

How to setup a home router and Wifi Access Point

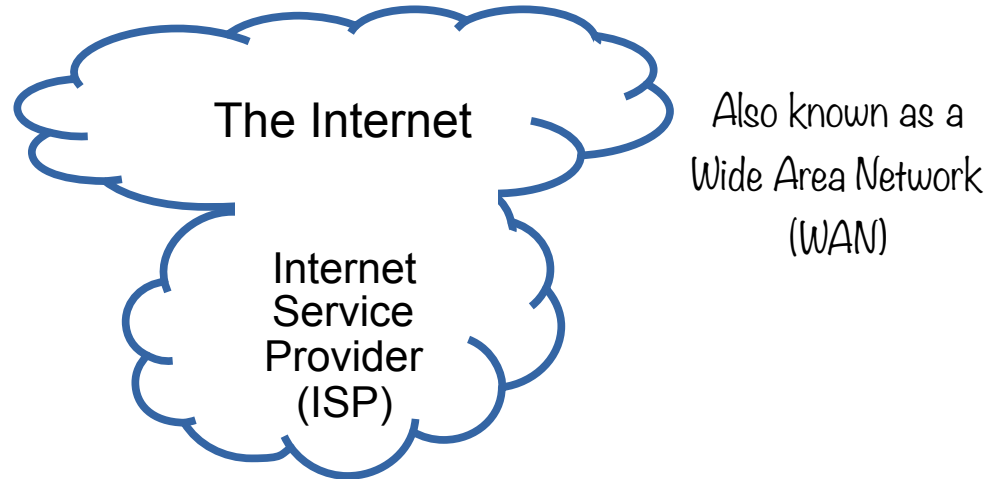
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SIR Branch 8

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Please ask questions at any time

Your home without a router



WAN

WAN

LAN

LAN



LAN (Local Area Network)

Router

From Wikipedia

A router is a networking device that forwards data packets between computer networks. Routers perform the traffic directing functions on the Internet.

A router is connected to two or more data lines from different networks.

May include a Wifi Access Point (AP)



\$70



\$350



Best 2017 routers:

<http://www.pcmag.com/article2/0,2817,2398080,00.asp>

Router Firmware Options

Vendor Firmware

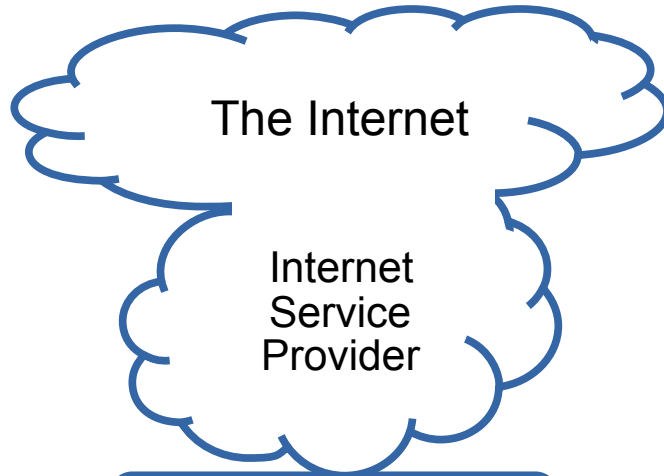
- Default for most installed routers
- It's there, vendor can help, should just work

Third party firmware (for the more adventurous)

- Additional services on the router
 - ✓ Web server
 - ✓ SSH server
- More/Better options for
 - ✓ NAS (Network Attached Storage)
 - ✓ VPN (Virtual Private Network)
 - ✓ Firewalls
 - ✓ QOS (Quality of Service)
 - ✓ Traffic monitoring

Router firmware projects

- DD-WRT (What I run on my home router)
- Tomato
- BSD Router Project: Motto - Don't buy a router: download it !



Also known as a Wide Area Network (WAN)

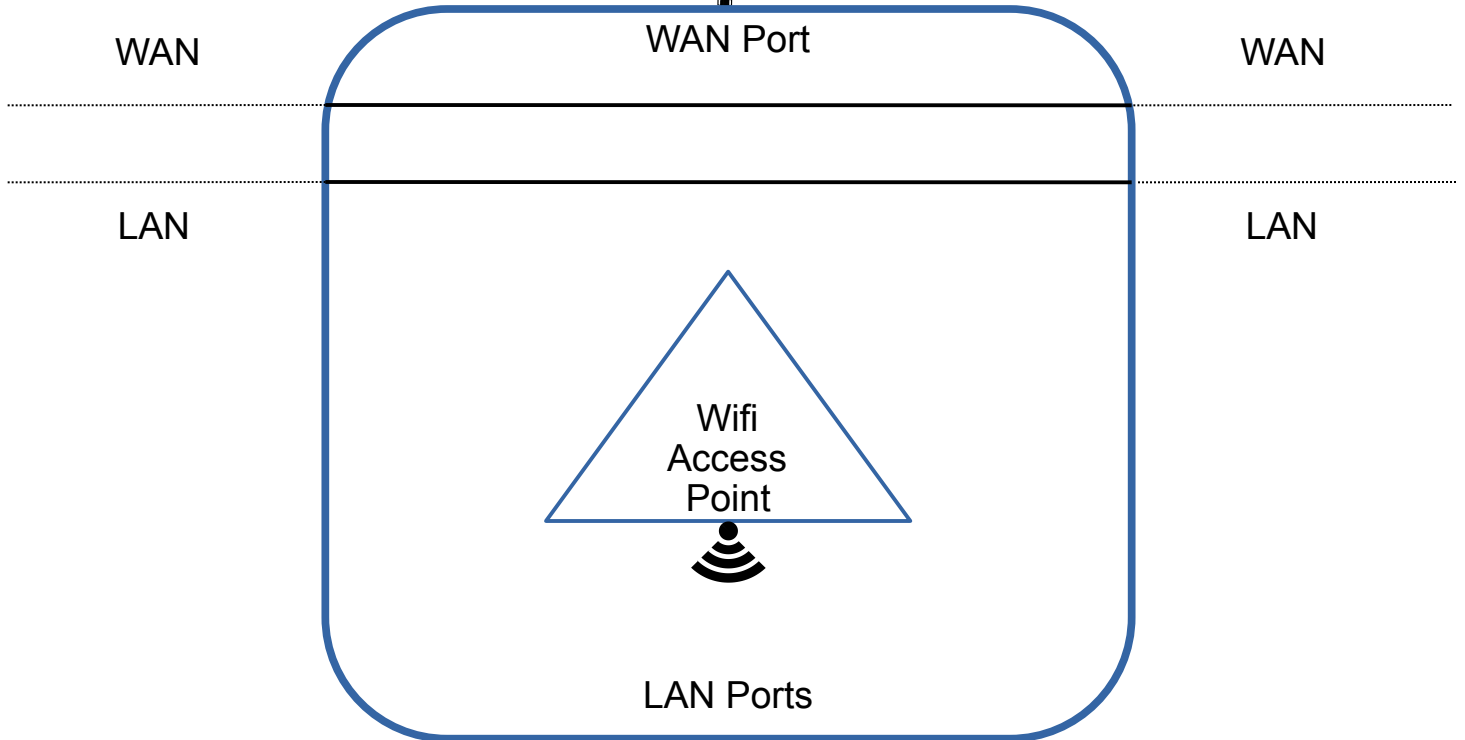
Your Internet Service Provider (ISP) such as Astound, Comcast or Verizon "rents" you a modem

Hint: Ask for a senior discount



The modem and router/wifi are sometimes combined into one box

Router/wifi



LAN (Local Area Network)

To connect to your router,
Read The Fine Manual
(RTFM)
that came with it.

Most routers have a Quickstart guide
and

router manuals are available on the vendor's website

Connect your computer to the router
with an ethernet cable plugged
into one of the LAN ports
or
using wifi

Open a browser
and type in the address
from the Quickstart guide

If this doesn't work...

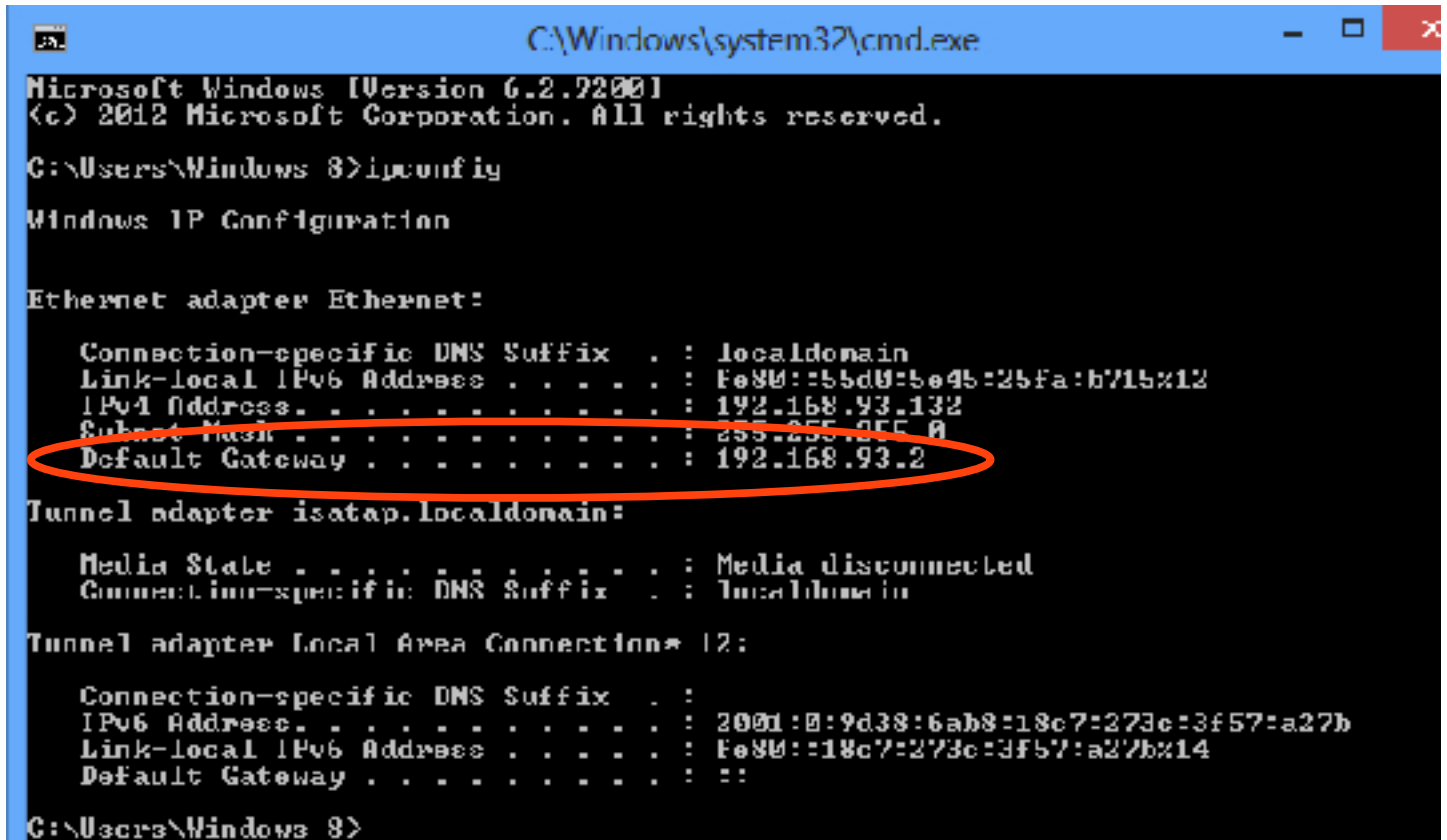
How to connect to your router if the previous method fails

Windows

Go to the start menu and select Run....

Type **cmd** in the box and click OK

At the C:> prompt type **ipconfig**



```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.2.9200]
(c) 2012 Microsoft Corporation. All rights reserved.

C:\Users\Windows 8>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

    Connection-specific DNS Suffix  . : localdomain
    Link-local IPv6 Address . . . . . : Fe80::55d0:5e4b:25fa:b715%12
    IPv4 Address. . . . . : 192.168.93.132
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.93.2

Tunnel adapter isatap.localdomain:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : localdomain

Tunnel adapter Local Area Connection* 12:

    Connection-specific DNS Suffix  . :
    IPv6 Address. . . . . : 2001:0:9d38:6ab8:18c7:273e:3f57:a27b
    Link-local IPv6 Address . . . . . : Fe80::18c7:273e:3f57:a27b%14
    Default Gateway . . . . . :

C:\Users\Windows 8>
```

The number after Default Gateway is the address to enter in your browser (192.168.93.2)

Mac OS

Click the Apple icon in the top left corner.

Click "System Preferences".

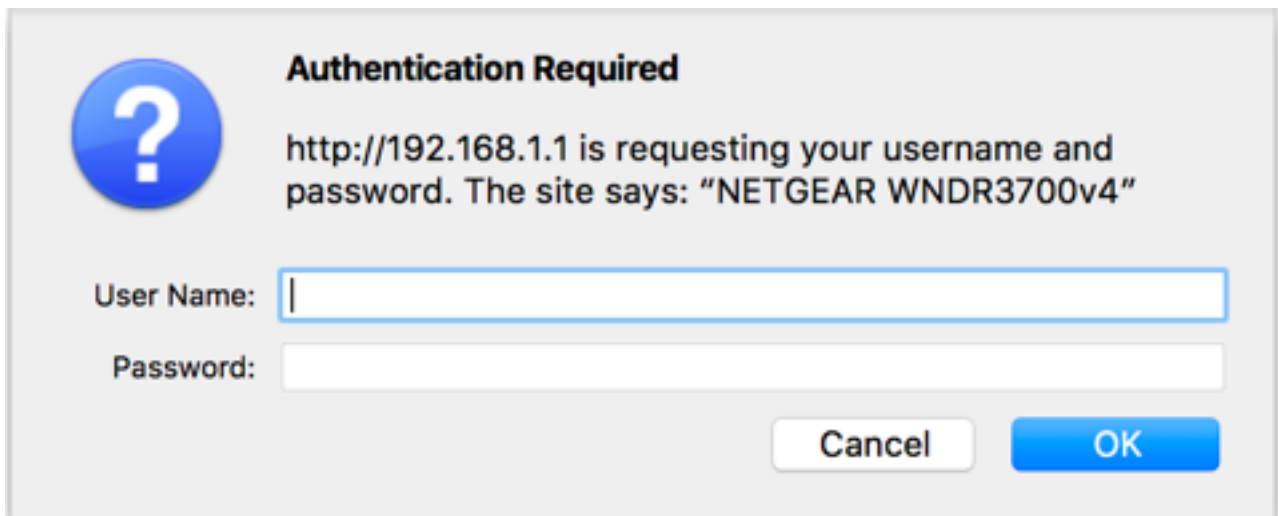
Click "Network".

The default gateway will appear next to "Router".

Usually it will end in .1 and look like
192.168.0.1 or 192.168.1.1 or 10.JK.MN.1

Type this address In your browser and hit enter.

When you see something that looks like this:

A screenshot of a web browser's authentication dialog box. It features a blue circular icon with a white question mark on the left. The title is "Authentication Required". The main text reads: "http://192.168.1.1 is requesting your username and password. The site says: 'NETGEAR WNDR3700v4'". Below this, there are two input fields: "User Name:" followed by a white text box with a blue border, and "Password:" followed by a white password box with a blue border. At the bottom right, there are two buttons: a white "Cancel" button and a blue "OK" button.

Success: we can talk to the router!

Now we need to remember the User Name and Password

For most routers:

User Name is admin

Unfortunately, the default password is password

This "password" should always be changed!!

Note: This is not the wifi password
which is usually printed
on a sticker on the router

Router Home Page

The screenshot displays the Netgear Genie router's home page. At the top left, the logo reads "NETGEAR genie" with "WNDR3700v4" below it. On the top right, there is a "Logout" button and the text "Router Firmware Version V1.0.1.52". Below the logo, there are two tabs: "BASIC" (selected) and "ADVANCED". A language dropdown menu is set to "Auto".

A vertical navigation menu on the left side includes the following items: Home (selected), Internet, Wireless, Attached Devices, Parental Controls, ReadySHARE, and Guest Network.

The main content area features six status tiles arranged in a 2x3 grid:

- Internet:** Status is **GOOD**.
- Wireless:** SSID: **NETGEAR11**, Password: **yellowe...**
- Attached Devices:** Number of devices: **1**
- Parental Controls:** Status: **NOT ENABLED**
- ReadySHARE:** Status: **No USB drive**
- Guest Network:** Status: **NOT ENABLED**

Change the router password!

WNDR3700v4

BASIC

ADVANCED

ADVANCED Home

Setup Wizard

WPS Wizard

▶ Setup

▶ ReadySHARE

▶ Security

▼ Administration

[Router Status](#)

[Logs](#)

[Attached Devices](#)

[Backup Settings](#)

[Set Password](#)

[Firmware Upgrade](#)

▶ Advanced Setup

Set Password

× Cancel

Apply ▶

Old Password

password

Set Password

Repeat New Password

Enable Password Recovery

Internet (WAN) setup

Internet Setup

Test

x

Cancel

Apply



Does your Internet connection require a login?

Yes

No

Account Name (If Required)

WNDR3700v4



Domain Name (If Required)

Internet IP Address

Get Dynamically from ISP

Use Static IP Address

IP Address

64. 131. 273. 6

IP Subnet Mask

255. 255. 255. 0

Gateway IP Address

64. 131. 273. 1

Domain Name Server (DNS) Address

Get Automatically from ISP

Use These DNS Servers

Primary DNS

64. 131. 273. 25

Secondary DNS

- - -

Third DNS

- - -

Usually you don't have to change anything here

Wireless setup

Wireless Settings

Region Selection

Region:

Wireless Network (2.4GHz b/g/n) ¹

- Enable SSID Broadcast
- Enable Wireless Isolation

Name (SSID): ²

Channel: ⁵

Mode:

Security Options

- None
- WPA-PSK [TKIP]
- WPA2-PSK [AES] ³
- WPA-PSK [TKIP] + WPA2-PSK [AES]
- WPA/WPA2 Enterprise

Security Options (WPA2-PSK)

Passphrase: ⁴ (8-63 characters or 64 hex digits)

Wireless Network (5GHz a/n) ¹

Rest of web page deleted

1. Wifi frequencies: this router supports both 2.4 GHz and 5 GHz.
2. SSID: Service Set Identifier. The wifi network's name.
3. WPA2-PSK [AES]: The **ONLY** security option you should use to encrypt your home network. All the others can be hacked.
4. Security passphrase. Combining 2-3 words and a number is a good way to create a passphrase (or a password).
5. Channel – See next slide.

Wifi Channels - 2.4 GHz and 5 GHz

2.41 – 2.48 GHz: 11 channels in the US

- Original Wifi channels – very crowded
- Microwave ovens, bluetooth and many other devices use this range

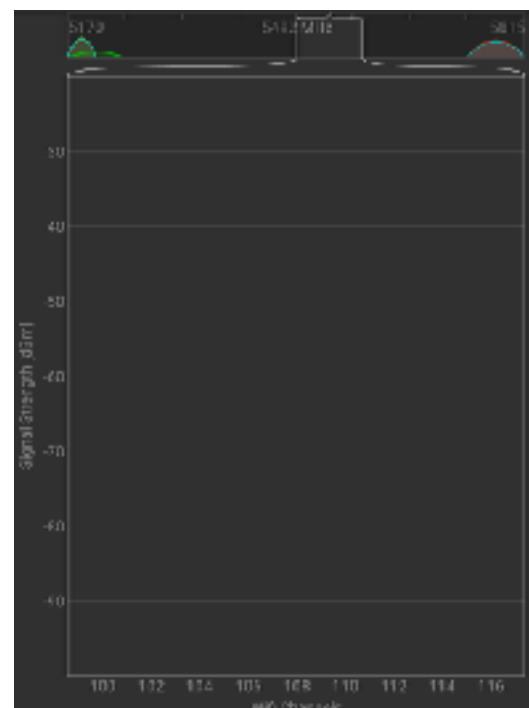
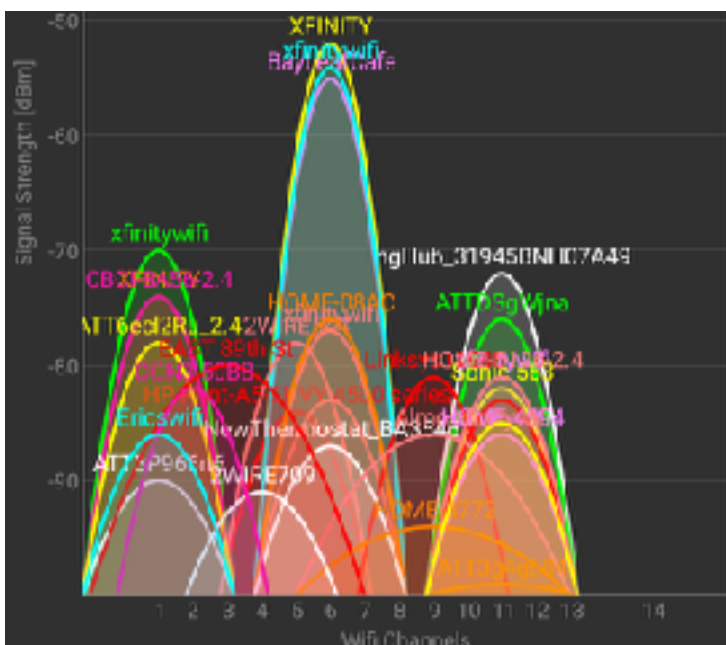
5.17 – 5.83 GHz: 45 channels in the US

- ✓ Newer channels that are much less used
- × Older devices don't have radios that can use them
- × Shorter range and poorer wall penetration

Wifi Analyzers

- Android - [Wifi Analyzer](#)
- IOS – [Airport Utility](#) (See Appendix) or [Network Analyzer](#)
- Mac OS – [Wifi Scanner](#) (\$)
- Windows - [NirSoft WifiInfoView](#) or [Wifi Analyzer](#)

Wifi Channels at the Bay Leaf Cafe in Concord



Locating your Wifi AP and Selecting a Channel

General rules of thumb

- Central location in the house
- Minimize metal around the router (Glass mirrors are bad)
- Don't put the AP on top of other electronics or objects which give off heat.
- Higher can be better.
- If it is easy and convenient to run an ethernet cable, use a hard wire connection. My roku and laptop in my office are hard-wired (Don't forget to turn off the laptop wifi).
- Flexibility in locating your AP may be a good reason not to have the AP bundled with the ISP modem.
- Put older devices on the 2.4GHz band and newer devices on the 5 GHz band (if the 5 GHz has acceptable range).
- The auto channel setting may or may not be effective.

Frequency/Channel selection

- Using a Wifi Analyzer app, walk to the corners of your house and/or property and record the channels with the largest signals.
- Choose another channel and configure the AP.
- Measure your AP's signal at the corners of your house/property and use an internet speed app on your portable device to measure upload/download speeds. (<https://www.speakeasy.net/speedtest/>)
- If you still have issues, try a different channel or moving the AP.
- If you still have issues...

Solving Issues with more Hardware

From Wikipedia

(Full disclosure – I have no experience with this hardware)

Wifi Extenders

A wireless repeater (also called wireless range extender) takes an existing signal from a wireless router or wireless access point and rebroadcasts it to create a second network.

- Wireless interference with other networks on the same channel is at least doubled.
- Throughput is reduced by at least 50%

New Hardwired AP

Hardwire a LAN port on the new AP to a port on the router

- Ethernet wire if practical
- AC Power Line extender such as the TP-Link AV500 Nano Powerline Adapter Starter Kit

(\$32 and has 4 stars for over 6K reviews on Amazon)

Mesh Network

Network nodes talk to other available nodes and relay traffic

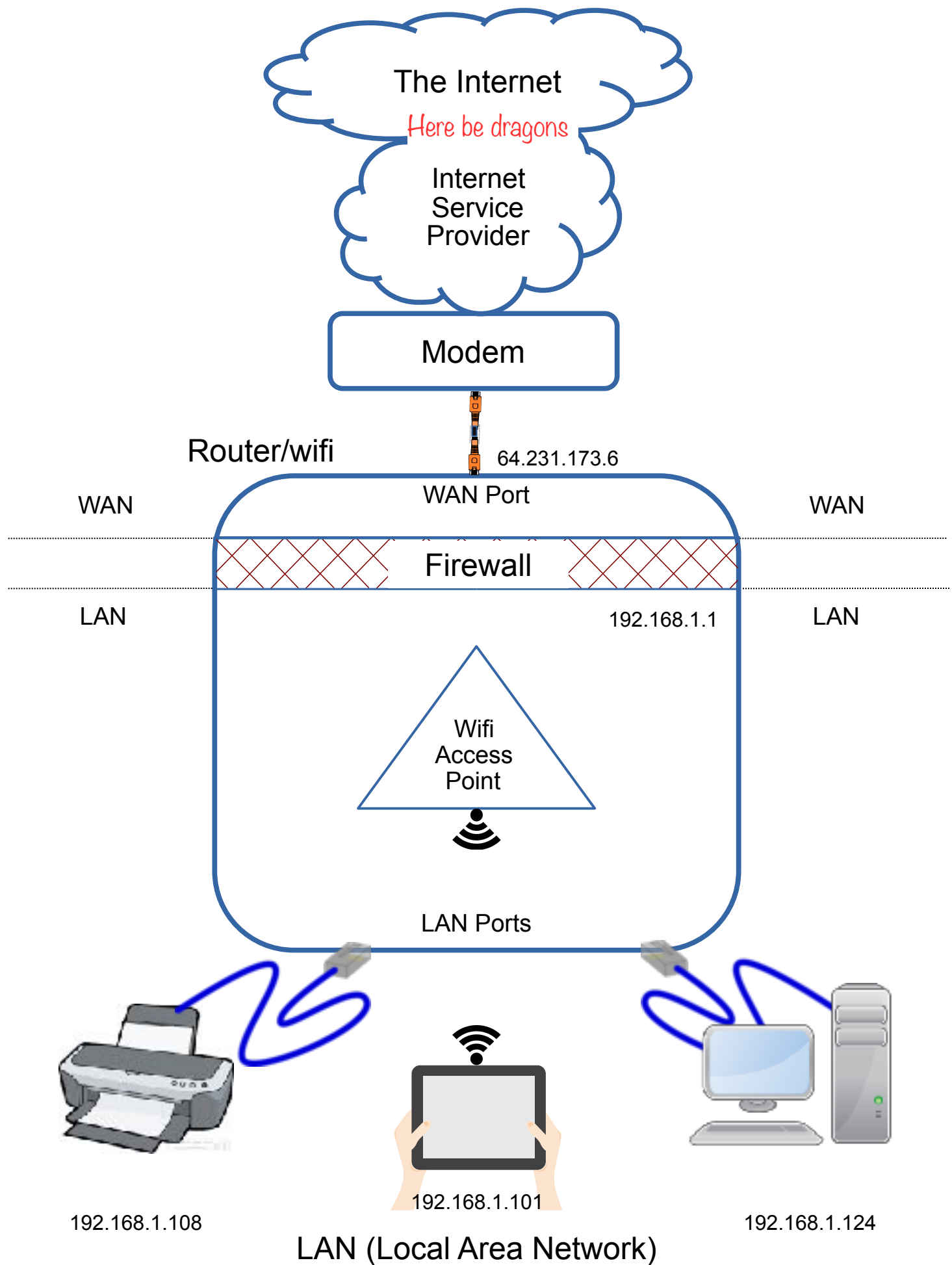
- Designed for simple configuration
- Relatively new and expensive
- Could be the technology which solves your wifi problem

Firewall

From Wikipedia

A firewall is a network security system that monitors and controls the incoming and outgoing network traffic based on predetermined security rules.

A firewall typically establishes a barrier between a trusted, secure internal network and another outside network, such as the Internet, that is assumed not to be secure or trusted.



Testing your firewall

<https://www.grc.com/shieldsup>

Click on Proceed

Click on All Service Ports

The following page will appear



PASSED

**TruStealth
Analysis**

PASSED

Note: This tests both your router and computer firewalls

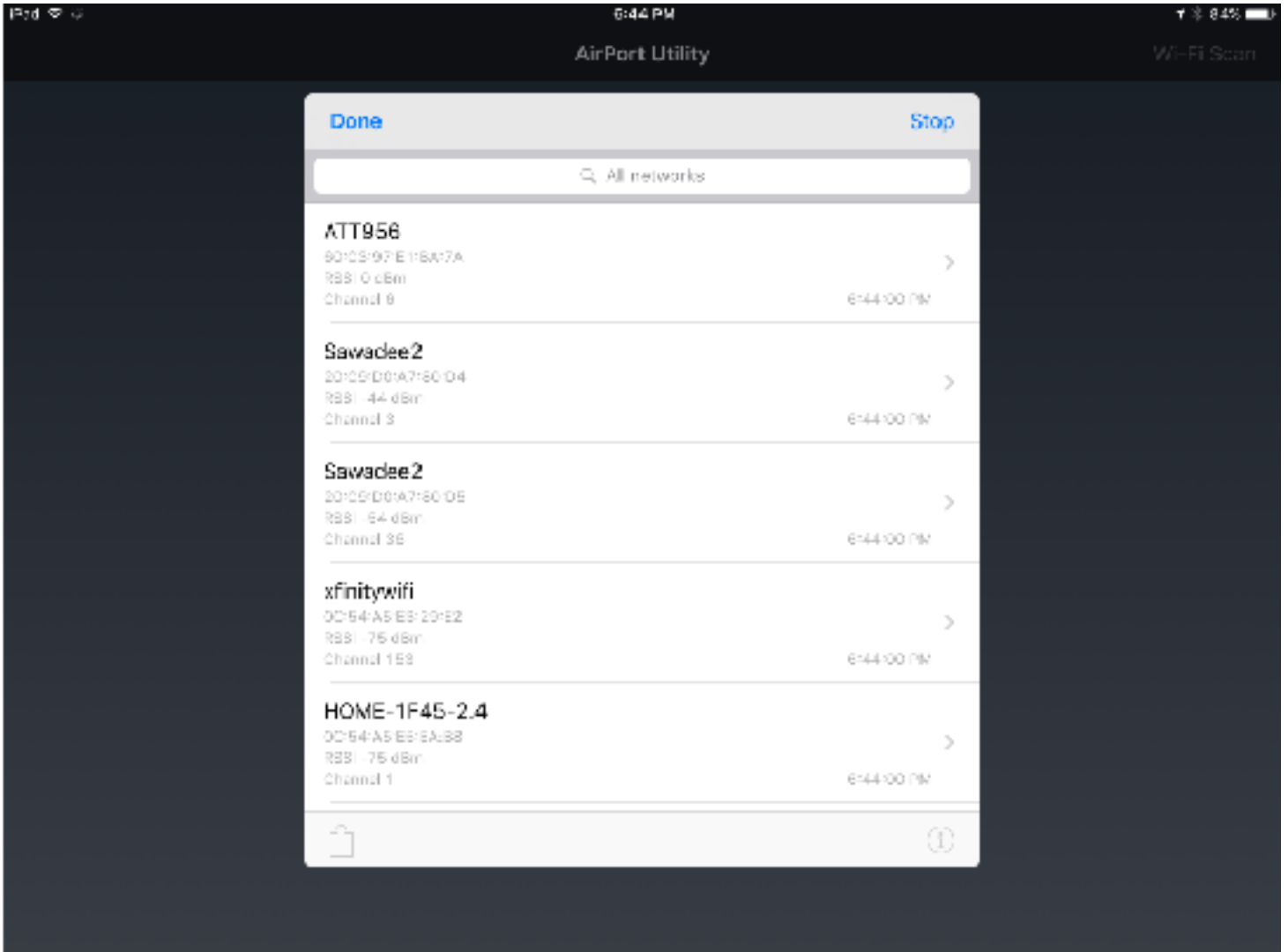
Appendix

Thanks to Neil Schmidt for finding these instructions
and the following screenshots

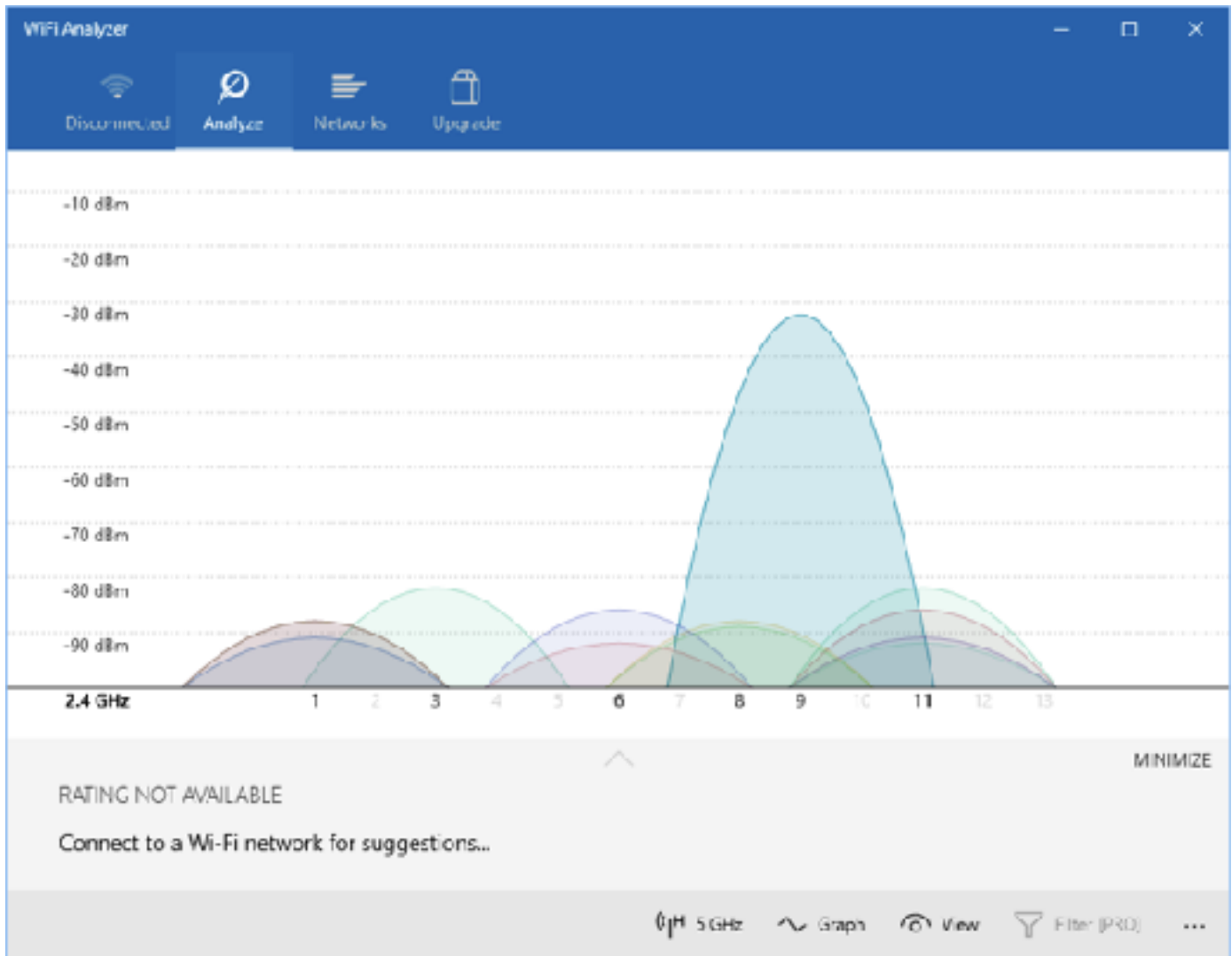
Choosing the best WiFi channel using iOS:

1. Download the AirPort Utility via Appstore.
2. Go to iOS settings and find Airport utility
3. Turn WiFi scanner on.
4. Open Airport utility.
5. Tap Scan and again Scan.
6. Wait 10 sec.
7. Now you can see all the networks with their channels and levels.
8. Remember the channels of top 3 networks. Those channels are not for you.
9. Now you can stop scanning.
10. Tap on a "i" button.
11. Now you can see the most busy WiFi channels.
12. Now you know which channels are free or not so busy. Don't forget about #8

IOS "Airport Utility" App



Windows "Wifi Analyzer" App (Analyze Screen)



Windows "Wifi Analyzer" App (Networks Screen)

The screenshot displays the 'Networks' screen of the Windows 'Wifi Analyzer' application. The interface features a blue header with navigation icons for 'Disconnected', 'Analyze', 'Networks', and 'Upgrade'. The main content area lists five available networks, each with a signal strength bar and detailed information.

Network Name	BSSID	Manufacturer	Channel	Signal Strength	Frequency	Mode	Security
Sawadee1	10:C3:7B:44:9:1D8	ASUSTek COMPUTER INC., TW	CH 9	-29 dBm	2.452 GHz	802.11n	WPA2 (RSNA-PSK, AES-CCMP)
Sawadee2	20:C9:D0:A7:00:D4	Apple, Inc, US	CH 3	-82 dBm	2.422 GHz	802.11n	WPA2 (RSNA-PSK, AES-CCMP)
*****HIDDEN	FA:A0:97:EC:01:A4		CH 11	86 dBm	2.462 GHz	802.11n	WPA2 (RSNA-PSK, AES-CCMP)
HP-Print-E3-Officejet 6600	28:EA:A7:4C:7B:E3	Hewlett Packard, US	CH 11	-92 dBm	2.462 GHz	802.11g	WPA2 (RSNA-PSK, AES-CCMP)
xfinitywifi	0C:54:A5:E5E8:EA	PEGATRON CORPORATION, TW					

The bottom of the screen contains a control bar with icons for sorting, current view (PRO), showing less, filtering (PRO), and a menu.