WiFi

Wireless Networking

IEEE 802.11

A Quick Guide

Introductory Level

Designed for iPad. Applicable to other devices.

GUARDRAIL Tutorials

What is WiFi?

WiFi - the technology that allows the exchange of data between electronic devices using UHF radio waves.* The term WiFi has been used since about 2000.

The Wi-Fi logo used by the Wi-Fi Alliance which oversees compliance testing

Some common Wi-Fi symbols

Computers can detect and interpret wireless signals, providing they are equipped with some sort of **wireless adaptor** to do this. A wireless signal (radio wave) can carry the digital code used by computers, albeit in a different format. The encoded radio waves have to be converted into data which is intelligible to a computer. The process of converting data into radio signals, and vice versa, is facilitated by a **wireless adapter** (at the computer end) and a **wireless router** (at the network end).

The WiFi (**radio wave technology**) used by computers is similar to radio used by cell phones, walkie talkies and other devices. The main differences are:
- **Transmission frequency** is normally 2.4GHz or 5GHz, which is much higher, and allows for a greater amount of data to be carried

- They use the **802.11** networking standards *(more about this later)*

* Defined under the IEEE **802.11** standards (outlined by the global **I**nstitute of **E**lectrical and **E**lectronics **E**ngineers).

Simple Home Wireless Network (WLAN)

WiFi

internet

no cables

wireless enabled PC

radio waves

ADSL modem,
wireless router,
internet gateway

wireless enabled iMac

wireless laptop computer

wireless enabled iPad

wireless enabled
smart phone

Most modern computers and mobile
devices have inbuilt wireless adaptors

Wireless Interface Devices

- PCMCIA Wireless Adapter (old laptops)

- PCI Wireless Adapter (inside computer)

- USB Wireless Adaptor ('dongle')

- Built-in Wireless Adaptor (mobile devices - not shown)

PCMCIA

PCI

USB
'dongle'

802.11 WiFi Standards

- 802.11a - 5Ghz frequency. 54mbps data speed

- 802.11b - 2.4Ghz frequency. 11mbps data speed

- 802.11g - 2.4Ghz frequency. 54mbps data speed

- 802.11n - 2.4Ghz frequency. 140mbps data speed

802.11n is the newest of the commonly adopted standards today. Many wireless devices will be listed as 802.11b/g/n which means they are backwards compatible with each previous standard.

802.11ac is the newest standard but is not yet widely adopted. Devices which support this standard are also backwards compatible with a, b, g and n. It allows for data rates of up to 450mbps and is less prone to interference.
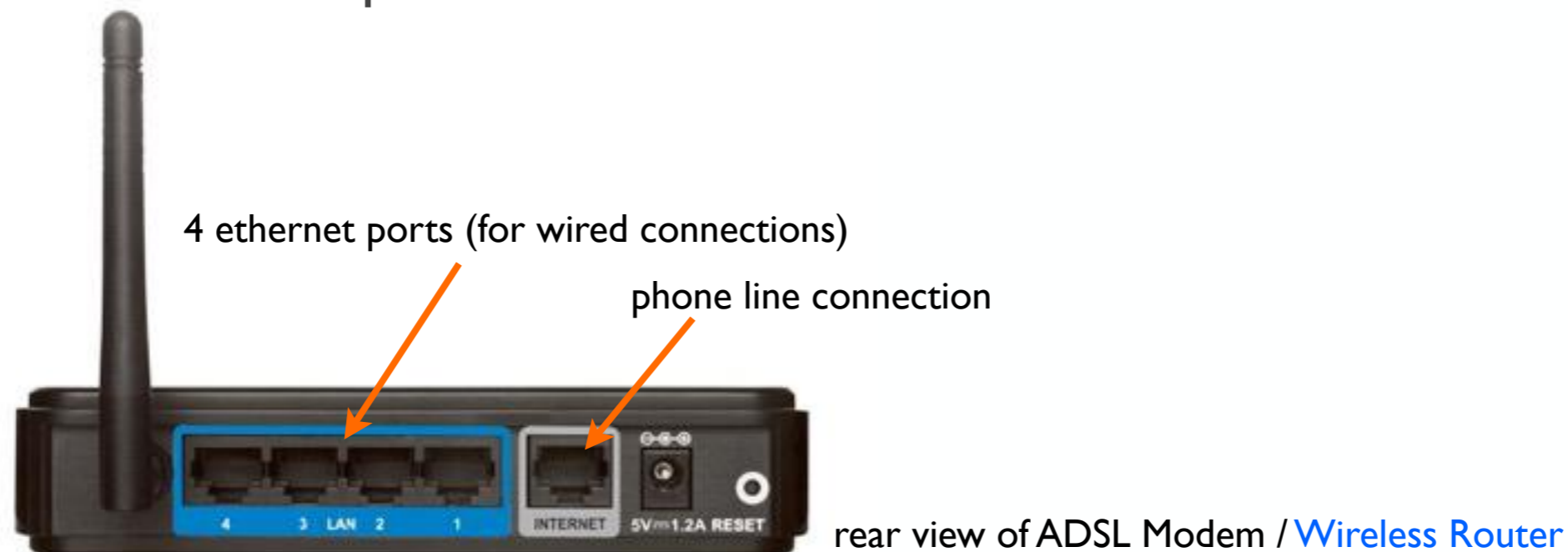
ADSL Modem
Wireless Router

Wireless Internet

With the success of WiFi, most people are now able to easily access wireless internet at a very affordable price. With an ADSL (broadband) modem/wireless router, it is easy to set up a wireless network at home, or office, which shares the broadband internet connection amongst various devices. Computers can be moved around without having to worry about disconnecting and reconnecting cables. The range for such a network is generally around 20 metres, depending on variables such as wall types, the presence of metallic structures and so on.

Of course, the wireless router will normally have several ethernet ports for wired connections and can be used to allow access to stationary devices such as non-wireless printers which can then be shared over the network.

4 ethernet ports (for wired connections)

phone line connection

rear view of ADSL Modem / Wireless Router

WiFi Security

Public wireless access is also provided free of charge by many businesses such as hotels, cafes, airports and clubs. In these cases connecting to the wireless network is effortless on your wireless enabled mobile device. However, there is a small security risk with public WiFi access because the unencrypted wireless signals are broadcast, and therefore easily intercepted by other devices (with the intended capability). Therefore, don't do your internet banking over a public WiFi network unless it is deemed secure!

For your private WiFi network at home, you need at least some basic security to provide authentication and the secure transfer of data over the wireless connection. WPA (Wi-Fi Protected Access) is a security standard for wireless networks. It is essential, and fairly easy to implement (the necessary instructions should be provided with your wireless router).

WiFi Settings - IOS

*IOS devices (iPhone, iPad and iPod Touch)
should be similar to these screen shots.
(iPhone 3GS - IOS version 6.1.6)*

The settings for the device are normally accessed from a **Settings** icon on the Home Screen.
Under 'Settings' tap the 'Wi-Fi' row. Whilst ON the device will detect any wireless networks within range, and will indicate if they are secured (by displaying a lock symbol). A tick will appear next to the network you are connected to (if allowed to connect).

With WiFi turned OFF, you will not see any wireless networks listed and you will not be able to connect to a network through Wifi..

With 'Ask to Join Networks' ON, the device will not connect automatically to public WiFi networks. If a public network is detected, you will be prompted via a popup screen to choose whether or not you would like to connect. This is useful for security reasons (otherwise there is a remote possibility you could accidentally join a potentially harmful network used to intercept peoples' sensitive data).

WiFi Settings - Android

Most Android devices (smartphones or tablets) should be similar to this.
(Amicroe TouchTAB II - Android version 4.0.4)

The Settings for the device are normally accessed from a **Settings** icon on the Home Screen. Under 'WIRELESS & NETWORKS' WiFi can be turned ON or OFF. Whilst ON the device will detect any wireless networks within range, and will indicate if they are '**Secured**', '**Not in range**' or '**Connected**' (if you have connected to a network for which you have permission to connect).

With WiFi turned OFF, you will not see any wireless networks listed and you will not be able to connect to a network through Wifi.

Summing Up

- Wifi uses radio waves to transmit data at speeds of normally less than 140mbps at a frequency of around 2.4GHz (or 5Ghz in the case of 802.11a and 802.11ac)

- Many types of wireless adaptors are available for computers and mobile devices (almost all modern computers and mobile devices already have an inbuilt adaptor)

- Be aware of the security issues regarding WiFi, especially in public places.

- WPA (or the newer WPA2) security should be implemented on your home, or business, wireless network.