

EXTENDING YOUR LOCAL NETWORK (LAN)

Part 2--

WIRELESS RANGE EXTENDERS AND

POWERLINE NETWORKING

by Francis Chao

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Web location for this
presentation:

<http://aztcs.org>

Click on

“Meeting Notes”

EXECUTIVE SUMMARY

You can use powerline networking and/or wireless range extenders to extend your local network.

Let's start off with a demonstration of powerline networking and wireless range extenders for extending your local network:

MEASUREMENT METHODOLOGY

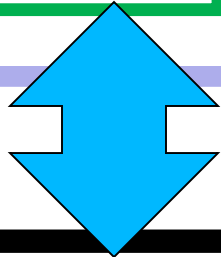
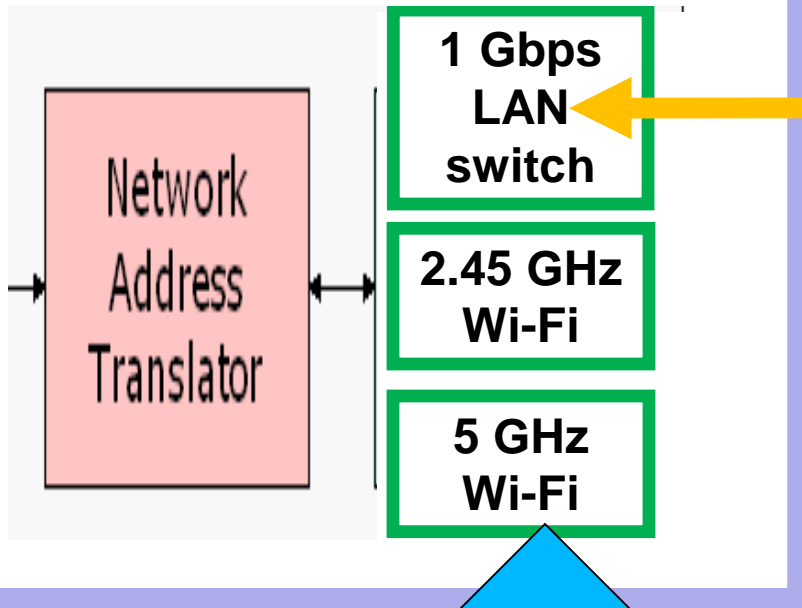
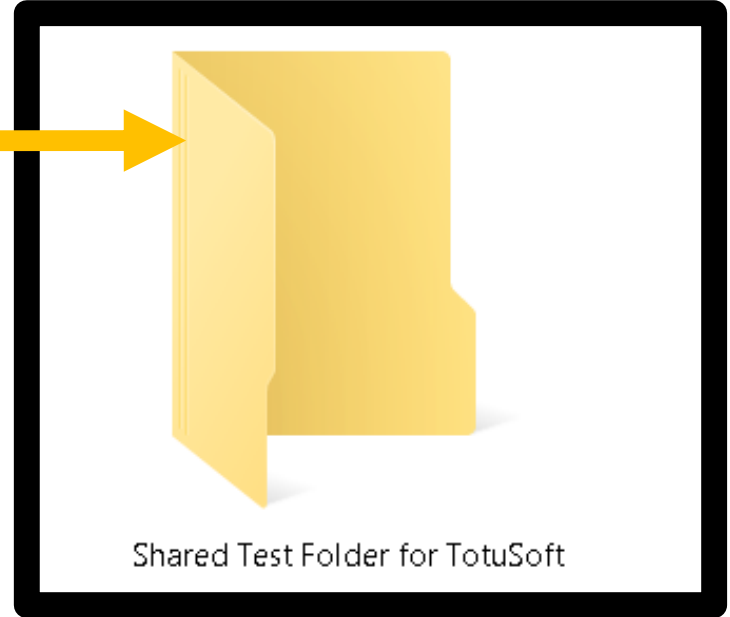
- Internet bandwidth values were obtained by measuring the download speed at <http://speedtest.net>
- Local network speeds were obtained by taking the download value as measured by TotuSoft's "LAN Speed Test (Lite)" v. 1.1 (<http://totusoft.com/downloads/>)

To measure the speed of a local network connection, TotuSoft's free "LAN Speed Test (Lite)" program creates and uploads a file from computer #1 to computer #2. Then it downloads the same file from computer #2 to computer #1.

Netgear Router

"Windows.." or Mac "OS X"
computer #2

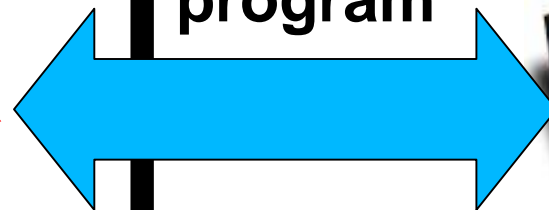
Cat 5/6
Cable



"Windows.." or Mac
"OS X" computer #1
running the Totusoft
"Lan SpeedTest"
program



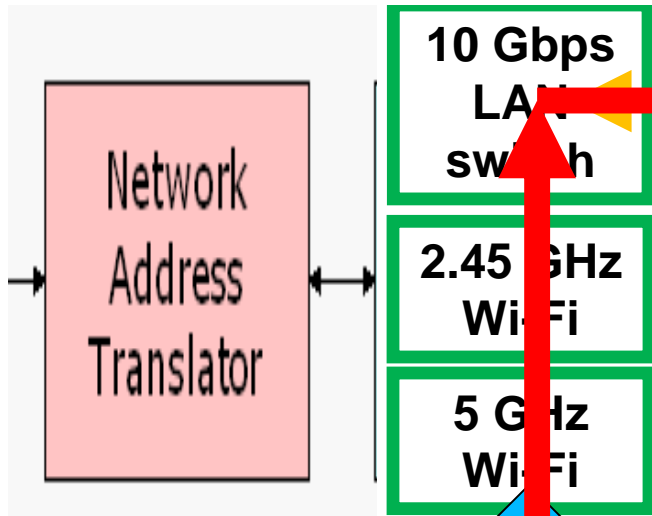
Powerline Networking kit or
Wireless Range Extender
or any other local network
device under test



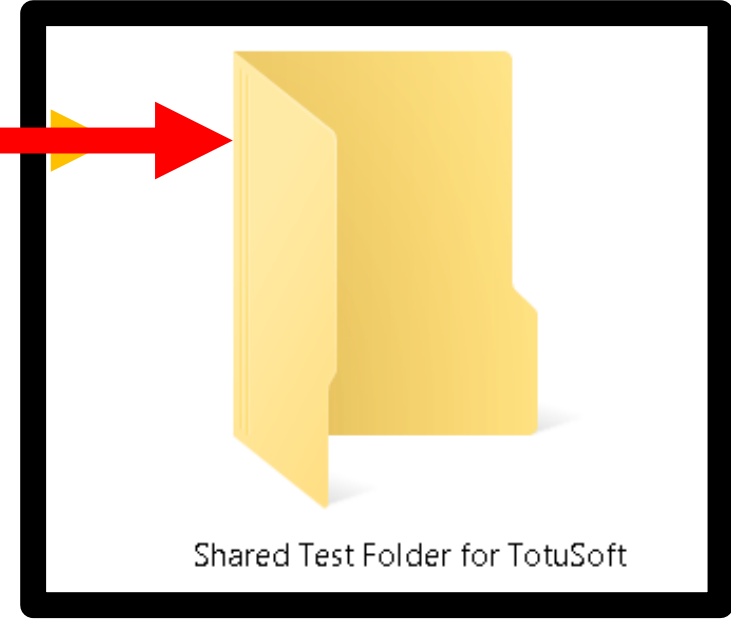
Netgear Router

"Windows.." or Mac "OS X"
computer #2

Cat 5/6
Cable

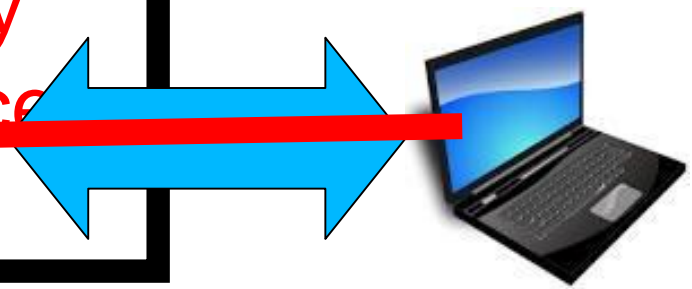


**First
"Totusoft.."
calculates
upload
speed**



"Windows.." or Mac
"OS X" computer #1
with Totusoft "Lan
SpeedTest" program

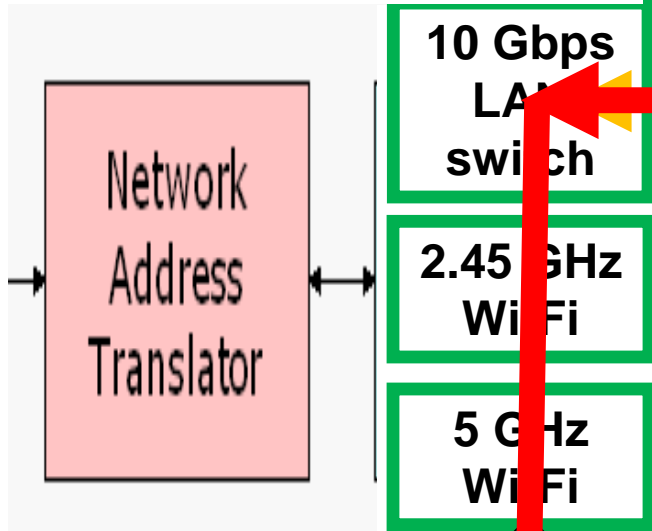
**Powerline Networking kit or
Wireless Extender or any
other local network device
under test**



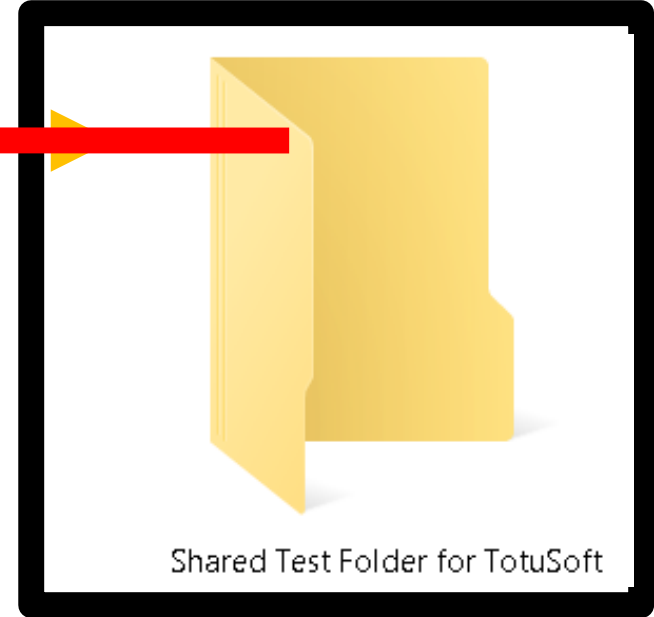
Netgear Router

"Windows.." or Mac "OS X"
computer #2

Cat 5/6
Cable



Then
"Totusoft.."
calculates
download
speed



"Windows.." or Mac
"OS X" computer #1
with Totusoft "Lan
SpeedTest" program

Powerline Networking kit or
Wireless Extender
under test



NETWORK MEASUREMENT VALUES

- The measurement values that are shown in the following diagrams consist of
Internet download speed
in Megabits per second
followed by a slash
/
followed by the local network
speed
in Megabits per second

Equipment
used in our
demonstration:

Our baseline point of
reference is
a Netgear R6250
Wireless router:



NETGEAR AC1600 Dual Band Wi-Fi Gigabit Router (R6250)

by [Netgear](#)

★★★★☆ ▾ [611 customer reviews](#) | [85 answered questions](#)

Price: **\$108.00** & **FREE Shipping**. [Details](#)

Want it TODAY, July 25? Order within **11 hrs 56 mins** and choose **Same-Day Delivery** at checkout. [Details](#)

In Stock.

Ships from and sold by Amazon.com. Gift-wrap available.

Capacity: **AC1600**

AC1200
\$89.99

AC1600
\$108.00

- Compatible with next generation Wi-Fi devices and backward compatible with 802.11 a/b/g/n devices, it enables HD streaming throughout your home.
- With up to 300 + 1300Mbps speed and simultaneous dual band Wi-Fi technology, the R6250 avoids wireless interference, ensuring top Wi-Fi Speeds and reliable connections.
- The dual-core 800Mhz processor delivers high-performance connectivity, while the USB 3.0 port provides up to 10x faster USB hard drive access.

Our state-of-the-art
Powerline AV2
networking link consists
of a D-Link DHP-701AV
kit:

D-Link Powerline AV2 2000 Adapter Gigabit Extender Starter Kit (DHP-701AV)

by [D-Link](#)



[403 customer reviews](#) | [125 answered questions](#)

Price: **\$79.99** & **FREE Shipping**. [Details](#)

Want it TODAY, July 25? Order within **11 hrs 58 mins** and choose **Same-Day Delivery** at checkout. [Details](#)

In Stock.

Ships from and sold by Amazon.com. Gift-wrap available.

Model: **AV2000**


AV2 1000
\$49.99

AV2000
\$79.99

 **Want to hire a computer technician?**



As any manufacturer of powerline networking kits creates newer, better models, they will increase the "claimed speed" value in their description of the models:
You should usually buy model with the highest available "claimed speed" after reading reviews and customer comments at Amazon.com and other Web sites:



D-Link Powerline AV2 2000 Adapter Gigabit Extender Starter Kit (DHP-701AV)

by [D-Link](#)



[403 customer reviews](#) | [125 answered questions](#)

Price: **\$79.99** & **FREE Shipping**. [Details](#)

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In Stock.

Ships from and sold by Amazon.com. Gift-wrap available.

Model: **AV2000**

AV2 1000
\$49.99

AV2000
\$79.99

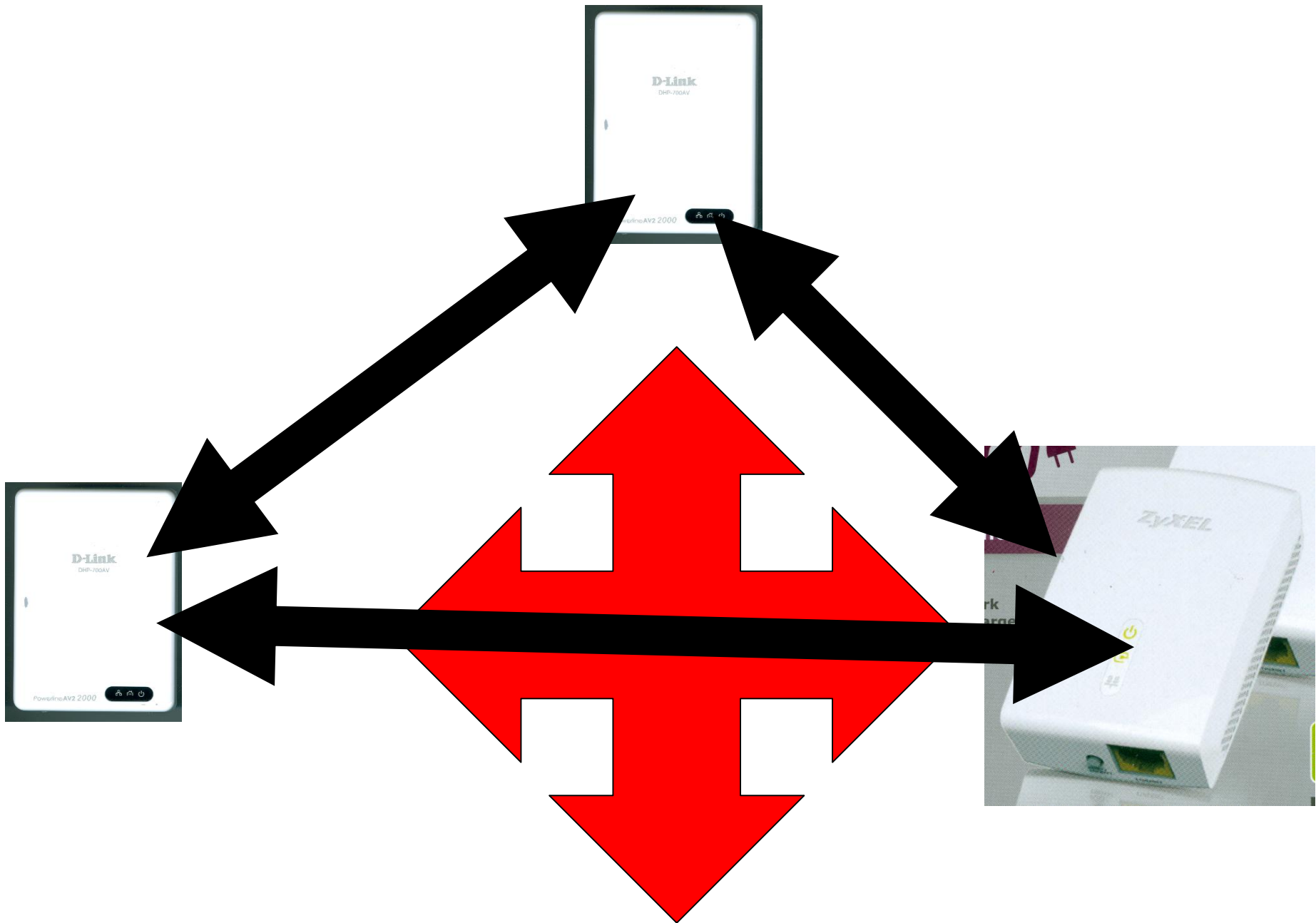
 **Want to hire a computer technician?**



The D-Link DHP-701AV
kit contains 2
DHP-700AV Network
Adapters that conform to
the "HomePlug AV2"
standard:



Powerline AV2 2000



Our Edimax
"BR-6478AC V2" router
was configured in
"Wireless Range
Extender" mode:



BR-6478AC V2 New AC1200 Gigabit Dual-Band Wi-Fi Router/Range Extender/AP/Bridge/WISP with USB Port and VPN (White)

by [Edimax](#)

★★★★☆ ▾ [72 customer reviews](#) | [12 answered questions](#)

List Price: ~~\$69.99~~

Price: **\$59.24** & **FREE Shipping**. [Details](#)

You Save: **\$10.75 (15%)**

Want it tomorrow, July 25? Order within **12 hrs** and choose **Same-Day Delivery** at checkout.

[Details](#)

In Stock.

Ships from and sold by Amazon.com. Gift-wrap available.

Model: **AC1200**

AC1200

\$59.24

AC750

\$29.96

Our Hawking
model HWREN2
Wireless 300N range
extender was purchased
in 2012:



Hawking HWREN2 Hi-Gain Wireless-300N Range Extender Pro

by [Hawking Technology](#)

★★★★☆ ▾ [93 customer reviews](#) | [14 answered questions](#)

Price: **\$60.99** & **FREE Shipping**. [Details](#)

Want it tomorrow, July 25? Order within **12 hrs 2 mins** and choose **Same-Day Delivery** at checkout. [Details](#)

In Stock.

Ships from and sold by Amazon.com. Gift-wrap available.



Want to hire a computer technician?

Buy professional computer technician services directly on Amazon. Backed by our Happiness Guarantee.

[Learn more](#)

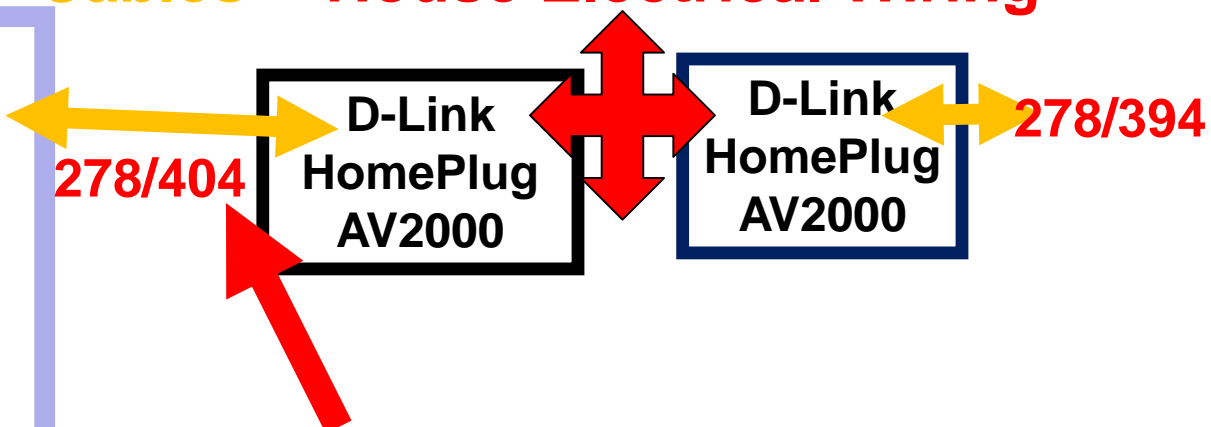
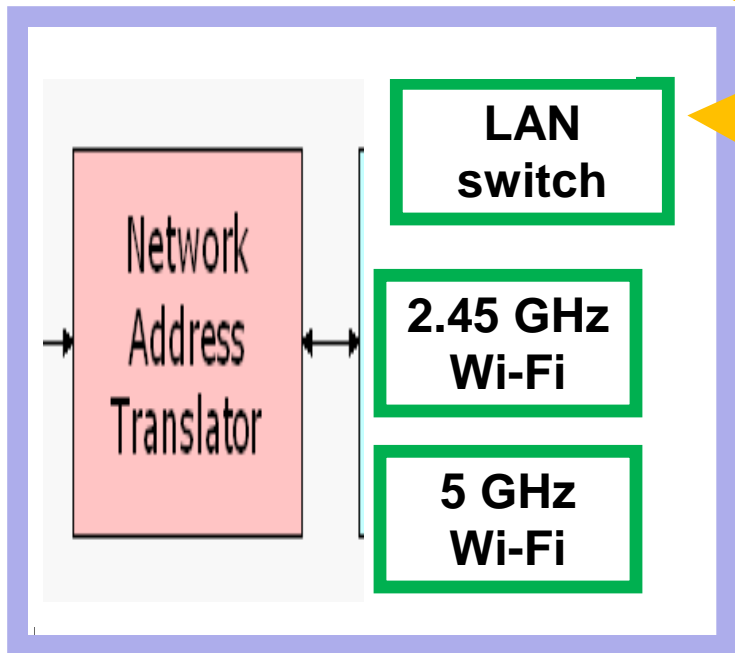
- Supports 2.4GHz Wireless Frequency Only
- High Power Range Amplified Technology boost your wireless performance up to 4 times, compared to a standard wireless network
- Provides IEEE 802.11b/g/n wireless LAN capability

**Block diagrams
of our
demonstration:**

4 feet of separation between
our Netgear "wireless router"
and
the two "wireless range
extenders"
plus the remote powerline
networking unit:

Cat 5/6
Cables

4 feet of energized 110VAC
House Electrical Wiring



404 Megabits per second is a typical data communications speed for wired Gigabit Ethernet (which has a claimed speed of 1000 Megabits per second)

Netgear Router used as a baseline reference point

*Internet Download Speed

in Megabits per second

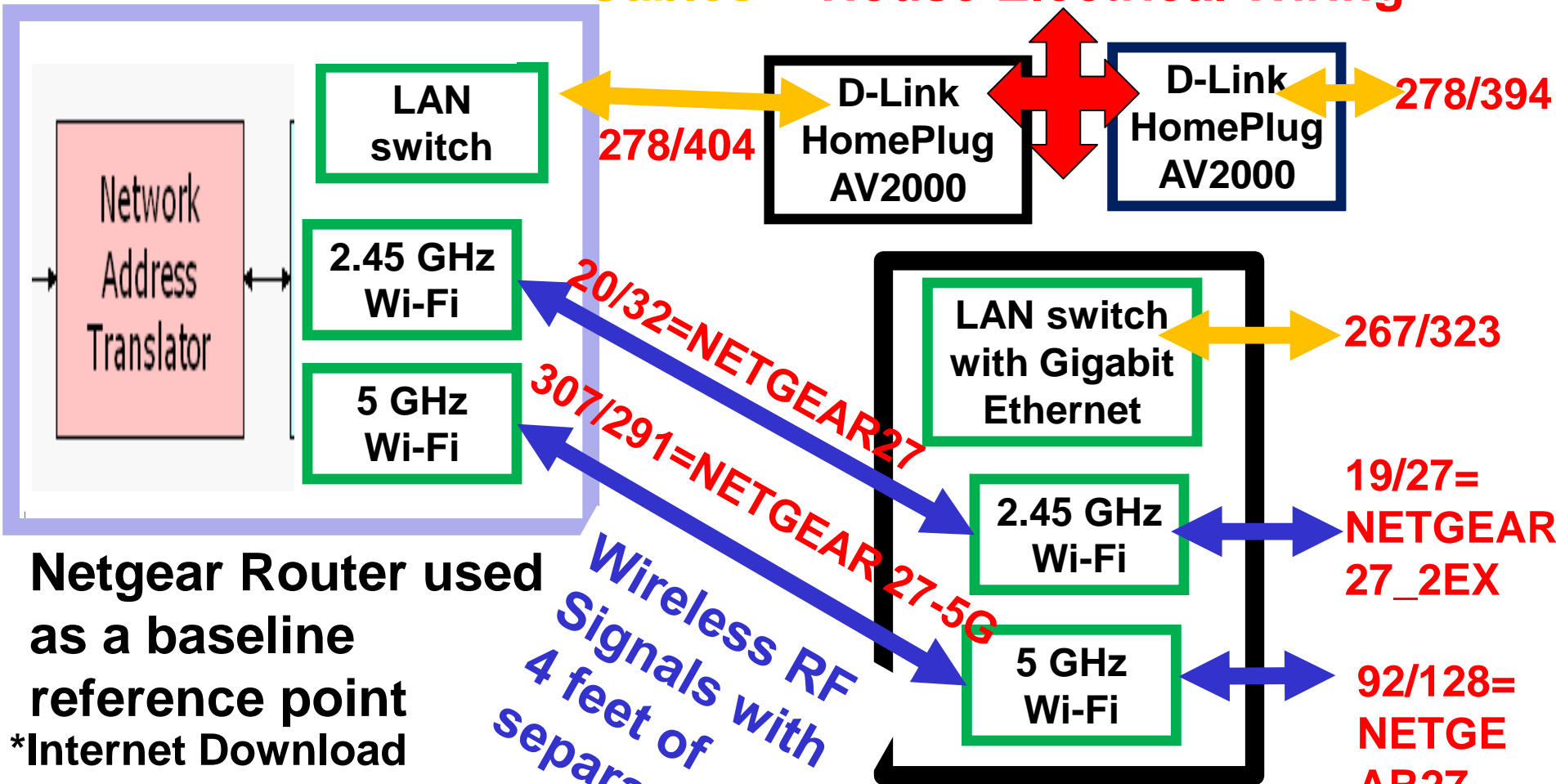
Local Area Network

Speed

in Megabits per second

Cat 5/6
Cables

4 feet of energized 110VAC
House Electrical Wiring



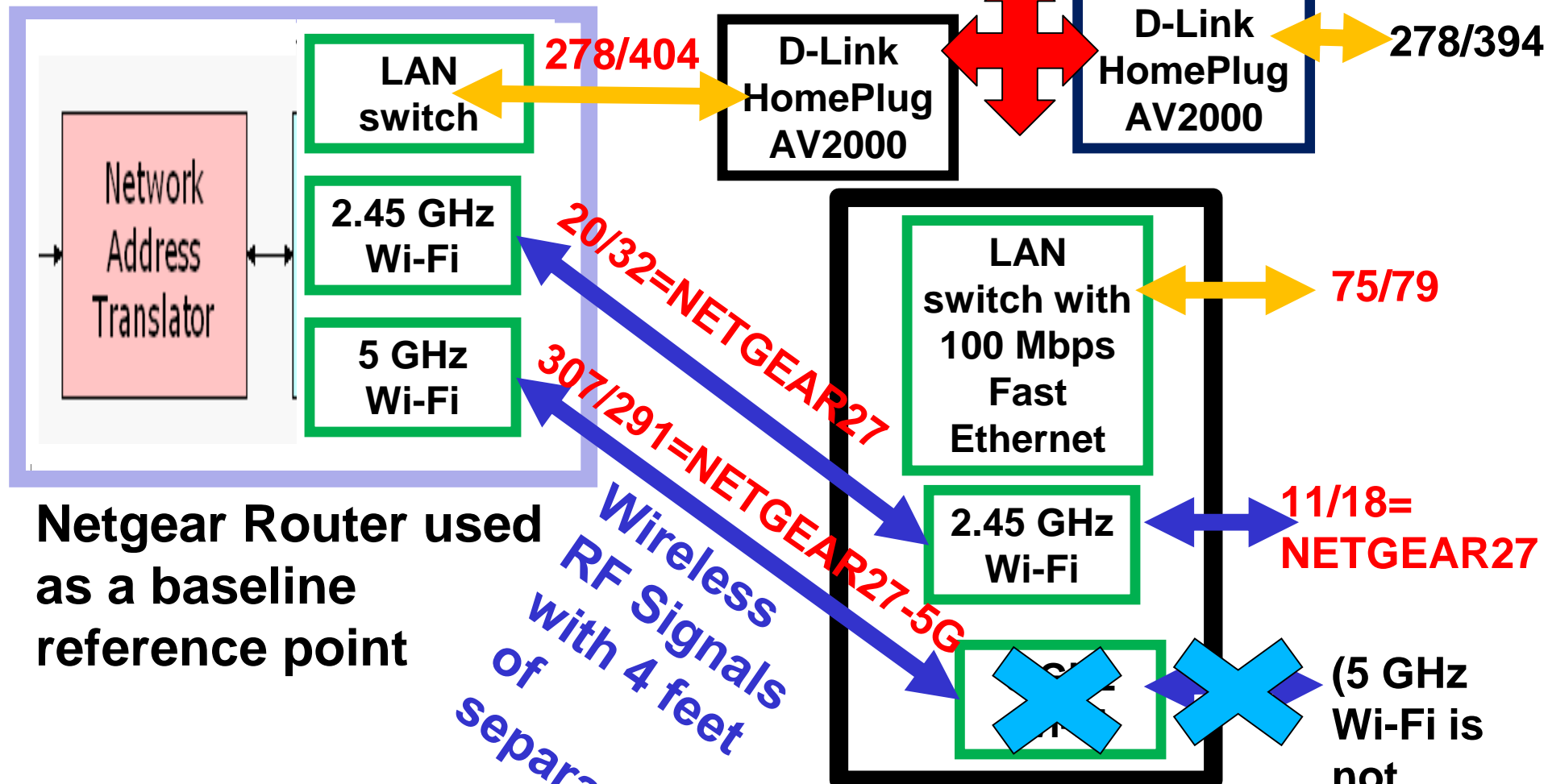
Netgear Router used as a baseline reference point

*Internet Download Speed in Megabits per second
Local Area Network Speed in Megabits per second

Edimax Router Configured As A "Wireless Range Extender"

Cat 5/6
Cables

4 feet of energized 110VAC
house electrical wiring



Netgear Router used as a baseline reference point

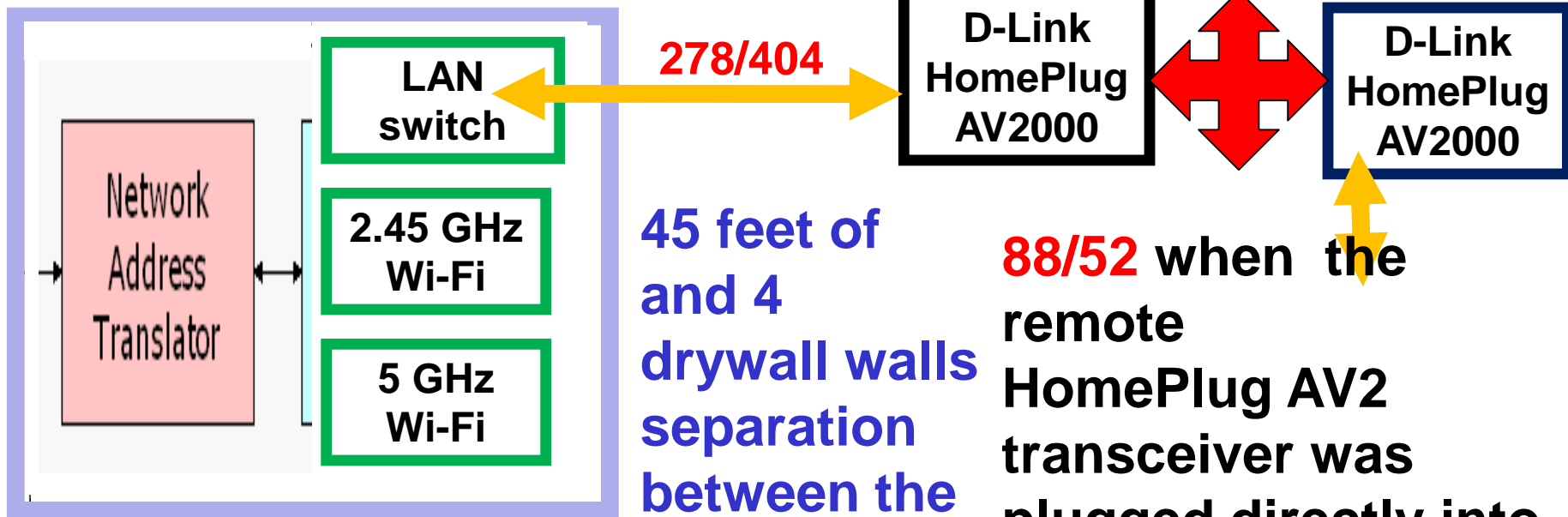
Hawking "Wireless Range Extender"

*Internet Download Speed in Megabits per second / Local Area Network Speed in Megabits per second

45 feet of separation with
4 drywall walls between the
Netgear wireless router
and
the two "wireless range
extenders" plus the remote
powerline networking unit:

Cat 5/6
Cables

95 feet of energized 110VAC
house electrical wiring



Netgear Router used
as a baseline
reference point

*Internet Download Speed
in Megabits per second /
Local Area Network Speed
in Megabits per second

45 feet of
and 4
drywall walls
separation
between the
two
powerline
networking
units which
were on
different
circuit
breakers

88/52 when the
remote
HomePlug AV2
transceiver was
plugged directly into
a wall outlet
13/13 when the
remote HomePlug
transceiver was
plugged into a surge
strip which was
plugged into a wall
outlet

Powerline networking
data speed declines with
increasing distance while
regular

Cat 5/Cat 5e/Cat 6

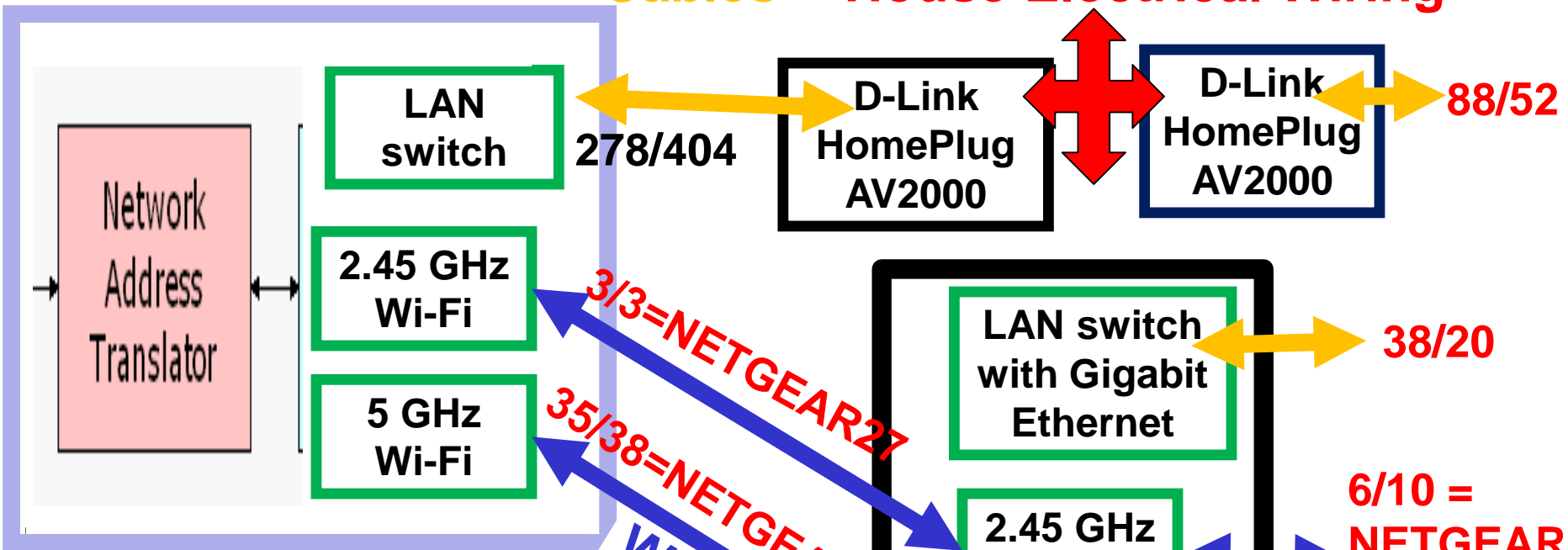
"Ethernet" cables do not:

The powerline networking link in my home drops both my Internet speed and local network speed down to about 20 percent of what I get when I am connected by means of a Cat 5/5e/6 cable directly to my broadband cable modem's built-in router.

Powerline networking is severely slowed down by power surge strips and UPS units so never plug powerline networking units into surge strips and UPS units.

Cat 5/6
Cables

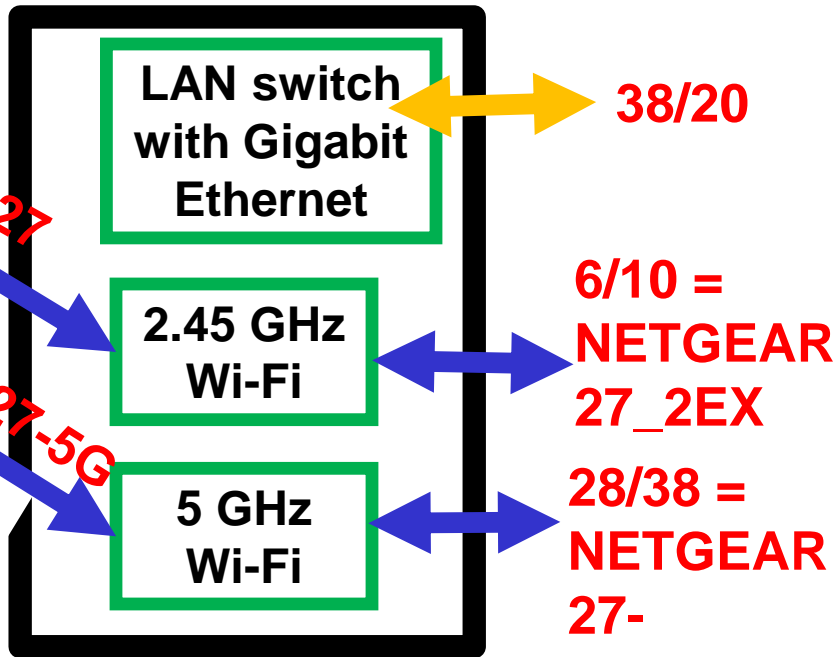
95 feet of energized 110VAC
House Electrical Wiring



Netgear Router used as a baseline reference point

*Internet Download Speed in Megabits per second
Local Area Network Speed in Megabits per second

Wireless RF Signals with 45 feet of separation



Edimax Router Used As A "Wireless Range Extender"



Wi-Fi 2



On



NETGEAR27-5G_5EX
Connected, secured



5 GHz SSID of Edimax



NETGEAR27_2EX
Secured



2 GHz SSID of Edimax



NETGEAR27
Secured



**Either 2 GHz SSID of
Netgear router or
2 GHz SSID of Hawking**



NETGEAR27-5G
Secured



2 GHz SSID of Netgear router

Rule of Thumb:

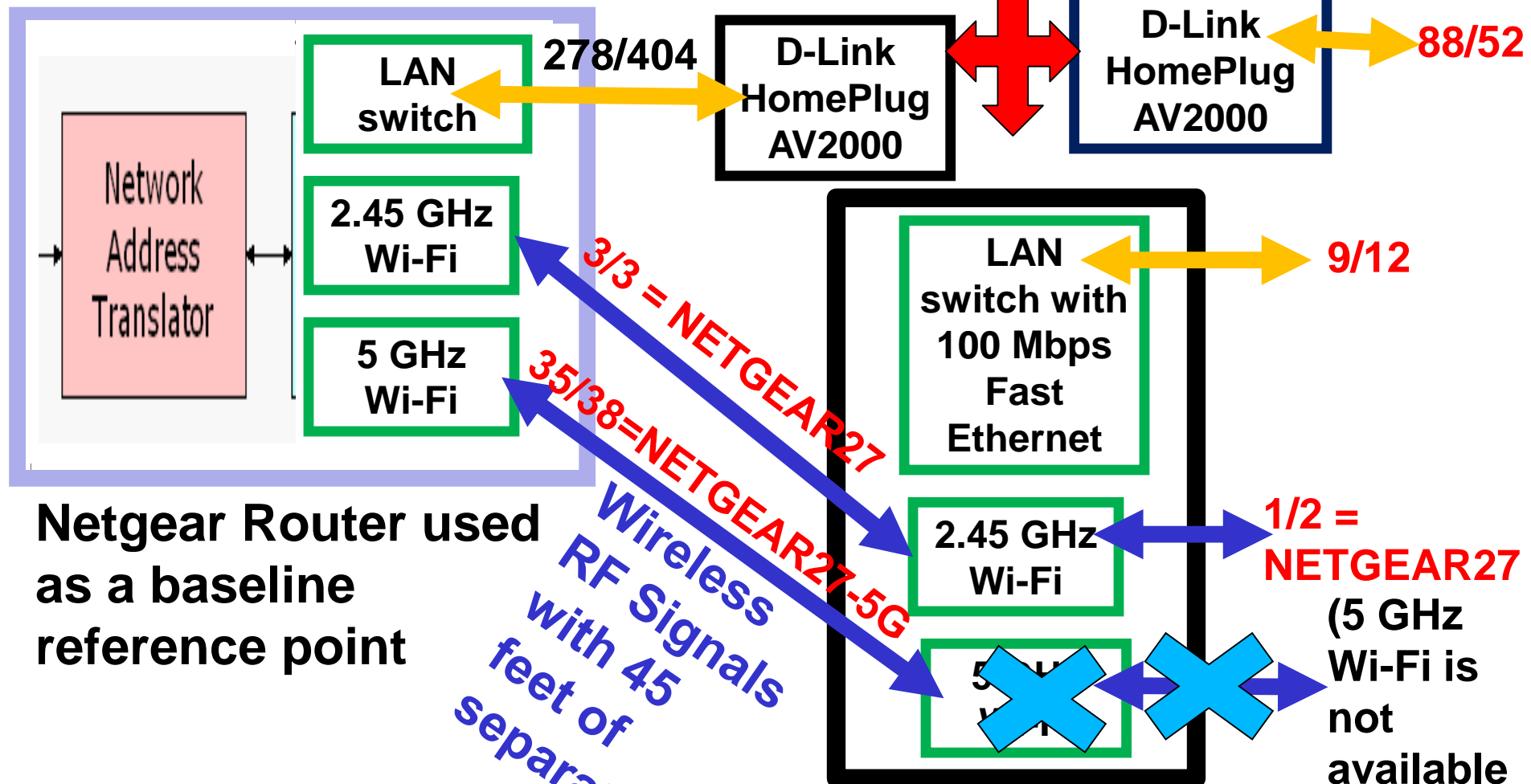
At any given point in your local network, if a wired network jack is available, it will give you faster data communications speeds relative to connecting by means of Wi-Fi.

After you put in some realistic physical distance, powerline networking is almost always faster than wireless range extenders.

The wired 10Base-1000
"Gigabit Ethernet" jack at a
"Wireless Range Extender" (if
there is one) will be faster than
connecting via Wi-Fi to the
"Wireless Range Extender".

Cat 5/6
Cables

95 feet of energized 110VAC
house electrical wiring



Netgear Router used as a baseline reference point

Hawking "Wireless Range Extender"

*Internet Download Speed in Megabits per second / Local Area Network Speed in Megabits per second

The Hawking unit has a stronger RF signal relative to the Edimax unit but the Edimax unit had better data throughput speeds relative to the Hawking unit because the Edimax unit has a 5 Gigahertz "Wireless Access Point" while the Hawking unit only has a 2 Gigahertz "Wireless Access Point".

The free "Acrylic Wi-Fi Home" program shows you the maximum "claimed speed" of each of our 5 wireless access points:















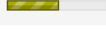

SSID	MAC Ad	RSS	Chan	802.11	Max Speed	WEP	WPA	WPA2	WPS	Vendor
NETGEAR27	00:0E:3B:56:...	-35	1+5	b, g, n	300 Mbps			PSK-CCMP	1.0	Hawking Technologies.
NETGEAR27-5G	E8:FC:AF:7F:...	-39	149+153+157+161	n, ac	1300.05 Mbps			PSK-CCMP	1.0	NETGEAR
NETGEAR27	E8:FC:AF:7F:...	-39	1	b, g, n	144.4 Mbps			PSK-CCMP	1.0	NETGEAR
NETGEAR27-5G_5E	74:DA:38:36:...	-51	149+153+157+161	n, ac	866.7 Mbps			PSK-CCMP	1.0	Edimax Technology Co.
NETGEAR27_2EX	74:DA:38:36:...	-47	1+5	b, g, n	300 Mbps			PSK-CCMP	1.0	Edimax Technology Co.

Instead of showing the maximum "claimed speed" of a Wireless Access Point, the free "Netspot" program shows you the maximum level of 802.11 signals that a Wireless Access Point is capable of generating:

802.11 **a**, 802.11 **b**, 802.11 **g**, 802.11 **n**,
or 802.11 **ac**

<input type="checkbox"/>		SSID	BSSID	Graph	Signal	%	Min.	Max.	Average	Level	Band	Channel	Width	Vendor	Security	Mode
<input checked="" type="checkbox"/>		NETGEAR27-5G	E8:FC:AF:7F:...		-38	67	-39	-38	-38		5	153	80	NETGEAR	WPA2 Personal	
<input checked="" type="checkbox"/>		NETGEAR27	E8:FC:AF:7F:...		-39	66	-54	-38	-45		2.4	1	20	NETGEAR	WPA2 Personal	
<input checked="" type="checkbox"/>		NETGEAR27_2EX	74:DA:38:36...		-49	55	-49	-47	-48		2.4	1 + 1	40	Edimax	WPA2 Personal	
<input checked="" type="checkbox"/>		NETGEAR27-5G_5EX	74:DA:38:36...		-53	50	-53	-53	-53		5	153	80	Edimax	WPA2 Personal	

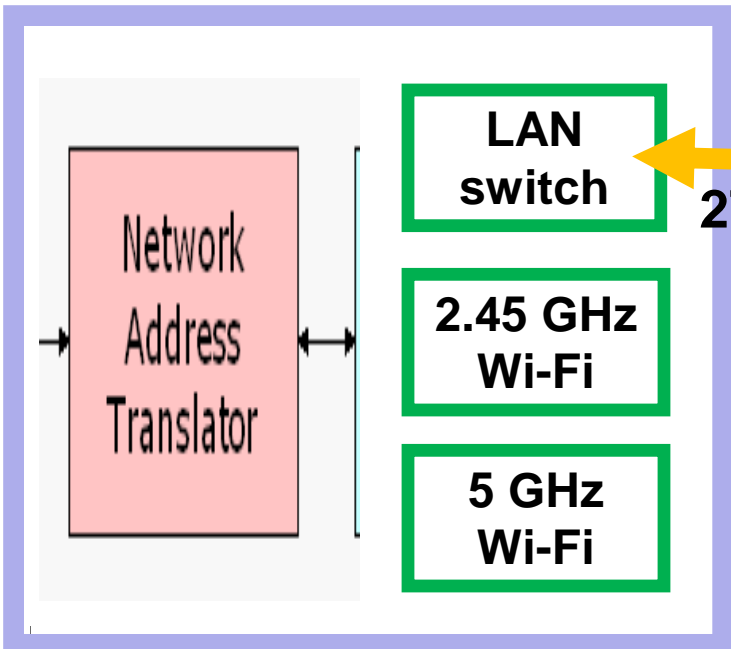
Both the free "Acrylic Wi-Fi Home" program and the free "NetSpot" program show that the Netgear router generates a Wireless Access Point called "NETGEAR27" and the Hawking wireless range extender also generates a Wireless Access Point called "NETGEAR27".

<input type="checkbox"/>		SSID	BSSID	Graph	Signal	%	Min.	Max.	Average	Level	Band	Channel	Width	Vendor	Security	Mode
<input checked="" type="checkbox"/>		NETGEAR27-5G	E8:FC:AF:7F:...		-38	67	-39	-38	-38		5	153	80	NETGEAR	WPA2 Personal	
<input checked="" type="checkbox"/>		NETGEAR27	E8:FC:AF:7F:...		-39	66	-54	-38	-45		2.4	1	20	NETGEAR	WPA2 Personal	
<input checked="" type="checkbox"/>		NETGEAR27_2EX	74:DA:38:36...		-49	55	-49	-47	-48		2.4	1 + 1	40	Edimax	WPA2 Personal	
<input checked="" type="checkbox"/>		NETGEAR27-5G_5EX	74:DA:38:36...		-53	50	-53	-53	-53		5	153	80	Edimax	WPA2 Personal	

If you already have an old wireless router available to use, you can put it at the end of a powerline networking kit in order in order to extend your local network:

Cat 5/6
Cables

95 feet of energized 110VAC
House Electrical Wiring

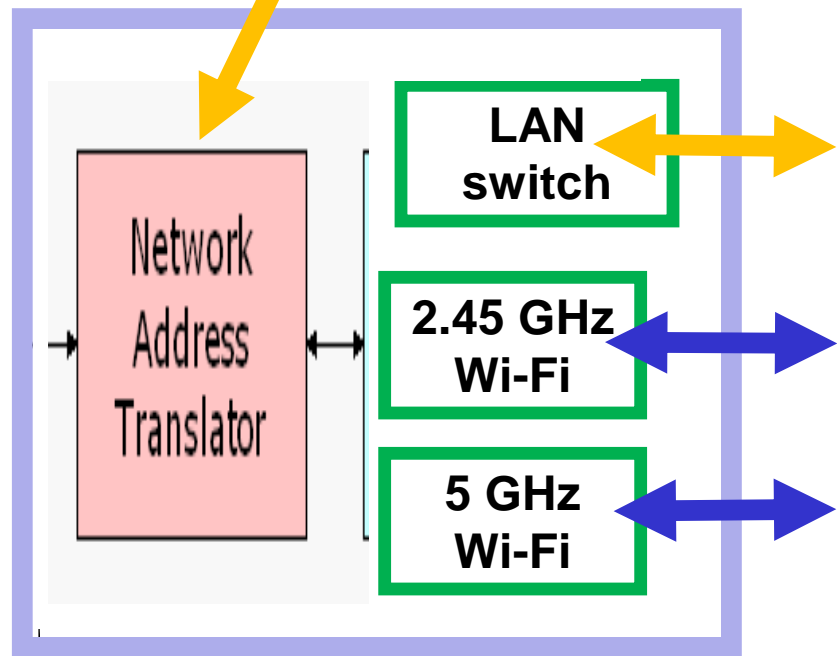


278/404

88/52

**Netgear Router used
as a baseline
reference point**

***Internet Download
Speed
in Megabits per second
Local Area Network
Speed
in Megabits per second**



**Any available wireless
router**

If you put a secondary wireless router at the end of a powerline networking kit, it is best to use a different brand of router from the brand of your main, existing wireless router in order to prevent private IP address conflicts and other interactions

TOPICS

- Two Ways to Extend a Local Network:
 - Wireless Range Extenders
 - Powerline Networking
- Wireless Extender and Powerline Hybrids

TWO WAYS TO EXTEND A LOCAL NETWORK (continued)

- **Wireless Range Extenders:**
Slowest method, usually less expensive relative to powerline networking
- **Powerline Networking**
More reliable and faster than wireless range extenders

WIRELESS RANGE EXTENDERS

(continued)

- The terminology is not precise: The same device might be called a "wireless range extender", a "wireless repeater", or a "wireless booster". Read the fine print in the manufacturer's documentation to determine if a particular wireless range extender is what you want.

WIRELESS RANGE EXTENDERS

(continued)

- A "wireless range extender" extends physical range of your Wi-Fi system but it repeats in both directions (send and receive) the 2.5 Gigahertz and/or 5.0 Gigahertz signals of your existing wireless access point. Because of this "repeater" activity, it slows down your data communications speed.

WIRELESS RANGE EXTENDERS

(continued)

- Get all Wi-Fi-capable devices as high off the ground as possible. Placing Wi-Fi-capable routers, range extenders, repeaters, or boosters at 1 foot "Above Ground Level" (or even closer to the ground) can attenuate both radio signal strengths and data throughput speeds down to 25 percent.

WIRELESS RANGE EXTENDERS

(continued)

- When you obtain a wireless range extender, the manufacturer of the device will provide you with a specific set of instructions for installing and configuring it. Follow those instructions exactly:

WIRELESS RANGE EXTENDERS

(continued)

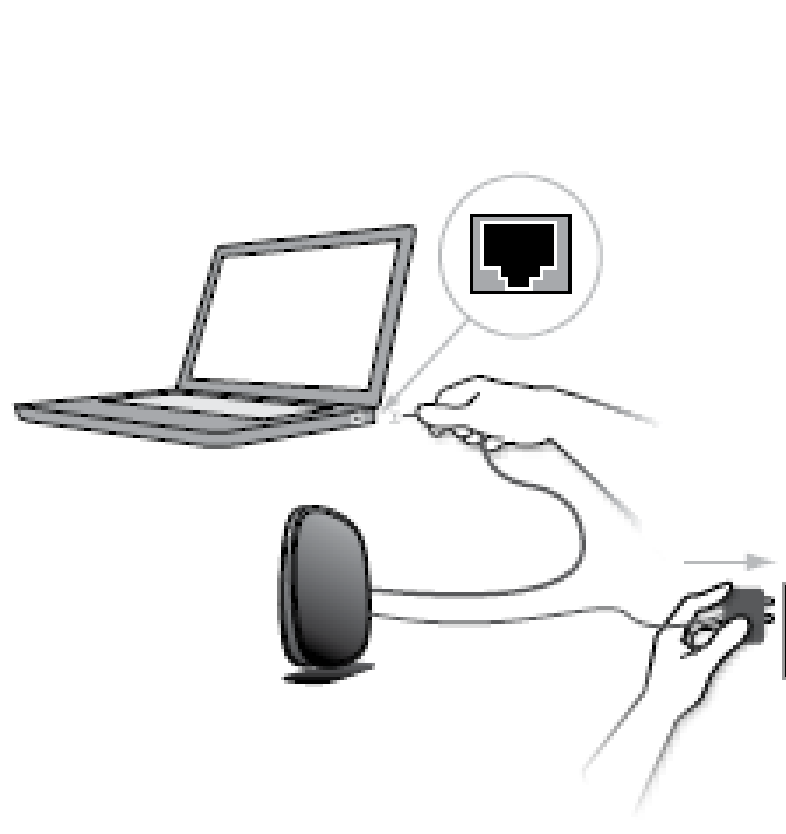
- A very typical installation procedure for a wireless range extender can be found at http://cache-www.belkin.com/support/dl/MAN_F9K1106_8820-00923_A00_Dual-Band_WRX.PDF?_ga=1.123152776.2068611582.1469258651 :

Initial Setup

To get started, you will need:

- Your primary wireless router, its network name (SSID), and password. If it's a dual-band router, please be sure you have both SSIDs and passwords.
- A personal computer with a web browser

Step 1: Connect the cable to the Ethernet port on your PC, and then plug in the power supply.

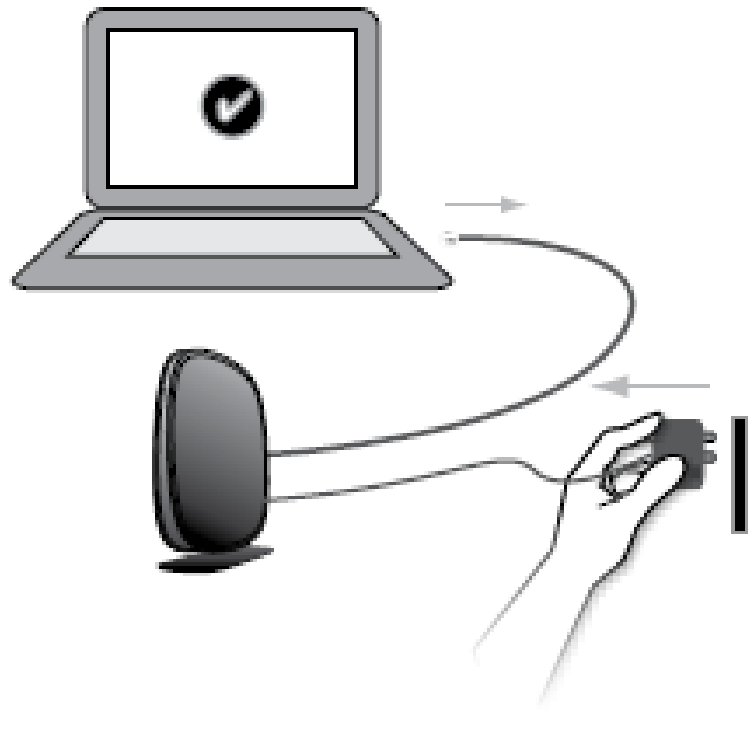


WIRELESS RANGE EXTENDERS

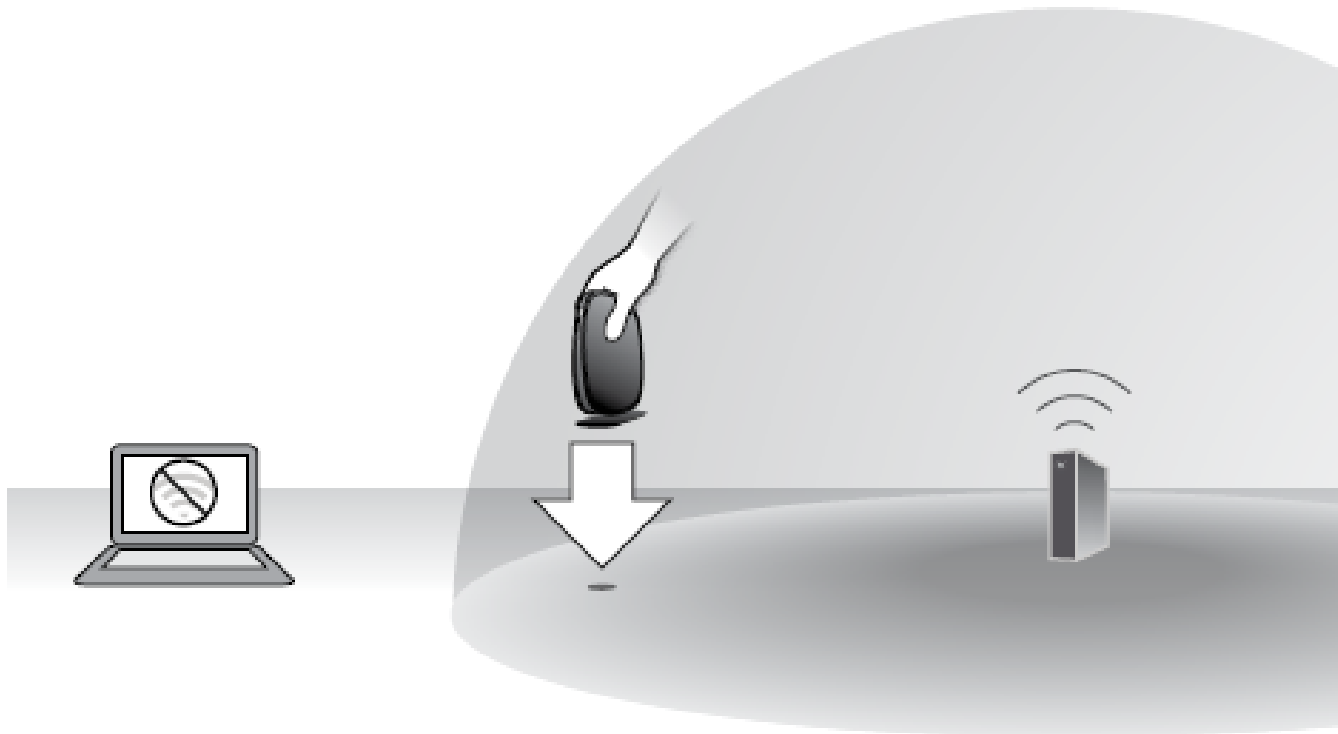
(continued)

- Use a Web browser to access the local Web page that is generated by the wireless range extender. From inside the local Web page, configure the wireless range extender, following the steps in the user's manual of the wireless range extender.

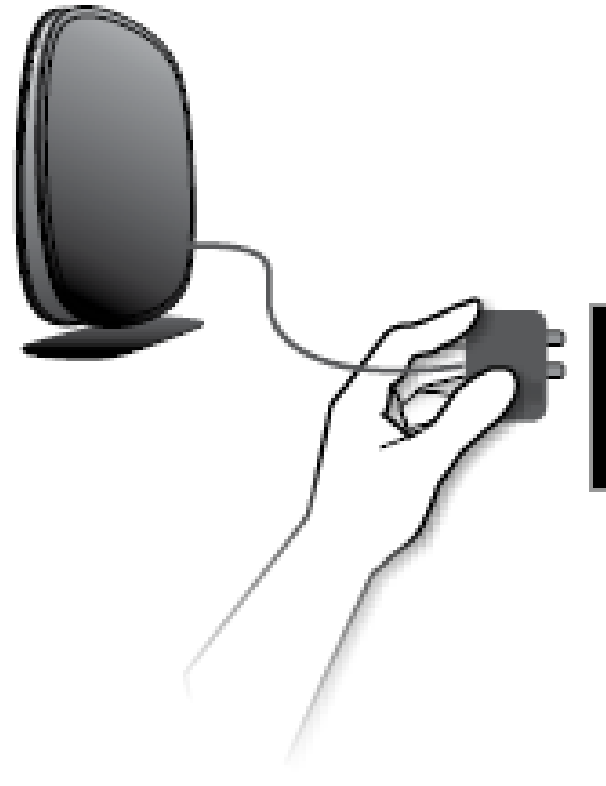
Step 3: Once the Range Extender has successfully joined the wireless network, disconnect it from the PC, and unplug the power supply.



Step 4: Place the Range Extender in an area where you can still access your wireless network without problems, but close to the area where you want to establish your extended network.



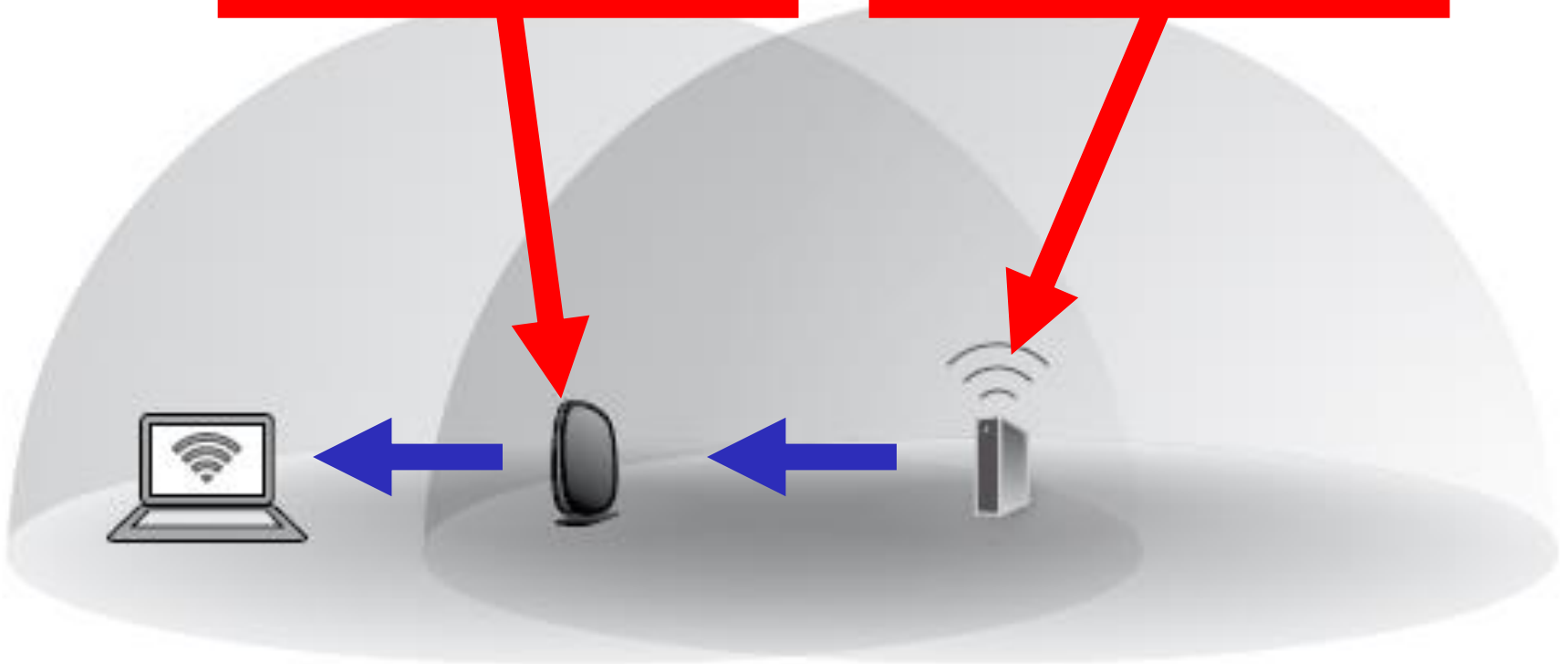
Step 5: Plug in the power supply.



Step 6: Join your new extended wireless network.

**Wireless
Range
Extender**

**Existing
Wireless
Router**



WIRELESS RANGE EXTENDERS

(continued)

- Most wireless range extenders let you connect to them either by means of a 10Base-x wired Ethernet jack and/or by means of a wireless access point that they broadcast.

If a wireless range extender has both of these capabilities, you can connect some client devices to them with wired Ethernet and other client devices wirelessly.

WIRELESS RANGE EXTENDERS

(continued)

- Some wireless range extenders require a wired Ethernet (or a Powerline AV2) connection back to the existing router
- Some wireless range extenders can grab an existing wireless signal over-the-air and repeat it.
- Some wireless range extenders let you chose between being wired into an existing network or being a repeater.

WIRELESS RANGE EXTENDERS

(continued)

- Some wireless range extenders generate a wireless access point that has the exact same SSID and password as your existing wireless access point
- Other wireless range extenders generate a different wireless access point that has a different SSID and/or password relative to your existing wireless access point

WIRELESS RANGE EXTENDERS

(continued)

- In most cases, it is better to have a wireless range extender that generates a different SSID relative to your existing wireless access point. This gives you more control over which wireless access point you are connected to at a specific location in your home or business.

WIRELESS RANGE EXTENDERS

(continued)

- When we use our Edimax router as a wireless range extender, it generates a different SSID relative to your existing wireless access point.

WIRELESS RANGE EXTENDERS

(continued)

- When we use our Hawking wireless range extender, it generates a wireless access point that has the exact same SSID and password as your existing wireless access point.

WIRELESS RANGE EXTENDERS

(continued)

- Many routers have a "wireless access point mode" that let's them work more transparently with existing wireless routers. When using a router in "wireless access point mode", it's normal routing functions are turned off which means it does not have a dynamic host configuration server running and it does not do a network address translation.

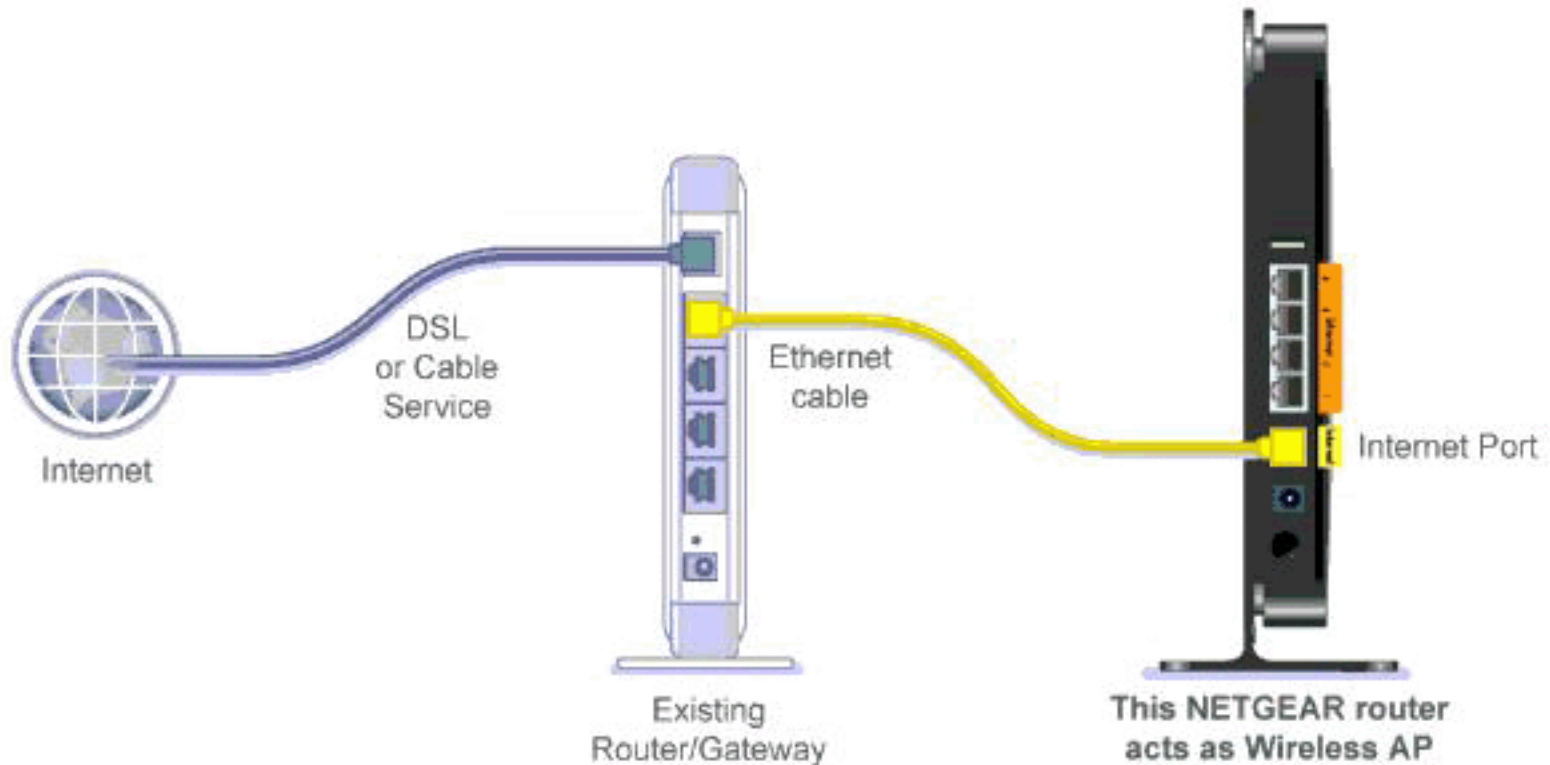
WIRELESS RANGE EXTENDERS

(continued)

- With these routing functions turned off, a client computer, tablet, or cell phone that connects to the wireless range extender will receive a private IP address assignment from your existing Wi-Fi router. The net result is that your client computer, tablet, or cell phone will have a private IP address that is recognized as legitimate by your existing Wi-Fi router.

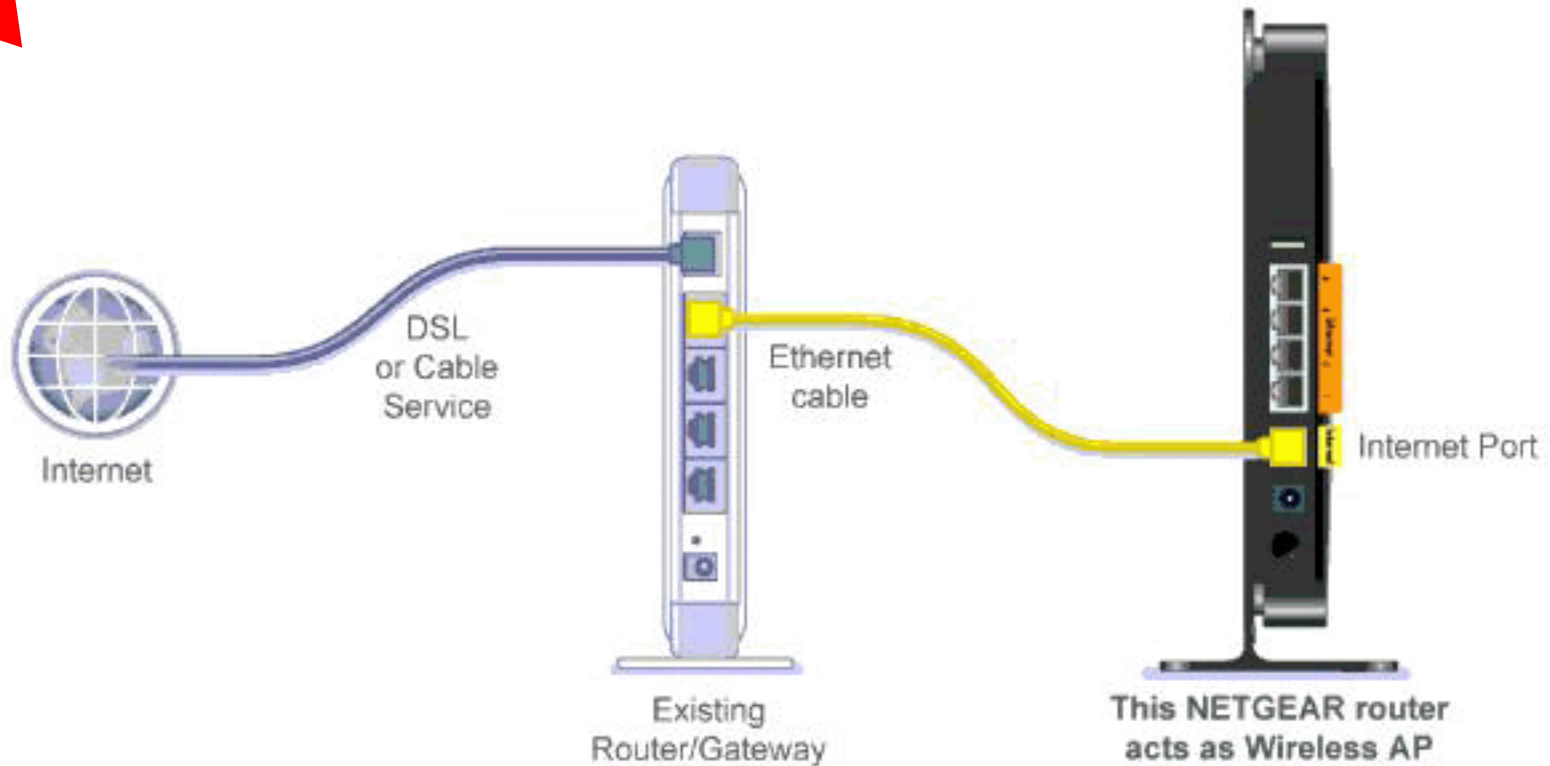
Wireless AP mode allows this device to work as a stand-alone wireless access point on your existing network.

Enable AP Mode



Wireless AP mode allows this device to work as a stand-alone wireless access point on your existing network.

Enable AP Mode



WIRELESS RANGE EXTENDERS

(continued)

- When you have two wireless access points with the same name, you need to use the signal strength indication in your operating system to determine whether you are connecting to the original wireless access point or the wireless access point of the wireless range extender:

Wi-Fi 2



NETGEAR27

Connected, secured



NETGEAR27-5G

Secured



BR-6478AC V2 New AC1200 Gigabit Dual-Band Wi-Fi Router/Range Extender/AP/Bridge/WISP with USB Port and VPN (White)

by [Edimax](#)



[72 customer reviews](#) | [12 answered questions](#)

List Price: ~~\$69.99~~

Price: **\$59.24** & **FREE Shipping**. [Details](#)

You Save: **\$10.75 (15%)**

Want it TODAY, July 23? Order within **10 hrs 1 min** and choose **Same-Day Delivery** at checkout. [Details](#)

In Stock.

Ships from and sold by Amazon.com. Gift-wrap available.

WIRELESS RANGE EXTENDERS

(continued)

- During the configuration and installation of the Edimax router, it defaults to it's "router" mode. To make it behave as a "wireless extender mode", you have to place a checkmark in the bottom-most option:

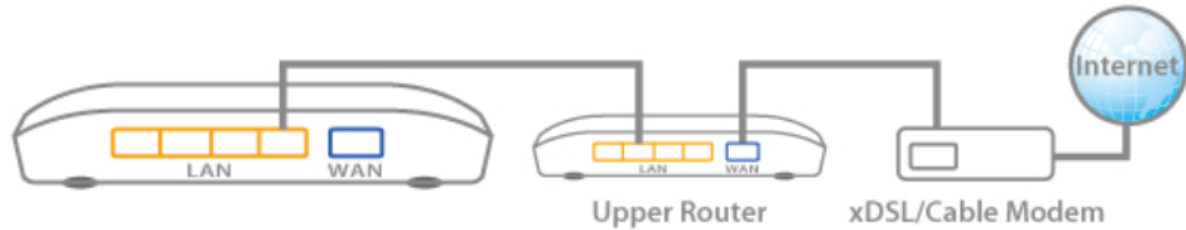


Please select a mode :

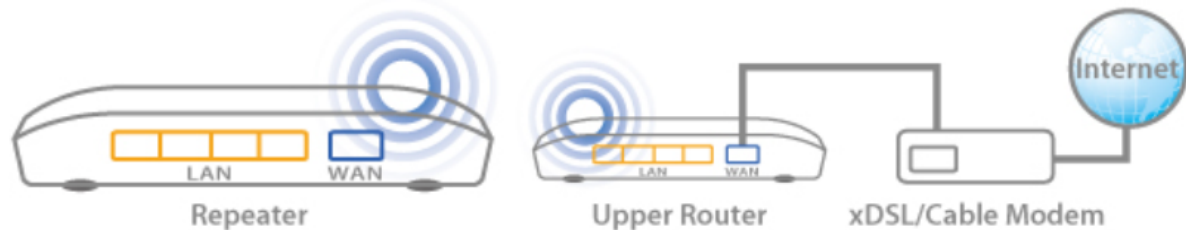
Wi-Fi Router :



Access Point :



Range Extender :



Back

Next

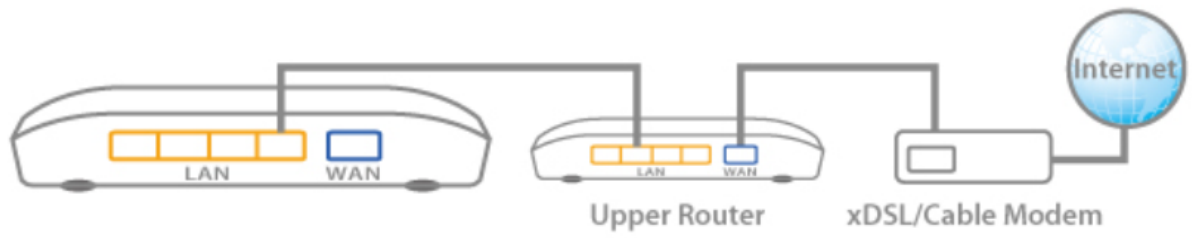


Please select a mode :

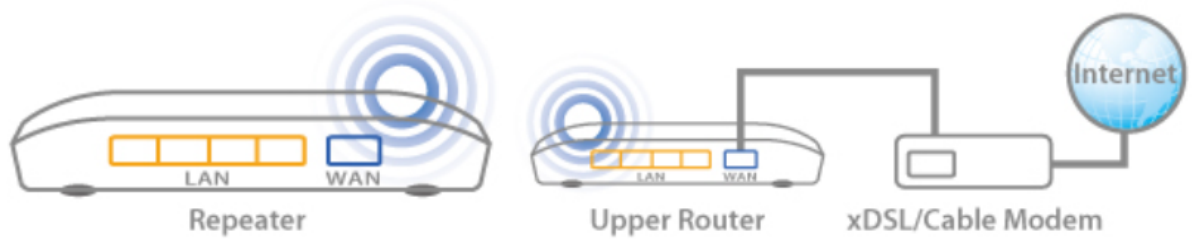
Wi-Fi Router :



Access Point :



Range Extender :



Back

Next



Hawking HWREN2 Hi-Gain Wireless-300N Range Extender Pro

by [Hawking Technology](#)



[93 customer reviews](#) | [14 answered questions](#)

Was: ~~\$57.97~~

With Deal: **\$52.17** & **FREE Shipping**. [Details](#)

You Save: **\$5.80 (10%)**

Want it TODAY, July 23? Order within **9 hrs 56 mins** and choose **Same-Day Delivery** at checkout. [Details](#)

In Stock.

Ships from and sold by Amazon.com. Gift-wrap available.

- Supports 2.4GHz Wireless Frequency Only
- High Power Range Amplified Technology boost your wireless performance up to 4 times, compared to a standard wireless network
- Provides IEEE 802.11b/g/n wireless LAN capability
- Supports 64/128-bit WEP, WPA, and WPA2 wireless data encryption
- Supports MAC address filtering (Only allow specific wireless device of your choice to connect to this access point)

WIRELESS RANGE EXTENDERS

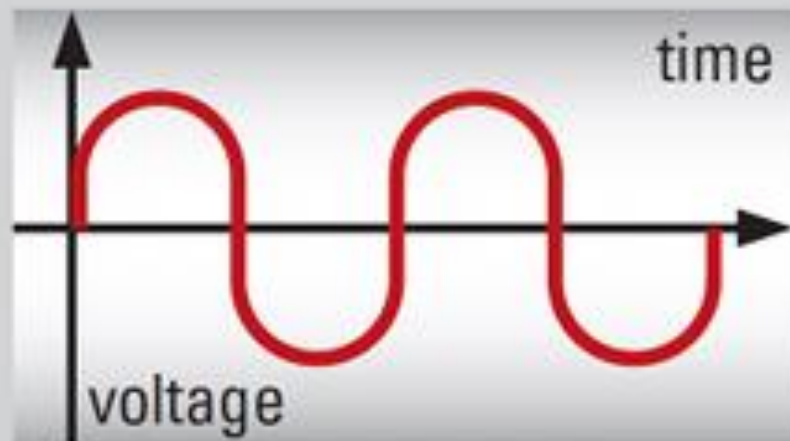
(continued)

- To get the latest and fastest models of wireless range extenders:
look for mentions of "802.11AC" or "AC" in the names of the extender and Gigabit Ethernet capability in the network jacks.

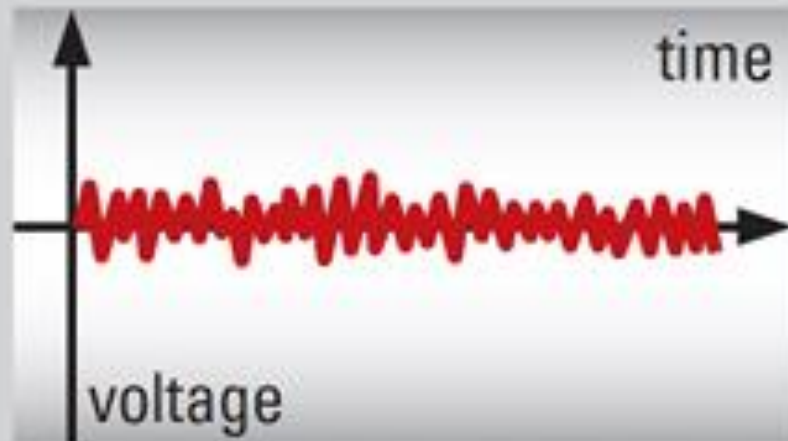
"PLC"

- "PLC" means "Power-line communications"
- "Powerline networking" is one of many technologies that utilize carriers riding on conductors used for 110 VAC/220 VAC power distribution

1 Electricity (Hz)



2 Data Signal (MHz)



3 The two signals are combined



4 The overlapping electrical and data signals are divided and extracted



"PLC" (continued)

- Source for the previous illustration:
<http://www.powerethernet.com/product/what-is-powerline.html>

"PLC" (continued)

- See https://en.wikipedia.org/wiki/Power-line_communication

EXTENDING A NETWORK WITH POWERLINE NETWORKING DEVICES

- Add in powerline networking devices and then you can either use the single 10-Base-x jack at the remote end or you can put a wired network switch or a wireless router at the far end of the powerline networking link.

EXTENDING A NETWORK WITH POWERLINE NETWORKING DEVICES (continued)

- Betty Waring calls this technique the "secret sauce" for resolving network resolving local network problems in her article at <http://windowssecrets.com/top-story/get-wired-performance-from-your-wi-fi-network/>

EXTENDING A NETWORK WITH POWERLINE NETWORKING DEVICES (continued)

- Good advice for installing powerline networking devices can be found at <http://www.techhive.com/article/3041996/home-networking/pump-up-your-powerline-how-to-get-the-best-performance-from-a-homeplug-network.html>

EXTENDING A NETWORK WITH POWERLINE NETWORKING DEVICES (continued)

- Good advice for installing powerline networking devices can be found at <http://www.smallnetbuilder.com/basics/lanwan-basics/32769-how-to-troubleshoot-your-powerline-network>

COMPETING STANDARDS FOR POWERLINE NETWORKING

- HomePlug Alliance's
"HomePlug AV2"
- HomeGrid Forum's
"Gh.n"

COMPETING STANDARDS FOR POWERLINE NETWORKING (continued)

- <http://electronicdesign.com/communications/whats-difference-between-homeplug-and-ghn>

"HOMEPLUG AV2" STANDARD

- HomePlug Alliance's "HomePlug AV" standards are alive and well
 - Their latest standard is called "HomePlug AV2"

"HOMEPLUG AV2" STANDARD

(continued)

- HomePlug Alliance's "HomePlug AV" standards (continued)
 - However, some manufacturers call it
 - "HomePlug AV2 500",
 - "HomePlug AV2 600",
 - "HomePlug AV2 1200",
 - and
 - "HomePlug AV2 2000"

"HOMEPLUG AV2" STANDARD

(continued)

- HomePlug Alliance's "HomePlug AV" standards (continued)
 - And, some manufacturers call it "Powerline AV2 500", "Powerline AV2 600", "Powerline AV2 1200", and "Powerline AV2 2000"

"HOMEPLUG AV2" STANDARD (continued)

- The numbers after "AV" are the usually stated nominal data transmission rates in Megabits per second
- Some manufacturers put in the nominal data transmission rate value without prepending it with "AV"

"HOMEPLUG AV2" STANDARD (continued)

- The current "AV1200", "AV1500", and "AV2000" monikers imply that "HomePlug AV2" equipment is now comparable in data transmission speeds to "Gigabit Ethernet" which is the current standard for network switches and routers

"HOMEPLUG AV2" STANDARD (continued)

- Do not buy equipment that was manufacturer in accordance with the old "HomePlug AV" standard: These models are now obsolete and their reliability and capabilities nowhere as good as the current "HomePlug AV2" models

"HOMEPLUG AV2" STANDARD (continued)

- Advantages of power line networking:
 - No signal attenuation by walls and furniture
 - No signal attenuation by radio frequency interference

"HOMEPLUG AV2" STANDARD (continued)

- To search for transceivers that are compliant with HomePlug Alliance's "HomePlug AV2" :
Go to <http://amazon.com>
Search for
homeplug

"HOMEPLUG AV2" STANDARD

(continued)

- To get the latest and fastest models of Homeplug devices: look for mentions of Powerline AV2" (Not "AV") and look for claims to have 1 or 2 Gigabit speeds by placing a 1000, a 1200, a 1500, or a 2000 in their names

"HOMEPLUG AV2" STANDARD (continued)

- Installing "Homeplug AV2" transceivers is a trial and error process:
You plug them in and look at the three LEDs on the transceivers.

"HOMEPLUG AV2" STANDARD (continued)

- "Homeplug AV2" transceivers do not work well when plugged into surge strips or UPS units

"HOMEPLUG AV2" STANDARD (continued)

- "Homeplug AV2" transceivers have reduced data speeds when they are plugged into outlets that have GFCIs or AFCIs

"HOMEPLUG AV2" STANDARD (continued)

- GFCI = "Ground Fault Circuit Interrupter"
- AFCI = "Arc Fault Circuit Interrupter"





"HOMEPLUG AV2" STANDARD (continued)

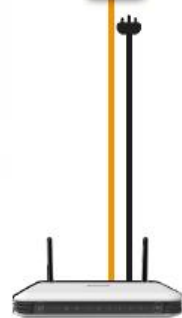
- You can install more than two "Homeplug AV2" transceivers and they all will communicate with each other with some loss in data throughput.

POWERLINE NETWORKING

Home Office



HomePlug AV
500Mbps
Pass Through
HL115EP



Broadband Router

Bedroom 2



Mini HomePlug AV
200Mbps
Ethernet Adapter
HL112E



Internet 3D TV

Stylish & Compact HomePlug

With Aztech HomePlugs, you are now empowered to turn any power outlet into an Ethernet point without the use of additional wiring! Simply plug Aztech HomePlug AV 200Mbps Ethernet Adapter into any available power outlet to connect your PC, game console or IP camera.

Bedroom 1



HomePlug AV
200Mbps
Wireless-N Extender
HL110EW



Living Room



4-Port HomePlug AV
500Mbps
Gigabit Switch
HL125G



Free Up Your Power Outlet

Designed to provide additional convenience, Aztech HomePlug AV 500Mbps Pass Through is built with a noise-filtered power outlet for plugging in a power strip to connect home office equipment.



Home Office



Broadband Router

Bedroom 2



Internet 3D TV

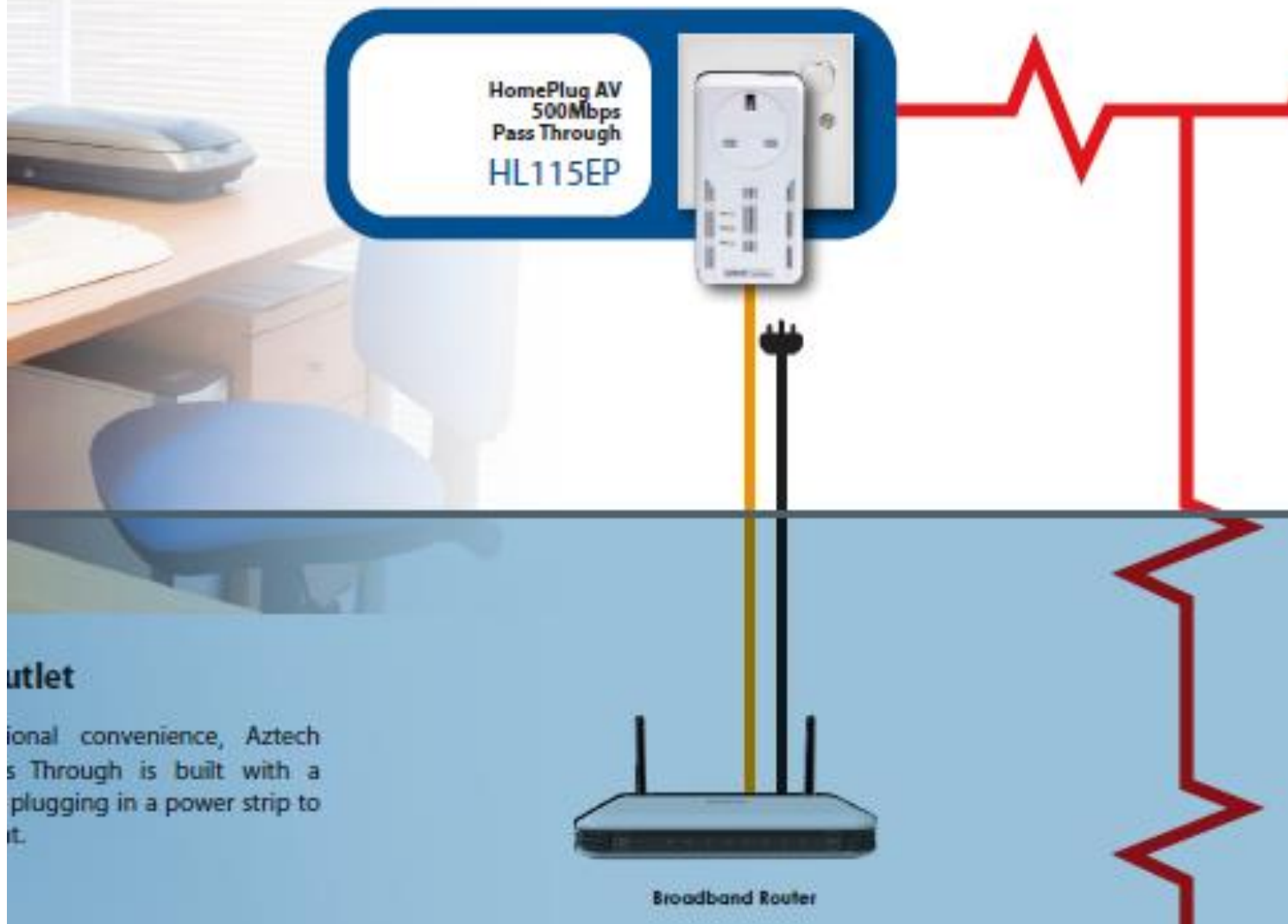
Free Up Your Power Outlet

Designed to provide additional convenience, Atech HomePlug AV 100Mbps Pass Through is built with a noise-filtered power outlet for plugging in a power strip to connect home office equipment.

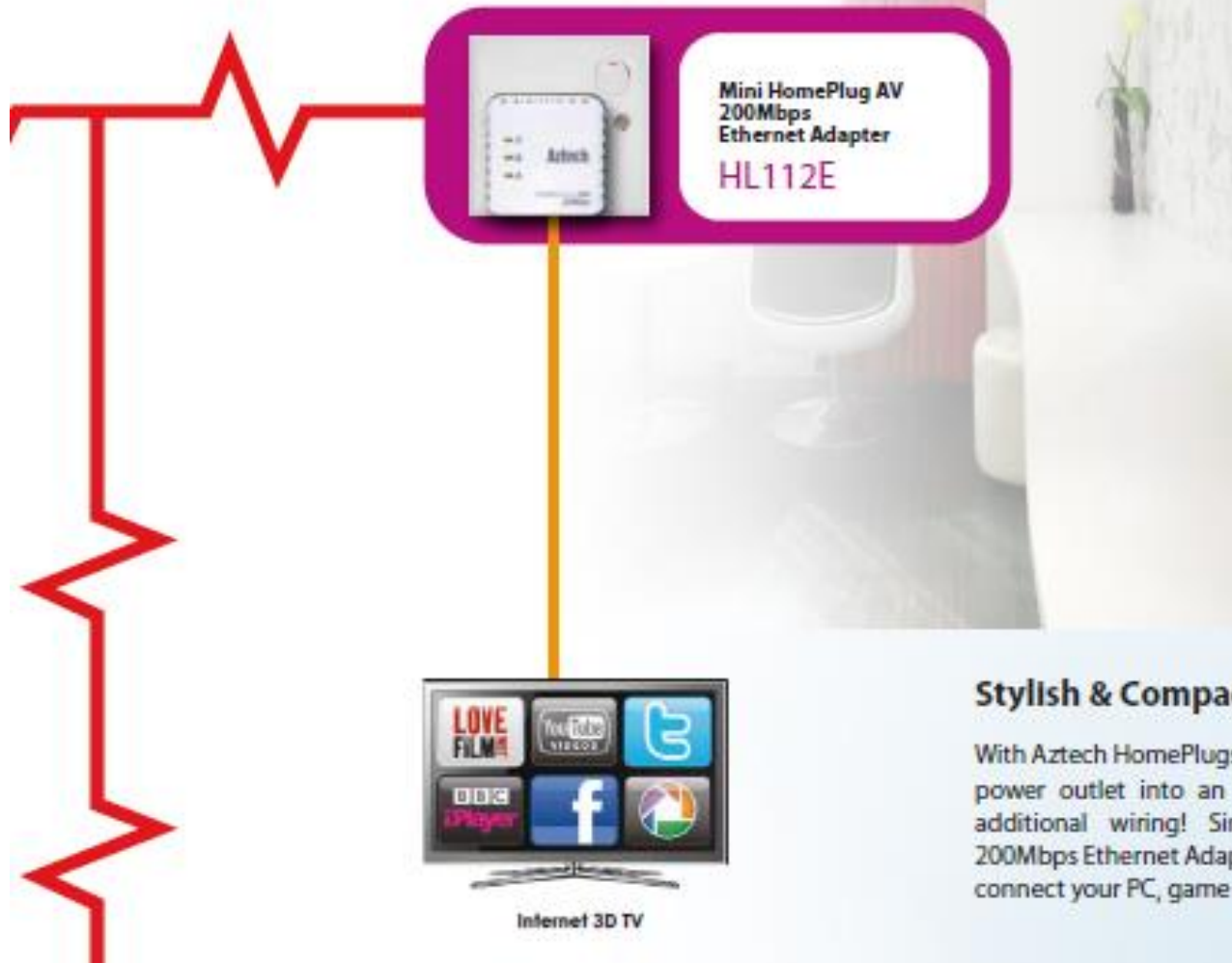
Stylish & Compact HomePlug

With Atech HomePlugs, you are now empowered to turn any power outlet into an Ethernet point without the use of additional wiring! Simply plug Atech HomePlug AV 100Mbps Ethernet Adapter into any available power outlet to connect your PC, game console or IP camera.

Home Office



Bedroom 2



Stylish & Compact

With Aztech HomePlugs power outlet into an additional wiring! Since 200Mbps Ethernet Adapter connect your PC, game console, etc.

"HOMEPLUG AV2" STANDARD (continued)

- The competing **Universal Powerline Association** ceased to exist at the end of 2010.
- "HomePlug" equipment and "Universal Powerline Association" equipment are NOT compatible so do not put them both on the same home or small business network.

"HOMEPLUG AV2" STANDARD (continued)

- Mix and match strategies?
 - The equipment of the various "HomePlug AV" manufacturers inter-communicate well with each other.
However, you lose proprietary, non-standard functions when you mix the equipment of different manufacturers

"HOMEPLUG AV2" STANDARD (continued)

- "Homeplug AV2" uses sub-carriers in the 1.8 to 86 Megahertz frequency range

"HOMEPLUG AV2" STANDARD (continued)

- According to <http://www.hindawi.com/journals/jece/2013/892628/> the "HomePlug AV2" standard divides the 1.8 to 86.13 MHz frequency range into 3455 subcarriers that are 24.414 kilohertz apart.

"HOMEPLUG AV2" STANDARD

(continued)

- The 1.8 MHz to 86MHz frequency range of "HomePlug AV2" equipment covers the legacy 3 to 30 Mhz shortwave radio band so there may be interference BETWEEN shortwave radio receivers & transmitters AND "HomePlug AV2" equipment. However, there are lots of interference sources, both natural and man-made in the 3 to 30 Mhz shortwave band

"HOMEPLUG AV2" STANDARD (continued)

- Based on various reviews, some of the best performing and lowest priced "HomePlug AV 1200" products are available from TP-Link
 - See <http://www.newegg.com/Product/ProductList.aspx?Submit=ENE&DEPA=0&Order=BESTMATCH&N=-1&isNodeId=1&Description=homeplug+tp-link&x=0&y=0>

HOMEGRID'S G.hn STANDARD

- An emerging new standard with very few products:
<http://www.homegridforum.org/>

HOMEGRID'S G.hn STANDARD (continued)

- Only one product is available at the present time:
Comtrend's PG-9172

HOMEGRID G.hn STANDARD (continued)

- https://www.amazon.com/Comtrend-G-hn-Powerline-Adapter-Kit/dp/B00X3GX99C/ref=sr_1_1?ie=UTF8&qid=1469672526&sr=8-1&keywords=G.hn



Comtrend G.hn Powerline Adapter Kit - 1200 Mbps - Gigabit Port - PG-9172-KIT (Adapter Pair)

by [COMTREND](#)

★★★★★ [21 customer reviews](#)

List Price: \$119.99

Price: **\$86.32 & FREE Shipping**

You Save: **\$33.67 (28%)**

Estimated Delivery Date: Aug. 1 - 4 when you choose Expedited Shipping at checkout.

Only 2 left in stock - order soon.

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Want to hire a computer technician?

Buy professional computer technician services directly on Amazon. Backed by our Happiness Guarantee.

[Learn more](#)

- RJ-45 X 1 for Ethernet connection AC power plug X 1
- Standard IEEE 802.3u, 802.3ab One 10/100/1000 BaseT Ethernet Port Auto rate and duplex negotiation MDI/MDX support
- OFDM, FEC; Flexible frequency configuration
- HTTP Web-based management; Firmware upgrade via TFTP
- AES 128 bits encryption ensures total data security

HOMEGRID'S G.hn STANDARD (continued)

- See
<http://www.pcmag.com/article2/0,2817,2484232,00.asp>
and
[http://www.comtrend.com/links/201\\$product.htm](http://www.comtrend.com/links/201$product.htm)

HOMEGRID'S G.hn STANDARD (continued)

- https://www.amazon.com/ARRIS-SURFboard-Gigabit-Extender-SBX-1000P/dp/B01E3VN6DO/ref=sr_1_2?ie=UTF8&qid=1469457864&sr=8-2&keywords=arris+powerline

POWERLINE NETWORKING KITS

- "Powerline networking kits" consist of a pair of transceivers of the exact same model and firmware revision. You usually get a better price by buying a pair as a "..kit" relative to buying each transceiver separately.

MANUFACTURERS OF POWERLINE NETWORKING KITS

- D-Link
- Netgear
- Zycel
- TP-Link
- Extollo Communications
- TRENDnet

D-link Systems Inc

17595 Mount Herrmann St

Fountain Valley, CA 92708

NETGEAR Headquarters

350 E. Plumeria Drive

San Jose, CA 95134

United States

ZyXEL Communications, Inc. - North America Headquarters

Tel: +1-800-255-4101(free), +1-714-632-0882

Fax: +1-714-632-0858

Address: 1130 North Miller Street Anaheim, CA 92806-2001

Email: sales@zyxel.com

<http://www.zyxel.com/us/en>

Extollo Communication Inc.

1667 Grant Ave. #156

Blaine, WA 98230

604.897.2079

TP-LINK USA CORPORATION

Website: www.tp-link.us

Tel: +1 626 333 0234

Fax: +1 626 961 9691

E-mail: sales.usa@tp-link.com

Technical Support Phone: +1 866 225 8139 (Toll Free)

Technical Support E-mail: support.usa@tp-link.com

Address: 975 Overland Ct, San Dimas, CA 91773

TRENDnet Inc.

20675 Manhattan Place

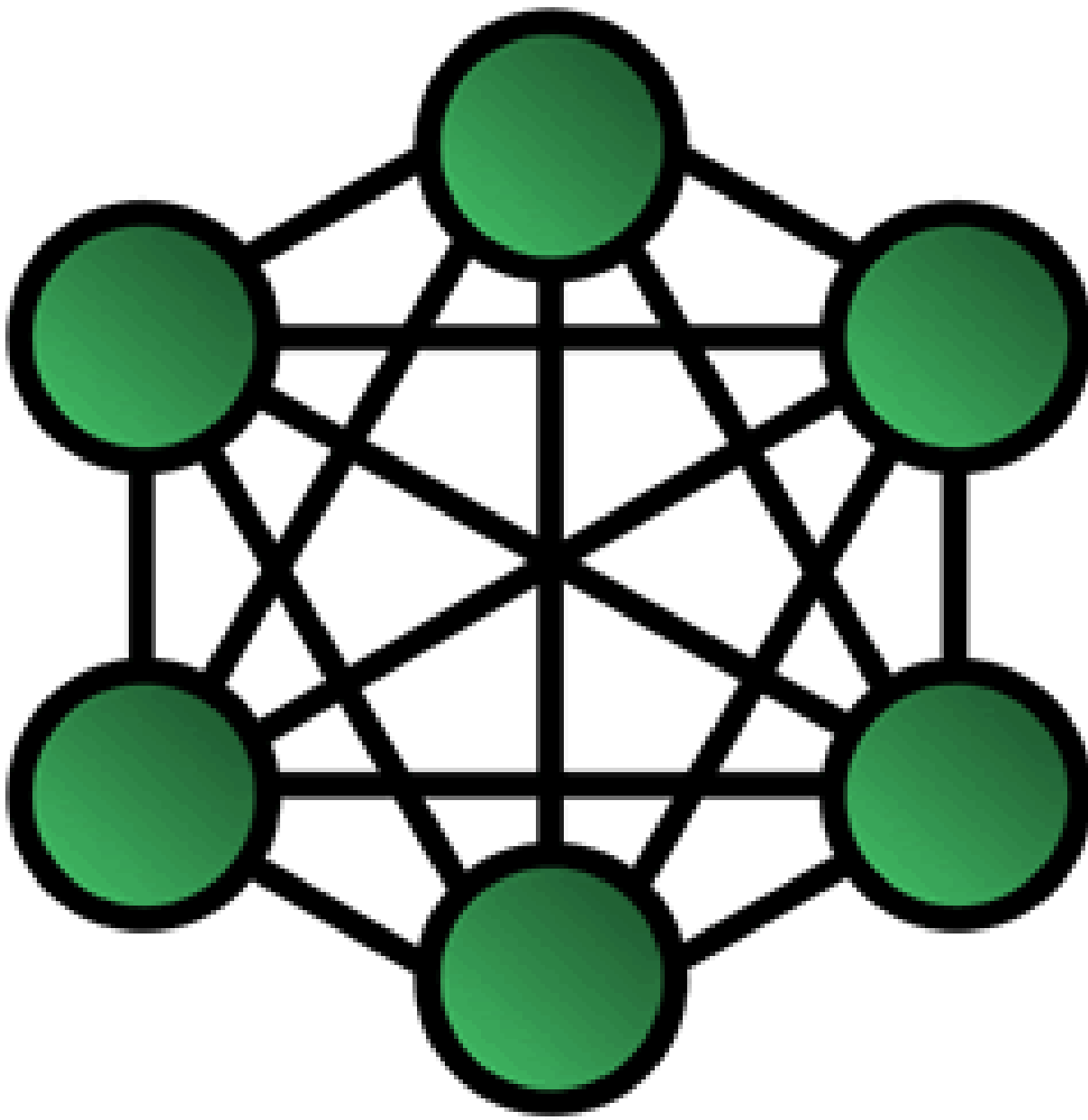
Torrance, CA 90501 USA

Tel.: (310) 961-5500

POWERLINE NETWORKING KITS

(continued)

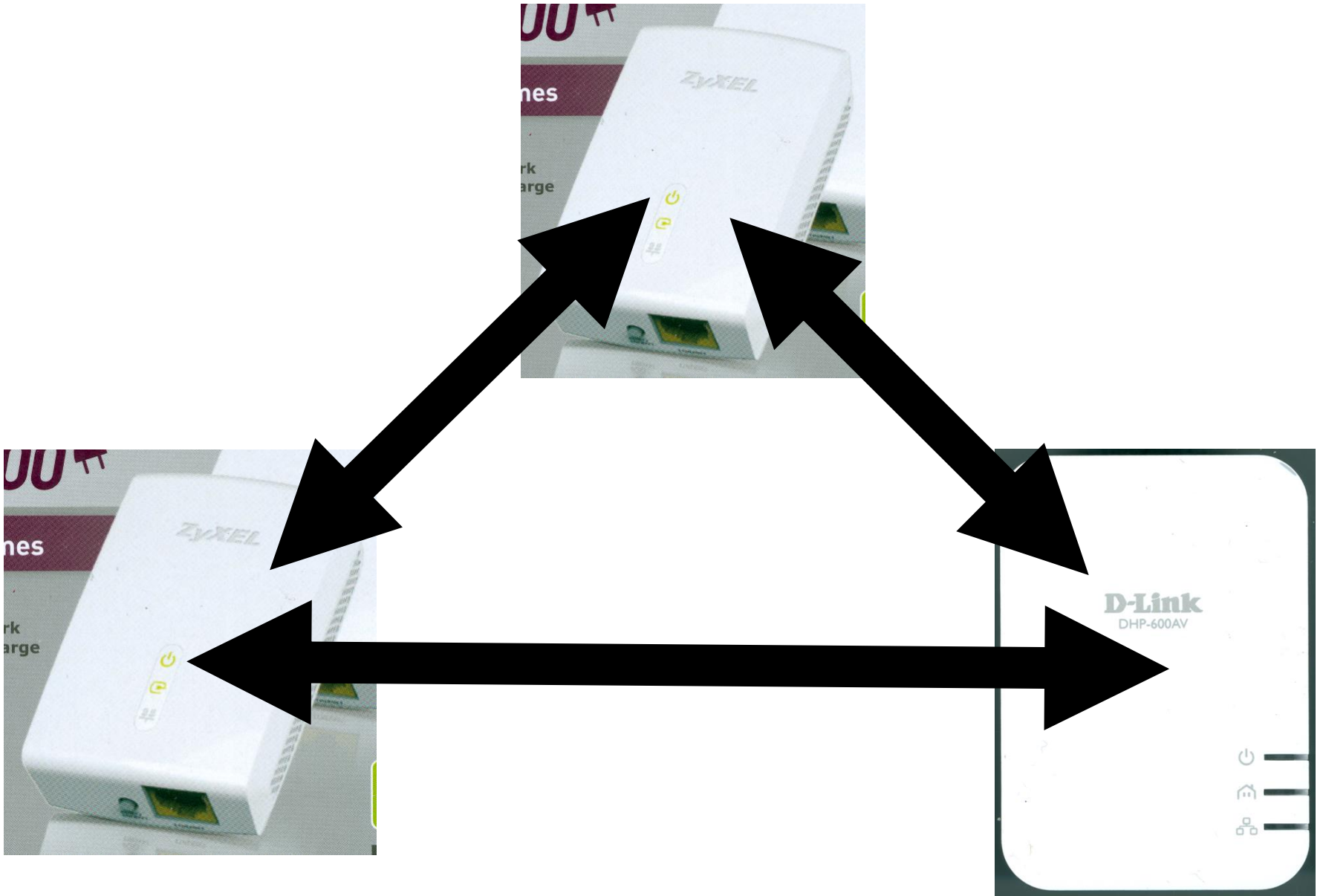
- When you install more than two powerline networking transceivers, they will default to a "mesh network" where each transceiver communicates with every other transceiver (This does not happen with wireless range extenders.)



POWERLINE NETWORKING KITS

(continued)

- Source for the previous illustration:
<http://www.digi.com/technology/rf-articles/wireless-zigbee>



SETTING UP INDEPENDENT GROUPS OF POWERLINE NETWORKING TRANSCEIVERS

- By using the "Encrypt" button of powerline networking transceivers, you can set up independent groups of powerline networking transceivers that "clannishly" only communicate with each other:

SETTING UP INDEPENDENT GROUPS OF POWERLINE NETWORKING TRANSCEIVERS (continued)

- "Transceiver A" communicates with "Transceiver B"
- "Transceiver C" communicates with "Transceiver D"
- "Transceiver E", "Transceiver F", and "Transceiver G" communicate with each other.

SETTING UP INDEPENDENT GROUPS OF POWERLINE NETWORKING TRANSCEIVERS (continued)

- Trendnet's owners manuals refers to this configuration as "overlapping powerline networks".

See

[http://www.trendnet.com/download
manager/default.asp?iFile=17356](http://www.trendnet.com/download_manager/default.asp?iFile=17356)

REVIEWS OF POWERLINE NETWORKING KITS

- See <http://thewirecutter.com/reviews/best-powerline-networking-kit/> and <http://thewirecutter.com/reviews/best-powerline-networking-kit/>

HANDS-ON EXPERIENCES WITH "HOMEPLUG AV2"

- See

http://aztcs.org/meeting_notes/winhardsig/networks/powerline/powerline-experiences.pdf

WIRELESS RANGE EXTENDER & POWERLINE HYBRIDS

- Several manufacturers have a hybrid kit that consists of a regular Powerline AV2 unit at the "near end" and a Powerline AV2 unit combined with a wireless range extender at the "far end".

WIRELESS RANGE EXTENDER & POWERLINE HYBRIDS

- Most hybrid kits do not have the gigabit-speed state-of-the-art powerline technology yet.
Do not buy them:
They are too slow

WIRELESS RANGE EXTENDER & POWERLINE HYBRIDS (continued)

- The only hybrid kit that has both Gigabit-speed powerline technology and a state-of-the-art wireless range extender is made by TP-Link:



TP-LINK AC1200 Wi-Fi Range Extender, AV1200 Powerline Edition (TL-WPA8630 KIT)

by [TP-LINK](#)

★★★★★ ▾ [2 customer reviews](#)

Price: **\$149.99** & **FREE Shipping**. [Details](#)

In Stock.

Want it tomorrow, July 26? Order within **4 hrs 43 mins** and choose **One-Day Shipping** at checkout. [Details](#)

Ships from and sold by Amazon.com. Gift-wrap available.

- AC1200 Dual band Wi-Fi - delivers combined speeds of up to 1200Mbps, providing fast and seamless network for multiple devices
- AV1200 Powerline Speed - Fully meet the demand for bandwidth-intensive activities with ultra-fast powerline transfer speed of up to 1200Mbps
- Wi-Fi Clone - Automatically copies the network name (SSID) and password of your router with the touch of the Wi-Fi clone button
- Wi-Fi Auto-Sync - Makes it easy to add additional extenders to your powerline network by uniformly syncing settings such as SSID, password, Wi-Fi Schedule and LED Schedule for all network devices



WIRELESS RANGE EXTENDER & POWERLINE HYBRIDS (continued)

- See https://www.amazon.com/TP-LINK-Extender-Powerline-TL-WPA8630-KIT/dp/B01A90CH4M/ref=sr_1_28?s=pc&ie=UTF8&qid=1469459436&sr=1-28&keywords=wireless+extender+with+powerline