New York State
Department of Transportation

New York Statewide Services ITS Architecture
Review Workshop

December 15, 2008

Consensus Systems Technologies
Shenorock, NY

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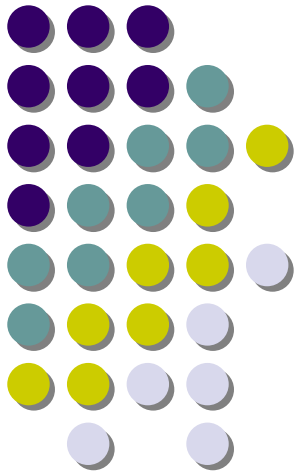


ConSysTec

Agenda and Workshop Schedule

Item	Description
1	Review Agenda and Introductions
2	Review purpose for update of the *New York Statewide Services ITS Architecture* and Project Schedule.
3	ITS Architecture Briefing - What is an ITS Architecture - Where ITS Architecture "products" show up - Using the ITS Architecture as a tool for systems engineering
4	Review and resolve areas of ambiguity and inconsistency: - *NYSDOT IEN*
5	Web site demonstration and procedure for stakeholder review of the New York Statewide Services ITS Architecture
6	Review of Draft ITS Architecture Maintenance Plan
7	Wrap-up and Questions

- Introductions

Item 2:
Review Purpose of Update of the Statewide Services ITS Architecture and Schedule

Purpose of ITS Architecture Update

- 12 Main Office Priority Projects Updates/Included

1. 511NY.ORG Traveler Information System
2. Information Exchange Network (IEN)
3. Video Exchange Network (VEN)
4. Regional Streetwise Servers
5. Transit Service Information Portal (TSIP)
6. Regional Bus Rapid Transit (BRT)
7. Commercial Vehicle Operations / WIM / Real-time information for Inspectors
8. Integrated Incident Management System (IIMS)
9. Maintenance Asset Management Information System (MAMIS)
10. Asset Management System
11. Maintenance Decision Support System (MDSS) and Road Weather Information System (RWIS)
12. STICC - Statewide Transportation Information Coordination Center (STICC)

Purpose of ITS Architecture Update

- Other Projects

13. NYSTA E-ZPass
14. MPO Transportation Database and Archived Data Management
15. Regional Traffic Operations Center (RTOC) "Template"

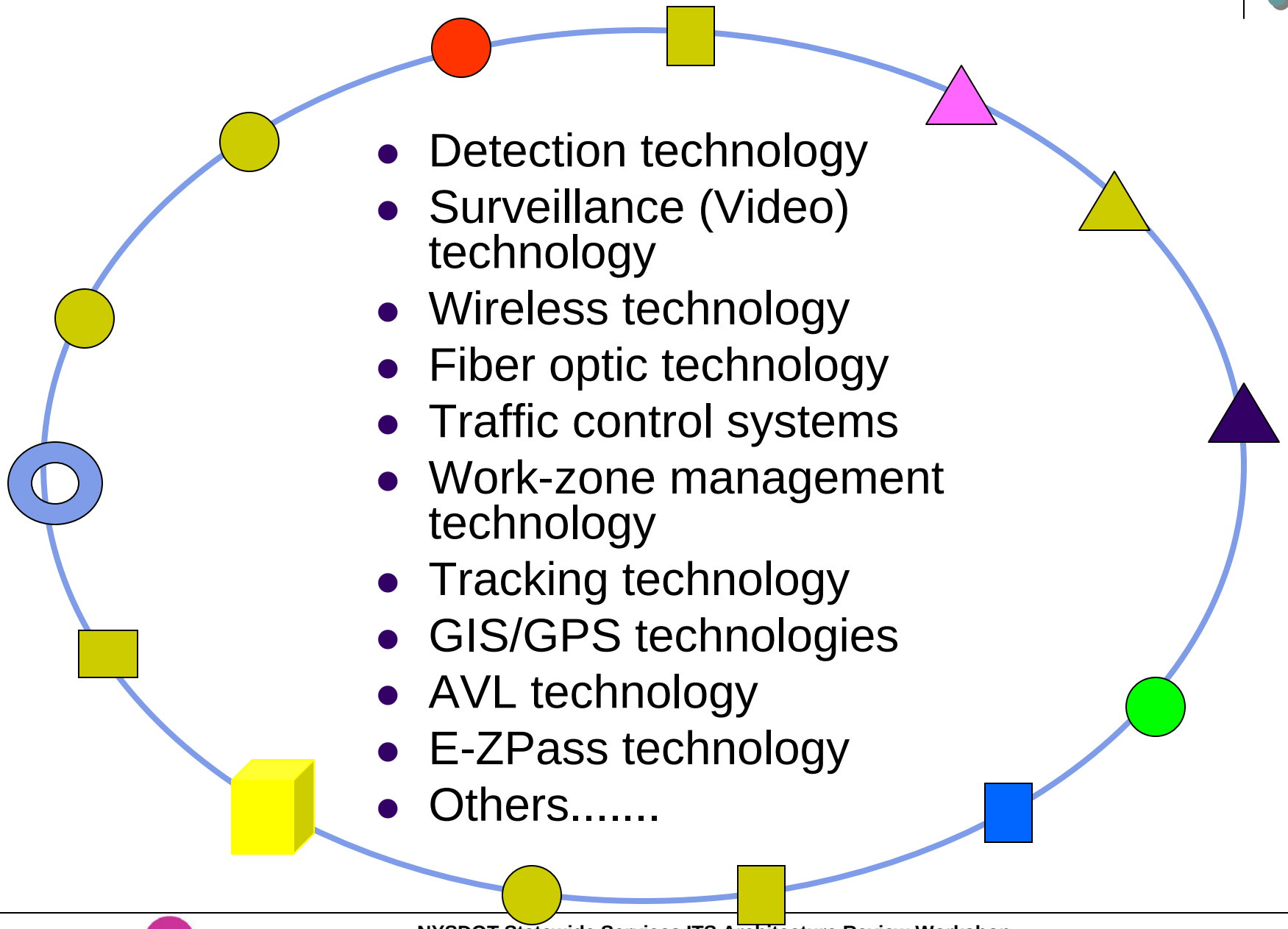
NYSDOT Statewide Services ITS Architecture Update Schedule

Item	Dates	Description
1	10/24/2008	Kick-off Meeting
2	10/24 – 12/12/2008	Meetings with Main Office priority projects representatives to review preliminary market packages.
3	12/15/2008	Draft Statewide Services ITS Architecture Review Workshop and Draft Web Site: www.consystec.com/newyork/web
4	12/20/2008	Cut-off date for stakeholder feedback on the web based draft architecture. Feedback should be submitted via: ●E-mail on the webpage, ●Email to rsj@consystec.com or ●FAX to 914-248-5840.
5	12/21 – 12/31/2008	Delivery of Final New York Statewide Services ITS Architecture, Web Site, and Documentation

Item 3:
ITS Architecture Briefing

Item 3.1:
What is an ITS Architecture

There are many technologies used in ITS



- 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

Vehicle-to-Vehicle

Operations Centers

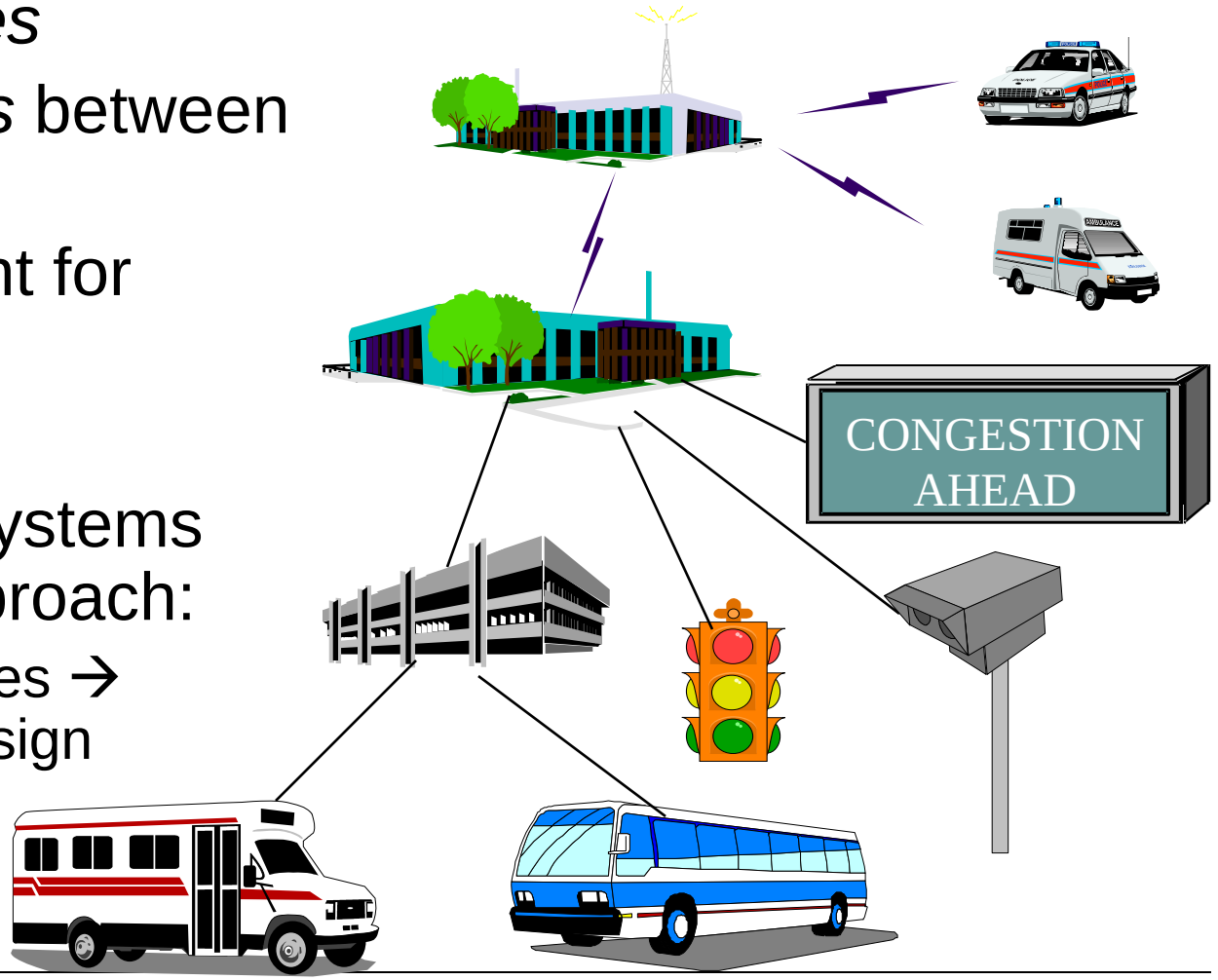
Vehicle-to-Roadside

Vehicle-Based / Navigation

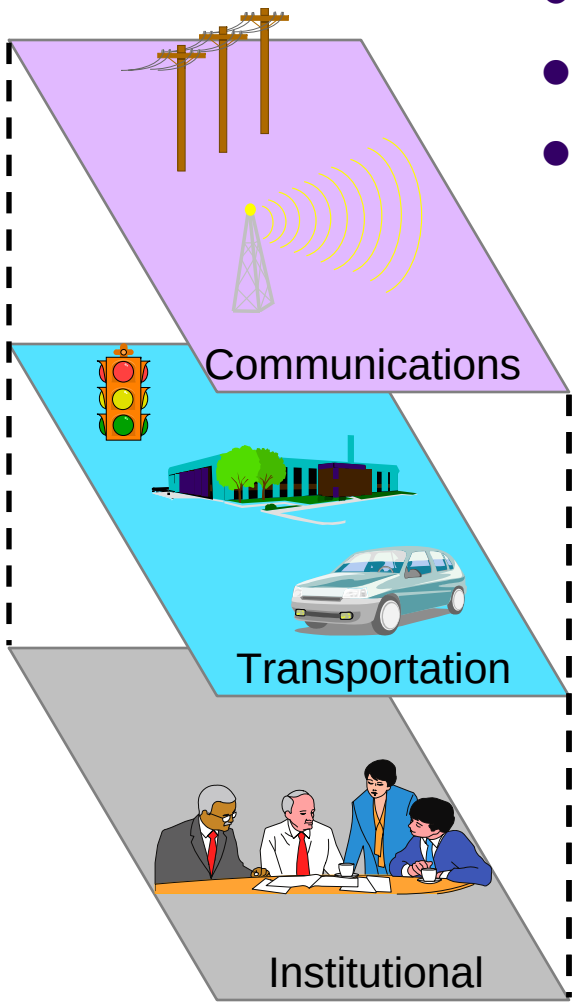
The National ITS Architecture is a Framework to Help:

- Describe *services*
- Define *interfaces* between subsystems
- Develop blueprint for *integration*

- Encourages a Systems Engineering Approach:
  - Needs → Services → Functions → Design



National ITS Architecture Layers



- Defines physical entity interfaces
- Distributes functionality
- 3 layers

Interfaces

Solutions

Objectives & Requirements

Communications Layer

- **How information is transferred between ITS elements**

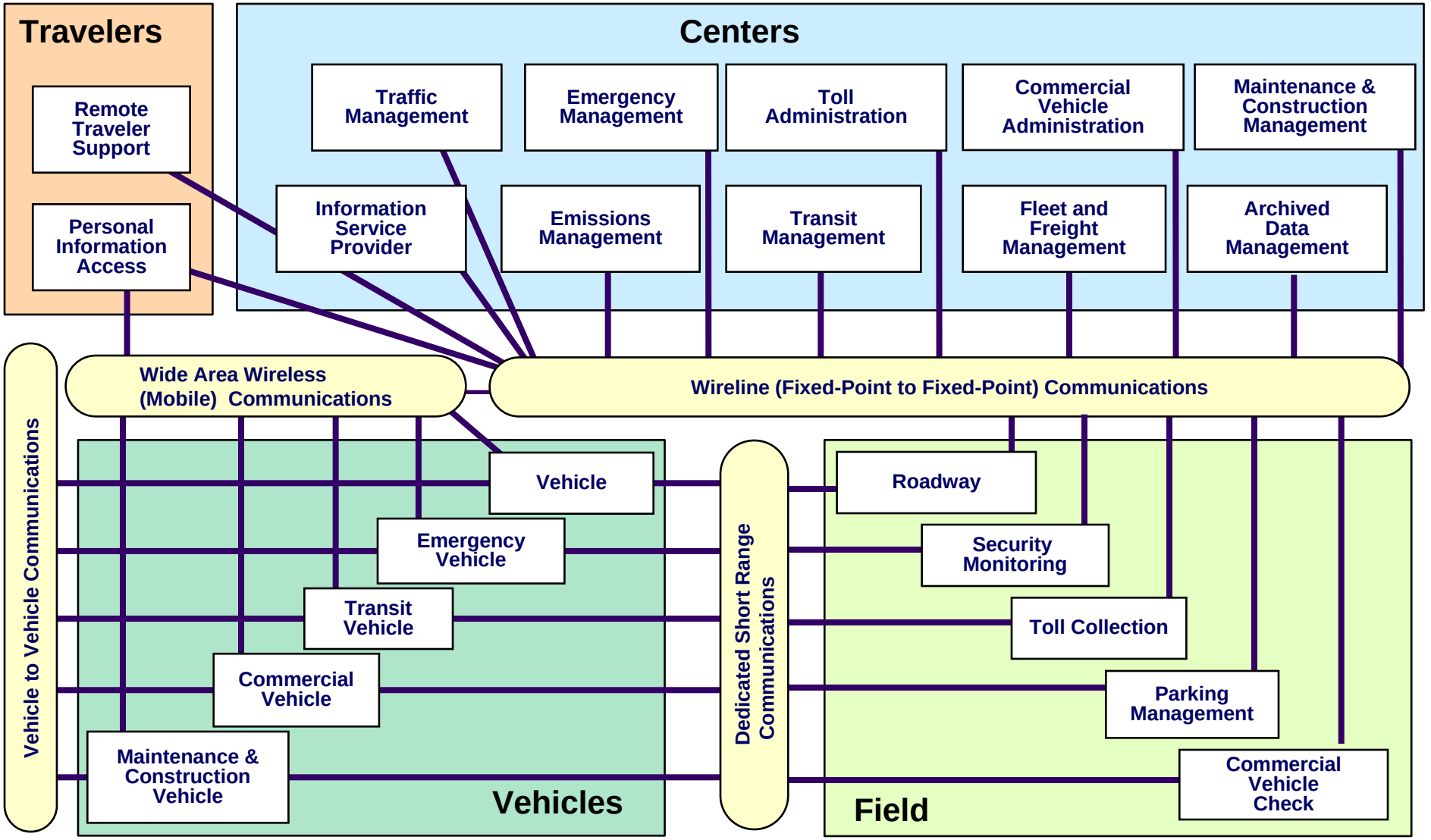
Transportation Layer

- **What ITS elements transfer what information**

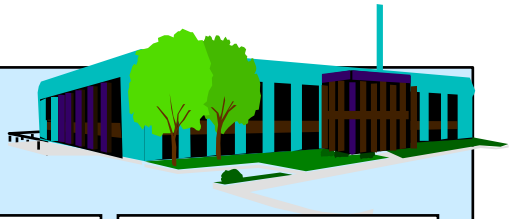
Institutional Layer

- **Supporting institutional structure, policy, and strategies**
- **<u>Stakeholder Driven</u>**

National ITS Architecture
V 6.0 - “Sausage Diagram”



Center Subsystems

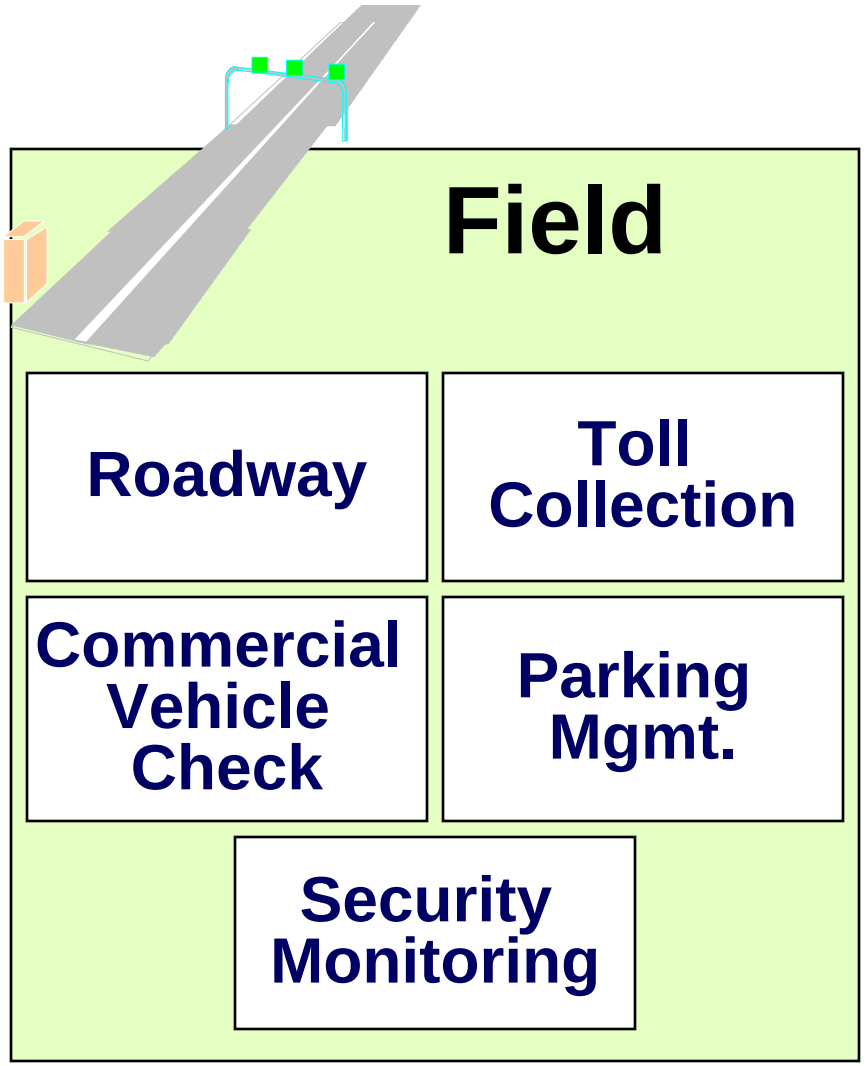


Centers

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

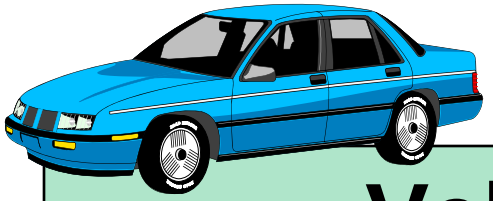
- Perform management and administration functions
- Coordinate with other Center Subsystems

Field Subsystems



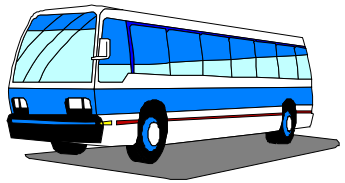
- *ITS* infrastructure
- *On* or *along* the transportation network
- Surveillance
- Control plans
- Supply information

Vehicle Subsystems

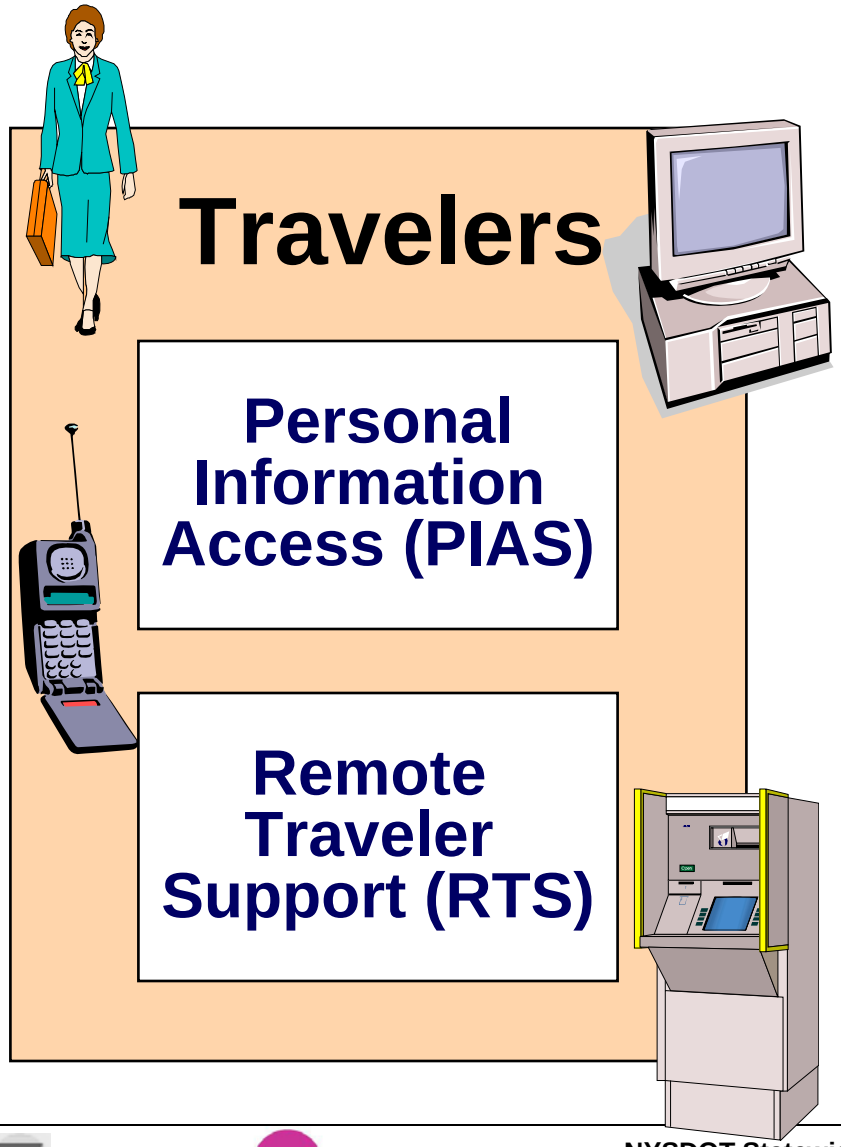


Vehicles

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



Traveler Subsystems



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

Regional/Statewide ITS Architecture

- Is a planning tool for implementing ITS within a region or state
- 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/state in the form of a Regional/Statewide ITS Architecture

Regional/Statewide ITS Architecture Scope

- Geographic Boundaries
- ITS Services to be provided
- Time Frame
  - Existing Today → 10 to 15 years in the future

FHWA Rule 940/FTA Policy

Regional ITS Architecture Requirements (23 CFR 940.9)

1. Description of the region
2. Identification of participating agencies and other stakeholders
3. Operational concept
4. Agreements required for implementation
5. System functional requirements
6. Interface requirements
7. Identification of ITS standards
8. Sequence of projects required for implementation
9. Process for maintaining your Regional ITS Architecture

FHWA Rule 940/FTA Policy

Systems Engineering Analysis Report (23 CFR 940.11)

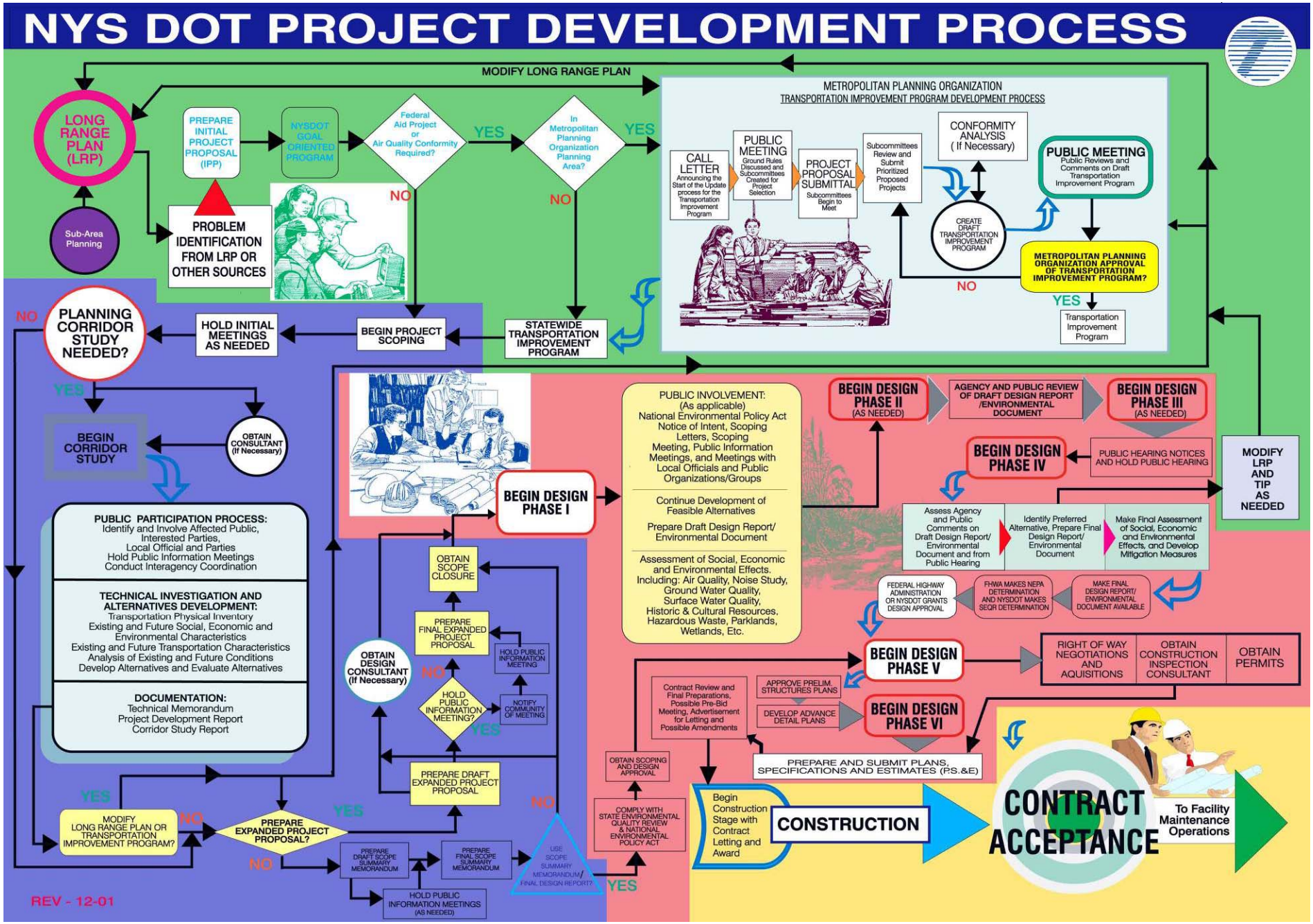
- Any *ITS project*, that receives federal aid and that moves into design, is required to follow a *systems engineering analysis*
- ITS project: the project or part of the project implements one or more ITS user services (see http://www.iteris.com/itsarch/documents/userservices/userservices.pdf)

FHWA Rule 940 Systems Engineering Analysis

(parts in italics come from your regional/statewide ITS architectures)

1. *Identification of portions of the regional architecture being implemented*
2. *Identification of participating agencies roles and responsibilities*
3. *Requirements definition*
4. Analysis of alternate system configurations and technology options to meet requirements
5. Procurement options
6. *Identification of applicable standards* and testing procedures, and
7. Procedures and resources necessary for operations and management of the

Item 3.2:
Using the ITS Architecture to support the NYSDOT Project Development Process

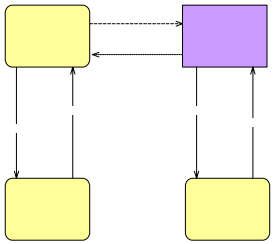

NYS DOT PROJECT DEVELOPMENT PROCESS
MODIFY LONG RANGE PLAN
LONG RANGE PLAN (LRP)
Sub-Area Planning
PREPARE INITIAL PROJECT PROPOSAL (IPP)
NYSDOT GOAL ORIENTED PROGRAM
Federal Aid Project or Air Quality Conformity Required?
YES
In Metropolitan Planning Organization Planning Area?
YES
NO
NO
PROBLEM IDENTIFICATION 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)
PUBLIC MEETING
Public Reviews and Comments on Draft Transportation Improvement Program
CREATE DRAFT TRANSPORTATION IMPROVEMENT PROGRAM
METROPOLITAN PLANNING ORGANIZATION APPROVAL OF TRANSPORTATION IMPROVEMENT PROGRAM?
NO
YES
Transportation Improvement Program
PLANNING CORRIDOR STUDY NEEDED?
NO
HOLD INITIAL MEETINGS AS NEEDED
BEGIN PROJECT SCOPING
STATEWIDE TRANSPORTATION IMPROVEMENT PROGRAM
YES
BEGIN CORRIDOR STUDY
OBTAIN CONSULTANT (If Necessary)
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
OBTAIN DESIGN CONSULTANT (If Necessary)
HOLD PUBLIC INFORMATION MEETING?
NO
YES
PREPARE DRAFT EXPANDED PROJECT PROPOSAL
MODIFY LONG RANGE PLAN OR TRANSPORTATION IMPROVEMENT PROGRAM?
YES
NO
PREPARE EXPANDED PROJECT PROPOSAL?
YES
NO
PREPARE DRAFT SCOPE SUMMARY MEMORANDUM
PREPARE FINAL SCOPE SUMMARY MEMORANDUM
HOLD PUBLIC INFORMATION MEETINGS (AS NEEDED)
USE SCOPE SUMMARY MEMORANDUM/ FINAL DESIGN REPORT?
NO
YES
OBTAIN SCOPING AND DESIGN APPROVAL
COMPLY WITH STATE ENVIRONMENTAL QUALITY REVIEW & NATIONAL ENVIRONMENTAL POLICY ACT
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 V
BEGIN DESIGN PHASE VI
RIGHT OF WAY NEGOTIATIONS AND AQUISITIONS
OBTAIN CONSTRUCTION INSPECTION CONSULTANT
OBTAIN PERMITS
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

ITS System Journey from Plan to Deployment

Regional Transportation Plan

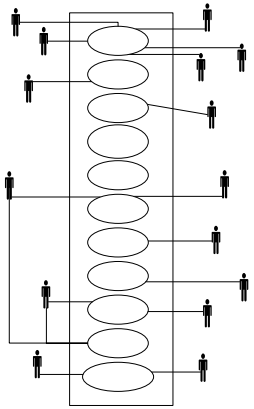
1

ITS Architecture



2

Concept of Operations



3

Requirements

Alternatives Analysis (High Level Design)

Use Cases & Requirements

Alternatives Analysis

User Interface | Center Systems | Commu-nications | Field Elements

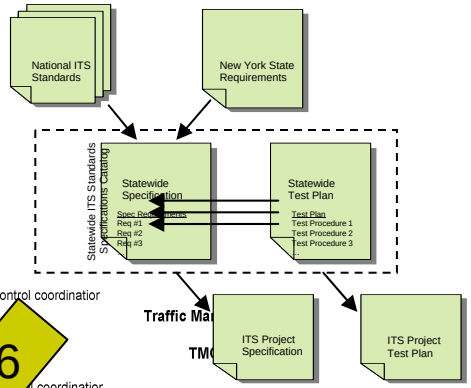
Data Storage Retrieval

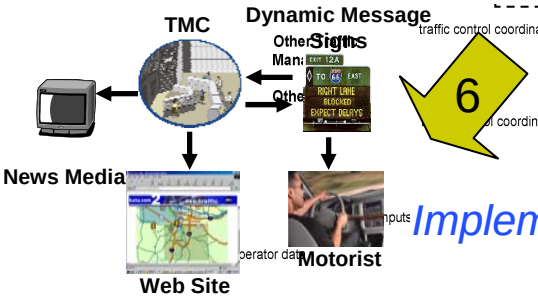
$ $ $ $ $

4

5

Specifications and Test Plans





Implementation

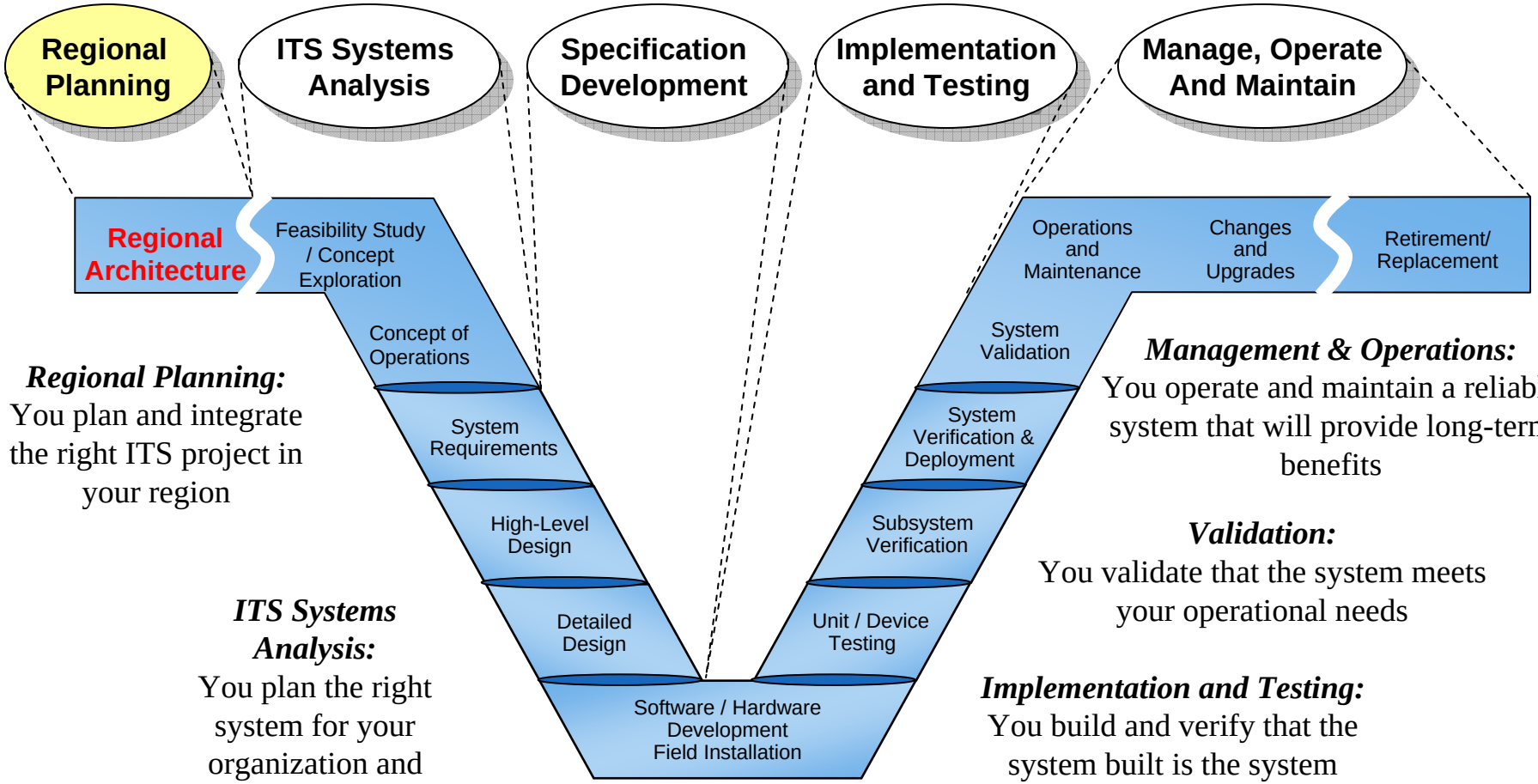
Traffic Operations Personne

Other Center Operator

Traffic Operations Personne

TMC ' Operator

Statewide ITS Architecture initiates the Systems Engineering that supports you through the ITS System Development Life Cycle



Regional Planning:
You plan and integrate the right ITS project in your region

ITS Systems Analysis:
You plan the right system for your organization and your customers

Specification Development:
You design a high quality, high value system for the least cost

Implementation and Testing:
You build and verify that the system built is the system specified

Validation:
You validate that the system meets your operational needs

Management & Operations:
You operate and maintain a reliable system that will provide long-term benefits

Key Systems Engineering Deliverables as related to the NYSDOT Project Development Process

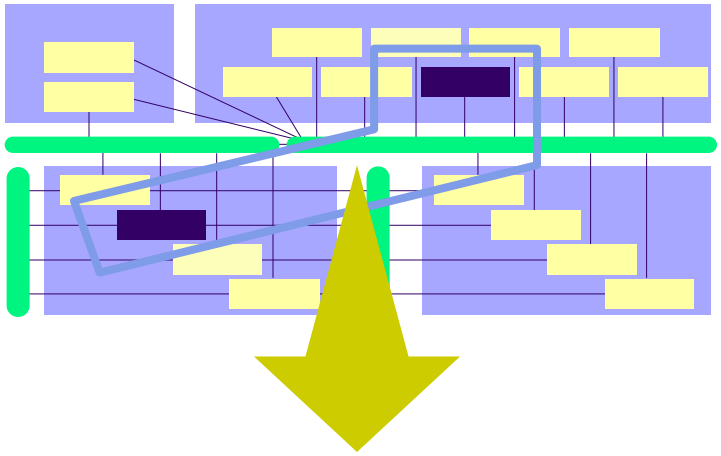
NYSDOT Project Development Process	Systems Engineering Deliverables	Regional/Statewide ITS Architecture "Products"
Transportation Planning	*Regional/Statewide ITS Architecture*	*Project Identification, Priority, and Sequence*
Initial Project Proposal / Project Scoping	Concept of Operations	*Market Packages in System Overview*
Design Report	Requirements	*High Level Functional Requirements*
Advanced Detail Plans (ADP) & Plans, Specifications & Estimates (PS&E)	Specifications	*ITS Standards Identification*
Construction	Test Documentation	

Item 3.3:
Using the ITS Architecture – ITS Standards Identification and Specification

Modeling ITS Architecture Solutions: *Market Packages*

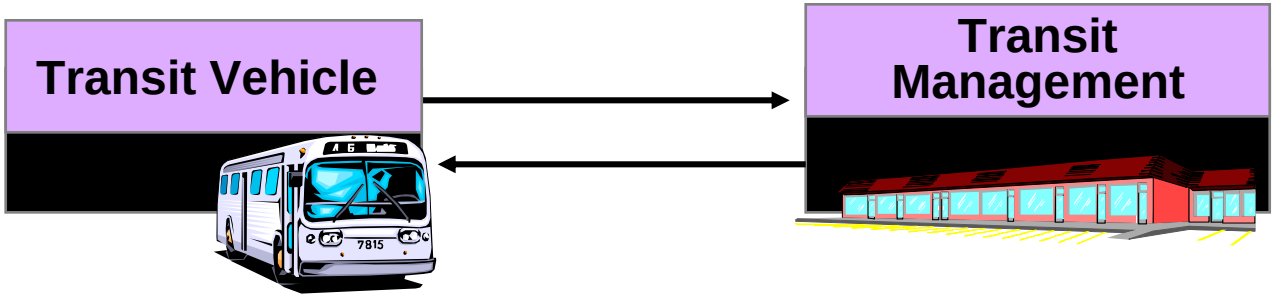
- The National ITS Architecture introduced the term *Market Package*
- Market Packages illustrate ITS elements that can be grouped to provide ITS services to transportation system users.

Market Packages



Architecture

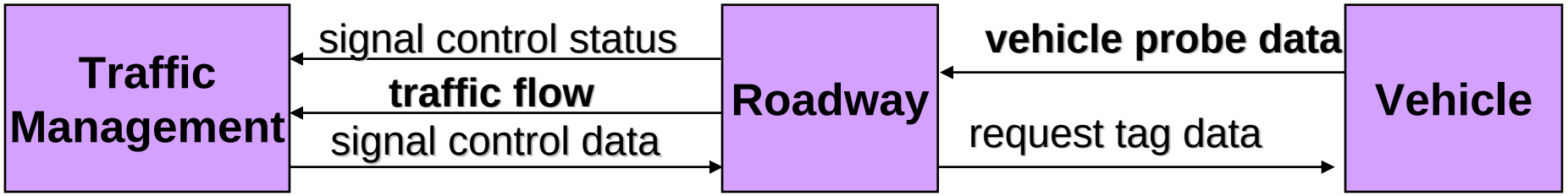
Framework spanning all of ITS



Market Packages

Pieces of the architecture that provide a particular transportation service.

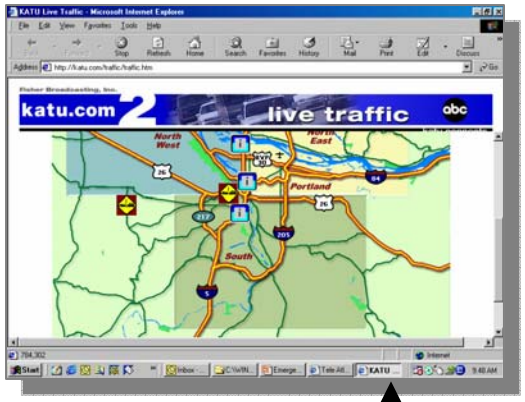
Moving Standardized Information between ITS Elements: *Architecture Flows*



- *Architecture Flows*
  - Identify the expected types of information messages that flow between ITS elements
  - Provide a high-level mapping to ITS standards

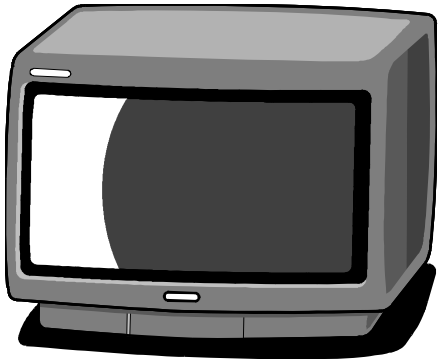
… let's look at a few examples

Traffic Information Dissemination

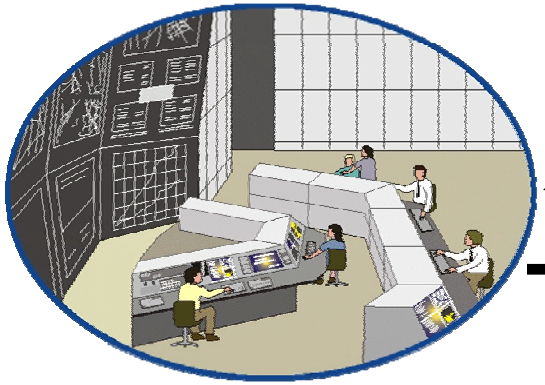


Web Site

Motorist



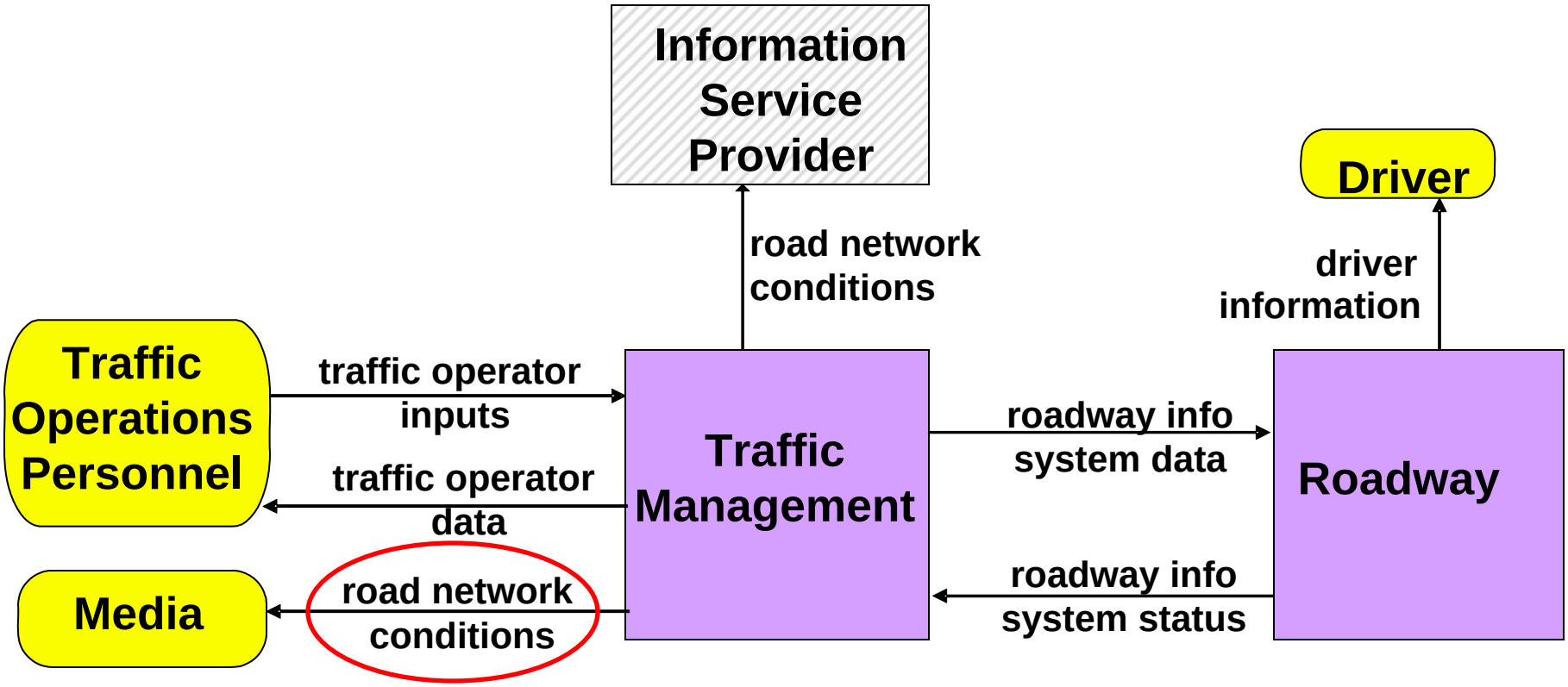
Television Station



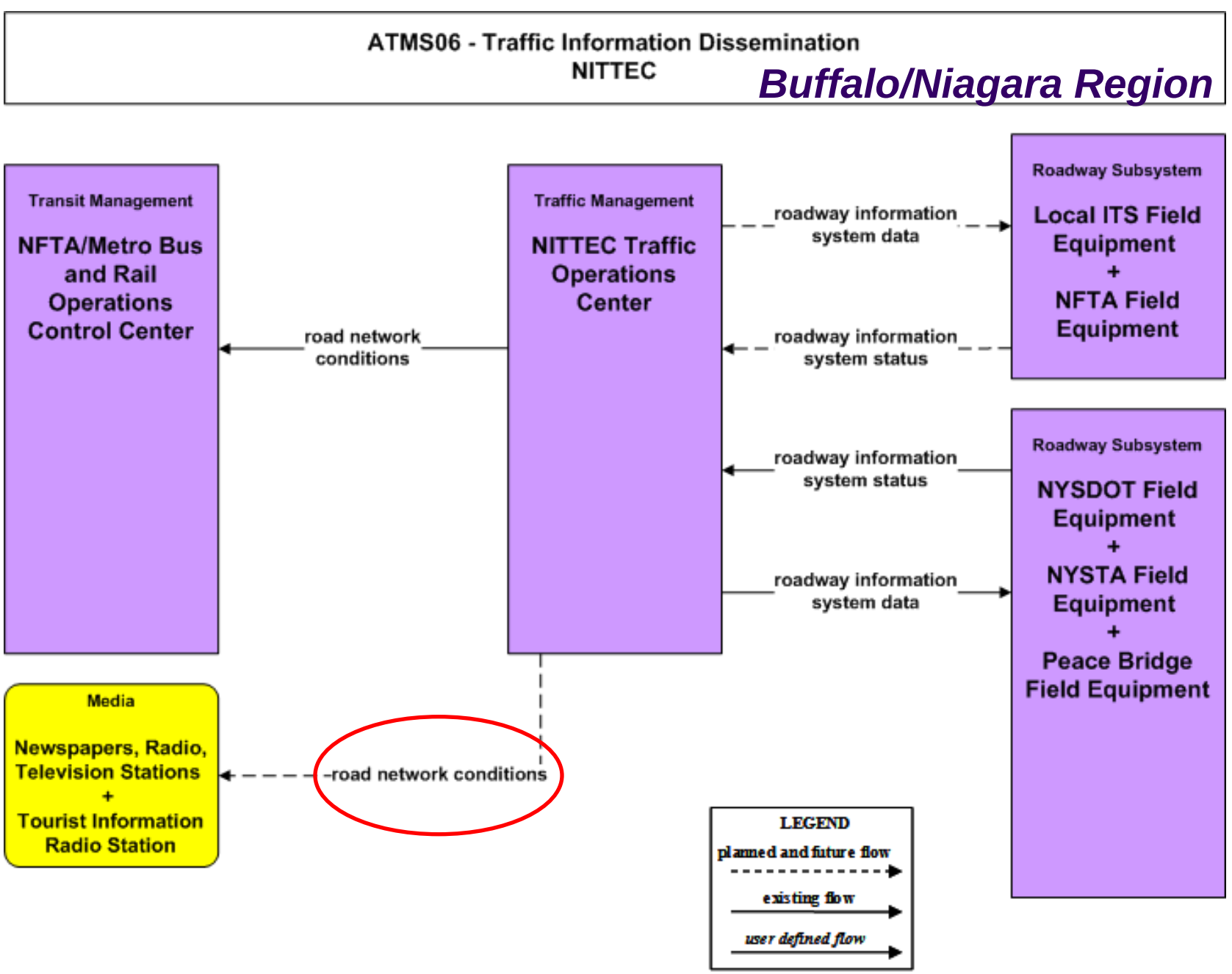
Traffic Management Center

Dynamic Message Signs

ATMS06 – Traffic Information Dissemination *[National ITS Architecture]*



We'll track *road network conditions* from National ITS Architecture to Regional ITS Architecture and identify applicable ITS standards


ATMS06 - Traffic Information Dissemination
NITTEC
Buffalo/Niagara Region
Transit Management
NFTA/Metro Bus and Rail Operations Control Center
Traffic Management
NITTEC Traffic Operations Center
Roadway Subsystem
Local ITS Field Equipment + NFTA Field Equipment
Roadway Subsystem
NYSDOT Field Equipment + NYSTA Field Equipment + Peace Bridge Field Equipment
road network conditions
roadway information system data
roadway information system status
roadway information system status
roadway information system data
Media
Newspapers, Radio, Television Stations + Tourist Information Radio Station
road network conditions
LEGEND
planned and future flow
existing flow
user defined flow

Example ITS Architecture Flow Mapping to ITS Standards [National ITS Architecture 6.0]

- road network conditions
  - NTCIP C2C: NTCIP Center-to-Center Standards Group
  - ITE TMDD 2.1: Traffic Management Data Dictionary and Message Sets for External TMC Communication (TMDD and MS/ETMCC)

Item 4:
Review of ITS Architecture Ambiguities and Inconsistencies

NYSDOT IEN – Resolution of Ambiguities and Inconsistencies (1 of 3)

- The consultants believe that the NYSDOT IEN represents an ITS element used for the purposes of inter-regional communication, and statewide aggregation. However, during the review meetings, the IEN was suggested for intra-regional communications, which the consultants believe is the intended purpose of the Regional TOC. For example, Local Transit and Local DPW would not receive ITS information via the IEN, but via an interface to the RTOC.
  - THIS IS HOW IT IS CURRENTLY SHOWN.

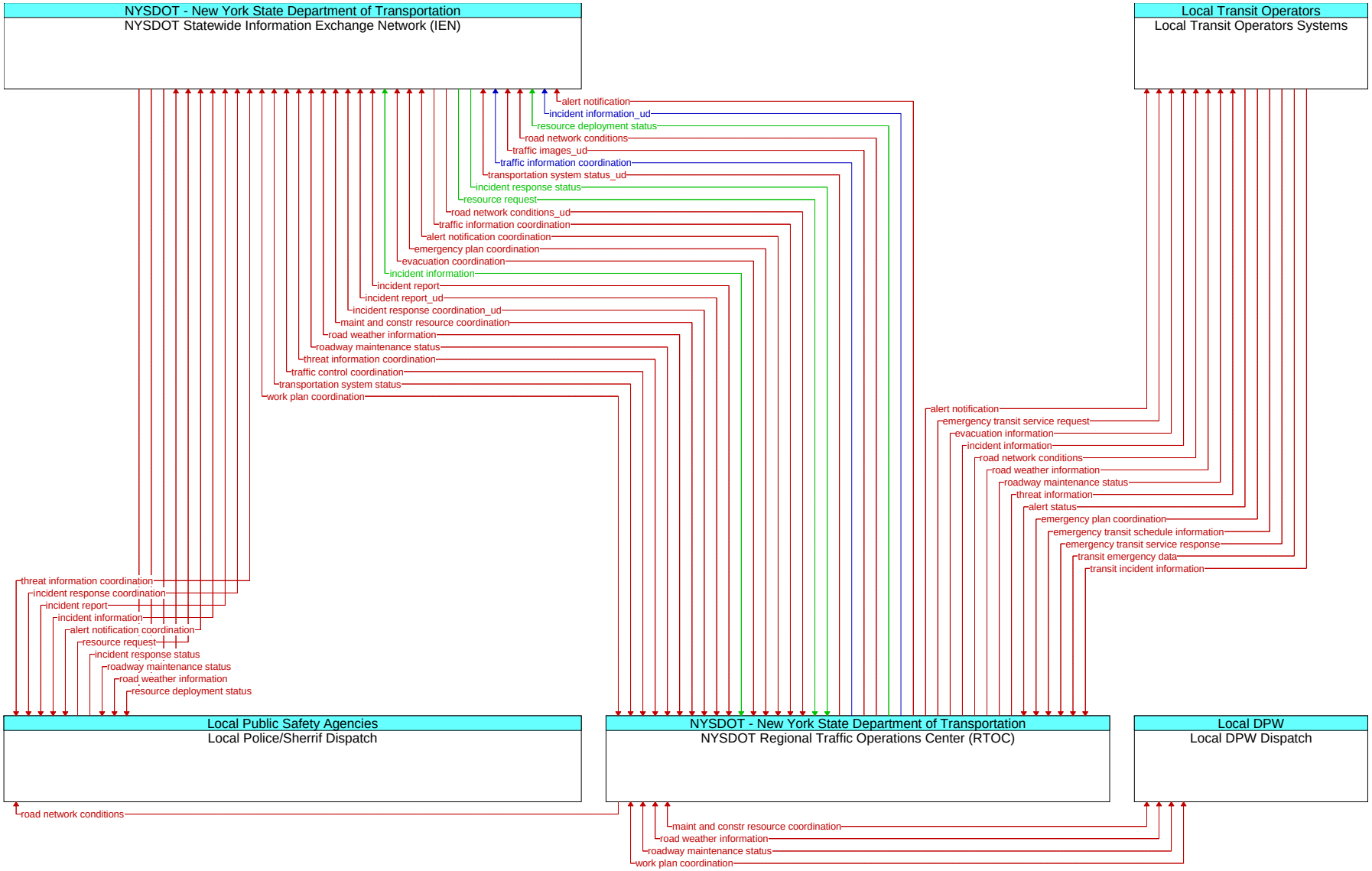
NYSDOT IEN – Resolution of Ambiguities and Inconsistencies (2 of 3)

- An ambiguity results in that communication with Local Public Safety is via the NYSDOT IEN to the local RTOC, and possibly all NYSDOT RTOCs.
- The described ambiguity does not mean that a project implementation may not use the IEN software elements to allow exchange of information between local ITS providers (for example transit and law enforcement) information to an RTOC. The IEN design describes an “I3B” software element that is suitable for intra-regional communications. In fact, this is the design carried out in several regions.

NYSDOT IEN – Resolution of Ambiguities and Inconsistencies (3 of 3)

- From an architecture perspective, the consultants would like to clarify that local ITS elements (including public safety) connect to the RTOC, then the RTOC (possible packaging information from various local sources) would distribute ITS information to other regions via the IEN.
- Therefore, it is suggested to show local public safety connecting directly to the RTOC (minus showing the IEN detail).

NYSDOT IEN – Example of how things are connected now



Item 5:
Web Site Demonstration

Demonstration Points

- Navigating to a Project Description and ITS Elements
- Navigating to a Stakeholder and ITS Element's Description
- Navigating to an ITS Element's Context Diagram
- How to send your comments using the e-mail hyperlink
- Navigating to a PDF Version of Project Documents

Item 6:
Maintenance Plan

NYSDOT Statewide Services ITS Architecture Maintenance Plan

- Rule 23 CFR 940.9
  - Requires that each region and its stakeholders must have a plan to maintain the regional ITS architecture
- Defines a formal process to update the Statewide Services ITS architecture to reflect changes in ITS capabilities, goals, projects and plans.
  - Define Change Management Process
  - Define policies related to access/distribution/use of information content of the regional ITS architecture

NYSDOT Statewide Services ITS Architecture Maintenance Plan

- Roles and Responsibilities
  - Steering Committee
    - NYSDOT and NYSTA managers responsible for ITS project initiatives from creation, funding and project development
  - Responsible Agency
    - Contracting agency
    - Allocates resources, maintains the “records”
  - Maintenance Manager
    - Coordinates maintenance activities, maintains Change Request Forms and Change Request Database
    - Manages Consultant

NYSDOT Statewide Services ITS Architecture
Maintenance Plan

- Roles and Responsibilities
  - Maintenance Working Group
    - Provides oversight for completeness and appropriateness
    - Possibly consider points of contact for priority projects for this ITS architecture update, a subset of this initial working group, plus NYSTA.
  - Chairperson
    - Calls and leads meetings
    - Reports to Steering Committee
    - Assigned by Steering Committee for one 2-year term
  - Stakeholders
    - Responsible for identifying updates to its projects and elements
    - Assign an Authorized Representative regarding updates and policies

NYSDOT Statewide Services ITS Architecture Maintenance Plan

- Change Management Process
  - When to Update
    - Maintenance Manager to request updates every 3 months
    - Major Revisions may occur every 3-5 years, concurrent with a new TIP, RTP, or Capital Plan
  - Change Request Form
    - Requires signature(s) by the Authorized Representative of all Stakeholder directly affected by the proposed change

NYSDOT Statewide Services ITS Architecture Maintenance Plan

- Submit Change Request Form to Maintenance Manager
  - Enters in the Change Request Database
  - Preliminary Check for completeness and appropriateness
  - Creates a notification bulletin of proposed changes
- Assessment
  - Maintenance Working Group provides oversight
  - Reviews proposed changes for appropriateness

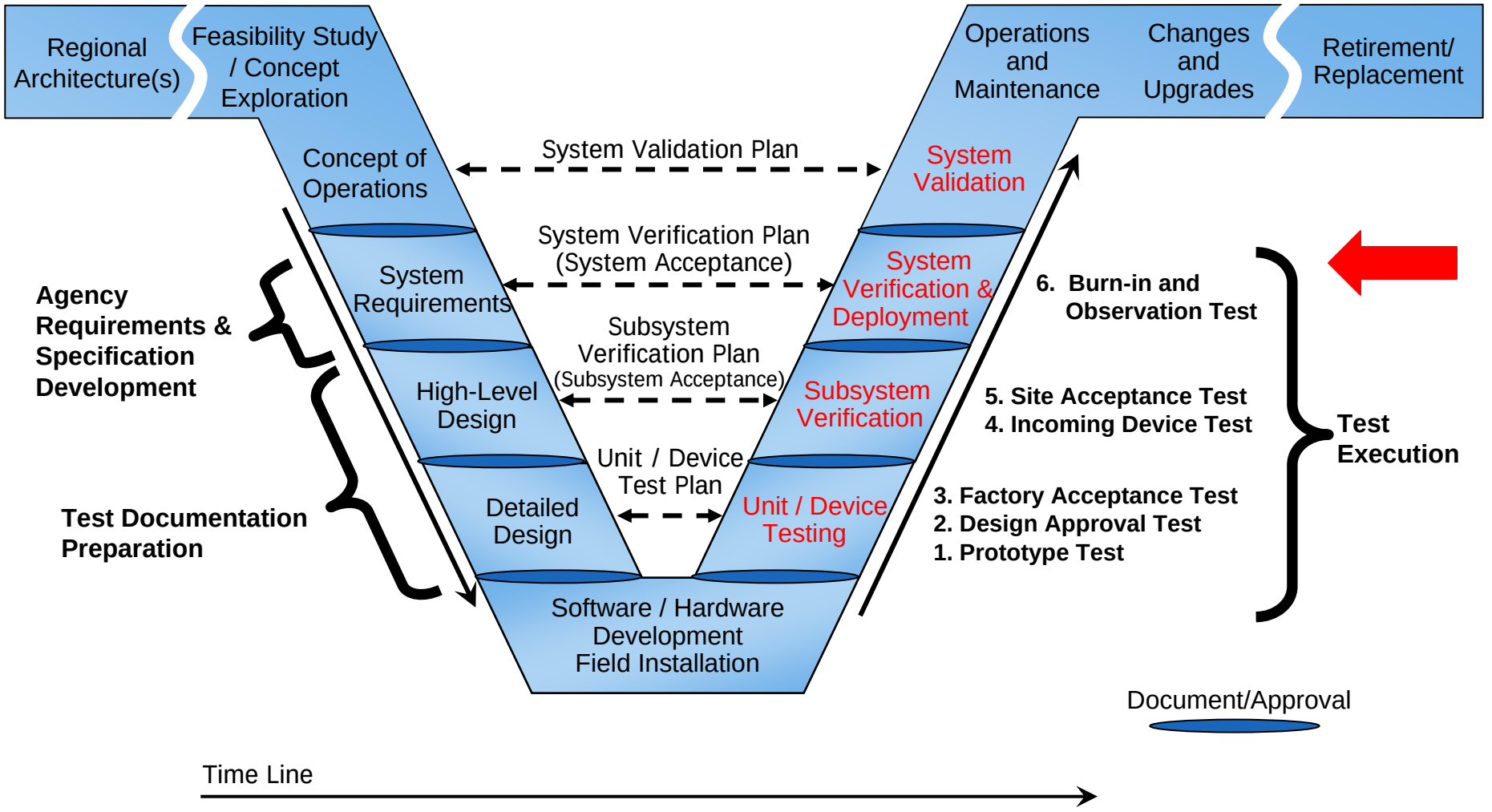
NYSDOT Statewide Services ITS Architecture Maintenance Plan

- Implementation
  - Make agreed changes to the Baseline
  - Update Change Request Database
  - Informs Stakeholders via e-mail
  - Distribute changes
  - Updates Web Site.

Item 7:
Wrap-up and Questions?

Additional Support Slides:
ITS Standards Implementation and Testing as part of a Systems Engineering process

Implementation and Testing



Testing Phases

Test Phase	Purpose	Number of Units	Test Location
Prototype Test and Inspection	Verify the electrical and mechanical design.	One prototype.	Test Laboratory
Design Approval Test and Inspection	Verify the final design.	Pre-production or a small percentage of the production units	Laboratory
Factory Acceptance Test	Verify production units are identical to the final design and production quality	A percentage of the production unit.	Production factory.
Incoming Device Test	Inspect for damage due to shipping and handling.	All delivered units, including spares	Agency.
Site Acceptance Test	Full functionality of the entire system.	All installed units.	Final location for operation.
Burn-in and Observation Test	Monitor proper operation of the installed unit.	All installed units.	Final location for operation.

Test Documentation

- Test Plans. Describes the scope, approach, resources, and schedule of testing activities
- Test Designs. Describe which requirements are to be tested and which test cases cover which requirements. Pass-fail criteria.
- Test Cases. Describe the inputs, outputs, expected results, and procedures used to verify one or more requirements.
- Test Procedures. Sequence of steps in a test.