ATIS and Future Synchronization Needs

WSTS 2015

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ATIS COAST-SYNC

General Information

- COAST-SYNC is the timing and synchronization subcommittee of ATIS Copper/Optical, Access, Synchronization and Transport (COAST) Committee.
- The complete text of the COAST-SYNC Mission and Scope statements are attached as backup slides to the end of this presentation.
- The ATIS COAST-SYNC Update presentation at the 2014 WSTS provided details on the technical reports and standards documents supported by COAST-SYNC as well as a report on activities up to the date of the 2014 WSTS. These slides are included as extra slides in the backup slide section.

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What are we doing now?

- GPS jamming/spoofing – vulnerability, mitigation, and potential backup solutions
- Time profile discussions and coordination US/ITU-T (Q13)
- Ongoing support of standards documents

What will we be doing?

- What are the “Future Synchronization Needs”?

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GPS jamming/spoofing – vulnerability, mitigation, and potential back up solutions

- This is the issue that consumes most of current COAST-SYNC bandwidth.
- The March 2014 letter to the US DHS received a lot of attention.
- As a direct result of that letter, the US Communications Sector Coordinating Council (CSCC) engaged with ATIS and COAST-SYNC. A joint ATIS/CSCC webinar on GPS issues was produced and delivered October 3, 2014. It was well-attended and well-received.

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GPS jamming/spoofing – vulnerability, mitigation, and potential back up solutions (continued)

- Dr. Marc Weiss did an excellent job presenting the COAST-SYNC material at the ATIS/CSCC webinar. COAST-SYNC leadership gratefully acknowledges Marc's contribution.
- COAST-SYNC will continue to collaborate with the CSCC.
- GPS jamming/spoofing mitigation and potential back up solutions under discussion include Navigational Message Authentication, sync over broadcast spectrum, and terrestrial beacons in addition to sync over fiber and eLORAN as discussed last year.

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GPS jamming/spoofing – vulnerability, mitigation, and potential back up solutions (continued)

- COAST-SYNC has requested liaison with 3GPP-RAN to insure we are aligned on phase timing requirements for LTE and LTE-A.
- A second letter to DHS reporting on COAST-SYNC activities to date has been drafted and is in the review process.

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Time profile discussions and coordination US/ITU-T

- Study Group B no longer requires US contributions to go through a review process.
- Since the implementation of these changes, none of the COAST subcommittees have received contributions for review.
- The author of the contribution has the option to request review. COAST-SYNC will review any sync related contributions to ITU-T SG15/Q13 if requested.

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Ongoing support of standards documents

- 46 of the current COAST standards are considered “stable”.
- ANSI allows such stable standards to undergo a 10-year review, versus the typical 5-year review process, called “stabilized maintenance” (per ATIS OP, section A.13.3).
- ATIS and COAST leadership recommended placing all 46 standards documents in stabilized maintenance. A letter ballot to approve is expected to pass.
- This action will reduce document maintenance workload and free up time for other COAST-SYNC issues.

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What are the "Future Synchronization Needs"?

- First, a retrospective look at COAST-SYNC
- Then, future synchronization needs and the role of COAST-SYNC

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A retrospective look at COAST-SYNC

- The roots of COAST-SYNC are in ANSI T1X1.3, charged with developing frequency synchronization standards for TDM and SONET based networks.
- TDM, SONET, and DS0 loop start telephone lines will soon join magneto telephones, open wire, and analog carrier in the telecom history of obsolete technology.
- 15+ years ago, it was widely believed that timing and synchronization would sunset with TDM and SONET, that there would be no need for timing and synchronization in all IP networks. While it is true IP transport is sync agnostic, the applications are a whole different story. Not only do they require sync, the required phase accuracy makes traditional ST1 frequency sync look easy by comparison.

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Future synchronization needs and the role of COAST-SYNC

- 4G wireless services are already driving phase requirements at base stations to microsecond accuracy.
- At the present time, this level of accuracy requires GPS timing sources at or very near the edge, and perhaps PTP backup from a source in the core network.
- At the same time, there are concerns about GPS vulnerability to jamming and spoofing. Will a backup to GPS be required?

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Future synchronization needs and the role of COAST-SYNC (continued)

- Future developments in wireless technology, cloud computing, Network Function Virtualization, and Software Defined Networks will almost certainly drive phase requirements into the sub-microsecond range
- These issues are complex, and evolving. There is a need for a comprehensive timing architecture and open standards that address current and future sync requirements.
- The nature of sync has changed, and the need for sync standards is greater than ever. COAST-SYNC is already engaged, and is working collaboratively with others to identify best solutions going forward.

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Future synchronization needs and the role of COAST-SYNC (continued)

- It will not be easy, but with the assistance of those attending this workshop and others in the international timing community, new architecture and interoperability standards for sync in IP networks and new applications will become a reality.

Questions?

Thank You

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ATIS COAST-SYNC Backup Material

Mission

SYNC develops and recommends standards and prepares technical reports related to telecommunications network technology pertaining to network synchronization interfaces. The interfaces are between United States Telecommunications Networks, some of which are associated with other Telecommunications Networks. SYNC focuses on those functions and characteristics necessary to define and establish synchronization between networks and also on areas concerned with network phase/time characteristics that require theoretical, analytical and empirical investigations to ensure that standards and reports meet the highest norms of technical integrity and completeness. SYNC also prepares recommendations on related subject matter under consideration in various North American and international standards organizations.

ATIS COAST-SYNC Backup Material

Scope

The scope of the work undertaken by SYNC includes the concept, definition, analysis and documentation of matters pertaining to synchronization between carriers. This includes how synchronization is provided between carriers, and network phase/time characteristics at asynchronous and synchronous interfaces. Although the standards produced by COAST describe network interfaces, equipment specifications are also examined to ensure the feasibility and correctness of the network interface requirements. All theoretical and analytical work necessary to support the documented results is generated or coordinated by SYNC. This requires close liaison with other COAST Subcommittees and approved liaison with other ATIS Committees.

Note – Current Mission and Scope are subject to change as liaisons are now needed with IETF, IEEE, MEF, and 3GPP.

ATIS COAST-SYNC

COAST: "Copper/Optical, Access, Synchronization and Transport"

Technical Reports:

Synchronization of Packet Networks (2007)

Metrics Characterizing Packet-Based Network Synchronization (2010)

Intra-office Synchronization Architecture (2013)

Synchronization Standards:

Physical Interconnection for Intra-Office Ethernet-based Timing Distribution (2009)

Synchronization Interface Standard (2013)

Ongoing activity:

Time profile discussions coordination US/ITU

GPS jamming/spoofing

Prior Name: OPTXS-SYNC (before April 2010)
Originally: ANSI T1X1.3 (before 2005)

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ATIS COAST-SYNC Publications

ATIS American National Standards

- ATIS-0900101.2013 (formerly T1.101-1999), Synchronization Interface Standard
- ATIS-0900105.03.2013, Synchronous Optical Network (SONET) - Jitter and Wander at Network and Equipment Interfaces
- ATIS-0900105.09.2013, Synchronous Optical Network (SONET) - Network Timing and Synchronization
- ATIS-0900002.2009(R2014), Synchronization Standard – Physical Interconnection for Intra-Office Ethernet-based Timing Distribution

ATIS Technical Reports

- T1.TR.06-1990, Slave Stratum Clock Performance Measurement Guidelines
- T1.TR.08-1991, Jitter Measurement Methodology
- T1.TR.09-1991, Maximum Skew One-Tenth Maximum (MSTM) Model for Mode-Partition Noise (MPN)
- T1.TR.17-1993, The Effects of SONET on Payload Output Jitter
- T1.TR.33-1994, Synchronization Network Management Using Synchronization Status Messages
- T1.TR.52-1996, Value and Interpretation of Digital Pulse Masks and Eye Patterns
- T1.TR.81-2003, Synchronization Network Architecture
- ATIS-0900001 (2008), Synchronization and Packet Networks
- ATIS-0900003 (2011), Metrics Characterizing Packet-Based Network Synchronization
- ATIS-0900004 (2013), Intra-Office Synchronization Architecture

ATIS Recent Releases

Synchronization of Packet Networks, Technical Report, ATIS–0900001 (2008)

- Origins trace back to 1995/1996 in T1X1.3 when impact of ATM cell-delay-variation was discussed (c.f. T1X1.3/96-086)
- Very broad scope including timing distribution, mechanisms for timing over packet, circuit emulation, different packet transport technologies (IP, ATM, MPLS, Ethernet, xDSL, PON)

Physical Interconnection for Intra-Office Ethernet-based Timing Distribution, Synchronization Standard, ATIS–0900002.2009 (April 2010)

- Content addresses the "physical layer"
  - Covers "copper" (electrical) as well as "fiber" (optical) transmission
  - Includes 100Mbit/s as well as 1000Mbit/s Ethernet formats
  - Connectorization

Metrics Characterizing Packet-Based Network Synchronization, Technical Report, ATIS–0900003 (May 2011)

- Started as Issue SYNC 010 April 2010, completed and consented October 2010
- Related to material in G.8260 Appendix 1
- Discusses packet frequency transport metrics
  - Defines packet time sequence, PDV measurement
  - Pre-processed and integrated packet selection
  - Includes such metrics as minTDEV, MATIE, and MAFE

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ATIS Current Work

New Technical Report

- ATIS-0900004 (2013), *Technical Report: Intra-Office Synchronization Architecture*
  - Description of methods for delivering a timing (time/frequency) reference from TSG (BITS) to Network Element in an intra-office environment with emphasis on performance aspects
  - Addresses both time and frequency distribution
  - Covers PTP (IEEE 1588), NTP, Synchronous Ethernet, DOCSIS Timing Interface (DTI)

Standards Updates

- ATIS–0900101 (2013) *Synchronization Interface Standard (published Feb 2014)*
- ATIS–0900002.2009(R2014) *Physical Interconnection for Intra-Office Ethernet-based Timing Distribution*
- ATIS-0900105.03.2013 *Synchronous Optical Network (SONET) – Jitter at Network Interfaces*
- ATIS-0900105.09.2013 *Synchronous Optical Network (SONET) – Network Element Timing*

ATIS Current Work

GPS backup

- GPS vulnerability: jamming and spoofing
- COAST-SYNC/ATIS activities related to GPS backup:
  - Correspondence with DHS on backup to GPS for precise time and frequency distribution
  - Letter to DHS (March 2014) highlighting current telecom technologies and the criticality of GPS vulnerability
  - Letter to FCC reviewing LightSquared GPS interference (LightSquared filed for bankruptcy May 2012)
  - Light Reading Conference on GPS Interference Nov 2012 including “GPS Security Vulnerabilities In The Mobile Networks and Alternative Synchronization Solutions” by James Armstrong (ATIS Board Member, CTO Symmetricom)
  - DHS GPS vulnerability meeting Feb 2013
  - ATIS “GPS vulnerability and implications for telecom” webinar with Todd Humphreys (UT Austin), Martin Nuss (CTO Vitesse), and James Armstrong (CTO Symmetricom) Feb 2013
  - NIST-DHS-USNO experiment to transfer time through a public network (future)
  - Technical Report planned – Editor: Marc Weiss (NIST)