

Wireless Video Surveillance with Ruckus Wi-Fi



Introduction

Although the majority of surveillance camera installations are now analog, huge growth in the wireless IP video market is expected as wireless shipments supersede analog cameras and as a large majority of the 8-10 year analog camera replacement cycle comes due replacing wireless IP equipment. (*ABIresearch July 19, 2010*)

Thanks to a steady stream of wireless technology innovation, increasing popularity and ease of use, the IP camera market has migrated from high-end specialized industries such as banks and casinos, all the way down the business size chain to homeowners and small businesses.

Why are businesses and individuals so interested in wireless IP video surveillance technology?

Innovation, practicality, and cost.

Unlike its analog cousin, IP video cameras can record and store streaming video files, with confidence, for virtually unlimited periods of time. Furthermore, placing and aiming wireless IP surveillance cameras in blind spots and difficult access areas delivers a peace of mind that is otherwise not available via wired alternatives. Video in lieu of physical security guards can save significant costs in the long run and decrease insurance premiums and liabilities. However, wireless IP cameras are only part of the equation; streaming IP video is only a reliable option with a stable and fast wireless network (WLAN) where video stream quality is consistent and pervasive. When it comes to mission-critical surveillance, half measures are unacceptable.

Implementation Approach

Whether you are considering replacing an existing wired video network, extending an existing wired network into hard to wire areas, or deploying a new wireless video surveillance network, the implementation approach is similar.

Wireless cameras face the same bandwidth and distance challenges as laptops, iPads, and smartphones. Addressing these issues is key to success.

Environmental Considerations

RF signals are impacted by the density and type of obstacles between wireless radios. Line of sight and other obstacles are issues that need to be addressed, as well as interference. This is another instance in which the site survey becomes the map to hidden treasure, in this case, the treasure is the ideal locations in which to mount the APs and client cameras.

The primary objective of a WLAN is to maximize range, reliability, and capacity when deploying Wi-Fi enabled security systems. Ruckus' adaptive antenna technology with twice the capacity and twice the range of other vendors, results in a reliable, higher performing wireless connection regardless of environmental interference.¹

¹ Tom's Hardware

PERFORMANCE CONSIDERATIONS FOR WIRELESS VIDEO SURVEILLANCE

RANGE — RF signals weaken with distance, 802.11 devices compensate by lowering their transmission rate.

PERFORMANCE OSCILLATION — Video traffic requires continuous, uninterrupted bandwidth. Interference and multipath fading result in reduced and unpredictable signal strength, coverage holes and packet errors.

BANDWIDTH SHARING — Wi-Fi bandwidth is shared between simultaneous applications. A single large file transfer can stop video transmissions.

Ruckus' BeamFlex technology makes this possible by leveraging up to 19 polarized antennas, along with real-time software, that focus each packet of energy on the client thus implicitly steering around interference and increasing overall signal strength.

Other benefits — Ruckus' meshing and bridging technologies. Both are critical in getting the most out of your wireless video surveillance network.

What is the Ruckus Advantage?

Ruckus' heritage began in the consumer market with IPTV, where Ruckus successfully resolved issues commonly found with streaming video over a wireless network via its patented adaptive antenna technology (BeamFlex). This adaptive antenna technology, in combination with Ruckus' SmartCast technology, delivers greater throughput and more predictable performance for latency sensitive applications, such as those associated with video camera applications that are jitter and delay sensitive.

What is SmartCast?

SmartCast is a smart traffic management system that maximizes reliability and wireless performance. It is comprised of an advanced superset of IEEE 802.11e/WMM hardware based queuing standards as a software enhancement that automatically inspects, classifies, pre-queues, and schedules traffic (See Figure 1). SmartCast also provides automatic Band Steering, directing dual-band radio clients to the optimal band (See Figure 2). Another feature, air-time fairness, more efficiently shares the spectrum with a combination of older and newer client radios (See Figure 3). Ruckus SmartCast plus adaptive antenna technology is successfully deployed in millions of subscriber homes that have high-definition wireless video streaming.

Meshing Advantages

Another must-have for video deployments is wireless mesh. Wireless mesh allows for very long distances by breaking long distances into a series of shorter hops. This is perfect for wireless video surveillance camera networks. Typically, these networks already have some sort of wired network. Ruckus' Smart Mesh uses a hybrid approach whereby the wired network is leveraged to minimize the degradation over very long distances. This is called Ethernet mesh or 'emesh', saves a wireless hop and ensures

BENEFITS OF RUCKUS' SOLUTION

- **Powerful** — Sophisticated, application-aware classification engine, per-client scheduling and prioritization for WLANs provides precision bandwidth management, traffic shaping and service level agreements for video traffic.
- **Superior Performance** — Eliminates jitter and delay for video traffic providing quality of service and outstanding user experience.
- **PoE Power** — Outdoor APs can accommodate power requirements for wireless cameras.
- **Optimal utilization** — Airtime fairness provides efficient use of the available spectrum, resulting in greater network capacity in high-density and diverse client environments.
- **Increased efficiency and capacity** — Band steering directs dual band clients to the less congested 5 GHz spectrum, while load balancing directs clients to less congested APs, distributing client load across all available channels and APs.
- **Easy to use and deploy** — Smart heuristic-based classification automatically provisions QoS services.
- **Easy to install** — Lightweight design.

WIRELESS REQUIREMENTS

Bandwidth intensive

- Requirements sustained, higher rates
 - MPEG-4, SD - 0.5 - 1 Mbps
 - MPEG=2, SD – 2.5 - 4 Mbps
 - HD can go as high as 20 Mbps!
- Typical video deployments require multiple streams so bandwidth requirement multiplies equally

Many protocols

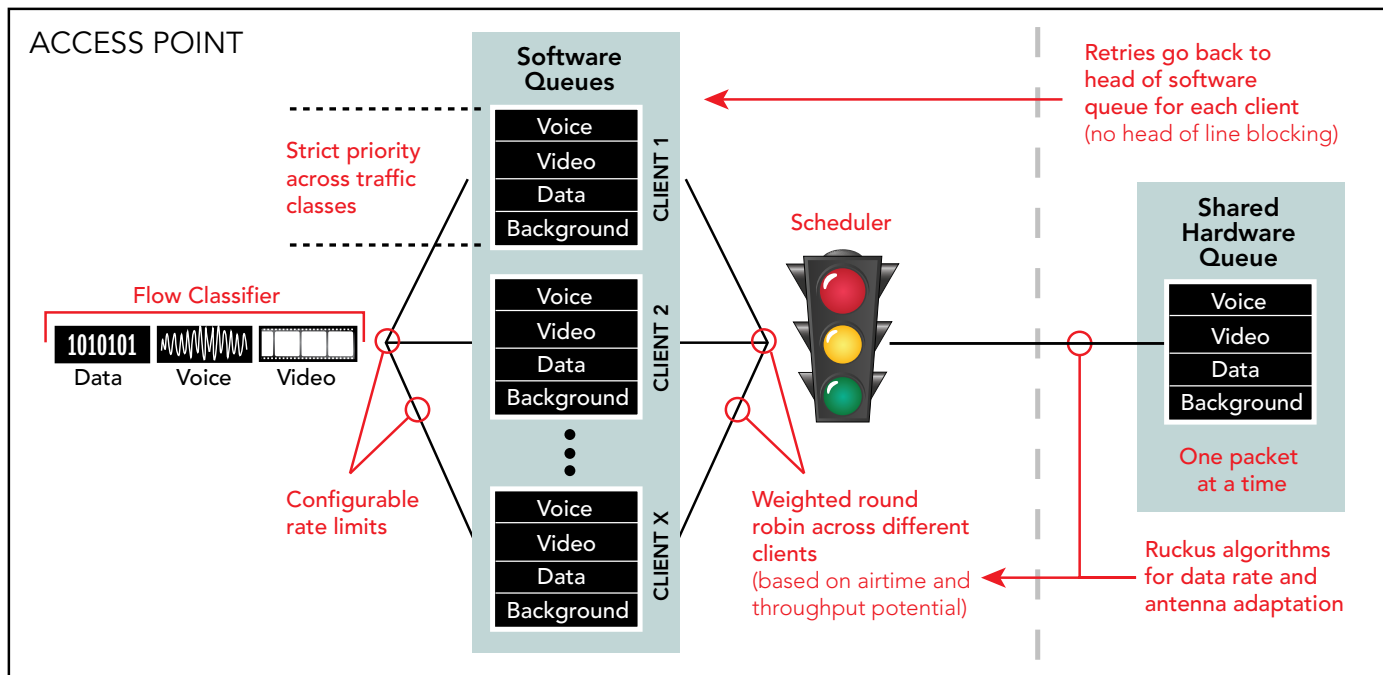
- UDP, TCP, multicast, unicast

Reliable and consistent network access

- Reduced latency, jitter, packet loss

minimal throughput degradation. Furthermore, Ruckus' solution dynamically selects different channels for adjacent hops further allowing for simultaneous transmission on orthogonal channels.

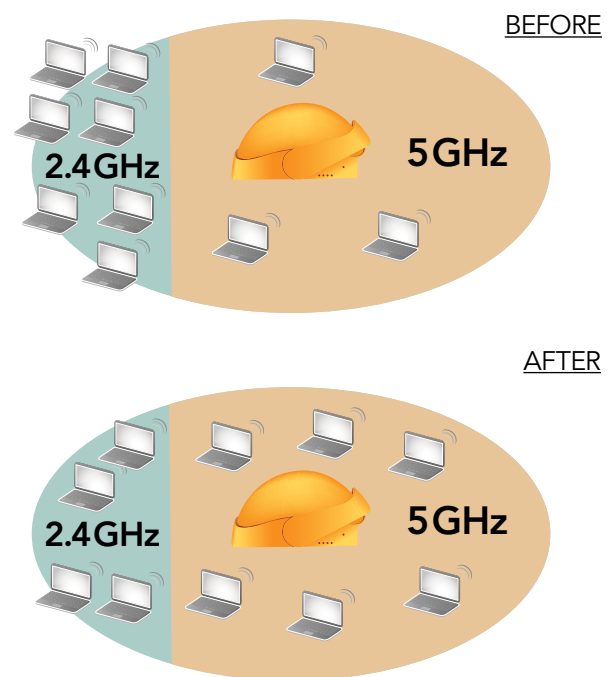
The hybrid mesh allows Ruckus APs to be connected by Ethernet to remote mesh nodes; forming new trees in the middle of the mesh. Hybrid Mesh takes advantage

FIGURE 1: SmartCast Queuing and Scheduling

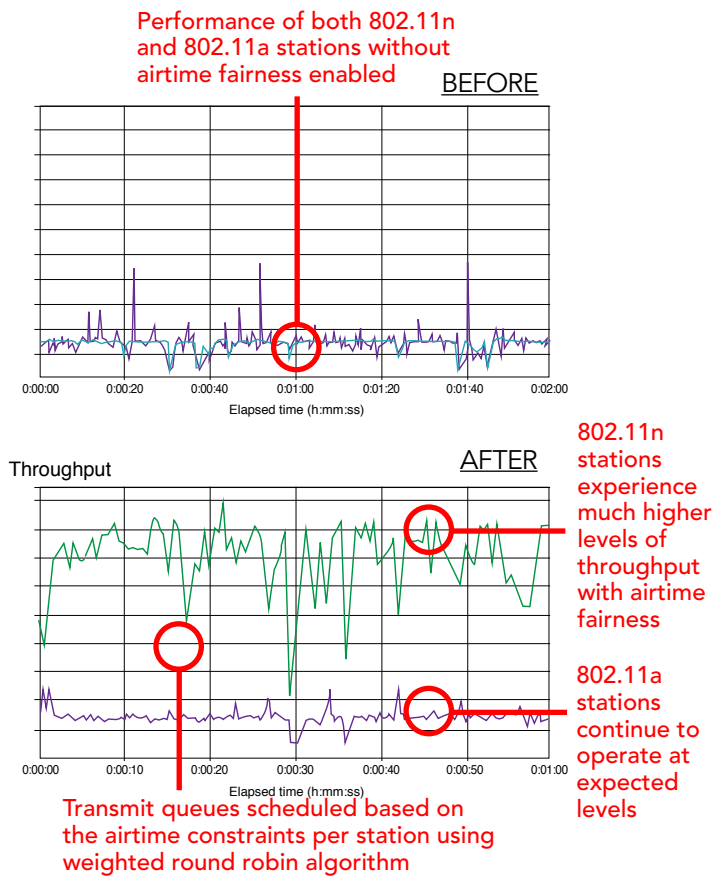
of spectrum reuse to increase system capacity while expanding the mesh; APs automatically determine their own role in the mesh and automatically adjust to topology changes. Ruckus' Smart Mesh Networking is self-organizing, self-optimizing, and self-healing. And, it is the first Wi-Fi meshing approach that combines high-gain smart antenna arrays, sophisticated RF routing, and centralized management within a single WLAN system.

Customers have taken note. Research from the Dell'Oro Group, a leading industry analysis company acknowledges Ruckus Wireless as the worldwide leader in Wi-Fi mesh AP shipments to service providers, garnering 41% of the market in the Q4 of 2009 and 57% in Q1 of 2010.

From a practical standpoint, there is virtually no configuration necessary to enable the Ruckus solution meshing capabilities. By clicking on one button within the user interface (UI) the AP is automatically provisioned and enabled, maximizing efficiency through channel selection, ensuring a fast and reliable connection irrespective of time and changing environments. Other solutions require manual channel selection 'spray and pray' which is not dynamic and does not adapt with the naturally changing environmental conditions that ultimately impact wireless networks (See Figure 4).

FIGURE 2: Band Steering in Action

- Ideal for high-capacity environments
- Automatically steers clients to 5GHz
- Takes into consideration RSSI levels across both bands
- Supported in Ruckus dual-band APs

FIGURE 3: The Impact of Airtime Fairness

Bridging

In the past, limited availability of network ports and cabling in hard to reach areas that are difficult or impossible to wire have been gating factors for widespread deployment of analog or wired IP surveillance. The advent of the wireless bridge and its facility to connect two or more physically or logically separated network segments, and Wi-Fi enabled video surveillance equipment offers a more cost effective alternative. This is particularly true with regards to the expenses associated with trenching and pulling cable/fiber. A Ruckus point-to-point bridge provides uninterrupted bandwidth up to 50 Mbps at 10KHz — at wire-like speed that meets the demands of even very large video installations (See Figure 5).

Cost

The Ruckus solution requires 50% less equipment than competing vendors (CAPX)². Point-to-point bridges

² CAPX = A capital expenditure is incurred when a business spends money either to buy fixed assets or to add to the value of an existing fixed asset with a useful life that extends beyond the taxable year

RUCKUS' MESHING ADVANTAGES

Smart Mesh Networking dramatically lowers deployment costs

Smart Mesh Networking eliminates costly Ethernet cabling to every Wi-Fi access point. Extended signal range from high-gain directional antenna arrays reduce the number of mesh APs typically required.

No RF experts required

Smart Mesh Networking automatically determines the optimal network topology and maintains the best connections between APs.

Extended range minimizes mesh hops for high performance

High-gain directional antenna arrays in every Smart Mesh Networking access point enable signals to reach farther to eliminate needless mesh hops that degrade performance.

Hybrid mesh architecture expands the mesh without reducing throughput

APs can be connected by Ethernet to remote Mesh APs, forming new trees on new channels and eliminating the "halving of throughput" that happens when adding a hop.

Deploys in half the time of conventional 802.11 WLANs

Smart Mesh Networking automates configuration, reducing Ethernet cabling and eliminating extensive RF planning, enabling Smart Mesh Networking WLANs to be deployed and operational in half the time of conventional WLANs.

Integrated interference avoidance ensures high reliability

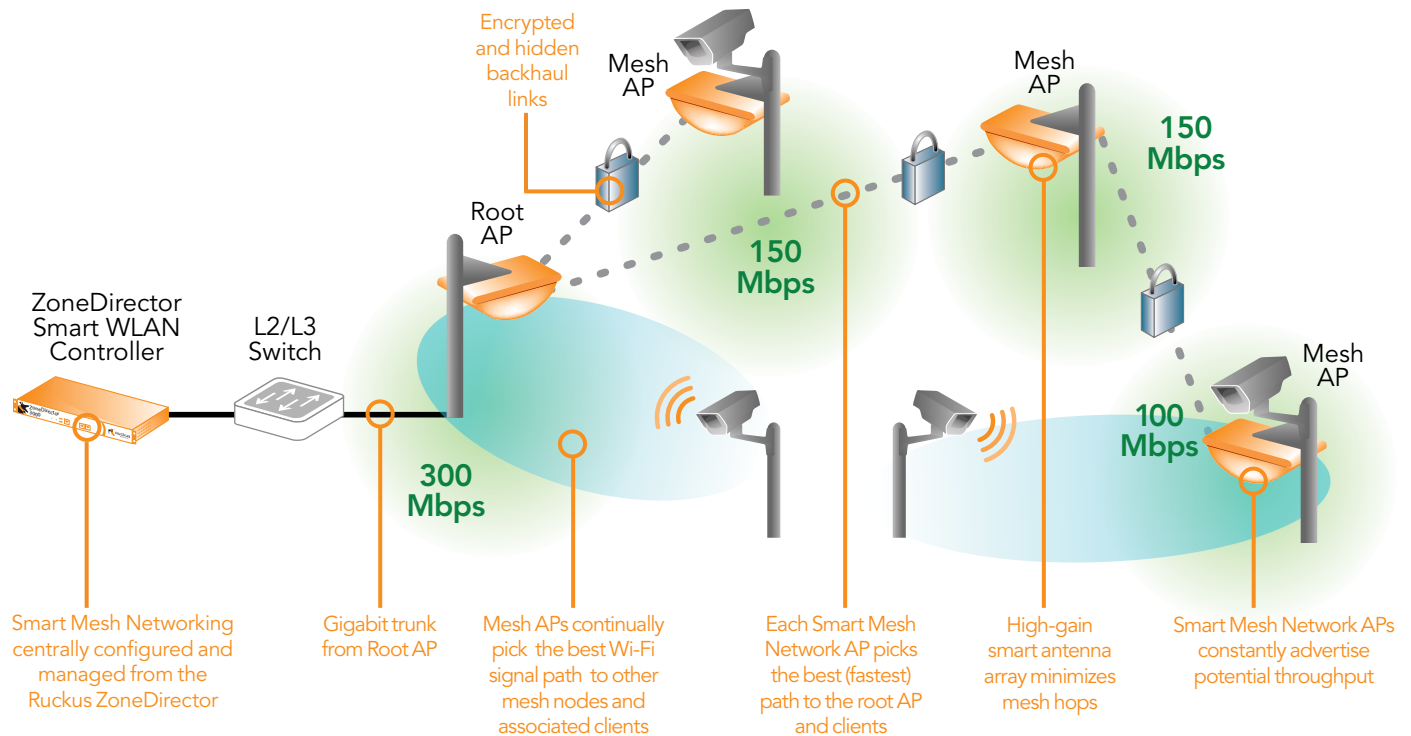
An intelligent antenna array in each ZoneFlex AP picks the best signal path for traffic at any given time and automatically steers signals around interference to ensure high availability of mesh links.

Automated deployment keeps things simple

Configure the entire Smart Mesh Network in minutes from a central management system. Plug mesh APs into the network and the ZoneDirector™ automatically provisions all nodes.

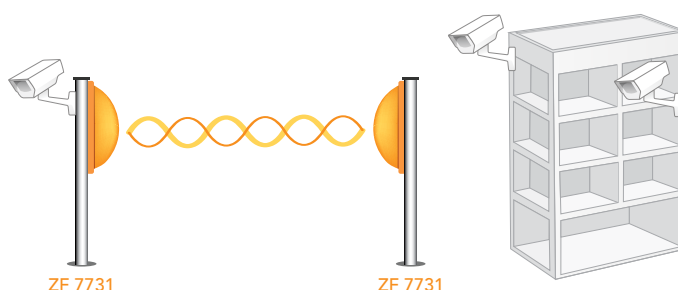
Highly secure

All mesh backhaul links between nodes are encrypted and hidden to ensure safe and secure operation.

FIGURE 4: SmartMesh Networking with Wireless Video Surveillance Cameras

are paid off in less than one year — a more viable and economical alternative to paying a Telco for dedicated link location service level agreements (OPEX)³. Customer testimonials repeatedly support this fact. Hence, when taking into consideration the up front costs, ongoing expenditures, proven performance, and ease of deployment and management, Ruckus is the smart Wi-Fi choice for adding a wireless IP video surveillance system to your crime prevention and security breach repertory.

³ OPEX = An ongoing cost for running a product, business, or system.

FIGURE 5: Bridging

COMMON CAUSES FOR UNRELIABLE WI-FI

- RF interference – you hated it w/analogue TV, hate it more with IPTV
- Traffic prioritization – video must take priority over data and background traffic
- Capacity – too many clients or AP is too busy with other traffic

For a reliable network

- Speed/throughput
- Reliability and consistency
- Priority (QoS) over data/background traffic

If you are missing any of these, the deployment can fail.

BeamFlex Optimizes wireless for video:

- Picks best path for each packet
- Improves signal reliability
- Increases effective throughput
- Avoids /mitigates interference
- Increase range
- Maximize coverage

BEST PRACTICE CHECKLIST

- Reduce background scanning or disable if environment is stable enough
- Stick with 802.11a if possible
 - Choose highest channel on the 7962
- Configure 7111 adapters to an SSID that is dedicated for video
- Use different 'video' SSIDs between the individual AP's so the 7111 adapters won't crowd to one 7962
- Reduce unnecessary traffic
 - Chatty protocols (Bonjour, etc.)
 - Broadcast/multicast traffic from wired networks
 - Unnecessary SSIDs
- Limit mesh hops
- Multicast to unicast conversion
 - Done automatically by Ruckus SmartCast!
- Avoid 802.11b devices on 2.4 GHz
- Avoid channel changing, which is a popular approach to interference avoidance. BeamFlex and Ruckus' adaptive antenna technology effectively automates interference avoidance to provide more than twice the capacity and coverage as other vendors.

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