

Time to Improve Your Wireless Network

Wireless networking is a technology that has helped transform ICT in schools. A decade ago – if a school was fortunate enough to have a significant number of computers – they were desktop devices in an ICT suite, connected by Ethernet cables. The arrival of wireless networking – often referred to as Wi-Fi – in conjunction with affordable laptops meant that ICT could be taken into the classroom and elsewhere. It was no longer necessary to be tethered to the wall and you could use the internet wherever it was needed.

However, the problem with wireless is that it is desperately slow. This is not such an issue when a school has only a few laptops and they are mainly used for connecting to the internet. But a classroom of, say, 30 laptops all trying to logon to the network at the same time can create something akin to the M25 motorway on a wet Friday afternoon before a Bank holiday weekend - with two of the lanes coned off. Accordingly, many schools find the wireless experience frustrating and relatively disappointing.

To understand why these bottlenecks exist, it is necessary to understand a bit about wireless technology. If you have broadband at home, you're probably aware that the speed of the connection is important to ensure a good experience. Domestic broadband speeds range from about 1 Mbit/second to about 20 Mbits/second, with an average nationwide speed of just over 2 Mbits.

Wireless technology comes in different flavours but the most common variety is known as '11g', which operates at a maximum speed of 54 Mbits. Sounds good? Well it might be if it really did work at this speed, but it simply doesn't. Firstly, the speed is dependent on the distance of the laptop from the wireless access point (the WAP or transmitter). For instance, if the WAP is located outside of the classroom and somewhere down the corridor then the top speed might drop to, say, 30 Mbits. To help mitigate against this, best practice is to have WAPs in each classroom.

The second problem is that wireless is subject to interference. Specifically, it operates on the same frequencies as baby monitors, microwave ovens, cordless telephones and wireless security cameras to name just some devices. If these are present – along with neighbouring wi-fi systems – they create radio noise (interference). The effect then becomes like trying to hold a conversation at a noisy party: you have to speak more slowly and have to repeat yourself. The net effect is that the overall throughput drops and instead of a speed of 54 Mbits you typically get something like 10-20 Mbits "real world" throughput. Incidentally, when you see an icon on the Taskbar telling you that you are connected at 54 Mbits, take it with a pinch of salt. It's rather like sitting in slow moving traffic on the motorway whilst the sign outside reminds you that the speed limit is 70mph.

The final killer is that this bandwidth has to be shared by all the laptops. So, suppose the actual throughput is 20 Mbits and there are 20 laptops; if everyone hits the Enter button at the same time then each laptop might be getting just 1 Mbit at that moment. In practice things are not quite as bad as that; people cannot all press the Enter button at exactly the same moment and even a gap of a few milliseconds is enough for the system to allocate a bit more bandwidth temporarily to the other laptops. But the key message is that the actual speed is only a fraction of the advertised speed and this can be a real issue when the network is stressed, such as at logon and logoff times or when watching video or saving large presentations or pictures.

Fortunately, there is a way to improve matters. The latest version of Wi-Fi is known as '11n' or simply 'N' (the full name is actually IEEE 802.11n-2009). This has three advantages over its predecessor: firstly, it operates at higher speeds – up to 600 Mbits in theory but certainly 150 Mbits in practice. Secondly, it can operate at a different frequency band – one which is far less susceptible to interference. Thirdly, it operates over a greater distance. The combination of these factors means that an 11n network can be noticeably faster than an older 11g one, resulting in a far more pleasant and productive experience.

However, there are a couple of 'gotchas' for the unwary. 11n had a long gestation period; the standard was drawn up over several years and went through a number of iterations. Some manufacturers, in the hope of gaining advantage and because they were selling to unknowing customers, tried to jump the gun by launching products before the specification was finalised. These wireless systems are usually described using terms such as 'pre-N' or 'draft-N'. Some manufacturers simply invented their own names, like Turbo-n, 2x-n and so on. In general, these products do not meet the 11.n specification and sometimes only operate with other products from the same manufacturer. Those that are still on the market should be avoided.

The second stumbling block is that 11n can operate on two separate frequency bands. For compatibility purposes, it can operate on the old 2.4GHz band used by 11g products (and microwave ovens, baby monitors etc). When it does this, it operates at slower speeds and is still susceptible to interference. In addition it follows the "army marches at the pace of the slowest soldier" principle; if a single 11g device is detected within range of a WAP, then that WAP switches back to 11g operation and everything else also operates at the slowest speed. It is only when 11n operates on its alternative frequency band of 5GHz that its true benefits become available.

Realistically, unless you are starting from scratch there is going to be some legacy 11g equipment and this has to be catered for, preferably without penalising the 11n equipment. This can be done by investing in WAPs that feature simultaneous dual-band operation. Watch out for that all-important word, *simultaneous*. Some WAPs are described as dual-band, but often this simply means what was described in the previous paragraph. Simultaneous dual-band means the WAP has two separate transmitters, one for each frequency, so it can service current 11n kit and older 11g kit at the same time without compromise.

Buying Recommendations

Today, 11n represents the standard and you should look for this when buying laptops or other wireless devices such as netbooks and tablets. There should be no price overhead – adding 11n capabilities costs the manufacturer less than 30p. Things that only have 11g are likely to be old stock or bargain basement stuff.

For WAPs, it is time to invest in simultaneous dual band devices only, and these should be properly certified as 11n (at this stage all the tier 1 manufacturers are). These will be more expensive than what might have once been described as "regular" WAPs, but the difference over the lifespan of the equipment (say 5 years) is pennies per week. The benefits of improved performance and keeping your options open make this a no-brainer.

The Future

Wireless is only going to get better and will eventually reach the point where it replaces wiring in most situations. The next standard is likely to be Gigabit wireless; that is, wireless that operates at a sustained speed of 1000 Mbits and a peak speed of 7000 Mbits. However, this is maybe 5 years away from standardisation and widespread adoption and not worth worrying about now.