

V2X SUMMIT SPEAKER

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Future of V2X Survey Results

ITS America's Future of V2X Working Group

- Comprised of IOOs, OEMs, and industry stakeholders
- Focused on evaluating impact of the FCC's proposed spectrum reallocation
- Sought to identify which applications could or could not be deployed in a limited 30 MHz environment
- Released a Preliminary Application Map in January 2021

Preliminary Application Map

- Evaluated 90+ ITS applications:
 - Spectrum requirements
 - Stakeholder priority
 - Safety benefit
- Conclusions
 - A number of message types and applications will fit in 30 MHz
 - BSM, MAP, SPaT, RSM, SRM, SSM, RTCM, PVD
 - Some advanced applications and message types will not:
 - Sensor data sharing
 - Maneuver sharing/coordinating
 - Personal safety messages
- Limitations

V2X in 30 MHz Research Project

- Scope of Research
 - Simulation-based research
 - Focused on V2X applications in Channel 183 (upper 20 MHz)
 - Includes both highway and intersection scenarios
- Three Phases
 - Baseline use of Channel 183
 - Use of SAE J3161 priority parameters
 - Suggested enhancements or changes

Future of V2X Survey

- Solicited feedback on a broader set of issues and from additional stakeholders
- Five Issue Areas
 - Experience with V2X
 - Flexibility of Deployment
 - Channel 180
 - Application Prioritization
 - Additional Spectrum
- Survey – 64 complete responses
 - IOO – 24
 - OEM – 10
 - Industry Stakeholders – 30

Experience with V2X

- This section focused on:
 - (1) the types of deployments undertaken,
 - (2) the goals of those deployments, and
 - (3) plans to deploy C-V2X devices in the upper 30 MHz
- Respondents included 18 IOOs with deployments and 10 OEMs, representing a significant portion of the relevant population

Experience with V2X (cont.)

Deployments

- Ranged in size from 2 to over 1,000 RSUs
 - 6 large deployments – over 100 RSUs
 - 3 medium deployments – 26-100 RSUs
 - 9 small deployments – 25 or fewer RSUs
- Most large and medium deployments have begun to move forward with C-V2X testing or installation
- Some deployments have turned off their DSRC devices with no plans to convert to C-V2X due to lack of funding
- Applications

Experience with V2X (cont.)

C-V2X

- Most respondents indicated they would move to C-V2X technology
- Many IOOs and OEMs expressed concern with regulatory uncertainty:
 - “when it becomes consensus”,
 - “not until the federal government signals a clear and unambiguous intention to support deployment”,
 - “when it appears that everything is settled”, and
 - “uncertainty of out of band emissions from WiFi”
- IOOs also noted their dependence on actions from the OEM community
- One OEM noted that “public commitment to deployment plans [is] challenging without US regulations in place”

Experience with V2X (cont.)

Takeaways

- There is intentional effort being undertaken toward the promise of reduced crashes, reduced fatalities, and improved safety with V2X systems
- Regulatory uncertainty is a significant hurdle to deployments by both IOOs and OEMs, and is stifling current action
- While there is interest, and some continued deployment activities, among the IOOs, an effective V2X system needs OEM deployments
- Despite regulatory uncertainty, some agencies are moving forward with C-V2X deployment

Flexibility of Deployment

- This section addresses questions related to Flexibility of Deployment:
 - (1) Should message types and applications be limited to ensure availability and performance?
 - (2) Should stakeholders be provided flexibility to choose which applications operate in a given area?
 - (3) Should definitions be established for which applications constitute “core safety” applications vs. other types of applications?
- There was universal consensus indicating that safety is paramount and should have full and priority use within the remaining 30 MHz

Flexibility of Deployment (cont.)

Takeaways

- Consensus indicated that safety is paramount and should have full and priority use within the remaining 30 MHz
- A number of respondents requested flexibility but not to the detriment of core safety, with facility-specific variations allowed
- It will take a broad industry coalition to define the core safety applications, and it should be done expeditiously

Channel 180

- This section asked questions related to the use of Channel 180:
 - (1) Should Channel 180 be used to deploy V2X applications that may be more tolerant to interference?
 - (2) Should Channel 180 be used to provide critical service needs, such as over-the-air support for certificate top-off, certificate revocation lists, misbehavior detection and reporting, and device management?
 - (3) Should Channel 180 be used for a different purpose not contemplated by the previous options?
- Channel 180 – potential for interference
- Limitations

Channel 180 (cont.)

Takeaways

- There is not a clear consensus on the use of Channel 180
 - Some want to use it as a guard band to adjacent channels, while others want to continue to use it for applications
- It is not clear what applications might effectively operate in Channel 180 under real-world conditions
- One technical item not addressed is that the use of Channel 180 would require two radios

Application Prioritization

- Identified almost 90 connected vehicle applications for prioritization
- Duplicates combined
- Highest Priority Applications
 - We identified the applications that were ranked highest by at least 50% of respondents

Highest Priority Applications

V2I	V2V
Wrong Way Driver Warning	Approaching Emergency Vehicle Warning ¹
Emergency Vehicle Signal Preemption / Approaching Emergency Vehicle Warning ¹	Intersection Collision Warning
Work Zone Warning	Cooperative Collision Warning
Pedestrian in Signalized Crosswalk Warning (Transit)	Cooperative Forward Collision Warning
Traffic Signal Violation Warning	Emergency Electronic Brake Lights (EEBL)
Queue Warning (Q-WARN)	Do Not Pass Warning (DNPW)
Curve Speed Warning	Blind Spot/Lane Change Warning (BSW/LCW)
Signal Priority (Transit, Freight)	
Highway/Railroad Collision Warning	
Stop Sign Violation Warning	

Message Types for High Priority Applications

Safety Application	Message
Approaching Emergency Vehicle Warning	RSA
Intersection Collision Warning	BSM
Cooperative Collision Warning	BSM
Cooperative Forward Collision Warning	BSM
Emergency Electronic Brake Lights (EEBL)	BSM
Do Not Pass Warning (DNPW)	BSM
Blind Spot/Lane Change Warning (BSW/LCW)	BSM
Wrong Way Driver Warning	TIM/RSA
Emergency Vehicle Signal Preemption	SRM/SSM
Pedestrian in Signalized Crosswalk Warning (Transit)	PSM/ICA/CPM
Traffic Signal Violation Warning	MAP/SPaT
Signal Priority (Transit, Freight)	SRM/SSM
Highway/Railroad Collision Warning	ICA/CPM
Stop Sign Violation Warning	MAP/RSA/ICA

Additional Spectrum

- The transportation industry has called on the FCC to work with NTIA and USDOT to identify and allocate additional spectrum for use by V2X technologies, we asked:
 - (1) Should that spectrum be reserved for 5G NR V2X or another next generation technology?
 - (2) Which applications that might not fit within 30 MHz would be first on your list to include in that additional spectrum?
- Respondents overwhelmingly supported reserving additional spectrum for a next generation V2X technology

Additional Spectrum (cont.)

- IOOs
 - Infrastructure Safety Applications
- OEMs and Industry Stakeholders
 - Vehicle-to-Vehicle applications
- VRUs
 - Supported by IOOs, OEMs, and other industry stakeholders – showing breadth of support

Next Steps

- Continued research and analysis of what can be supported within the 30 MHz
- Defining what constitutes “core safety” applications
- Evaluating the potential for flexibility
- Other Remaining Issues
 - Interference Concerns
 - C-V2X Waiver Requests

Questions?



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