Mobile Government Transformation with Next-Generation Cisco Outdoor Wireless Solution

Many public sector agencies around the world are facing the challenge to provide improved services to their citizens while operating with limited resources. Citizens today expect to be able to access public services in ways that are convenient to them without having to spend a lot of time making multiple visits to different offices and filling out a lot of paperwork. One of the ways to meet these new requirements is to transform how local government operates and to deliver new types of e-services. With next-generation wireless broadband technology, local government can build the network infrastructure to deliver mobile applications, as well as better communications and services, serving their citizens with greater speed and effectiveness while significantly lowering their operational costs.

This paper explores how the next-generation Cisco® Outdoor Wireless Networking solution is leading the wireless industry in providing affordable, secure, scalable, and easily managed wireless networks. As a result, government and public safety agencies can extend their communications beyond the physical network without compromising quality or security. A properly designed and configured wireless network can allow government agencies to easily manage and deploy applications for their mobile workers to meet challenges such as secure data access, collaboration, and communication with their peers.

A New Era of Outdoor Wireless Deployments

Wireless broadband technology enables flexible, mobile, and dynamic communications, so that information can be more easily shared and services performed more efficiently. Government and public safety agencies around the world are deploying the Cisco Outdoor Wireless Networking solution to enhance public safety and services.

For example, in the City of Cleveland, Ohio, an outdoor wireless mesh network provides government agencies with a cost-effective means of sharing information and resources, to allow their citizens access to public-information databases. The wireless network enables the government to efficiently integrate the network in selected city areas with the local university campus, allowing students and public sector workers to access their network as they roam within the community.

In the City of El Paso, Texas, the city inspectors and police officers use wireless technology to access department databases for information to conduct their daily field assignments. With this solution, the inspectors can shorten their commute time between job sites and increase their responsiveness to public service requests. The police officers are able to spend more time in the field by downloading documents and doing paperwork at secured hotspots throughout the city.

These are just a few examples of how city officials are leading the way into a new era of communications, using the Cisco Outdoor Wireless Networking solution to improve public services and enhance the public safety and the well-being of their citizens.

The Driver: Enabling Applications for a Better Community

Local government and public safety agencies are looking at ways to better manage their resources and to improve productivity, public safety, and service delivery in their communities (Figure 1). Some agencies are extending existing applications running internally on their wired network infrastructure to the field using Cisco Outdoor Wireless & Mobile Networking solutions. These solutions give government employees access to business-critical and time-sensitive information—information that can be used to better serve the public.

Figure 1. Applications Available with the Cisco Outdoor Wireless Networking Solution

City officials and first responders have traditionally used wireless communications to exchange information with each other, but their outdated communications tools are too slow to support more sophisticated applications. Now many agencies are enhancing and complementing these systems with the Cisco Outdoor Wireless Networking solution based on the IEEE 802.11 standard, making it possible to store and retrieve data at far greater speeds. In doing so, they not only increase the

performance and availability of existing text-based applications, but also enable entirely new ones, such as traffic signal management, parking enforcement control, automated meter reading, location-based services, land management, digital tourism and much more.

As a result, local government and public safety employees can make faster, more informed decisions and are better able to manage their resources. By avoiding the need to transfer data between department servers and vehicle computers, they can also save considerable time filing reports and taking care of other administrative tasks.

In one city on the east coast, police officers use the Wi-Fi hotspots downtown and in city parks and school areas to file paperwork, download license plate alerts, and upload captured license plate data from their license plate recognition system. They can also view and monitor video images of all the surveillance cameras placed in strategic city locations on their police laptops. The images are pulled down from the network at the hotspot location and streamed to the Cisco 3200 Series Wireless and Mobile Router in the police car. With so many tools at their disposal, law enforcement can be much more self-reliant, easing the burden on dispatchers and other support staff.

In another scenario, a police officer using a digital camera and a handheld scanner can capture suspect mug shots and fingerprints at the point of arrest. The information can then be transmitted from the officer's vehicle back to headquarters over a Cisco outdoor wireless network, and then automatically cross-referenced with regional, state, and federal databases.

Without this technology, a suspect typically would be transported back to headquarters to be photographed and fingerprinted by police technicians, who would then manually enter the results into relevant databases.

In addition to saving time and effort, a Cisco wireless LAN enables the officer to conduct a real-time database query on the suspect, comparing the fingerprints against thousands of others on file. This not only verifies the suspect's identity, but could potentially lead to a match with prints from an unsolved case.

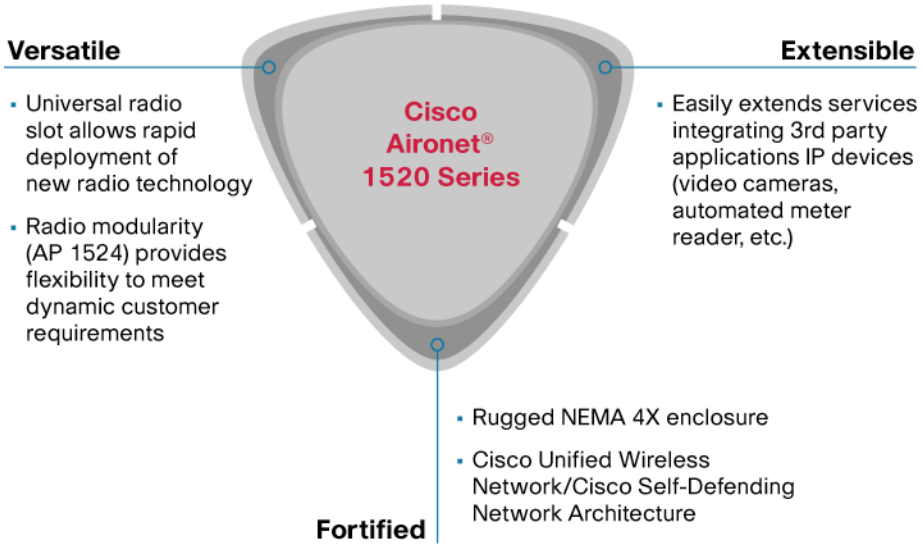
Some of the most exciting applications for high-speed wireless LANs involve the ability to send and receive live video feeds. These days, most videos are converted on the Internet protocol that defines how information is passed between systems via the network. It can be used to remotely monitor public areas and to gain insight into rapidly developing or escalating situations.

The Solution: Next-Generation Wireless Mesh Deployment for a Versatile and Flexible Outdoor Network

The cornerstone of the Cisco Outdoor Wireless Networking solution is a high-speed wireless broadband network infrastructure providing wide area hot spots and hot zones coverage.

The next-generation Cisco Aironet® 1520 Series wireless broadband platform (Figure 2) is a key component of the Cisco Unified Wireless Network and Cisco Outdoor Wireless Networking solution, providing connectivity with other Cisco mesh access points to form an outdoor wireless mesh network. This versatile platform makes it easy to integrate additional radios in order to meet network and application requirements. The platform provides flexibility and speedy deployment of new applications by allowing the wireless infrastructure to extend services to third-party devices such as video cameras, automated meter readers, and sensors.

Figure 2. The Cisco Aironet 1520 Series Wireless Broadband Platform



The unified wireless architecture centralizes critical functions of the wireless LAN to provide scalable management, advanced security, and mobility services. The Cisco Aironet 1520 Series is managed and monitored by Cisco wireless LAN controllers and the Cisco Wireless Control System (WCS). It supports zero-touch configuration, allowing mesh access points to be easily deployed and automatically configured once they are connected to the network. Radio resource management is implemented to allow the mesh access point to continuously monitor the surrounding airwaves and take corrective actions when there is radio frequency interference on the mesh access point. The Cisco Aironet 1520 Series is based on an intelligent wireless routing protocol called the Adaptive Wireless Path Protocol (AWPP), which it enables an access point to dynamically optimize the best route to the connected network within the mesh, and reroute to bypass failed and troubled links to help ensure high network capacity.

Multiple uplink connectivity—such as Gigabit Ethernet, fiber and cable, and various AC, DC, and cable power options—allows the Cisco Aironet 1520 Series to be deployable almost anywhere in outdoor locations.

Benefits

The main benefits of the Cisco Aironet 1520 Series are:

- **Lower total cost of ownership:** Centralize configuration and management reduce complexity and cost of managing and deploying the wireless mesh network. Having a single network infrastructure for multi-purpose (public access and government) usage reduce capex and opex for the network operator
- **Improved access and backhaul connectivity:** The Cisco solution provides integrated dual- and multi-radio support for 802.11a and 802.11b/g radios.
- **Enhanced security:** The Cisco Aironet 1520 Series supports 802.11i, Wi-Fi Protected Access (WPA), WPA2, and Advanced Encryption Standard (AES) for a secured wireless network.
- **Improved radio performance:** 802.11g Maximal Ratio Combining (MRC) technology maximizes radio receive sensitivity.
- **Increased reliability and availability:** The 1520 Series provides a rugged enclosure design for extreme weather, hazardous environments, and improved field maintenance for ease and speed of repair.

- **Easy application deployment:** The 1520 Series supports Power-over-Ethernet (PoE) port to allow applications and solutions to be deployed quickly and efficiently on the wireless mesh network.
- **Improved integration into urban landscape:** The small form factor and paintable enclosure make it easy to match decor of buildings and surrounding environments.

For government agencies, the Cisco outdoor wireless network will be used to extend the city's existing network to the roadside. The benefits of this secure, intelligent, information network are extended to mobile employees on the street. Employees will be able to have access to all their enterprise applications and can seamlessly roam on the network as they travel to different parts of the city.

Unlike public hotspots—which are often located in airports, hotel lobbies, and coffee shops as a convenience for visitors with a wireless-enabled computer or device to access the Internet—the intelligent network corridors or wireless hot zones can be deployed for multi-purpose usage. The same infrastructure can be used to provide separate wireless infrastructure for both citizens and public sector employees. Separate virtual LAN (VLAN) or Service Set Identifiers (SSID) can be assigned to different user groups so they can access their own network. Public sector users in the United States can also access a wireless network dedicated only for public safety use. The licensed wireless technology is based on 4.9GHz which provides mission critical communications without interference from citizen wireless networks.

For many communities, one of the attractive features of Cisco Aironet 1520 Series wireless mesh solution is the scalable fashion in which it can be deployed, starting with the establishment of hotspots around city hall and police stations, and selected city streets, such as streets near the central business district. Later on, communities can expand the wireless network to other areas, including more city streets, public transit terminals, schools, fire stations, libraries, and parks as resources become available or requirements grow.

The Cisco Mobile Network: Enabling real-time communications for Public Safety & Transit Organizations

Public-safety and transit agencies can extend their office to remote employees by equipping their vehicle fleets with Cisco 3200 Wireless and Mobile Routers. These rugged, compact devices make it possible to maintain secure network connections as the vehicles move from one hotspot to the next, avoiding the need to re-authenticate users each time they come within range of another access point.

The Cisco 3200 Wireless and Mobile Router is a wireless agnostic platform which enables the vehicle network to take advantage of multiple wireless connections including WiFi, 4.9GHz, cellular and satellite networks. The vehicle manages an uninterrupted connection for the client devices in the vehicle network.

For public safety & transit agencies, wireless networks help enable rapid and efficient communications with command centers. Wireless technology can be used to gather and distribute vehicle telemetry data, such as passenger load, route changes, and revenue-collection information.

The Wi-Fi infrastructure provides a means of delivering mission critical communications from a mobile network on board a bus, train, or first responder vehicle to a central command center. The Cisco 3200 Wireless & Mobile Router leverages the Cisco 1520 outdoor wireless mesh to provide

broadband communications to and from the mobile network. Municipal workers are now empowered to communicate in real-time to command centers for day-to-day operations or emergency situations. Together, The Cisco outdoor wireless and mobile network solutions provide transit agencies with a foundation for offering new services that benefit customers and generate additional revenue.

A Secure, High-Availability Mesh Network

With recent increased terrorism and emergency alerts since 9/11, government agencies have placed a tremendous amount of focus on having a secure, high- performance, and highly reliable network. The goal of this new focus is to help ensure that law enforcement personnel will always be able to communicate with each other in times of emergency.

The Cisco Outdoor Wireless Networking solution allows organizations to build secure, high-availability wired and wireless LANs with fault-tolerant configurations. With redundant and self-healing capability implemented in the mesh network, the outdoor wireless network can have backup access points that will immediately take over in the rare event that a primary access point fails. The mesh network self-heals itself by rerouting traffic away from the failed access point.

For downtown areas where there are many users using the network, government agencies may wish to deploy additional access points to balance out the data traffic going into the existing access points. The load-balancing features of Cisco Aironet solutions can be utilized to help ensure that the different access points work as a system, evenly distributing bandwidth among the various users and optimizing performance in real time.

Cisco Integrated Security Systems and Cisco Secure Wireless offer the most comprehensive set of feature-rich security services—security services that can be flexibly deployed with the Cisco Outdoor Wireless Networking solution. The Cisco Secure Wireless offers wireless LAN authentication and encryption features, closely paralleling the security services in a wired LAN.

Cisco Aironet solutions support all IEEE802.11i, WPA, and WPA2 security schemes. They provide a strong security mechanism for protecting wireless network. The wireless mesh platform also uses AES encryption to protect data transmitting on the backhaul so that information are securely sent over the airwave.

In addition, X.509 certificates is used to prevent rogue access point from joining the network. The network administrator will have a list of all the X.509 certificates of mesh access points that are allowed to be on the network. Any access points with X.509 certificate that does not match the ones granted by the network adminstrator will not be allowed to join the network.

For users looking to provide a seamless security framework between radio networks, an added layer of security can be achieved through the use of virtual private network (VPN) solutions. Cisco VPN solutions meet the highest security requirement of the federal government, providing strong triple Data Encryption Standard (DES) encryption and authentication through digital certificates, one-time password tokens, and pre-shared keys to further protect sensitive information transmitted over wireless networks.

A recognized leader in network security issues and solutions, Cisco believes that no single point of defense can guarantee data privacy and protection; for true network security, an end-to-end approach is required across both the wired and wireless LAN, from the network core to the network edge.

Summary

Many municipalities are now working on plans to implement a city Wi-Fi infrastructure to enable applications for their local government and public safety personnel. Public sector agencies with outdoor wireless deployments have already experienced significant improvements in users productivity and operation efficiency. Some of these cities are already expanding their existing wireless network to a broader coverage area to extend the benefits of wireless to the rest of the community.

The Cisco Outdoor Wireless Networking solution offers municipalities a cost- effective, secure, and scalable way to deploy a wireless broadband network. It is simple to deploy and easy to manage, combining a superior access network and back-end systems that allow municipalities and service providers to meet the demand for broadband services for many years to come.

Comprehensive Solutions to Support a Wide Range of Wireless Needs

Cisco Aironet 1520 Series wireless broadband platform provides a high-performance and feature-rich solution for deploying an outdoor wireless network in a metropolitan area. Designed to be a cost-effective, secure, and scalable outdoor wireless network, it is engineered specifically for harsh outdoor environments that require an extended operating temperature range. It supports the IEEE 802.11a and 802.11b/g frequency bands with various uplink connectivity options. It offers radio versatility and allows easy integration to third-party IP devices such as cameras and network sensors. Optional external antennas are supported for flexibility in deployment.

For the Cisco Aironet 1520 Series data sheet, visit:
http://www.cisco.com/en/US/prod/collateral/wireless/ps5679/ps8368/product_data_sheet0900aecd8066a16c.html

Cisco 3200 Series Wireless and Mobile Router is the foundation of Cisco Mobile Network solutions. The Cisco 3200 Series creates an IP network for the vehicle, enabling secure voice, video, and data communications with a network operations center. The vehicle network maintains seamless connectivity while stationary or in motion.

For a Cisco 3200 Series Mobile Access Router data sheet, visit:
http://www.cisco.com/en/US/products/hw/routers/ps272/products_data_sheets_list.html

Cisco wireless LAN controllers work in conjunction with Cisco Aironet lightweight access points and the Cisco Wireless Control System (WCS) to provide systemwide wireless LAN functions for medium-sized to large-sized networks. As components of the Cisco Unified Wireless Network, the Cisco Wireless LAN Controller provides network administrators with the visibility and control necessary to effectively and securely manage business-class WLANs and mobility services, such as enhanced security, voice, guest access, and location services.

For the Cisco 2106 Wireless LAN Controller data sheet, visit:
http://www.cisco.com/application/pdf/en/us/guest/products/ps7221/c1650/cdccont_0900aecd805aaab9.pdf

For the Cisco 4400 Series Wireless LAN Controller data sheet, visit:
http://www.cisco.com/application/pdf/en/us/guest/products/ps6307/c1650/cdccont_0900aecd802570b0.pdf

For the Cisco Catalyst® 6500 Wireless Integrated Service Module data sheet, visit:

http://www.cisco.com/application/pdf/en/us/guest/products/ps6526/c1650/cdccont_0900aecd80364340.pdf

Cisco Wireless Control System (WCS) delivers an aggregated platform for enhanced scalability, manageability, and visibility of large-scale implementations of the Cisco Unified Wireless Network. This powerful, software-based solution gives network administrators cost-effective, easy access to information from multiple, geographically diverse Cisco WCS management platforms.

For the Cisco Wireless Control System Network Management data sheet, visit:
http://www.cisco.com/application/pdf/en/us/guest/products/ps7305/c1650/cdccont_0900aecd80633649.pdf

Cisco Service and Support

From initial installation to future upgrades, Cisco makes it easy for public and government agencies to complement their existing communications systems with secure, reliable, high-speed wireless LANs. Deployment assistance is available through Cisco Total Implementation Solutions, and extended technical support is offered through Cisco SMARTnet® support and Cisco SMARTnet Onsite service programs. For municipalities that require advanced deployment, design, and integration services, Cisco has a variety of partners with the expertise to assist in all phases of the process, including:

- Site surveys
- Coverage mapping
- Hotspot design and deployment
- Wireless bridge installations
- 700-MHz, 2.4-GHz, and 5-GHz systems integration
- Mobile device installation and configuration
- Training and support
- System certification

For information on how to get started, visit: http://www.cisco.com

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