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Few gadgets in your home can make you quite as frustrated or bewildered as a router with a crummy WiFi signal. Without a fast and reliable internet connection, you find yourself huffing as you wait for websites to load on your laptop, fidgeting as YouTube videos freeze on your tablet, and staring in despair at email inboxes and social media feeds as they struggle to refresh on your smartphone. As for streaming the latest edition of “WrestleMania” on your smart TV? Forget about it. To add to your angst, you may not know how to troubleshoot those problems—beyond calling a tech-savvy relative and pleading for help.

Sick of all the waiting? Let our experts bring you up to speed on solutions.

How does my router work?

Understanding the basics of what your wireless router does will go a long way toward helping you fix some hiccups. “Think of a router as an electronic traffic cop,” says Richard Fisco, who oversees electronics testing for Consumer Reports. Once it’s hooked up to the modem provided by your internet service provider (ISP), a router directs the internet connection throughout your home, making it wirelessly available to devices like your laptop, smart speaker, and smart TV.

Your router serves as a link between the outside world and all of your personal and financial data. The tax return you filed electronically? It

travels through your router. Those credit card numbers you share online with Amazon? They exit through the router, too.

That’s why a router has to be a security guard in addition to being efficient and convenient. A good one receives routine firmware updates from the manufacturer to combat potential threats from hackers and other ne’er-do-wells.

Is my router a slowpoke?

If your WiFi connection is noticeably sluggish, you may be tempted to write off your current router as a dud. But don’t be too hasty—there may be other factors at play.

First, take a look at a bill from your ISP to see what level of broadband you’re paying for. You’ll need a connection of at least 25 megabits per second to stream Netflix video for 4K TV, for example. If you’re not paying for that, or if you don’t have access to that kind of speed where you live, a brand-new router won’t help you.

You can easily run a speed test using a service like fast.com to see what you’re really getting. You may want to run this test a few times. First, run it with your laptop plugged into your router to check your speed in the best-case scenario. You can then move around with your laptop to different areas of your home to see how fast WiFi is at different locations.

Next, you’ll want to assess the placement of your router. They tend to do best when set up in the center of a home, allowing the signal to reach out in every direction. A router tucked away in a corner may not have the range to travel to the other side of the house, or from the second floor to the basement, because the signal degrades the farther it gets from the source.

If your router is in a suboptimal spot (the basement, for example), try moving it. One way is to buy a long Ethernet cable (keep it under 300 feet),

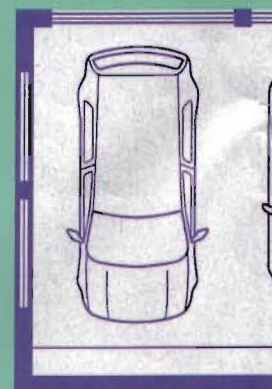
FIVE COMMON WIFI ROADBLOCKS & HOW TO FIX THEM

“WiFi is electromagnetic radiation, just like light,” says Bhaskar Krishnamachari, a professor of electrical and computer engineering and computer science at the University of Southern California. “There are objects that block it and others that let it through.” Here are some common obstacles to think about as you place routers and use connected devices. In this diagram, we’ve arranged a three-piece mesh router network to help eliminate potential dead spots in a multilevel home.

- MESH HUB
- MESH SATELLITE

THE SETUP

For the best results, place the hub in the center of your home (1) and between the satellites (2 and 3), says Richard Fisco, who oversees electronics testing for CR. Note that satellite 3 sits on the kitchen counter away from the refrigerator (4). The WiFi signal from both the hub and satellites can also reach up and down to other floor levels, eliminating potential dead zones.





THE WALLS

Thicker walls tend to absorb more of a WiFi signal than thinner walls, Krishnamachari says. While you can't easily change how thick your walls are, simply repositioning a mesh satellite closer to a room's entrance may help boost the signal.



THE FRIDGE

A refrigerator and other appliances that contain a lot of metal can cause trouble, too. WiFi signals may bounce off them instead of passing through to the other side. Metal plumbing and rebar in your walls create similar problems.



THE NEIGHBORS

If you live in an apartment building or a heavily populated neighborhood, you might be susceptible to wireless congestion created by nearby devices running on the 2.4GHz frequency band. Try changing your router and devices to the 5GHz frequency band, which has many more channels. If your router doesn't support 5GHz, select another channel in the device's settings.



THE MICROWAVE

Microwave ovens also operate in the 2.4GHz frequency band, Krishnamachari points out. That can cause interference, he says, if, for example, you decide to make a second bag of popcorn while streaming a Netflix movie. To avoid the interruption on movie night, try switching your laptop or smart TV to the 5GHz band.



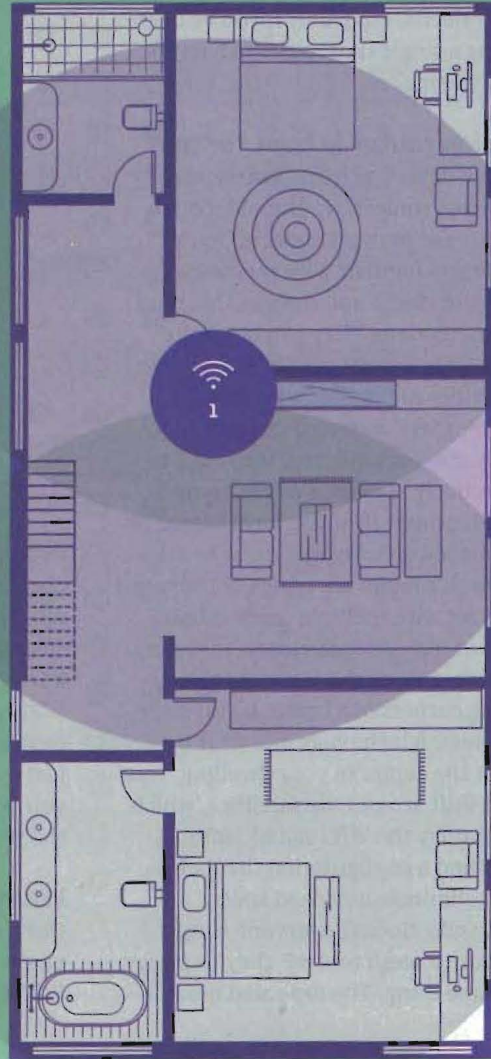
THE FISH TANK

Water absorbs radiation, Krishnamachari says. So your WiFi signal is likely to get hung up near pools, tubs, and, yes, that 100-gallon fish tank you installed.

FIRST FLOOR



SECOND FLOOR



plug it into the modem and the router, and move the router yourself. Or you can ask your ISP to help you relocate the modem, though the company may charge you depending on the labor involved. If you're planning to change providers, Fisco says, you may be able to get the job done free, so ask while you're negotiating the switch.

If your router is already in a central location, the slow connection might be due to obstacles in the house that can impede a WiFi signal. (See "5 Common WiFi Roadblocks & How to Fix Them," on page 48.) You can try moving the router around a room to address such problems.

If those tweaks don't help, it may be time to find a model better suited to your needs, especially if you've been using a single-unit router in a multi-story home.

Which router is best for me?

These days, you'll find two types of wireless routers: traditional models and mesh network models. You're probably familiar with the former. They're single-unit devices that plug into a modem. They can be plenty fast, supporting even the data-hungry activities of families with dozens of internet-connected devices. But they don't always have the range to effectively blanket a whole home in WiFi, especially if you have a large or obstacle-laden layout.

Mesh routers are typically packaged in a set with multiple units—a hub and one or more satellites—that work together to spread WiFi into the far-flung corners of a home. If you place the hub, which plugs into your modem, near the center of your dwelling, you can shift around the satellites, which help relay the WiFi signal, until you find a configuration that helps you eliminate any dead spots.

So why doesn't everyone simply choose a mesh router? They're pricey, for one thing. The top-rated models

CR PICKS FOR EVERY HOME

GREAT VALUE FOR BIG HOUSES

💰 **TP-Link Deco Whole Home (3-pack)** \$180

74
OVERALL SCORE



STRONG FOR MEDIUM SPACES

💰 **Asus AC2900** \$160

86
OVERALL SCORE



ALL YOU NEED FOR A SMALL HOME

💰 **TP-Link Archer C7 AC1750** \$70

70
OVERALL SCORE



that promises faster speeds, a longer range, and better support for the ever-expanding fleet of connected devices in modern homes.

Also known as 802.11ax, WiFi 6 replaces the WiFi 5 standard formerly known as 802.11ac, which debuted in 2013, and WiFi 4 (802.11n), which dates back to 2009. The consortium that sets these standards announced a WiFi 6 certification program in September 2019, and a number of routers that support the standard are now available, including three models in our ratings.

But only a few internet-connected devices are currently WiFi 6-compatible. (The latest Apple iPhone and Samsung Galaxy Note smartphones are examples.) WiFi 4 and 5 devices can connect to a WiFi 6-compatible router, but they get none of the technology's speed benefits. So our experts say it's fine to hold off on making the leap if you can save money on a slightly older model. "If you still have a WiFi 4 router but your smartphone, TV, and laptop all support WiFi 5, get a WiFi 5 router instead," Fisco says. That will set you up for a good five years.

Why buy when I can rent?

Many consumers simply accept the model provided by their ISP. But internet companies usually charge a \$10 to \$12 monthly rental fee for the privilege, which can eclipse the price of a new router within two years.

In addition to providing potential savings, buying your own router gives you far more say in the operation and security of your home WiFi network. Using a simple mobile app, you can set up your router to receive automatic firmware updates. If you have a large family or frequent house guests, our experts suggest a model that offers robust settings that let you establish parental controls and a guest network to wall folks off from certain websites and private information.

in our ratings cost \$400 to \$500. By contrast, our top-rated single-unit model sells for \$200, followed by one that goes for about \$160. There's also an argument to be made for simplicity. With a mesh system, you have several devices strewn about your home vs. just one with a traditional router. If you don't actually need mesh routers, there's no reason to invest in them.

What does "WiFi 6" mean?

Once you start shopping for a router, you're likely to hear a lot of buzz about WiFi 6, a new technology standard

Ratings > **WiFi Wizards** The routers that ace our testing get points for data security, data privacy policies, signal speeds (near, midrange, and far), and the simplicity of the setup process.

Brand & Model	Overall Score	Price	Test Results						Features					
			Data security	Data privacy	Throughput, near	Throughput, midrange	Throughput, far	Versatility	Ease of setup	Supports WPS	Parental controls	WiFi 6	Gigabit Ethernet	Number of LAN ports
WIRELESS ROUTERS														
 Synology RT2600ac	91	\$200	↑	↑	↑	↑	↑	↑	↑	•	•	•	4	2
 TP-Link Archer C3150 V2	87	\$160	↑	↓	↑	↑	↑	↑	↑	•	•	•	4	2
 Netgear Nighthawk X10 (AD7200)	86	\$395	↑	↑	↑	↑	↑	↑	↑	•	•	•	6	2
 Asus AC2900 (RT-AC86U)	86	\$160	↑	↑	↑	↑	↑	↑	↑	•	•	•	4	2
 Netgear Nighthawk AC1900 (R7000)	79	\$150	↑	↑	↑	↑	↑	↑	↑	•	•	•	4	2
 TP-Link Archer AC5400	79	\$235	↑	↓	↑	↑	↑	↑	↑	•	•	•	4	2
 Asus AX6000 (RT-AX88U)	78	\$290	↑	↑	↑	↑	↑	↑	↑	•	•	•	8	2
 Netgear Nighthawk X6S (AC4000)	78	\$300	↑	↑	↑	↑	↑	↑	↑	•	•	•	4	2
 Asus AC3100 (RT-AC88U)	77	\$225	↑	↑	↑	↑	↑	↑	↑	•	•	•	8	2
 Linksys AC3200 (WRT3200ACM)	76	\$250	↑	↑	↑	↑	↑	↑	↑	•	•	•	4	2
 Google and Asus OnHub AC1900	74	\$120	↑	↑	↑	↑	↑	↑	↑	•	•	•	1	1
 Netgear Nighthawk X6 (AC3200)	73	\$200	↑	↑	↑	↑	↑	↑	↑	•	•	•	4	2
 TP-Link Archer C1900	72	\$105	↑	↓	↑	↑	↑	↑	↑	•	•	•	4	2
 TP-Link Archer C7 AC1750	70	\$70	↑	↓	↑	↑	↑	↑	↑	•	•	•	4	2
Linksys AC1900 (WRT1900AC)	69	\$210	↑	↑	↑	↑	↓	↑	↑	•	•	•	4	2
Asus Blue Cave (AC2600)	67	\$180	↑	↑	↑	↑	↑	↑	↑	•	•	•	4	1
Linksys WRT32X AC3200 Dual-band Gaming	67	\$300	↑	↑	↑	↑	↓	↑	↑	•	•	•	4	2
Asus AC1900 (RT-AC68U)	66	\$180	↑	↑	↑	↑	↓	↑	↑	•	•	•	4	2
Netgear AC1750 (R6400)	66	\$130	↑	↑	↑	↑	↓	↑	↑	•	•	•	4	1
Netgear Nighthawk AX8 (RAX80)	65	\$340	↑	↑	↑	↑	↑	↑	↑	•	•	•	5	2
Razer Silla (AC3000)	64	\$230	↑	↑	↑	↑	↑	↑	↑	•	•	•	3	2
Netgear AC1600 (R6260)	64	\$80	↑	↑	↑	↑	↑	↑	↑	•	•	•	4	1
Linksys AC1900 (EA6900)	64	\$70	↑	↑	↑	↑	↓	↑	↑	•	•	•	4	2
Linksys Max-Stream AC2200	59	\$140	↑	↑	↑	↑	↑	↑	↑	•	•	•	4	1
Linksys AC1200 (EA6350)	57	\$80	↑	↑	↑	↑	↓	↑	↑	•	•	•	4	1
Linksys AC1000 (EA5800)	43	\$40	↑	↑	↓	↓	↓	↑	↑	•	•	•	4	1
Netgear AC1200 (R6120)	33	\$55	↑	↑	↓	↓	↓	↑	↑	•	•	•	4	1
Netgear AC1000 (R6080)	32	\$45	↑	↑	↓	↓	↓	↑	↑	•	•	•	4	0

Brand & Model	Overall Score	Price	Test Results						Features					
			Data security	Data privacy	Throughput, near	Throughput, midrange	Throughput, far	Versatility	Ease of setup	Supports WPS	Parental controls	WiFi 6	Gigabit Ethernet	Number of LAN ports
MESH WIFI														
✓ Netgear Orbi AC3000 (3-pack)	83	\$400	↑	↑	↑	↑	↑	↑	↑	•	•	•	4	1
✓ Eero Pro Tri-band Mesh Network (3-pack)	74	\$500	↑	↑	↑	↑	↑	↑	↑	•	•	•	5	0
Ⓢ TP-Link Deco Whole Home (3-pack)	74	\$180	↑	↓	↑	↑	↑	↑	↑	•	•	•	6	0
Ⓢ Netgear Orbi AC2200 Tri-band (3-pack)	70	\$300	↑	↑	↑	↑	↑	↑	↑	•	•	•	11	0
✓ Linksys Velop AC6600 (3-pack)	70	\$480	↑	↑	↑	↑	↑	↑	↑	•	•	•	2	0
Ⓢ Eero Home WiFi (2nd Gen) (3-pack)	70	\$250	↑	↑	↑	↑	↑	↑	↑	•	•	•	2	0
Google Wifi AC1200 Dual-Band Whole Home (3-pack)	64	\$260	↑	↑	↑	↑	↑	↑	↑	•	•	•	5	0
Linksys Velop AC3600 (3-pack)	59	\$220	↑	↑	↑	↑	↑	↑	↑	•	•	•	2	0
Linksys Velop AC3900 (3-pack)	59	\$300	↑	↑	↑	↑	↑	↑	↑	•	•	•	2	0
Ubiquiti Networks Amplifi (AC1750) (3-pack)	57	\$340	↑	↓	↑	↑	↑	↑	↑	•	•	•	4	1
Arris Surfboard mAX Plus AX7800 (W130) (2-pack)	55	\$500	↑	↓	↓	↑	↑	↑	↑	•	•	•	3	0

HOW WE TEST: The Overall Score is based on the performance of a device's data security protections, signal speeds, versatility, and ease of setup. Data security evaluates how well the device and its service provider protect personal info via

authentication, encryption, software updates, and resistance to known exploits. Data privacy is a measure of how the device and its service provider collect, share, and use data, and how much control the user has over the flow of that data.

Throughput scores are based on signal speeds at near (8 feet from router), midrange (30 feet away), and far (an average of the results at 45 and 100 feet away) distances. Versatility scores are based on the number of LAN and USB ports,

parental control options, and quality of tech support. Ease of setup is based on the availability of status LEDs, guest network options, and WiFi-protected setup, and the simplicity of the mobile app or web browser-based activation process.

WHAT'S THE DEAL WITH WIFI EXTENDERS?

You may have seen ads online touting tiny devices that manufacturers promise will expand the reach of your WiFi network for \$25 or less. Known as WiFi range extenders, these devices can push signals from a router deeper into your home in an effort to eliminate dead spots in a far-flung bedroom or office. The catch? You

might notice a significant drop in throughput speeds in the "extended" network, says Kannan Athreya, an associate professor of computer science and engineering at Ohio State University. That's in part because an extender relies on the same frequency band as the router itself. "So now the data that originally would have come directly

from the access point to your connected device is going through an intermediate step," he says. By contrast, mesh routers use two different frequency bands. The bottom line? An extender may work well for you, but a mesh router is more likely to smoothly stream 4K video to multiple TVs at once.