U.S. Department
of Transportation
**Federal Highway
Administration**

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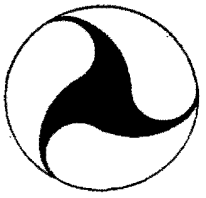
NHI Course No. 13602

Deploying Integrated Intelligent Transportation

Participant Workbook

National Highway Institute

Module 0
Introduction and Overview



Introduction and Overview

- Who are we?
- Who are you?
- Course expectations
- Course overview and objectives
- Administrative items

Who Are We?

- Names
- Where we're from
- What we do

Who Are You?

- Name
- Job
- Responsibilities

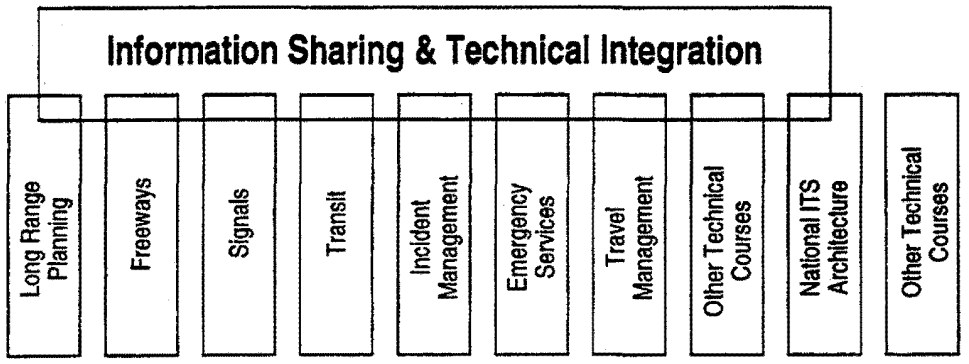
Course Expectations

- What are you expecting this course to cover?
- How familiar are you with ITS?
- How many of you have attended the ITS Awareness Seminar?

Course Overview and Objectives

- Context
- Learning objectives
- Outline
- Schedule

Context

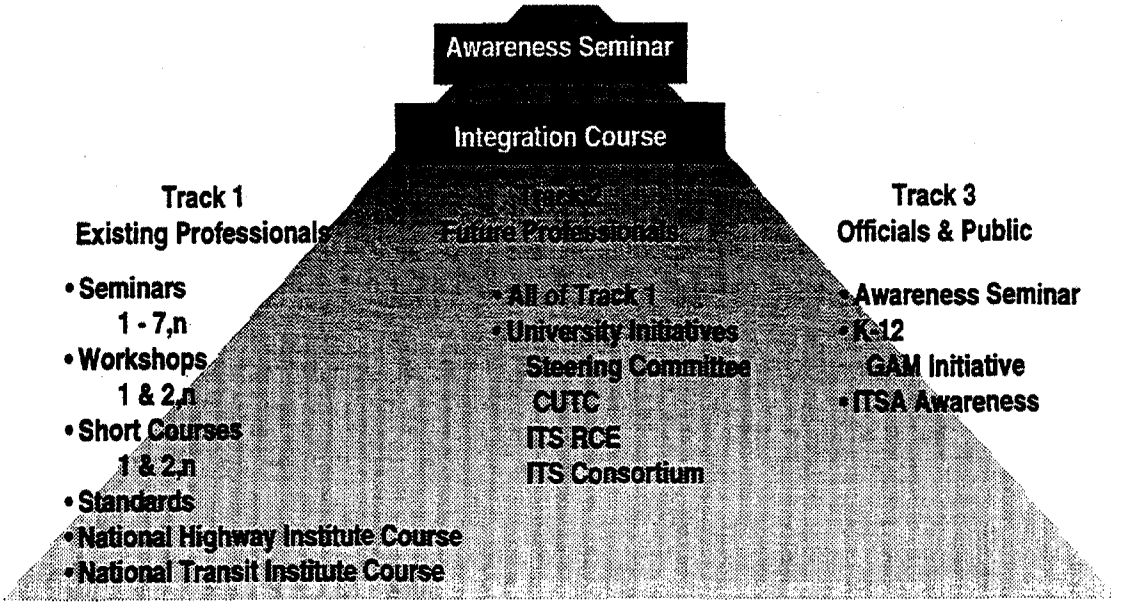


Professional Capacity Building Program

The Professional Capacity Building Delivery Plan

- Awareness Seminar 1/2 - 1 Day
- Deploying Integrated Intelligent Transportation Systems 3 Days
- Seven 1/2 to Full Day Seminars
- Two Workshops of 1/2 - 2 Days
- Two Short Courses of 2 - 3 Days
- Many Other Short Courses and Seminars Available Now * In Catalog
- New Courses and Seminars Will Be Developed to Serve Additional Needs

The Professional Capacity Building Umbrella



Learning Objectives

- Identify at least five benefits provided by integrated, intermodal intelligent transportation systems (ITS)
- Identify the agencies with whom information should be shared in integrating ITS

Learning Objectives (cont.)

- Identify the information flows that should be established by your agency and each "partner" agency to operate an integrated ITS
- Describe the various "types" of information sharing that exist in today's transportation environment

Learning Objectives (cont.)

- Describe the National ITS Architecture and how it can be used as a time saving tool to implement integrated ITS
- Explain the institutional challenges that must be addressed to integrate ITS successfully

Learning Objectives (cont.)

- Explain the technical challenges that must be addressed to successfully deploy an integrated ITS
- Explain the importance of local issues and challenges within a regional context
- Understand procurement alternatives

Outline

- Module 1 — Course Framework
- Module 2 — Stakeholders and Operational Objectives
- Module 3 — Information Needs and Sharing
- Module 4 — Operational Implications of Information Sharing

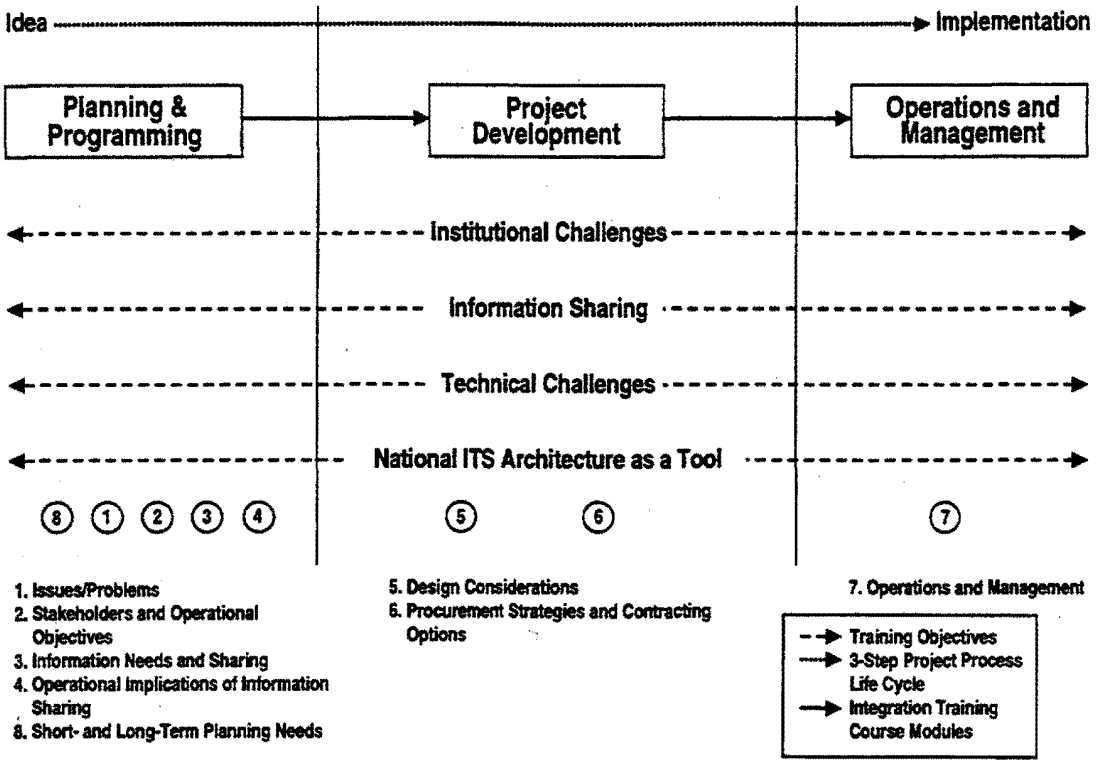
Outline (cont.)

- Module 5 — Design Considerations
- Module 6 — Procurement Strategies and Contracting Options
- Module 7 — Operations and Management
- Module 8 — Short- and Long-Term Planning Needs
- Module 9 — Course Wrap-Up

Schedule

- See fold out

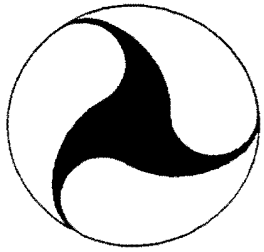
"Integration" Course Framework



Administrative Items

- Participant materials
  - Participant's Guide
  - Reference Material
- Breaks
- Lunch
- Restroom location(s)
- No evening plans
- Course evaluation forms

Module 1A
Course Framework



What are the Transportation Challenges in Your Area?

- Problems/Site conditions
- Deployment Issues/Constraints
- Other

Smart Moves Video

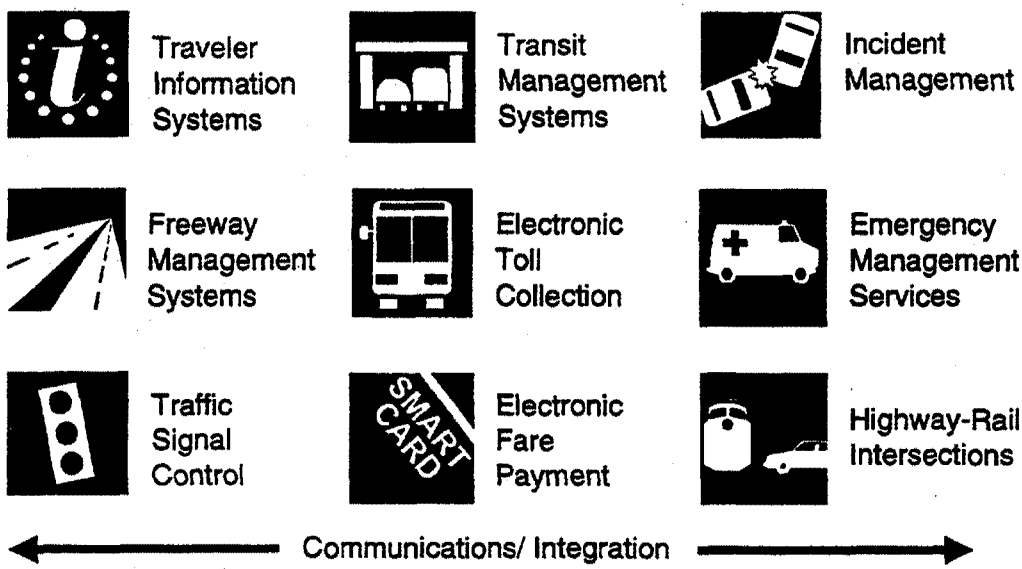
- Presents the benefits of ITS
- While you watch:
  - Note problems
  - Note solutions
- How does this compare to our lists?

What is ITS?

What is ITS?

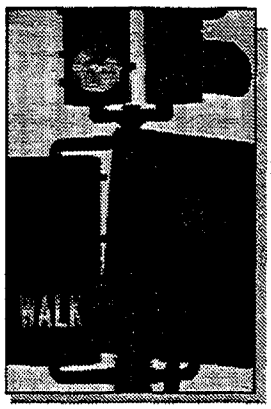
- The application of sensor, computer, electronics, and communications technologies and management strategies in an integrated manner - providing traveler information to increase the safety and efficiency of the surface transportation systems

Metropolitan ITS Infrastructure Components



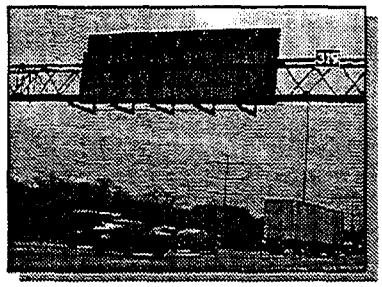
Traffic Signal Control

TSC



Freeway Management Systems

FMS

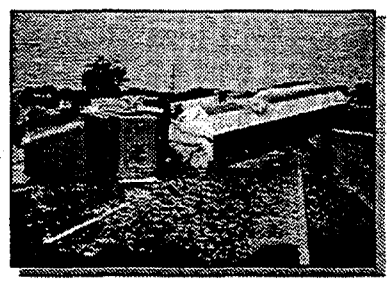


Transit Management Systems

TMS

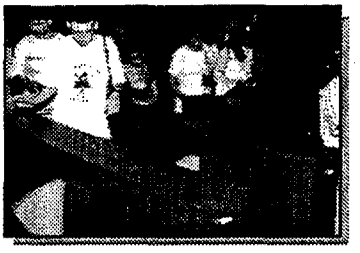
Incident Management

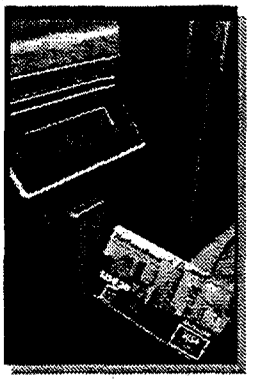
IM

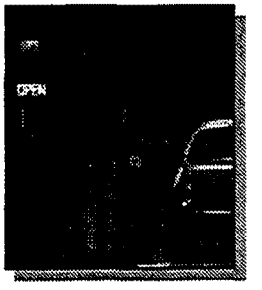


Electronic Fare Payment

SMART CARD EFP





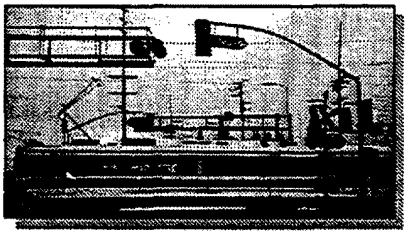


Electronic Toll Collection

ETC

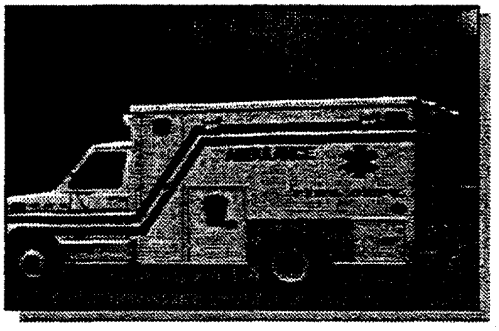
Highway-Rail Intersections

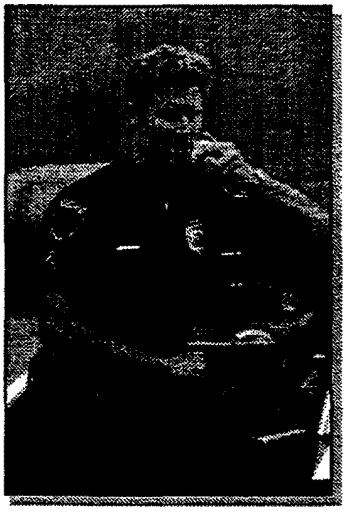
HRI



Emergency Management Services

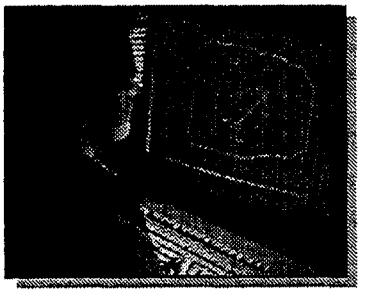
EMS





Traveler Information Systems

TIS



Telecommunications

- The element that facilitates integrating the ITS infrastructure components into a regional transportation system
  - Information sharing
- Integration is the desired result, communications provides the "glue"

How Does ITS Address Problems/ Site Conditions?

- Match the components with the "Top-10" challenges

National ITS Architecture

- A unifying framework that enables ITS infrastructure components to share information and function as an intermodal transportation system
- Documents stakeholder consensus regarding
  - Current information sharing needs and future opportunities
  - Data descriptions, processing specifications, and process flows
  - Subsystem definitions, functionality, and standard interface needs
  - Telecommunications options for subsystem inter-connections
  - Potential institutional roles, responsibilities, and relationships

Relationship Between the National ITS Architecture and the ITS Infrastructure Components

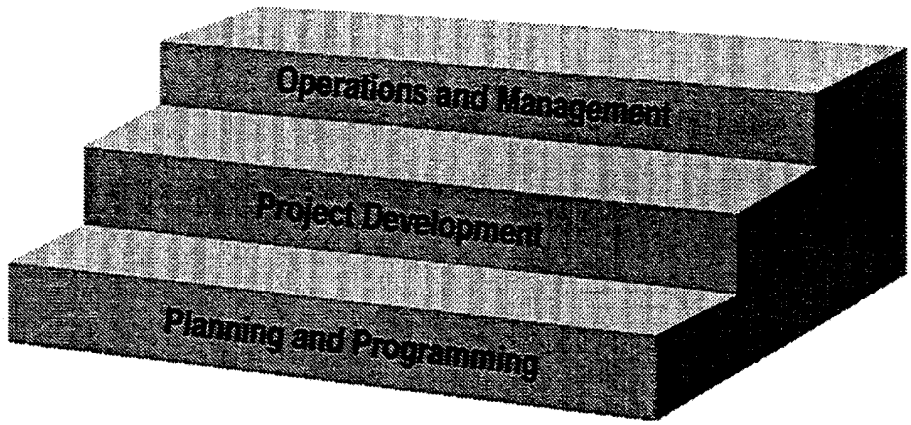
Architecture Subsystem \ ITS Infrastructure Component	Traffic Signal Control	Freeway Management Systems	Transit Management Systems	Incident Management	Electronic Fare Payment	Electronic Toll Collection	Highway-Rail Intersections	Emergency Management Services	Traveler Information Systems
Commercial Vehicle Administration (CVAS)									
Commercial Vehicle Check (CVCS)									
Commercial Vehicle Subsystem (CVS)									
Emergency Management (EM)								x	
Emissions Management (EMMS)									
Emergency Vehicle Subsystem (EVS)								x	
Fleet and Freight Management (FMS)									
Information Service Provider (ISP)									x
Personal Information Access (PIAS)									x

Relationship Between the National ITS Architecture and the ITS Infrastructure Components

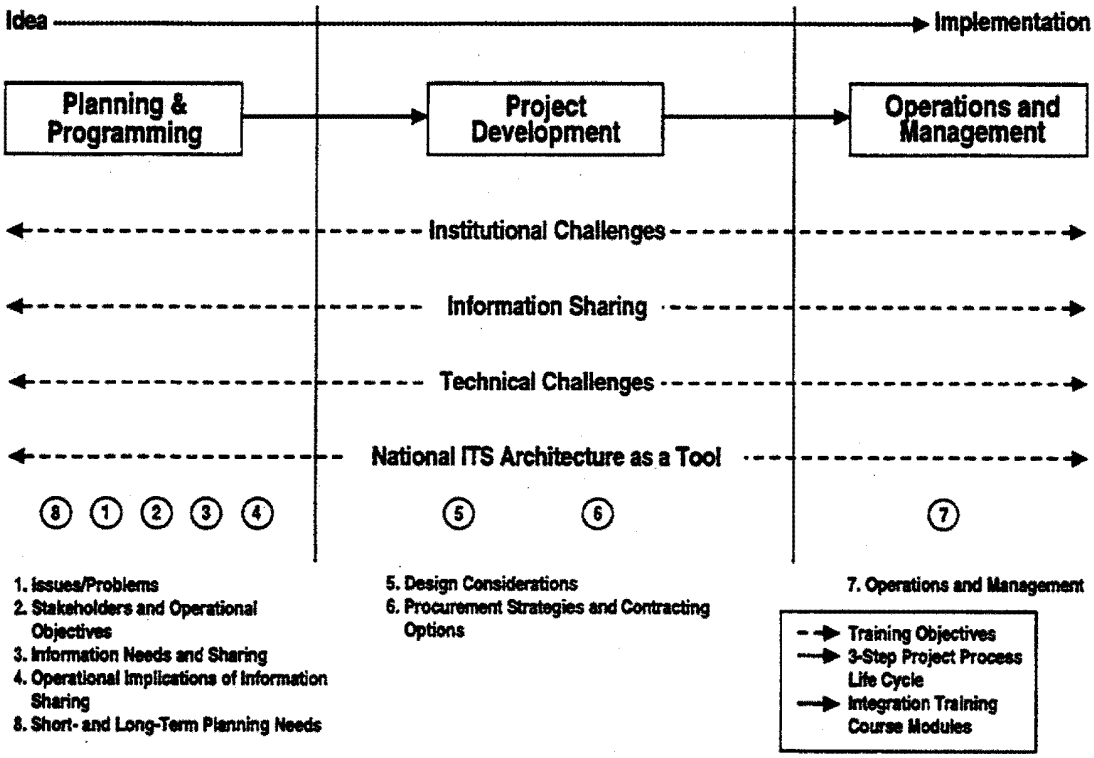
Architecture Subsystem \ ITS Infrastructure Component	Traffic Signal Control	Freeway Management Systems	Transit Management Systems	Incident Management	Electronic Fare Payment	Electronic Toll Collection	Highway-Rail Intersections	Emergency Management Services	Traveler Information Systems
Parking Management (PMS)									
Planning Subsystem (PS)									
Roadway Subsystem (RS)	x	x					x		
Remote Traveler Support (RTS)					x				x
Toll Administration (TAS)						x			
Toll Collection (TCS)						x			
Traffic Management (TMS)	x	x		x			?		
Transit Management (TRMS)			x		x				
Transit Vehicle Subsystem (TRVS)			x		x				
Vehicle (VS)						x			

? = Interface had not yet been determined

From Idea to Implementation



"Integration" Course Framework



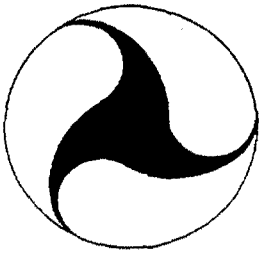
Let's Review

- Identified regional transportation challenges
- Defined ITS
- Introduced the ITS infrastructure components and their integration
- How the infrastructures components address transportation challenges

Let's Review (cont.)

- Telecommunications: The glue that holds it all together
- Introduced the three major steps of the project process
- Recognize institutional vs. technical challenges

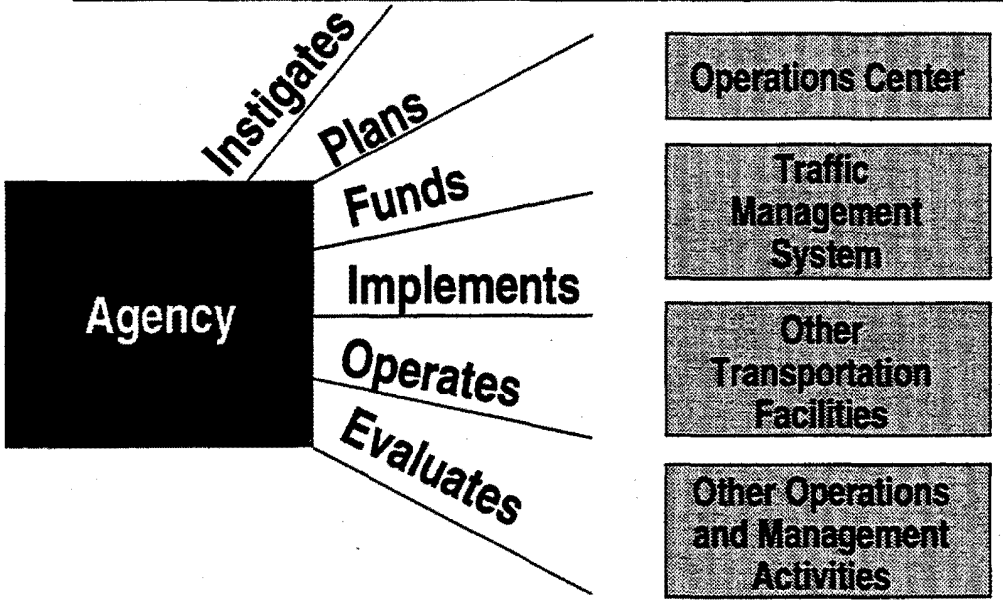
Module 2A
Stakeholders and Operational Objectives



Module Objectives

- Identify:
  - Agency stakeholders
  - Lead agency for coordination
  - Lead agencies for projects
  - Participating stakeholders
  - Customers/users
- Involve all stakeholders

Identify Stakeholder Agencies



Identify Stakeholder Agencies

- Name all of the agencies (based on your personal experience) that you consider to be primary stakeholders in the operations and management of transportation systems

Identify Primary Stakeholders

- Using the "Top 10 List" (of challenges identified in Module 1A), identify some of the primary stakeholders

Identify Lead Agencies

- For coordination
- For projects

Identify Lead Agency

- Is a "Lead Agency" important in planning, developing and operating ITS projects?
- How does this relate to a "champion"?

Identify Lead Agency

- In your region, provide an example of a "Lead Agency" and a project it might sponsor

Identify Other Participating Stakeholders

- Agency or firm that recognizes the utility of having other transportation facilities assist in achieving its agency mission
- Broad base of stakeholders
  - Tourist bureaus
  - Chambers of commerce
  - Hospitals

Identify Other Participating Stakeholders

- Based on your experience, name a few agencies that could be "other" participating stakeholders

Identify Other Participating Stakeholders

- Using the "Top 10 List" (of challenges identified in Module 1A), identify some of the "other" participating stakeholders

Identify Customers/Users

- General public
- Transportation disadvantaged
- Interest groups (e.g., AAA, news media, AARP, environmental)

- Does this broaden the list of stakeholders?

Involve All Stakeholders

- Include all perspectives in the region
- Encourage
  - Inter-agency communication
  - Consensus of regional needs and issues
  - Conceptualizing solutions collaboratively

Identify Operational Objectives

- "High-level" functional capabilities, requirements and system performance criteria desired by the involved agencies to address identified issues/problems

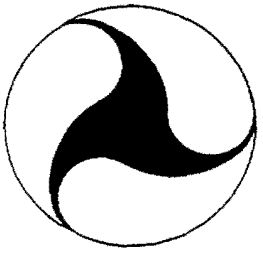
Identify Operational Objectives

- What are your agency's "primary" (day-to-day) operational responsibilities within your region's transportation system?
- The National ITS Architecture documents can help with this

Identify Operational Objectives

- Generate possible operational objectives for each ITS infrastructure component as "mapped" to an identified challenge (from Module 1A)

Module 3A
Information Needs and Sharing



Module Objectives

- Illustrate how integrated deployment lays the foundation for information sharing
- Describe how integrated ITS can be deployed within current transportation institutions
- Illustrate how the National ITS Architecture can help

Where We Are Now...

- Module 1
  - Mapped issues/problem to potential ITS infrastructure component "solutions"
  - ITS solutions often involve exchanging information with multiple ITS components

Where We Are Now. . .

- Module 2
  - Broke down ITS infrastructure components into possible ITS projects
  - Established ITS project "Lead Agency"
  - Identified other ITS stakeholders

Regional Integration

- Ground zero—develop trust and relationships
- 1st generation of integration—information sharing
- 2nd generation of integration—responsibility sharing

Information Sharing

- Focus on information sharing between agencies
- Examples
  - Share/distribute CCTV video images
  - Pass-along/share incident locations
  - Provide transit routes/schedules/status
  - Provide real-time network status

Responsibility Sharing

- Define agreements to identify implementation/ operating responsibilities
- Includes information sharing

What Information Needs to Be Shared

- List the information that you currently share between your agency and other regional agencies
- How does this information help your agency to do its job better?

Participant Worksheet (Example)

Your Agency	Information Currently Shared	Information Flow	Other Agency
State DOT	CCTV video image	1-way (⇨)	Transit
State DOT	Bus route/schedule	1-way (⇦)	Transit
State DOT	Ramp metering "priority"	2-way (⇔)	Transit
State DOT	Network status	2-way (⇔)	Local Agency

What Information to Share?

- List the information your agency would like from other regional agencies
- How will this information help your agency to do its job better?

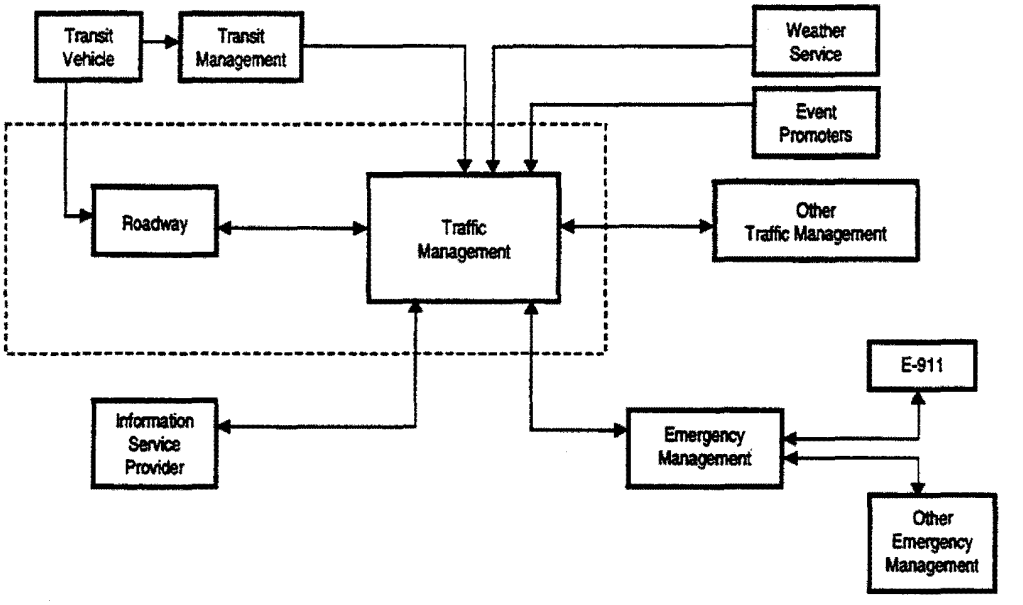
National ITS Architecture

- Provides some tools to assist ---- a road map
- Information sharing requires compatible ITS deployments
- National ITS Architecture provides the framework for integrating basic infrastructure
- Includes technical and institutional elements

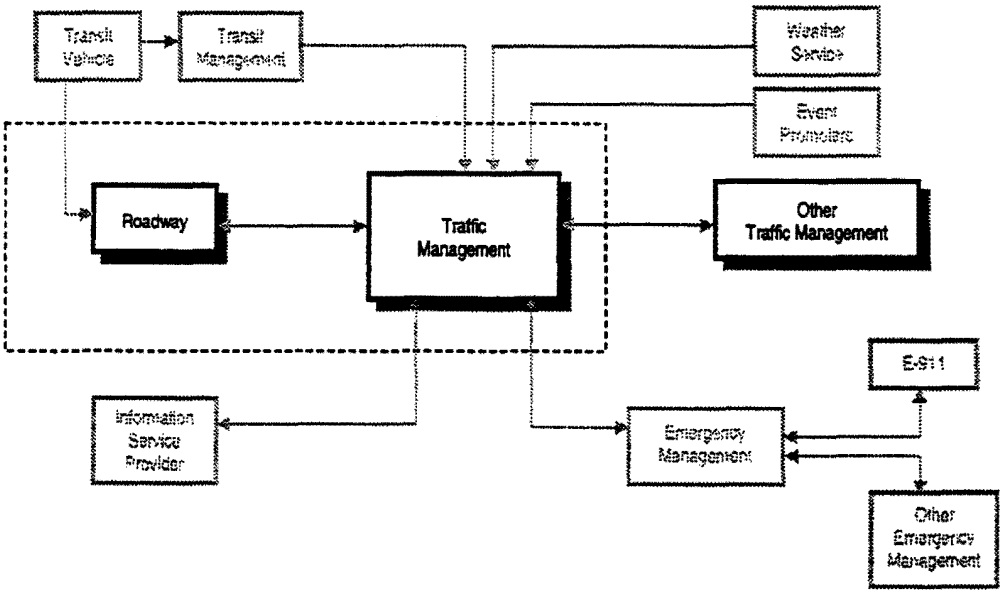
Steps Toward Implementing a Project

- Convene the requisite subgroup of regional stakeholders
- Define system operational objectives and functional requirements
- At an institutional level, sketch out:
  - Information needs, sources, and flows
  - Facilities and communications links
  - A general concept-of-operations

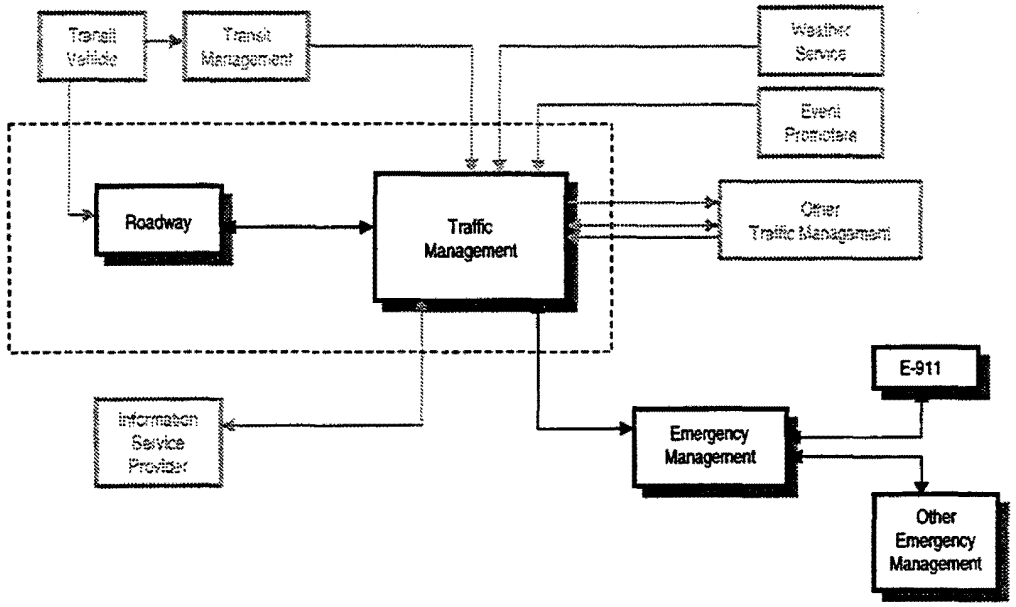
Incident Management Information Needs/Flow



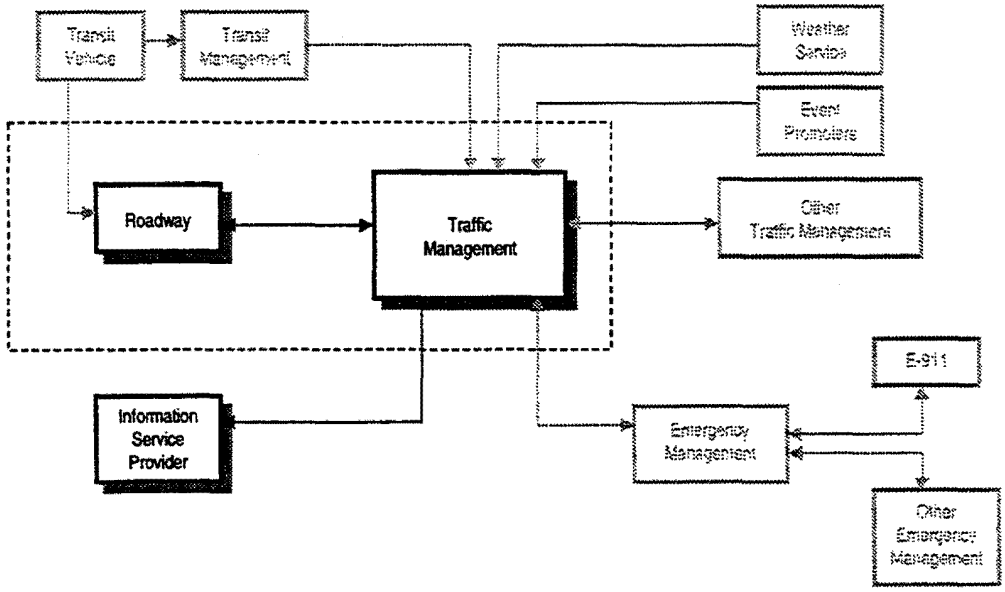
Incident Management and Other Traffic Management



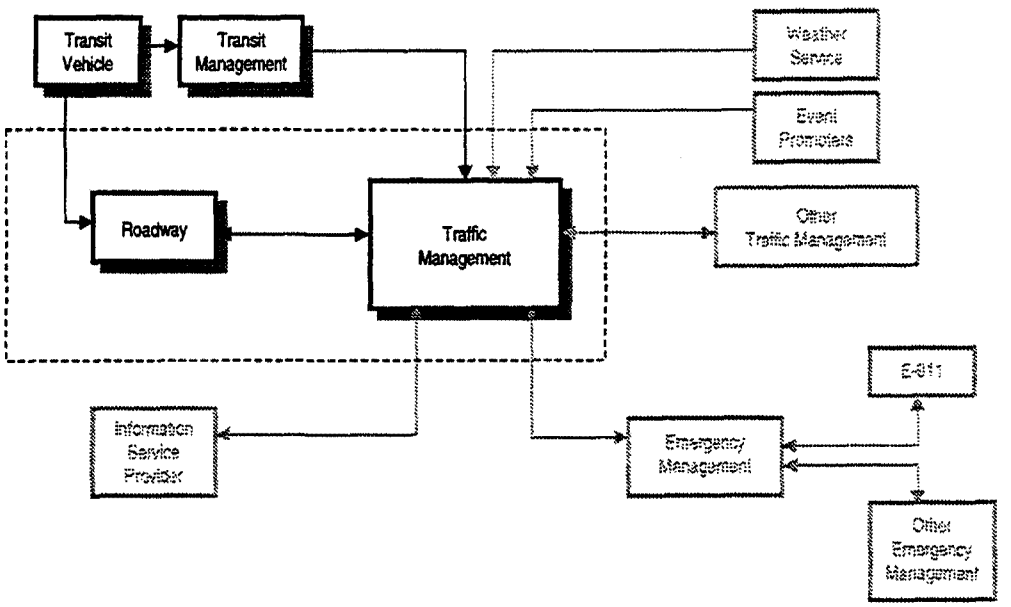
Incident Management and Emergency Management



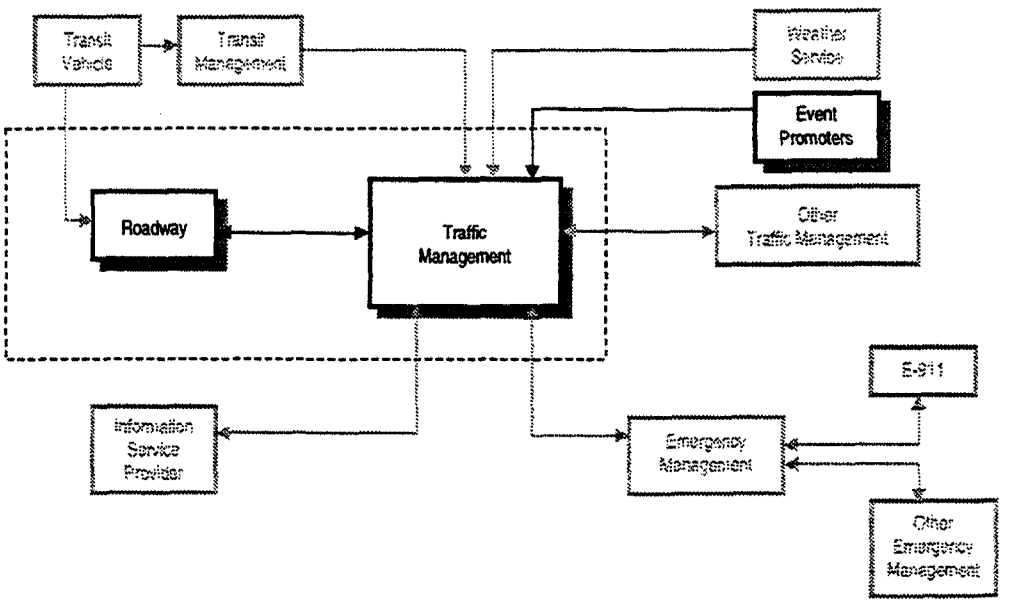
Incident Management and Information Service Provider



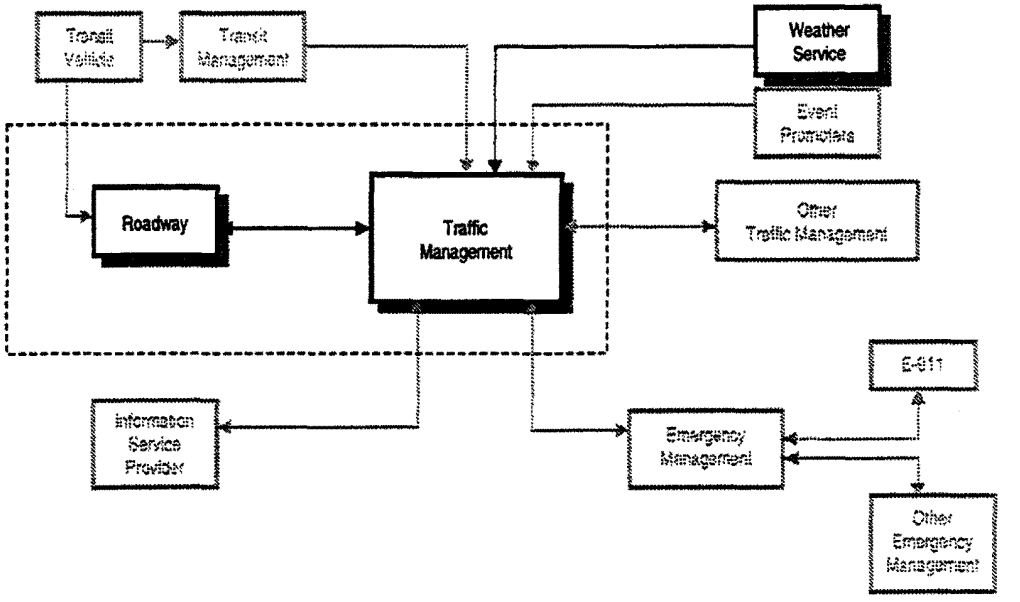
Incident Management and Transit Management)



Incident Management and Event Promoters



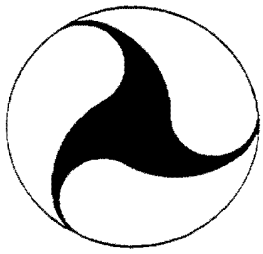
Incident Management and Weather Service



Review

- National ITS Architecture helps
- Provides roadmap
- Integration is the key

Module 4A
Operational Implications of Information Sharing



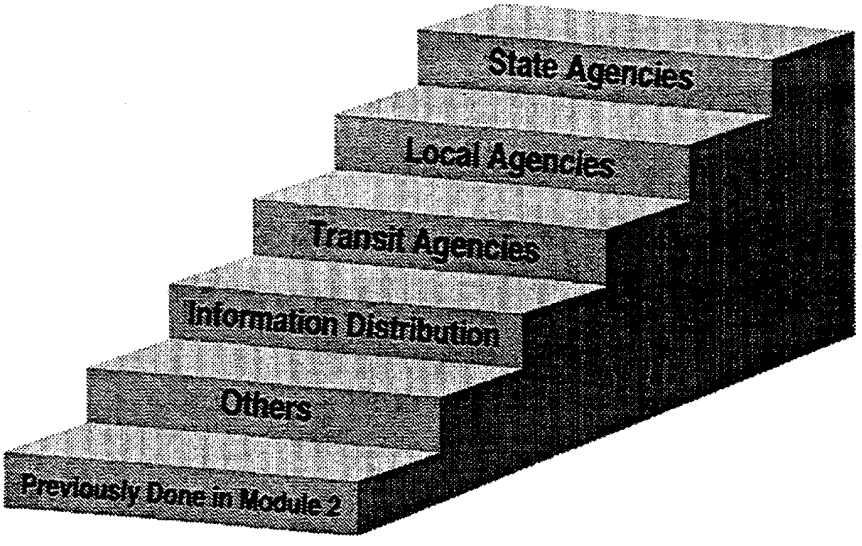
Module Objectives

- Describe how information sharing between ITS infrastructure components will influence agency operations (and vice-versa)
- Describe how to accomplish "real" infrastructure integration within today's transportation environment

Integration Between Agencies

- Identify ITS stakeholders
- Define agency concept-of-operations
- Establish pre-defined operational policies and procedures between agencies

Identify ITS Stakeholders



Concept-of-Operations

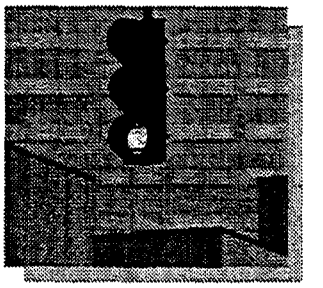
- Operational concepts are the functional requirements and performance expectations of the "partner" agencies
- "What the system will do, how it will do it, and how well it will do it"
- Linked to regional goals and operational objectives

Concept-of-Operations

"Particular" operational objectives within your agency	"Categorized" operational objectives on a per ITS infrastructure component basis

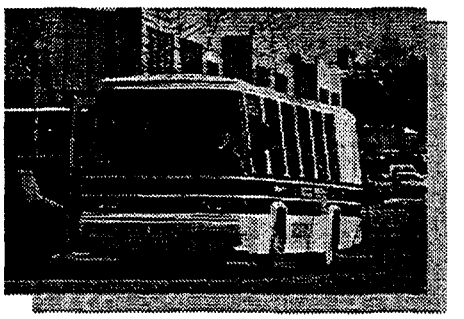
Concept-of-Operations (Example)

- Traffic Signal Control
  - Coordination settings vary throughout the day
  - Area-wide coordination
  - Traffic "adaptive" signal control
  - Use cellular phones to get information



Concept-of-Operations (Example)

- Transit Management
  - Provide real-time information/status to travelers about schedule adherence and timely arrivals
  - Re-route transit vehicles around major incident



Operational Implications of Information Sharing

Agency "current" level of information sharing

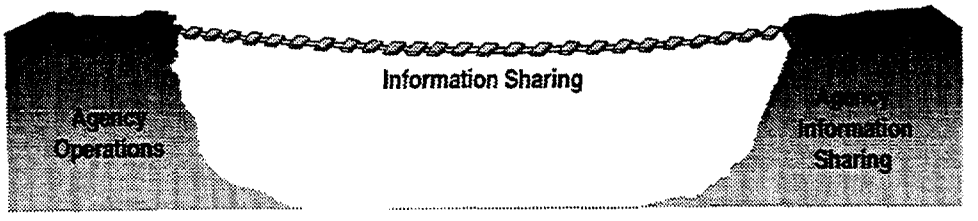
Agency "desired" level of information sharing

Operational Implications of Information Sharing

- "Match-up" current operational objectives with:
  - "Current" level of information sharing
  - "Desired" level of information sharing

Operational Implications of Information Sharing

- The identified information sharing "gap" should indicate where agency operations need to be "re-addressed"
- The identified agency operations "gap" should indicate where information sharing arrangements need to be "re-addressed"



Types of Information Sharing

- Information Sharing
- Direct Interaction
- Standard operating Procedures
- Decision Support System
- Expert System

Types of Information Sharing

- 1st generation—information sharing
- Examples
  - Share/distribute CCTV video images
  - Pass-along/share incident locations
  - Provide transit vehicle routes/schedules/status

Types of Information Sharing

- 2nd generation—responsibility sharing
- Examples
  - Signal and ramp metering timing coordination
  - Transit "priority"
  - 24-hours-a-day/7-days-a-week operations (24/7)

"Sharing" Examples

- Information sharing
  - Caltrans D12, City of Anaheim, and City of Irvine (Orange County, CA)
- Direct interaction
  - "Basic" day-to-day approach
- Standard operating procedures (SOP)
  - Seattle Incident Management Plan (Seattle, WA)
- Any local examples?

Operational Implications of Information Sharing (Example)

- Traffic Signal Control (current)
  - Optimize coordinated throughput of vehicles at signalized intersections
- Freeway Management (desired)
  - Ability to coordinate diversion strategies (e.g., ramp metering rates, signal timings, signing strategies, etc.) during an incident

Operational Implications of Information Sharing (Example)

- Traffic Signal Control (resultant)
  - Provide ability to accommodate additional traffic volumes diverted from freeway through directional "flush" signal timings
  - Provide ability to get coordinated signal timings "back-to-normal"

Operational Implications of Information Sharing (Example)

- Freeway Management (resultant)
  - Provide incident notification to Traffic Signal Control to initiate pre-defined, agreed-upon signal timings
  - Provide signing strategies (e.g., VMS, portable VMS, HAR, etc.) to tell motorists about upcoming diversion/re-routing

Can It Be Done?

- "Willingness" of agencies to support resultant operations
  - Institutional
  - Technical
  - Financial

"Who Can Help..."

- Scanning tours
- Peer-to-peer group
- ITS specialists
  - Agency
  - USDOT (FHWA/ FTA/ Volpe Center)
  - Consultants

Potential Benefits of Integration

- Coordinated:
  - Incident response
  - Traveler information
- Reduced development cost/risk
- Shared:
  - Communications
  - Facilities
  - 24-hours-a-day/7-days-a-week operations
  - Data

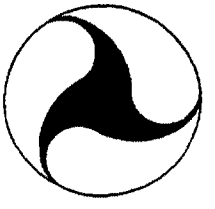
What Makes Integration Possible---Telecommunications

- Provides the critical links between subsystems
  - Informational backbone for ITS infastructure will transmit voice messages, video images, and control and survelliance data

What Makes Integration Possible---Telecommunications

- Wireless wide area network (WAN) communications
- Dedicated short-range communications (DSRC)
- Wireline WAN communications
- Vehicle-to-vehicle communications

Module 5A
Design Considerations



Challenges

- Meet operational goals
- Cost-effective over time
- Expand
  - Geographically
  - Functionally

Challenges (cont.)

- Provide regional/national compatibility
- Leading edge vs. bleeding edge
- Continue institutional coordination/ cooperation

Discussion Questions

- How do we ensure that the deployed system will meet our operational goals?
- How do we design for regional compatibility and expandability?
- What do we need to consider to ensure cost-effectiveness over time?

Discussion Questions (cont.)

- What is the role of the National ITS Architecture in all of this?

National ITS Architecture Purpose

- To ensure that ITS consumer devices will work consistently throughout the nation
- Developed as a consensus of public and private sector stakeholders
- Covers current and envisioned ITS user requirements 20 years into the future

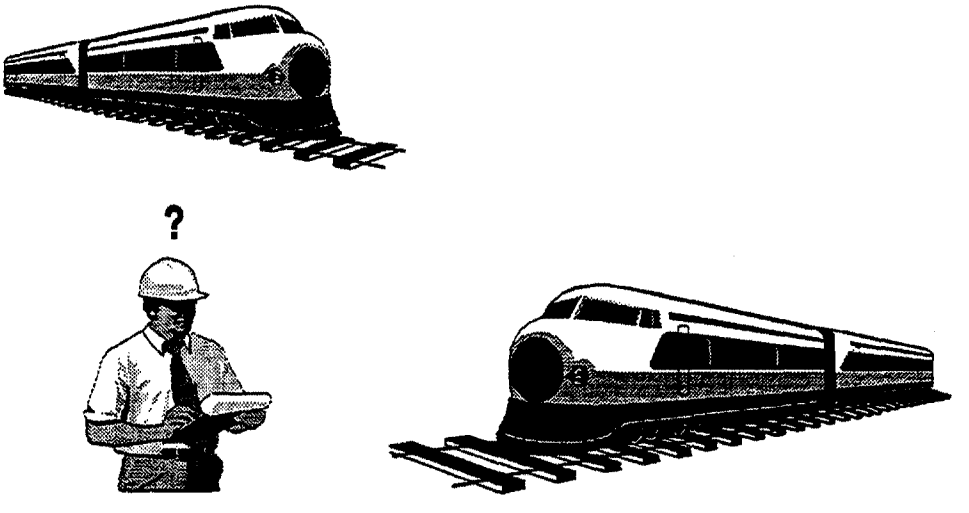
National ITS Architecture Development Principles

- Technology and vendor independent
- Market driven standards and protocols
- Choice in price/performance/functionality
- Ability to leverage existing infrastructure

National ITS Architecture Development Principles (cont.)

- Flexible public/private roles and responsibilities
- Information privacy protection
- Incremental implementation/upgrade/expansion
- Progressive levels of integration

Why is an Architecture Needed?



National ITS Architecture

- Defines the basic subsystems, interconnections, data flows, and functions required to make ITS work
- Identifies the interfaces between subsystems for which standards must be developed
- Subsystems commonly depicted in "laymen's terms" through the ITS infrastructure components

National ITS Architecture Structure

- User requirements/services
- Market packages
- Logical architecture
- Physical architecture

User Requirements/Services

- Currently 30 user service groupings
- Can be expanded as warranted

Market Packages

- Identify which National ITS Architecture subsystems and what equipment is needed to complete representative ITS applications
- Identifies both the logical and physical elements associated with a subsystem
- Provides simple traceability to associated user requirements

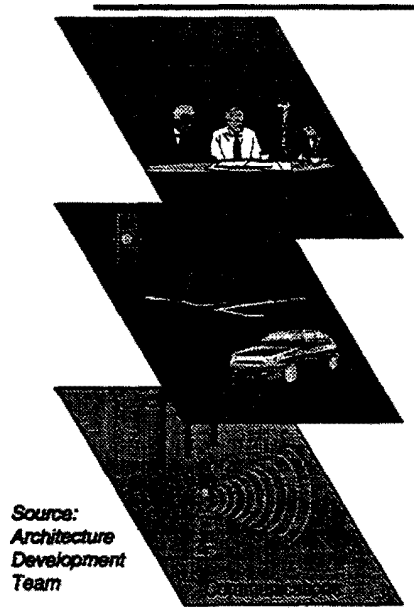
Logical Architecture

- Defines
  - Architecture boundary
  - Functions to be performed
  - Relationships between functions
- Does not define
  - Where the functions are performed
  - How the functions are implemented

Physical Architecture

- Describes how functionality is distributed between physical entities
- Defines the physical entity interfaces
- Must correspond/align with physical entity boundaries

Map of National ITS Physical Architecture



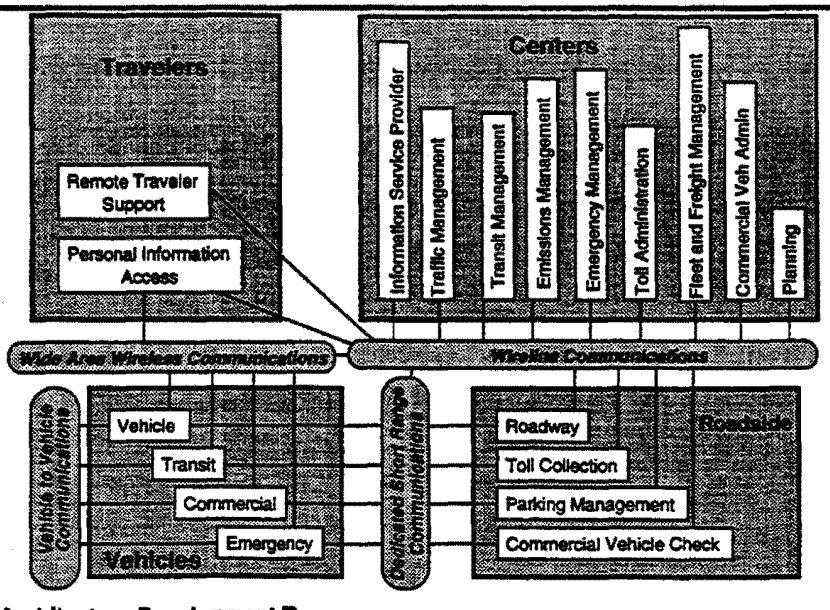
Source: Architecture Development Team

Institutional Layer
- –Implementation Strategy Document
- –"What is the supporting institutional structure, policy, and strategies?"

Transportation Layer
- –Physical Architecture Document
- –"What Transportation Systems transfer what information?"

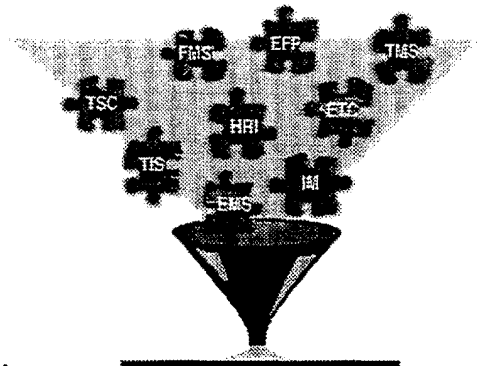
Communications Layer
- –Communications Document
- –"How is information transferred between Transportation Systems?"

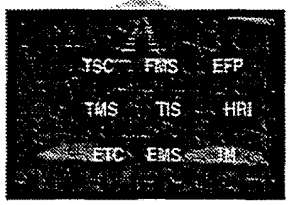
National ITS Architecture Subsystems and Interconnects



Source: Architecture Development Team

National ITS Architecture Integrates ITS Infrastructure Components

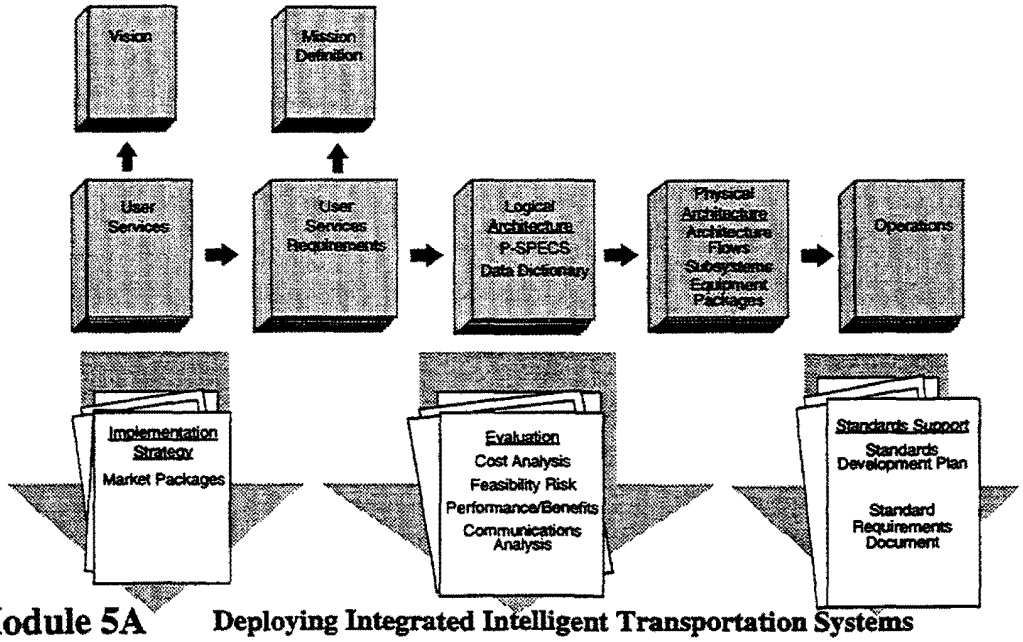




TSC - Traffic Signal Control
FMS - Freeway Management Systems
EFP - Electronic Fare Payment
TMS - Transit Management Systems
TIS - Traveler Information Systems

HRI - Highway Rail Intersections
ETC - Electronic Toll Collection
EMS - Emergency Management Systems
IM - Incident Management

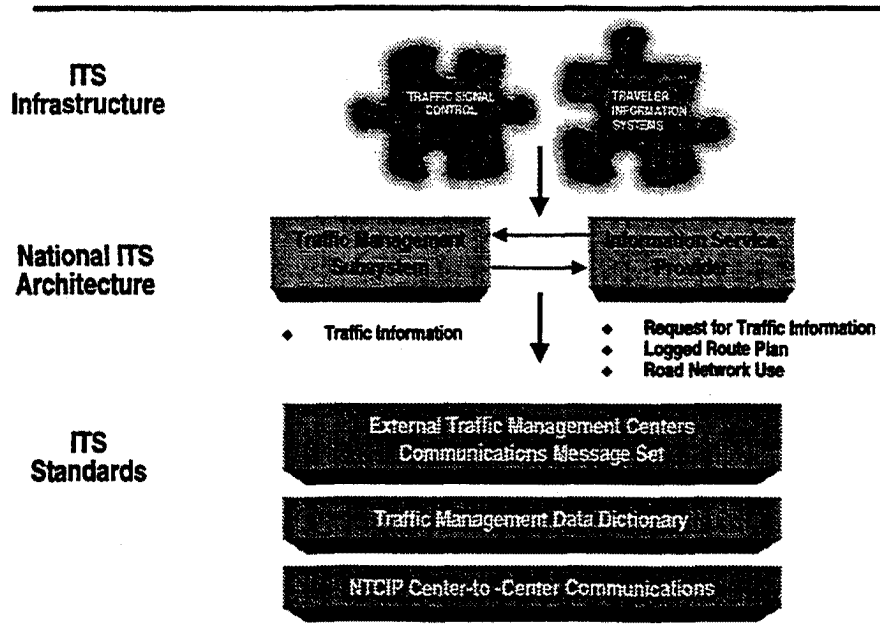
National ITS Architecture Documentation



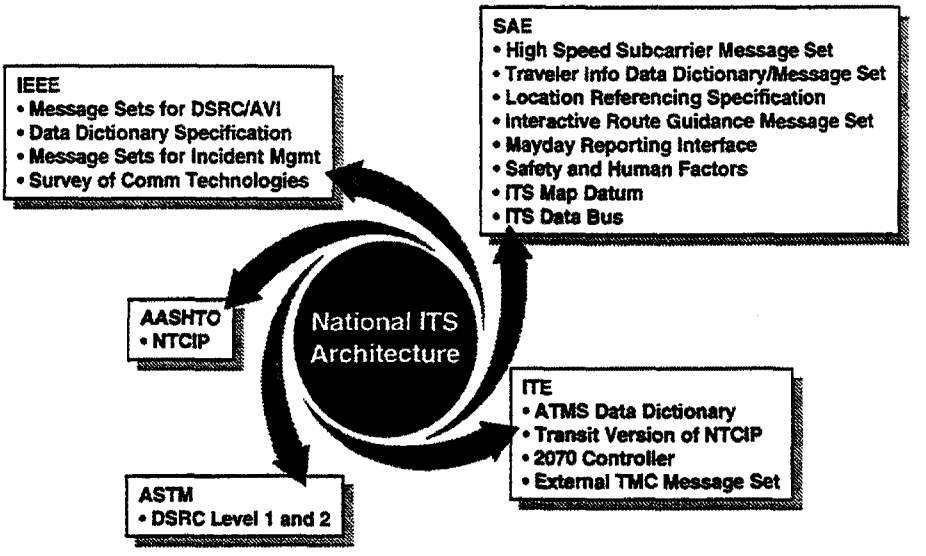
Importance of Standards

- National ITS Architecture
  - Use as guiding framework
  - Identifies interfaces
  - Specifies what systems perform which functions
- Standards and protocols specify how the subsystems must do it

ITS Infrastructure, Architecture, and Standards Example



Standard Development Organization Support



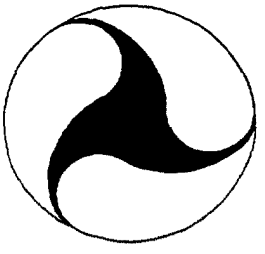
Benefits of Using the National ITS Architecture

- Facilitates information sharing and cooperation/coordination across institutional boundaries, enabling agencies to do a better job
- Reduces risk of acquiring incompatible/ dead-end technology

Benefits of Using the National ITS Architecture (cont.)

- Facilitates integrated deployment with simple "pick-n-choose" capabilities
- Reduces system engineering and development time by up to a factor of four
  - Denver, CO example

Module 6A
Procurement Strategies and Contracting Options



Module Objectives

- Discuss available strategies for implementing ITS infrastructure
- Identify issues for consideration when selecting an approach

Outline of Module

- Available strategies
- Review of selected characteristics
- Issues for selecting strategies

Strategies for Consideration

- Engineer/Contractor
  - Design/Bid/Build
- System Manager
- System Integrator
- Design/Build
- Design to Budget

Strategies for Consideration (cont.)

- Build, Own, Operate, Transfer (BOOT)
- Franchise/Lease
- Shared Resources
- Variations on a Theme
- Supplemental Transit Procurement Features

Engineer/Contractor - Advantages

- Long history of use
- Well-defined roles
- Legal precedent for handling disputes
- End product well-defined at early stage
- Many contractors available in market
- Contractor manages subcontractors
- Well-suited to highway construction

Engineer/Contractor - Disadvantages

- Artificial dividing line between design and construction
- Not well-suited to software development work
  - Difficult to specify
  - Buyer may not know needs
- Prime contractor may lack experience in areas crucial to project success

Engineer/Contractor - Disadvantages (cont.)

- Contractor has financial incentive to find deficiencies in bid documents and "changed" site conditions to seek change orders
- Lack of continuity - shifting of fault/blame

System Manager - Advantages

- Overall system design, software development, system integration, and testing controlled by a single entity
- Continuity and accountability = no shifting of fault/blame
- More flexibility to allow changes than traditional approach

System Manager - Advantages (cont.)

- Well-suited to ITS projects
- Relatively strong agency experience
- Relatively strong competition available
- Requires partnering

System Manager- Disadvantages

- Somewhat smaller number of firms in marketplace with requisite blend of skills
- Somewhat unfamiliar to local engineers/procurement officials
- Requires partnering and shared responsibilities

System Manager- Disadvantages (cont.)

- Heavy reliance on successful performance of System Manager
- End product less well- defined than engineer/contractor approach, difficult to manage "expectancies"

System Integrator-Advantages

- Very similar to System Manager
- Reduced agency responsibility
  - Fewer contracts
- May reduce cost escalation risk

System Integrator-Disadvantages

- Very similar to System Manager
- Less well known by agencies
- Direct bidding by System Integrator may violate agency procurement process

Design/Build-Advantages

- Full transfer of responsibility to design/build team
- Rapid completion possible
- Streamlined procurement possible

Design/Build-Advantages (cont.)

- Engineer and construction work done cooperatively with a single entity to resolve problems
- Financial incentive to rapidly complete work
- May include warranty or operations and management

Design/Build-Disadvantages

- Decisions must be made faster than agency may be accustomed to
- Aggressive approach required for agency quality control
- May meet resistance from local contractors

Design/Build-Disadvantages (cont.)

- May increase costs because of contractor risk (design not complete)
- May violate statutes (17 states)
- Requires significant agency commitment to quality control--staffing issue

Build to Budget -Advantages

- Similar to Design/Build
- Allows maximum flexibility to proposers to use their most cost-efficient designs
- Reduced risk based on previous developments/applications
- May allow added functionality for given budget

Build to Budget -Disadvantages

- Similar to Design/Build
- Very unusual practice for agencies
- Risk based on lack of detailed designs
- Detailed design document may prove contentious point and delay project

BOOT-Advantages

- Little expenditures of public money to deliver project
- Contractor has full responsibility for project design, construction, and operation

BOOT -Advantages (cont.)

- Operations and/or maintenance is often included
- Agency owns project at end of long-term contract
- Similar time to deliver as Design/Build

BOOT -Disadvantages

- Statutory authorization required, little experience in the U.S.
- May limit competition
- Pricing may preclude use of facilities by economically disadvantaged persons
- Interest costs may increase overall project costs

Franchise or Lease -Advantages

- No initial cost to agency
- No operations and management responsibility to agency
- Reduced implementation time possible
- Facilitates private investment and access to private facilities

Franchise or Lease - Disadvantages

- Unusual in transportation sector
- Reduces agency control
- Difficult to apply to "non-profitable" elements of infrastructure
- Requires long-term commitment

Franchise or Lease - Disadvantages (cont.)

- Appearance of competitive advantage or monopoly position
- Operator's goals may not reflect public goals

Shared Resources-Advantages

- Significant potential benefit at little or no cost to agency
- May generate income for agency
- May provide needed technical design and operations and management resources to agency at no cost
- Successful experiences and models are available

Shared Resources-Disadvantages

- May require legislative action
- Complex, controversial selection process
- Uncertain outcome versus agency needs
- May complicate issue of maintenance and operations responsibility

Variations on a Theme

- Use- approved vendor lists (Salt Lake and Arizona DOT experience)
- Extension of "government furnished equipment" concept (California, New York 170 Model)

Let's Discuss Some Examples

- Atlanta
- Maryland, Missouri NY Thruway
- Detroit
- Virginia Toll Project
- Salt Lake city
- Columbus
- California State Route 91
- San Juan, P.R.

Supplemental Transit Comments

- All procedures apply at some level
- Common use of 2-step process
  - Evaluated proposals
- Fixed price bidding

Chicago Transit Authority Experience

- AVL/advanced communications system
  - 1500 on-board units plus infrastructure
  - Emergency communication
  - Computer assisted dispatching
  - Data messaging
  - Service management
  - Traffic signal priority
  - Real-time information

Chicago Transit Authority Experience (cont.)

- Positive features
  - Satisfied with results
    - Products meeting their requirements
  - Provided ability to compare features of different technologies and compare alternative solutions

Chicago Transit Authority Experience (cont.)

- Positive features (cont.)
  - Learned what various vendors were providing and combined approaches
  - Gained knowledge about the technology

Chicago Transit Authority Experience (cont.)

- Pitfalls/negatives
  - Critically review marketing and vendor promises
  - Undefined specifications lead to implied rather than explicit requirements
    - Creates need for renegotiation
    - Renegotiation creates delays

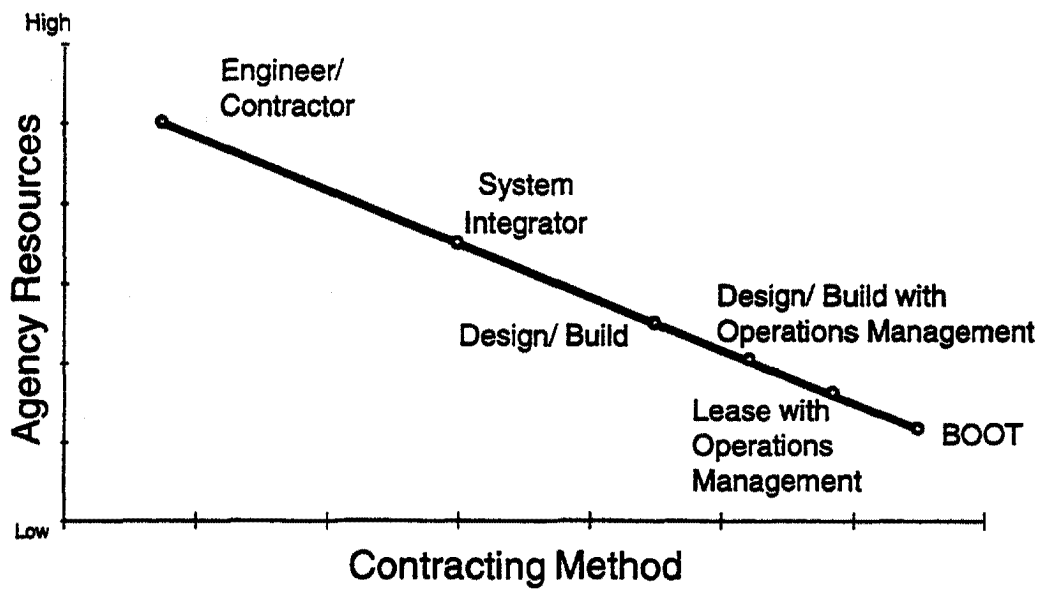
Issues for Selecting a Strategy

- Strategy "goal"
- Provide on-going operations and management
- Funding sources
- Integration requirements
- Legal constraints

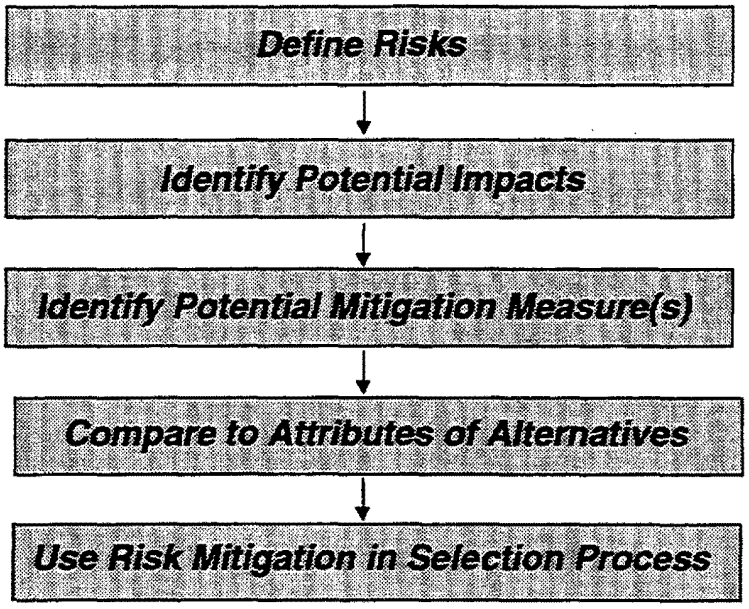
Issues for Selecting a Strategy (cont.)

- Project/program relationship to others
- Completion date
- Available skills and resources
- Project risks
- Administrative burden

Relationship Resources vs. Procurement Process



Risk Analysis Process



Risk Mitigation

Risk	⇨ Mitigation	⇨ Method
Project not finished when needed	Minimize pre-construction time	Design/Build reduces •Stage design •Advertising time •Build time

I-15 Salt Lake (Risk Mitigation Example)

- **Process:** Design/Build needed to finish project before 2002 Olympics
- **Problem:** Poor geo-technical conditions in area would cause contractors to add $ to cover risk given bid using 30% level plans
- **Solution:** Keep 30% level plans but do 90% level geo-technical investigations

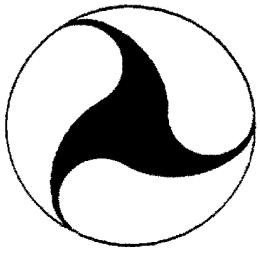
What is Best?

- **One size does not fit all**
- **Decisions must truly reflect local conditions**
- **Significant differences between alternatives make "doing-it-the-old-way" not always the best way**

Therefore...

- Keep the analysis relatively simple
- Start with desired outcomes
- Examine the raised questions
- Compare against attributes of alternatives
- Involve several persons (different perspectives)
- Involve procurement staff from day one

Module 7A
Operations and Management



Module Objectives

- Pro-actively manage transportation system, not deploy "something"
- Describe how ITS supports effective operations and management
- Operations and management should be considered throughout planning and deployment process

Operations and Management Functions

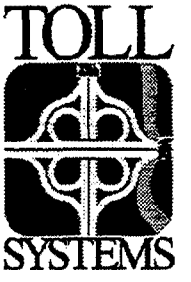
- What are typical operations and management functions in your organization?

Practical Operations and Management Applications

- Communicate and coordinate
- Develop and enhance skills
- Identify roles and responsibilities
- Plan for the future
- Enhance software and hardware
- Share information
- Perform maintenance

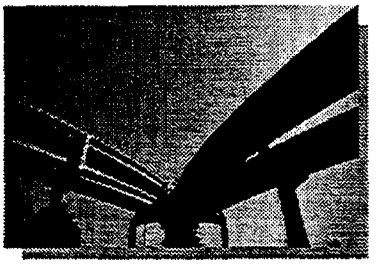
Typical ITS Functions

- Callbox and 911 dispatch centers
- Revenue collection systems
  - Toll booths
  - Automated revenue collections
- Transit services
  - Dispatching
  - Schedule adherence
  - Information requests



Typical ITS Functions (cont.)

- Freeway management system
  - Detect incidents
  - Control ramp metering
  - Coordinate freeway operations with surface street operations
  - Provide traveler information
  - Coordinate with EMS



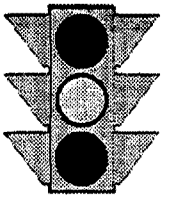
Typical ITS Functions (cont.)

- Arterial traffic management system
  - Adjust signal timing during special events or incidents
  - Control field devices (e.g., CCTV, VMS, HAR)
  - Maintain signals
  - Develop timings
  - Coordinate with incident management

ITS Functions

- Computer hardware/software requirements are unique
  - Operating system version upgrades
  - Other software version upgrades
  - PC hardware replacement at frequent intervals (< 3 years)
  - Database maintenance essential
  - Configuration management

ITS Functions



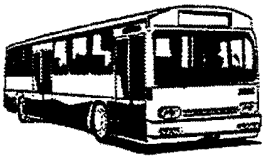
- Maintain:
  - Telecommunications infrastructure
  - Traffic signals
  - Other traffic management elements (e.g., ramp meters, signs, detectors, etc.)
  - Computer systems
  - Transit vehicles
  - Requires 24-hour commitment
  - Map database

"New" Considerations

- Multi-agency coordination
- Multi-agency "systems"
- Maintaining regional compatibility
  - Configuration management
- Multi-agency procurement, operations and management
- "Virtual" control centers

Traditional Skill Areas

- Dispatch
- Electrical maintenance (traffic signals)
- Trouble shooting
- Bus mechanics
- Construction trades
- Administration



ITS Skill Areas

- ITS Infrastructure management
  - Computer technicians
  - Software maintenance
  - Optical communications maintenance
  - Telecommunications maintenance
  - Digital electronic hardware maintenance
  - Television equipment maintenance
  - Configuration management

Representative Roles and Responsibilities—Agency

- Public agency may provide or contract for:
  - Operations
  - Maintenance
- Larger agencies may support "smaller" ones
- Multi-agency "cooperative" use of contractor support

Operations and Management Decisions

- Consider specific alternatives
- Ask key questions
  - similar to procurement
- Consider advantages/disadvantages

Potential In-House Operations and Management—Advantages

- Agency maintains control of:
  - Operations and management
  - Management priorities and practices
- Dedicated staff develops "pride-of-ownership"
- Local fixed base of operations

Potential In-House Operations and Management-Disadvantages

- Difficult to obtain appropriate blend of skills in small agencies
- High start-up costs for capital equipment, staff training, test equipment, and spares inventory
- May require contract support for specialty elements

Potential In-House Operations and Management-Disadvantages (cont.)

- Agency maintains responsibility for claims
- Staffing and training present unique challenges
- May have higher costs (guaranteed retirement benefits, etc.)
- Salary competition for trained staff

Potential Contract Operations and Management—Advantages

- A single contractor may provide a full range of services
- Contractor provides:
  - Trained staff
  - Capital and equipment
- Cost may be lower than in-house maintenance (especially for smaller agencies)

Potential Contract Operations and Management—Advantages (cont.)

- Contractors maintain insurance to protect agency from contractors' negligent acts or omissions
- May broaden funding opportunities
- Union/employee agreements

Contract Operations and Management—Disadvantages

- Unavailability of local, skilled contractors
- May require extensive agency supervision
- Contractor may have to balance priorities of multiple agencies

Additional Methods of Providing Needed Resources

- Vendor/supplier support agreements
- Software/hardware support is valuable—don't expect free support from vendors beyond a reasonable warranty period

Available Options

- Which points are the most valid? Why?
- Are any invalid? Why?

- Are we doing a good job at Operations and Management?

Examples

- New York Information for Motorists (INFORM)
- Chicago Incident Management
- Los Angeles Motorist Services

Staff Training and Education

- Assess staff motivation to perform new tasks and learn new skills
- Verify staff can benefit from training
- Identify realistic training objectives
- Continue training throughout process

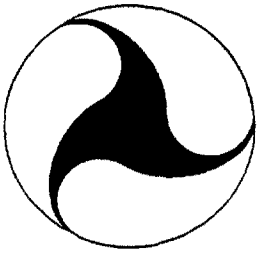
Overcoming the Hurdles

- Proactive approach
- Fund operations and management at an appropriate level
- Provide functional and attractive work environment
- Develop career paths for staff
- Empower staff

Roles and Responsibilities

- Your agency
- Budget
- Unique elements
- Inter-agency operations and management challenges
- Recruiting and training
- Strategies to overcome problems
- How do we do this better?

Module 8A
Short- and Long-Term Planning Needs



Parallel Structure

- Short range
  - Improve system efficiency
  - Operations and management of existing components
- Long range
  - Meet state and regional goals
  - State and regional integration
  - Focus of this module

Policy Framework

- ISTEA
  - Shift in national transportation policy
    - Multimodal transportation solutions
    - Improving system efficiency
- NEXTEA
  - Continues policy shift
  - Planning for operations and management?

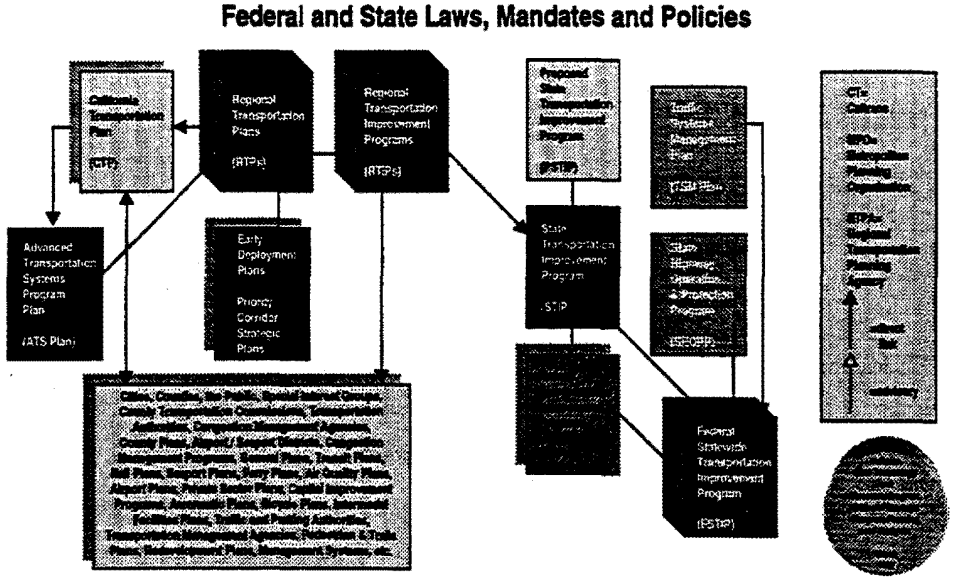
ITS Evolution

- ITS deployed for years
  - Traffic signal systems, freeway management
- Integration of components
  - Occurring throughout country
- Integration into planning process
  - ITS part of solutions
- New technologies

State and Regional Framework

- Is there a need for state and regional integration?
- What is happening in your state or region?

Interrelationship of Transportation Planning & Programming Documents



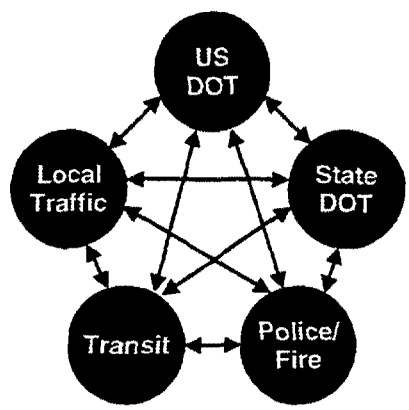
Integration Challenges

- Institutional
  - Who's in charge? Who pays?
- Process
  - How is ITS included in planning process?
- Technical
  - How is technology integrated?

Institutional Challenges

- Who's in charge?
- Who funds regional efforts?
- Paradigm shift
- New players
- New roles and programs

Many to Many



Process Challenges

- How is ITS incorporated into planning process?
- Paradigm shift
  - Major investment, long term
  - Small - large investment, short - long term
- New evaluation methods / tools
  - Performance measures (travel times and V/C)
  - Tools (IDAS - four step model)
  - IDAS - ITS Infrastructure Deployment Analysis System

Technical Challenges

- How are components integrated?
  - Using the National ITS Architecture
  - Legacy systems
  - Communications standards

Planning and Programming ITS Projects

- How have you or others identified ITS projects in your area?

Strategy for Regional Integrated Deployment

- Systematic and integrated approach to identifying ITS projects
  - Focus on concepts, not terminology
  - Not federal requirements
- Approach will vary
  - Change over time
  - From area to area

What Do We Want to Do?

- Stakeholders / players
  - Decision-makers / high-level staff
  - MPO may be logical forum and lead
- Inventory of existing conditions
  - Physical and information sharing
- Definition of where you want to be
  - Physical and information sharing

How Do We Do It?

- Stakeholders / players
  - Operations oriented staff
- Architecture
  - Subsystems (by stakeholder agency)
  - Information flows (not data elements)
- Operations requirements
  - Concept-of-operations
  - Roles, responsibilities of players

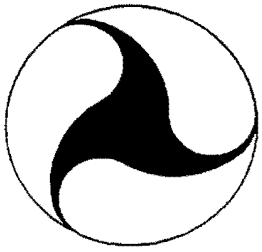
How Do We Do It? (cont.)

- Part of Transportation Plan and Transportation Improvement Program
- Phasing
  - Geographic
  - Functional
- Regional Technology "Agreement"
  - Telecommunications
  - Technologies

Summary

- Short- and long-term focus
  - Added dimensions and new players
- Challenges ahead
  - Institutional, process and technical
- ITS and the Transportation Plan

Module 9
Course Wrap-Up



Module Objectives

- Describe how the course learning objectives were achieved
- Identify success stories and list ways to build on what was learned

Learning Objectives

- Identify at least five benefits provided by integrated, intermodal intelligent transportation systems (ITS)
- Identify the agencies with whom information should be shared in integrating ITS

Learning Objectives (cont.)

- Identify the information flows that should be established by your agency and each "partner" agency to operate an integrated ITS
- Describe the various "types" of information sharing that exist in today's transportation environment

Learning Objectives (cont.)

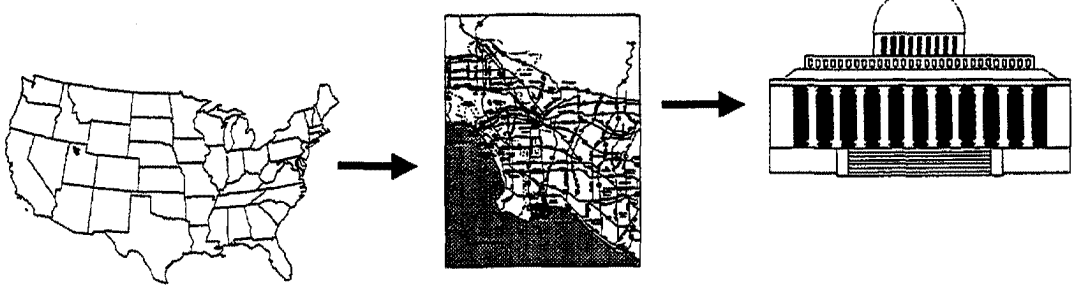
- Describe the National ITS Architecture and how it can be used as a time saving tool to implement integrated ITS
- Explain the institutional challenges that must be addressed to integrate ITS successfully

Learning Objectives (cont.)

- Explain the technical challenges that must be addressed to successfully deploy an integrated ITS
- Explain the importance of local issues and challenges within a regional context
- Understand procurement alternatives

ITS Deployment

- Think nationally
- Plan regionally
- Build locally



Individuals Do Make a Difference

- Technology is important
- Institutions are more important
- People are the most important
- Examples of people who made a difference in solving problems

Congestion significantly impacts the expansion of our critical convention and recreation venues.

- Guided Anaheim ITS
  - Ties to Caltrans Districts 7 & 12
  - Provided ATIS interface for Caltrans
  - Many funding sources
- "Partner" Orange County agencies
  - Super streets coordination
  - Signal roundtable

Don Dey

NEED: Improve operations management in a highly congested urban area

- Houston Metro
- Transit agency, but
  - Leads ITS HOV efforts
  - Coordinates regional freeway management
  - Leads citywide signal computerization
- Innovative financing

Bob MacLennan

NEED: Get involved agencies together to reduce congestion in high volume corridor

- Forged alliance of
  - LA County Commission, Caltrans
  - City of Los Angeles
  - California Highway Patrol
- For LA Smart Corridor project
  - "Found" $50 M (many sources)
  - Established technical and steering committees

Ginger Gherardi

Question: How do you foster strong ties between the enforcement community and a highway agency?

- Liaison CHART to Maryland State Police
- Trains State Police on ITS
- State Police "shared space"
- Now, excellent joint support and cooperation

Lt. C.D. Tyler

Question: How can we assist the minority community in participating in ITS?

- Brought HBCUs and minority businesses to ITS
- Strengthened HBCU ITS education program
- Formed HBCU/ sponsor relationships

Tom Farrington

What Can You Do and How Can You Do It?

- Facilitate the information sharing between ITS components
- Develop/enhance regional cooperation between stakeholders
- Facilitate the decision-making process at both regional and local levels
- Inform/educate others

Facilitate Regional Integration of ITS: How?

- Participate on committees and task forces
- Introduce the opportunities of operations and management in terms of alternatives/options
- Provide sample language for mission/vision statements
- Introduce information sharing operations and management concepts to wide range of stakeholders

Develop/Enhance Regional Cooperation Between Stakeholders: How?

- Identify leaders and assist them
- Identify and expand existing coordination points
- Include operations and management in planning process
- Become a team member

Facilitate the Decision-Making Process: How?

- Get involved early
- Bring agencies/stakeholders together
- Get involved in pre-program planning
- Participate on planning committees
- Encourage operations and management infrastructure policies
- Consider operations and management as an integral part of all projects

Inform/Educate Others: How?

- Look for opportunities to provide information/materials
  - Professional conferences/meetings
  - Major program/project reviews
  - Municipal/community meetings
  - Individuals
- Identify new stakeholders
- Develop materials

ITS Information Sources

- Internet
- U.S. DOT (ITS Joint Programs Office)
  - http://www.its.dot.gov
- ITS America
  - http://www.itsa.org
- ITE
  - http://www.ite.org

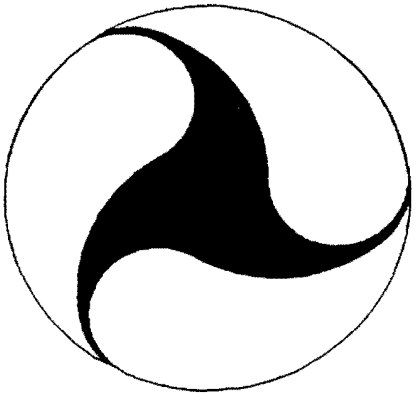
Other ITS Information Sources

- Draft ITS standards
- Communications trade-off studies
- Joint use studies
- Trade journals
- Commercial Vehicle Operations industry
- Computer journals

Course Wrap-Up

- What actions could you take in the next few months to:
  - Enhance your agency's/region's awareness of ITS?
  - Encourage the integration of ITS infrastructure in specific programs or projects at your agency/organization and in your region?

Module 1B
Concepts Application Exercise
Issues and Problems



Module 1B - Introduction to Concepts Application Exercise

Scenario

This Concepts Application Exercise presents a sample situation which simulates the process of "accelerated" deployment and integration of various ITS projects. Over the three days of this course, you will address the transportation challenges that arise with the development of the "Arch Deluxe" theme park in the St. Louis, Missouri metropolitan region.

- ***The "Arch Deluxe" theme park and many of the conditions presented in this Concepts Application Exercise are fictional in nature.***

- ***There are several workable and effective solutions to the various problems presented in this Concepts Application Exercise. The sample solutions provided are only examples.***

Situation

A private sector developer has just received local approval to locate a major theme park in the St. Louis metropolitan region. The theme park is expected to accommodate 90,000 visitors per day (peak season forecast). This will result in 30,000 vehicles per day into the park, including approximately 5,000 employee vehicles and buses. Figure 1 shows the location of the theme park outside the city of St. Louis.

Because of geographic and topographic limitations, only one entrance to the park could be allowed. This entrance is onto a four lane arterial adjacent to the site, with a nearby interchange with I-270. Both the arterial and interchange are already congested.

The roadway improvements needed for the theme park have been identified as part of the local approval process. The improvements will be funded primarily by the developer and are included in the MPO's Transportation Improvement Program (TIP). **The improvements are adding two general purpose lanes to the arterial from the theme park's entrance to the I-270 interchange and minor interchange improvements.**

The project has accelerated the start of a Major Investment Study (MIS) the MPO will conduct for a corridor that extends from the airport to the City of St. Charles. The MIS is not expected to be completed by the time the theme park opens, but a focal point of the effort is access from the park to the airport. The major arterial streets around the airport and between the airport and the theme park are highly congested during peak periods.

A light rail line runs between the region's international airport and the downtown area, connecting a number of key destinations in-between (e.g., stadium, hospital,

convention center, etc.) A bus "feeder" service currently operates from the surrounding areas to most stations on the rail line, but not to the airport station.

There is no space for hotels on the park property, but several hotels are located near the international airport about four miles away and in the downtown area about ten miles away.

The MPO completed an Early Deployment Plan (EDP) five years earlier. Most of the regional integration recommendations of the plan have not been implemented. However, agencies have deployed or are planning to deploy ITS projects identified in the plan. The MPO is considering an update to the EDP, primarily to get agency buy-in to regional integration.

The ITS projects that are in place or programmed are:

- a freeway management system on I-70 from downtown St. Louis to St. Charles, operated by the Missouri Department of Transportation (DOT) from a transportation management center near the project;

- traffic signal systems on most of the adjacent arterial roadways operated by St. Louis and St. Charles Counties, each having a separate traffic operations center;

- a traffic information service provided by a private local company with feeds to local radio and television stations;

- an incident management program under development by the Missouri DOT and the St. Louis County Emergency Management Services Department that should be deployed by the time the theme park opens (the plan is to expand into St. Charles County); and,

- an automated vehicle location (AVL) system to be purchased by the transit agency within the next year, with the primary intention of improving the operations of the bus fleet through fleet management and on-schedule adherence.

Table 1B-1 summarizes the ITS applications that will influence or be influenced by the theme park.

In addition to the roadway improvements noted above, **the theme part development agreement requires the developer to work with local agencies and the Missouri**

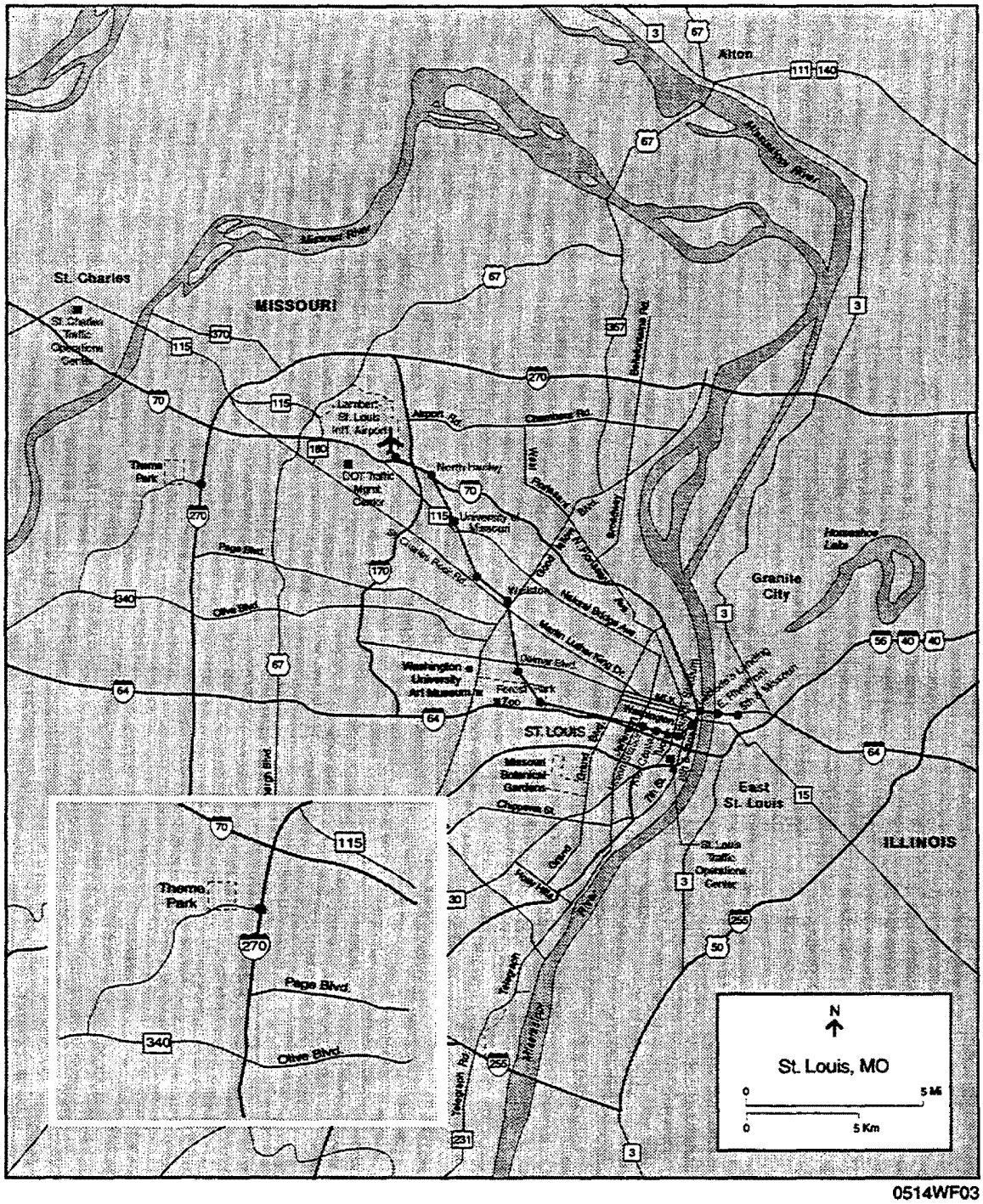


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Figure 2

Department of Transportation on an integrated ITS response to the park's transportation system impacts. The MPO sees this integration effort as a possible "kick-start" and building block to the regional integration effort envisioned by the EDP.

One of the developer's concepts for the theme park is use of a "Smart Card" for all financial transactions within the park. The developer also thinks that there are future opportunities to link this concept to transportation, but needs some help in determining how to achieve this. **Another concept is setting up information kiosks, some to be located in the park and some outside the park in places such as local hotels and the airport. The kiosks will provide information about upcoming events at the park, hotels and restaurants in the area, and travel options and schedules.**

The developer has invited several agencies to participate in defining what should be done to incorporate and integrate ITS applications into the project. Thus, initial stakeholders of the theme park include the following at a minimum:

- Theme park developer (private sector interest)
- Missouri Department of Transportation (DOT)
- St. Louis and St. Charles County Transportation Departments
- East-West Coordinating Council Metropolitan Planning Organization (MPO)
- Transit agency/property
- Commercial traffic reporting service (private sector interest)
- St. Louis and St. Charles Police and Emergency Services Departments
- Divisional representative(s) (FHWA and/or FTA)
- Regional Visitors Bureau

In this Concepts Application Exercise, you will :

- **perform the appropriate steps to integrate the existing and programmed ITS applications as required by the conditions for approval that will be in place by the time the theme park opens (within the next three years), and**

- **identify ITS projects that will be needed over the long term (beyond the next three years) to address regional goals and anticipated future population and traffic growth in the area.**

General Instructions to Participants

This Concepts Application Exercise has eight parts or sessions, each part building on the previous one. The instructors will assign you to a workgroup, which will be your "team" for all work on the Concepts Application Exercise. You will also be assigned a specific format.

Table 1B-1 – Summary of ITS Projects in the Study Area

ITS Infrastructure Components	Existing and Programmed ITS Projects	Lead Agency
Traffic Signal Control	• Computerized signal system on major arterials leading to the theme park. • Each county has its own traffic signal system center.	St. Louis County and St. Charles County
Freeway Management (I-70 from St. Louis to St. Charles)	• Traffic sensors / detectors • Highway Advisory Radio (HAR) • CCTV surveillance • Variable message signs • Traffic management center	Missouri DOT
Transit Management	*Transit agency will purchase an Automated Vehicle Location (AVL) system in the next year for fleet management and on-schedule adherence operations.*	*Transit Agency*
Incident Management	• *CCTV access at police and EMS stations (programmed)* • *Pre-planned diversion strategies* • *Courtesy patrols and tow truck arrangements*	*Missouri DOT*
Electronic Fare Payment	*Theme park has interest in Smart Card for all theme park transactions, with an interest in transportation uses*	*Theme park developer*
Electronic Toll Collection	NA	NA
Highway-Rail Intersections	NA	NA
Emergency Management Services	*EMS priority is planned*	St. Louis County EMS
Traveler Information Systems	*Theme park developer has interest in information kiosks at the park, at the airport and in hotels.* *Commercial traffic reporting service has interest in cable TV station.*	*Theme park developer, Commercial reporting service*
Communications	*Connections between the FMS and IM are programmed*	*Missouri DOT*

Projects and agencies in italics are planned or programmed.

Agency Role," which should be different from your current job. The reason for this is to give you an opportunity to focus on another stakeholder perspective and address issues from a different viewpoint. This is your chance to wear another hat for a while!

The instructor will select a group leader for each Concepts Application Exercise Session to ensure that one person is not unduly burdened with leadership responsibilities and to provide opportunities for more people to serve as leader.

At the beginning of each Concepts Application Exercise Session, the instructors will clearly explain what you are to do in that session and what you are to produce by the end of the time period. Each exercise session will end with group presentations and discussion. Be sure to ask questions about anything you are not clear about.

Module 1B - Concepts Application Exercise Session 1: Issues and Problems

In this first Concepts Application Exercise Session, you will begin to identify transportation issues or problems resulting from the "Arch Deluxe" theme park project. Remember, roadway improvements for the project have been defined and agreed upon in the theme park's development order. You are now embarking on the second component of the development order, creating an integrated ITS response that further mitigates the theme park's impacts. As you discuss these issues with your team, use what you have learned in Module 1A about integrated ITS solutions. Think about possible ITS infrastructure components that may be useful in addressing each of the issues or problems you identify.

Objectives:

- Identify transportation issues or problems relating to the "Arch Deluxe" theme park development project.
- Match issues/problems with the ITS projects listed in Table 1B-1.
- Prepare a two minute report on your group's identified issues and possible ITS solutions.

What You Will Do:

1. Read the General Instructions to the Concepts Application Exercise.
2. Review the list of planned and programmed ITS projects for the region around the theme park (Table 1B-1).
3. On your own, identify several transportation issues or problems that may result from the theme park project.
4. As a group, combine everyone's identified agency issues/problems into one list (use a flip chart).
5. Using the Table 1B-2 worksheet, list specific involved agencies in the agency column and your group's identified issues or problems in the second column. Then, discuss the issues with your team members and match each issue or problem with appropriate ITS projects listed in Table 1B-1 by putting checks in the appropriate columns of Table 1B-2. Transpose the information onto a flip chart.
6. As a group, prepare a two-minute report to be presented to the class on some of the issues and possible ITS solutions you have identified. Select a spokesperson to present your group's results. This is your group's time to be "in the spotlight!"

Output:

- List of transportation issues/problems, by agency, related to the theme park development.
- Completed Table 1B-2, matching issues/problems to ITS infrastructure components that may be useful in addressing each issue/problem. Some of you may find that working backwards (i.e., identifying specific projects before checking boxes in Table 1B-2) is helpful. Feel free to do this and, if you do, write down the projects because it may be helpful in later Concepts Application Exercise Sessions.
- Each group will have up to two minutes to present their findings. We will provide Sample Solution for Table 1B-2 after the presentations.

Table 1B-2 -- Issues/Problems and Potential Improvements

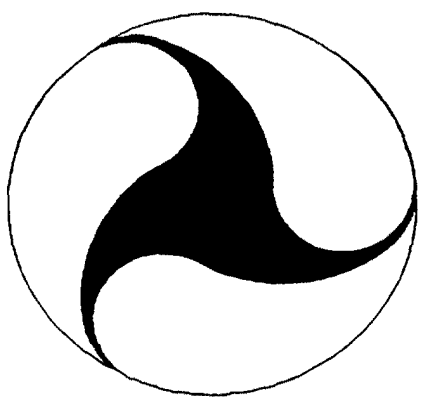
Agency	Issues/Problems	Potential Improvements								
		TSC	FMS	TMS	IM	EFP	ETC	HRI	EMS	TIS

The acronyms used in the table header are:

- TSC – Traffic signal control
- FMS – Freeway management system
- TMS – Transit management system
- IM – Incident management
- EFP – Electronic fare payment
- ETC – Electronic toll collection
- HRI – Highway and rail intersection
- EMS – Emergency management system
- TIS – Traveler information system

*Roadway improvements for the theme park have been defined and agreed upon in the development order.

Module 2B
Stakeholders and Operational Objectives



Module 2B - Concepts Application Exercise Session 2:
Identify Stakeholders and Operational Objectives

In this second Concepts Application Exercise Session, you will focus on the various agencies, organizations, or groups who have an interest or "stake" in the "Arch Deluxe" theme park. These are the stakeholders with whom you will need to talk and build relationships in order to coordinate deployment and integration of ITS to solve the issues in Session 1.

You will also begin to think about specific operational objectives that result from these issues. These objectives state what you will accomplish and, as a result, help guide your planning and implementation efforts. **For example, an operational objective for transporting visitors from the airport to the theme park is providing a full range of travel information to those arriving at the airport, including bus schedules, roadway maps and preferred routes.** By establishing these objectives, you begin to develop a deployment and integration strategy.

Objectives:

- Identify the agencies and organizations with whom you will need to coordinate during ITS integration and deployment.
- Define how ITS can address the issues and problems identified in Module 1B.
- Present your group's list of stakeholders and objectives to the class.

What You Will Do:

1. Rejoin your group.
2. As a group, identify other stakeholders that need to be involved in the deployment and integration of ITS projects for the theme park. List these in the last three columns of Table 2B-3. We have provided four problems / issues from the Sample Solution in Table 2B-3 to start with. For the fast groups, there are additional rows that you can fill-in at the bottom of Table 2B-3.
3. Refer back to Table 1B-1 in the Introduction and Table 1B-2 in the Sample Solution Handout to determine the integration needs between projects and the stakeholders that should be involved.
4. As a group, define operational objectives based on the problems identified in Session 1. List these in Table 2B-4. When you have completed Table 2B-4, take a few minutes to revisit your list of stakeholders in Table 2B-3.
5. Transpose Tables 2B-3 and 2B-4 onto a flip chart, then present your group's list of stakeholders and objectives to the class. Be prepared to explain and discuss your selections.

Outputs:

- Completed Stakeholders matrix, Table 2B-3.
- Completed Operational Objectives matrix, Table 2B-4.
- Each group will have up to two minutes to present their findings. We will provide Sample Solutions for Tables 2B-3 and 2B-4 after the presentations.

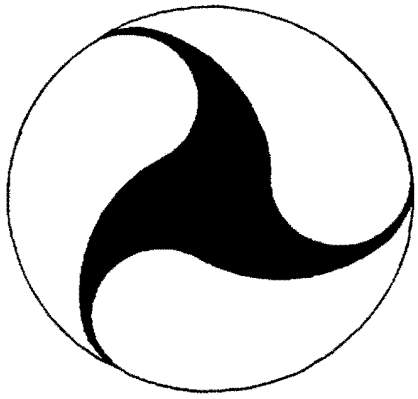
Table 2B-3 –Stakeholders

Problems / Issue	Primary Stakeholders	Other Stakeholders	Lead Agency/Champion
Traffic management for major events			
How visitors find the theme park			
Transporting visitors from / to the airport and LRT			
Smooth traffic flow at gates			

Table 2B-4 – Operational Objectives

Problems / Issue	Operational Objectives
Traffic management for major events	
How visitors find the theme park	
Transporting visitors from / to the airport and LRT	
Smooth traffic flow at gates	

Module 3B
Information Needs and Sharing



Module 3B - Concepts Application Exercise Session 3: Information Needs and Sharing

We continue to move on. In the last Concepts Application Exercise Session, you identified who you need to integrate with (the stakeholders) and what you hope to accomplish (operational objectives) with the existing and programmed ITS projects. You now need to get more specific, beginning with what you need to do to for integration and what information you need from others to accomplish the operational objectives.

Objectives:

- Identify the types of information (and other responsibilities) that your agency will need to develop internally or get from others to successfully integrate and deploy ITS projects.
- Understand how to work with other agencies to determine what information they have, what additional information is collectively needed and who is responsible for the providing the additional information.

What You Will Do:

1. Rejoin your group.
2. Identify agency responsibilities for accomplishing the operational objectives by completing Table 3B-5. You will notice that we have listed only the kiosk project in Table 3B-5 because of time constraints.
3. Use the information from Table 3B-5 to complete Table 3B-6. In addition, the information exchange needed by the kiosk, identify other exchanges needed to integrate the ITS projects listed in Table 1B-1. For example, information is needed by EMS from the FMS.
4. Transpose the information from Tables 3B-5 and 3B-6 onto a flip chart then, present your group's list of stakeholders and objectives to the class. Be prepared to explain and discuss your selections.

What You Will Use:

- Table 2B-3, Stakeholders from the Sample Solution Handout
- Table 2B-4, Operational Objectives from the Sample Solution Handout

Outputs:

- Completed Information Needs matrix, Table 3B-5.
- Completed Information Exchange matrix, Table 3B-6.
- Each group will have up to two minutes to present their findings. We will provide Sample Solutions for Tables 3B-5 and 3B-6 after the presentations.

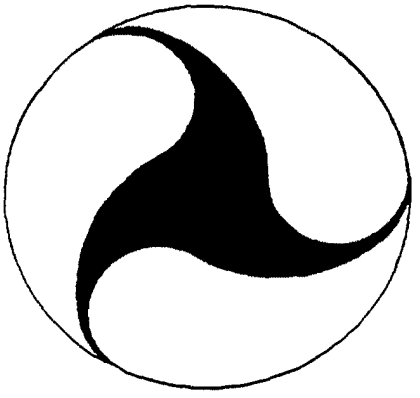
Table 3B-5 – Information Needs

Agency	Kiosks

Table 3B-6 -- Information Exchange

To---> From	DOT Traffic Mgt. Centers	Local Traffic Signal Sys. Centers	Police/ EMS Dispatch Centers	Transit Mgt. Centers	Theme Park Security Center	Theme Park Admin. Center	Private Traveler Info Centers
DOT Traffic Mgt. Center							
Local Traffic Signal Sys. Centers							
Police/ EMS Dispatch Centers							
Transit Mgt. Centers							
Theme Park Security Center							
Theme Park Admin. Center							
Private Traveler Info Center							

Module 4B
Operational Implications of Information Sharing



Module 4B - Concepts Application Exercise Session 4:
Operational Implications of Information Sharing

In Session 3, each agency defined the information needed to integrate ITS projects by completing Table 3B-5. The agencies then identified what information they could exchange with one another by completing Table 3B-6.

We will now determine how this shared information will influence the operations and technical capabilities of agencies. On the surface, information sharing seems relatively simple, but it is not as simple as it seems. For example, bus signal priority may negatively influence the County traffic engineers' objective of efficient traffic flow.

Objectives:

- Determine how the information exchanges developed in Session 3 will change each agency's operating procedures
- Define how the agencies will work together to collectively respond to the information needs
- Understand how to technically meet the information sharing needs developed in Session 3.

What You Will Do:

1. Rejoin your group.

2. Review the three possible information exchanges from Table 3B-6 in the Sample Solution Handout in the left-most column of Table 4B-7.

3. In the "Technical" column of Table 4B-7, list what technical upgrades (i.e., equipment, staff training, etc.) your agency will need for each of the three exchanges. You will need to make assumptions about your existing technical capabilities.

4. In the "Organizational" column of Table 4B-7, list what organizational changes (establish protocols, hire new staff, add functions, etc.) are needed by your agency for each exchange. Again, you will need to make assumptions about how your agency currently operates.

The group will do this exercise collectively so that everyone can understand the dynamics of how information exchanges will affect the way others do business. It will also help you understand the types of compromises and agreements that must be reached.

What You Will Use:

The Sample Solution Handouts from the previous Sessions will be most helpful to you in this exercise, particularly:

- Table 2B-4 - Operational Objectives
- Table 3B-5 - Agency Responsibilities
- Table 3B-6 - Information Exchange

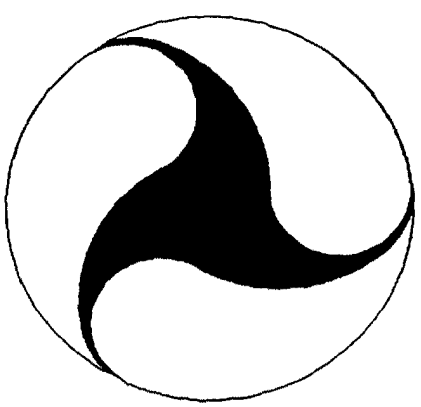
Output:

- Complete the top three rows of Table 4B-7. Fast working groups can add information exchanges in the bottom two rows, but we suggest that you complete the first three rows before you do.
- Each group will have up to two minutes to present their findings. We will provide Sample Solutions for Table 4B-7 after the presentations.

Table 4B-7 – Technical and Organizational Implications of Information Sharing

Information Exchange (from Table 3B-6)	Technical	Organizational
Bus priority		
Real time traffic map		
Upcoming event information		

Module 5B
Design Considerations



Module 5B - Concept Applications Exercise Session 5: Design Considerations

Your next challenge is defining the design specifications for the theme park. In this exercise we will focus on the design specifications for the kiosks. You will consider the options available to you and the experiences from other kiosk installations around the country.

As presented in Module 5A, there are a number of factors to consider before beginning the design phase of implementation, such as:

- What kind of hardware and software will get the job done and how reliable is it?
- What kind of connections are needed with other hardware and software (system interfaces and standards)?
- What is the best way to procure the hardware and software needed?
- What are the operations management (e.g., maintenance and training) requirements for the hardware and software?

You will put these considerations to test in this Concepts Application Exercise Session.

Objectives:

- Using the technology selection factors (such as product support by the vendor)
- Using design considerations (such as open system interfaces)
- Identifying who will handle procurement and operations management.

What You Will Do:

1. Rejoin your group.
2. Take a few minutes to read "Traveler Information Kiosks; Research Reveals Pitfalls to Avoid and Ways to Boost Use," and Table 5B-8, Kiosk Options, on the following pages.
3. Complete Table 5B-9, Design Specifications. You need to first identify the hardware and software needs for the kiosks such as computers that run the kiosks, display screens, printers, maps and communication lines. You will define the design specifications for each hardware and software item(like Table 5B-8 in the second column. You will then justify the design specifications in the third column.
4. Transpose Table 5B-9 onto a flip chart and present your recommendations to the class.

Output:

- Table 5B-9, Design Specifications
- Each group will have up to two minutes to present their findings. We will provide Sample Solutions for Table 5B-9 after the presentations.

Table 5B-8 – Kiosk Options

Options	Capability	Requirements/Cost
Interface: Touch Screen	Allows easy user interaction	Software development, testing/$10,000s
PC Monitors	Limited user interaction	$1,000s
Printers	Provides users with hard copy of information	Continual maintenance/$10,000s
Communication Links Fiber Optic	Real time information available immediately	Installation of fiber optic links/$100,000s
Integrated Services Digital Network (ISDN)	Real time information updated every second	Purchase ISDN line/$1,000s
Telephone Line	Real time information updated every 3 seconds	Telephone modems/$1,000s
Mapping: 911 systems	Full coverage, updated monthly, map difficult to read	Link with 911/$1,000s
Unix ARCINFO, Commercially available maps	Full coverage, updated annually (for a fee), user friendly map	Create new map, purchase hardware/software/$10,000s

Traveler Information Kiosks

Research Reveals Pitfalls to Avoid and Ways to Boost Use

By Mark Burris, Research Associate, CUTR
Phil Winters, Sr. Research Associate/TDM Program Manager, CUTR

Interactive kiosk technology has improved to the point where kiosks are no longer cost-prohibitive to implement and are now acceptable to users in terms of speed and ease of use. More public agencies are taking advantage of this new communication medium to distribute vital information to the public. But effective installation of a kiosk involves making decisions and answering questions many agencies may not be equipped to handle: What information should be provided? How should the information be displayed? What technology should be used? Where should the kiosk be located?

In a project for the Metro Dade Metropolitan Planning Organization (MPO), the Center for Urban Transportation Research (CUTR) examined past kiosk experiences in an effort to guide the organization to successful kiosk implementation. CUTR's research revealed several pitfalls to avoid and keys to successful implementation.

The investigation revealed that providing real time traffic/transit information to the public is a rapidly growing interest in many cities. Some agencies use interactive kiosks, and others use the World Wide Web to distribute information. Some kiosk projects are provided as a public service, and others are provided by private agencies that rely on advertising as a revenue source.

Some of the most frequent problems encountered by the kiosk projects examined were slow processor speed (when using 386 or 486 processors), software malfunctions, and printer difficulties. Kiosks using modems with speeds of 14.4 kbps or lower to transfer data reported that the information updating process was too slow. Many project managers recommended using Pentium-based computers and Integrated Services Digital Network (ISDN) modem connections (if a modem is the choice to update information).

Of the kiosk project managers that accurately and extensively documented the successes and failures of their projects, the following were key issues associated with many kiosk projects:

- Funding
- Communication
- Information presentation
- Kiosk failure
- Maintenance
- Kiosk usage levels
- Kiosk location

See Kiosks on page 7

Features at Kiosks Across the Country:

ATLANTA	A, B, C, K, L, M, O, P
PORT AUTHORITY OF NY/NJ	C, N, O, P
LOS ANGELES SMART TRAVELER KIOSKS	A, C, D, H
GUIDESTAR (MINNESOTA)	A, B, C, D, I, J, K
RIDERLINK (SEATTLE)	A, C, D, E, F
RIVERSIDE COUNTY (CALIFORNIA)	C, D, G
FAIRFAX COUNTY (VIRGINIA)	C, D, E, Q
ACCUTRAFFIC (HOUSTON)	A

A = Real-time traffic conditions and speeds
B = Real-time transit information
C = Transit route planning/schedules, fares
D = Carpool/vanpool information
E = Bike information
F = Ferry information
G = Videos
H = Driving tips/effects on the environment
I = Park and ride locations
J = Elderly and disabled services
K = Special events
L = Weather
M = Airline information
N = Airport ground transportation
O = Tourism information
P = Hotel and restaurant information
Q = Access to other government services

A 50 percent discount was determined to be most effective.

Focus group results revealed that this level discount was both enough to convince some users to alter travel times and affordable for the County.

It was determined that the discounts would be offered from 6:30 a.m. to 7 a.m., 9 a.m. to 11 a.m., 2 p.m. to 4 p.m., and 6:30 p.m. to 7 p.m.

Phase I of the project was completed in one year, ending in December 1996. Authorization has been given by FHWA to begin Phase II, which will include design and implementation of both the ETC system and variable pricing. Most importantly, it also includes extensive data collection efforts both before and after variable pricing is introduced.

For additional information on variable pricing, contact Mark Burris at (813) 974-3120 or burris@cutr.eng.usf.edu.

Kiosks *continued from page 3*

Funding was often noted as critical to project success. The Riverside County TransAction program in California was terminated because there was no provision for funding beyond the pilot program period.

Communication, between kiosks and where the updated traffic/transit information is transmitted, played a vital role in the success of kiosks. Because users will not tolerate slow responses by the kiosk system, several project managers suggested that agencies consider using ISDN, the fastest communication connection currently available for a reasonable price.

Various project managers partially attribute low kiosk usage to the method of **information presentation**. User surveys conducted on the Guidestar and Riderlink projects indicated that the kiosk information was difficult to understand. Many of these people were not computer literate, indicating the importance of designing kiosk screens, maps, and displays for use by people unfamiliar with computers. Other users were frustrated by the complexity of the information. One respondent to a TranStar survey complained that the map was developed for use by experienced traffic managers, not the man on the street.

The **location** of a kiosk has a dramatic affect on use. It was found that office building locations often receive the least use, possibly because travel to and from the office is a fixed, regular event that doesn't require the additional information a kiosk would offer. TDM agency customers could prove good sources for soliciting locations. Developers could be asked to include them in mall information centers. Locating kiosks inside public agencies with high levels of non-employee traffic would be ideal. Transit stores would be a natural location. To encourage use, the kiosk must also be readily visible and the screen must be positioned to avoid glare.

The Smart Traveler project found **Kiosk failure**, to be a major problem. Failures occurred most often in the form of hardware/software problems, audio/video problems, loose or unplugged power plugs, or a turned off power source.

Maintenance played a vital role in keeping kiosks usable. Kiosk systems with printers reported considerable maintenance requirements. Riderlink and New York/New Jersey Port Authority kiosks required maintenance almost weekly. Maintenance included clearing paper jams and adding paper to the printers. Many project managers advised having someone on site to address these and other problems, including rebooting malfunctioning machines.

In order to increase **kiosk usage levels**, kiosk program designers must be more customer oriented than product focused. A customer-driven program does not assume that the kiosk products are inherently desirable. Nor does it dismiss the issue of computer literacy. TDM agencies should conduct focus groups of commuters to determine what information is desirable and how it should be presented.

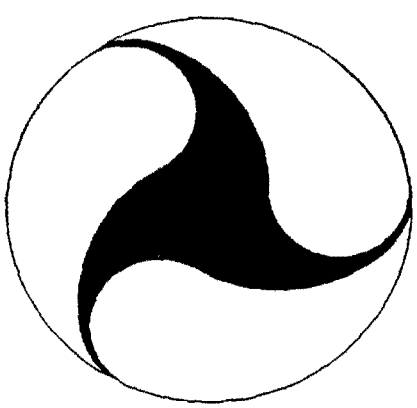
TDM agencies can also help improve usage levels by bringing their promotional expertise to the kiosk design. These agencies recognize that valuable segments of the population respond to different messages. Experimentation with variations of the kiosk screens to serve different markets would help avoid losing users as a result of focusing on a single, obvious market.

For additional information on traveler information kiosks, contact Mark Burris or Phil Winters at (813) 974-3120. Send e-mail to burris@cutr.eng.usf.edu or winters@cutr.eng.usf.edu.

Table 5B-9 – Kiosk Design Specifications

Hardware/Software	Specifications	Justification

Module 6B
Procurement Strategies
and
Contracting Options



Module 6B - Concepts Application Exercise Session 6:
Procurement Strategies and Contracting Options

For this Concepts Application Exercise Session, the challenge is determining the best way to implement the projects you have identified in earlier sessions. You need to answer questions such as:

- What projects should we deploy together?
- Should we use in-house staff or outside help?
- If we use outside help, who should we use?

Objectives:

- Determine how to group ITS projects into logical procurement "packages" using the concepts from Module 6A
- Apply the pros and cons presented in Module 6A to identify the best method for procuring the hardware and software for each of the packages

What You Will Do:

1. Rejoin your group.

2. Refer to Table 1B-1A in the Sample Solution Handout, which is the final list of ITS projects for the theme park, and identify how you will group the projects into logical procurement packages. Assume that all projects listed in the table will be built or completely upgraded. The packages are entered into the left-most column of Table 6B-10.

3. Use the pros and cons presented in Module 6A to determine the best way to procure the hardware and software needed for each package. List the recommendations in the second and third column of Table 6B-10

4. Transpose the information from Table 6B-10 onto a flip chart. Present your findings to the class.

The Materials You Will Use:

- Table 1B-1A from the Sample Solution Handout to develop ITS packages.

Outputs:

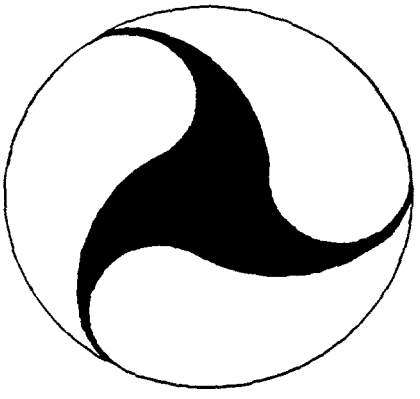
- Each group will complete Table 6B-10. We recommend that you define two packages and identify the hardware and software procurement strategies for those two first. If you have time left, then add procurement packages.

- Each group will have up to two minutes to present their findings. We will provide Sample Solutions for Table 6B-10 after the presentations.

Table 6B-10 – Procurement Recommendations for ITS Packages

Package Description	Procurement Strategy

Module 7B
Operations and Management



Module 7B - Concepts Application Exercise Session 7:
Operations and Management

We will step forward in time for this Concepts Application Exercise Session. You are to assume that the ITS deployments and integration have taken place as envisioned in earlier Concepts Application Exercise Sessions (refer to Table 1B-1A in the Sample Solution Handout) and the theme park has opened.

The theme park has a major event (a concert and a fireworks extravaganza) planned for July Fourth and has coordinated with the Missouri DOT, the County traffic engineers and the transit agency. Assume that the theme park and agencies have nearly perfected their responses to major events at the theme park.

Unfortunately, this major event will have to contend with the reconstruction of the I-70 from I-170 just east of the airport to just west of the I-70 bridge over the Missouri River. The Missouri DOT worked with the County traffic engineers and the transit agency to develop alternative route and mode strategies for the reconstruction. That plan is now being implemented.

The challenge for each group is to identify how to respond to the theme park's major event given the I-70 reconstruction.

Objective:

- Apply the operations management concepts presented in Module 7A to the situation presented above that agencies are to collectively address.

What You Will Do:

1. Rejoin your group.
2. Develop a list of specific responses you will make to the situation presented above. You should identify how you arrived at the response you are recommending. You may or may not want to use Table 7B-11 as a guide.
3. Transpose your recommendations onto flip chart and present your findings to the class.

The Materials You Will Use:

- Table 1B-1A of the Sample Solution Handout
- Table 7B-11 may help organize your approach, although you can use another approach

Outputs:

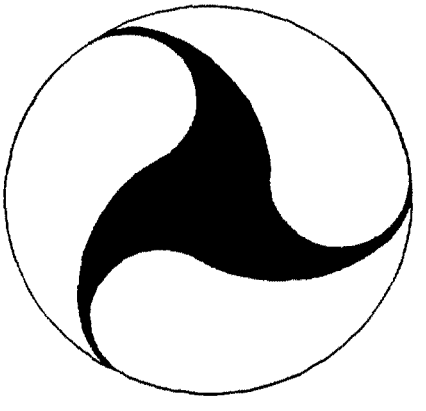
- A list of recommended responses to the theme park's major event during reconstruction

- Each group will have up to two minutes to present their findings. We will provide Sample Solutions for this Session after the presentations.

Table 7B-11 – Operational Responses to the Major Event and Reconstruction

Operational Objectives	Coordinating Agency	Other Agencies to Involve	Responses

Module 8B
Short- and Long-Term Planning Needs



Module 8B - Concepts Application Exercise Session 8:
Short- and Long- Term Planning Needs

Up to this point in the Concepts Application Exercise you have been focusing on integrating existing and programmed ITS projects. This Session shifts the focus from integrating existing projects for the theme park to identifying regional, long-term project deployment and integration needs.

If you recall, the region completed an Early Deployment Plan (EDP) five years ago. Most projects in the EDP have been deployed; however, not much has happened with the Plan's regional integration recommendations. Responding to the theme park has provided an opportunity for the region to update the EDP, which will occur simultaneously with the MPO's update of the Transportation Plan.

Initial results of the MPO's Transportation Plan update indicates that travel demand in the theme park area will continue to increase moderately to the year 2020. The existing plan identifies the need for a Major Investment Study (MIS) in the corridor that extends form the airport to the City of St. Charles, which includes the theme park. The MIS is nearing completion and is recommending an extension of the light rail system to the theme park.

A major emphasis of the MPO's Plan update is continuing the development of multi-modal options in the region. A second emphasis area is improving the efficiency of existing roadway and transit systems

In this module, your group will identify the ITS projects you think are needed to meet regional transportation goals. Your recommendations will be included in the MPO's Transportation Plan.

Objectives:

- Use what you have learned from earlier exercise steps to prepare the recommendations for the MPO's Transportation Plan.

What You Will Do:

1. Rejoin your group.

2. Review the inventory (Table 1B-1A) and Sample Solutions provided so far to establish an inventory of what is there.

3. List regional objectives from the information provided in the Introduction to the exercise and the Introduction to this Session.

1. Identify projects that address the regional issues and goals in Table 8B-12. You can simplify this step by listing the ITS infrastructure components or you can list specific projects; the level of detail is up to you.

2. Prioritize the projects you identify in the previous step because it is unlikely that all of your project recommendations can be funded immediately. The prioritization criteria listed in Table 8B-12 may help you with this task.

3. Transpose Table 8B-11onto a flip chart. Present your findings to the class.

The Materials You Will Use:

- You will want to refer back to Figure 1 (a map of the region) and Table 1B-1A (a summary of existing and programmed ITS projects) as your inventory.

- You will also want to review all the tables in the Sample Solutions Handout to identify stakeholders, operational objectives, information flows, etc.

Outputs:

- Each group will complete Table 8B-11

- Each group will have up to two minutes to present their findings. We will provide Sample Solutions for Table 8B-11 after the presentations.

Table 8B-11 – Project and Integration Needs

Objectives	Regional Projects and Integration Needs	Priority (1,2,3)

Table 8B-12- Project Prioritization Criteria

Priority 1	• Ability to immediately integrate / enhance capabilities of existing projects • Ability to immediately address current issues and problems
Priority 2	• Ability to integrate /enhance existing capabilities over time • Ability to address current issues and problems over time • Needed prior to implementing new capability / technology
Priority 3	• Ability to address future travel demand and problems / issues • Ability to achieve regional goals and objectives (seamless, multi-modal travel • Take advantage of new capacity / technology (upgrade from 486 to Pentium)

Module 9B - Concepts Application Exercise Session 9:
Concepts Application Exercise Summary (Marketing ITS and Public Relations)

We now assume we have just put together the ITS response to the opening of the theme park. The MPO is very curious about what we have done and requests a briefing. Your job is to prepare a presentation to the MPO, which will also serve as the kick-off for informing residents and theme park visitors about ITS solutions.

Objectives:

- Integrate the concepts learned in the Concepts Application Exercise
- Gain insight into how ITS projects are presented to the public

What You Will Do:

1. Rejoin your group.

2. Develop an outline for the presentation using Table 1B-1 from the Sample Solution Handout.

The Materials You Will Use:

- Table 1B-1 from the Sample Solution Handout as a reference

Outputs:

- A presentation outline that the group leader will use to present your group's ITS responses to the opening of the Arch-Deluxe Theme Park

- The class will select a spokesperson from one of the groups to make the presentation. The presentation should take no more than ten minutes.

ɔloying Integrated Intelligent Transportation Systems"
FHWA/FTA Training Course

3-Day Course Schedule (Version 1)

urse Session 00 - 10:50 AM)		Course Session (11:00 - 11:50 AM)		Course Session (1:00 - 1:50 PM)		Course Session (2:00 - 2:50 PM)		Course Session (3:00 - 3:50 PM)		Course Session (4:00 - 4:50 PM)
le 1B – epts Application ise ues/Problems	Break	Module 2A – Stakeholders & Operational Objectives	Lunch	Module 2B – Stakeholders & Operational Objectives — Course Exercise	Break	Module 3A – Information Needs & Sharing	Break	Module 3B – Information Needs & Sharing — Course Exercise	Break	Day-in-Review — Discussion/Q&A
le 5A – n iderations	Break	Module 5B – Design Considerations — Course Exercise	Lunch	Module 6A – Procurement Strategies & Contracting Options	Break	Module 6B – Procurement Strategies & Contracting Options — Course Exercise	Break	Module 7A – Operations and Management	Break	Day-in-Review — Discussion/Q&A
le 8B – -and Long-Term ing Needs urse Exercise	Break	Module 9 – Course Wrap-Up								

"Deploying Integrated Intelligent Transportation Systems
FHWA/FTA Training Course

4-Day Course Schedule (Version 2)

TIME / DAY	Course Session (8:00 - 8:50 AM)		Course Session (9:00 - 9:50 AM)		Course Session (10:00 - 10:50 AM)		Course Session (11:00 - 11:50 AM)		Course Session (1:00 - 1:50 PM)	
DAY #1									Module 0 – Introduction & Overview	Break
DAY #2			Module 2A – Stakeholders & Operational Objectives	Break	Module 2B – Stakeholders & Operational Objectives — Course Exercise	Break	Module 3A – Information Needs & Sharing	Lunch	Module 3B – Information Needs & Sharing — Course Exercise	Break
DAY #3			Module 5A – Design Considerations	Break	Module 5B – Design Considerations — Course Exercise	Break	Module 6A – Procurement Strategies & Contracting Options	Lunch	Module 6B – Procurement Strategies & Contracting Options — Course Exercise	Break
DAY #4			Module 8A – Short-and Long-Term Planning Needs	Break	Module 8B – Short-and Long-Term Planning Needs — Course Exercise	Break	Module 9 – Course Wrap-Up			

Interrelationship of Transpor
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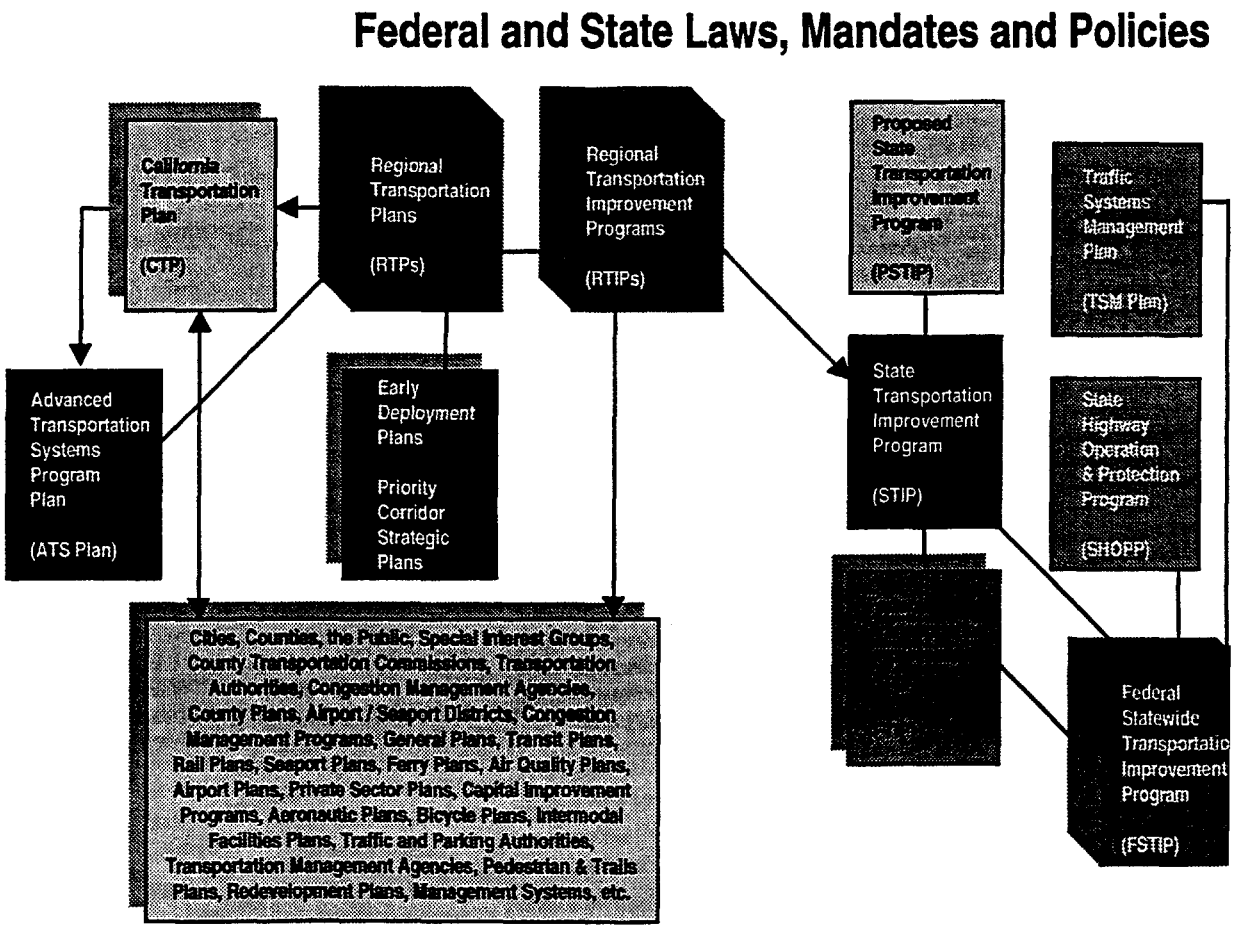
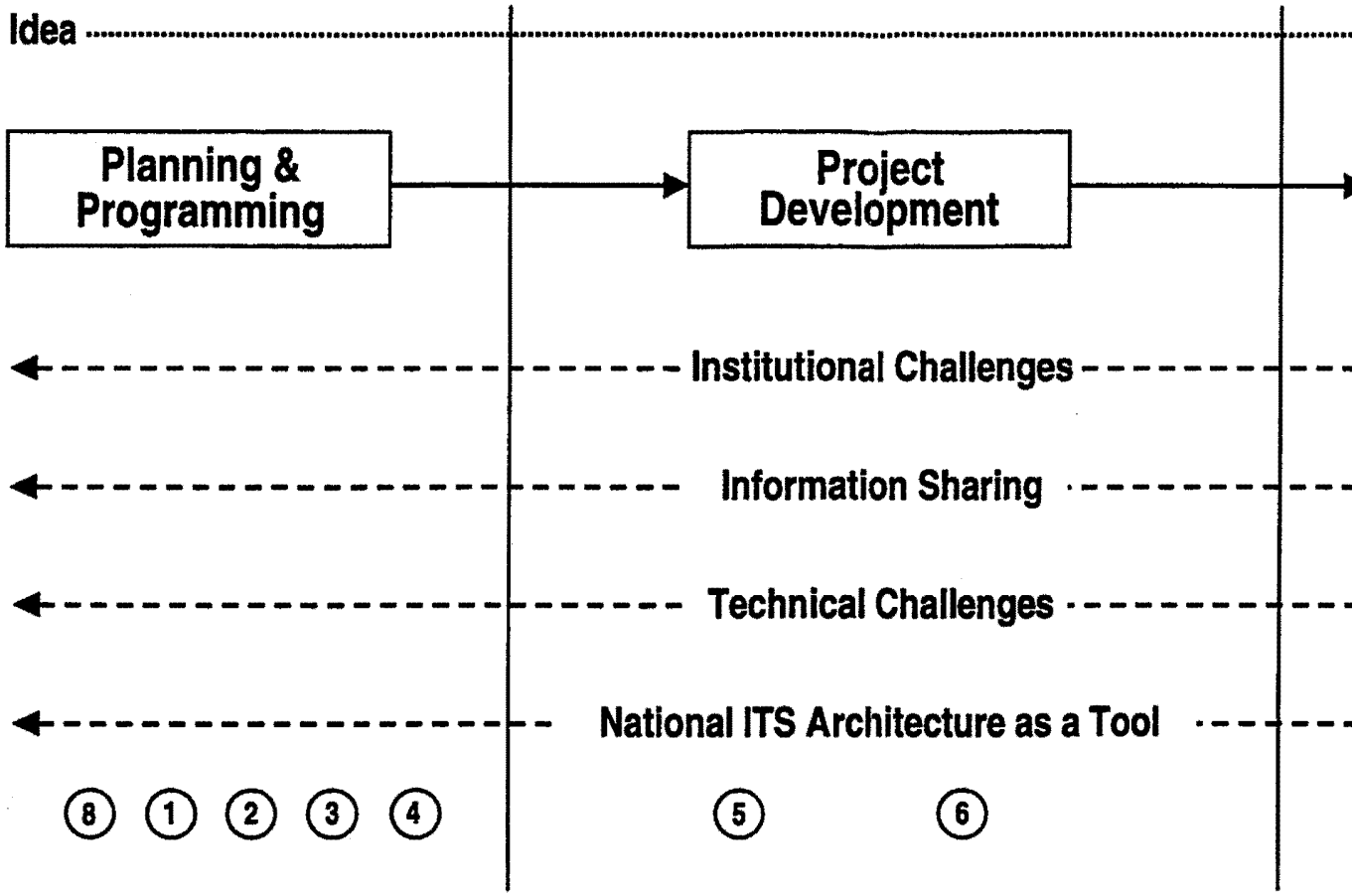


Integration Course Framework



1. Issues/Problems
2. Stakeholders and Operational Objectives
3. Information Needs and Sharing
4. Operational Implications of Information Sharing
8. Short- and Long-Term Planning Needs

5. Design Considerations
6. Procurement Strategies and Contracting Options

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Course #