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Research in Network Management

Review of Wireless Technologies in the Local and Metropolitan Networks

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This document looks to review the wireless technologies available in Local and Metropolitan Area Networks, these technologies include Radio over Fibre, WiMax, and Ad-Hoc as well as router-based. These technologies are being reviewed to see what are the benefits and drawbacks of using such technologies. (Abstract)

Local area network (LAN), Metropolitan area network (MAN), Wireless LAN (WLAN).

Introduction

This document will hope to show the uses of wireless technologies in Local and Metropolitan Area Networks. It will discuss where wireless technologies come from, how important the wireless technology can be. The document will review many different forms of Wireless technologies such as Radio over Fibre, WiMax, Ad-Hoc and Router-Based as well as the protocols used for communication in these technologies.

What is Wireless

Brief History

The first wireless network was created in 1970 with the use of Ham-like Radios; they were used in a bi-star topology to communicate 7 computers across 4 islands without the use of phone lines. [1]

There are two main methods of transmitting a wireless signal these two are light signals often referred to as infrared and radio signals, there are advantages and drawbacks to both of these methods. The first IEEE proceedings was released in 1979 by F.R. Gfeller and U. Bapst for a wireless local area network using diffused infrared [2], shortly followed by P. Ferrert in 1980 using radio for communications on a network. [2]

Due to the relatively high costs wireless was only used if a wired connection was not an option, recent advances in the technology and standards introduced have seen the cost lowered substantially. [1]

Comparision of Infrared and Radio

Infrared and Radio use two different mediums to transfer data in a network, these differences come with advantages and disadvantages of using such technologies.

Infrared utilizes light to transfer data, with the advances in infrared its cost is very cheap and offers a cost effective solution but the technology does not offer any flexibility in the fact that it has to be used at fixed points and is not scalable as it limited to direct line of sight connectivity meaning multiple fixed access points per station. Other drawbacks include light diffuses over distance so distorts the signal meaning data is unreadable leaving large distance networks not possible.[3]

Radio is a very flexible solution but it more expensive than infrared, it does not need a direct line of sight and therefore the station does not need to be a fixed point, radio can even pass through certain walls without distorting the signal too much so that it is still readable this helps with scalability, radio can also accommodate several stations at once.

Standards in Wireless

There are many standards in wireless mostly focus on radio wave frequency's rather than infrared, focusing on different aspects of the technology these can be security, performance and reliability.

The most common standard in a Wireless Local Area Network (WLAN) is 802.11 utilizes different frequency's of radio waves to communicate some frequency's are reserved for experimentation or military use these frequency's range from 2.4Ghz – 5Ghz utilizing this band it can achieve a range of transfer speeds up to 54Mbps. It offers different level of security ranging from weak (WEP) to Extensible Authentication Protocol – Transport Layer Security (EAP-TLS) considered one of the most secure protocol standard. Often referred to as Wireless Fibre (Wi-Fi) is used by several technologies such as Ad-Hoc and Router-Based networking.

The 802.16 IEEE is WiMax it is used in Metropolitan Area Networks (MAN), WiMax offers large scalability and decent transfer rates, and it also offers up to 16Mbps in the 2 – 11Ghz frequency band, data security including DES3 and AES, with AES being one of the most secure encryptions available it can be very secure protocol to use.

Radio-over-Fibre is when light is modulated by radio waves for transmitting over optical fibre, it offers huge scalability, and with fibre optics offering up to gigabits of

speed it will be able to handle the increasing speeds of Wireless for years.

Ad-Hoc is wireless communication between two stations without the need of an Access point.

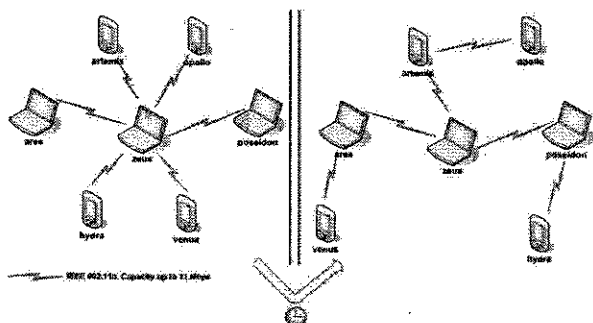
These standards ensure compatibility of devices and help ease of use.

Uses of Wireless Technologies

This section will review how each standard operates in an environment drawing advantages and drawbacks

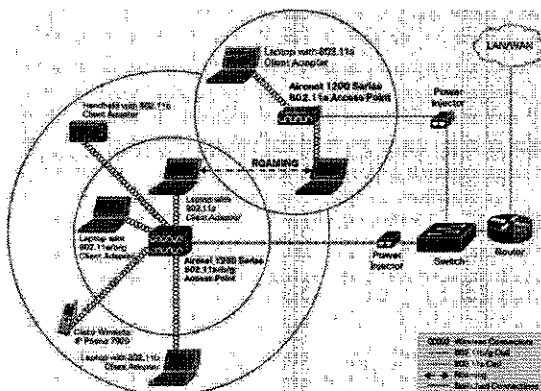
Topologies

Ad-Hoc Topologies



Ad-Hoc offers a lot of flexibility as long as you stay within the range limits of the wireless as you can see the users move but yet still achieves connectivity to each other.

Wireless LAN topology

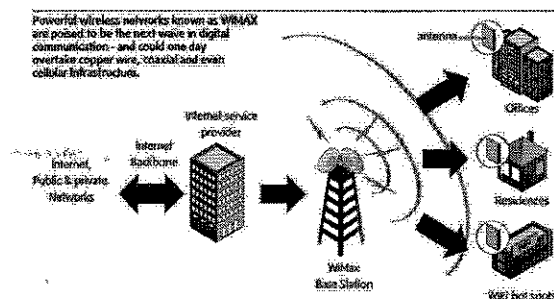


With multiple access points a Wireless LAN can offer roaming and much better connectivity than Ad-Hoc

WiMax topology

WiMAX: How it works

Powerful wireless networks known as WiMAX are poised to be the next wave in digital communication—and could one day overtake copper wire, coaxial and even cellular infrastructure.

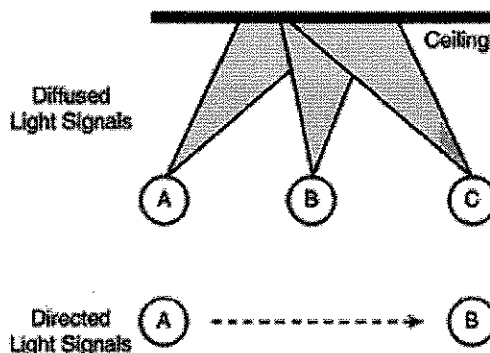


WiMax offers wide connectivity that can scale up to the size of city's offering a wireless broadband connection to users

Radio-over-Fibre

Offers the same topology as Wireless LAN but on a bigger scale since the fiber can carry the signal greater distances.

Infrared topologies



The two infrared topologies offer direct point to point connections or point to multipoint connections

Conclusions

In conclusion we have found that Radio frequency is best suited for LAN's and MAN's as they offer fair greater reliability and flexibility, radio isn't limited to a single room like infrared and is not as easily distorted as infrared, maybe a combination of LAN and MAN technologies like WiMax and WLAN would be the perfect blend of technologies for future use.

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References

[1] http://en.wikipedia.org/wiki/Wireless_LAN

[2] <http://www.technology-unplugged.com/computer-networking/history-of-wlan-part-1/>

[3] http://www.searchtwice.com/wirelesslan_technology.asp