Nemzeti Média- és Hírközlési Hatóság

Starlink terminal
practical experience
(december 2022 – february 2023)

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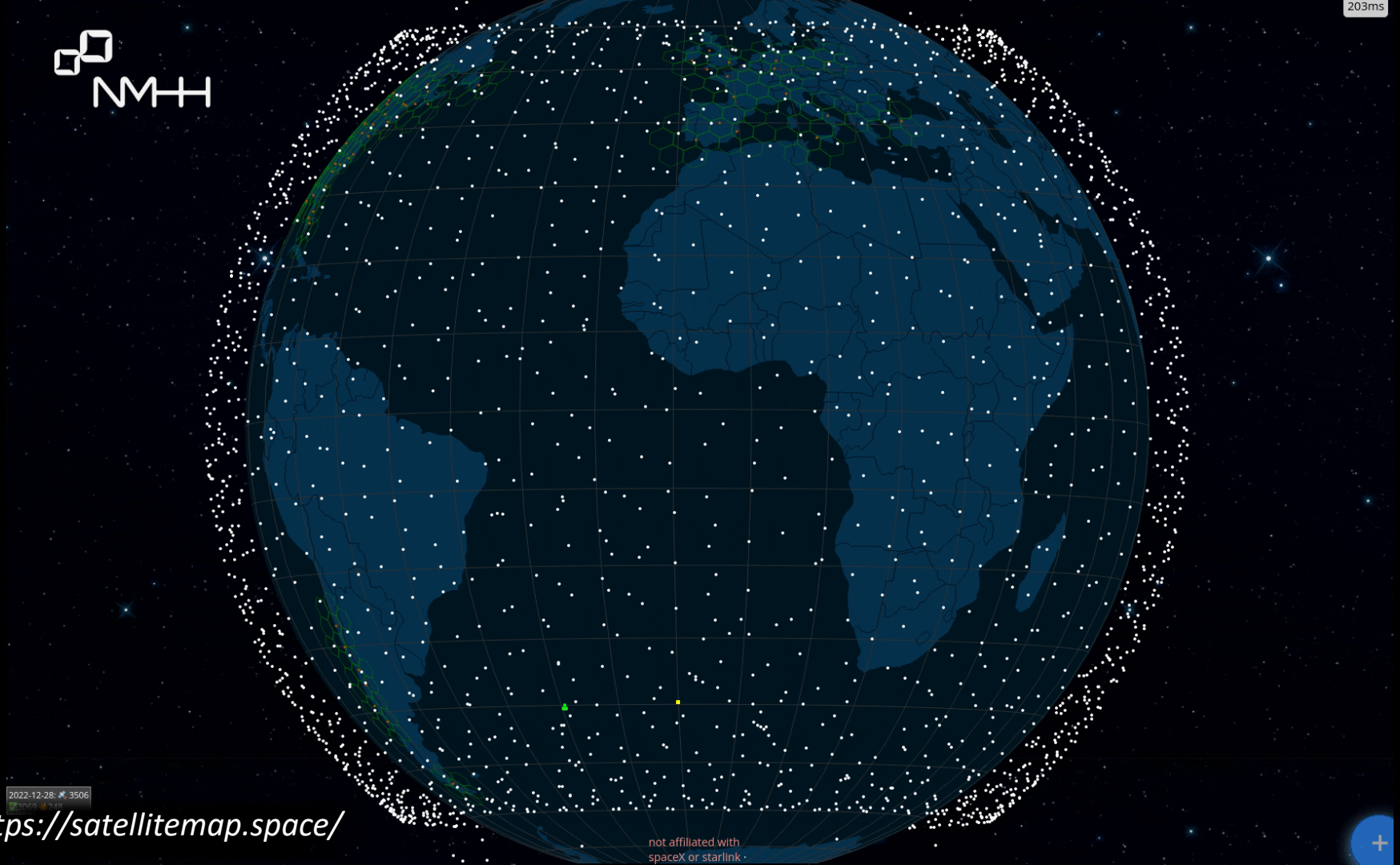
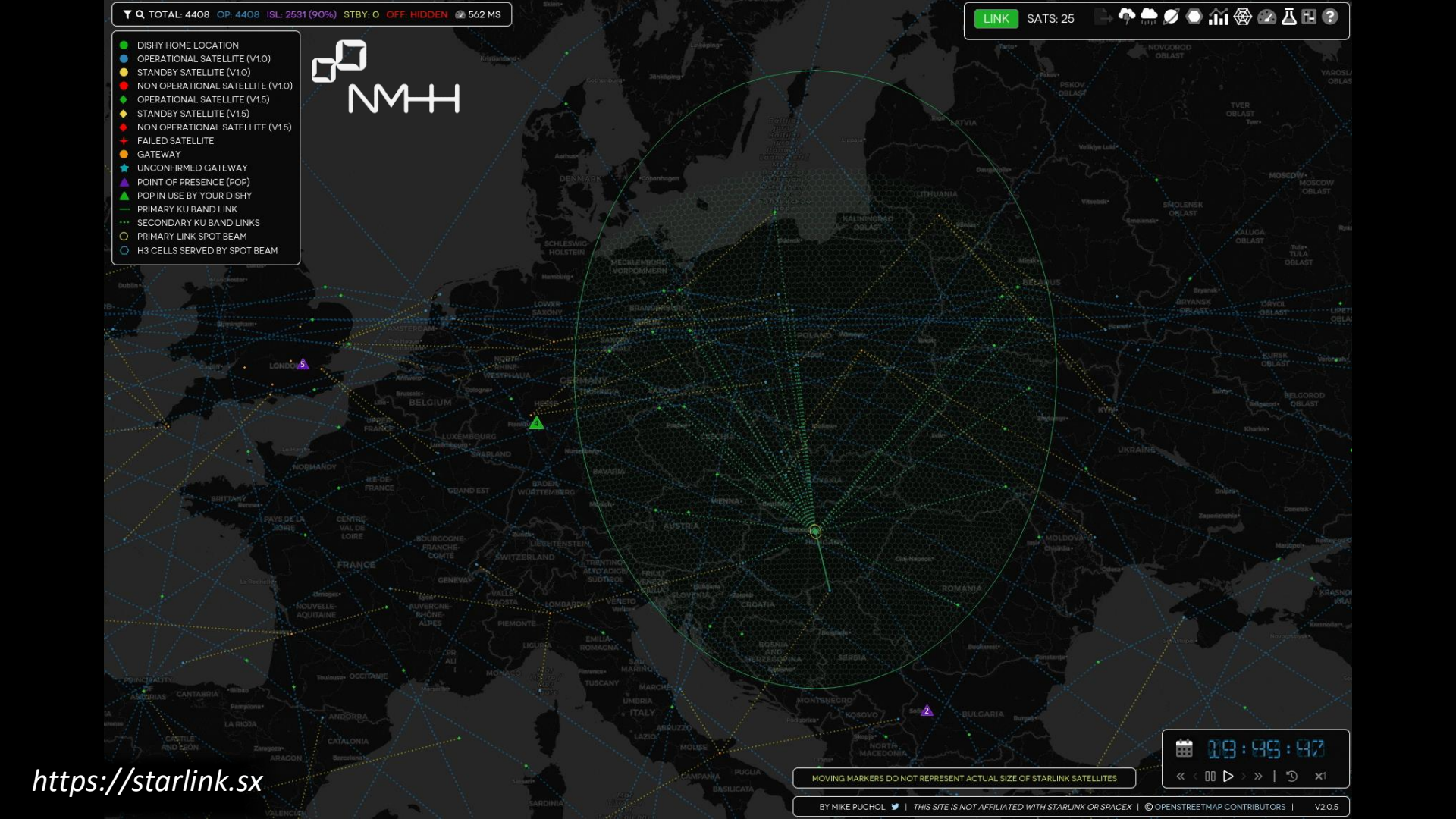
Contents

- How many satellites? How does it work?
- Terminal types, we had a „High Performance” model
- Wi-Fi CPE and TCP/IP options
- Bandwidth and delay
- Public ports
- Physical limits
- Energy usage



https://satellitemap.space/



https://starlink.sx

https://www.reddit.com/r/Starlink/comments/msx6n0/german_ground_station_found

Terminal types (as of January 2023.)

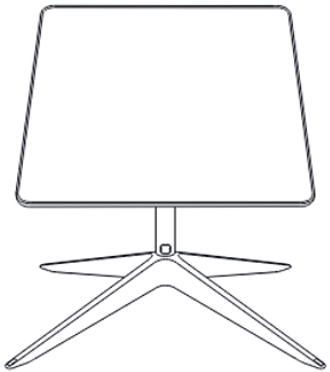
1st generation	2nd generation		
			
„Dishy McFlatface”	„Standard”	„High Performance”	„Flat High Performance”

More info: https://www.starlink.com/specifications?spec=1

„High Performance” – what’s in the box?

Installation

Starlink Business
Install Guide



STARLINK

ENGLISH

SETUP

ENGLISH

Find A Clear View of the Sky

Your Starlink needs a clear view of the sky so it can stay connected with satellites as they move overhead. Objects that obstruct the connection between your Starlink and the satellite, such as a tree branch, pole, or roof, will cause service interruptions.

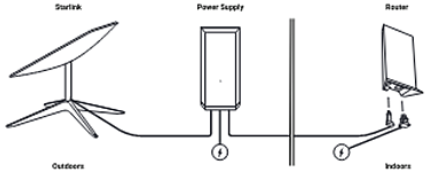
To find a location with a clear view of the sky:

1. Download the Starlink App.
2. Use the "Check for Obstructions" tool to find an install location that will deliver the best service.
3. For best results, Starlink should be installed as close to vertical as possible.

If you could not find a clear field of view from the ground level, consider installing in an elevated location, like a roof, pole, or wall. Additional mounts and accessories are available for purchase on the Starlink Shop.

Plug Starlink In

1. Put Starlink into base and plug into power.



2. Starlink will automatically level itself to search for satellites overhead. **Do NOT attempt to manually adjust your Starlink.**
3. After a few minutes, Starlink will make an initial connection to the Starlink constellation and tilt to the optimum angle for satellite coverage (slightly north or south based on your location in the northern or southern hemisphere).

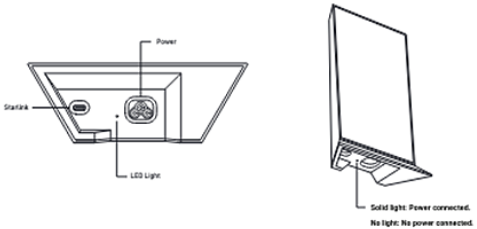
INSTALLATION

ENGLISH

Connect to WiFi

1. On your device, find and connect to the STARLINK network in your WiFi settings.

2. Once connected, a browser window will open prompting you to enter a new SSID (Network name) and password. This step is optional but recommended.
3. You are now connected! Open the Starlink App to customize additional settings, check your connection, and more.



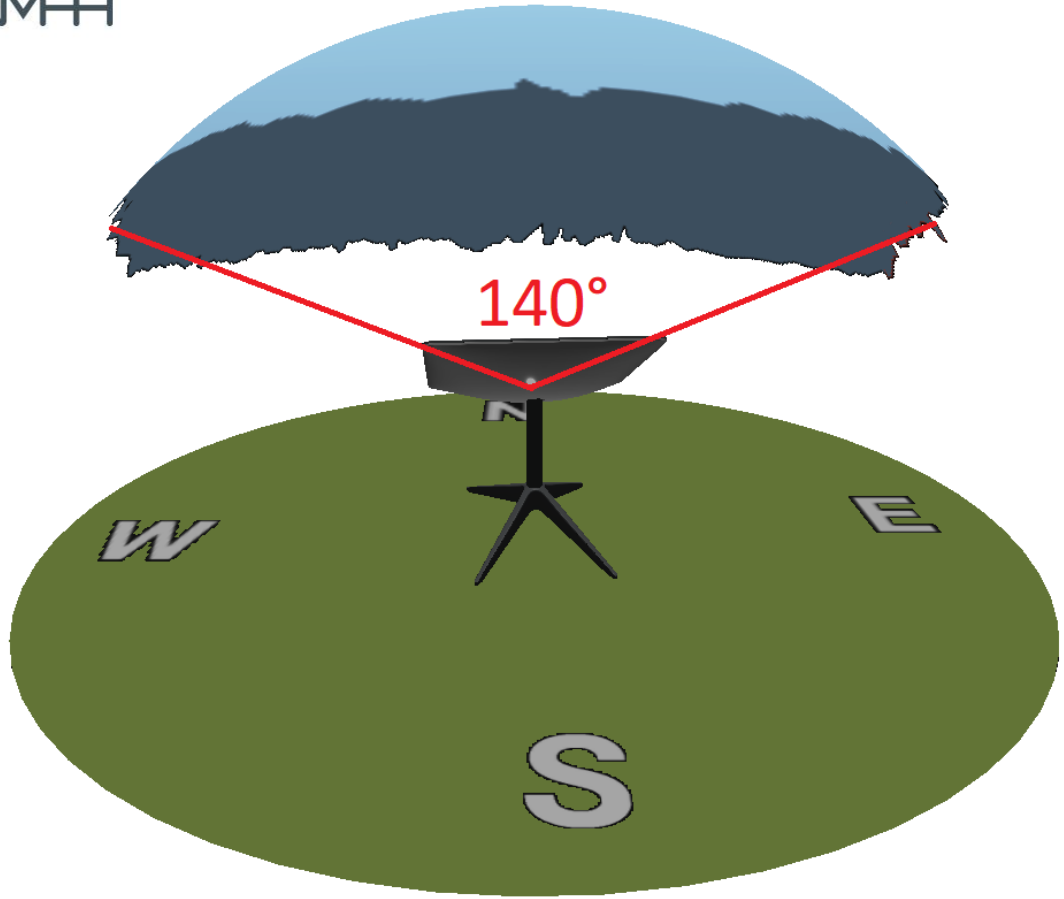
Can't Get Online?

1. Open the Starlink App to check for any alerts, outages, or obstructions.
2. Check the WiFi router light.
3. Make sure everything is securely plugged in and there is no damage to hardware or cables.
4. Confirm you are at the correct service address listed on your account.
5. Power cycle Starlink by unplugging from power and then plugging back in.
6. If none of these works, contact **Starlink Customer Support** by logging into your account on starlink.com.

For Further Assistance

Find answers to frequently asked questions, installation education, and additional troubleshooting in the Starlink App and the Support section of starlink.com.

Watch for blocking stuff!



Turning it on

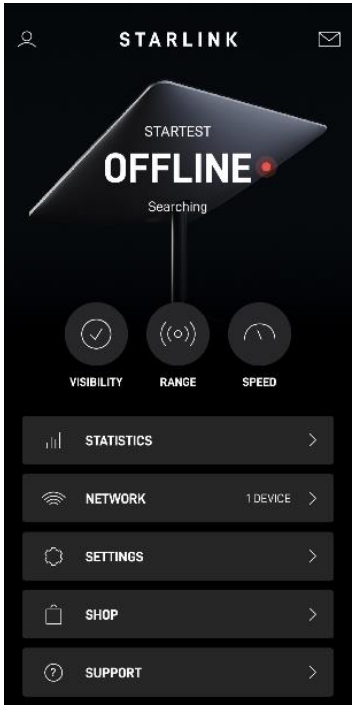
Out of the box, assembled state

Movement during statup procedure

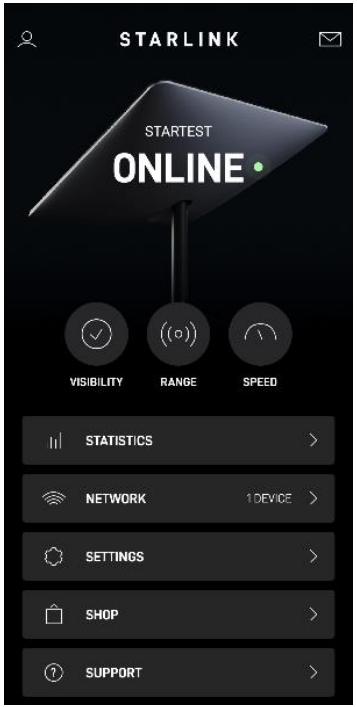
Final position with active service

Automatically adjusted tilt

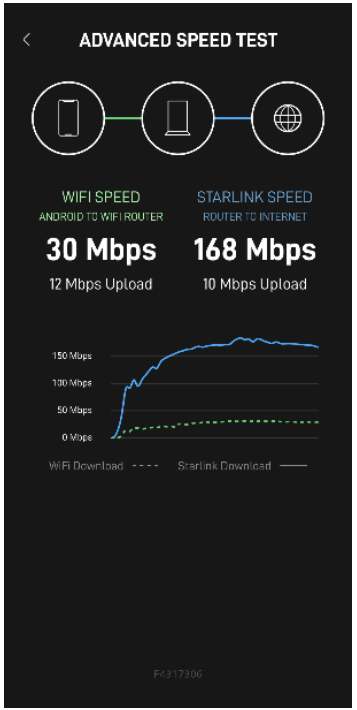
Turning it on



During startup



With service running



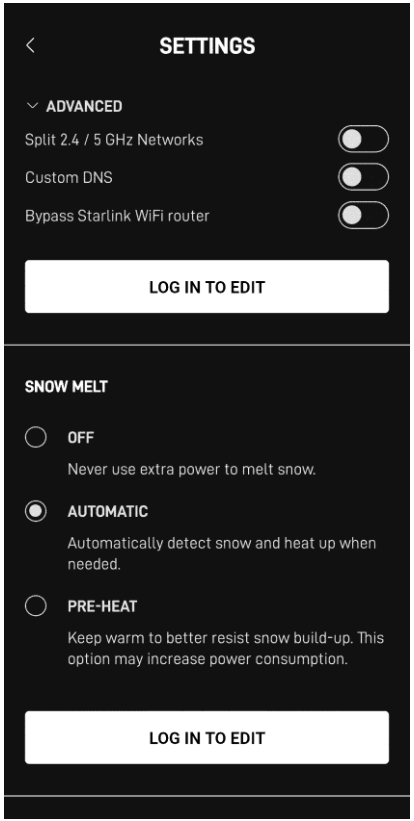
Built-in speed test

Starlink router (CPE)

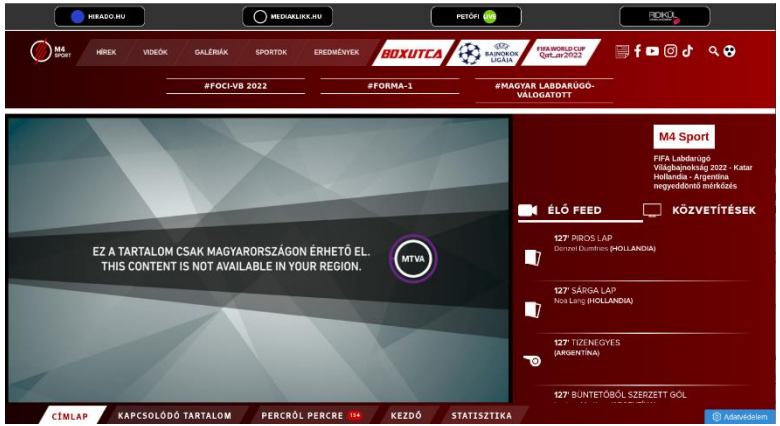
- No Ethernet port, only Wi-Fi
- No Wi-Fi 6 and no WPA3 encryption
- No external antenna connector
- Wi-Fi coverage extension officially only possible with Starlink „mesh” nodes

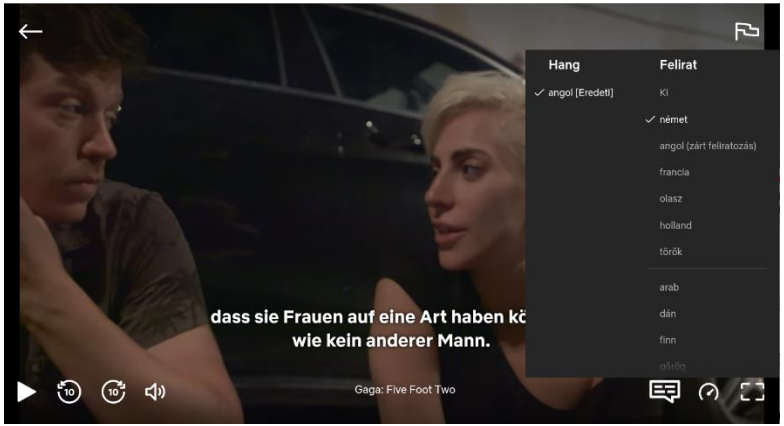
TCP/IP – factory CPE

- No router web admin page for settings (it redirects to www.starlink.com)
- A few settings can be changed through the cloud via the mobile application
- No port forwards, no public IP address by default. You're being NATted either behind this CPE, or behind a CgNAT

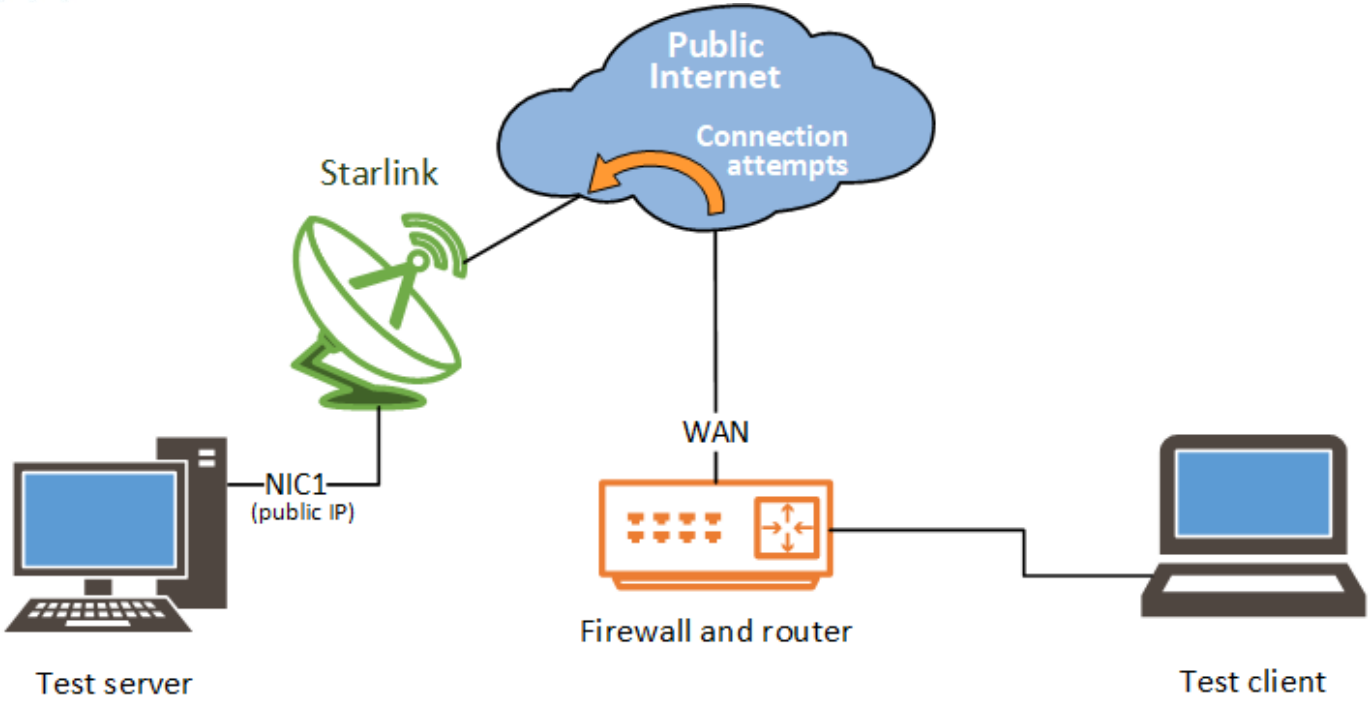


- Public IP address can be requested separately (DHCP, seems static)
- Needs a 5-minute power-cycle
- IP address geolocation may be incorrect (not in your country!)



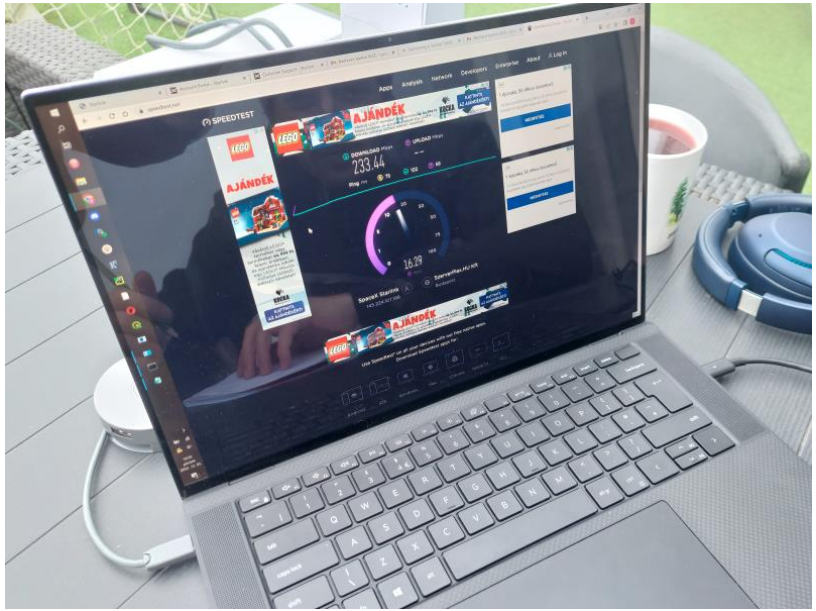


TCP/IP – public ports



Result: all TCP and UDP ports (1-65535) can accept inbound connections

Speed and latency



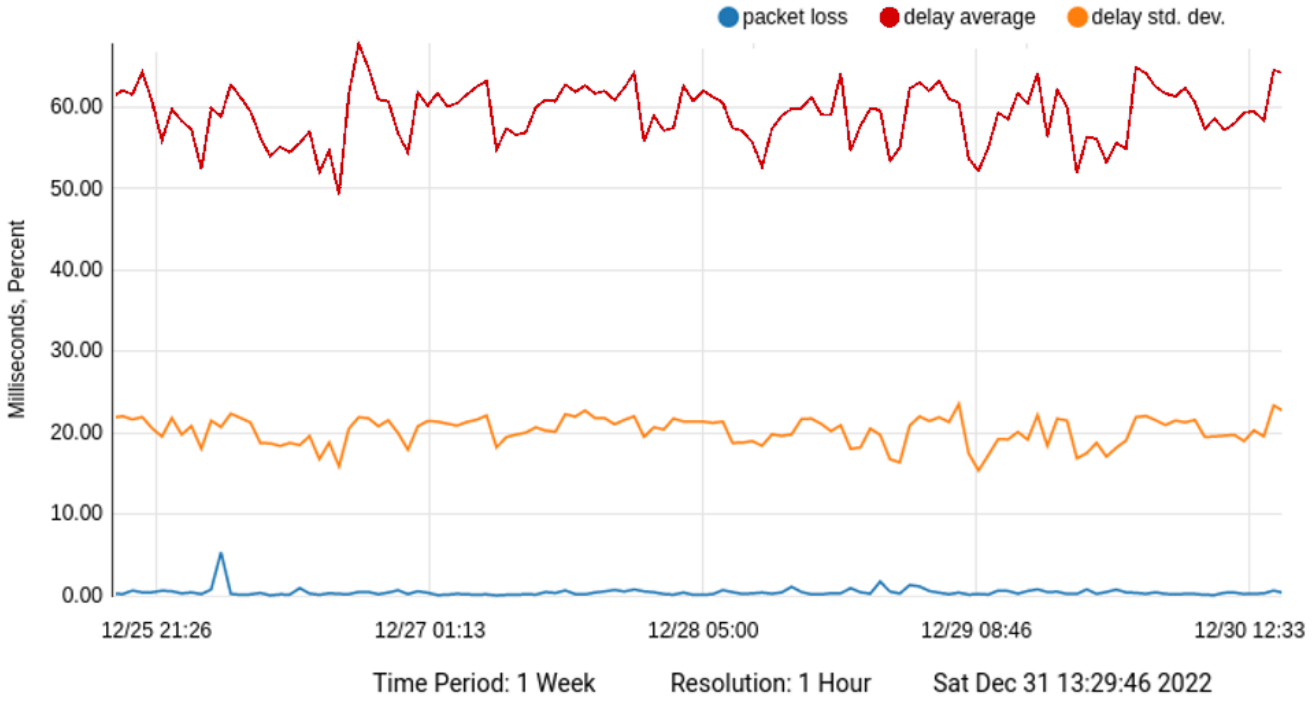
Technical parameters of the service in December 2022 (as stated on the website):

Package	*Availability*	*Latency (ms)*	*Download (MBps)*	*Upload (MBps)*
„STANDARD”	≥99%	25-50	20-100	5-15
„BUSSINESS”	≥99%	25-50	40-220	8-25
„BEST EFFORT / MOBILITY”	≥99%	25-50	5-50	2-10

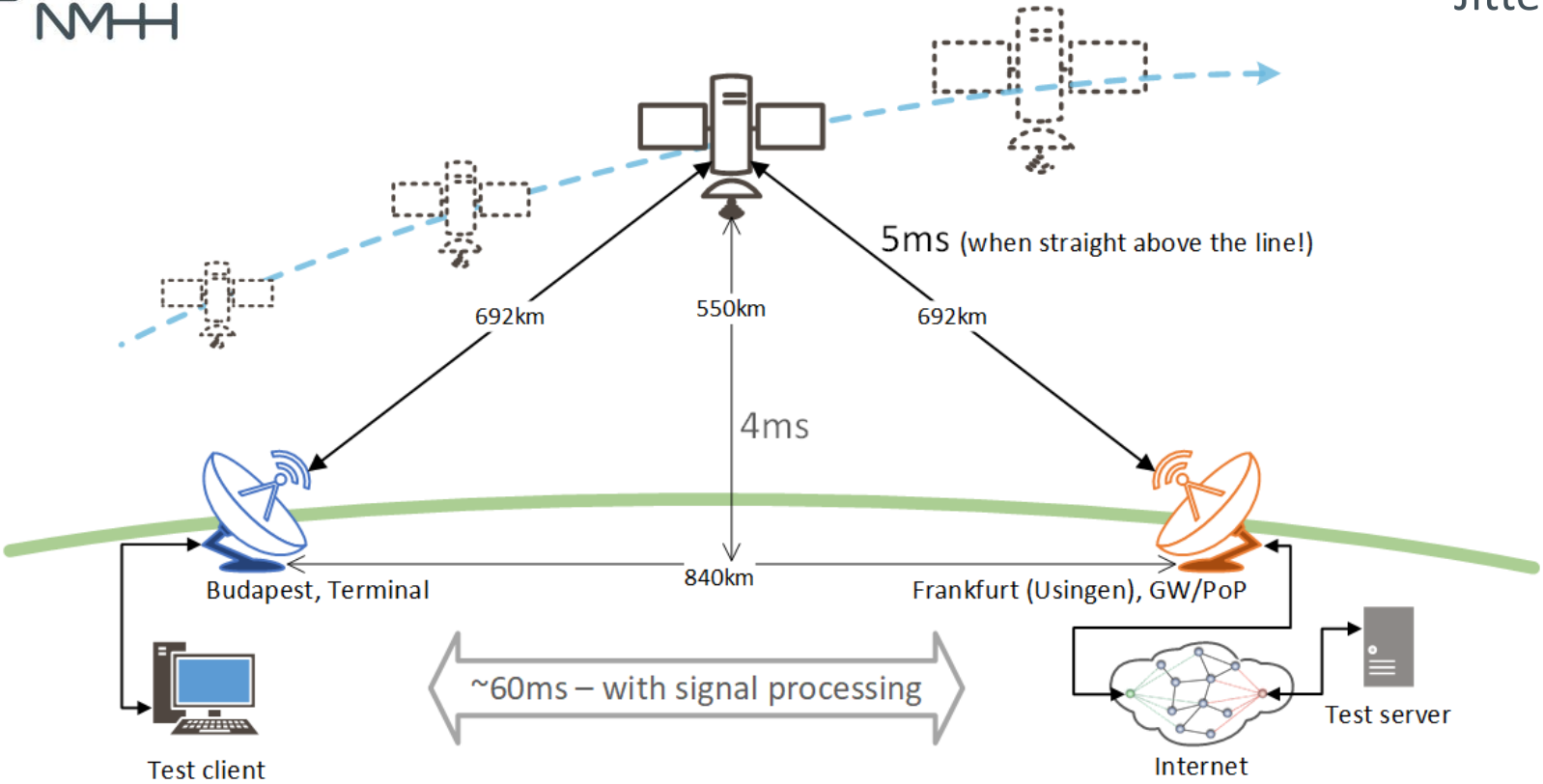
10 immediate speedtest.net runs, in December 2022

Speedtest.Net speed measurements		
Download speed (Mb/s)	*Upload speed (Mb/s)*	*Latency (ms)*
225,47	28,36	83
269,42	36,49	97
245,55	26,42	103
193,39	15,13	89
212,53	28,91	122
224,1	29,58	90
252,03	29,99	94
188,66	46,39	93
205,26	28,42	105
175,54	19,75	100
219,195 (average)	**28,944 (average)**	**97,6 (average)**

Latency and Jitter



5 days of continuous pinging to 8.8.4.4 every 500ms



High jitter due to satellite movement and handovers

Usability issues due to latency and high jitter

Compared to wired terrestrial services, Starlink is less appropriate for:

- IPTV-like audio-and video streaming (UDP unicast, multicast)
- Very low delay audio (less than 100ms, pro-audio applications)
- Online gaming (Microsoft Xbox Series X – „Rocket League”)

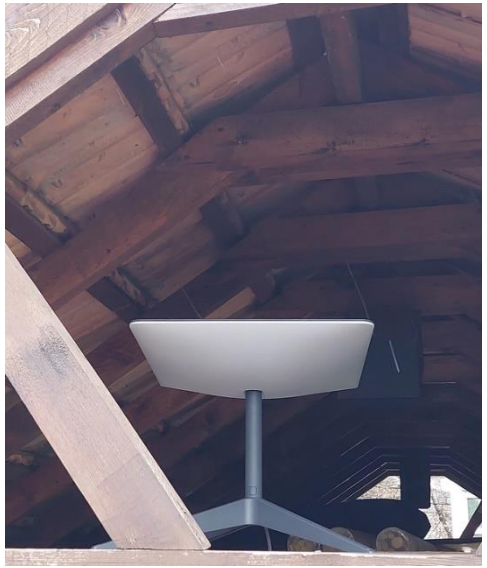
Using radomes




No serious influence, service OK

Radomes courtesy from Grante Zrt.

Using radomes

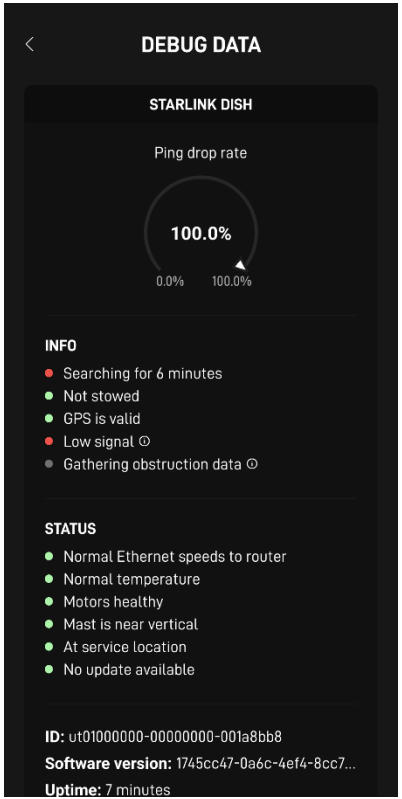


Clay roof tiles

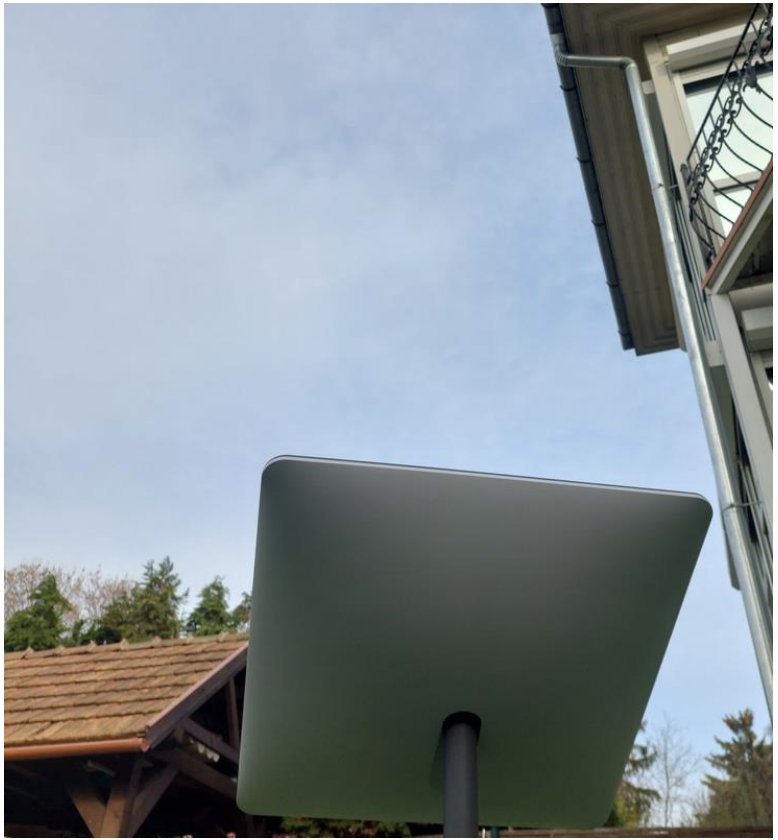
Slate tiles

Service stopped!

Error in the app:



Partial blocking outview



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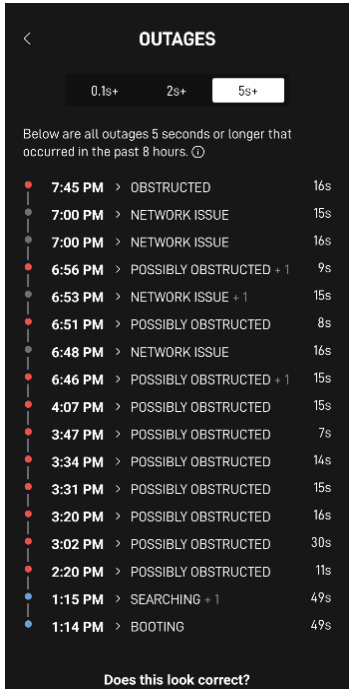
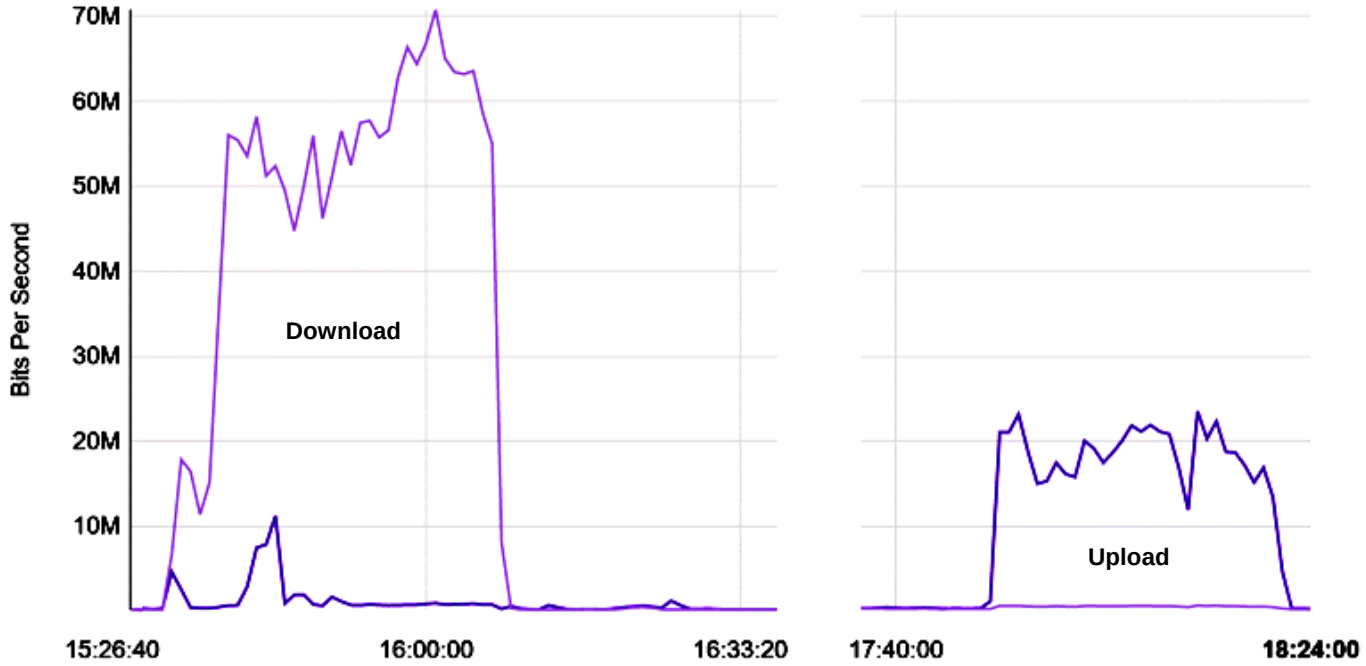
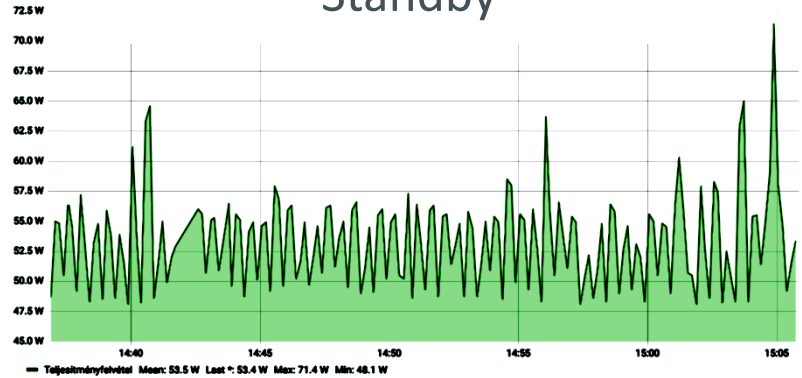




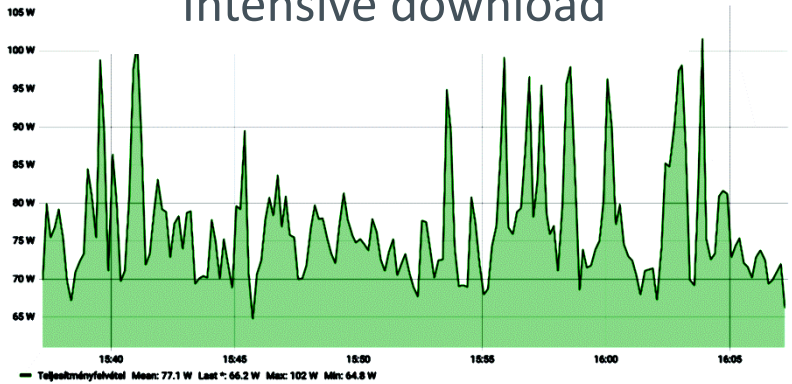
Maxing out with download and upload transfer

Energy usage

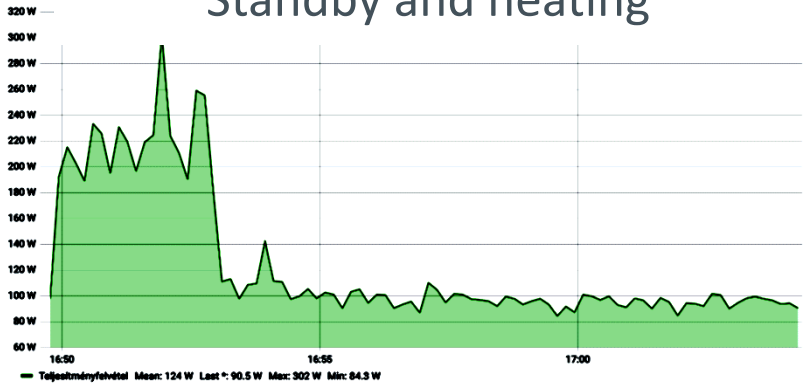
Standby



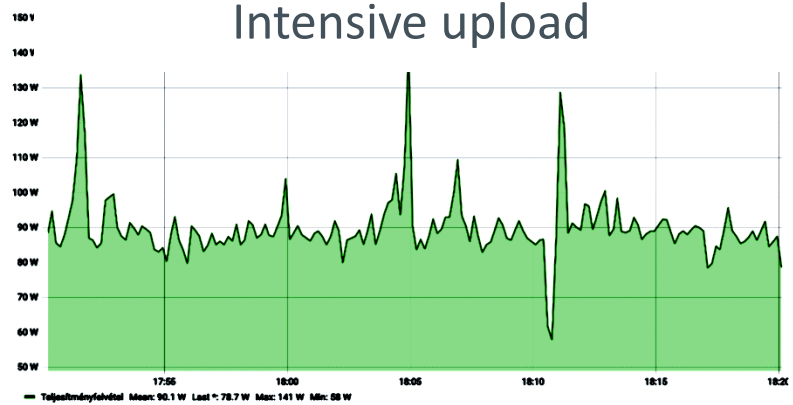
Intensive download



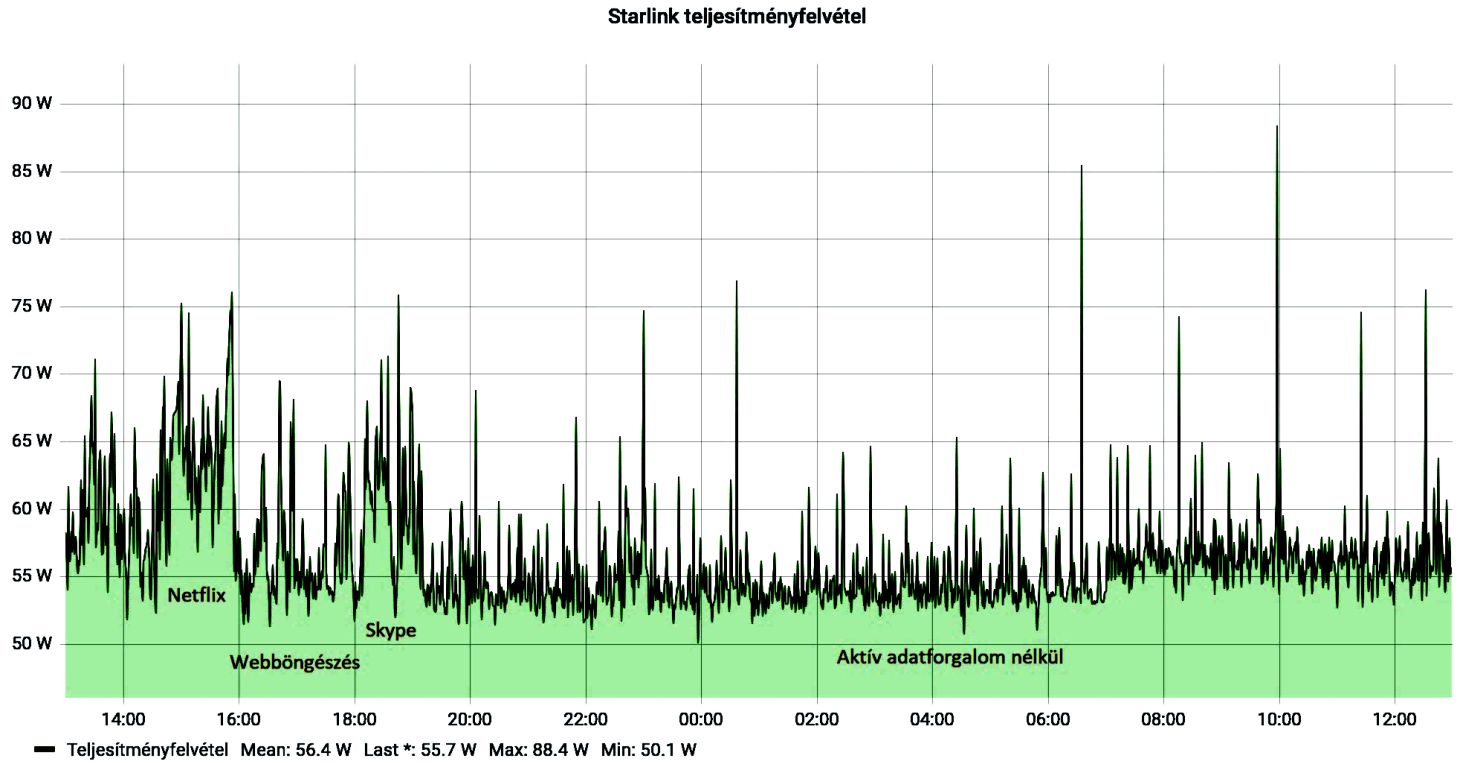
Standby and heating



Intensive upload

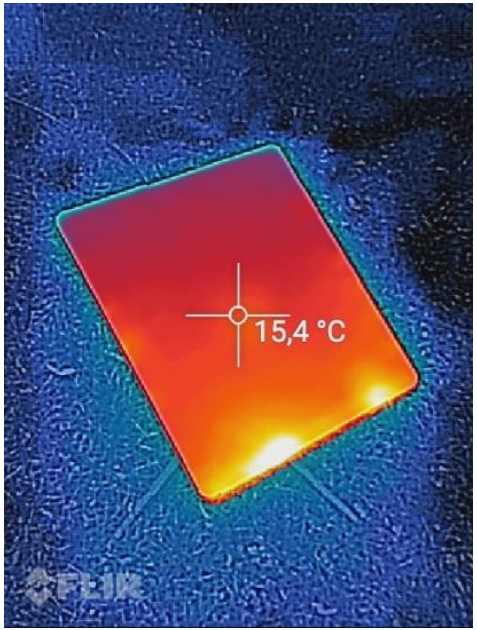


Energy usage

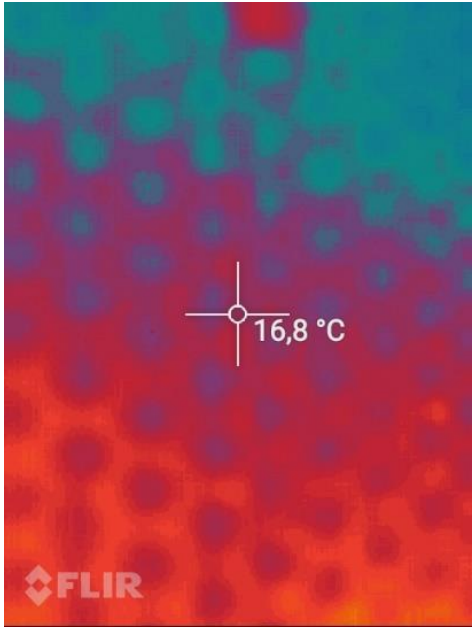


Average on 24 hours timespan

Thermal camera view



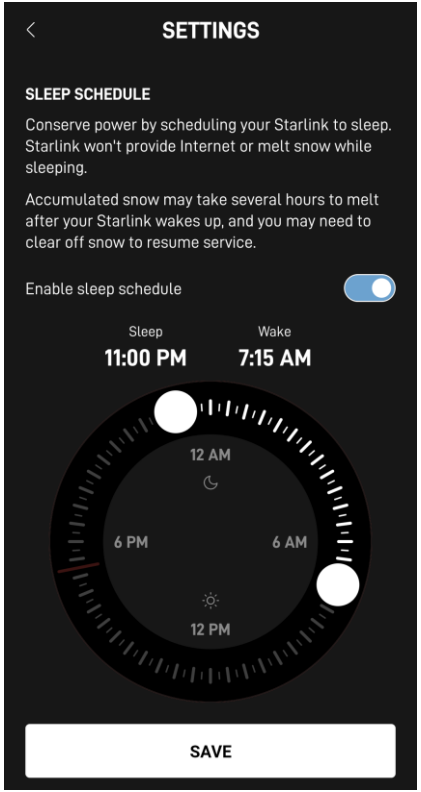
Heats up more at the bottom



The MIMO antennas can be seen

Back is also warm

Sleep mode



- A Sleep schedule can be set
- No service during sleep mode
- No de-icing in sleep mode

Conclusion

- Very good for average internet usage
- Business plan has public IPv4 address with server-like functionality
- Weak CPE/Wi-Fi, advisable to use own instead
- Limited usage for industrial/professional applications
- Very high energy demand, compared to other technologies

Thanks for watching!