White Paper

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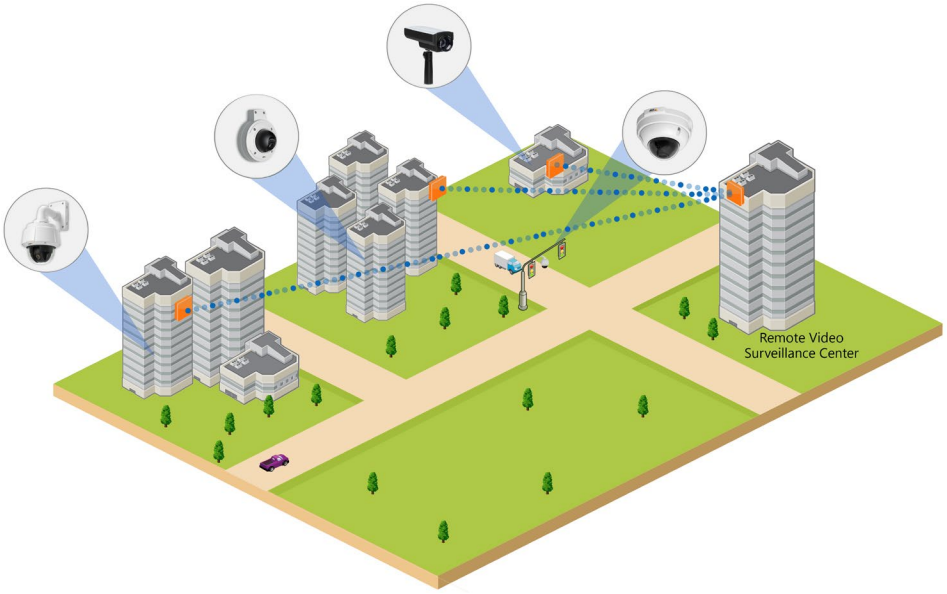
The Proxim Advantage

Video Security via Wireless

Security Has Always Been a Concern, Now More Than Ever

Over the years there have been two distinct trends that have combined to boost the video surveillance or monitoring market evermore into the forefront of discussions. The first has been the rise in terrorism, vandalism, refugee populations crossing borders and additional global turmoil. The second trend has been the advancement in video camera technology – from analog NTSC or PAL standard definition video formats to IP based cameras supporting full frame rate (30fps) 1080p HD video, the technology behind video security has progressed significantly in the last 10 years.

With these new resolutions has come advanced technology, functions that were not possible before or were only available off of a server in the central monitoring station are now done routinely, often in the cameras themselves. This refers to features such as facial recognition, automatic license plate readers, automatic red light cameras and more. What all these new smart, HD video cameras need is connectivity.



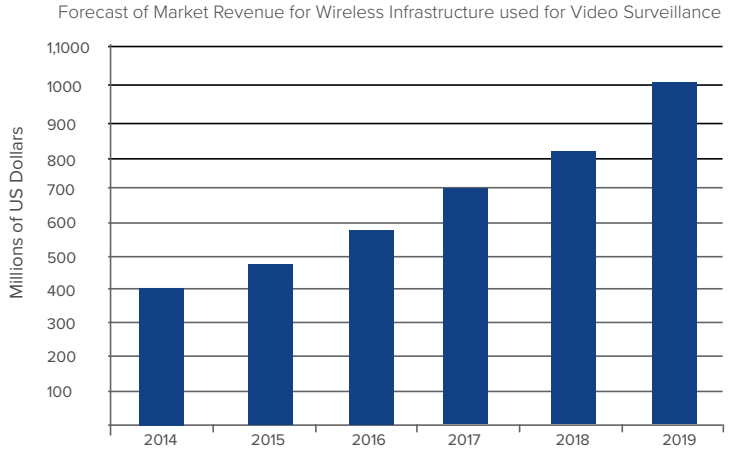
Most of these Applications Require Outdoor Cameras

While all these applications may seem to be unique, there are a few things all of them have in common. First, these deployments and features require good to excellent video definition quality. Standard definition is no longer acceptable, and running at 10 frames per second vs. a full rate of 30fps, is not acceptable.

Second, almost universally these applications will have a high percentage of cameras being deployed outdoors – outdoors where the environment is harsh, units are unguarded and connectivity is seldom available. For video security the camera needs to be placed where it can perform it's desired function – not where there is a convenient fiber or Ethernet cable handy. Having a fiber strand within 10 feet of the desired location of a camera is not much better than being a mile away. It still requires permits, right of way negotiations and some level of digging.

Market

With all of these factors combined, the wireless video surveillance market is forecasted to reach $1 Billion in 2019.



"For those who want to establish surveillance solution, low cost solutions will be a great find. So, wireless video surveillance equipment takes away the need to establish trenching cables and thus leads to cost effective solutions," Josh Woodhouse, Video Surveillance Analyst at IHS.

These numbers do not address the latest shifts in the video security market being driven by orthogonal applications. For example cities deploying Intelligent Traffic Systems use wireless to connect signaling lights in intersections. In many cases the decision is made to add a camera to the deployment, using the wireless network to support both the signaling traffics as well as the video traffic.

When carriers or municipalities decide to deploy public Wi-Fi or hot spots, increasingly the request is bundled with a desire for adding a video camera to the hot spots deployment.

Video Security Requirements

With the need and growth for video surveillance, and in particular wireless video surveillance established, what are the specific requirements for this application? What requirements must a viable video security solution provide? These requirements can be broken down into those that apply to the cameras themselves and those that apply to the wireless network component providing the connectivity.

Video Security Requirements for Wireless Networks

- High Capacity – up to 25 Mbps per cameras
- Reliable Video Communications – the network must have high availability (as much as 99.999%) and be secure
- Mobility
- Water- and dust-proof (IP67 - rated)
- Wide operating temperature range -40 °C to 55°

Video Security Requirements for the cameras

- Complex and constantly changing lighting
- Complex picture composition, backlighting
- Large area overview
- High level of detail needed
- Vibration
- Clear images of rapidly moving objects and persons

When it comes to throughput or capacity requirements, these can vary a great deal based on resolution, frame rate and even the device being used to view the video streams. In this case the device is typically a large monitor in a central location. Table below gives some idea of capacity per camera requirements.

	240	480	720	1080
Max (10 Compression Ratio)	1.02 Mbps	2.71 Mbps	8.13 Mbps	16.7
Recommended (30 Compression Ratio)	636 Kbps	1.62 Mbps	4.87 Mbps	9.88
Min (90 Compression Ratio)	207 Kbps	590 Kbps	1.77 Mbps	3.63

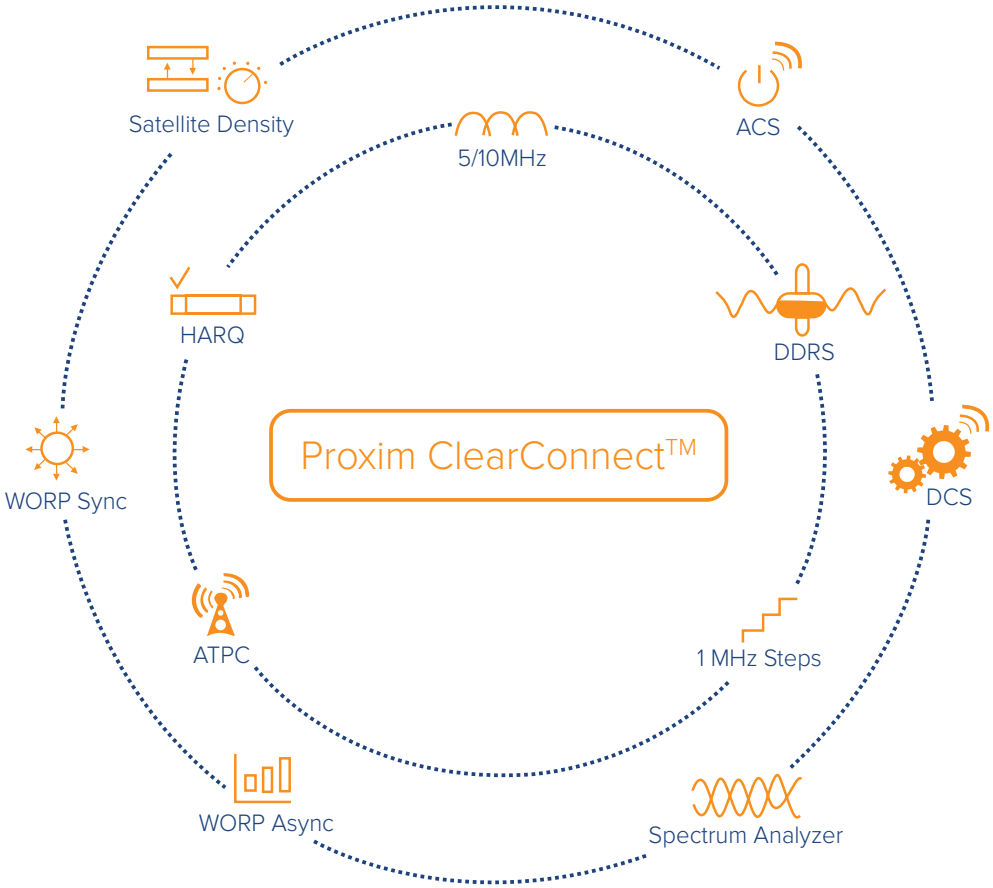
Data rate Requirements at 30fps

From the table it can be seen that to provide an HD video stream at 720p, a common resolution, the network must support at least 2 Mbps and ideally 8 Mbps. When this is multiplied out it can be seen that a good security camera will require on the order 700 Gb per day.

Wireless Video Security and Proxim

When looking at each of the wireless network requirements, it is clear that the Proxim Wireless Tsunami® product line delivers on all of these, and does so with features and functionality that meet and exceed the needs described here.

- High Capacity
  - With a typical security camera consuming up to 8 Mbps, to effective the wireless network will likely be supporting more than one camera per network. Proxim offers a variety of Tsunami® products that support 10Mbps, 25Mbps, 50Mbps, 100Mbps, 240Mbps up to 633Mbps of useable bandwidth.
- Reliable Video Communications – There are three main factors to reliable video communications
  - The network must have high availability (as much as 99.999%)
    - The Tsunami® product line of outdoor wireless networking systems offer a full two year warranty. Proxim has customers who have deployed radios from ten years ago, have never been touched, and are operating today. With an Field determined MTBF of well over 1 million hours for some product lines up to over 2 million hours of MTBF for others, this equates to 1.5 to 3 seconds outage per year.
  - The network must ensure the quality of the video stream in the face of radio frequency impairments or other traffic being carried on that wireless link
    - In this application poor image quality is absolutely not allowed. It is no exaggeration to state that in many deployments lives are at stake, and the video system and in particular the network must be top quality. From an Radio frequency performance perspective, Proxim builds into every unit it's suite of interference mitigation technologies known as Proxim ClearConnect™ ensuring reliable wireless connectivity



- While basic connectivity is a must, it is not enough to ensure “Reliable Video Communications.” To meet this standard the wireless technology beyond the Radio frequency layer must deliver high quality video images. This relates to the MAC layer used, and Proxim has spent the last 15 years developing, improving and delivering to the market the premier outdoor QoS MAC protocol – WORP®. With WORP® users of a Proxim Tsunami® network have the ability to set jitter and latency Service level Agreement for the traffic. Minimum data rates for video traffic can be reserved. And all of this is implemented in a network that can be supporting more than just the video – Voice over IP and sensor data can also be supported on the same wireless network with WORP® running.

- Video is unique in another way from typicall data traffic in that it is almost all upstream. Meaning the vast majority of the traffic is coming from the camera and being uploaded to the network. Many systems are designed to be asymmetric, supplying more data capacity in the downstream the the reverse. With Proxim the system is dynamic in it’s upstream/ downstream ratios and can easily move to 80% upstream lending support for this application.
- A large amount of video traffic is now transmitted as Multicast, which most wireless vendors transmit as multiple unicast with massive increases in required bandwidth. Proxim supports Multicast and IGMP snooping to ensure Multicast streams are properly and efficiently transported over the wireless connections.

- The network must be secure – Video security traffic is mission critical and as such has work and it has to be secure. Proxim delivers on this requirement in multiple ways
  - Over the air format – Unlike many wireless video systems that are based on and use standard Wi-Fi protocols, WORP® on Tsunami® networks is a Proxim owned, developed and secured protocol. It is impossible for example to use a Wi-Fi sniffer on Tsunami® traffic, unlike mesh systems which use common Wi-Fi frames.
  - The enclosures used in the Tsunami® product line are die cast aluminum, not plastic, and come with tamper proof seals.
  - Encryption - every packet sent over a Tsunami® link is encrypted with AES 128 encryption.

- Mobility – Security is not required just on the street corner, or in a stadium, it must also operate on trains, trams, buses and even ferries. When looking at backhauling video traffic off of any of these platforms, the bandwidth demand from even one camera can reach gigabits per day. Assuming a 720P camera from the previous table is used, multiply that by four or even more cameras per train car, per bus yields an instantaneous data rate requirement of 8Mbps and 700 Gb per day. The options for transporting this traffic off of a mobile platform are typically restricted to Mesh Wi-Fi, Advanced cellular (LTE) or Proxim.

  - Mesh - In the first case, as noted mesh is not secure and has a very difficult time supporting the necessary QoS required for quality video imaging. In addition handoffs between nodes in a Mesh network can be problematic, especially when confronted with hidden node issues.
  - LTE - While the network can support this traffic, it is cost prohibitive. If a 720p camera is used, this equates to 700 Gb per day at a typical $10/Gb can equate to $7,000 per day, per camera. With 2 Mbps for standard def video*86k minutes/day =175 Gb of data per camera per day.
- Outdoor Deployments – With a significant percentage of the video security deployments taking place outdoors, the equipment has to be able to pass stringent specifications including a rating of IP66 or more. Proxim Tsunami® products are all IP67 rated, meaning they can be submerged in 1 meter of water for 30 mins with no water ingress.
- Wide operating temperature range – Security is not just a concern in temperate climates. The Middle East with day time temperatures reaching 50 °C, and other areas such as Russia or Canada going as low as -40 degrees C, the wireless network has to be able to survives these brutal temperature ranges. Tsunami® products are rated for -40 to +60 degrees C operation. For those environments that are more temperate there are version of Tsunami® that support -30 to 55 temperature ranges.

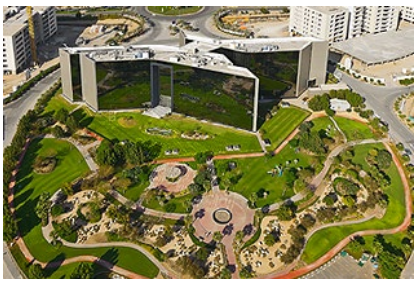
Beyond these core, fundamental requirements for any wireless network carrying mission critical video traffic Proxim offers additional support.

- Small Form Factor – Video camera deployments are meant in most cases to be unobtrusive, able to blend into existing surroudnigs. The Tsunami® 800 series of products offer a unit that is only 96 x 8.62 x 2.58 in (126 x 219 x 65.5 mm) in dimensions, and includes an integrated antenna to limit the overall subscriber unit profile.

- PoE Out – Given that for every subscriber unit there will be a camera attached, Proxim offers a second PoE port on the subscriber units that can deliver up to 25 watts of power to third party devices such as video cameras. This feature means deploying the camera does not require additional cable runs, the camera is plugged into the Tsunami® unit for both power and connectivity.

Wireless Video Case Studies

Proxim has been delivering to customers high end, carrier class Tsunami® systems for many years. Video security has always been a major application for the Tsunami® line given how it meets and exceeds the demanding feature a specification set required by the video security application. A select group of typical deployments are described here.



Dubai Investment Park

Spread over 2300 hectares, Dubai Investments Park required a high-speed, cost-effective network to enable video security for intrusion detection and monitoring purposes. Over 40 HD closed-circuit television (CCTV) cameras 6 fixed ALPR cameras Automatic License Plate Recognition were deployed. The Proxim Tsunami® MP-8200 solution was installed across the residential zone of the park aggregating live feeds to a central monitoring station.

The Result: The Video surveillance network covers over 25% of the entire park area and required 15 days to perform the whole installation.

Allentown PA

As part of the city's re-vitalization project, Allentown, PA - USA deployed security cameras to capture license plates at significant distances at night as well as monitor critical locations around the clock. The video solution they chose used high definition PTZ cameras requiring 4 Mbps of continuous bandwidth per camera. The local integrator, Communication Systems Inc (CSi), installed more than 300 Sony cameras, 175 of which are connected using wireless. Tsunami® was used as the wireless network component for Allentown.

The Result: The citywide surveillance network helped reduce crime by 20%.

Statue of Liberty

When Hurricane Sandy hit the greater Metro New York area, one of the areas hardest hit was the island in the middle of the harbor with the Statue of Liberty. As part of the renovation following the devastation, the Statue surveillance and security system needed to migrate from analog CCTV to the latest in digital video technology. The Park decided to deploy 160 IP cameras with HD resolution. The cameras had the ability to operate in extreme low light, with an undistorted 200 degree FOV and operated at 6 megapixel resolution.

The Result: The entire park/island is now covered with HD video surveillance using Proxim Tsunami® radios as the network backbone.

Tenerife Spain tram

In Tenerife Spain they have a tram used for local mass transportation. The requirement was to provide complete CCTV Coverage at speeds up to 100Km/h along 80Km of winding track which goes through the city and through tunnels Proxim Tsunami® BSUs were deployed along the track in the proper locations and multiple SU's were deployed in each train to backhaul each camera and provide 4 Mbps of continuous connectivity.

The Result: The Tenerife Tram Surveillance Solution team was able to effortlessly and quickly deploy the surveillance cameras on board the moving trams and backhaul the video traffic using Proxim's wireless mobility solution. The resultant network cost-effectively delivered connectivity along the track and within the tram, with the entire network being managed with Proxim's ProximVision Advanced system.

Summary

Video Security is increasingly becoming a fact of life. Places like downtown London have 100% coverage and many cities such as New York are moving in that direction. It is clear that to protect and monitor public domains such as sidewalks, parks, transportation systems, and the like, a wireless network will be part of the solution. Of critical import in selecting the mission critical wireless network system, are the abilities of the system to survive the harsh environment both physical and Radio frequency, provide guaranteed QoS via WORP® over a secured connection, and be able to deliver high bandwidth connectivity not just to light poles but on moving platforms as well. Proxim's FastConnect™ is the best and possibly the only cost effective QoS assured mobility solution available. For a mission critical applications such as video security, when performance matters Proxim delivers.

Company Profile

Proxim Wireless: Performance Matters. Proxim Delivers.

Proxim Wireless is a pioneer and global leader in advanced Wi-Fi, point to point, and point to multipoint outdoor wireless systems that are purpose built for mission critical and high availability communications. With over 30 years of wireless experience, Proxim is recognized for its unparalleled reliability, superior performance and drive for innovation.

Products and Markets

Marketed under the ORiNOCO® and Tsunami® brands, Proxim provides a comprehensive product line for a wide variety of market segments including enterprises, service providers, carriers, governments and municipalities, Wi-Fi Operators/Hot spot Operators and other organizations that need high performance, secure scalable wireless solutions.

Go to Market

Proxim serves customers through a global network of distributors, value-added resellers, system integrators and original equipment manufacturers. Our strong internal sales force also engages in direct-touch, consultative selling with major customers regardless of whether fulfillment is direct or via a channel partner. Our experienced system engineering team is available to provide professional services to both our channel partners and end customers.