Extending your Wi-Fi range

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While wireless networks free you from the cost and clutter of cables, you can't avoid the virtual leash of the signal's limited range. A simple Wi-Fi setup will usually cover compact dwellings, such as an apartment or townhouse, but many family-sized homes are dotted with black spots, especially outdoors. Boosting signal strength not only extends the network's reach, it can also lift the throughput to the practical maximum rate.

With the right techniques you can cast the signal even further – across the road, down the street or even spanning several suburbs – creating a point-to-point connection for file sharing and gaming.

Wireless 101

Much of the terminology used in wireless networking relates to radio theory. This is extremely dry at best, but there are some terms you'll need to understand.

- dB (decibel) describes the effect a device has on signal strength. It's a logarithmic (not linear) scale where every additional 3dB doubles the signal strength.
- dBm (dB milliwatt) is a measure of signal strength. 0dBm is 1mW of power. Smaller signals are described as negative numbers (for example, -75dBm). 30mW is the typical output of an 802.11b wireless card, and is equal to 15dBm.
- dBi (dB isotropic) is the "gain" that a directional antenna has over one that transmits equally in all directions. While a completely omni-directional antenna doesn't exist in reality, it's a useful reference measure for designing, building and comparing aerials.

The typical power output of a Wi-Fi access point is a meager 30mW, which is good for up to 300 metres under line of sight conditions, but add a few walls and an assortment of building materials and it can be difficult to get beyond 15 metres indoors. Without an external antenna, the signal will be lucky to get to the other side of your house. The reason these figures are important is that the smart way to increase wireless range is by boosting the effective signal strength.

Tighten your beam

There's no need to spend upwards of $700 on wireless bridges, which repeat a Wi-Fi signal much like a TV or radio translator station, or special signal amplifiers. Instead, you can use efficient antenna designs to focus the wireless signal into a beam. This also reduces the risk of someone outside that beam path hacking into your network.

There are hundreds of antenna designs on the Web, ranging from the very easy to the extremely complex. However, there are a few that are tried and tested and perform extremely well for minimal effort.

A uniquely Australian method is to use the antennae from defunct pay TV operator Galaxy. They're perfect for wireless networking, and former Galaxy customers will probably let you take them away for free if you ask nicely. Martin Pot's Web page (http://martybugs.net/wireless/conifermods.cgi) contains easy-to-follow instructions for making the necessary changes to convert a Galaxy TV dish into an 802.11b antenna. For around $20 worth of parts and three hours of work, you'll end up with an 18– 24dBi parabolic grid antenna – an effective boost of six to eight times the access point's signal strength.

Another variation is at www.mrx.com.au/wireless/conifermodifications.htm, which simply cuts away part of the existing hardware inside the aerial's nose cone.

Then there are those famous conversions of Pringles cans and cake tins, which use the same basic "Yagi" antenna design as the average TV aerial. These may only be good for 12dBi, but keep in mind that the built-in antenna on a PC Card is usually only 3dBi, and the short omni-directional whips on most access points are lucky to be 6dBi – so a quick and dirty Yagi array will still give you a 2x or 4x gain in signal strength.

Rob Flickenger gives detailed instructions on how to re-purpose an empty Pringles container at http://www.oreillynet.com/cs/weblog/view/wlg/448, while Andrew Clapp has done a great deal of work on this same topic at http://www.netscum.com/~clapp/wireless.html.

Martti Palomaki reports that a "cake dish antenna" is good for 14dBi, which is excellent for such a low-profile unit. His plans are at http://www.saunalahti.fi/~elepal/antenna1.html.
There are also designs that slide over an access point's own aerial. The first (at http://osiris.urbanna.net/antenna_designs/projects/template) requires a bit of craftwork and parts you may

need to source from the local hardware store, but the second design (http://osiris.urbanna.net/antenna_designs/projects/template2) is as simple as printing out two sheets of paper, gluing on some tinfoil, and cutting and folding it into shape.

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