



# The Installation, Care and Feeding of a Mesh Router

Presentation to APCUG - 8/17/19

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# In the Beginning. . .

- Computers were personal
  - No connections (maybe a printer)
- Initial networking was dial-up
  - Bulletin boards, World Wide Web, Email
- Ethernet brought faster internal and external connections
  - Home networks, routers, switches, modems
- Wireless enabled mobility
  - Cellular, Wi-Fi, Bluetooth, Bluetooth LE, Zigbee

# What is Wi-Fi?

- Wireless network connection through RF link
- Uses 2.4 GHz, 5 GHz, 60 GHz (new)
  - ISM (industrial, scientific and medical) radio band
  - Internationally reserved, unlicensed band
  - Shared with cordless phones, Bluetooth, microwave ovens, garage door openers, baby monitors
  - Buildings, furnishings and other materials reflect and attenuate the signal
    - 300 ft in open air, 30 to 100 ft in buildings
    - Higher frequencies are attenuated more

# Wi-Fi Standards

- IEEE 802.11 standards (a, b, g, h, j, n, ac, ax)
  - Wi-Fi 4 or 802.11n is 72 - 600 Mbit/s link rate
  - Wi-Fi 5 or 802.11ac is 433 Mbit/s - 6.933 Gbit/s
  - Wi-Fi 6 or 802.11ax is 600 Mbit/s - 9.608 Gbit/s
- 802.11b/g/n can use 2.4 GHz
  - 11 channels, 5 MHz wide (US)
  - Channels must differ by 5 to not overlap
  - 1, 6 and 11 are only group of 3 non-overlapping
- 802.11a/h/j/n/ac/ax can use 5 GHz
  - At least 23 non-overlapping 20 MHz channels

# Wi-Fi Identification / Security

- SSID (Service Set Identifier)
  - Serve as network names
- Encryption
  - WEP (Wired Equivalent Privacy)
  - WPA (Wi-Fi Protected Access)
  - WPA2
  - WPA3 (new standard)
- VPN

# Wi-Fi Networks

- City-wide Wi-Fi
- Campus-wide Wi-Fi
- Wi-Fi ad hoc (no access point)
- Wi-Fi Direct
- Tunneled Direct Link Setup (TDLS)
- Mesh

# Wi-Fi Devices - Hosts

- Wi-Fi routers
- Access points
- Wireless bridges
- Range extenders or repeaters

# Wi-Fi Devices - Users

- Wireless network interface
  - Laptops
  - Desktops
  - Tablets
  - Smart phones
  - Printers
  - Smart home devices (voice operated assistants, smart speakers, cameras, thermostats, appliances, IoT, fitness trackers, etc.

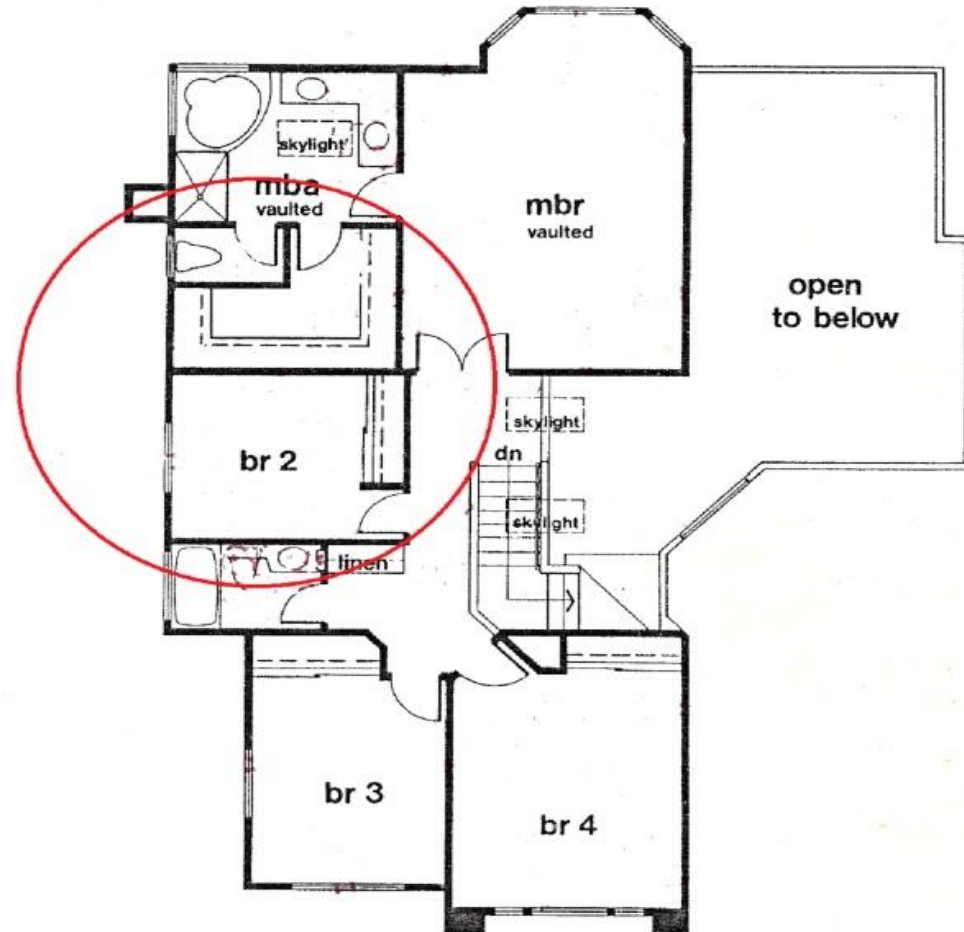
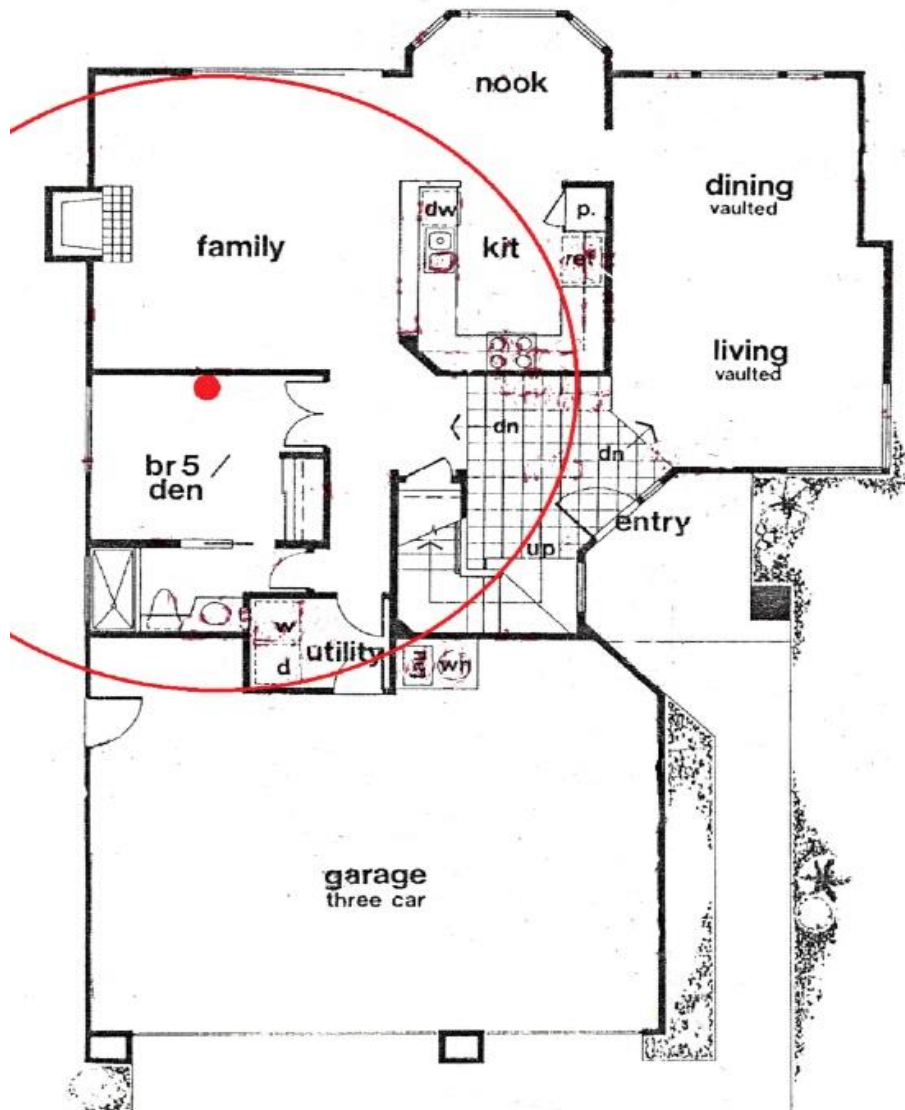


# My First Wi-Fi

- Location of wireless router poor for coverage
- TP-Link wireless access point - downstairs



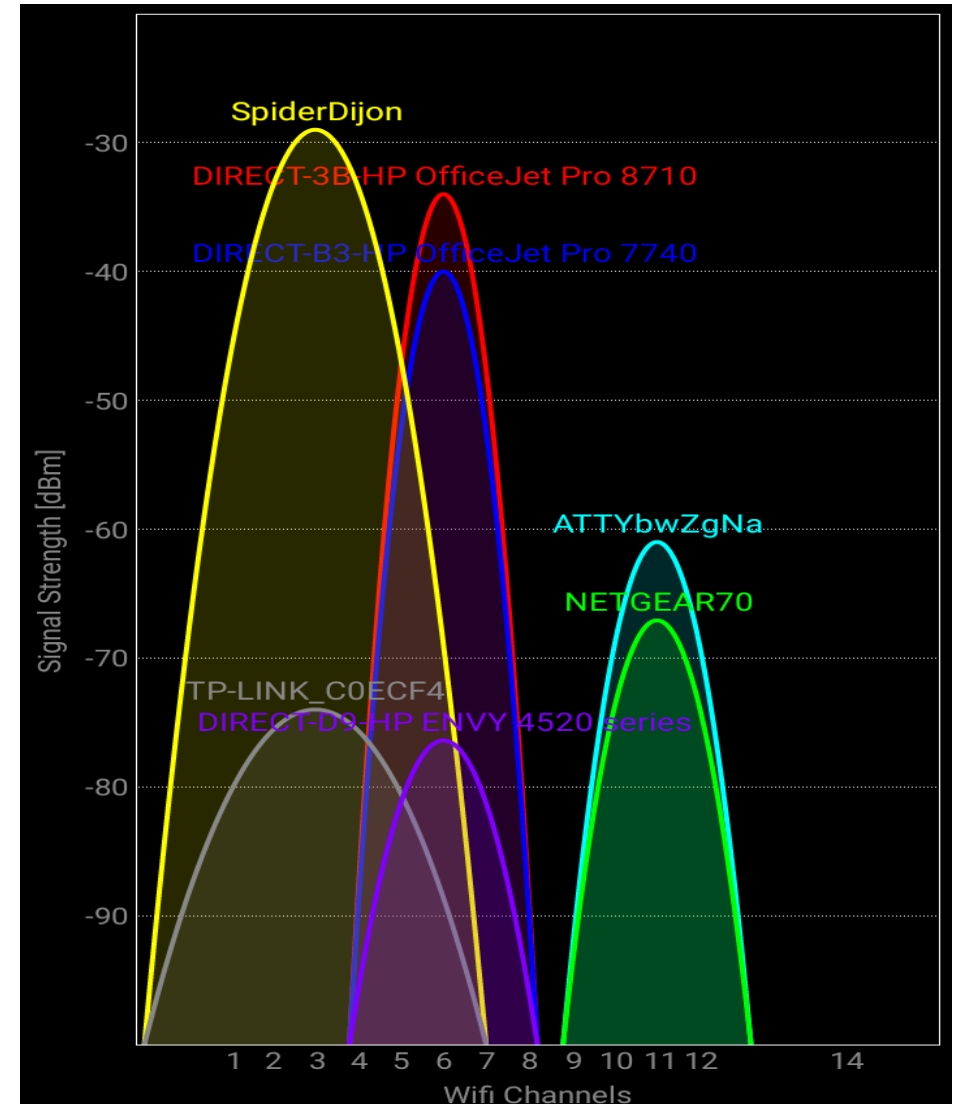
# Home Layout - WAP



# WiFi Analyzer - Android App

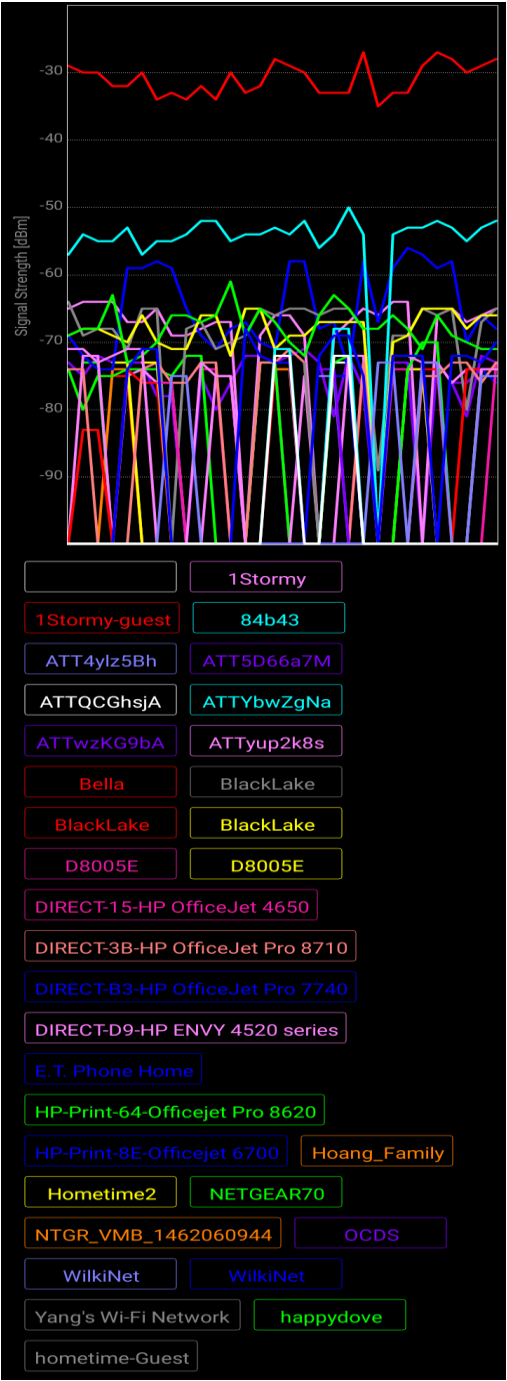
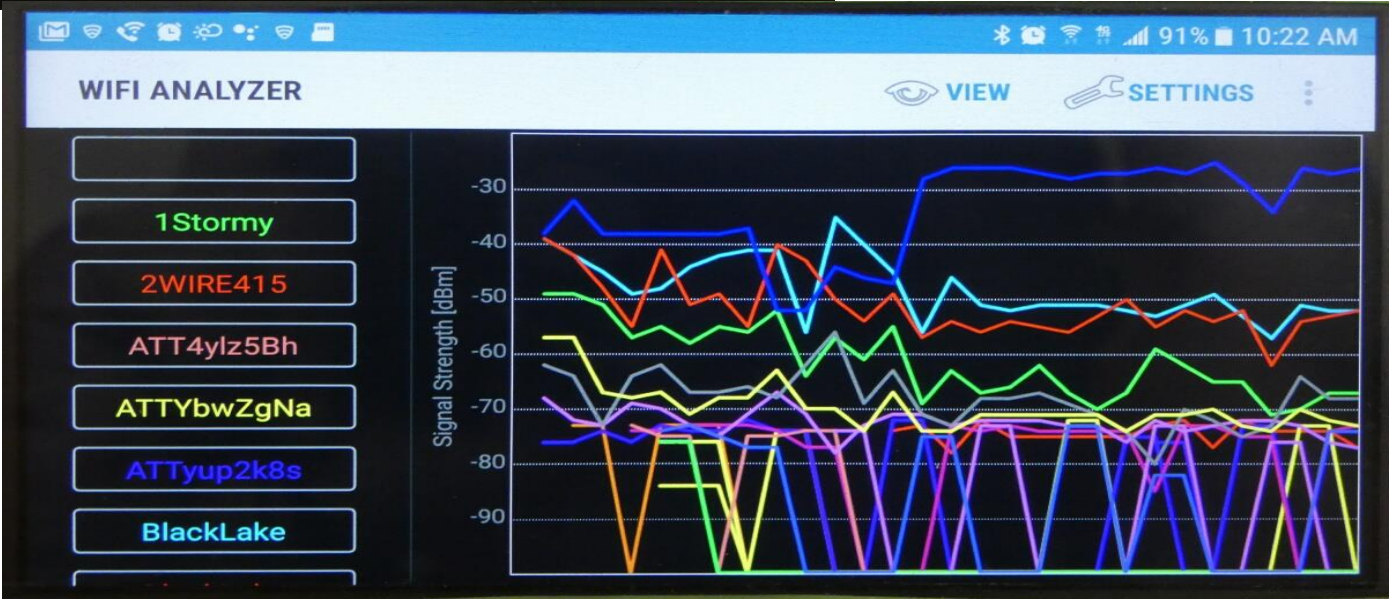
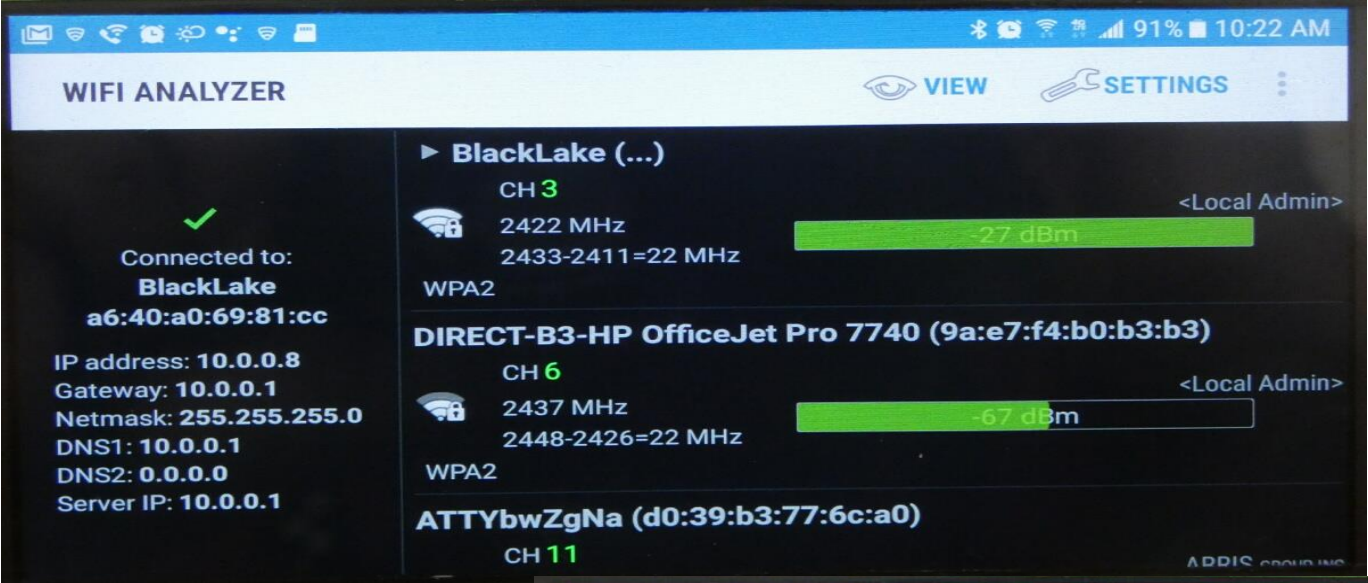
- By farproc
- In Google Play store
- Very useful
  - Near real time
  - Wi-Fi analysis
  - Identify signals
  - Network interference
  - Several screens
  - Snapshots
  - Free

br5



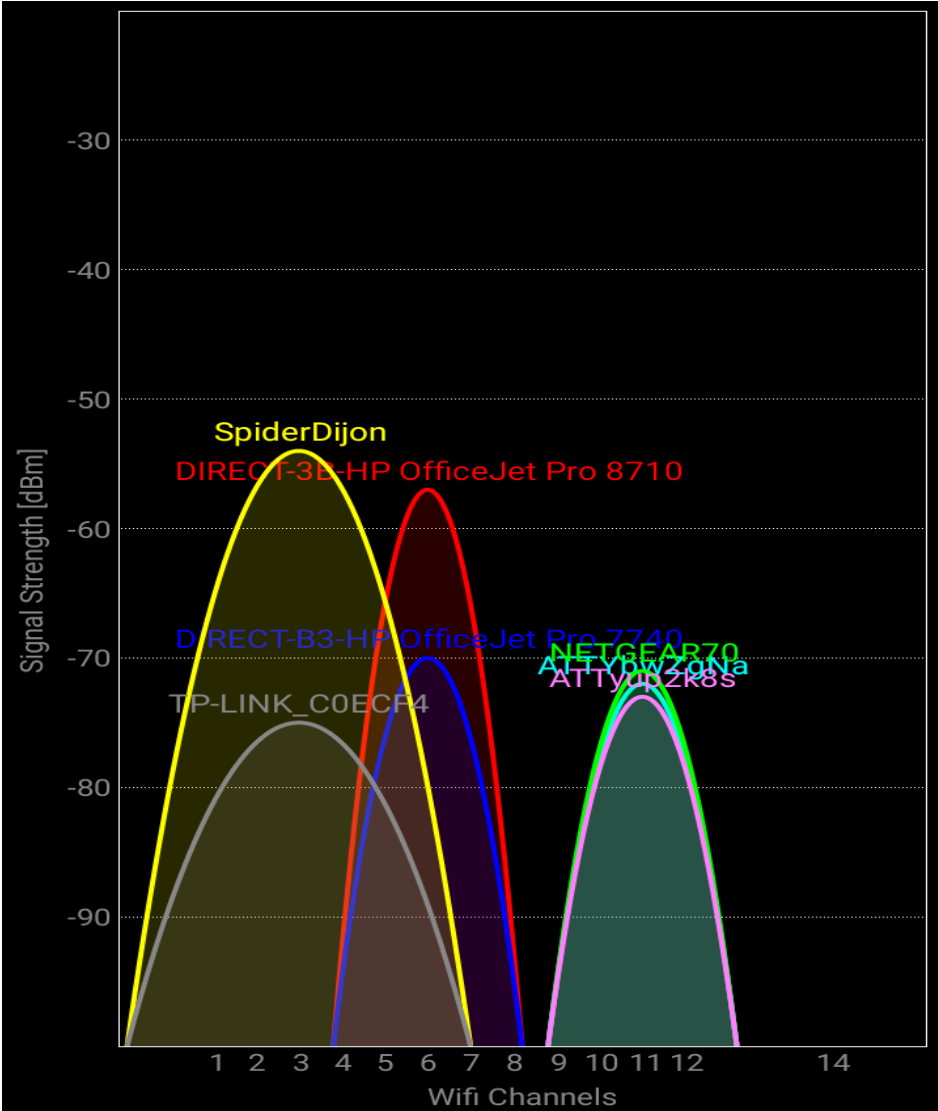


# Other Screens

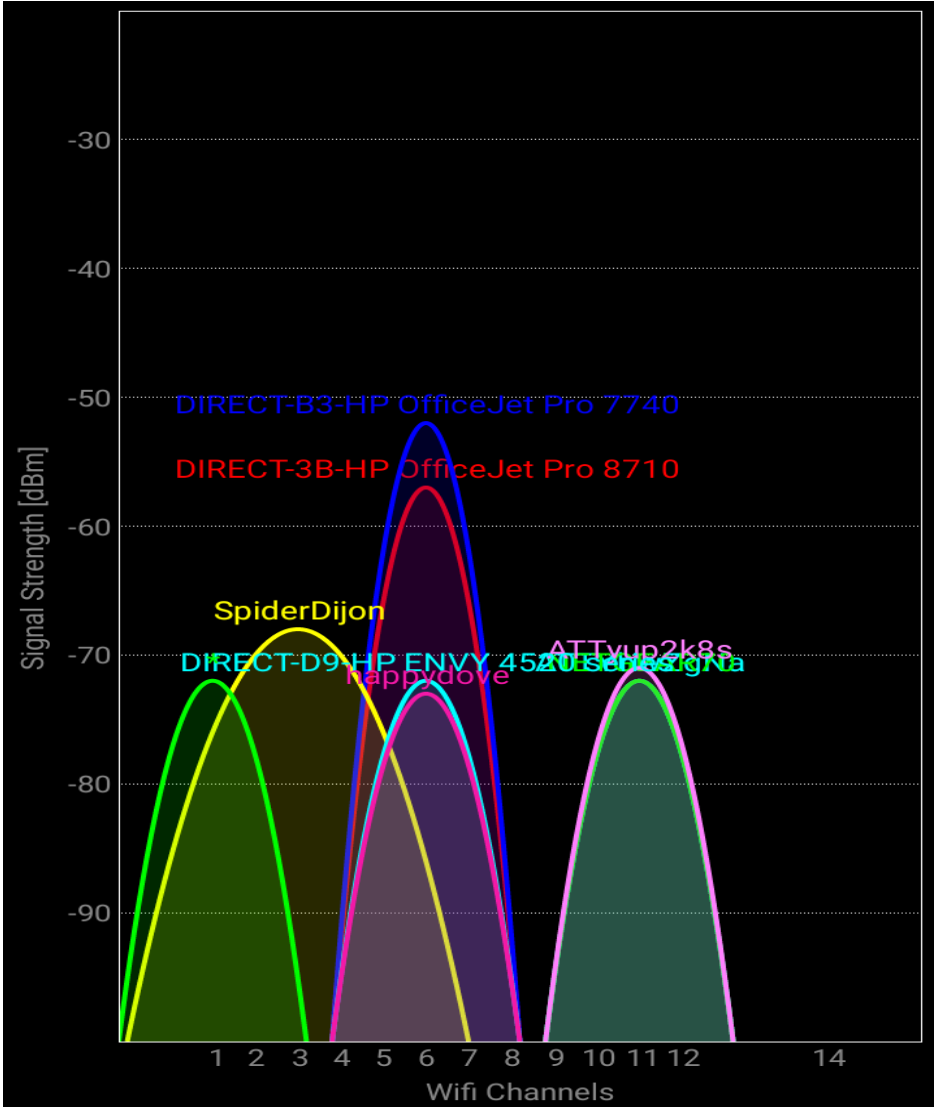


# With WAP

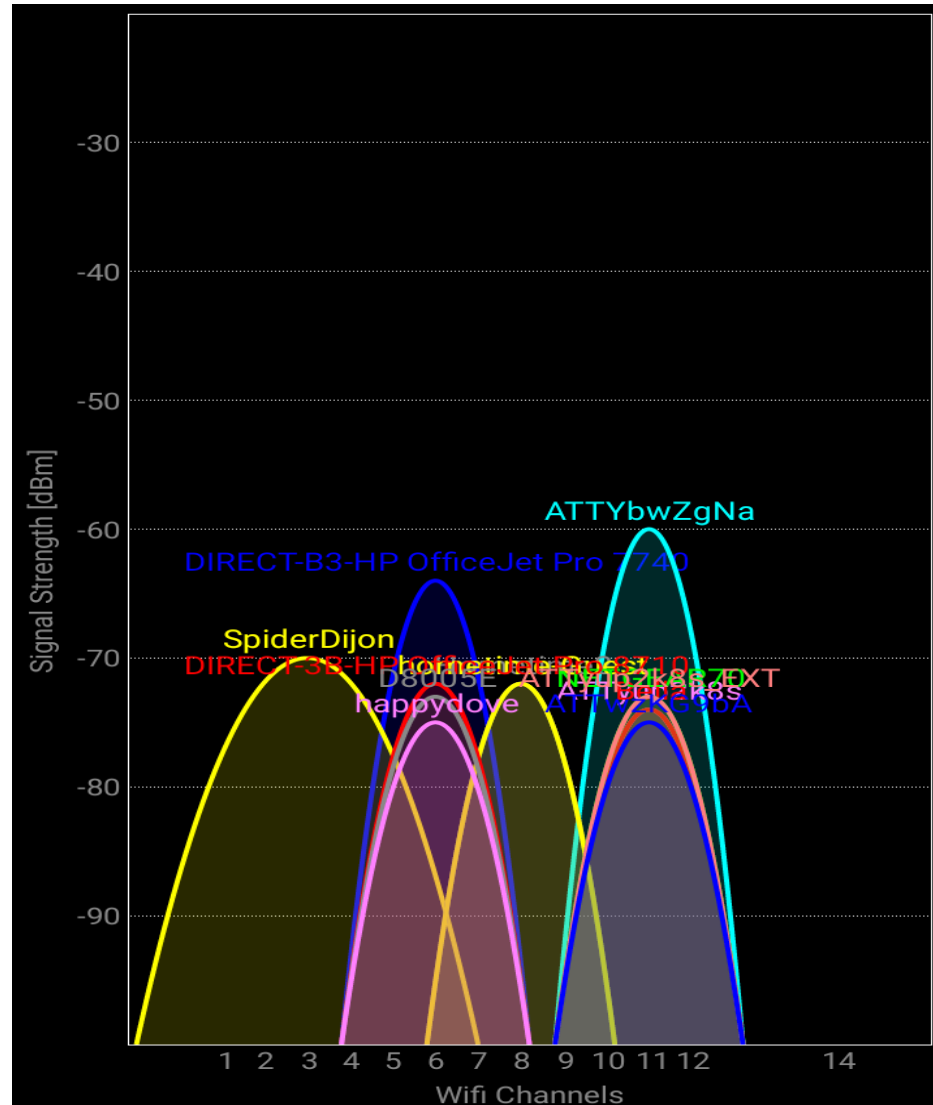
nook



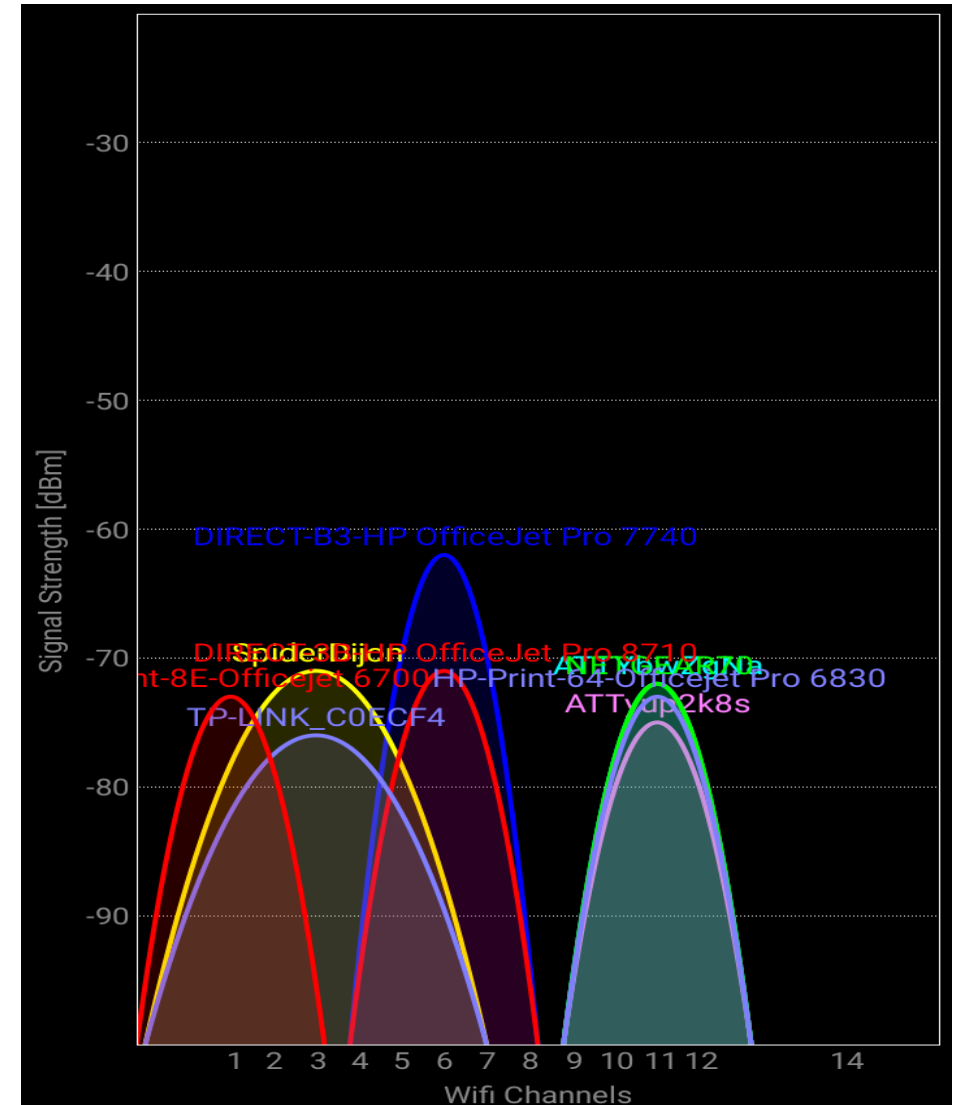
living



# With WAP



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mbr

# What is Mesh Wi-Fi?

- Modular whole-house Wi-Fi with a single SSID
- Main mesh router with one or more satellites
- Units work together (coordinate) to provide seamless coverage with no dead spots
- Great for larger homes or ones with lots of interference issues
  - Signal-blocking materials
  - Outside interference

# Mesh Features

- Mesh router has wired connection to home network
- Satellites connect to mesh router wirelessly (some can have wired connections)
- Modular - satellites can be added
- Seamless roaming with one SSID and password
- Router usually provides typical router features and capabilities



# Mesh Sources

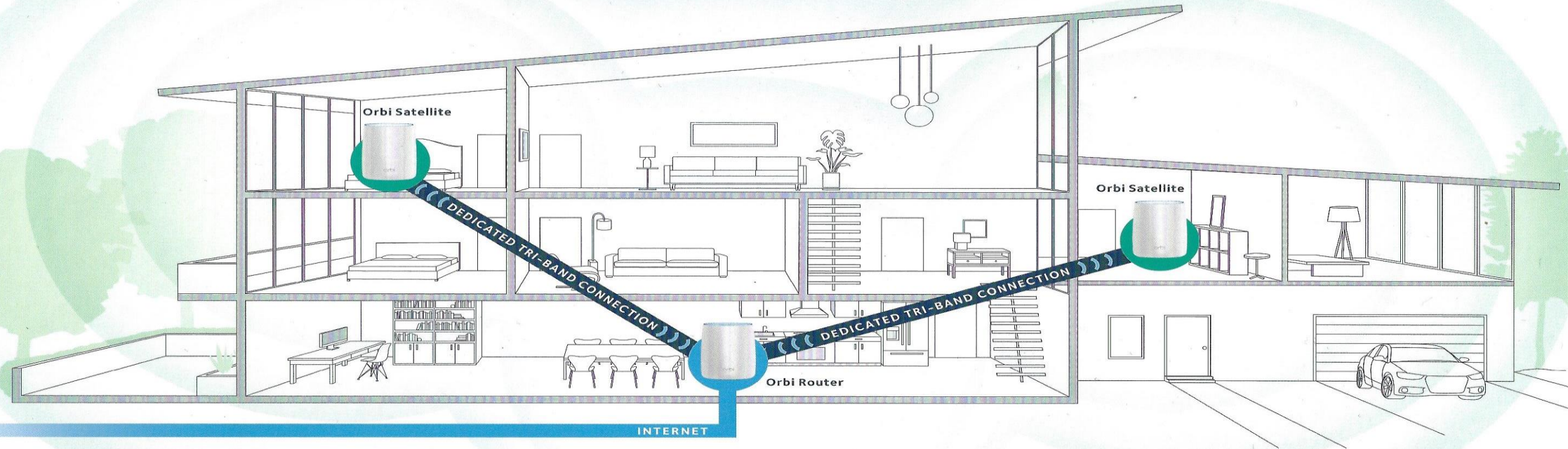
- Linksys Velop
- Netgear Orbi
- Asus Lyra
- Google WiFi
- Samsung Connect Home
- D-Link Covr
- Costs range from \$66 to \$500, depending on capabilities

# My Mesh System - Netgear Orbi

- AC3000 Three-unit (1 router, 2 satellites)
  - RBK53-100NAS
  - Utilizes tri-band RF communications between units
    - 802.11b/g/n 2.4 GHz x1, 802.11a/n/ac 5 GHz x2
  - Six high-performance antennas with high-powered amplifiers and beamforming
  - Quad-core 710 MHz processor
  - Has wired Ethernet ports (outputs only)
  - Easy setup (through apps or browser interface)
  - Works with Amazon Alexa and Google Assistant

# Orbi Typical Coverage

7,500 Square Feet of Orbi WiFi Coverage



Dedicated Tri-band Connection ensures devices connect directly to maximum Internet speeds

My documentation recommends this; the website also says satellites can be daisy-chained.

# Why Mesh? Why Orbi?

- Wanted good coverage throughout house for all my devices
  - Cameras, smart speakers, thermostat, light controllers, wife's iPhone
- Wanted front yard coverage for outside security cameras, back patio for web surfing
- Had good reviews (Cnet, Tom's Guide)
- Could have gone with a smaller system, but Costco had this one at a good price



# Orbi Devices

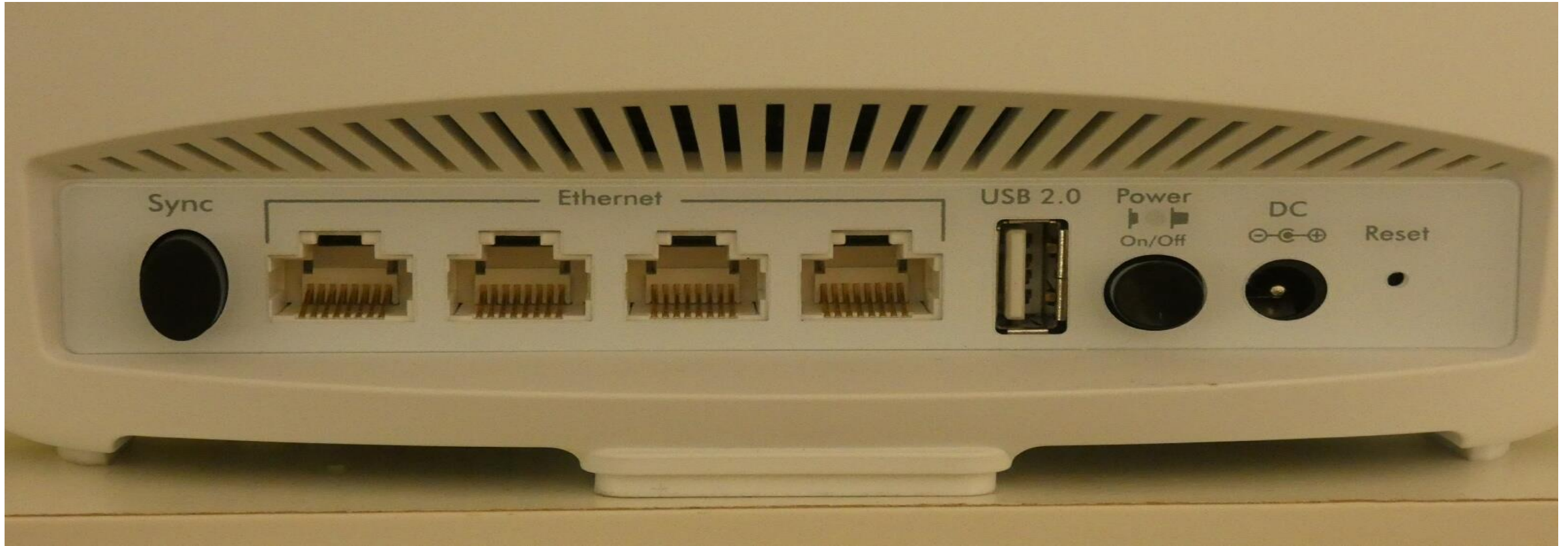


# Orbi Router Connections

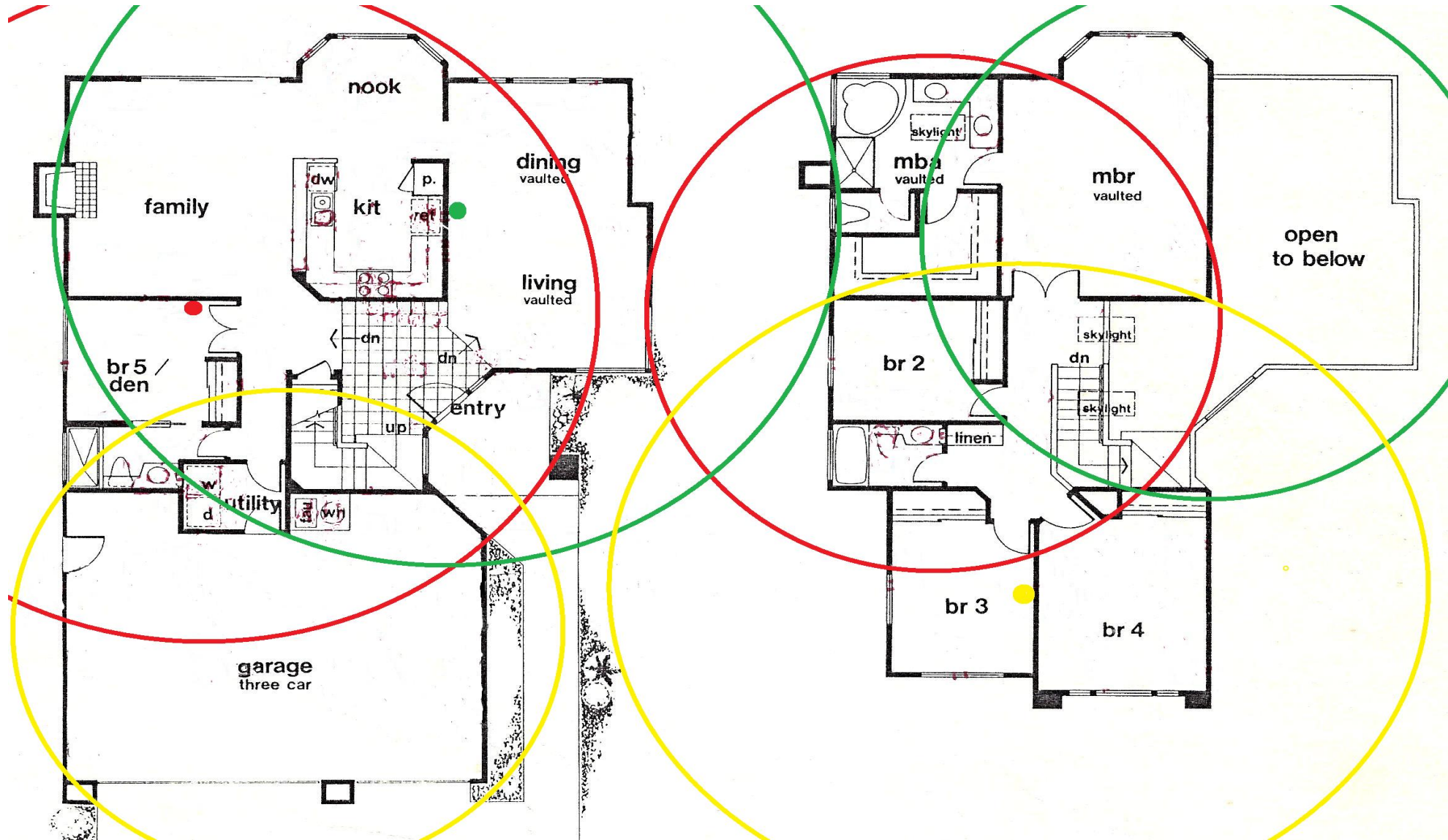




# Orbi Satellite Connections



# Selecting Orbi Locations





# Orbi Locations



# Orbi Connections / Setup

- Router needs only power and network input (Ethernet WAN, from modem)
- Satellites need only power
- Turn power on router - wait for light ring to go solid white
- Turn on 1st satellite - light ring lights white, then lights to indicate link status
- Repeat for second satellite

# Satellite Link Status

After the Orbi satellite's ring LED lights white, it lights one of the following colors for about three minutes and then turns off:



## **Blue**

The connection between the Orbi router and Orbi satellite is good.



## **Amber**

The connection between the Orbi router and Orbi satellite is fair. Consider moving the Orbi satellite closer to the Orbi router.



## **Magenta**

The Orbi satellite was unable to connect to the Orbi router. Move the Orbi satellite closer to the Orbi router.

**Note:** If the ring LED still lights magenta after about one minute, press the **Sync** button on the back of the Orbi router and on the back of the Orbi satellite. If the Orbi satellite successfully syncs with the Orbi router, the satellite's ring LED lights white then lights blue to indicate a good connection, and then turns off.

Repeat these steps to connect the second Orbi satellite.

# Orbi Network Setup

- Connect to the Orbi router in one of the following two ways initially:
  - Ethernet cable to any Orbi unit (using laptop or desktop)
    - Set up device to get IP address from Orbi
  - Wi-Fi (using smart phone, tablet, Chromebook, laptop or desktop)
    - Use the preset wireless settings on the sticker on the Orbi router (SSID and network key/password)

# Orbi Network Setup

- Set up the Orbi router in one of the following two ways:
  - Netgear Orbi app (on smart phone or tablet)
    - Follow the instructions in the app
  - Web browser (on smart phone, tablet, Chromebook, laptop or desktop)
    - Go to *orbilogin.com*. Use the default user name and password in the Quick Start Guide. You should change those immediately after gaining access.

# Orbi Network Setup

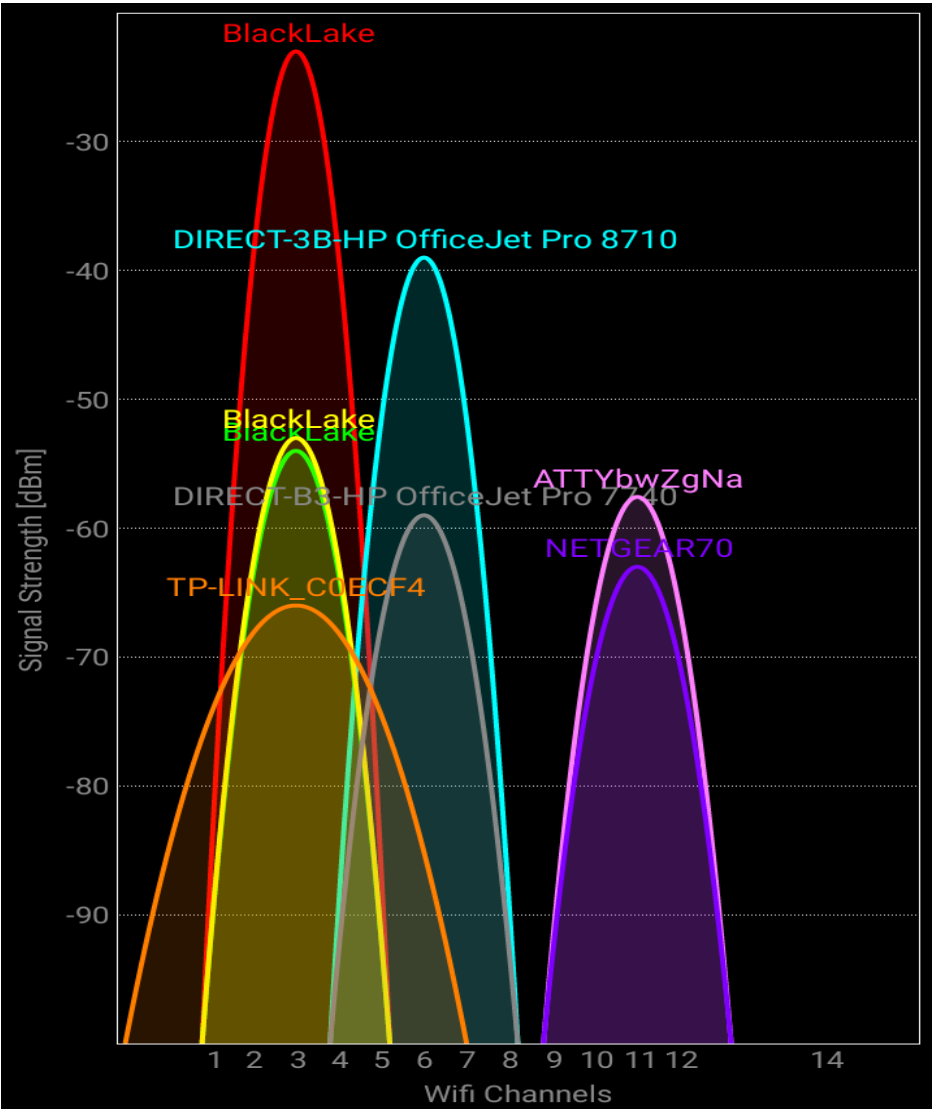
- You should change or check the following router settings:
  - SSID
  - Password (network key)
  - Security (use *WPA2-PSK [AES]* if possible, as it is the most secure option available)
- Also
  - Register your Orbi system with Netgear
  - Check for firmware updates (from within app or setup page in browser)

# Orbi Network Setup

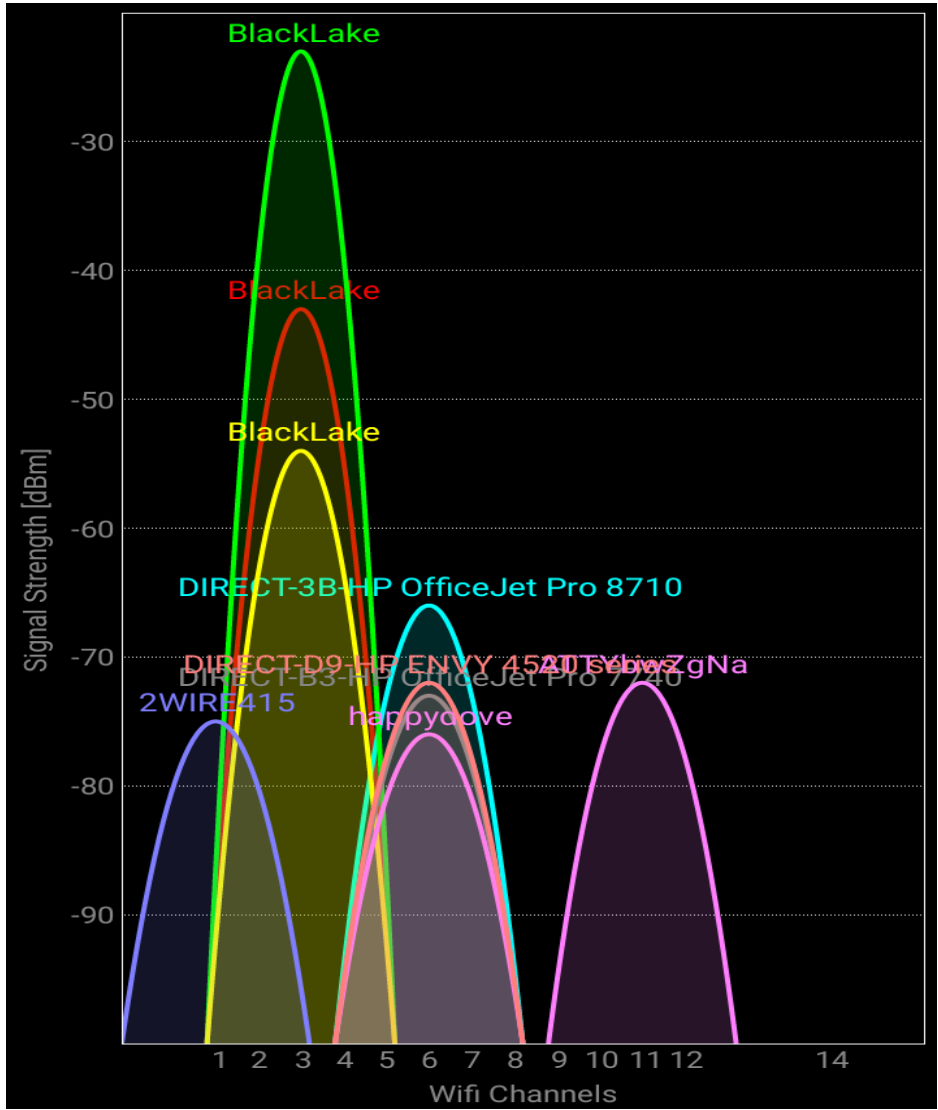
- Other optional settings
  - Router or access point
  - Parental control
  - Guest account
  - Change IP address
  - Enable MAC address filtering
  - Verify attached devices
  - And more

# Signal Results with Orbi

br 5  
(R)



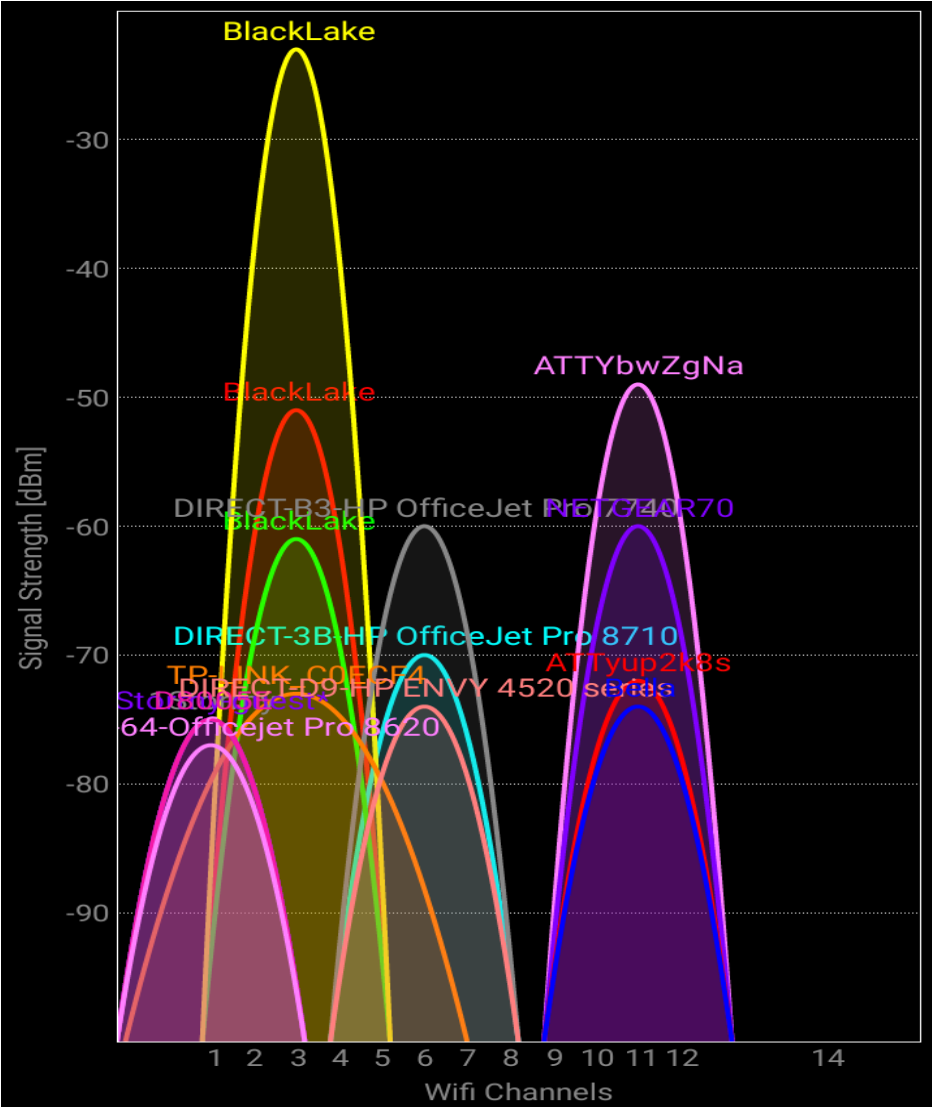
Living  
(S1)



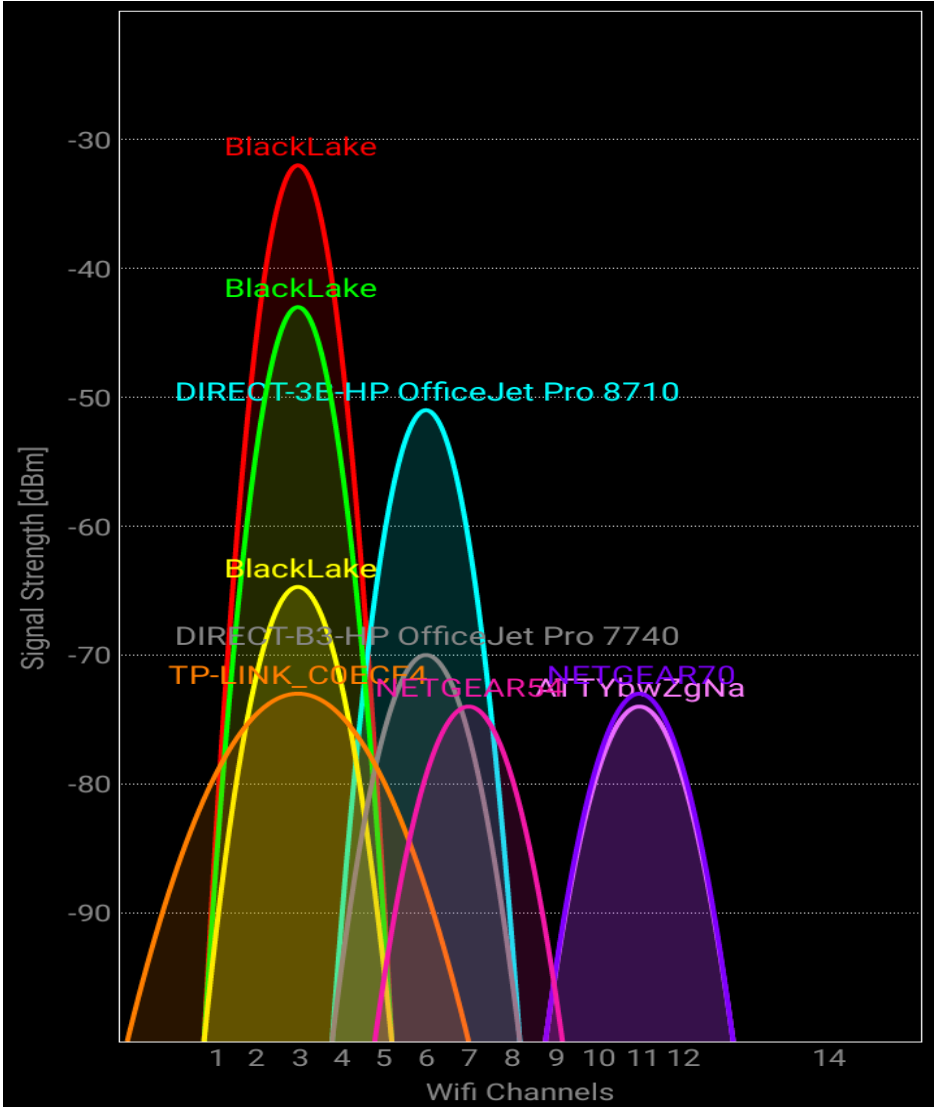


# Signal Results with Orbi

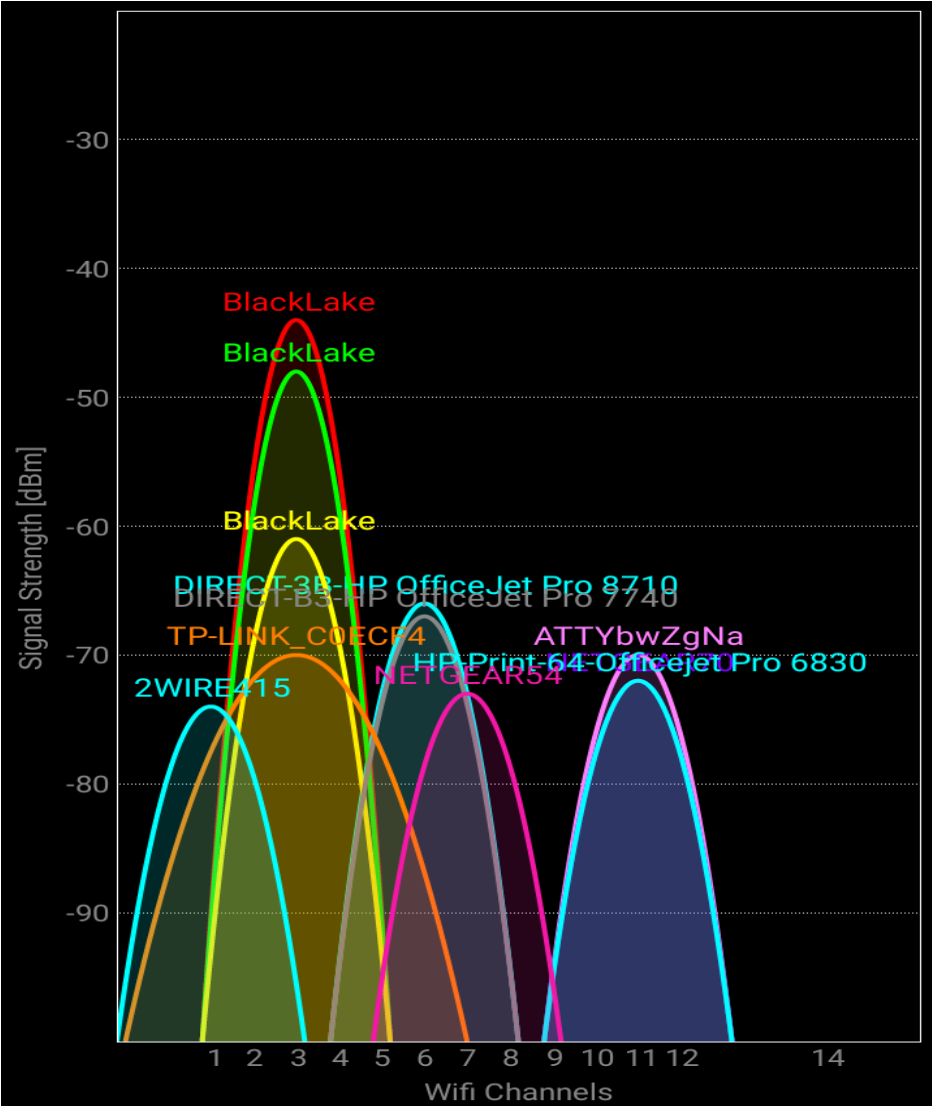
br 3  
(S2)



nook

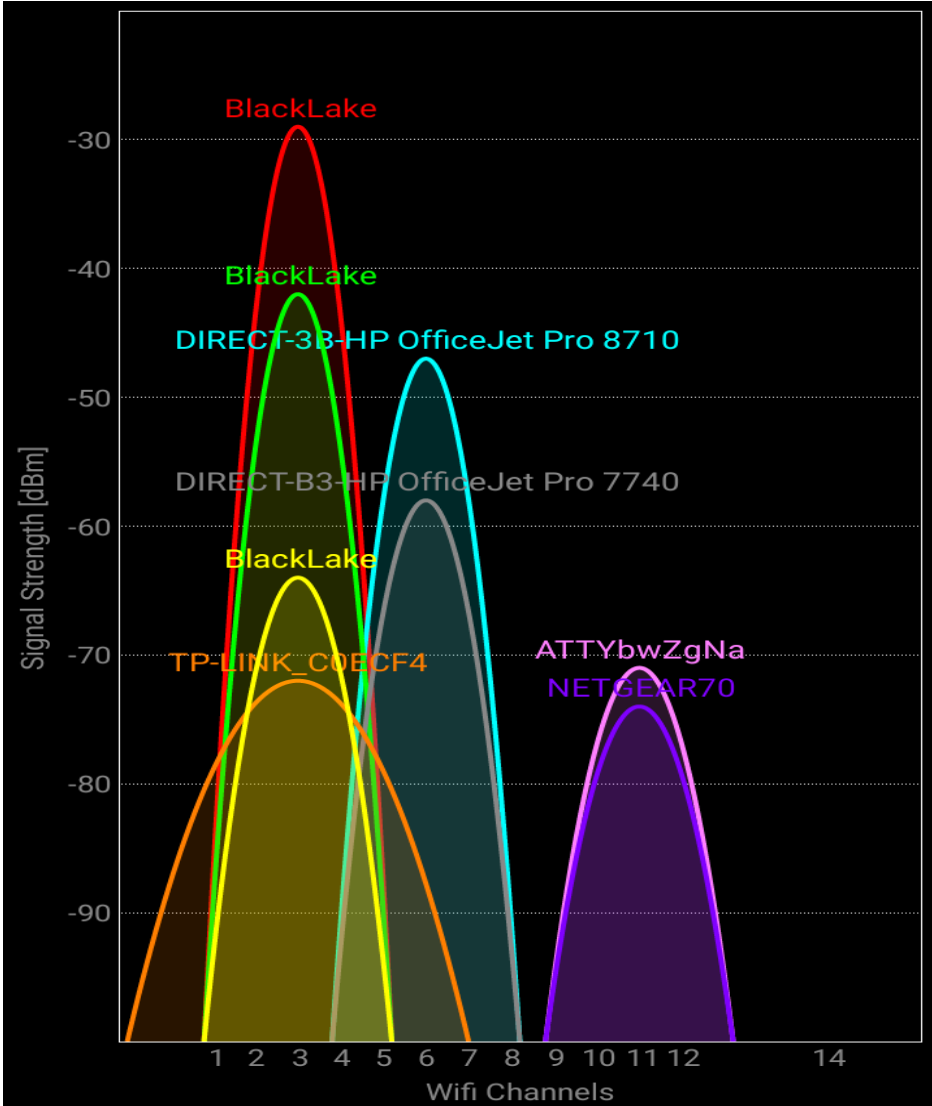


# Signal Results with Orbi



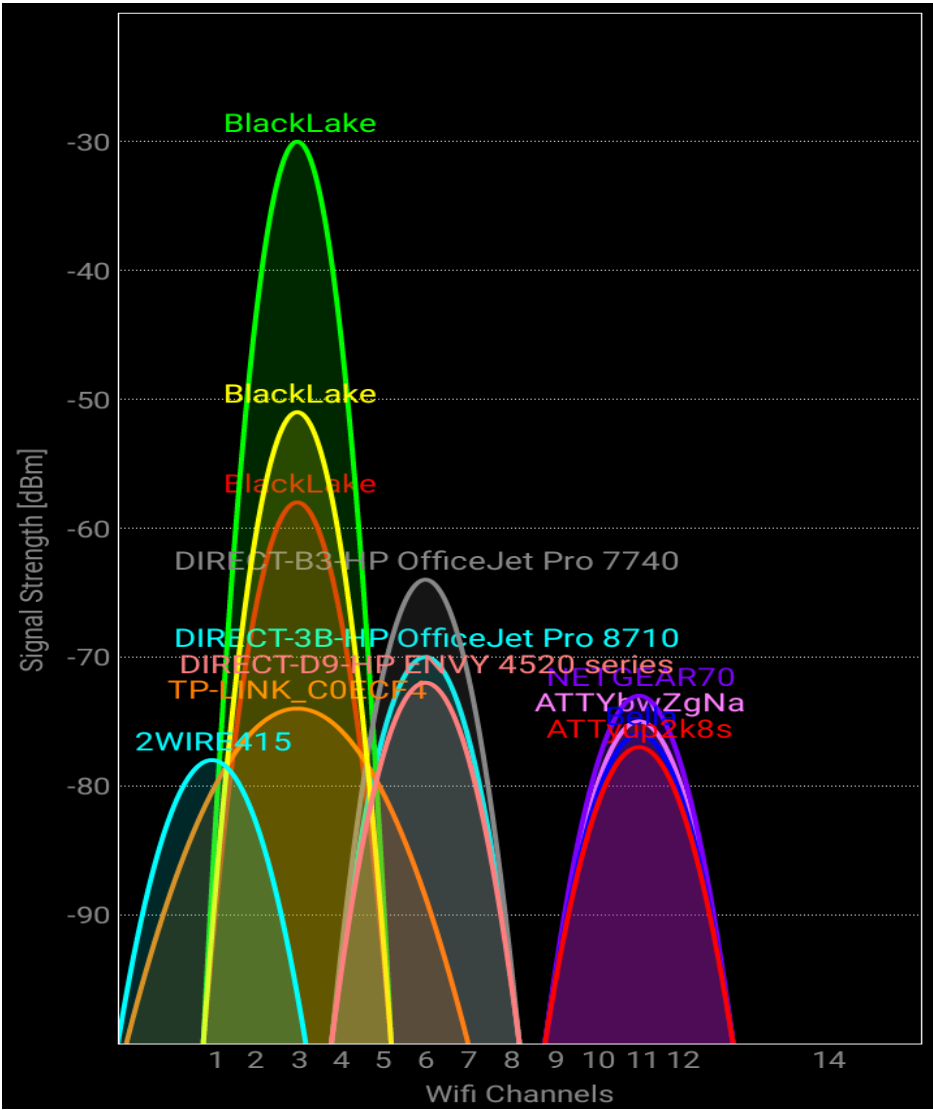
Patio

family

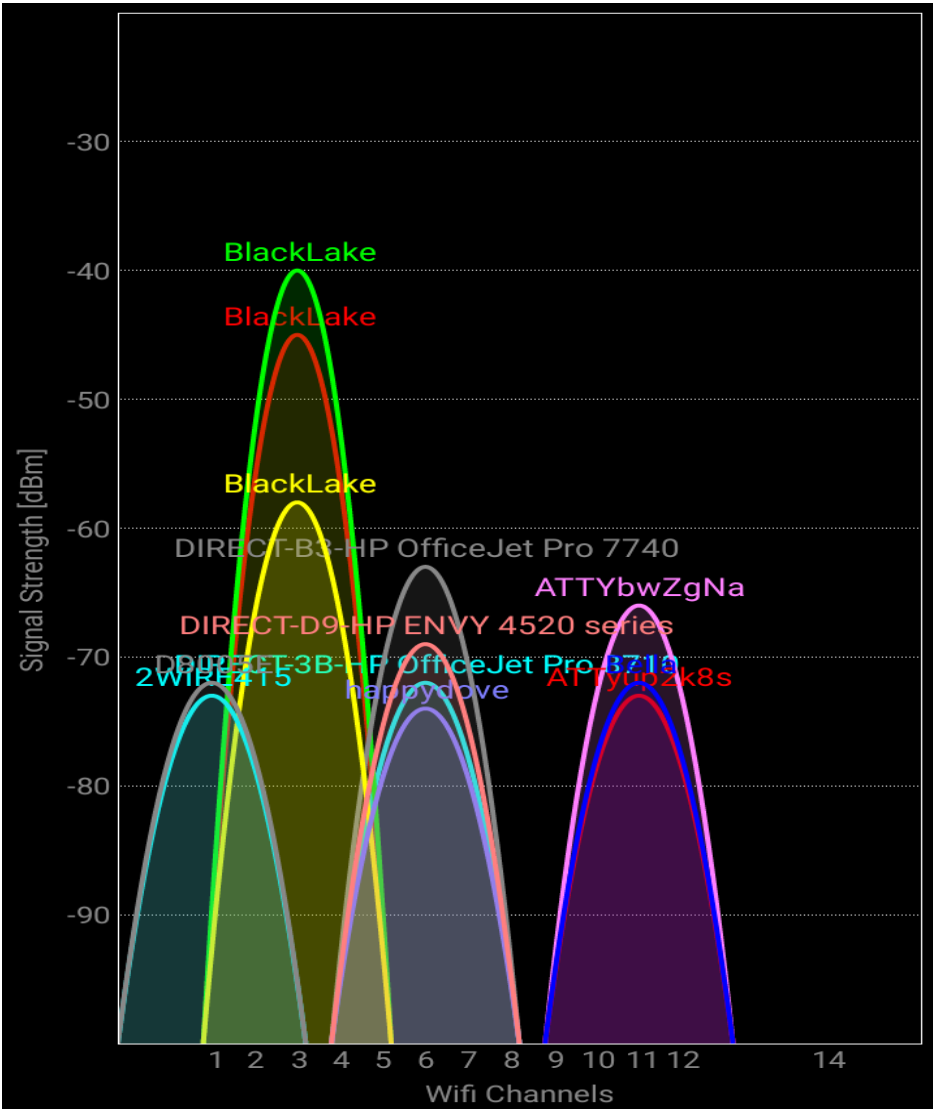


# Signal Results with Orbi

dining

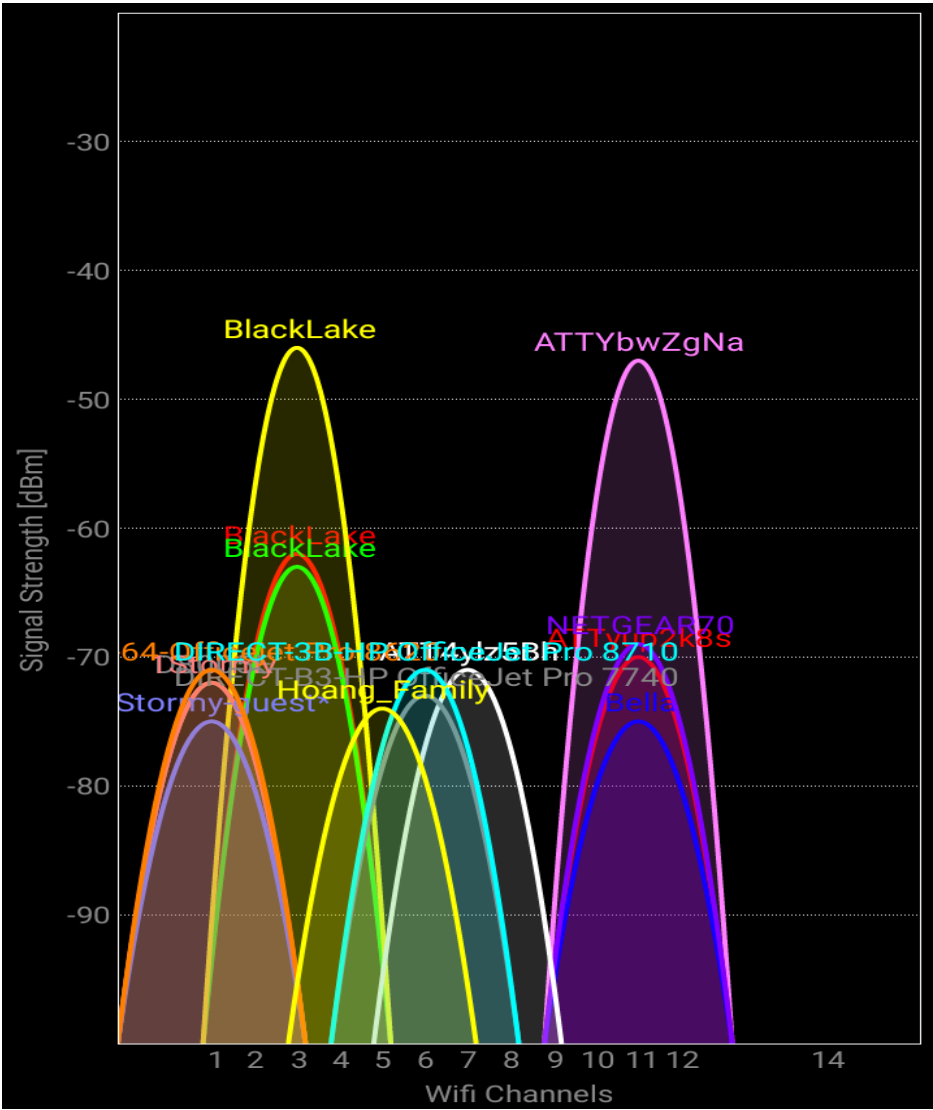


living

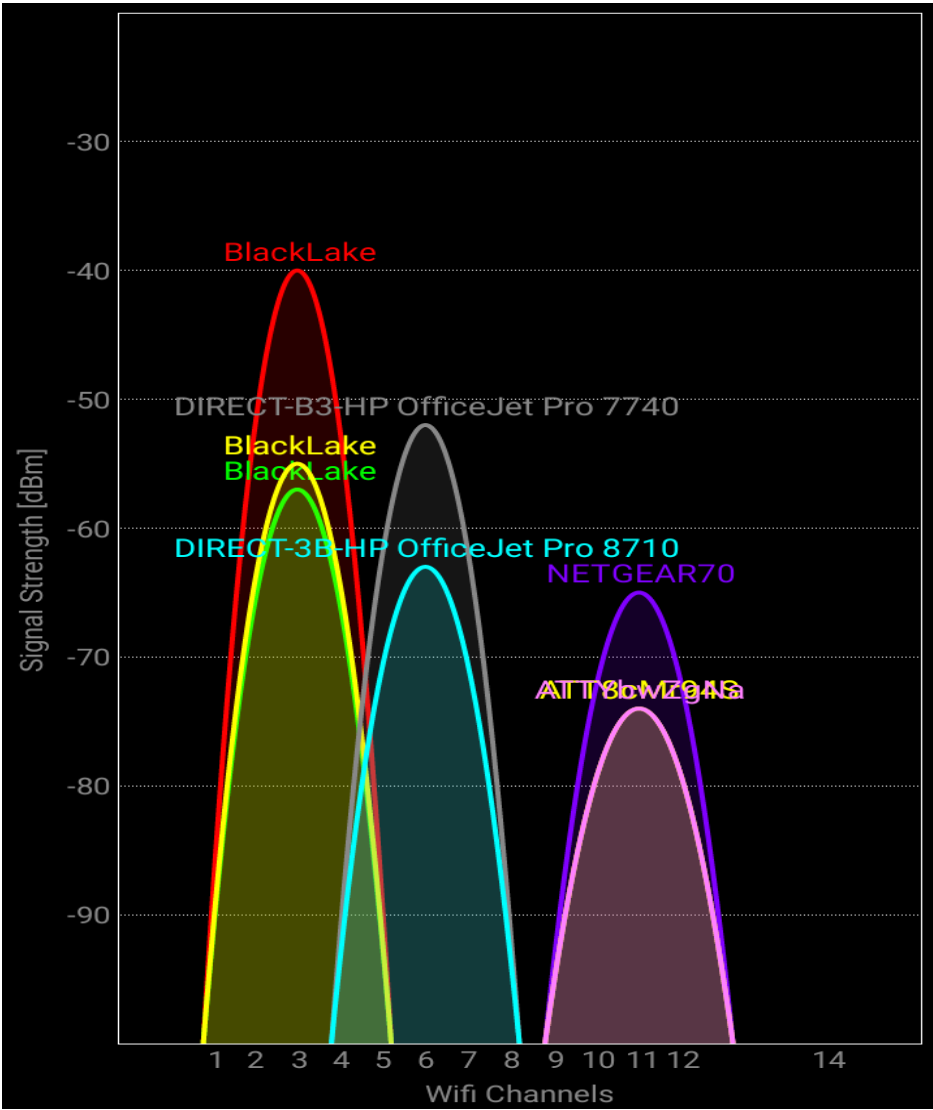


# Signal Results with Orbi

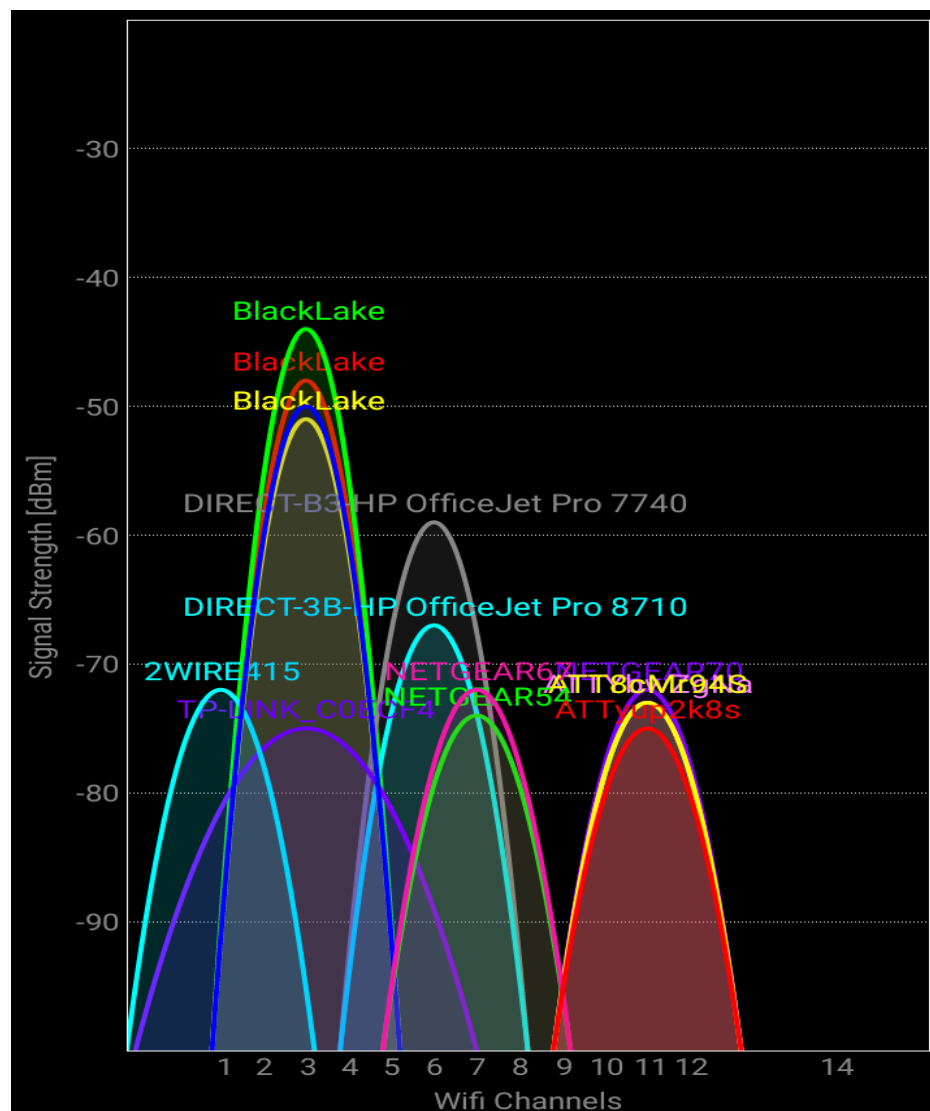
Front  
outside



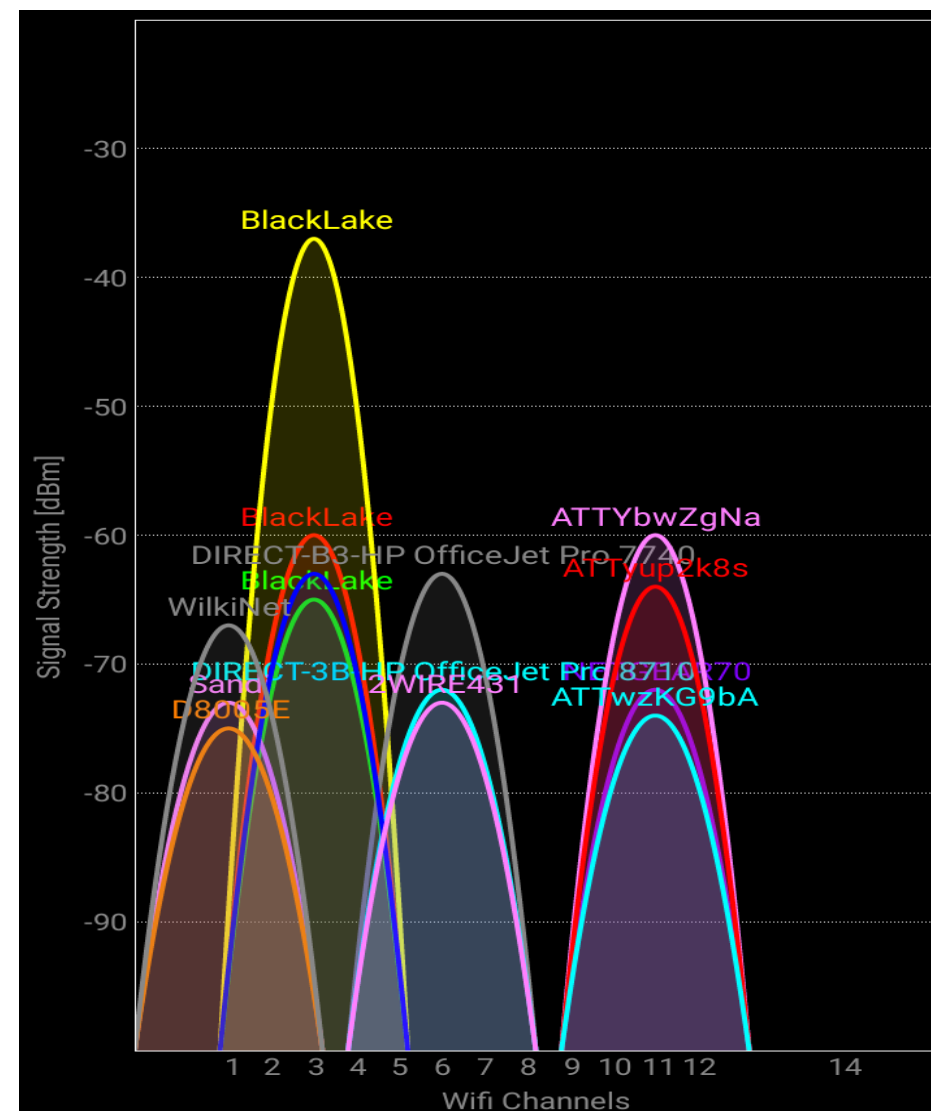
mba



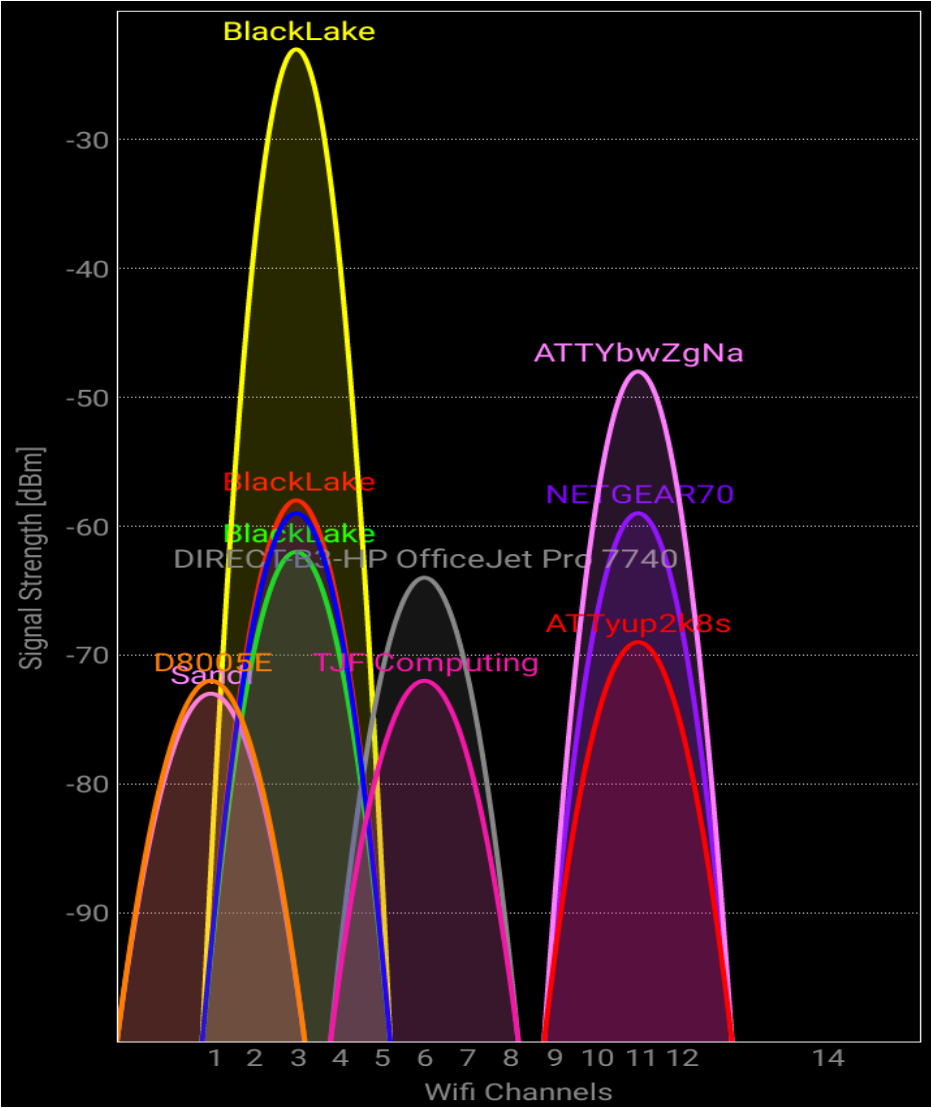
## mbr



br4



# Signal Results with Orbi



br3



# My Now Happy Wi-Fi Devices



# Questions?

## Mesh Routers

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An International  
Association of Technology  
& Computer User Groups