Enabling Superior Public Safety
High Performance Backhaul for Security & Video Surveillance
Introduction

Traditionally, Public Safety applications relied on voice for incident reporting and response. Technology has accelerated since then and today, the rapid evolution of the communication infrastructure and end device technologies have enabled High-Definition video surveillance systems for active crime prevention and superior incident management. This evolution demands the need for scalable high capacity and secure backhaul links which can be commissioned and managed instantly.

This white paper presents the range of deployment applications and unique advantages that Proxim’s Tsunami® 8000 Point-to-Point and Point-to-Multipoint wireless products can bring to Public Safety and Security applications.

Public Safety Infrastructure

A superior Public Safety architecture requires the high security, deployment flexibility and scalability that can only be provided by the end-to-end convergence of the communication infrastructure. Convergence of the entire system into one common platform allows other security departments with similar systems to seamlessly integrate for communicating and collaborating across security groups, eventually forming a macro system. This brings in the demand for an “all-IP” backbone which is fundamentally interoperable, flexible and scalable to accommodate multiple systems offering convergence of different services through infrastructures that previously accommodated only one service. Hence, IP represents the building block to provide a solid platform for benchmarking digital networks.

To increase situational awareness at an incident spot, Public Safety departments have to go beyond voice to include video, data and still images. This increase in incident information will help the first response team with informed decisions and the right resources at the right time.
The massive improvement in available bandwidth from wireless systems has allowed video to be on par with voice in reliability, reach and quality. Availability of video for incident monitoring and street surveillance will take Public Safety to a new level. With the increase in readily available low cost HD surveillance cameras and high performance wireless backhaul systems, Public Safety can now place their cameras where the crime is. This flexibility, when combined with mobile video sharing, presents an incremental force multiplier to law enforcement.

**Why Wireless?**

The advantage of ensuring security through high quality video surveillance is indispensable and, until recently, analog ‘CCTV’ surveillance systems were the only way to go.

These legacy surveillance systems relied on extensive cabling and as public safety video surveillance networks evolved in scale, the complexity of installing and maintaining these cable infrastructures was a herculean task. Also, accommodating long distances with the coaxial cables has always been an issue due to their inherent high attenuation which required frequent termination points, thus greatly effected deployment flexibility.

There have been various solutions presented to solve the cabling problem but these solutions seem to treat the symptoms and not the ailment. Comprehensive solution: Go Wireless! The wiring complications can be simply solved by eliminating the wires. But can wireless be the be-all, end-all to this solution to this problem?

Wireless technology has advanced so much in the last 10 years that current wireless technologies can provide equal performance as the wire-line alternatives, while greatly enhancing deployment flexibility drastically reducing the cost. Complete end-to-end wireless solutions now exist to provide everything needed for video surveillance and security networks of any size.

*Figure 1: Video Surveillance Backhaul using Tsunami® MP-8000-BSU and MP-8000-SU*
A simple end-to-end wireless solution for video surveillance uses wireless cameras which transmit video data to a central receiver and data from the central receiver will be backhauled wirelessly to a remote surveillance center.

The evolution of these high quality surveillance applications can be attributed to the high capacity backhaul systems. Wireless backhaul technology offers very high capacity and flexibility when compared to the wireline alternative and far exceeds wireline on a price versus performance comparison. It’s often the only practical solution in certain metropolitan areas where wire line services cannot be installed due to regulatory and physical restrictions and is prohibitively expensive. In any scenario, the flexibility and anytime/anywhere capabilities of wireless cannot be matched by wire line alternatives.

In today’s macroeconomic climate, it is especially relevant to be careful with every dollar we spend. This is among the key reasons that wireless will continue to build its dominating influence on high capacity backhaul. Hence, the need for high capacity, secure and low cost backhaul solutions is accelerating the migration towards wireless networks.

### Make Way for High Definition

IP surveillance system with VGA resolutions and small bandwidth requirements ushered in the digital era for the security and surveillance market and became a practical technology only a few short years ago. However, many security experts unsatisfied with the video performance improvements between digital and analog were unconvinced of the need for an overhaul of existing analog surveillance networks.

Today, with high definition cameras providing 1920x1080 1080p resolutions, electronic image stabilization, high optical zoom capabilities and the ability to stream directly to computer monitors many are convinced the need is finally here. And with the growing deployment of HD IP surveillance equipment the need for quality video backhaul becomes critical.

### Proxim’s Video Surveillance Backhaul Solution

Public safety organizations always need the latest and greatest tools to serve and protect the community better. Proxim’s high performance secure and reliable backhaul links are ideal for transporting live, high-quality video from multiple surveillance cameras to the command center with military grade encryption. These highly-scalable solutions allow instantaneous deployment of multiple surveillance cameras backhauled by a single radio.

Some think that “Wireless is easier said than done”, but not for Proxim. Performance, flexibility and scalability come together with Proxim’s high security Tsunami® QB-8000/MP-8000 Series.

Proxim’s Tsunami® Point-to-Point QB-8000 and Point-to-Multipoint MP-8000 series products feature the combination of MIMO and advanced OFDM technologies to enable carrier-grade reliability, performance and quality for robust connectivity even in Non-Line-of-Sight (NLoS) deployments. These devices make the backhaul solution secure, flexible, scalable, and cost-effective for top-of-the-line public safety and video surveillance deployments.
A MIMO antenna mitigates the signal loss due to Multipath fading and significantly improves the overall gain.

Public safety surveillance camera requirements vary according to the location and situation. Monitoring suspicious events such as perimeter breach, motion sensing, objects moving in the wrong direction, and object presence after a set time need only low resolution VGA cameras with 5 fps frame rate. Deployments in high security locations like airports and banks need applications like face-recognition, ability to identify abandoned packages, unattended bags, etc. to run in an environment with a high volume of people. Such installations require 1080p resolution HD cameras running at 30 fps frame rate to capture every pixel.

A variety of public safety applications are possible using Proxim’s video surveillance backhaul solution. To illustrate, a few scenarios are rendered here.

**Street Surveillance**

Street surveillance cameras are usually located on street lights, traffic signals, roof-tops or other high-elevation points to have a clear view of the streets below. These locations are also ideal to co-locate Tsunami® QB-8000/MP-8000 backhaul units to relay the video traffic from the camera networks to the receiver.

Number of cameras supported by Tsunami® QB/MP-8000 series backhaul links using popular camera resolutions and frame rate are given below taking two common deployment scenarios:
These cameras along with the transmitter are capable of operating in all-terrain and all-weather conditions with a high degree of ‘situational awareness’ using video analytics software. A variety of high resolution cameras along with video analytics are currently being used for traffic surveillance, identifying license plates, traffic signal violations, road accidents, etc.

Constant surveillance in tunnels and bridges is critical in road safety and have always been a staggering task to install and maintain surveillance systems with cabling in those environments. Deployment is simpler and much quicker with surveillance cameras combined with Proxim wireless radios, and in case of any changes or problems it is easier to check and modify the modular end points versus checking the entire cable network. No wonder we are witnessing an accelerated demand towards wireless modular configurations which only need a power source.

Incident Surveillance

When it comes to incident or event surveillance no venue has the exact same security needs. Modular wireless surveillance systems offer the needed flexibility for the best security coverage. A couple of HD surveillance cameras connected to a Tsunami® MP-8000-SU (Subscriber Unit) as a surveillance module transmits high quality surveillance video traffic to the Tsunami® MP-8000-BSU (Base Station Unit). The MIMO capabilities of the Tsunami® series is leveraged for robust connectivity in NLoS deployments offering tremendous deployment flexibility. These modules provide the ultimate in coverage and flexibility and can be quickly deployed as self-contained fully networked stand-alone units, capable of operating in all-terrains and all-weather conditions.
On any given day when a 911 distress call is received, an incident is reported and a first responder is dispatched. First responders arrive at the location, evaluate the gravity of the situation and then take the appropriate action.

Incidents like a building on fire, forest fire, hostage situation, hijacked plane parked on the runway, etc. all require extensive visuals before any action is initiated. With video-capable wireless networks, first responders can quickly set up surveillance camera pods, connectivity bridges between the cameras and central receiver, and backhaul from central receiver to the command center to establish a temporary video surveillance system. As the incident develops, these temporary surveillance networks expand to include surveillance collaboration with additional responders such as rescue/action teams, fire trucks, ambulances, SWAT teams, etc.

Proxim’s Tsunami® Q8-8000/MP-8000 series products include two 802.3af compliant Power-over-Ethernet (PoE) ports, with PoE out to power external devices like cameras. A Tsunami® MP-8000 base station can power a collocated access point through its second PoE to give surveillance access to additional responders or can power a collocated Tsunami® Q8-8000 end point to backhaul the video traffic to another Tsunami® Q8-8000 end point at a remote command center.

**Technology Migration**

Analog systems have been used for Public Safety since the dawn of the surveillance age, thus it can be very expensive to upgrade the entire network to IP overnight. An all-IP solution would mean an end-to-end Ethernet-ready system beginning with IP cameras, switches/routers, and Ethernet backhaul all the way to the surveillance center and network storage. But with Proxim’s high performance wireless backhaul and connectivity solutions, you can replace the existing analog backhaul with an Ethernet-ready, high capacity wireless backhaul solution to ensure core IP compatibility and scalability. Existing analog cameras can be made IP compatible by digitizing their output to an Ethernet ready format using an encoder. The digitized data from the clusters of analog and IP camera installations can be routed through Tsunami® Q8-8000/MP-8000 series high performance backhaul devices to transmit the video data to a remote location, effectively replacing the existing low capacity high maintenance wired backhaul with a high capacity 4G wireless backhaul solution. This Proxim solution presents the best opportunity to quickly implement a highly scalable and secure Ethernet-ready network backbone.

Figure 4: A Simple Network Diagram rendering the Coexistence of Analog and IP Network Cameras using Tsunami® Series for High Capacity Video Traffic Backhaul
About Tsunami® QB-8200/MP-8200 Series

Paving a new path in the wireless video surveillance space, the Tsunami® 8200 is a high-power, 3x3 MIMO radio with enhanced receiver performance that delivers blazing speeds (300Mbps) and features the latest encryption standards. The 8200 additionally offers a bouquet of services spanning from link aggregation capabilities to easy install tools that empowers network architects with unparalleled flexibility and convenience not to mention superior reliability. The 8200 is an ideal wireless solution for video surveillance deployments, offering the following benefits customized for the video surveillance applications:

High Performance

Leveraging the latest 802.11 standards and Proxim’s proprietary WORP® technology, the Tsunami® 8200 features nLoS functionality and provides speeds in excess of 4G speeds with QoS class of service for delivering voice, video and data applications. Few of the many benefits are:

- High Power 25.8 dBm for better coverage
- Low Latency <3msec for superior streaming
- 300Mbps for Ultra fast communication

Low Latency

With Latency lesser than 3 msec. The 8200 ensure that delay-sensitive, voice and video based applications face minimal interruption and users have a smooth experience.

Ultra Fast

Point to Multipoint and Point to Point solution that can deliver 300Mbps data rates.

High Transmission Power

High power radio capable of up to 25.8dBm Tx power to extend the range and coverage.

Gigabit Ethernet Port

The Tsunami® 8200 features dual Gigabit Ethernet ports which allow heavier bandwidth intensive applications, in comparison to other products in the market which support on 10/100Mbps Ethernet Ports.

Superior nLoS

The 8200 Series offers 3x3 MIMO which enable stronger Non-Line-Of-Sight link capabilities compared to other products in the market that support only 2x2 MIMO.
### Better Security

Based on the AAA (Authentication, Authorization and Accountability) and CIA (Confidentiality, Integrity and Availability) security concepts, Proxim Wireless offers a very secure solution that leverages on state of the art encryption algorithms as well as Proxim’s proprietary routing protocol:

- Impossible to crack AES -128 encryption – requires a colossal $2^{128}$ operations or $340,282,366,920,938,463,463,374,607,431,768,211,456$ turns to decipher the message
- WORP proprietary protocol and security

#### WPA2/AES-128

Proxim achieves CIA with the world’s most secure algorithm, the AES -128 or Advanced Encryption Standard, a secure 128 bit key standard, which simply means that it would take $2^{128}$ operations or $340,282,366,920,938,463,463,374,607,431,768,211,456$ turns to decipher the message for an unauthorized user which is widely known to be out of reach even for the contemporary computing techniques. In addition to this operating within a licensed frequency enhances the security level.

#### WORP® Security

Proxim’s proprietary routing protocol, WORP® offers a variety of security features for securing data in the network. First, the protocol is not publicized or standardized, which makes it less vulnerable for hackers than a Wi-Fi based system. Secondly, WORP® requires the SU to register on the Base to do a mutual authentication with identification via a MD-5 secret string. Both know that their peer belongs to the network (avoiding both rogue SU and BSU). Additionally Access Control (authentication) occurs locally and via RADIUS server. Finally, all remote management methods are password-protected. Different passwords can be set for SNMP read, SNMP read/write, Telnet and HTTP, thereby ensuring secure authentication and authorization.

### More Reliability

#### 99.995% Service Availability

- 99.995% Service Availability implying a potential downtime of only 22 minutes in year!
- Enhanced QoS to prioritize and allocate bandwidth based on the type of traffic.

The overall performance or reliability of a communication system is verified in terms of its “availability” Proxim’s Tsunami® 8200 offers 99.995% availability, which means that in a year, you could face a potential downtime of only 22 minutes!

#### Bandwidth Control

Existing products utilize standard Wi-Fi technology which cannot allocate fixed amounts of bandwidth for different data whereas the 8200 uses a unique polling technology based on WORP® to guarantee bandwidth for important applications such as voice or video.

#### Enhanced Video Optimization

The 8200 utilizes Proxim’s proven WORP® algorithm which enables our video optimization technology to provide rich QoS functionality to dynamically allocate bandwidth for important applications such as video and voice.
Easy Install

- PoE Out for powering other surveillance cameras
- No more guess work with Audible Antenna Alignment tool
- Spectrum Analyzer for detecting interference

In addition to the high scalability and performance, the Tsunami 8200 provides a wide spectrum of deployment utility tools ranging from antenna alignment tools to Link budget calculators that streamline the installation process into a truly effortless operation with minimal turnaround time.

PoE Out

The 8200 features dual Gigabit Ethernet ports with Power over Ethernet out to power other devices like surveillance cameras or additional radios, thereby reducing the networking deployment time and also increasing the coverage of deployments with no limits over cable lengths from the controller.

Audible Antenna Alignment

Audible antenna alignment is an easy to use deployment tool that provides both audible and numerical feedback while dynamically rendering the running Signal-to-Noise Ratio (SNR) values twice a second. The output from the beeper for antenna alignment consists of short beeps with a variable interval. The interval changes with the SNR level to assist in correctly aligning the antenna. An increase in signal level is indicated by a shorter interval between beeps; a reduction in signal level results in beeps further apart. Aiming is complete when moving in any direction results in a falling SNR value, which can be heard as longer periods between beeps.

Customized Spectrum Analyzer

Spectrum Analyzer allows deployment engineers to gain insights in the surrounding RF interference. The Analyzer scans the spectrum to select a channel with the least interference during a link setup predicated on the maximum and minimum Received Signal Strength Indication (RSSI) on each channel. (RSSI is a measurement of the power present in a received radio signal). The Spectrum Analyzer additionally is tailored specifically one’s regional regulations.

Summary

Utilizing Proxim’s Tsunami® Point-to-Point QB-8000 and Point-to-Multipoint MP-8000 series products provides true 4G wireless backhaul and connectivity for top-of-the-line, high-performance and ultra-secure public safety and video surveillance deployments. The culmination of MIMO and advanced OFDM technologies enables carrier-grade reliability, performance and quality for robust connectivity even in NLoS deployments. For everything from traffic surveillance and synchronization to emergency video for first responders, Proxim’s 4G wireless solutions provide the highest performance, most flexible and scalable, and cost-effective security and surveillance networks.
About Proxim

Proxim Wireless Corporation (OTC Markets: PRXM) provides Wi-Fi®, Point-to-Point and Point-to-Multipoint 4G wireless network technologies for wireless internet, video surveillance and backhaul applications. Our ORINOCO® and Tsunami® product lines are sold to service providers, governments and enterprises with over 2 million devices shipped to over 250,000 customers in over 65 countries worldwide. Proxim is ISO 9001-2008 certified. For more information, visit www.proxim.com. For investor relations information, e-mail ir@proxim.com or call +1 413-584-1425.