



December 6, 2017

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Via Electronic Filing

Re: Restoring Internet Freedom, WC Docket No. 17-108

Dear Ms. Dortch,

The Electronic Frontier Foundation (EFF) is the leading nonprofit organization defending civil liberties in the digital world. Founded in 1990, EFF champions user privacy, free expression, and innovation through impact litigation, policy analysis, grassroots activism, and technology development. With over 35,000 dues-paying members and well over 1 million followers on social networks, we focus on promoting policies that benefit both creators and users of technology. We offer the following comments correct certain misunderstanding present in the Federal Communications Commission's (FCC) draft Order¹ in the above-captioned proceeding, and add additional facts to the record regarding the nature of wireless telephone and mobile Broadband Internet Access Service (BIAS). In particular, we seek to correct misunderstandings in the draft Order regarding technical details of the Public Switched Telephone Service (PSTN) and mobile BIAS.

As we explain below, mobile networks are currently in the final stages of a project spanning over a decade to unite the classical PSTN with the Internet. Thus, the Commission's conclusion that mobile BIAS does not constitute a commercial mobile service is incorrect because it is based on the incorrect assumption that mobile BIAS and the PSTN are not interconnected. In fact, there are two major technical systems which unite mobile BIAS (and the Internet in general) with the PSTN: the E.164 Number to URI Mapping (ENUM) standard², which integrates the addressing systems; and the Evolved Packet Core (EPC)³ of 5G networks, which integrates the infrastructure. We explain each of them in turn.

¹ "DECLARATORY RULING, REPORT AND ORDER, AND ORDER", available at

² Bradner, S., Conroy, L., and K. Fujiwara, "The E.164 to Uniform Resource Identifiers (URI) Dynamic Delegation Discovery System (DDDS) Application (ENUM)", RFC 6116, DOI 10.17487/RFC6116, March 2011, <<https://www.rfc-editor.org/info/rfc6116>>.

³ Firmin, F., "The Evolved Packet Core", <<http://www.3gpp.org/technologies/keywords-acronyms/100-the-evolved-packet-core>>.



Addressing systems are integrated and unified to interoperate.

First, modern Voice over IP (VoIP) services use a system called ENUM to allow either Internet Protocol (IP) addresses or North American Numbering Plan (NANP) numbers to dial NANP addresses⁴. This ENUM system is not dependent on the address space of the originating number (i.e. whether the call originates from an IP address or a regular telephone number); rather, it is only required that the caller's network includes a device that can subscribe to ENUM⁵, and that the destination number is registered with the ENUM service. This service works by placing entries in the public DNS system, using the same infrastructure that translates domain names to IP addresses.

In the ENUM system, when a number is dialed, it connects to a system that determines where to pass the call along to, whether in the PSTN or along IP. In some cases, it can be forwarded in multiple directions simultaneously; a recipient with both a Mac and an iPhone will receive the call at both locations. *This is possible because the phone and Internet services are interconnected at the network level.*⁶ As with any routing request, software can translate between multiple addressing systems that point to the same logical network location.

In plainer terms: the ENUM system very clearly connects devices that have IP addresses, *including the smartphones used by customers of mobile BIAS*, to the PSTN, by enabling devices on each network to call devices on the other.

Furthermore, even calls placed entirely within the PSTN traverse multiple networks and translate between multiple address spaces. Signaling System 7 (SS7)⁷, the series of protocols that describe the modern telephony network, includes within it value-added services. For example, Unstructured Supplementary Service Data (USSD)⁸ allows a phone number to communicate with the mobile network operator, enabling functionality such as checking the balance on a prepaid phone and refilling the balance on a SIM card.

⁴ Peterson, J., Liu, H., Yu, J., and B. Campbell, "Using E.164 numbers with the Session Initiation Protocol (SIP)", RFC 3824, DOI 10.17487/RFC3824, June 2004, <<https://www.rfc-editor.org/info/rfc3824>>.

⁵ An ENUM subscription capable device would here be acting in the role of an interconnected service provider.

⁶ The connection may be made through either direct or indirect connection; in either case, the network as a whole is interconnected.

⁷ Morneault, K., Ed., and J. Pastor-Balbas, Ed., "Signaling System 7 (SS7) Message Transfer Part 3 (MTP3) - User Adaptation Layer (M3UA)", RFC 4666, DOI 10.17487/RFC4666, September 2006, <<https://www.rfc-editor.org/info/rfc4666>>.

⁸ ETSI, "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Unstructured Supplementary Service Data (USSD); Stage 1 (3GPP TS 22.090 version 14.0.0 Release 14)", <http://www.etsi.org/deliver/etsi_ts/122000_122099/122090/14.00.00_60/ts_122090v140000p.pdf>.



New developments have deprecated legacy circuit-switched networks to fully integrate all information sent from a mobile device.

Not only are the networks interconnected, mobile carriers are deploying technology which unifies the underlying infrastructure which makes up the PSTN and the Internet on their networks. In other words, the underlying networks themselves are converging. As a result, the Commission's argument that the PSTN is circuit switched and data is packet switched, and that the two travel over different, disconnected networks, is invalid because that distinction has almost completely disappeared (regardless of whether or not it ever mattered).

This is because of the latest iteration of mobile network implementation, called the Evolved Packet Core (EPC), which is the packet-switched-only evolution of the core mobile network for 4G and 5G LTE networks. In EPC a transformation between two distinct networks (one circuit switched and one packet switched) is not required—the LTE network was designed to natively carry packet-switched voice calls alongside packet-switched mobile broadband. In other words, the network that carries telephone calls is the same exact network as that which carries mobile BIAS data. A modern phone in the United States will only perform a circuit-switched call if service is particularly spotty, and the connection has to fall back to 3G, or if the user turns off LTE data services. With the planned deprecation of the 3G network by some network providers⁹, it will soon be impossible place a circuit-switched call from a mobile phone at all. (And of course, as we explained above, even without an LTE connection a mobile phone can perform a VoIP call as easily as it can call over the PSTN.) As such, the Commission's proposed distinction between a mobile phone network that carries only voice calls and a mobile BIAS network that carries only data will soon be non-existent from a technological standpoint.

Given the extent of implementation integration, the FCC must look towards the services layer for its regulatory efforts.

The Commission's argument that a "traditional public switched telephone network" exists separately from the Internet because phones are identified by their phone number and Internet devices are identified by an IP address reflects an archaic and factually incorrect understanding of how modern mobile networks are constructed. While we still call our mobile devices "phones", there is nothing inherent about their telephony capabilities. The phone app is just another application that the device can run, albeit one that comes preinstalled with modern mobile operating systems. The app, whether PSTN or VoIP, provides a voice service. The underlying format only determines which of the phone's underlying radio connections it will choose to access.

Elaborating further, voice calling, Internet access, and text messaging are all services that are offered on top of a mobile carrier's network. The underlying network does not have a uniform addressing scheme that applies to its entire contents. Rather, different devices on the network can be addressed by different schemes, such as NANP and IP, depending on which service is being

⁹ Dano, M., "Verizon to shut down 2G CDMA 1X network by the end of 2019", July 13 2016, <<https://www.fiercewireless.com/wireless/verizon-to-shut-down-2g-cdma-1x-network-by-end-2019>>.



used. Even within an IP portion of the network, Network Address Translation devices (NATs)¹⁰ convert different addresses when reaching different parts of the network. The addressing scheme (whether it be phone numbers or IP addresses) is not what defines the network, and it is certainly not what defines a service that runs over a particular network. Arguing otherwise would be like arguing that email and web-browsing run on different networks, because they use different addressing schemes (an email address versus a domain name), and because not every device reachable via email (because it runs email server software) is also reachable via a website (because it runs software that hosts a website) or vice versa. This is obviously absurd—both services run on the same network, the same way voice calls and data services run on the same network in modern mobile networks.

Thus, contrary to the conclusions in the draft Order, mobile BIAS does in fact make “interconnected service available (A) to the public”¹¹, where “interconnected service” is defined as “service that is interconnected with the public switched network.”¹² If the Commission wishes to respect “the fundamental canon of statutory construction that ‘unless otherwise defined, words will be interpreted as taking their ordinary, *contemporary*, common meaning’”¹³, the record (including this letter) demonstrates that the common meaning of the term “public switched network” is not the same now as it was more than two decades ago. Thanks to the ever-forward march of technology, the line between the Internet (including mobile BIAS) and the traditional phone network has blurred to the point of being unrecognizable. To claim otherwise is to ignore two decades of technological advancement. Thus, we strongly urge the Commission not to adopt a definition of the “public switched network” that is more than two decades out of date.

Respectfully,

Erica Portnoy, Staff Technologist
Dr. Jeremy Gillula, Senior Staff Technologist

¹⁰ Srisuresh, P. and K. Egevang, "Traditional IP Network Address Translator (Traditional NAT)", RFC 3022, DOI 10.17487/RFC3022, January 2001, <<https://www.rfc-editor.org/info/rfc3022>>.

¹¹ 47 U.S.C. § 332(d)(1).

¹² 47 U.S.C. § 332(d)(2).

¹³ Proposed Order para. 75, internal citations omitted.