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T-Mobile Netherlands B.V.

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onderwerp	Contribution public consultation on BEREC guidelines on net neutrality rules Bor (16) 94
	Business confidential

Dear Sir, Madam,

T-Mobile Netherlands Holding B.V. (hereafter 'T-Mobile'), is a limited liability company incorporated
and domiciled in the Netherlands with its registered office in The Hague, the Netherlands.
T-Mobile is a member of the Deutsche Telekom group since September 2002 and is a wholly-owned subsidiary of
Deutsche Telekom Europe B.V. The ultimate parent company of the group is Deutsche Telekom AG in Bonn, Germany.

We welcome the opportunity to provide stakeholder feedback to the BEREC Guidelines that seek to harmonize the
implementation of EU Regulation 2015/2120.
T-Mobile endorses the contribution of DT Group and wants to add some more (technical) input being a *mobile only
player* on the Dutch market.

The information displayed in this letter is business confidential and is to be treated as such.

Being the only mobile only (network) player in the Dutch Telecommunications market gives T-Mobile a different market
position than for example KPN, Vodafone, Ziggo or Tele2 who all have a mobile and a fixed footprint. This makes T-
Mobile's position in the converging communication markets very different from the forementioned parties and creates
different challenges. Unfortunately, the BEREC Guidelines do not sufficiently take the interest of mobile only players into
account. Importantly, not only an (ex- post) assessment of commercial conditions is required, as stated in margin

number 43 of the draft BEREC guidelines BoR (16)94, but with future data expectations mobile operators have to be able to deploy certain traffic measurements. T-Mobile is emphasizing that it agrees with the spirit of the net neutrality law and supports the protection of end user's right to open internet access.

With our contribution T-Mobile is of the opinion that it accommodates towards this goal and makes the rules more future-proof.

In the Netherlands net neutrality legislation came into force in 2012. T-Mobile feels safe to say that she is experienced working according to the net neutrality laws and the way these work out in the Dutch market. Our field of expertise, our operational practical background regarding compliance with net neutrality rules, meetings with our NRA on this topic and a brand new proposition 'Endless Online' for all mobile devices has given us more insight in the near future and the obstacles we encounter with these net neutrality rules.
In the text below T-Mobile gives her point of view on what is missing in the draft guidelines.

Mobile operators need to be able to take traffic management measures going beyond congestion management measures in order to guarantee access and good user experience for end-users on mobile networks

Mobile infrastructures differ from fixed infrastructures. First of all because the access medium, the air interface, is a *shared* medium. Secondly, because radio spectrum is *scarce* and the air interface *capacity* is limited. Thirdly, because the limited air interface capacity is negatively influenced by radio *propagation* and *interference* effects.

1) The air interface is a shared medium; users in a certain geographical area need to share the available capacity. Since mobile usage is still increasing ánd the applications are becoming more data 'hungry', the amount of simultaneous users on the network will increase, resulting in a lower average available capacity per user;

2) Increasing the average available capacity per user is only limited possible, due to the limited available spectrum operators have.

3) Radio propagation is impacted by attenuation due to atmospheric gasses, clutter and walls. As a result, the signal further away from the basis station, as well as the signal received in an indoor environment, will be weaker, which results in a lower throughput per radio resource block.
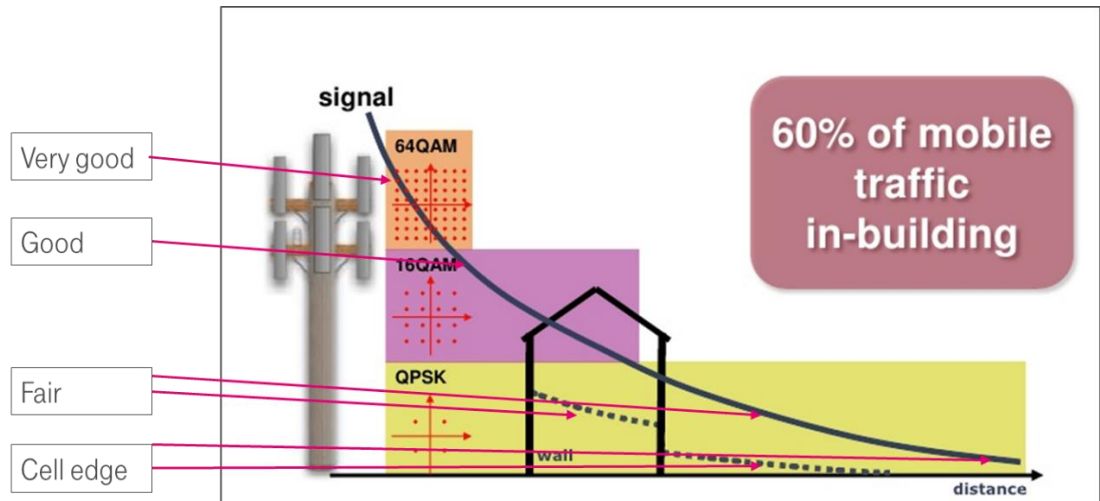
The further away a terminal is from the base station, the more radio resources it occupies in order to receive/transport the same amount of data. This effect effectively reduces the average available capacity per end-user on the air interface.

Today's mobile networks are so-called single frequency networks. This means that each base station is transmitting a channel with the same frequency. Therefore a base station transmitting is basically an interferer to the neighbor base station. The levels of interference are increasing when the load in the network increases. Therefore, higher usage in a certain cell of a base station will have a negative impact on the neighboring base stations due to increased interference levels. This increased interference causes the affected base station to use lower modulation schemes and stronger forward error correction schemes in order for the terminal to still retrieve the information from the received wanted signal. This effect causes that the effective capacity of a radio resource block decreases; worst case up to a factor 40.
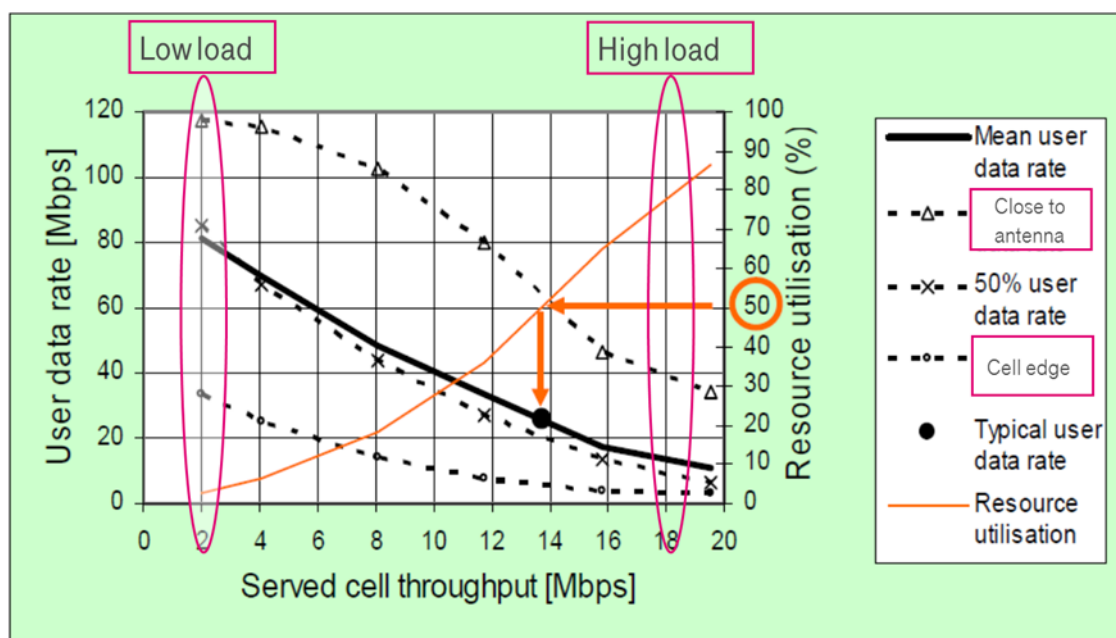
Due to the increased interference levels when network usage increases, the total available air interface capacity will decrease, resulting in an even more reduced average available capacity per user.

On the other hand, we see an increasing demand for data-hungry applications. One of them is video; the biggest contributor to network load today. Increasing video resolutions (480p → 1080p → 4k) as well as new capabilities like 360 degree video and Virtual Reality (VR) have a huge bandwidth demand. Where a 480p video requires a bandwidth of 1 - 1.5 Mb/s, a 4k video already requires approx. 20 Mb/s, and a 4K VR video approx. 200Mb/s. A 4G mobile network has not been designed to serve an individual customer with such high bandwidths continuously for an hour or more. This type of usage will have a significant negative impact on the customer experience of users served by that base station as well as surrounding base stations.

Another category of applications that has a significant negative impact on the customer experience of other users on the mobile network are e.g. 4G routers, providing a fixed internet service over a mobile network. They tend to demand a high bandwidth for a long period of time as well.

The current mobile networks cannot cope with these continuous high bandwidth demands without having a significant impact to the customer experience of other users in the area in case article 3(3) does not allow for traffic management

measures to be taken by mobile operators. The impact can become so significant that users of a 4G network may ultimately have a 2G experience in terms of throughput. Where today's customers can experience average throughputs in the range from 40 - 60Mb/s, it can become as low as 100s of Kb/s in a loaded network tomorrow. It is T-Mobiles strong belief that this in the end will block innovation for all the players on the mobile telecommunications network.

In order to guarantee that all users on the mobile network have a good experience, T-Mobile is of the opinion that net neutrality rules should allow for certain traffic management measures in mobile networks. These are:

    a. Limiting the usage of e.g. 4G routers and/or tethering within a mobile-dedicated subscription. I.e., when a subscription is explicitly meant for e.g. smartphone use, the operator can limit the use of 4G routers and/or tethering to a certain limited volume.

    b. Adjusting the bandwidth for video applications to a certain limit, so that the video resolution will be optimized to the screen of a smartphone. On the one hand this prevents unnecessary data usage for the video user, on the other hand it limits the impact to other users on the network.

T-Mobile is convinced that this is the best way forward; the end-users will have access to internet access services and the ISPs will be able to manage their networks.

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We ask BEREC to modify the consulted draft guidelines in order to be in line with EU regulation 2015/2120. In its current form the guidelines seek to impose unjustified restrictions on (mobile) ISPs to manage their networks that go far beyond the intentions of the co-legislators and will have to be tested in court.

Sincerely,

Joepke van der Linden
Sr. Regulatory Affairs Counsel
T-Mobile Netherlands B.V.