Mobile Broadband Networks Can Manage Congestion While Abiding By Open Internet Principles

February 12, 2015

Mobile carriers have asserted that their networks present unique traffic management challenges that would make network neutrality technically infeasible. The carriers have emphasized, for example, their need to dynamically manage often unpredictable congestion among users who move from cell to cell on inherently capacity-constrained networks.

From a technical standpoint, however, mobile broadband providers have the capability to implement strong network neutrality rules that prohibit any discriminatory treatment of third-party applications or content. This study by CTC Technology & Energy (CTC), commissioned by OTI,[1] demonstrates the fallacy of wireless industry claims that adherence to strong open Internet principles for consumers and edge providers is not technically feasible for mobile carrier networks.

LTE Networks Are Technically Capable of Adhering to Strong Net Neutrality Protections

The CTC study concludes that Long Term Evolution (LTE, or 4G) technology is capable of managing *moderate* congestion through application-agnostic prioritization protocols (e.g., user-directed prioritization) and is capable, when faced with *severe* congestion, of prioritizing delay-sensitive traffic while avoiding discrimination among like applications, content, or services.

The study acknowledges, as OTI has in its comments on the issue, that because of unpredictable and localized surges in demand, such as during a major sporting event, the dynamic prioritization of delay-sensitive applications like video chat and VoIP calls can be a reasonable means of ensuring quality of service (QoS) in a capacity-constrained network.

Nevertheless, and contrary to the claims of mobile carriers, the study demonstrates that LTE technology has the capability now to manage even situations of severe network congestion by ***treating like applications alike, without favoring carrier-sponsored or carrier-affiliated applications, content, or services.***

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[1] "Mobile Broadband Networks Can Manage Congestion While Abiding By Open Internet Principles," CTC Technology & Energy, Nov. 13, 2014. http://www.newamerica.org/oti/mobile-broadband-networks-can-manage-congestion-while-abiding-by-open-internet-principles/

As an example, the study describes in detail how LTE networks could, as needed in severely congested cells or sectors, prioritize the category of VoIP applications in a manner that both treats like applications alike *and* provides third-party providers essentially the same QoS as comparable carrier-provided or carrier-affiliated applications (e.g., voice-over-LTE, or VoLTE). Figure 1 illustrates a sample LTE network architecture that could achieve this type of prioritization.
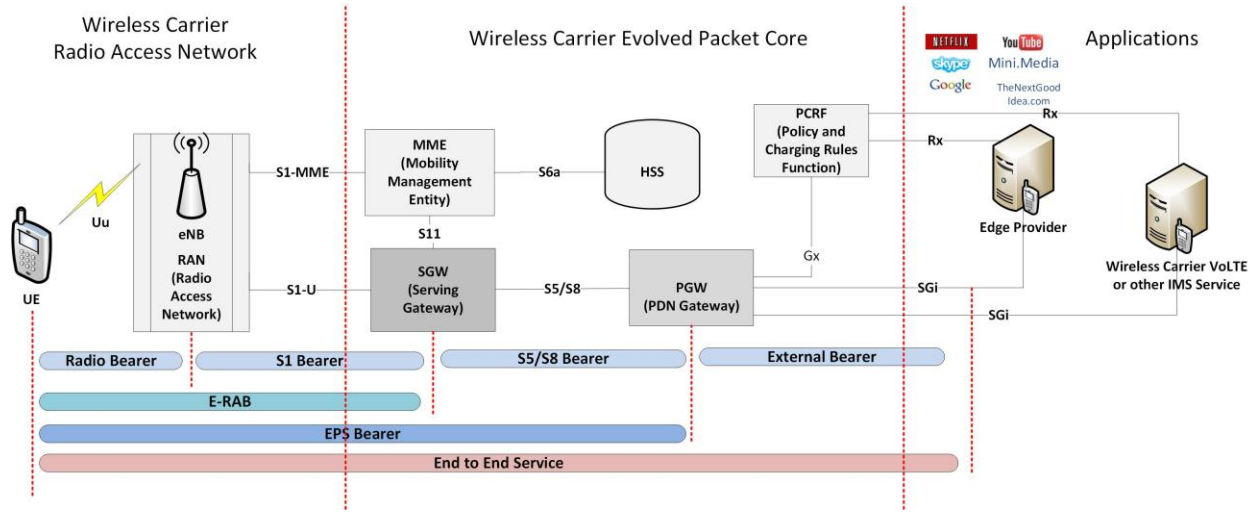
Figure 1: Architecture of LTE Network

Table 1 lists LTE standard QoS Class Identifier (QCI) levels, which carriers can assign to different types of applications and traffic to specify latency and packet loss parameters for groups of applications.

Table 1: Priority, Delay, and Loss Parameters According to QCI

QCI	Guarantee	Priority	Delay budget	Loss rate	Example Application
1	GBR	2	100 ms	1e-2	VoIP
2	GBR	4	150 ms	1e-3	Video call
3	GBR	3	50 ms	1e-3	Real time gaming
4	GBR	5	300 ms	1e-6	Streaming
5	Non-GBR	1	100 ms	1e-6	IMS signaling
6	Non-GBR	6	300 ms	1e-6	Streaming, TCP
7	Non-GBR	7	100 ms	1e-3	Interactive gaming
8	Non-GBR	8	300 ms	1e-6	Streaming, TCP
9	Non-GBR	9	300 ms	1e-6	

Of course, at most times and in most places, the capacity of mobile broadband networks is **_not congested_** and there is little if any need to prioritize any user or use. In fact, the study observes that nearly all mobile carrier traffic today is carried on a "best effort" basis, including streaming video applications.

The study shows that **_moderate congestion_** can be handled with application-agnostic prioritization, such as by "throttling" certain categories of users, or by offering user-directed prioritization that allows consumers to choose to pay for a premium speed tier. As the FCC declared in its 2010 Open Internet Report & Order, "[u]se-agnostic discrimination (sometimes referred to as application-agnostic discrimination) is consistent with Internet openness, because it does not interfere with end users' choices about which content, applications, services, or devices to use. Nor does it distort competition among edge providers."[2] The Commission suggested "end-user control" (i.e., user-directed prioritization) as a reasonable tool to manage network capacity constraints.[3]

LTE technology permits carriers to offer differentiated tiers of service to subscribers; these tiers can include a "premium" service that prioritizes an individual subscriber's traffic in times of congestion. For example, earlier this year the Austrian mobile carrier Drei announced it would offer this user-directed prioritization at varying premium service tiers beginning in June 2015.[4]

The study also details how, even when faced with **_severe congestion_**, LTE networks have the capability to dynamically prioritize delay-sensitive applications in a completely non-discriminatory fashion that does not favor carrier-affiliated content or services.

LTE Networks Are Technically Capable of Treating Like Applications Alike

Therefore, if the FCC determines that prioritizing delay-sensitive applications at times of severe congestion constitutes "reasonable network management," then the Commission can also confidently determine that LTE network providers can do this in a manner that "treats like applications alike." The study outlines an approach that can be implemented now using standards-compliant LTE technologies and which could entail the following steps and safeguards (see pp. 5-6):

1) An industry standards body or another industrywide process approved by the FCC could create generic QoS profiles related to latency sensitivity or other attributes that need

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[2] Report and Order, *In the Matter of Preserving the Open Internet*, GN Docket No. 09-191, FCC 10-201 (Dec. 23, 2010), at ¶73 ("Use-Agnostic Discrimination"), *available at* https://apps.fcc.gov/edocs_public/attachmatch/FCC-10-201A1.pdf (accessed Feb. 11, 2015).

[3] *Id.* at ¶ 71. The Commission stated: "Maximizing end-user control is a policy goal Congress recognized in Section 230(b) of the Communications Act, and end-user choice and control are touchstones in evaluating the reasonableness of discrimination. . . . [E]nabling end users to choose among different broadband offerings based on such factors as assured data rates and reliability, or to select quality-of-service enhancements on their own connections for traffic of their choosing, would be unlikely to violate the no unreasonable discrimination rule, provided the broadband provider's offerings were fully disclosed and were not harmful to competition or end users."

[4] "LTE-Leistungsklassen statt Drosselung?" *LTE-Anbieter.info*, October 17, 2014, http://www.lte-anbieter.info/lte-news/lte-leistungsklassen-statt-drosselung (accessed Feb. 11, 2015).

similar QoS treatment, and make them open to all like applications, such as toll-quality voice and video communications. The profiles could be developed in many ways. One approach would be to base them on the latency-sensitive applications already receiving QoS from wireless carriers, such as SD and HD voice.

2) Mobile carriers could define the type of network management each profile will receive, understanding that the management may be dynamic and complex, but that all like applications within the profile will receive the same treatment.

3) The FCC or standards body could create a streamlined process through which edge providers can identify their content and applications to the wireless carriers for treatment according to a QoS profile, with best-effort packet inspection as the fallback for edge providers that do not affirmatively participate.

4) The FCC or an industry standards body could create a process, such as a periodic audit of active QoS rules, to transparently verify that the defined management structure is consistently being implemented. At a minimum, this should be triggered by a complaint.

5) The FCC or an industry standards body approved by the Commission could revisit the profiles regularly, and revisit the need for QoS and prioritization as spectrum efficiency increases and other technological improvements enter the marketplace.

The Commission recognized in the 2010 *Order* that the policy rationale for open Internet protections is as relevant for mobile as for fixed broadband service.[5] The 2010 *Order* also adopted a definition of "reasonable" network management that could accommodate any unique constraints faced by mobile carriers, particularly with respect to managing congestion.[6] The only issue would seem to be whether *all* ISPs should be required to manage congestion *in a competitively neutral manner* and whether there is a reasonably feasible way for mobile carriers to do so.

As the CTC study makes clear, wireless carriers have technological options for managing mobile networks that adhere to strong net neutrality protections and allow equitable QoS treatment for like applications.

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[5] *See 2010 Open Internet Order* at ¶ 49.
[6] *Id.* at ¶ 82 ("A network management practice is reasonable if it is appropriate and tailored to achieving a legitimate network management purpose, taking into account the particular network architecture and technology of the broadband internet access service").