



Integrian Wireless Video Communication for Transit Systems

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Transit Agencies Advancing Operational Efficiencies

Transit operators are constantly seeking new and improved ways to leverage technology for increased operational performance that improves passenger throughput, maximizes fleet uptime, increases responsiveness and reduces operational risk and waste.

With the use of on-board vehicle monitoring the role of the 'black box' has increased to include not only telemetry data but video and audio too. Capturing information about what is happening with the vehicle now also includes what is happening with the passengers and drivers. Passenger vehicles are capturing more and more digital data and agency operations are using this data to make day to day decisions. The business adage "If it can be measured, it can be managed" now holds true as all data points are reviewed.

Some of the review points that an agency may consider with collected data may include:

- Efficient routing for passenger pick up
- Passenger crowding
- More effective fuel management
- Risk Management

Data collected may include:

- Video Images
- On-board audio
- Vehicle Speed
- Vehicle Location
- Equipment Status
- Equipment Health
- On-board sensors
- Communications Traffic (Operator to Dispatch)





How much data is collected and is stored is usually dictated by how much and how quickly the data is needed for review and processing by operations. This may be months, weeks or days. In fact there may also be requirements to have instant access to data or to transmit data on a near real time or instant basis.

There are unique situations where extended data storage requirements act as a safeguard for unpredictable events that may require further investigation. A good example of this may be a passenger 'slip and fall' claim that took place weeks or a month ago and operations wants to review digital video footage. Long term on-board storage requirements would be able to provide video evidence to review this claim. In the case of video surveillance many agencies have minimum on-board data storage requirements that vary from 72 hours to 90 days. This has been determined by requirements of insurance, number of claims and ability to respond quickly to capture the data before it is automatically overwritten by the video system.

There are some standard scenarios where a data collection system can 'push' data to operations for review. These scenarios are triggered events that may be diagnostic alerts sent by on-board equipment, crash sensors, emergency panic switches and GPS violations. Systems can be configured to 'priority transmit' this data to operations for prompt review and response to minimize impact of and 'event in progress'. Data would include event type, vehicle location, and possibly images from the vehicle.

With all this data now being collected the next step is to get it off the vehicle and into operations hands for review. Data extraction could be accomplished by physically retrieving storage media from the vehicle or downloading to a data storage device. For agencies with large fleets this could be a major undertaking and require some additional staffing.

With newer advanced wireless communications technology agencies now have the option to offload data automatically or upon demand if events require. The operations control center may wish to 'dial up' a vehicle and get information for situational analysis. Emergency first response would be another reason why advance review of video or data may be needed to prevent a crisis.



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There are three main wireless video applications for mobile surveillance ...

Recorded Event Wireless Data Download

It is not efficient to attempt to wirelessly download the complete storage of a recording device. What is recommended is to data-stamp and time-bracket selected video for a particular event and then wirelessly download the data to a garage server wireless access point. Large fleets may necessitate this download from multiple garages or with large bus yards multiple access points.

Data selection may be accomplished by automatic book-marking aka 'tagging' of data from on-board sensors or triggers. Manual selection may also be an option for unpredictable events. Manual selection may be done by vehicle operator or agency supervisors and investigators. This would then be 'queued' for wireless download the next time a vehicle reaches an access point 'hot spot'.

Live Wireless Video Streaming

This application allows agencies the ability to be 'on scene' with the vehicle and receive video, and data transmissions from the vehicle. This application provides agencies and law enforcement the ability to prevent or mitigate a catastrophic event-in-progress with video & data sharing to first responders en route or on-site. This application has become popular for Homeland Security initiatives where agencies are seeking effective communication methods for increased responsiveness.

Agencies can also leverage wireless video streaming to see first hand passenger density, traffic/road conditions, or an accident or criminal activity in progress.

Wireless Video Playback or Review

Provides agency with the ability to wireless access digital video recorder to review and playback recorded video and data history. Quick access to information that happened within the last few minutes or few hours may be helpful in determining incident cause and resolving a situation.



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Types of Wireless Connectivity

The three main types of wireless connectivity are 802.11(WiFi), 802.16 (WiMax) and Cellular Broadband.

802.11g is a wireless standard currently being deployed in wireless video applications. 802.11g provides up to 54 megabits per second throughput with an optimal range of up to 300 feet. Many agencies are utilizing 802.11 for various WLAN (wireless local area network) communications because of low cost, no requirement for licensing and ease of deployment. This wireless approach can be used for all previously described wireless applications but is limited by signal range to when access points are in close proximity to vehicle.

802.16 does provide a broader reach of up to 6 miles per signal cell and a higher throughput up to 75 megabits per second. There are licensed and unlicensed frequency bands available. The most common frequency is the public safety band at 4.9 Gigahertz and is licensed. Sometimes this frequency is shared by transit for public safety initiatives related to transit passengers including vehicle or platform video camera live viewing. Many metropolitan areas are setting up a WiMax infrastructure through their respective cities. This type of setup requires more investment in equipment and a number of transmitters placed throughout the required coverage area.

Cellular broadband is usually provided by a service provider and is limited by the signal coverage that the provider has for the coverage area. Optimum throughputs are up to 700 kilobytes per second and although this is slower than 802.11 and 802.16 standards it is sufficient for wireless video sharing and data transfer.

Note that all of the above wireless standards are under constant development and standards review. Expected developments will increase signal throughput, channel density and signal reach. This means that equipment for both vehicle-side and terrestrial-side will also be advancing and changing.



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