Nemzeti Média- és Hírközlési Hatóság

Report on net neutrality in Hungary

Pursuant to Regulation (EU) 2015/2120 of the European Parliament and of the Council of 25 November 2015 for the period between 30 April 2016 and 30 April 2017

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1 Hungarian regulations on net neutrality

Net neutrality regulation in Hungary is based on a number of components. As Hungary is an EU member state, *Regulation (EU) No. 2015/2120* (hereinafter: "EU Regulation"), amending *Directive 2002/22/EC on laying down measures concerning open internet access, universal service, and users' rights relating to electronic communications networks and services and Regulation (EU) No 531/2012 on roaming on public mobile communications networks within the Union*, is directly effective and applicable.

NMHH Decree 2/2015. (III. 30.) on the Detailed Rules of Electronic Communications Subscriber Agreements (hereinafter: Electronic Communications Decree) has, since the entry into force of the EU Regulation last year and in the interest of ensuring transparency, already contained provisions on net neutrality.

These provisions require service providers supplying internet access services to provide access to their internet services for subscribers and users, in the quality specified in their general terms and conditions and specific subscriber agreements, as well as information about any traffic management measures employed and the effects on subscribers thereof in line with the subscriber agreement.

The Electronic Communications Decree also requires service providers supplying internet access services to publish on their websites and continuously update standard service description tables on each internet access service packages.

Based on the Electronic Communications Decree, the service providers are required to specify in the table the name of the tariff plan, the offered upload and download speeds (Mbps), the guaranteed upload and download speeds (Mbps), the data traffic included in the plan (GB), the contractual consequences of using up the data traffic quota (slowdown of internet access, applicable traffic charges) and information about how the service can be shared among multiple devices.

An additional international legislation is NMHH Decree 13/2011 (XII.27.) on the requirements for electronic communications service quality relating to the protection of subscribers and users, and on the authenticity of billing (hereinafter: Electronic Communications Decree) that requires all fixed and mobile internet access service providers to specify in their subscriber agreements certain quality indicators such as offered bandwidth, as well as guaranteed download and upload speeds[1]. In terms of the quality indicators relevant to service speeds, the Electronic Communications Decree currently does not differentiate between mobile and fixed internet access services. Service providers with over one thousand subscribers are required to verify compliance with their guaranteed service level indicators by submitting an annual declaration of compliance to NMHH or a certificate issued by the a designated quality assessment organization.

The purpose of the national regulation (transparency, protection of end-user rights) currently in force is similar to those incorporated in the Regulation, but it regulates not only internet service but also the quality of other electronic communication service.

[1] guaranteed download and upload speeds: the lowest data rate that is specified in the subscriber agreement to be made available for uploading at the subscriber termination point concerned.

2 Monitoring the implementation of the EU Regulation

Internet use and internet-based digital economy have become decisive factors in our lives. Therefore, the National Media and Infocommunications Authority (NMHH) monitors and controls net neutrality in Hungary as well as compliance with the relevant rules as a priority issue. NMHH controls compliance with net neutrality rules by service providers during its annual planned as well as unplanned monitoring activities.

Authorisation for such activities is granted under the EU Regulation as Article 5 therein requires the national regulatory authorities to strictly monitor and ensure compliance with the provisions of the EU Regulation, and to promote the continued availability of non-discriminatory internet access services at levels of quality that reflect the current state of technology. Section 7 of the Preamble of the EU Regulation empowers and requires national regulatory authorities to intervene when commercial practices would result in the undermining of the essence of the end-users' rights.

NMHH performs its activities with regards to net neutrality as listed under the supervisory powers stipulated in Act C of 2003 on Electronic Communications (hereinafter: Electronic Communications Act). The supervisory tools of NMHH form a complimentary system of components for the purpose of effective operation of the electronic infocommunication market, support for fair competition, and the protection of the rights and legitimate interests of subscribers and users.

A large segment of NMHH's supervisory functionality are **ex officio investigations** including **investigations as part of the annual supervisory plan.** Each year NMHH compiles the supervisory plan based on past experience, reports, comments, complaints and requests from subscribers, users, market players and other authorities as well as the strategic goals in the relevant regulation, and identifies the areas planned for investigation the following year. However, changes in the market, development in services and issues raised during the year also necessitate that **NMHH performs investigations beyond those already planned.**

The other main pillar of the supervisory activity is made up of the **proceedings launched on the basis of the requests and reports from the subscribers of electronic infocommunication services**, which facilitate quick detection of and flexible reaction to negative market tendencies and are also important tools in enforcing subscribers' and users' rights.

NMHH may impose sanctions on those violating any rule regarding electronic communications or the general contracting terms and conditions. Pursuant to the Electronic Communications Act, rules on electronic communication include an EU legal act pertaining to electronic communication and to be applied directly, including the EU Regulation. Therefore, NMHH is fully empowered to control and enforce compliance with the relevant provisions on net neutrality by the service providers.

For the purpose of verifying that the requirements in the new regulation are put into practice, NMHH added to its annual planned supervisory activities the investigation of compliance with the requirements of traffic limiting measures by service providers. The purpose of this investigation is to ensure that internet access services provided in a quality compliant with the relevant technological development level are available on the market. In addition, NMHH considers it as one of its top priorities to monitor market trends, especially the websites and commercials of service providers in terms of net neutrality. Furthermore, NMHH occasionally performs ad hoc reviews of the General Terms and Conditions (hereinafter: GTCs) and

related amendments of mobile and fixed internet access service providers with the largest numbers of subscribers in terms of net neutrality.

2.1 Monitoring of contractual and commercial conditions

With regards to net neutrality, NMHH inspects offers for unlimited online video streaming, unlimited access to the most popular social media sites and messaging applications as well as unlimited music streaming plans during the reporting period.

Since the Regulation became effective, NMHH has launched three proceedings where the relevant service providers by marketing the above offers follow a commercial practice that may violate compliance with the requirements and objectives included in the rules on net neutrality.

In all three cases, NMHH concluded that the commercial practices investigated also quality as discriminatory traffic management measures and as such violate the rules for net neutrality. Therefore, NMHH banned such unlawful behaviour and ordered the service provider to discontinue the unlawful differentiation between various types of internet traffic.

The decisions by NMHH have become final but the relevant service providers have appealed to the national court against them. In their request for review, the service providers urged that the EU Regulation is interpreted by the Court of Justice of the European Union instead of the court of the Member State; therefore, each service provider proposed a preliminary ruling procedure to be conducted. The national court has not yet ruled on the merits of the cases, nor has it decided whether a preliminary ruling procedure was really needed. However, the court rejected the service provider application for suspending the enforcement of the resolution even before ruling on the merits of the case.

2.1.1 Online video streaming

The subject of the proceeding was the option named “Korlátlan TV és film” (Unlimited TV and film), which offers unlimited access exclusively to two online video streaming services (TV GO, HBO GO).

As a result of the investigation of the commercial practice of the service provider marketing the optional offer, NMHH concluded that the data traffic generated by the named services of the subscribers using the option did not decrease the data quota for the specific mobile internet subscription, and after the amount of data included in the quota is used, these services remain available to subscribers free of any restriction. In contrast, the data traffic generated by other internet content is deducted from the quota and access to them is restricted by slow-down after the quota is used.

In the opinion of NMHH, the offer under investigation includes a traffic management measure that uses positive discrimination for certain internet content specified by the service provider and favours those over other internet content; therefore, by using a traffic management measure, the service provider discriminates against certain content, applications and services.

Based on the foregoing, NMHH has concluded that in applying the traffic management measure, the service provider deviated from the requirement for equal and discrimination-free treatment as specified in Article 3 (3) of the EU Regulation.

Among other things, NMHH also warned the service provider that the name of the “Unlimited TV and Film” option may mislead subscribers because the option, but for the two services included in the package, does not offer free access to any TV and film service without any data charge incurred. Due to the violation, NMHH banned such unlawful behaviour and ordered the service provider to discontinue the differentiation between various types of content.

It was the first case in Hungary that NMHH issued a resolution for the purpose of net neutrality, and it was among the first cases on EU level to apply these EU requirements.

2.1.2 Unlimited access to social media websites and messaging applications

The subject of the proceeding was the additional package of a service provider providing unlimited access to certain social media websites and messaging applications.

The service provider offered the specific package to pre-paid mobile phone subscriptions. The package had two components. On one hand, it included a free-to-use 1 GB data quota. In addition, the service provider offered the domestic quota-free use of content and application of certain social media sites and messaging applications such as Facebook, Facebook Messenger, Whatsapp, Instagram, Twitter and Viber (hereinafter jointly referred to as “Social Media ”).

NMHH concluded that the data traffic generated by Social Media Applications available in the Benefit System did not reduce the 1 GB quota for pre-paid mobile internet subscription, and after the amount of data included in the quota was used, these services remained available to subscribers at the original bandwidth, i.e. without any slow-down. In contrast, the data traffic generated by other internet content not included in the package was deducted by the service provider from the quota and access to such content was restricted by slow-down after the quota is used.

Based on the analysis of the offer, NMHH concluded that it constituted traffic management of the type violating Article 3 (3) of the Regulation. Thus, the service provider, based on commercial considerations, provides Social Media Applications with unlimited use and without slow-down, whereas access to all other internet content is limited to max. 32 Kbps download and upload speeds once the data quota for the package is reached without any justification for the traffic management measures stipulated in Article 3 (3) of the Regulation.

Based on the foregoing, NMHH has concluded that in applying the referenced traffic management measure, the service provider, without an appropriate reason, deviated from the requirement for equal and discrimination-free treatment as specified in Article 3 (3) of the EU Regulation.

Due to the violation, NMHH banned such unlawful behaviour and ordered the service provider to discontinue the differentiation between various types of content.

2.1.3 Unlimited music streaming packages

The subject of the investigation was the service packages available in the offering of one service provider that offers specific music streaming services and online radio listening.

The service packages targeted by the investigation are offered by the service provider in three versions and are available as an option to any monthly postpaid and prepaid customer

with an active mobile data package. In certain tariff plans, the monthly fee already includes the “Start” version of the option.

The Start package version offers 500 MB of data traffic with four specific streaming applications (Deezer, Apple Music, Tidal, Spotify) and seven online radios (Kossuth, Petőfi, Bartók, Dankó, Rádió 1, Music FM and Sláger FM) (hereinafter jointly referred to as “Music Applications”). The Nonstop package version offers unlimited data traffic to access the Music Applications above. The Deezer package version also offers unlimited data traffic to access the Music Applications and the monthly service subscription fee already includes the subscription fee for the Deezer service.

The proceeding concluded that with the tariff packages investigated, the service provider offers subscriber access to Music Applications under preferential terms. The data traffic generated by the Music Applications available as part of the packages was not deducted from the data traffic quota available to subscribers, and after the amount of data included in the quota is used, these Music Applications remain available to subscribers free of any restriction. (With the Start tariff package, Music Applications are available under preferential terms up to the 500 MB data tariff quota.) In contrast, the other internet content outside the Music Applications generate data traffic that incur charges, and access to them, depending on the tariff plan of the subscriber, is limited in the form of slow-down or blocking once the amount of data included in the subscriber’s data traffic quota.

Based on the above, NMHH concluded that the service provider is conducting a commercial practice during which a traffic management measure is used. By discriminating against and favouring certain selected content over other internet content, the service provider deviated from the requirement for equal and discrimination free treatment as specified in Article 3 (3) of the EU Regulation without any lawful reason.

Due to the violation, NMHH banned such unlawful behaviour and ordered the service provider to discontinue the differentiation between various types of content.

2.2 Restricting end-user rights

NMHH monitors restrictions on end-user rights as a priority issue. Hungarian regulations provide a legislative guarantee (Electronic Communications Act) for user rights and also list mandatory components for subscriber agreements. In addition to legislative regulations, the Electronic Communications Decree) detail the requirements for the content of subscriber agreements.

Controls regarding compliance with rules on net neutrality relevant to end-user rights focused on two specific fields in the investigation period: restrictions imposed by service providers with regards to subscriber’s terminal equipment and the blocking of tethering[2].

2.2.1 Restricting the use of subscriber’s terminal equipment

Within the context of a questionnaire-based survey, NMHH assessed internet access service providers for their practices on subscriber’s terminal equipment, with a special emphasis on the conditions of connecting subscriber’s terminal equipment not provided by the ISP.

[2] Tethering allows end-users to share the mobile internet connection of a phone or a tablet with another device, e.g. a laptop computer.

The investigation found no irregularities with regards to net neutrality.

2.2.2 Prohibition of tethering

Prior to the EU Regulation's effective date, service providers sometimes had contractual provisions for the disabling of tethering. During its monitoring activities, NMHH found only one case since the EU Regulation went into effect where a contractual provision restricted tethering. The restrictive prohibition was found in the GTC of the affected mobile internet service provider effective as of January 2017. This, however, was voluntarily removed by the service provider in the same month.

2.3 Handling of complaints related to net neutrality

End users can make complaints about net neutrality as per the general rules. Service providers are required to have compliant and established complaint management procedures incorporated in the GTC, thus they are available to subscribers.

Under national legislation currently in force, the Service Provider is required to respond on the merits of the written complaint within 30 days from the date the complaint is received.

The ISP practice relevant to net neutrality may be detected by end users also in the form of a network error. Troubleshooting has its own controlled procedure different from complaint management that requires the provider to investigate the fault report within 48 hours. Receipt of the fault report must be confirmed to the subscriber and must be recorded. The period from reporting the fault to its correction shall not exceed 72 hours. Immediately but within 24 hours after resolving the fault, the Service provider shall notify the subscriber about the fault resolution, and register the means and time of notification.

Thus, the subscriber can report the issue (including the complaint resulting from the network error referenced above) to the service provider, which then investigates the issue. If the subscriber does not agree with the response received or he believes the service provider does not perform as per the subscriber agreement, the subscriber may submit his case to a court as per the dispute resolution procedure specified in the agreement, or, in the case of subscribers who qualify as consumers, can seek assistance from an arbitration board. Should the service provider fail to investigate the complaint or violates the laws pertaining to subscriber legal relationship, the party filing the complaint may submit his case to NMHH.

2.3.1 Complaints submitted to NMHH and their outcome

During the inspection period, NMHH received no complaint from end-users with regards to compliance with the net neutrality rules of the EU Regulation.

2.4 Performance of the internet access service

NMHH used a number of different methods to assess the parameters of the internet access services offered by internet service providers. Each method included a **questionnaire-based survey** conducted among service providers (see Section 2.4.1 of the report) as well as a review of the GTCs of market leading service providers in terms of the traffic management applied. In addition, NMHH conducted its own measurements to test whether the actual

bandwidth experienced by subscribers corresponds with the service values listed in the offers of service providers. (The measurements conducted by NMHH and their results are listed in Section 2.4.2 of the report).

2.4.1 The traffic management tools employed

For the purpose of verifying practical implementation of the new regulation, NMHH added to its annual planned supervisory activities for both 2016 and 2017 the testing of compliance with the requirements of traffic limiting measures by service providers.

NMHH believed that a traffic management inspections similar to the one recommended by section 171 of the BEREC guidelines[3] was reasonable along with some other questions regarding net neutrality. **The questions included restrictions and blockings, the different priority levels of data traffic, and application dependent and independent traffic control tools.**

NMHH called upon 29 service providers to submit data during the questionnaire, of which 8 provide mobile internet access service, 27 fixed internet access service (5 service providers reported on both services).

Selected participants of the survey were service providers with the highest number of subscribers in the field of open internet service, thus their activity is decisive in terms of assessing the Hungarian situation for the availability of discrimination-free internet access and internet net neutrality.

The service providers involved in the survey represent 91.6% of subscribers of fixed internet access service, 99.9% of mobile internet access service, and 96.85% of the total subscriber pool.

The market-leading 3 network service providers and 2 MVNOs[4] (which use the infrastructure of the network service providers to provide their services) have contracts with 99.3% of subscribers for mobile internet services. The 4 largest service providers are connected with 80% of subscribers for fixed internet services.

To facilitate easier comparison of the inspections and results, NMHH separated fixed and mobile internet access services. The assessment weighed market leading service providers more heavily.

2.4.1.1 Inspection of restrictions and blockings

The assessment of the blockings and restrictions is based on data reported by the service providers.

With regards to **fixed internet access services**, we arrived to the following conclusions based on the responses received from the service providers:

- Half of the service providers reported that they do not impose any restriction, the other half roughly equally uses restricted access or even blocking, but these are

[3] A view of traffic management and other practices resulting in restrictions to the open Internet in Europe, BoR (12) 30

[4] Mobile Virtual Network Operator

primarily not imposed due to reasons related to net neutrality but, for instance, in order to protect network integrity.

- Close to half of the service providers involved in the assessment use SMTP[5] traffic limiting by disabling the TCP[6] 25 port to protect against spam and malware, which allows SMTP outgoing traffic only towards its own servers. This blocking, however, may be lifted upon subscriber request, and may even be bypassed by using other, e.g. VPN[7] or proxy solutions.

The inspections of **mobile internet access services** yielded the following results:

- For the purpose of maintaining the quality and continuous availability of their internet services, mobile service providers use technical solutions designed to ensure that customers can transfer data even in the case of temporary failure of certain component systems.
- Although all mobile service providers use restriction and/or blocking, but these are not due to reasons related to net neutrality.
- Service providers basically use these restrictions for violation of the general terms and conditions (the user endangers the service provider's network and thereby renders servicing other users impossible), upon reaching the data traffic limit specific in the contract.
- Another special case is disabling or blocking TCP and UDP[8] ports to limit traffic generated by viruses. This is a special case of traffic management usually affecting only a tiny fraction of subscribers.
- When reviewing the GTC, we saw that one significant service provider interrupts data connectivity over 24 hours without any or any distinction for all clients using any data service whether in the domestic network or while roaming. NMHH is still investigating whether this violates the principle of net neutrality.

2.4.1.2 Varying levels of priority in terms of data traffic

Data traffic management of different priority levels is when the service provider employs a traffic management tool or measure to group delivery of data packages of certain types based on priority, i.e. certain data packet receive lower priority than others based on their content or the group of users of the specific data packet. It does not involve any intentional blocking or slow-down of a specific traffic type, but it may have a similar impact if the increase of traffic of higher priority results in a noticeable slow-down of data traffic of lower priority due to traffic waiting. In practice, it is definitely a discrimination within data traffic, and it is permissible in terms of net neutrality rules if applied in exceptional cases listed in the EU regulation.

[5] Simple Mail Transfer Protocol
[6] Transmission Control Protocol
[7] Virtual Private Network
[8] User Datagram Protocol

The inspection by NMHH wanted to find out where and for which types of content, applications and services different priority levels are employed.

With regards to **fixed internet access services**, the following conclusions can be made based on the response received from the service providers:

- The service providers inspected no longer block or restrict the bandwidth of P2P[9] traffic type as in the previous years.

  None of the fixed internet access service providers use blocking or restriction by bandwidth control for VoIP[10] traffic.

- In addition, 3 smaller service providers indicated differentiation based on discriminated services and by turning the data transfer interface of the cable tv network.

- 1 significant service provider noted that they preferred their own VoD[11] content. Considering that the service provider did not advertise the video service introduced to its offering as a "special service", and since the impact of the bandwidth used by VoD content and that of the service on the internet access service is unclear, further investigation is needed to decide whether providing VoD service under such circumstances violates the principle of net neutrality.

The inspections of **mobile internet access services** yielded the following results:

- Based on the responses the survey, mobile service providers do not use blocking or bandwidth restrictions for P2P, VoIP or IM[12] services.

- None of the internet access service providers favour any specific OTT[13] traffic.

- Based on a review of GTCs, one significant service provider qualify the subscriber after downloading a certain amount of data as "excess traffic generating subscriber", who then is ranked lower on the priority list when distributing network resources during network overload. NMHH is still investigating whether this intervention is in violation of the provision on net neutrality.

2.4.1.3 Application independent traffic control tools

Application independent traffic control tools are those that manage traffic without deep content inspection or analysis of data traffic. NMHH's investigation in this regard focused on whether internet access service providers use any such tool.

The inspections of **fixed internet access services** yielded the following results:

- Close to one-third of fixed internet access service providers do not use any traffic control tool. These service providers reported that their network is sufficiently scaled and their core network is redundant; therefore, they do not need any such traffic control tools under normal operating circumstances.

[9] Peer- to-Peer
[10] Voice over Internet Protocol
[11] Video On Demand
[12] Instant Messages
[13] Over The Top

- A significant percentage of the service providers employ certain traffic control protocols specifically designed to avoid congestion.
- 1 smaller service provider reportedly use static rules to manage network congestions, which separates traffics of internal communication of the infrastructure, of cable programme distribution and of fixed telephone service from the traffic of internet access service. In case of network congestion, the traffic of internet access service slows down or stops without any discrimination.

Based on their responses, the 3 major **mobile internet access service provider** defining the market employ application independent traffic control tools as follows:

- 1 service provider uses the "throttling" technique that specifies a maximum download capacity for the network as a whole. The purpose of the throttling technique is to keep the speed of the mobile internet traffic generated by subscribers at maximum network capacity level.
- 1 service provider indicated that its network is planned to be congestion-free under normal and fault-free conditions. They manage any congestion by traffic-depending rerouting and preferential treatment of certain service categories.

2.4.1.4 Application dependent traffic control tools

Application dependent traffic control tools and technological solutions like DPI[14] can detect specific content, application or service within the data traffic investigated, so they may be especially suitable for intervention by the service provider violating net neutrality.

The questionnaire-based survey of NMHH here focused on whether internet access service providers use any technological solutions designed to provide content-based, differentiated management of data traffic (transferred packets).

- The majority of **fixed internet access service providers** do not use any technological solution for differentiating traffic or packages, and only 2 significant service providers use QoS[15]-based traffic differentiation.
- Only 2 of the 3 major **mobile internet access service providers** on the market reported the use of such tools. 1 significant service provider has an advanced external DPI device whose detection capabilities are always updated and a Gateway integrated DPI function is used to detect logics in certain tariff plans/additional services.

  Another significant service provider uses such tools to configure their source-side QoS.

2.4.1.5 Other intervention in end-user data traffic

In addition to the foregoing, NMHH believed it was justified to ask additional questions in the survey as to what other ways service providers use to intervene in end-user data traffic.

[14] Deep Packet Inspection
[15] Quality of Service

Considering the low number of cases, we do not separate fixed and mobile service providers here. The following conclusions can be made based on the responses:

- 1 significant service provider reported that in order to protect its network (e.g. in the event of a DDOS[16] attack), it performs "purging" of identified damaging content or full blocking, and as the ultimate measure, completely isolates the endpoint under attack, which becomes invisible both from the service provider's side and from the internet. (Black Hole).
- 1 medium-sized service provider indicated to use network address translation (NAT[17]).

In summary, having reviewed the responses of the service providers to the questionnaire and the GTCs with regards to the traffic management used by service providers, we can conclude that even though the regulation is new, NMHH found no service provider practice clearly violating net neutrality. Service providers appear to make a conscious effort to take into account the principle of net neutrality in providing internet access services.

The investigations uncovered for NMHH a number of service provider practices that may be considered as "reasonable traffic management" measures under the EU Regulation. Some service providers reported to use measures that go beyond the measures applicable in general cases but the EU Regulation permit those in justifiable cases. However, with regards to a few service providers, this control process uncovered certain practices that need further clarification with regards to their impact on net neutrality. Consequently, net neutrality will continue to remain an important investigation focus for NMHH.

2.4.2 Presentation and evaluation of NMHH's measurement results

In 2012 NMHH launched its *"SZÉP"*[18] project to gain an accurate picture of the real quality parameters of domestic broadband services and thereby facilitate the performance of its regulatory tasks. The project objectives expanded over time to include, for instance, facilitating conscious selection of service providers and services by customers.

In 2015, NMHH deployed, as part of the project, an interactive system publishing the measurement results of certain quality indicators of internet access services and net neutrality parameters at http://szelessav.net. Currently, NMHH can obtain the base data from measurements from the *SZÉP* project in three ways:

- the measurements by NMHH's **sensor-equipped cars** relevant to upload and download speeds, latency (response time) and the current coverage of mobile networks. As per NMHH's measurement plan, sensor-equipped cars drive around the

[16] Distributed Denial of Service

[17] Network Address Translation - NAT is a continuously operating powerful active network device used to provide internet access due to limitations of IPv4 addresses. However, it ties up considerable computing capacities if traffic is considerable and, due to its concentrated nature, many network protocols only accept it after complicated configuration.

[18] Project Broadband

country to map the coverage and quality parameters of the 3G and the currently constructed 4G networks.

- **software measurements**, during which **users start** measurements from the browser of their computer or smartphone via the szelessav.net portal. Measurements may be completed in two ways: without registration and after user registration. Software measurements provide information about the current values of download and upload speeds. Repeated measurements by a user may be suitable to monitor service quality parameters available for the specific user. However, these measurements are hard to use to create a comprehensive image relevant to specific service providers, technologies or geographical areas.
- **fixed hardware measurements** during which NMHH obtains base data measured by hardware devices installed at the user's location at regular intervals.

Currently, these tools also support inspections of port blocking and detection traffic discriminations (slow-downs) by launching a software measurement (Glasnost[19]).

With regards to net neutrality, NMHH uses regular hardware measurements to investigate the actual quality of fixed-line internet access service using the measuring instruments installed at the access points.

Over the past year, NMHH performed long-term measurements (for a number of months, at daily intervals) using measuring instruments installed at 250 measurement points at the following geographical locations (see figure 1), where the size of the balls indicates the order of magnitude of the specific metering point.

Based on the data collected at the metering points and gathered from the registration data provided by the user, the following can be established: name of service provider, name of tariff plan, offered download and upload speeds, guaranteed upload and download speeds, metering location ID and geographical location.

From the data recorded, the current investigation analyses the number of measurements, the number and time of measurement days, the completed download and upload speeds as well as the ping value.

Charts have been prepared from the data regarding the measured speed values, the changes in ping values over time, their average and daily distribution (every hour, on weekdays and holidays), the maximum and minimum values of the actual speed and the data sorted by speed.

(The data that can be extracted for NMHH from the specific metering points are detailed on the charts in Annex 1).

[19] The test can detect if the access being tested has any restrictions and the ports and the extent where these restrictions can be detected.

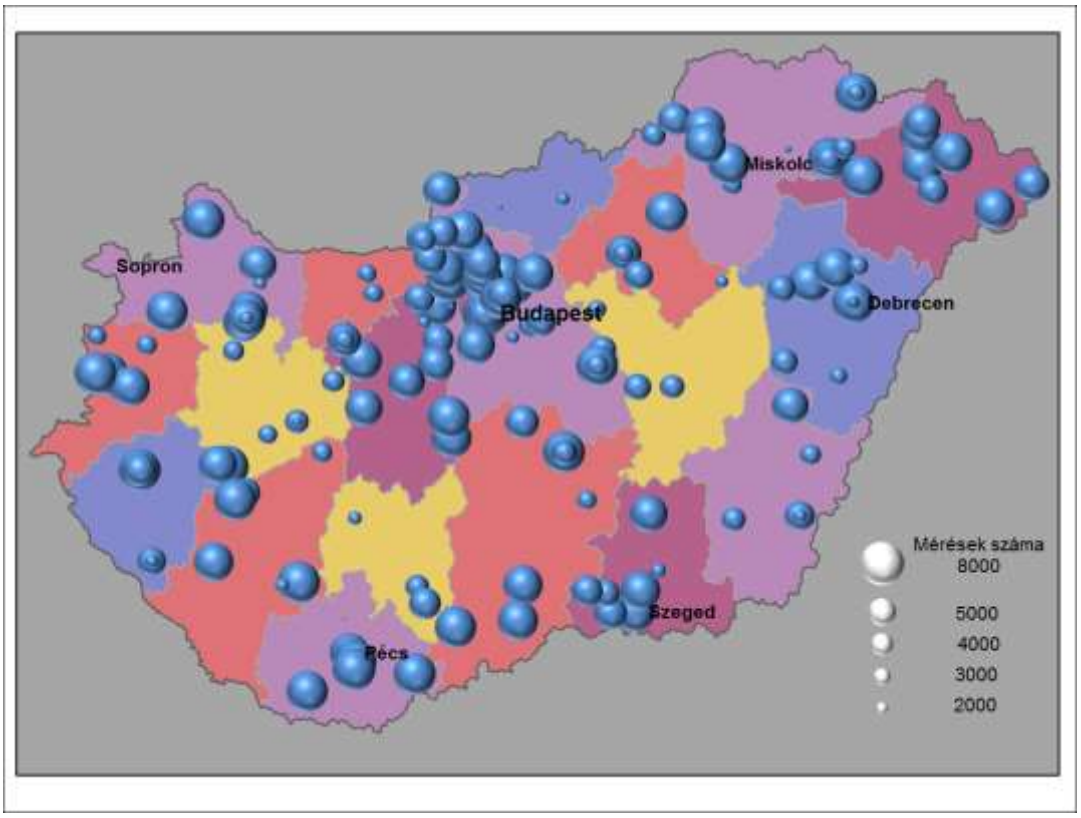

Figure 1: Geographic distribution of measurement locations

For the purpose of performing nationwide representative measurements, 1000 additional metering points are estimated as the necessary minimum number of metering devices to be installed. At the same time, based on the measurement results stored in the metering system and the tariff plan data with an analysis pertaining to the service providers, certain conclusions may be established for the technology from this non-representative data sample. Namely, the values measured may be compared against the values guaranteed by the service provider for the specific subscription (tariff plan).

The Electronic Communications Decree requires all internet access service providers to specify in their subscriber agreements the quality indicators listed in the regulation **such as the offered (advertised) bandwidth as well as guaranteed download and upload speeds.**

The measurements involved 103 service plans of 40 service providers. During the long-term measurements, a total of 1,351,575 measurements on a total of 65,920 days at 250 measurement locations were made.

After an analysis of the measurement results of the service providers involved in the tests, NMHH drew the following **non-representative conclusions**:

- **The accesses provided are basically suitable for reaching the speeds offered.** (The offered speed was met at least once at 72.4% of the measurement locations.) 76.7% of the service packages were able to reach the offered speeds and 38.8% of the service packages had at least one metering point where the average download speed exceeded the value of the offered speed)

- **Depending on the time of the day and network load, a significant portion of the services offered by the Service Providers are characterized by considerable fluctuation of speed.**
- The concepts of “normally available speed” specified in Article 4 (1) of the EU Regulation and the “significant, constant or regularly reoccurring difference” of the service quality indicators provided by service providers and actually available as specified in Article 4 (4) therein have no normative definitions in the EU Regulation, so this task is left to the legal application procedure.

  Based on the results of the hardware measurements NMHH modelled how the actual download and upload speeds of fixed internet access services compare against some of the possible requirements for the “normally available speed” as specified in Article 4 (1) d) of the EU Regulation in the case of the following offered speed categories: under 10 Mbps, between 10 and 30 Mbps, between 30 and 100 Mbps and over 100 Mbps. (Table 1)

  Based on the results, it is likely that some services would fail to meet service quality requirements even if a more permissive interpretation of the concept of “normally available speed” is used.
- **The average speed of services is usually below the offered (advertised) speed values during peak times. (Figure 2)**

Offered download speed range	Of the offered download speed								
	90% at least in the following percentage of the measurements			80% at least in the following percentage of the measurements			70% at least in the following percentage of the measurements		
	90%	80%	70%	90%	80%	70%	90%	80%	70%
up to 10 Mbps	37.5	43.8	50.0	43.8	50.0	62.5	52.1	60.4	66.7
10–30 Mbps	60.9	73.6	77.0	74.7	80.5	82.8	83.9	88.5	90.8
30–100 Mbps	34.9	46.0	52.4	50.8	63.5	69.8	66.7	76.2	77.8
over 100 Mbps	5.8	7.7	9.6	7.7	9.6	9.6	9.6	11.5	17.3
	percentage of the number of monitoring locations.								

Table 1: Percentage of meeting the offered download speed

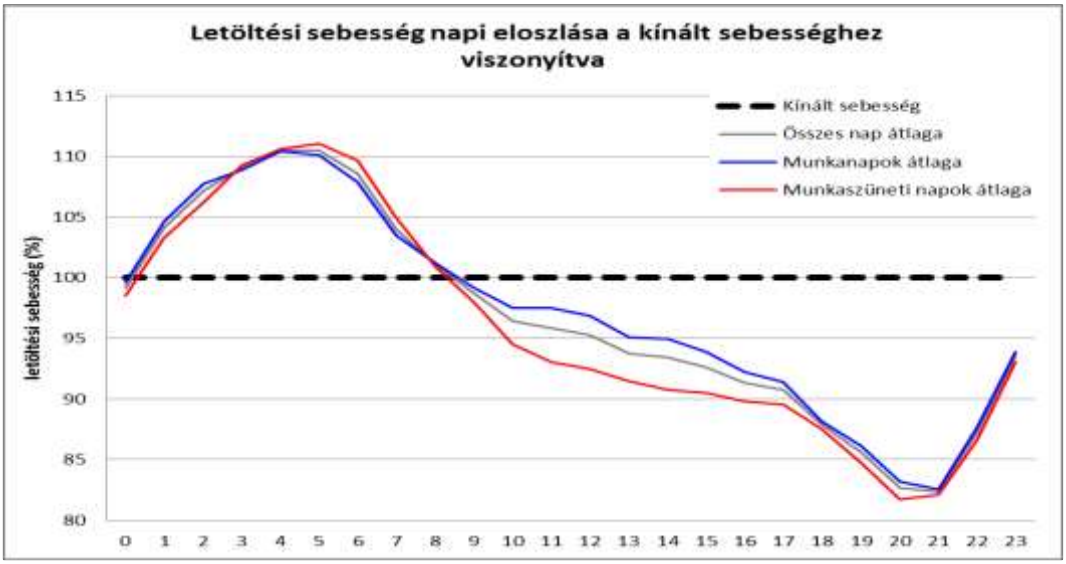

Figure 2: Daily breakdown of download speed (based on April 2017 data)

NMHH currently uses the analyses of the above measurements of fixed services to perform general monitoring of the availability of the service, information to subscribers as well the implementation of the requirements facilitating the enforcement of subscriber rights as stipulated in Article 4 (1) d)–e) of the EU Regulation.

2.5 Special services

Of the special services, NMHH monitored, by reviewing the contract terms and conditions of the service providers and by conducting technical measurements, the conditions and practical implementation of IPTV[20] in the reporting period, which is also named in the guideline.

IPTV service was chosen because it is the most common special service on the market and, based on the experience obtained so far, we assume that there may be some net neutrality issues with regards to IPTV.

The investigations referenced above are in progress and the first results are expected to arrive in the next reporting period.

2.6 Assessment of how the transparency requirements governing internet service providers have been implemented

NMHH performs continuous assessment of the contract terms and conditions of internet access services. The purpose of this continuous assessment is to ensure that the agreements relevant to internet access services include all information relevant to subscribers in a non-ambiguous, understandable and comprehensive manner to facilitate subscribers' decision-making process.

The first tangible result of the efforts to increase transparency was the April 2013 publication of the standard service information tables of internet services. First the service providers represented by the Communications Reconciliation Council prepared the service description tables of their broadband internet access plans and published them on their websites. In

[20] Internet Protocol Television

addition to the typical speeds of the specific broadband internet plans, the tables also described the applicable restrictions (e.g. slow-down or blocking of VoIP, video or file exchange applications).

The service description tables were thus first published at the incentive of NMHH and within the context of market self-regulation.

Later, it was requested to apply the service description tables to all internet access service providers and services. **As a result, legislation was passed in 2015 to require service providers to public to their websites and continuously update the standard service description tables for each of their internet access service offers.** These requirements are specified in the Electronic Communications Decree referenced above.

Although the table already provided subscribers with detailed information, the EU Regulation required further information to be provided to subscribers.

For this reason, NMHH incorporated the requirements in Article 4 (1) a)–e) of the EU Regulation in the Electronic Communications Decree.

The inspections have not been fully completed, but the preliminary results indicate that the GTCs of the service providers are defective, they do not meet all the requirements outlined in Article 4 (1).

The investigations on the defects identified are currently in progress, and it will only be decided later what NMHH measures will be required.

2.7 Other NMHH activities related to net neutrality

NMHH has also conducted some other activities related to net neutrality and not listed in the BEREC guidelines, which complements and makes more complete NMHH's monitoring activity.

NMHH collected the results of the annual market research on net neutrality conducted among subscribers and users, and also had a research conducted on the opinion of the general public on net neutrality.

2.7.1 Results of NMHH's earlier annual market research relevant to net neutrality

Each year NMHH prepares a large-sample survey of national representation on Hungarian internet use among internet users living in Hungary and aged 16 and older. The research uses an online form and involves 3000 respondents.[21]

Results of the 2015 internet survey relevant to net neutrality:

- The vast majority of Hungarian internet users believe that the internet should be a free world without any restrictions, open to all by default and with equal opportunities. Users also expect service providers, companies and the state to fundamentally not

[21] NMHH research, Residential internet use, 2015.: http://nmhh.hu/dokumentum/170534/lakossagi_internethasznalat_2015_teljes.pdf,
NMHH research, Residential internet use, 2016.: http://nmhh.hu/dokumentum/187704/lakossagi_internethasznalat_2016.pdf,

regulate content shared over the internet or internet activities even if a user generates too much traffic on the network.

- 82% of users believe that the internet is a public utility and that tariff plans with quotas restrict equal access to content available on the public internet.
- 85% of respondents would prefer if internet access service providers did not regulate what subscribers use the internet for, and 76% believe that it is not the business of the internet access service providers to make decisions on the availability of certain types of content.

With regards to the question on the priorities of criteria to consider when shopping for an internet subscription, Hungarian internet users in the surveys basically listed only criteria for net neutrality in addition to net neutrality:

- For instance, the second most important requirement for mobile internet was speed (84%),
- no. 3 was quota not restricting use (no quota or enough quota: 76%–76%)
- no. 4 was content neutrality (any website should be available without any surcharge: 71%), and
- no. 5 was the prohibition of traffic slow-down (the service provider should not slow down internet connection when the user performs activities generating large data traffic: 67%).

The importance of accessibility of online content for Hungarian internet users is also indicated by the fact that although subscribers are extremely price-sensitive, only one-fifth of internet users would be willing to subscribe for an mobile internet plan that is cheaper than the rest but blocks certain content and activities. One out of four internet users reject zero rating type plans because the subscription has a quota.

Results of the 2016 internet survey relevant to net neutrality:

One of the lessons of the latest survey is that one of the most important obstacles for Hungarian internet users today is the data traffic limit.

Dissatisfaction has considerable grown in this field in terms of mobile internet service quality over the past year. In just one year, the number of those who complained about having exceeded their data traffic limit with mobile internet use, could not download something or did not even try to download because they thought they would exceed their quota has increased by close to 50%.

In parallel, zero-rating type offers are becoming less popular. Between 2015 and 2016 the ratio of those respondents who said they would not subscribe for a zero-rating type offer because of the data traffic limit almost doubled (from 27% to 51%).

2.7.2 Results of the Social Listening[22] research

For the first time this year NMHH has had a social listening research conducted on net neutrality for the periods 2016Q1 and the period between December 2016 and 2017Q1.

[22] Social Listening is a procedure that identifies, collects, analyses and evaluates what has been published in the specific topic on the internet.

The research concluded that there is less talk about net neutrality than other infocommunication topics on the Hungarian language internet, but this is not lower than what was registered during the same period in the English and German language segments of the world wide web. In the majority of the cases the topic appeared in connection with NMHH.

The most frequently discussed topics in the period under investigation involved the resolutions of the NMHH issued in December 2016 on zero rating. The topic was mostly discussed on news portals and technical portals and was less significant in the social media. In general, neutral and negative opinions were dominant among the posts. The opinions did not contest the professional competence of the resolutions; users rather expressed their disappointment about those offers of the service providers that were discontinued due to violation on net neutrality rules. In certain cases criticism was due to the lack of sufficient background information. As a result, public opinion on NMHH with regards to net neutrality was also slightly negative.

According to the recommendations prepared for the research, NMHH can improve public opinion about net neutrality by frequent appearances in social media, by expanding public knowledge about the topic, by demonstrating the positive effects of net neutrality and by keeping the issue alive.

3 Evaluation of the uninterrupted availability of discrimination-free internet access services

The internet has become one of the most important infrastructures of society and the economy and its key role is unquestionable in virtually all segments of our lives. **Most EU member states consider it a priority issue to avoid exclusive control over content and services transferred over the network due to ownership over the network infrastructure because that would be in violation of the principle of free information flow and provision of services.**

At the beginning of managing net neutrality, Hungary, like many other member states, believed that no separate legislation was needed because the opportunities offered by the framework directive were sufficient for NMHH to ensure compliance with the rules. At the same time, both the Electronic Communications Act and the Electronic Communications Decree included certain requirements for net neutrality to ensure transparency.

The EU Regulation proved to be a milestone because it not only resulted in a standard regulation but it also created a more predictable, and in many ways a more uniform, environment both to service providers and users. The uniform regulation also resulted in a significant change for the regulatory authorities of the member states as the various interpretations of net neutrality often different in the member states was replaced with a set a criteria to establish a uniform monitoring and assessment system.

NMHH's summary based on the experience of the evaluated period:

- NMHH can effectively monitor and control compliance with net neutrality requirements. Authorization for this is provided by the EU Regulation itself by assigning the task to enforce compliance to the national regulatory authorities, and with the system of supervisory rules of the Electronic Communications Act NMHH has all the means necessary to control and enforce compliance with the regulations

by the service providers. The investigations conducted by NMHH did not identify any circumstance that would justify the introduction of any additional, special sanction other than those already available.

- For the most part, service providers comply with the requirements of the EU Regulation. NMHH has already managed some of the issues discovered, and, as a result, has issued a number of resolutions. In some other issues, however, further investigations are needed to clarify whether the principle of net neutrality is violated, and if so, what additional NMHH measures are necessary.
- NMHH has not received any subscriber complaint about net neutrality. However, Social Listening and Market Survey data indicate that awareness of net neutrality needs to be improved so that more end-users would learn about their rights.
- NMHH is continuously improving its metering systems. Our mid-term objective is to increase acceptance of the metering system and the measurement results and to use the results of the http://www.szelessav.hu/ website as a reference, which will improve the chances for enforcing the law among both subscribers and service providers.

4 Technological abbreviations used

DDOS:	Distributed Denial Of Service
DPI:	Deep Packet Inspection
IM:	Instant Message
IPTV:	Internet Protocol Television
NAT:	Network Address Translation
OTT:	Over The Top
P2P:	Peer to Peer
QoS:	Quality of Service
SMTP:	Simple Mail Transfer Protocol
TCP:	Transmission Control Protocol
UDP:	User Datagram Protocol
VoD:	Video on Demand
VoIP:	Voice over Internet Protocol
MVNO:	Mobile Virtual Network Operator
VPN:	Virtual Private Network

5 Annexes:

Annex 1

Graphical representation of a metering point during a long-term measurement conducted by NMHH