National Media and Infocommunications Authority • Hungary

Testing the quality of Internet services in Hungary

The software and hardware based public measurement system of NMHH.

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The Status of the Hungarian Broadband Infrastructure Mapping

- A national telco infrastructure database is being set up for the Hungarian network operators, however it is still in an early phase.
- The Ministry of National Development in a work program under the name SZIP, have performed a survey in 11/2014 on the Hungarian broadband and sub-broadband network infrastructure. These data will be included (expectedly in 11/2016.) in the National Network Development Support Monitoring System (HTMR).
- Network capacities are expected to grow dynamically by the end of 2017, due to new construction activities under the operative program named SZIP.
- The Broadband Map of Hungary compiled from the data of the 2014 survey is publicly available under on web pages, including all internet capable networks under and over 30Mbps, with street/building accuracy (http://szelessav.e-epites.hu/map-core/)
- **Verified QoS data are available from the NMHH's Broadband Measurement System, which was launched in last August**.

Objectives of the system

A public service operated by NMHH enabling users to check the basic parameters of their broadband Internet service in Hungary with software and hardware based tools.

The aims of the system:

- To provide objective, real information for Internet users facilitating the choice of Internet service and checking and verification of their internet service.

- To provide information for the authority on the actual quality of domestic broadband internet services => well-informed decisions.

- To promote market competition and encourage technical development and penetration of broadband services: actual, measured quality instead of marketing messages.

The broadband measurement system of NMHH

The web-site of the broadband program of NMHH

www.szelessav.net

- For promoting the broadband.
- Helping the users in the usage of internet: knowledge base, advices for troubleshoot problems with internet access (*Why is my speed slow?)*
- Public measurement facilities: checking internet access quality, comparing to the offered speed value., etc.
- Measurement results: of fixed line internet access:
  software and hardware based measurements
  + mobile internet quality.

The broadband measurement system of NMHH
History of the system

2011 Pilot Project :

- Investigate the feasibility of such measurement system
- Succesfully implementing a demo system

2012-2015 Broadband Project :

Development of the system:

- An outside partner and experts of NMHH
- 2014 Public Procurement
- Contracted partner:

  Planning architecture of system,

  Developing measurements software for sw.+hw. tools and servers.

  Developing interface and logics for operate the system (scheduling measurements etc.)
- Authority's experts:

  Testing, configuring the complex informatics system behind the system
  Laboratory testing of hw. and sw. elements: functionality, accuracy
  Load-test of the system's central servers
  Developing software to support hardware tools deployment to users
  Planning of web-site, advertising and promoting the project,
  Providing the content of web-site, knowledge base, advices on the site…

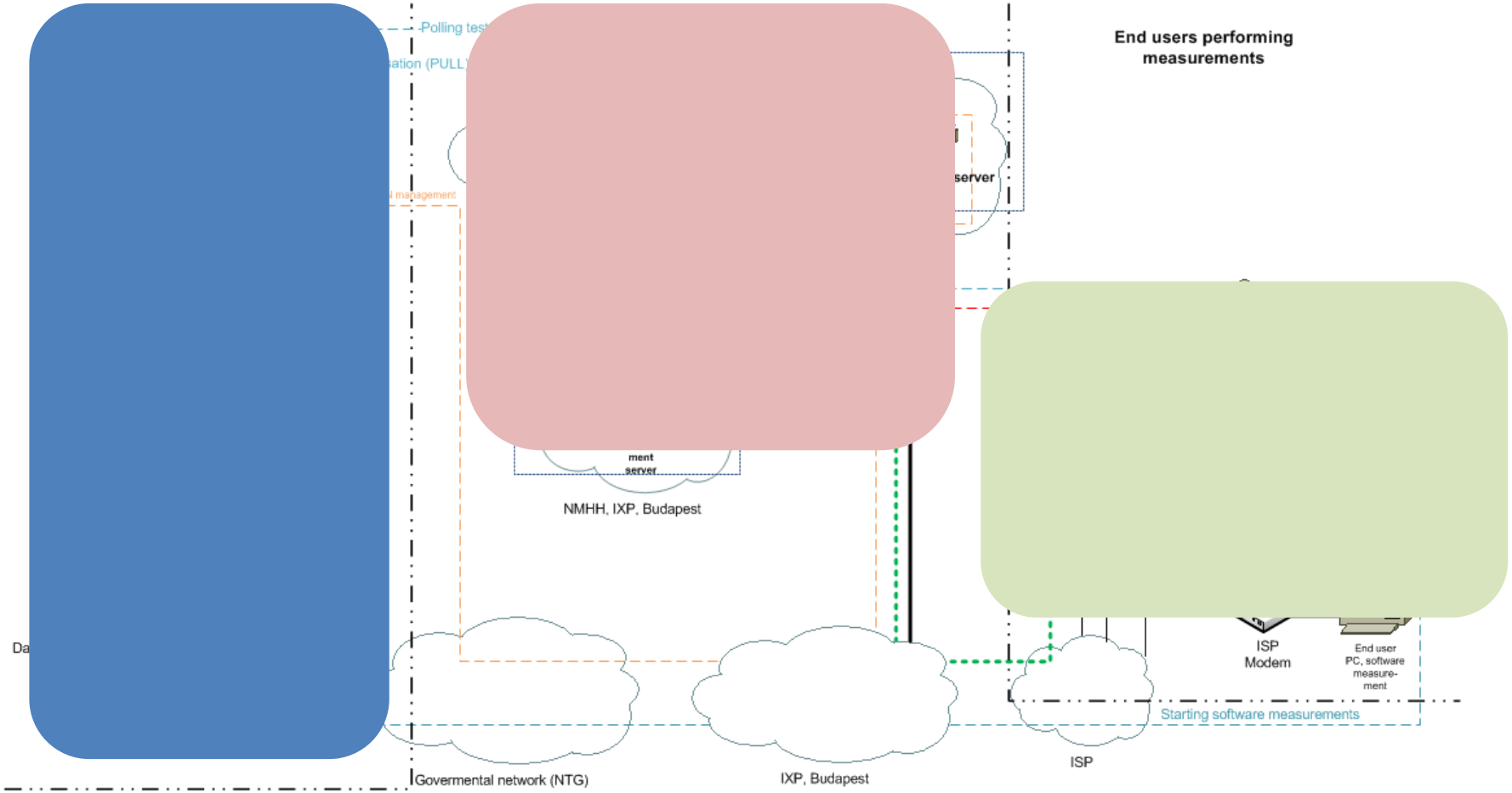
The broadband measurement system of NMHH

Launched officially on 19 August 2015. Positive reactions.

Complex measurement, informatics and publication system.

The broadband measurement system of NMHH

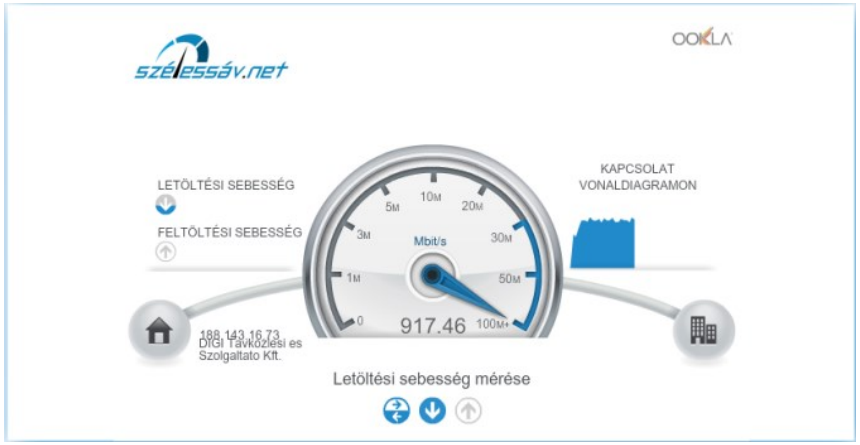
The architecture of the broadband measurement system of NMHH



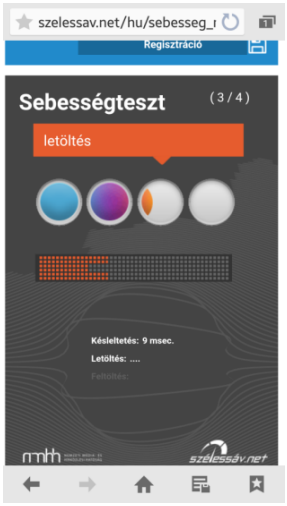
The broadband measurement system of NMHH

Measurement elements of the system

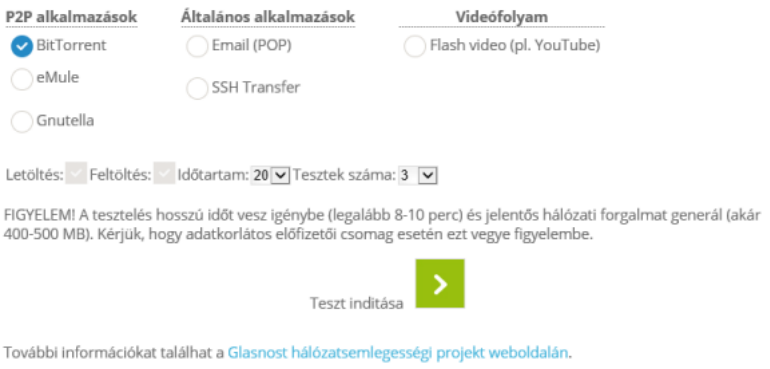
Software download-, upload speed, latency (Ookla, flash)



Software download-, upload speed, latency (html 5)



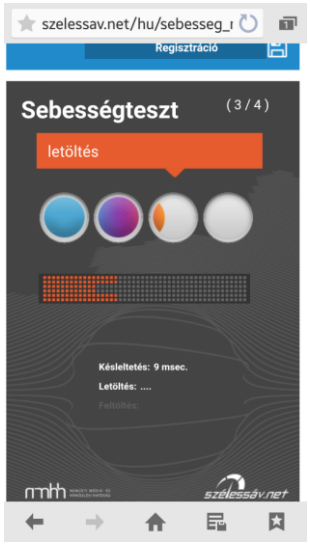
Software net. neutrality - Glasnost (Java)



Hardware tools: speed, latency and net. neutrality (port scan)

Mobile Internet quality meas. system (Swissqual)

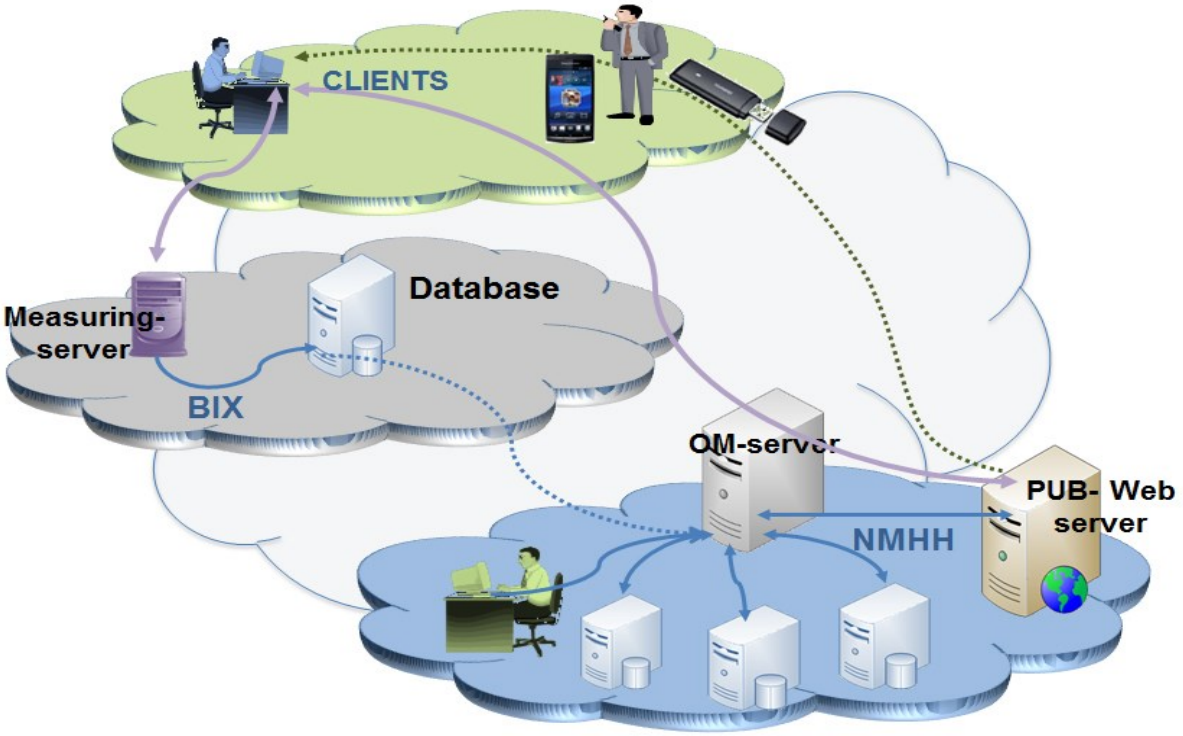
The broadband measurement system of NMHH
Software based measurements on the web-site



- Primarily Ookla speedtest (Flash technology), secondly own developed html 5 based software tool.
- It can be started from web-browser. The user don't need to install any program.
- Measurement server located in the BIX: independent from the service provider, neutral, uniform reference.
- Measured parameters: download-, upload speed, latency + network neutrality.
- The measurement result may be influenced by the user (PC hw. or configuration problems, cabling issues, viruses, etc.)
- The users can registrate on the web site: giving his/her, postal code, internet service provider, service package.
- The registered user can see his/her previous result and can apply for a hardware tool.

The broadband measurement system of NMHH

Software based measurements on the web-site (cont.)



The structure of the software measurement system

The broadband measurement system of NMHH
Software based measurements on the web-site:
Network neutrality measurements - Glasnost

Testing of traffic shaping:

The service provider may distinguish between different types of traffic of user.

The aim is to check whether traffic of the user's applications (like Bittorent, flash video etc.) is being rate-limited, throttled or blocked.

We use technology of Glasnost (Max Planck Institute, Berlin):

Glasnost generates two tcp traffics: one with the protocol elements and content of the investigated protocol and one another without it.

Comparing the speed of the two traffic.

Repeating the measurements then decision.

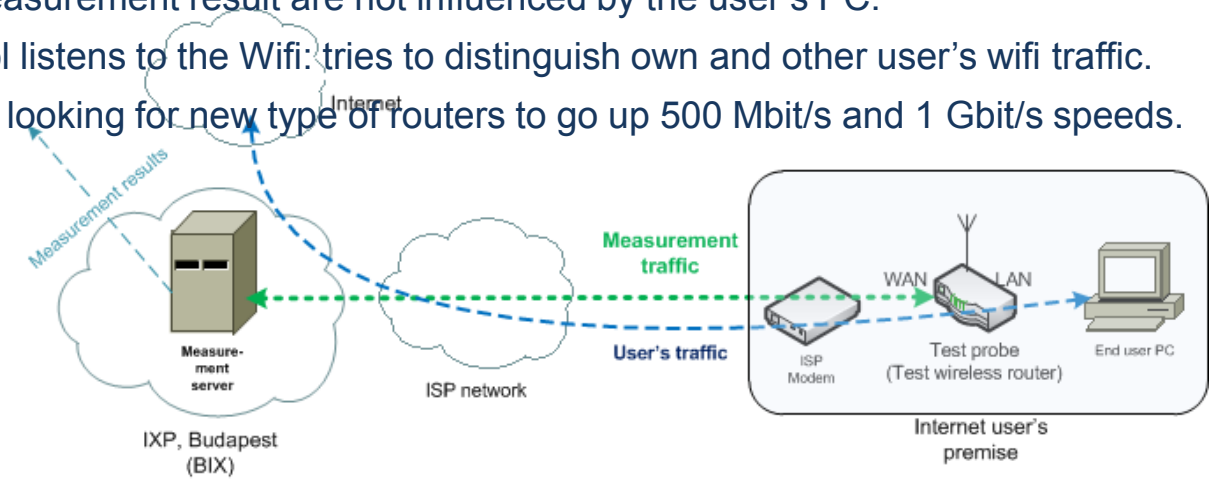
Relatively long measurement, lots of data transmitted.

The development of Glasnost has stopped, we are planning to develop a new software tool.

The broadband measurement system of NMHH

Hardware based measurement on fixed line Internet access

- Internet users can apply for hardware measurement tool.
- Based on commercial routers (2 types: TP-Link TL-WR841N, TP-Link WDR3600) with own developed firmware, measuring software, configurable scripts.
- Transparent to the user, no need user configuration.
  It can handle automatically PPPo and DHCP connections too.
- Measured parameters: download, upload speed, latency, port scan.
- „Calibrated” speed measurements up to 50 and 150 Mbit/s.
- Active measurements: hw. tool generates traffic between itself and the measurement server. The measurement server located in the BIX.
- Accurate, close to Ookla method (max. some percentage of error), checked in laboratory of NMHH.
- HTTP-TCP throughput with statistical post processing, Http response time.
- The measurement result are not influenced by the user’s PC.
- Hw. tool listens to the Wifi: tries to distinguish own and other user’s wifi traffic.
- We are looking for new type of routers to go up 500 Mbit/s and 1 Gbit/s speeds.



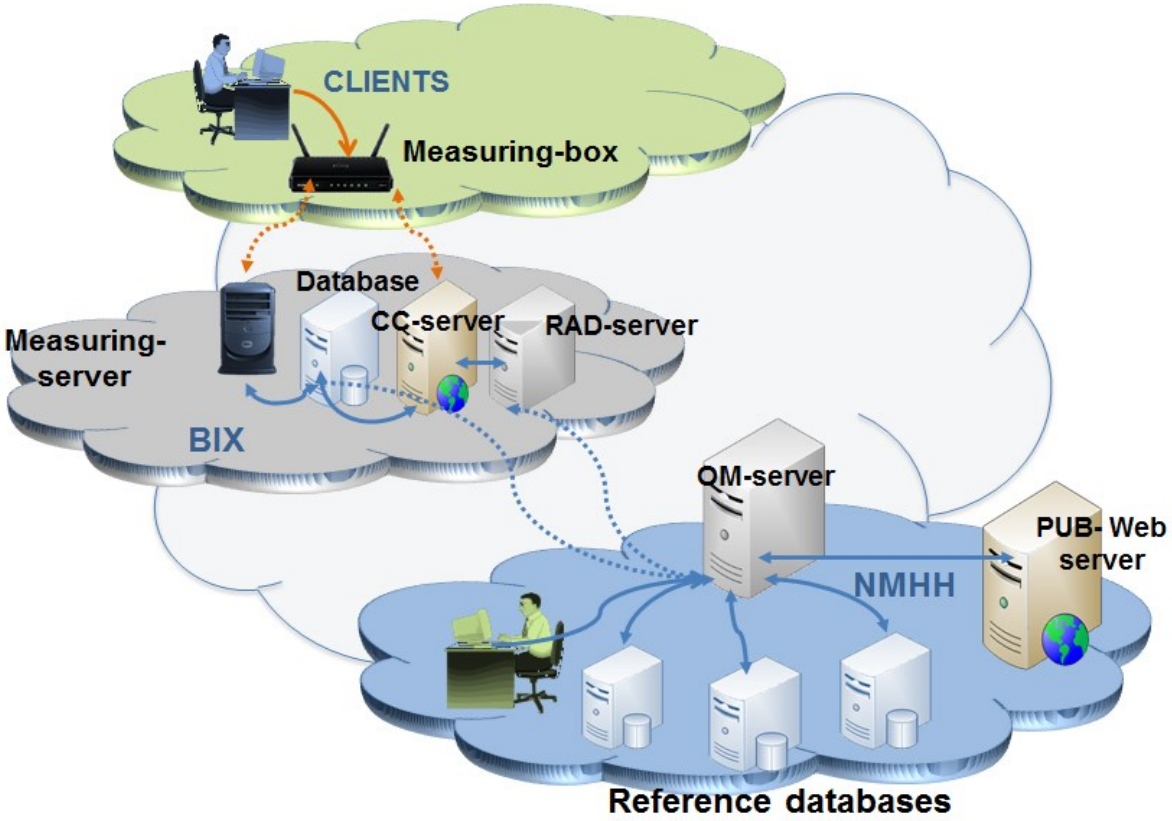
The broadband measurement system of NMHH

Hardware based measurement on fixed line Internet access (cont.)

- Hardware tools are controlled from broadband centre of Authority.
- Automated and scheduled 24/7 measurements.
- Life-signs, pings in every minute from the hw. tools.
- Secure, encrypted communication between hw. tools and the central servers, authentication (RADIUS).
- Privacy issues.
- Tested against hacking.

The broadband measurement system of NMHH

Hardware based measurement on fixed line Internet access (cont.)



The structure of the hardware measurement system

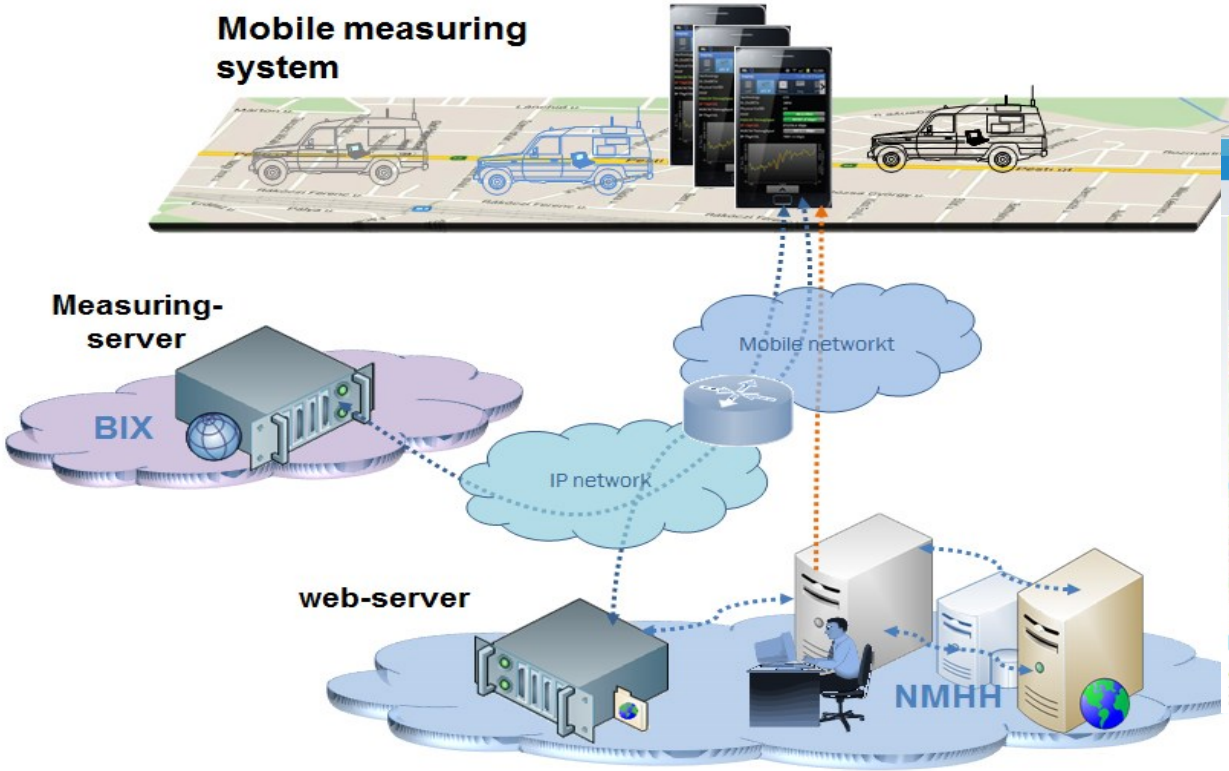
Measurement method of hardware tools

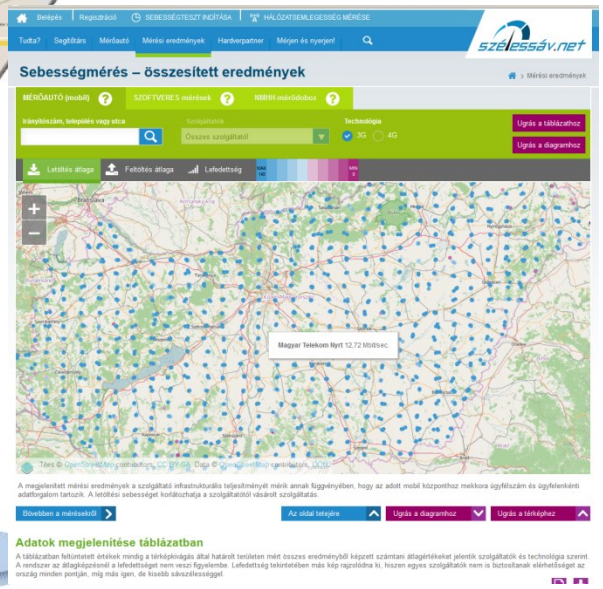
Measuring the download and upload data speed:
Active measurements, downloading and uploading file from/to the measuring server.
The hw tool checks the user traffic, it starts the measurement when the user's traffic is negligible.
Close to OOkla method: HTTP-TCP based measurement, multithreaded.
Many partial measurement results during the downloading.
Statistical post-processing of the results:
Removing the lowest and highest results - trying to measure the maximum stable speed during the meas. period. The rest is averaged, then the result is sent back to the server.
The measured absolute (Mbit/s) and % of the offered value displayed.
Also port latency and port scan measurements on the hw. tool.

The broadband measurement system of NMHH

Mobile internet measurements

Measuring with a professional tool: Swissqual system.
Measured results are imported in the broadband system and displayed on map.

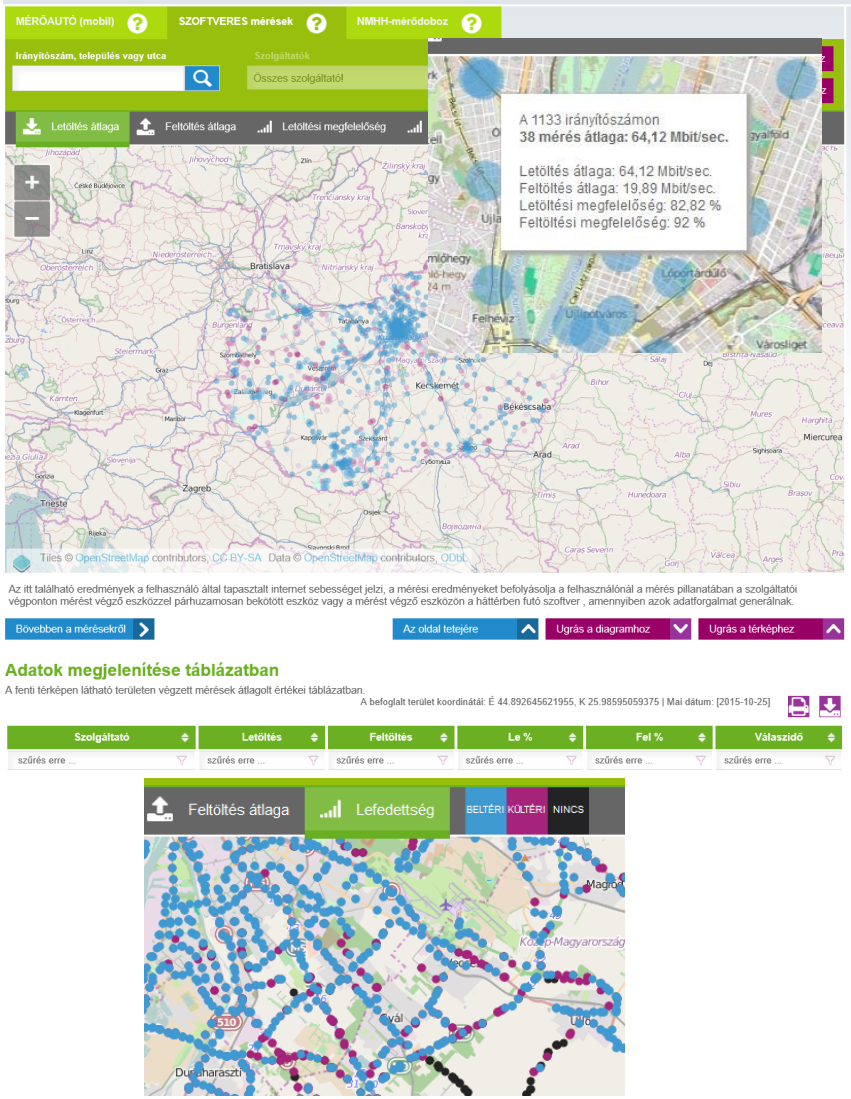


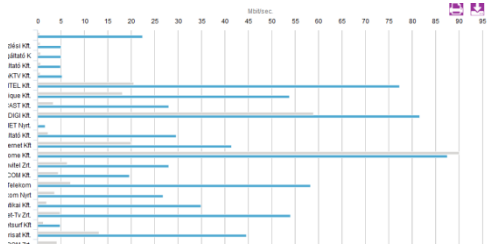


The broadband measurement system of NMHH

Displaying of measurement results

- The own results of the user (for registered users) and aggregated results of all users of last 3 months.
- Mobile internet, fixed line software based, and hardware based measurement results displayed.
- Results are displayed in the form of zoomable map, downloadable tables and time-graphs.
- Aggregated measurement results on the map.
- Filtering data: service provider, internet service…
- Network neutrality measurement results.





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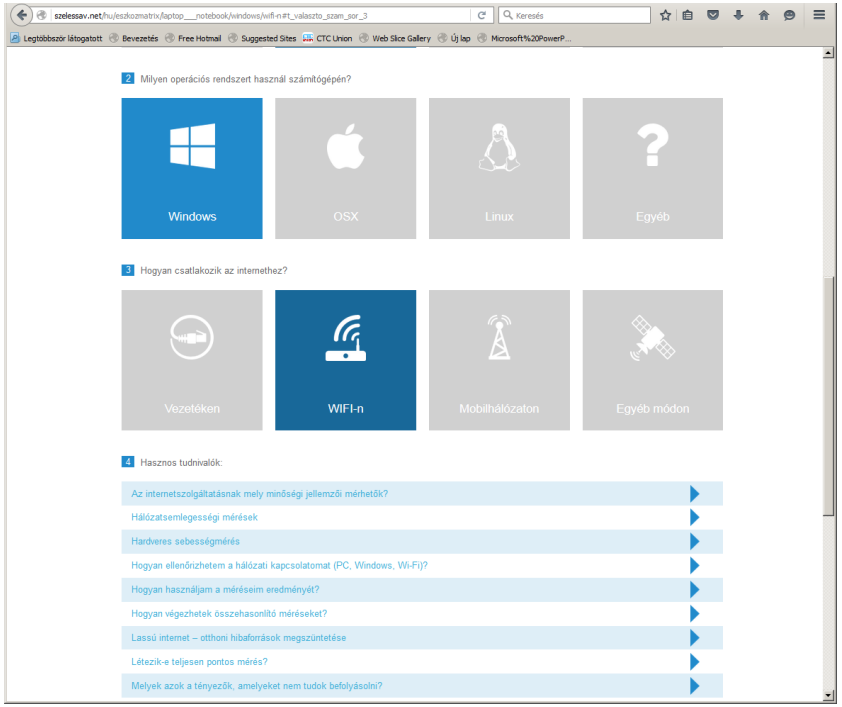
Knowledge base and advices for internet usage



The broadband measurement system of NMHH
Some figures…

From 19 August, 2015 up to now:

For fixed line Internet access measurements:

Registered users: >8900.

Number of registrated software measurements: >34 000.

Number of deployed hardware tools: ≅240.

Number of hardware measurements on fixed line: >548 000.

Future of the system

Some planned improvements and developments:

- New hardware tools for higher speeds (up to 1 Gbit/s)
- New parameters to measure (on line video quality etc.)
- Improving html 5 sw. tool for higher speeds (Flash is over…)
- Improving wifi detection capability of hw tools (to detect user's possible parallel wifi traffic).
- New sw. tool for testing network neutrality.
- Improved maps to display the results.
- Improved statistical model for deploying hardware tools.
- Increase the number of users of the system: to achieve statistical representativity.

The broadband measurement system of NMHH

Main features and advantages of the system

The szelessav.net is not simply a web portal for speed test:

- Software (web-browser based) + hardware measurement for fixed line access.
- Mobile internet results from professional measurement system are also displayed.
- Measurement server located in IXP (BIX): independency from operators, the same reference point for all user endpoints.
- Up-to date database of domestic Internet service providers and services: comparing results with the offered speed.
- The portal also offers a knowledge base, a help interface and information to help users to understand measurement results, and gives troubleshooting advices on internet usage.
- A complex tool designed to increase consumer awareness.

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Thank you for your attention.