

Starlink Beta Test experiences in White Cove II area.

Prepared by: Tom Lewellen

Last Update: 4/25/2021

House location: 673 Bywater Way N

Background:

Like many of use in the Bywater Way area, we have been frustrated with internet connection speeds. Most of us have considered conventional satellite internet options from suppliers like Hughes Net or Dish. But these solutions are slow and have draconian data cap restrictions. Another option has been cellular hot spots from Verizon or AT&T. The costs have tended to be high and often also have data cap and other limitations that impact use.

For those of us living north of Hidden Springs, there has been the options of using the CenturyLink (CL) telephone lines for VDSL modems. That was very limited until recent upgrades allowed up to 10 megabit per second (Mbs) downloads and 1.5 Mbs uploads on a single line, or 20 down and 2.1 up using two lines and a modem (bonded pair modem) that allows the data to split between the two CL lines.

For most, 10 to 20 Mbs can support most streaming requests, but it is slow for large downloads. Further, for video conferencing like Zoom, the slow upload speeds can really make that a frustrating experience.

Other options like Wave cable are not available in our area without a large infrastructure cost hit to lot owners.

In our household, we use apple's iCloud for offsite of backups for 5 computers - requiring terabytes of data movement per month. In addition to streaming and downloading moves, we also download and upload large data files for our professional activities (and software upgrades) and engage in a many Zoom meetings. All the options available to us until early January 2021 were just not good enough to meet our goals.

When Starlink was first announced I was one of the first to signup for consideration as a beta test site. As the Starlink satellite constellation was grown, the coverage for our area has improved and our household was invited to the Beta test program in mid January 2021. The intention of this document is to present our experiences to date with installing the system and determining the best position for the Starlink dish for maximum performance.

Initial challenges:

The kit comes in with a Dish, a simple ground mounting stand (puts the dish at about knee height), a modem, and a WiFi router. There is a 100 foot long cable that connects the dish to the modem and a shorter Ethernet cable to connect the router to the modem. The router is very basic and does not allow the user to change configurations, but does have special functions for managed the dish and modem for optimization of performance and software updates. I believe it would be adequate for many users. However the Starlink router is inadequate to support our internal network configuration.

So the main challenges we identified before starting installation were:

1. Where to place the dish given the number of trees around the house as is typical of our Bywater homes and the general Starlink requirement to have an unobstructed view of the north sky,
2. How to bypass the Starlink router for the main connection to our internal WiFi network
3. Determining how the Starlink system compares to our previous VDSL modems (speed and stability).

Dish placement:

The Starlink application for smart phones has a tool to help initial placement. It provides an indication where the dish needs to point for "see" the constellation and to what extent there are obstructions. There sales agreement gives you an options for return for a full refund within 30 days of delivery if you are unable to find a suitable location for the dish.

One complication here is that the dish is what is termed a phased array and can do some very clever things to try and map around obstructions in determining where to steer its receiving area in the sky. Once the dish is placed, our experience is that it can take several hours for the optimization to take place. The more the obstruction is an issue, the longer for the system to stabilize its performance.

The other complication is the 100 foot cable between the dish and modem. It can not be extended, so the modem just be within 100 feet of the dish. Since our current router and hard wired Ethernet connections are all in our garage (next to where we park the RV), we have to put the Starlink modem and router there. We considered the top of the roof (which is about 40 feet above grade level), but the cable run would be too long. The same problem if we try to put the dish far enough down in the view corridor north of our house to get a clearer view of the north sky.



The net result of these practical limitations was to restrict our possible locations to the roof of our garage and the area north of the drive way to the RV part of the garage. The images below give you some idea of what the landscape is in those areas.



The initial test



was to assemble the system and driveway about half way to the street. We connected to the Starlink router and watched the dish initialization sequence. At first, there are two white lights on the modem indicating it was sending power to both the dish and router. The router has a status light but it was off. After about 5 minutes the dish rotated form its stowed position (dish perpendicular to the ground) to pointing the dish straight up. For the next 15 minutes the dish rotated a bit and collected data to align the dish to the best location for the "seeing" the constellation. During this period the Starling router went live and allowed the smart app to connect to it. The app showed the the dish was connecting. The dish then repositioned and the router updated showing it had a connection and could run a speed test. The initial

speed was only about 20 Mbs. But over the next hour it increased to 110 Mbs. It then varied a bit more and then after about 5 hours became more stable. The application indicated it was still fine tuning the dish data to lower the impact of the obstructions (in our case the large tree to the north of the garage).

Next we moved the dish to the garage roof and tried several locations. In all cases, the initial data rate was far below our initial placement. The issue again being the trees to the north of the garage.

We finally selected four locations on the ground on the north side of the garage and associated driveway. We gathered data for at each location for 24 hours. We found that the location farthest to the east was significantly less stable than the other three, We then proceeded to select a location that was near the center of a triangle connecting the three good locations, but was also far enough from a power vault on our property and areas where we routinely take the tractor and mower to minimize any complications. We also wanted a site that would minimize the effort needed to dig a trench for the cable that was at least a foot deep.

Final Placement of the Starlink Dish

Sine this was a beta test, we wanted to make sure we could “easily” change the location of the dish if needed. We used a standard chain link fence end post and a garden stack to make a mast for the dish. The cable runs in a trench to the garage. As you can see, there is a tree almost directly north of the dish. But the dish is able to find members of the Starlink satellite constellation and aim around the tree with it’s phased array. We were impressed with how well it handle the potential obstruction of the



trees.

At first, we did have some significant slow downs and drop outs in the early mornings and evenings - most noticeable when trying to hold a Zoom meeting. As more satellites were added to the constellation and some really significant software upgrades on how the dish finds satellites and the passing of data streams between satellites, the performance improved to the points we turned off our backup VDLS lines. Canceling the Century link services and keeping (until Starlink is out of beta) our North Olympic data services line (a bonded VDLS service over the Century link copper lines).

According to Starlink we should see the beta end sometime in the summer with the expectation of doubling our current download and upload speeds by the Fall.

Performance - Starlink only online:

As noted during the testing of sites for the dish summarized above, we saw some significant variations in stability and performance. Rather than present the total data set, I am only presenting part of the data collected with the final location test. First yet another caution. Speed tests can be misleading. They are highly variable depending on the loads and route to the server that is being used to test download and upload speeds. Most servers are selected based on the time it takes to “ping” the server (check to see if it is there). But in some instances the fastest ping will not prove the maximum speed due to the total load on the server. The range we have seen during a 12 hours of testing in lane January varied from a low of 89 Mbs down and 6 Mbs up to a maximum of 163 Mbs up and 18 Mbs up. The typical has been running 130 to 145 Mbs down and 12 to 13 Mbs up. The image is of some of the tests on 1/21/21 30 minutes after the final test location setup.



The image shows two screenshots from the Speedtest app. The top screenshot displays a table of test results from January 21, 2021. The bottom screenshot shows a similar table for April 25, 2021, with a 'Speed' tab selected.

Type	Date	↓ Mbps	↑ Mbps
Wi-Fi	1/21/21 3:27 PM	130	13.3
Wi-Fi	1/21/21 3:25 PM	68.1	12.1
Wi-Fi	1/21/21 12:56 PM	141	13.0
Wi-Fi	1/21/21 12:44 PM	163	12.6

Type	Date	↓ Mbps	↑ Mbps
Wi-Fi	4/25/21 1:40 PM	168	20.9
Wi-Fi	4/25/21 1:39 PM	104	12.8
Wi-Fi	4/25/21 1:38 PM	114	28.2

The performance continues to improve. On a typical day with our final location setup, running only Starlink, we see download speeds in excess of 100 mbit/second down and 15 to 30 mbit/second upload speed (using the Speedtest app that is a common tool for looking at network performance). An example of three consecutive tests on Sunday 25 April 2021 is shown in the figure to the right.

In the figure below the speed test results is the evaluation of video download speeds (again using Speedtest) from a single test run done about 10 minutes after the basic speed tests were performed on 25 April 2021



Bottom line impression:

For our location just a bit north of Hidden Springs, Starlink is clearly the best value for the dollar (\$99/month) for the speed we desired - both upload and download. Starlink has pledged not to introduce tiered plans with different speeds for different prices nor to place caps on download and upload volumes as the move out of the beta phase. With the expectation of doubling the speeds by Fall, the increase in the number of satellites in the constellation (and thus reducing or effectively eliminating drop outs) and some very neat methods to dynamically tune the bandwidth allocated to a specific user on an essentially real time basis (so all users see the same effective response times) should even improve the user experience further.

Our household is currently running only Starlink except for the occasional beta dropouts that we were warned to expect. We will definitely keep and only use Starlink as the system improves.