



Cabling and Infrastructure for Enterprise Wireless Networks

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Effective November 1, 2010, BICSI recognizes **Cabling and Infrastructure for Wireless Networks Part I** training for the following BICSI Continuing Education Credits (CECs).

RCDD	RITP	ESS	NTS	OSP	WD	Installer 2 Cu/Fiber	Tech- nician	Cert. Trainer
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AGENDA

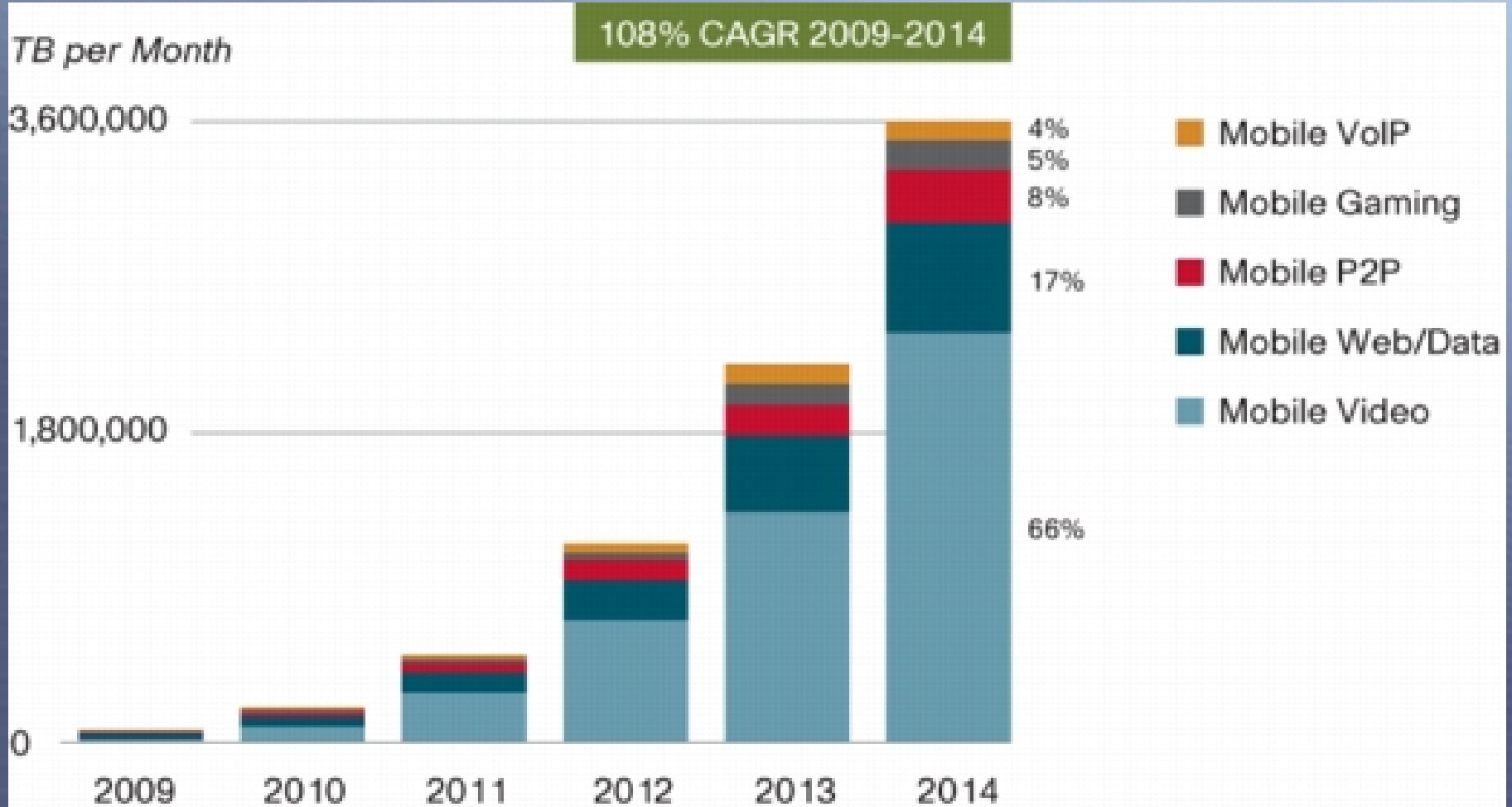
PART 1 December 1 2010

- Wireless Networking design basics
- Cabling the infrastructure - TIA standards
- Power over Ethernet (PoE)

PART 2 February 2 2011

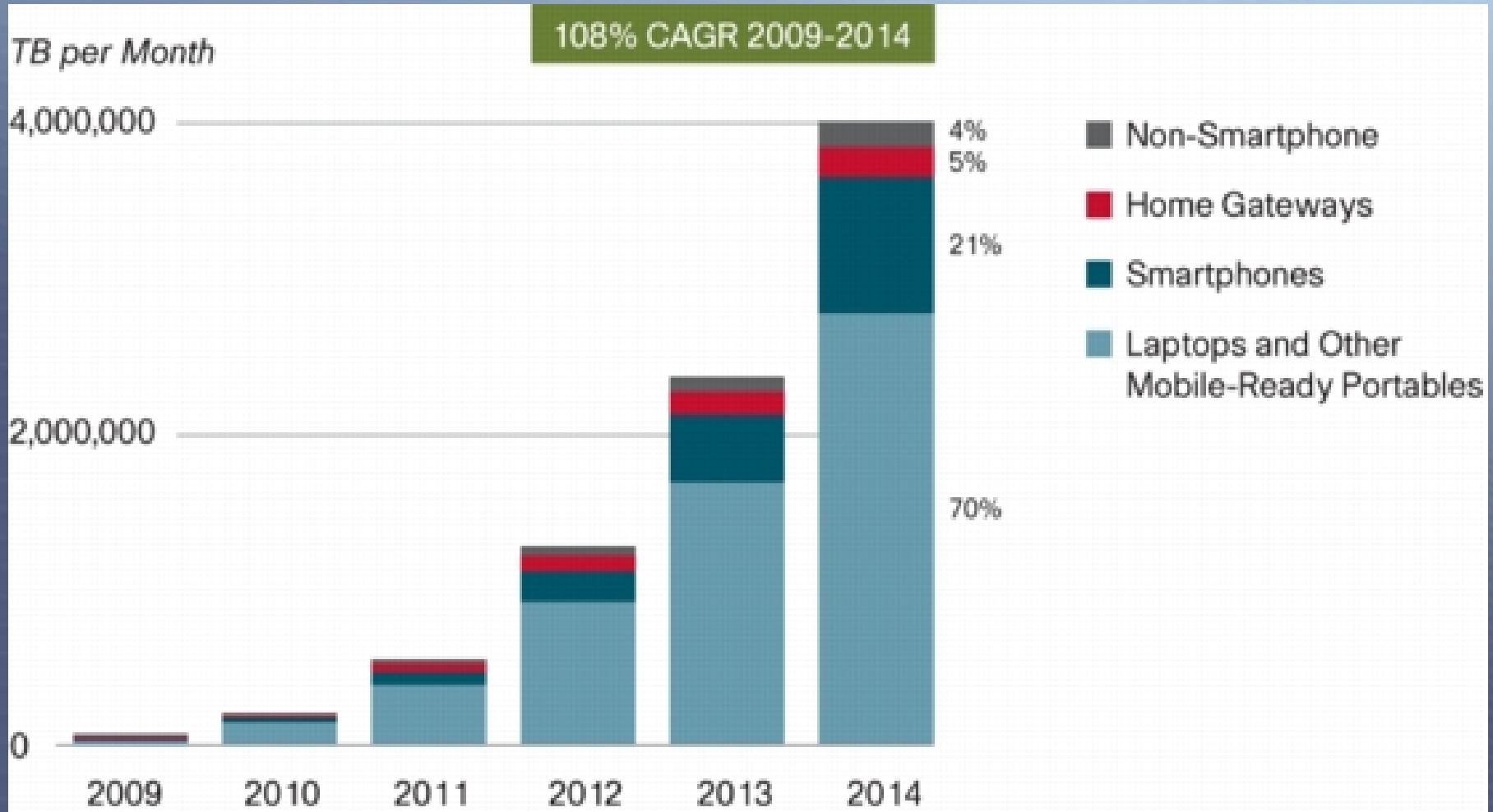
- Installing in the air-handling space
- Cabling for IEEE 802.11n wireless access points
- Wireless in Healthcare
- Emerging applications

Growth in Global Mobile Data



Source: Cisco VNI Mobile, 2010

Growth in Global Mobile Data



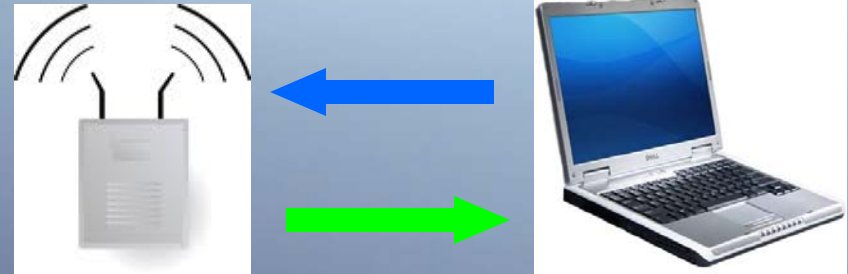
Source: Cisco VNI Mobile, 2010

Wireless Networking Design Basics

- Requirements gathering
- Define the client devices to be used
- Define the applications to be used
- Define the coverage area and density of users
- Document initial assumptions, AP configs, antennas used in survey, cable lengths, etc.

Wireless Networking Design Basics

- Perform a site survey
- Set the access point transmit power level to the same level as your critical client devices. Note that some AP's power is dependent on the channel
- Identify the fringe based on minimum Received Signal strength indication (RSSI) or Signal to Noise ratio (SNR) required by critical devices and application
- Remember that different client devices may receive different signal levels based on client antenna styles

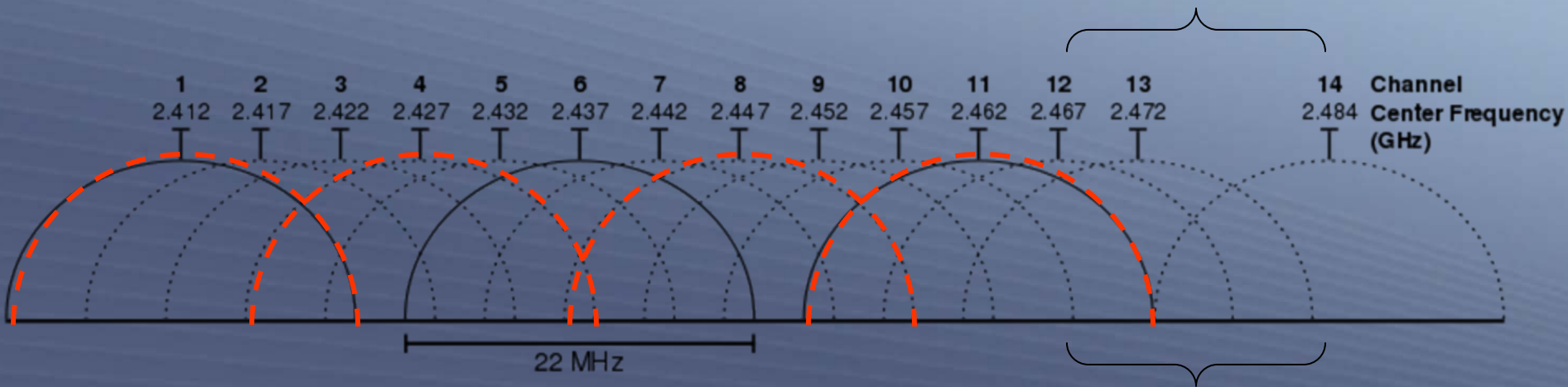




Wireless Networking Design Basics

- Engage 802.11n access points – cabled infrastructure should support 1 gigabit interfaces
- Engage WMM (wireless multimedia) for QoS
- Exploit the 5 GHz band (21 non-overlapping channels, versus 3 non-overlapping channels at 2.4 GHz)
- Implementation should closely match the survey

Wireless Networking Design Basics- 2.4 GHz channels



Channels 12,13,14 not available
in North America

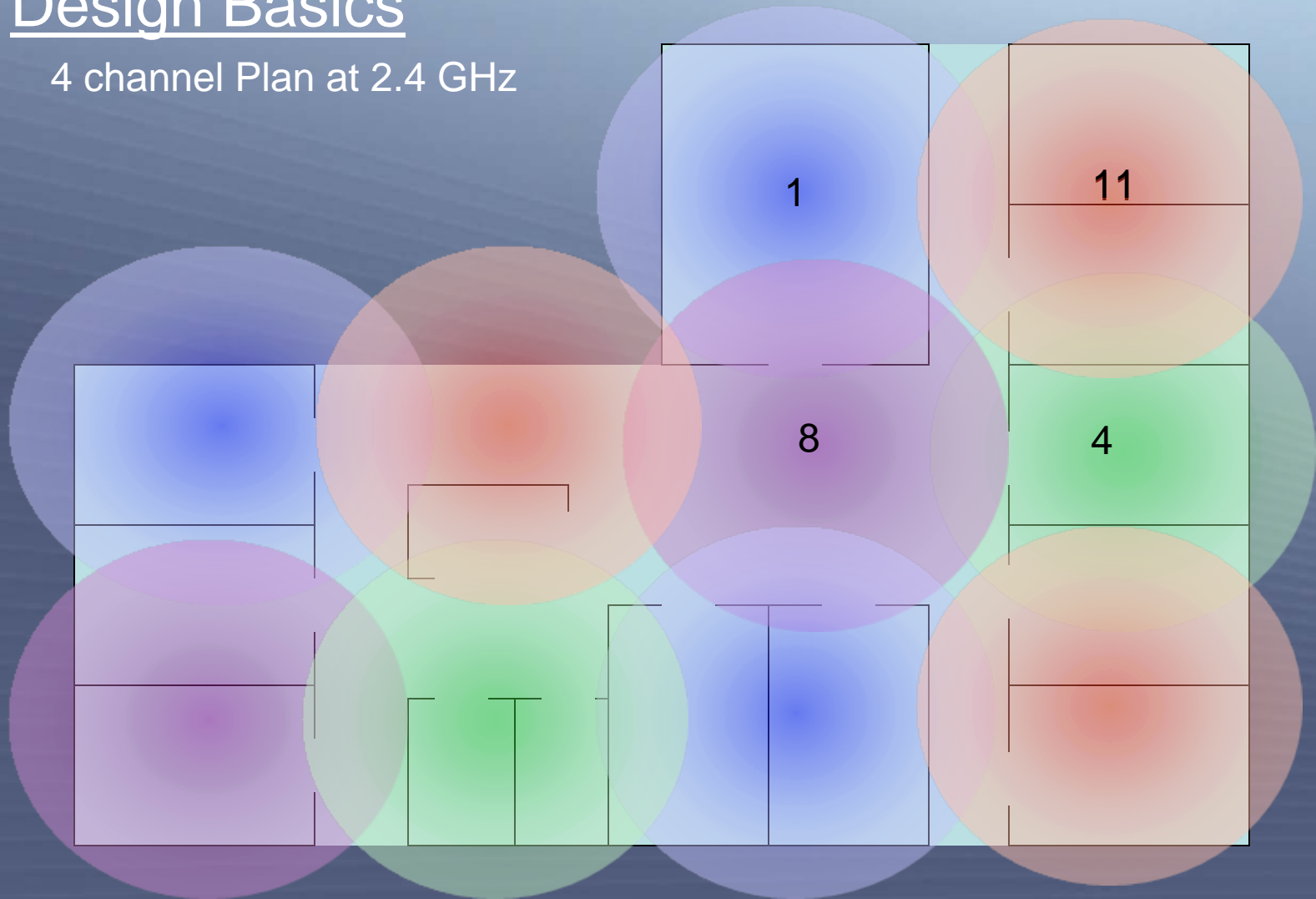
Wireless Networking Design Basics

3 channel Plan at 2.4 GHz



Wireless Networking Design Basics

4 channel Plan at 2.4 GHz



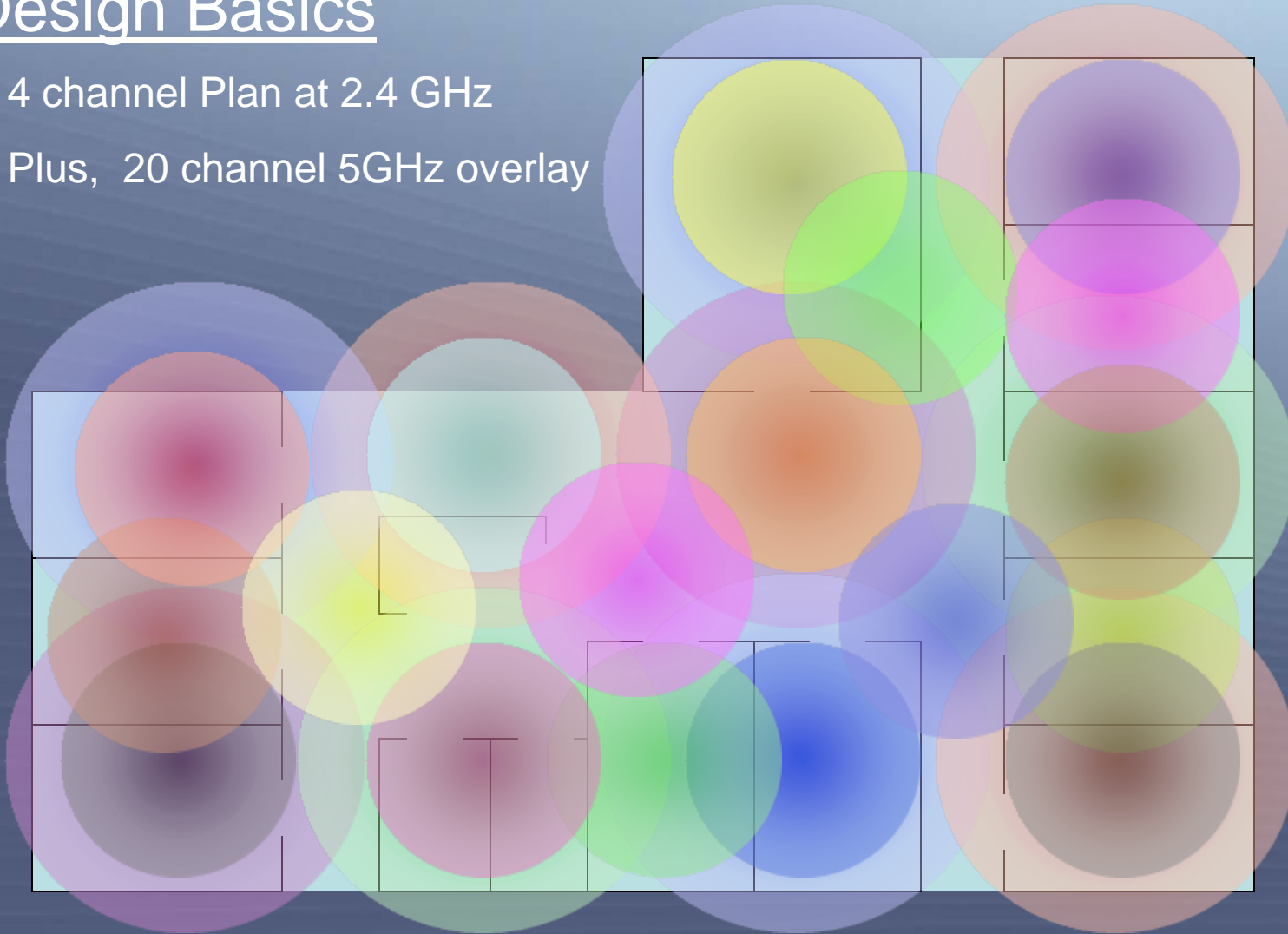
Wireless Networking Design Basics- 5 GHz channels

- 2.4 GHz ISM band 11 channels (3 non-overlapping, 1 W)
- UNII -1 channels 36, 40, 44, 48 (5.18 to 5.24 GHz – up to 50 mW)
- UNII-2 channels 52, 56, 60, 64 (5.26 to 5.32 GHz –up to 250 mW)
- UNII-2 extended channels 100, 104, 108, 112, 116 (5.50 to 5.58-250mW)
and 136 and 140 (5.68 to 5.70 GHz 250 mW)
- DFS Rules apply to channels 52 through 64 and 100 through 140
- UNII-3 149, 153, 157, 161, 165 (5.745 to 5.825 – up to 1W)

Wireless Networking Design Basics

4 channel Plan at 2.4 GHz

Plus, 20 channel 5GHz overlay



CABLING THE INFRASTRUCTURE FOR WIRELESS NETWORKS

Cabling for Wireless

TIA TR-42 is *Telecommunications Cabling Systems*, but the wireless design is impacted by cabling standards, pathways and spaces, powering, and access point locations.

IEEE 802.11 wireless LAN access points will work over TIA compliant cabling

Standards and Guidelines for Structured Cabling

TIA 568-C Standards for Structured Cabling

*TIA 569-B Commercial Building Standard for
Telecommunications Pathways and Spaces*

*TSB-162 Telecommunications Cabling Guidelines
for Wireless Access Points*

*TIA-1179 Healthcare Facility Telecommunications
Cabling Standard*

*TSB-184 Guidelines for supporting Power
Delivery over Balanced Twisted Pair Cabling*

TIA 568-C Standards for Structured Cabling

568-C.0 Generic Telecommunications cabling for
Customer Premises

568-C.1 Commercial Building Telecommunications
Cabling Standard

568-C.2 Balanced Twisted Pair Telecommunications
Cabling and Components Standards

568-C.3 Optical Fiber Cabling Components Standard

568-C.4 Coaxial Cabling (IN DEVELOPMENT)

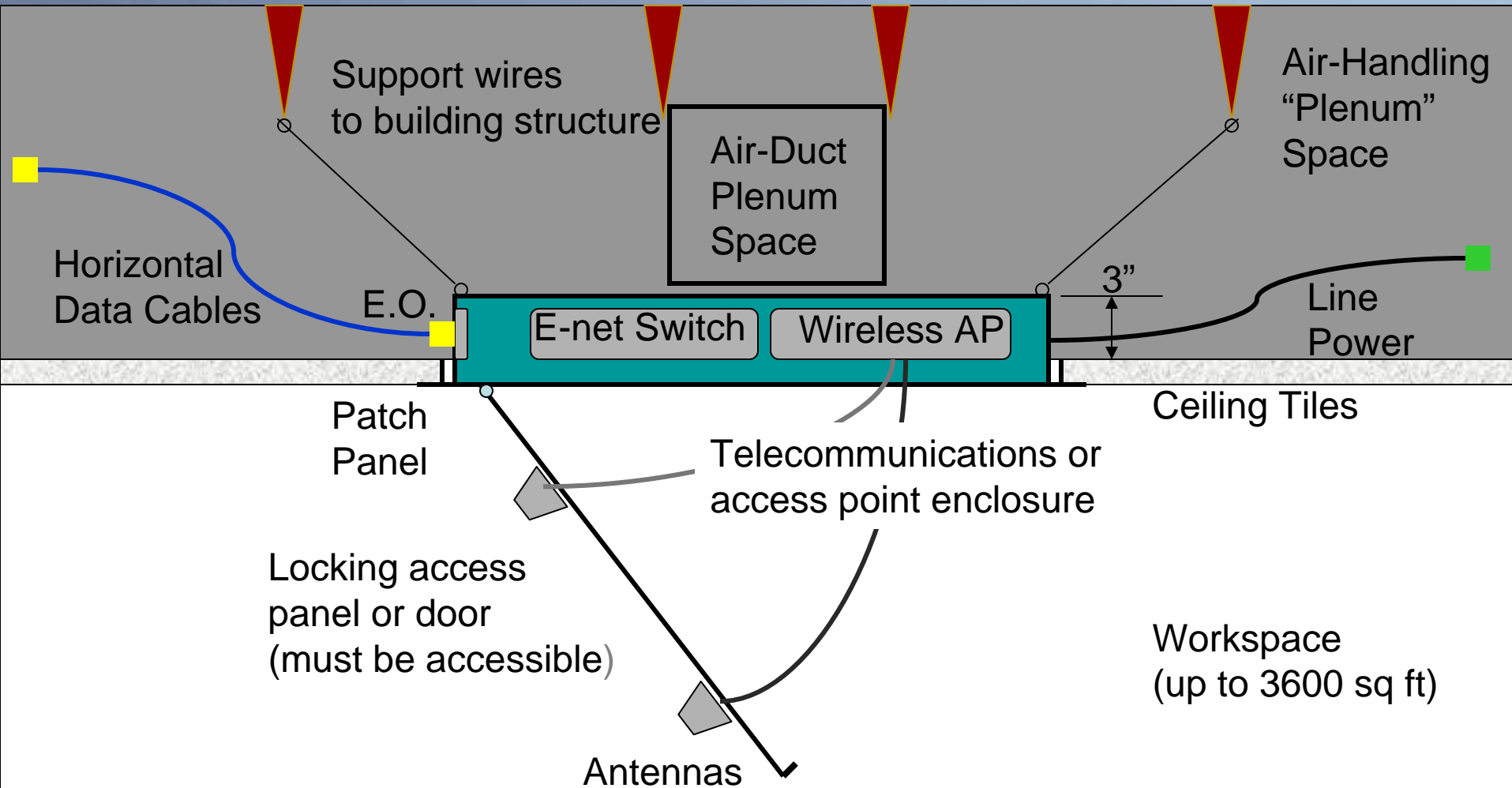
TIA 569-B Commercial Building Standard for Telecommunications Pathways and Spaces

- Suspended ceiling space is acceptable for consolidation points and horizontal connection points, provided that the space is accessible without moving building fixtures and heavy furniture.
- Inaccessible ceiling areas shall not be used as a distribution pathway
- A minimum of 3" clear vertical space shall be available above ceiling tiles for horizontal cabling

TIA 569-B “Pathways and Spaces” Telecommunications Enclosures (TE)

- The TE may serve an area up to 3,600 sq. ft. and may replace a TR in office spaces less than 5,000 sq. ft.
- The TE shall be placed as close as practicable to the center of the area served
- The TE shall facilitate access for maintenance and MACs, and control unauthorized access.
- The TE shall provide lighting for maintenance and adequate power and ventilation for equipment contained therein.
- A Telecommunications Enclosure (TE) may augment a Telecommunications Room (TR) on each floor of a building

TIA 569-B "Pathways and Spaces"
Telecom enclosure in the ceiling



TSB-162 –Guidelines for Wireless

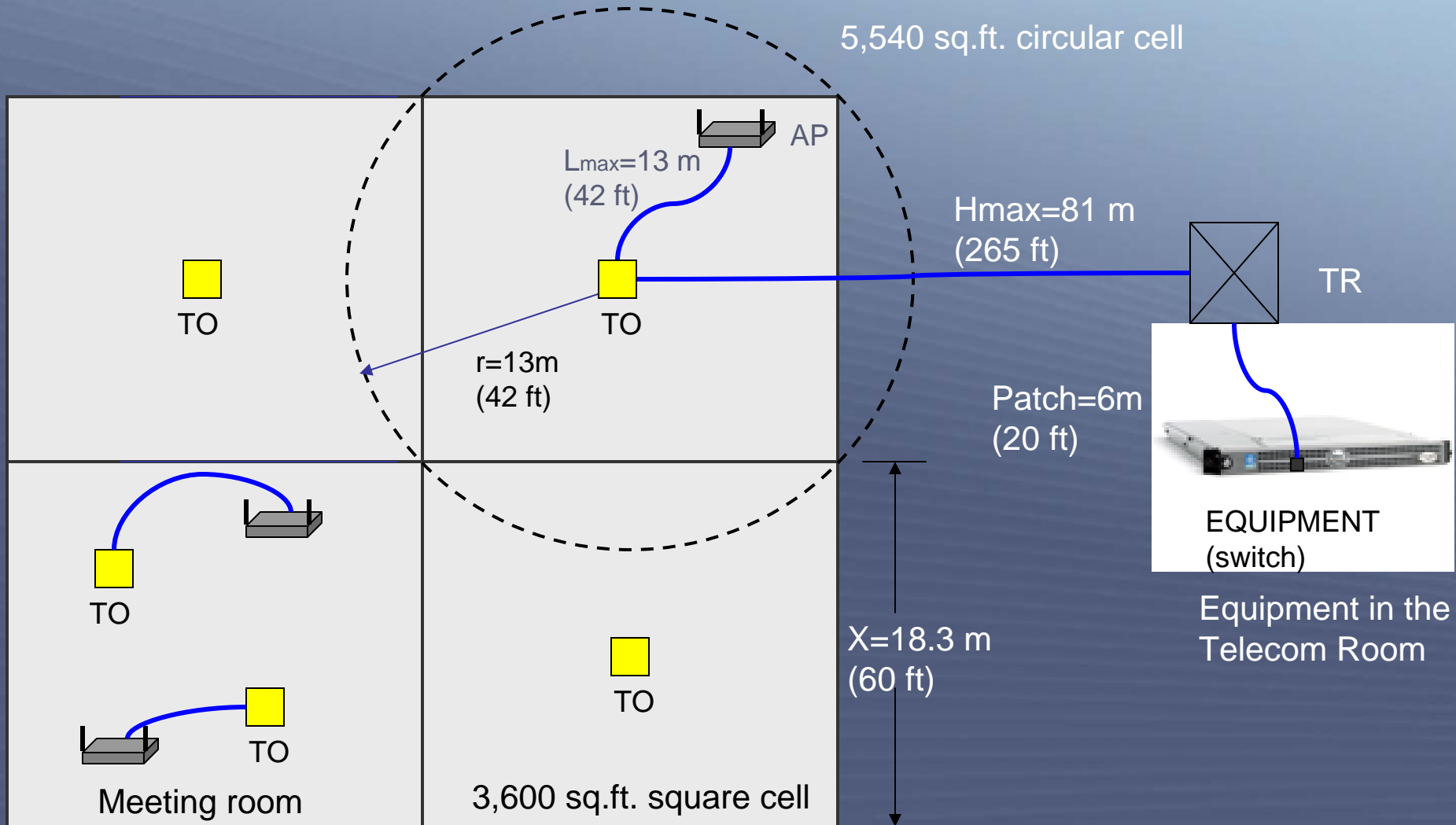
Telecommunications Systems Bulletin TSB-162 *Telecommunications Cabling Guidelines for Wireless Access Points (APs)*

Provides guidelines on the topology, design, installation, and testing of cabling infrastructure for supporting wireless local area networks (WLANs)

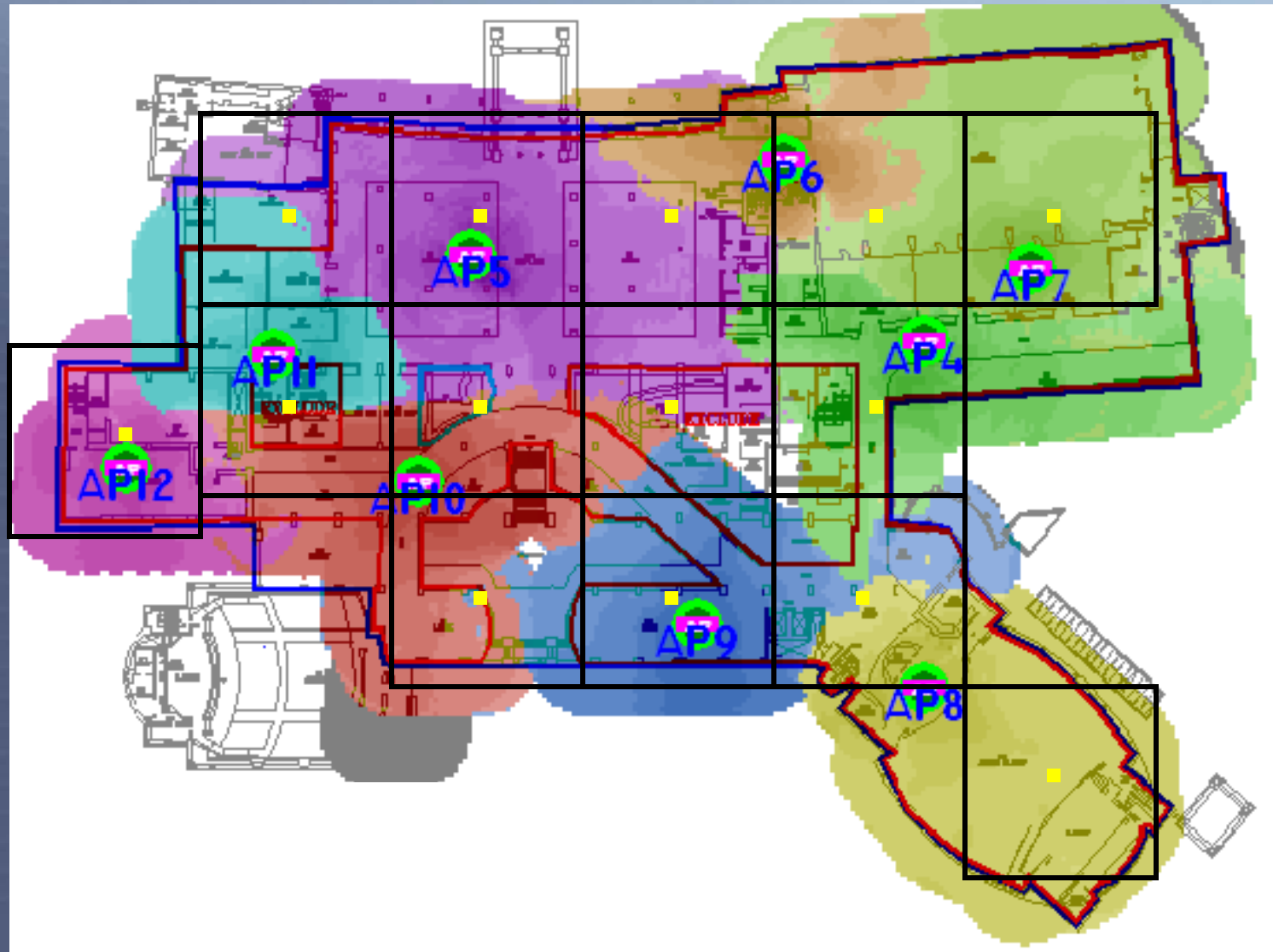


- TSB-162 states that cabling (for wireless access points) should be installed and performance tested per existing 568-B.2 standards. (Now 568-C.2)
- Determination of exact cell size and placement of the wireless access point (WAP) is outside the scope of the TSB (perform a site survey or simulation)

TSB-162 Pre-Cabling Guidelines for Wireless Access Points



TSB-162 Pre-Cabling Guidelines for Wireless Access Points



TSB-162 Cabling Guidelines for Wireless Access Points

- Accepts an in-the-grid ceiling mount, with antenna unobstructed by ceiling tiles
- Accepts wall mount above or below suspended ceiling. AC power must be in an approved enclosure above the ceiling
- Telecommunications Enclosures (TEs) can be mounted in a ceiling panel to provide locked security or aesthetics for APs
- Consider maintenance and security of APs
- Observe separation of power and network cabling
- Local power or PoE acceptable (end span and mid span)
- Horizontal should be terminated at E.O., then patch to AP

Installation



Why use a wireless access point enclosure?

- Enclosures provide physical security, and protect the AP from tampering, accidental moves, disconnects, damage and obstructions, *thereby preserving the integrity of the site survey.*
- Enclosures serve as a convenient place to terminate and conceal data and antenna cables. Cable certification can be performed by the installer “to the enclosure”, and the access point can be installed thereafter.
- Enclosures can improve the aesthetics or appearance of the installation. The ceiling is the ideal location for antennas.
- Code or directive compliance. For example in Healthcare environments, ceiling enclosures provide easy access to the AP for moves, adds, & changes without exposing the air handling (plenum) space.



Physical Protection



Aesthetics and Convenience



ICRA in Healthcare



Code Compliance



Prevent obstruction or tampering



Improve coverage and
preserve the site survey

POWER OVER ETHERNET

Power Over Ethernet (PoE and PoE+)

IEEE 802.3af (PoE) and 802.3at (PoE+)
DTE Power via Media Dependent Interface (MDI)

- PoE delivers 12.9W to PD delivered over DATA or SPARE pairs
- PoE+ delivers 24W to PD. Some solutions may deliver 60W to the end device, by providing two standard compliant PD interfaces in a box
- PoE+ delivers over 2 or 4 pairs
- PoE+ is interoperable, interchangeable with existing PoE infrastructure

TIA TSB-184 : Guidelines for
Supporting Power Delivery Over
Balanced Twisted-Pair Cabling

- Recommends CAT5e, or better, horizontal cabling
- DC Loop resistance and balance
- End-span and Mid-span configurations
- Tables of temperature rise within cable bundles
- References to safety standards
- The TIA has conducted tests with the higher current levels in cable bundles verifying that PoE plus cabled infrastructure can be operated safely in the air handling space.

- Link to Cisco PoE calculator

http://www.oberonwireless.com/WebDocs/Partner_Resources/PoE_Calculator.xls

- Cisco and FCC Mobile wireless forecast

http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html

http://www.fcc.gov/ftp/Daily_Releases/Daily_Business/2010/db1021/DOC-302324A1.pdf

www.oberonwireless.com

Presentation available at

<http://www.oberonwireless.com/webinars.php>

Please view product demonstrations at

<http://www.youtube.com/oberoninc>