Cyber Security Considerations for V2X Technology

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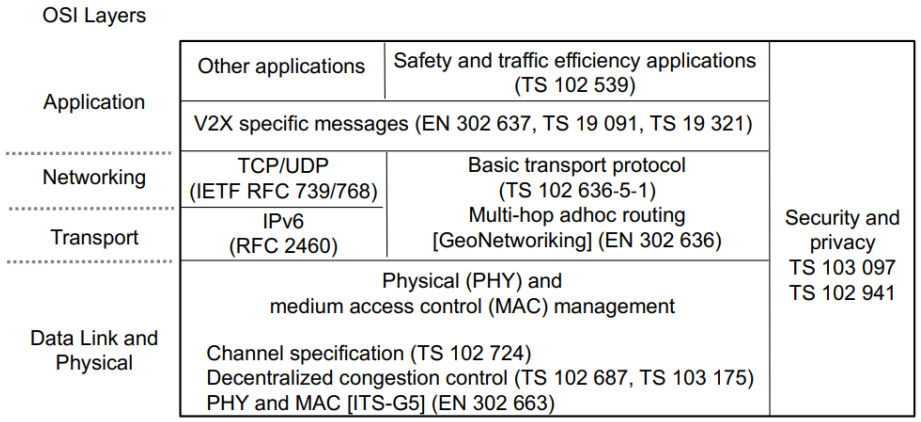
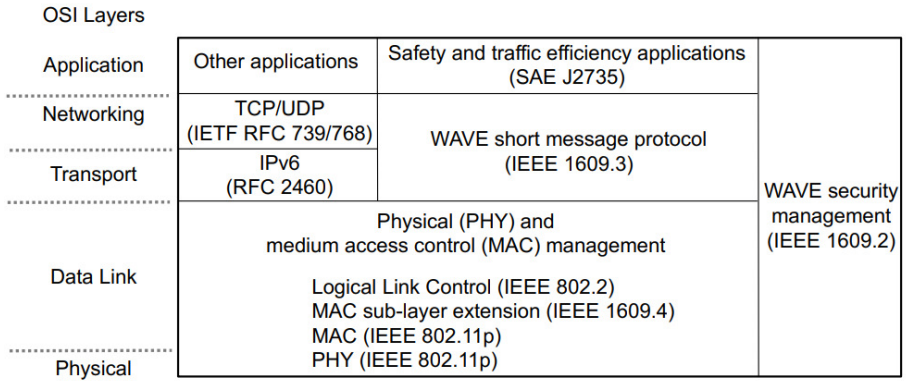
V2X Technology: Status Check

- Standardization for V2X Communication and Frequency Allocation
- ITS Spectrum Recommendation and Regulation Consideration
- Cyber Security Standardization in V2X
- Challenges for DSRC V2X and Cellular V2X

Protocol stack and related core standards for V2X communications



US (SAE 2945/1)



Europe (ETSI-ITS)

Security Service compatibility in ETSI and SAE/ IEEE

Security Service	ETSI-ITS	IEEE 1609.2
Misbehavior reporting	No support	No support
Plausibility validation	Supported by data validation	Basic support based on geographic location or message expiry time
Reply protection	Timestamp message and insert/ validate sequence number	Timestamp message
Session management	By maintaining a security association	Not fully supported – on the fly association by identifying trust hierarchy

Open Issues

- Lack of evaluation, comparison and feasibility study for the existing methods.
- There is a gap between existing academic research and large-scale practical testing of PKI for V2X applications.
- Ambiguous specifications in standards
- Equipment interoperability from different vendors
- Scalability requirements

Design considerations

- Configuration ambiguity in V2X security solutions
- Efficient CRL distribution
- Pseudonym change strategies for location privacy
- Threats to Intra-vehicle Components and Countermeasures
- Trade-off between different aspects
  - False positive rates
  - CRL size
  - RSU availability
  - Complexity

Major V2X security projects in Europe and US

	EVITA	sim^{TD}	OVERSEE	PRESERVE	ISE	CAMP-VSC6
Project focus[a]	OBS	CNS	OBS	OBS and CNS	CNS	CNS
Objective	On-board intrusion detection/prevention	Secure V2X communications	Secure and standardized communication/application platform	Close-to-market security/privacy solution for inter-and-intra-vehicle networks	Privacy-preserving message authentication	Security credential management and misbivevior detection
Evaluation approach	Proof-of-concept implementation	Field trial, simulations, conceptual[b]	Proof-of-concept implementation	Proof-of-concept implementation, simulations	Proof-of-concept implementation	Conceptual[b], prototype development (ongoing)
Reuse of existing projects	No	No	Yes[c]	Yes[d]	No	No
Use of PKI	N/A	Yes	N/A	Yes	Yes	Yes
Initiative	European Union	Germany	European Union	European Union[e]	France	United States
Status	Completed (2008-2011)	Completed (2008-2013)	Completed (2010-2012)	Completed (2011-2015)	Completed (2014-2017)	Ongoing (2016-present)