Research Recap

Mobility21
A USDOT NATIONAL UNIVERSITY TRANSPORTATION CENTER

Connected Vehicle Infrastructure for a Smart City

Purpose: To provide credible and quantitative results surrounding the most cost-effective strategies for wireless smart city technology, infrastructure and spectrum to support connected vehicles and help municipalities decide which technology to deploy. The team also addressed issues that recently arose in the connected vehicle landscape regarding proposed rules for spectrum allocation and sharing to deploy vehicle-to-everything (V2X) devices in cars.

Approach: The team started with collecting data from large connected vehicle deployments in the U.S. and Europe. After that, they developed detailed packet-level network simulation to estimate performance. Finally they developed engineering-economic models to determine how costs are related to deployment strategies, spectrum allocation and V2X technology choices.

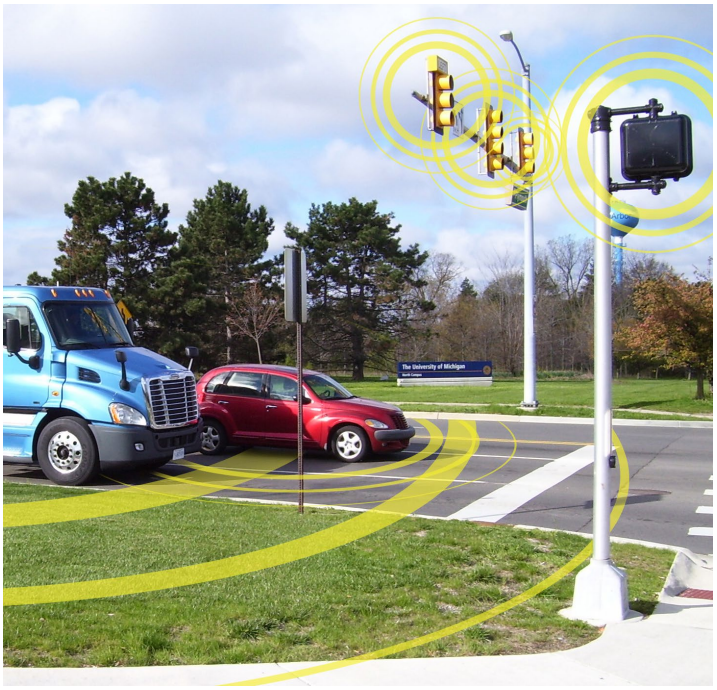
Key Findings:

Spectrum - The team uncovered that it is highly efficient to share spectrum allocated for ITS with unlicensed devices. V2X and unlicensed devices coexisting in shared spectrum might require up to 50% less bandwidth than is required to achieve the same throughputs if spectrum is not shared.

V2X Technology Choices - The team found that for distances shorter than 100 meters, the update delay has an average around 50-60 ms with standard deviation of 50 ms, for DSRC communications and high vehicle density (highway with 200 vehicles/km). At larger distances, the update delay can be significantly higher, although at larger distances delay is more tolerable.

Conclusion: As long as safety-critical messages are transmitted on exclusive spectrum, the FCC could allow vehicles and unlicensed devices to share spectrum for non-safety-critical communications in a highly efficient way.

The team recommends sharing the portion of the ITS spectrum not needed for safety critical communications with unlicensed devices, because this would enhance the utilization of spectrum significantly.



Research Team:

- Jon M. Peha (Principal Investigator)
  https://orcid.org/0000-0003-4915-306X

Project Record:

- https://ppms.cit.cmu.edu/projects/detail/173

Follow Us:

www.facebook.com/traffic21.tset

@Traffic21CMU