September 9, 2020

Via Email
PNTresearch@ostp.eop.gov
Office of Science and Technology Policy

Re:     RFI Response: PNT Resilience
        ATIS SYNC Comments to Docket Number 2020-17399

To the Office of Science and Technology Policy:

The Alliance for Telecommunications Industry Solutions SYNC Committee (ATIS SYNC) is writing to offer comments in response to the Office of Science and Technology Policy (OSTP) *Request for Information* (*RFI*) seeking input about the development of a National Research and Development Plan for Positioning, Navigation, and Timing (PNT) Resilience.

*About ATIS SYNC*. ATIS is a leading developer of standards and other technical deliverables for Information and Communications Technology (ICT) and Services (ICTS) companies. ATIS develops standards on a broad range of important issues, including 5G and the Internet of Things (IoT). ATIS also is the North American Organizational Partner in 3GPP, a global project that unites ATIS and six other regional and national telecommunications SDOs in the development of wireless standards, and a founding partner in oneM2M, a global forum for the development of technical specifications that concern a common machine-to-machine service layer.  Nearly 600 industry subject matter experts work collaboratively in ATIS' open industry committees, such as SYNC.

ATIS SYNC develops and recommends standards and prepares technical reports related to telecommunications network synchronization interfaces.  ATIS SYNC has published a number of documents related to network timing, including the *ATIS SYNC Technical Report on GPS Vulnerability*, which notes the telecommunications industry's dependence on the Global Positioning System (GPS) and highlights GPS vulnerabilities of concern to the communications sector.  This document is available electronically from the following link: https://access.atis.org/apps/group_public/download.php/36304/ATIS-0900005.pdf.

*Input to RFI*.  ATIS SYNC has prepared responses to key questions posed in this *RFI*. The input below represents the consensus view of ATIS SYNC member organizations.

**Question 1a. How will PNT services be used over the next ten years?** ATIS SYNC notes that the telecommunications industry requires the reliable delivery of precision timing signals to enable operation of cellular networks.  Over the next ten years, timing and synchronization technologies will remain a necessary and enabling technology of advanced telecommunications technology and deployments.

**Question 1b. What values for precision and integrity for non-GNSS dependent systems over the same timeframe will support assured PNT services and why?**  As part of the *ATIS*

*SYNC Technical Report on GPS Vulnerability*, ATIS SYNC prepared the following table of accuracy requirements in telecommunications systems.

| Application/ Technology | Accuracy | Specification |
|---|---|---|
| Billing and alarms | 100 ms | |
| IP network delay monitoring | 100 µs to 1 ms | NOTE – No standard requirement yet - operator dependent. |
| W-CDMA (Home NodeB) | µs level accuracy | [b-3GPP TR 25.866] section 8 |
| LTE-A | µs level accuracy | [b-TR 3GPP TS 36.814] |
| WCDMA MBSFN | 12.8 µs | [b-3GPP TS 25.346] sections 7.1A and 7.1B.2.1 |
| LTE-TDD (wide-area) | 10 µs | [b-3GPP TS 36.133]) section 7.4.2 |
| LTE-TDD to CDMA | 10 µs | [b-TS 3GPP TS 36.133] section 7.5.2.1 |
| CDMA2000 | 3 µs | [b-3GPP2 C.S0002] section 1.3; [b-3GPP2 C.S0010] section 4.2.1.1 |
| TD-SCDMA | 3 µs | [b-3GPP TS 25.123] section 7.2 |
| LTE-TDD (home-area) | 3 µs | [b-3GPP TS 36.133] section 7.4.2; [b-3GPP TR 36.922] section 6.4.1.2 |
| WCDMA-TDD | 2.5 µs | [b-3GPP TS 25.402] sections 6.1.2 and 6.1.2.1 |
| PRTC | 100 ns | [ITU-T G.8272] (Primary Reference Time Clock) |
| ePRTC | 30 ns | [ITU-T G.8272.1] (Enhanced Primary Reference Time Clock) |

**Question 1c. Similarly, what level of synchronization to Coordinated Universal Time (UTC) is anticipated to be needed?** ATIS SYNC notes that, depending on the application, UTC traceability in timing systems may be necessary within a telecommunications network. Recommendation ITU-T G.8272.1/Y.1367.1 sets the requirement for an Enhanced Primary Reference Time Clock (ePRTC) at 30 ns against UTC. When considering development of alternative timing and synchronization sources traceable to a recognized standard such as UTC, delivering better than 1 microsecond to the end application, with respect to the standard, would still meet many requirements within telecommunications systems.

**Question 2. What may affect or prevent the adoption, integration, and operation of resilient PNT services and equipment?** ATIS SYNC notes that three factors may affect adoption, integration, and operation of resilient timing services and equipment:

1) Commercial industries may not sufficiently understand the threats, such as jamming and spoofing. Today, disruptions to telecommunications networks are typically associated

2) Deployed synchronization technology (e.g., GPS receivers) typically have long life cycles before they are replaced. Timing and synchronization infrastructure deployed in telecommunications networks typically have a life cycle of ten years or more, which likely slows the adoption of newer, more resilient alternatives to existing solutions.

3) Cost, complexity, and power considerations. An alternative PNT system to GPS might increase operating costs and have different operational (including power) requirements.

**Question 3b. What features or capabilities in equipment or systems could provide effective protections or mitigations against interference or manipulation?** ATIS SYNC notes that the telecommunications industry is critically dependent on Global Navigation Satellite System (GNSS), and often GPS, as a source of time. ATIS SYNC identified mitigation strategies in its technical report on GPS vulnerabilities, including notably the need for alternative non-GNSS timing and synchronization sources.

**Question 4. What R&D activities are currently being conducted, or planned, to develop non-GNSS dependent PNT services or equipment, or to improve the resilience of PNT services or equipment?** The U.S. Department of Homeland Security (DHS) has been leading the efforts on the development of a conformance framework for resilient PNT systems (via its Conformance Framework Working Group or CFWG), with involvement from leading organizations and representatives in industry, academia and the government, including ATIS SYNC. The CFWG is targeted at identifying resiliency requirements for PNT systems and has resulted in a generic framework. The ongoing work of the CFWG can serve as a basis for future work by standards bodies and other organizations such as ATIS and 3GPP on the classification and certification of PNT system resiliency and its applicability to various industry sectors and user needs.

**Question 5a. What knowledge or capability gaps currently exist that, if filled, could contribute to improving resilience?** Telecommunications networks deployed today are complex systems of systems. ATIS SYNC has identified the following gaps in publicly available information that, if filled, may inform design and architecture of resilient synchronization in communications networks:

- *Lack of testing data available from operational telecommunications networks assessed against various types, levels, and durations of synchronization disruption.* The level of degradation of telecommunications networks experiencing timing disruptions will vary based on technologies and features in the networks. Degradations may be geographically localized. In general, more data is needed to better characterize these effects and to better compare timing and synchronization requirements in telecommunications networks against critical industry functions and their respective user applications.

- *Lack of threat information available to industry against which to test resilient systems.* As noted in the *ATIS Technical Report on GPS Vulnerability*, telecommunications industry

stakeholders are much more likely to observe a synchronization disruption from a faulty antenna installation than from intentional interference or targeted spoofing.

- *Alternative ways to distribute time.* Resilience requires diverse technologies for distributing PNT. The resiliency requirements of PNT systems represent an open area of research and development.

**Question 5c. What role does the Federal government have to encourage and collaborate on these activities?** Economic incentives, direct investments, support of industry standardization, and establishment of a clear policy on the adoption and integration of alternate PNT solutions and services are needed to ensure that critical industry sectors and their users are protected from cyber security attacks and other vulnerabilities.
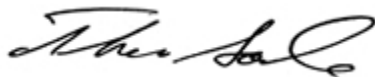
As a developer of industry standards, ATIS SYNC actively collaborates with U.S. Civil Government Agencies such as the U.S. National Institute of Standards and Technology (NIST) and DHS on the topic of PNT resiliency. ATIS SYNC welcomes these dialogues, finding them to be useful vehicles of collaboration.

ATIS SYNC supports and encourages the simplification of the use of foreign GNSS as alternative timing sources for Federal Communications Commission (FCC) licensed receivers.

Moreover, while ATIS SYNC generally supports efforts of the FCC to maximize the bandwidth available for wireless services, it cannot support these efforts at the expense of degrading existing network operations. Given the critical nature of communications networks and the support that these networks provide for other critical infrastructure services, ATIS SYNC believes that it is crucial to consider how signals in frequency bands near or in GNSS bands may impact existing network operations.

ATIS SYNC appreciates the opportunity to provide its input to the *RFI*. If there any questions, please contact the undersigned.

Sincerely,

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