



AirTegrity™  
AirSync™ for Public Safety





# AirTegrity™ AirSync™ for Public Safety

AirTegrity's AirSync™ is a specialized software to provision and support quality-of-service demands in complex, performance critical, wireless networks such as those found in public safety settings. AirTegrity's AirSync™ Platform and industry specific toolkits, provide an integrated set of performance management functions to ensure public safety officers get optimal network performance, when and where they need it.

## Performance Challenges in Citywide Wireless Networks

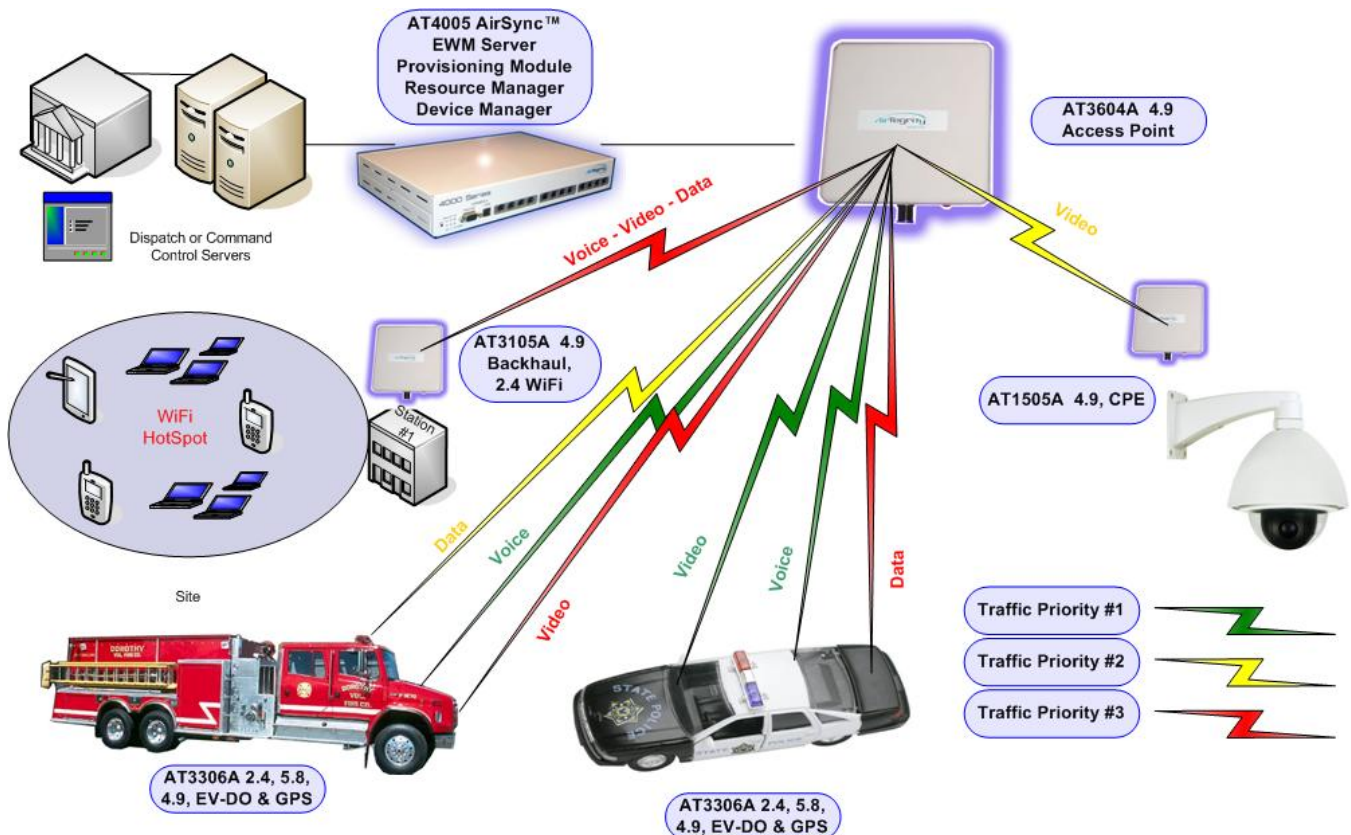
The rapid proliferation of WiFi and WiMAX technologies into citywide networks affords a vast range of opportunities for public safety users. The underlying technologies have the potential for very high throughput if properly allocated and configured. This throughput can translate into lifesaving tools for public safety officers if it can be harnessed for mission critical applications such as telemetry, video, access to critical drawings, models or command applications.

Predictable performance can enable real-time telemetry from incident-area personnel, vehicles, or other sensor assets. It can enable rich-media applications to improve situational awareness such as video surveillance, teleconferencing, real-time access to modeling, database [GIS, HAZMAT] or command applications.

Dynamic configuration and bandwidth allocation are essential ingredients to deliver quality-of-service in today's complex wireless environments. Unlike the more static "wired" network environment, the wireless network is continuously affected by external environmental factors which can significantly impact performance. Therefore, quality-of-service in these networks needs to be much more dynamic.

At any given time, the network might have to dedicate 100% of its bandwidth to a performance critical application (e.g., surveillance video in a law enforcement situation). Without a context of who the specific user is and what their current role might be, it is impossible to provide the level of specific bandwidth allocation required for predictable performance.

The diagram below shows an ad-hoc incident area network and where the software components reside.





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## The AirTegrity Solution

AirTegrity provides an integrated software platform and industry specific toolkits that utilize a unique provisioning engine which is rules and role based to ensure devices, users and applications get maximum performance from standards-based wireless networks. This functionality enhances performance by ensuring priority for essential users and devices, modification of network resources based upon problem detection, and the ability to invoke specialized protocols and algorithms best suited to specific user and service requirements.

Through a unique combination of user roles and priority merged with dynamic network optimization techniques (and controls), the Platform is uniquely differentiated in the marketplace and is essential in the management of your public safety wireless network. The industry specific toolkits couple organizational rules and business processes (e.g. NIMS) with interfaces to external systems (e.g. dispatch, command and control software) and translate these into network configurations tailored to individual users, incident teams, or command zones.

Unlike competing software, AirTegrity's AirSync enables dynamic management and control over wireless network service flows, including the ability to invoke real-time optimizations for difficult traffic types, such as VoIP, streaming video (i.e. video conferencing) and telemetry. For performance critical networks, AirTegrity provides a next generation software solution designed to maximize return on multi-use wireless network investments.

## AirSync Platform

The AirSync Platform, is a wireless network management system that fully integrates provisioning, device management and resource management. The provisioning system allows policy managers to create a custom set of service levels and rules that are then applied to users and applications. This provides an intelligent, rules-driven foundation which the device manager and resource manager leverage to provide higher throughput and predictable service levels. As a result, the Platform modifies and manages users, accounts, applications, application rules, and devices within a context and priority-based environment.

AirSync provisions wireless networks with environmental triggers that adjust access point configuration parameters in real-time to minimize interference, bumping lower priority users off the network. This technique assures mission-critical data (service flows) such as those found in public safety, healthcare, or transportation applications, to pass without delay under emergency scenarios.

Metro Wireless	Impact to Public Safety Users	AirTegrity's Solution
Predictable Bandwidth	With conflicting users, applications, & priorities, bandwidth becomes unpredictable. High-priority users squeeze-out low priority. Sensitive applications (video, telemetry) adversely impacted.	Strict SLA monitoring. Proprietary schedulers and packet boosters (specific to traffic types).
Coverage	Access points are tuned for generic coverage models which may not be optimal for public safety users, settings, or venues.	Ability to dynamically link SLA and user (service flow) monitoring to network resource configuration, changes to meet needs of priority users.
Interference (environmental, competing networks, other users)	Difficult environments suffer from multipath (bounced/degraded signals) and materials (walls) which block access. Dense network population (too many access points).	Ability to sense these factors (i.e. source of interference) and change resource configuration (access point) to optimize around interference.
Application "Co-existence"	"Heavyweight" consumers of bandwidth (video, downloads) can "crowd out" interactive applications (i.e. web or telemetry) which require predictable access.	Intelligent scheduling to ensure predictable (timely) access.
Limited Spectrum	Dense network population (too many access points, not enough throughput).	Dynamic configuration and coordination to optimize use of available spectrum.



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The Platform also has the ability to interact with external applications via bolt-on interfaces for enhanced functionality and integration with existing infrastructure. Additionally, optional billing, ticketing and reporting tools are available as an integrated package to provide a complete provisioning package when no 3rd party tools exist. The AirSync Platform is designed to integrate with leading 3rd party technology partners for security, billing, directory and visualization tools.

AirSync closely adheres to industry standards and can significantly improve performance and predictability in standards-based wireless technologies such as 802.11 and 802.16.

### Provisioning Manager

The provisioning manager defines the rules through which applications and their associated service levels and priorities are assigned to groups of users, devices and applications by creating roles. Depending on the business process requirements, service levels can be associated with companies, departments, individual employees, devices, applications residing on devices or any combination thereof.

### Resource Manager

The resource manager monitors network conditions and invokes the service level rules established in the provisioning manager to dynamically configure managed devices in real-time. This control includes traffic shaping and radio parameters on both network devices such as access points (or base stations) and the devices traversing the network. The resource manager constantly monitors the network anticipating the need to change network configurations to ensure the service levels mandated by the provisioning manager.

### Device Manager

The device manager provides the ability to manage the embedded software (images, applications, and configuration) of devices - both network devices and mobile client devices are supported. It serves both a centralized management role whereby embedded device software can be updated and controlled remotely, as well as an active part in the AirSync system by enabling dynamic changes of device parameters on-the-fly as dictated by the resource manager. This functionality has proven invaluable in public safety scenarios, where "incident" requirements and environment (i.e. interference, range) can dictate vastly different device configurations. AirSync can work around these issues thru dynamic configuration and optimization techniques to enable rich media applications on dedicated public safety devices such as vehicle gateways (MDT) and personnel wireless gateway devices (i.e. PDA, PMG).

AirSync's ability to communicate via both IP and MAC layers adds both efficiency and flexibility to the network with minimal overhead.

Feature	Functionality & Benefit
<b>Provisioning Manager</b>	
Service flow definition	Invokes optimization algorithms for each service type (VoIP, video, data and telemetry) and permits modification of each flow with priorities and bandwidth variables.
User import	Imports list of users from external system (e.g. enterprise directory, duty roster), so they can be associated with devices and roles, and then dynamically managed.
Role definition	Allows convenient association of services with conditional rules, which are grouped into a service package – associated with groups of users and devices – a powerful yet detailed administrative tool.
<b>Resource Manager</b>	
Dynamic Rules-based Provisioning	Changes the network on-the-fly based on input from external systems, such as dispatch center or command and control systems dictating role changes assigned to groups and users
Service Level Degradation	Dynamically reallocates scarce network resources in times of contention to ensure Service Flows for high priority applications and users retain high quality-of-service levels.



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Feature	Functionality & Benefit
Interference Management	Scans radio signals relevant to serviced users and optimizes throughput to high priority users and applications. Implements RF link optimization (s).
Packet Classification	Allows the system to recognize which packets are associated with which service flow (s) and user (s), and schedules these packets according to role assigned. Dynamic packet level management of network according to network conditions and external triggers is critical to predictability of network based applications.
Device Management	
Dynamic Network Control	Transparently communicates network profiles and policies to the access point and to managed wireless client devices. Securely, reliably, and quickly institutes changes in network performance in accordance to instructions from the resource manager.
AirSync Agent	Lightweight component residing on the access point or wireless device (optional) responsible for implementing changes in IP, MAC and PHY settings of the device. Also responsible for implementing patches, updates and maintenance from remote server.
Device Maintenance	Publishes updates, patches, and version upgrades to AirSync Agent and wireless device firmware automatically.
Public Safety Tool Kit	
Multimedia Control Extensions (MCX)	Client based agent to control applications, service flow (s)), and client wireless devices. Extends network control to device's radio, and internal resources to ensure network policies (driven by resource manager) are implemented to the edge of the network. Can be ported with SDK to rugged handhelds, smartphones, notebooks, and surveillance cameras.
NIMS Based Roles & Network Profiles	Allows import of NIMS based profiles to pre-populate service flows and rules. Can be modified depending on client devices deployed.
Public Safety Role Change API	A set of web services targeted at role changes as defined by NIMS first response scenarios. This allows easy integration of legacy or new dispatch and command and control systems – transparently to field personnel. Dynamically reconfigures the network to complement role changes of in field first responder team.

## AirSync for Public Safety

AirSync for Public Safety enables rapid implementations in metro-wireless public safety scenarios. The public safety toolkit includes profiles, templates, and interface tools which are architected to conform with the National Incident Management System (NIMS) structures and policies. By leveraging NIMS roles, terminology, and hierarchies, AirSync can enable expeditious network provisioning that is tailored to common roles and service requirements for 1st responder teams such as incident commanders or rescue leads.

The public safety toolkit includes profiles based on these roles, organization structures, and anticipated communications requirements. Each of the identified roles is paired with anticipated network utilization, priority levels associated with each team member/role, and device characteristics. Thus the network is capable of supporting individual participants who may have evolving incident assignments.

For example, an individual respondent may be assigned sequentially several roles (first incident commander, then operations, then containment) and each of these roles will have a different priority associated with the applications used, such as VoIP, video, GPS and chemical sensor.



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The role changes are triggered automatically by outside events, such as dispatch software or command and control software. Web services, included in the toolkit, allow these triggers to be standardized according to NIMS defined incident scenarios, dynamically and transparently allocating network resources as responsibilities change.

Finally, multimedia control extensions (MCX) extend application and network control to rugged handheld devices at the periphery of the network, managing multiple applications, personal area gateway for Bluetooth devices and rich media types access to the network in accordance with network profiles.

AirSync for Public Safety focus on ensuring 802.11 & 802.16 networks have the agility to meet the demanding and quickly shifting requirements of first responders in field settings.

### **Deployment of AirSync for Public Safety**

AirSync deployment topologies can either be in the form of ad-hoc networks with backhaul provided by vehicle-based gateways, or used in conjunction with wide-area WiFi or WiMAX coverage zones. Vehicle-based linkages use MDT's or vehicle-gateways to bridge local hotzone coverage (802.11g) networks with remote network operations centers and dispatch centers via long range (802.16) wireless networks. Alternatively, AirSync provides support to citywide coverage models (802.16) which are then bridged into 802.11g hotspots which are populated throughout high-traffic sectors. AirSync manages end-to-end performance under both topologies highlighted above.

Changes in network priority assigned to individuals are triggered by role changes according to application and network resource requirements of the NIMS role. In this example the incident commander uses a rugged notebook to assign roles to public safety personnel as they arrive on the scene of a hazardous materials incident. The wireless network responds to these role assignments and modifies application by application the network priorities associated with users.



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The chart below shows how network service flows change in accordance with role designation in the field.

Roles	0mins	5 minutes	15	30
Dispatch	{VoIP:1}, Video, Data	{VoIP:1}, Video, {Data:1}	{VoIP:1}, Video, {Data:1}	{VoIP:1}, Video, {Data:1}
Incident Commander	VoIP, Video, Data	{VoIP:1}, Video, {Data:1}	{VoIP:1}, Video, {Data:1}	{VoIP:1},{Video o 2}, {Data:1}
OPS	VoIP, Video, Data	VoIP, Video, Data	[VoIP:2], Video, Data	[VoIP:2], Video, Data
Rescue Lead	VoIP, Video, Data	[VoIP:2], {Video:1}, {Data:1}	[VoIP:2], {Video:1}, {Data:1}	[VoIP:2], {Video:1}, {Data:1}
Containment Lead	VoIP, Video, Data	[VoIP:2], Video, Data	[VoIP:2], Video, Data	[VoIP:2], Video, Data
Perimeter Lead	VoIP, Video, Data	VoIP, Video, Data	[VoIP:2], Video, Data	[VoIP:2], Video, Data
Hazmat Lead	VoIP, Video, Data	VoIP, Video, Data	[VoIP:2], Video, Data	[VoIP:2], Video, Data
Hazmat Fire Fighter	VoIP, Video, Data	VoIP, Video, Data	[VoIP:2], Video, Data	{VoIP:1}, {Video:1}, {Data:1}
Truck	VoIP, Video, Data	VoIP, Video, {Data:1}	VoIP, Video, {Data:1}	VoIP, Video, {Data:1}
Engine	VoIP, Video, Data	VoIP, Video, Data	VoIP, Video, Data	VoIP, Video, Data
Suburban	VoIP, Video, Data	VoIP, Video, Data	VoIP, Video, {Data:1}	VoIP, Video, {Data:1}



## AirTegrity™ AirSync™ for Public Safety

### **Conclusion**

Public Safety usage of MANs for incident response and management is an area facing significant challenges. Networks are typically statically managed, and only managed to the access point level, resulting in unpredictable wireless application performance. AirTegrity's AirSync Platform addresses the issue of unpredictable network performance by offering granular control over services and priorities. This ensures that critical applications have predictable network performance under challenging conditions – this is done via closed-loop, dynamic changes to network configuration, and without active-user intervention. The ability to set these service levels is critical to adoption of these new technologies.

The AirSync Public Safety toolkit has a number of ease-of-use functions to enable rapid deployments. AirSync provides predefined NIMS compliant roles and user imports, making it easy to deploy and ad-hoc defined services and tailored roles make it easy to customize.

Finally, web services make it easy to integrate with existing dispatch center and command and control systems. Three core competencies make this the ultimate public safety wireless management solution: dynamic provisioning of network resources, preconfigured profiles based on NIMS roles, and ease of modification and integration with existing systems make citywide deployments vastly more efficient.

### **About AirTegrity Wireless, Inc.**

AirTegrity™ Wireless is a market leader providing a secure wireless broadband platform that encompasses all networking and security requirements for the delivery of voice and data services in a single cohesive product. AirTegrity award winning wireless modules operate in both licensed and unlicensed frequencies. AirTegrity™ Smart Networks dramatically reduce the cost of network deployment, ownership and management by integrating Multi-Channel Radio and Antenna technology with powerful routing, switching and security functions into each AirTegrity™ system.

[www.AirTegrity.com](http://www.AirTegrity.com)



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