



# The National ITS Architecture and Standards

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# What is an Architecture?

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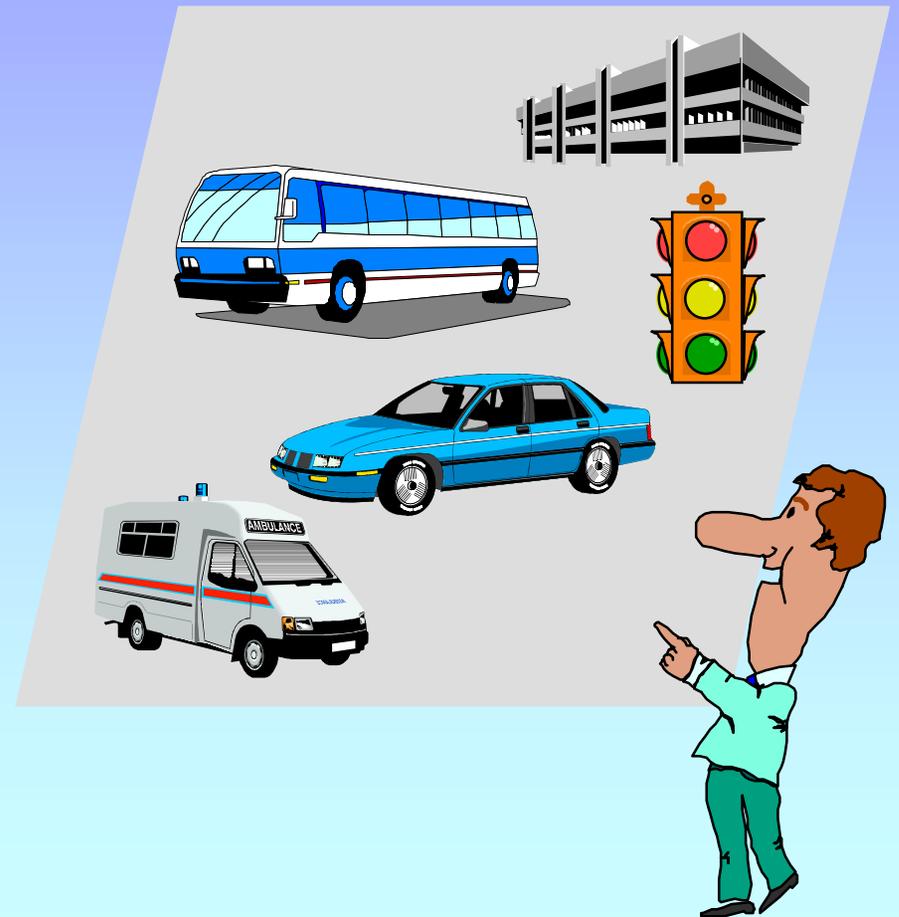
- ◆ Identifies boundaries and participants
- ◆ Describes activities or functions
- ◆ Provides a framework for planning, defining, and integrating ITS





# National ITS Architecture Provides a Framework to Help:

- ◆ Identify key stakeholders and their relationships
- ◆ Describe required activities or functions
- ◆ Define interconnections and interdependencies between functions
- ◆ Define a blueprint for integration of systems





# What does the National ITS Architecture Consist of?

User Services

*Requirements*  
e.g. Incident Management

National ITS Architecture

Logical Architecture

*What functions are performed?*  
e.g., Detect Incident  
Verify Incident

*Where are the entities that perform the functions?*  
e.g., Traffic Management Center

Physical Architecture



# User Services & User Service Requirements (USRs)

- ◆ 6 Categories of 31 *User Services*
- ◆ Each User Service composed of hierarchically organized *User Service Requirements* (about 1000)
- ◆ Primarily *functional* requirements
  - ▶ *What* the ITS has to do
  - ▶ Not
    - *Where* (physical architecture)
    - *How* (technology)

<b>1.0</b>	<b>TRAVEL AND TRAFFIC MANAGEMENT</b>
1.1	PRE-TRIP TRAVEL INFORMATION
1.2	EN-ROUTE DRIVER INFORMATION
1.3	ROUTE GUIDANCE
1.4	RIDE MATCHING AND RESERVATION
1.5	TRAVELER SERVICES INFORMATION
1.6	TRAFFIC CONTROL
1.7	INCIDENT MANAGEMENT
1.8	TRAVEL DEMAND MANAGEMENT
1.9	EMISSIONS TESTING AND MITIGATION
1.10	HIGHWAY-RAIL INTERSECTION
<b>2.0</b>	<b>PUBLIC TRANSPORTATION MANAGEMENT</b>
2.1	PUBLIC TRANSPORTATION MANAGEMENT
2.2	EN-ROUTE TRANSIT INFORMATION
2.3	PERSONALIZED PUBLIC TRANSIT
2.4	PUBLIC TRAVEL SECURITY
<b>3.0</b>	<b>ELECTRONIC PAYMENT</b>
3.1	ELECTRONIC PAYMENT SERVICES
<b>4.0</b>	<b>COMMERCIAL VEHICLE OPERATIONS</b>
4.1	COMMERCIAL VEHICLE ELECTRONIC CLEARANCE
4.2	AUTOMATED ROADSIDE SAFETY INSPECTION
4.3	ON-BOARD SAFETY MONITORING
4.4	COMMERCIAL VEHICLE ADMINISTRATIVE PROCESSES
4.5	HAZARDOUS MATERIAL INCIDENT RESPONSE
4.6	COMMERCIAL FLEET MANAGEMENT
<b>5.0</b>	<b>EMERGENCY MANAGEMENT</b>
5.1	EMERGENCY NOTIFICATION AND PERSONAL SECURITY
5.2	EMERGENCY VEHICLE MANAGEMENT
<b>6.0</b>	<b>ADVANCED VEHICLE SAFETY SYSTEMS</b>
6.1	LONGITUDINAL COLLISION AVOIDANCE
6.2	LATERAL COLLISION AVOIDANCE
6.3	INTERSECTION COLLISION AVOIDANCE
6.4	VISION ENHANCEMENT FOR CRASH AVOIDANCE
6.5	SAFETY READINESS
6.6	PRE-CRASH RESTRAINT DEPLOYMENT
6.7	AUTOMATED VEHICLE OPERATION



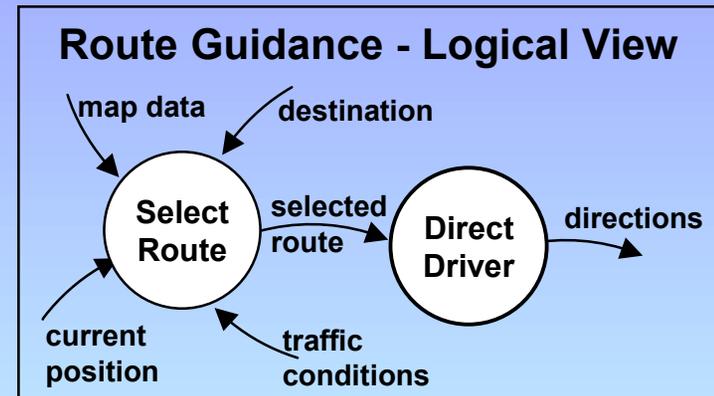
# Logical Architecture

A logical architecture defines:

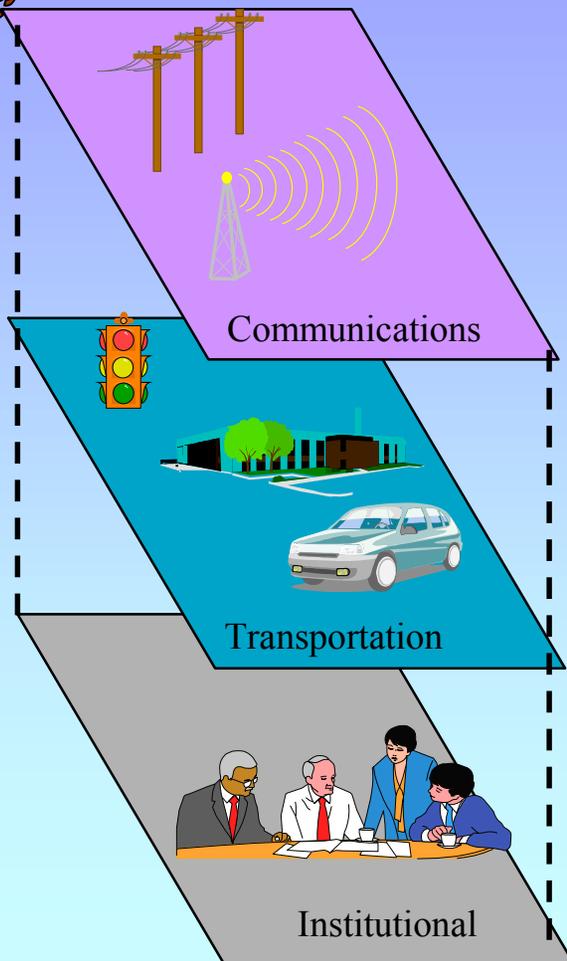
- ◆ The functions to be performed
- ◆ The information transfers between functions

It does **NOT** define:

- ◆ Where the functions are performed
  - ▶ This is the role of the physical architecture
- ◆ How the functions are implemented
  - ▶ This is not done anywhere in the National ITS Architecture



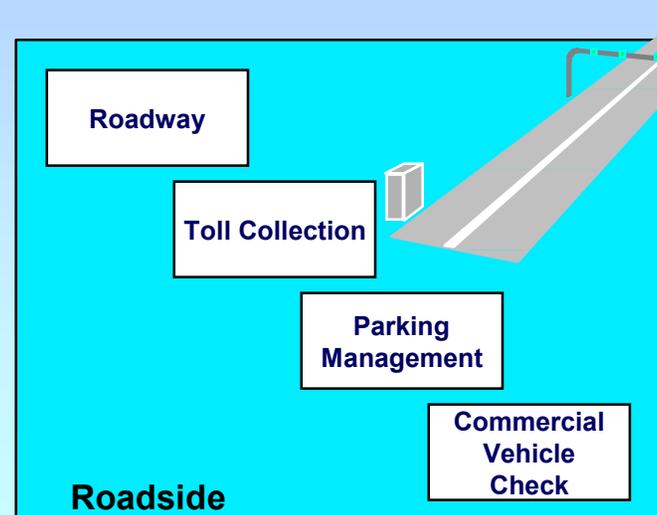
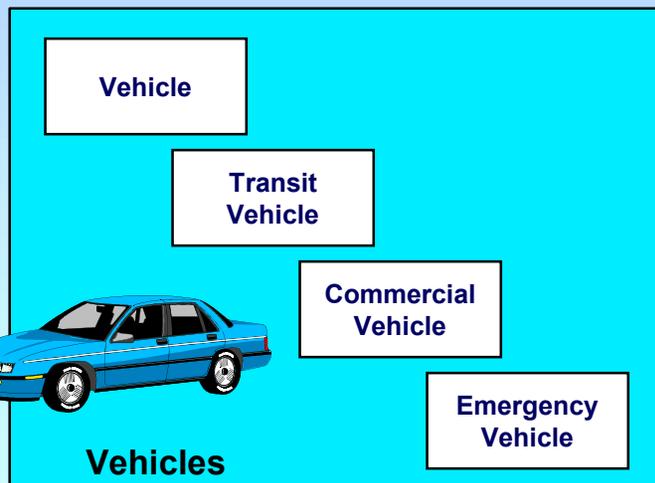
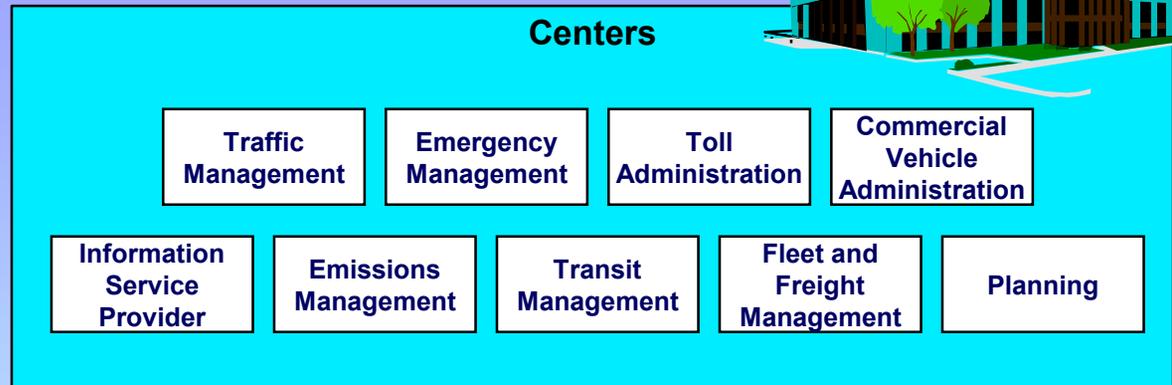
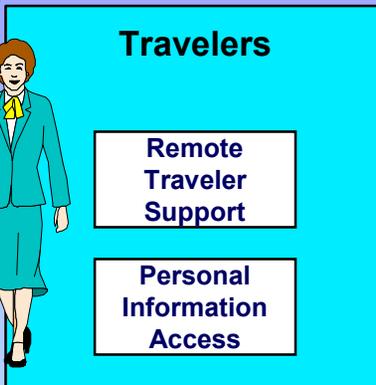
# Physical Architecture



- ◆ Defines physical entity interfaces
- ◆ Describes where functions performed
- ◆ 3 layers
  - ▶ *Communications Layer*
    - How information is transferred between transportation systems
  - ▶ *Transportation Layer*
    - What transportation systems transfer what information
  - ▶ *Institutional Layer*
    - Supporting institutional structure, policy, and strategies

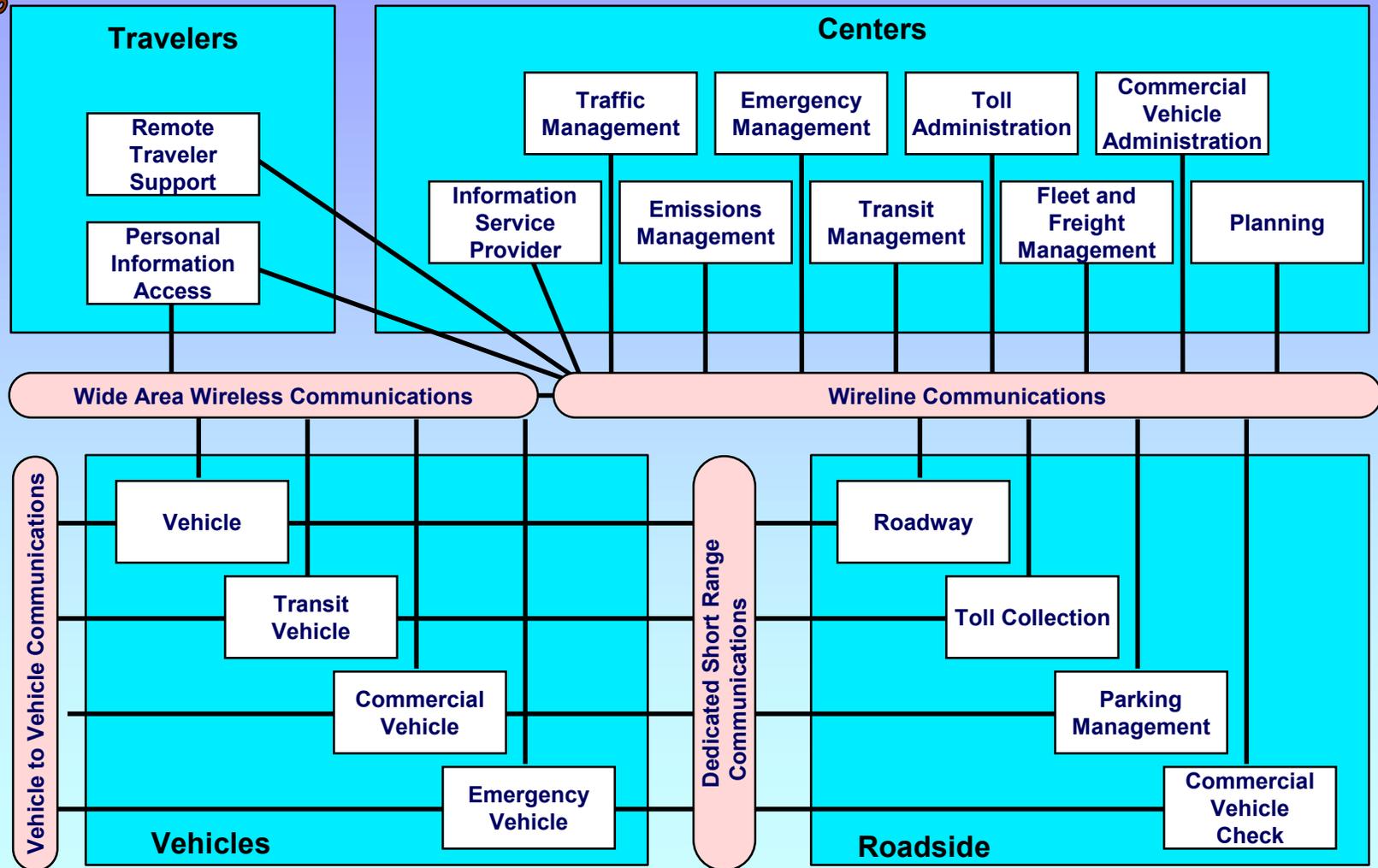


# Physical Architecture Subsystems



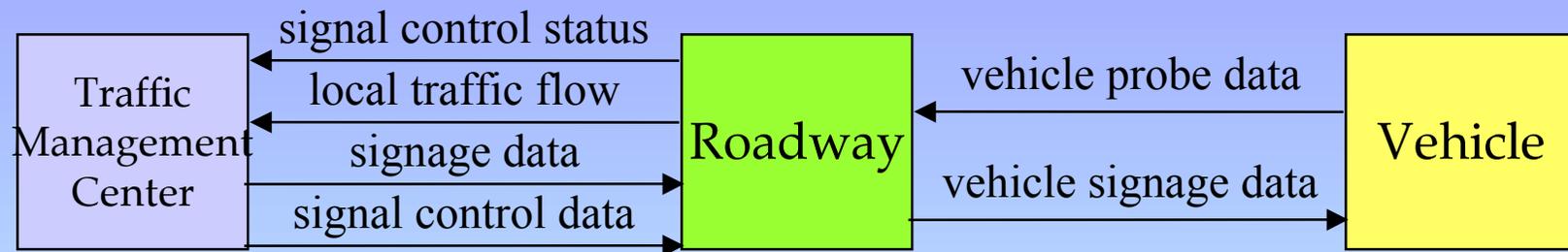


# Physical Architecture Subsystems and Interconnects





# Connecting Subsystems: Architecture Flows

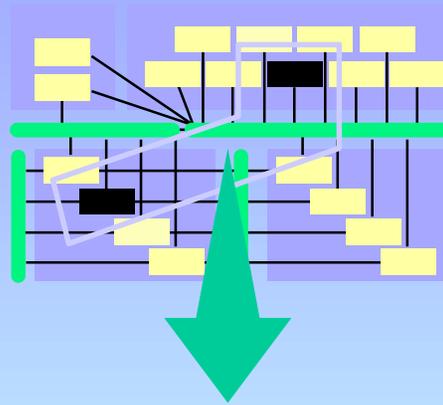


## Architecture Flows

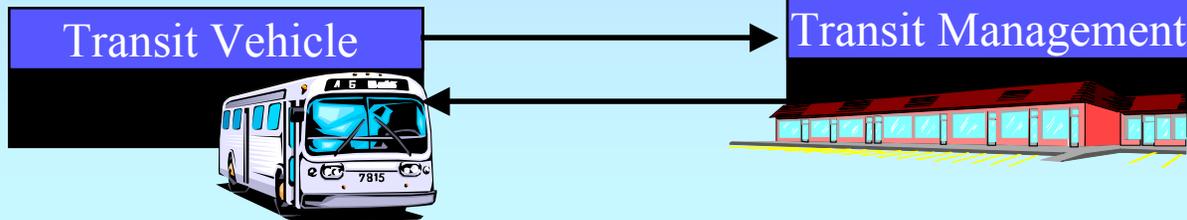
- Identify flow of data between subsystems
- Level of detail being discussed for “Architecture Consistency”
- Supporting detailed definitions in the logical architecture



# Market Packages



Architecture  
*Framework spanning all  
of ITS*



Market Packages  
*Pieces of the architecture  
that provide a particular  
transportation service.*



# Market Packages

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- ◆ Identify the pieces of the architecture required to implement a particular service
  - ▶ Subsystems, architecture flows and supporting logical architecture elements
- ◆ More specific than user services
  - ▶ Segregate potential early deployments from higher risk services
  - ▶ Originally defined to support benefits analysis with clear ties to transportation problems

*Effective entry point into the architecture for regional planning and project definition*



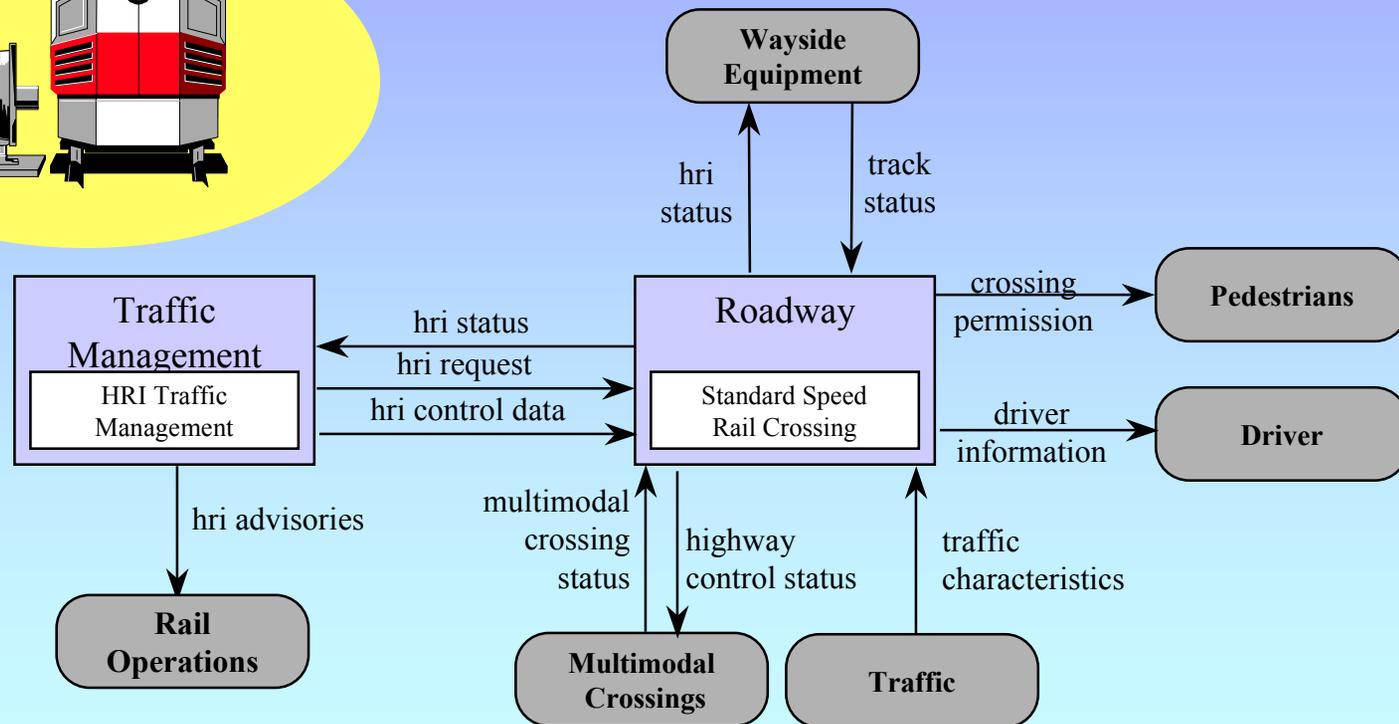
# Traffic Management Market Packages

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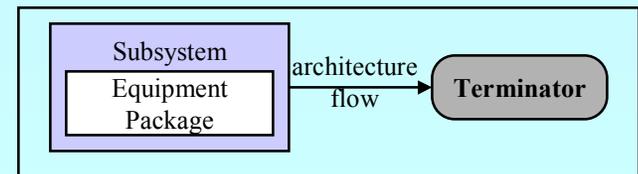
- Network Surveillance
- Probe Surveillance
- Surface Street Control
- Freeway Control
- HOV Lane Management
- Traffic Information Dissemination
- Regional Traffic Control
- Incident Management System
- Traffic Prediction and Demand Management
- Electronic Toll Collection
- Emissions Monitoring and Management
- Virtual TMC and Smart Probe Data
- Standard Speed Railroad Grade Crossing
- Advanced Railroad Grade Crossing
- Railroad Operations Coordination
- Parking Facility Management
- Reversible Lane Management
- Road Weather Information System



# Example: Standard Speed Railroad Grade Crossing

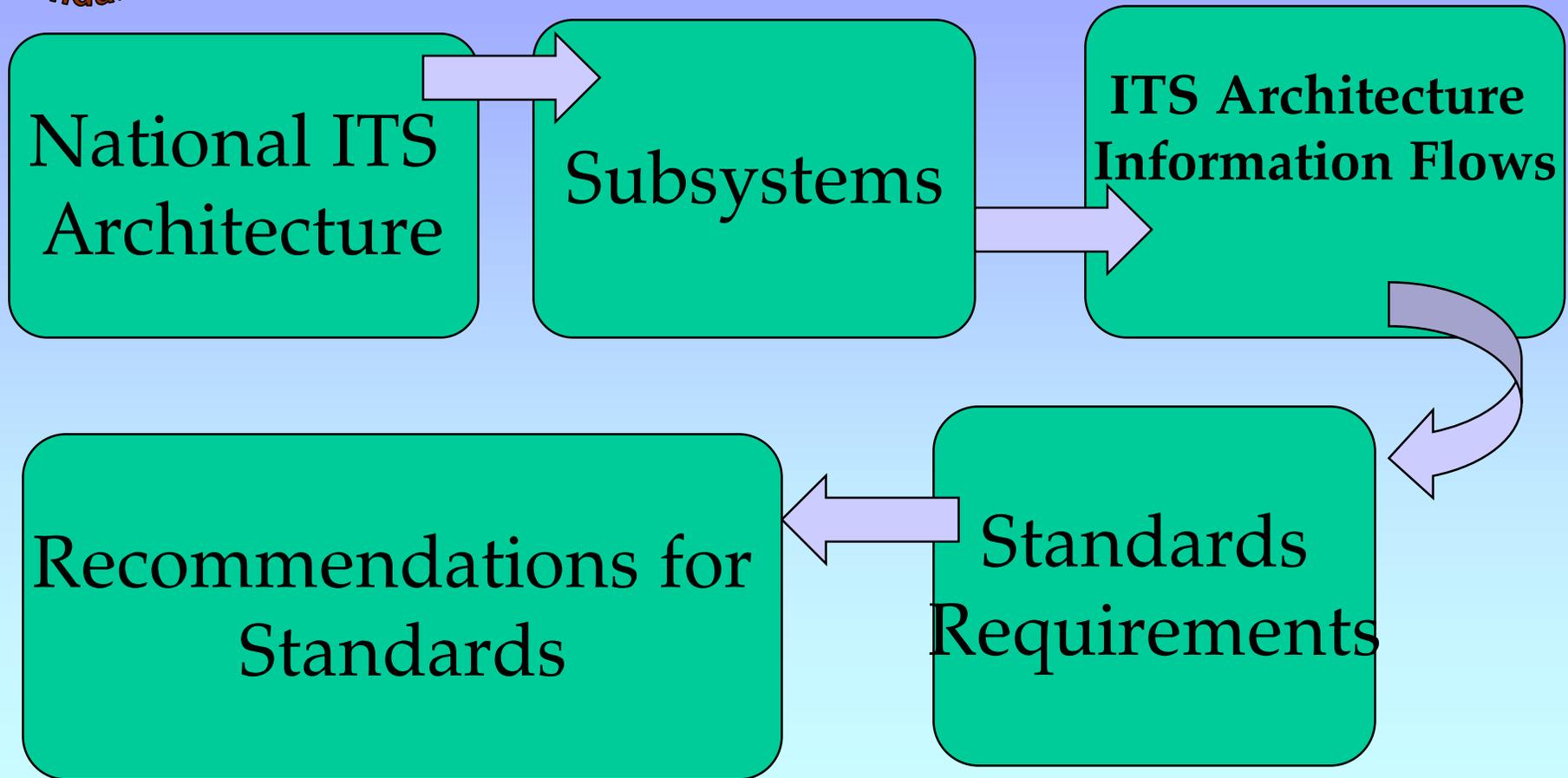


Note: HRI = highway rail intersection





# Architecture to Standards





# Architecture and Standards

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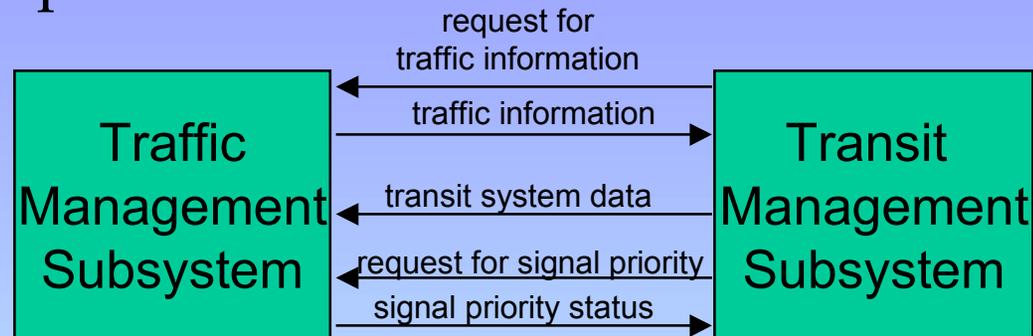
- ◆ Standards were created to address subsystem interfaces
- ◆ Can map from architecture flows to ITS standards



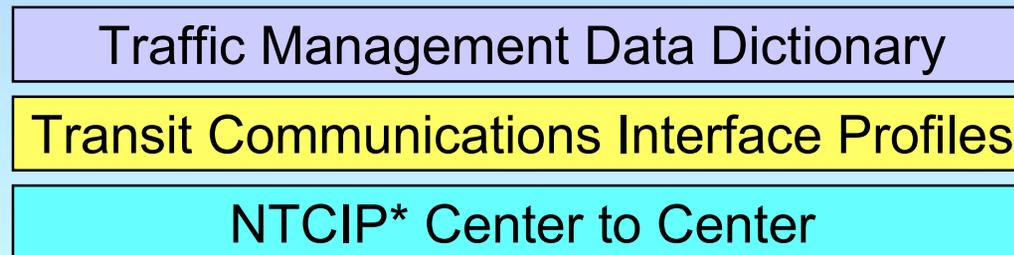
# Architecture and Standards

An Example:

*ITS  
Architecture*



*ITS  
Standards*



Data Elements  
Message Set  
Comm. Profile

\*NTCIP: National Transportation  
Communications for ITS Protocol



# Architecture and Standards

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- ◆ Certain information flows must be nationally or regionally interoperable
- ◆ Standards enable interoperability
- ◆ National ITS Architecture flows identify which ITS standards are needed