Distributed Antenna Systems (DAS)

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Background

The trend toward using higher and higher frequencies and more sophisticated encoding schemes used by the cellular providers, coupled with modern materials used in building construction are making cellular signal penetration from outdoor cellular towers more and more challenging. Indoor Distributed Antenna Systems (DAS) are intended to provide good cellular coverage within buildings, and consist of three components: 1) in-building antennas specifically intended to enable cellular communications from multiple carriers, 2) in-building head-end equipment to interconnect the antennas and to capture, amplify, and retransmit such signals, and 3) fiber optic or radio frequency (RF) connectivity from the building to individual providers' service points. Each of the major cellular carriers uses different signal characteristics, typically resulting in multiple head-end units that must be installed in each building, one for each provider (although single infrastructure solutions seem to be emerging). In addition, each carrier typically has a different service point, to which either fiber must be run or RF connections via "donor antennas" must be established. Either way, the multitude of carriers necessitates expensive physical infrastructure, and introduces enormous complexity for the installation, operations, and management of such services. Funding for installation, operations, and maintenance of such systems is generally the responsibility of the building owner (i.e. CSU). A Gartner consultant recently estimated a total implementation cost on the order of $30-35 million for our three campuses in Fort Collins, encompassing hundreds of buildings. He also indicated that our current Wi-Fi networks have much more bandwidth, are far less expensive, are far more capable, and are much easier to operate than DASs, and suggested that since VoIP over Wi-Fi is emerging and will likely mature within the next few years, one strategy is simply to invest in Wi-Fi infrastructure that is already deployed and being supported.

A complicating factor is that first responders rely on good in-building coverage for their radio systems that operate in the 700-800 MHz range, and are simply connected to the building's physical network. Such in-building infrastructure required to support this need is much simpler and less expensive than carrier-specific DAS solutions. Also, because these devices operate at lower frequency, they have far better penetration characteristics.

Analysis

Neither Telecommunications nor ACNS has the staff to install, operate, and manage carrier-based distributed antenna systems. Note that, already, Skype is in widespread use, and seems to work well over CSU's Wi-Fi network. Furthermore, strategic thinking is that voice communications is heading toward becoming an app in the cloud. It seems, therefore, prudent and wise to anticipate technologies that may avoid such large costs for the three campuses.

Recommendations

Ergo, recommendations fall into three areas:

1. CSU should not invest in in-building DAS, as there is no scalable funding or viable operational model.
2. Telecommunications and ACNS pursue VoIP over Wi-Fi to assess its performance and other pertinent characteristics.
3. CSU should continue to develop and make more robust its Wi-Fi infrastructure. This has ancillary benefits.

4. Telecommunications and ACNS should work together with Facilities and CSUPD to explore the infrastructure needed for first responders, developing standards for such connectivity to be included in Facilities building standards.