Designing life saving buildings starts with proper planning for a public safety DAS

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Radio challenges from 9/11

Communications lost between emergency services personnel and command and control due to:

- Lack of public safety RF penetration through building materials
- Police, fire ambulatory services on different networks and frequency bands
- Handheld radio devices with different protocols
- Out-of-state emergency services teams on different networks and frequencies
- Public safety phones located in the buildings were immobile
- Communication equipment was not protected from fire, water, and heat
New public safety codes, regulations, & rules

- IFC 510
- National Electric Code Articles 770 and 800
- NFPA 72
- NFPA 1221
- Local State Uniform Fire Prevention and Building Codes
- Local AHJ
- Public Safety DAS Equipment OEMs
Types of public safety DAS infrastructures

- Analog
- Digital
- Passive DAS
- Active DAS
  - Passive vs. Active
    - Passive DAS are less expensive
    - Passive DAS are easier to design and install
    - Passive DAS have fewer points of failure
    - Active DAS can provide better coverage for large deployments
    - Active DAS provide better management and monitoring capabilities and features
    - Active DAS are better if combining with cellular DAS solutions
Major public safety DAS components

- Coaxial cabling infrastructure
- Fiber optic cabling infrastructure
- Bi-directional amplifier (BDA) class A or class B
- Signal source antennas
- Head-end base interface unit
- Remote amplification units
- Network management system
- Uninterrupted power supplies (UPS)/battery back-up units (BBU)
- Service antennas (omni/panel)
- Fire alarm monitoring panels
- Fire alarm annunciator panel
Commonly supported public safety frequencies

FREQUENCY SPECTRUM

VHF

VERY HIGH FREQUENCY
30-300MHz

150MHz

ULTRA HIGH FREQUENCY
300-3000MHz

450MHz

800MHz

Various safety services

700MHz

Public safety, P25 radio communication

900MHz

PUBLIC SAFETY BANDS
Important DAS pre-deployment processes

1. Review specifications document
2. Reference applicable compliance standards
3. Communicate with local AHJ to understand local standards
4. Research the best solution to meet the following:
   - Number of channels
   - Supported frequencies
   - Automatic gain control
   - Oscillation prevention
   - Output power grain & attenuation
   - Dry contact/monitoring capability
   - Enclosure (NEMA4, IP66, red, lockable, ventilation)
   - Operation modes (passive, active, analog, digital, wideband channelized)
   - Compliance (UL, NFPA, FCC, AHJ, etc.)
Proper public safety DAS design

- Certified DAS designer
- Trained/certified engineering team
- Review updated NFPA 72/1221 and local requirements
- Ensure converged DAS solution is acceptable by local AHJ
- Submit DAS design to the OEM for review and approval
- Submit converged solution design to WSPs for review and acceptance
- Submit design to local AHJ for review and approval
- Import RF based design into AutoCAD for proper floor plan development
Signal source antenna mounting requirements

- Non-penetrating roof mount with mats and weights
- Roof penetration
- Mounting to existing structure
- Wind load calculations
- Antenna separation
- Grounding
- Lightning protection
- Weather proofing
- Conduit support
- Weather head installation
Coaxial and fiber cabling and service antennas

- Conduit size and installation
- Pull box sizing and installation spacing
- Coaxial cables (plenum, foam; ½” or larger; black, white, blue, red)
- Cable connector (male, female, N-Type, 4.3-10, SMA, QMA, PIM)
- Coaxial cable testing (D-to-F, return loss, insertion loss, PIM)
- Fiber cable type (riser, armored, single-mode, multi-mode, single strand, multi-strand, ribbon, hybrid fiber)
- Fiber connectors (SC-APC, LC-APC, LC UPC)
- Fiber termination (fusion splice, UniCam, pre-terminated, housing)
- Fiber cable testing (OTDR loss testing, power meter)
- Antenna mounting options (drop ceiling tile, hard pan, wall, unistrut, enclosures, specialized mounting and housing)
- Labeling (wrap around, local fire department required labeling)
Preparation of head-end and remote closets

- Fire rating for closets (no rating, 2-hour, 4-hour)
- Ample rack and wall space
- Ample power, outlets (available circuits in the electrical panel)
- Availability of emergency back-up power
- Space for BBUs and UPS (NEMA2 or NEMA4 requirements)
- Grounding of equipment and racks (available busbars, wire gauge)
- HVAC requirements for DAS active components (Tonnage)
- Conduit size and pathway access (head-end to roof, head-end to IDF)
- Fire alarm system integration (remote monitoring panel, annunciator panel)
Equipment installation, testing, & commissioning

- Per manufacturers’ specifications
- Rack sizing
- Equipment grounding
- Equipment labeling
- Benchmark testing
- Grid walk testing
- DAQ testing
- Constant wave testing
- Commissioning
- System optimization
- Dry contact alarming and testing
- As-build documentation
Questions?

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