UNITED STATES
DEPARTMENT OF TRANSPORTATION

Connected Vehicle Security

ITS Advisory Committee
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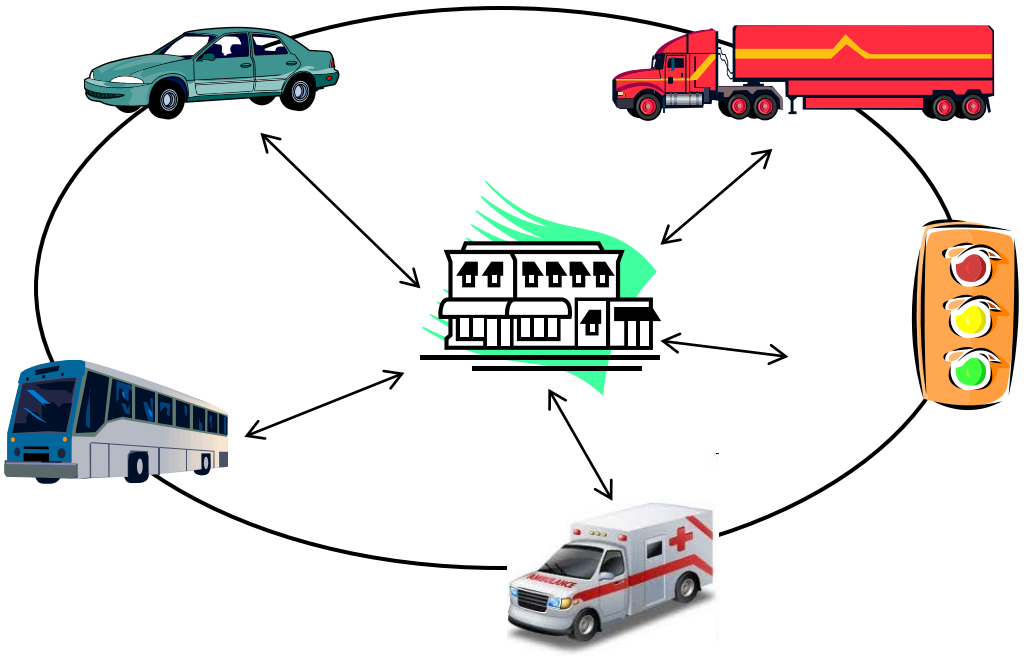
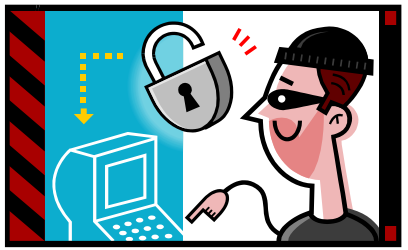
Need for Security



Trust

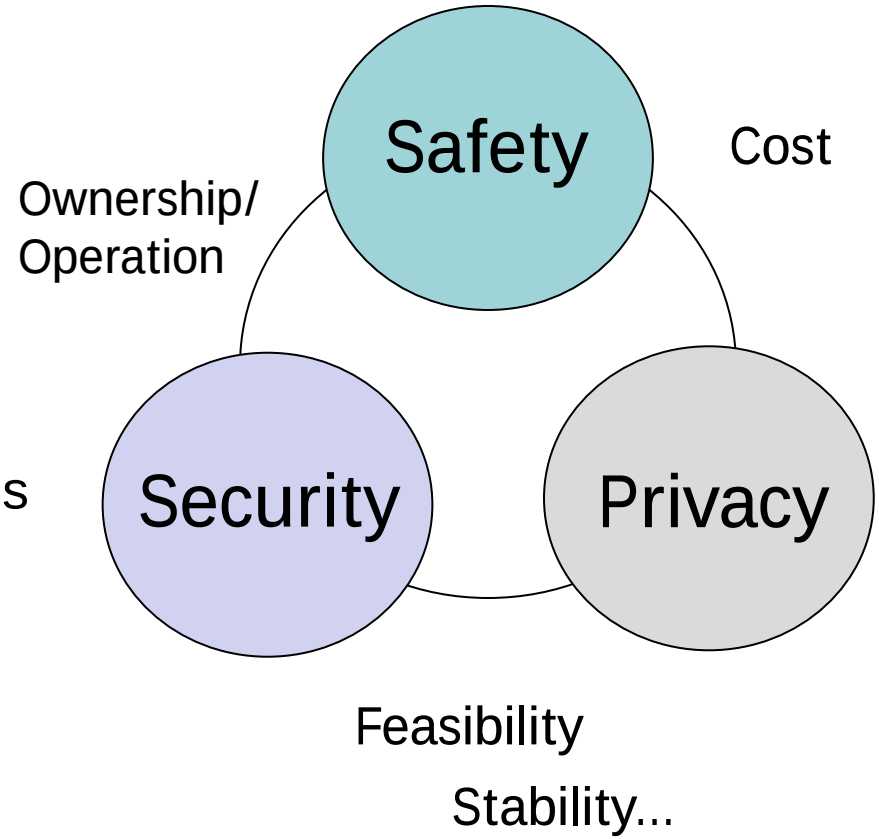
Message Validity



Defense Against Attacks

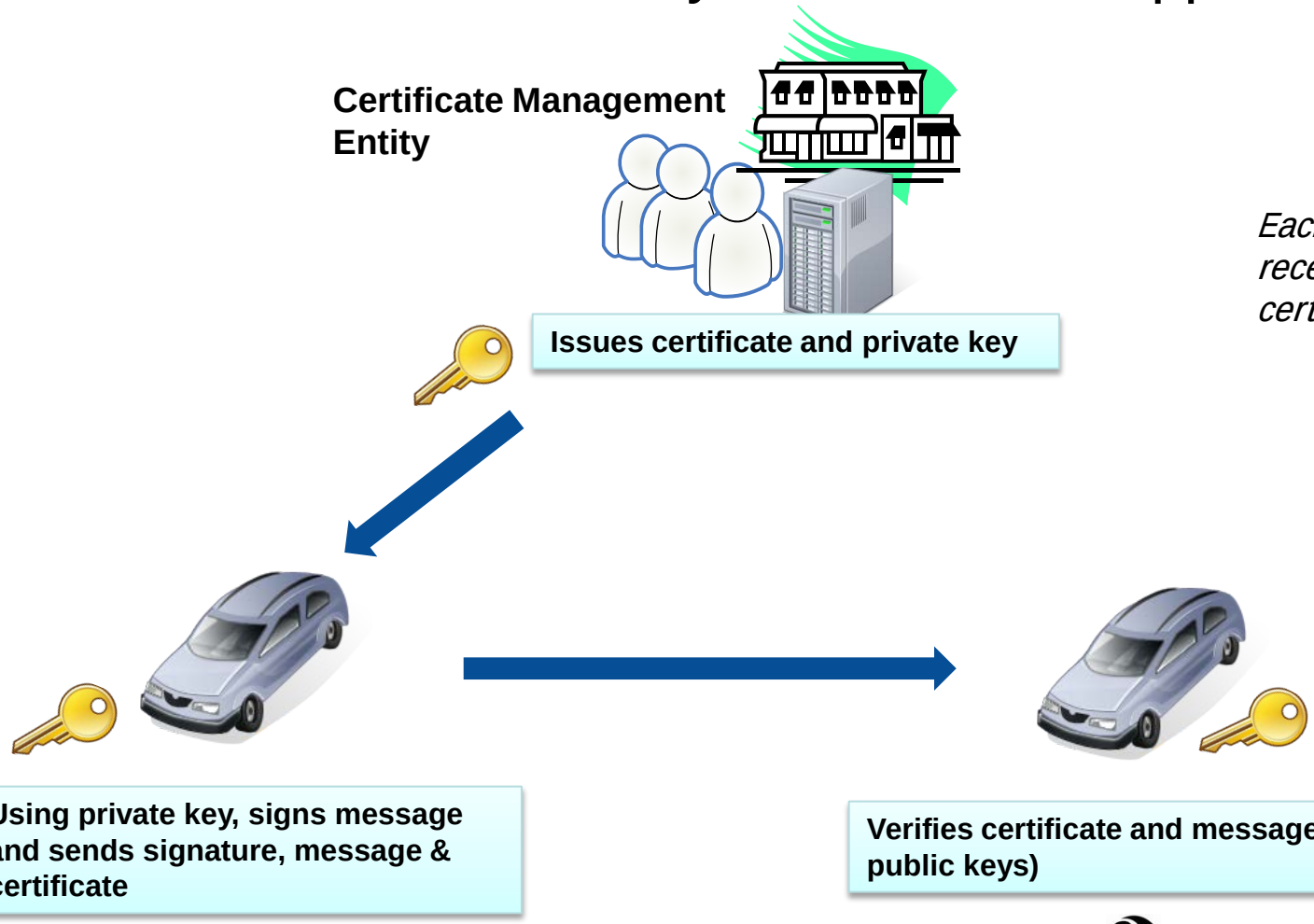
Goals for Security System

- ✓Trust
- ✓Message validity
- ✓Protection against attacks
- ✓Appropriate user privacy
  - ✓ Non-traceability for trips
  - ✓ Personal information protections
- ✓Implementable



Proposed Security Approach

Modified Public Key Infrastructure Approach



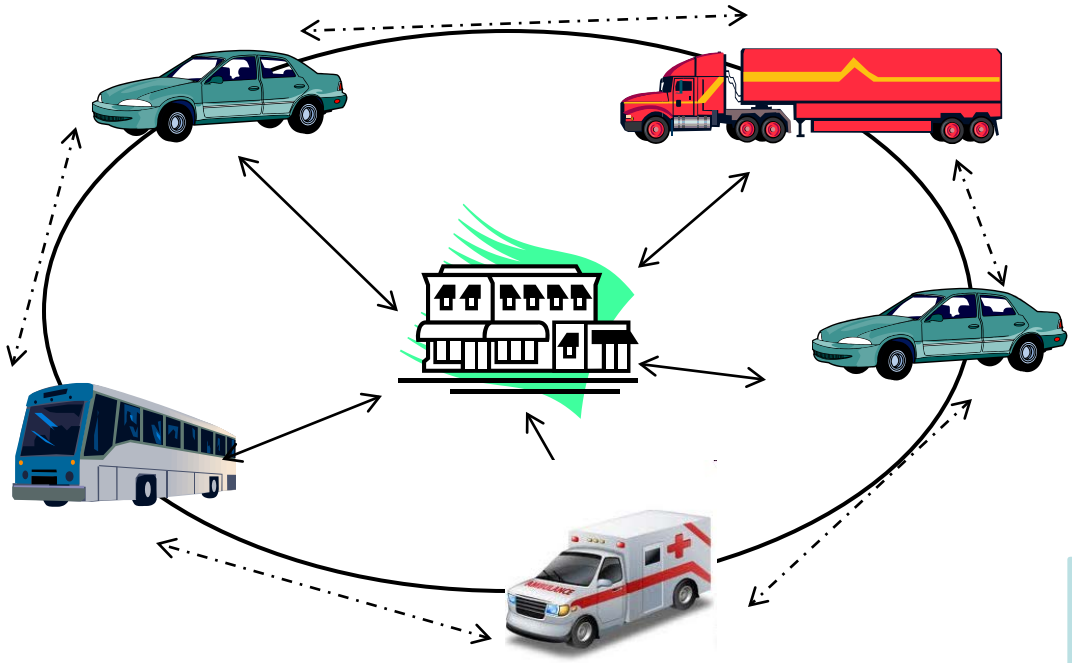
Each device potentially receives thousands of certificates per year

Generally, System Would Include:

- Security Network – for credentialing and certificate management
- Security Back Office (Certificate Management Entity) – operational functions that apply across any type of Security Network
- Applications Infrastructure – Infrastructure specifically for V2I safety (DSRC) or V2I mobility (other options)

All require sustainable funding

Overall Security System Components

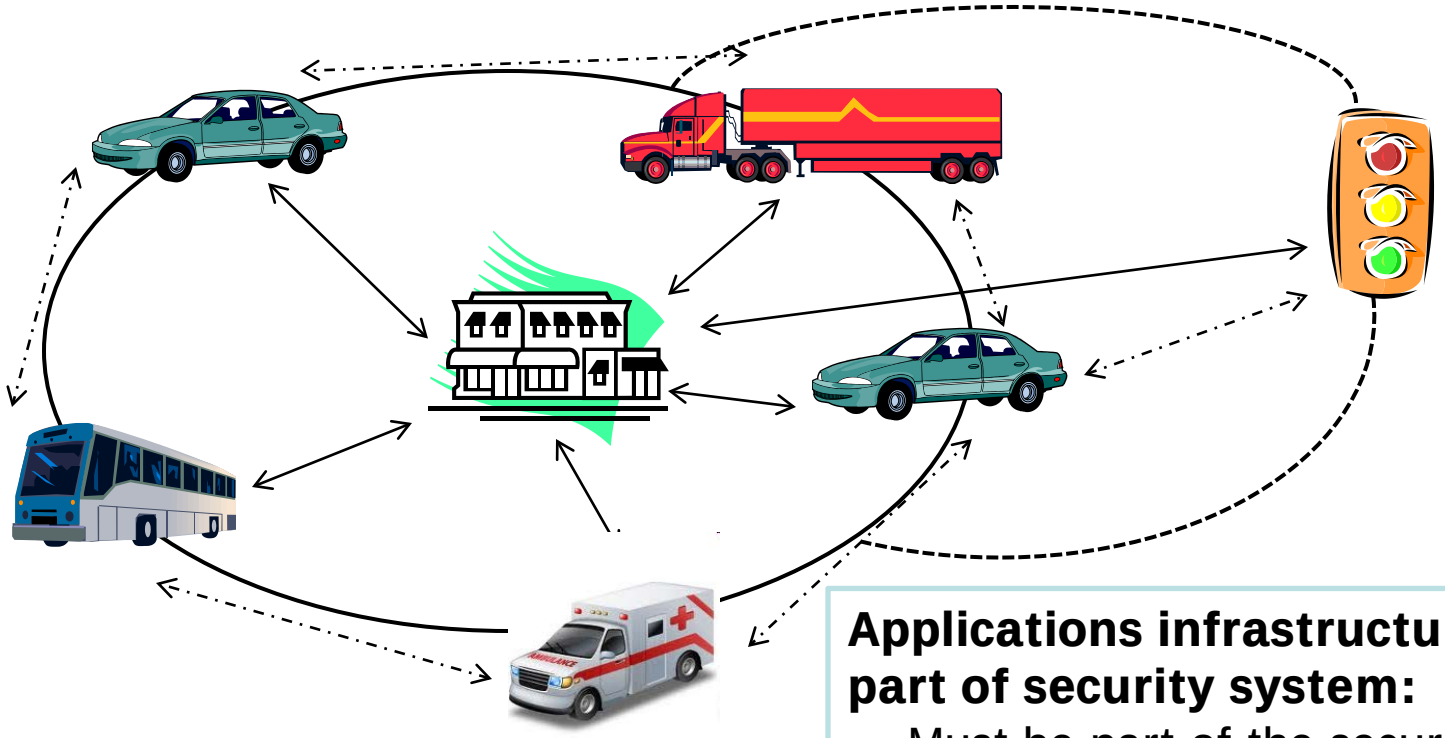


V2V communication via DSRC

Security Network Options:
- Cellular/hybrid
- DSRC
- Other

Security Back Office Functions
- Manage operations
- Certify processes & equipment
- Revocation

Security System & Security Infrastructure



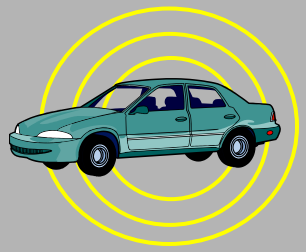
V2V communication
Via DSRC

Applications infrastructure as a part of security system:

- Must be part of the security network
- Adhere to performance requirements
- Adhere to system governance
- Adhere to certification requirements

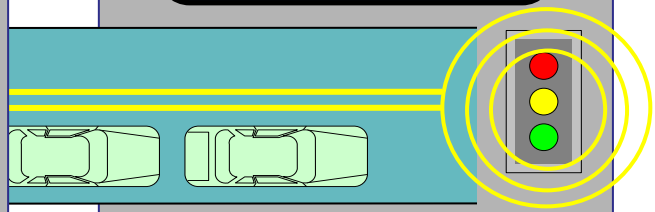
Connected Vehicle Communications Needs

Vehicle To Vehicle



- Safety messages
- Certificate exchanges

Vehicle To Infrastructure



- Many needs – safety and mobility application needs differ

Security Management

- Security credentials updating and management
- Volume of data may be substantial

Communication exchanges are distinct, which complicates a "one-size fits all" approach

Media Options for Communication Needs

Cellular	Wide area two-way mobile communications based on point to point mode (not broadcast)
	Voice and data oriented with high-speed data transfer rates; requires IP addressing
WiFi Technology	Provides internet access to devices in range of base station footprint (typical range 100 feet)
	Typically takes ~ 10 seconds to recognize devices in network (too slow for some CME functions?)
Dedicated Short-Range Communications (DSRC)	Designed specifically for communicating data with moving vehicles
	Allows terminals to broadcast to all other devices in radio range (range ~ 300 meters)

Study Scenario 1: Hybrid

Certificate Management	**Cellular**
V2I Mobility Data	**Cellular**
V2V and V2I Safety Data	**DSRC**

- Uses cellular data delivery for Certificate Management (CM) and V2I communications, and the DSRC network for the V2V communications
- Will examine potential efficiencies and costs of using two different networks for data delivery, and its ability to deliver CM functions

Study Scenario 2: Hybrid

Certificate Management	**Any and all opportunities: Cellular, WiFi and DSRC**
V2I Mobility Data	**Cellular and DSRC**
V2V and V2I Safety Data	**DSRC**

- Relies on the wireless ecosystem to provide certificate data exchange needs
- Must determine practicality: technical and deployment paths with data exchange functions important (e.g., OBE must have radio that can receive the right wireless connection)

Study Scenario 3: All DSRC

Certificate Management	**DSRC**
V2I Mobility Data	**DSRC**
V2V and V2I Safety Data	**DSRC**

- Relies on DSRC to provide the wireless data communications needed for each of the operational functions of the certificate data exchange system
- Need to determine incremental or additional costs of building DSRC network to deliver certificate communication needs

Ongoing Work

- Evaluating costs and organizational models for certificate management entities
  - Exploring private, or hybrid models
- Evaluating security network and communications options and costs
- Assessing how strategies effect security, privacy, and safety
- Assessing business/investment models for implementation and ongoing expenses
- Conducting a field test using prototype security system (Safety Pilot)

Questions?

For More Information

- http://www.its.dot.gov/connected_vehicle/connected_vehicle_policy.htm

www.its.dot.gov