STRATEGIC WHITE PAPER

In-building Wireless Continuity Solution for Healthcare

Healthcare facilities are under pressure to provide high-quality wireless coverage using a range of devices and technologies for clinicians, patients and visitors throughout their environment. This paper describes the features and capabilities of the In-building Wireless Continuity Solution, which uses centralized WLAN access points and a Distributed Antenna System (DAS) that uniformly distributes wireless services throughout the healthcare facility. A base station is added for each service provider, and native mode radio frequency (RF) for multiple providers is supported simultaneously by the backbone and antenna system. With extended in-building coverage for public networks and consolidation of internal Wi-Fi® networks, the resulting infrastructure is capable of supporting all wireless technologies and is implemented for optimal coverage, minimal interference and scalable capacity throughout any healthcare facility.

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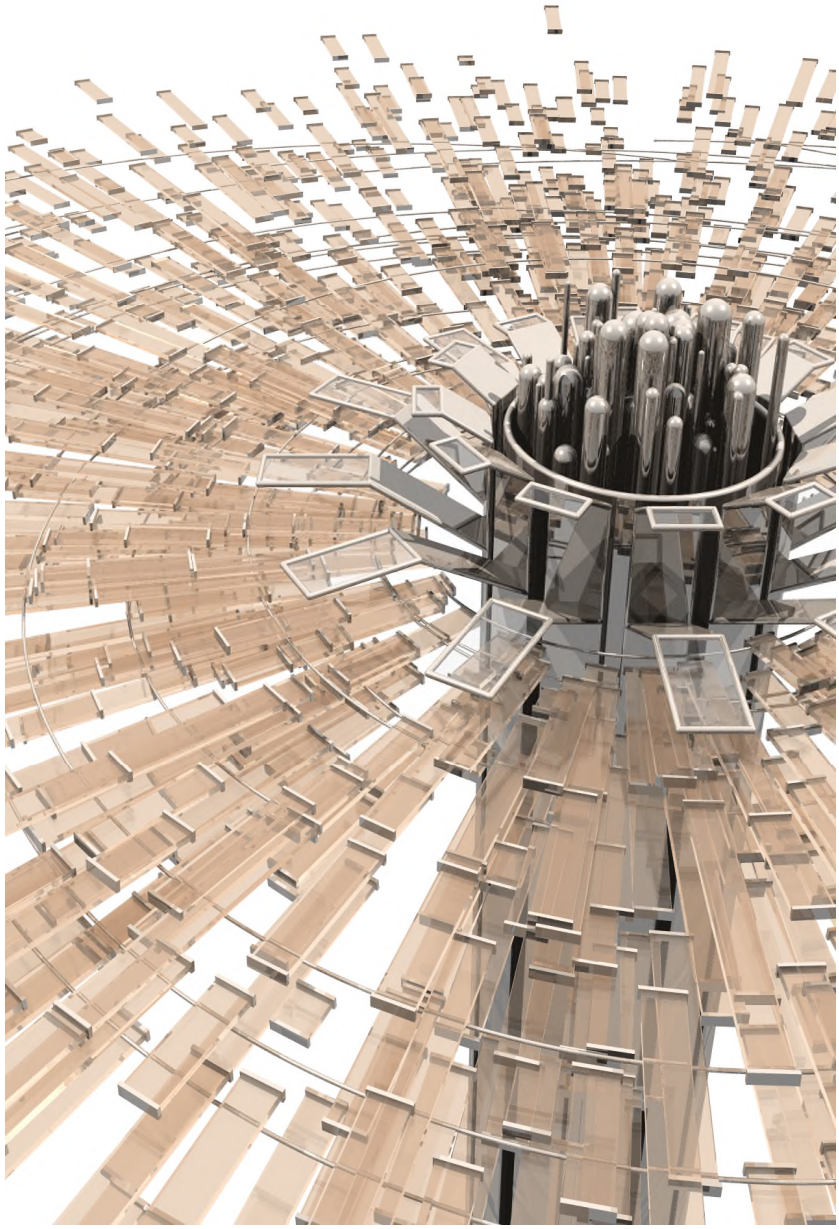


The challenge

Healthcare personnel require access to a range of wireless technologies with high availability and reliable connectivity. Most healthcare facilities are faced with pressure from clinicians, patients and visitors to provide thorough, high-quality service from wireless service providers, especially if they are heavy users of the latest wireless technologies and smartphones. Healthcare facilities need to offer this high-quality wireless coverage from multiple service providers.

IP networking for many types of devices with uninterrupted access within a healthcare facility or campus is just as critical. In addition to the range of services and assured coverage, reliability, quality, minimal RF interference and capacity are paramount considerations. The processing of critical data, such as patient alarms, demands unwavering availability, and diagnostic imagery requires more and more bandwidth. The network must allow mobile users to have secure access from all areas of the facility to ensure mobile productivity.

Wireless systems commonly evolve from point solutions. For example, a RF identification (RFID) scanner in the pharmacy may spawn the need for a solution to support a receiving and inventory-control application, or a department may need better in-building cellular coverage. To solve the problem, the current cellular service provider is typically called on for a solution, resulting in a patch that only works with that provider and frequently only works in a small section of the building.

The resulting patchwork of provider- and application-specific solutions inevitably becomes unwieldy and unscalable. Such situations endanger a healthcare facility's ability to provide quality care because RF interference is unpredictable, and the ability to rapidly deploy new, critical applications is severely impaired.

The solution to meeting these diverse needs is a wireless infrastructure that is capable of supporting all wireless technologies and is implemented for optimal coverage, minimal interference and scalable capacity.

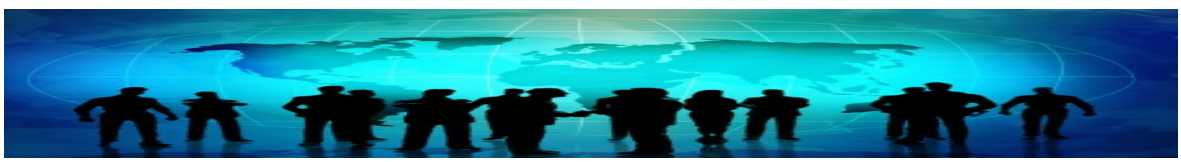
The goal and solution

The goal: To deliver wireless services in a highly reliable wireless network throughout the healthcare facility.

The In-building Wireless Continuity Solution implements a wireless broadband network throughout a healthcare facility's building or campus. Multiple modulation protocols utilize a common backbone network to transport voice and data information to remote areas to enhance coverage. This design enables the wireless infrastructure to support numerous wireless technologies simultaneously.

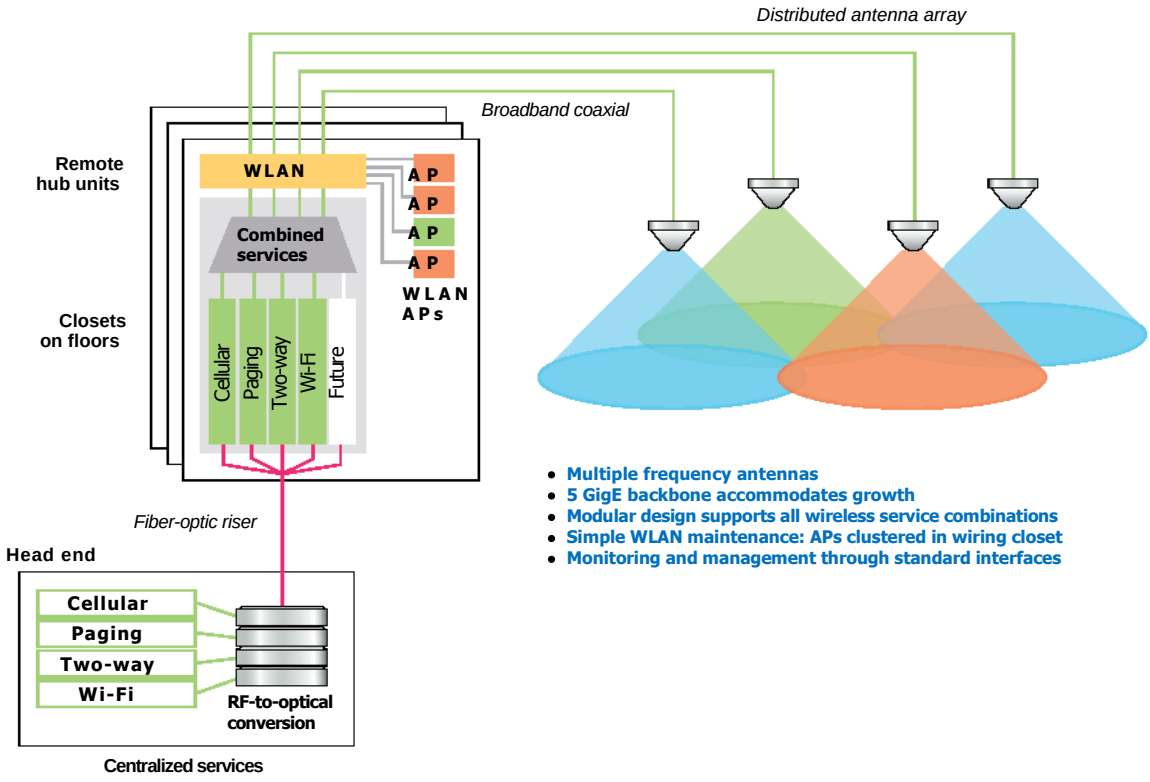
A properly implemented indoor wireless solution covers two prime kinds of wireless communication:

- Extended in-building coverage for public networks such as cellular voice, Third Generation/ Fourth Generation (3G/4G) data, public safety radio and pagers
- Consolidated internal Wi-Fi networks for IP wireless LAN (WLAN) functionality



A typical installation includes a centralized services area, commonly in the basement of the facility, where various services are converted from RF to optical (see Figure 1). From the services area, optical fiber pairs are routed to intermediate data closets that are located in each of the remote service areas, such as a floor or an outlying building. In the data closet, the optical signal is converted back to RF and then routed through coaxial cable to the antenna system.

Figure 1. In-building Wireless Continuity Solution: Sample architecture



Source: Mobile Access

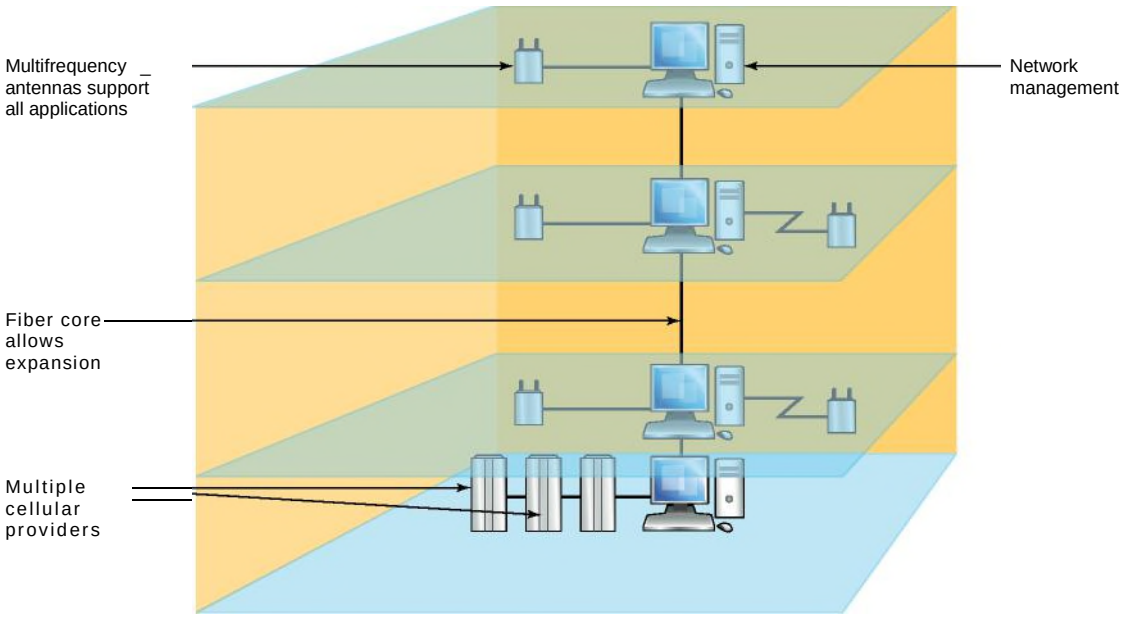
Unlike copper runs, there is little signal loss in optical transmission media, which allows new service areas and devices to be easily added. In traditional wireless infrastructures, adding a new device, antenna or cable run can throw off the balance of an entire system, necessitating substantial engineering to correct the problem.

PVA engineers a DAS: A distributed antenna array, specific to each section that simultaneously works on all applicable frequencies. PVA is capable of optimizing designs for active antennas, passive antennas and “leaky” coax solutions. Many healthcare facility environments require active antenna arrays to minimize RF interference with medical devices. Passive arrays suffer from signal attenuation across cabling runs, and this attenuation is compensated for by increasing power output and adding more antennas. The result is increased cost and RF interference. Properly engineered active antenna arrays do not exhibit these problems.

WLAN access points are also able to be centralized in the intermediate data closet. The centralization of WLAN access points greatly simplifies management, making it unnecessary to open the ceiling to add an access point — often a potentially costly prospect in older buildings with sealed asbestos areas. The common architecture of the In-building Wireless Continuity Solution is shown in Figure 2.

In North America, a broadband wireless implementation typically includes support for 610 MHz, 800 MHz, 850 MHz, 1900 MHz, 2400 MHz and 5700 MHz bands. The full implementation simultaneously facilitates WMTS (GE®), iDEN, SMR, analog cellular, CDMA, TDMA, GSM, UMTS, EVDO, IEEE 802.11b, IEEE 802.11g and other technologies on a common infrastructure.

Figure 2. In-building Wireless Continuity Solution: Common architecture



Source: Mobile Access

Extending cellular coverage

To extend cellular, 3G data or paging networks into a building, a base station is added for each associated service provider. Service providers usually connect the base station into their networks using a T1 line. Native mode RF for multiple providers is supported simultaneously by the backbone and antenna system. Native mode means that if a customer uses a Code Division Multiple Access (CDMA) phone for accessing their cellular service, the same CDMA service is provided throughout the In-building Wireless Continuity system. It is also possible to keep the signals from competitive carriers segregated through the backbone if there are contractual obligations to do so.

Consolidating Wi-Fi networks

A WLAN can utilize the same antenna and infrastructure system. The access points and networking equipment are centrally located in the data closets, and the bandwidth of the infrastructure easily accommodates multiple channels. Using this capability, it is possible to deploy a secured WLAN that is only accessible by appropriate staff, a separate channel dedicated to patient telemetry, and a publicly accessible WLAN that provides Internet connectivity in patient rooms and visitor lounges.

The In-building Wireless Continuity network is easily expandable and provides uniform, high-performance wireless services throughout the healthcare facility. Services and coverage areas are modularly implemented with fiber optics, greatly simplifying growth. The infrastructure is managed by a single framework, simplifying operations and reducing the associated expenses. These benefits are all under the control of the healthcare facility.

After it has been implemented, the In-building Wireless Continuity Solution is ready to accommodate all wireless applications. The healthcare facility is able to keep up with the state-of-the-art services required by today's physicians, utilize personnel and assets more efficiently, improve the patient experience, and provide the best care available from a modern medical facility. In addition, the solution expands with the facility.

Solution integration and customization

PVA, as a Certified Alcatel-Lucent Business Partner, provides a complete range of professional services to manage the full life cycle of a project. Services and products are identified to address the specific requirements and circumstances of each customer. PVA is accountable for all phases of design, project management, implementation and, where required, operation. All projects begin with a planning phase.

Solution planning and design

PVA provides the associated control and management plans and designs to meet the specified quality of service. This includes:

- Interviewing stakeholders and documenting requirements
- Analyzing in-building RF coverage, capacity and performance requirements
- Planning the design approach for providing in-building coverage
- Planning in-building DAS architectures for coverage and capacity requirements
- Planning an in-building system to meet performance requirements and limit the performance interference of outdoor macro networks
- Selecting appropriate DAS vendor(s) and components
- Specifying DAS design requirements and test plans
- Developing the final deployment plan for the DAS solution
- Designing the monitoring and management solution
- Designing the testing and validation plan

Solution project management

In line with corporate practices and the international methodology defined by the Project Management Institute (PMI®), PVA incorporates tools and resources and assigns a general project manager to the project office to:

- Oversee all phases of the project plan
- Maintain the project schedule
- Manage the scope of work, responsibilities and interdependencies
- Manage all participants, including third parties
- Guarantee end-to-end network performance
- Ensure quality of work in a healthcare environment — amid strict regulations and requirements concerning infection control
- Complete timely reporting and documentation
- Oversee risk management and risk mitigation plans
- Manage procurement and sourcing management
- Ensure successful turnover

Services for healthcare facilities

Our portfolio of services for healthcare facilities spans all aspects of planning, implementing, managing and maintaining secure, multivendor networks. Our primary practice areas include packages that focus on:

- RF assessment of an existing healthcare facility to identify gaps in wireless coverage and provide the facility manager with plans for addressing these gaps
- Mobility and wireless networks and application integration
- Outsourced operations, including security, management and maintenance
- Optimization services, including assessment and planning for emergency preparedness
- Consolidation of networks and services for merged entities

PVA is able to serve a healthcare facility's needs for in-building wireless continuity with a solution that delivers excellent wireless coverage for healthcare clinicians, patients and visitors.

Acronyms

3G	Third Generation wireless technology
4G	Fourth Generation wireless technology
AP	application processor
CDMA	Code Division Multiple Access
DAS	Distributed Antenna System
EVDO	Evolution Data Optimized
GE	General Electric
GSM	Global System for Mobile Communications
iDEN	Integrated Digital Enhanced Network
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
LAN	local area network
PMI	Project Management Institute
RF	radio frequency
RFID	RF identification
SMR	Specialized Mobile Radio
TDMA	Time Division Multiple Access
UMTS	Universal Mobile Telecommunications System
Wi-Fi®	Wireless Fidelity
WLAN	wireless LAN
WMTS	Wireless Medical Telemetry Service