WI-FI TECHNOLOGY IN LIBRARIES : SOME PERSPECTIVES

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Abstract

This article explores some of the major issues of wireless networks in libraries and components of the wi-fi technology are discussed. Fortunately, the technology has advanced considerably and can be deployed without sacrificing the security of library's network. The weakness of security for all Ethernet networks is eavesdropping. The low-level media access rules that govern how Ethernet networks communicate follow the party-line telephone model. Infrastructure facilities require for the libraries to go wi-fi network. Availability of commercial and free wi-fi services. Advantages and disadvantages of wi-fi services are also discussed.

Keywords : RFID Technology, Wi-Fi Technology

1.   Introduction

IT STANDS as perhaps the signal success of the computer industry in the last few years, a rare bright spot in a bubble-battered market: Wi-Fi, the short-range wireless broadband technology. Among geeks, it has inspired a mania unseen since the days of the internet boom. Tens of millions of Wi-Fi devices will be sold this year, including the majority of laptop computers. Analysts predict that 100m people will be using Wi-Fi by 2006. Homes, offices, colleges and schools around the world have installed Wi-Fi equipment to blanket their premises with wireless access to the internet. Wi-Fi access is available in a growing number of coffee-shops, airports and hotels too. Yet merely five years ago wireless networking was a niche technology. How did Wi-Fi get started, and become so successful, in the depths of a downturn? Wi-Fi seems even more remarkable when you look at its provenance: it was, in effect, spawned by an American government agency from an area of radio spectrum widely referred to as "the garbage bands". Technology entrepreneurs generally prefer governments to stay out of their way: funding basic research, perhaps, and then buying finished products when they emerge on the market. But in the case of Wi-Fi, the government seems actively to have guided innovation. "Wi-Fi is a creature of regulation, created more by lawyers than by engineers," asserts Mitchell Lazarus, an expert in telecoms regulation at Fletcher, Heald & Hildreth, a law firm based in Arlington, Virginia. As a lawyer, Mr. Lazarus might be expected to say that. But he was also educated as an electrical engineer—and besides, the facts seem to bear him out.

2.   What is Wi-Fi ?

Wi-Fi is short for "wireless fidelity", and is another name for a wireless communications standard called "IEEE 802.11b" or "802.11g". 802.11b is the older slower version of this standard, sending and receiving data at 11 megabits per second; 802.11g is the newer, faster standard, capable of 54 megabit-per-second communications. Laptops often feature built in wireless network cards or accept plug in adapters that support either 802.11b or g protocols. Both standards provide broadband connections to the Internet and allow users to surf the Web and use e-mail. Increasingly coffee houses, hotels, schools, airports, and (imagine this!) libraries are making Wi-Fi available to attract and meet customers' needs.   A Wi-Fi hotspot network is composed of one or more access points, which are the "point" at which laptop or pocket PC users connect to the wireless network. The term "Wi-Fi" comes from a nonprofit international

association formed in 1999 to certify interoperability of wireless LAN products based on the international 802.11 specifications. Wi-Fi certification is your guarantee that products from different wireless networking vendors will work together. (1)

3.   Components of Wi-Fi Technology

The following diagram is an example of a hotspot network setup. The access point, firewall, and switch shown in the figure could be changed according to the requirements of the network. (For example, a 3Com® Wireless LAN Access Point 8750 could be used if simultaneous 802.11a, 11b, and 11g support is required.) For more information on 3Com products, see the product sections at http://www.3com.com/ or talk to your local 3Com reseller for recommendations. (6)
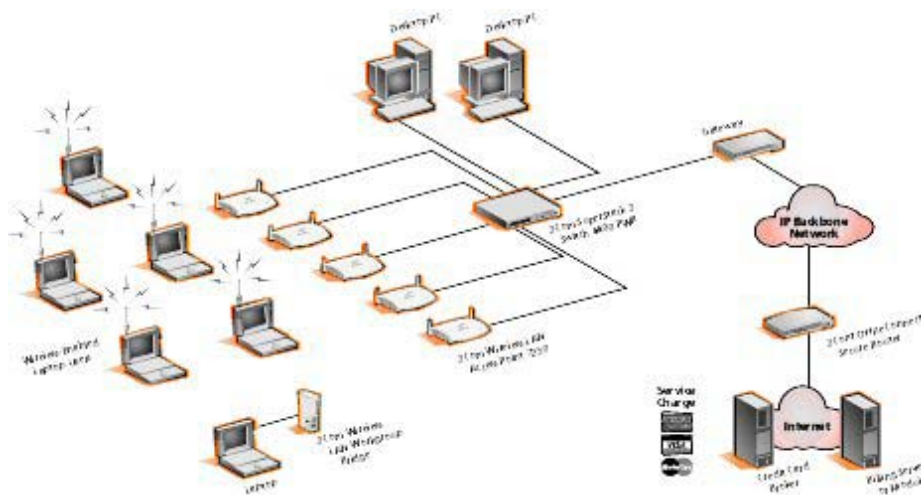
3.1   Access point

An access point is essentially a compact radio transmitter with an antenna that connects to a wired connection, such as an Ethernet network, or digital subscriber line (DSL) or cable service supplied by an Internet Service Provider (ISP). The 3Com Wireless Access Point 7250 supports up to 253 wireless users at speeds up to 54 Mbps at distances up to 100 meters (328 feet). Multiple access points can provide overlapping coverage throughout a site. Access points can be installed almost anywhere because power and data are supplied over one cable and different antenna options offer various coverage configurations.

3.2   Network switch

A network switch such as the 3Com SuperStack® 3 Switch 4400 PWR provides installation flexibility by distributing power and data over the same network cable through its built-in Power over Ethernet (PoE) capability. The 3Com switch supports up to 24 wireless access points. The switch also separates user traffic on the wireless network, for example, separating public user traffic from business operations traffic to keep business communications private and secure. The switch also prioritizes traffic usage for uninterrupted Internet access.

3.3   Secure router

The secure router detects and protects the wireless network and its users from Internet hacker attacks. The 3Com Office Connect® Secure Router also supports two private communications channels, or virtual private network (VPN) tunnels, for secure site–to-site or remote user-to-site data and e-mail exchange.

3.4   Wireless LAN bridge (optional)

A wireless LAN workgroup bridge expands a Wi-Fi hotspot's revenue potential by enabling laptop or pocket PC users without built-in wireless capability to connect to the hotspot network. Leisure spot businesses can rent a 3Com a/b/g Wireless LAN Workgroup Bridge and LAN cable to customers or guests who want the added convenience of Internet access during their stay.

3.5   Wireless authentication and billing gateway

Enables hospitality and leisure spot businesses to control access to the Wi-Fi hotspot network by conducting authentication checks similar to credit card or member ID authentication. The gateway also tracks wireless usage for billing purposes and provides payment transaction services. It interoperates with hotel, airport, or other leisure spot reservation systems to verify appropriate customer or guest use. 3Com has developed partnerships with leading authentication gateway vendors in order to offer plenty of choices and a local regional presence throughout the world. 3Com has thoroughly tested authentication gateway partner products with select 3Com wireless network products to ensure smooth network installation and integration.

4.   Infrastructure Facilities to go Wi-FI in Libraries

We need the the following infrastructure to go Wi-Fi in Libraries.

*   Broadband Internet connection

*   An access point

*   An understanding of what your patrons will need to know to connect to your network

*   An 'Acceptable Internet Use' Policy

*   Means of protecting your staff network from Wi-Fi users

*   A plan for marketing your library's Wi-Fi hotspot

4.1   A broadband Internet connection through an Internet Service Provider (ISP), $40-$120/month plus installation costs. Broadband Internet access typically is achieved using DSL, cable, ISDN (Integrated Services Digital Network), or dedicated frame relay access. In Montana, a DSL connection with Internet access runs in the neighborhood of $50 to $125 a month.

4.2   An access point, preferably supporting both 802.11b and g protocols, costing under $100. Access points are dictionary-sized gizmos, incorporating the functions of a hub, a router, a transmitter, and a receiver. Your access point either connects to your LAN (local area network), or directly to the Internet. The newer standard 802.11g access points can support wireless laptops as far as 150 feet away, but walls and 'noisy' electronics can shorten this distance. You can provide hotspots throughout your library with additional access points or range extenders. Popular access point brands include Linksys http://www.linksys.com, and NetGear http://www.netgear.com.

Note: Because a wireless access point (definition) acts similar to a hub (not a switch) on a wired LAN (definition), the total bandwidth is divided among all users using an access point (see the Bandwidth Availability section of Wireless Security). More importantly, the total bandwidth available is going to be limited by the speed of your internet connection (which is typically much slower, e.g., a T1 (definition) line is only capable of 1.544Mbits per second). An important consideration, especially if your Wi-Fi access is going to be sharing its internet connection with your wired LAN, may be the ability to limit bandwidth and/ or protocols (e.g., http, https, ftp, etc.) either via the AP itself, or through another firewall or router.

4.3   An understanding of what your patrons will need to know to connect to your network. Typically those bringing laptops into your library will know the ropes. But you might want to put together a brochure for the good of your staff as well as your public. Scottsdale Public Library, the Boston Public Library, the Palo Alto Library, or the St. Joseph County Public Library, have all written great instructions you might consider. Because patrons are used to an expectation of privacy in a library setting, it is especially important to inform your patrons of the necessity of properly safeguarding their computers and data when using relatively insecure public Wi-Fi. A good starting point is the Complete Guide to Wi-Fi Security by Tony Bradley & Becky Waring.

4.4   An 'Acceptable Internet Use' Policy. Wireless users should abide by your library's Acceptable Internet Use Policy.   This is for your protection as much as their education. Some libraries offer filtered wireless access to the Internet, others don't. In terms of policy, wireless Internet access is probably no different than your wired Web workstation-related policies. There's an extensive compilation of good internet policies on Web junction.

4.5   Means of protecting your staff network from Wi-Fi users. Many libraries have staff workstations, circulation systems, mail, and web or content servers. With any kind of public Internet access, wired or wireless, you want to constrain non-staff access to library applications and servers.

Note: There are two alternatives: a) Connect both staff and public access through one point of Internet access, and protect your staff-side with a bombproof firewall (usually a hardware firewall); or b) Connect staff resources to one Internet connection (don't forget the firewall), and connect public access (wired or wireless) to the Internet through another completely separate connection. This second option is probably the simplest to implement, and with broadband costs coming down, becoming more affordable.

In either case you'll want to get qualified help setting this up, as there are several complex issues to consider, including using DHCP (Dynamic Host Configuration Protocol — definition), NAT (Network Address Translation — definition), bandwidth, protocol, and time limiting, authentication, and so on. If you don't have network-savvy staff, see if your ISP or a local vendor can help you set this up. It might cost a few bucks, but you can't afford unauthorized access to your servers and library applications, nor do you want to allow nefarious characters the ability to utilize your Wi-Fi for spamming, hacking, illegal file trading, etc.

4.6 A   plan for marketing your library's Wi-Fi hotspot. After you bring Wi-Fi up in your library, brag it up. Trumpet the good news with banners over your front door and signs stretching wide across your front windows. Get articles in your local newspaper and on the TV news. Most radio stations will run public service announcements letting your community know that their library is serving up Wi-Fi access, along side other great library services. And, perhaps most importantly, make sure to advertise your new Wi-Fi on the front page of your library's Web site. Patrons who have laptops are probably accessing your library's services primarily through your Web site from home … or that Internet café down the street! (1)

5. Commercial Wi-Fi

Commercial Wi-Fi services are available in places such as Internet cafes, coffee houses and airports around the world (commonly called Wi-Fi-cafés), although coverage is patchy in comparison with cellular.(3)

- (*http://www.wisezone.net*) provides commercial hotspots for airports, universities, and independent cafes in the US;

- T-Mobile provides hotspots in many Starbucks in the U.S;

- Pacific Century Cyber Works provides hotspots in Pacific Coffee shops in Hong Kong;

- a Columbia Rural Electric Association subsidary offers 2.4 GHz Wi-Fi service across a 3,700 mi² (9,500 km²) region within Walla and Columbia counties in Washington and Umatilla County, Oregon;

- Other large hotspot providers in the U.S. include Boingo, Wayport and iPass;

- Sify, an Indian internet service provider, has set up 120 wireless access points in Bangalore, India in hotels, malls and government offices.

- Vex (*http://www.pointernetworks.com.br*) offers a big network of hotspots spread over Brazil. Telefónica Speedy WiFi (*http://www.speedywifi.com.br*) has started its services in a new and growing network distributed over the state of São Paulo.

- Link repository on Wi-Fi topics at AirHive Net (*http://www.airhive.net/ modules.php?name=Web_Links*)

6. Free Wi-Fi

While commercial services attempt to move existing business models to Wi-Fi, many groups, communities, cities, and individuals have set up free Wi-Fi networks, often adopting a common peering agreement (*http://www.freenetworks.org/peering.html*) in order that networks can openly share with each other. Free wireless mesh networks are often considered the future of the internet.

Many municipalities have joined with local community groups to help expand free Wi-Fi networks. Some community groups have built their Wi-Fi networks entirely based on volunteer efforts and donations.

For more information, see wireless community network, where there is also a list of the free Wi-Fi networks one can find around the globe.

OLSR is one of the protocols used to set up free networks. Some networks use static routing; other, such as Wireless Leiden rely completely on OSPF. Most networks rely heavily on open source software, or even publish their setup under an open source license.

Some smaller countries and municipalities already provide free Wi-Fi hotspots and residential Wi-Fi internet access to everyone. Examples include the Kingdom of Tonga or Estonia which have already a large number of free Wi-Fi hotspots throughout their countries.

Many universities provide free WiFi internet access to their students, visitors, and anyone on campus. Similarly, some commercial entities such as Panera Bread offer free Wi-Fi access to patrons. McDonald's Corporation may be offering Wi-Fi access soon, and currently has Wi-Fi access at their flagship restaurant in Oak Brook, Illinois.

However, there is also a third subcategory of networks set up by certain communities such as universities where the service is provided free to members and guests of the community such as students, yet used to make money by letting the service out to companies and individuals outside. An example of such a service is Sparknet (*http://www.sparknet.fi/*) in Finland. Sparknet also supports OpenSparknet (*https://open.sparknet.fi/*), a project where people can name their own wireless access point as a part of Sparknet in return for certain benefits.(3)

7. Application of Wi-Fi in Libraries

Road warriors may no longer have to stay put in an airport lounge or Starbucks to access the high-speed Internet via an 802.11 Wi-Fi network. Thanks to software developed by two computer scientists at the University of California, San Diego, the time it takes to hand off from one Wi-Fi wireless network to the next can be dramatically shortened — overcoming a major obstacle in Wi-Fi roaming.

"Wi-Fi offers tremendous speeds if you stay in one place or at least within 100 meters of the same access point," said Savage, an assistant professor in the Computer Science and Engineering department and academic participant in the California Institute for Telecommunications and Information Technology. "SyncScan is a handoff algorithm which can cut the time it takes to switch from one Wi-Fi access point to another by a factor of a hundred over existing solutions. This is a requirement for demanding applications like Voice over Wi-Fi [VoWi-Fi], where even short interruptions can disrupt the illusion of continuous connectivity." Savage notes that SyncScan also allows mobile devices to make better handoff decisions and therefore improve signal quality overall.

Many libraries have introduced free Wi-Fi Internet access. The library says that patrons bringing in their own wireless-equipped laptops will have access to "the entire range of full-text databases normally accessible from the library's own computers," as well as Internet access. Computers must be equipped with an 802.11b Wi-Fi Ethernet interface card; the high-speed wireless connections are available during operating hours only. Several libraries also will be using Wi-Fi-equipped laptops for PC training as part of Click On @ the Library program of computer instruction. The wi-fi hotspot network is good news for all patrons, both with and without wireless-enabled devices. Wi-Fi users can now employ their own laptops to tap into the card catalog and all of the library's research databases without having to wait in line for an available computer terminal, which in turn frees up more space for patrons without their own wireless devices.

Anticipated yearly maintenance costs have been kept down primarily because of the ACS software, which allows the library's few IT staff members to manage the entire system from one central location, and to create and provision consistent security policies across the network. Airespace's software also provides accurate location tracking which enables rapid fault isolation and problem resolution for each site. In addition to free, public Wi-Fi, the Airespace WLAN system provides a secure channel for the city's field workers, Chicago police, and public safety personnel to access.

"Within the library, a certain part of the network is dedicated to police and other city employees. It extends out into the parking lot so that they can pull in and get wireless access without having to leave their vehicles," says Aaron

8. Advantages of Wi-Fi

- Unlike packet radio systems, Wi-Fi uses unlicensed radio spectrum and does not require regulatory approval for individual deployers.

- Allow LANs to be deployed without cabling, potentially reducing the costs of network deployment and expansion. Spaces where cables cannot be run, such as outdoor areas and historical buildings, can host wireless LANs.

- Wi-Fi products are widely available in the market. Different brands of access points and client network interfaces are interoperable at a basic level of service.

- Competition amongst vendors has lowered prices considerably since their inception.

- Many Wi-Fi networks support roaming, in which a mobile client station such as a laptop computer can move from one access point to another as the user moves around a building or area.

- Many access points and network interfaces support various degrees of encryption to protect traffic from interception.

- Wi-Fi is a global set of standards. Unlike cellular carriers, the same Wi-Fi client works in different countries around the world.(3)

9. Disadvantages of Wi-Fi

- Use of the 2.4 GHz Wi-Fi band does not require a license in most of the world provided that one stays below the 100mWatt limit and one accepts interference from other sources; including interference which causes your devices to no longer function. It is alleged that Amateur Radio operators have license to boost the power on their routers up to the legal maximum for their license class, which tends to be 1500 watts (roughly 15,000 times that of a normal router).

- Legislation is not consistent worldwide; most of Europe allows for an additional 2 channels; Japan has one more on top of that - and some countries, like Spain, prohibit use of the lower-numbered channels. Furthermore some countries, such as Italy, used to require a 'general authorization' for any WiFi used outside the owned premises; or required something akin to an operator registration. For Europe; consult http://www.ero.dk for an annual report on the additional restriction each European country imposes.

- The 802.11b and 802.11g flavors of Wi-Fi use the 2.4 GHz spectrum, which is crowded with other devices such as Bluetooth, microwave ovens, cordless phones (900 MHz or 5.8 GHz are, therefore, alternative phone frequencies one can use if one has a Wi-Fi network), or video sender devices, among many others. This may cause degradation in performance. Other devices which use microwave frequencies such as certain types of cell phones can also cause degradation in performance.

- Power consumption is fairly high compared to other standards, making battery life and heat a concern.

- To be easily breakable even when correctly configured. Although newer wireless products are slowly providing support for the Wi-Fi Protected Access (WPA) protocol, many older access points will have to be replaced to support it. The adoption of the 802.11i (aka WPA2) standard in June 2004 makes available a rather better security scheme for future use — when properly configured. In the meantime, many enterprises have had to deploy additional layers of encryption (such as VPNs) to protect against interception.

- Wi-Fi networks have limited range. A typical Wi-Fi home router using 802.11b or 802.11g might have a range of 45 m (150 ft) indoors and 90 m (300 ft) outdoors.

- Interference of a closed or encrypted access point with other open access points on the same or a neighboring channel can prevent access to the open access points by others in the area. This

can pose a problem in high-density areas such as large apartment buildings where many residents are operating Wi-Fi access points.

- Free access points (or improperly configured access points) may be used by a hacker to anonymously initiate an attack that would be impossible to track beyond the owner of the access point. (3)

10.   Conclusion

Wi-fi may offer some better services in the libraries. It provides access to the remote users, where user community can access the databases like CD-Rom databases, bibliographic databases, and services like library web pages, off campus services through the library web pages. Though it offers good and tremendous services it may lacking with some other applications in libraries. Many advanced technologies have come like Wi Max, Skype etc. The recent technologies may offer better services than with wi-fi services.

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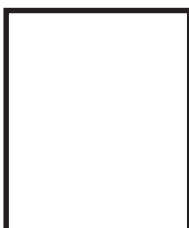
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