

Video Surveillance Linear Architecture



SECURITY – FAST, RELIABLE, AND COST EFFECTIVE

Violent crime, burglary and theft threaten the safety of our citizens. Public Safety organizations are charged with leading the efforts to create and maintain a safe environment for community members. The task of creating a safe environment is made more challenging with the constraint of budget requirements. It has been proven that public safety is enhanced with video surveillance systems, but these systems have frequently been expensive and required months to install.

Reliable video surveillance is now rapidly deployable and cost effective with Cambium Networks' unmatched portfolio of wireless broadband video surveillance solutions.

Wireless technology significantly improves the enablement of remote monitoring, mobile video and high speed transmission. These solutions extend the reach of existing personnel, enabling them to view high crime areas, remote locations, high traffic intersections, and special events. Through better real time situational awareness, wireless video surveillance helps public safety personnel to save lives, reduce crime, and keep neighborhoods safe without increasing payroll.

Wireless connectivity can be used to complement an existing CCTV video surveillance network, or to extend coverage into a new geography as a standalone network. For more detailed information on network architectures, refer to the Solution paper on Video Architectures.



SURVEILLANCE PLACEMENT – THE DEPLOYMENT CHALLENGE

One of the more significant challenges with any planned surveillance network is camera placement. Wire based video surveillance systems commonly limit the location of cameras to sites that are within cable length to provide communication and power. Wireless systems are significantly more flexible and easy to deploy in areas where it is not cost effective to run cable. With wireless connectivity, public safety professionals can better and more quickly place the cameras in locations where surveillance is most needed.

In the event that a camera needs to be moved, wireless connectivity enables relocation to be accomplished faster and at a fraction of the cost of wired solutions.

Cambium Networks' wide-range of wireless broadband products uniquely offers a multitude of solutions that can overcome most any wireless video deployment challenge. Be it distances, path obstacles, bandwidth capacity, or network complexity, Cambium Networks has a wireless technology (PTP backhaul, PMP access) that has been proven time and again to fill the need efficiently and effectively. Cambium Networks' wireless broadband leadership becomes even more pronounced when the usage of licensed 4.9 GHz Public Safety spectrum is targeted as a municipal requirement.

As is being seen more and more in urban environments, a particularly effective architecture of deploying video surveillance networks in a “linear” manner (down dense city streets, toll-way or expressway networks, along mass transit lines, etc.) is becoming a logical deployment design need. Cambium Networks’ PTP Point-to-Point and PMP Point-to-Multipoint products can easily fill this need, while providing multiple competitive advantages within the industry. These advantages fall in the key areas of costs, spectral efficiency, manageability, sustained capacity without “hop loss”, and expandability.

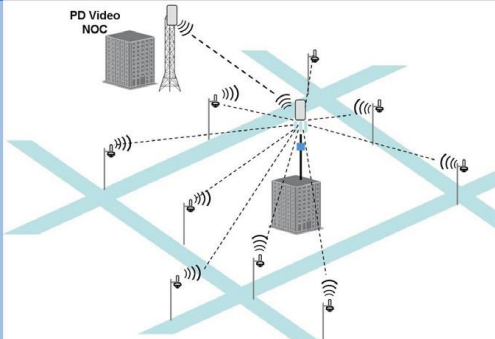
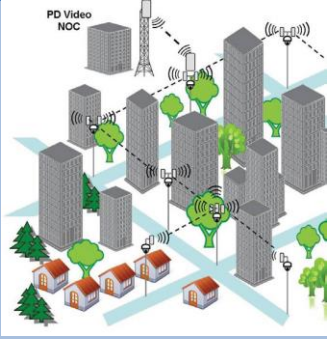
At the same time, where practical, more traditional Hub and Spoke Architectures for video surveillance are also easily attained via Cambium Networks’ Point-to-Multipoint solutions with some of the same industry leading advantages. The tables that follow throughout the remainder of this solution paper further detail many of the key product solution aspects that can be used towards designing and implementing a wireless video surveillance network that fits your specific challenge. Municipal deployments will select the architecture, or combination of architectures that best meets their connectivity needs.

Super Bowl Deployment

“With the stadium being in the heart of downtown Detroit, and not surrounded by parking lots like many other stadiums, we needed a solution that would boost officials’ situational awareness at the entrances and exits to the grounds. This solution allowed the officers to monitor a large area and population from their laptops while remaining in their dispatched areas.”

Derrick Miller, City of Detroit, CIO

WIRELESS VIDEO SURVEILLANCE ARCHITECTURE OPTIONS:

	Hub and Spoke Architecture	Linear Architecture
Diagram		
Typical Application	- Line of Sight (LOS) application where all locations are reachable from a central location	- Near Line of Sight (nLOS) or Non Line of Sight (NLOS) application where trees or buildings prohibit use of hub and spoke architecture
Strengths	- Proven Solution - Simple to design - Very low cost	- Proven Solution - Reliable performance in locations with obstructions - Single POP for city IT infrastructure - Easily expandable
Single POP for city IT	- Assumes all locations reachable from central location - Requires additional PTP links or more POP locations to expand	- Requires some planning for radio locations to account for obstructions - Slightly higher equipment costs

Hub and Spoke

DEPLOYMENT SITUATION: “T” LOCATIONS IN LINEAR SOLUTIONS

Placing cameras where they yield the greatest benefit to public safety places a high value on solutions that use RF spectrum efficiently and are easily managed. Spectrum is always limited, and systems that can be easily enabled to use RF spectrum enable deployments to maximize coverage and minimize the cost of equipment, design and installation. As shown below, the Cambium Networks wireless broadband system with a 10 MHz channel can accommodate “T” distributions in linear systems because the smaller channel size enables network operators to select from up to 5 channels in a 50 MHz spectrum.



Other systems using a 20 MHz channel are restricted to using only 2 channels. This demonstrated product flexibility and spectral efficiency is unique to Cambium Networks broadband products and is critical when deploying multiple or complex networks in the spectrum limited 4.9 GHz band.

	Competitor 20 MHz Channel Width Solution	Cambium Networks 10 MHz Channel Width Solution								
Diagram										
Channel Use	Competitor = <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 33%;">Ch1</td> <td style="width: 33%; background-color: red;">Ch2</td> <td style="width: 33%;">Ch3</td> </tr> </table> 32 Mbps	Ch1	Ch2	Ch3	Motorola = <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 20%;">Ch1</td> <td style="width: 20%;">Ch2</td> <td style="width: 20%;">Ch3</td> <td style="width: 20%;">Ch4</td> <td style="width: 20%;">Ch5</td> </tr> </table> 21 Mbps	Ch1	Ch2	Ch3	Ch4	Ch5
Ch1	Ch2	Ch3								
Ch1	Ch2	Ch3	Ch4	Ch5						
Throughput Efficiency	32 Mbps in a 20 MHz Channel	21 Mbps in 10 MHz Channel								
Strengths	<ul style="list-style-type: none"> - Wireless video surveillance - Higher throughput where channel is available 	<ul style="list-style-type: none"> - Wireless video surveillance - Sufficient throughput - Greater flexibility in channel selection - Lower total cost of ownership - Efficient use of RF spectrum 								
Challenges	<ul style="list-style-type: none"> - Limited channel selectivity - Required to switch to omnidirectional antenna (RF saturation) or add dual radio nodes (higher cost) - Channel re-use may be limited by interference or availability 	<ul style="list-style-type: none"> - Some channel planning 								
Business Impact	<ul style="list-style-type: none"> - Restricts camera deployment based on channel management - Increased cost of equipment 	<ul style="list-style-type: none"> - Deploy the cameras where needed - Consistent cost of camera infrastructure 								

INVESTMENT VALUE

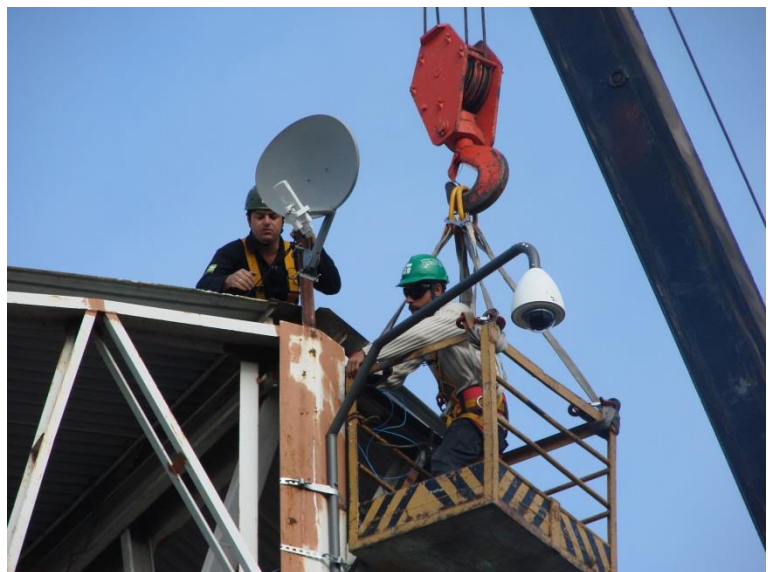
The monetary value of saving a person from harm or creating a safe community is beyond estimation. As much information as is gathered from video surveillance systems, one camera is not a replacement for a skilled, insightful public safety professional. Many communities that are deploying video surveillance solutions consider them as an information resource that complements and improves the efficiency of existing public safety personnel.



Public safety network operators should consider the value of the cameras when selecting locations for camera placement, and prioritize those locations where the cameras will provide the best complement to the public safety teams.

Typically, security monitoring personnel can cost approximately \$50 per hour, or \$100,000 per shift per year. As the video surveillance system works around the clock, a system of 10 video surveillance cameras can complement the existing public safety force to the same degree as three shifts of security monitoring personnel with a prevailing annual cost of \$300,000.

Public safety leaders will have different estimations based on the specifics of their particular situation. Once the decision has been made to proceed with deploying a video surveillance system, public safety leaders should consider the question of wired and wireless solutions.



CAMBIUM NETWORKS WIRELESS VIDEO SURVEILLANCE

With a portfolio of industry leading wireless broadband solutions and extensive field experience, Cambium Networks knows how to build systems that meet the needs of Public Safety professionals now and over the lifetime of the network. Cambium Networks understands that no one technology meets the needs of all applications. With a portfolio of wireless broadband solutions, CIOs and network operators can deploy the network that is the best fit to locate the video surveillance cameras exactly where they are needed.

Cambium Networks has also created an innovative and powerful approach to network management that helps ensure the highest video surveillance network uptime. Wireless Manager software allows video NOC staff to monitor the network in a holistic Google map-based view that graphically shows throughput and performance and alerts operators of any issues in real-time. This allows the fastest possible corrective action to any network issues if they should arise.

Reliable	<ul style="list-style-type: none"> • Encryption Cambium Networks wireless broadband systems can be configured with 128-bit AES encryption and are FIPS 197 certified. This level of encryption meets HIPAA (Health Insurance Portability and Accountability) requirements for data transfer of personal information. • Authentication Cambium Networks wireless broadband systems can be configured with positive authentication control, to deny access to unauthorized “sniffers”. • Rugged Cambium Networks wireless broadband solutions perform over time. With (literally) millions of modules deployed around the world, Cambium Networks wireless broadband equipment demonstrates a less than 1% field failure rate. This means that the system works when it is needed.
Cost Effective	<ul style="list-style-type: none"> • Less Infrastructure Without cables connecting each camera, the cost of material and maintenance of the network is dramatically reduced. • Less Time and labor Wireless technology means that video surveillance systems can be installed in a matter of hours instead of months required to pull cable and deal with construction issues. • Scalable GPS synchronization of the PTP and PMP layers in the Cambium Networks wireless broadband network means that new equipment can be added to the network without creating problems. Cambium Networks solutions can scale from small tactical coverage areas to city wide networks without removing and replacing equipment. MESH technology means that the cost to deploy in hard to reach locations is within range and Agencies now have the ability to distribute video to mobile field personnel.
Proven	<p>Cambium Networks wireless broadband systems are providing video, data and voice connectivity in more than 10,000 networks in 150 countries around the world. They are proven to work in harsh conditions in desert locations, high altitude winter applications, and over water.</p> <ul style="list-style-type: none"> • New Orleans In 2005, when hurricane Katrina hit New Orleans, a Cambium Networks wireless video surveillance system was rapidly deployed to provide security and assistance to the recovery teams. • Los Angeles In the high crime Watts area of Los Angeles, a Cambium Networks wireless video surveillance system is a part of a project designed to help curb criminal activity and provide a safe environment for residents in one of the city’s most notorious high-crime public housing areas.



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