Technical Notes
New Force Broadband Internet Service for Hidden Village

Section 1 – What Speed Should I Sign Up For?

Force Broadband is planning on offering three data speeds – 100 Mbps for $50/month – 300 Mbps for $70/month and 1 Gbps for $100/month. (Mbps = megabits per second) These are maximum speeds and your data rates may be slightly less depending on the time of day, number of HV customers using the Force Broadband system and the type of router and cabling you are using in your home network. Force Broadband advises that their planned service will be symmetrical, meaning that the maximum upload and download data speeds will be approximately the same.

The first decision is what speed of service do I need? For perspective here are several common applications and typical internet bandwidths (data speeds) they require:

- Searching the web and emails, 2-4 Mbps
- One on one video calls and screen sharing, 2-3 Mbps
- Group Zoom calls, including home schooling, 3-4 Mbps
- Voice over the internet – as in replacing your Century Link wired phone, 3 Mbps
- High definition video conferencing, 5-7 Mbps
- Home automation devices, locks, security cameras and appliances use low data rates, typically under 1 Mbps
- Video games 3-5 Mbps. Competitive gamers need low latency which comes with higher data rates (typically 100 Mbps or higher)
- 4K high definition television streaming requires at least 15 Mbps and some providers like Netflix recommend 25 Mbps
- New 8K high definition TVs now being tested and used in Europe require approximately 50 Mbps service
- If you are downloading graphic files and very large data files for your work, you should check with your employer – most of these can be adequately handled with service speeds less than the basic 100 Mbps package and a few may benefit from rates up to the 300 Mbps or 1 Gbps service level

Using these approximations then, here are how the various service levels could match up with HV household needs. You can upgrade your subscription at a later date if the need develops.

100 Mbps - If you use your internet for email, searching the web, some video streaming or remote video learning and one or two others in your household occasionally using the web, the basic 100 Mbps service will meet your requirements. (As a comparison, today many people in HV are lucky to have 15 Mbps service and a lot of us on the east end of the Village have 2-3 Mbps service, or no service at all.) The basic 100 Mbps service will be adequate for many households in HV.

300 Mbps- If you work from home and also have others simultaneously working from home, using the internet including home schooling and simultaneously streaming video, playing games, along with video security devices, 4K smart TVs and other connected devices, you should subscribe to the 300 Mbps service. (Force Broadband told us that they recommend this level of service for most homes in HV)

1 Gbps - For households with several people working at home simultaneously and children simultaneously using video, and multiple connected devices and gamers and need to up load and down load large graphic files while other users are playing games or streaming high definition video, the 1 G class service may be appropriate. Out of the 155 households in Hidden Village probably only a handful really need 1 Gbps service today!

Section 2 - What Is the New Installation Going to Involve?

Force Broadband will bury a fiber optic cable to the side of your house and install a small box on the exterior that contains their optical network unit. The optical network unit converts the optical signal to electrical signals to connect to your router and devices. **The extent of their installation will include mounting their box outside and running their Ethernet cable inside to your router near an exterior wall. Force Broadband will install cabling through one exterior wall (and up to about 15 feet inside) but will not run additional cabling inside homes, in crawl spaces, attics, basements or through interior walls.** If you need additional Ethernet cabling run inside your home it is your responsibility to do it yourself or find a computer or low voltage cabling company to get this done.

At your computer, or where the Force Broadband Ethernet cable coming from the outdoor optical network unit ends, the Force Broadband cable will plug into a small power supply or power module. An Ethernet cable from your router also plugs into this power module. Power for the outdoor optical network unit comes from this power module via sharing the Ethernet cable (termed power over ethernet) so they only need to install one cable into your home. The remainder of Ethernet cabling in your house is all your responsibility (See Section 4 – Ethernet Computer Cabling)

Force Broadband will contact each customer prior to installation to schedule a **site survey**. At the site survey they will work with the homeowner and determine the buried cable route, equipment mounting location and their cabling details.

Although not necessary, if possible, it is a good idea to power the Force Broadband power module and your router and optionally some of your computer equipment with an uninterruptable power supply. This not only helps protect sensitive electronic equipment from power fluctuations it also prevents momentary power outages from causing you to reset devices and possibly can prevent loss of your data.

Section 3 – Wireless Routers

What Kind of a Wireless Router Do I Need?

There have been major advances in wireless routers for home and small office use. The newest technology allows for more simultaneous users and additional range

Until recently, wireless router technology was identified by a series of numbers, like 802.xxxx that represented the technical standards the router met. Last year the industry got together and decided to simplify the identification of technological progress. They categorized the devices in general by their generation number. At this point in time the market is introducing the new sixth generation of devices, so the very latest in technology is called generation 6 or WiFi-6. WiFi-5 is the current series and while approaching the end of its technology life cycle, works quite well and is more than adequate for many applications. Most WiFi 5 routers are still identified by their older designation, as meeting standard 802.11AC and manufacturers typically have the letters “AC” somewhere in their model number. If you

are not sure about what technology it is look closely at the box. The newer WiFi 6 devices usually say WiFi 6 on the box and will meet the WiFi 6 standard which is 802.11AX. Most of these new WiFi6 devices have an "AX" in their model number. Also, note that WiFi-5 is not the same thing as 5G cellular, don't confuse the two!

If you have your own wireless router and it is more than 5 years old and you are subscribing to the 300 Mbps or 1 Gbps service, replace it. If you are subscribing to the basic 100 Mbps service and your existing wireless router in your home provides adequate coverage and features, keep it. If you are purchasing a new wireless router, here are some things you need to know:

Purchasing A New Router? – Here Are Three Questions You Need to Answer:

A. Do I Buy the Latest WiFi-6 Technology or A WiFi-5 Model?

Why would you purchase a WiFi-6 wireless router? For one thing, if you are subscribing to the 1Gbps service and have multiple wireless devices in your home, the WiFi-6 routers can provide dedicated streams of data and provide the higher data rates for up to 8 devices simultaneously. In addition, WiFi-6 routers have improved antenna technology, cover a greater area in your home and have less latency for wireless game consoles. They are also more resilient to interference from your neighbors, a big issue for apartment houses but usually not a factor here in HV due to the distance between residences.

However, there are more WiFi-5 routers on the market and they are less expensive. Also important to note is that WiFi-6 routers are backward compatible with WiFi-5 technology so you can mix and match devices. As a general guideline, if you are subscribing to basic 100 Mbps or 300 Mbps service you will be satisfied with WiFi-5 technology and can save yourself some money. If you are planning on 1 Gbps service with lots of simultaneous users, game consoles and one or more high definition TVs, you should consider the WiFi-6 devices. With all wireless routers you will never see the same speed to a wireless device as a cable attached device can attain, wireless will always be slower. (Force Broadband advises that most of their customers with WiFi-5 routers attain wireless speeds of 200-250 Mbps and those with WiFi-6 with 1 Gbps service reach 600 Mbps).

B. Do I Buy A Single Router or A Mesh Router?

Another feature available in both WiFi-5 and WiFi-6 technology products is "mesh" networking. Mesh systems send a signal from the main wireless router to one or more additional devices, or nodes, that then broadcast that signal to cover a much larger area. This is more appropriate for homes larger than 2000 square feet or homes with three or more levels. It is possible to add multiple mesh nodes, for example, three or four to cover very-large homes or in some cases your home and outbuildings. (Note that mesh technology is different than the simple WiFi repeaters that have been around for years. WiFi repeaters have numerous problems. They rebroadcast the original signal but with a different home network address, much lower data rates and sometimes severe latency and jitter.) Mesh systems effectively broadcast the signal with the same home network address everywhere, so you can move around your house seamlessly without dropping the signal and then manually reconnecting.

C. What Wireless Router Features Do I Need?

There are many features to consider that are available in both WiFi-5 and WiFi-6 technology. One is the number of extra ports the main router has for directly attaching computers and game consoles that need the absolute fastest service. Some of them come with one extra port, while many have four ports.

You can purchase wireless routers that have a variety of additional features. Some can block certain types of web sites, be operational during specified times of day or limit the amount of data transmitted to specific devices (for example, a child's computer). Many provide additional levels of security and can have a guest access network. This keeps your visitors linked to the Internet without needing your home network access codes. Some have speakers and microphones built in so they can use Alexa or integrate with other personal or home automation technology. If you have a lot of Apple or Android smart home systems, some router features are more user friendly to a specific operating system than others- so check on those features when shopping.

As far as what brand to purchase, there are numerous brands available at local stores and over the internet. Some of the more popular and proven brands, in no particular order, include Asus, TP Link, Netgear, Amazon eero, Google Nest, D-Link and LinkSys. (For a mesh system, Force Broadband tells us that they recommend Google Nest systems as they have one of the simplest set up procedures and work well. Force discourages the use of LinkSys equipment, but I have had good luck with several LinkSys routers and products. For sure, some routers are much harder to set up than others. The bottom line here is you need to do your own research or ask whomever you use for networking help – as the HV Internet Committee is not endorsing any specific product or manufacturer.)

What Is The Best Place to Locate My Wireless Router?

Try and locate your main router near your main computer. If it is centrally located all the better and you may realize adequate coverage without the additional expense of a mesh system. Another common question, how far away from my router can I get a good signal? There is no fixed answer. Distance from your main wireless router or a mesh end point is dependent on numerous factors that impair wireless signals, including thickness and construction of walls and other obstacles. Also, keep mesh nodes and your main router as far away as practical from your microwave oven (and in no case less than 10 feet), the microwave oven is close in frequency to one of the standard WiFi frequencies. Some mesh systems, like the Google Nest WiFi system, help you place your mesh points to attain a strong signal and test your wireless connections to all your devices.

What if My Wireless Router Doesn't Have Enough Ethernet Ports?

Some wireless routers have only one auxiliary Ethernet port and you may want to directly connect more than one device to your network, such as storage and other computers. A very low cost and common addition is a switch. A switch takes an Ethernet port and converts it into 4, 8 or more Ethernet ports on you home network. Be sure you are using a gigabit switch even if you are using the 100 Mbps service. Many older switches are only 10/100 Mbps and can cause more issues than just slower speeds on your network.

Switches are very low cost: a 4 port add on gigabit ethernet switch is typically under $30 and an 8 port gigabit add on switch is usually under $60. If you already have a switch in your home network, make certain it is a gigabit switch or replace it. Your maximum data rate will be as slow as the slowest

element in your network and even with 100 Mbps service the older 10/100 speed switches are problematic. What brand to purchase? There are numerous manufacturers, but some of the same well-known names in routers also make proven, low cost home network switches (including TP Link, Netgear, D-Link and LinkSys).

Section 4 – Ethernet Computer Cabling

Wired computer networking cable uses a type of cable termed Ethernet cable. Ethernet is the name given to a common type of twisted pair metallic data cables first made commercial in the 1970s. They have evolved and are now a low cost worldwide standard.

There are several Ethernet cable types and their application is dependent on how fast (maximum data rate) is required. Their capabilities are categorized by the performance specification they meet as in Category 5, Category 6, etc. and just shortened as Cat 5, Cat 6, Cat 7, etc. The higher the category number the longer the distance that the higher data rates can be transmitted. And higher category cables are less susceptible to interference from microwave ovens, lights, electric heaters and other electronic devices. Cat 5 cable which is still around but hasn't been manufactured for more than ten years, can support a maximum data speed of up to 100 Mbps for cable length up to 100 meters. It can support faster speeds for much shorter distances. The current technology is Cat 5e and Cat 6 or Cat6a cables. Cat 5e can support data rates up to 1 Gbps over cable runs up to 100 meters but it is gradually being replace with Cat 6 and Cat6a that can support rates beyond 5-10 Gbps. There are higher category Ethernet cables and shielded versions of these cables that cost more but are not required for home networks here in HV.

If I Want to Install Wired Devices – (Additional Computers, TVs or Game Consoles, etc.), What Type of Cable Should I Use?

It is a good idea to directly wire (Ethernet cable) your devices that require the highest speeds and are the most important in your home network – for example, the computer or laptop you use for work. Devices directly connected are faster than wireless connections. For home networking the Cat 5e or Cat 6 series cables should be used. These are also the most common and lowest cost data cables in the marketplace today. All are available at most office, computer and home improvement stores like Home Depot or Lowes and numerous locations on the Internet, for example, Amazon. Most ethernet cables are round with a few versions of flat ethernet cables. Don't use flat ethernet cables except for extremely short distances. They are not as durable and are more susceptible to interference.

If you already have a home network with Ethernet cables more than 10 years old and you can't find a Category description labeled on the cable, assume they are old Cat 3 or Cat 4 phone or data cables - or older, and replace them. If you have existing Cat 5 cable it will probably work OK for the 100 Mbps service and shorter distances for the 300 Mbps level of service. If you are subscribing to Force Broadband's 1Gbps service use Cat 6 cables.

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(and credit to Dan Hamilton of Force Broadband for edits and additional information)