Attachment—Additional Questions for the Record

Subcommittee on Communications and Technology
Hearing on
"Legislating to Stop the Onslaught of Annoying Robocalls"
April 30, 2019

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The Honorable David Loebsack (D-IA)

1. **What specific work is currently being done to overcome the limitations of copper networks for the implementation of anti-robocall technology like STIR/ SHAKEN?**

Response: Although the SHAKEN/STIR standards are designed for implementation across Internet Protocol (IP) networks, industry is working on solutions to overcome the limitations to deployment on traditional time division multiplexing (TDM) networks (*i.e.*, copper networks). For example, the Network Working Group of the Internet Engineering Task Force (IETF) in March, 2019, published an Internet Draft working paper entitled *STIR Out-of-Band Architecture and Use Cases* ("*IETF Paper*") which addresses potential approaches for deployment of SHAKEN/STIR capabilities on traditional TDM networks.[1]

The *IETF Paper* discusses certain limitations of TDM networks for deployment of SHAKEN/STIR. It notes for example, that even if fields for sending authentication information could be found in traditional public switched telephone networks (PSTN) signaling, the "legacy elements would strip the signatures from those fields," or "might damage them to the point where they cannot be verified."[2] However, the *IETF Paper* observes that while the core network of the PSTN remains fixed, "the endpoints of the telephone network are becoming increasingly programmable and sophisticated."[3]

It states that TDM networks are "shrinking, and increasingly being replaced" by various classes of "intelligent devices" such as IP Private Branch Exchanges (PBXs) and terminal adapters, all of which provide both Internet access and access to the PSTN. Additionally, the *IETF Paper* notes that various kinds of gateways "increasingly front for deployments of legacy PBX and

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[1] *See* IETF Network Working Group, Internet Draft, STIR Out-of-Band Architecture and Use Cases (March 11, 2019) (available at: https://tools.ietf.org/html/draft-ietf-stir-oob-04#section-1) (visited June 21, 2019) (*IETF Paper*).

[2] *IETF Paper*, p. 3.

[3] *Id*.

PSTN switches."[4] It concludes that all of these factors "provides a potential avenue for building an authentication system that implements stronger identity while leaving PSTN systems intact."[5] The *IETF Paper* then discusses a "high-level architecture" for overcoming TDM limitations in certain use cases.[6]

As the IETF proceeds with its important work, and as networks continue their evolution from TDM to IP networks, there are currently solutions available in the marketplace that can address this issue on an interim basis. For example, TNS provides its Call Authentication Hub for SHAKEN/STIR that enables Tier 2 and Tier 3 carriers to deploy SHAKEN/STIR capabilities and can provide a solution for TDM carriers using out-of-band signaling.[7] Some industry stakeholders have also identified a variety of ways that carriers with traditional TDM trunks can implement STIR/SHAKEN that are consistent with the findings in the *IETF Paper*.[8] For example, a STIR/SHAKEN-aware gateway can be put in front of legacy infrastructure that will enable calls to show up as being valid signed calls at their destination. In addition, if there are endpoints or intermediaries in the legacy TDM infrastructure that can access the Internet, there can be an implementation of an out-of-band infrastructure for STIR/SHAKEN. Finally, an upstream carrier with an IP gateway can potentially sign calls on behalf of the carrier with traditional TDM trunks.

2. What do you estimate is the percentage of calls that are not pure, end-to-end IP?

Response: As discussed in response to the previous question, industry is working on solutions to overcome the limitations to deployment of STIR/SHAKEN on TDM networks, and interim solutions are available in the marketplace. While we do not know with precision the percentage of calls that are pure end-to-end IP, our best approximation is about half of calls are end-to-end IP today, with some margin of error in either direction. However this percentage is shrinking every day as carriers upgrade their infrastructure.

We are unaware of public data directly addressing the question. There is also some technical uncertainty regarding the extent to which a given call that originates and terminates at IP end-points remains on an IP path for the entirety of the call. Nonetheless, we can assume that this is the case for the purpose of a crude estimation.

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[4] *Id.*

[5] *Id.*

[6] *IETF Paper*, pp. 11 – 15.

[7] *See*, TNS, *Ex Parte* Presentation to the FCC, GC Docket No. 17-59 and WC Docket No. 17-97 (filed May 28, 2019) (available at: https://ecfsapi.fcc.gov/file/10528829902187/TNS_FCC_Presentation_052319.pdf) (visited June 21, 2019) at p. 11 (discussing TNS Call Guardian Authentication Hub, which provides a pre-STIR/SHAKEN out of band capability for TDM carriers).

[8] *See*, Neustar website, *STIR/SHAKEN Q&A: Restoring Trust in Calls* (available at: https://www.home.neustar/resources/faqs/stir-shaken-q-and-a) (visited June 21, 2019).

According to 2017 Federal Communications Commission (FCC) data,[9] there were approximately 455 million business and residential end-user voice connections consisting of 65 million interconnected VoIP wired lines (14 percent), 55 million switched wired lines (12 percent), and 335 million wireless voice subscribers (74 percent). Assuming approximately four-fifths of wireless subscribers use IP-based technology that bypasses the TDM network, such as Voice over LTE,[10] we approximate that nearly three-quarters (73 percent) of end-user connections are IP and nearly one-quarter (27 percent) are switched. Based on highly simplified probabilities, we estimate that a little more than half of all calls (approximately 55 percent) are IP-to-IP, with the remainder originating, terminating, or both, on a switched network. However, these are merely estimates based on statistical probabilities, not actual call records.

[9] *See* FCC, Voice Telephone Services: Status as of June 30, 2017 (November 2018) at Table 1 (VTS). This analysis disregards non-interconnected, over-the-top communications.

[10] *See* Ericsson, Mobility Report (November 2018) at 13, available at https://www.ericsson.com/en/mobility-report/reports/november-2018 (visited June 21, 2019) (stating that 87 percent of North American wireless subscriptions are LTE). For our purposes, we assume a lower percentage of calls are LTE to account for potential non-LTE devices and usage, such as non-subscription devices that do not use LTE service (e.g., some prepaid phones) and LTE-capable devices roaming on non-LTE networks.