New York State Department of Transportation

Technical Support and Strategic Plan Development

NYSDOT Task 2.A Presentation Workshop

Hawthorne, NY

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ConSysTec Corp

under subcontract to Siemens ITS

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Presentation Outline

- Purpose of the Workshop:

  To gather feedback and to review a process to incorporate regional ITS architecture and ITS standards into NYSDOT's Project Development Process.

Presentation Outline

ITS Standards	What are ITS Standards and where do they fit?
Standards in NYS Projects	ITS Standards in the NYSDOT Project Development Process
PSEA	Project Systems Engineering Analysis
Specifying ITS Standards	Level of detail when specifying ITS Standards

Presentation Outline

- Motivation
  1. You want to connect (share information) with your neighbors
  2. You need to develop good specifications for your ITS projects (interactive exercise)
  3. NYSDOT is working to develop a common approach to integrating regional ITS architecture and ITS standards with your Project Development Process
  4. Interactive discussion to gather feedback on “Best Practices for ITS Standards Specifications Report”

Presentation Outline

- NYSDOT Technical Support & Strategic Plan Development Task 2.A Subtasks
  1. Review of National Standards and Testing Programs
     - Draft Final Report. Used as a “desk reference”.
  2. Best Practices for ITS Standards Specification
     - Draft Report – will be updated based on today’s workshop
  3. Key ITS Standards for NYS and Testing Opportunities
     - Reviewing preliminary information today
  4. Standards Specification Guidance
     - Will build upon subtasks 2 & 3
  5. Course Development: "Using ITS Standards for Deployment: Identification, Specification, and Testing“
     - Will build upon subtask 4 and input from today’s workshop

Presentation Outline

- Agenda (AM – Project Programming)
  - Introductions
  - Exercise #1
  - ITS Standards Overview
  - BREAK
  - Overview of the NYSDOT Project Development Process (Project Programming)
    - Initial Project Proposal
    - Transportation Improvement Program
    - Regional ITS Architecture
    - Project Scoping
  - Exercise #2

Presentation Outline

- Agenda (PM – Project Design and Specification)
  - Review of Key ITS Standards
  - Exercise #3
  - BREAK
  - Systems Engineering Overview
  - Project Systems Engineering Analysis
  - Overview of the NYSDOT Project Development Process (Project Design)
    - Design Reports
    - Advanced Detailed Plans
    - Plans, Specifications & Estimates
  - Testing Standards

Introductions and Administration - Please Sign-In

- Brief Introduction
  - Name
  - Organization
  - What is your role in ITS?
  - What area do you need help in implementing ITS and ITS standards?
- Safety and Comfort Announcements
  - Exits
  - Restrooms
  - Today's adjournment

Exercise #1

Exercise # 1 – Interagency Coordination

Problem: A major truck accident with spilled chemicals has just occurred, causing a blockage of one interstate highway and rerouting of all traffic to a bypass facility running through an adjacent region. You have to notify the other region……

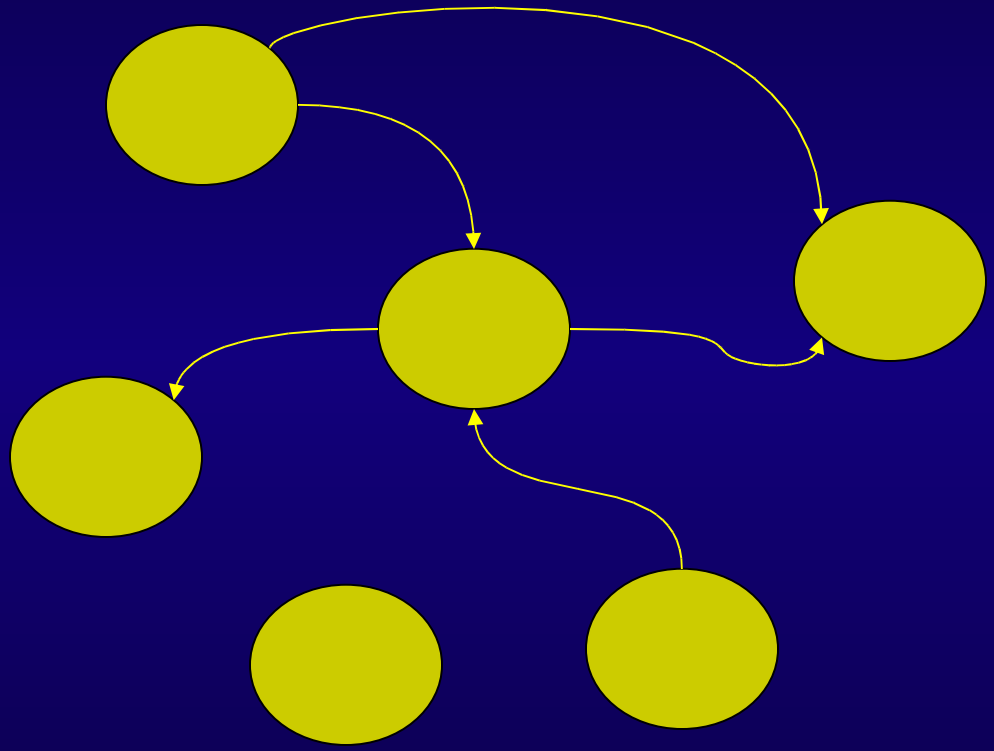
Your Task: Determine the following:

1. Who will you contact to relay this information ?
2. What information will be conveyed ?
3. How will this be done – now, and in the future ?

- Class discussion Time 15 minutes

Exercise # 1 – Class Discussion

Coordinating with other partners in your region.



Exercise # 1 – Class Discussion

Coordinating with other partners in your region.

Who Will Contact Who	What Information Will You Convey	How Will This Be Done Currently	How Will This Be Done in the Future
DOT District to DOT District	*Message on DMS Signs*	*Telephone*	*System to System*

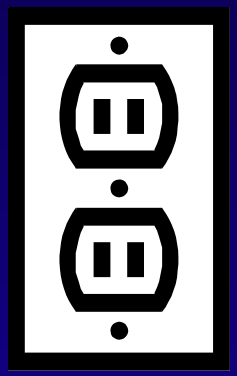
Exercise # 1 – Class Discussion

- What have we learned ?
  - Communication with our regional partners is important.
  - Incidents can have a dramatic impact on neighboring jurisdictions.
  - Better understanding of real world impacts.
- We will be discussing standards for the deployment of interoperable systems

Overview:
ITS Standards

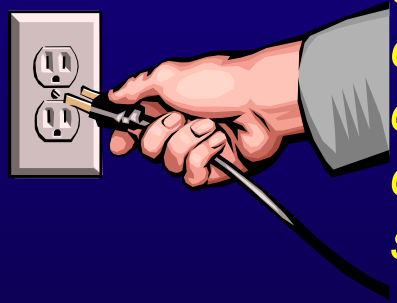
What is a Standard?

MUTCD?



- Power Cord?
- Railroad Track?
- *Standards can be defined as:*
  - *"Prescribed set of rules, conditions or requirements concerning definition of terms and classification of components; specification of materials, performance or operation; definition of procedures; or measurement of quantity and quality in describing materials, products, systems or practices."*

- National US Policy



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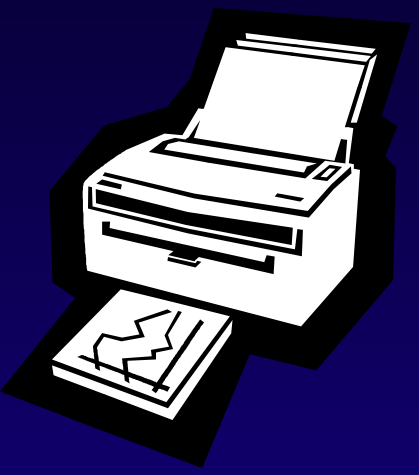
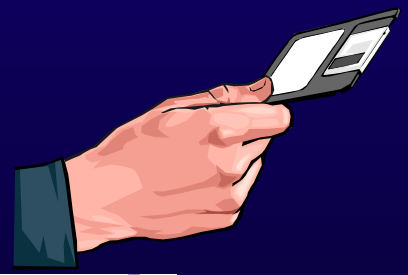
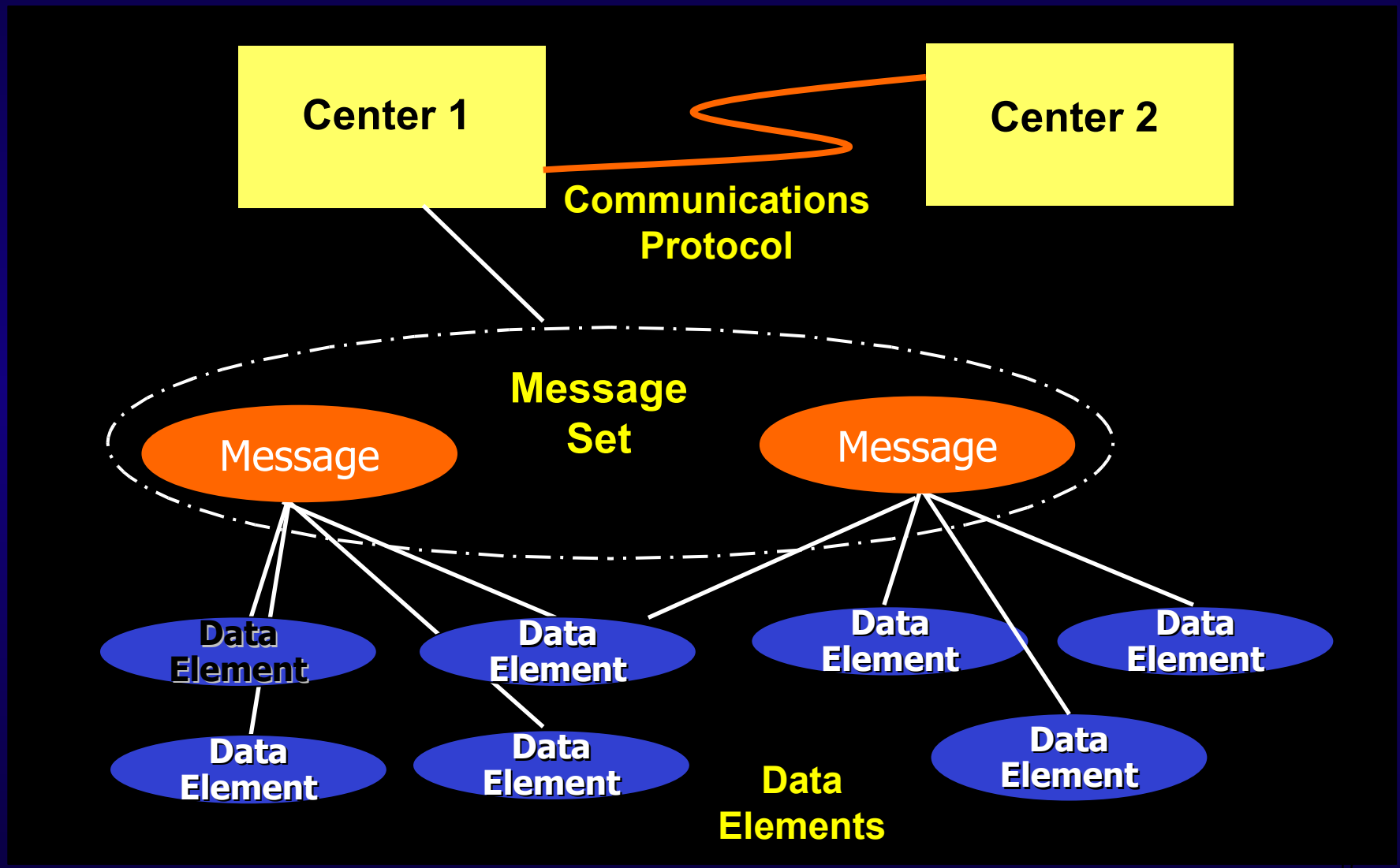
Types of Standards



- Hardware
- Software
- Equipment
- Performance
- Maintenance
- Practices



ITS Standards Structure



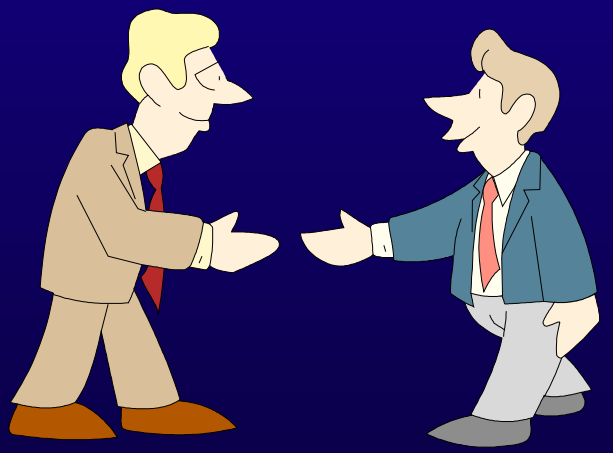
ITS Standards Structure

- Data Elements → "words"
- Message Set → "sentences"
- Communications Profile → "rules for sending sentences across an interface"

Incident message

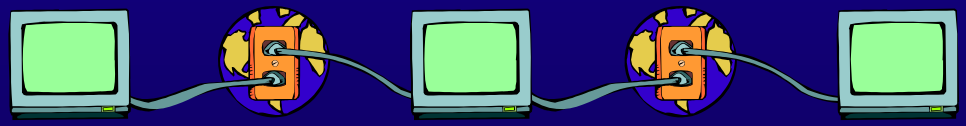
What is a Protocol?

- Protocols standards are set of common rules for exchanging data:
  - Data format
  - Control information coordination
  - Error handling
  - Timing

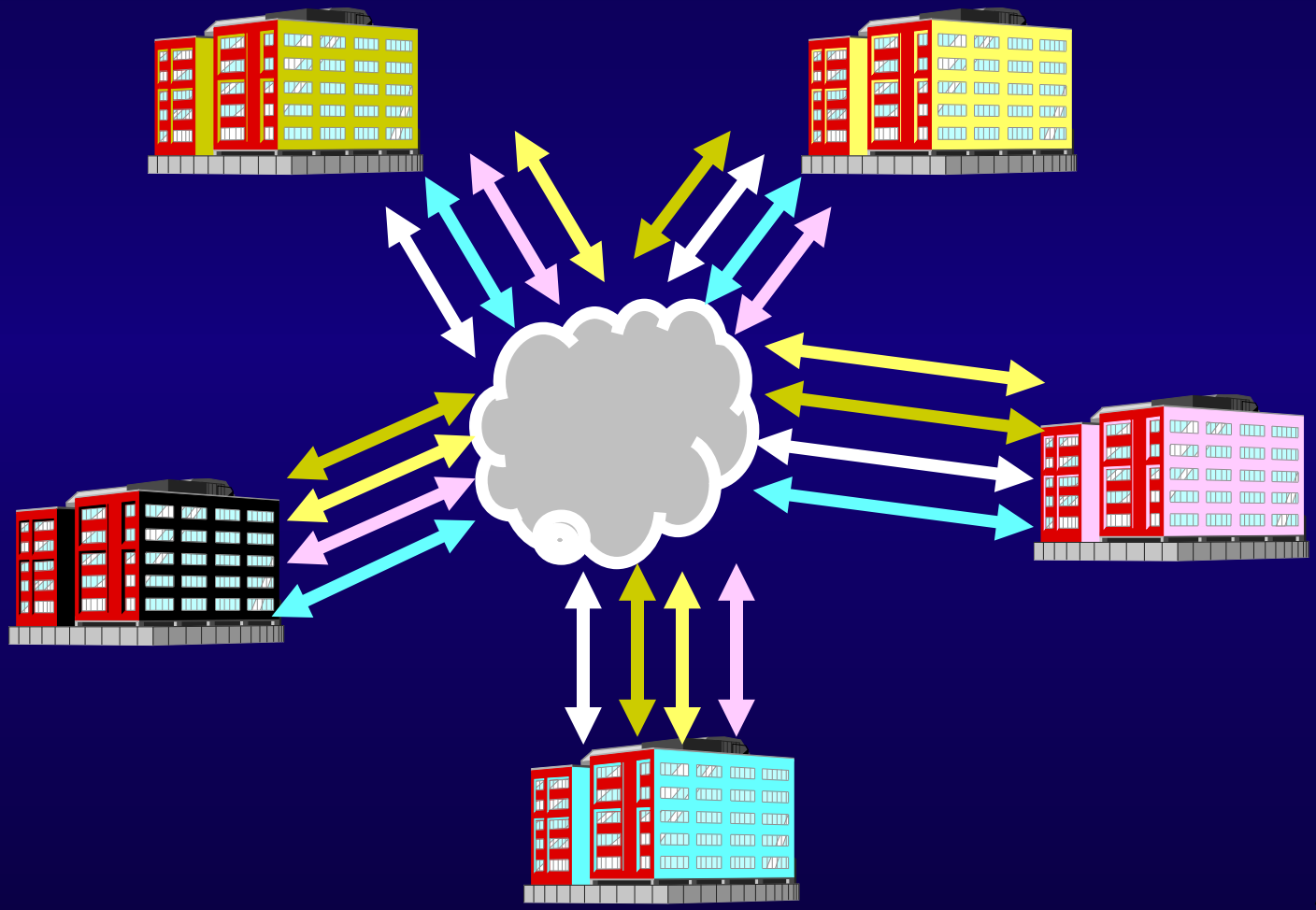


Examples of Internet Protocols

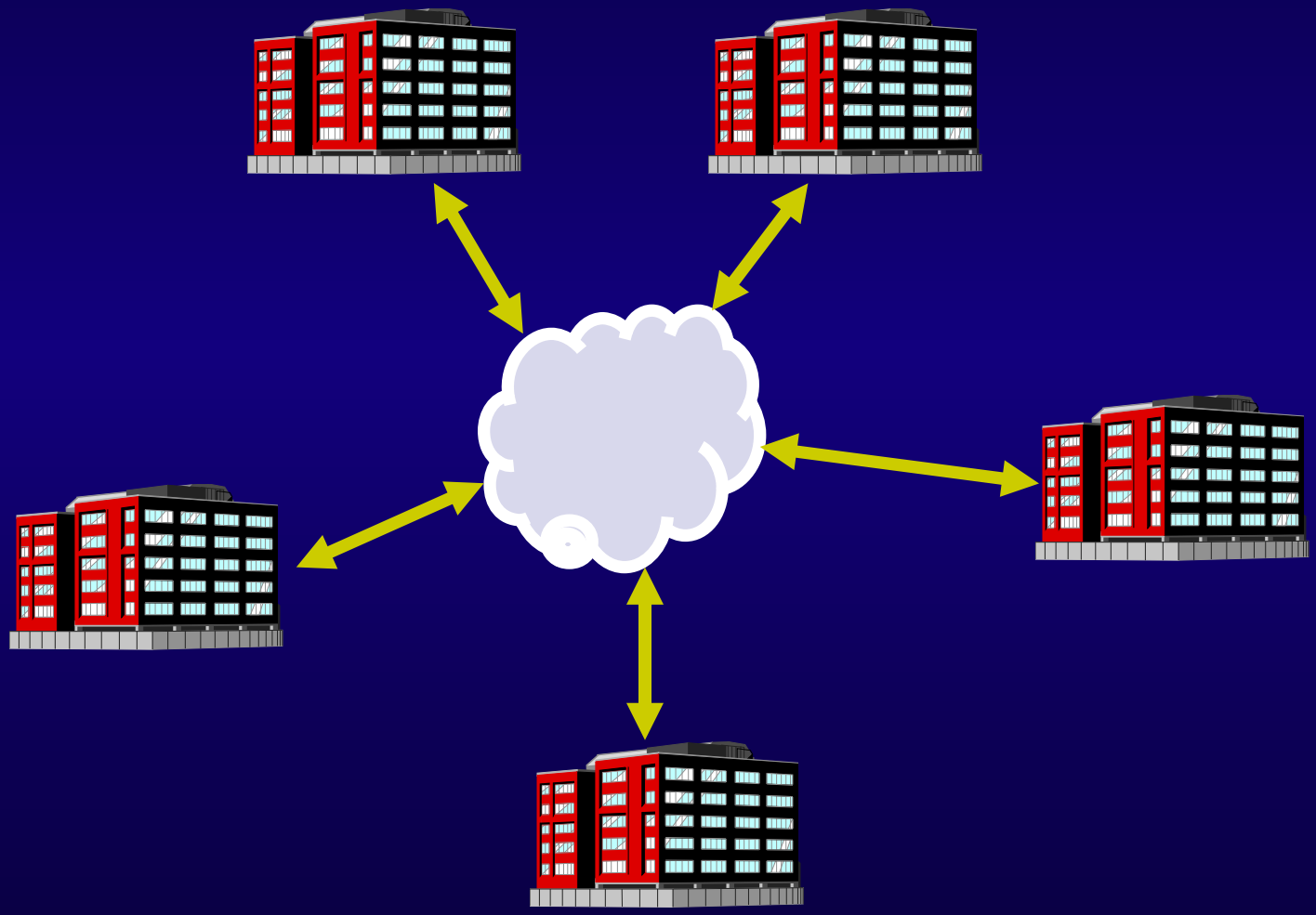
- Hypertext Transfer Protocol (HTTP)
- File Transfer Protocol (FTP)
- Transmission Control Protocol (TCP)
- Internet Protocol (IP)
- Simple Network Management Protocol (SNMP)



Without Standard: Many Interfaces Needed

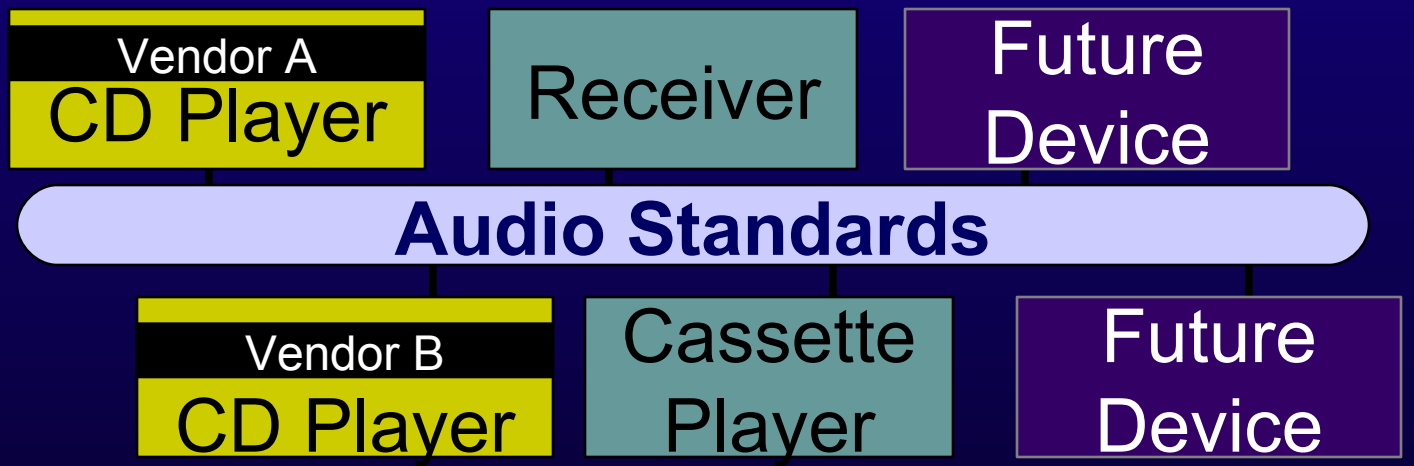


With Standard: Just one Interface



Open Standards Lead to...

- Interchangeability - multiple brands of a device on the same communications channel
- Interoperability - different types of devices on the same communications channel
- Expandability - add future devices



How do ITS Standards fit into the NYSDOT Project Development Process?

Agency's Perspective – What are the Issues?

- Integration of Systems across Institutional Boundaries
  - How does a region facilitate regional integration of systems?
- Transportation Planning / Project Scoping
  - How to define ITS projects that are in compliance with regional and not only agency-specific needs?
  - How to define ITS projects consistent with the regional ITS architecture?
  - What is the role of ITS architecture and standards in presenting high-level "solutions" to transportation needs and problems?

Agency's Perspective – What are the Issues?

- Design Report Development
  - How and where to address ITS Architecture and Standards?
  - How to evaluate ITS project design (solution) alternatives?
- Advanced Detail Plans (ADP) & Plans, Specifications & Estimates (PS&E)
  - How do you develop an ITS Standards-based specifications that reflect the final design?
- System Testing during Design and Build
  - Unit and/or Factory Testing of ITS Standards-based specifications
  - Field Testing
  - System Acceptance Testing

NYS DOT PROJECT DEVELOPMENT PROCESS

MODIFY LONG RANGE PLAN

LONG RANGE PLAN (LRP)

Sub-Area Planning

PREPARE INITIAL PROJECT PROPOSAL (IPP)

NYSDOT GOAL ORIENTED PROGRAM

Federal Aid Project or Air Quality Conformity Required?

YES

In Metropolitan Planning Organization Planning Area?

YES

NO

NO

PROBLEM IDENTIFICATION FROM LRP OR OTHER SOURCES

METROPOLITAN PLANNING ORGANIZATION
TRANSPORTATION IMPROVEMENT PROGRAM DEVELOPMENT PROCESS

CALL LETTER
Announcing the Start of the Update process for the Transportation Improvement Program

PUBLIC MEETING
Ground Rules Discussed and Subcommittees Created for Project Selection

PROJECT PROPOSAL SUBMITTAL
Subcommittees Begin to Meet

Subcommittees Review and Submit Prioritized Proposed Projects

CONFORMITY ANALYSIS (If Necessary)

CREATE DRAFT TRANSPORTATION IMPROVEMENT PROGRAM

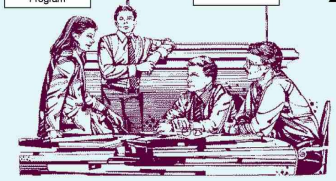
PUBLIC MEETING
Public Reviews and Comments on Draft Transportation Improvement Program

METROPOLITAN PLANNING ORGANIZATION APPROVAL OF TRANSPORTATION IMPROVEMENT PROGRAM?

NO

YES

Transportation Improvement Program



STATEWIDE TRANSPORTATION IMPROVEMENT PROGRAM

BEGIN PROJECT SCOPING

HOLD INITIAL MEETINGS AS NEEDED

NO

PLANNING CORRIDOR STUDY NEEDED?

YES

OBTAIN CONSULTANT (If Necessary)

BEGIN CORRIDOR STUDY

PUBLIC PARTICIPATION PROCESS:
Identify and Involve Affected Public,
Interested Parties,
Local Official and Parties
Hold Public Information Meetings
Conduct Interagency Coordination

TECHNICAL INVESTIGATION AND ALTERNATIVES DEVELOPMENT:
Transportation Physical Inventory
Existing and Future Social, Economic and Environmental Characteristics
Existing and Future Transportation Characteristics
Analysis of Existing and Future Conditions
Develop Alternatives and Evaluate Alternatives

DOCUMENTATION:
Technical Memorandum
Project Development Report
Corridor Study Report

BEGIN DESIGN PHASE I

PUBLIC INVOLVEMENT:
(As applicable)
National Environmental Policy Act Notice of Intent, Scoping Letters, Scoping Meeting, Public Information Meetings, and Meetings with Local Officials and Public Organizations/Groups

Continue Development of Feasible Alternatives

Prepare Draft Design Report/ Environmental Document

Assessment of Social, Economic and Environmental Effects. Including: Air Quality, Noise Study, Ground Water Quality, Surface Water Quality, Historic & Cultural Resources, Hazardous Waste, Parklands, Wetlands, Etc.

BEGIN DESIGN PHASE II (AS NEEDED)

AGENCY AND PUBLIC REVIEW OF DRAFT DESIGN REPORT /ENVIRONMENTAL DOCUMENT

BEGIN DESIGN PHASE III (AS NEEDED)

BEGIN DESIGN PHASE IV

PUBLIC HEARING NOTICES AND HOLD PUBLIC HEARING

MODIFY LRP AND TIP AS NEEDED

Assess Agency and Public Comments on Draft Design Report/ Environmental Document and from Public Hearing

Identify Preferred Alternative, Prepare Final Design Report/ Environmental Document

Make Final Assessment of Social, Economic and Environmental Effects, and Develop Mitigation Measures

FEDERAL HIGHWAY ADMINISTRATION OR NYSDOT GRANTS DESIGN APPROVAL

FHWA MAKES NEPA DETERMINATION AND NYSDOT MAKES SEQR DETERMINATION

MAKE FINAL DESIGN REPORT/ ENVIRONMENTAL DOCUMENT AVAILABLE

OBTAIN SCOPE CLOSURE

PREPARE FINAL EXPANDED PROJECT PROPOSAL

HOLD PUBLIC INFORMATION MEETING

NOTIFY COMMUNITY OF MEETING

HOLD PUBLIC INFORMATION MEETING?

NO

YES

OBTAIN DESIGN CONSULTANT (If Necessary)

PREPARE DRAFT EXPANDED PROJECT PROPOSAL

YES

NO

MODIFY LONG RANGE PLAN OR TRANSPORTATION IMPROVEMENT PROGRAM?

NO

PREPARE EXPANDED PROJECT PROPOSAL?

YES

NO

PREPARE DRAFT SCOPE SUMMARY MEMORANDUM

PREPARE FINAL SCOPE SUMMARY MEMORANDUM

USE SCOPE SUMMARY MEMORANDUM/ FINAL DESIGN REPORT?

YES

HOLD PUBLIC INFORMATION MEETINGS (AS NEEDED)

OBTAIN SCOPING AND DESIGN APPROVAL

COMPLY WITH STATE ENVIRONMENTAL QUALITY REVIEW & NATIONAL ENVIRONMENTAL POLICY ACT

BEGIN DESIGN PHASE V

RIGHT OF WAY NEGOTIATIONS AND AQUISITIONS

OBTAIN CONSTRUCTION INSPECTION CONSULTANT

OBTAIN PERMITS

Contract Review and Final Preparations, Possible Pre-Bid Meeting, Advertisement for Letting and Possible Amendments

APPROVE PRELIM. STRUCTURES PLANS

DEVELOP ADVANCE DETAIL PLANS

BEGIN DESIGN PHASE VI

PREPARE AND SUBMIT PLANS, SPECIFICATIONS AND ESTIMATES (P.S.&E)

Begin Construction Stage with Contract Letting and Award

CONSTRUCTION

CONTRACT ACCEPTANCE

To Facility Maintenance Operations

REV - 12-01

NYSDOT Project Development Process

- Initial Project Proposal (IPP)
- Transportation Improvement Program (TIP)
- Design Phase I
  - Project Scoping Report
- Design Phase IV
  - Preliminary Design Report
  - Detailed Design Report

NYSDOT Project Development Process

- Design Phase V
  - Advanced Detailed Plans
  - Plans, Specifications and Estimates (PS&E)
    - Test Plan
- Construction
  - Testing
- Contract Acceptance

Exercise # 2 – ITS Project Programming

Problem: Based on the Incident Scenario, program an ITS project.

Your Task: Determine the steps to program the project?

4. Develop an Initial Project Proposal
5. Outline the steps to incorporate the IPP into the TIP
6. Issue: Should an ITS project be checked for consistency with the Regional ITS Architecture as part of ITS Project Programming?

- Class discussion Time 15 minutes

Overview:
National and Regional ITS Architecture

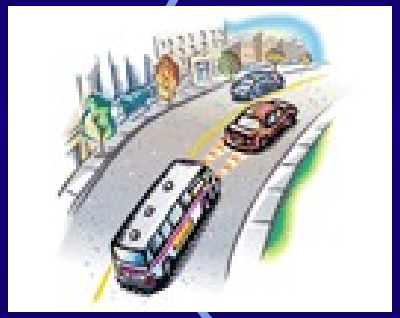
There are many technologies used in ITS Systems.

- Detection technology
- Surveillance (Video) technology
- Wireless technology
- Fiber optic technology
- Traffic control systems
- Work-zone management technology
- Tracking technology
- GIS/GPS technologies
- AVL technology
- E-ZPass technology
- Others.....

How do we *PLAN* to use and integrate these technologies in ITS?

Vehicle-Based/Safety

Management/Operation/HW-SW



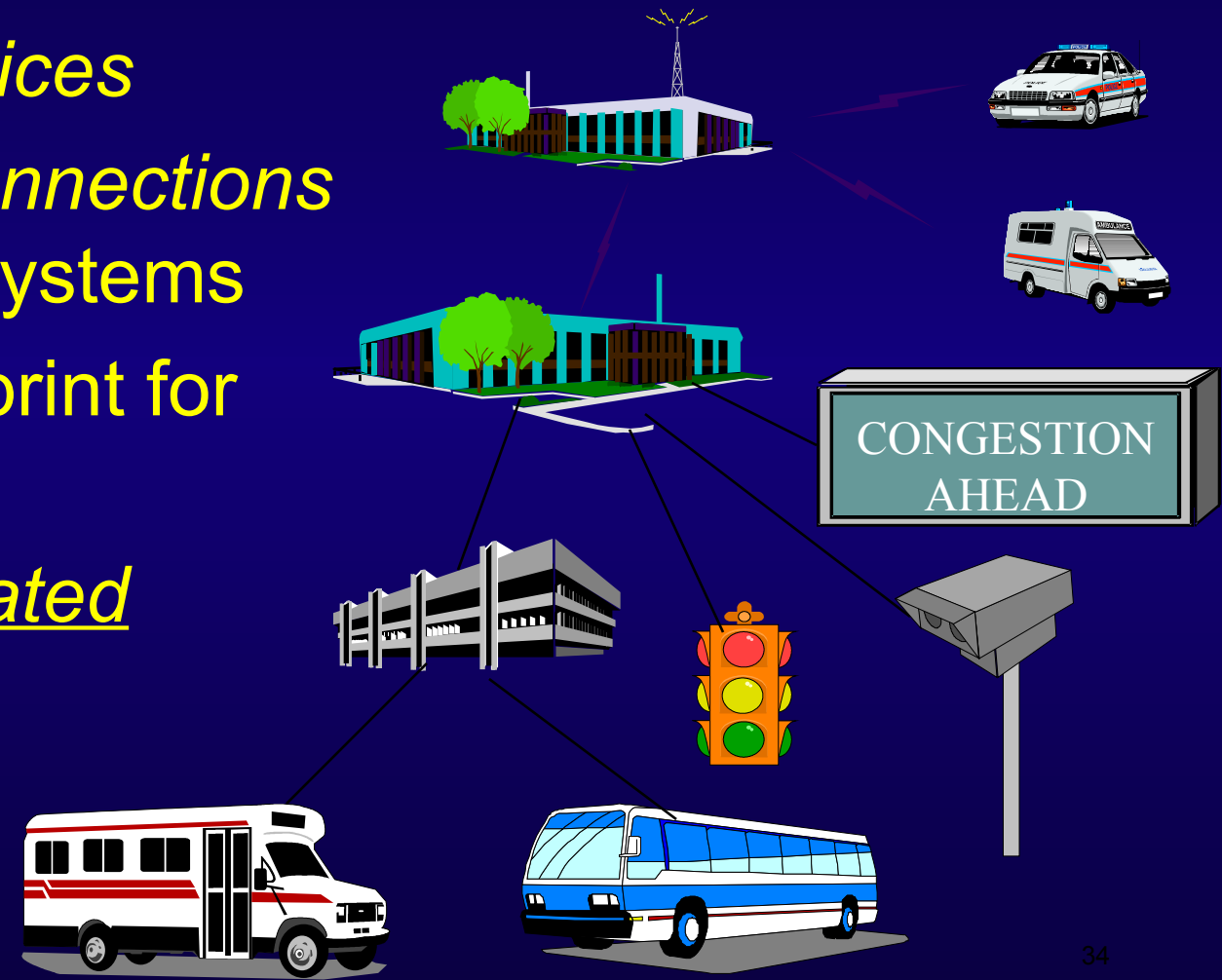
Vehicle-to-Vehicle

Vehicle-to-Roadside

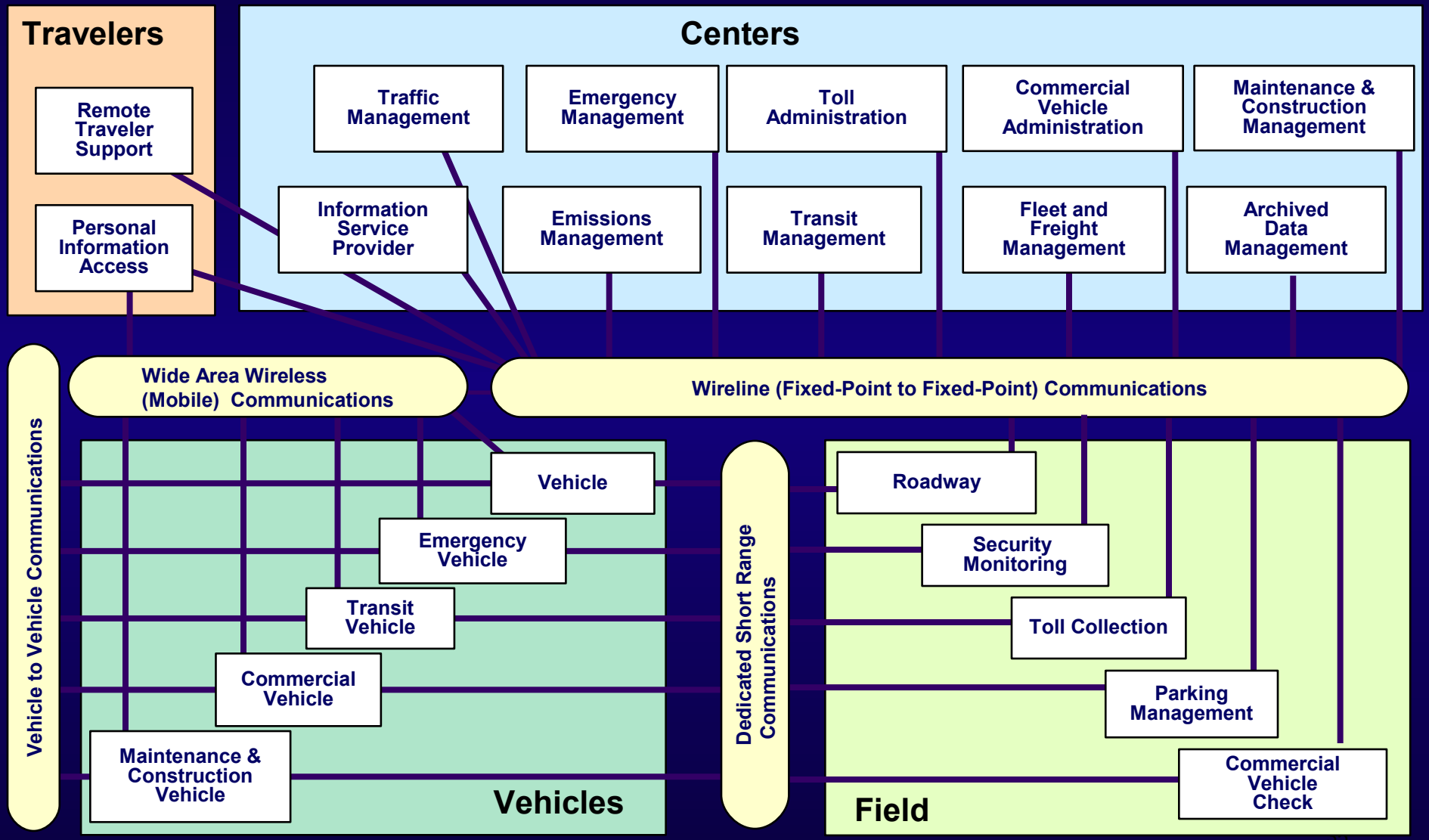
Vehicle-Based/Navigation

The National ITS Architecture is a Framework to Help:

- Describe *services*
- Define *interconnections* between subsystems
- Develop blueprint for *integration*
- Deploy *integrated* systems



National ITS Architecture
V 5.0 - “Sausage Diagram”



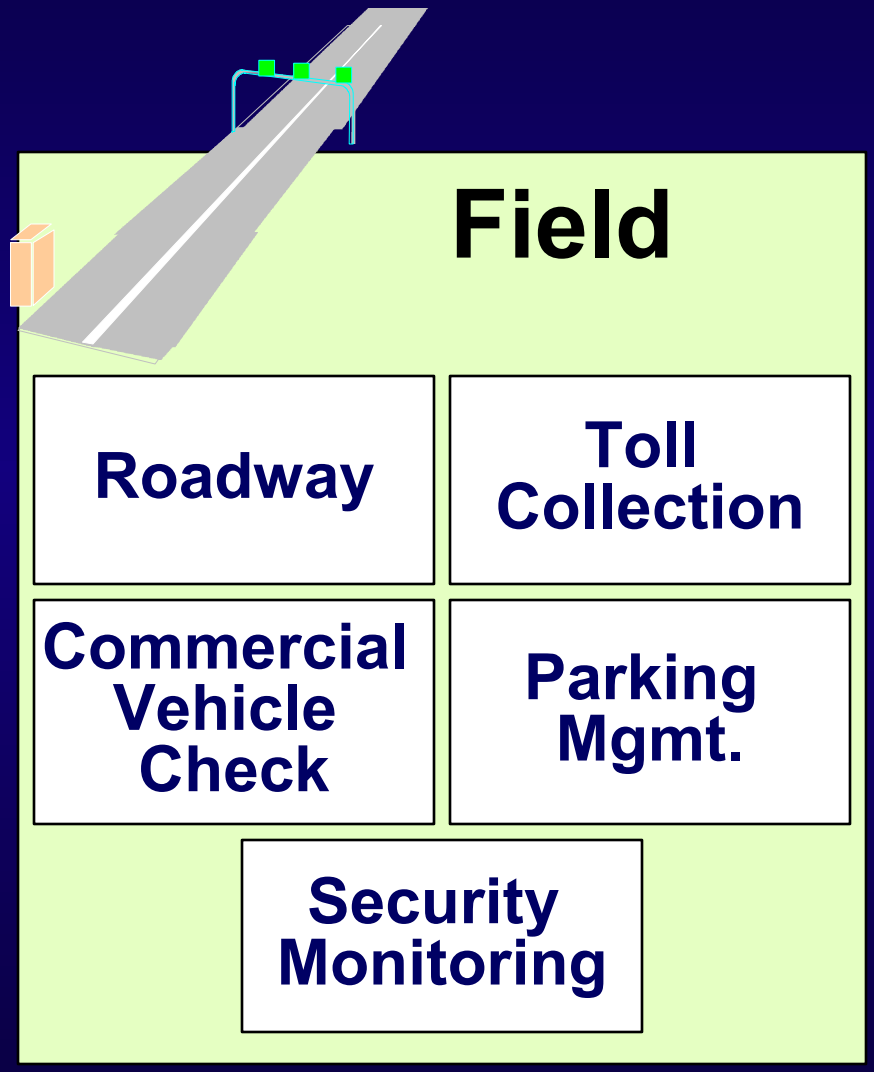
Center Subsystems

Centers

Traffic Management	Emergency Management	Toll Administration	Commercial Vehicle Administration	Maintenance & Construction Management
Information Service Provider	Emissions Management	Transit Management	Fleet and Freight Management	Archived Data Management

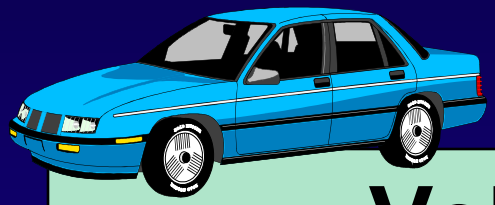
- Perform management and administration functions
- Coordinate with other Center Subsystems

Field Subsystems



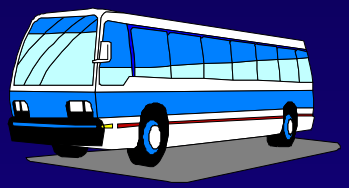
- *ITS* infrastructure
- *On* or *along* the transportation network
- Surveillance
- Control plans
- Supply information

Vehicle Subsystems



Vehicles

- Vehicle
- Transit Vehicle
- Emergency Vehicle
- Commercial Vehicle
- Maintenance & Construction Vehicle

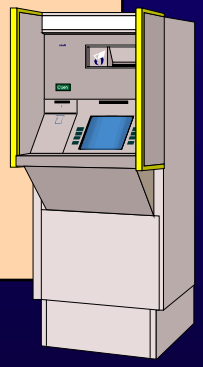


Traveler Subsystems

Travelers

Personal Information Access (PIAS)

Remote Traveler Support (RTS)



- Equipment To Access ITS Services
- PIAS represents “Personal” Devices
- RTS represents “Public” Devices

Regional ITS Architecture

- Is a planning tool for implementing ITS within a region
- Uses the National ITS Architecture as a template – borrowing concepts, functional requirements, information flows, etc.

… the National ITS Architecture is tailored to meet the needs of a region in the form of a Regional ITS Architecture

ice and Associates

ConSysTec Corp

LEGEND

National ITS Architecture Entity — No Regional Architecture Elements Map To National ITS Architecture

National ITS Architecture Entity — Regional Architecture Elements Map To National ITS Architecture

Information Service Provider Subsystem
CDTA Traveler Information System*
CDTA Webpage
NYSDOT Capital Region TMC Traveler Information System *
NYSDOT Web Page
NYSTA Web Page
Regional Cellular Telco Probe Service*
Thruway 800 number*
TRANSCOM RA Servers

Traffic Management Subsystem
City of Albany/City of Schenectady/Local TMC
NYSDOT Traffic Signal Control Servers
NYSDOT/ NYSP Capital Region TMC
NYSTA Division Traffic Office
NYSTA Thruway Statewide Operations Center (TSOC)
Other State/Regional TMCs*
Transmit Servers*

Emergency Management Subsystem
Capital State Police PSAP
County/City Emergency Operations Centers
Local Public Safety Dispatch
NYS Police Dispatch- COMSEC
NYSDOT HELP Program
NYSTA Thruway Statewide Operations Center (TSOC)
Private Mayday Providers Vehicle Emergency Systems
State Emergency Operations Center
Tow Dispatch

Transit Management Subsystem
CDTA Transit Dispatch
Local Transit Operations Centers
School Bus Dispatch-Private
School Bus Dispatch- Public

Maintenance & Construction Management
Local Dept of Public Works
NYSDOT Maintenance Residency
NYSDOT Regional Transportation Maintenance
NYSTA Lane Closure Reporting System*
NYSTA Operations and Maintenance Dispatch

Toll Administration
NYSTA E-ZPass Customer Service Center
NYSTA E-ZPass Service Center

Archived Data Management Subsystem
CDTA Transit Archive
Local Government Planning Department Archive
NYS DMV Accident Reporting System
NYSDOT Region 1 TMC Archive
NYSTA Traffic Data Systems Archive*

Remote Traveler Support Subsystem
CDTA Transit Kiosks*
TRANSCOM Kiosks*

Personal Information Access Subsystem
Private Traveler Personal Computing Devices

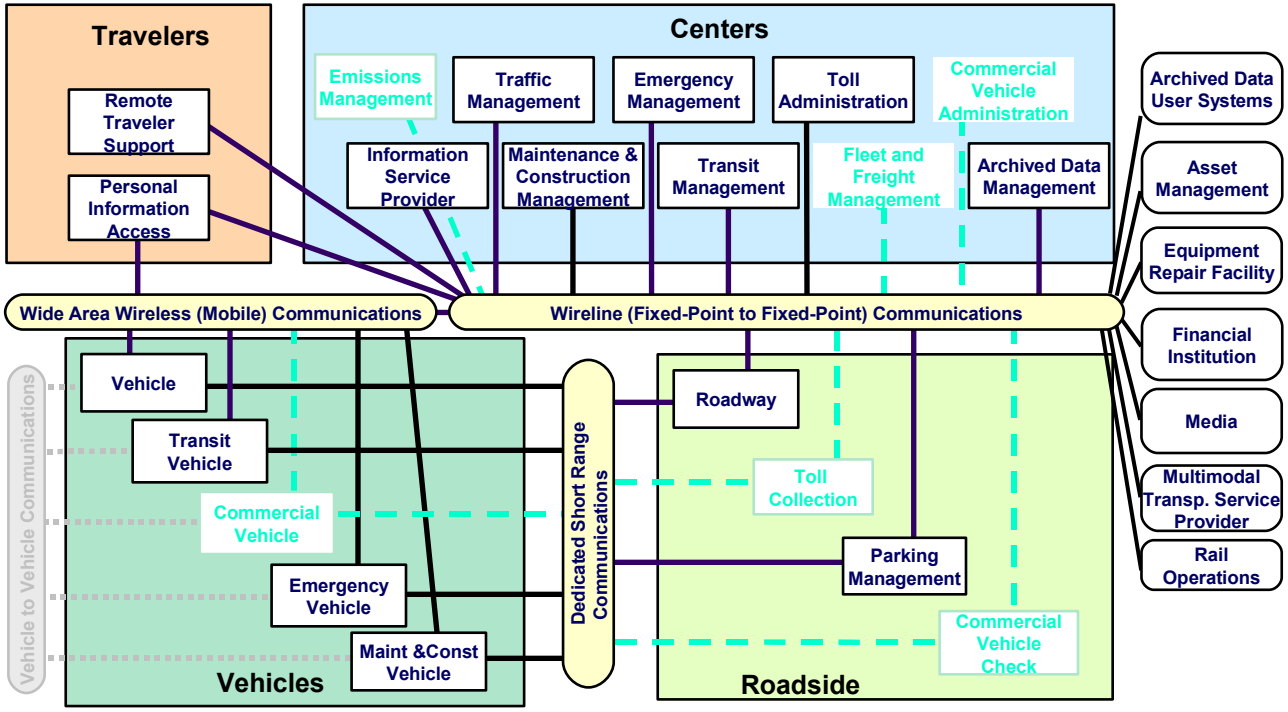
Traveler Card
E-ZPass II Tag*
E-ZPass Tag

Emergency Vehicle Subsystem
Local Public Safety Vehicles
MedFlight Helicopters
NYS Police Vehicles
NYSDOT HELP Truck

Maint & Const Vehicle Subsystem
Local Maintenance and Construction Vehicles
NYSDOT Maintenance and Construction Vehicles
NYSTA Maintenance and Construction Vehicles

Vehicle Subsystem
Private Vehicles

Transit Vehicle Subsystem
CDTA Supervisor's Vehicles
CDTA Transit Vehicles
Local Transit Vehicles



Archived Data User Systems
RPI

Asset Management
NYSDOT Bridge Management System

Equipment Repair Facility
Local DPW Repair Facility

Financial Institution
Financial Institutions

Media
Newspapers, Radio, Television Stations

Multimodal Transp. Service Provider
Albany International Airport

Rail Operations
Amtrak Passenger Train Terminal

Capital District, NY
Regional ITS Architecture

"Sausage Diagram"

Roadway Subsystem
City of Albany/City of Schenectady/Local Field Equipment
NYSDOT Field Equipment
NYSTA Field Equipment

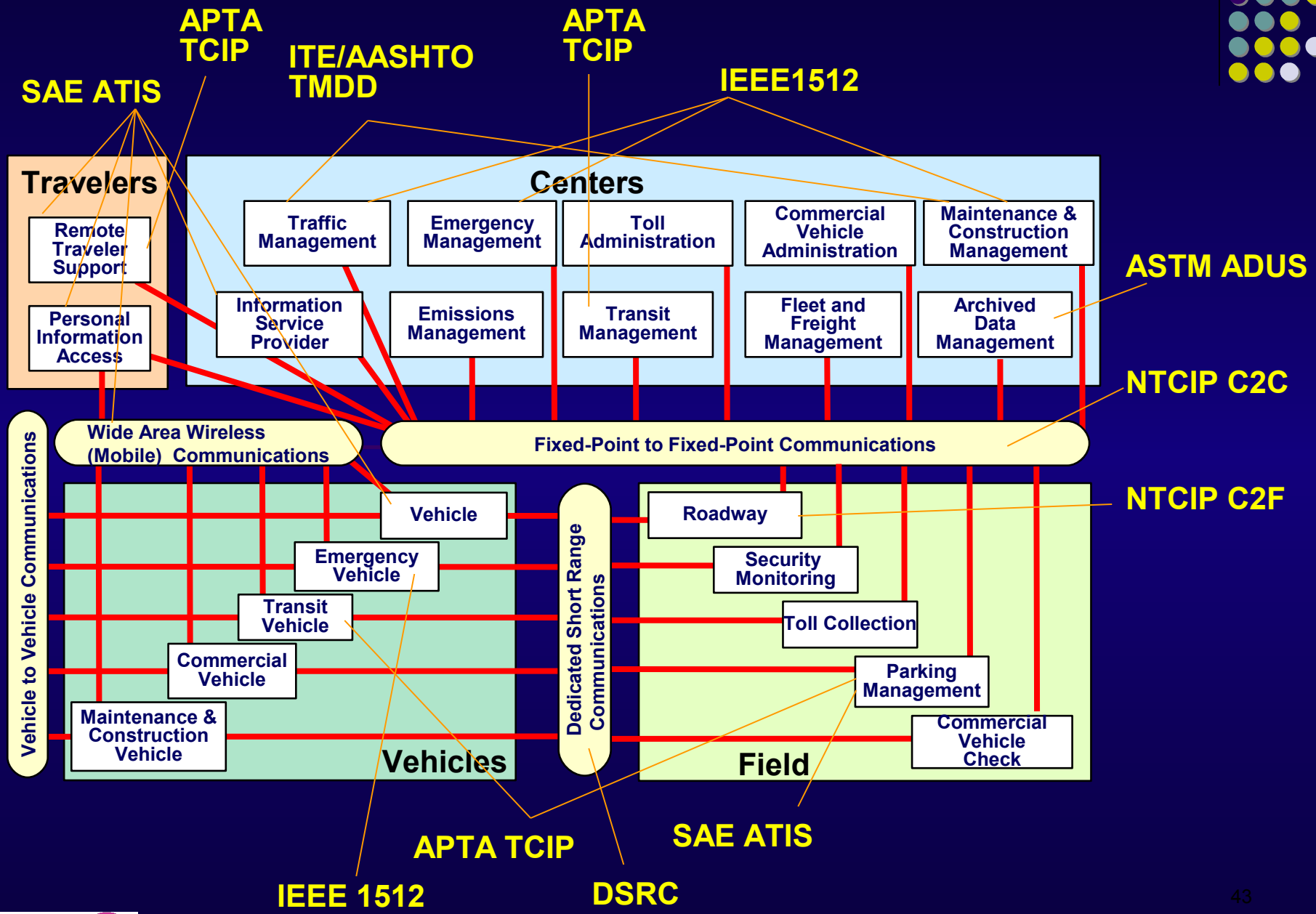
Parking Management Subsystem
Albany International Airport Parking Management System
CDTA Parking Management System*

* Elements are *planned*, not *existing*.

June 28, 2002

Recommendations:
Key ITS Standards

NYSDOT Key ITS Standards in relation to the National ITS Architecture



Acronyms used in Key ITS Standards

- SAE – Society of Automotive Engineers
  - ATIS - Advanced Traveler Information Systems
  - SAE J2354
- ITE - Institute of Transportation Engineers &

  AASHTO - American Association of State Highway Transportation Officials
  - TMDD – Advanced Traffic Management Systems Data Dictionary
- APTA - American Public Transportation Association
  - TCIP – Transit Communications Interface Profiles
- ASTM - American Society for Testing & Materials
  - ADUS – Archived Data Users Standard
- IEEE - Institute of Electrical and Electronics Engineers
  - IEEE 1512 Family of Standards for Incident Management
- NTCIP – National Transportation Communications for ITS Protocol
  - Joint NEMA - National Electrical Manufacturers Association, ITE, and AASHTO Standard
  - Center to Field Communications and Objects (Data Elements) for Traffic Control Devices
  - Center to Center Protocol

Range of Standards Reviewed

- Traffic Management (Center to Field)
  - NTCIP, Devices
  - NTCIP, Protocols
  - ATC Family (2070)
  - NEMA TS Standards
- Traffic Management (Center to Center)
  - TMDD
- Transit Management
  - TCIP Family
- Travel Information
  - SAE-ATIS
- Incident Management
  - IEEE 1512 Family
- Center to Center Protocols
  - DATEX
  - XML
- Other Standards
  - DSRC (**)
  - ADUS (*)
  - CVO (*)

Hardware

Data Elements

Messages

Protocols

* Question: ADUS & CVO Standards

** Regional DSRC – E-ZPass

Review of Criteria for Selecting Key ITS Standards

- Applicability to NYSDOT and NYS ITS systems, existing and planned
- Maturity of the standard
- National and NYS project experience with implementation of the ITS standards

Exercise #3

Exercise # 3 – ITS Project Scope, Requirements and Design

Problem: Based on the Incident Scenario, create an ITS project to implement the Center-To-Field and Center-To-Center aspects.

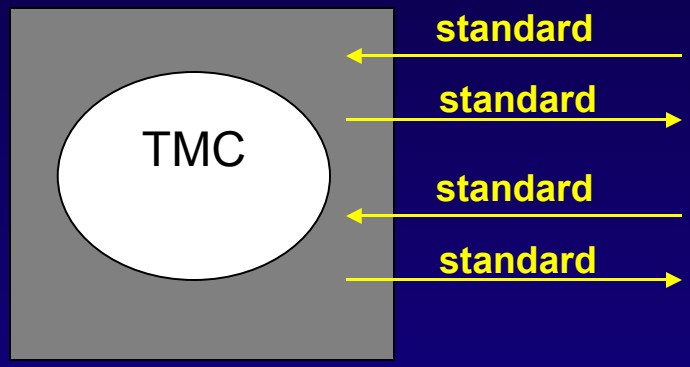
Your Task: Determine the following:

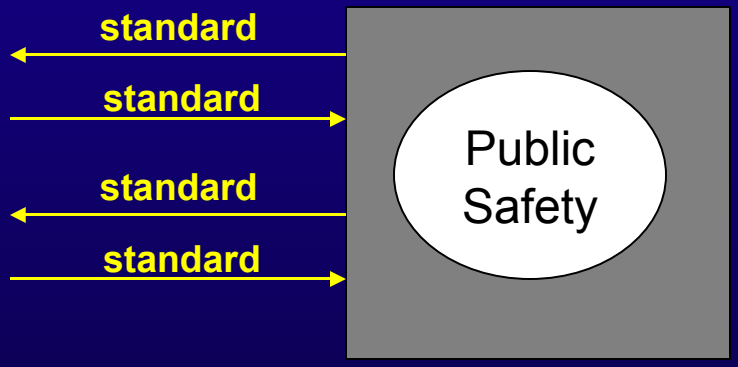
4. Track the steps to build the project?
5. Identify and analyze applicable ITS standards for your project.
6. Label your drawing from Ex. #1 with applicable ITS standards.

- Class discussion Time 15 minutes

Exercise # 3 – ITS Project Scope, Requirements and Design

Discussion for Center to Center



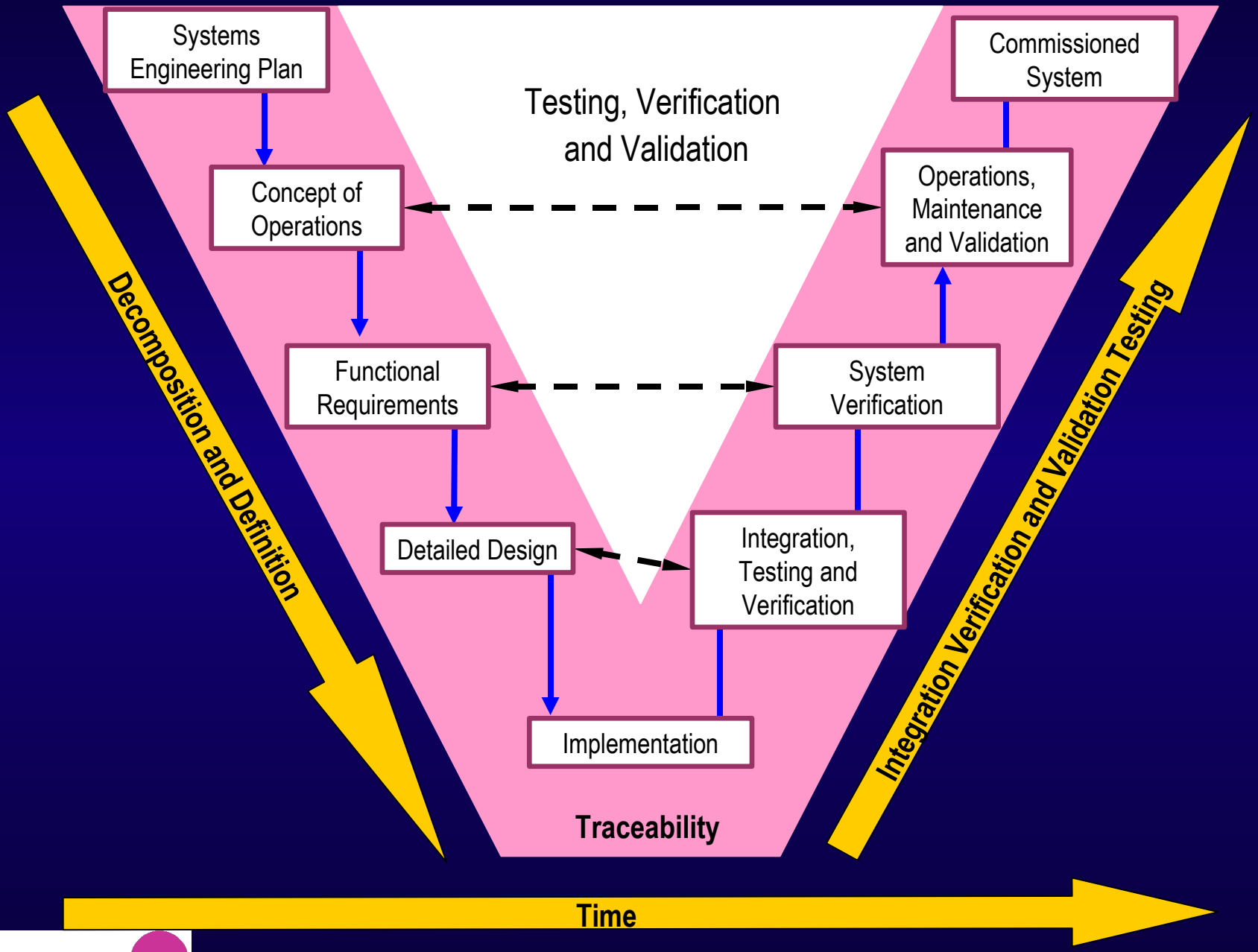


Overview:
Systems Engineering Process

What is a systems engineering process (SEP)?

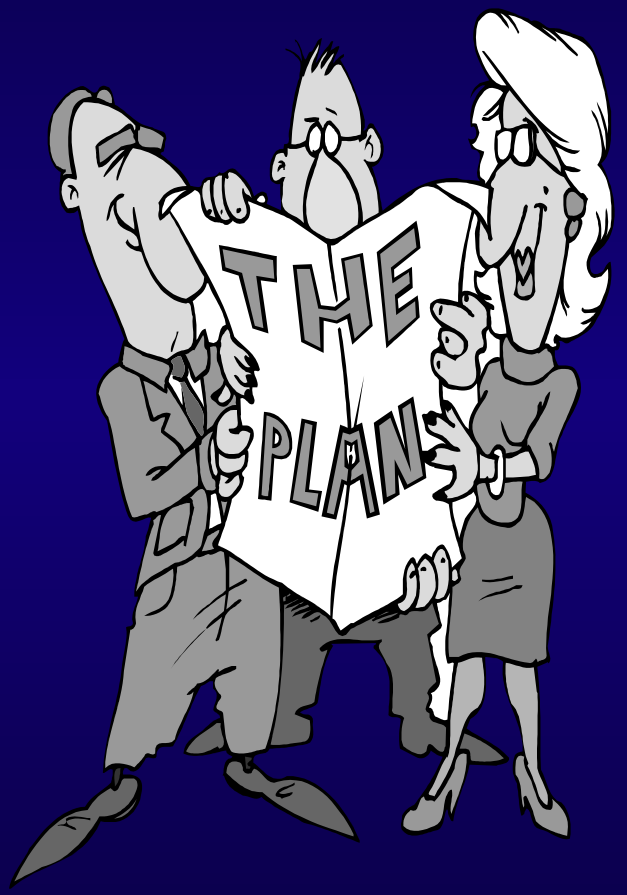
- A structured way of thinking...
  - Allows us to build systems based on our needs with reliability and stability.
  - We can trace engineering decisions back to user needs.
  - It improves chances of system development on time and within budget.

Systems Engineering Process Model



Concept of Operations (ConOps)

- The concept of operations is a document that defines the environment in which the system is to operate.
- The Environment:
  - Relationships between system and Agency's responsibilities
  - Physical environment
  - Expectations



Functional Requirements & Design

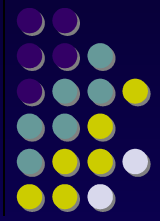
Functional Requirements
"What the system will do."

System Design
"How the system will do it.

Specifications

To meet my agency's needs, I need a system that will perform these stated functions...

System Integration and Testing



- Testing
- Acceptance Procedures

- Application Software
- Standards-Protocols

- Hardware Components
- Component Software

Recommendations:
“Best Practices for ITS Standards Specifications”

Systems Engineering and the NYSDOT Project Development Process

Project Systems Engineering Analysis Report
- list of 7 items to help guide the systems engineering process

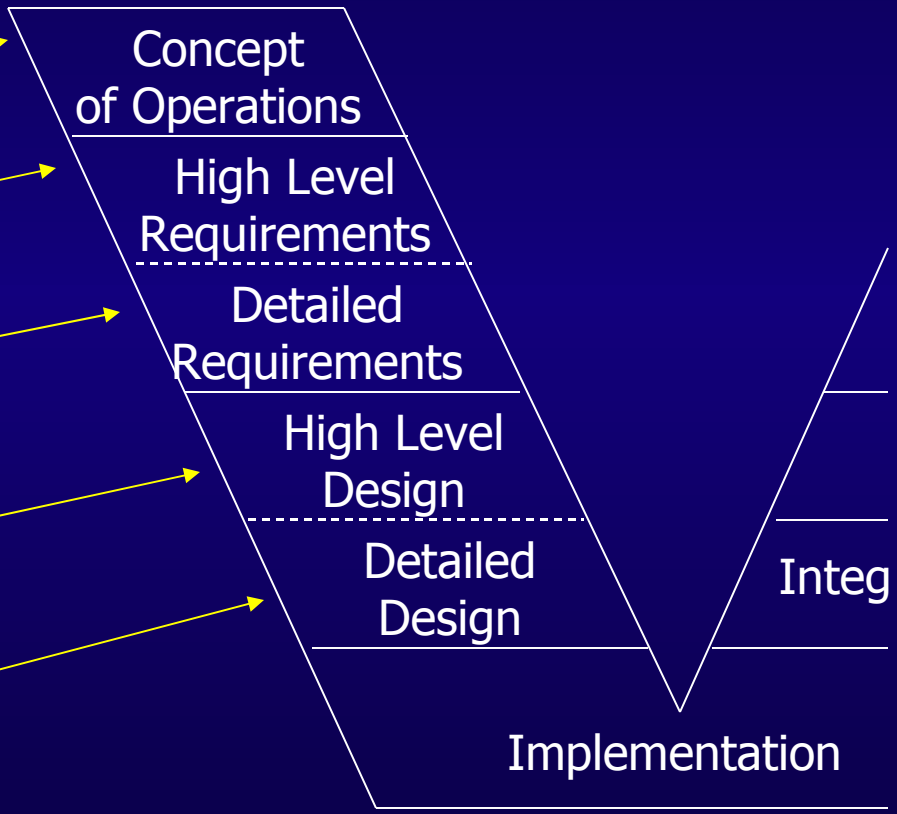
Concept of Operations Report

Design Phase IV (Preliminary Design Report)

Design Phase IV (Detailed Design Report)

Design Phase V (Advanced Detailed Plans)

Design Phase V (Plans, Specs, & Estimates)



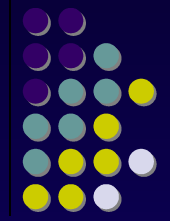
The VEE does not show project programming steps including: TIP, Regional ITS Architecture, IPP, and Project Scoping.

Level of Detail for ITS Standards for Project Programming Steps

- Project Programming Steps
  - Regional ITS Architecture
    - List of ITS standards applicable for implementation of an architecture flow
  - Initial Project Proposal (IPP)
  - Project Scoping (based on Appendix on Project Scoping of Project Development Manual)
    - List of ITS standards that may be considered for implementation

Recommendations: Project Systems Engineering Analysis (PSEA)

NYSDOT Project Systems Engineering Analysis



Includes the following:

1. Implement a “portion” of the regional architecture being implemented
2. Agree on roles and responsibilities by participating and affected agencies
3. Define the functional requirements
4. Identify alternative communications infrastructure and configurations
5. Identify applicable ITS standards and testing procedures
6. Identify procurement options
7. Develop procedures and implement resources necessary for operations and management of the system

An example is provided in the “Best Practices Report”

The list is based on FHWA Rule/FTA Policy on systems engineering analysis

Example

- Example ITS Project
  - The NYC Freeway Expansion Project is a freeway management project focused on the deployment of communications and ITS field equipment. The field equipment will be integrated into a central software system located at the New York City Joint TMC. The development of the New York City Joint TMC (with its central system) and any center to center communications to connect the TOC to other centers are not considered a part of this project for this example.

1) Portions of Regional ITS Architecture Being Implemented

Remote Traveler Support
- AMTRAK/LIRR/NJ Transit Penn Station Information Displays
- Long Island Transit Operators Customer Info Systems
- Mid Hudson South Transit Operators Customer Info Systems
- MTA LIRR Customer Info Systems
- MTA LIRR Fare Point of Sale
- MTA LIRR Security Equipment
- MTA LIB Customer Info Systems
- MTA LIB Fare POS
- MTA LIB Security Equip
- MTA MNR Customer Info Sys
- MTA MNR Fare Point of Sale
- MTA MNR Security Equipment
- MTA NYCT Bus Security Equipment
- MTA NYCT Customer Info Systems
- MTA NYCT Fare Point of Sale
- MTA NYCT Subway Security Equip
- MTA Regional Transit Fare POS
- NYC DOITT Kiosks
- NYCDOT Division of Ferry Operations Customer Info Systems
- NYCDOT Franchise Bus Info Sys.
- PANYNJ Airports In-Terminal Customer Information Systems
- PANYNJ Bus Terminals/Stations In-Terminal Customer Info Systems
- PANYNJ PATH Fare Point of Sale
- PANYNJ PATH PATHVISION
- TRANSCOM Kiosks
- WC Bee Line Customer Info Sys.

Personal Information Access
- Private Travelers Computing Dev
- TRANSCOM Mobile Comm Devices
- TRIPS123 Subscriber Systems

Transit Vehicle
- Long Island Transit Operators Veh
- Mid Hudson South Transit Operators Vehicles
- MTA LIRR Trains
- MTA LIB Buses
- MTA LIB Paratransit Buses
- MTA MNR Trains
- MTA MetroCard Reader
- MTA NYCT Buses
- MTA NYCT Staten Is. Railway Veh
- MTA NYCT Subway Vehicles
- NYCDOT Ferry Operations Ferries
- NYCDOT Franchise Buses/AVL
- PANYNJ PATH Transit Vehicles
- Private Long-Distance Bus Buses
- Private Paratransit Vehicles
- WC Bee Line Buses
- WC Bee Line Paratransit Vehicles

Vehicle
- Private Travelers Vehicles

Emergency Management (1)
- AMTRAK Emergency Dispatch
- FDNY Fire/EMS Dispatch
- MTA NYCT Security
- MTA Police Dispatch / Command Center
- Municipal/County EOCs
- Municipal/County Public Safety Dispatch
- NYCDEP Dispatch Center

Archived Data Management
- Hudson Valley Traveler ITS Operators Operational DB
- Long Island ITS Operators Operational DB
- MTA B/T, Bus, and Rail ITS Archives
- NYC ITS Operators ITS Archive
- NYMTC Member Agencies Data Collection Systems
- NYMTC/DCP Regional Planning Database
- NYSDMV Accident Reporting Sys.
- NYSDOT Accident Reporting Sys.
- TRANSCOM Archived Data System

Fleet and Freight Management
- PANYNJ Port Commerce CARGO*MATE
- Private Commercial Vehicle and Fleet Dispatch
- Private Terminal Operators Systems

Emergency Vehicle Subsystem
- FDNY EMS Vehicles
- FDNY Fire Vehicles
- MTA Bridges/Tunnels Emergency and Maintenance Vehicles
- MTA Bridges/Tunnels OCCC Special Operations Vehicles
- MTA NYCT Bus Depot Road Service Trucks
- MTA Police Vehicles
- Municipal/County Public Safety Veh.
- NYCDOT OER Emergency Vehicles
- NYCOEMWatch Command Veh.
- NYPD Vehicles
- NYS Police Vehicles
- NYSDOT/NYPD Help Vehicles
- PANYNJ Tunnels/Bridges/Terminals Emergency Response Vehicles

Commercial Vehicle
- Private Commercial and Fleet Vehicles

Maintenance & Const Vehicle
- MTA Bridges/Tunnels Emergency and Maintenance Vehicles
- Municipal/County PWD Vehicles
- NYCDOS Vehicles
- NYCDOT Maintenance Vehicles
- NYSDOT Maintenance Vehicles
- PANYNJ Tunnels/Bridges/Terminals Maintenance Vehicles

Emergency Management (2)
- NYCDOT Office of Emergency Response
- NYCOEMWatch Command Center
- NYPD 911 Communications Center Dispatch
- NYPD Dispatch
- NYPD Operations
- NYPD TMC
- NYPD Transit Bureau
- NYS Police Dispatch
- NYSDEC Systems
- PANYNJ PAPD 211 Communications Center Dispatch
- State EOCs

Toll Administration
- E-ZPass CSC
- E-ZPass Reciprocity Network

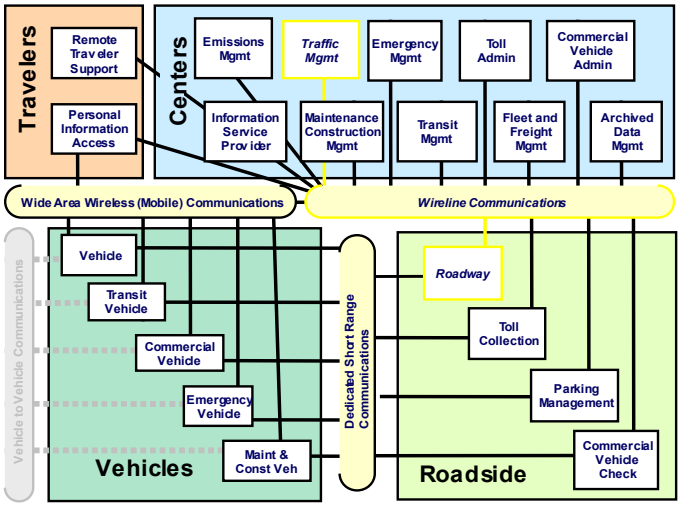
New York City Sub Regional ITS Architecture
"Sausage Diagram"
(LIE Expansion Project Elements Highlighted)

Information Service Provider (1)
- Agency Run Traveler Info Systems
- E-ZPass CSC Web Site
- MTA Bridges/Tunnels Public Relations Office
- MTA Bridges/Tunnels Web Site
- MTA LIRR Customer Info Center
- MTA LIRR Web Site
- MTA LIB Customer Info Center
- MTA LIB Web Site
- MTA MNR Customer Info Center
- MTA MNR Web Site
- MTA NYCT Customer Info Center
- MTA NYCT Web Site
- New York State Emergency Road Reporting System
- NYCDOT Bus Franchise Website

Information Service Provider (2)
- NYCDOT Bus Franchise Operators Website
- NYCDOT Traveler Info Web Site
- NYCDOT/DCP Parking Info System
- NYSDOT Traveler Info Systems
- PANYNJ PATH Web Site
- PANYNJ Port Commerce CARGO*MATE Web Site
- PANYNJ Port Commerce FIRST Web Site
- PANYNJ Traveler Info Systems
- Private ISPs
- TRANSCOM RA Servers
- TRIPS123
- WC Bee Line Traveler Info System
- WC Bee Line Web Site

Maintenance & Construction Management
- Municipal/County PWD Operations
- NYCDOS Dispatch
- NYCDOT Bridge Maintenance
- NYCDOT OCMC
- NYCDOT Street and Arterial Maintenance Division
- NYS Bridge Authority Mid Hudson Bridges Maintenance
- NYSDOT Construction Operations
- NYSDOT Maintenance Ops
- PANYNJ Tunnels/Bridges/Terminals Maintenance Unit

Emissions Management
- NYCDEP Office of Environmental Analysis



Parking Management Subsystem
- E-ZPass Plus Systems
- MTA MNR Parking Facilities
- NYCDOT Parking Facilities
- NYCDOT/DCP Parking Facilities
- NYCDOT/DCP Parking Info System
- Public & Private Park and Ride Sys.

Toll Collection
- E-ZPass Plus Systems
- MTA Bridges/Tunnels Facility Toll Collection Equipment
- NYS Bridge Authority Mid Hudson Bridges Toll
- NYSTA Toll Collection Equipment
- PANYNJ Airports Vehicle Identification Systems
- PANYNJ Tunnels/Bridges/Terminals Electronic Toll Collection Equipment

Roadway Subsystem
- Long Island Municipal/County Field Equipment
- Mid Hudson South Municipal/County Field Equipment
- MTA Bridges/Tunnels Facility Field Equipment
- MTA Bridges/Tunnels Lift Span Control System
- MTA Bridges/Tunnels Security Equipment
- MTA LIRR Drawbridge Control Sys
- MTA MNR Drawbridge Control Sys
- NYCDEP Environmental Monitoring Stations
- NYCDOT Drawbridge Control Sys
- NYCDOT Field Equipment

Roadway Subsystem
- NYSDOT R8 Field Equipment
- NYSDOT R10 Field Equipment
- ***NYSDOTR11 Field Equipment***
- PANYNJ Airports Field Equipment
- PANYNJ Bus Terminals/Stations Field Equipment
- PANYNJ PATH Vehicle Detection System
- PANYNJ Port Commerce Field Equipment
- PANYNJ Tunnels/Bridges/Terminals Field Equipment
- Private Terminal Operators Roadside Tag Readers
- TRANSMIT Agencies Field Equip.

Commercial Vehicle Admin
- MTA Bridges/Tunnels Engineers Office
- MTA Bridges/Tunnels Facility Operations Center
- MTA Bridges/Tunnels OCCC
- NYC DEP HAZMAT Permitting
- NYCDOT Commercial Vehicle Permits Office
- PANYNJ Port Commerce CARGO*MATE
- PANYNJ Port Commerce Credentialing Back Office (SEALINK)
- PANYNJ Port Commerce Operations Centers
- PANYNJ Tunnels/Bridges/Terminals Communications Desk/Operations Center
- Private Terminal Operators Systems

Traffic Management Subsystem
- I-95 CC Information Exchange Network
- Long Island Municipal/County Local TOCs
- Mid Hudson South Municipal/County Local TMCs
- MTA Bridges/Tunnels Facility Operations Center
- MTA Bridges/Tunnels OCCC
- ***New York City Joint TMC***
- NYCDOT Drawbridge Control Booths
- NYS Bridge Authority Mid Hudson Bridges
- NYSDOT R10 INFORM
- NYSDOT R8 Hudson Valley Traveler TOC
- NYSDOT Statewide IEN
- NYSTA TSOC
- PANYNJ Airports Communications Desk/Ops Center
- PANYNJ Port Commerce Ops Centers
- PANYNJ TB&T Communications Desk/Ops Center
- TRANSCOM IRVN Server
- TRANSCOM Other Member / Non-Member Agencies Systems
- TRANSCOM RA Servers
- TRANSCOM Regional Architecture Workstations
- TRANSCOM TRANSMIT Server
- TRANSMIT Agencies TRANSMIT Servers

Commercial Vehicle Check
- MTA Bridges/Tunnels Facility Commercial Vehicle Check
- PANYNJ Port Commerce Terminal Access Equipment
- PANYNJ Tunnels/Bridges/Terminals Commercial Vehicle Check
- Private Terminal Operators Roadside Tag Readers

Transit Management Subsystem
- Long Island Transit Operators Maintenance
- Long Island Transit Operators Systems
- Mid Hudson South Transit Operators Maintenance Facilities
- Mid Hudson South Transit Operators Systems
- MTA Agencies Transit Maintenance
- MTA LIRR Fare Mgmt System
- MTA LIRR Maintenance Yards
- MTA LIRR Operations Center
- MTA LIB Depot / Garage
- MTA LIB Fare Mgmt System
- MTA LIB Fixed Route Bus Ops
- MTA LIB Paratransit Operations
- MTA MNR Fare Mgmt System
- MTA MNR Maintenance Yards
- MTA MNR Operations Center Sys.
- MTA MetroCard Fare Mgmt System
- MTA NYCT Bus Command Center – Operations
- MTA NYCT Bus Depot Central Road Operations
- MTA NYCT Bus Depot Central Road Service Unit
- MTA NYCT Customer Info Center
- MTA NYCT Fare Mgmt System
- MTA NYCT Paratransit Command
- MTA NYCT Service Planning
- MTA NYCT Staten Island Railway Control Facility
- MTA NYCT Subway Rail Control Center
- MTA NYCT Subway Yard
- MTA NYCT Transit Bus Depot Maintenance
- NJT Bus Operations Systems
- NJT Fare Mgmt System
- NJT Rail Operations Systems
- NYCDOT (Franchise Bus) Systems
- NYCDOT Division of Ferry Operations Systems
- NYCDOT Franchise Bus Operators Systems
- PANYNJ Airports AirTrain Ops
- PANYNJ Airports Communications Desk/Operations Center
- PANYNJ Bus Terminals/Stations Communications Desk/Ops Center
- PANYNJ PATH Fare Mgmt System
- PANYNJ PATH Operations Center
- PANYNJ PATH Vehicle Maint
- Private Ferry Operators Systems
- Private Long-Distance Bus Ops
- Private Paratransit Operators
- Regional Transit Fare Reciprocity
- TRANSCOM Other Member / Non-Member Agencies Systems
- TRIPS123
- WC Bee Line Fare Mgmt System
- WC Bee Line Operations Center
- WC Bee Line Transit Maintenance

August 19, 2004.

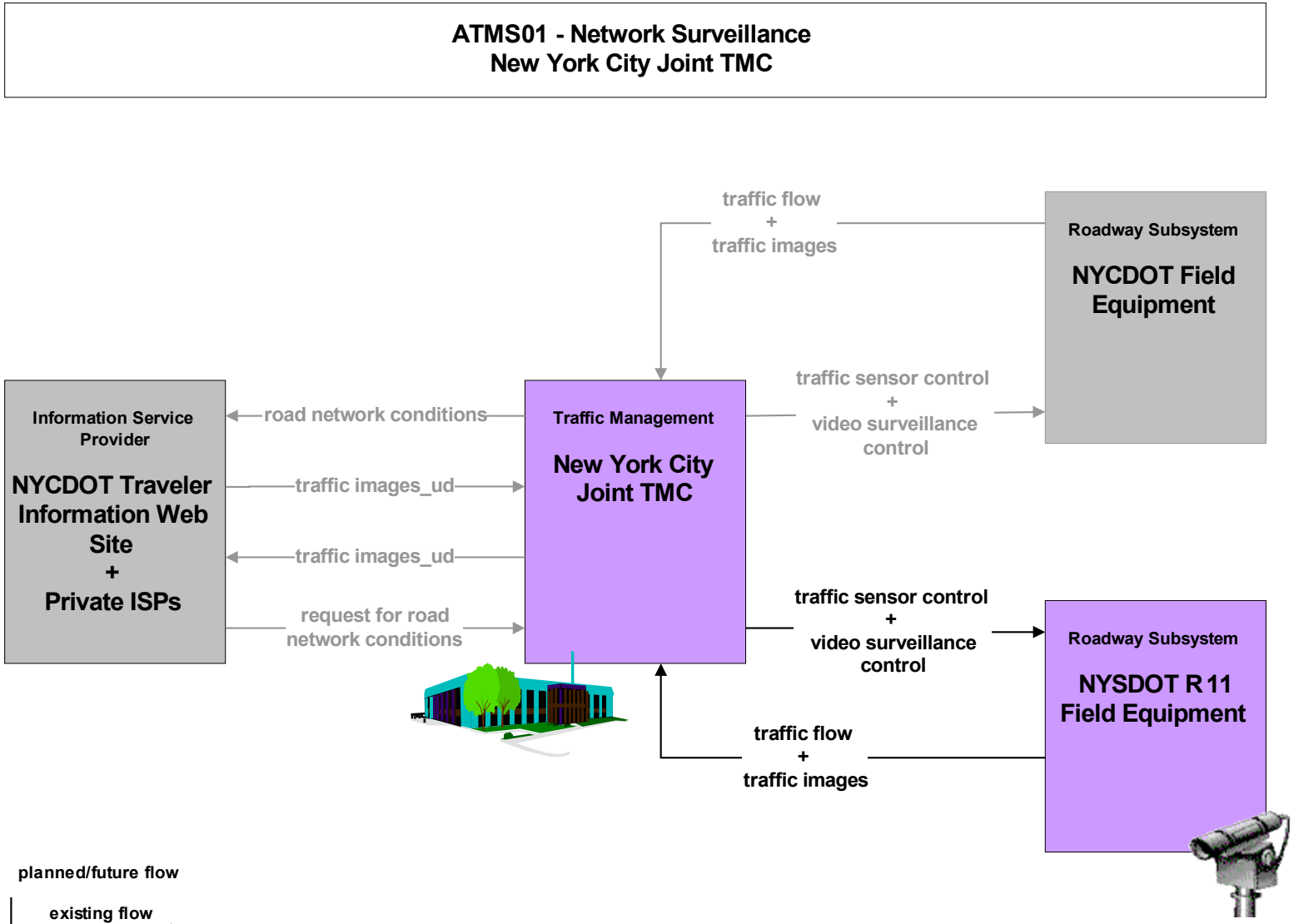
Portions of Regional ITS Architecture Being Implemented – ITS Elements

Project ITS Element	National ITS Architecture Subsystem
New York City Joint TMC	Traffic Management Emergency Management
NYSDOT R11 Field Equipment	Roadway Subsystem

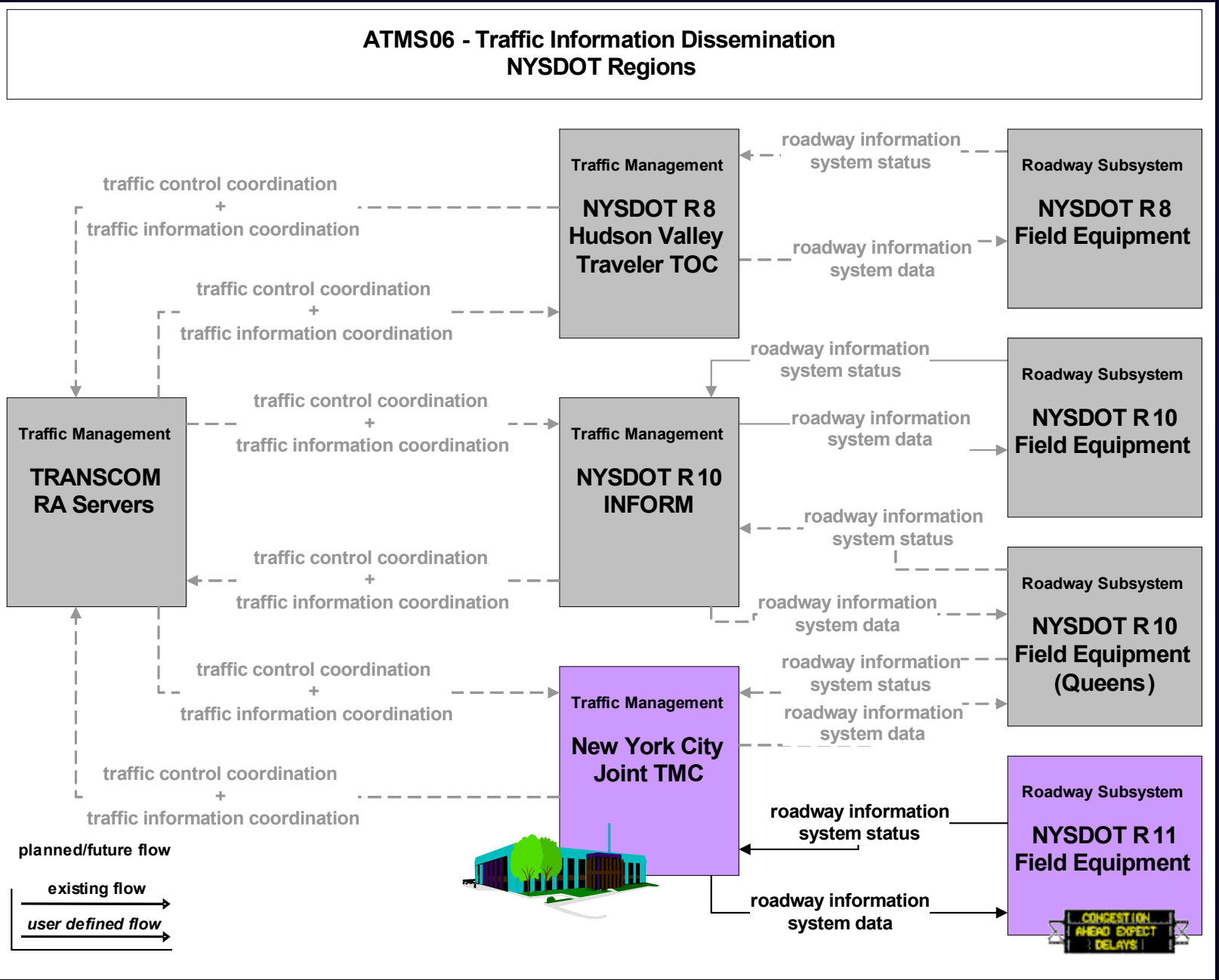
Portions of Regional ITS Architecture Being Implemented - Market Package Identification

Market Package Diagram	MP Name	Applicable ITS Project Elements
ATMS01-3	Network Surveillance – New York City Joint TMC	New York City Joint TMC, NYSDOT R11 Field Equipment
ATMS04-1	Freeway Control – NYSDOT R8/R10/R11	New York City Joint TMC, NYSDOT R11 Field Equipment
ATMS06-09	Traffic Information Dissemination – NYSDOT Regions	New York City Joint TMC, NYSDOT R11 Field Equipment

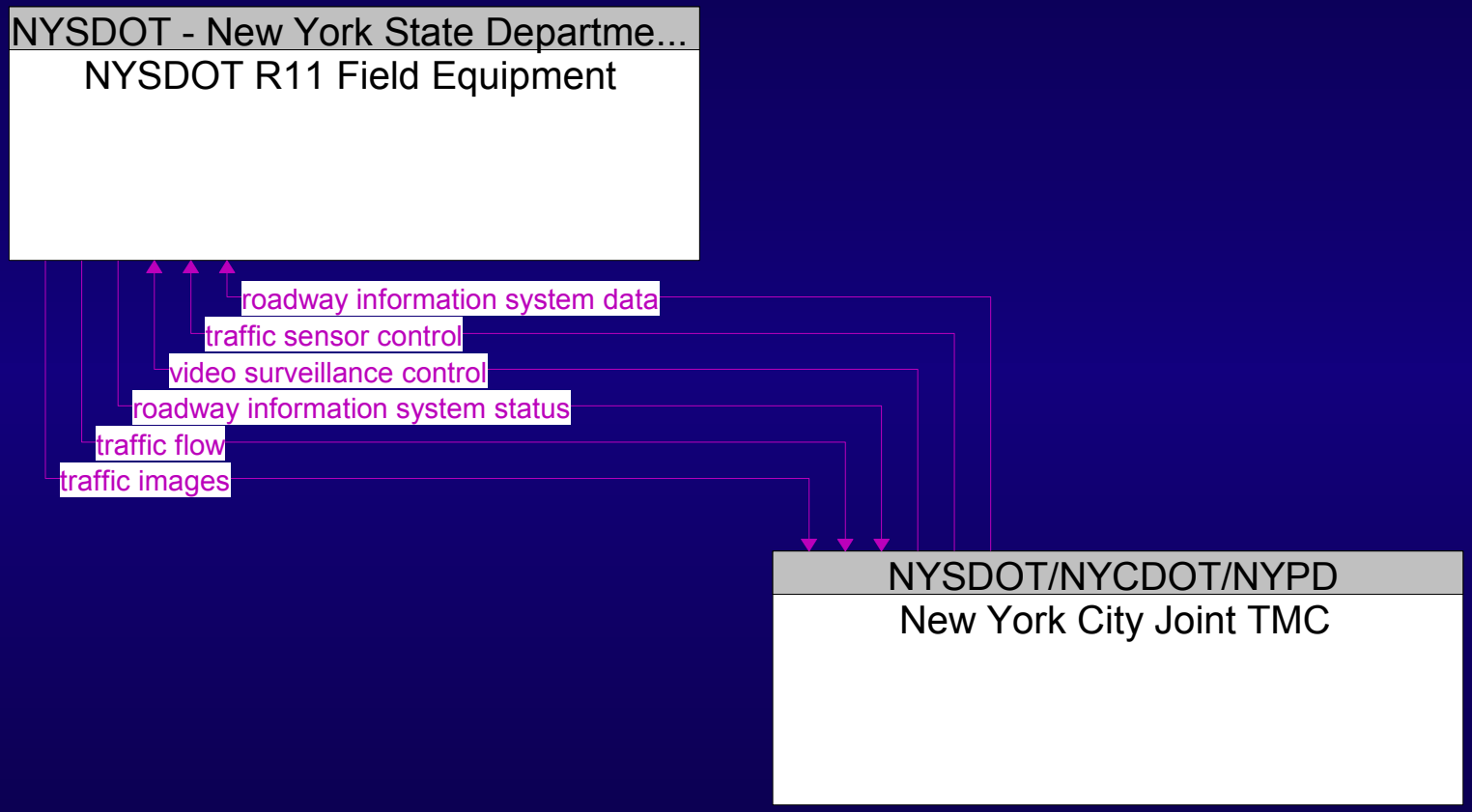
Portions of Regional ITS Architecture Being Implemented



Portions of Regional ITS Architecture Being Implemented

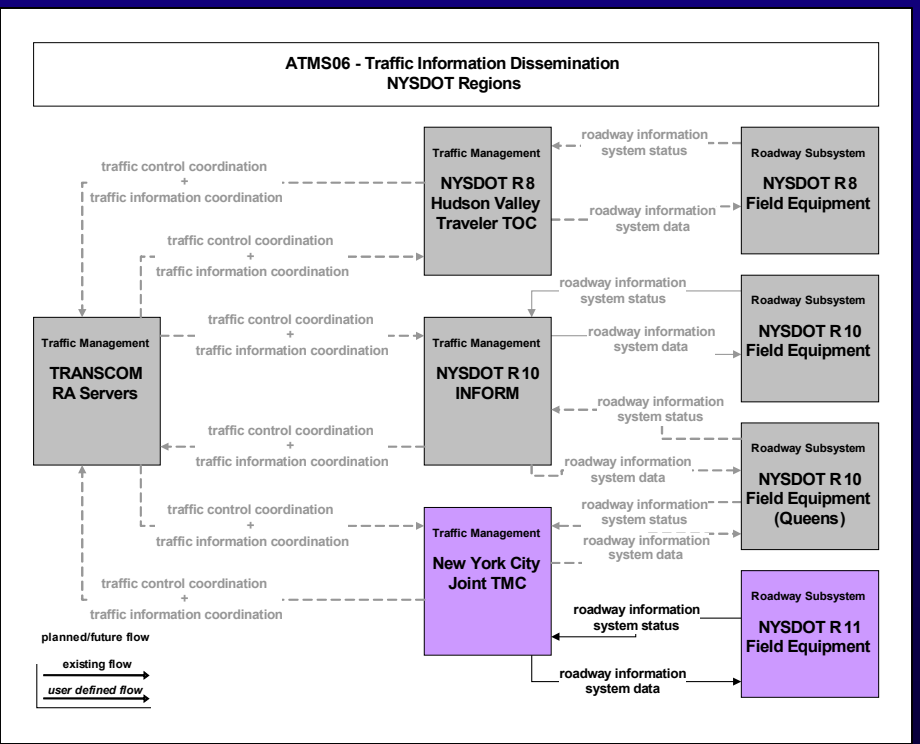


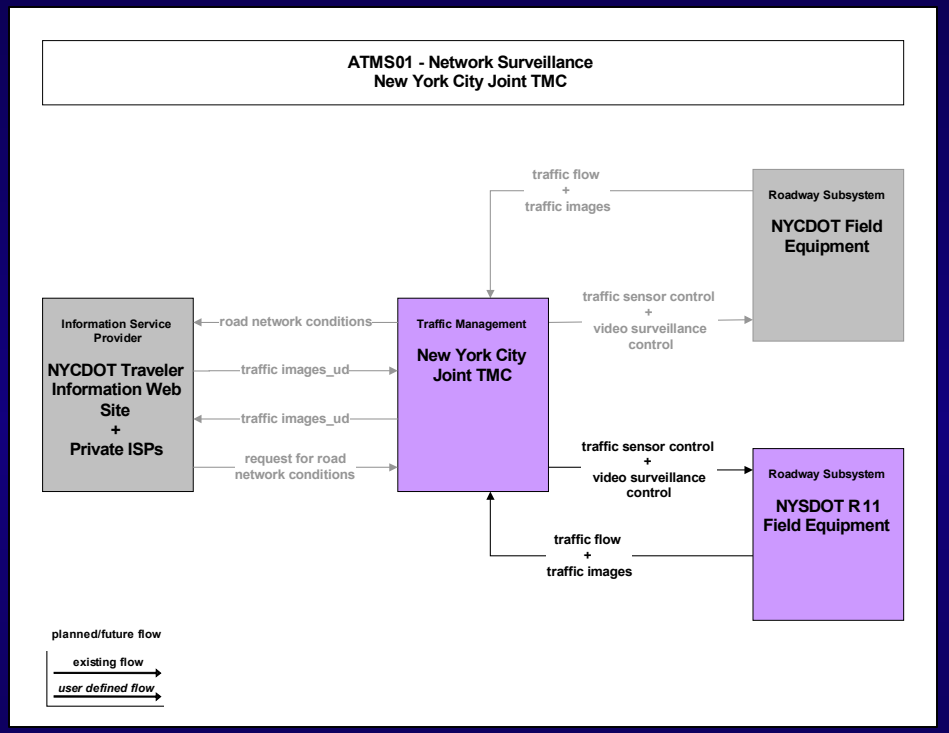
Portions of Regional ITS Architecture Being Implemented



ConSysTec Corp

Question: Would it be useful to define what portion of the regional ITS architecture is being implemented at IPP?





2) Participating Agencies Roles and Responsibilities

Stakeholders	Project ITS Elements	Roles and Responsibilities
New York City Joint TMC	New York City Joint TMC	NYCDOT and NYSDOT jointly manages and operates the Joint TMC. From the Joint TMC various project freeway field equipment will be operated and controlled.
NYSDOT – New York State Department of Transportation	NYSDOT R11 Field Equipment	Freeway management field equipment operated and maintained by NYSDOT.

3) System Functional Requirements

- Tailor add/remove requirements from the Regional ITS Architecture to specify Project Requirements
- Turbo Architecture Functional Requirements are a good place to start

3) System Functional Requirements

ITS Element	Functional Area	Requirement
New York City Joint TMC	Collect Traffic Surveillance	The center shall distribute road network conditions data (raw or processed) based on collected and analyzed traffic sensor and surveillance data to other centers.
NYSDOT R11 Field Equipment (DMS)	Roadway Traffic Information Dissemination	The field element shall include dynamic messages signs for dissemination of traffic and other information to drivers, under center control; the DMS may be either those that display variable text messages, or those that have fixed format display(s) (e.g. vehicle restrictions, or lane open/close).
NYSDOT R11 Field Equipment (CCTV)	Roadway Basic Surveillance	The field element shall collect, process, and send traffic images to the center for further analysis and distribution.
NYSDOT R11 Field Equipment (CCTV)	Roadway Basic Surveillance	The field element shall return sensor and CCTV system operational status to the controlling center.

4) Analysis of Alternative System Configuration and Technology Options

- **Operational Alternatives.**
  - For the purposes of a PSEA, this section would reflect which centers that house operational staff are involved. In the case of this example, all staff will be housed in the New York City Joint TMC and will be staffed 24 hours a day/7 days a week. However, another project may include the construction of a new, separate management center (whether operated by private sector operators). How the field equipment will be maintained (in-house or contractor) might also be included.

4) Analysis of Alternative System Configuration and Technology Options

- **Technology Assessment**
  - This section should propose various design alternatives for system or equipment to deliver the required ITS functionality. For example, a number of technologies may be considered to fulfill the requirements of the “NYSDOT Vehicle Detectors” subsystem including: radar detectors, inductive loops, and magnetometers. Likewise, fulfilling the requirements of the “NYSDOT CCTV” may be done with still frame, slow scan, or full motion video cameras. Each of these alternatives may carry additional or reduced cost to the project.

4) Analysis of Alternative System Configuration and Technology Options

- **Communications Infrastructure Alternatives**
  - Communications alternatives will depend on some of the factors included in the bullets above (number of centers involved, the location of equipment, and the bandwidth of information that needs to be transferred). Communication options may include: fiber, dial-up, wireless, and a wide selection of network equipment (e.g., modems, Ethernet communications equipment, and fiber communications equipment) and communications protocols.

5) Procurement Options

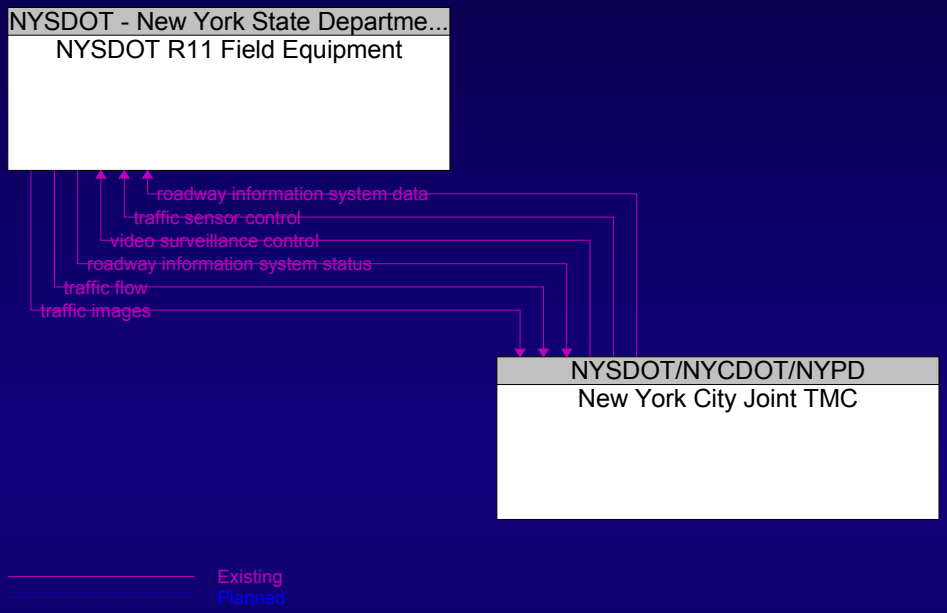
- Identify
  - Funding Source / Document
  - Project ID
  - Funds Available
- Options
  - Sole-source
  - Competitive Bid
  - Public/Private Partnership

Project Document	Project ID	Amount Allocated
NYSDOT State TIP	NYS-12345	$X million
NYSDOT Capital Plan	NYSDOT-12345	$Y00,000

5) Procurement Options

- System life cycle cost information that may be highlighted in the section include:
  - ITS Equipment Cost
  - System Integration and Engineering Support Cost
  - Operations and Maintenance Cost

6) ITS Standards and Testing Procedures



Start with mapping of ITS Architecture flows to ITS Standards

Architecture Flow	Interface	ITS Standard
roadway information system data roadway information system status	TMC ←→ DMS	NTCIP 1203 – Dynamic Message Signs
traffic images video surveillance control	TMC ←→ CCTV	NTCIP 1205 – CCTV
traffic sensor control traffic flow	TMC ←→ Traffic Sensors	NTCIP 1209 – Traffic Sensor Systems

6) ITS Standards and Testing Procedures

- List of Applicable ITS Standards for Project

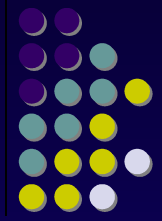
Document Number	Document Title Involved	Project Applicability
NTCIP 1101	Simple Transportation Management Framework (STMF)	Yes
NTCIP 1201	Global Object Definitions	Yes
NTCIP 1203	Object Definitions for Dynamic Message Signs (DMS)	Yes
NTCIP 1205	Object Definitions for Closed Circuit Television (CCTV) Camera Control	Yes
NTCIP 1206	Object Definitions for Data Collection and Monitoring (DCM) Devices	No
NTCIP 1208	Object Definitions for Closed Circuit Television (CCTV) Switching	No
NTCIP 1209	Data Element Definitions for Transportation Sensor Systems	Yes
NTCIP 2101	Point to Multi Point Protocol (PMPP) Using RS-232 Sub Network Profile	Yes
NTCIP 2103	Point-to-Point Protocol (PPP) Over RS-232 Sub network Profile	Yes
NTCIP 2201	Transportation Transport Profile (“NULL” Transport Profile)	Yes
NTCIP 2202	Internet (TCIP/IP and UDP/IP) Transport Profile	Yes
NTCIP 2301	Simple Transportation Management Framework (STMF) Application Profile	Yes

6) ITS Standards and Testing Procedures

- Testing Procedures
  - To accomplish system testing of the ITS elements, the following types of tests will be required for each unit of equipment furnished:
- Unit Test
- Integration Test
- System Test

Based on Guidance from ITS Standards Training Program.

6) ITS Standards and Testing Procedures



- ITS Standards Testing
  - Documentation
    - MIB (Device Database) or XML Schema (C2C Message Template)
  - Acceptance Testing
    - How conformance with the standards will be tested
  - ITS Standards Interpretation Resolution
    - How conflicts or ambiguities in interpreting the standard will be resolved

7) Procedures and Resources for Operations and Management

- This section of the PSEA should outline the organizational procedures that will be put in place for the operations and management of the project's capabilities (in this example freeway device operations). In addition, any resources necessary for operations and management would be considered.

Recommendations:
Integrating Regional ITS Architecture and Standards into NYSDOT's Project Development Process

Concepts Of Operation

- Level of Detail
  - No direct relationship between ITS Standards and Concepts Of Operation document
  - Focus is on operations and maintenance, but is a valuable input.

Preliminary Design Report

- High Level Requirements
  - Should be same level of detail, perhaps refined, of what is stated in the PSEA.

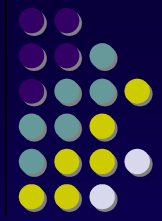
Detailed Design Report

- Detailed Requirements (C2F)
  - System Functions
    - Normal Conditions
    - Abnormal Conditions
  - Control Modes
  - System Monitoring
  - Installation and Testing

Detailed Design Report - Example

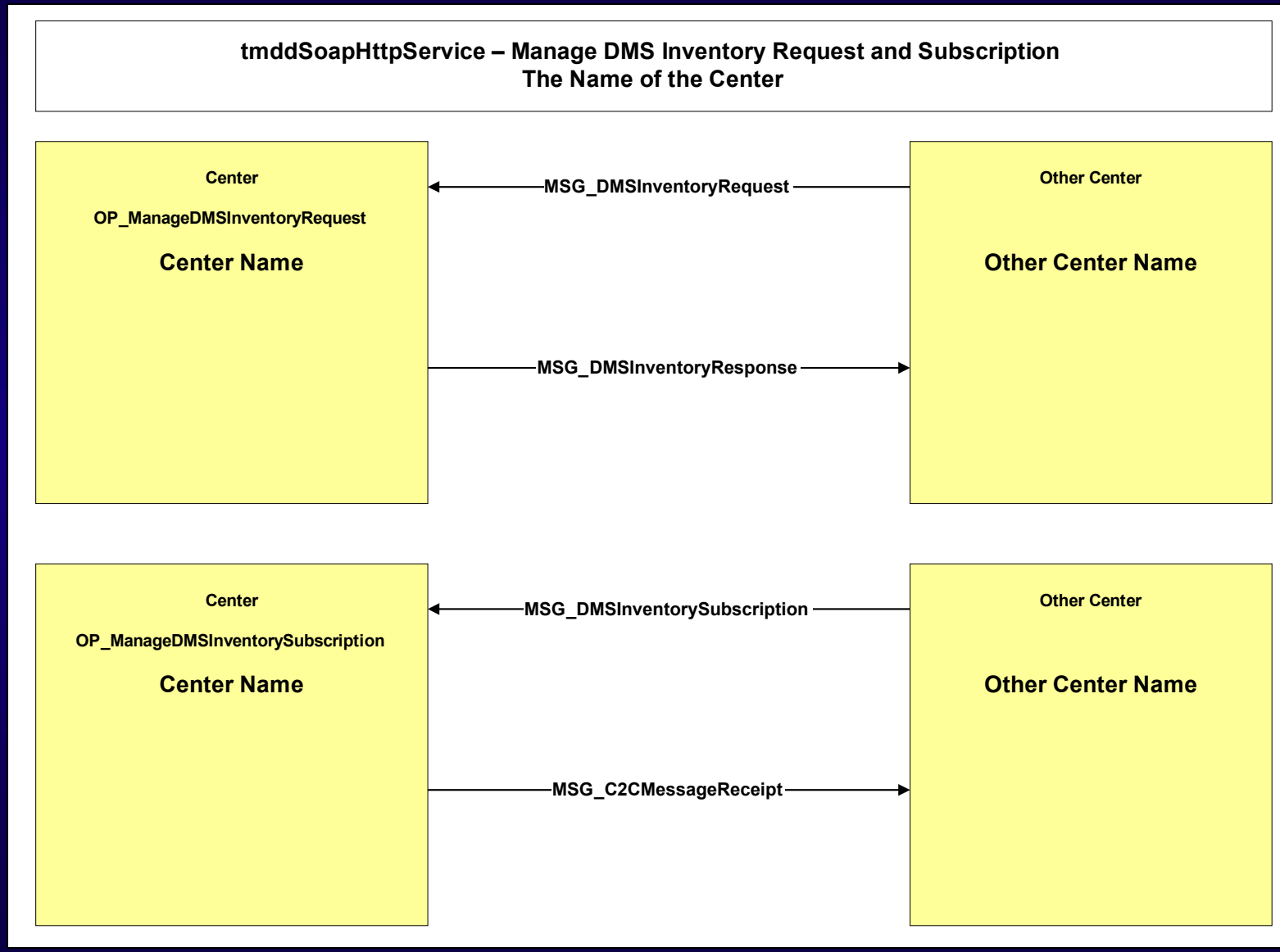
- **Sign Display Behavior After Bootup**
  - When the DMS is first powered on, the DMS face shall remain blank during the power-up and boot-up cycle. Once the boot-up cycle is complete, the DMS will display a default message until a message is commanded.
  - The default message to be displayed can be a blank message, a specific defined message, or the last message commanded before the DMS was shut down. Note that a different default message may be displayed if the DMS controller was shut down due to a controller software reset command or a momentary power loss (see below). The duration of time which constitutes a momentary power loss is user-defined.
  - The default message to be displayed after a DMS Bootup is currently a ***blank*** message.
- **Sign Display After a Momentary Power Loss**
  - If the elapsed time is less than the defined time duration, for example, one second, the DMS can be configured to display a default message. The default message to be displayed can be a blank message, a specific defined message, or the last message commanded before the DMS momentarily lost power.
  - The current default message to be displayed after a Momentary Power Loss shall remain the ***current*** message, and the defined time duration shall be ***1 second***. The assumption is that if the DMS momentarily loses electrical power for less than 1 second, the message should not change from what is currently displayed before the momentary power loss.

Detailed Design Report

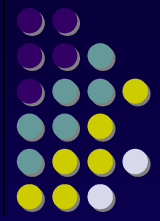


- Detailed Requirements (C2C)
  - System Functions
    - Normal Operations
    - Abnormal Conditions
  - Specific Messages
  - Message Dialogs & Relation to System Functions
  - Monitoring
  - Installation and Testing

Example Dialogs for C2C



Advanced Detailed Plans



- High Level Design (C2F)
  - Build on ConOps Information, and add
  - Profile Implementation Conformance Specifications (PICS)
  - MIB Objects Specification
  - Example MIB

An example is provided in the “Best Practices Report”

Advanced Detailed Plans – Example PICS

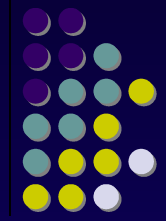
Requirements ID	Functional Requirement	Project Requirement
1.0	Manage the DMS Configuration	
1.1	Identify DMS	
1.1.1	Determine Sign Type and Technology - The DMS shall allow a management station to determine its type (such as DMS, CMS, BOS, portable) and technology (such as LED, Fiber optic, bulb, hybrid).	dmsSignType(5 - vmsLine) dmsSignTechnology(1 - LED)
1.2	Determine Message Display Capabilities	
1.2.1	Determine Basic Message Display Capabilities	
1.2.1.1	Determine the Size of the Sign Face - The DMS shall allow a management station to determine the height and width of the sign face.	
1.2.1.2	Determine the Size of the Sign Border - The DMS shall allow a management station to determine the size of the horizontal and vertical border around the sign face.	

An example is provided in the “Best Practices Report”

Advanced Detailed Plans

- High Level Design (C2C)
  - Focus on selection of Messages and Dialogs that support the project requirements
  - Preliminary selection of protocol
  - Identification of Application Profile
  - Profile Implementation Conformance Spec (PICS) derived from the Profile Requirements List
    - Based on NTCIP 2306 Solutions Bundles
    - Message Encoding (SOAP / XML) & Transport

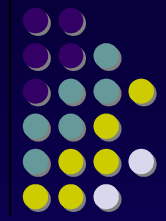
Plans, Specifications & Estimates



- Detailed Requirements (C2F)
  - Final determination of functions the device must support
  - Final determination of optional elements that are mandatory for this project
  - Complete PICs and optionally a sample MIB

An example is provided in the “Best Practices Report”

Plans, Specifications & Estimates – Example MIB



- -- 1.2 SIGN CONFIGURATION AND CAPABILITY OBJECTS
- dmsSignCfg OBJECT IDENTIFIER ::= { dms 1 }

- -- This node is an identifier used to group all objects for DMS sign
- -- configurations that are common to all DMS devices.
- -- 1.2.1 Sign Access Parameter
- dmsSignAccess OBJECT-TYPE
- SYNTAX INTEGER (0..255)
- ACCESS read-only
- STATUS optional
- DESCRIPTION
- "<Definition> Indicates the access method to the sign. Methods that are defined are:
- Bit 0- Other
- Bit 1- Walk-in access
- Bit 2- Rear access
- Bit 3- Front access
- If a bit is set to one (1), then the associated feature exists; if the bit is set to zero (0), then the associated feature does not exist.

- <DescriptiveName>DMS.signAccess:code

- <DataConceptType>Data Element"
- ::= { dmsSignCfg 1 }

- -- 1.2.2 Sign Type Parameter
- dmsSignType OBJECT-TYPE
- SYNTAX INTEGER{
- other (1),
- bos (2)

Plans, Specifications & Estimates

- Detailed Requirements (C2C)
  - Final determination of optional elements in the messages that are mandatory for this project
  - Final determination of protocol
  - Completed WSDL Worksheet, PICs, and optionally sample messages and WSDL

An template is provided in the “Best Practices Report”

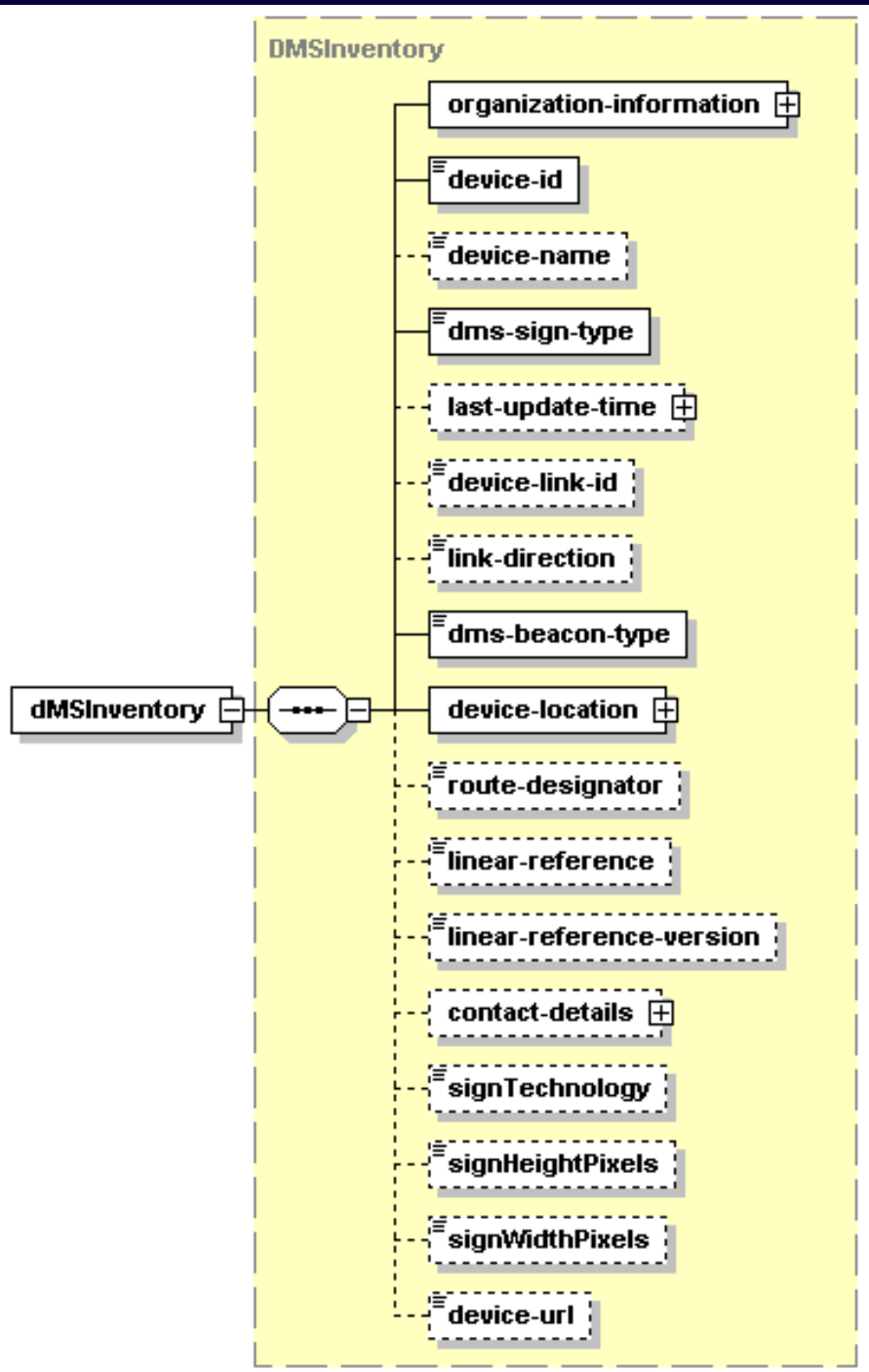
Example C2C XML Message Template Showing Optional and Mandatory Data Elements

Agencies need to determine which optional elements are mandatory!

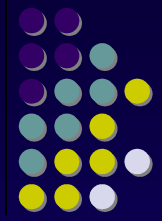
Legend

mandatory

optional



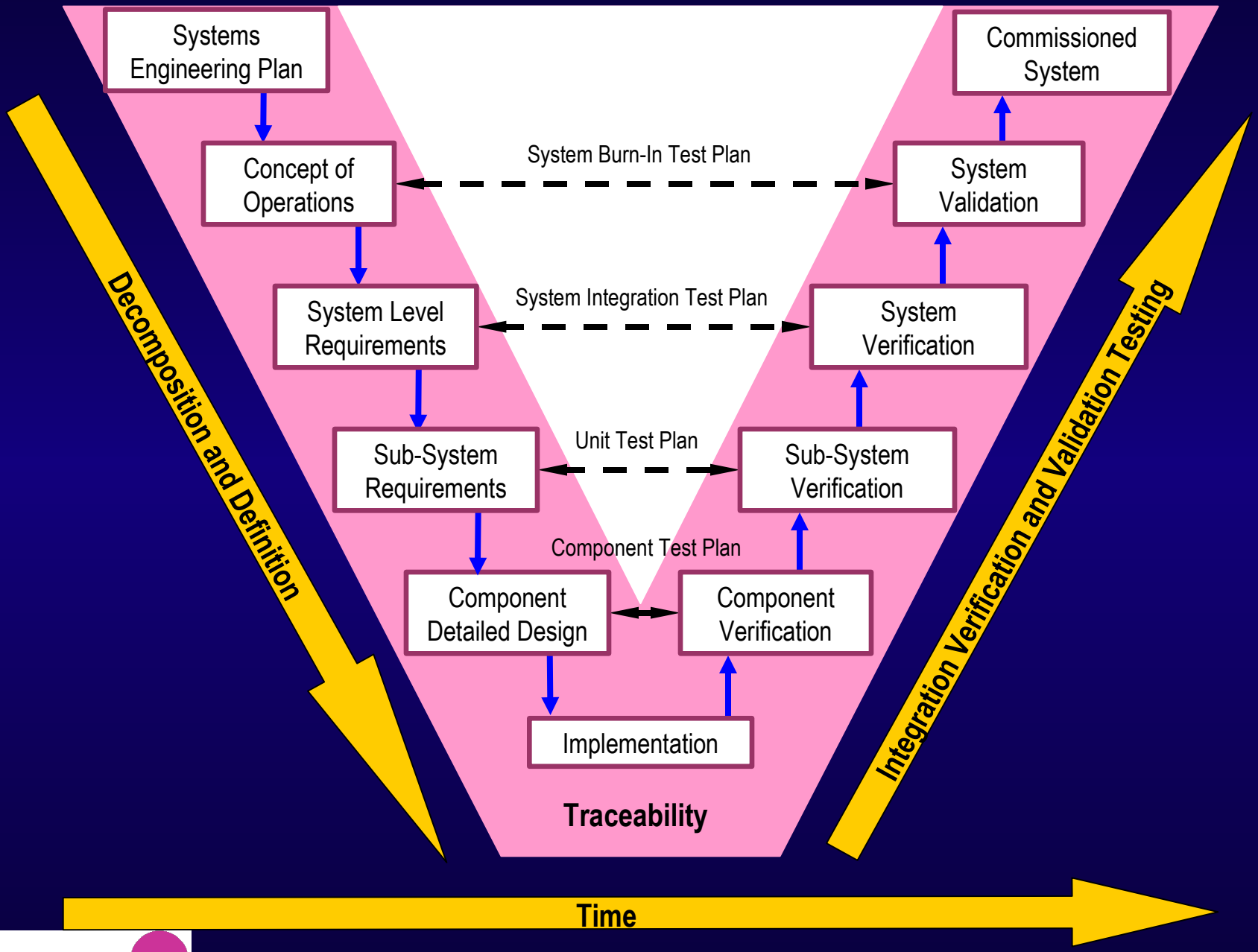
Example C2C Message



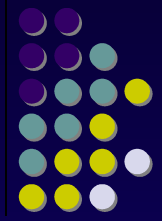
```
<dMSInventory>
        <device-list>
                <device>
                        <organization-information>
                                <organization-id>
                                        tmc.dot.state.org
                                </organization-id>
                                <organization-name>
                                        The State DOT
                                </organization-name>
                        </organization-information>
                        <operator-id>0</operator-id>
                        <device-id>22</device-id>
                        <device-name>22.dms.dot.state.org</device-name>
                        <dms-sign-type>variable message sign</dms-sign-type>
                        <device-location>
                        <latitude>XXXXXXXX</latitude>
                        <longitude>YYYYYYYY</longitude>
                        </device-location>
                </device>
                        <!-- Continue with additional devices   -->
        </device-list>
</dMSInventory>
```

Standards Testing

Systems Engineering Process Model

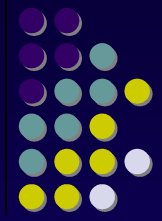


Standards Testing



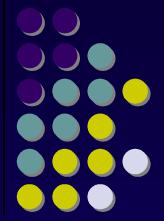
- Types of Testing (Center-to-Center)
  - Dialogs are implemented as specified
  - System can exchange messages
  - System can extract data elements from message content

Standards Testing



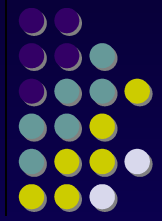
- Types of Testing (Center-To-Field)
  - Hardware Tests
    - Electrical, Mechanical
  - Environmental Tests
    - Temperature, Humidity, Vibration
  - Functional Tests
    - Does it do what I expect it to do?
  - Performance Tests
    - Does it respond or function in a timely manner?
  - Standards Conformance Tests

Standards Testing



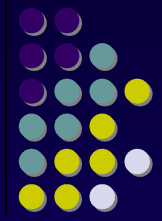
- ITS Standards are NOT functional requirements.
  - The data “objects” and messages defined ***SUPPORTS*** the functional requirements.
- Functional Testing
  - Tests if the device “complies” with the functional requirements.
- Standards Testing
  - Tests if the device “conforms” with the specified standard

Standards Testing



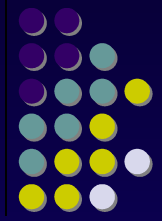
- Conformance
  - To claim “Conformance” to a Standard, the vendor must minimally satisfy the mandatory requirements as identified in the Standard.
  - In addition, a conformant device may offer additional (optional) features, as long as they are conformant with the requirements of the Standard and the standards it references.

Standards Testing



- Testing Tools
  - MIB Compiler
  - MIB Viewer
  - SNMP Manager Software
  - Device Simulator (for example, SNMP Agent running on a PC)
  - NTCIP Exerciser
    - SNMP Manager
    - Device Simulator

Standards Testing



- Certification
  - ITS standards do not certify, nor provide a way to certify, a device or manufacturer
  - Certification is ideal for public sector, but there are issues:
    - Each unit is different
    - Who certifies the certifiers?
  - Considering Conformance Statements

Your Comments about the Workshop??

ITS Standards Discussion Support Charts

Highlight of Key ITS Standards (Center-To-Center)

ITS Functional Area	SDO	Message Set / Protocol Name	Version Status
Traffic Management (Message Set)	ITE/AASHTO	Message Set for External TMC Communications	Version 2.1 Complete
Incident Management (Message Set)	IEEE	1512 BASE, 1512.1 (Traffic Incidents), 1512.2 (Public Safety), 1512.3 (HAZMAT)	Version 2 nearing completion or in ballot
Traveler Information (Message Set)	SAE	J2354 – ATIS Message Set	Version 2 under Development Complete
Transit (Message Set)	APTA	TCIP	Version 2.7 under development
Center-to-Center Communications (Message Encoding and Transport)	NTCIP	W3C Web Services Architecture-based (NTCIP 2306)	Version 1 in User Comment Draft development, being deployed in New York and Texas.
		DATEX ISO-14827 (NTCIP 2304)	Complete

Highlight of Key ITS Standards (Center-To-Field)

ITS Functional Area	SDO	Version Status
Global Objects	NTCIP 1201	Version 2 Complete.
DMS	NTCIP 1203	Version 2 Balloted. VDOT, ENTERPRISE, ISTHA
ESS	NTCIP 1204	Version 2 Balloted.
TSS	NTCIP 1209	Version 1 in Ballot. Device support is uncertain.
DCM	NTCIP 1206	Version 1 Balloted and Complete. Device support is uncertain.
CCTV	NTCIP 1205	Version 2 Balloted and Complete. FDOT using in Florida.
Video Switch	NTCIP 1208	Version 1 is Balloted and Complete.
Ramp Meters	NTCIP 1207	Version 1 complete. Standard is being deployed in Utah.
Traffic Signal Controller	NTCIP 1202	Version 1 is complete. 2070 or ATC is required.
Field Management Stations	NTCIP 1210	Version 1 is Balloted.
Signal Prioritization	NTCIP 1211	Version 1 complete.
Network Camera Operation	NTCIP 1212	In draft.

Highlight of Key ITS Standards (Supporting)

SDO	Version Status
NTCIP 2101	Point to Multi Point Protocol (PMPP) Using RS-232 Sub Network Profile
NTCIP 2102	Point to Multi Point Protocol (PMPP) Using Frequency Shift Key (FSK) Network Profile
NTCIP 2103	Point-to-Point Protocol (PPP) Over RS-232 Sub network Profile
NTCIP 2104	Ethernet Sub network Profile
NTCIP 2201	Transportation Transport Profile (“NULL” Transport Profile)
NTCIP 2202	Internet (TCIP/IP and UDP/IP) Transport Profile
NTCIP 2301	Simple Transportation Management Framework (STMF) Application Profile
NTCIP 2302	Trivial File Transfer Protocol (TFTP) Application Profile
NTCIP 2303	File Transfer Protocol (FTP) Application Profile
NTCIP 2304	DATEX-ASN Application Profile
NTCIP 2305	CORBA Application Profile
NTCIP 2306	Application Profile for XML in ITS Center-To-Center Communications