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January 8, 2006

**Via e-mail**

Dr. Judah Levine  
National Institute for Science and Technology  
325 Broadway  
Boulder, CO 80305

**Subject: LORAN-C Use in Wireline Telecommunication Service Providers**

Dear Dr. Levine:

The Alliance for Telecommunications Industry Solutions (ATIS), on behalf of its Optical Transport and Synchronization Committee (OPTXS), would like to provide you with information on the committee's view regarding the importance of LORAN-C to wireline telecommunications service providers. LORAN-C, as an independent primary frequency source (PRS), provides a diverse back-up to GPS. It is the consensus of the ATIS OPTXS that LORAN-C is the only viable alternative to GPS for providing precise UTC time-of-day with a frequency accuracy that is suitable for use as a telecom PRS.

ATIS is an American National Standards Institute (ANSI) accredited standards organization that develops technical and operations standards for the communications and related information technology industries. The ATIS OPTXS committee concentrates on telecom equipment that transports voice, data and video over copper and fiber and its OPTXS-SYNC subcommittee is involved with synchronization aspects including accurate frequency generation and distribution.

The use of PRS is essential for the operation of wireline and wireless telecommunications service networks. One way that telecom service providers get accurate frequency references for their networks is to use radionavigation receivers specially modified for timing (frequency) instead of position. Before GPS was widely available, LORAN-C was widely used as a PRS for many telecom service providers. A PRS provides a frequency signal with an accuracy of 1 part in  $10^{11}$  or better. This frequency is then distributed throughout the network. The use of time-of-day (wall clock time) is not part of the definition of a PRS, but is also a requirement of many telecom network operators.

Due to the uncertain future funding of LORAN-C, its use as PRS has declined in recent years. Currently, there are few LORAN-C receivers on the market. Although some service providers are still using LORAN-C as a

backup to GPS, many have switched from LORAN-C to atomic PRSs, such as Cesium. Other carriers have chosen to rely exclusively on GPS as PRS.

Impacts to telecom networks' loss of PRS can vary from minor noise impairments short term to network-wide outages long term. The critical nature of PRS diversity is best captured in the "U.S. Space-Based Positioning, Navigation, and Timing Policy" signed by the President of the United States on December 8, 2004, and published December 15, 2004. The relevant section of that report requires the Secretary of Transportation to:

In coordination with the Secretary of Homeland Security, develop, acquire, operate, and maintain backup position, navigation, and timing capabilities that can support critical transportation, homeland security, and other critical civil and commercial infrastructure applications within the United States, in the event of a disruption of the Global Positioning System or other space-based positioning, navigation, and timing services, consistent with Homeland Security Presidential Directive-7, Critical Infrastructure Identification, Prioritization, and Protection, dated December 17, 2003.

The use of LORAN-C is the only commercially possible solution to maintaining backup position, navigation and timing capabilities in the event of GPS disruption. Atomic PRS can only meet the frequency portion of the timing requirement, but none of the UTC time-of-day/position/navigation requirements.

Other, often overlooked advantages of LORAN-C as a telecom PRS include its resilience against unintentional and intentional jamming and its ability to work in urban canyons. Due to LORAN-C's low frequency, high power, and geographically diverse signals, it is virtually un-jammable. In addition, LORAN-C's ability to use indoor antennas also eliminates problems associated with ice/snow accumulation and lightning strikes on external antennas.

In 2002, the ATIS OPTXS standards committee, known then as T1X1, published document T1X1/2002-049, "E-LORAN Liaison to NIST," highlighting the importance of maintaining LORAN-C and enhancing E-LORAN for telecom use. This document listed two key criteria for continued LORAN viability: (1) a funding commitment for at least 15 years; and (2) frequency accuracy of  $1 \times 10^{11}$  or better. The document also listed several desired enhancements for E-LORAN, including the requirement for UTC time-of-day and indoor antenna capabilities. Since that document was published, new receivers have successfully demonstrated the required and desired enhanced technical capabilities.

While the importance of LORAN-C as a telecom PRS has been highlighted in this letter, other suggested sources for additional detailed information including vulnerabilities and limitations of other telecom PRS options include: (1) "The Role of LORAN Timing in Telecommunications" by Michael Lombardi, NIST, et al (published May 17, 2006); and (2) "The Case for eLORAN" by Research and Radionavigation, General Lighthouse Authorities of the United Kingdom and Ireland (published May 8, 2006).

To summarize, many service providers use two diverse PRS sources in their networks in order to have a reliable frequency reference. The consensus of the ATIS OPTXS is that LORAN-C is the only viable alternative to GPS for providing precise UTC time-of-day with a frequency accuracy that is suitable for use as a telecom PRS. LORAN-C is the only source, other than GPS, of distributed UTC, can be used in dense urban environments and is a proven technology with an established user base.

If you have additional questions, please contact Adam Wertheimer ([awerthei@telcordia.com](mailto:awerthei@telcordia.com)), the Chair of OPTXS-SYNC Subcommittee, or Ken Biholar ([ken.biholar@alcatel-lucent.com](mailto:ken.biholar@alcatel-lucent.com)), Chair of the OPTXS Committee.

Thank you,

A handwritten signature in black ink, appearing to read 'T Goode', is positioned above the typed name.

Thomas Goode  
ATIS General Counsel

cc: Adam Wertheimer ([awerthei@telcordia.com](mailto:awerthei@telcordia.com)), OPTXS-SYNC Chair  
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