Connected HHI

WiFi For The Home

Presented by Joe Chappell – Connected HHI

About Me

- Raised in suburban Philadelphia with lots of technology exposure
- Began programming at 12
- Spent 30 years in IT and then software companies
- CEO of 3 tech startups based in Boston
- Moved to HHI in 2010
- Started Connected HHI in 2016 after spending several years helping friends and property management customers with tech projects and problems

Presentation Flow

- Network Overview – Context for WiFi
- Roles of WiFi
- Measuring and Understanding WiFi Performance
- Latest Developments
- Security Considerations
- Q&A

Role of the Network

- Connect my devices to content and services that I want to access
  - Music
  - Video
  - News
  - Financial Services
  - Social Networks
  - Home Management

Basic Elements of Networks

- Content Providers and Websites
- INTERNET
- Local Internet Providers
  - Hargray
  - Spectrum (Time-Warner)
- Home Network
  - Modem
  - Router
  - Switches
  - Wired Connection (Ethernet)
  - Wireless Connection (WiFi)
- Connected Devices

Content Providers and Websites (Examples)

- Google
- Facebook
- Netflix
- E-Trade
- Island Packet

INTERNET – (CAPITAL LETTERS)

- An interconnected set of public and private networks that allows access to resources globally.
- Governed by standards organizations
- Primarily privately owned in the US by large telecom companies

Local Internet Providers

- Provide our connection to the INTERNET and govern the **MAXIMUM** performance that we can expect.
- Performance varies greatly dependent on
  - Physical location of our homes
  - Technology available in that location (Fiber, Cable, Telephone/DSL)
  - Plan that we choose (Gig, 30MBS, 5MBS)

Local Internet - Hargray

- Telephone / DSL transitioning to Fiber
- Download speeds range from 5MBS to 10000MBS
- Upload speeds range from 1MBS ro 300MBS

Local Internet - Spectrum (Formerly Time-Warner)

- Cable (Coax) transitioning to Fiber
- Download speeds range from 30MBS to 300MBS
- Upload Speeds range from 5MBS to 30MBS

Home Network Elements - Modem

- Modem – translates from carrier signal to Ethernet
- Can be included (fiber), leased or customer owned. Should be DOCSIS 3.0 or higher to get speeds up to 1.2GBS.
- Older modems limited to 40MBS down and 30MBS up.
- Some modems also serve as the router and WiFi access point.

Home Network Elements - Router

- Connects to the MODEM and Manages traffic within home network and with the internet.
- Assigns and manages addresses for all devices on your network.
- Most often also provides the FIREWALL or protective shield to limit what can get to your network from the internet.
- *Too many home networks have more than 1 device serving as a router which slows performance and can create issues.
- Many home routers also serve as the WiFi connection for the home.
- Most routers have several Ethernet jacks to allow wired connection for nearby computers, printers, and entertainment devices.

Router Example

Home Network Elements – Wired Connections

- Wired connections utilize Ethernet cable (Cat 5, 5e, or 6) or Fiber (extremely rare in residential installations.
- Wired connections usually are capable of the highest speeds.
- Many homes have been pre-wired with Ethernet, although they may not be connected to anything.
- PowerLine Connectors are a hybrid solution sending data over your home electrical system.
- Wired connections may or may not be more secure than WiFi.

Home Network Element – WiFi

- WiFi is networking using radios instead of wires
- WiFi has the same challenges as other radios in and near the home:
  - Interference from other radios and electronic devices
  - Physical barriers that impede signals
  - Weakening over distance
- Not all WiFi devices are equal – power, antennas, processors, and versions (a,b, g.n. ac) determine speed and reach.

WiFi in the Home – What Devices Use WiFi

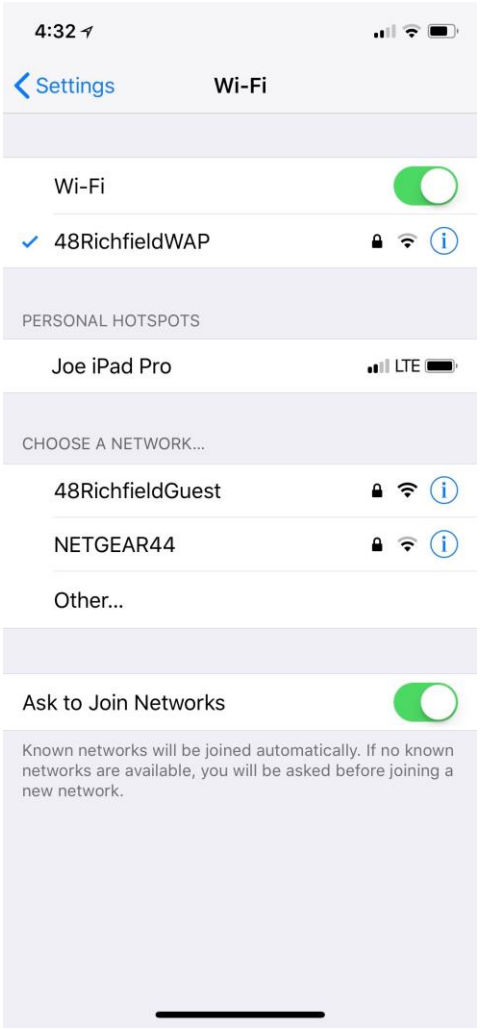
- Smartphones, Tablets, e-readers, printers,and PCs
- Personal Assistants – Amazon Alexa and Google Home
- Televisions, BluRay Players
- Streaming Video – AppleTV, Roku, FireTV, YouTube
- Streaming Music – Sonos, Pandora, Spotify
- Security and Cameras
- Smart Home Automation
- Smart Appliances

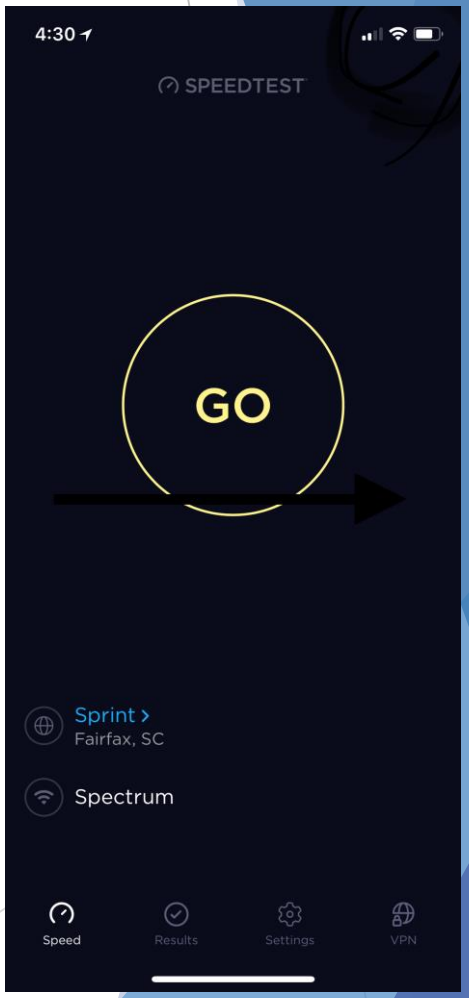
WiFi in the Home – Practical Considerations

- Where do you need WiFi access and for what purposes
- What are your location options for WiFi Radios
- How fast is your internet service
- What is the capacity of your WiFi equipment – access points, laptops, tablets, phones, streaming devices
- How should you secure your network
- Do you need to provide for guest access

How ”Good” Is Your WiFi

- Smartphone Settings – Available Networks
- WiFi Indicator
- **Speedtest.net**
- **Netspot** and other Network Analyzers





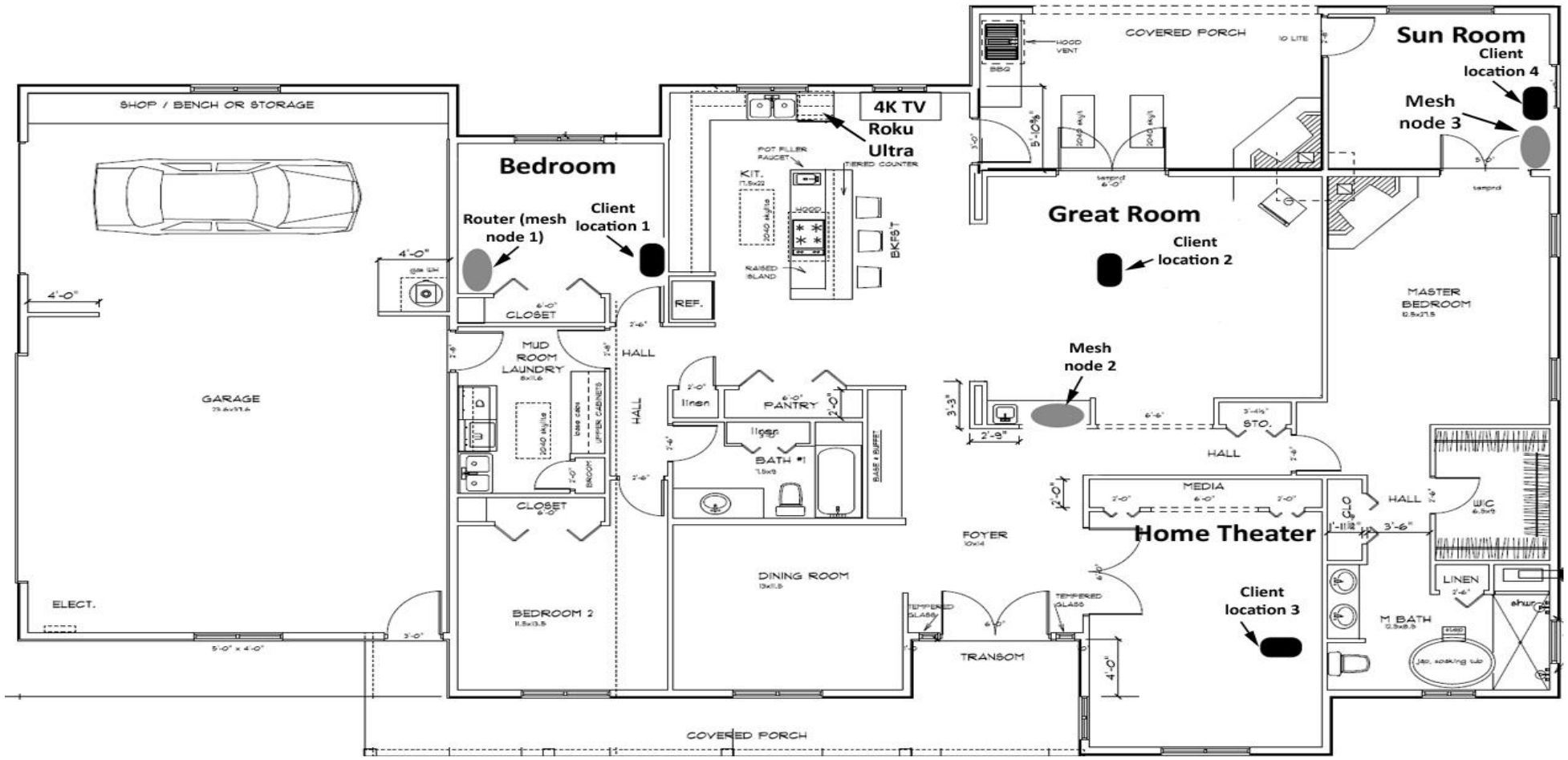
NetSpot

Ways to Improve WiFi Reach and Speed

- Quality of Equipment
- Location of Equipment
- Speed of your Internet Service

WiFi Versions and Maximum Speeds

Protocol	Frequency	Channel Width	MIMO	Maximum data rate (theoretical)
802.11ac wave2	5 GHz	80, 80+80, 160 MHz	Multi User (MU-MIMO)	1.73 Gbps[1]
802.11ac wave1	5 GHz	80 MHz	Single User (SU-MIMO)	866.7 Mbps[1]
802.11n	2.4 or 5 GHz	20, 40MHz	Single User (SU-MIMO)	450 Mbps[2]
802.11g	2.4 GHz	20 MHz	N/A	54 Mbps
802.11a	5 GHz	20 MHz	N/A	54 Mbps
802.11b	2.4 GHz	20 MHz	N/A	11 Mbps
Legacy 802.11	2.4 GHz	20 MHz	N/A	2 Mbps


SHOP / BENCH OR STORAGE
GARAGE
ELECT.
Bedroom
Router (mesh node 1)
Client location 1
CLOSET
MUD ROOM LAUNDRY
HALL
REF.
4K TV
Roku Ultra
KIT.
RAISED ISLAND
BKFST
COVERED PORCH
HOOD VENT
BBQ
Great Room
Client location 2
Mesh node 2
Sun Room
Client location 4
Mesh node 3
MASTER BEDROOM
STO.
HALL
MEDIA
Home Theater
Client location 3
HALL
LINEN
M BATH
jac. soaking tub
linen
PANTRY
BATH #1
FOYER
DINING ROOM
TEMPERED GLASS
TRANSOM
BEDROOM 2
CLOSET
COVERED PORCH

When Will You Need Multiple WiFi Access Points

- Large homes and homes that “sprawl”
- If your internet connection is in the corner of your home
- If you have architectural features that reduce or interfere with WiFi radio signals
- If you want to reach zones not currently served – pool, bonus room, master suite.

Options for Multiple WiFi Access Points

- WiFi Extenders (Repeaters)
  - Slow and prone to problems staying connected
  - Usually requires changing your WiFi connection as you move from zone to zone (Home, Home-EXT)
- Adding Additional WiFi Access Points
  - Usually requires changing your WiFi connection as you move from zone to zone (Main, Bonus_Room)
  - Requires a wired connection to each new access point

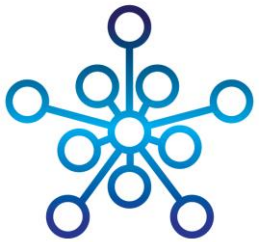
Mesh WiFi Networks

- One Wired Connection
- One or more wireless Satellites
- Network manages your WiFi connection as you move from zone to zone.
- Capable of very high speeds
- Easy to Configure and Install
- More expensive than adding another access point

WiFi Security Considerations

- Use Password Protection – For WiFi and Equipment
  - Don’t keep default passwords
  - Follow password hygiene – nothing easy to guess
- Create a Guest Network
  - Limit access to Internet only - no local network access
- Best Case – Isolate all appliances to Guest or separate network
- Keep all software and firmware updated
- Make sure Router Firewall is on and current

Q&A



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