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| WHITE PAPER |

HOTSPOTS, NOT NOTSPOTS:

Best Practices for Wireless Site Design

ENTERPRISE

General introduction

In the workplace, secure, reliable, high-speed wireless coverage needs to extend to dozens, hundreds, or perhaps even thousands of people, as efficiently and as cost-effectively as possible.

But that is not always easy to achieve: the built environment and surrounding areas of any office premises may be physically complex and/or full of obstacles, legacy installations, and sources of interference.

Network security in a shared business premises alongside other organisations – where the access needs of visitors and customers may need to be catered for alongside those of employees – is not as simple as opening the box, plugging in a domestic hub, setting a password, and hoping for the best.

At the same time, the 'consumerisation' of IT is continuing apace, with many employees now preferring to use their own smart, mobile devices rather than corporate desktops and laptops, and this is providing the impetus for changes in the workplace, too, to accommodate more flexible and collaborative workflows.

A core component of those new workflows is the use of high-bandwidth applications, such as unified communications and collaboration (UC&C) tools, and these present a further challenge to the speed, accessibility, and reliability of wireless networks, and to the smooth transition from a solely wired infrastructure.

Add all of the above together, and the end result is a major challenge for IT professionals whose main task should be supporting the business with fast, reliable, secure, standards-based technology that is accessible to all authorised users.

This paper will explore why world-class wireless site design demands access to dedicated professional tools and best practice advice. So what are the best practices for corporate wireless site design? And what are the tools that can help?

First, let's set out the full range of issues that most organisations face, regardless of their size and budget.

The Corporate Context

Wi-fi has become so ubiquitous in our daily lives that most employees never give it a second thought – beyond expecting the network to be available, fast, stable, consistent, and secure, whether they are at their own desk in the office, roaming around the workspace, hot-desking, or taking part in a videoconference or face-to-face meeting.

And with the added dimension of bring your own device (BYOD) schemes, employees also expect the wi-fi network to be equally accessible to all platforms and device types.

For the organisation, however, the corporate network needs to support and enable its business aims, while allowing employees to make the most of their skills and experience – and, above all, to get their work done.

More, it needs to be able to protect sensitive data on customers, prospects, employees, and intellectual property, and allow seamless, secure connectivity with the extended network of partner organisations – and, in some cases, with customers too.

All of this demands that the IT professional has real insight into how the wireless network is performing from day to day, as well as how best it can be designed in the first place – not only for today's capacity, but also for future workloads, including UC&C tools, rich media, big data, the Internet of Things, and in-depth analytics.

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Employee Expectations

A world-class, high-speed network can be a real competitive differentiator and a source of pride for every IT professional – and that means designing for future needs, not just for present capacity.

At the very least, the consumer experience of sitting in cafes and other public hotspots has taught employees to expect seamless, 'go anywhere' networking. Yet while the occasional slow patch or drop-off might be acceptable in a crowded cafe or at a railway station or airport, they are major irritants and obstacles in the workplace.

The corporate wi-fi network needs to be faster, better, more reliable, more secure, more consistent, and more robust than a public wi-fi hotspot, and failure to provide these superior levels of service may turn the workplace into a 'notspot' for employees. That's something that no IT professional can afford to let happen.

Certainly there would be no upside of a badly designed, low-grade corporate wifi network. For example: poor, unreliable, or slow connectivity may force workers to use less secure public connections and put vital data at risk; complaints would rise and leave IT professionals on the back foot again, firefighting and fixing problems; and employees would come to see the organisation as having low-grade technology – hardly an incentive to stay.

With data volumes increasing all of the time – with the rise of high-definition media and the increased prevalence of video communications – all wireless sites need to be designed for the future, and not just the present. The arrival of high-speed wireless standard 802.11ac [see below] offers a solid basis for this, combined with good forward-planning and a strategy for data growth.

BYOD and Different Devices

BYOD schemes are a further consideration in world-class wireless site design.

BYOD offers many advantages to organisations of every size and their employees. These include the ability for staff to work more flexibly, intuitively and productively from their preferred platforms and devices, while minimising the organisation's capital expenditure and the constant upgrade cycle of fast-depreciating hardware and software.

However, upfront planning and design are essential for successfully integrating different types of devices with the corporate WLAN, which also demands real insight into wi-fi capacity and coverage.

Understanding the devices themselves is equally important. For example, most mobiles are optimised for low power consumption and for their small physical size. This may place constraints on RF performance and antenna gain.

Overall, the big picture for IT professionals is that they need to be in the driving seat of this more employee-centric view of communications and IT, in which they need to be forward thinkers, planners, and service enablers.

Any failure to drive digital transformation from the front will leave IT professionals fixing problems that may only have proliferated because of a lack of planning and upfront engagement.

Failure to provide superior levels of service may turn the workplace into a 'notspot' for employees.

Wi-Fi Trends

More and more workplaces solely offer wi-fi access (as opposed to a traditional cable- and router-based networking). However, all wi-fi networks still end in a wire, but this last and least visible part of the network is, traditionally, the least well served by many network monitoring and management tools.

That, too, is a challenge for IT professionals, who need access to dedicated, expert tools and to follow professional best practices.

The trend towards wi-fi-only access can only continue, now that the 802.11ac high-speed networking standard offers multi-station connectivity at data transfer speeds of up to 1Gb per second. The standard is gaining traction in many workplaces, where data volumes and speeds can only rise in the years ahead.

But faster access and throughput also means the risk of faster and more extensive data breaches – if IT professionals and network engineers fail to consider the full security implications of unmonitored access.

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New Application Types

In previous decades, some standalone UC systems – such as high-end videoconferencing suites – were seen as expensive, standalone luxuries, But the rise of free services, such as Skype, and of affordable UC&C applications and platforms, demands fast, reliable networking for data, voice, video, social, and 'shared space' functions.

Such UC&C tools are increasingly ubiquitous, and are important to many organisations as a means of saving costs, collapsing distance, unlocking skills, and creating more of a 'teamwork' environment for those digital-native employees who have grown up with the internet, mobiles, and social platforms.

Other application types are on the rise, too, including cloud-based enterprise suites and dashboards, big data analytics, and applications associated with smart environments and the Internet of Things. Clearly, this can only mean that IT professionals need to design wireless sites to cope with a significant ramping-up of data volumes, speeds, and throughput in the future.

Put simply, it makes no sense to design for 'good enough' capacity today, when the overall trend of enterprise IT is overwhelmingly towards cloud-based services, rich media, and UC&C functionality. So IT professionals need to give bandwidth priority to real-time applications, such as VoIP and conferencing. In some case, these may demand careful quality of service (QoS) allocation.

Quality of Service

Another challenge is the increased network complexity needed in order to provide end-to-end QoS in UC&C, so that real-time apps can be merged with data applications: a tough call in an era of multiple wide-area carriers and peering agreements.

Failure to address these needs and to incorporate them upfront in world-class wireless site design could have costly, embarrassing consequences for IT professionals. For example: conferencing sessions that don't work, poor connections, jittery service, and other problems that may cause a loss of confidence in the organisation – perhaps even a loss of business.

IT professionals should always bear in mind that, for employees, partners, suppliers, and customers alike, the corporate network 'is' the business, just as much as its values, products, and services are. World-class wireless site design is essential, whether the organisation is a long-established large enterprise or a dynamic startup.

That said, from day to day, many IT professionals tend to encounter the problems, bugs, headaches, and technical challenges of supporting a business rather more than they have time to contemplate a grand strategic vision, which is why having access to best practice advice and dedicated professional tools is more important than ever.

The Physical Office

The built environment can be complex, challenging, and full of obstacles and signal blockers. Legacy installations, rogue access points, and different sources of interference may also abound, while security in a shared premises full of other organisations, visitors, customers, and prospects is not as simple as just setting a password and hoping for the best.

IT professionals and network engineers need to consider real-world network coverage in a space that may contain thick walls, mirrors, metal surfaces, complex electrics, kitchen areas, old kit from previous installations, and more.

In short, the corporate network has to be designed for the real world, and not just the virtual one: and in an office space that may be a standalone premises dedicated to one organisation, or located in a facility that's shared with several other companies.

In this way, IT professionals need to think in three dimensions: three dimensional, multi-floor access and availability, and three-dimensional security. In each of these cases, specialist wireless site design tools are essential.

For example, RF signals travel through and around walls. Users can choose to deploy fewer access points, or not deploy any on a few floors in a multi-floor building, without compromising any throughput and coverage requirements.

Decision-making in these situations demands access to professional tools, which offer real insight into device performance and network coverage in three dimensions. For example, such tools can be used in 3D at the technical planning stage, highlighting potential issues, and should be powerful and detailed enough to provide visibility into new and/or upgraded installations. Plus, they should allow IT professionals to check and confirm that the newly installed equipment is working according to the plans.

Temporary Networks

A world-class network is not always built to be permanent. For example, major conferences, functions, and trade shows are expensive, high-profile events – often with millions of dollars of business at stake, not to mention corporate reputations.

Today, such events stand or fall on the quality, accessibility, speed, reliability, and security of the wireless network, particularly if they are in technology-and communications-centric markets, or are attended by journalists, bloggers, and media representatives who expect fast, reliable network access so they can do their jobs and give instant feedback via social media.

No event wants all the delegate chatter to be about how poor the wi-fi is! Put simply, any event that an organisation holds needs to represent the same levels of quality, professionalism, and IT reliability as the organisation itself and its own office premises.

But not all events will have access to large teams of expert wireless technicians, which means that world-class wireless site design tools need to be equally as accessible to junior technicians as they are to seasoned professionals.

Access to simple, cost-effective tools that are accurate and easy to use still allows the results to be collated and studied by more senior engineers. In this way, the machines do the hard work, not the junior engineer who may only have been brought in for the day.

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Plan, Do, and Check

For any wireless network – whether built to last in the years ahead, or put together swiftly in support of a temporary space or event – the three key stages are planning, installation, and checking.

At each of these stages, access to dedicated tools and best practice advice is essential: to plan and design the installation around the premises (or proposed premises), to help install the equipment in the correct locations, and to check that it is performing consistently and as envisaged in the real world location. Site surveys are part and parcel of this [see below].

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Noise and Interference

IT professionals should pay attention to the underlying wired network infrastructure and other potential trouble spots – such as microwaves in kitchen areas, which can interfere with wi-fi signals.

Other sources of interference tend to arise as wireless systems evolve. Effective software tools can continuously monitor this and alert network engineers. In the case of interference from other wi-fi devices, this is most easily eliminated by changing channels on one or more devices in the vicinity.

However, BYOD can pose a problem in this context. Most devices will have both Bluetooth and wi-fi enabled, effectively saturating the 2.4 GHz band in their vicinity. (In many cases, 2.4GHz is being replaced by 4GHz devices, but this transition may take years.) The saturation problem applies even when there is no official BYOD scheme, since devices may still be polling and attempting to connect.

Put simply: whether or not employees are using their own devices for work, their phones will still be in their pockets and, in most cases, switched on. In each of these cases, policy and good management are the keys, supported by dedicated, specialist tools that can provide insight into overall wi-fi 'health' and into every point of interference.

And now the Good News...

But the good news is that there are tools that can help IT professionals to plan and design for world-class wi-fi coverage and performance – while checking for problems such as dark spots and left-behind rogue access points (in recently modernised premises, for example).

Network Design Tools

Network design tools have revolutionised the way that IT professionals can deploy wireless systems. Using information about site and building layouts, the existing network infrastructure, the radio frequency (RF) environment, the device population, and usage, these tools can predict WLAN coverage and performance accurately.

However, it's important to verify all of these findings with real-world, on-the-ground surveys.

Site Surveys

Site surveys are essential in wireless site design and implementation.

All wireless networks should provide location-specific wireless coverage and throughput, while minimising interference. However, RF signals are unpredictable. If an access point is placed in an open environment with no obstacles, the signals usually maintain an omni-directional pattern. However, when obstacles and walls that have different characteristics are in play, RF signals will be disrupted and access point coverage will vary, depending on their location.

There is no single, correct way to design a wireless network. Every wireless implementation is different – a small web design office or startup versus a hospital, for example, or a medium-sized local insurance company versus a global media organisation's headquarters. Without a dedicated site survey and professional-level tools, it is impossible to determine if the requirements of each end user in each environment are being met.

Site surveys determine local signal coverage, throughput, interference sources, dead spots, and likely roaming behaviour, and this helps the IT professional to determine what wireless equipment to purchase. In other words: how many access points to buy; where to deploy them; and how to configure each of them for optimum coverage for the highest number of authorised users.

Site surveys are equally important for new installations (to discover the number of access points and locations, based on predictive performance analysis), and for existing installations (to verify the number of access points, as opposed to the number actually deployed, and validate their location to ensure optimal performance).

IT professionals take note: simply wandering around with a laptop and a free manufacturer-supplied tool or smartphone app is far from the most efficient and accurate means of mapping a complex environment, or planning a world-class wireless network. Access to a dedicated, professional-level tool is essential.

These checks should take place in real-world situations as the network is being used during peak hours, and not just at the end of the day when the workspace is quiet. Using the theoretical design as a baseline, walk tests and verifying data rates will allow IT professional to improve the design iteratively until access points' (APs) final locations are confirmed.

Capacity Planning

IT professionals should establish the throughput that each end user needs to meet their networking requirements. Once average end-user needs are established, the surveyor can calculate the maximum number of end-user clients that should associate with each access point (AP), based on the total throughput available to it.

During the survey, it may be necessary to experiment with both the configuration settings (channel, transmitted power, and so on) and locations of APs. Adding or removing APs may be the best option.

Troubleshooting

Of course, planning and checking are only part of the task for IT professionals: sometimes things don't go according to plan and equipment may not be performing to specification. Almost invariably, there will be some complaints and tickets raised as rooms are reconfigured or their usage is changed, and sporadic access issues will need troubleshooting.

In all of these situations, the ability to identify and fix the problem is paramount, and it may be in either the wireless or wired parts of the infrastructure. Whatever the root cause, a single, seamless solution that can cover both would be a boon.

Security Tools

Network and data security is at a much higher premium than in the past. While hardware vendors may offer rudimentary security tools, only a dedicated wireless intrusion prevention system (WIPS) can secure multiple sites.

A WIPS works in two ways. It monitors the radio spectrum for any unauthorised wireless devices (detection) and automatically stops those devices accessing the WLAN (prevention).

Large organisations are particularly susceptible to threats from bogus access points that could expose the entire network to anyone within wireless range. The WIPS will detect these using MAC address filtering and, to guard against MAC spoofing, device fingerprinting (which identifies each device). The WIPS will also detect and flag any attempted use of wireless attack tools.

With the proliferation of BYOD and wireless networking, and the consequent rise in vulnerabilities and threats, another key security element is regular updates as new threats – and patches – are discovered. A dedicated WIPS can centrally manage updates across the organisation, without requiring specialist expertise.

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While satisfying performance needs, RF spillage outside the corporate building should be kept to a minimum, unless service is to be provided in outside areas, such as car parks or communal areas. Taking advantage of any RF leaks, unauthorised personnel can gain access to the corporate network, so IT professionals should ensure that physical security measures can be implemented to nullify these intrusions.

The Benefits of Good Planning

IT professionals should consider site surveys and specialist wireless site design and monitoring tools to be essential parts of corporate wireless deployment, especially tools that allow 100 per cent visibility over both the wireless and wired parts of the infrastructure and enable troubleshooting to take place when problems arise.

Gaining critical insight and information on overall signal coverage, real user data from active surveys, user capacity, and the security of the network, are all core to the building of world-class wireless sites.

And if the survey, design, implementation, and monitoring are done correctly using specialist tools, IT professionals will not only be helping to enable a secure, world-class, high-speed, reliable network, but also saving money – for example, by identifying a need for fewer, better quality access points, rather than paying for the installation and maintenance of unnecessary equipment.

Hardware costs are only part of the equation here: the installation cost is a major factor, too, not to mention the disruption to the working environment. Get it right first time and IT professionals can really support the business and help plan for the future.

World-class wireless site design demands access to the right dedicated professional tools that look at wi-fi as an integral part of the entire corporate infrastructure.

About NETSCOUT

NETSCOUT SYSTEMS, INC. (NASDAQ: NTCT) is a market leader in real-time service assurance and cybersecurity solutions for today's most demanding service provider, enterprise and government networks. NETSCOUT's Adaptive Service Intelligence (ASI) technology continuously monitors the service delivery environment to identify performance issues and provides insight into network-based security threats, helping teams to quickly resolve issues that can cause business disruptions or impact user experience. NETSCOUT delivers unmatched service visibility and protects the digital infrastructure that supports our connected world.

Solutions from NETSCOUT

AirMagnet Wireless Solutions

AirMagnet enables predictive modeling of enterprise WLANs, provides advice on AP placement and channel allocations, and runs what-if analyses on the impact of BYOD growth. After WLAN deployment, AirMagnet measures actual coverage and verifies true end-to-end performance and provides an Android app. to visualise coverage.

More information at: enterprise.netscout.com/airmagnet

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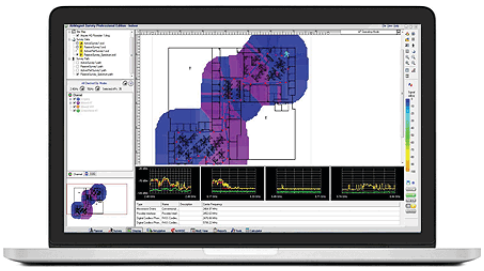
Design and deploy wireless 802.11n/a/b/g/ac LAN for optimal performance, security and compliance with wireless site survey software.

More information at: enterprise.netscout.com/airmagnet-survey



AirMagnet Spectrum XT

Proactively identify and locate any radio frequency (RF) interference impacting WiFi network performance.

More information at:
enterprise.netscout.com/enterprise-network/wireless-network/AirMagnet-Spectrum-XT

AirMagnet WiFi Analyzer PRO

Analyze & troubleshoot common enterprise wi-fi issues.

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