In-Building DAS Overview

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Agenda

- Why is In-building DAS Needed?
- DAS Public Safety or Cellular
- In-building Coverage Options:
  - Passive DAS
  - Active DAS
  - CRAN, DRAN, ERAN Solutions
- Closing

What is DAS?

- Distributed Antenna System

  A solution that distributes RF signal throughout a building, stadium or other defined area. Can be used to distribute cellular, public safety or just about any RF signal. RF sources can either be from the outdoor network (radio tower) or directly from base station radios. Typically public safety DAS are fed by a BDA using off-air signal. Cellular DAS solutions can be fed by BDAs but more commonly base station radios now.

Why is iDAS needed – No Macro Signal Penetration

Not enough signal or capacity

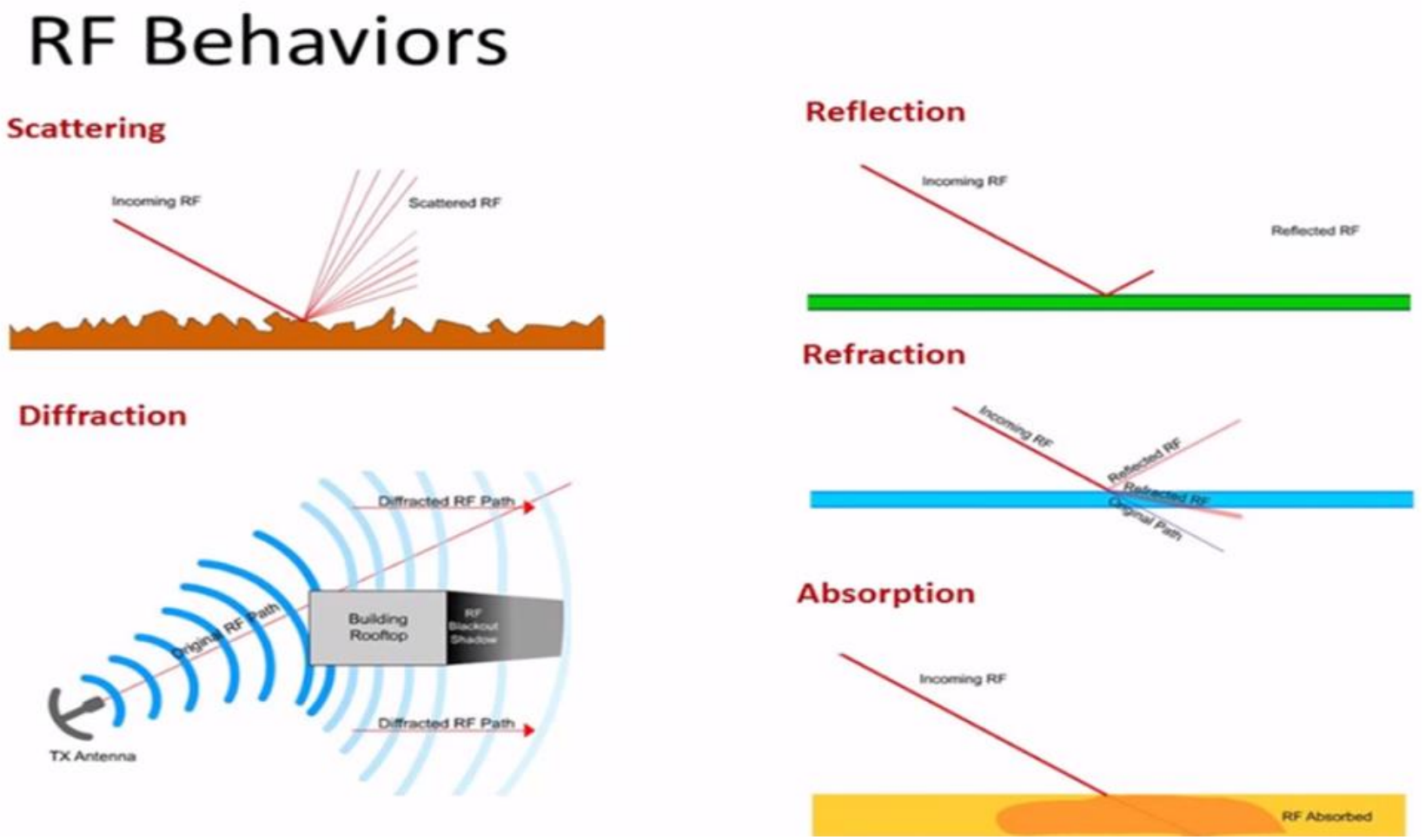
- No (or low) coverage in the area
- Poor building penetration
- Areas below ground level
- Signal shadowing

Why is iDAS needed – Too Much Interference

Too much signal / noise

- Multiple towers in line of sight
- Hand-off issues
- Too much noise

RF Behaviors



Industry Drivers

- For Public Safety

  IFC and NFPA based building codes now mandate in building coverage for first responder radio systems. It's the responsibility of the building owner to comply. Generally only applies to new construction, but is being made retroactive in some cities.

- For Cell Phones

  The proliferation of cellular phones, and especially smart phones, has caused a much greater need for cellular coverage and capacity indoors. By most accounts 80% of cellular traffic originates inside.

In-Building Coverage Options

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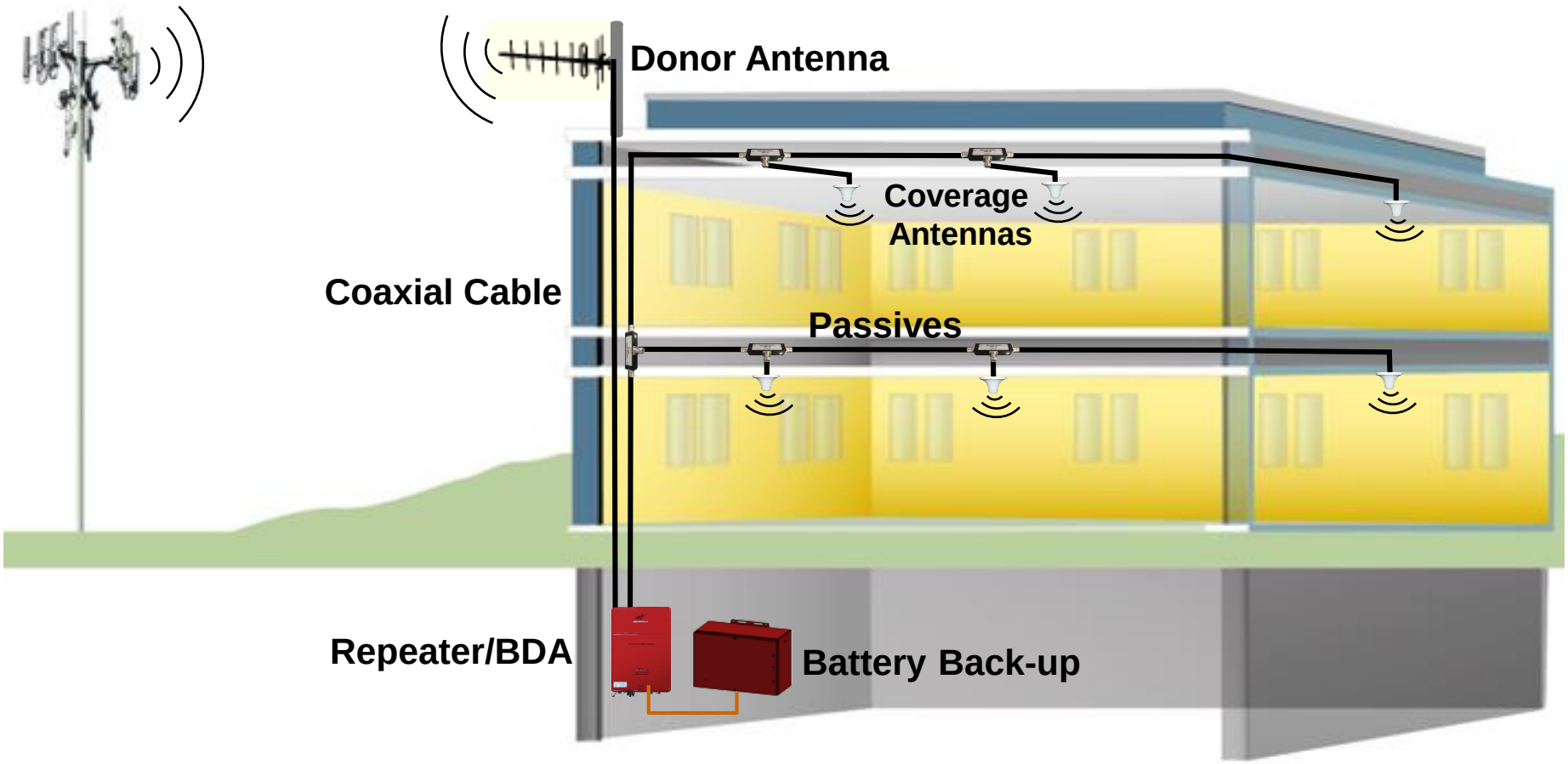
Small Cells

What the heck is a small cell?

- Femto Cell
- Pico Cell
- Metro Cell
- Dot
- Mini BTS

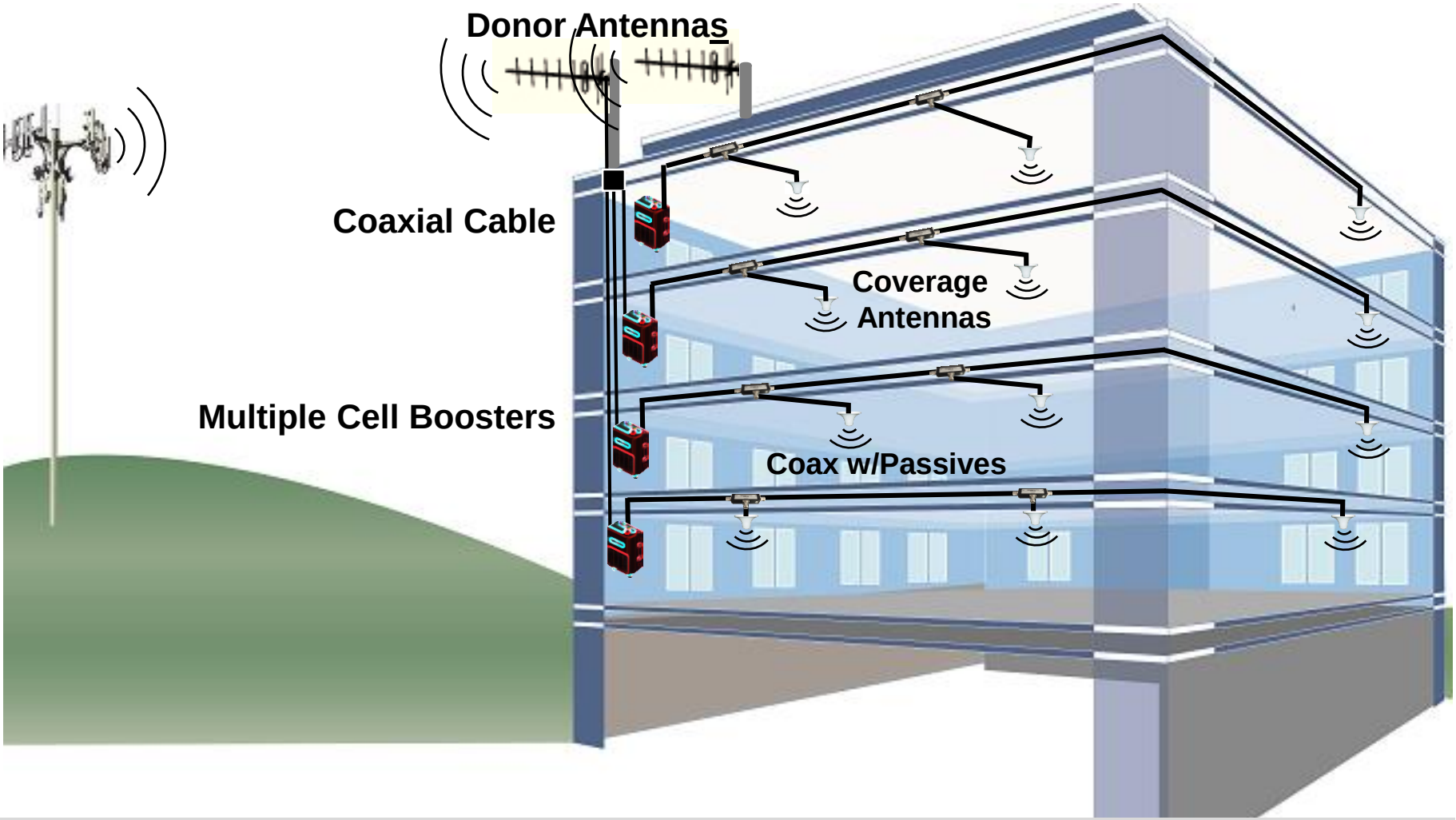
Just about anything that isn't a high power BTS, typically 20 watts or less

Basic PS Passive DAS Configuration



- Repeater - only active component
- Ideal solution for smaller venues <200K sq. ft
- Limited growth or expansion capability

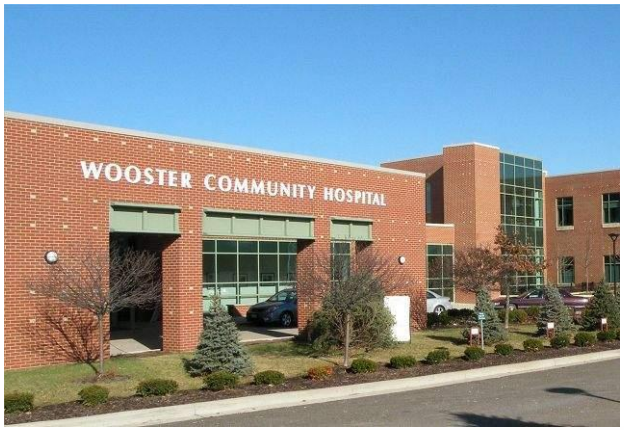
Consumer Booster Configuration



- **Active Equipment: Cell Boosters**
- **No control over what operator signal is boosted, except with antenna**
- **Can be single operator if only one operator in donor path, not likely though**

Typical Venues for Passive DAS

Big box stores

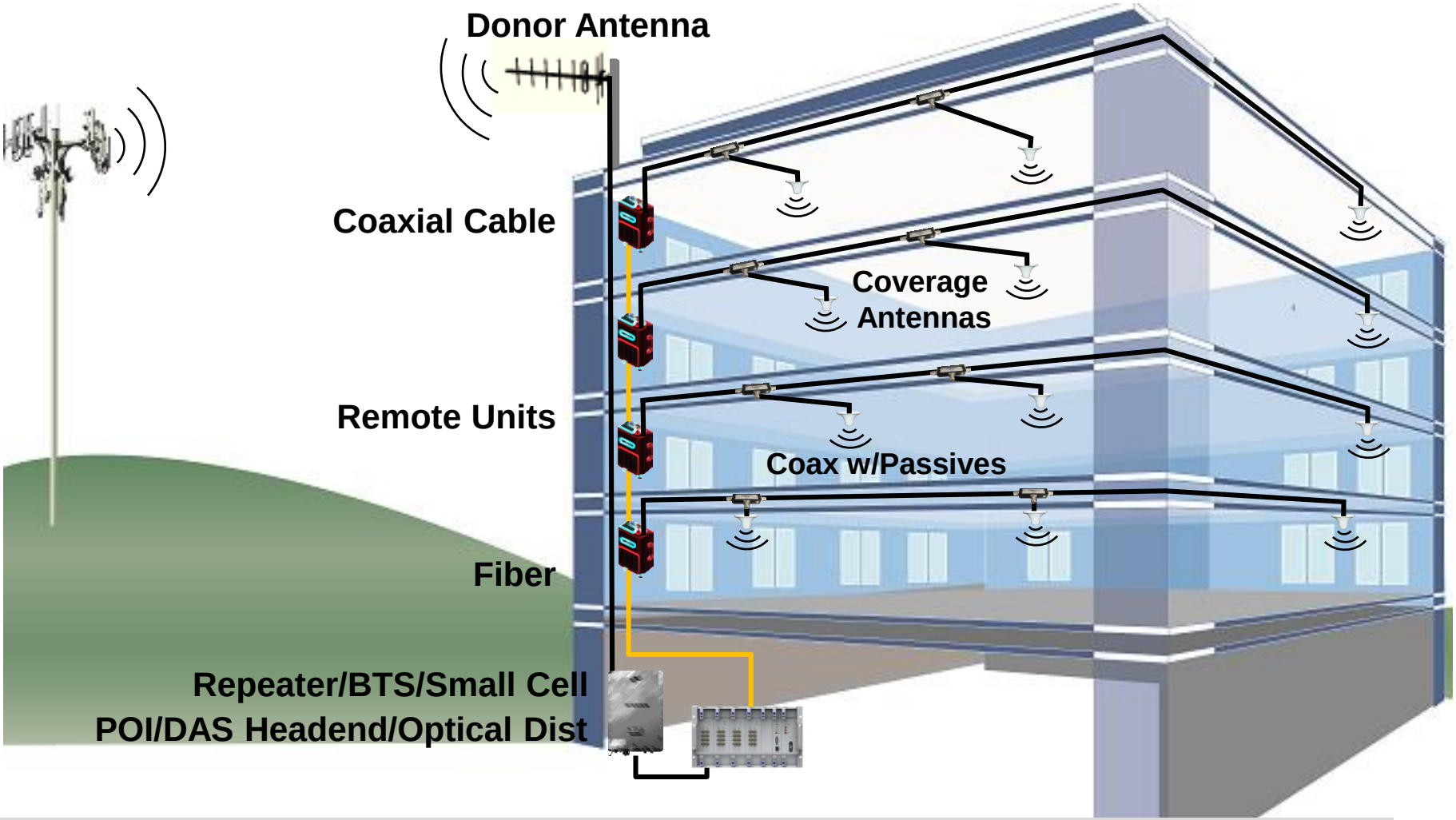


Rural - Community hospitals

- Areas where cell sites are not overloaded
- Low capacity buildings
- Small coverage requirements
- Most public safety applications
- Cell operators may not allow off-air repeaters

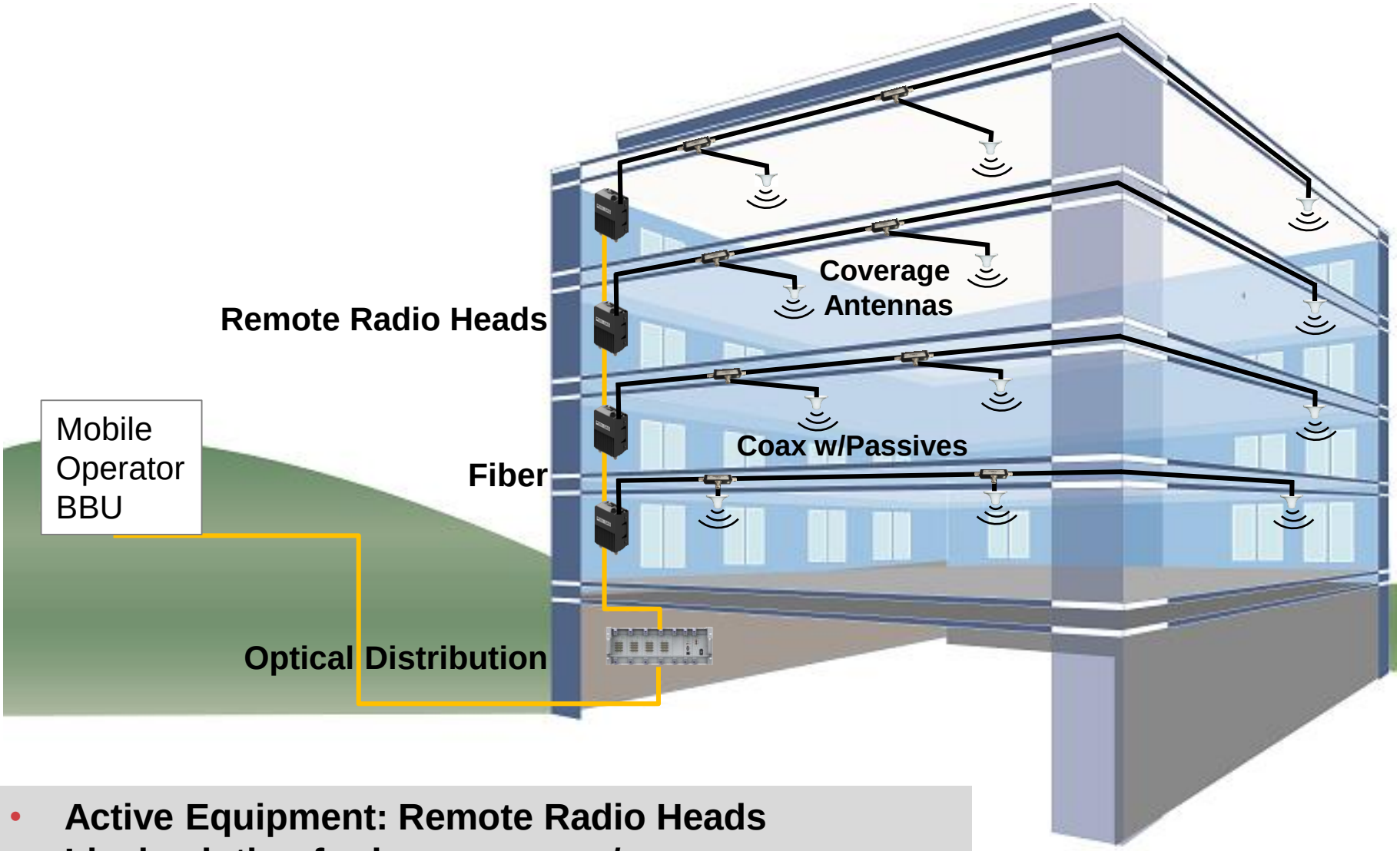
Small office buildings

Active DAS Configuration



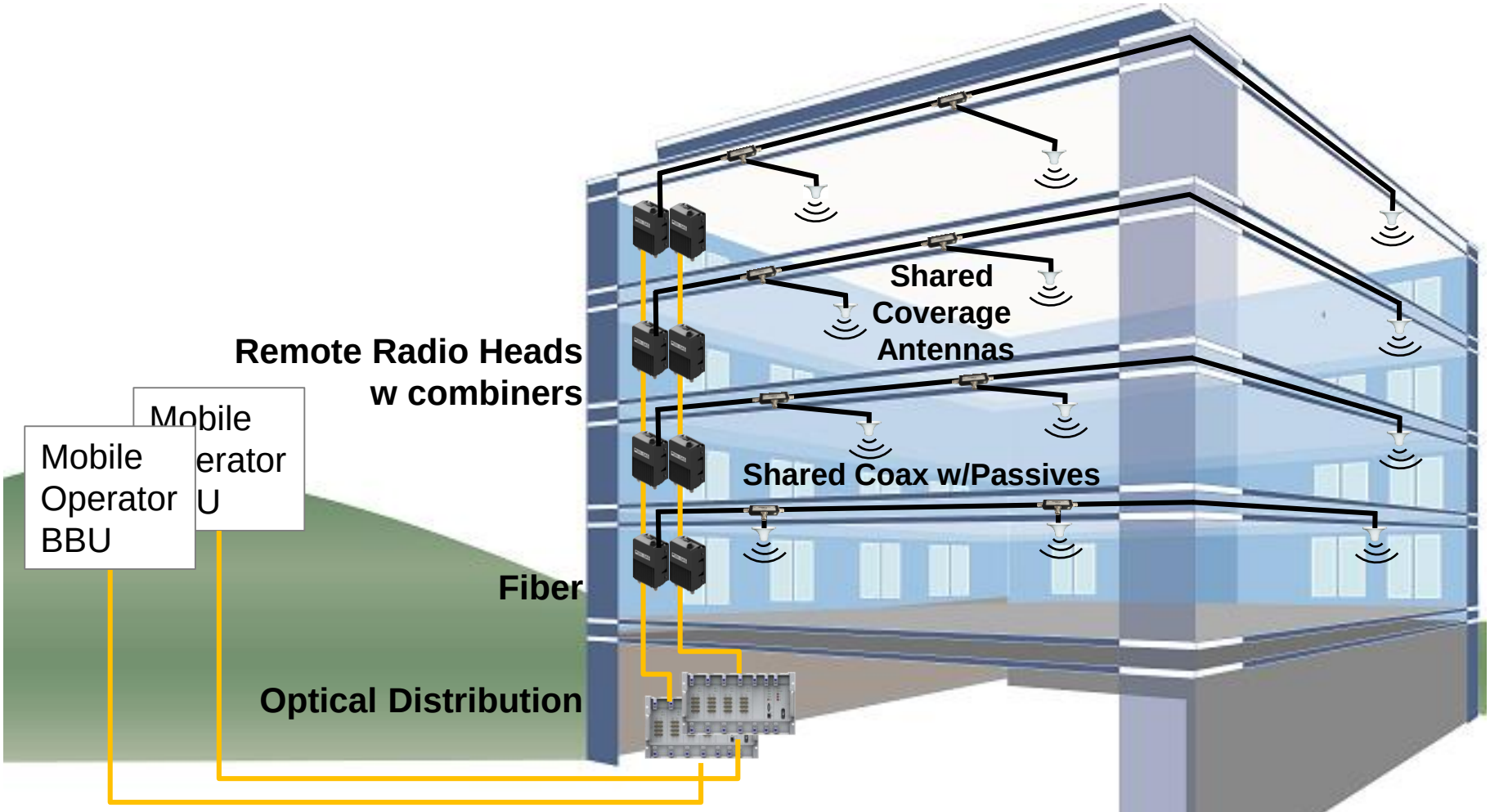
- **Active Equipment: BDA/BTS, DAS HU & RUs**
- **Ideal solution for mid/larger venues/campuses**
- **Capability for expansion, Multi-Operator, Multi-Service**

C-RAN Configuration



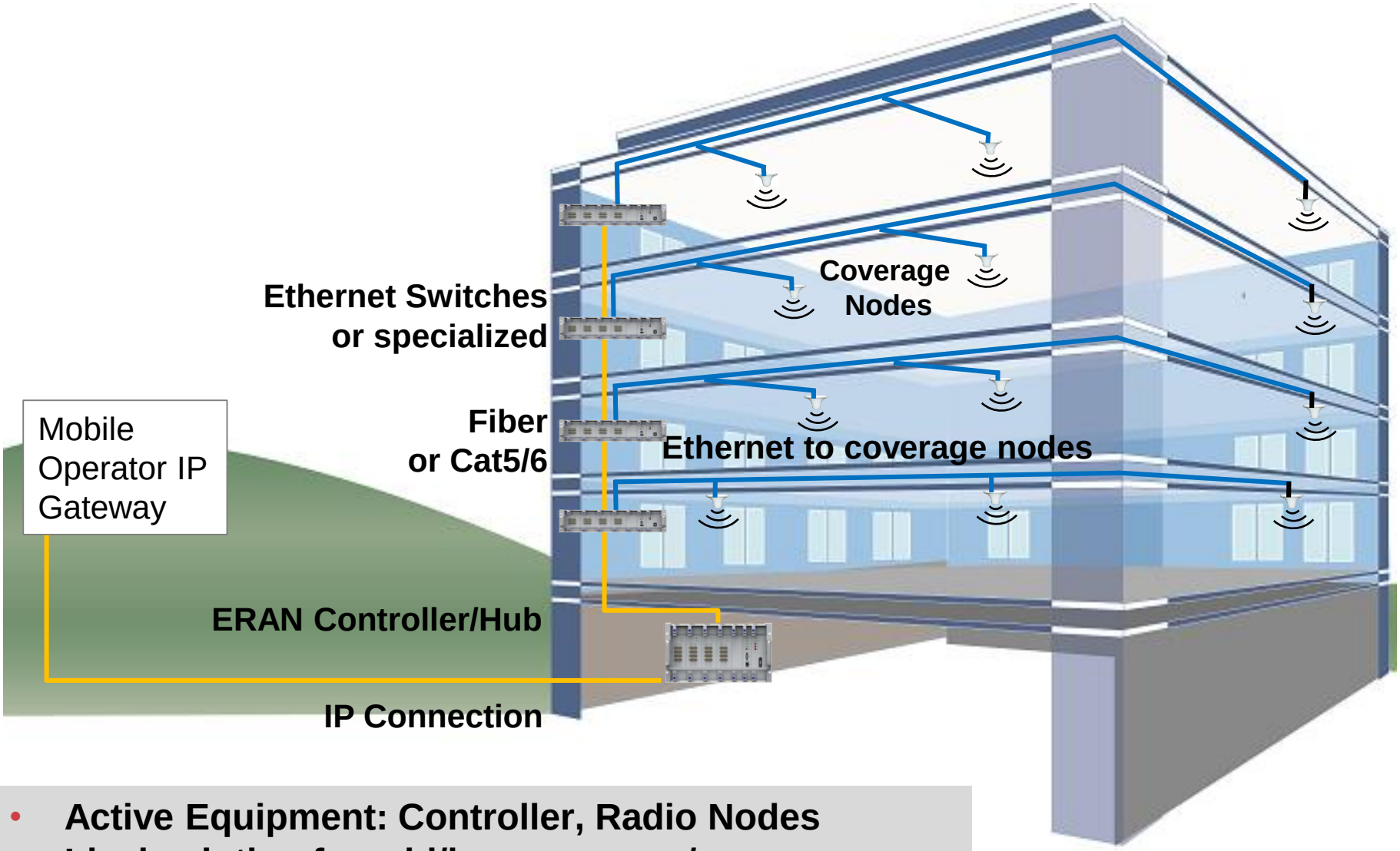
- **Active Equipment: Remote Radio Heads**
- **Ideal solution for larger venues/campuses**
- **Single Operator, passive can be doubled for MIMO**

Neutral Host C-RAN/D-RAN Configuration



- **Active Equipment: Remote Radio Heads**
- **Ideal solution for mid/larger venues/campuses**
- **Multi-Operator, passive can be doubled for MIMO**

E-RAN Configuration



- **Active Equipment: Controller, Radio Nodes**
- **Ideal solution for mid/larger venues/campuses**
- **Single Operator, single or dual band, MIMO**

Typical Venues for Active DAS

- High capacity requirements
- Large coverage area

Large Hospitals

Malls

College Campuses

Large Buildings

Stadiums and Arenas

Casinos

Recap: Passive and Active DAS

Passive DAS:

- Ideal for smaller buildings
- Fed with public safety repeaters/signal boosters – Only Active Component
- Amplifiers (repeaters) are in one location
- RF distributed over coax to antennas throughout building or area or radiating cable/leaky coax

Active DAS, E-RAN, C-RAN, D-RAN:

- Ideal for larger building and campuses
- Public safety fed by repeaters Cellular fed by BTS/Small Cell
- Low power and high power solutions depending on coverage and capacity requirements
- Active DAS best for multi-operator, CRAN, ERAN for single operator

Westell Public Safety Solutions

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Westell Public Safety Signal Booster: PS51080 & PS71090

- Supports 700/800 MHz PS Spectrum
- Passband Options:
  - 17 MHz:788-805 / 758-775 MHz
  - 3 MHz: 806-809 / 851-854 MHz
  - 10 MHz: 806-816 / 851-861 MHz
- 27 dBm (1/2W) or 2W (33dB) Pout
- NFPA 72 compliant
  - Red NEMA4 Enclosure
  - Compliant Alarming
- Class B Amplifier
- UL Listed
- Compliant with the most current FCC test specifications for Signal Boosters
- **Future Proof - FirstNet Ready**
  - 10 MHz: 788-798/758-768 MHz

Westell Public Safety Portfolio: Passives - Non-PIM Rated

Product Offering:

- Power Splitters
- Directional Couplers
- Power Tappers
- Hybrid Couplers

Features and Benefits:

- Frequency coverage 340-2700 MHz
- Low Insertion Loss
- Low VSWR
- Not PIM rated
- IP-65 Ingress Protection Rated
- Inventory available with N(f) and 4.3-10(f) Connectors

Westell Low PIM Portfolio: Passives up to -161dBc

Product Offering:

- Power Dividers - AKA “Splitters”
  - 2-Way, 3-Way, 4-Way - HP + LP
- 50 Ohm Terminations “Loads”
- Directional Couples – “DC’s”
- Power Tappers – “Taps”
- Hybrid Couplers – “Hybrids”
- Diplexers
- Duplexers
- Filters
  - Notch, Public Safety
- Cross Band Couplers – CBC’s
  - Dual-Band, Tri-Band, Quad-Band

Westell Public Safety Portfolio: Donor Yagi Antennas

- Options to Support 700 – 960 MHz
- 11 or 14 dBi Options
- Multi-elements
- Hermetically Sealed
- Rugged Lightweight Design
- Stainless Steel Hardware

Westell Public Safety Portfolio: Donor Panel Antennas

- High Isolation Donor Antenna
- High Front/Back Ratio of 37dB
- Excellent Dynamic PIM Performance
  - Minimized Metal-to-Metal Contact (PIM)
- Designed & Tested For 170 m/Hour Wind Survival (Hurricane)
  - Fiberglass Radome with inner support for 170mph survival. Competition uses plastic Radome
- Sturdy Mounting Bracket made of steel, Designed with the Grip to Maintain Strong Mounting Angle

Low-Band: 698-940 MHz

Also offers High-Band, 1710-2690 MHz

Westell Public Safety Portfolio: Server Antennas

Omnidirectional

- Supports 698-2700 MHz
- 2 dBi Gain
- Max Power – 50W
- Flexible Mounting Options
- Symmetric Construction
- Wide Beamwidth

Directional Panel

- Supports 698-2700 MHz
- 7 dBi Gain
- Max Power – 50W
- Flexible Mounting Options
- Symmetric Construction
- Wide Beamwidth

Thank You!

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Connect with us: