

CAT Coalition Infrastructure-Industry Working Group Meeting

November 18, 2021
1:30-3:00 pm (Eastern)

Today's Agenda

- Welcome and Introductions
- Overview of AV Survey Findings
- Overview of ITSA's Update on AV Mobility Principles
- Potential Use-Cases for Broadband in Transportation
 - Presentation by the Advanced Television Systems Committee (ATSC)
 - Discussion and Q&A
- Partner Updates and Announcements
 - CAT Coalition, USDOT, ITS America, ITE, TRB, and Other Partners
 - Ongoing Commitment to Outreach and Knowledge Transfer
- Closing Remarks

I-I Working Group: Recap of Activities

- The role of this Working Group is to:
 - Support pre-competitive industry research that will advance infrastructure development and maintenance
 - Connect IOOs with industry
 - Support the natural evolution of infrastructure to accelerate CAVs
 - Clarify terms, definitions and target audiences
- Last meeting recap:
 - Digital Twinning Conversation: Chattanooga Perspective by Mina Sartipi and Kevin Comstock
- Link: https://transportationops.org/CATCoalition/infrastructure_industry_WG

Overview of AV Survey Findings

Jeremy Schroeder, Athey Creek Consultants

AV Survey Findings

- Distributed and received responses on four surveys as a broader follow-up to the 2020 AV Shuttle Survey

1. Public Sector: AV Shuttles (15 responses)
2. Public Sector: PDDs (9 responses)
3. Public Sector: Other AVs (8 responses)
4. Private Sector AV (2 responses)

Some individuals completed multiple surveys for a total of 24 public sector responses.

- Currently analyzing input and compiling results

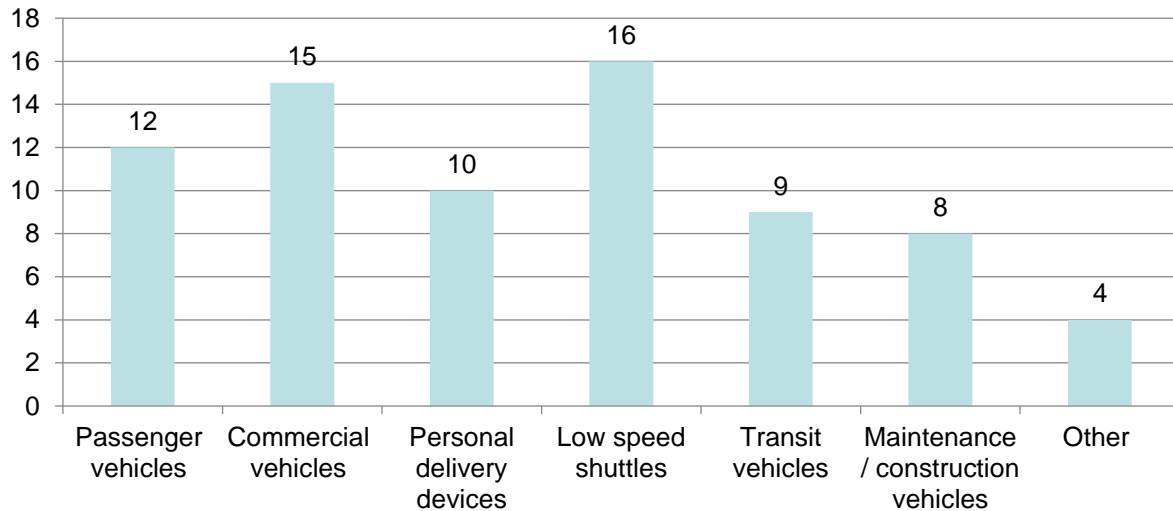
- 2020 AV Shuttle Survey Report here:

<https://transportationops.org/sites/transops/files/I-1%20AV%20Synthesis%20Report%20061120%20with%20disclaimer.pdf>

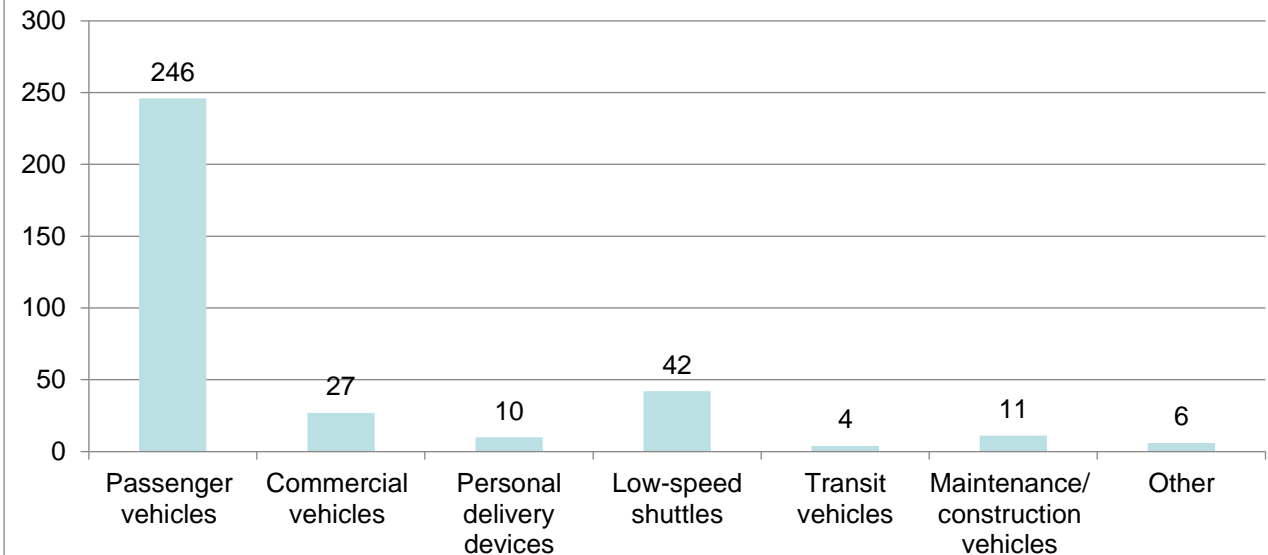
AV Survey Findings

- Overarching questions for all three public-sector AV surveys

All applicable categories of AV deployments/demonstration types that have approached you (including any that were deployed). Number for 24 public-sector respondents:



For each category of AV type, number of separate testing or deployment efforts that are being (or have been) conducted. Total number for 24 public-sector respondents:



*Note: Caltrans responded with 200 passenger efforts

AV Survey Findings

- Detailed responses for individual questions, by agency, for example:
 - What are the top 3 critical success factors for AV Shuttle deployment?

	#1 Critical Success Factor:	#2 Critical Success Factor:	#3 Critical Success Factor:
Delaware DOT	Detailed specifications, requirements and acceptance testing	Continued and direct support from vendor	Open, direct, support from agency managers
Georgia DOT	Demand	Street network	
Maryland DOT	Safety	Collaboration	Readiness
Texas DOT	Funding	Technology	Champion leadership
Washington State DOT	State Law requires Transit Agency Support, AV Shuttle must not parallel, disrupt or compete with existing transit service.	State or Federal Grant is needed to offset upfront cost / Business Case must demonstrate long-term sustainable operation	Vehicle must be NHTSA/FMVSS Approved (not an exemption) to scale to commercial deployment.
RTC of Southern Nevada	Market availability of a transit AV that meets all stringent federal requirements of grant agreement with USDOT/FTA	Transit AV that can safely navigate a relatively complex urban operational design domain in mixed-flow traffic	Rider user experience and public perception and acceptance of transit AV technology and safety

AV Survey Findings

- Next steps
 - Finish compiling results
 - Post on the CAT Coalition website

Overview of ITSA's Update on AV Mobility Principles

Tracy Larkin-Thomason, ITS America

ITS – America

Equity, Climate, Safety, and Infrastructure Principles for Automated and Autonomous Mobility



Principle Recommendations:

- Improving Transportation Safety
- Expanding Transportation Equity
- Accessible Transportation
- Sustainable Transportation
- Advancing Electrification Goals
- Modernizing Americas Infrastructure

<https://itsa.org/wp-content/uploads/2021/09/ITS-America-AV-Principles.pdf>

ITS – America

Equity, Climate, Safety, and Infrastructure Principles for Automated and Autonomous Mobility

- Improving Transportation Safety
 1. Supports enacting a federal regulatory framework to accelerate and guide AV's development and deployment.

- Expanding Transportation Equity
 2. Supports conducting/encouraging AV pilot programs and research activities in Areas of Persistent Poverty within state and local testing and deployment sites.
 3. Supports integration of AVs with other programs focused on enhancing equity.
 4. Support developing criteria to evaluate and prioritize AV pilot program selection on the priorities identified in USDOT RAISE grants.

ITS – America

Equity, Climate, Safety, and Infrastructure Principles for Automated and Autonomous Mobility

- Accessible Transportation

5. Supports accelerating updating federal regulation to allow for implementation of new vehicle designs, technologies and capabilities to improve accessibility and equitable access.

6. Supports accessible and barrier-free universal design practices for AVs and infrastructure.

7. Supports disseminating best practices to ensure that learnings from publically funded pilot programs are broadly shared.

- Sustainable Transportation

8. Supports AVs and alternative and sustainable fuels policies that support, not replace, high-efficiency modes of transportation such as public transport.

ITS – America

Equity, Climate, Safety, and Infrastructure Principles for Automated and Autonomous Mobility

- Advancing Electrification Goals

9. Supports policies that encourage widescale adoption of zero-emission vehicles (ZEV) and urges Congress to eliminate the statutory obstacles to electric vehicle charging on federal-aid highway right of way

- Modernizing Americas Infrastructure

10. Supports increased digital infrastructure investments, including broadband, 5G and intelligent transportation systems, to support human drivers and AVs.

<https://itsa.org/wp-content/uploads/2021/09/ITS-America-AV-Principles.pdf>

Potential Use-Cases for Broadband in Transportation

Madeleine Noland, Advanced Television Systems Committee (ATSC)

Opportunities for Automotive, Vehicular, and Smart City Infrastructure with ATSC 3.0

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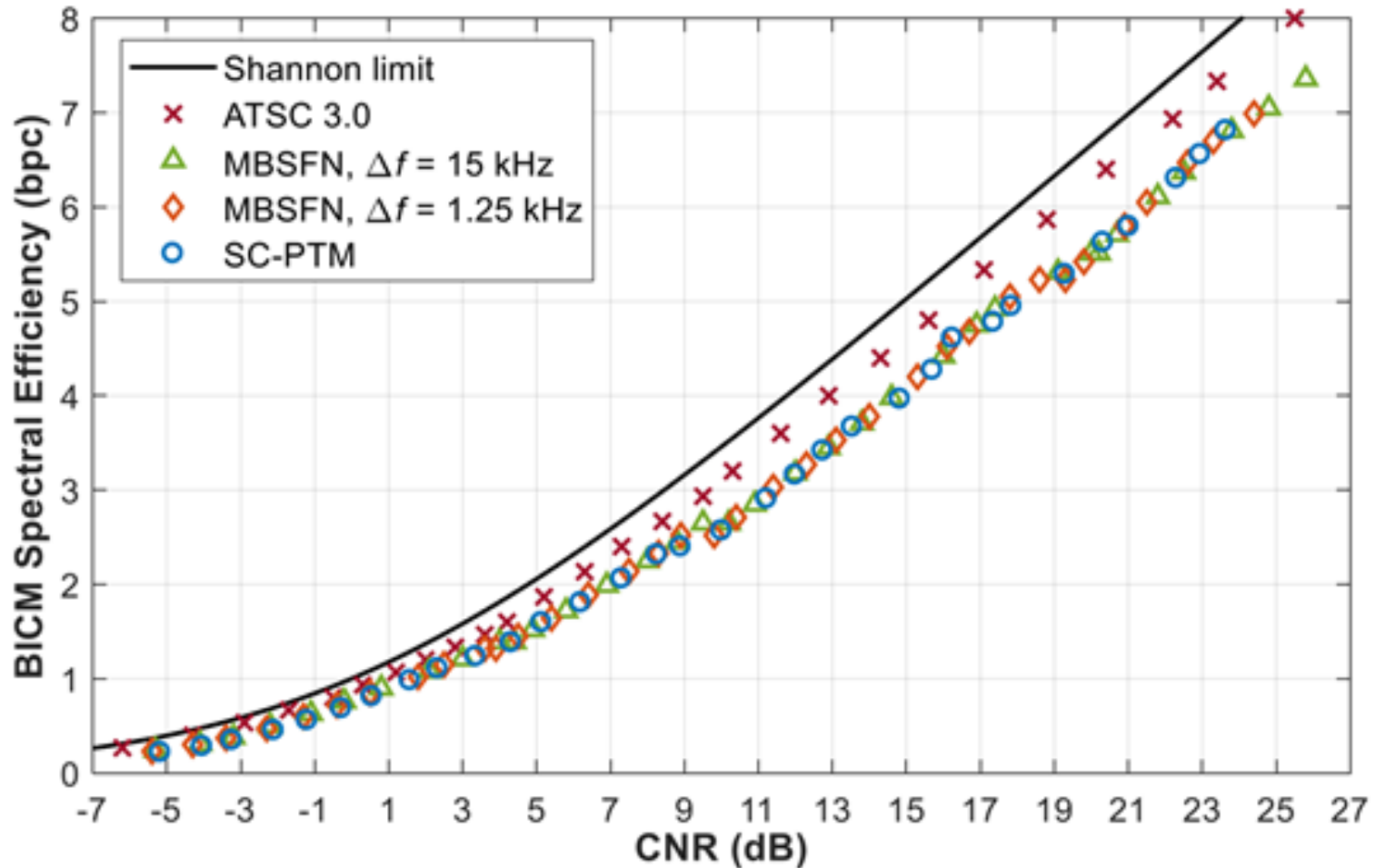
Madeleine Noland, President ATSC

mnoland@atsc.org

ATSC 3.0 – Broadcasting in the Internet Age

- Physical Layer – flexible, configurable, world’s most efficient one-to-many DTT system
- Transport – IP-based protocol via MMPT and ROUTE/DASH
- Video - UHD, HDR, WCG, HFR, scalable video coding via HEVC H.265
- Audio – immersive audio, personalization via Dolby AC-4, MPEG-H Audio
- Apps – web-based interactivity via HTML5, CSS, JavaScript and Websocket APIs
- Accessibility – new capabilities for visually and hearing-impaired audience
- Advanced Emergency Messaging – new rich media capabilities and receiver “wake-up”
- Security – encrypted data, signed signaling, secure studio-to-transmitter link
- **Datacasting to the Internet of Things**

ATSC 3.0 – Highly Efficient PHY

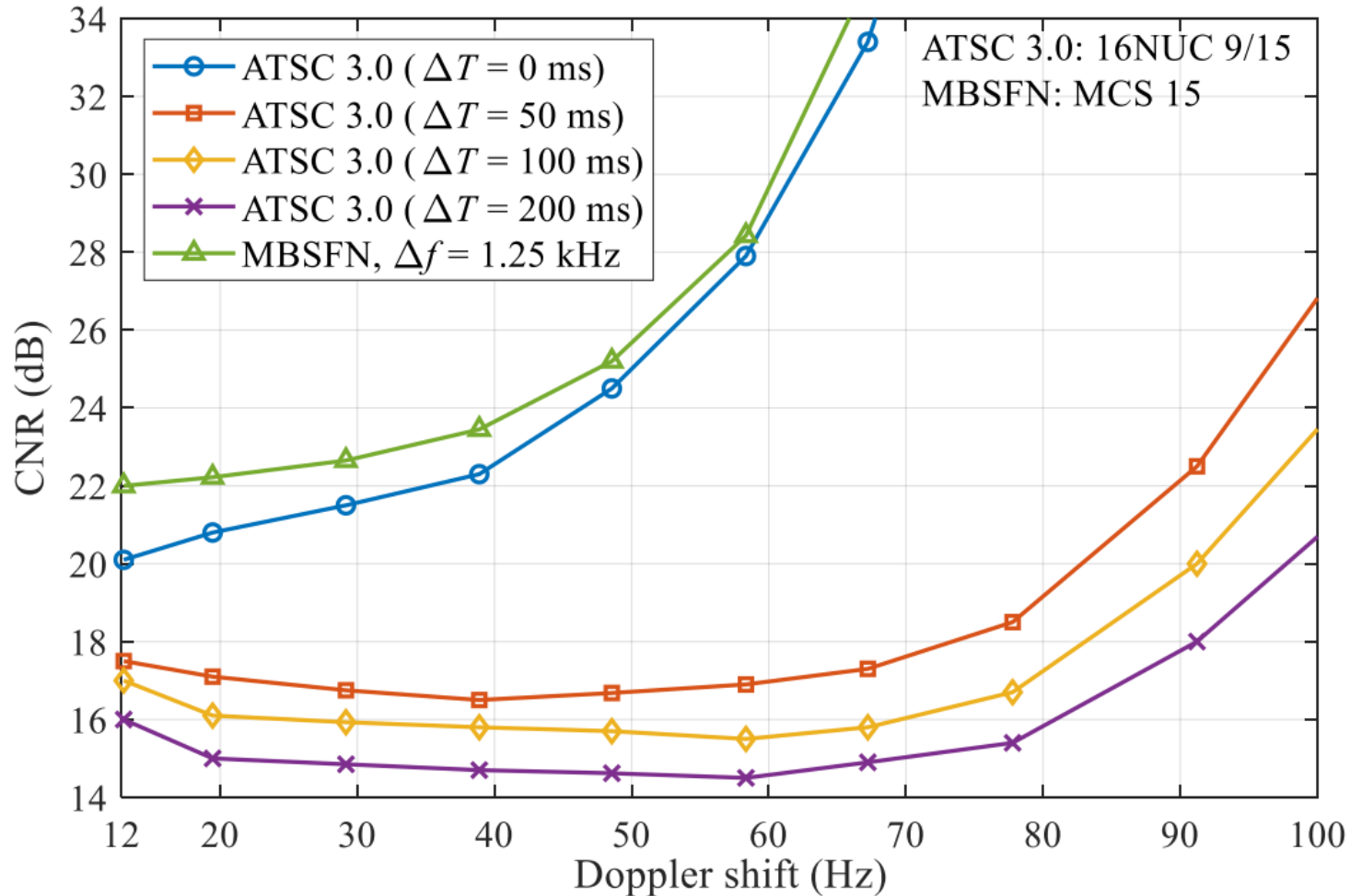


BICM Spectral Efficiency as a function of CNR for BLER=0.1% (SISO AWGN Channel)

ATSC3.0 Performance is closest to Shannon Limit

Source: TSDSI 5000 v1.0.0 Technical White Paper Broadcast Offload

ATSC 3.0 – Excellent for Mobile Reception



Required CNR to achieve a BLER of 0.1% for ATSC 3.0 for various Doppler shifts is significantly lower

As mobility increases (shown by the increase in Doppler shift) the degradation in required CNR is much faster in the case of MBSFN as compared to ATSC 3.0

Source: TSDSI 5000 v1.0.0 Technical White Paper Broadcast Offload

Spectrum
is a
Finite Resource

UNITED STATES FREQUENCY ALLOCATIONS

THE RADIO SPECTRUM

RADIO SERVICES COLOR LEGEND

▲ AERONAUTICAL MOBILE	▲ FIXED SATELLITE	▲ MOBILE SATELLITE
▲ AERONAUTICAL MOBILE SATELLITE	▲ LAND MOBILE	▲ RADIO DETERMINATION SATELLITE
▲ AERONAUTICAL RADIOBROADCASTING	▲ LAND MOBILE SATELLITE	▲ RADIOLOCATION
▲ AMATEUR	▲ MARITIME MOBILE	▲ RADIOLOCATION SATELLITE
▲ AMATEUR SATELLITE	▲ MARITIME MOBILE SATELLITE	▲ RADIONAVIGATION
▲ BROADCASTING	▲ MARITIME RADIOBROADCASTING	▲ RADIOBROADCASTING SATELLITE
▲ BROADCASTING SATELLITE	▲ METEOROLOGICAL	▲ SPACE OPERATION
▲ EARTH ORBITAL SATELLITE	▲ METEOROLOGICAL SATELLITE	▲ SPACE RESEARCH
▲ FIXED	▲ MOBILE	▲ STANDARD FREQUENCY AND TIME SIGNAL
▲ FIXED SATELLITE	▲ MOBILE SATELLITE	▲ STANDARD FREQUENCY AND TIME SIGNAL SATELLITE

ACTIVITY CODE

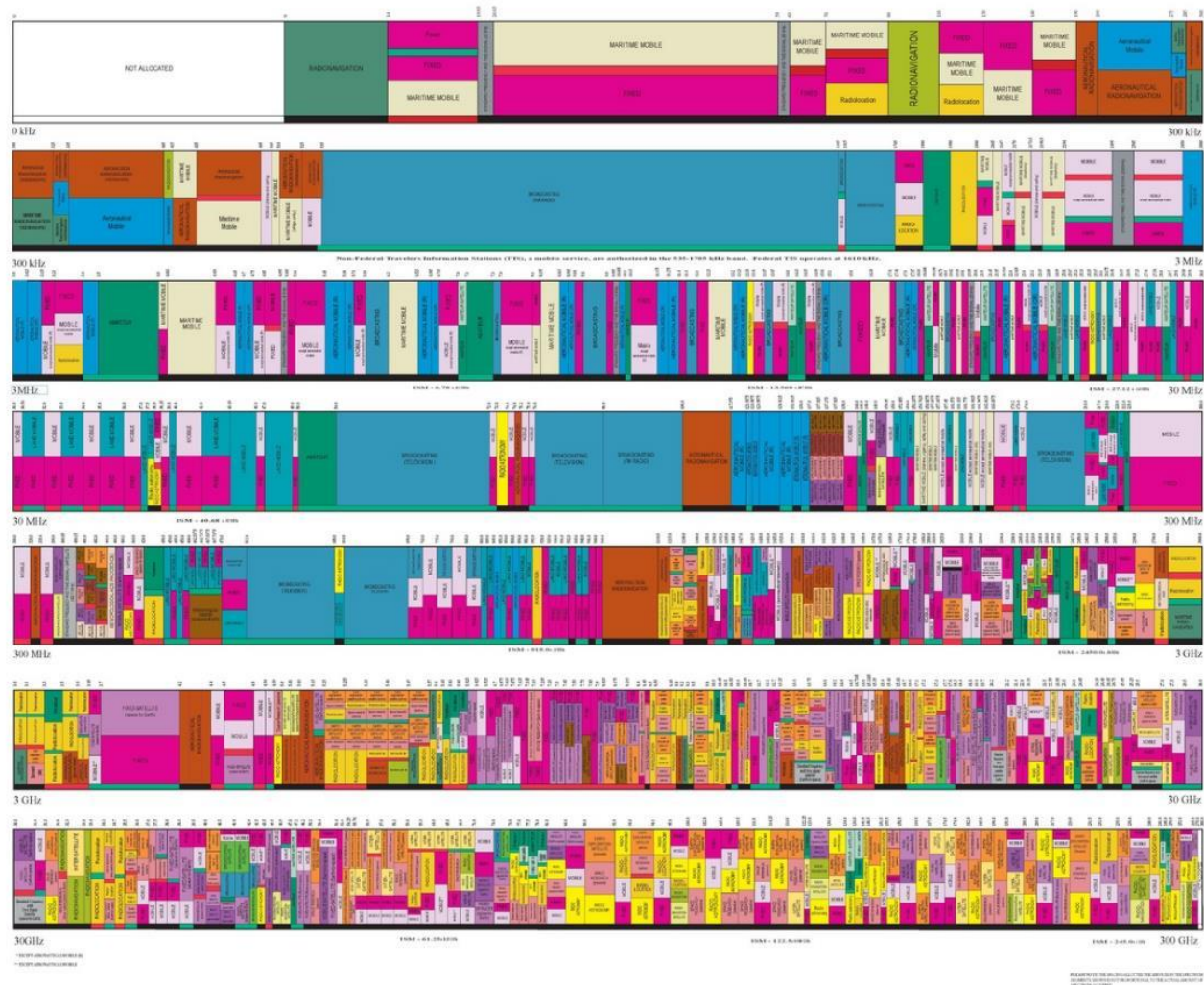
■ FEDERAL EXCLUSIVE	■ FEDERAL/STATE/LOCAL SHARED
■ NON-FEDERAL EXCLUSIVE	

ALLOCATION USAGE DESIGNATION

SERVICE	EXAMPLE	DESCRIPTION
Primary	F1D1D	Coastal Station
Secondary	M1A1A	Not subject to the same conditions

This chart is a public information document of the NTIA. It is not intended to be used for legal purposes. It is not intended to be used for legal purposes. It is not intended to be used for legal purposes. It is not intended to be used for legal purposes.

U.S. DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Office of Spectrum Management
JANUARY 2016



Heterogeneous Network Approach

- Different networks, infrastructure and frequency bands excel at different use cases
- The ability to dynamically steer, switch or split data sessions across different data networks allows optimal usage of spectrum
- Large data sessions intended for a large number of devices can be most efficiently carried by a P2MP network
 - Example: SW/FW updates to IoT
 - Example: Popular media content
- Use ATSC 3.0 for large data downlinks
- Use another network in the connected car for unicast data downlinks and uplinks (e.g., LTE, Wi-Fi)
 - Connected TVs do this today

ATSC 3.0 and Automotive Use Cases

- Potential cost savings for large data downlink transmissions
 - Infotainment
 - Map updates
 - Software/Firmware updates
 - Traffic awareness
- Resilient broadcast infrastructure stays up during emergencies
 - Redundant precision time source
 - Redundant GPS source
 - Emergency messages (evacuation routes, etc.)

“Smart” Road Equipment: Trailers

This portable trailer has multiple communication network interfaces:

- LTE
- Bluetooth sensors

ATSC 3.0 Smart Road Equip Use Case:

- Cheaper SW/FW update
- Rural coverage



Freight

- Most interested in “fluidity” – i.e., reliable flow of trucks from point A to point B
 - 60% of congestion issues are not from normal traffic volume – i.e., crashes, road work, weather, special events, roadside assistance, etc.
- Improved efficiency for freight is easy to translate into economic benefit
 - they know cost metrics tied to miles and time
- Truckers need their own map info
 - passenger car map details do not always apply to trucks, e.g., a detour may not be a usable truck route
- Truckers need to know if parking is available up ahead
 - there are regulations about how long a person can drive without rest

ATSC 3.0 Freight use case

- Cheaper SW/FW, map data delivery
- Emergency info
- Entertainment
- Rural coverage


First Responder Vehicle Use Case

- First responder vehicles are packed with equipment connected to several communications networks
- Installation of after-market gear is the norm and an ATSC 3.0 antenna/receiver is easy to imagine

ATSC 3.0 use case

- Emergency information
- High reliability
- Rural coverage



 alamy stock photo

B771K4
www.alamy.com

NEXTGENTV

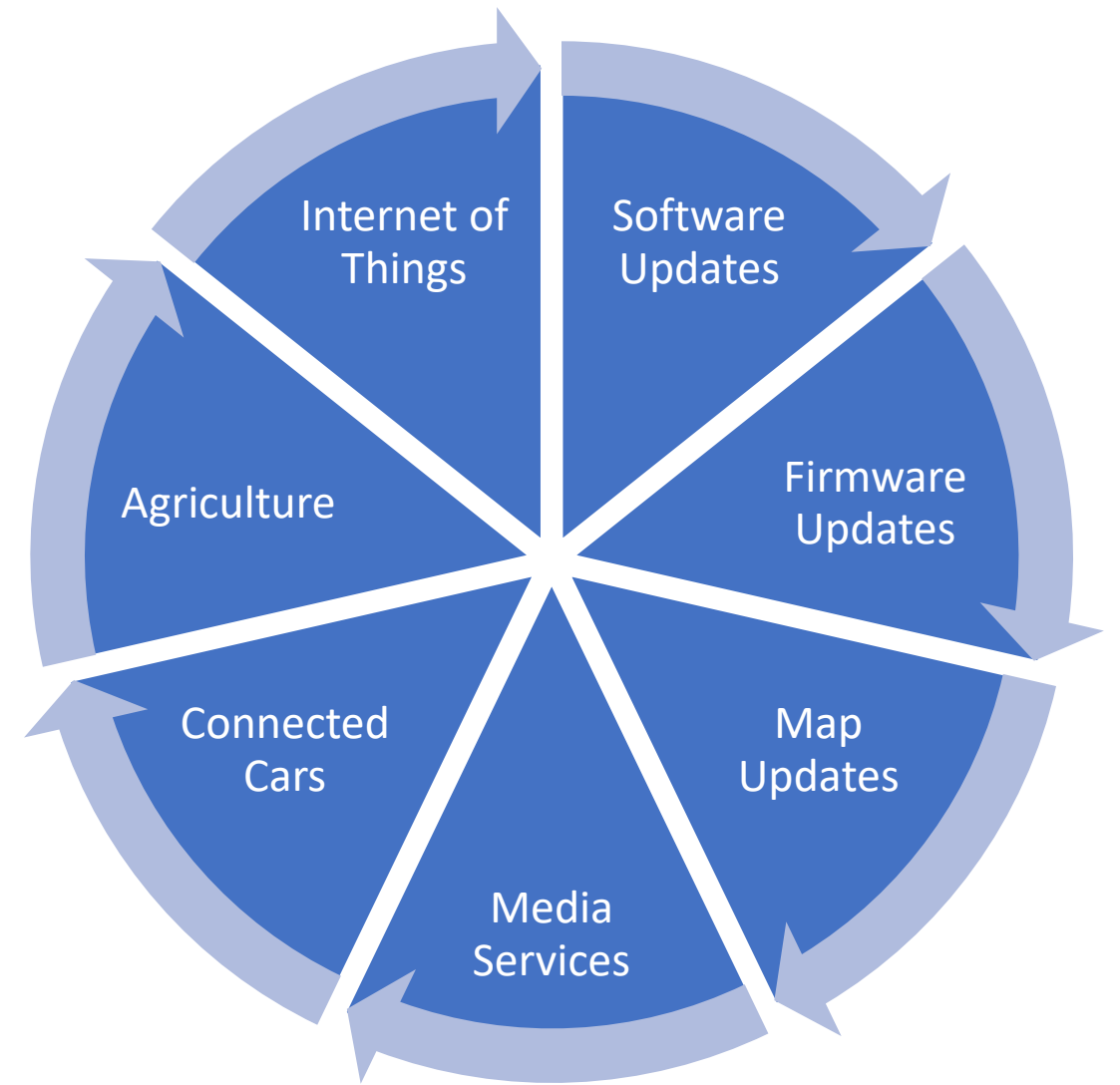


POWERED BY
ATSC 3.0



Datacasting Use Cases

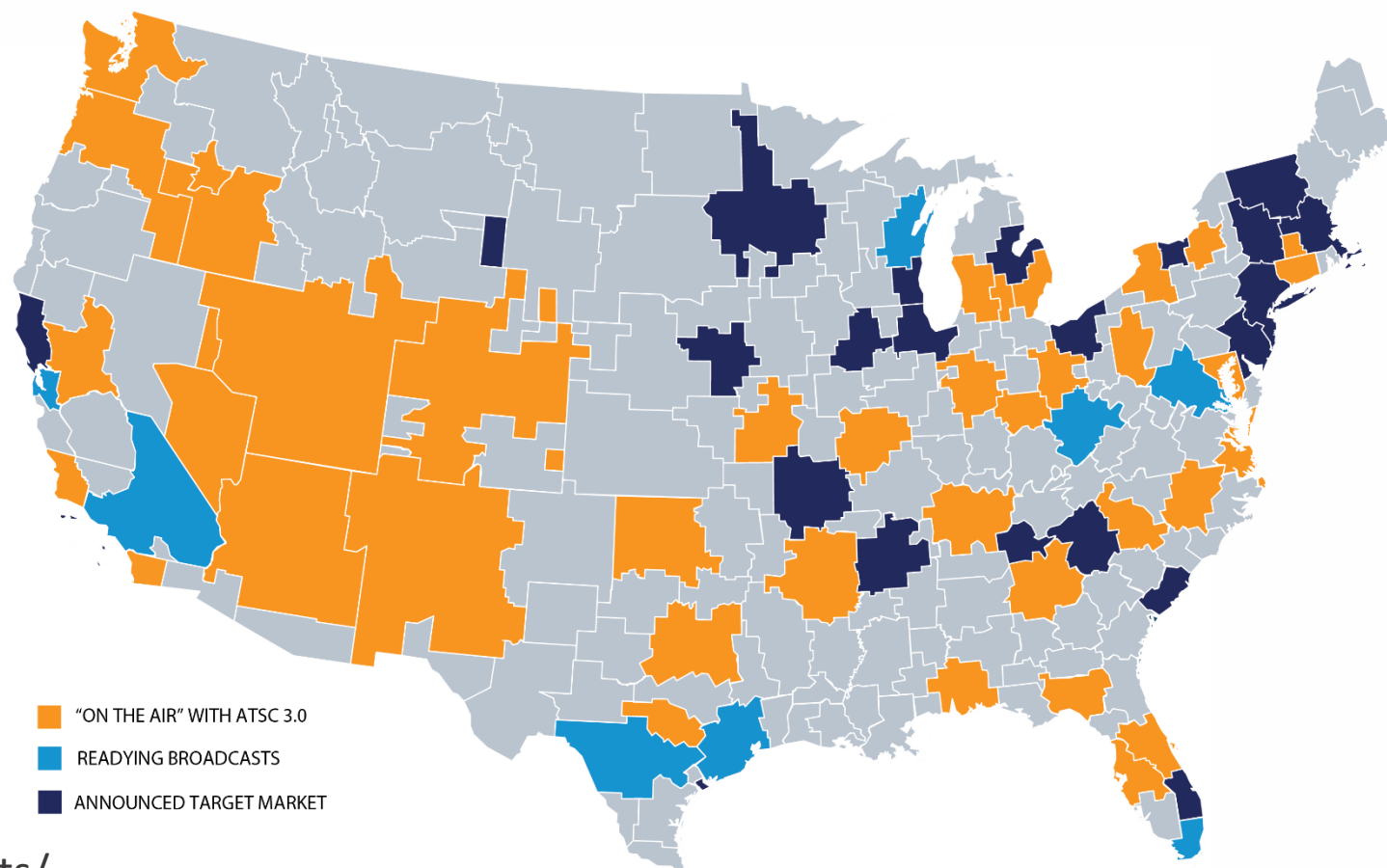
- ATSC 3.0 is a large digital data delivery pipe
- Broadcasters can offer data delivery services on a local, regional or national basis
- Automotive is the most common use case in discussion for data services



DEPLOYMENTS

Broadcasters have announced that they are working together to bring ATSC 3.0 first to 62 markets across the country, which collectively would mean next-generation TV reception by more than 75% of all viewers. Those 62 “First Markets” are indicated on this map. Each “first market” (in dark blue) will transition to readying broadcasts (in light blue) and then on-the-air with ATSC 3.0 (in orange.)

UNITED STATES DEPLOYMENTS



Additional Resources

- Deployment trackers
 - U.S. cities and market areas with ATSC 3.0 services
 - <https://www.atsc.org/nextgen-tv/deployments/>
 - <https://www.watchnextgentv.com/>
- ATSC Planning Team 5 on Automotive Applications Reports
 - Use cases and FAQs:
 - <https://www.atsc.org/atsc-documents/type/3-0-planning-team-reports/>
- Public Automotive Field Trials and Test Beds
 - Motown Test Track, Auton Field Trial, Sony Field Trial
 - <https://www.atsc.org/news/five-detroit-broadcast-stations-collaborating-to-launch-motown-3-0-test-track-as-nextgen-tv-broadcasts-begin-in-motor-city/>
 - <https://www.atsc.org/news/auton-achieves-field-trial-success-of-its-connected-car-technology/>
 - <https://www.atsc.org/news/sony-puts-atsc-3-0-mobility-to-the-test/>
- We love questions!
 - atsc@atsc.org

Thank you.
Questions?

mnoland@atsc.org

Announcements and Closing Remarks

Updates and Announcements from Partners

- CAT Coalition, AASHTO, USDOT, ITS America, ITE, TRB, and Others

Ongoing Commitment to Outreach and Knowledge Transfer

- Suggestions from WG Members on Ways to Enhance Impact:
 - Proposed new WG Members
 - Communications with/involvement in other initiatives outside the CAT Coalition
 - Knowledge resources to include on CAT Coalition website
 - E-mail suggestions to schroeder@acconsultants.org

Thank you for joining us today!

- Next Infrastructure-Industry WG Meeting in 2022 TBD