How to optimise B4RN broadband speeds in every room of your home

Can't get your wireless signal all over your house? Wireless too slow? Then read on!

Wireless networking is all well and good if you are close to your router but after ten feet and a wall or two wireless speeds start to drop. Even the newest wireless devices will have trouble with bricks and mortar. Add a ceiling into the mix and you may well find your hyperfast connection isn't. Wifi will not go through water or metal, but it can often bounce around and get into different areas of your house.

SUMMARY OF CONTENTS:

1. WIRELESS REPEATERS

Wireless repeaters are a way to extend your wireless coverage. These work by connecting to your existing wireless network but really need to be able to 'see' your wireless router to work well and are not especially fast but they are inexpensive.

2 - HOMEPLUG ADAPTORS

Homeplugs are devices which allow you to use the mains wiring in your house for networking. Ideally they should be on the same ring main, plugged directly into the wall socket. They are connected at either end by ethernet cables.

3 - ETHERNET

Ethernet is a type of network cable used to connect devices together. Bought from the right place it is inexpensive and apart from drilling a few holes it is easy to run. Most modern network cables and devices support hyperfast gigabit speeds over distances of up to 100m.

4 - APPENDIX

1. WIRELESS REPEATERS - a very basic solution

A wireless repeater is a device that helps computers maintain stronger wireless signals by taking in WiFi signals and re-emitting them. The repeater is a powered unit that needs to be placed about half way between your router and the area you want to use your WiFi devices within picking up distance of the signal. These distances aren't great but should be enough to improve a signal to a nearby room where a signal was weak by picking up the signal and passing it on.

The primary drawback of a wireless repeater is that it effectively halves the bandwidth for any computers/devices connecting to it, rather than if they were connected direct to the router's WiFi. The reason for this is that the repeater receives the signal, processes the signal (which takes time) and then rebroadcasts the signal – and does this in both directions, from the router to the device and from the device to the router.

The only benefit of wireless repeaters is that they are fairly inexpensive and easy to setup, but we don't recommend them. Their position has to be where they can 'see' your primary router.

Many new wireless repeater units can also be connected to ethernet and used in more effective configurations. Please see the 'Ethernet' section below for details.

2. HOMEPLUG ADAPTORS - a pretty good solution

Homeplugs (sometimes referred to as 'Powerline' adaptors) use your home's mains wiring to send data around your house without complicated setup or any messy wires or rewiring required. You'll need one adaptor plugged in to the mains near your router and attached with a short ethernet cable (a patch lead). Then simply plug a second adaptor into the mains in another room and you can access your Internet connection from there. Some adaptors have built in WiFi antennas to help with WiFi dead-spots around the house, and other adaptors have multiple network sockets so you can connect multiple wired devices. You can even use multiple adaptors around the house to connect multiple rooms… it's an easy modular system.

Homeplugs come in different rated versions. 200av and 500av are the most common and best value, 500av being the highest performer. Although these two ratings should work together it's often better to stick to one standard, and if possible stick to one manufacturer so you know there will be no incompatibility.

Homeplugs only really work properly if they're plugged into the same ring-main. If the house's wiring is old or particularly complex then there may be some areas of the house that work very poorly or not at all. Also, homeplugs don't work quite as well if plugged into an extension lead - especially one with built in surge protector. The best way is to borrow some and do some quick tests before you invest.

The actual speed homeplugs communicate varies widely. 250Mbps is possible if they're plugged in almost next to each other, but this often drops to 50Mbps or less a few rooms away.

Homeplugs are known to cause interference on the shortwave radio bands. If you're using homeplugs and you have a radio amateur living two or three doors away, you may be broadcasting noise on a frequency he's using for his hobby. The interference can radiate out around 100 metres. There's also evidence that Powerline adapters can cause interference to FM and DAB radio reception. If you are a keen radio listener (or maybe your neighbour is) then consider borrowing a pair of homeplugs and trying them out first.

There are many other manufacturers but Solwise are good value and with a helpful UK office it's easy to get buying advice and tech support direct. Buy online at www.solwise.co.uk and use the discount code B4RNOFFER to get 10% off purchases.

3. ETHERNET - the best solution

3.1 Ethernet Cabling

Ethernet cables are like telephone cables except they are thicker and carry information between computers and other networked devices. Newer computers and routers use something called gigabit Ethernet and can run at the same fast speed as your B4RN hyperfast connection.

In the home Ethernet cables don't suffer from the same extreme speed drops over distance as wireless networking or homeplugs, nor do you need to enter a password when you connect up the cable to a computer. Even older computers with the slower form of Ethernet will still achieve faster access than when using wireless over distance.

Ethernet cables all use the same RJ45 male connectors at each end, but the cables themselves are made to different standards. All cables these cables should carry a signal without significant speed loss for at least 100m, even further with the best spec cables.
- Cat5 only supports around 100Mbps.
- Cat5e supports up to 1000Mbps (1Gbps) so works well with B4RN.
- Cat6 supports up to 10,000Mbps (10Gbps) so is futureproof!

Ethernet cables are inexpensive and you do not need a specialised skill set to run the cables to your devices. You plug one end into your router and the other into your computer, games console, TV, VoIP phone, set top box and so on (see figure 1).
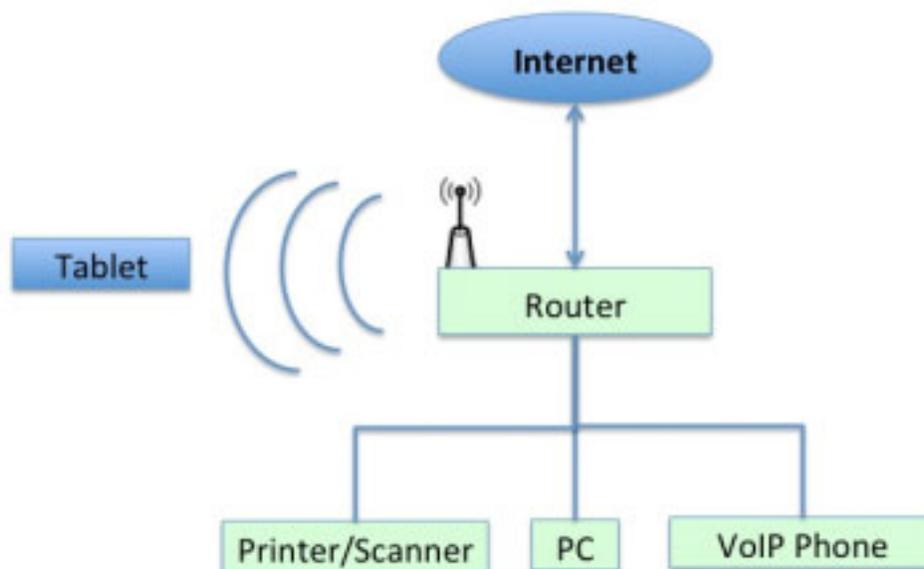
Figure 1 – A simple example of how a home network could be setup using only the B4RN router's built in WiFi (for the tablet) and built in Ethernet ports to three wired devices.

If you want to use Ethernet to connect different parts of your house then you'll need some basic DIY skills to pin the cables along skirting boards and drill through walls etc. or you may wish to hire a professional to do this for you. Most electricians are perfectly capable of installing Ethernet home networks and will often be able to make a much tidier job of it.

It's worth mentioning that anyone who is thinking about rewiring their house, building a new house or an extension should seriously think about installing Cat6 Ethernet sockets along with the mains sockets that are routinely installed. Give some thought to where the B4RN router is or will be sited as this will be the distribution point to all the Ethernet sockets in the house. While WiFi is fine for most cases, if the chance is there to install Ethernet wiring, it should always be considered.

Ethernet cable with RJ45 connectors (colours vary and are not representative of quality or performance) and Cat6 Ethernet wall plate (commonly available with 1,2 or 4 ports)

DIY expert tip: Some household phone circuits - particularly over recent years - have been installed using Cat5 cable. If you have a phone circuit you're not using (maybe you're using VoIP e.g. Vonage, or a DECT cordless phone) you could check to see if Cat5 is printed on the cable behind your phone sockets, if it is then it may be possible to repurpose that wiring. You should not attempt to do this yourself unless you understand how to disconnect from your landline at the master socket; it would be best to consult an electrician or networking specialist.

3.2 Ethernet Network Switches

B4RN routers come with four built in Ethernet ports, which is enough for most homes, but if you need more you can buy a 'network switch'. A Switch is simply a small powered box that turns one port into several. Switches with 5, 8, 16 and 24 ports are common and the smaller ones are not expensive. For an example of how a switch could be used see figure 2 below.
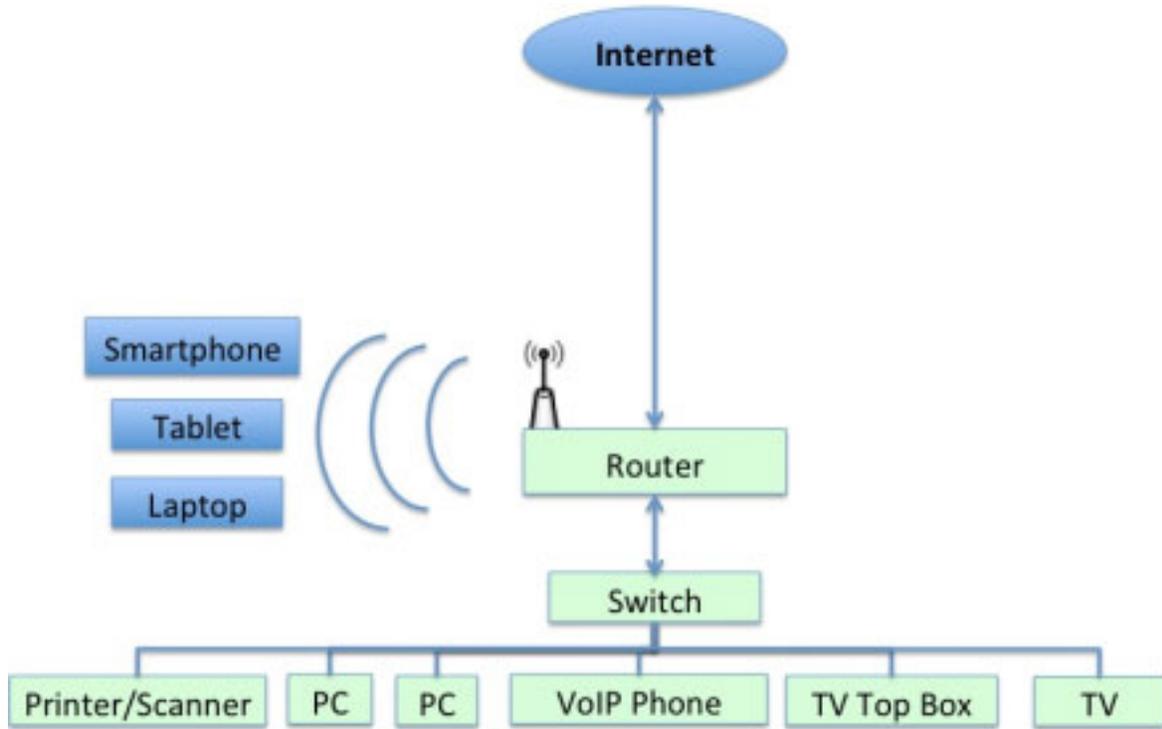

Figure 2 – An example of how even more devices could be setup on a home network. The number of WiFi devices is almost unlimited, and the addition of a network switch makes many more Ethernet cabled connections available.

To do something similar to the above configuration requires no special wall mounting sockets, and most devices are supplied with the required Ethernet cables. The sort of switch you would need for figure 2 above is smaller than your router/modem and most can be wall mounted.

The above setup makes transferring large files between computers a breeze. This sort of setup could even be used in a small business scenario so you can easily connect up an office if you chose to.

Left: A small 5 port switch suitable for connecting 4 devices to your router.

3.3 Ethernet to a Wireless Access Point (AP)

If you want or need wireless access in another part of your house beyond the router then homeplugs will work fairly well if you are on a ring main but as mentioned previously, there are better solutions. You could run an ethernet cable from your router to a dedicated wireless access point (AP) unit to create a second access point (figure 3). In this example the router and the access point both have their own 'SSID' (Service Set Identifier) i.e. they appear as two differently named networks each with it's own password. When you move from the room/s near your router to the room/s near your additional access point you may need to manually change the settings on your WiFi device (e.g. tablet / laptop) to connect to the nearest/strongest wireless signal, unless your device is clever enough to switch automatically.
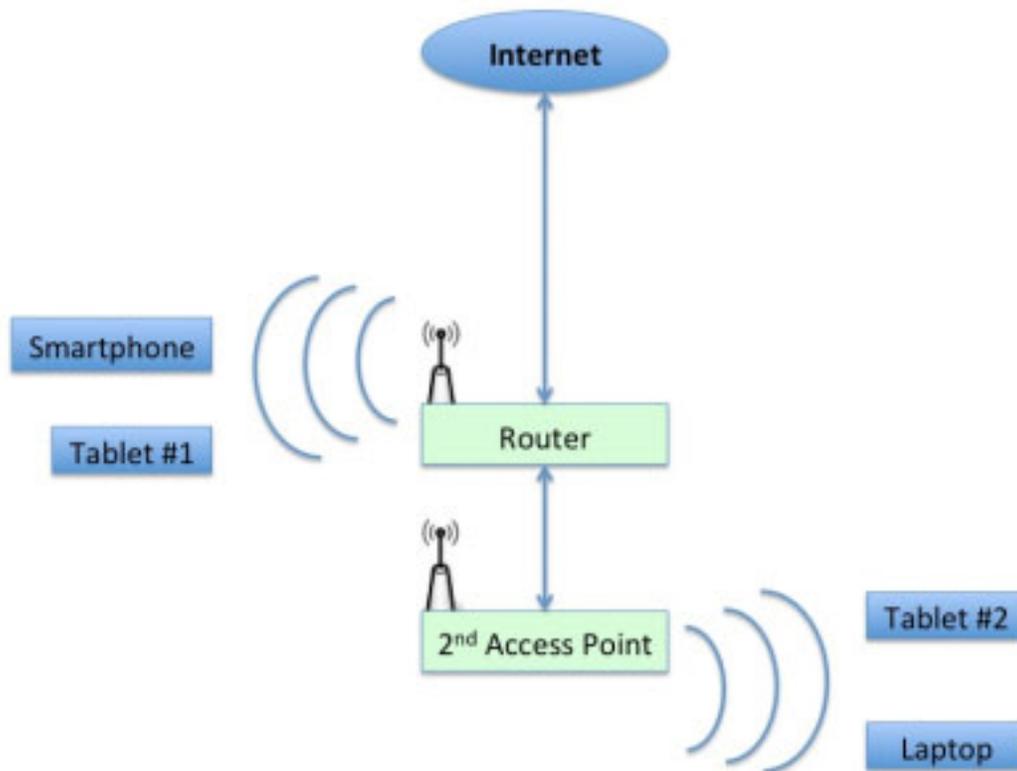

Figure 3 - Two wireless access points running separately, each with it's own SSID

As an alternative you can setup your second access point so that it is running with the same SSID i.e. the same network name and password as your router. This creates a single large wireless network and some devices will automatically adjust to use the strongest signal as you move around. However, this switching between access points when one becomes weaker does not always work reliably, so using separate SSIDs is generally more advisable. There are however products available which allow you to use one SSID over multiple access points. Whilst more expensive they are ideal for covering a large house or office without having to change wireless networks. See the links at the end of this document for further reading.

Above: examples of a wireless-N access points (AP). An AP can be connected by a long Ethernet cable to your B4RN router to provide strong broadband in areas of your house with poor WiFi signal..

3.4 Repurposing your Old Wireless Router

Now that you have a B4RN router you will probably have a spare old WiFi router lying around that you used to use on your old landline based broadband. *Some* of these old WiFi routers can be repurposed to be used as a second access point as shown in figure 3, but this does take some configuration tinkering, so you only attempt this if you have confidence.

Certain steps must be taken to configure the router so that it does not affect the rest of the home network. There are various guides online and you should find one that refers to the steps required for your model, but as a minimum any router configured as an access point should have the following configurations set:-

- DHCP (automatic device addressing), disabled. This will be provided by the main router.
- Any firewall turned off. Again, the main router will provide this facility.
- The IP address of the router acting as the access point should be different from the main router and also be set to a static IP.
- While the WiFi name (SSID) and access key (password) of the second router can be the same as the main one, it is often wise to set it to be different as switching between access points when one becomes weaker does not always work reliably.

4. APPENDIX

4.1 Wireless Standards

Wireless networking is standardised across the world and as of 2014 there were four standards. The old wireless B and G standards operate on frequencies of about 2.4GHz whilst the N standard uses 2.4GHz and 5GHz. The newest standard, wireless AC, uses the 5GHz band only.

2.4GHz and 5GHz are simply different frequencies, each with its advantages and disadvantages. To get the best of both worlds, some recent routers have the capability for dual-band operation in both ranges simultaneously. 5GHz offers higher speed at a shorter distance, while 2.4GHz offers increased coverage and better penetration through walls.

Wireless AC was only introduced in 2014 and although currently very expensive it promises wireless speeds up to about 1300Mbps. These devices are ideal for Gigabit internet connections such as B4RN. Being a new technology the tablets, smartphones and computers you currently own will probably not be capable of wireless AC so it is best to check what your device is capable of before buying any wireless AC equipment.

Wireless N technology was, until 2014, the fastest wireless standard available and most devices in your home will be wireless N rated. Wireless N is capable of speeds up to 450Mbps with optimised equipment, but in most situations 50-100Mbps is more usual.

Wireless G and B are the oldest of the four wireless standards in use today and the slowest. WIreless G is capable of speeds up to 54Mbps and for regular web browsing this is more than enough. A lot of older laptops are still wireless G/B but you can buy adaptors for them. Wireless B is the slowest of the lot at 11Mpbs and the newest kit doesn't even include wireless B. That being said Wireless G will work with wireless B devices.

The B4RN router operates in the 2.4 frequency because most of our computers recognise that one. The top wifi speed on the B4RN router is about 80Mbps. This is more than adequate, but if you want faster you can get it! The Apple extreme v5 (second hand on ebay) gives wifi speed of over 200 Mbps on a macbook air laptop. But be aware, your devices may not support these speeds! There is no need to invest in faster speed routers just for the sake of it. Phones need 20 Mbps. Ipads can cope with 40Mbps. Most laptops and even some desktops won't go faster than 100 Mbps (even on ethernet). Wifi is a minefield!!!

FYI the highest wifi speeds we have seen have been from an Apple Extreme v6 router, and at the demo day in Borwick we saw wifi speeds of over 400 Mbps on one via an apple macbook air. Bits of live stream of the event here: http://bambuser.com/v/5223360

4.2 Wireless Security

All wireless networks should be encrypted and protected with a strong password to stop unauthorised access of your network. There are two main wireless security standards in use today and these are WPA which is the older and WPA2 which is newer and currently the most secure. Wireless encryption is important as without it anyone could monitor your network traffic and potentially steal passwords etc. People could also download illegal content from your connection and you would get blamed if the copyright holders caught them doing it.

There is something called Wireless protected setup or WPS for short. WPS is a means of connecting devices like a printer by pressing a button on the wireless devices and entering a pin. A WPA/WPA2 password is not required.

NB: pressing the WPS button on the B4RN router for longer than 5 seconds will turn off your wifi. The only way to enable it again is to press the button for 5 seconds again. It is what is known as a toggle button.

4.3 Further Reading

A good article about increasing wifi speeds, it was written for the poor folk who aren't really on fibre broadband at all, but there are good tips in it. http://bit.do/wifi-optimisation

A more detailed guide to adding an old router as an Access Point (AP). http://bit.do/old-router

A 'big home' wifi network guide. http://bit.do/large-homes

Products specifically designed for easily creating a user friendly WiFi mesh throughout your home (via multiple APs) are starting to come to market. Two worth looking into are Eero http://bit.do/eero-mesh and UniFi http://bit.do/unifi-mesh

Many thanks to Ryan Elgar, Pat Close and John Hamlett for their contributions to this document. If you have any more suggestions or experiences of good or bad solutions, please comment on this document or send an email to helpdesk@b4rn.org.uk