



white paper

Making WLANs Work Reliably and Cost-Effectively

A GUIDE FOR ENTERPRISES AND HOTSPOT OPERATORS

Executive Summary

Administrators of enterprises and independent hotspots at hotels, stores, transportation centers, and other public venues are often frustrated by the limitations of wireless consumer products or other enterprise solutions with inadequate support for multimedia. These companies need an affordable, easy-to-use alternative that is still robust and scalable enough to extend the reach of their wireless LANs, support existing and next generation multimedia-rich digital content and services and provide reliable and predictable Wi-Fi performance.

This paper examines the opportunities and challenges associated with operating an enterprise WLAN or public hotspot. It explains the benefits of a self-configuring platform that can deliver Wi-Fi more reliably, to increasingly diverse devices and applications, covering larger areas and higher user densities, while minimizing total cost of ownership. Finally, this paper introduces the Ruckus ZoneFlex™ wireless LAN system, which is ideal for demanding multimedia applications, thanks to an advanced, patented smart antenna on each ZoneFlex AP.

In the Beginning

Wi-Fi has become the access method of choice for users at the office, at home, and on the road. About 440 million Wi-Fi chipsets were shipped during 2008. The number of cumulative Wi-Fi chipset shipments is expected to top 1 billion this year, up from more than 200 million sold in 2006, according to data from ABI Research. But even more impressive, the ABI research indicates that there will be well over a billion chipsets shipped in 2012 alone, with cellular handsets and consumer electronics accounting

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TABLE 1

SOMETHING'S MISSING: TODAY'S WLAN CHOICES

WLAN Requirement	Enterprise Wi-Fi	Consumer Wi-Fi
Easy to configure, deploy and manage		✓
Affordable		✓
Simple to secure		
Self-optimizing, self-healing	✓-	
Extended Wi-Fi coverage (no dead spots)		
Automatic RF management	✓	
Interference mitigation		
Support for isochronous (delay-sensitive) traffic	✓-	
Centralized management	✓	
Automatic client configuration		
Reduced cabling (wireless AP meshing)		

for over two-thirds of that total. Beyond computers, Wi-Fi enabled televisions, set-top boxes and DVD players are entering the market. With these devices in hand, users want to tap into multimedia-rich services and high bandwidth mobile applications, such as video on demand, streaming IP video, gaming, and social networking.

Gartner Group estimates that 64 percent of businesses have already deployed Wi-Fi, from isolated trials to campus-wide rollouts. Surveys show that Wi-Fi is no longer a niche technology, used largely for Internet access in conference rooms. Two out of three companies with WLANs use Wi-Fi as an Ethernet replacement in cubicles and offices, while one quarter use Wi-Fi to support core business applications like inventory management and manufacturing automation.

In addition, many workers now access the Internet and business applications through public Wi-Fi hotspots at hotels, airports, and many other venues frequented by travelers. Roaming access provider iPass reports that worldwide business use of iPass Wi-Fi hotspots increased by 46% from the first half of 2007 to the first half of 2008. Other key findings include rapid growth of Wi-Fi in Europe, Asia Pacific and Latin America, and the emergence of hotels, restaurants, train stations and public places as high-growth venues. Inter-city travel venues remain the most popular, accounting for nearly three quarters of sessions globally.

Airports are still on top with 40% of overall sessions and grew by 28% year over year. Hotels grew by 66% and now account for more than 34% of global share.

As Wi-Fi becomes pervasive, user expectations rise fast. To not only survive but thrive, today's casual data WLANs must mature into reliable "hotspots" – larger, higher-capacity WLANs that deliver predictable service to increasingly diverse and demanding users. For enterprises and hotspot operators, short on time and budget, the trick is to accomplish this mission critical transformation with minimal cost and complexity.

Overcoming Today's Challenges

Many business WLANs actually start with consumer-grade access points (APs). These APs are placed wherever wireless access is desired – initially in conference rooms and lobbies, later throughout offices and other work areas. This type of unplanned organic growth may have been satisfactory when Wi-Fi was a novelty, but as dependence and utilization grow, limited coverage and uneven performance and compromised security quickly starts to disappoint users and frustrate administrators.

While lack of formal planning plays a role, consumer-grade APs are just not up to the task of creating a comprehensive, reliable business-grade WLAN. These APs use inefficient omnidirectional antennas to cover a circular area of limited diameter. As Wi-Fi transmissions are absorbed and reflected by walls and other obstacles, those circles shrink from 300 feet wide in open space to under 50 feet inside a typical office.

Covering a larger office (or a hotel or school) requires multiple APs, but the outcome is often spotty (See **Figure 1**). At the edge of each circle, weak signal delivers unreliable low-rate connections. Dead spots in between prevent or break user sessions, requiring repeated log-ins, application restarts – even reboots.

To eliminate dead spots, some organizations try deploying consumer APs more densely. However, with only three non-overlapping 802.11b/g/n channels to choose from, this can generate disruptive co-channel interference between adjacent APs. In the end, total capacity does not improve, problems increase, user experience degrades, and administrators struggle to manage numerous APs, each operating autonomously.

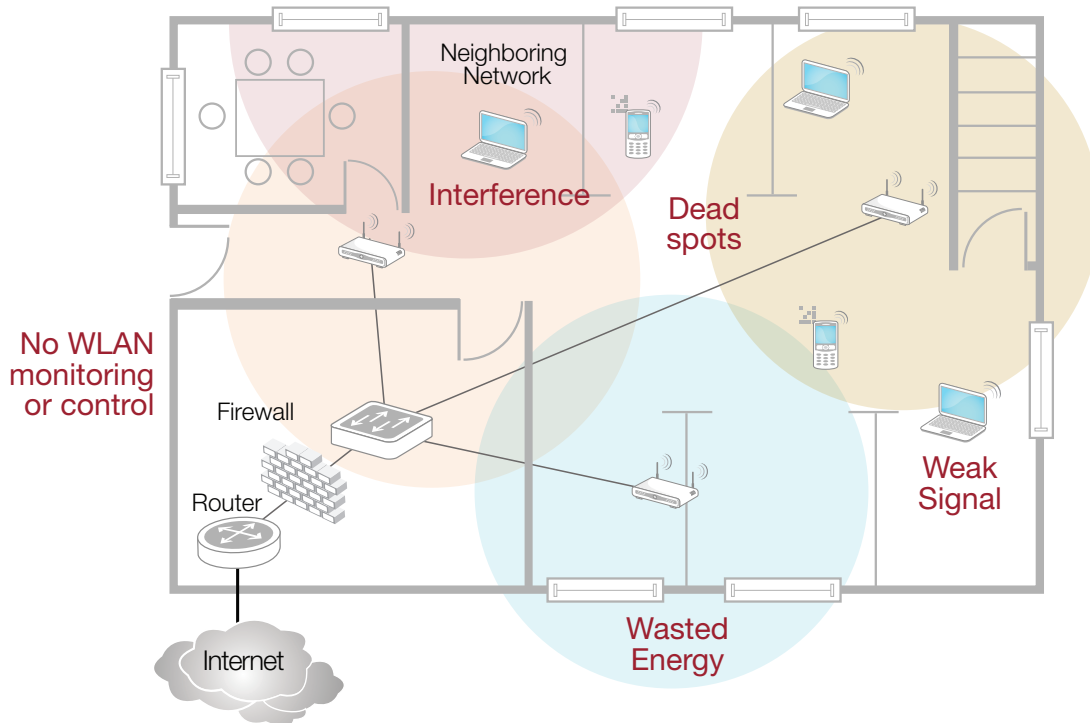
Larger enterprises overcome these challenges by deploying sophisticated WLAN switching systems and RF management suites. According to Gartner, 80 percent of enterprises are now revisiting their WLAN designs to cope with growing

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Figure 1: Office WLAN using consumer-grade access points



demands and external interference. Many are spending thousands on site survey tools (average cost \$3-5K), WLAN controllers (\$2-50K), wireless intrusion prevention servers (\$5-20K), WLAN management platforms (\$4-30K), and location tracking appliances (\$2-14K). Once the cost of design, installation, management, and maintenance are added, total cost of enterprise WLAN ownership is roughly double that of the infrastructure investment.

Clearly, high-end enterprise products are too expensive, and they require experienced IT staff and RF experts. Today, IT staffs are stretched thin performing a myriad of tasks and unprepared to be RF or Wi-Fi experts.

Meanwhile, as WLAN usage and footprint grows, the operational and performance problems associated with consumer-grade APs will only get worse. To survive, companies that are too big for consumer gear but unwilling to take on complicated enterprise suites must find another way to operate more reliably.

Meeting Tomorrow's Demands

Wi-Fi applications are expanding rapidly beyond guest Internet, employee Intranet, and email access. These casual data applications still represent the lion's share of WLAN traffic, but more demanding multimedia applications such as IP surveillance, streaming or video on demand, and videoconferencing are poised for growth. As shown in Figure 2, email, employee Intranet/Internet access, guest access, core business applications, and VoIP were in use at most of the companies surveyed this year.

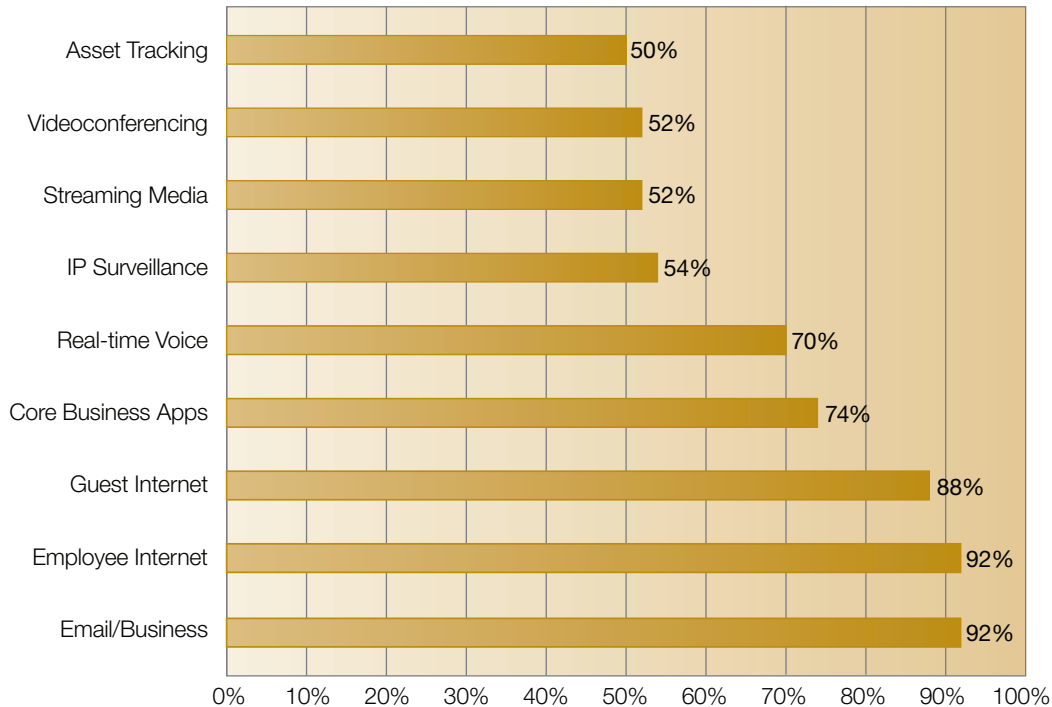
Today, business WLANs are dominated by laptops. Tomorrow, those WLANs will be required to support a far more diverse collection of business devices, including Wi-Fi-enabled projectors, printers, smart phones, and VoIP handsets. For example, Gartner Group expects the installed base of Wi-Fi phone used in enterprise WLANs to grow from 1.2M in 2008 to 6.4M in 2012. Dual-mode (cellular + Wi-Fi) phones/smartphones used in enterprise WLANs will grow from an installed base of 2.5M in 2008 to 73.1M in 2012, for use in Fixed Mobile

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Figure 2: Enterprise WLAN deployment



Source: October 2008 Wireless LAN Series Webinars

Convergence (FMC) initiatives that route calls over corporate LANs, Wi-Fi APs, and fixed-mobile networks.

Public hotspots will experience similar growth in applications and devices. Consumer video applications like YouTube, IPTV, and Slingbox have already taken hold. Hotspots now advertise support for Skype softphones and handsets as a competitive differentiator. Voice over Wi-Fi is heavily-used by guests and staff in hospitality WLANs. For example, Wi-Fi communicator badges are quickly replacing those old walkie-talkies carried by hotel and conference center staff.

To keep tomorrow's users happy and productive, today's casual data WLANs must grow into robust multimedia hotspots. This means delivering predictable, secure coverage that blankets the entire service area with sufficient capacity and density. It also means satisfying the diverse constituencies who share the same airwaves by delivering the class of service appropriate for each user, device, and application. WLAN operators that prepare to meet these escalating demands will thrive in the multimedia age.

Getting from here to there

Meeting these increasingly stringent demands without working yourself into the ground or breaking the bank requires a new kind of platform — one specifically designed for the target environment. Whether you are building your own WLAN or a public hotspot, you will need an affordable, easy-to-use platform that is still robust and scalable enough to enable footprint, capacity, and service expansion. What essential characteristics should you look for in your next WLAN platform?

Simplified installation and configuration

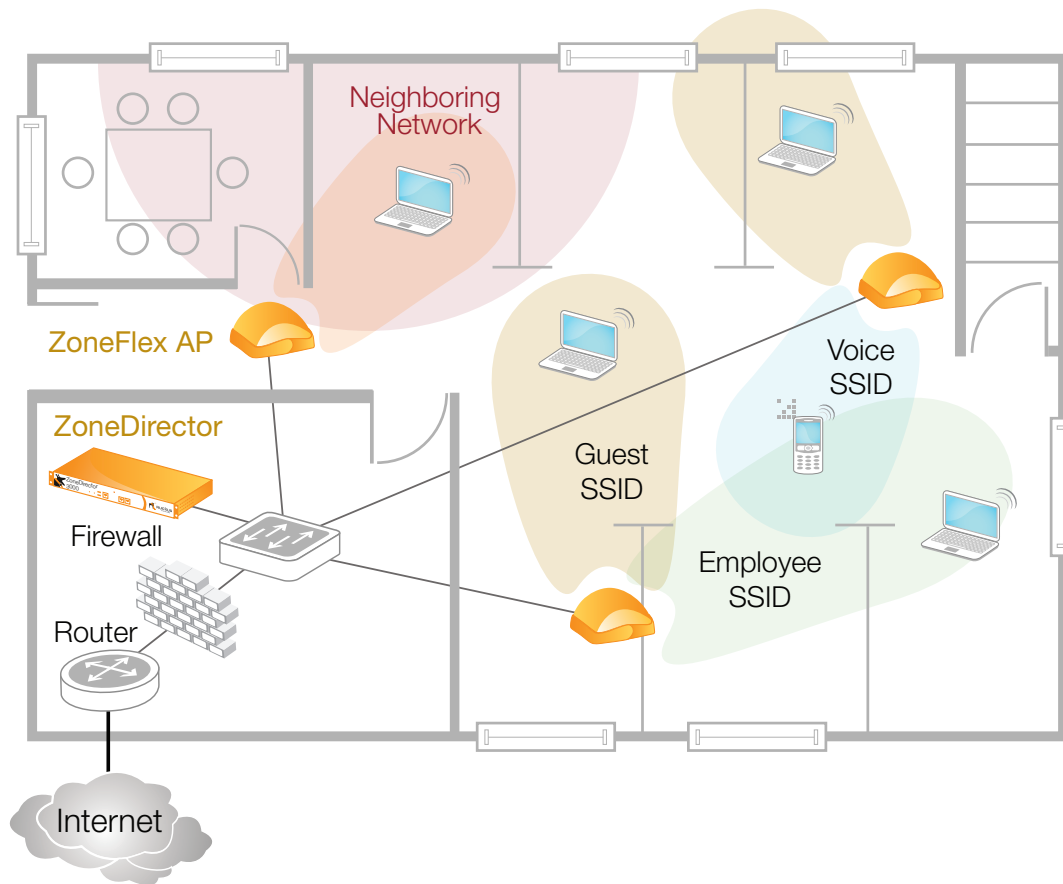
Given limited staff and RF expertise, enterprise and hotspot operators need to be able to quickly install and configure all the requisite WLAN components such as controllers and APs. Wizard-based configuration systems that provide easy-to-understand setup are a must. Additionally, a platform that can find and activate new APs on its own, make automated post-deployment adjustments to reduce dependence on pre-deployment site surveys and expert set-up, is a sound investment.

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Figure 3: Office WLAN based on Ruckus ZoneFlex



IT-lite deployment

Gartner Group estimates that enterprise AP installation runs \$200 to \$800 per AP. A significant portion of that cost involves supplying power and network connectivity to each AP. Look for APs that can reduce or eliminate those costs. Using Ethernet cables to deliver DC power (802.3af) is one good option. Another is using Wi-Fi to create a wireless mesh between APs thereby eliminating Ethernet cables to APs altogether — particularly when the AP must be located out of reach of the existing Ethernet drops. Merely place APs anywhere and add power. The APs then find the best performing RF path to the root or backhaul AP wired to the network.

Self-tuning

The single-most time-consuming and frustrating aspect of WLAN administration is dealing with change. New APs are added, existing APs fail, obstacles and users move, and environmental

conditions vary — all impacting optimal channel assignment, power output, and antenna positioning. Even if you could tweak parameters to respond to those changes, doing so would take RF expertise and full-time supervision — and adjustments still wouldn't occur fast enough. Instead, look for a platform that tunes itself, dynamically adjusting RF settings to automatically mitigate interference, fill coverage gaps, and deliver predictable performance.

Increased capacity

AP range and capacity directly impact cost of ownership. Upgrading from 802.11n to 802.11ac can make your WLAN less complicated and costly as 802.11ac APs can cover larger areas at higher data rates. However, more raw bandwidth does not always result in proportionally higher throughput and doesn't guarantee higher user and session density. Start with APs that

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can support more than a handful of simultaneous sessions and APs that automatically load share. Then look for features (broad channel support, adaptive directional antennas) that allow those APs to be placed in closer proximity without interference.

Tiered service levels

Tomorrow's diverse devices and multimedia applications will require WLANs that adapt to their unique needs. Just throwing more bandwidth at multimedia is not enough — streaming video will gobble capacity, slowing data and rendering VoIP unusable. Deploy only APs that let you prioritize traffic using 802.11e Wi-Fi Multimedia (WMM) access categories: voice, video, best-effort, and background without tedious or complex administration. In addition, look for optimizations important to your users, like WLAN tunneling to reduce VoIP latency and power-save to conserve handset battery life. By delivering premium service to selected users, enterprises can allocate resources appropriately and hotspot operators can tap opportunities to earn more revenue.

Robust but simple security

Start with APs that support standard 802.11i security, including WPA and WPA2, using PSK and 802.1X authentication. Then seek out new capabilities that provide automatic client security configuration. New systems now provide the ability for the network itself to configure the wireless and security settings on end user laptops. Another key criteria is the integration with your Active Directory or RADIUS server if already in place. In a perfect world, every client would support these strong security measures. But, as more users and devices connect to your WLAN for a wider variety of reasons, one-size-fits-all security will not cut it. Those with guests may require login portals, while those with embedded devices may need MAC filters. Look for a platform that lets you assign role-based security policies using multiple SSIDs and VLANs to segregate those clients and control their traffic flow.

Reduced maintenance

Enterprises and hotspot operators cannot afford to continually watch their networks, nor can they spend a lot of time tuning them. However, you still want the ability to quickly determine how your WLAN is operating and who is using it. Look for a platform with a centralized easy-to-use console that lets you see the entire WLAN at a glance, then drill down to trouble-shoot or update APs. Too much information is overwhelming but too little information is just as bad. Make sure that you can visualize RF status, device locations, user connections, recent alerts, and historical reports at a level of detail that is right for you.

Introducing Ruckus ZoneFlex

The Ruckus ZoneFlex Smart WLAN solution is a family of products developed to fill the gap between unreliable consumer-grade APs and pricey, complicated high-end enterprise WLAN systems.

By combining smart ZoneFlex multimedia APs with a turnkey centralized control system, Ruckus has enabled painless deployment of robust, full-featured WLANs that are more affordable and easier to deploy and manage. ZoneFlex was created with simplicity in mind, using drag-and-drop interfaces, wizards and automation to simplify installation and operation.

And ZoneFlex was designed to do much more than simply address the headaches associated with today's casual data WLANs. By using smart Wi-Fi antenna technology to pick the best signal path and mitigate interference, ZoneFlex squeezes the most out of your airspace. ZoneFlex can help you expand your WLAN's footprint, capacity, and services by creating a reliable Wi-Fi hotspot that requires fewer APs than any other enterprise WLAN system.

ZoneFlex can be deployed in an office environment (see **Figure 3**) or a public hotspot, using a single ZoneDirector to automatically discover, provision, and manage up to 250 ZoneFlex Smart Wi-Fi APs.

ZoneFlex APs are less expensive than enterprise APs and far more powerful and robust. These APs implement Ruckus patented antenna technology (BeamFlex™), sophisticated RF routing (Smart Mesh Networking), quality of service (SmartCast™), and advanced security mechanisms (SmartSec).

BeamFlex uses smart antennas to extend AP range and coverage up to 2 times by dynamically adapting to traffic along the optimum path to each client (see **Figure 3**). By mitigating RF interference, BeamFlex not only enables high density WLANs — it does so while delivering more predictable and reliable service without manual tuning and constant tweaking. In short, ZoneDirector does the rest — from dynamically selecting and adjusting AP transmit power levels and channel assignments to automatically adapt the ZoneFlex APs to your environment, avoiding administrator and user frustration. This results in fewer APs deployed, higher-levels of performance to end users and the elimination of Wi-Fi dead spots.

802.11ac carries the promise of high data rates and throughput. The Ruckus ZoneFlex R700 with BeamFlex delivers on this promise by ensuring that the advanced techniques used in 802.11ac are optimized.

Smart Mesh Networking leverages BeamFlex to extend the

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benefits of increased range and interference mitigation across a multi-AP environment. Smart Mesh Networking leverages best signal path determination to enable a high-performance AP mesh that reduces deployment costs and continually adjusts to ensure optimal user performance.

SmartCast uses patent-pending advanced heuristics to automatically process and classify Wi-Fi packets, managing transmit queues and schedules to deliver high-quality multimedia services — including voice and streaming video. Each ZoneFlex AP then delivers the requested class of service, supporting up to 20 concurrent voice calls and 50 data clients.

SmartSec is a collection of advanced security mechanisms for the ZoneDirector that seamlessly integrates with your existing Layer 2/3 switches, firewalls, authentication servers and other network infrastructure. Simply plug the ZoneDirector into your LAN and point-and-click to create per-SSID roles that reflect your performance and security needs. ZoneDirector enforces your policies by authenticating users through a built-in captive portal, Pre-Shared Key (PSK), or 802.1X, consulting an internal database or your existing Active Directory or RADIUS server. ZoneDirector provides an innovative new technique, patent-pending Dynamic Pre-Shared Key (PSK) capability that enables strong security in situations where it would not otherwise be practical (public hotspots, guest WLANs), without adding any IT effort. Data transmissions use key caching techniques when roaming across ZoneFlex 802.11g/n access points. By supporting multiple SSIDs, each with its own broadcast, quality of service, security, and management parameters, ZoneFlex APs can deliver tiered services that support different users, devices, and applications from a single platform.

The ZoneFlex family offers many other features designed to

simplify installation and maintenance and reduce total cost of ownership. For example, ZoneFlex APs support PoE to make the most of power drops and switch ports. ZoneDirector delivers many enterprise-class WLAN management and monitoring features, from rogue AP detection and wireless intrusion detection to performance reporting, without introducing enterprise complexity or cost.

FlexMaster, a Linux-based management platform, performs all critical administration and control functions from a single intuitive, web-based interface. Advanced capabilities lets companies build networks, create unique configuration parameters on a bulk basis, load different versions of firmware for each group of devices, monitor events, generate trend reports, and upgrade devices individually or in groups with a simple click of the mouse.

ZoneFlex is the ideal next step for enterprises and hotspot operators that have outgrown consumer APs and casual data WLANs. ZoneFlex can help you deliver reliable Wi-Fi to increasingly diverse and demanding users, adding capacity and range with limited IT staff and budget.