DISTRIBUTED ANTENNA SYSTEM (DAS)

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Panelists

• Eddie Mardon – UC San Diego

• Erich Snow – Stanford University

• Ken Mills – University of Southern California
DAS Overview

A Quick Look at the Technology
DAS Layout

Just as there are 3 layer in one LAN network model, there are 3 basic layers in a DAS network.....
DAS Components

• Hub (Headend) – Per carrier (core)
• Remote Equipment (distribution)
• Antennas (access)
• Like LAN, don’t forget cabling
  – Fiber
  – Coax
  – Cat 5 or 6 if Ethernet to Antennas is used
Indoor DAS
Carrier RRU’s (Remote Radio Units) at Hub Site
DAS Headend Equipment - iDAS
Verizon – Pilot Beacon
Remote Equipment in Building MDF
Indoor Antenna
• **Two Macro Sites**
  • Beckman
    • AT&T
    • Sprint
    • T-Mobile
  • Meyer Library
    • AT&T
    • Sprint
  • Cell on Wheels -
    • AT&T – one deployed at Hospital
    • Others have been removed
• Neutral Host Distributed Antennae System (DAS) implemented Sept 2009
  • 23 Outdoor Remote Access Nodes (RAN) operational
  • Stadium
  • Crown owned, operated DAS
  • AT&T owned, operated Wi-Fi
  • Main Head End on Beckman, secondary in Bonair ECH
  • Most major cellular providers have bought into the DAS
    • AT&T
    • Verizon
    • T-Mobile
    • Metro PCS
  • Business Model
    • Carriers buy into system
    • Crown builds, owns and operates
    • Carriers buy into the system – capital/recurring
- **5 New RANs in planning stages in faculty subdivision**
  - Top of Pine Hill 1
  - Junipero Serra and Frenchmen’s Road
  - Junipero Serra and Stanford Avenue
  - Nixon and Stanford Avenue
  - Peter Coutts / Page Mill area

- **Additional RANs on campus in various stages of planning**
  - New Parking lot – Galvez/Campus Drive
  - Tresidder
  - Additional bandwidth to Stadium DAS
    - 8 sectors to 16 sectors
• Neutral Host iDAS in operation Huang Engineering Center
  • T-Mobile
• Carrier specific systems in operation at Law, Littlefield and old Knight bldgs.

• In final stages for completing an agreement for Neutral Host iDAS
  • School of Medicine – Grant, Alway, Lane, Edwards, LKSC, SIM1
  • School of Engineering – Huang, Nano, Y2E2, New Bio/Chem E
  • Knight Management Center (GSB) – Bass, Zimbrano, Serra East
  • Law School - Neukom Building

• New Business model to encourage carriers to buy into the iDAS
  • School pays 1/3 of initial investment
  • Carrier pays 1/3 of initial investment – AT&T, Verizon
  • IT Services carries monthly recurring
DAS Hut at Stanford
Carrier BTS Equipment
Outdoor DAS Antenna
DAS Monopole
UC San Diego Cellular Coverage Today

- Macro sites on and around campus
- DAS System since 2009
  - Crown Castle
  - 5 rooftop sites in central campus
  - AT&T sole carrier
  - Upgrading to LTE
- Each carrier has a different approach
- Outside coverage mostly OK (except SIO).
- Indoor coverage often poor to non-existent.
Hopes for the future

• More rooftops

• More carriers, using shared antennas

• Better indoor coverage in key buildings
Part of a broader solution for indoor coverage?

- Enterprise grade femtocells and picocells
- WiFi calling
- Always Best Connected. Aastra Mobility Client+
- Carrier use of lower license frequencies for voice
- HetNet
STADIUM DAS
Carrier Headend Equipment
Batteries at Carrier Headend
DAS Headend Equipment in Carrier Hub Space
DAS Headend Equipment at Coliseum
DAS Headend Equipment at Coliseum
DAS Distribution Equipment – Concourse Level
Cable Tray – Concourse Level
Cable Tray – Concourse Level
Trenching to Lower Tunnels
Lower Tunnel Junction Box
Panels Over Lower Tunnel Entrance
Antennas – Lower Tunnel
Stealth Box Hiding Antennas – Lower Tunnel
DAS Antenna Over Upper Tunnel
Antennas in Tunnels
DAS Antennas – Outside Stadium
Items to Consider

• Where will antennas go?
• How are antennas protected and stealthed?
• Hub site for DAS at stadium
• Distribution closets for remote equipment
• Cable runs – fiber, coax, Cat 5 or 6
• Battery backup – No power backup, DAS will go down if power is lost
Issues and Lessons Learned
Options

- Do nothing
- Build our own DAS
- Outsource DAS to someone who will build, maintain, and monitor it at no upfront or ongoing cost
  - 3rd Party
  - Carrier
  - Carrier Consortium
Students

• With removal of dorm lines, cell coverage now critical
• Parents and friends want to reach them and vice versa
RF Killers

• LEED certified buildings
• Tall buildings that require multiple antennas place around vs. single cell site
Coverage vs. Capacity

- On campus, issue is usually coverage
- In stadium or large venues, coverage can be good, but cell site is overload
Everyone Must Be on Same Page

• Together on what you want
• If not, will confuse carriers and DAS vendor
• Other options will continue to be thrown out, wasting time
• Single point of contact for carriers and DAS vendor helps facilitate
Campus Approval Process

- Who can approve as far as utility requirements, aesthetic requirements, etc.
- Technical Infrastructure Committee
New Buildings and Ones Undergoing Major Renovations

• Ask department upfront if they want DAS and where
• Expensive, so help carriers with funding by work in items to facilitate DAS
  – SM Fiber to building
  – Riser fiber
  – UPS power in closets
  – Run lateral cable where it makes sense
• Get DAS vendor together with architecture and project manager
• Issue for public universities?
Much Different than WiFi Deployment

• Universities own buildings, but not spectrum
• Need full cell carrier support to do anything
  – Engineering and design
  – Financial support
• Expensive, especially for indoor DAS
Everyone Wants Coverage Now

- Deployment is slower than what constituents want
- Carriers have budgets with many projects for a year
- Outdoor DAS is a quicker and less expensive approach to get broad coverage and see how far the indoor penetration is
- Prioritize what needs to be covered soonest
Assisting Carriers

- For hub space, carriers do not need “Cadillac” space and won’t pay for it
  - Would rather put their money in other things
  - You would also rather have them put the funds in the DAS

- Partner and help facilitate – do your part
  - Carrier spending lots of money
  - Assist with access (Field services, project manager, etc.)
  - Facilitate items like parking
Alternatives to DAS

• Femtocells

• “Repeaters” or “Signal Boosters”
  – Gray area with FCC
  – Carriers can make you remove them if they interfere with their network
Questions?

Input?
Resources

• FCC DAS Forum (Feb. 2012)
  – Mary McLaughlin from University of Michigan is on Second Panel

• DAS Forum
• ACUTA Meetings and DAS Webinars
• Other Colleges and Universities