atis UPDATE

Advancing ICT Industry Transformation | Fall 2018
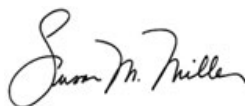
IN THIS ISSUE

PRESIDENT'S MESSAGE

Welcome to the *ATIS Update*. This issue offers insight into the results ATIS is achieving and their impact in advancing industry transformation. 5G – IoT – Smart Cities – Connected Vehicles – Unmanned Aerial Vehicles – Network-Enabled Artificial Intelligence – and Block Chain. ATIS is delivering solutions to our industry's most formidable challenges. Our initiatives add value to the network, make it more secure, and seize the opportunities inherent in disruptive technologies. In the *Update*, you will learn about our work to:

- Leverage artificial intelligence to advance ICT industry objectives

- Place ATIS in a leadership role in mitigating unwanted robocalling by serving as the Secure Telephone Identity Governance Authority

- Deliver insight on 3GPP work to enable support for UAVs

- Collaborate with vertical industries, including the automobile industry on connected car cybersecurity and with U.S. Ignite to accelerate and streamline Smart Cities data sharing

- Advance Wireless Emergency Alert standards

- And much more

Enjoy learning about our work. The pace of progress is rapid. Keep up to date at www.atis.org. Follow us on Twitter and LinkedIn.

Sincerely,

Susan M. Miller
President & CEO

FEATURED INITIATIVES

MITIGATING UNWANTED ROBOCALLING AND CALLER ID SCAMS

Leadership to maintain trust in the voice network.

In 2017, working together with the SIP Forum, ATIS developed the SHAKEN *or Signature-based Handling of Asserted Information using toKENs Framework,* (ATIS-1000074) protocol which, working with the IETF's STIR protocol, delivers the ability to authenticate, digitally sign and verify calling party numbers to help stop suspicious calls before they reach subscribers. In addition to developing the SHAKEN framework, ATIS is also allowing the industry to test implementations to ensure interoperability.

To put SHAKEN into action throughout the network, ATIS has been chosen to manage the Governance Authority (GA) for the industry-led effort to support the timely deployment of the STIR/SHAKEN protocol and operational procedure. The STI-GA will ensure the integrity of the issuance, management, security and use of Secure Telephone Identity certificates issued in compliance with the SHAKEN specification and more. The solutions developed by the ATIS/SIP Forum IP-NNI Task Force as well as our ability to put them into action by establishing the STI-GA are critical to mitigating the serious problem of unwanted robocalling. ATIS is pleased to be advancing this industry-led initiative so critical to addressing a leading cause of FCC and FTC complaints — and, on a greater level, maintaining trust in the voice network.
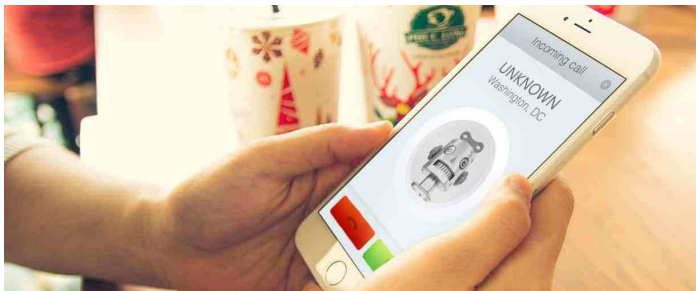
The initial STI-GA Board consists of representatives from the following stakeholders:

- **Chair** – Linda Vandeloop, AT&T

- **Vice Chair** – Glenn Clepper, Charter Communications; appointed by NCTA – The Internet & Television Association

- Clinton Lee, Jackson Energy Authority; appointed by the American Cable Association

- Nathan Sutter, Nex-Tech Wireless; appointed by the Competitive Carriers Association

- Indra Chalk, T-Mobile; appointed by CTIA

- Greg Rogers, Bandwidth; appointed by INCOMPAS

- Dave Frigen, Wabash Communications; appointed by NTCA – The Rural Broadband Association

- Chris Oatway, Verizon; appointed by US Telecom

- Gunnar Halley, Microsoft; appointed by the VON Coalition

- Michael Starkey; appointed by Western Telecommunications Alliance and TEXALTEL

- Tim Kagele, Comcast

- Darah Franklin, Google

Learn more at the STI-GA website.

THE INNOVATION AGENDA

A framework for advancing industry transformation.

The Innovation Agenda was created by ATIS' Board of Directors to address our industry's evolution, one that is bringing about a complete transformation – and a new industry state with fresh business models. At its core, the Innovation Agenda defines ATIS' overarching technology strategy, direction, and prioritizes forward-looking initiatives in the next two to five-year timeframe

as determined by their industry impact. Each priority is intended to focus on where the industry is best served to align and collaborate early. The initiatives coming out of our Innovation Agenda are some of the most exciting areas in which our industry is seeking new models to align, collaborate, and partner strategically with vertical industries.

BLOCKCHAIN/DISTRIBUTED LEDGER

*Harnessing an emerging technology for ICT industry business objectives.*

An ATIS strength is assessing the opportunities inherent in technologies that are still in exploratory and developmental phases but have the potential for high industry impact. Distributed ledger or "blockchain" technology is one of those having the potential to deliver new decentralized data management frameworks that can be applied to an innovative range of uses. ATIS' Distributed Ledger Technology (DLT) Initiative is examining DLT's role in enabling new business models and revenue streams governed through use of smart contracts.

Innovative deployments of DLT require a match between the specific benefits of DLT and use cases that enable the realization of these benefits. The DLT initiative is identifying practical examples of applications that can leverage the technology. The group is assessing whether a distributed ledger is an appropriate and helpful tool to address the business needs associated with a given use case. The work seeks to fully understand the required trust assumptions, application requirements, involved parties, and technical characteristics such as throughput and latency. Items also under

consideration are the establishment of clear rules for governance; how operations on the ledger relate to the broader regulatory environment; and how to maintain integrity, security and privacy of data stored on a smart ledger. Learn more.

CONNECTED VEHICLE CYBERSECURITY

Bringing ICT industry insight to reducing the threat of cybersecurity breaches in a new world of vehicles connected through the telecommunications network.
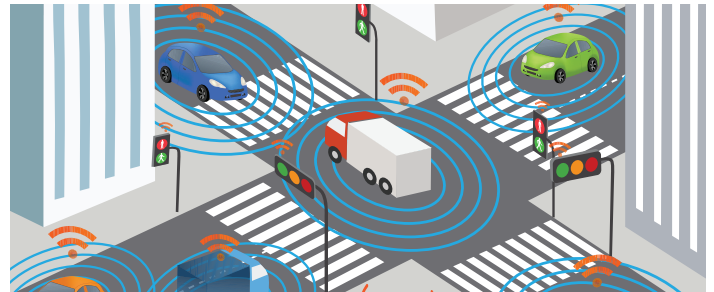
Automobile original equipment manufacturers face unique cybersecurity challenges given the increasing complexity of the connected car (i.e., the growing number of electronic control units, lines of code in key functions, and level of connectivity). Cyberattacks have the potential to put lives in danger, erode public trust, and inflict reputational damage to a carmakers' brand. To address the problem, our Connected Vehicle Cybersecurity work is applying ICT industry insights to reducing the threat of cybersecurity breaches in a new world of vehicles connected through the telecommunications network. So far, it has generated a roadmap for an industry-to-industry collaborative cybersecurity program. *Improving Vehicle Cybersecurity: ICT Industry Experience and Perspectives* has been hailed as a blueprint for effective collaboration between the ICT industry and connected vehicle manufacturers.

Building upon this foundation, ATIS is now garnering support directly with the vehicle OEM's and through the Automotive Information Sharing and Analysis Center (ISAC) for a joint cybersecurity program between the ICT industry and the vehicle OEMs. The goal is to develop a program of benefit to both industries.

CONTEXT-AWARE IDENTITY MANAGEMENT

Helping service providers leverage the vast wealth of context-aware information to make identifying users and devices (and granting them access to authorized services) easier and more secure.

Transforming the network also means we will be able to more effectively leverage the power of the contextual data that is generated. Consider that an average user has more than 100 online accounts associated with multiple identities. ATIS' Context Aware Identity Management work is helping service providers leverage the vast wealth of context-aware information to make identifying users and devices easier for the end user, and at the same time, more secure. What if this abundance of contextual information could be applied to creating a highly robust set of IdM solutions that could leverage situational awareness factors, such as your location, proximity to other users or devices, environmental data or user characteristics.

This contextual-based solution would also reduce the need for users to continuously manage and reset identifying information. Further, data derived from many context-aware sources would be more difficult to manipulate by unauthorized parties. ATIS is assessing the new landscape of applying contextual information to identity management solutions and creating a more robust ecosystem that benefits from the many new sources of context-aware data. A report, forthcoming in 4Q 2018, will include a CaIdM framework describing a context domain that receives requests and delivers contextual information to a consumer domain that may include IdM infrastructure, federations, third parties or OTT entities.

NETWORK-ENABLED ARTIFICIAL INTELLIGENCE

Advances in artificial intelligence are creating a burgeoning range of possibilities for advancing network transformation. ATIS is helping service providers leverage these technologies.

By applying a cross-operator perspective, a recent ATIS initiative is instrumental in discovering how increasingly sophisticated artificial intelligence (AI) and machine learning (ML) can be leveraged to address some of the ICT industry's leading challenges — and, beyond that, spur innovation. While AI and ML have been active areas of research for decades, advances in technology create a growing wealth of opportunity. Among other benefits, advances in these areas make it possible to use data gathered from the network to help systems automatically react to changing traffic patterns, faults and other capacity and performance-impacting events in real time. This means higher network performance with less effort on the part of the service provider. ATIS' work was conducted with an eye toward how industry collaboration can advance AI and ML solutions as well as companies' business objectives. A new report *Evolution to an Artificial Intelligence Enabled Network* (ATIS-I-0000067) was published in September.
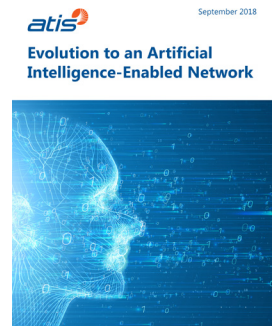
5G

Positioning ATIS members as leaders in advancing the new network.

ATIS' 5G work is geared toward enhancing the new network's efficiency, security and service velocity as well as advancing the commercial opportunities inherent in 5G. ATIS leadership ensures that 5G can use techniques such as network slicing and virtualization to meet a full range of application scenarios critical to the North American market, including mobile broadband, IoT and critical communications on a common infrastructure. ATIS also represents North America's 5G requirements globally into bodies such as 3GPP, where ATIS is a founding North American Organizational Partner.

A 2017 GSMA Intelligence report notes that 89% of mobile service providers see enterprise services as an important area for 5G incremental revenue. To help them exploit this opportunity, our work in this area has focused on exploring new 5G-enabled services that are both valuable and consumable by the enterprise.

Specifically, our work is exploring:

- Traffic segmentation and partitioning

- Resource reservation for connection characteristics

- Application prioritization and QoS categorization

- Enterprise control of identity applied to QoS classes and monitoring visibility

- Security for enterprise end points and traffic routing

- Multi-operator enterprise control through "standard" approaches

- Zero-touch provisioning of things

This work includes discussion of enterprise neutral host and roaming architectures. Discussions addressing current challenges related to these architectures have included use of block chain/

distributed ledger implementation for charging. ATIS' report *Neutral Host Solutions for Multi-Operator Wireless Coverage in Managed Spaces* (ATIS-I-0000052), published in 2016, will be updated to be consistent with 5G technical enhancements.

SMART CITIES

Delivering a data platform to help cities manage and monetize their data into the future while securing the network and devices.

Early this year, ATIS released its *Data Sharing Framework for Smart Cities*, which provides recommendations to help Smart Cities develop the robust data sharing ecosystem needed to derive value from their Smart Cities data; our most recent work is helping cities advance the goals outlined in the Framework. The Framework was set into motion by an initial analysis, the *ATIS Smart Cities Technology Roadmap*, that found, among other things, that Smart Cities data management platforms can collectively create value, but interworking of data beyond city boundaries will be a formidable challenge as Smart Cities solutions expand in the future.

Evolving Smart Cities technology is increasing the potential value that cities can gain from data sharing. If they are to reap these benefits, they will need a consistent approach to fully leverage the value of their data. This is what the Data Sharing Framework provides. It recognizes that data sharing is an evolutionary process. Most cities will initially focus on a set of first mover applications, open data portals and improvements to city efficiency. Static data will be progressively replaced with more dynamic real-time data.

Smart Cities will expand to Smart Regions. Increasingly, cities will need to share data across other Smart City ecosystems and with state and federal government entities. Eventually, the focus will shift to sharing data and creating value with citizens and application developers. This will involve awareness of data file formatting, real-time analytics, privacy, ownership and monetization. The new Data Sharing Framework helps with all of this. At this critical juncture, cities and industry have a unique opportunity to collaborate and develop consistent approaches to exchanging, interworking and creating value from data.

To put the Data Sharing Framework into action, ATIS is involved in a joint initiative with U.S. Ignite to give cities the ability to greatly enhance their Smart Cities' data sharing capabilities and is inviting cities and municipalities of all sizes to participate. The resulting Smart Cities Data Exchange specification will include a data sharing reference framework, data formats and protocols, security and privacy requirements and common APIs. This specification will also include representative use cases and a template of business alternatives, which will allow cities to evolve to data marketplaces, data brokering, federation, value creation and data exchange with the private sector.

For more information on this work, please contact ATIS Vice President for Technology and Solutions Mike Nawrocki (mnawrocki@atis.org).

UNMANNED AERIAL VEHICLES

Advancing ICT industry imperatives in a rapid-growth emerging industry.

In 2017, ATIS developed an analysis of the critical role of cellular networks and services in advancing adoption of unmanned aerial vehicles (UAVs) or "drones." The report showed the ways in which ICT boosts UAV performance, reliability and safe operation. The work was timely as not only are networks increasingly supporting drone use, but drones are also being used for many different

purposes in our own industry. These include providing cellular coverage after outages and disaster situations, boosting coverage during large events, inspection of critical infrastructure including cell towers and more. As the number of drones in the air and their flying time increases, safety, security and privacy concerns are coming to light. These issues were addressed in ATIS' initial report, *Unmanned Aerial Vehicle (UAV) Utilization of Cellular Services: Enabling Scalable and Safe Operation* (ATIS-I-0000060). The report also showed how 3GPP cellular networks could add value to UAVs to address communication, identity and other needs of applications and the UAVs themselves.
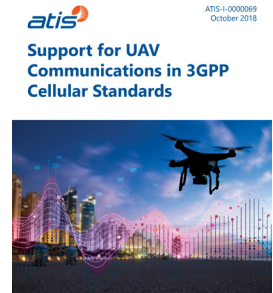
This October, ATIS expanded upon its initial report by releasing *Support for UAV Communications in 3GPP Cellular Standards,* (ATIS-I-0000069). which captures all the current and planned work in 3GPP to enable support for UAVs — showing the extent to which 3GPP standards are technically preparing cellular networks to support UAV needs. This report is written to help a broad audience, including experts in UAV operations and regulation, understand the technical features of the 3GPP standard that equips mobile cellular networks to support UAV communication needs. It will also help experts focused on only one part of the 3GPP standard to gain a broad appreciation of the whole scope of 3GPP activities related to UAVs.

TECHNOLOGY AND OPERATIONS COUNCIL INITIATIVES

IOT CATEGORIZATION

Delivering network-centric perspective insight into the IoT.

With major growth in the IoT ecosystem — in terms of the number of connected devices globally

and in total spending on end-point devices and services — a recent ATIS initiative is delivering a network-centric perspective on the IoT. The IoT Categorization Focus Group is refining a taxonomy to define a small number of categories with similar requirements from a network/platform perspective. These could be used in subsequent activities to identify network requirements (e.g., network slices) that could apply to a range of IoT applications. Several new device characteristics, and their proposed parameters, have been added to the data collection.

The categories will be assessed from the perspective of business, technology and regulation to ensure support of a robust IoT network platform. With the completion of the initial taxonomy, the classification will be shared with appropriate industry vertical groups for verification. Feedback is being integrated into a final report to aid service providers' efforts to build networks that support a full range of IoT devices and services. The results of this work are expected to provide valuable input into initiatives exploring secure ID for IoT devices. The final report is expected the fourth quarter of 2018. Learn more.

OS-IOT

Bringing the power of oneM2M to lightweight applications.

ATIS is advancing member imperatives in light of the significant growth in the IoT services projected for the coming decade. One of these projects is its Open Source – Internet of Things (OS-IoT) software, which is designed specifically to boost the adoption of the oneM2M standard.

oneM2M defines a common, interoperable, platform for IoT systems, providing application-independent building blocks that fulfill core tasks of secure data collection, management and distribution. After thorough testing in May of 2018, the OS-IoT open source client platform is now available to allow lightweight devices to access oneM2M IoT clouds without having to run

full oneM2M database and routing functions. oneM2M already has interworking to multiple other IoT technologies and transport technologies and is now being used successfully in a number of industrial and consumer applications in the areas of Smart Cities, eHealth and the Smart Grid. However, until ATIS developed OS-IoT, no open source lightweight client platform existed to bring the power of oneM2M to smaller scale applications. Thanks to ATIS, oneM2M benefits can be brought to a burgeoning market of developers and innovations in the areas of wearables, low-cost environmental monitors and smart metering to name just a few. Learn more at www.os-iot.org.

SOLUTIONS AND STANDARDS

Through collaboration, ATIS' technical and operations committees develop standards and solutions that deliver and enhance key communications services. From enhancing emergency communications services, addressing GPS vulnerabilities, being the industry's "go-to" resource for creating ordering and billing resources, advancing electrical protection, and more, ATIS committees deliver results for the industry in many forms.

BACK UP POWER MAINTENANCE

The Sustainability in Telecom: Energy and Protection Committee recently released *Recommended Maintenance Routines and Frequencies for Central Office Backup Power* (ATIS-0600035), a guideline, recommending a baseline set of routines along with maintenance intervals (frequency) for central office back-up power. These recommendations are applicable to central offices (they are not applicable to remote terminals, data centers, customer premises locations, etc.), and are the minimum suggested intervals, with the understanding that individual operating companies and State and/or local authorities may require more frequent intervals than those cited in this document.

BAR CODE TECHNOLOGY - 2D

With a goal of providing a practical approach to the subject of bar code and two-dimensional (2D) labelling, the Automatic Identification & Data Capture Committee has updated the industry resource, *Implementation Guide for Package Labeling* (ATIS-0300006). This update provides implementation guidelines for package labels in compliance with the more technical information supplied in ANS MH10.8.6, shipping/transport unit labels in compliance with ANS MH10.8.1, and cable reel labels, in compliance with *Guidelines for the Identification and Bar Code Labeling of Cable Reels* (ATIS-0300044). ATIS-0300044 provides a description of the labels and their uses, suggested procedures for the implementation of a package labeling program, provides an explanation of the existing specifications' technical requirements set in non-technical terms, and sets forth a common format for the exchange of labeling requirements.

EMERGENCY COMMUNICATIONS

ATIS is an industry focal point for developing and implementing many of the requirements set forth in the FCC's *Fourth Report and Order on Wireless E911 Location Accuracy Requirements* (FCC R&O). As part of this work, our Emergency Location (ELOC) Task Force has created the specifications for location accuracy improvements for emergency calls specific to North American regulatory policies and practices. In addition, it has provided the architecture and requirements for implementation of the Nationwide Emergency Address Database (NEAD). NEAD will store information related to the location of Wi-Fi access points and Bluetooth beacons to provide dispatchable location information to public safety.

- Some enterprises may not be able to populate the NEAD with their Wi-Fi/BLE beacon information for various corporate security or privacy reasons. However, some may be able to interface with the NEAD to determine a 9-1-1

caller's location in real-time. ATIS is currently developing the solutions to specify support for discovering the location of 9-1-1 calling devices from external sources (i.e., Enterprise network device location systems) while maintaining the architecture and features of the NEAD solution that have previously been defined. These enhancements will be contained in the forthcoming version 2 of ATIS-0700028.

- To enhance location-based routing of emergency calls, ATIS is reviewing and updating *ATIS Standard for Implementation of 3GPP Common IMS Emergency Procedures for IMS Origination and ESInet/Legacy Selective Router Termination* (ATIS-0700015) to reflect recent related 3GPP and ATIS work. Areas to be addressed include determining any impact on U.S. emergency call handling procedures based on 3GPP SA2 work on IMS in 5G as well as reviewing the 5G security specifications to determine any impact on U.S. emergency call-handling procedures, especially the increased attention to privacy.

WIRELESS EMERGENCY ALERTS

Advancing our Wireless Emergency Alerts (WEA) system is another focus of our work. Not only has ATIS contributed the solutions that have put the WEA system into action, our Wireless Technologies and Systems Committee (WTSC) is refining it. Most recently:

- WTSC submitted its findings in response to the FCC *Second Report and Order and Second Order on Reconsideration* regarding PS Docket Nos. 15-91 and 15-94. In the docket, the Commission acknowledged ATIS' work to analyze whether existing or legacy wireless devices can be modified via an update to the devices' software to support WEA geo-targeting capabilities. In providing the results of this work, ATIS noted that only those smartphones that meet upgradeability conditions stated in the report may be able to be updated through firmware/software modification to support

WEA geo-targeting capabilities. As standards are completed, OEMs and OS vendors will develop products and software to meet those standards. At that time, the industry may have a better understanding of which devices can be updated through firmware/software modification to support WEA device-based geo-targeting. ATIS continues to update the Commission on its progress to enhance WEA.

INTERNATIONAL MOBILE SUBSCRIBER IDENTITY SOLUTIONS

ATIS fulfills the important industry function of managing the International Mobile Subscriber Identity (IMSI) Oversight Council (IOC). The IOC is an open industry council of telecommunications companies and other organizations that oversees the management of IMSI codes that have been assigned to the United States and its possessions as authorized by the U.S. Department of State since 1996,. The critical 15-digit IMSI is used within mobile phones and allows service operators to identify mobile terminals for purposes of international roaming.

Earlier this year, IOC expanded its support for the management of IMSI codes by developing and approving guidelines that support the assignment of IMSIs for the Citizens Broadband Radio Service (CBRS) shared spectrum users in the 3.5 GHz band. This work resulted in a solution to support the use of CBRS spectrum to aid in providing mobile connectivity service in locations such as stadiums, apartment buildings, malls and other large facilities, as well as for other uses as they evolve. The result is that mobile connectivity is now more widely available — thanks to this collaborative effort with the CBRS Alliance. Learn more.

ORDERING AND BILLING

- *ASOG Update.* In September 2018, the Ordering and Billing Forum (OBF) released the *Access Services Ordering Guidelines (ASOG) Version 58*, a major industry operations support resource, which is scheduled for implementation on

March 16, 2019. ASOG Version 58 includes a revision to the Switched Ethernet order (EVC Practice 016) to accommodate the additional fields needed to provision Managed Access E-Line (MAEL) Services as specified in MEF 62. The update is another product highlighting the collaboration between OBF and MEF to streamline the Ethernet ordering process.

- *Emergency Procedures.* OBF is also creating a resource to help assess whether an ASOG release should be delayed, as well as to provide clarification about workarounds available during a significant event such as major storms. The Emergency Procedures for Requested Delay of Access Order Implementation document defines an established process within the U.S. for addressing an event that may jeopardize the published ASOG Implementation Date, which is the cutover date when companies switch from one version of ASOG to the next. This document was created as multiple hurricanes impacted the U.S. during the ASOG Implementation period in 2017.

NETWORK RELIABILITY

- *Best Practices for Emergencies.* One of the many roles ATIS fulfills for the industry is delivering the resources to help the network perform during natural disasters and other emergencies. The Hurricane Checklist is one of these. In 2018, the Network Reliability and Steering Committee (NRSC) updated and streamlined the checklist, making the document more applicable to a greater number of disasters. The new Emergency Preparedness and Response Checklist is being updated to cross reference Industry Best Practices.

- *Improving PSAP Notification in the Event of a 9-1-1 Outage.* In conjunction with the Association of Public-Safety Communications Officials (APCO), the National Association of State 911 Administrators (NASNA), and the National

Emergency Number Association (NENA), in 2018, NRSC announced the first deliverable from a joint initiative to improve Public Safety Answering Point (PSAP) notification in the event of a service outage. *Service Providers: Outage Reporting Structure and Potential Types of 9-1-1 Outages* provides recommendations for standardized content and delivery which will help reduce confusion associated with notifications independent of the service provider type.

This resource presents consensus-driven expert insight to help service providers and Public Safety organizations communicate critical information in the rare event that an outage occurs. The template and definitions contained within are the product of a working group that includes representation from carriers, third-party providers, 9-1-1 industry associations, and the PSAP community. Additionally, ATIS is developing Best Practices for collecting, managing, and utilizing PSAP and carrier contact information to ensure timely delivery of outage-related information. [Learn more](#).

REAL TIME TEXT (RTT)

ATIS has published the *[Real Time Text End-to-End Service Description Specification](#)* (ATIS-0700030). This standard defines the RTT end-to-end service behavior for the handling of RTT in support of the IP transition in order to facilitate a consistent use of RTT across multiple Commercial Mobile Service Providers (CMSPs).

SPECTRUM

With ever-increasing complexity of spectrum needs and uses in North America, ATIS developed a repository for current and new spectrum bands for the United States, Canada, and Mexico. *[North American Spectrum Bands (United States and Canada)](#)* (ATIS-0700040) summarizes the commercial and commercial/unlicensed wireless

bands currently used in North America.

ATIS Committees

- AIDC - Automatic Identification & Data Capture Committee

- ESIF - Emergency Services Interconnection Forum

- INC - Industry Numbering Committee

- IOC - International Mobile Subscriber Identity Oversight Council

- NGIIF - Next Generation Interconnection Interoperability Forum

- NRSC - Network Reliability Steering Committee

- OBF - Ordering and Billing Forum

- PTSC - Packet Technologies and Systems Committee

- SNAC - SMS/800 Number Administration Committee

- STEP - Sustainability in Telecom: Energy and Protection Committee

- SYNC - Synchronization Committee

- TMOC - Telecom Management and Operations Committee

- WTSC - Wireless Technologies and Systems Committee

ATIS EVENTS

CBRS SHARED HNI WEBINAR

Nov. 6, 2018

On November 6, 2018, the CBRS Alliance Technical Working Group and ATIS will host an educational webinar offering an overview of shared HNI (Home Network Identifier) on CBRS and its benefits for the overall industry.

The session will include an explanation of Home Network Identifiers (HNI), its purpose, the benefits of shared HNI compared to non-shared HNI, and best practices to set up network identifiers in a shared HNI environment.

To register for our upcoming webinar, please visit click here.

PROTECTION ENGINEERS GROUP CONFERENCE

March 5-7, 2019 | Northbrook, IL

The annual ATIS Protection Engineers Group (PEG) Conference presents solutions based on the latest electrical protection practices and applications in today's networks. This includes changes in standards and technologies needed to meet ongoing challenges of providing reliable voice, data and video services in decentralized networks.

Learn more at pegconference.com.

WORKSHOP ON SYNCHRONIZATION AND TIMING SYSTEMS

March 25-28, 2019 | San Jose, CA

The 27th Annual Workshop on Synchronization and Timing Systems (WSTS), sponsored by NIST and ATIS, is a vendor-neutral technology workshop that will address evolving sync requirements, as well as the roll-out of new sync systems and standards, and how these affect industries and equipment manufacturers.

Learn more at atis.org/wsts.

INDUSTRY EVENTS

IWCE'S CRITICAL LTE COMMUNICATIONS FORUM

Nov. 6-7, 2018 | Chicago, IL

IWCE's Critical LTE Communications Forum is the only event in the industry dedicated to critical communications for government, public safety, critical infrastructure and enterprises as they prepare to transition from LMR to mission-critical LTE, and state and local governments prepare for FirstNet and Smart Cities. Join us for this two-day conference to examine how the deployment of the largest LTE network in the country affects all sectors and users of critical communications

technology. You'll also gain insight into LTE's transformation of traditional LMR users, cellular networks, 5G, NG911, critical infrastructure and the deployment of smart city technologies.

Register at iwceexpo.com/criticallte18 with the discount code CTWEET to receive a 25% discount.

ATIS is a Critical LTE Communications Forum Allied Partner.

NGMN INDUSTRY CONFERENCE & EXHIBITION

Nov. 6-8, 2018 | Vancouver, Canada

NGMN is excited to be organizing the 7th NGMN Industry Conference & Exhibition taking place at the JW Marriott Parq Hotel, Vancouver, Canada on November 6-8, 2018, kindly supported by TELUS.

In this highly recognized event, thought leaders of the ICT industry will take center-stage and present their views and visions on:

• 5G Business

• 5G Architecture & Technology

• 5G Experience from First Deployments and Field Trials

The line-up of speakers and panelists consists of NGMN Board members - representing world-leading operators - and top-level executives from our industry partners.

Our exhibition will showcase world premier demonstrations of 5G systems and solutions from our international NGMN partners.

And not to forget, this event provides a unique networking platform in an outstanding conference and exhibition environment bringing together key

players from the entire mobile ecosystem.

Register at ice2018.ngmn.org/registration/ under "Non Partner" with VIP code Coop20 to receive 20% off your conference pass.

ATIS is a NGMN Industry Conference & Exhibition Co-operation Partner.

DC5G

Nov. 12-13, 2018 | Washington, DC

DC5G is the one event that represents the entire 5-G connected ecosystem. Enterprise markets, local municipalities, telcos, industry experts, satellite service providers, device manufacturers, federal policy makers and innovative adopters will gather for the second year to learn about the potential of the next generation of connectivity.

MUST SEE SESSION
What Can 5G Do For Smart Cities?
Tuesday, November 13, 2018
8:45-9:30 a.m.
Moderated by Mike Nawrocki, Vice President of Technology and Solutions, ATIS

Panelists:

• Jackie Crotts, Deputy Director of Technology, Department of Emergency Communications, City of Richmond, VA

• Bonnie Pierce, Professor, Georgetown University; Managing Director, NDP Analytics

Register at 2018.dc5G.com using VIP code ATIS5G to receive 20% off your pass.

ATIS is a DC5G Association Partner.

SCWS AMERICAS

Dec. 4-5, 2018 | Santa Clara, CA

SCWS Americas (formerly Small Cells Americas) will bring carriers, tower companies, enterprise verticals, building owners, cities and suppliers together to discuss how small cells, Wi-Fi and DAS will be the building blocks of 5G, in-building and smart city networks.

Register at scwsamericas.com with the action code ATIS30 to receive a 30% discount; carriers and end user register for free!

ATIS is a Partner Association for SCWS Americas 2018.

SMART CITIES INTERNATIONAL SYMPOSIUM & EXHIBITION

Jan. 22-24, 2019 | Chicago, IL

The 3rd Annual Smart Cities International Symposium & Exhibition, January 22-24, 2019 in Chicago brings together thought leaders and practitioners from around the world to explore the most recent technology advances, business models, and lessons learned to date in making the Smart City a reality. Expert speakers will examine the experiences of municipal governments who are pushing the envelope and moving toward actual implementation of the Smart City vision. The emphasis is on implementation strategy, case studies, best practices, and the development of compelling business models for transitioning to the 21st Century Smart City.

The event also features a pre-conference workshop on "The Future of Mobility" which looks at key developments in the e-mobility space, their likely impact on current infrastructures, and how best to implement and manage them over the coming years in order to optimize the overall smart city vision.

Register with the discount code ATIS15 to receive a 15% discount.

ATIS is an official Association Partner for the 2019 Smart Cities International Symposium.

IWCE 2019

March 4-8, 2019 | Las Vegas, NV

Since 1977, the International Wireless Communications Expo (IWCE) has been the authoritative annual event for information and communications technology (ICT) professionals in the working world. IWCE features over 400 exhibitors showcasing the latest products and trends in the industry. Over 7,000 individuals attend from a diverse group of industry professionals including government/military; public safety (law enforcement, fire service, emergency medical & 911); utility; transportation and business enterprise. The flagship IWCE event will be held March 4-8, 2019 at the Las Vegas Convention Center.

Register at iwceexpo.com/iwce19/ with the discount code BR1 to receive a 20% discount.

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