SMART CITIES

MITIGATING
UNWANTED
ROBOCALLING

atis

THE ALLIANCE FOR TELECOMMUNICATIONS INDUSTRY SOLUTIONS

UNMANNED
AERIAL
VEHICLES

ADVANCING ICT INDUSTRY TRANSFORMATION

NETWORK-
ENABLED
ARTIFICIAL
INTELLIGENCE

CONTENTS

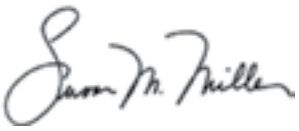
Letter from the President and CEO

Welcome to the *ATIS Overview,* a focused lens on ATIS' recent work and the results that are addressing the information and communications technology (ICT) industry's top challenges. ATIS solutions keep a constant eye toward the future. Our work is advancing ICT industry transformation. It is progressing new business opportunities and creating platforms for ICT collaboration with other industries. Speed, agility, and innovation are the hallmarks of our initaitives.

In this *Overview,* you'll learn how ATIS is mitigating the problem of unwanted robocalling, leveraging artificial intelligence to advance ICT industry objectives, creating new business opportunities through a Smart Cities Data Exchange, and spurring cross-industry collaboration by creating solutions that vehicle original equipment manufacturers can use to ensure that the mobile data in today's connected vehicles is secure.

Enjoy learning about the value our work delivers to the industry. The pace of progress is rapid. Keep up to date at www.atis.org.

Sincerely,



Susan M. Miller
ATIS President & CEO

ATIS Overview

Advancing ICT Industry Transformation

Our work takes place through our Board of Directors-driven Innovation Agenda initiatives, our Technology and Operations Council and our committees.

ATIS Overview

ATIS is where companies in the ICT industry come together to address common, critical priorities. Whether it's aligning on how to address challenges and progress new business opportunities; taking the long-term, strategic view on how to advance industry transformation; or creating a platform for collaboration with other industries, ATIS drives innovation.

In any emerging technology area critical to the industry's future, ATIS is at work. Our value-driven mission identifies how and where to collaborate as well as share resources, effort, and cost to develop large-scale, interoperable solutions for the common industry good.

Our projects are as diverse as the challenges they address. They encompass technology assessments for strategic industry planning, business use case formulation, open source projects, requirements, specifications, standards, interoperability testing, software toolkits, industry best practices, user guidelines, industry-supported testbeds and more.

While technical in nature and addressing members' business priorities, the work often integrates a policy component, which contributes to its success. This *Overview* provides insight into some of our recent priorities.

National and Global Accreditation
ATIS is accredited by the American National Standards Institute (ANSI). The organization is the North American Organizational Partner for the 3rd Generation Partnership Project (3GPP), a founding Partner of the oneM2M global initiative, a member of the International Telecommunication Union (ITU), as well as a member of the Inter-American Telecommunication Commission (CITEL).

Our Members

Our membership represents all sectors of the ICT ecosystem. It spans wireless and wireline service providers/network operators, cable operators, equipment manufacturers and suppliers, content

providers, government agencies, applications providers, as well as subsystem and professional services forums. We see the key to our solutions' success as the collaboration that takes place across our diverse member constituency.

For Network Operators

ATIS provides a collaborative structure to:

- Engage operators as well as a broad range of vendors, web services companies and application providers
- Share the costs of technology assessments and standards development
- Identify and explore new technology and business opportunities
- Investigate and apply solutions across networks and domains that require cooperation and alignment

For Equipment Manufacturers and Suppliers

ATIS brings together the vendor community with service providers, allowing them to:

- Directly engage their customers
- Drive standards development approaches
- Gain insight into deployment scenarios
- Unlock new commercial opportunities by aligning industry and resolving technical problems that may block market adoption

For Web Services, Content and Application Providers

ATIS delivers the benefit of:

- Participation in global standards development initiatives such as 3GPP and oneM2M
- Early insights into how networks and systems will be deployed and support future applications
- Partnering in the larger solution space for industry and government-driven needs
- Creation of technical alignment between content and content-access ecosystems
- Collaboration with key vertical markets

Setting Our Priorities - The Innovation Agenda

Board-Driven Industry Transformation. ATIS' Board of Directors sets the organization's strategic, technical and operational direction. It is made up of C-level executives from the leading ICT companies and offers a future-orientation that only a view from the top can bring.

Specific priorities are set by our Board-driven Innovation Agenda. It is a framework for defining and prioritizing our most strategic initiatives. With a focus on the future and disruptive technology, it asks the big picture questions and provides leadership in answering them:

- What do we see the state of the industry and technology to be in the next few years and beyond?
- What disruptive technologies are on the horizon and how will they impact the marketplace?
- What opportunities do disruptive technologies create for ATIS members and consumers?
- What action should we take today to have the future we want as an industry?

ATIS Board of Directors - Leadership (Officers)

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ATIS

View full Board.

Most recently ATIS' Innovation Agenda is advancing a range of initiatives to deepen cross-industry collaboration, enable innovations in the network and improve infrastructure and access as mapped out on the following page:

Cross-Industry Collaboration

Connected Vehicle Cybersecurity. ***Bringing ICT leadership to connected vehicle OEMs.*** Much of our work creates a platform for collaboration with other industries. Our members innovate and compete "on top of" ATIS' foundational work. Collaborative efforts across industries lead to greater scale and customer adoption. Our Connected Vehicle Cybersecurity work is one example. It applies ICT industry insights to reducing the threat of cybersecurity breaches in a new world of vehicles connected through the telecommunications network.

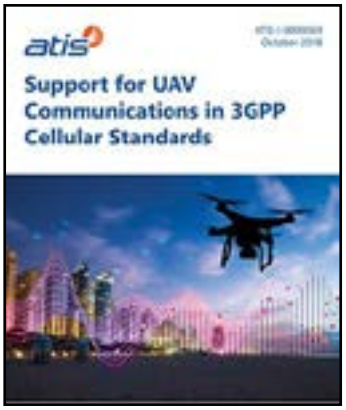
Thus far, the initiative has generated a roadmap for an industry-to-industry collaborative cybersecurity program, *Improving Vehicle Cybersecurity: ICT Industry Experience and Perspectives*, which serves as a blueprint for effective collaboration between the ICT industry and connected vehicle manufacturers. Building upon this foundation, ATIS is currently garnering support for a joint cybersecurity program between the ICT industry and the vehicle original equipment manufacturers to develop a program that would benefit both industries.

Smart Cities. ***ICT solutions shaping the Smart Cities data-sharing landscape.*** The growing use of Smart Cities technology presents opportunities for the ICT industry and ATIS is helping our members grow these. Cities are increasingly leveraging Smart Cities technology and the data it delivers to improve life in urban regions and surrounding communities. As sophisticated new applications help cities collect real-time data from sensors, vehicles and IoT-enabled infrastructure, cities are investing in a broad range of platforms to process and create value from the data being delivered. For cities to be able to benefit from the next generation of enhanced applications leveraging real-time data, the data they collect must be shared in an interoperable and secure way with other cities, adjacent communities,

federal/state government agencies, trusted partners, citizens, and application developers to create a vibrant data ecosystem. ATIS' Data Sharing Framework for Smart Cities helps them do this.

To put the Framework into action, ATIS launched a joint initiative with U.S. Ignite to give cities the ability to significantly 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 – which encompasses data brokering, federations, monetization, as well as value creation and data exchange with the private sector.

Unmanned Aerial Vehicles. ***Advancing ICT industry imperatives in a rapid-growth industry.***
Growth in the use of unmanned aerial vehicles (UAVs) for both commercial and recreational purposes brings the need for focus on their safety and reliability. Again ATIS is there delivering the industry resources to help members improve strategic positioning in a rapid-growth market.



In 2017, ATIS developed an analysis of the role of cellular networks and services in advancing the adoption of unmanned aerial vehicles (UAVs) or "drones." The report showed how ICT boosts UAV performance, reliability, and safe operation. Our work was timely as not only are networks increasingly supporting drone use, but drones are also being used for many different purposes in our industry. These include providing cellular coverage after outages and disasters, 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*. 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.

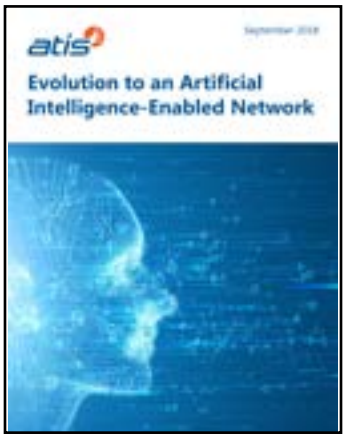
In October 2018, ATIS delivered a resource that has captured all current and planned work in global standards organization 3GPP to enable UAV support — showing the extent to which 3GPP standards are technically preparing cellular networks to support UAV needs. A wide range of 3GPP standards is advancing technical improvements to further enhance the cellular services provided to UAVs. ATIS' *Support for UAV Communications in 3GPP Cellular Standards* helps a broad audience, including experts in UAV operations and regulation, understand these.

UAV disaster recovery implications were covered in another ATIS piece. When a significant disaster event damages infrastructure, the restoration of communications is one of the most urgent and essential tasks. UAVs have started being used for several important roles in the process of restoring communications infrastructure. One role is to act as flying cell sites, which can provide mobile cellular coverage as an alternative to ground-based cell towers.

The new report, *Use of UAVs for Restoring Communications in Emergency Situations* introduces some of the ways in which drones are being used in this capacity and covers the technical and logistical considerations. It may be used by emergency planners and organizations that provide UAV-based communication services during disasters to assist with the preparation and execution of disaster recovery.

Network Enablers

Artificial Intelligence. ***Leveraging AI to advance ICT industry objectives.*** By applying a cross-operator perspective, ATIS was 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 enables higher network performance with less effort on the part of the service provider. ATIS conducted the work with an eye toward how industry collaboration can advance AI and ML solutions as well as

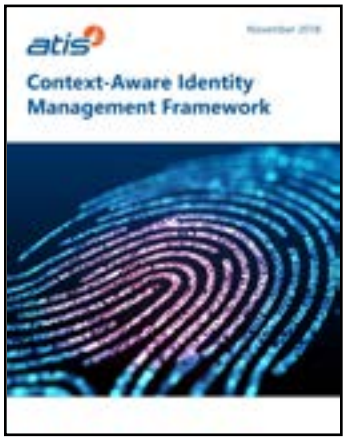


companies' business objectives. A report, *Evolution to an Artificial Intelligence-Enabled Network*, was published in 2018.

Cybersecurity. ***An overall industry framework for addressing cyber threats.*** The rise of new business models, architecture, and technologies presents new challenges for ICT cybersecurity. The cyber threat landscape is continually evolving with different strains of malware attacking the network daily. Recognizing the need for a comprehensive Cybersecurity Agenda, ATIS takes a proactive role in developing industry solutions and resources focused on securing critical communication network infrastructure against growing and evolving cyber threats. Our work addresses important current and future areas of investigation that leverage emerging technologies and processes to enable trusted network environments. Key elements:

- **Securing Across Network Domains.** To further network capabilities to mitigate unwanted Robocalling and Caller ID fraud, ATIS and the SIP Forum developed the *SHAKEN (Signature-based Handling of Asserted information using toKENs) Framework,* ATIS 1000074 specification. By using cryptographic digital signatures, authorized originators of calls into the VoIP network are validated with non-repudiation. This attestation is cryptographically "signed" with a "trusted" Secure Telephone Identity (STI) certificate in a manner that allows the terminating service provider to verify calling party number information.
- **Protecting Infrastructure.** ATIS monitors regulatory, legislative and other public policy developments related to cybersecurity issues in the industry, reviewing NIST, NTIA, DHS and other security publications and provides comments in selected cases. ATIS has created a process for performing an Architectural Risk Analysis to enable the proactive development of cybersecurity risk management steps for ICT solutions. Starting with an end-to-end architectural assessment, this process includes procedures to determine security goals, identify and assess potential risks, and develop proactive measures to mitigate identified risks.
- **Securing the IoT.** ATIS' Cybersecurity agenda progresses a more detailed Architectural Risk Analysis on the IoT segment through an in-depth look at IoT architecture identifying critical assets, attributes, attack classes, and vectors and potential mitigations in assessing IoT solution risk.
- **Connected Car.** ATIS has proposed an end-to-end security framework that encompasses the connected vehicle domain, network domain and cloud domain (back-end systems).
- **Smart Cities.** One finding of ATIS' Smart Cities Technology Roadmap was the need to advance data and infrastructure resiliency against cybersecurity threats and disaster events. Cities will be faced with IoT-enabled cybersecurity threats similar to networks and enterprises and can take advantage of the secure IoT frameworks being developed by ATIS.
- **How networks can enhance security.** ATIS is developing a proposed framework for the use of context-aware information to create more robust identity management solutions. This approach makes use of contextual attributes, such as location, proximity, user profiles and behavior, and sensor data to meet the increasingly complex demands for authentication and authorization of users, devices and resource requests.

Context-Aware Identity Management. ***Advancing the future of identity and authentication.*** Our work in this area is 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. "Context awareness" refers to a system's ability to gather information about its environment and adapt behavior accordingly. "Situational awareness" extends this concept to project contextual data onto process and tasks, and even predict future events. "Identity management (IdM)" refers to how service providers identify, authenticate and provide users and devices access to a range of services they are authorized to use. ATIS brings these factors together to shed light on how the increasing wealth of context-aware information the network delivers positions service providers and enterprises to develop increasingly sophisticated IdM capabilities.



It is estimated that an average user has more than 100 online accounts associated with many identities (email accounts, telephone numbers, social media accounts, web domains, etc.). Today, users are authenticated by passwords, biometrics and other identifiers. Overwhelming for users, the burden of managing these identifiers becomes increasingly complex as more applications operate across industry sectors and vertical markets. Envision a world in which, instead of having to apply increasingly more complex passwords and authentication factors, a system leverages contextual information to increase security performance while transparently delivering

a better user experience. These contextual-based solutions would also reduce the need for users to continuously manage and reset identifying information. Further, unauthorized parties would have a harder time manipulating data derived from many context-aware sources. ATIS has assessed the new landscape of applying contextual information to identity management solutions. The resulting report *Context-Aware Identity Management Framework* presents the framework and functional elements that will drive CAIdM innovations into the future.

Distributed Ledger Technology/Blockchain. ***Harnessing an emerging technology for ICT industry objectives.*** An ATIS strength is assessing 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 the 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.

Infrastructure & Access

5G. ***Positioning ATIS members as leaders in the new network.*** ATIS' 5G work is 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*, will be updated to be consistent with 5G technical enhancements.

Addressing the Industry's Leading Challenges

Mitigating Unwanted Robocalling and Caller ID Scams. ***Solutions to mitigate the FCC's leading cause of consumer complaints.*** In addition to helping the industry prepare for the future, ATIS also helps the industry find solutions to current challenges. While this work takes place in many areas, it is most notable in the major strides we made in 2018 to mitigate unwanted robocalling. As we see our initiatives in this area as not just about problems solved, but opportunities advanced, the work is not only addressing the FCC's leading source of consumer complaints but also about

restoring trust in the voice network. It is providing critical input to advance industry, FCC and consumer objectives and is delivering the key protocols to begin to mitigate the problem.

With the SIP Forum, ATIS developed the *SHAKEN (Signature-based Handling of Asserted Information using toKENs) Framework*, ATIS-1000074), 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. In August 2018, ATIS announced the findings of its testbed activities validating the IETF's STIR protocol with the SHAKEN framework, demonstrating product implementations that enable signing and verification of calling numbers to combat unwanted robocalling.

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 Secure Telephone Identity Governance Authority (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.

Technology and Operations Council -- Defining and Directing Responses to Board-Driven Priorities

Whereas the Innovation Agenda is concerned with a longer-term horizon, ATIS' Technology and Operations (TOPS) Council identifies industry imperatives that need addressing in 12-to-18-month timeframe, with a technical and operational emphasis, a stronger focus on implementation factors, promoting the readiness of new technology, and consisting of work outside of any single ATIS Committee boundary. Most recently, the TOPS Council is delivering results in the areas of:

OS-IoT. ***Bringing oneM2M innovation to lightweight clients.*** 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 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 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 https://www.os-iot.org.

IoT Categorization. ***Gaining insight into the IoT from a network-centric perspective.*** Growth in the IoT ecosystem — in terms of the number of connected devices globally and in total spending on end-point devices and services — is driving a range of new uses, and this is creating new network infrastructure requirements. ATIS is helping the ICT industry better understand these through our IoT Categorization (IoT Cat) initiative. Existing IoT initiatives take an application-centric approach, often from the perspective of a single application or industry vertical. IoT Cat goes broader and deeper, examining the IoT from a network-centric perspective. The goal is to determine an effective way to categorize the IoT into a small number of "categories" with similar requirements from a network/platform perspective. These are based on device types, applications, services, or a combination of these, considering business, technology and regulatory implications. Ultimately, these categories will provide a basis to identify specific network capabilities, enhancements and requirements to support a robust IoT network platform.

Standards and Solutions

Architecture & Services

Emergency Services Communication

When it comes to delivering collaborative industry solutions to ensure our emergency communications networks work at their optimum, ATIS is an industry leader. Much of the work takes place in our Emergency Services Interconnection Forum (ESIF), working with other ATIS bodies such as the Wireless Technologies and Systems Committee (WTSC). ESIF develops Next Generation 911 (NG911) and location accuracy requirements and solutions. It is where the industry comes together in a voluntary open forum to identify and resolve technical and operational issues to facilitate interconnection of emergency services networks with other networks (e.g., wireline, cable, satellite, Internet, etc.). ESIF members come from industry, government, standards, and public safety organizations.

ATIS' work is instrumental in supporting the future of location accuracy technologies, with contributions to help emergency responders more quickly locate wireless 9-1-1 callers.

- Our organization 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). Previously, ATIS contributed a location accuracy testing methodology in response to the FCC R&O and delivered the first phase of the necessary standards, *Location Accuracy Improvements for Emergency Calls* (ATIS-0700028 v1.1). The standard included specifications for location accuracy improvements for emergency calls specific to North American regulatory policies and practices. It provides the architecture and requirements for implementation of the Nationwide Emergency Address Database (NEAD), which 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/Bluetooth Low Energy 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 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 version 2 of ATIS-0700028.

- ATIS serves as project manager for the 9-1-1 Location Technologies Test Bed, LLC, as well as the NEAD LLC, independent entities established by CTIA - The Wireless Association®. ATIS oversees test plan implementation to ensure the test bed produces unbiased data in a timely manner for the various stakeholders in accordance with the FCC's rule, and assists in the implementation of the NEAD.

- 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; and 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 the Wireless Emergency Alert (WEA) system is another focus of our work. Not only has ATIS contributed the solutions that have put WEA into action, it is also expanding the system. Most recently ATIS 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.

Real Time Text (RTT). ATIS' Wireless Technologies and Systems Committee 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).

Network-Enabling Resources

Numbering. ATIS' Industry Numbering Committee (INC) is recognized as an open industry forum for addressing and developing solutions for numbering issues. In 2018, INC has been engaged in major activity to combine the Central Office Code (NXX) Assignment Guidelines (COCAG) and the Thousands-Block Number (NXX-X) Pooling Administration Guidelines (TBPAG). This combination will help to achieve administrative efficiencies by streamlining the Guidelines for obtaining numbering resources, making them more user friendly. The INC created the Central Office Code (NXX) Assignment Guidelines in the 1990s during the transition of central office administration to the NANPA under FCC contract, and then created the Thousands-Block (NXX-X) Administration Guidelines also in the 1990s, when the FCC mandated thousands-block pooling.

The INC has continued to maintain the two sets of Guidelines to address the processes for the separate NANP resources due to the different assignment procedures, different timelines, and different Number Administrators contracted by the FCC. Although there are separate processes for central office codes versus thousands-blocks, there are many similarities in administration and there are also processes that involve both codes and blocks. When finalized, the document will be *Thousands-Block (NPA-NXX-X) & Central Office Code (NPA-NXX) Administration Guidelines* (ATIS-0300119).

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.

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.

In May 2018, 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.

Ordering and Billing. ATIS' Ordering and Billing Forum (OBF) creates the collaborative standards and solutions that ensure accurate billing for the industry's core services as well as emerging innovations. It is the industry's go-to resource for resolving issues and creating ordering, billing, provisioning and exchange of information solutions about access services as well as other connectivity between telecommunications customers and providers. This includes:

- Updating a widely used industry resource, the Access Ordering Guidelines (ASOG). In September 2018, ATIS released the *Access Services Ordering Guidelines (ASOG) Version 58* (ATIS-0404028-0058), 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. Another recent example is 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.

Operational Excellence

Back-Up Power Maintenance. ATIS' Sustainability in Telecom: Energy and Protection (STEP) Committee helps reduce ICT's environmental impact as well as operators' energy costs and addresses industry power and protection issues by delivering industry-developed solutions. STEP deliverables are enabling vendors, operators and their customers to deploy and operate more reliable, environmentally sustainable, and energy efficient communications technologies. In 2018, ATIS released *Recommended Maintenance Routines and Frequencies for Central Office Back-up Power*, (ATIS-0600035), a guideline, recommending a baseline set of routines along with maintenance intervals (frequency) for central office back-up power.

Network Reliability. ATIS' Network Reliability Steering Committee (NRSC) is home to a set of industry advisors on the health of the nation's communications networks. It provides timely consensus-based technical and operational expert guidance and best practices to many segments of the public communications industry. It proactively holds quarterly public meetings with the FCC and provides information to help minimize the number of agency rule-makings and mandates.

- **Best Practices for Emergencies**. ATIS delivers resources to help the network perform during natural disasters and other emergencies. The Hurricane Checklist is one of these. In 2018, ATIS replaced this checklist to update and streamline it, making the document more applicable to a broader range 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 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), NRSC, in 2018, 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 insights 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.

Network Synchronization and Timing Systems. ATIS' Synchronization Committee (SYNC) is a central industry hub for developing and recommending standards and solutions related to telecommunications network technology pertaining to network synchronization. This includes those functions and characteristics necessary to define and establish: synchronization between networks and areas concerned with network time/phase/frequency characteristics that require theoretical, analytical and empirical investigations to ensure that solutions meet the highest norms of technical integrity and completeness; and interconnection of signals comprising network transport, including aspects of both asynchronous and synchronous networks.

A strong SYNC focus currently is examining GPS vulnerability and methods of GPS back-up for time and frequency synchronization with the goal of maintaining the reliability of the timing systems that are a critical part of our communications networks. In November, 2018, SYNC made recommendations to the Federal Government to address GPS/GNSS (Global Positioning System/Global Navigation Satellite Systems) vulnerabilities and mitigate their impact. These recommendations represent the views of government, industry and GPS/GNSS users.The recommendations include establishing an Assured Positioning, Navigation and Timing Program for U.S. civilian infrastructure; monitoring for GPS/GNSS disruptions, interference, and impacts; and taking enforcement action against spectrum violations. Access the full recommendations here. In terms of the impact of GPS vulnerability on the financial trading industry, ATIS includes a financial track as part of the Workshop on Synchronization in Timing Systems, taking place March 25-29, 2019, in San Jose, CA.

2D Bar Code Technology. ATIS' Automatic Identification & Data Capture (AIDC) Committee delivers solutions to simplify the receiving, shipping, transportation and tracing processes for telecommunications products, helping the industry achieve greater efficiencies throughout the global supply chain. It manages a catalog of technical standards that includes specifications for how telecommunications equipment is identified for inventory management and asset tracking. This includes guidelines for equipment product identification schemes, barcode labels, RFID tagging, and data elements including the Management Information Base (MIB). AIDC also acts as a critical liaison with several related groups to ensure the effective integration of U.S. and global standards.

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

To learn more about ATIS' initiatives, contact Rich Moran, ATIS Director of Membership, at 202-434-8858 or rmoran@atis.org.