Tsunami™ QB-8100/MP-8100

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™ 8100 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.

Wireless technology has advanced so much in the last 10 years that current wireless technologies can provide equal performance as the wireline 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.

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 wireline 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 wireline 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.

Table 1: Bandwidth requirements of popular camera resolutions

<table>
<thead>
<tr>
<th>Mega Pixel</th>
<th>Resolution</th>
<th>Aspect Ratio</th>
<th>Screen</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3</td>
<td>640x480</td>
<td>4:3</td>
<td>Computer Monitor</td>
<td>VGA</td>
</tr>
<tr>
<td>0.4</td>
<td>720x480</td>
<td>3:2</td>
<td>Television</td>
<td>NTSC</td>
</tr>
<tr>
<td>0.9</td>
<td>1280x720</td>
<td>16:9</td>
<td>Wide screen</td>
<td>HD 720p</td>
</tr>
<tr>
<td>2.1</td>
<td>1920x1080</td>
<td>16:9</td>
<td>Wide screen</td>
<td>HD 1080p</td>
</tr>
</tbody>
</table>

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-8100/MP-8100 Series.

Figure 2: Tsunami™ QB-8100 Series offer robust connectivity even in Non-Line-of-Sight (NLoS) conditions using Multiple-Input-Multiple-Output (MIMO) antenna technology. A MIMO antenna mitigates the signal loss due to Multipath fading and significantly improves the overall gain.
Proxim’s Tsunami™ Point-to-Point QB-8100 and Point-to-Multipoint MP-8100 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.

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-8100/MP-8100 backhaul units to relay the video traffic from the camera networks to the receiver.

Number of cameras supported by Tsunami™ QB/MP 8100 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

Table 2: Number of cameras supported by the backhaul link in a typical Road Intersection deployment - to identify license plates, register traffic violations, spotting road accidents, etc

<table>
<thead>
<tr>
<th>Megapixel</th>
<th>Name</th>
<th>30 fps</th>
<th>24 fps</th>
<th>18 fps</th>
<th>12 fps</th>
<th>6 fps</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3</td>
<td>VGA</td>
<td>215</td>
<td>253</td>
<td>318</td>
<td>431</td>
<td>759</td>
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<tr>
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<td>NTSC</td>
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<td>312</td>
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<td>744</td>
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<tr>
<td>0.9</td>
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<td>89</td>
<td>115</td>
<td>150</td>
<td>253</td>
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<tr>
<td>2.1</td>
<td>HD 1080p</td>
<td>33</td>
<td>39</td>
<td>49</td>
<td>67</td>
<td>122</td>
</tr>
</tbody>
</table>

Number of cameras supported is ultimately limited by the backhaul link throughput (227 Mbps, UDP)

Table bandwidth requirement has been calculated as per H.264 video compression algorithm

Table 3: Number of cameras supported by the backhaul link in a typical Train Station deployment - monitoring suspicious people/objects, facial identification, spotting unattended bags, etc

<table>
<thead>
<tr>
<th>Megapixel</th>
<th>Name</th>
<th>30 fps</th>
<th>24 fps</th>
<th>18 fps</th>
<th>12 fps</th>
<th>6 fps</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3</td>
<td>VGA</td>
<td>98</td>
<td>103</td>
<td>108</td>
<td>130</td>
<td>217</td>
</tr>
<tr>
<td>0.4</td>
<td>NTSC</td>
<td>93</td>
<td>98</td>
<td>103</td>
<td>122</td>
<td>195</td>
</tr>
<tr>
<td>0.9</td>
<td>HD 720p</td>
<td>32</td>
<td>33</td>
<td>35</td>
<td>42</td>
<td>70</td>
</tr>
<tr>
<td>2.1</td>
<td>HD 1080p</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>19</td>
<td>30</td>
</tr>
</tbody>
</table>

Number of cameras supported is ultimately limited by the backhaul link throughput (227 Mbps, UDP)

Camera bandwidth requirement has been calculated as per H.264 video compression algorithm

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-8100-SU (Subscriber Unit) as a surveillance module transmits high quality surveillance video traffic to the Tsunami™ MP-8100-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™ QB-8100/MP-8100 series products include two 802.3af compliant Power-over-Ethernet (PoE) ports, with PoE out to power external devices like cameras. A Tsunami™ MP-8100 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™ QB-8100 end point to backhaul the video traffic to another Tsunami™ QB-8100 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™ QB-8100/MP-8100 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.

Summary

Utilizing Proxim’s Tsunami™ Point-to-Point QB-8100 and Point-to-Multipoint MP-8100 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 Tsunami™ QB-8100/MP-8100 Series

Proxim Wireless expands the industry leading Tsunami™ product family with a high capacity QB-8100 Series, ideal for large scale Point-to-Point wireless deployments and MP-8100 Series for high performance Point-to-Multipoint deployments. The new Tsunami product family combines MIMO and OFDM technologies with Proxim’s Wireless Outdoor Routing Protocol (WORP) to provide PtP and PtMP backhaul for Carriers, WISPs and Government entities.

Tsunami™ QB-8100 Series is the easiest-to-install outdoor bridges on the market — links can be installed in a couple of hours. A complete Hop-in-a-Box solution includes everything required to set up the link right out of the box.

With performance as high as 300 Mbps, the Tsunami™ QB-8100/MP-8100 Series operate with Carrier-class reliability in the 2.3 – 2.5 and 4.9 – 6.0 GHz frequency bands. Tsunami™ Series prominent features include QoS support for converged video, voice and data, enhanced security with AES encryption, high-performance with WORP and a second Gigabit Ethernet port with PoE out to power external devices like surveillance cameras.

Both the Tsunami™ QB-8100 PtP and the Tsunami™ MP-8100 PtMP provide true 4G wireless backhaul. For more information visit www.proxim.com/products/

About Proxim

Proxim Wireless Corporation (OTCQX: PRXM) (PINKSHEETS: PRXM) is a leading provider of end-to-end broadband wireless systems that deliver the quadruple play of voice, video, data and mobility to all organizations today. Our systems enable a variety of wireless applications including Point-to-Point Wireless Backhaul, Security and Surveillance, VoIP, Last Mile access, and Enterprise LAN Connectivity. We have shipped more than 1.8 million wireless devices to more than 235,000 customers in over 65 countries worldwide. Proxim is ISO 9001:2000 certified. Information about Proxim can be found at www.proxim.com. For investor relations information, e-mail ir@proxim.com or call +1 413-584-1425.