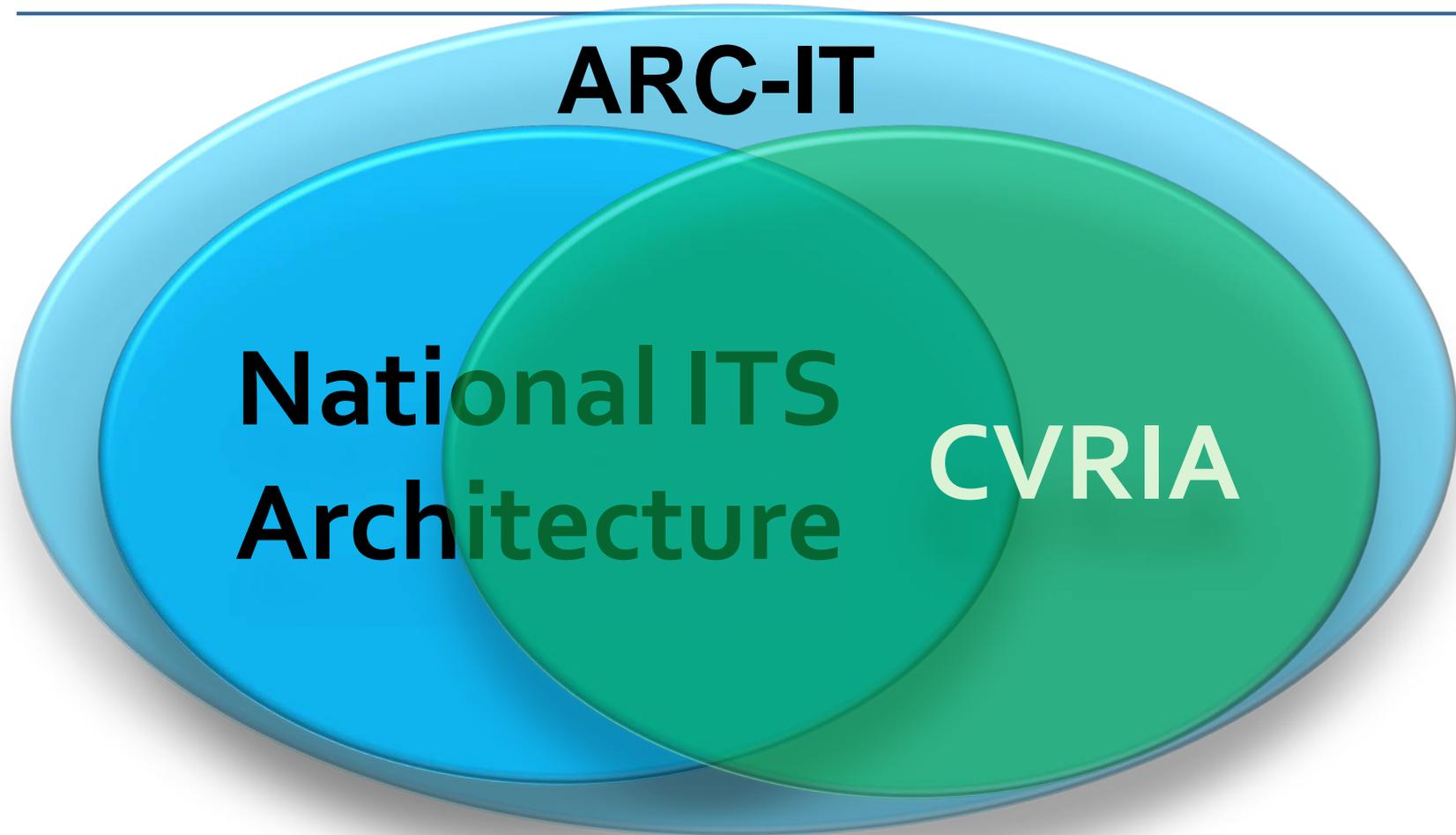




ARC-IT V8 Workshop

ARCHITECTURE OVERVIEW

ARC-IT Scope



- ARC-IT combines services of National ITS Arch with connected vehicle content of CVRIA

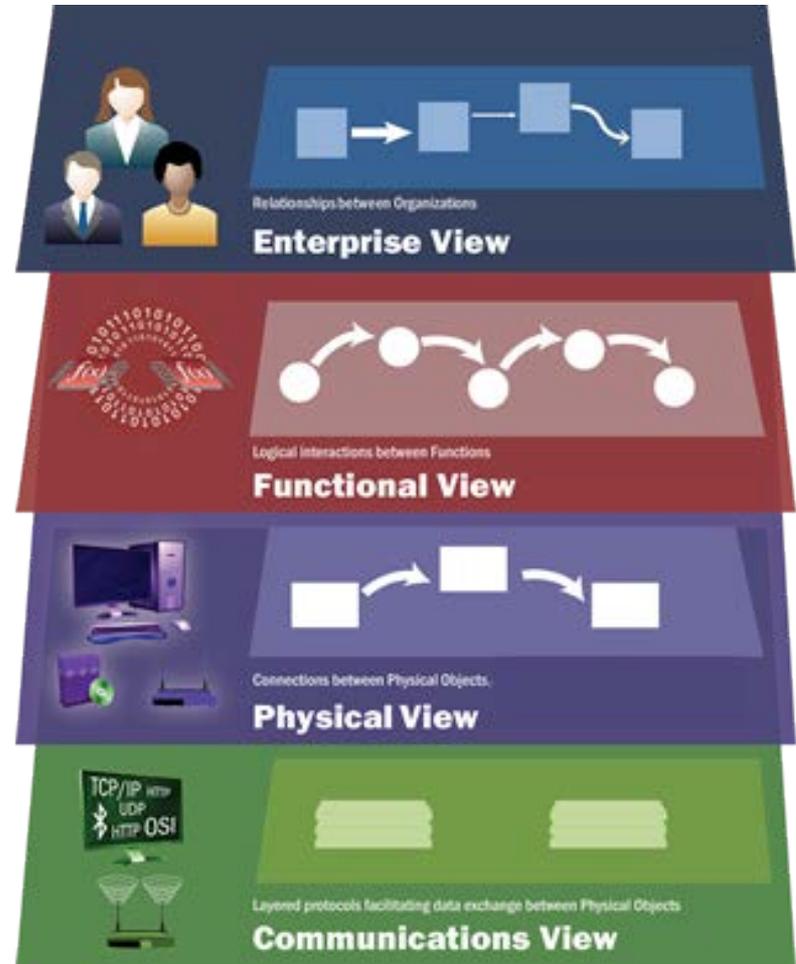
ARC-IT Scope

- ARC-IT is comprised of the following
 - Architecture Details contained in
 - Databases
 - Diagram files
 - Architecture Website
 - Hyperlinked view of architecture information
 - Support Tools
 - Regional Architecture Development (RAD-IT)
 - Project Architecture Development (SET-IT)



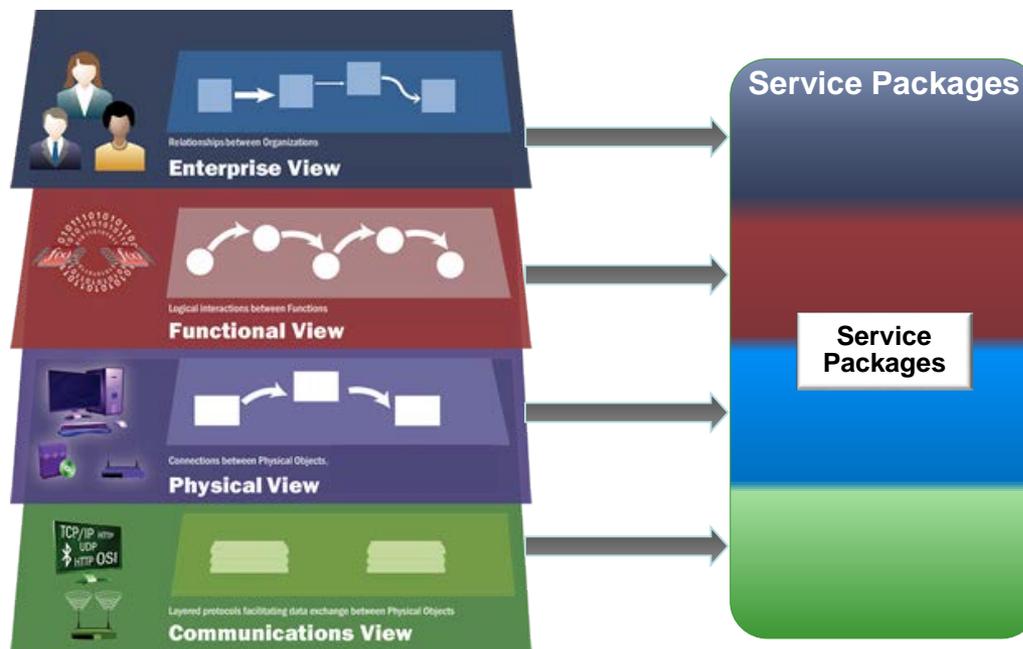
ARC-IT Structure

- Defined around 4 views:
 - Enterprises to carry out services
 - Functions to implement services
 - Physical objects to implement that functionality
 - Communications protocols necessary



ARC-IT Organization

- ARC-IT organized around **Service Packages**
 - Represent the portion of each view that provides a single ITS service
- User Services (from 1992) have been “retired”



ARC-IT Service Packages

- Service Packages grouped by Area

Traffic Management



Traveler Information



Public Transportation



Public Safety



Commercial Vehicle Operations



Support



Maintenance and Construction Management



Data Management



Parking Management



Sustainable Travel



Weather

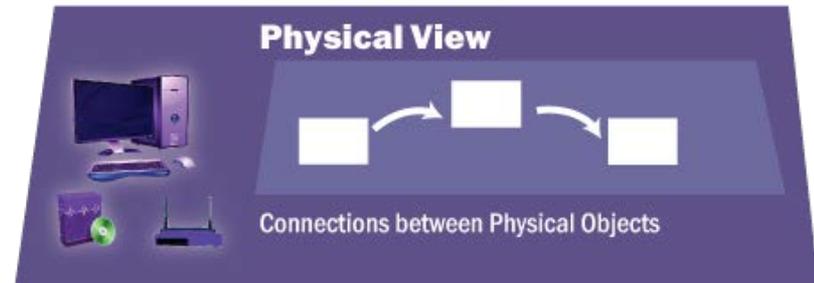


Vehicle Safety



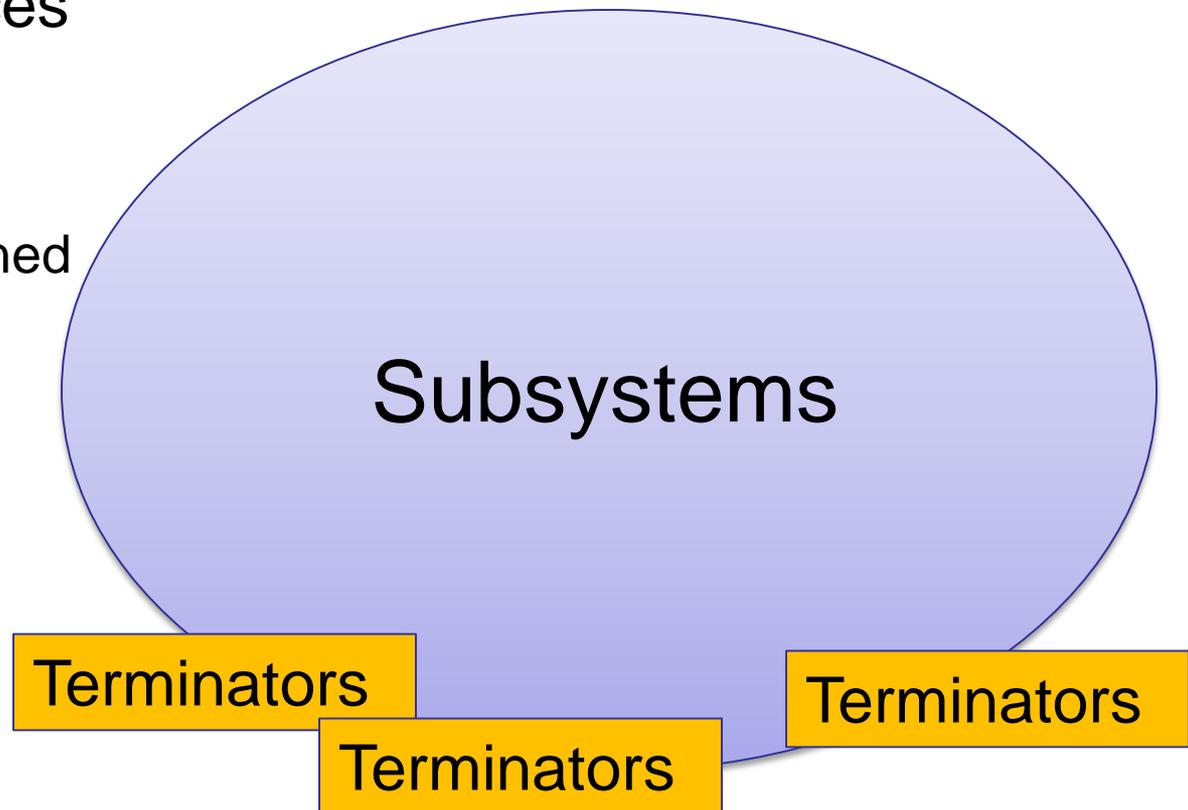
ARC-IT Physical View

- Depicts:
 - Physical objects that interact to deliver services
 - Interfaces and flows of information between those physical objects
- Identifies options for...
 - What are the interfaces to support ITS services?
 - What functionality is allocated to physical objects?
 - What objects require information security safeguards and what are they?



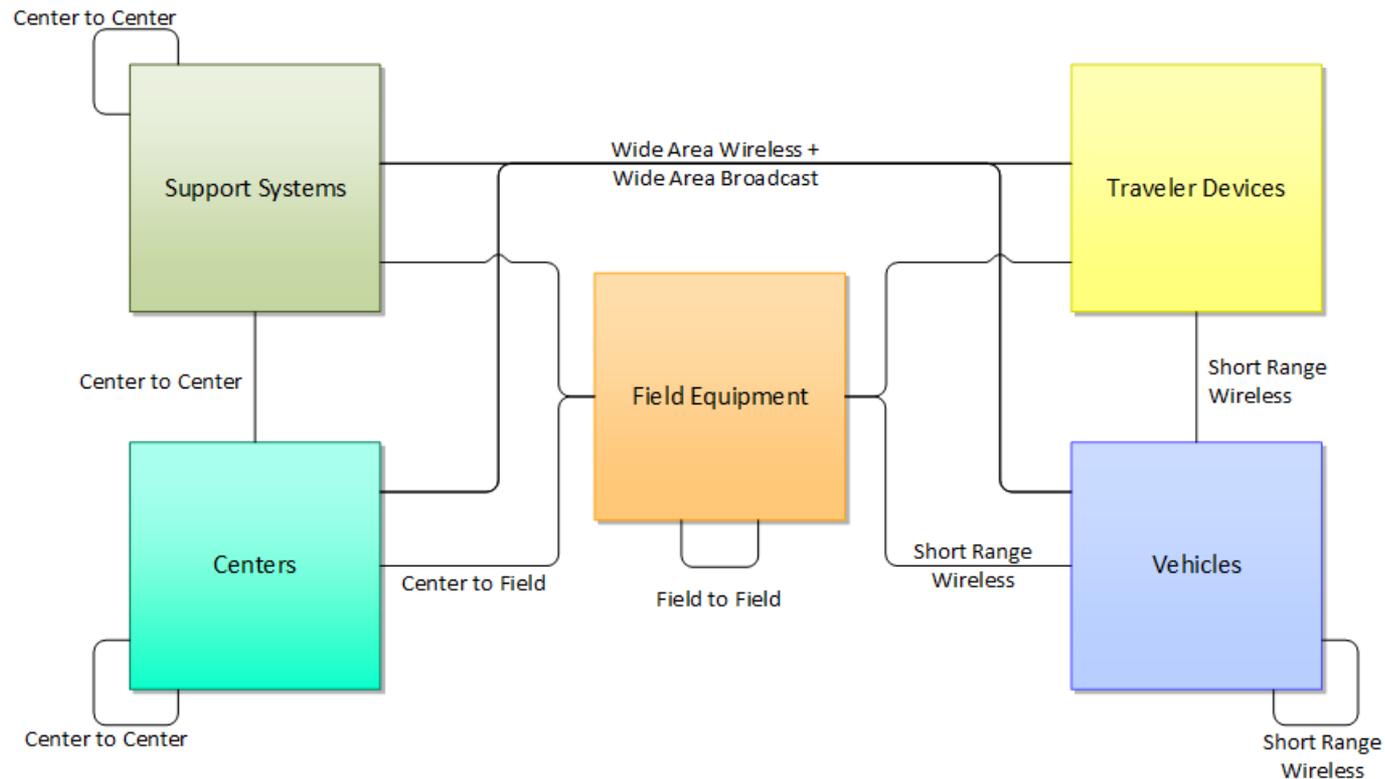
Physical View- Physical Objects

- Key “building blocks” of Physical View
- The physical systems, devices, vehicles, or people that provide ITS services
- Two Types
 - Subsystems
 - Functionality defined
 - Terminators
 - No Functionality
 - Three types



Physical View- Physical Objects

- Organized into 5 Classes

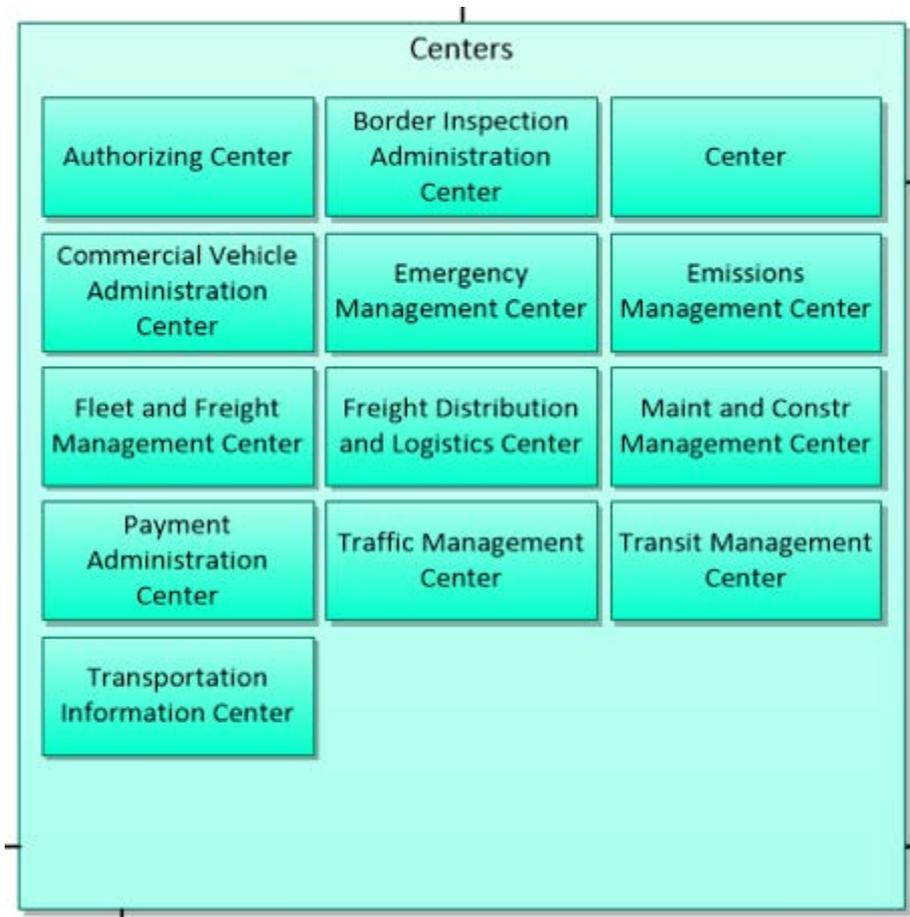


Layer 0: Classes and Primary Interconnects			
4	Physical View	Mar 21, 2017	NAT

Physical View- Physical Objects

■ Centers

- Provide Key Operational functionality for ITS Services
- Subsystem names use “center” (vs subsystems in earlier versions)
- Includes generic Center to address how support functions interface with all centers.



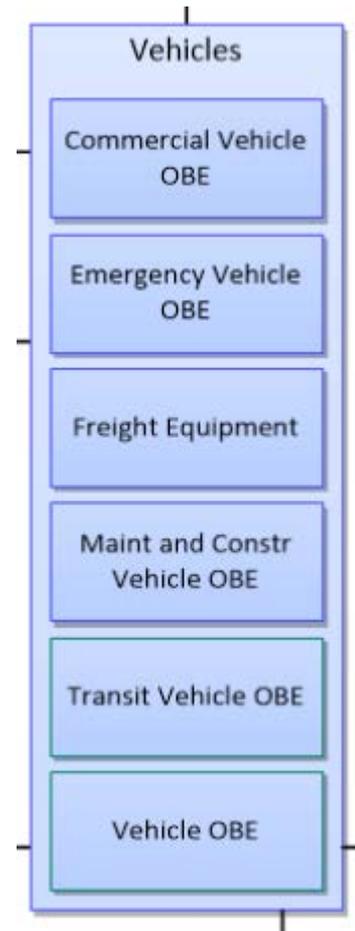
Physical View- Physical Objects

- Field Equipment
 - ITS Field Devices both
 - Long in use (e.g. CCTV, Traffic Signals, DMS) and
 - New (e.g. Connected Vehicle Roadside Equipment and Electric Charging Stations)



Physical View- Physical Objects

- Vehicles
 - ITS equipment in vehicles (on-board equipment)
 - Includes Freight Equipment



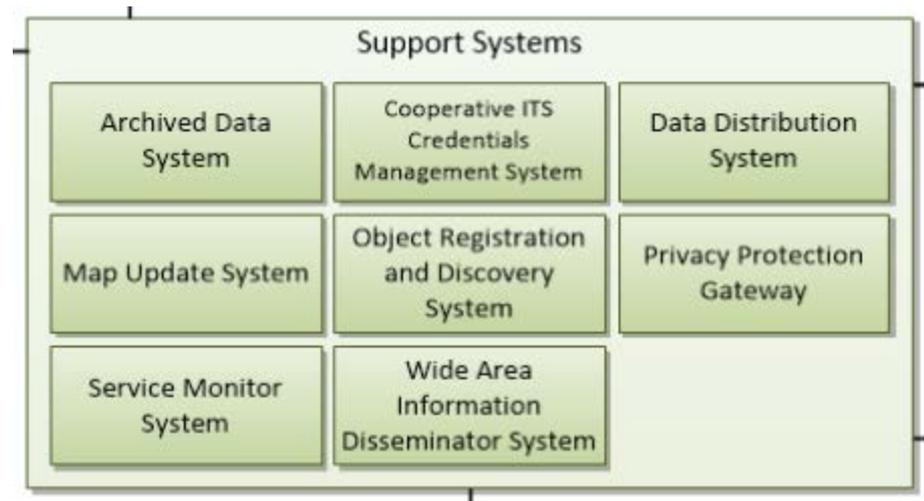
Physical View- Physical Objects

- Traveler Devices
 - Personal Devices (e.g. smart phones, tablets, and computers)
 - Public Devices (e.g. kiosks and transit stop signage)

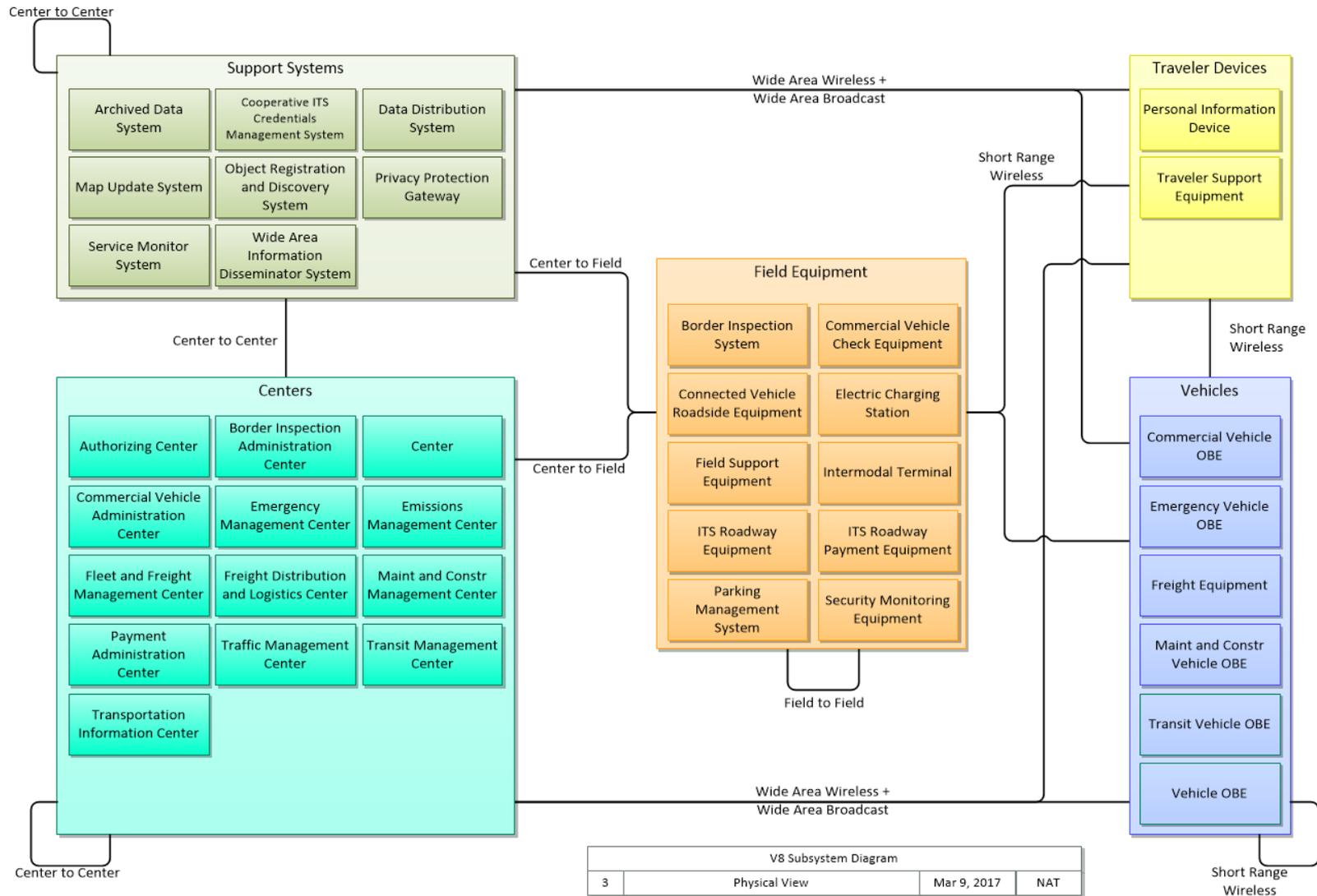


Physical View- Physical Objects

- Support Systems
 - Includes non operational use of data (e.g. Archived Data System)
 - Systems that support operations
 - for all ITS (e.g. Map Update System)
 - For connected vehicle specific services (e.g. cooperative ITS credentials management system)



Physical View- Interconnect Diagram



Physical View- Terminators

- Represent People or Systems “on the edge” of the scope of ARC-IT
- Three primary types
 - System
 - Other Systems
 - Humans
- Within each type organized by class
 - Center/ Field/ Vehicle/ etc.



Physical View- Functional Objects

- Functional Objects are functional building blocks of Subsystems
 - Define the functions and interfaces required to support a “deployable” piece of the subsystem
 - Functional requirements are defined for each functional object
 - Replaces “Equipment Packages”

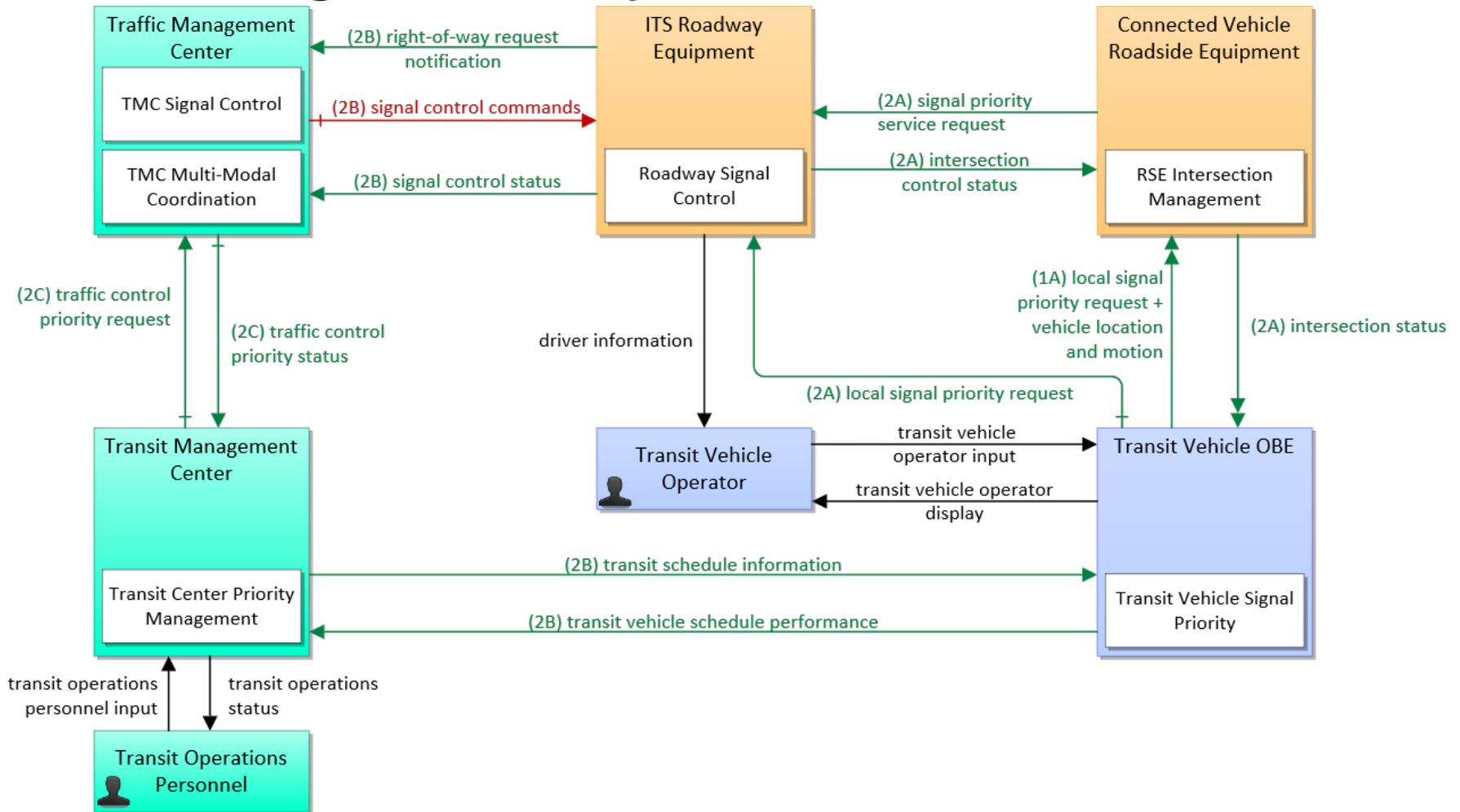


Physical View- Service Packages

- Service Packages in the Physical View are defined by a set of:
 - Physical Objects
 - Functional Objects
 - Information Flows
- Plus a diagram showing all how all these are connected.



Service Package Example – Transit Signal Priority

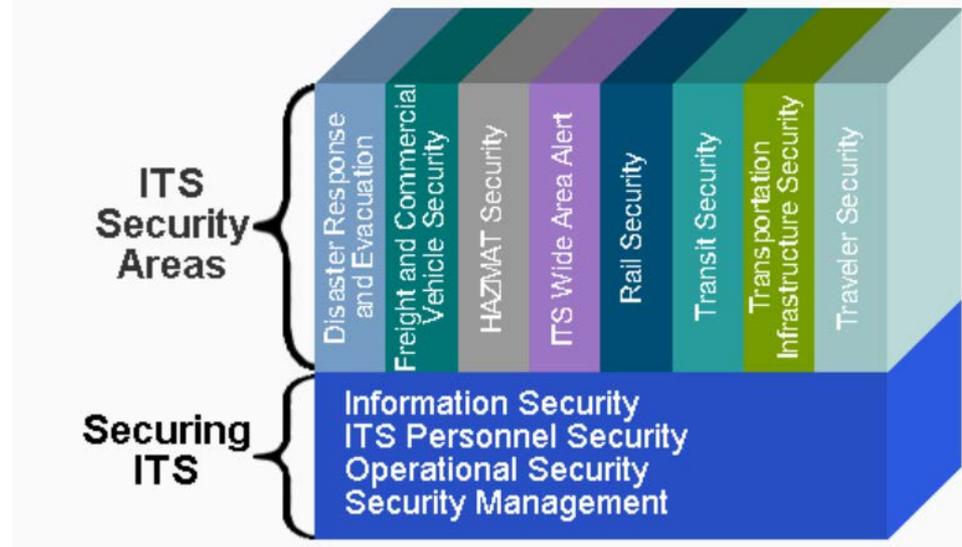


PT09: Transit Signal Priority			
7	Physical	Oct 14, 2016	NAT



Physical View: Security

- Security Analysis of Physical Objects and Information flows included
 - Based on the FIPS-199 analysis
 - Confidentiality, Integrity, Availability
 - Security Device Classes
 - Lays the groundwork for following the NIST cybersecurity framework



ARC-IT Communications View

- Depicts:
 - Layered communications protocols that support communications between physical objects
- Identifies options for each “triple”...
 - Identity and appropriateness of protocols at all layers
 - How these protocols ensure or support:
 - Security
 - Privacy
 - Status of protocols as standards or privately provided protocols and the implications of their use from an evolve-ability perspective



ARC-IT Communications View Example

DSRC-WSMP		
local signal priority request -->		
Transit Vehicle OBE		Connected Vehicle Roadside Equipment
ITS Application Information Layer SAE J2735	Security Plane IEEE 1609.2	ITS Application Information Layer SAE J2735
Application Layer Undefined		Application Layer Undefined
Presentation Layer ISO ASN.1 UPER	Security Plane Undefined	Presentation Layer ISO ASN.1 UPER
Session Layer Undefined		Session Layer Undefined
Transport Layer IEEE 1609.3 WSMP		Transport Layer IEEE 1609.3 WSMP
Network Layer IEEE 1609.3 WSMP		Network Layer IEEE 1609.3 WSMP
Data Link Layer IEEE 1609.4, IEEE 802.11		Data Link Layer IEEE 1609.4, IEEE 802.11
Physical Layer IEEE 802.11		Physical Layer IEEE 802.11



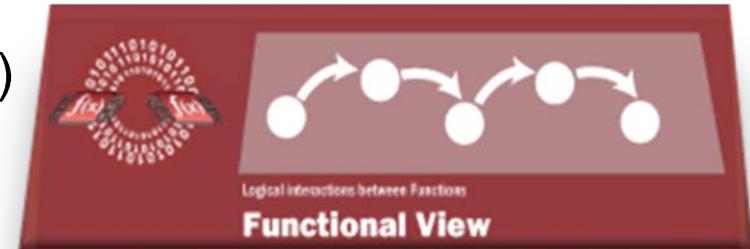
ARC-IT Enterprise View

- Depicts:
 - Relationships between organizations
 - Roles organizations play in delivery of ITS services
- Organized around **Enterprise Objects**
 - Interact to exchange information
 - Manage or Operate Systems
- Details of View will be added in Version 8.1



ARC-IT Functional View

- Depicts:
 - Abstract functional objects (processes)
 - Flows of data between those processes
- Identifies options for...
 - What functionality is in physical objects?
 - What are the interfaces between logical objects?
 - What data flows between those functional objects?
- Details of View will be added in Version 8.1



ARC-IT Website

www.arc-it.net



ARC-IT Version **8.0**
Including the National ITS Architecture and CVRIA

Architecture ▾ Architecture Use ▾ Architecture Resources ▾ Architecture Terminology ▾ Contact The Architecture Team

[Home](#)

Architecture Reference for Cooperative and Intelligent Transportation

The Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) provides a common framework for planning, defining, and integrating intelligent transportation systems. It is a mature product that reflects the contributions of a broad cross-section of the ITS community (transportation practitioners, systems engineers, system developers, technology specialists, consultants, etc.).

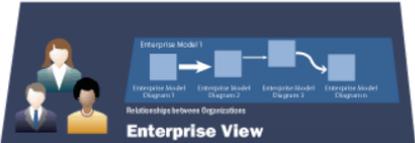
The architecture defines:

- The functions (e.g., gather traffic information or request a route) that are required for ITS
- The physical entities or subsystems where these functions reside (e.g., the field or the vehicle).
- The information flows and data flows that connect these functions and physical subsystems together into an integrated system.

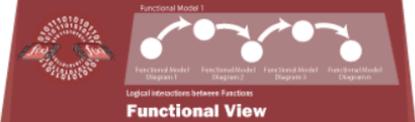
If you would prefer a summary document that you can print and read over coffee, a brief document is available that presents the [key architecture concepts](#).

The information contained on these web pages (www.iteris.com/itsarch and its sub-pages) were developed for the U.S. Department of Transportation and are in the public domain. The information is free from copyright restrictions except where noted.

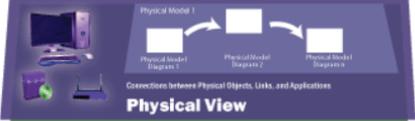
Connected Vehicle Reference Implementation Architecture



Enterprise View
Relationships between Organizations



Functional View
Logical Interactions between Functions



Physical View
Connections between Physical Objects, Links, and Applications



Communications View
Layered communications protocols between Physical and Application Objects

ARC-IT Resources

United States Department of Transportation

ARC-IT Version 8.0

Including the National ITS Architecture and CVRIA

Architecture ▼ Architecture Use ▼ **Architecture Resources ▼** Architecture Terminology ▼ Contact The Architecture Team

[Home](#) > Resources

Resources

This page provides links to various resources to help you understand your understanding of ARC-IT.

- [Databases](#) - provides the Microsoft Access databases that contain the source material for ARC-IT content
- [Documents](#) - provides a set of links to documents related to ARC-IT
- [Tools](#) - provides the links to download a copy of ARC-IT software tools: Regional Architecture Development for Intelligent Transportation (RAD-IT) and Engineering Tool for Intelligent Transportation (SET-IT)
- [Training](#) - provides on-line training material on ARC-IT, RAD-IT, and SET-IT