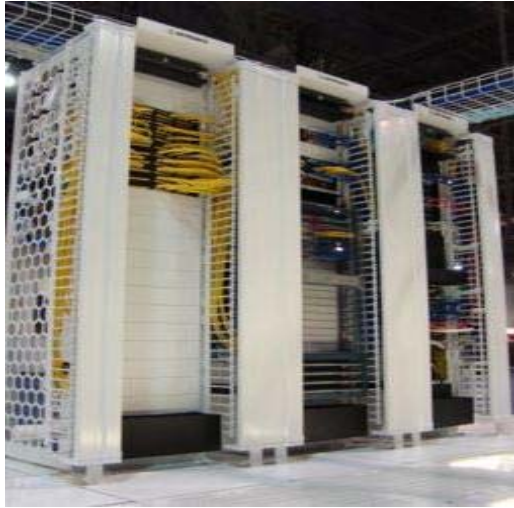
Best practices for designing and integrating diverse applications on the ICT network.

Ratified: August 2017

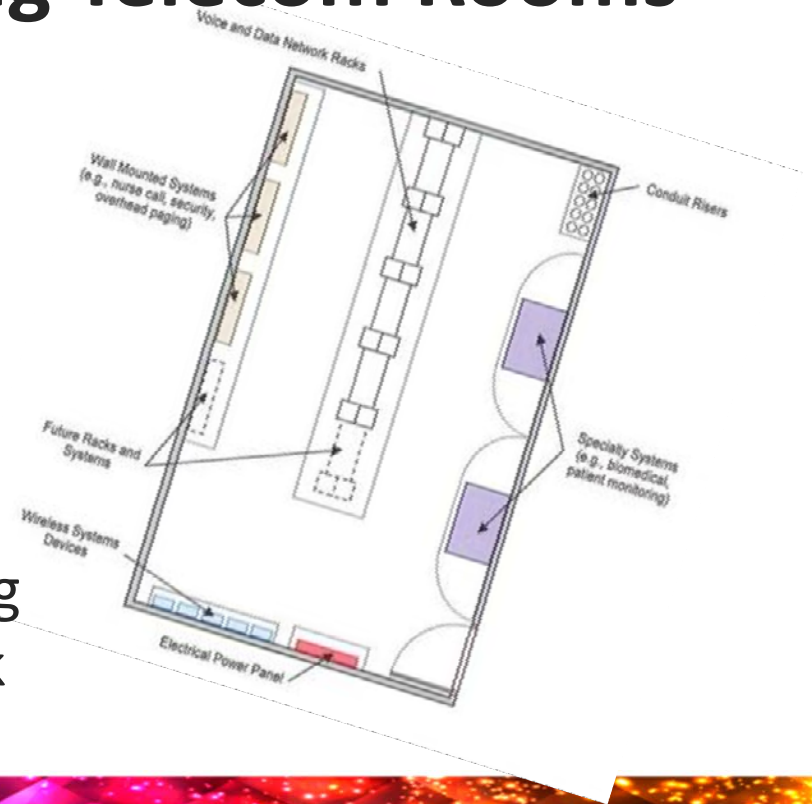


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ANSI/BICSI-007: Planning Telecom Rooms



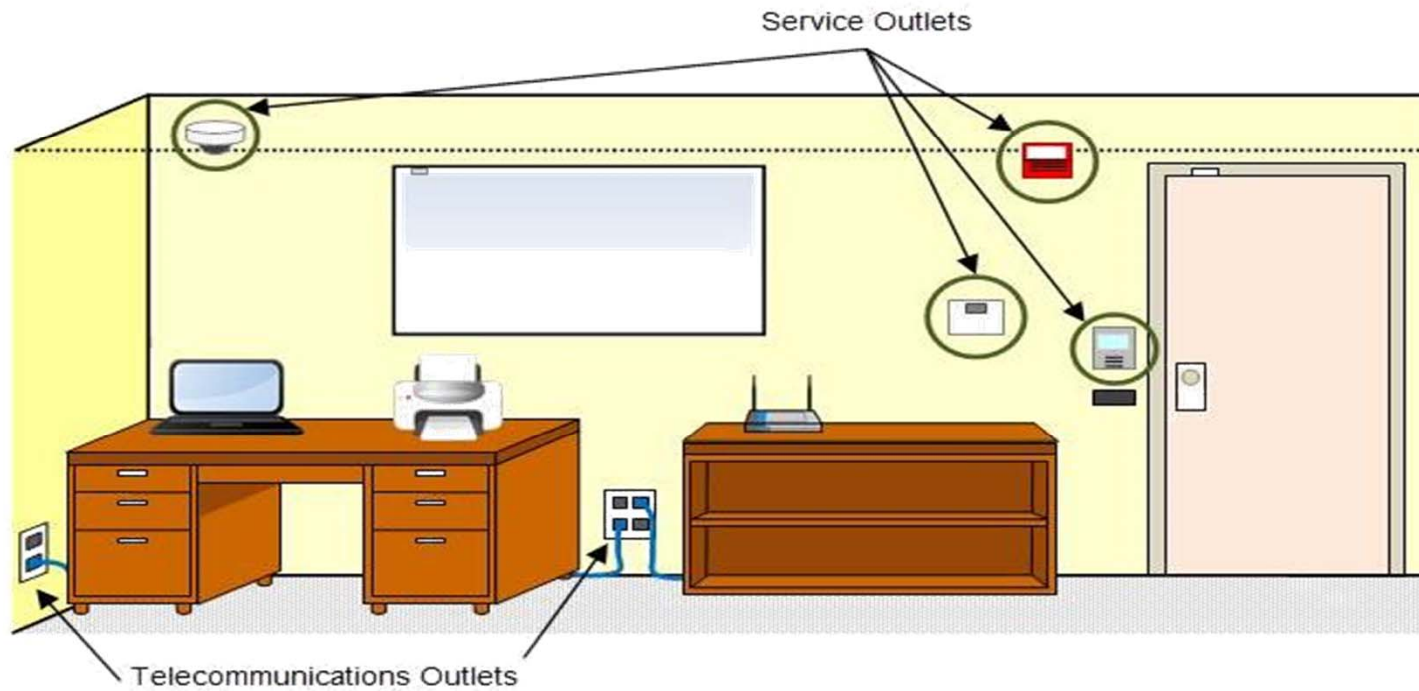
- Allow for additional systems and cabling
- Segmenting systems from core network
- Allow for future racks and systems



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Source: BICSI-004 Healthcare Standard

ANSI/BICSI-007: Planning Outlets



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Infrastructure Choices



Connectivity:
Jacks & Field Term Plugs



Termination:
Faceplates & Surface
Mount Boxes



Cable Management:
Racks & Cabinets



Pathways



Cable and Patch Cords



**High Density
Solutions**

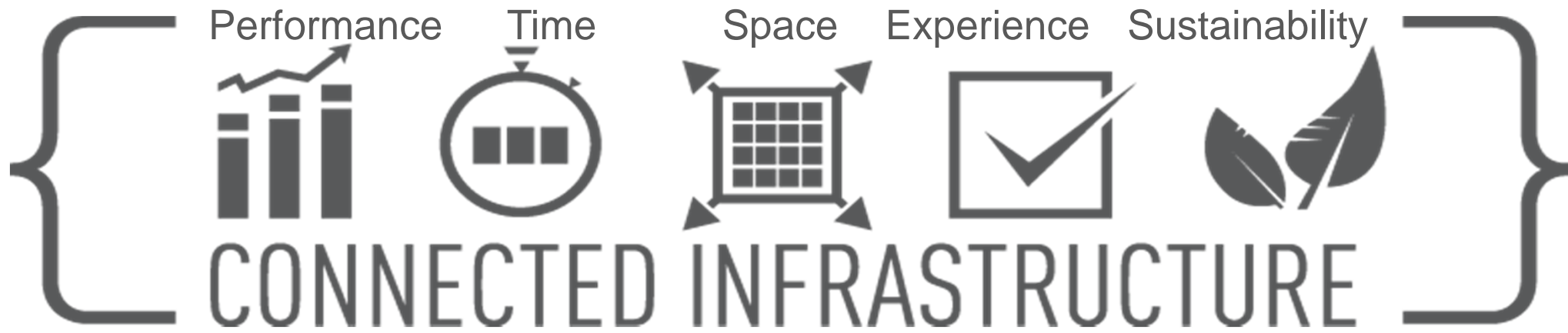


Power, Cooling & Network Monitoring



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Key Elements in Infrastructure Planning



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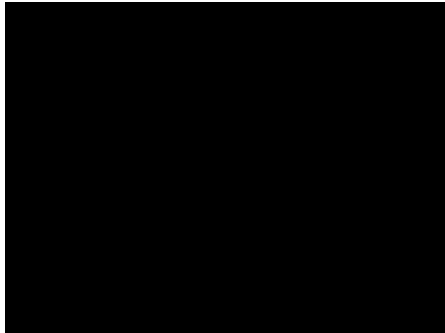


A Digital Building Case Study

Farukh Aslam
CEO, Sinclair Holdings LLC



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Current Digital Building Projects



Sanger Office Building



Sinclair Marriott Autograph Hotel



Hilton Annex Apartments



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The Digital Building Structure

Lighting

WiFi

Internet

Fiber

Cat5e IP TV



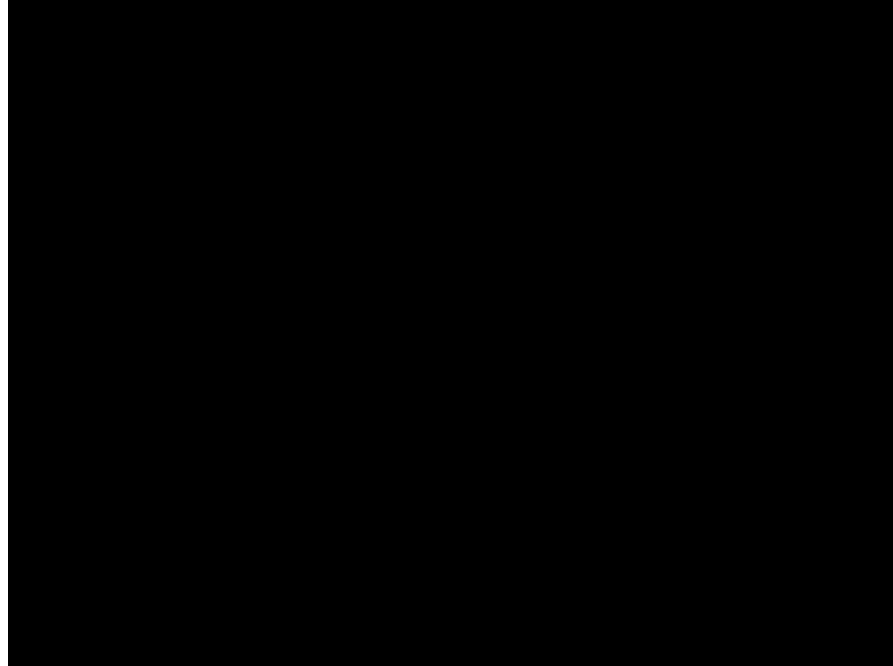
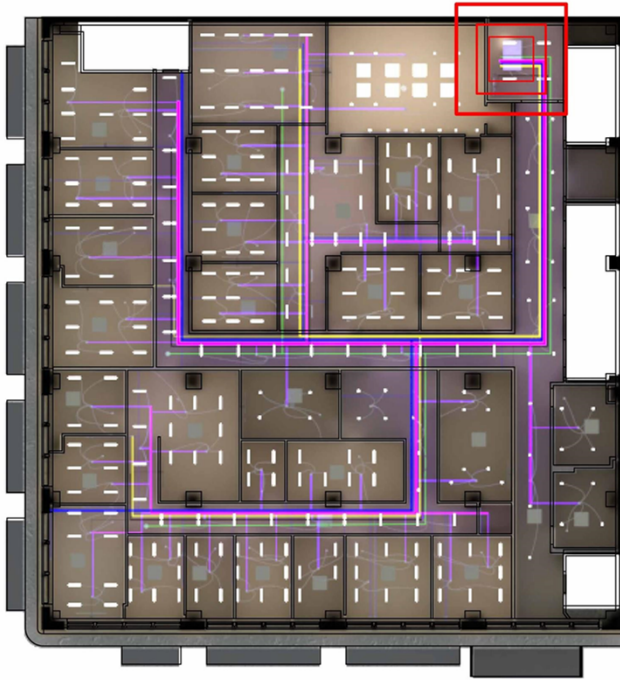
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Design Possibilities of PoE



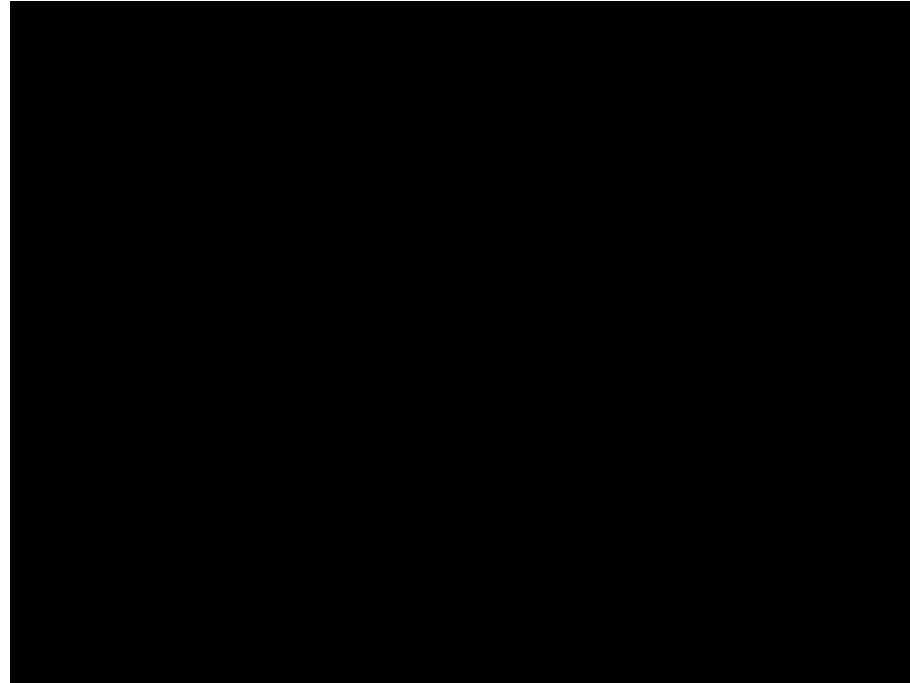
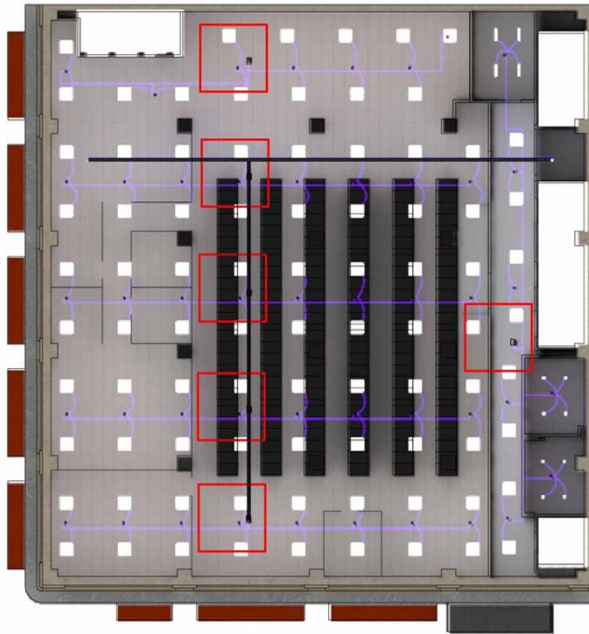
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Sanger Office Building Centralized Deployment



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Sanger Office Building Decentralized Deployment



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PoE Safe and Easy to Install



Before
Installation

During
Installation

After
Installation



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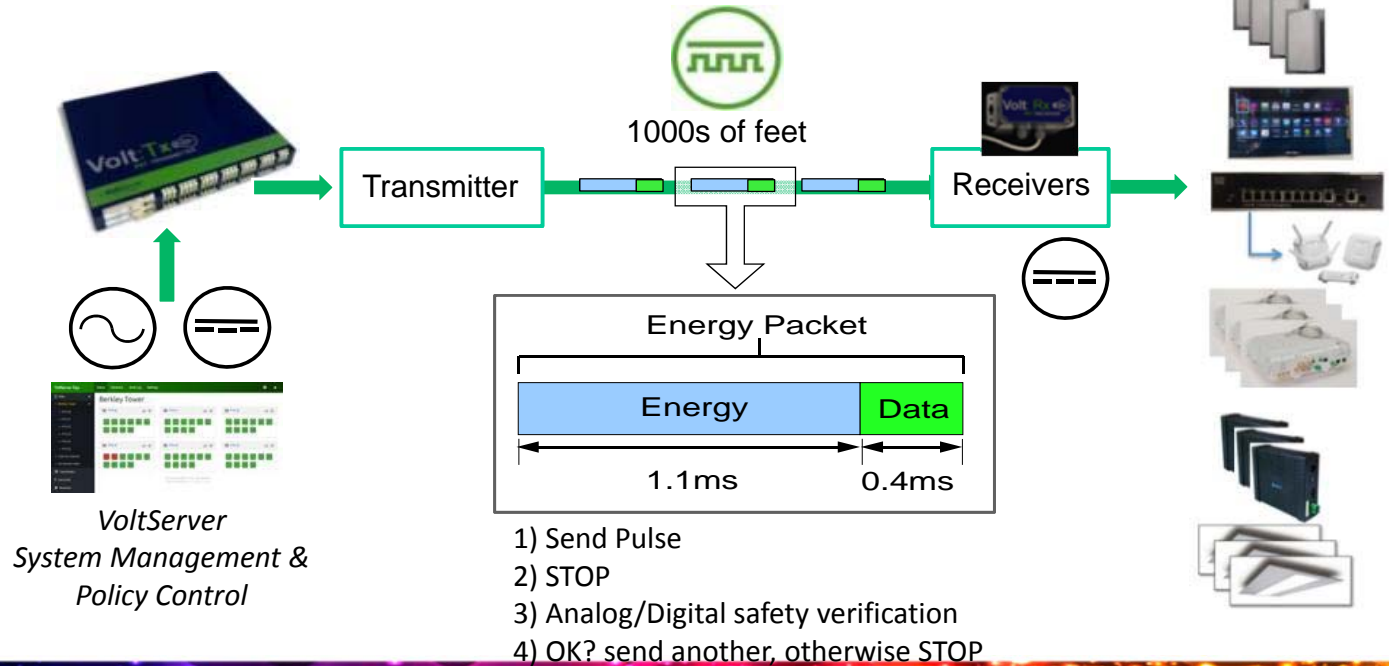
The Sanger Office Building

Power Infrastructure

Electricity that is safe to touch & smart!
IEC 62368-1 Approved Limited Power Source!



*Evaluating Technology
 functionality, viability, and cost
 structure*



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Sinclair Holdings

Fixed Load Zone 0.04795 kWh

Year	Month	Forecast kWh	Min kWh	Max kW	Actuals kWh	Under kWh	Under usage Cost	Commodity Cost	Total Monthly Commodity (excluding taxes)
2015	July	151,077	113,308	188,846	132,233			\$6,340.57	\$6,340.57
	August	189,791	142,343	237,239	189,823			\$9,102.03	\$9,102.03
	September	189,341	142,006	236,676	168,945			\$8,100.91	\$8,100.91
	October	172,463	129,347	215,579	126,679	-2,668	\$69.52	\$6,074.25	\$6,143.77
	November	161,615	121,211	202,019	88,298	-32,913	\$891.83	\$4,233.89	\$5,125.71
	December	147,818	110,863	184,772	87,530	-23,333	\$716.18	\$4,197.07	\$4,913.25
2016	January	177,011	132,758	221,264	85,206	-47,552	\$1,341.56	\$4,085.64	\$5,427.20
	February	148,059	111,044	185,074	84,440	-26,604	\$810.58	\$4,048.91	\$4,859.49
	March	124,098	93,074	155,123	106,648			\$5,113.77	\$5,113.77
	April	156,402	117,301	195,502	114,248	-3,054	\$78.29	\$5,478.17	\$5,556.46
	May	169,520	127,140	211,900	128,786			\$6,175.30	\$6,175.30
	June	182,587	136,940	228,234	146,618			\$7,030.33	\$7,030.33
	July	209,725	157,294	262,156	164,454			\$7,885.55	\$7,885.55
	August	189,791	142,343	237,239	158,973			\$7,622.73	\$7,622.73
	September	189,341	142,006	236,676	140,732			\$6,748.08	\$6,748.08
	October	172,463	129,347	215,579	122,260	-7,088	\$157.14	\$5,862.35	\$6,019.49
	November	161,615	121,211	202,019	83,316	-37,895	\$992.88	\$3,995.00	\$4,987.88
	December	147,818	110,863	184,772	57,958	-52,905	\$1,175.42	\$2,779.11	\$3,954.52
2017	January	177,011	132,758	221,264	61,994	-70,765	\$1,379.29	\$2,972.59	\$4,351.88
	February	148,059	111,044	185,074	63,115	-47,930	\$1,281.52	\$3,026.34	\$4,307.86
	March	124,098	93,073	155,122	82,372	-10,701	\$279.28	\$3,949.74	\$4,229.02
	April	156,402	117,302	195,503	70,099	-47,202	\$1,105.22	\$3,361.27	\$4,466.49
	May	169,520	127,140	211,900	42,438	-84,702	\$1,550.83	\$2,034.89	\$3,585.72
	June	182,587	136,940	228,234	34,182	-194,052	\$2,103.45	\$1,639.03	\$3,742.48
					2,541,346				\$135,790.50
					Weighted Average		\$0.05343		

Sinclair Holdings Energy Consumption

Cost Increase for using LESS energy



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Fossil Creek Land Partners

Fixed Load Zone 0.04725 kWh

Sanger Office Building Energy Consumption

Year	Month	Forecast kWh	Min kWh	Max kWh	Actual kWh	Commodity Cost (excluding taxes)
2016	June	51,278	38,459	64,098	48,943	
	July	436,733	327,550	545,916	408,933	\$19,322.08
	August	447,933	335,950	559,916	416,273	\$19,668.91
	September	436,012	327,009	545,015	376,828	\$17,805.12
	October	432,264	324,198	540,330	364,903	\$17,241.67
	November	377,487	283,115	471,859	318,212	\$15,035.51
2017	December	383,143	287,357	478,929	314,829	\$14,875.66
	January	378,007	283,505	472,509	311,130	\$14,700.88
	February	345,435	259,076	431,794	283,270	\$13,384.50
	March	363,170	272,377	453,962	311,621	\$14,724.10
	April	369,994	277,496	462,493	295,371	\$13,956.26
	May	394,511	295,883	493,139	306,449	\$14,479.71
	June	421,714	316,286	527,143	338,830	\$16,009.73
July	140,260	105,195	175,325	115,320		

Before Renovations

After Renovations



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Conclusions

- IoT is finally making gains in modernizing Building Infrastructure
- Digital Building Network Infrastructure should be taken seriously
 - Lower CapEx and OpEx
 - Low Voltage simplifies installation
 - Enables greater project control
 - Enhances the look and feel of the space
- Digital Building infrastructure is the 4th Utility for Buildings
- We are just scratching the surface of changing the way Buildings are built



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Q & A

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