Agenda

Green ICT & Infrastructure

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Agenda

- Green ICT
- Reducing Emissions from ICT Equipment
- ICT solutions enhancing sustainability
- Infrastructure Requirements
  - Standards and Design Considerations
  - Remote Powering & Effects on Cabling

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Green ICT

What is Green ICT?

- The use of technologies and techniques to lower (or reduce the rate of increase of) the power consumption or carbon footprint of the ICT function.

- It also addresses the use of ICT as an enabling technology to help reduce power consumption or the carbon footprint outside of the ICT function.

Green ICT

Benefits of Green ICT

- Reduced emissions
- Less waste
- Extended maintenance periods
- Cost savings
- Raised awareness
- Improved corporate culture
- Improved reputation
- Customer satisfaction

Green ICT

Challenges of green ICT

1. Cost
2. Cultural pushback
3. Prioritization
4. Conflicting initiatives (AI)
5. Emerging fields (Green Software)

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Green ICT / Data Centers

How reduce emissions from ICT equipment?

Optimization is required for Data Center, Data Network Equipment, Storage Equipment & Servers

Some guidance can be adopted following **BICSI-002-2019** for energy efficiency in Data Centers.

Additional design guidance to improve energy efficiency can also be found in EU Best Practices for EU Code of Conduct on Data Centers and ASHRAE Best Practices for Datacom Facility Energy Efficiency, ASHRAE 90.4 & ISO/IEC 30134-2

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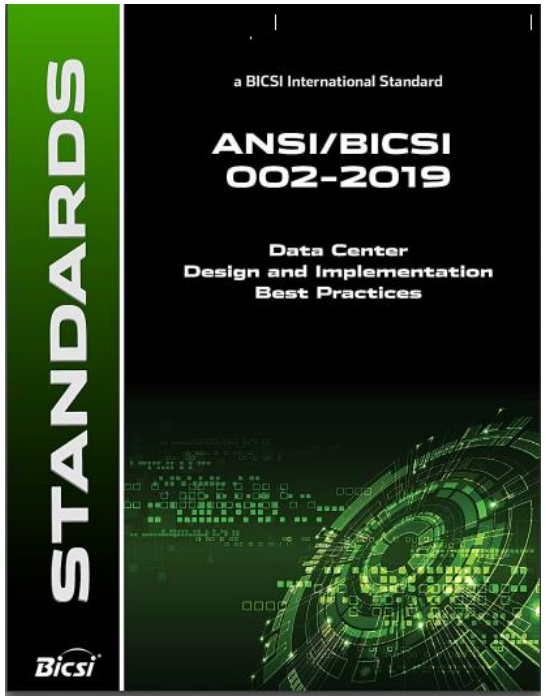
Is Your Data Centre Efficient?

Power Usage Effectiveness (PUE) = (Total Facility / IT) Power

Used to assess data center efficiency. It is a ratio that shows how much of the total energy consumed by a data center is directly used to power the servers and other ICT infrastructure within it.



PUE=2: For every 1w your ICT equipment uses, the infrastructure supporting it needs 2w.

Average DC has a PUE of 2.5 and best practice PUE has been quoted as 1.3 (Best target 1.3 to 2. Poor PUE is 3).

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Data Centre Efficiency Improvement Strategies:

- Reducing data volume and eliminating redundant data via de-duplication and compression, Switching to fewer higher-capacity disks & Increasing disk utilization
- Using Energy Star Labelled equipment as applicable
- Server virtualization & using high-efficiency blade servers
- Use cooling systems with Economizer Units
- Hot-aisle or cold-aisle containment systems & cabinets.
- Selection of high-efficiency power equipment such as UPS, capable of high efficiencies at low loads.

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Data Centre Efficiency Improvement Strategies:

- Where under-floor cooling is used, optimized quantity and location of floor vents or perforated tiles only in the cold aisles.
- Overhead wiring and cabling
- Use of blanking panels in equipment racks
- Blocking access floor cable cut-outs and sealing floor tile
- Use of energy efficient lighting along with timers, occupancy schedules, or motion detectors

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Green ICT Enabling Sustainability

How ICT can help for Greener environment & sustainability?

- Telepresence & Audio/Visual Conferences/calls
- E-commerce
- E-civil service & E-government
- E-learning & E-health care

Green ICT Enabling Sustainability

How ICT can help for Greener environment & sustainability?

- Smart work
- 2 Way Real Time Communications
- Smart grids
- Home energy management systems

Green ICT / Smart Grid

- Set of software and hardware tools that enable generators to route power more efficiently, reducing the need for excess capacity and allowing two-way, real time information exchange with their customers for real time demand side management
- Demand control (electricity) by load shifting via smart meters and appliances (Sensors, Controllers, Detector, Meters)

Green Facilities & Cabling Standards

ISO/IEC 11801

Information Technology—Generic Cabling for Customer Premises (Part 1, General Requirements & Part 6, Distributed Building Systems)

ANSI/TIA 862-C

Structured Cabling Infrastructure Standard for Intelligent Building Systems

ANSI/BICSI 007-2020

Information Communication Technology Design and Implementation Practices for Intelligent Buildings and Premises

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TIA-862-C-2022

Provide guidance for cabling used for:

- Cabling infrastructure to support intelligent building systems
- Wireless systems
- Remote powering over balanced twisted-pair cabling
- Smart lighting

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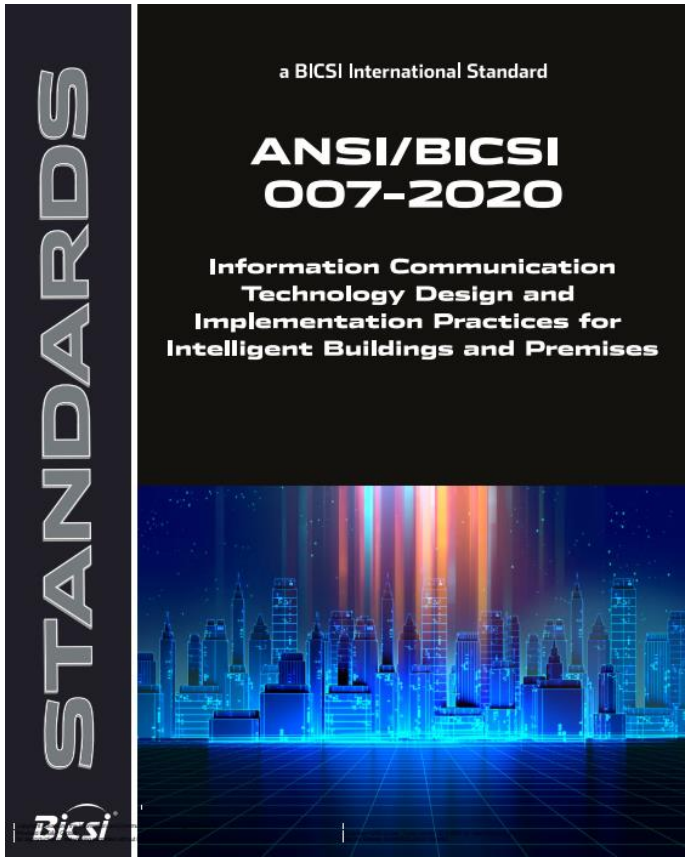
ANSI/BICSI 007-2020

Technology Design and Implementation Practices for Intelligent Buildings & Premises including:

- Communications Infrastructure
- Network Integration
- Commissioning
- Power, Data & Zone Cabling
- Other design Considerations



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ANSI/BICSI 007-2020

IT Systems:

1. User-centric comm.
2. Managed by IT Experts
3. Sensitive Corporate Data
4. Unpredictable Traffic Behavior

OT / BAS Systems:

1. Machine-to-Machine Comm.
2. Maintained by Facility Operators
3. Critical Building Functions
4. Predictable Device Behavior

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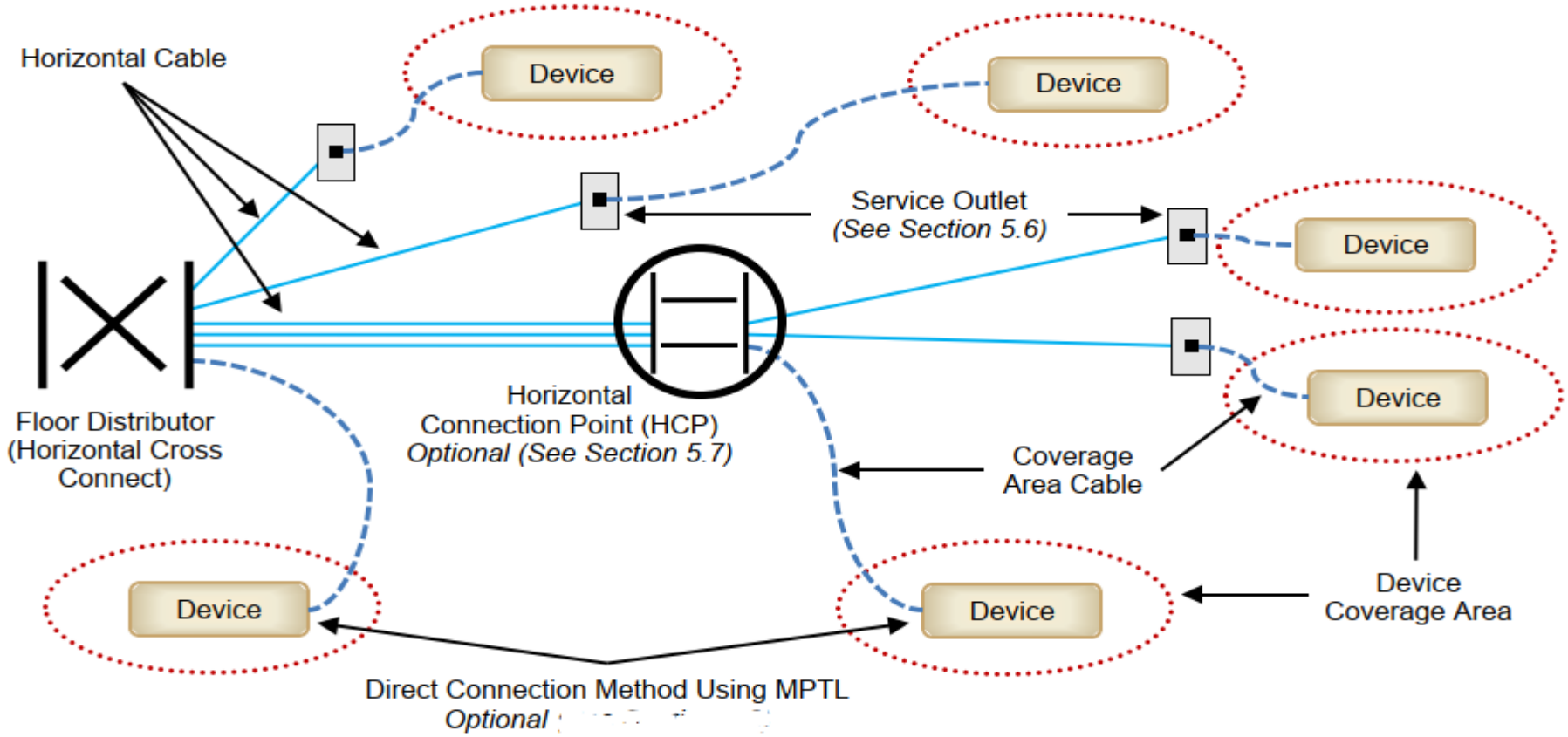
Horizontal Cabling



Centralized vs. Zone Cabling

- Standards-based approach to support convergence of devices
- Consists of cables run from connections in the telecommunications room (TR) to outlets housed in a zone enclosure servicing coverage areas
- Shorter cables run from outlets in the zone enclosure directly to devices or to outlets servicing devices
- 25% spare port availability recommended
- Supports rapid reorganization and deployment of new devices, 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

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Devices & Cabling choices

- Smart Buildings devices are using IP and PoE-based devices in the walls and ceilings unifying cables used & can be directly connected using MPTL rather than boxes, outlets and patch cords. Otherwise, new SPE cabling can be used instead as per the latest TIA-568.5-E.

- LED lights
- Security cameras
- Wireless access points
- Digital displays

- Building Automation Systems devices:
  - Sensors
  - Controllers
  - Detectors
  - Meters

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PoE Applications

Transmission Method	*Power at Source (W)*	*Maximum Current per Conductor (A)*	*Notes*
PoE Type 1	15.40	0.175	IEEE 802.3af, uses two pairs to transmit power
PoE Type 2	30	0.3	IEEE 802.3at, uses two pairs to transmit power
PoE Type 3	60	0.3	IEEE 802.3bt, uses all pairs to transmit power
PoE Type 4	90	0.5	IEEE 802.3bt, uses all pairs to transmit power
HDBaseT	100	0.5	HDBaseT 1.0 and HDBaseT 2.0 have the same power specifications. Also known as POH (power over HDBaseT)

In addition to new Application: SPOE, 79W using 1 pair (SPE) cable, IEEE 802.3cg using Cat SP1-400 & SP1-1000 cables (Subject to voltage drops, application Ethernet 10BASE-T1L

Standards address Cabling Heat Concerns

- NFPA 70 (NEC): Sections 310, 725 and 840 (Cables with transmitting power above 60W shall be rated to 60° C min.). Otherwise, marked with the max. applicable temperature and use relevant ampacity tables.
- TIA TSB-184: Allow maximum 15°C temperature rise above 45°C maximum ambient temperature.
- TIA-569-D-2: Covering Pathway heat dissipation and Space Considerations for Supporting Remote Powering Over Balanced TP Cabling

Cabling Solutions for Type 4 POE

For the high amperage of 500 mA per conductor within Type 4 POE Cables, the following design consideration to be considered:

- Use cables with a larger conductor (23 AWG instead of 24 AWG)
- Use cables with a higher Operating Temperature 75°C instead of 60 °C.
- Use a Limited Power (LP-rated) cable jacket to support increased ampacity (not well recommended)

Cabling Solutions for Type 4 POE

- Use Category 6A or higher or Screened cables (higher temperature rated & reduced length derating, so larger bundles can be used)
- Reduce bundle size to (24) and allow space between bundles
- Reduce channel length, as necessary, to offset increased insertion loss
- Use open wire tray or similar cable management that provides for largely unrestricted airflow around the installed cables
  - Disperse cables evenly across the width of the tray
  - Mix unpowered cables with powered cables

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Arcing problem with high power

- Arcing can result in corrosion on the plated contact surface at the arcing location.
- Specify Connecting hardware to have the required performance for mating and un-mating under the relevant levels of electrical power and load as per Annex B of TSB-184 & to be tested as per IEC 60512-99-001

Summary

- Green ICT Definitions
- Reducing Emissions from ICT Equipment
- ICT solutions enhancing sustainability
- Infrastructure Requirements for Green ICT
- Increasing numbers of applications running over twisted pair cabling platform
- Know the resources, codes and standards to help designing infrastructure
- Zone cabling and MPTL new trends
- Remote powering increasing demands & constrains on network cabling systems with related standards addressing this topic

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Thank You

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