

WLAN as a Complement to GPRS and 3G Services

White Paper

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Introduction

People are always searching for faster, cheaper access solutions to the Internet. As we have witnessed with voice services over the years, the benefits that mobility adds to a solution generates great appeal for users. Providing users with access to the Internet while they are on the move or away from their desk or office promises to deliver many benefits for corporate entities and consumers.

Telecommunication companies realised this long ago, and are already providing solutions that enable users to access the Internet with the same widespread coverage as their voice service today. This service is commonly referred to as the *mobile Internet*. The first generation of always-on data solutions being rolled out across the world is called General Packet Radio Service (GPRS), also referred to as 2.5G (2.5 Generation mobile technology)¹. The next evolutionary step is known as 3G (3rd Generation mobile technology). These networks will provide all the benefits of current mobile voice technology as well as allowing even faster and more transparent access to data and multimedia services like the Internet.

So where does Wireless LAN fit in?

Wireless LAN (WLAN) is a technology that has been around for some time. Only recently has it gained popularity to a point where we can begin to enjoy the benefits of its widespread use. WLAN allows users to access a data network like the Internet at high speeds of up to 11 megabits per second (Mbps) as long as users are located within a relative short range (typically 30-50 metres indoors and 100-500 metres outdoors) of a WLAN base station (or antenna)².

At present most WLAN deployments have been part of internal company wireless intranet solutions. However, there has been a great deal of effort amongst telecommunication suppliers to provide an integrated public WLAN solution by

¹ CDMA and CDMA 2000 used around the world have different sets of cellular standards. In this white paper we reference GPRS and 3G networks; however, the same concepts and arguments relating to WLAN apply equally for CDMA and CDMA 2000 related networks.

² Obstructions like walls, etc., can limit the effective range even further.

allowing an operator to deploy WLAN as a complement to their existing and future GPRS and 3G Wide Area Networks.

This white paper will describe WLAN and its current market segments. It will also briefly examine the benefits of providing an integrated solution (i.e. GPRS/3G with WLAN) and how these two network technologies promise to evolve over time as one Multi-Access network.

What is WLAN?

In short WLAN is effectively Ethernet without the wires. There are a number of WLAN standards around the world. The European Telecommunications Standardization Institute (ETSI) has a standardized WLAN called HiperLAN2. The American community, the Institute of Electrical & Electronics Engineers (IEEE) has created a standard called 802.11b, 802.11a and recently 802.11g. In the market we know 802.11 as Wi-Fi (www.wi-fi.com).

Generally the overall market has qualified 802.11b as the predominant WLAN standard across the world. Therefore, when we refer to WLAN in this paper we assume the 802.11 standard of technologies.

WLAN operates in two unlicensed bands:

1. 802.11b and 802.11g operate in the 2.4GHz band, together with many other devices including Bluetooth and cordless telephones.
2. 802.11a operates in the 5GHz band, which at this point is relative free of interference from other electrical devices operating in this band.

A WLAN network core components consists of:

- A WLAN access point, which is effectively a base station (typically about the size of a shoe box) that can support many clients. It broadcasts messages on a certain frequency and listens for responses from clients.

- The WLAN access card is the client interface that talks to the access point. Typically it can be a PC card or compact Flash card format that can be inserted into a laptop or Personal Digital Assistant (PDA).

Market Segments and Needs

Today there are three key market areas for WLAN (see Figure 1).

- **Enterprise**
 - Usage is mainly as an adjunct to corporate fixed LAN, giving users the freedom to move within the office and conference rooms.
- **Small Office, Home Office (SOHO)**
 - WLANs are used as the major hub for all wireless Internet connections within the home or office. WLAN access points usually connect to a major backbone via fixed or wireless networks, e.g. an ADSL/cable modem, satellite, LMDS etc.
- **Public Access LAN (PAL)**
 - Usually referred to as public 'hot spots'.
 - Provides public access usually in highly targeted areas where business users frequent or places where people wait, and are relatively stationary e.g. airports, train stations, coffee shops, hotels, shopping centres.

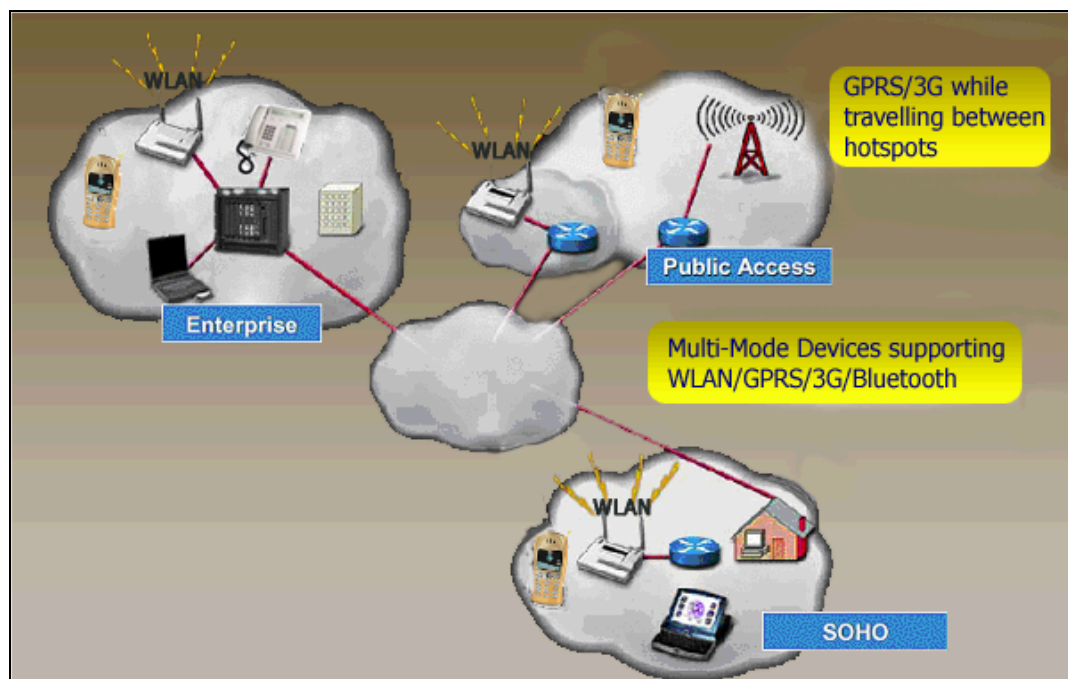


Figure 1: Overview of WLAN segments

The most important market needs are analysed for the three market segments below.

***Please note:** A brief summary is included below, a more comprehensive discussion can be found in the Appendix.*

Enterprise

Security. The most important element is to make WLAN networks secure from attacks and any unauthorised access.

Bandwidth. Enterprises are accustomed to low cost, high-speed 10 and 100 Mbps fixed Ethernet connections, therefore their expectation of WLAN access must meet similar performance levels.

Upgrade Path (investment protection). With investment in equipment such as access points and WLAN PC cards, some organisations require that their investment is not lost once an upgrade becomes available.

Roaming. WLANs provide the ability to roam by allowing automatic handover from access point to access point.

Cost. For an enterprise, the cost must be measured against a strict return on investment. Typically the main cost items are the WLAN access cards, access points and extra security.

Small Office, Home Office (SOHO)

A SOHO usually comprises of a small number of users, and is therefore less adverse to bandwidth issues relating to scalability. However, there are increasing security concerns which will continue to gain importance in the future.

Ease of Use/Set Up. WLANs are generally quite straightforward to configure.

Cost. SOHO users tend to be very price sensitive. The cost of equipment is decreasing all the time, and we are beginning to see the bundling of WLAN products with home PCs and ADSL modems.

Range. Typically, a WLAN access point can provide sufficient connection from a 30-50 metre indoor³ location.

Public Access LAN (PAL)

PALs are a new category of access and one which is being hotly debated by observers in the marketplace, especially in relation to complementing GPRS/3G solutions. PAL companies provide Internet access in public environments and are usually referred to as Wireless ISPs (WISPs).

The major needs of this segment are:

Quality of Coverage. As has been demonstrated time and again, coverage is the single most important factor for making a new wireless technology a success.

Roaming. The ability to allow users access to the Internet from different locations using different service providers e.g. access from both a hotel (using your service provider) and the airport (using a different service provider).

Authentication and Billing. Users will appreciate the ability to roam to different locations and still logon using the same credentials. The operator will want to integrate the billing so that all charges, including other services offered by their GPRS/3G network, is on one bill. In other words, the ability to provide secure **authentication, accounting (one bill) and administration⁴**.

How does WLAN complement current Mobile Data Services?

Many GSM operators around the world today offer GPRS services. Many others are beginning to rollout 3G services. Such wide area wireless networks are designed so users are able to connect to data services like the Internet with the same coverage and convenience as their voice services. GPRS and 3G enable users to always remain connected to the *mobile Internet*. This means users will be able to access their corporate applications and intranets, stream video and audio clips from news or sports services, engage in video conference calls, send multimedia messages⁵ and access the

³ IEEE802.11b will automatically step down to as low as 1 Mbps depending on signal strength and interference.

⁴ Referred to as AAA.

⁵ MMS (Multimedia Messaging Service) is the next generation SMS technology that will allow users to not only send text messages to each other but also rich media like video, digital pictures, audio and animation. Sony Ericsson T68i is the first generation phone that supports MMS.

same services that they can from a dial-up or broadband connection using their GPRS and 3G device at virtually any location. The great change that GPRS and 3G will deliver is the ability to provide convenience and personalisation for the user, in the same way that mobile phones changed the way in which phones were used. GPRS and 3G will transform the personal communication experience for voice, data and multimedia including the Internet and intranet. The *mobile Internet* promises to change the way people use and interact on the World Wide Web.

So if a wireless network exists with essentially national coverage⁶, and provides access from 20 kilobits per second (Kbps) up to 2Mbps⁷ to the Internet anywhere and in a convenient fashion, how does WLAN fit in?

Like any technology, each has its strengths. GPRS and 3G provide global coverage, mobility and Quality of Service⁸, therefore a user is guaranteed bandwidth on demand. This means applications such as video conferencing, streaming video and voice can be delivered in a secure fashion without any degradation in quality.

WLAN is designed to cover small areas. WLAN cells have a 30-50 metre radius, whereas a GPRS cell could have a radius up to 120 km and a 3G cell up to 35 km. This makes WLAN suitable for small hot spot locations, and GPRS/3G for broad umbrella coverage.

WLANs would typically be installed in areas that are frequently populated by people such as airports, train stations, shopping centres, coffee shops, hotels and convention centres. In such areas, the number of users wanting to access both voice and data services is high. Operators with GPRS/3G networks could add WLAN as an additional service, enabling them to provide their customers with the broadest coverage and access possibilities for voice, data and multimedia services in areas where there is a high density of users.

WLAN in such areas could be used to deliver best-effort Quality of Service, enabling users to access their corporate applications and the Internet. WLAN users could use

⁶ If you consider roaming then it is almost worldwide coverage today.

⁷ GPRS provides speed from 20 Kbps up to 115 Kbps. 3G starts from 64 Kbps up to 2 Mbps.

their GPRS/3G devices to access high quality services such as voice, video streaming and video conferencing. Of course, users could choose to access the same applications and services as WLAN using their GPRS/3G device. In the end, the user can choose the best available connection for the application they are using at that time.

Ericsson is developing solutions and leading the standards groups⁹ in integrating WLAN access networks with GPRS/3G networks. Ericsson's solution enables the operator to build a network using a *common core* of infrastructure for network and subscriber management, billing and login for all their wireless access networks (i.e. CDMA, GPRS, 3G and WLAN). This will enable users to logon to both a GPRS/3G and WLAN network transparently using one sign-on, similar to the method used today with GSM phones.

From a user's point of view, they are able to use WLAN and GPRS/3G services transparently and receive one bill. From an operator's point of view, they are able to offer an integrated set of services, providing more freedom for users and enabling them to access their services using whichever network makes sense at the time. This provides greater flexibility and freedom for both the operator and user.

More detailed information on Ericsson's WLAN solutions for users and operators can be found at

http://www.ericsson.com/about/publications/review/2002_01/article155.shtml.

Figure 2 illustrates the Ericsson vision, a combination of wide area GPRS/3G networks working together with WLAN local area hot spots.

⁸ QoS for data is defined only for 3G. GPRS is best-effort only.

⁹ 3GPP, the standards body for Universal Mobile Telecommunications System (UMTS), is actively involved in developing standards combining UMTS with WLAN.

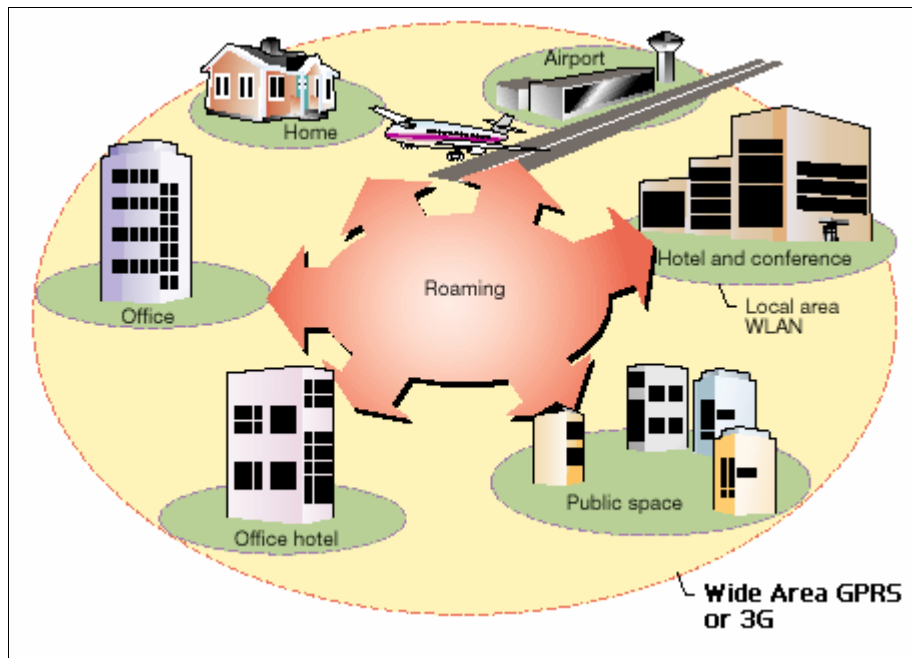


Figure 2: The Ericsson mobile operator WLAN vision: bridging local area and wide area networks.

How will WLAN and GPRS/3G be used together in the future?

In the near future, we will begin to see Multi-Mode Devices entering the market. These devices will be capable of accessing WLAN, GPRS/3G and Bluetooth networks from the one device. Such devices will be integrated into mobile phones, PDAs (e.g. Pocket PC¹⁰, Palm¹¹ etc.), and laptop PCs. Software within these devices will enable users to configure rules that will determine the best choice of network for a particular application. An example is included below.

A user is in a taxi on the way to the airport. His Sony-Ericsson mobile, a Multi-Mode Device (MMD¹²) has detected and already onto the GPRS/3G network. The MMD does not detect any available WLAN network as the user is not within range of a hot spot. The user then decides to click the web browser on his PDA to check if his flight is on time. On doing this, the MMD automatically uses the GPRS/3G network for Internet access. This action is transparent to the user. As the taxi approaches the terminal, he turns off the PDA.

¹⁰ Pocket PC is a trademark of Microsoft Corp.

¹¹ Palm is a trademark of Palm Corp.

¹² MMD assumes an ability to access GPRS/3G, WLAN and Bluetooth networks.

As the user walks towards the terminal and sits down, he decides to check his email before he boards the plane. He turns on his PDA and clicks the Outlook¹³ icon. The MMD detects the presence of both a GPRS/3G and WLAN network. However, the user has set up a profile so that when Outlook is used, the PDA first attempts to connect to the WLAN network for Internet access. If this is not successful or possible, it connects to the Internet via the GPRS/3G network.

The PDA connects to the user's corporate intranet using a secure VPN¹⁴ connection over the WLAN network. Once this is done, the Outlook application opens and the user can check his email.

The user reads a message requesting a quick chat with a colleague regarding an inventory issue. On clicking the icon, the PDA establishes a Netmeeting¹⁵ Video and Data session with his colleague, and at the same time, establishes a voice session using the GPRS/3G network. In this case the network is using WLAN for best-effort video and data sharing, and the GPRS/3G network for guaranteed quality of service voice.

His colleague is currently out of the office and working from a remote location. In this instance, her MMD only has access to GPRS/3G service, and she is not within a WLAN hot spot. Therefore, she establishes the video, data sharing and voice session using the GPRS/3G network.

¹³ Outlook is a trademark of Microsoft Corp.

¹⁴ Virtual Private Network (VPN) technology allows users to set up a secure encrypted *tunnel* through the public Internet to a company's intranet.

¹⁵ Netmeeting is a trademark of Microsoft Corp.

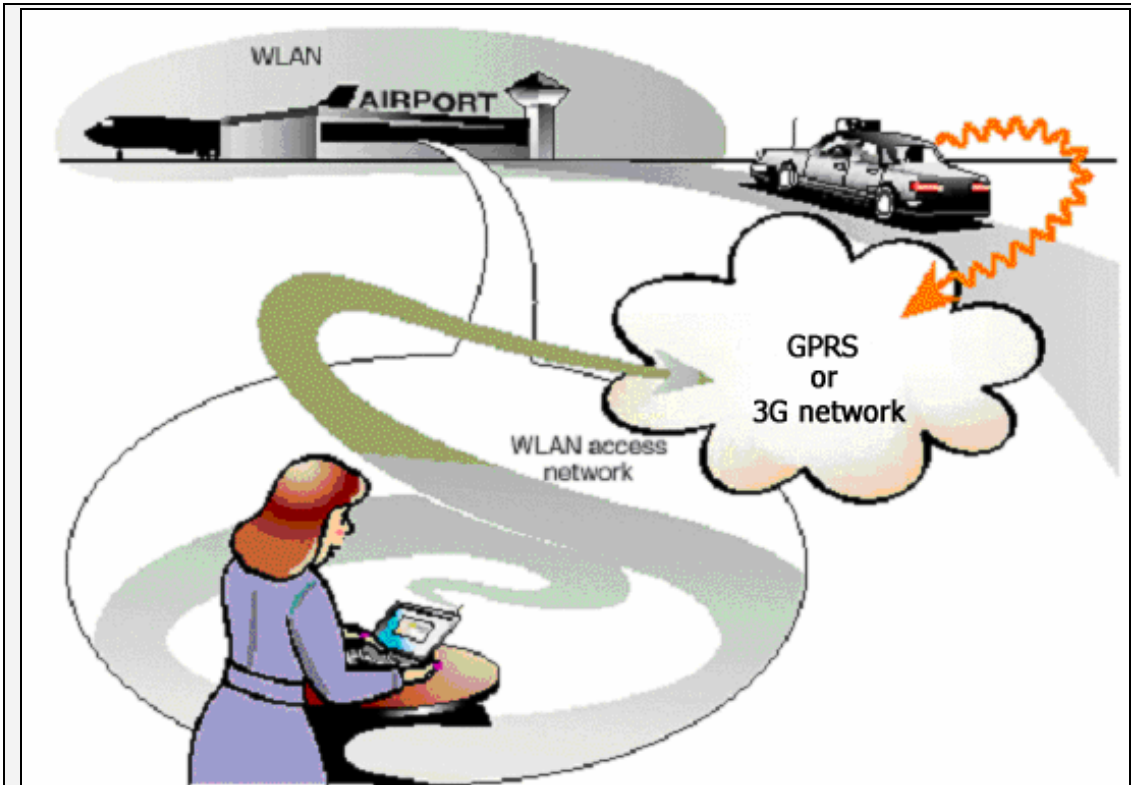


Figure 3: Complementing GPRS/3G with WLAN service

Figure 3 gives an insight into how WLAN and GPRS/3G networks work as a complementary solution, enabling users to access the appropriate network at the appropriate time for the appropriate application. Together, WLAN and GPRS/3G enable mobile operators to provide more options for users to access their services using a richer set of access technologies, typically referred to as Multi-Access Service.

Opportunities for Mobile Operators

Mobile operators have wireless infrastructure that covers wide areas. Therefore, with little additional investment, they can add indoor WLAN access to their present offerings. In addition, they have management systems for billing, authentication and subscriber handling. They also have a very large base of mobile subscribers who would be prime targets for a high-speed data offering. Given this background, Ericsson believes that mobile operators are in a very good position to add indoor WLAN service to complement their existing GPRS/3G service. Business

professionals are expected to be the first important group of users of a combined GPRS/3G and WLAN service. They already use mobile phones and usually take a laptop and a PDA when travelling.

In a recent report, ABN-AMRO¹⁶ found that deploying both WLAN and 3G could have a two-fold result:

1. 3G would generate wireless data cash flows earlier.
2. Total wireless data cash flows are likely to exceed that of a 3G-only scenario (i.e. deploying 3G without WLAN).

ABN-AMRO assumed a 10 per cent increase in cash flows from data access due to greater critical mass of wireless data users and more developed applications.

This potentially shows that WLAN can stimulate and catalyse the GPRS and 3G markets by educating users and application developers about the *mobile Internet*. WLAN would essentially make users more comfortable with accepting *mobile Internet* access. Once users become comfortable with the *mobile Internet* in their day-to-day lives, there will be a spillover or an increase in the overall take-up of other types of mobile access offered by the operator such as GPRS/3G.

This education process will also help stimulate application development and uptake. WLAN together with GPRS can deliver cost-effective wireless access to the *mobile Internet* today, with a migration to higher speed access on 3G networks in the future.

The market size and potential for WLAN access is shown in Figure 4. It illustrates the potential size of WLAN service revenues across a number of public hot spot locations. Clearly airports and hotels are seen as large growth areas by targeting the businessperson on the move. Figure 5 illustrates that 10 per cent of US hotels provide high-speed Internet access today, while 82 per cent are planning to provide high-

¹⁶ ABN-AMRO Report on Wireless LAN: "Wireless data innovator or 3G complicator?" 15 June 2001

speed Internet access in the next 24 months, suggesting large untapped opportunities for service providers.¹⁷

From an Australian point of view, IDC Australia predicts rapid growth for WLANs in Australia for 2002. In 2001 alone, some 67,620 WLAN terminals existed in the Australian market, and IDC estimates that there will be over 1 million WLAN enabled terminals in Australia by 2006. This statistic is mostly based on laptops being the WLAN terminals, but this figure could easily be three to five times that amount when considering PDA enabled WLAN devices and other new display oriented technologies with built-in WLAN capabilities are expected in the marketplace in the near future.¹⁸

With millions of potential WLAN capable end-user terminals in the market by 2006 in Australia alone, there exists tremendous revenue generating opportunities for operators to provide WLAN as a value added service together with their existing GPRS and future 3G voice, data and multimedia services. These access choices together form a complete set of options for medium to high-speed wireless Internet access solutions.

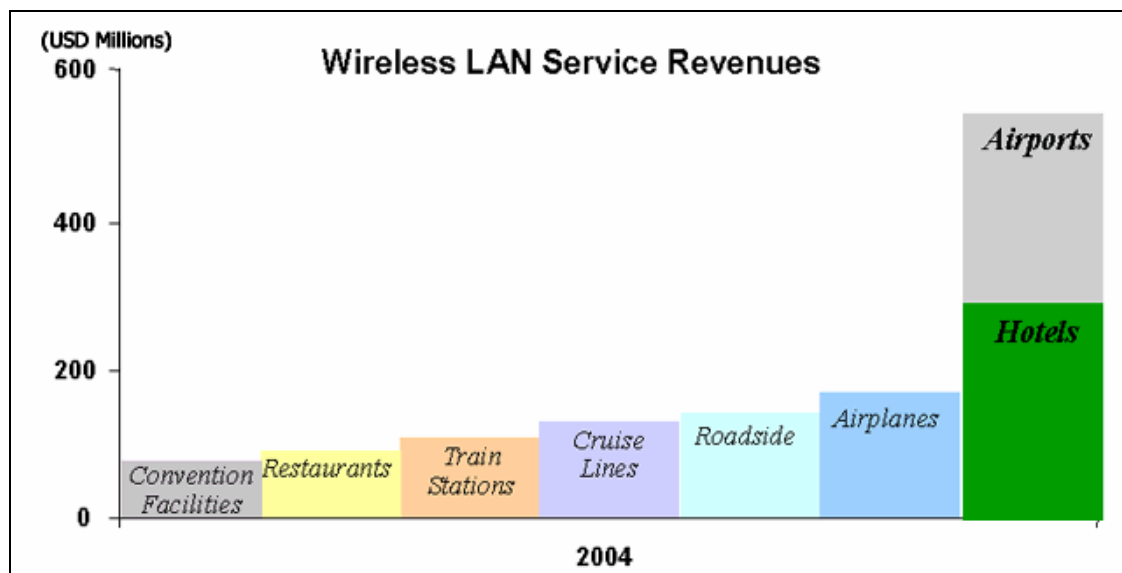


Figure 4: 802.11 WLAN network services market for public places ~ US\$1.4 billion by 2004. North America. Source: *Cahners-in-Stat, 2000, 2001*

¹⁷ Data for Figures 4 and 5 are based on US markets. Similar extrapolations can be applied for the Australian and New Zealand markets.

¹⁸ For more information on the new breed of display oriented WLAN devices, see: <http://www.microsoft.com/windowsxp/mira/default.asp>

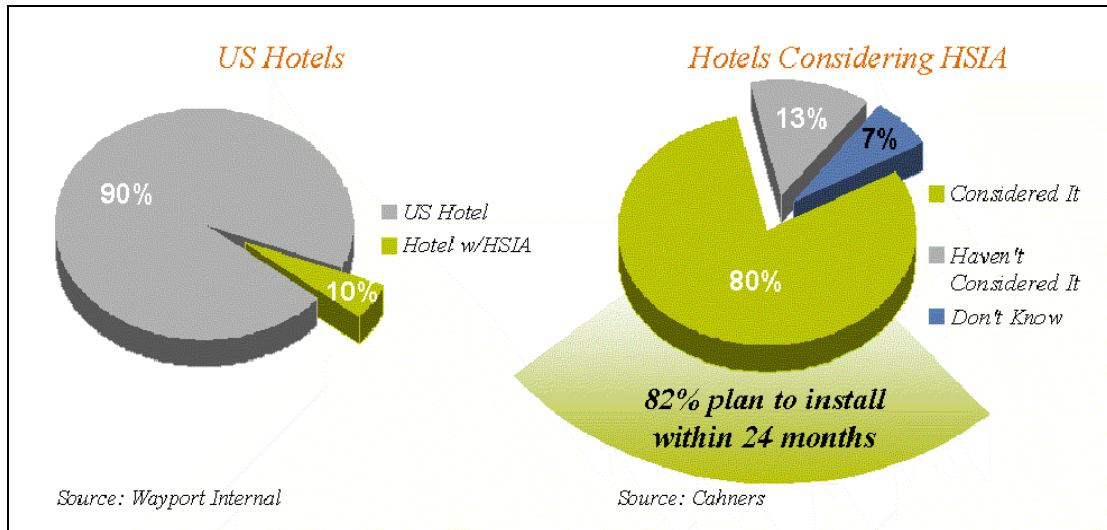


Figure 5: Opportunities for high-speed Internet access in the hotel industry: 25,000 hotels

Issues for Consideration

Regulation

One of the most talked about issues regarding WLAN is regulation. WLAN operates in the 2.4 GHz and 5GHz bands. Both bands stipulate regulations relating to power outputs. Since these bands are classified as unlicensed, they are free to be used by anyone as long as the user adheres to the relevant power outputs, which have been designed to be low to limit interference.

The issue is that companies, including operators, are considering offering public services over WLAN. It becomes increasingly difficult to guarantee quality of service with regards to interference if these bands are not regulated in some way.

Governments around the world will have to resolve this issue with industry, and come up with ways in which the spirit of unlicensed frequencies is maintained together with regulations to preserve quality of service for WLANs.

Security

WLAN security has been criticised in the past. There have been reports of hackers easily breaking the current standard security called Wired Equivalent Privacy (WEP).

As discussed previously, there are a number of solutions being offered that substantially increases the level of security.

The IEEE802.11i working group is looking at standardising a new, stronger security architecture, which is expected to be available shortly. In the meantime, organisations that provide VPN access to their corporate intranets using IPSec or other security technologies have a strong end-to-end security platform that should not deter them from using WLAN. In fact VPNs today are used on dial-up and broadband public Internet networks where security should also be seen as a large concern.

In the end, commonsense should be used. Even though we hear stories of hackers breaking WLAN networks, we should be aware that with some careful planning there exists a number of satisfactory security solutions that can be used for safe WLAN access.

Conclusion

There is much debate today in the marketplace on the potential use of WLAN technology, especially in relation to other wireless access technologies such as GPRS and 3G. WLAN is clearly a complement to these access technologies, and together it provides greater flexibility, choice and convenience for end users. From an operator's point of view, WLAN provides additional sources of revenue and a mechanism for promoting overall growth and uptake of wireless data access for the *mobile Internet*.

Ericsson is leading the way in standardising and developing WLAN solutions for GPRS and 3G networks. Today the company provides solutions for operators that integrate WLAN as part of their current GPRS and 3G services. This enables operators to provide seamless *mobile Internet* access service for their customers.

Helpful Links

<http://www.wi-fi.com>

(Wireless Ethernet Compatibility Alliance)

http://www.ericsson.com/about/publications/review/2002_01/article155.shtml

(Ericsson WLAN Solution for Operators)

<http://www.ericsson.com/enterprise/products/wlan.shtml>

(Ericsson WLAN Enterprise Solutions)

<http://www.business2.com/articles/web/0,1653,40556,FF.html?ref=cnet>

(Wi-Fi + 3G = Happy Convergence)

<http://www.business2.com/webguide/0,1660,14915,FF.html>

(An assortment of links, articles and tutorials on WLAN)

<http://www.80211-planet.com>

(A good source of information on 802.11 business and technology)

APPENDIX

Market needs for each of the three market segments

The most important needs for the three market segments¹⁹: are analysed below.

Enterprise

Security. The most important element is to make WLAN networks secure from attacks and any unauthorised access. Currently Wired Equivalent Privacy (WEP) is the only standards-based security offered which defines a shared key for encryption over the wireless air interface. The keys can range from 40 to 128 bits. It has now been conclusively proved that WEP provides an unsatisfactory grade of security, even if the key is increased in bit size. A new working group within the IEEE named 802.11i is working towards developing a new security standard. At present, many companies selling WLAN are also offering solutions providing higher levels of security. For example, Ericsson offers a product called the WLAN Guard that enables a highly secure connection to the enterprise network via a WLAN network²⁰. IEEE 802.1x security standard has been broadly supported by both hardware and software manufacturers as resolving many of the problems with WEP. Microsoft, as part of its new operating system Windows XP, supports the IEEE802.1x standard.

Bandwidth. Enterprises are accustomed to low cost, high-speed 10 and 100 Mbps fixed Ethernet connections, therefore their expectation of WLAN access must meet similar performance levels. Bandwidth is usually the measure of performance (together with range²¹) that is associated with WLAN. Currently, most WLAN networks provide up to 11 Mbps on the physical layer, which relates to around 5 Mbps of IP traffic, with only half-duplex. At most, you can configure three WLAN access points in the one location without major interference issues, effectively giving

¹⁹ Please note that this is by no means an exhaustive analysis, but a summary of what we consider to be some of the major needs for each segment. If you need further information, please feel free to contact the author.

²⁰ More information regarding security can be found at:
http://www.ericsson.com/enterprise/library/white_papers/WLAN_Security_Whitepaper.pdf

up to 33 Mbps (shared) in one physical location. This is still quite low compared to 10 to 100 Mbps per PC on the fixed Ethernet. New, 5GHz based WLAN technologies²² allow for up to 54 Mbps per access point (physical layer), and some proprietary solutions also allow up to 72 Mbps. Theoretically, you can have up to 12 (5 GHz) access points²³ in the one location, allowing for a theoretical upper limit of 648 Mbps. Issues relating to sharing bandwidth effectively requires that solutions offer some sort of load balancing and some vendors already provide this benefit.

Upgrade Path (investment protection). With investment in equipment such as access points and WLAN PC cards, some organisations require that their investment is not lost once an upgrade becomes available. At present 802.11b operates at 11 Mbps, and an IEEE working group has just standardised 802.11g, allowing for up to 54 Mbps without major changeover in hardware and offering backward compatibility to 802.11b. New 5 GHz 802.11a chipsets are also arriving with some vendors looking at providing chipsets that combine both 802.11a and .11b on the one chip.

Roaming. WLANs provide the ability to roam by allowing automatic handover from access point to access point. This works well when the access points are within the same network segment. However, some problems can occur when moving from one segment to another, resulting in some applications not functioning correctly. Although this is not an issue at the moment, a technology solution called MobileIP, standardised by the Internet Engineering Task Force (IETF) in 1992, solves the issue of changing IP addresses, thus allowing users to roam without losing the session. MobileIP solutions are available today but are not widely deployed.

Cost. For an enterprise, there are three major costs associated with implementing WLAN. One is the access point, the second is the PC card and the third is increased

²¹ WLAN 802.11b signal range for indoor office is 30-50m (depending on density of walls etc.), outdoor location is up to 500m; solutions offering up to 70km (directional) are available.

²² Are available from limited vendors at this stage.

²³ Depends on the country, e.g. US, Europe (except France), Australia allocates 300Mhz space in the 5 GHz area; Japan allocates less space.

security (as WEP has proven to be inherently insecure)²⁴. WLAN PC cards can be purchased for around US\$80 and access points can start from around US\$170.

Small Office, Home Office (SOHO)

A SOHO usually comprises a small number of users, and is therefore less averse to bandwidth issues relating to scalability. However, there are increasing security concerns which will continue gain importance in the future.

Ease of Use/Set Up. WLANs are generally quite straightforward to configure. As an example, a WLAN access point can be plugged into a power point (some can be powered by the Ethernet port), then into a hub and/or into an ADSL/cable modem or router via standard Ethernet²⁵. PC cards automatically scan for available access points and connect and obtain IP addresses automatically (assuming there is an available DHCP server on the network).

Cost. SOHO users tend to be very price sensitive. The cost of equipment is decreasing all the time. We are beginning to see packaged products primarily targeting the SOHO market. One example is the D-Link Wireless Gateway that sells for US\$250. It has a 802.11b WLAN, integrated cable/DSL router, three-port switch, print server, 128-bit WEP encryption and one WLAN PC card.

Range. Typically, a WLAN access point can provide sufficient connection from a 20-50 metre indoor²⁶ location. This satisfies almost all SOHO environments. Thus in most situations one to two access points will provide enough coverage for the majority of SOHOs.

²⁴ Cabling can also be expensive; however, in most cases enterprises do have existing network cabling.

²⁵ Definition of Ethernet can be found at: <http://www.webopedia.com/TERM/E/Ethernet.html>

²⁶ IEEE802.11b will automatically step down to as low as 1 Mbit/s depending on signal strength and interference

Public Access LAN (PAL)

PALs are a new category of access and one that is being hotly debated by observers in the marketplace, especially in relation to complementing GPRS/3G solutions. PAL companies provide Internet access in public environments and are usually referred to as Wireless ISPs (WISPs). There are a number of these companies operating including SkynetGlobal (www.skynetglobal.com), T-Mobile (<http://www.tmobilebroadband.com/>) and Telia HomeRun (<http://www.homerun.telia.com>). They tend to operate and provide PAL in areas where business users would tend to frequent such as airport lounges, conference centres and hotels. These areas are referred to as 'hot spots'. Some of the emerging new hot spots include coffee shops (e.g. Starbucks is rolling out WLAN networks in its coffee shops in the US)²⁷, McDonald's²⁸ and shopping centres²⁹.

This segment has similar needs to enterprises; however, security is less of an issue as users typically have their own VPN software to connect to their corporate network. WISPs are beginning to become more sophisticated in terms of service offerings by partnering with others to provide VPN services, enabling them to move through the value chain and provide secure enterprise access solutions³⁰.

The major needs of this segment are:

Quality of Coverage. As has been demonstrated time and again, coverage is the single most important factor for making a new wireless technology a success. WISPs are increasing their coverage using two strategies. The first is signing up more physical locations so they can roll out their network in these locations; and the second is partnering with other WISPs and jointly increasing coverage.

Roaming. As users may move from a hotel to an airport, what is needed is service roaming and secure **authentication, accounting (one bill) and administration**³¹.

²⁷ <http://www.thestandard.com/article/0,1902,21253,00.html>

²⁸ <http://afr.com/specialreports/report3/2001/08/15/FFX0UINP9QC.html>

²⁹ <http://www.comweb.com/article/COM20010809S0001>

³⁰ <http://www.gric.com/enterprise/index.html>,

³¹ Referred to as AAA

iPass³² and GRIC³³ are two companies that offer clearing house services for ISPs and which are now extending these services to WISPs, allowing users to log onto any ISP or WISP that have a roaming agreement with either of these organisations. GRIC has signed up 300 ISPs and telecommunication companies around the world, providing 15,000 dial locations in 150 countries.

Integration with WAN Wireless services such as GSM, GPRS and 3G is another solution. Companies such as Transat (www.transat-tech.com) provide products and solutions that enable authentication using a GSM SIM card via a WLAN network, eventually enabling operators to bundle new kinds of WLAN access. Ericsson is working with 3GPP to standardise methods of authentication including the use of a SIM for next generation WLANs.

With new smaller and mobile PDA devices arriving on the market, users of PALs may also require always-on service, therefore the ability to roam from PAL to WAN (e.g. GPRS and/or 3G) becomes important. To enable seamless roaming from an application point of view, MobileIP may need to be implemented to allow for session handover. Companies are already working towards providing solutions, e.g. ServiceFactory and BirdStep. Ericsson will support MobileIP in its upcoming releases of GPRS and 3G products.

End user devices like PDAs and laptop PCs have just begun to offer integrated solutions incorporating WLAN and GPRS access. As more manufacturers release products providing integrated support, we will most likely see a corresponding increase in subscribers.

³² www.ipass.com

³³ www.gric.com