



INTERNET SERVICE TYPES

Broadband – What is it?

- The FCC defines broadband as an internet service which provides speeds of 25 Mbps down and 3 Mbps up for fixed (single location) connections
- Broadband is also usually considered to be a service that is always on and available
- In 2018 there was talk of reducing the standard for wireless broadband to 10 Mbps down and 3 Mbps up, but the standard remains unchanged
- High speed internet –is it the same as broadband?
 - High speed internet basically means anything that is faster than dial-up service. It is not interchangeable with broadband.
 - It is generally accepted to mean download speeds greater than 768 Kbps and upload speeds of at least 200 Kbps

Bits vs. Bytes

- Internet service is measured in Kbps or Mbps (Kilobits or Megabits per second)
- These terms mean kilobits and megabits per second not kilobytes or megabytes which are used to measure storage and file size
- A byte is a group of 8 bits so generally speaking Kbps and Mbps are one 8th of KBps and MBps
- It is better for marketing to say 50 Mbps compared to 6.25 MBps

One KILOBit per second equals 1000 bits per second.
One MEGAbit per second equals 1000 Kbps or one million bps.
One GIGAbit per second equals 1000 Mbps, one million Kbps or one billion bps.

FCC Broadband Speed Guide

Activity	Minimum Download Speed (Mbps)
General Usage	
General Browsing and Email	1
Streaming Online Radio	Less than 0.5
VoIP Calls	Less than 0.5
Student	5 - 25
Telecommuting	5 - 25
File Downloading	10
Social Media	1
Watching Video	
Streaming Standard Definition Video	3 - 4
Streaming High Definition (HD) Video	5 - 8
Streaming Ultra HD 4K Video	25
Video Conferencing	
Standard Personal Video Call (e.g., Skype)	1
HD Personal Video Call (e.g., Skype)	1.5
HD Video Teleconferencing	6
Gaming	
Game Console Connecting to the Internet	3
Online Multiplayer	4

Dial-up

- Internet service is delivered on phone lines
- Uses standard phone jack and modem
- Analog technology
- Can receive data or voice – but only one at a time
- Speeds of between 33 kilobits per second (kbps) and 56 kbps



Digital Subscriber Line (DSL)

- Internet service is delivered on phone lines
- Uses standard phone jack and modem
- Digital technology
- Can receive both data and voice simultaneously on the same phone line
- Speeds may be between 1.5 megabits per second (mbps) and 10 mbps
- DSL is very dependent on distance from the phone company's central office. Service is usually only available up to 2-3 miles from the central office

Satellite

- Internet service is beamed to you from a satellite – requires a dish to receive the signal
- Service may be impacted by weather and tree cover
- The signal travels about 45,000 miles to reach your location
- High latency, service over-subscription, and draconian usage policies are typical
- There are quite a few new technologies in this arena with many companies trying a variation on this model
 - Elon Musk, Amazon, and others are proposing launching thousands of micro satellites in near Earth orbits to improve service and speeds available
 - Google Loon uses high altitude balloons to replace satellites in their experimental model
- Residents with satellite internet service are not considered to be served for either the Virginia Telecommunication Initiative (VATI) or the Center for Innovative Technology (CIT)



Cellular/Mobile

- Internet service delivered via a cellular phone or mobile hotspot
- Mobile technology is grouped into “Generations” (3G, 4G, 5G, ...)
- 4G is the most common technology used in the US with 5G beginning to be deployed in urban areas
- 4G has a theoretical maximum download speed of 979 Mbps and 5G has a theoretical maximum of 10 Gbps
- There are many factors that effect the actual speeds experienced such as your location, whether you are indoors or outdoors, the distance to nearby masts, and the amount of congestion on them
- Data collected from mobile speed tests in Q1 & Q2 of 2019:
 - VA Average Mobile speeds - 34.57 Mbps down, 9.76 Mbps up
 - US Average Mobile speeds - 33.88 Mbps down, 9.75 Mbps up
- Cellular/Mobile serve is not considered to be “Fixed” broadband in the FCC definition
- Residents using cellular/mobile internet are not considered to be served by the Center for Innovative Technology (CIT)



Fixed Wireless

- Internet service delivered via wireless antennas located on towers or other “Vertical Assets”
- A wired connection delivers the internet service to the tower and is then broadcast using the radio equipment
- The technology used to broadcast the radio waves determines the speeds experienced
- The weather, tree cover, and other factors will impact actual speeds experienced also
- There are several fixed wireless providers in Mathews County with speeds up to 25 Mbps being offered



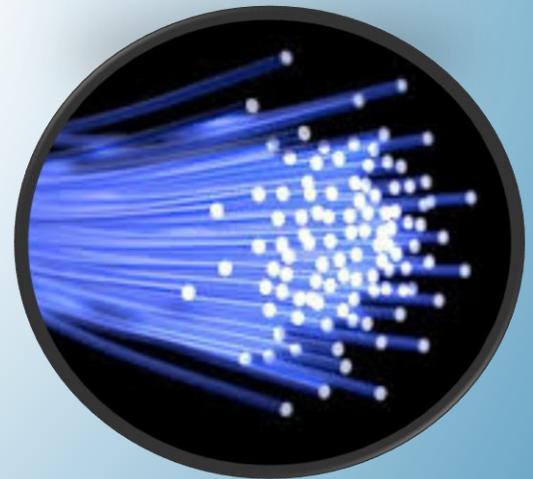
Data Over Cable Service Interface Specification (DOCSIS)

- Internet service is delivered over coaxial cable
- Uses the same type of cable that delivers cable TV
- Requires a special cable modem
- Residential plans can range from 50 Mbps down and 6 Mbps up to 250 Mbps down and 20 Mbps up - if you are in the service area
- Business plans are available that are much faster 300 Mbps down and 10 Mbps up, but these are much more expensive.



Fiber

- Internet service over fiber optic cables and is transmitted using pulses of light
- Download speeds of up to 10 Gigabits per second - Gbps
- Limited availability and is usually more expensive than other options
- No top speed for fiber has been realized yet. By improving the equipment at the ends of the fiber, higher speeds are attained



Broadband over Powerline (BPL)

- Internet service delivered through the existing power lines to a residence or business
- There have been many attempts worldwide to implement access BPL, all which have indicated that BPL is not viable as a means of delivering broadband Internet
- Dominion Power is not proposing using BPL to increase access to broadband internet
- Dominion Power is proposing running fiber to their substations for their purposes and then leasing access to a third-party provider who would then use another method (most likely fixed wireless) to deliver service to residences and businesses
- AT&T is working on project AirGig to deliver internet access using powerlines
 - AirGig technology sends data along power lines -- around them, not in them
 - AT&T has been experimenting with the technology since 2016 with an expected availability in 2021
 - Uses would connect wirelessly to radios on the power poles
 - In testing, backhaul speeds of 90 Gbps have been achieved



Summary

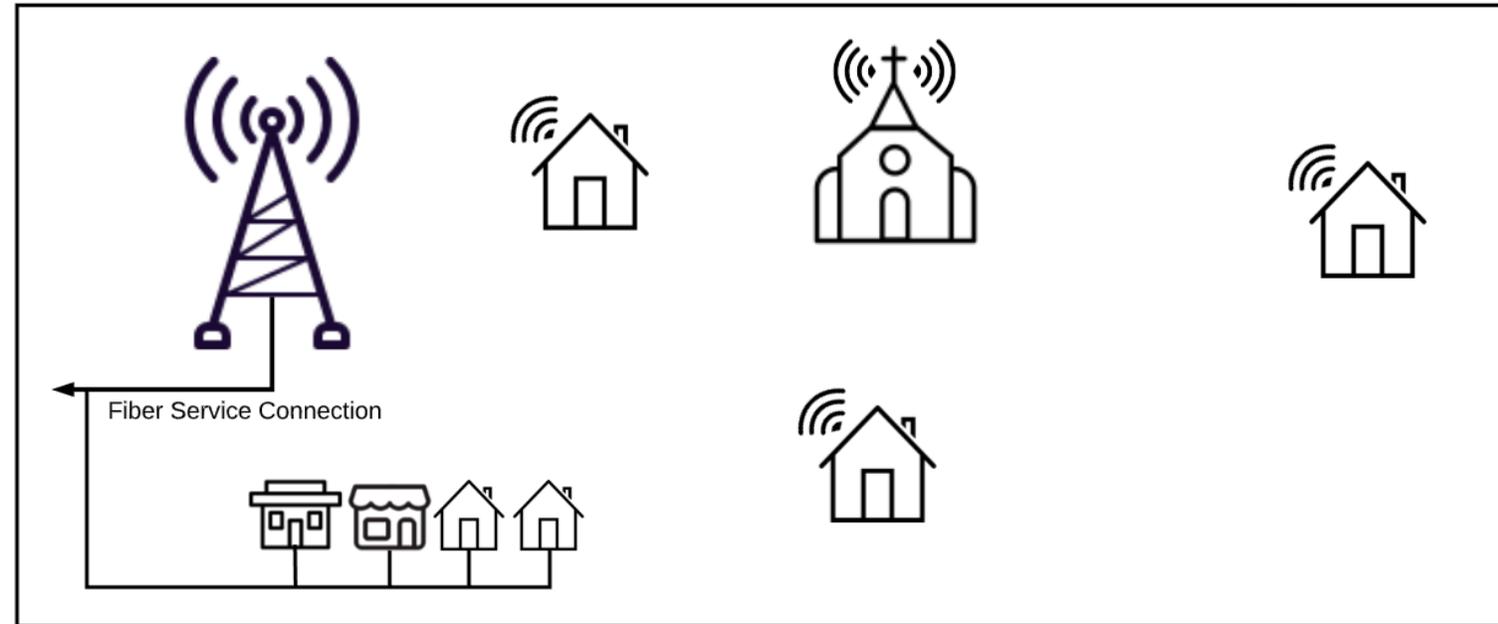
- Internet service is measured in kilobits and megabits per second which is much different from kilobytes and megabytes per second
- Internet service providers market “up to” speeds of service which are not usually fully realized by the service recipient
- Whether a service is fixed broadband is based on the speed of the service, not the technology used for delivery
- Fixed broadband service is at least 25 Mbps down and 3 Mbps up
- Cellular and mobile data services are not considered fixed broadband. The location of the device greatly impacts the level of service one will receive
- Dial-up and DSL are considered fixed services, but do not deliver the speeds necessary to be “broadband” in our area
- Satellite service is considered a fixed service, and may be able to deliver the “up to” speeds necessary to meet the broadband standards, but due to very restrictive usage policies, high latency, and over subscription, this service is usually not considered to meet service level standards to be called “broadband”
- That leaves fiber, cable, and fixed wireless as the only fixed service delivery options that would be able to deliver service levels which would satisfy the requirements to be considered “broadband”

Fast Fact:

40% of student households in Mathews County do not have access to broadband level service. (Based on a recent survey conducted by the School District in 2018)

Next Steps

- The Broadband Advisory Board recommends that a survey be advertised and promoted by the County and include support from businesses, civic and community organizations (churches, health care, social services, schools, etc.) in order to achieve the highest participation rate
- It is critical that the service address information be collected in the survey to be able to develop accurate maps of available service in Mathews County
- Having accurate service maps will allow us to counter the highly erroneous FCC service maps to qualify for grants and bring service partners to the table



Hybrid Service Model



THANK YOU