U.S. Department of Transportation

Intelligent Transportation Systems (ITS)
Joint Program Office (JPO)

Interoperable Integration of ADS and Smart Mobility into the Transportation System

Steve Sill
ITS Architecture and Standards Program Manager

April, 2018

ITS Architecture, Standards and Harmonization ("ASH")

- **ITS National Reference Architecture** provides a framework to guide State and local planning and interoperable deployment of ITS and identifies interfaces for standardization.

- **Standards** define interfaces within architectures to enable required interoperability and support efficient, non-proprietary ITS deployment.

- **International Harmonization** seeks to leverage global resources and expertise to (1) maximize commonality of ITS deployments, (2) share labor resources and (3) access best-available expertise in order to facilitate ITS deployment and open markets.

- **Goal:** Enable efficient, interoperable, secure and cost-effective ITS infrastructure, automation and connectivity deployments. Evolve the international knowledge base and tools in a unified, collaborative manner to maximize resource sharing and achieve harmonized results of public benefit.

Cooperative, Interoperable Integration?

- Automated Driving Systems (ADS) and Smart Mobility systems can – and do – operate without any communication or coordination with the transportation system Infrastructure Owner- Operator (IOO)
  - Similar to other mobile participants in the system
  - Is this optimal? Likely not …
- Increased communication and cooperation can aid both safety and mobility
- Interoperable integration between infrastructure and mobile participants in the transportation system requires agreement on architecture and key standards … and many other things

Challenges…

- Standardize when in the public interest
  - Avoid impeding innovation
  - But meet Transportation Systems Management and Operations (TSMO) and interoperability needs
- Maintain security
- Protect privacy and anonymity
  - Must be legally and publicly acceptable, adaptable across jurisdictions
- All of this in the context of a global marketplace ….
  - … yet cognizant of local needs
  - … and interoperable anywhere travelers may go
    - Regionally for vehicles, globally for devices
- Easy? Not really …

Examples for Discussion …

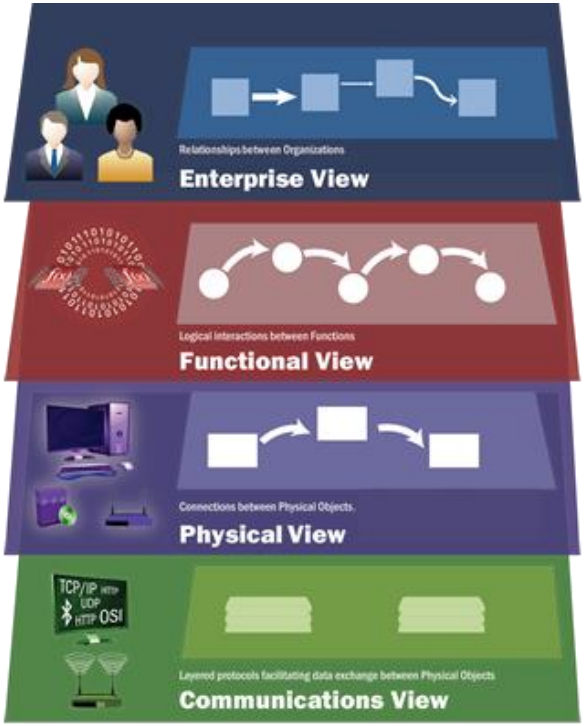
- CACC vs. ACC – capacity increase vs. decrease
- Need for dissemination of “rules of the road”
  - Recognition technologies can “read” signs in some cases
    - However, what about dynamic information?
- Need for IOO to understand state of their and neighboring networks
  - Some information available via infrastructure
    - Loop detectors, cameras at high cost with limited coverage
  - Likely far more detailed and timely from beacons on vehicles
- Need for travelers to understand state of the network and likely travel times, modal options and costs
  - Support required standardization while not impeding competition in the marketplace or impairing privacy expectations

Candidate Approach …

- Near-term candidate approach in US?
  - Analogous to C-ITS architecture effort (CVRIA)
- Regulation not likely viable - not necessarily a disadvantage
  - Forces reaching broad consensus, high quality products
- Facilitate broad stakeholder agreement on candidate architecture
  - Identify candidate interfaces for standardization
    - Accommodate multiple/future technologies whenever possible
    - Balance interoperability needs with competitive marketplace, need for IOOs to meet their unique needs
  - Identify other interface requirements
    - e.g. policies
- ITS Architecture views to guide development
- Likely large benefit from harmonization – global vehicle, device market after all
  - Lots of work to do – best to cooperate

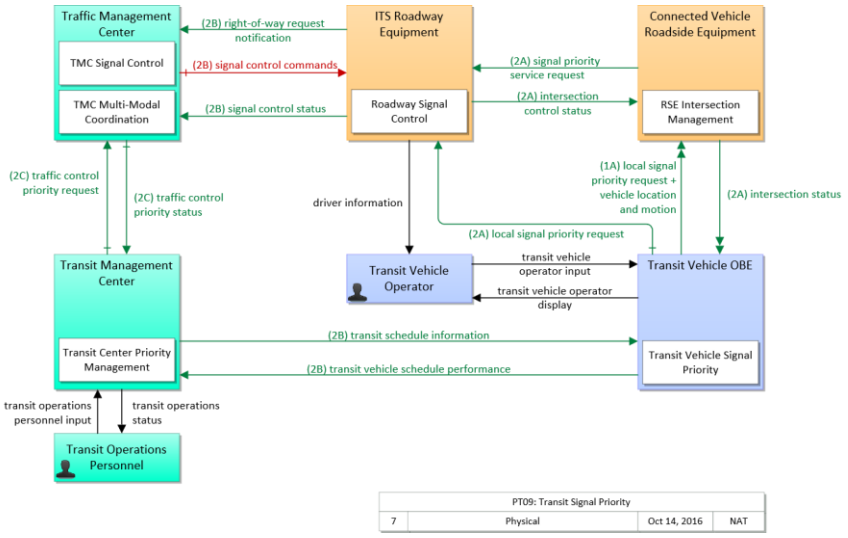
US ITS National Reference Architecture

- Architecture Reference for Cooperative and Intelligent Transportation ("ARC-IT", www.arc-it.org)
  - Companion software toolsets support customized regional and project architecture development
  - Deployment support includes training materials, customized workshops for State and local customers
  - Content informed by stakeholder needs, technology evolution
  - Four distinct views to meet diverse customer needs
  - Publicly available at no cost



US ITS National Reference Architecture (cont'd.)

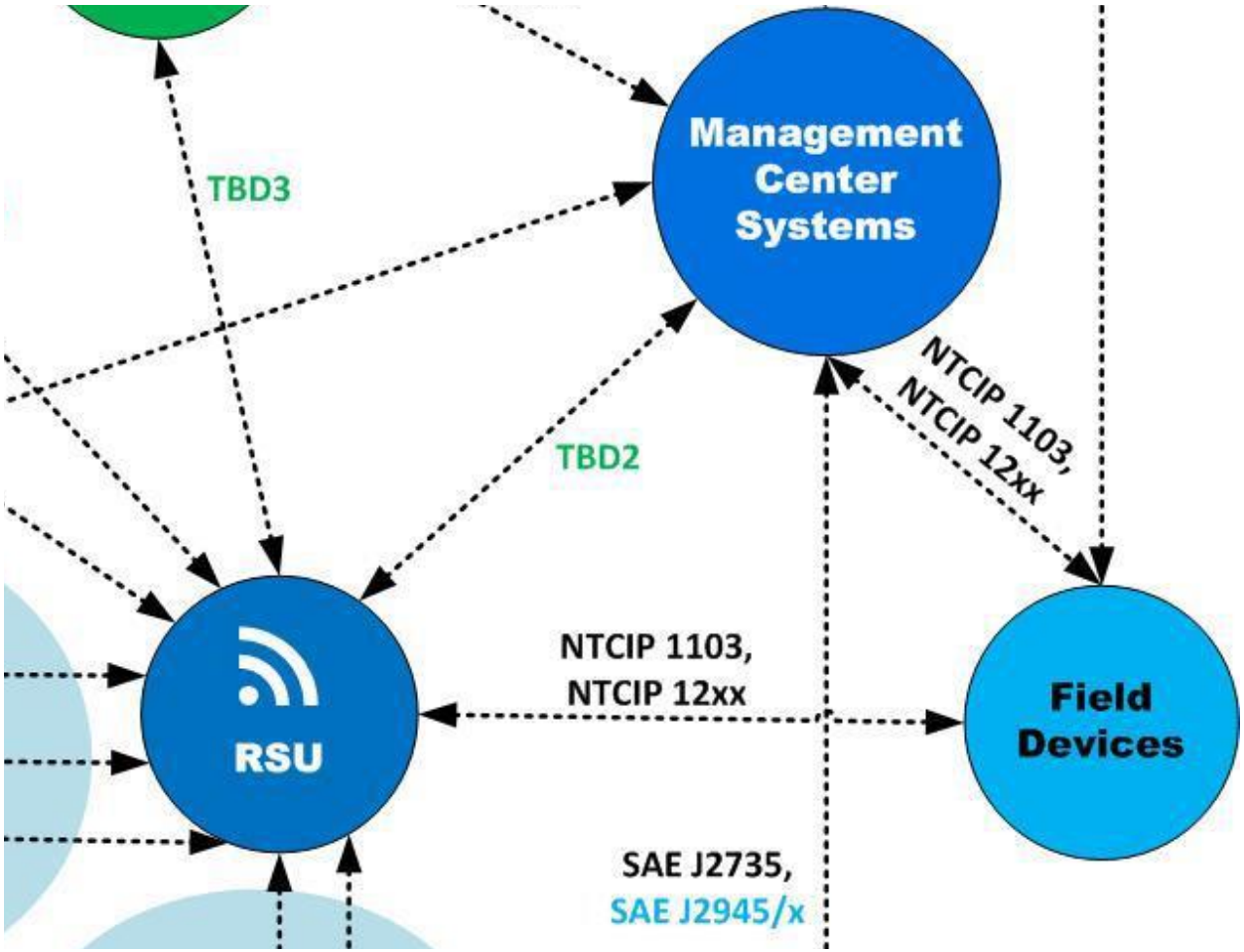
- 136 services (requires 1,600 + interfaces between 130 types of systems)
- Systems include centers (e.g.: traffic management centers), field devices (e.g.: traffic signal controllers), vehicle fleets, devices such as smartphones
  - Interfaces include data/information exchanges necessary to provide ITS services, from security credential distribution to field device control to traveler information
- Cooperating with Australia, Europe, Japan to recommend standards for connected vehicle interfaces
  - Most interfaces satisfied by Information Technology standards
  - For ITS-unique needs, specify available standards or identify gaps for future cooperative development work



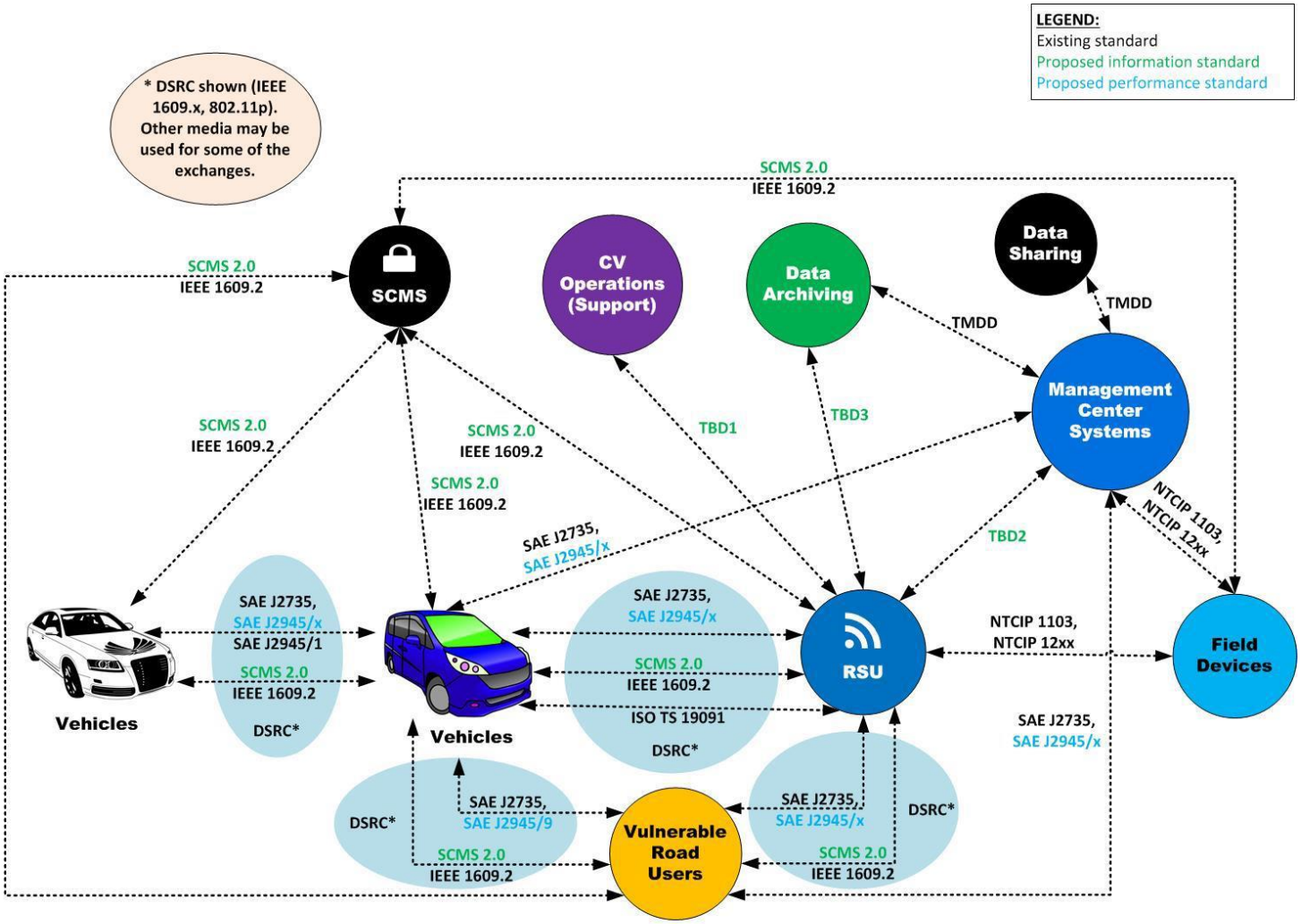
US DOT ITS Standards Program

- Cooperate with SDOs for broadly acceptable ITS consensus standards
  - Good practice ... and legislatively directed
- Facilitate consensus to support interoperable, efficient ITS deployment
  - Limited funding support, Federal leadership when beneficial
  - Most resources contributed by participating stakeholders
  - IEEE 802/1609, ITE, SAE, ISO TC204, AASHTO, NEMA …
    - Specify or adapt when able, develop when needed (ITS-unique)
- Primary standards development areas supported by ITS JPO
  - C-ITS: V2V, V2I, V2x – SAE J2735/2945, IEEE 1609/802.11
  - ITS C2C – TMDD, C2F – NTCIP, ATC
  - Automation/connected automation – initial roadmap completed, more coming
  - ITS-relevant: 3GPP, oneM2M, ETSI, CEN, UN WP29, ISO TC22, ITU, IETF

Center to Center, Center to Field Standards



C-ITS Standards



Vehicles include freight, transit, etc.
Communications network neutral except as indicated.

U.S. Department of Transportation

Questions / Discussion?

Steve Sill
ITS Architecture and Standards Program Manager
US DOT / ITS JPO
steve.sill@dot.gov