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THE LATEST TECHNOLOGY EXPLAINED

HomePlug AV

The new HomePlug AV standard looks set to raise the bar on home networking performance long before 802.11n sees the light of day. James Morris investigates how it achieves its stellar throughput

Wireless technology has popularised the idea that a network could be useful in your home. But even 802.11g isn't a patch on a wired network for performance, which limits what you can do with it. Streaming low-resolution video works over 802.11g, but high definition can't be reliably played across a WLAN. The forthcoming 802.11n standard promises to change this, but current Draft 802.11n products haven't filled early adopters with hope.

In the interim, it looks like 802.11n will have another serious competitor. Networking over powerlines has long seemed like a sensible idea but the first HomePlug standard, which arrived in 2002, offered less performance than 802.11g. Throughput may have reached about the same level with the introduction of the 85Mbps/sec proprietary version of HomePlug, but the new HomePlug AV standard looks set to smash anything wireless has to offer. The throughput is nominally 200Mbps/sec, and manufacturers have already

demonstrated a consistent 90Mbps/sec, which is about three times current wireless technology.

TUNING TO HOMEPLUG

You might think wired and wireless are different technologies, but they have a lot in common. They're both electromagnetic waves – one is transmitted through the air and the other down a wire. Wireless has a different set of problems to contend with, such as more competing signals and frequency allocation regulations. Wired networks don't have these issues, so Ethernet can be run much faster by using a broader range of frequencies.

With powerline technology, the data is piggybacking a wire that's carrying 240V of AC power, but only operating at 50Hz. The original HomePlug 1.0 standard uses higher frequencies than this, in the range of 4 to 21MHz, so the power and data shouldn't interfere, in theory. The frequency range is cut into 84 separate blocks using a process called Discrete Multi-Tone (DMT), with data sent on all frequencies

simultaneously. This is similar to the way ADSL works, although the latter uses a narrower range. Each block carries a small amount of data, but bundled together the throughput can be greater. The DMT system can survive interference as this will only affect some of the frequency blocks.

HomePlug 1.0 still only offered 14Mbps/sec, and much less in real terms. The 85Mbps/sec version is faster, but it's only compatible with products using the same chipset, so you can't guarantee adapters from different manufacturers will work together. HomePlug AV, however, is a fully fledged standard. With HomePlug AV, the frequency range has increased and now covers from 2 to 28MHz. This is split up much more finely into 1,536 blocks, so even though the overall throughput is greater, there are similar amounts of data being sent in each block.

There's an important distinction between the two HomePlug standards, too. Whereas HomePlug 1.0 uses Code Division Multiple Access (CDMA), HomePlug AV uses Time Division Multiple Access

Although many manufacturers have been offering 85Mbps/sec versions of the HomePlug 1.0 adapters, such as these Solwise PL-95PE units, there's no guarantee that they'll work across brands. The 85Mbps/sec system uses proprietary technology to get the higher bandwidth, and isn't a standard.



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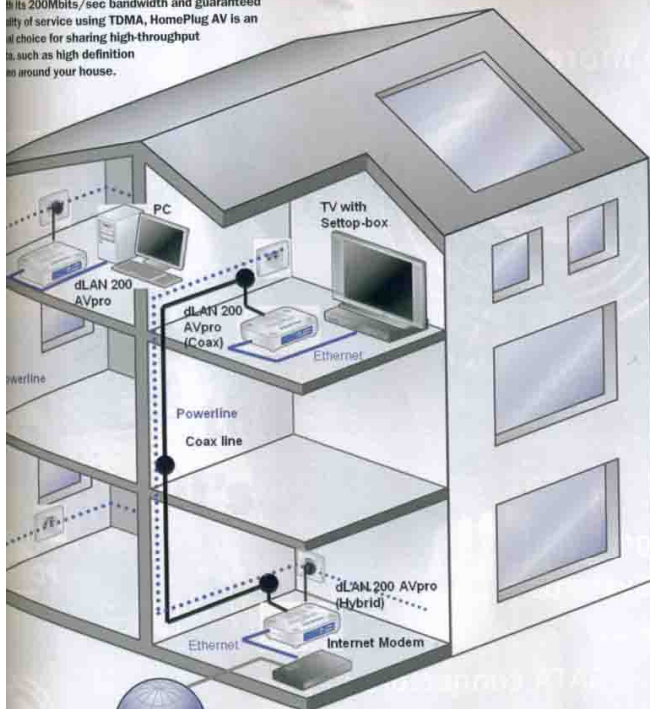
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GET CONNECTED

With its 200Mbps/sec bandwidth and guaranteed quality of service using TDMA, HomePlug AV is an ideal choice for sharing high-throughput services, such as high definition video, around your house.



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(TDMA). With CDMA, all the devices on the network send data on all frequencies in the range all the time, using an embedded code to distinguish. This is a simple system, but it places a limit on the number of devices that can be on the network. Interference means performance goes down with more devices, so HomePlug 1.0 has a limit of 12 adapters, and it can't guarantee a minimum throughput.

In contrast, the TDMA system divides each frequency block into timeslots. One device on the network acts as the master, and allots timeslots to the devices. This means devices don't interfere with each other. The bandwidth available does decrease with more devices, but degrades in a very controlled manner, which means a level of throughput can still be guaranteed to every adapter. The number of simultaneous devices also increases, with HomePlug AV supporting 20 to 30 adapters.

Although 802.11n is promising nominal throughput well in excess of 200Mbps/sec, with figures up to 540Mbps/sec being quoted, it uses CDMA. It can't guarantee bandwidth to every device on the network.

SHIPPING SOON

The technology used with HomePlug AV does have a downside: it's not backwards compatible with HomePlug 1.0. The two can coexist on the same set of powerlines, but HomePlug AV adapters can't exchange data with HomePlug 1.0 adapters. When a HomePlug AV master device detects HomePlug 1.0 devices, it limits transmissions when the latter are active, then brings the TDMA network back again afterwards – that's the limit on compatibility.

Unlike the final 802.11n specification, products based on HomePlug AV have already started to appear, with devolo being the first to market with its dLAN 200 AVI Starter Kit. The necessity of having a power plug nearby means HomePlug AV isn't as flexible as a wireless network but the potential quality of service makes it a reliable option for less mobile functions, such as hooking your bedroom games' console to the broadband in your lounge or sharing your Slingbox with others. We'll still want a wireless network for freedom of browsing around the house and garden, but HomePlug AV has the bandwidth upper hand for now. **PCF**

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