Cisco Mobile Network Solutions for Commercial Transit Agencies

Overview

Commercial transit agencies provide a vital service to our communities. Their goal is to provide safe, affordable, and convenient transportation to the general public. Transit agencies continually strive to find new ways to increase ridership, offer greater passenger safety, and new passenger services to enhance the public transit experience. In spite of these important objectives, transit agencies must find creative ways to achieve these objectives in spite of limited or decreasing budgets. According to the Federal Transit Agency, only 40 percent of operating costs are covered from passenger fare revenues. Agencies must find creative ways to offer new services and passenger safety using the same or fewer resources available to them.

Addressing Communication Challenges In Transit Agencies

Passenger Safety

Providing a secure and safe rider experience is a top priority for transit agencies. Transit agencies and first responders must cooperate to respond immediately to emergency situations. Today, traffic accidents, passenger and pedestrian injury, or criminal activity on public transit facilities are reported using limited communication systems between mobile transit employees and a central command center. Transit employees have limited situational awareness to respond appropriately to an incident.

To respond more effectively to life threatening events, transit agencies are looking for new ways to facilitate communications between bus and train fleets and command centers. With limited budgets, agencies must find ways to extract greater value from existing communications infrastructure such as video surveillance cameras and GPS.

Operational Efficiency

Transit agencies are continually looking for ways to improve their operational efficiency. One way agencies look to improve operational efficiency is by managing operating expenses. Operational expenses are easier to manage when maintence is predictable. Transit agencies must find ways to enable proactive maintenance of their mobile fleets to anticipate when maintenance is required. Providing a vehicle communications platform that securely transmits train or bus telemetry enables transit agencies to maximize fleet utilization, and anticipate maintenance.

Operating an efficient fleet of buses or trains delivers more reliable service to customers, and in turn generates greater passenger ridership. Furthermore, an efficient fleet translates into cost savings which can be passed on to passengers in the form of affordable fares.

Reliable Service

Passengers want to use public transit if they know it will provide a reliable and more efficient way to travel. A fundamental goal of transit agencies is to offer a predictable service where passengers can rely on the bus or train being on time. Transit agencies are looking for a reliable mobile communications infrastructure that provides customers with accurate bus or train reports while at home or at the bus/train station. These new services drive customer loyalty and increase ridership and revenue.

Passenger Amenities

To maintain or grow passenger ridership, transit agencies must find new ways to deliver services to passengers that will make their trip more convenient and informative. Providing services such as smart card payment, passenger Internet access, and digital signage provide passengers with real-time access to information during their travels. Providing a communications infrastructure in the bus or train capable transferring secure, real-time voice, video, and data communications enables new opportunities for transit agencies to deliver value-added services to their customer base.

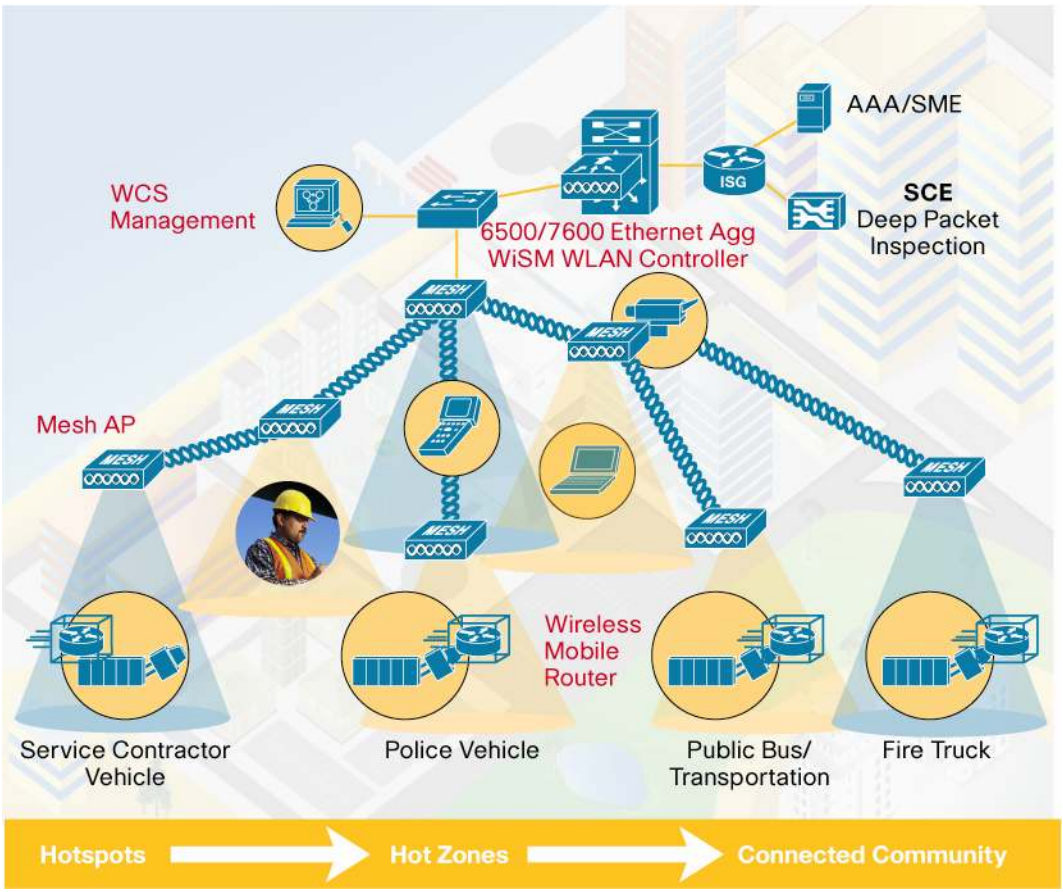
Cisco Outdoor Wireless Network Solutions

The Cisco® Outdoor Wireless Network Solutions use wireless mesh technology, wireless bridging, and mobile networks to allow government, public safety, and transportation organizations to build cost-effective outdoor wireless networks for private or public use. These technologies are designed to provide secure, high-bandwidth, and scalable solutions to enable access to fixed and mobile applications across metropolitan areas.

The Cisco Wireless Network is a wireless mesh solution that is easy to deploy, operate, and manage across a large metropolitan region. Solutions can be deployed in the city infrastructure at government and public buildings, along streets on lamp posts, and at intersections on traffic signal control systems.

Figure 1 shows a metropolitan mesh deployment providing secure, broadband wireless access for public safety, transit agencies, municipalities, and public wireless LAN users. The mesh network offers public safety organizations secure, licensed, 4.9-GHz broadband communications for transmitting rich multimedia applications. The Cisco 3200 Series Rugged Integrated Service Router (ISR) deployed in transit bus, trains, or first responder vehicles use the outdoor mesh network as a wireless connection to other vehicles or headquarters. In addition to utilizing the mesh network, The Cisco 3200 can also connect to other wireless networks including cellular, satellite, and other narrowband networks.

Figure 1. Cisco Outdoor Wireless Network Solution for Transit and Public Safety



Cisco Mobile Network Solutions

Cisco offers a mobile networking platform that addresses the communications challenges for transportation agencies. Transit agencies require a network communications infrastructure that can securely transport rich multimedia applications to and from mobile fleets. Buses and trains become a network extension to headquarters, offering access to network resources that were once available only when at headquarters. By creating an “office in a vehicle”, the transit fleet operators can make better decisions more quickly using network resources in real time.

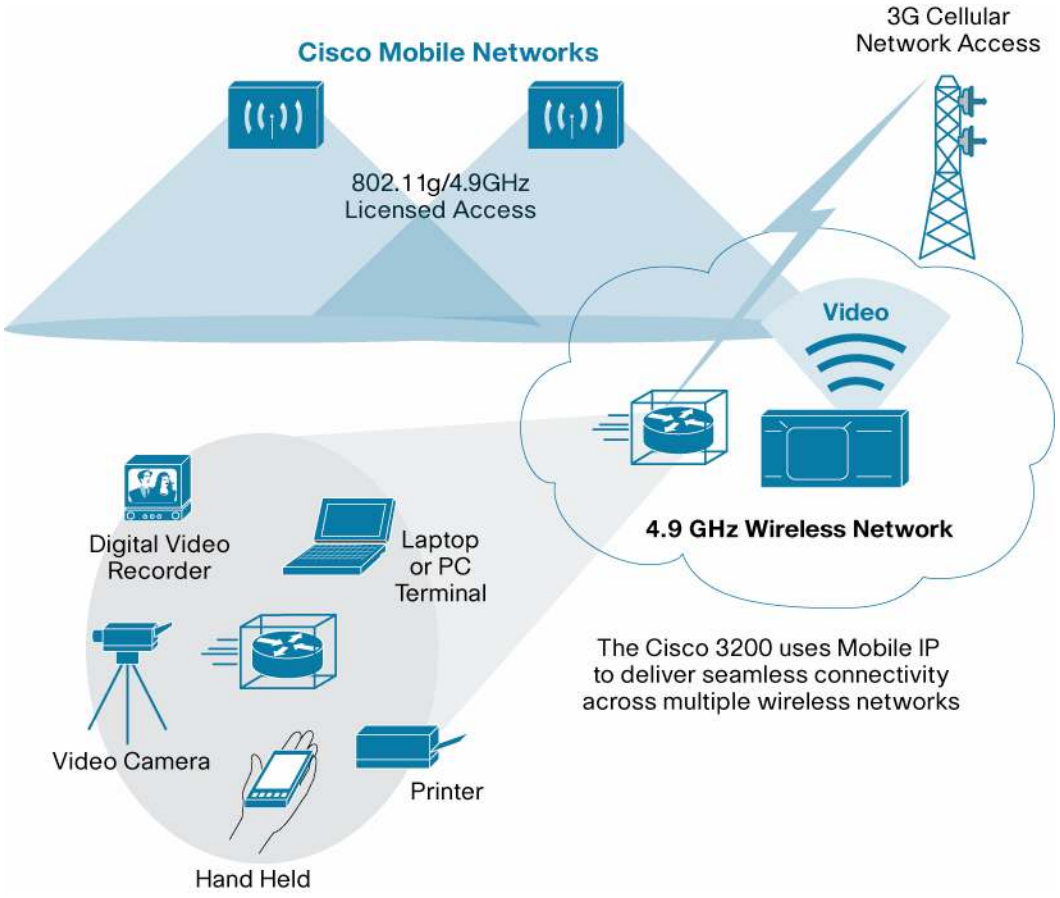
The cornerstone of the Cisco Mobile Network is the Cisco 3200 Series Rugged ISR (Cisco 3200). The Cisco 3200 is a fully functional Cisco IOS router in a ruggedized enclosure that is mounted in a bus or train and can be customized to support a variety of applications and multiple networks (Figure 2). The router comprises multiple mobile interface cards that comply with the industry-standard PC/104+ form factor. Cisco standardized its component design on the PC/104+ form factor to encourage third-party component vendors to build modules that could work in conjunction with the Cisco 3200.

Figure 2. Cisco 3200 Series Rugged ISRs

The Cisco 3200 has a modular design that includes expansion slots that accept a variety of PC/104+ components such as video encoder cards, 3G modems, and GPS. Support for different types of wide-area wireless connections include network connections such as General Packet Radio Service (GPRS), evolution-data optimized (EVDO), high-speed downlink packet access (HSDPA), satellite, 802.11a/b/g, and licensed 4.9-GHz connections for public safety use.

The Cisco 3200 also includes multiple LAN connections. Figure 3 shows a number of client devices that can be connected to the Cisco 3200 mobile router which forms the mobile network. Using its integrated Ethernet switch, 802.11b/g, and 4.9-GHz access points, the Cisco 3200 creates a wired network within the vehicle and a wireless network in and around the vehicle to support mobile clients. The components are packaged together in a single, rugged enclosure available from Cisco. The Cisco 3200 connects in-car video cameras using a video encoder card that stores video traffic locally or sends the video streams over IP multi-cast for real-time evidentiary purposes.

Figure 3. Cisco Mobile Network Solution for Commercial Transit Agencies



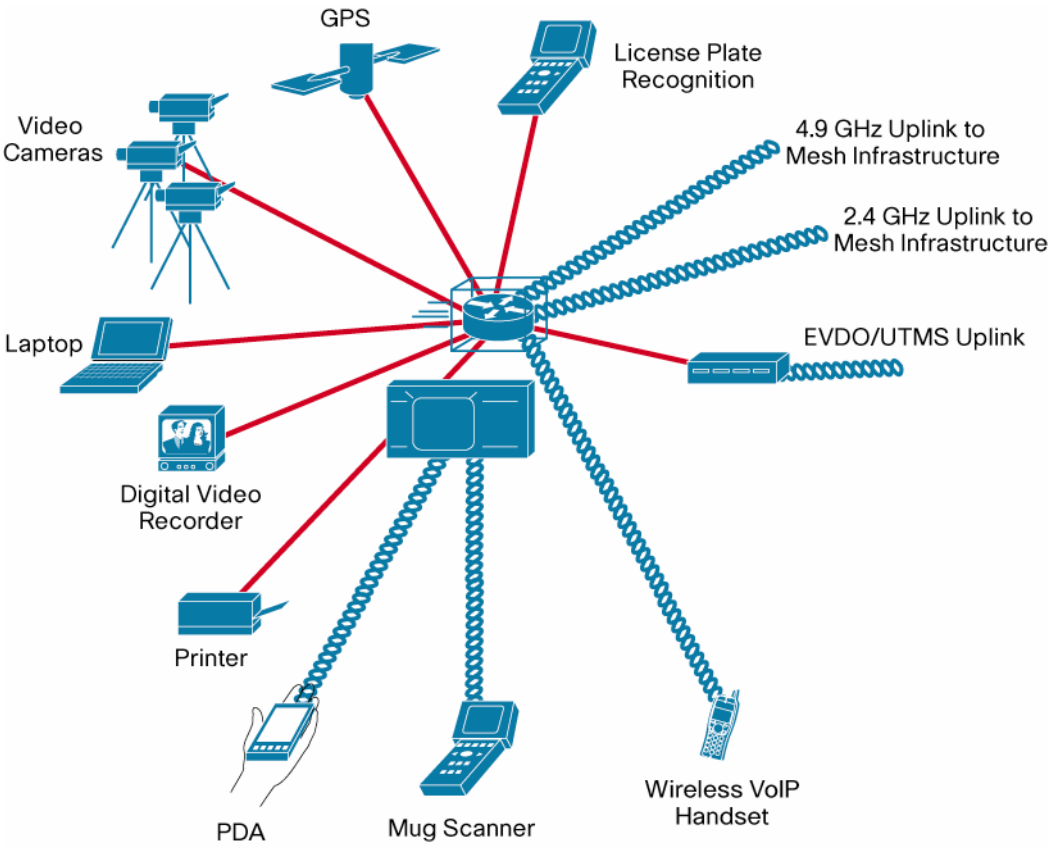
The Cisco 3200 provides transparent mobility for networked devices in the bus or train. The router supports standards-based Mobile IP, allowing the vehicle network to roam across more than one wireless network while remaining seamlessly connected.

The Cisco 3200 aggregates multiple networked devices in the vehicle and keeps them connected to the main agency network across different wireless links while the vehicle is in motion or parked at the scene of an incident. Effectively, the router extends the main agency network into the bus or train. The applications running on client devices in the bus or train operate the same way as they do when attached directly to the wired network at headquarters.

In addition to seamless mobility, ensuring a secure network connection is critical for emergency response in the event of an incident. The mobile network can provide instantaneous communications to command center operations using voice over IP, video, or data communications. Like other Cisco routers, The Cisco 3200 runs Cisco IOS® Software, which provides integrated network security features, including authorization and authentication, stateful firewall, intrusion detection, and VPNs, allowing transit agencies to manage security policies to the mobile devices in the vehicle using the same management tools they run at headquarters.

Figure 4 shows the type of network devices deployed in a transit vehicle. The Cisco 3200 is the network platform for managing security policies, access, and device management for clients connected to the mobile network.

Figure 4. The Cisco 3200 Aggregates Multiple Wide-Area Connections for Multiple Devices in a Bus

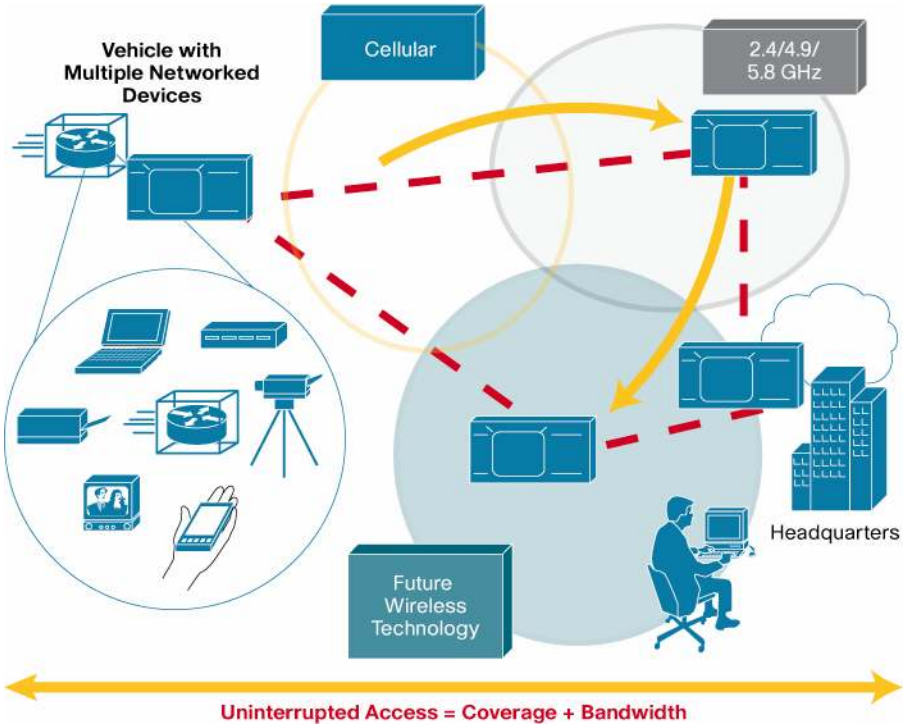


Mobile Network Benefits

Benefits of the Cisco Mobile Network architecture include:

- **Wireless broadband integration:** The Cisco 3200 Series Rugged ISR support 802.11a/b/g, licensed 4.9 GHz, third-generation (3G) cellular, and satellite networks that provide high-bandwidth connections capable of supporting the quality of service required for multimedia public safety applications.
- **Network security:** The Cisco 3200 provides a secure extension of the agency network into the field. It implements end-to-end wireless and IP security, including authentication, confidentiality, intrusion detection, and VPNs. Common security policies between headquarters and vehicles reduce the need for managing and maintaining new network components.
- **Redundant networks:** Wireless broadband technologies such as 802.11b/g (Wi-Fi) or 4.9-GHz public safety networks support high data rates that are suitable for streaming video and transferring high-resolution images from a bus or train. However, ubiquitous coverage is not always available, so many agencies augment WiFi networks with cellular data service in order to maintain connectivity anywhere within their jurisdiction. As the vehicle moves around, the Cisco 3200 maintains a connection to the headquarters network through the best possible wireless link. Figure 5 illustrates how the Cisco 3200 keeps the vehicle connected to the main network as it switches from one wireless technology to another. The Cisco 3200 maintains an always-on, continuous connection with the main agency network regardless of location.

Figure 5. The Cisco 3200 Keeps the Bus Connected as It Transitions from One Coverage Area to Another.



- **Network coverage:** The Cisco 3200 Wi-Fi and 4.9-GHz radios are high-powered and can be configured with roof-mounted high-gain antennas, allowing much greater wireless reception range than a laptop or personal digital assistant (PDA) with a direct connection to the citywide infrastructure. Whenever the broadband wireless is not available, the Cisco 3200 reverts to an alternative wireless technology to keep a continuous connection.
- **Smooth migration:** The Cisco 3200 provides a network platform to integrate peripheral devices onto an IP network. The network platform does not require disposing of proprietary radio handsets or use of existing narrowband networks. Public safety agencies can still use their narrowband radio networks, adding a platform to allow migration to enable broadband network applications such as real-time video.
- **Multiagency interoperability:** The Cisco 3200 provides a standards-based network infrastructure for communicating among agencies or within an agency. The vehicle node becomes the network for communicating between standards-based clients which share wide area network links.

Application Examples

Delivering Public Safety on Transit Buses and Trains

A top priority for transit agencies is the safety of their passengers and crew. As a result, transit agencies are deploying Cisco Mobile Network solutions on bus fleets and in transit police vehicles to provide on demand network communications in the event of an emergency on buses or trains. Video cameras are networked to the Cisco 3200 Series, forming a local area network inside the bus or train. Transit police are able to view the video camera feeds from their lap tops in their vehicles by authenticating to the bus over secure wireless connections. The Cisco 3200 provides on demand network connections between the transit vehicle and police. Transit police gain real-time situational awareness and are equipped to make better decisions more quickly.

Delivering Passenger Services

Transit agencies are continually searching for ways to offer new services that drives increased ridership on transit buses and trains. Large metropolitan transit agencies are using the Cisco 3200 to connect bus tracker applications to provide real-time mapping of their fleet position. In addition, the transit agency has created a web application that enables its customers to view the location of the bus in order to optimize their departure time to the bus stop. The mobile network also enables additional services on board the bus such as WLAN Internet services, and location based services for passengers.

Conclusion

The Cisco Outdoor Wireless Network Solution architecture addresses many of the communications challenges facing transit agencies today. The Cisco 3200 provides a secure network platform for the bus or train, allowing agencies to deliver real-time communications for data, voice, and video applications from a moving or stationary network. With access to rich multimedia applications, transit agency officials have greater situational awareness and therefore, are equipped to make better decisions more quickly. Better decision-making leads to more secure transit experience for passengers and agency personnel.

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