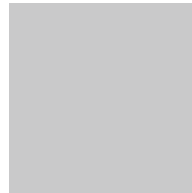
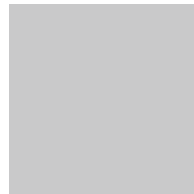
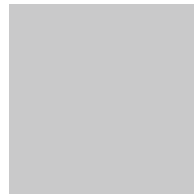


Alvarion's Benefits for Video Surveillance Over All-IP Wireless Networks

White Paper



Introduction

As security takes center stage in today's society, technology innovation in real time surveillance systems becomes very important, spurring the development of new capabilities. There are a multitude of markets that utilize surveillance systems including commercial buildings, malls, housing complexes, high traffic metro areas, cities and municipalities. While traditionally video surveillance has been deployed primarily using the existing fixed line technologies, due to over-dependence on the legacy infrastructure, long range wireless technologies are introducing new capabilities that significantly enhance the reach of existing networks. The advent of OFDMA technology coupled with advanced antenna technologies such as MIMO and beamforming have enabled significant improvements in radio performance which makes wireless broadband highly attractive as a building block for high capacity video surveillance networks.

Wireless Creates New Opportunities

As all-IP wireless broadband networks are built, many new technology functionalities come to the forefront, enabling a variety of applications. Alvarion's products are designed to process the features and attributes necessary to meet the cost, performance and coverage demands required for a wide-area, cost-effective, all-inclusive video surveillance system.

Wireless broadband networks complement existing wired infrastructure, and can be utilized as new infrastructure for video surveillance deployments. Wireless network infrastructure helps overcome many challenges, such as:

- Limited or lack of reach
- Time consuming deployment
- Limited flexibility for changes and rerouting
- High deployment costs (CAPEX)
- High operating costs (OPEX)

For more than 15 years, Alvarion has been at the forefront of the development and deployment of advanced radio and smart-antenna technologies for broadband wireless systems. As video surveillance is one of the applications that benefit from wireless systems, Alvarion solutions provide unique features to maximize video performance over wireless transmission and to minimize deployments costs.

Alvarion's Product Portfolio Provides an Optimal Solution

Alvarion's products incorporate several attributes and features that make them attractive and cost-effective solutions for high performance video surveillance networks. These include:

- Support for OFDMA and advanced antenna techniques such as Multiple Input Multiple Output (MIMO) and Maximum Ratio Combining (MRC): a base station can provide the Non-Line-of-Sight (NLOS) range to economically extend coverage beyond existing wireline facilities and provide a Line-of-Sight (LOS) range of up to 40 km in a point-to-multipoint topology (PtMP).
- Interference mitigation techniques such as Hybrid Automatic Repeat Request (HARQ) and Media Access Protocol Signaling (MAPS) repetition to ensure good performance in license-exempt bands.
- Support for channel bandwidth up to 20 MHz (2 X10) for WiMAX™ based systems and 40 MHz for other technologies to support multiple remote sites with high quality video and other broadband services.
- QoS support for multiple applications to enable voice, data and video traffic over the same link.
- Advanced security techniques to ensure communications confidentiality.
- Support for a high upstream data rate for high quality video surveillance images, and a custom made subscriber unit (SU-V) maximizing price performance.
- Multi-casting functionality that saves bandwidth by avoiding multiple transmission of the same video stream to different users.



Alvarion's WiMAX products are built on an all-IP backbone to enable easy integration and interoperability with a wide range of readily available off-the-shelf devices and systems. Deployments can be implemented in a variety of topologies, including PTP, PtMP, or Mesh, offering considerable flexibility in the design and optimization of a wide area broadband network.

Optimizing Video over Wireless

Wireless connectivity offers video surveillance solutions the combination of reduced deployment costs, flexibility and scalability in the placement of cameras and optimization of bandwidth allocation. Alvarion's extensive experience in the development and deployment of wireless communication systems enables reliable and resilient solutions, specifically designed and optimized for the video surveillance market.

However, a wireless solution may also be sensitive to interference caused by other radio transmissions. In a license-exempt environment the issue of interference is more challenging as the same frequency is being shared by multiple devices operated by non-synchronized operators serving different customers and applications. Such interfaces can cause significant performance reduction of the wireless link and reduce video quality.

Alvarion offers a software client that resides at the Subscriber Unit (SU) for enhancing video quality performance in a challenging wireless link environment. The software client utilizes a sophisticated algorithm which analyzes the wireless link status and the video stream characteristics. In addition, the video stream is adjusted via the dedicated algorithm and transferred in a unique sequence, maximizing the transmission efficiency and reliability of the video stream.

HARQ, a state-of-the-art error control method algorithm, is also part of the embedded software. This method outperforms other methods in poor signal conditions, by storing incorrectly received coded data blocks at the receiver (rather than discarding them). When the retransmitted block is received, the two blocks are combined (Chase Combining) for correct data extraction with significantly higher probability to receive a correct packet.

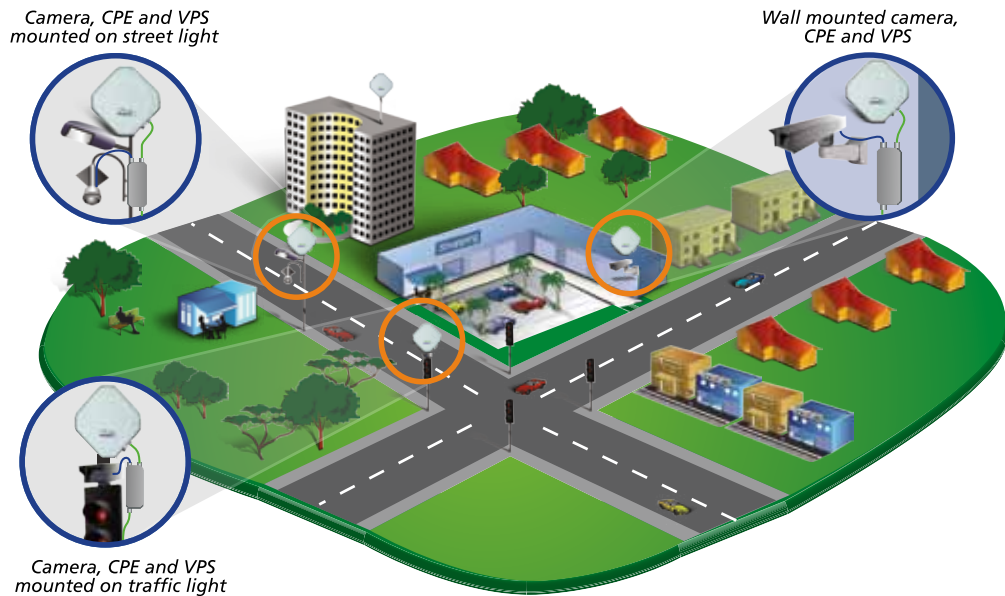
Video recording continuity is a crucial parameter in any video surveillance system. When the video stream quality is degraded the video recording might be stopped, which can be problematic for situation analysis. Alvarion's wireless systems significantly improve video quality in challenging wireless conditions, thus assuring video recording continuity for accurate analysis.



Camera Power Feeding

Wireless deployments reduce CAPEX and OPEX significantly when comparing to the deployment costs of alternative infrastructure solutions. Wireless eliminates the need for high cost trenching; and in license-exempt deployments, the expensive fees for owning a frequency license.

Although deployment costs are low when comparing to a wired deployment, Alvarion continues to integrate additional value-added features that reduce costs and facilitate installation. To cost effectively support video applications Alvarion's solution includes a subscriber unit dedicated for wireless video deployments (SU-V), supporting 8 Mbps upstream bandwidth with only 2 Mbps downstream. In addition, Alvarion's Video Power Supply (VPS) enables quick deployment of outdoor wireless video solutions by offering a single outdoor unit that provides power for both the SU-V and the camera, using the 802.3af standard.

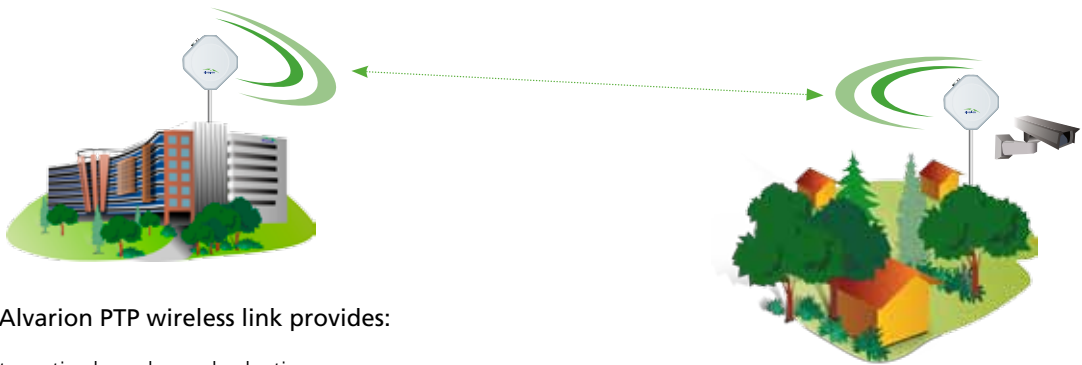


As illustrated above, one single AC power cable is connected to the VPS from which the power is distributed to both the SU-V and camera. The accessory also supports the IP connectivity between the SU-V and the camera. The VPS accessory also enables significant savings per installation, as the entire connectivity is outdoor using a single power cable feeding the system.

Wireless Point to Point Links

Wireless Point-to-Point (PTP) links support connectivity over up to 60 km, while maintaining very low costs. Such links are easily installed by experienced wireless installers. In recent years, cost-effective, reliable and ad-hoc wireless solutions are becoming extremely popular and demand for a system that can be deployed by non-experienced wireless installers is growing. Alvarion delivers a plug-and-play solution targeted to all installers, including those with only analog camera installation experience.

Alvarion offers a 10 Mbps wireless robust and secured PTP link to backhaul video surveillance cameras. The link is set up with a user friendly GUI wizard to set the basic parameters. The solution maximizes the wireless link throughput by automatically configuring the wireless parameters to best fit the environmental link.



The Alvarion PTP wireless link provides:

- Automatic clear channel selection
- Activation of enhanced interference mitigation algorithms
- Automatic adaptive modulation for noisy environments
- Automatic adjustment of asymmetric UL/DL ratio

Wireless quality PTP links can be easily installed by people who are not professionally trained on wireless installations. The PTP wireless link installation is also quick and less expensive. PTP solutions are available in different configurations supporting up to 250 Mbps.

Wireless Multicasting

Video surveillance deployments allow for real-time monitoring from a central office, allowing multiple mobile vehicles and terminals to view real-time video streams, enabling them to react rapidly and appropriately to emergency situations not only requires wireless solutions, but also requires a method that can transport the data efficiently.

Alvarion's BreezeMAX® Extreme can transmit the video stream received from the network video server to multiple clients leveraging its multicasting feature which reduces the video traffic, thus allowing for more cameras and subscribers on the wireless network. In this way, the QoS WiMAX 802.16e network can serve the upstream from the video cameras to the video server, as well as the video broadcasted to the vehicles.

The ability to multicast quality real-time video streams to multiple subscribers reduces the cost of the solution, since less base stations are required to support the application. The personnel in the vehicles see the video feed and may respond accordingly, before arriving at the scene.



Moving Forward

The deployment of video surveillance networks needs to meet the application's unique challenges. Wireless technology provides benefits, including ease of deployment and cost reduction. As more wireless-enabled applications are adapted, the optimization of the solution, especially for video surveillance, is critical.

Alvarion, a 4G wireless broadband leader with experience in the video surveillance market, invests heavily in optimizing video performance over wireless in radio and application layers, using standard and exclusive technologies, including:

- **Advanced Interference Mitigation Techniques:**

- MIMO Matrix A and Matrix B, Space Time Coding (STC), and Maximum Ratio Combining (MRC) are supported in both the base station and the terminal equipment
- HARQ and state-of-art error correction coding techniques
- Support for Dynamic Frequency Selection (DFS) and Dynamic Channel Selection (DCS) are especially important features for interference mitigation with deployments in license-exempt bands



- **Non Line-of-Sight (NLOS) Coverage:** Advanced antenna techniques and Scalable Orthogonal Frequency Division Multiple Access (S-OFDMA) with FFT size up to 1024 provides enhanced performance in NLOS conditions to ensure immunity to multipath typical in urban environments
- **Optimized Video Over Wireless** using software client that resides at the SU for enhancing video quality performance in a challenging wireless link environments
- **Wireless Video Multicasting** to save on bandwidth usage and the number of deployed base stations
- **SU-Video** specifically designed for video surveillance systems, coupled with the VPS to provide a cost-effective solution for an easy-to-install video surveillance terminal

For more information about Alvarion's video surveillance solution, please see our website:

<http://www.alvarion.com/index.php/en/solutions/video-surveillance>

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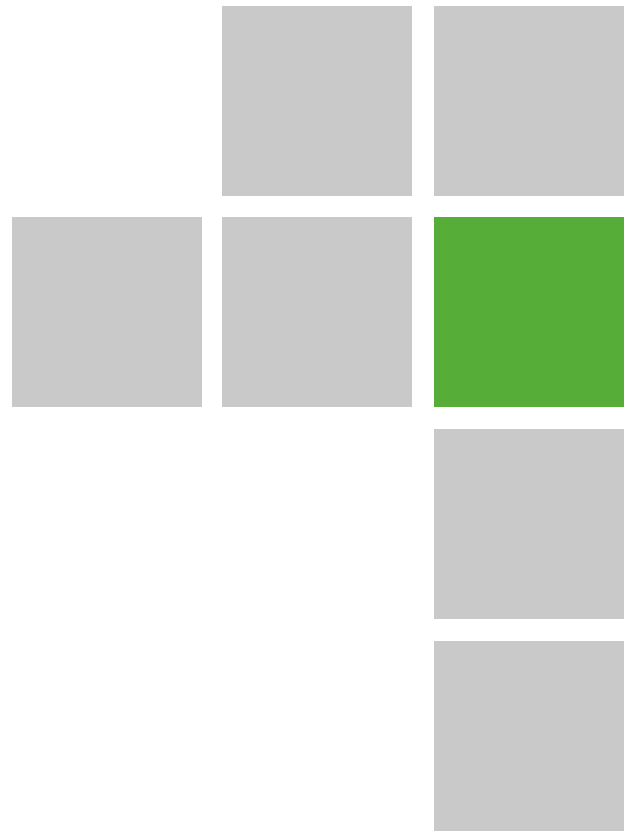
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About Alvarion

Alvarion (NASDAQ:ALVR) is a global 4G communications leader with the industry's most extensive customer base, including hundreds of commercial 4G deployments. Alvarion's industry leading network solutions for broadband wireless technologies WiMAX, TD-LTE and WiFi, enable broadband applications for service providers and enterprises covering a variety of industries such as mobile broadband, residential and business broadband, utilities, municipalities and public safety agencies. Through an open network strategy, superior IP and OFDMA know-how, and ability to deploy large scale end-to-end turnkey networks, Alvarion is delivering the true 4G broadband experience today (www.alvarion.com)

