# How to setup a home router and Wifi Access Point

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SIR Branch 8

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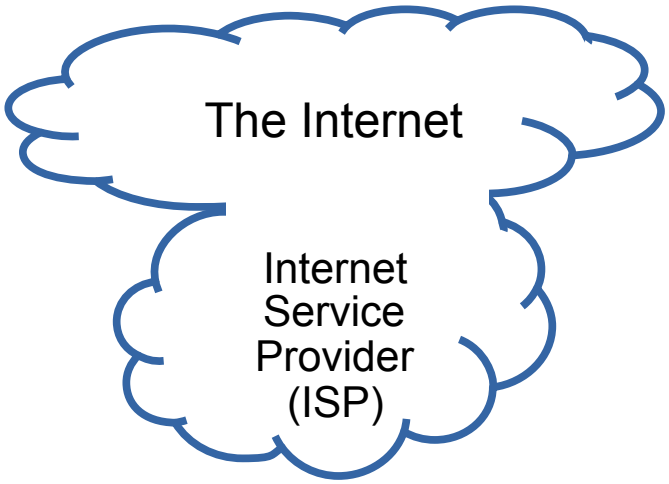
Please ask questions at any time

# Your home without a router




Also known as a Wide Area Network (WAN)

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

# Router Firmware Options

Vendor Firmware

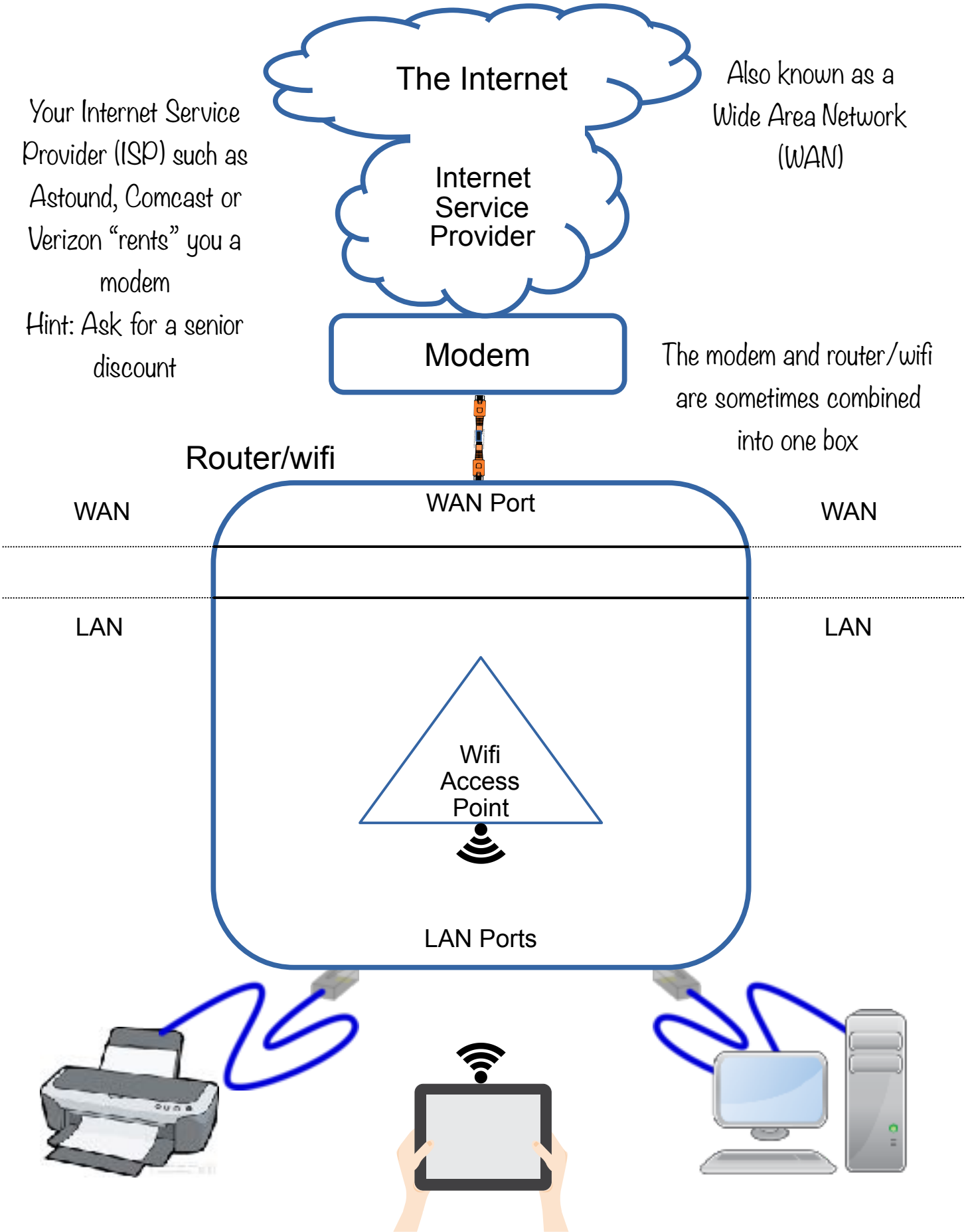
- Default for most installed routers
- It's there, vendor can help, should just work

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 !




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

Hint: Ask for a senior discount

Also known as a Wide Area Network (WAN)

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

LAN (Local Area Network)

To connect to your router,
**R**ead **T**he **F**ine **M**anual
(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

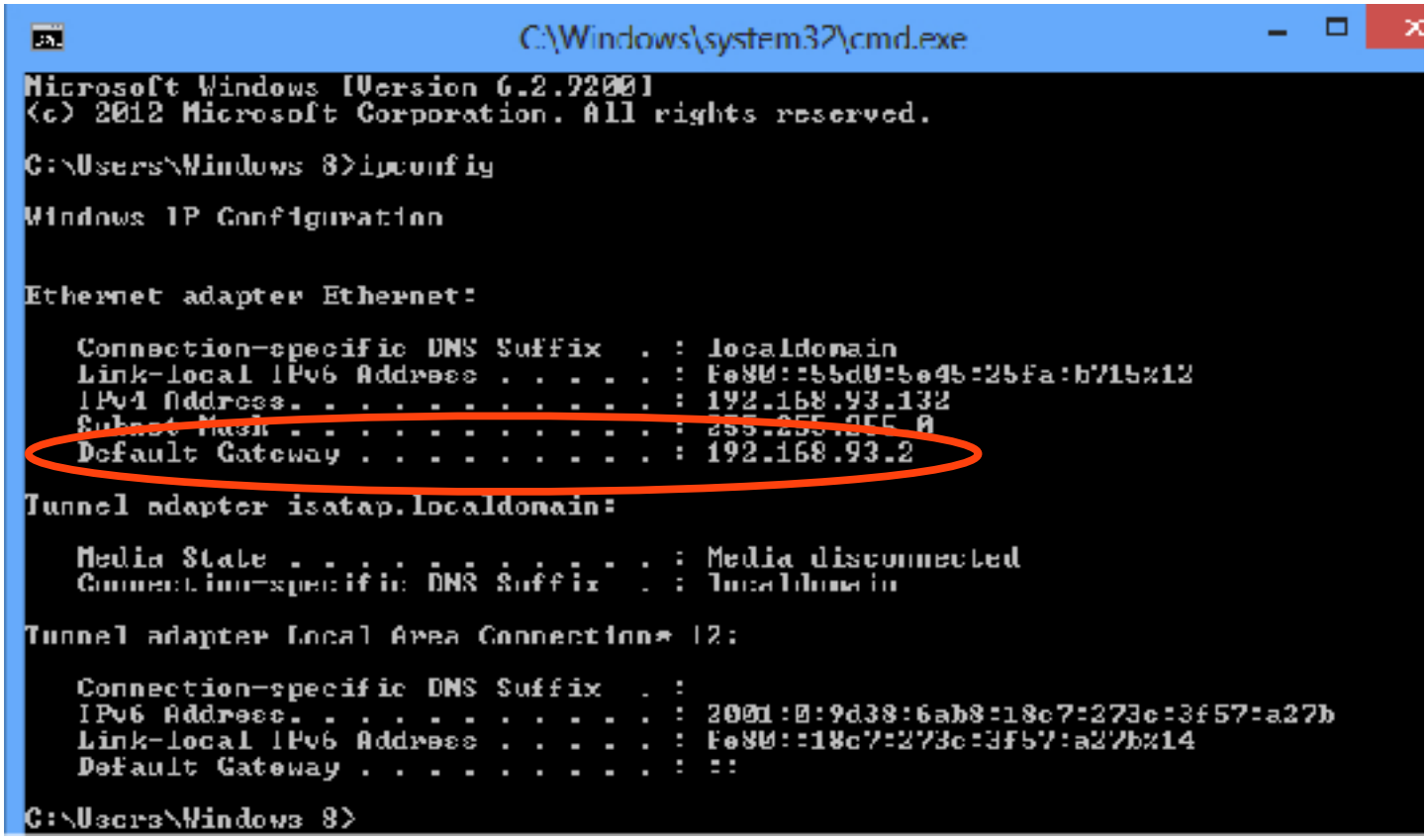
Open a browser
and type in the address
from the Quickstart guide

If this does'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**




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

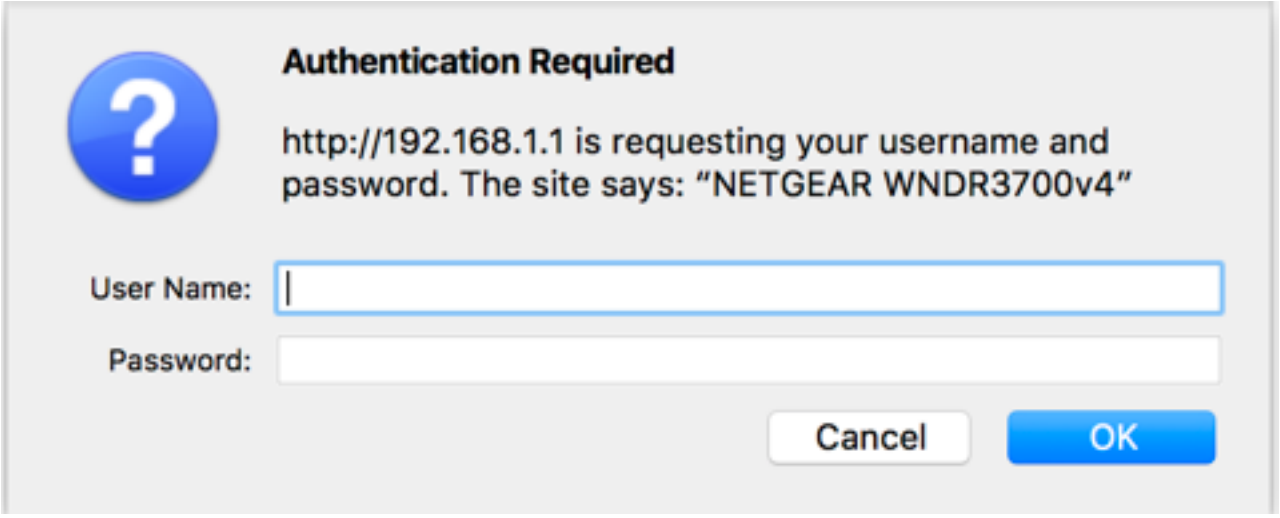
## Mac OS

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:




Success: we can talk to the router!

Now we need to remember the User Name and Password

For most routers:

User Name is admin

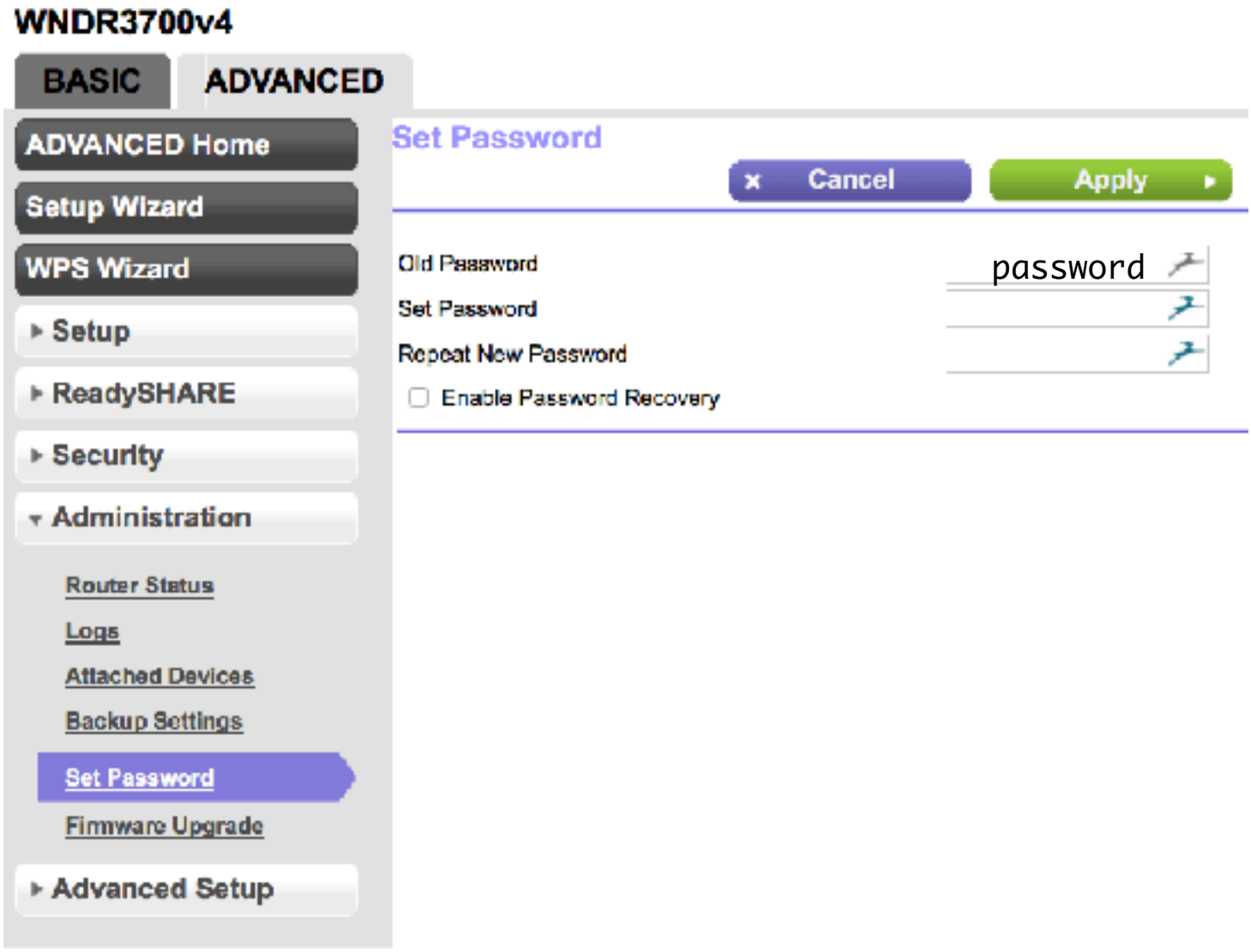
Unfortunately, the default password is password

This "password" should always be changed!!

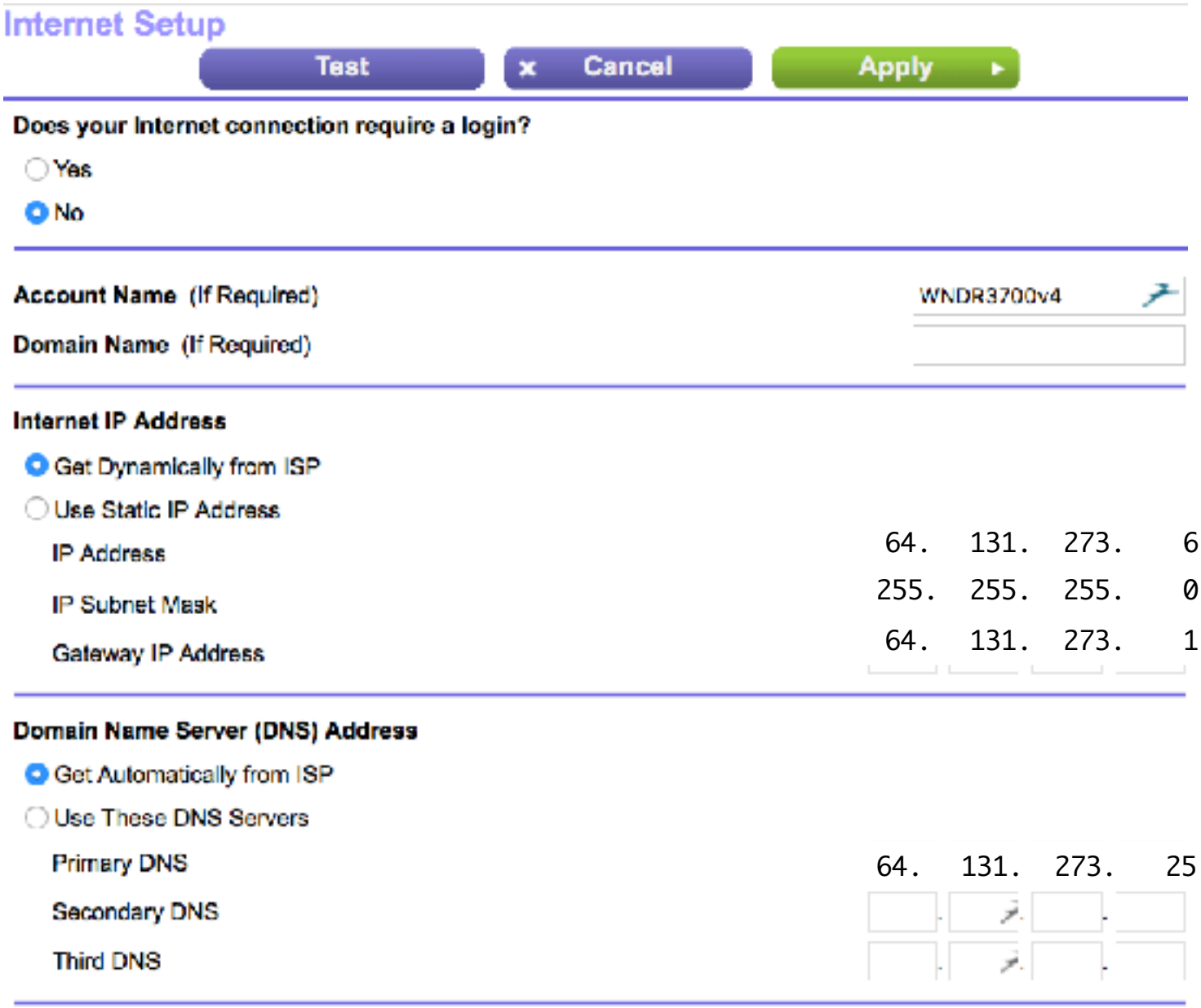
Note: <u>This is not the wifi password</u>
which is usually printed
on a sticker on the router

# Router Home Page

# Change the router password!

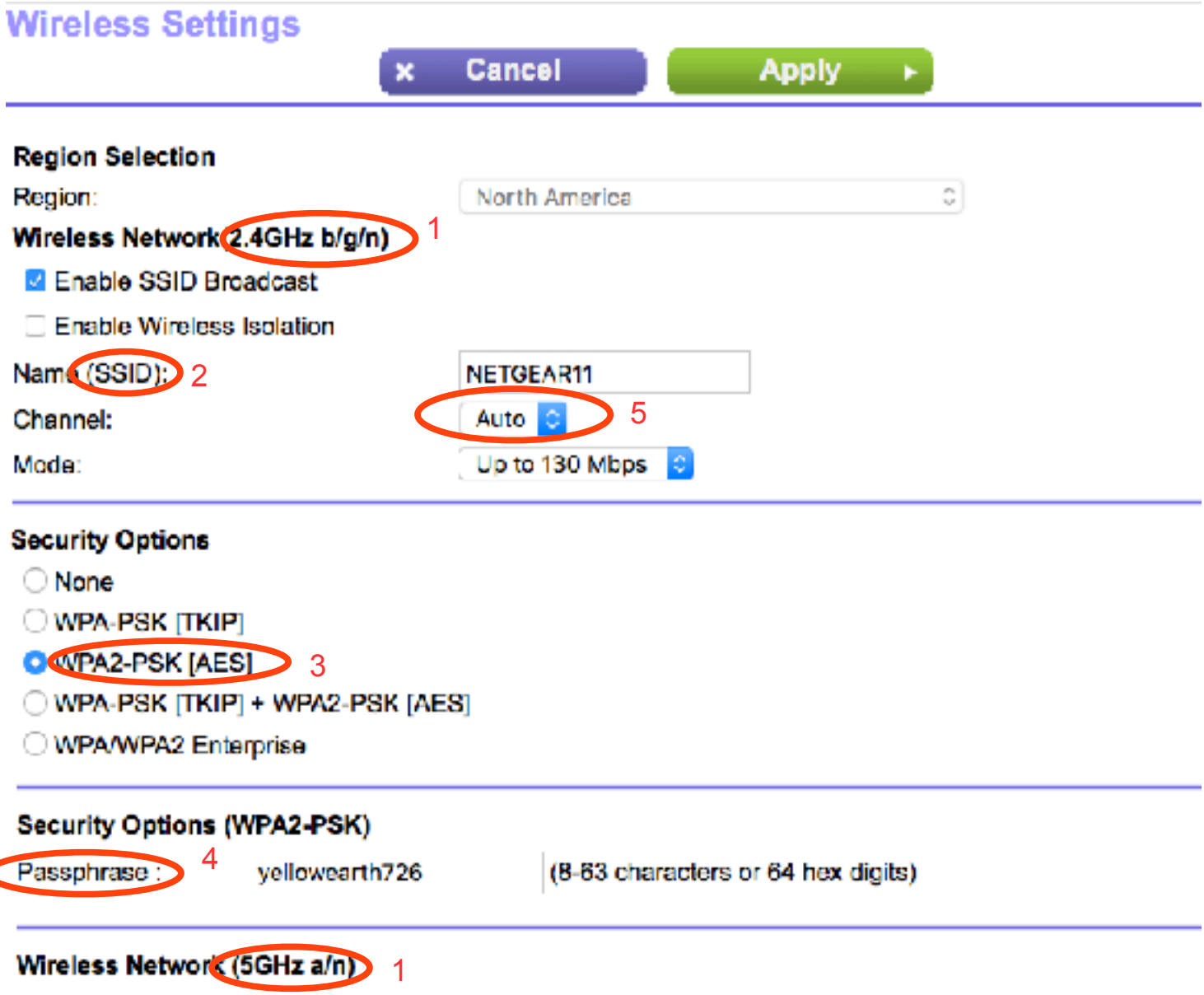


# Internet (WAN) setup




Usually you don't have to change anything here

# Wireless setup




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

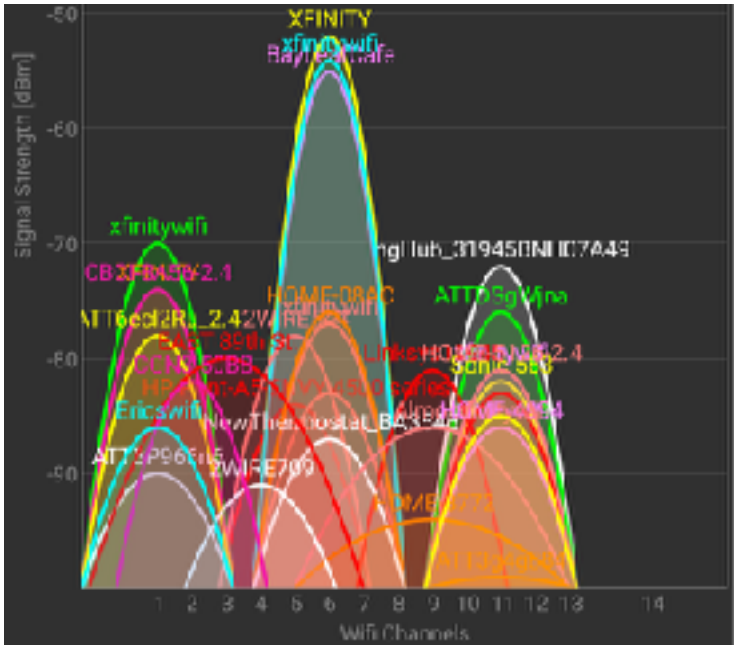
5.17 – 5.83 GHz: 45 channels in the US

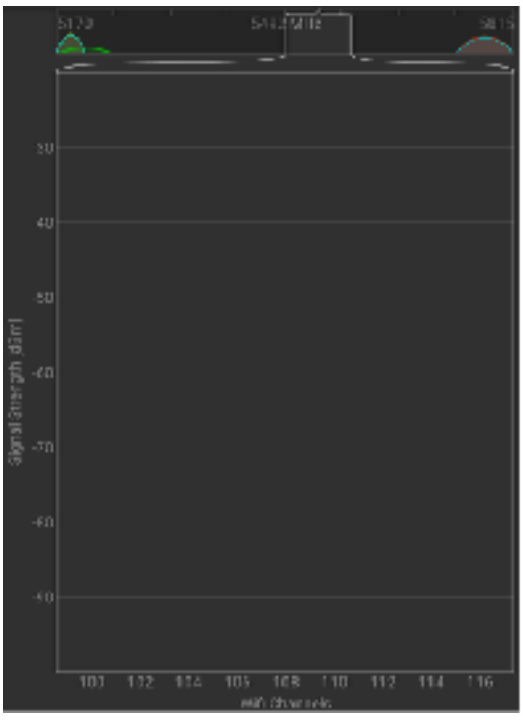
- ✓ Newer channels that are much less used
- ✗ Older devices don't have radios that can use them
- ✗ Shorter range and poorer wall penetration

# 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

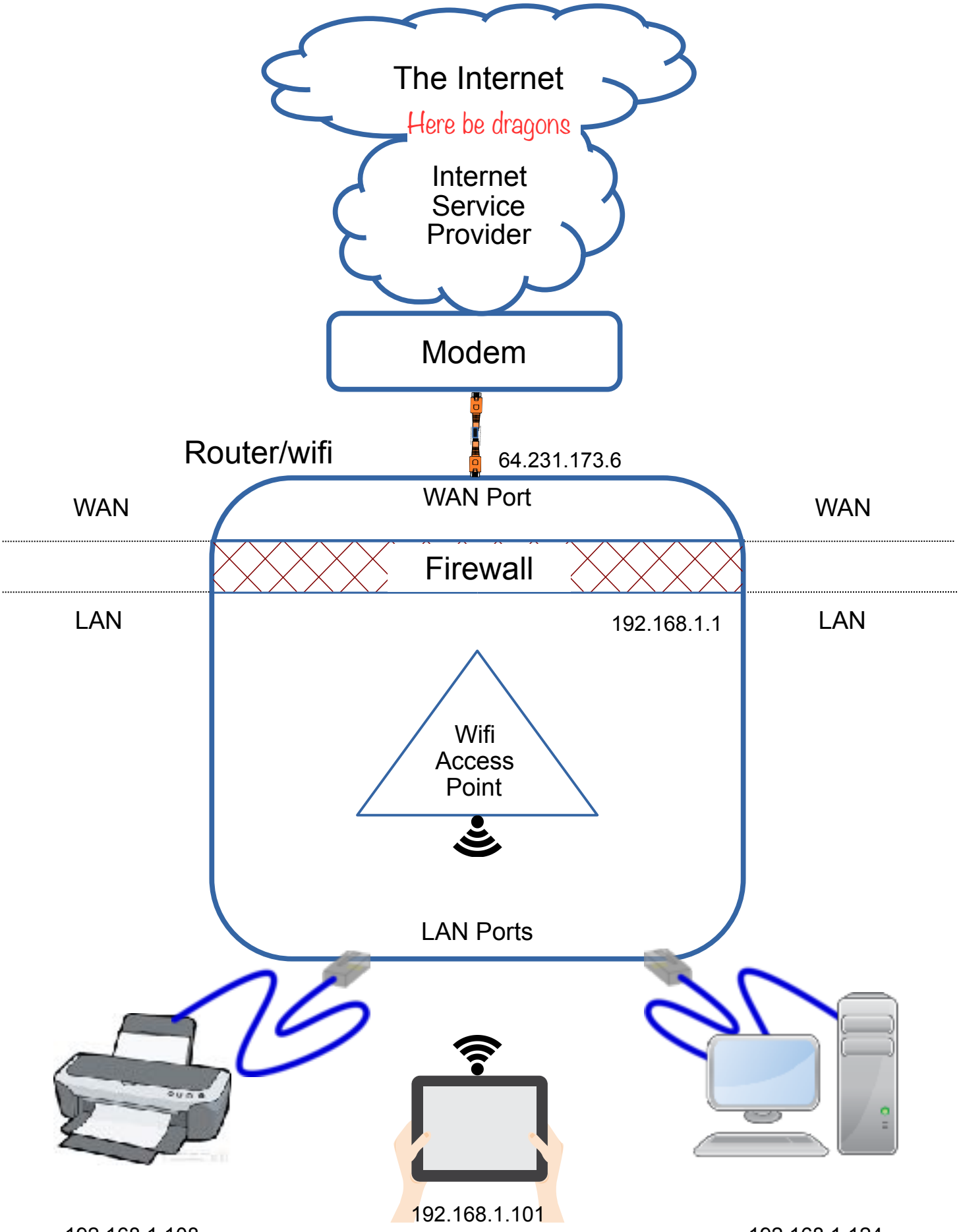
- Designed for simple configuration
- Relatively new and expensive
- Could be the technology which solves your wifi problem

# 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.


The Internet
Here be dragons
Internet Service Provider
Modem
Router/wifi
64.231.173.6
WAN
WAN Port
WAN
Firewall
LAN
192.168.1.1
LAN
Wifi Access Point
LAN Ports
192.168.1.108
192.168.1.101
192.168.1.124
LAN (Local Area Network)

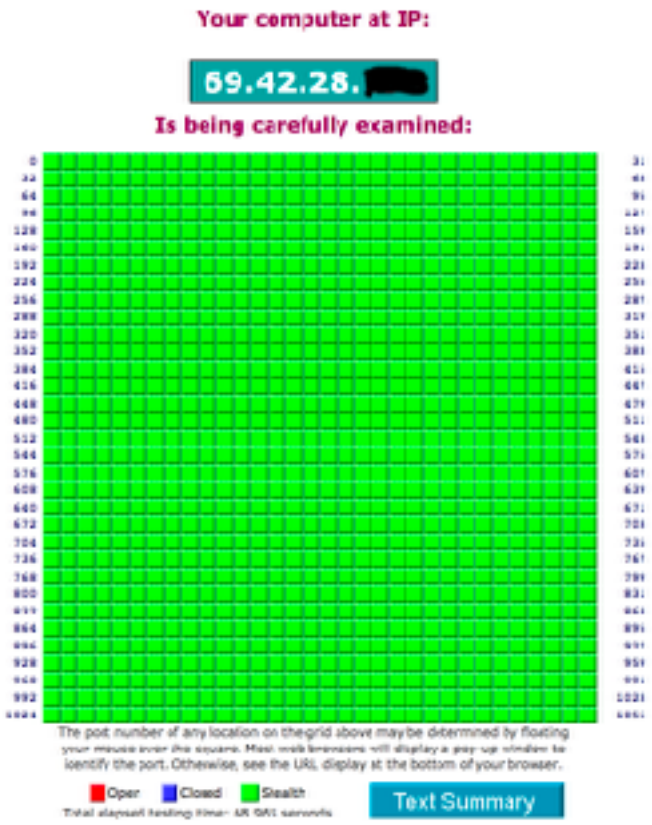
# Testing your firewall

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

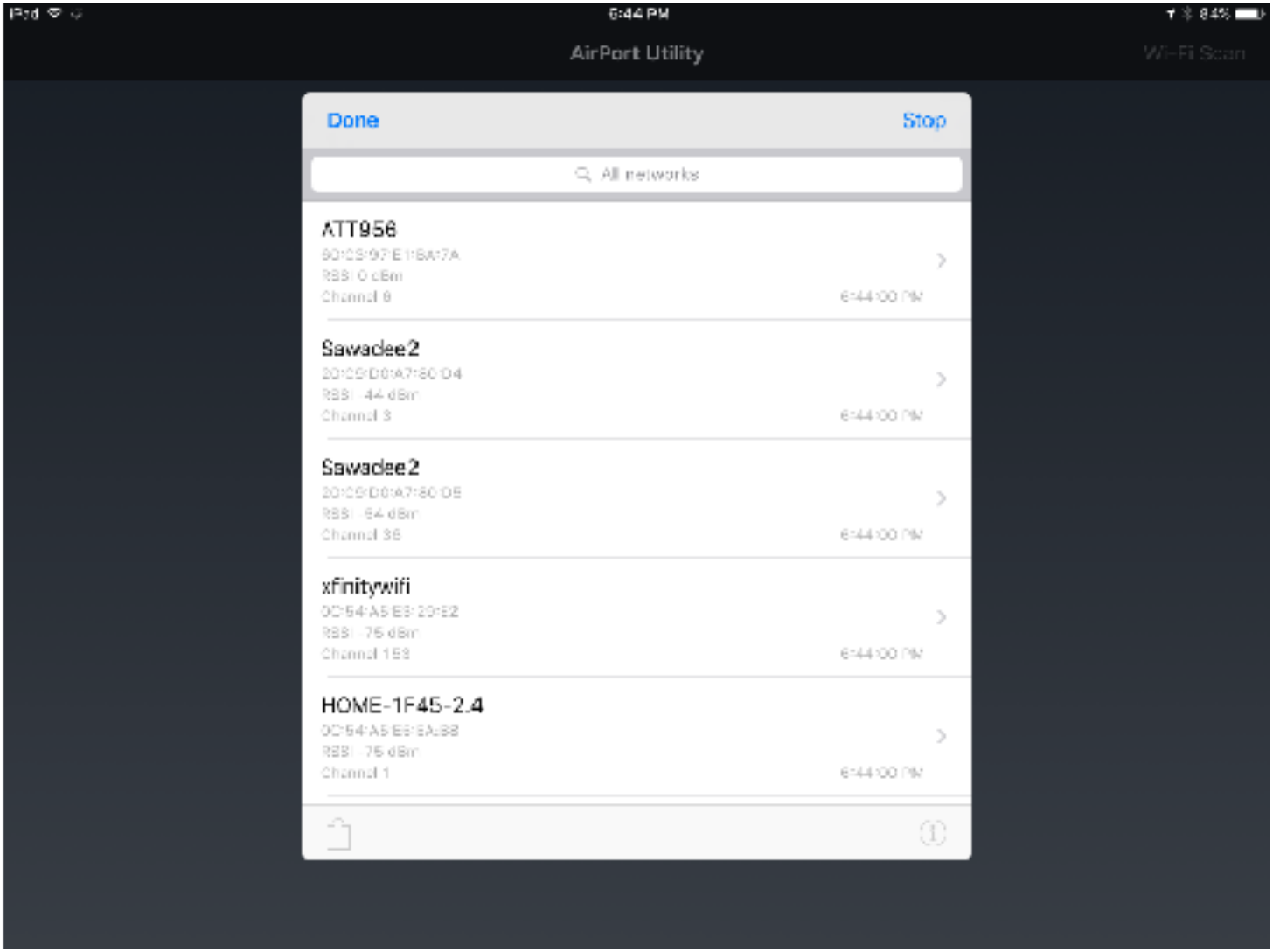
# Appendix

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

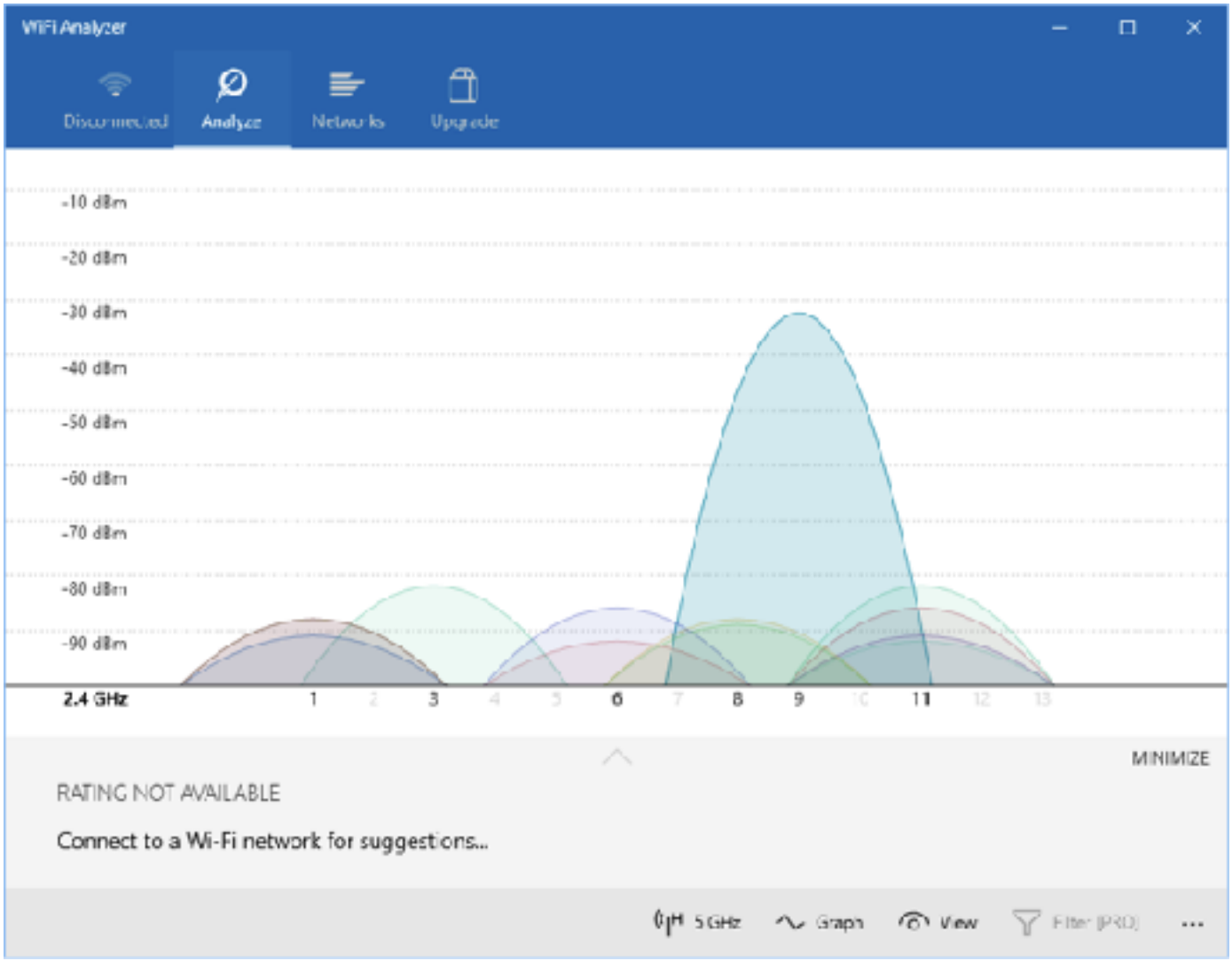
## Choosing the best WiFi channel using iOS:

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)