Air-Stream

A Community Network

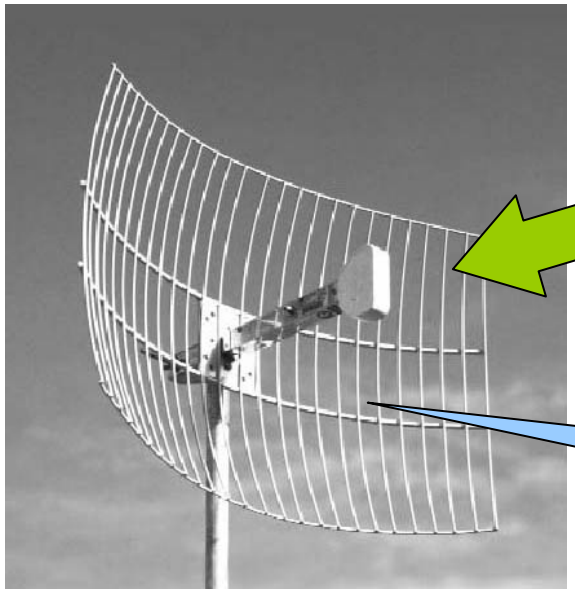
Air-Stream, a not-for-profit community organisation, the first in South Australia to successfully build a Wide Area Network (WAN) using class license radio telemetry and open source technologies.

Currently, our membership includes IT professionals, engineers, radio amateurs, community groups, and enthusiasts, who are volunteering their time and resources to build and support this network.

The Network Infrastructure

The technology deployed uses low power 802.11b and soon 802.11a (class licence) spread spectrum devices and as such requires line-of-sight where the distance is greater than ≈400 metres.

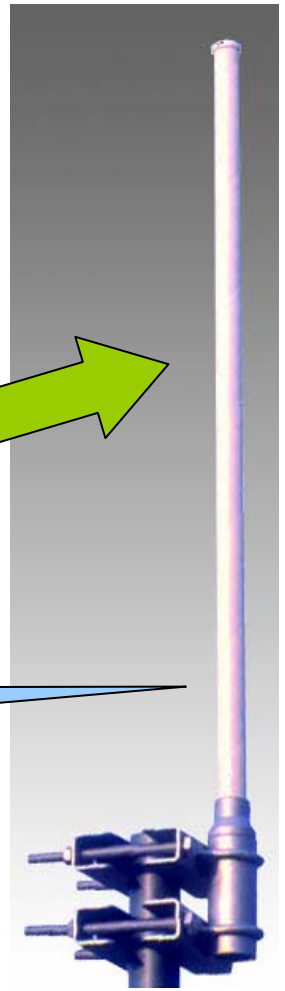
Nevertheless, due to the properties of microwaves high gain antennas allow networks to be established over much greater distances, sometimes in excess of 20km with the right conditions.



High Gain Antennas

Omni Direction Antenna

Direction Antenna



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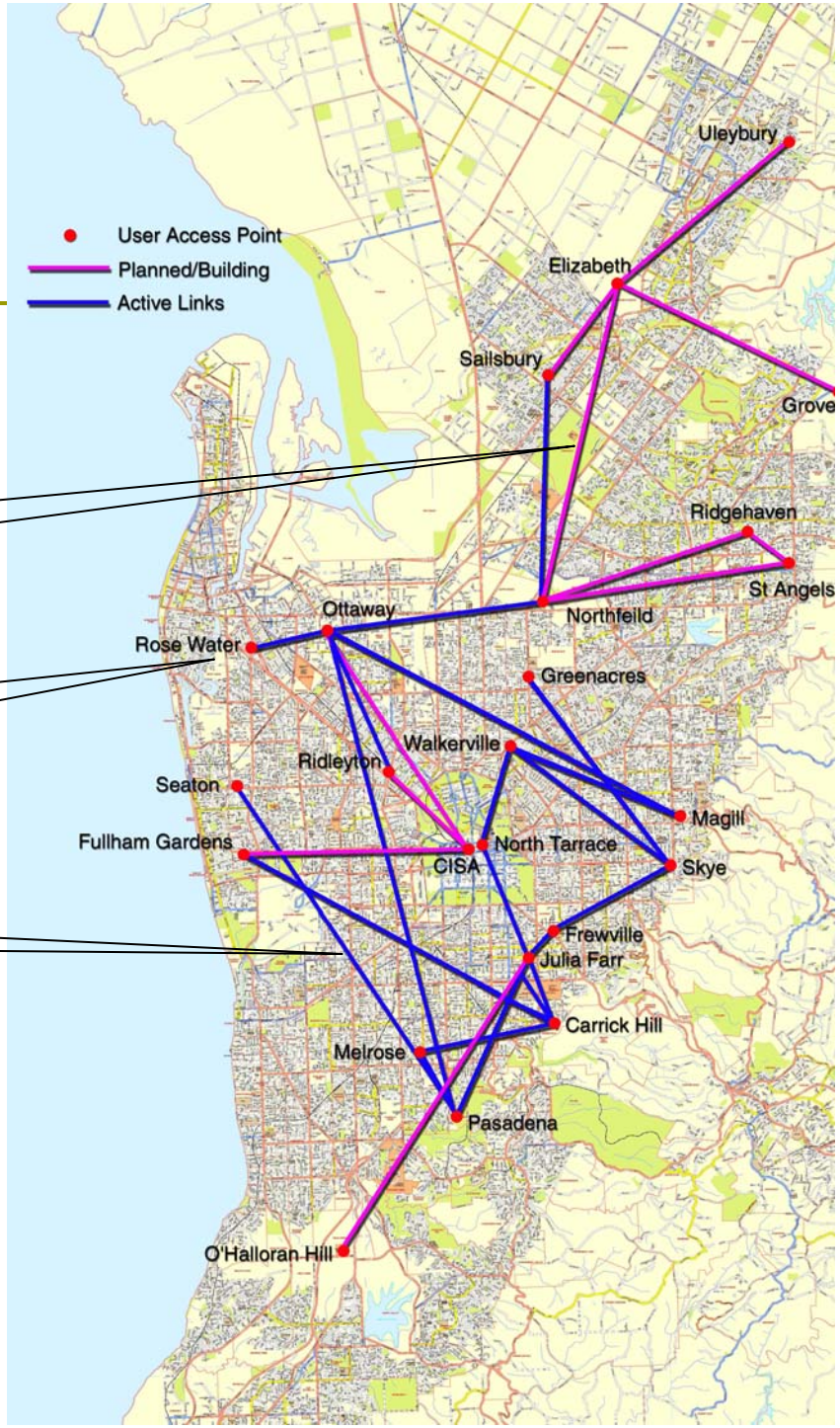
The purple lines represent new or future backbones which can extend or improved network services.

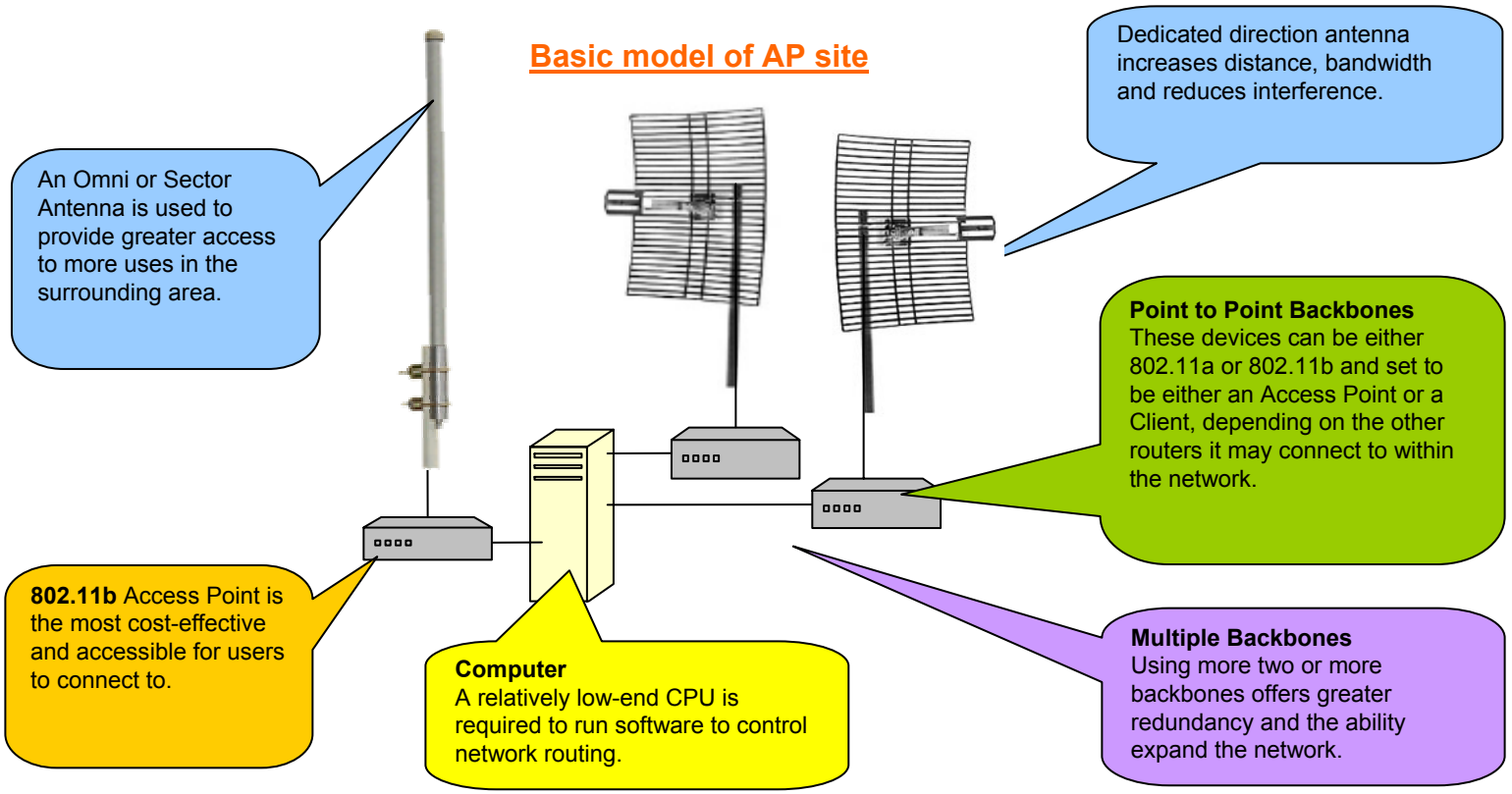
Each red dot is an access point that can support between 30 to 60 network users depending on the system deployed at the site.

The blue lines are backbone connections between each site.

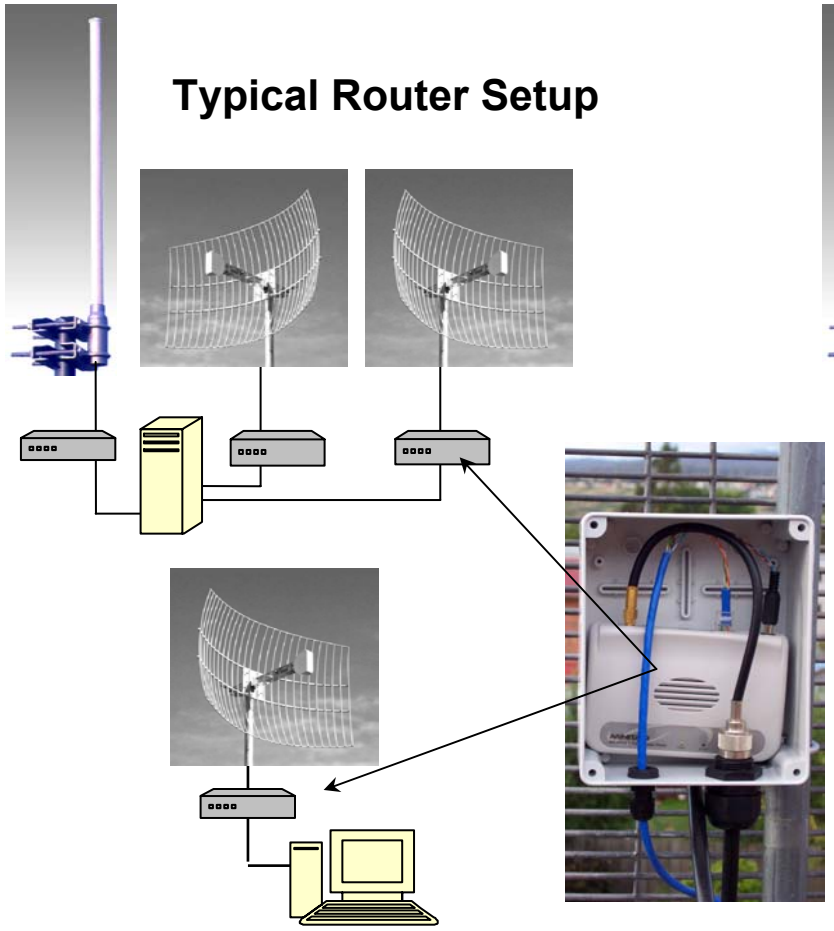


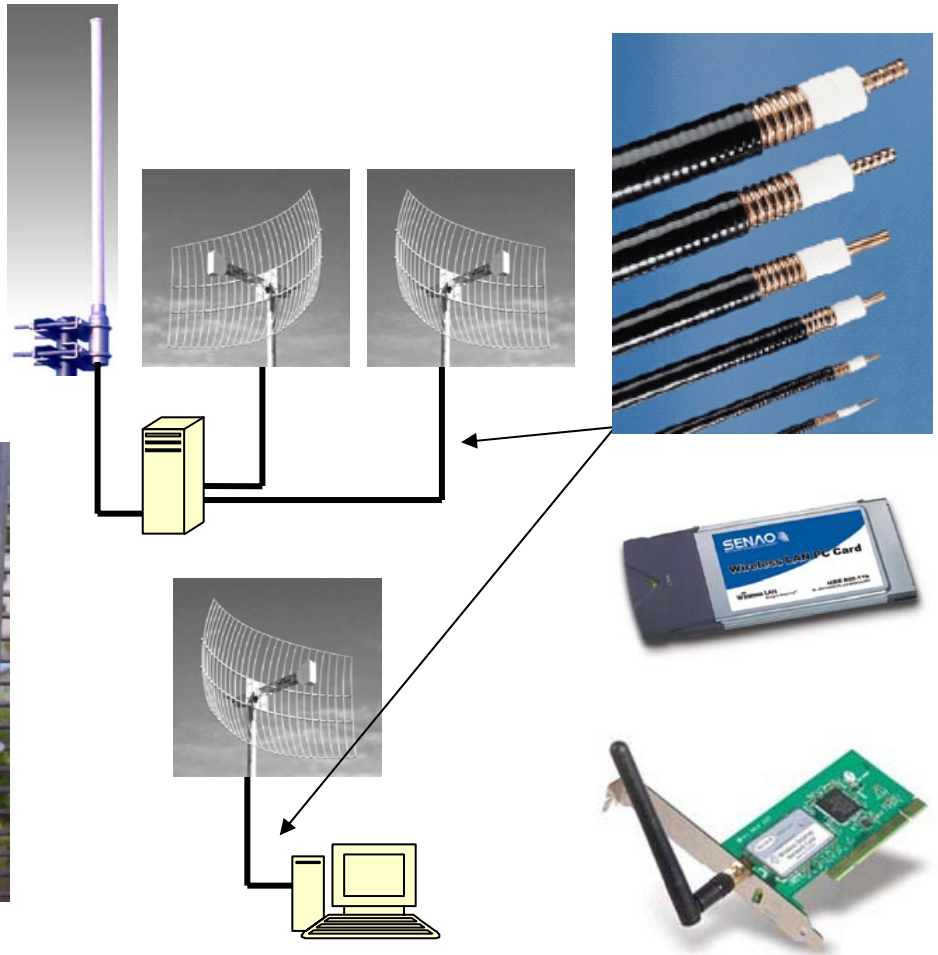
Typical Router

Using free open source software for dynamic routing, relatively low-end computers, and low-cost wireless devices, it possible to deploy multi backbone routers.



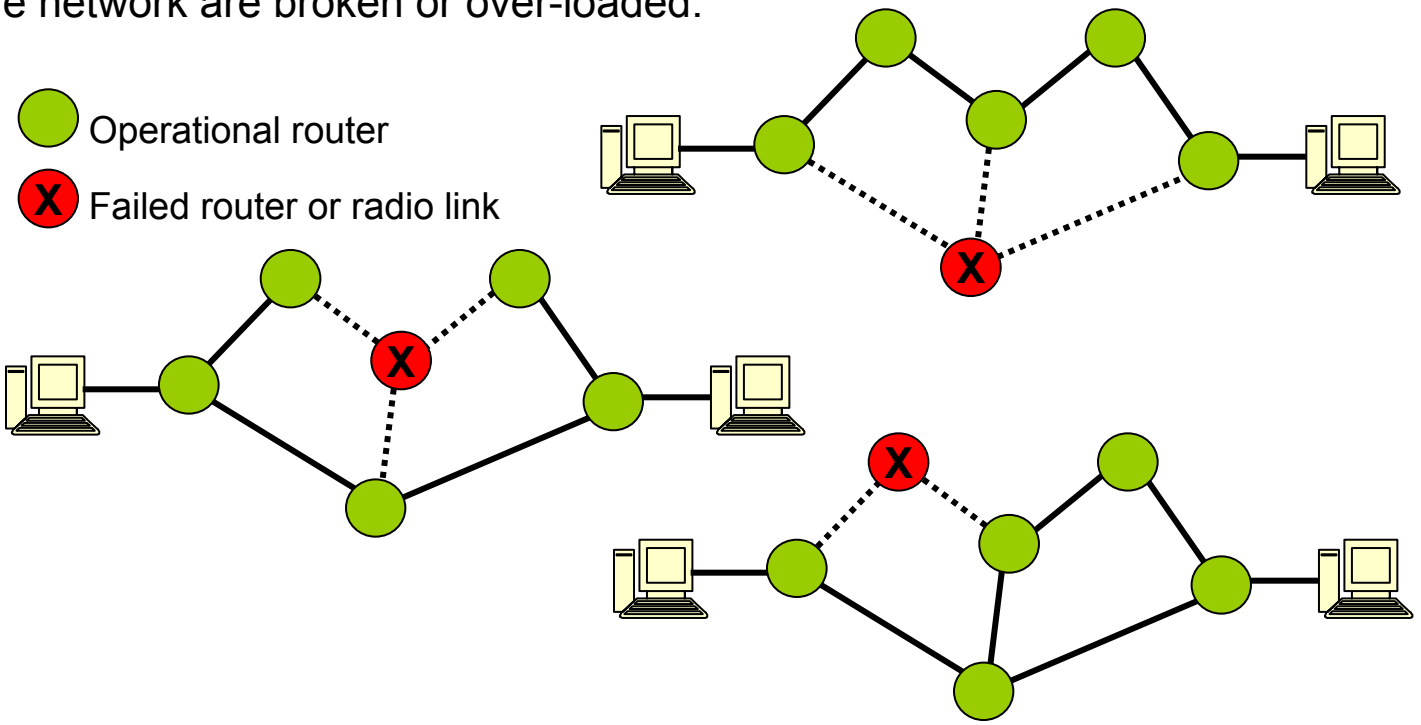
Types of configurations





Routing

The Internet is a Wide Area Network (WAN) and is built by connecting smaller networks together using multiple connections and software that controls traffic across these connections. Such layer 3 systems ensure data can traverse the network even if parts of the network are broken or over-loaded.

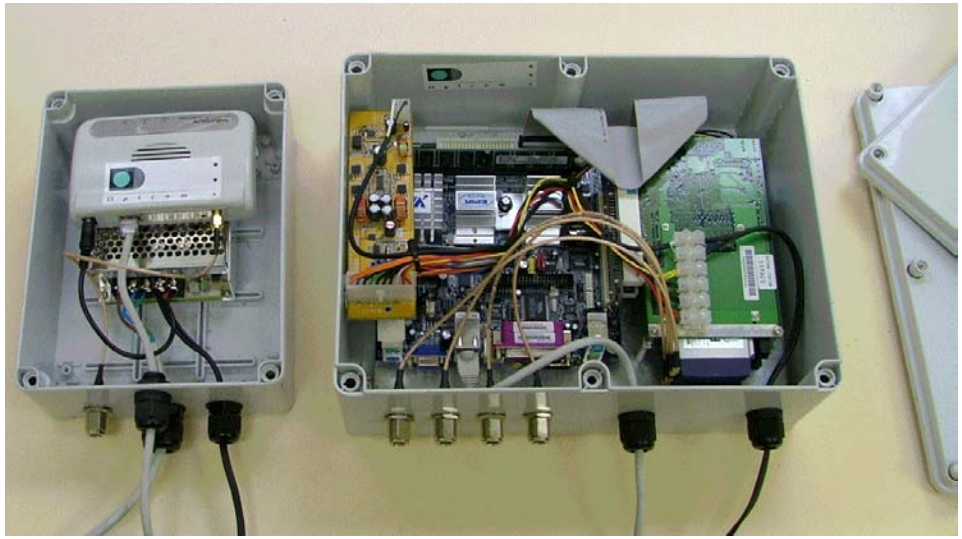


This offers a highly reliable and robust model for wireless networks overcoming many of the limitations of 802.11a and 802.11b wireless technologies on their own.

Cost of Implementation

It is currently practical to implement up to three 802.11b Access Points (AP) without interference and 5 APs where antenna can be spaced apart. This provides a bandwidth of up to 11Mbps per AP or 30 network users per AP with an average of bandwidth greater than 1Mbps.

It is also practical to implement up to as many as four 802.11a dedicated backbones without interference having a bandwidth of up to 54Mpbs per backbone between any AP. The estimated cost using this technology is less than $20 per person per year.

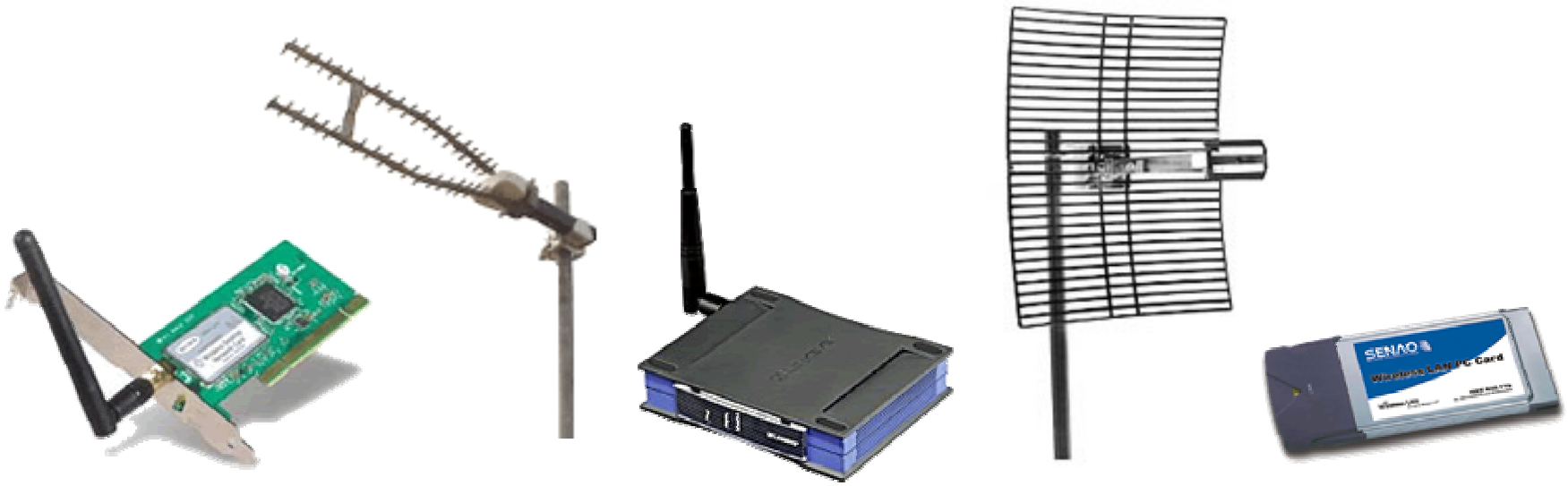


Radio Communications Act.

Under the Radio Communications Act, which covers the use of radio communications equipment within the radiofrequency spectrum, a license is required.

However, there are some spectrums that have been but aside for public use termed “class license”. Users of these spectrums do not require a license, provided specific measures are complied with.

The 802.11a and 802.11b wireless network equipment used by Air-Stream complies with the class license requirements and as such no licensing is required.

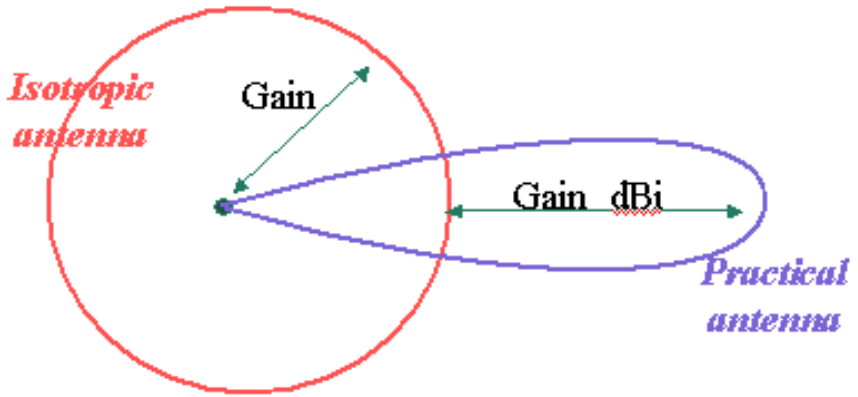


Class licence requirements

Under a class licence, all users operate in the same spectrum segment on a shared basis and are subject to the same conditions. A class license governs the frequencies that may be used, commonly prescribes equipment standards, and may specify other technical and operational parameters.

Spread spectrum devices are restricted the following frequency bands and power limits.

915 to 928Mhz is 1 watt
2400 to 2483.5Mhz is 4 watts (bandwidth greater than 1 Mhz)
2400 to 2483.5Mhz is 500 milliwatts (bandwidth greater than 1M Mhz)
5725 to 5875Mhz is 1 watt



Telecommunications Act.

Under the Telecommunications Act a carrier license authorises the use of network units for the supply of telecommunications services to the public.

The Air-Stream Network, as a not-for-profit incorporated body, falls within the meaning of ‘exempt network’. Under subsection 34 (3) of the Telecommunications Act 1997, the owner of the exempt network is not required to hold a carrier license.

An exempt network includes WLAN that are used for the sole purpose of supplying carriage services on a non-commercial basis.

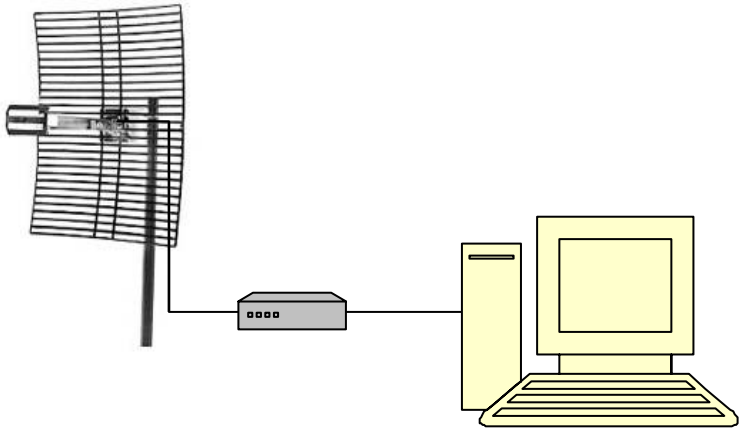
Technology Access

The equipment deployed ensures easy access in a number of ways:

1. Access Points where connections are made by users to the network use the 802.11b standard which offers the most reliable, accessible and cost-effective solution.

2. The network is configured to support Internet Protocols, so software used for the Internet can be used without any modification and is freely available, e.g., Internet Browsers, Email Clients, IRC, VoIP and any other system used over the Internet.

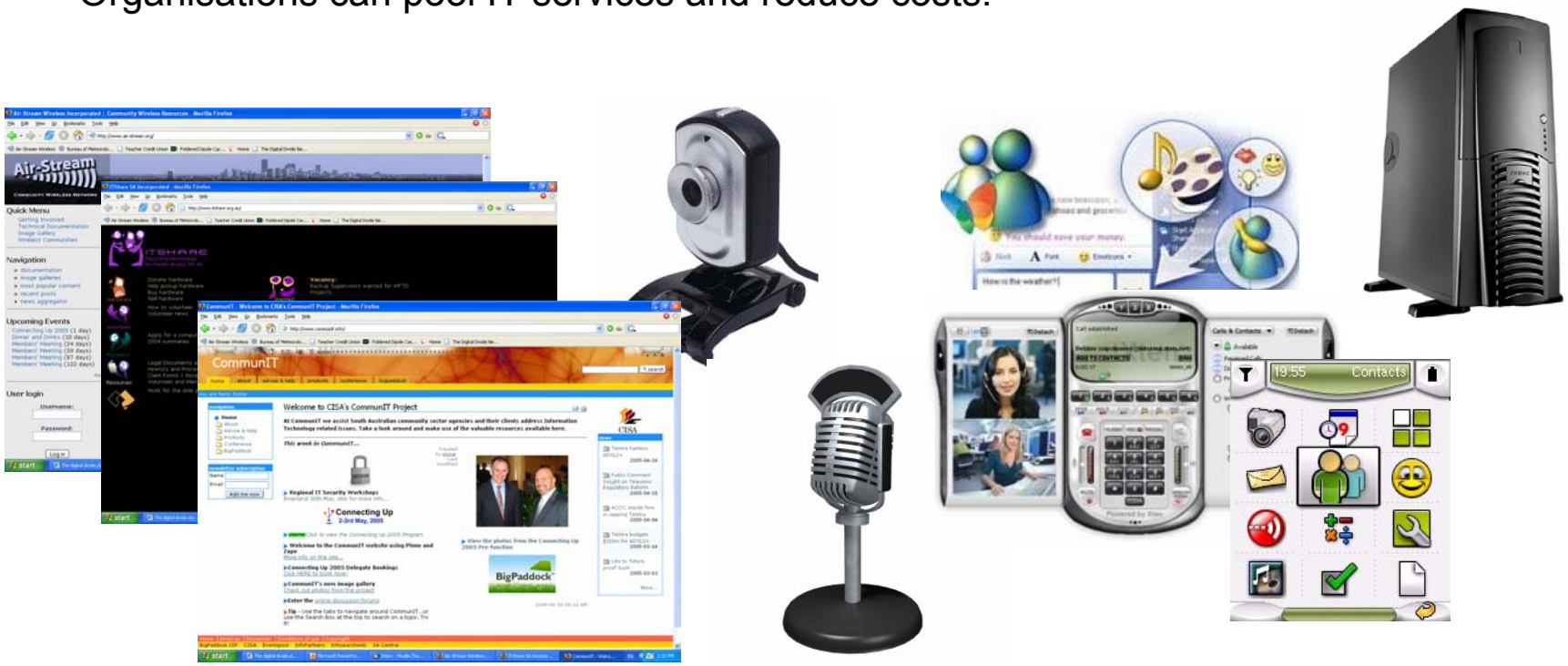
3. Air-Stream and the open source community freely share and promote information about using this technology, working with other community organisations in order to participate in building and using the network.



Network Content

A WAN is an ideal infrastructure for sharing IT resources such as WebPages, Email, IRC, VoIP, Video/Audio streaming and any other IT systems used over a network.

- Transfer information and communicate over the network without centralisation improving bandwidth as data is routed directly to its destination.
- An individual or organisation can choose share their Internet access with other community organisations or disadvantages groups.
- Organisations can pool IT services and reduce costs.



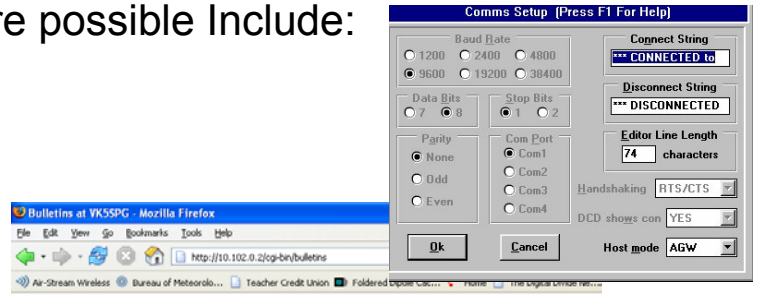
Amateur Radio

Amateur Radio operators have connections from their digital packet network into the Air-Stream network Packet radio makes use of a protocol called AX25, which makes use of modulation of a radio frequency signal.

However, AX25 can also be carried over the TCP/IP protocol (which the Air-Stream network uses). Hence many Amateur Radio functions can run in an integrated, seamless fashion over the wireless network, and many new functions become feasible due to its much higher speed.

Some of the functions that are possible Include:

BBS Access
Forwarding
Program Libraries
Voice Over IP
Web Pages
APRS
DX Cluster



Bulletins at VK5SPG

Origin	Size	To	Route	From	Topic
04-May	325	WP		VK5APC	WP Update
04-May	191	WP		VK5BRC	WP Update
04-May	123	WP	VK5ZAR	VK5SPG	WP Update
04-May	123	WP	VK5SO	VK5SPG	WP Update
04-May	123	WP	VK5ALE	VK5SPG	WP Update
04-May	123	WP	VK5APC	VK5SPG	WP Update
04-May	123	WP	VK5BRC	VK5SPG	WP Update
04-May	123	WP	VK5HB	VK5SPG	WP Update
04-May	123	WP	VK5LZ	VK5SPG	WP Update

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Network Security

Wireless networks operate in the same way as the Internet, so precautions should be taken to protect computers or LANs connected to it. This can be done on several levels and, as the network is tightly managed, it employs a number of security measures, such as:

Access point equipment can be encrypted providing security between the users and an access point.

Users may firewall and protect their computers using the same tools and applications available for the Internet.

Being a routed network, each AP manages its own subnet and traffic between each host can be highly controlled.

Users may also deploy encrypted virtual private networks (VPNs) as another layer, providing additional layer of security.

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Questions