STANDARDS ITS TRAINING

TRANSIT

WELCOME

U.S. Department of Transportation

Office of the Assistant Secretary for
Research and Technology

Module:15

Emerging Evacuation Standards of Communication/Incident Management (ISO 19083)

Instructor

Dave Matta

U.S. Expert

ISO TC 204 Working Group 8 Public Transport and Emergency Services

Course Developer: Paula Okunieff

Learning Objectives

Describe the Elements of the **Emergency Evacuation and Disaster Response and Recovery** (EEDRR) Framework

Explain **roles and responsibilities** of organizations (including Transit) in EEDRR

Use **Concept of Operations Template** for specifying a Decision Support System (DSS)

Review **Characteristics of** Transit Emergency Management Decision Support System

Learning Objective 1

Describe the Elements of the **Emergency Evacuation and Disaster Response and Recovery** (EEDRR) Framework

Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework Overview

Frequency and Impacts of Disasters

Weather Related Disasters Increasing (US)

- Disaster Declarations 1960 -1969 - 18 per year
- Declarations from 2000 - 2009 - 56 per year

Earthquake Threats (Worldwide)

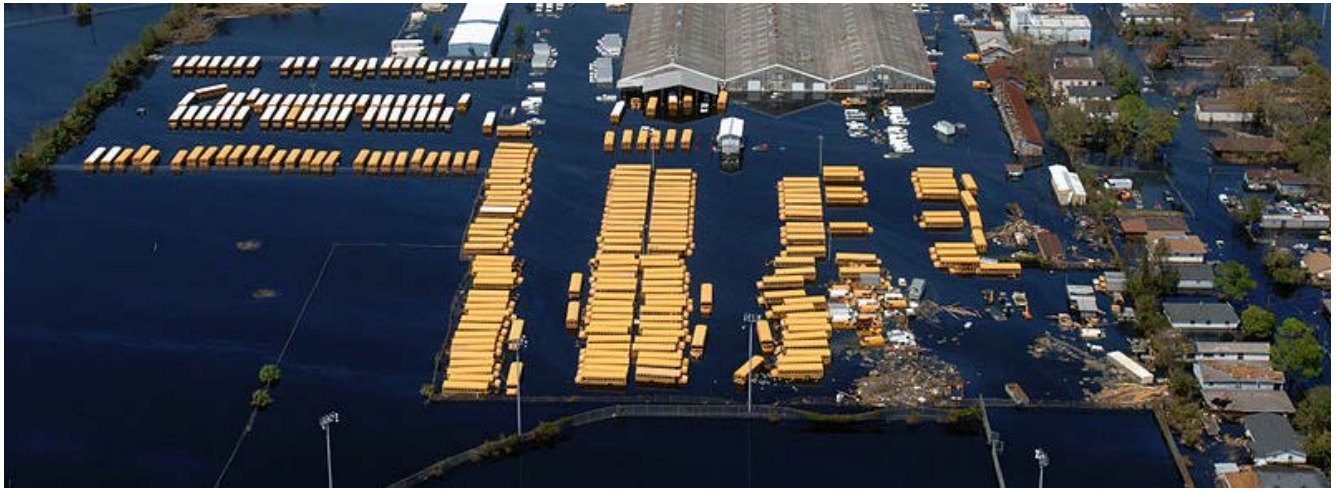
- Number of Earthquakes
  - 1970-1999- 1588 per year
  - 2000-2012- 1813 per year
- Deaths Related to Earthquakes
  - 1970-1999- 34,120 per year
  - 2000-2012- 62,590 per year

Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework Overview

Where is transit during a disaster?

Equipment and Facilities

- 2012 “Superstorm Sandy”- $6.2 Billion for repair and restoration of public transportation infrastructure



Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework Overview

Where is transit during a disaster?

Equipment and Facilities

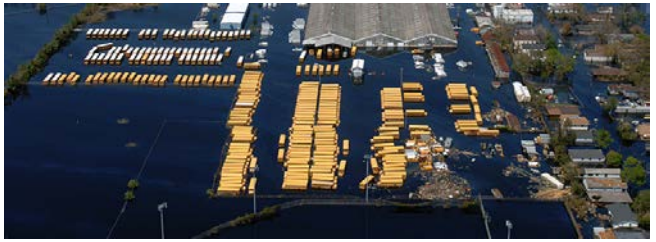
Service

- Hurricane Sandy triggered worst transit disaster in U.S. history
- More than half of the nation's daily transit riders were without service

Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework Overview

Where is transit during a disaster?

Equipment and Facilities



Service

Ridership

- Carless in an evacuation (low income, tourist, guest worker)
- Service Interruption during Recovery

Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework Overview

U.S. Interest and Activities Based on Needs

- Literature Review
- Government Agencies
- Business Organizations
- International Standards Organization

TRB TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

FTA

APTA

Homeland Security

NEMA NATIONAL EMERGENCY MANAGEMENT ASSOCIATION

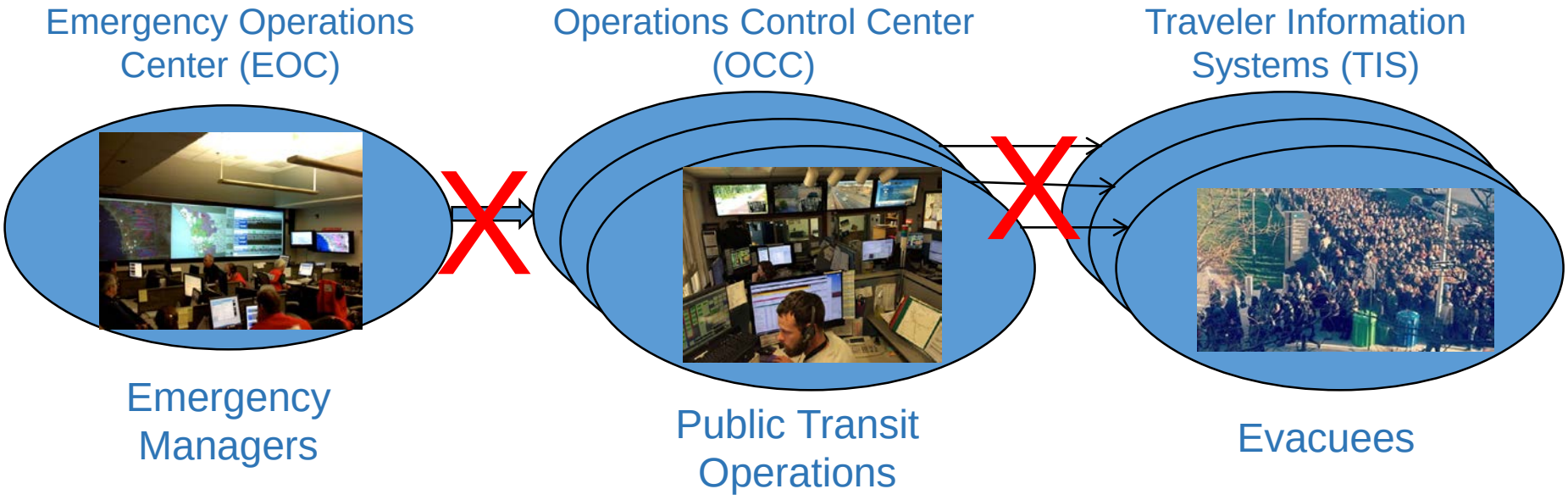
EMERGENCY EVACUATION TRANSIT'S ROLE

MARYLAND

Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework Overview

Missing System Components in ITS

- Transit in National ITS Architecture Emergency Service Packages
- Data Exchange with Emergency Operations Center Standards
- Passenger Identification Standards
- Emergency Route / Schedule Standards



Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework Overview

Need for Communications and Standards

- **Those without access to automobiles** depend on Transit for mobility
- **Poor or inadequate communications** is a major roadblock to providing the proper emergency services during a disaster
- **Infrequent occurrence and personnel turnover** cause loss of knowledge for responding to disasters
- **ITS technologies** are a platform from which to overcome these roadblocks
- **Standards** can provide an organized, dependable response to an emergency by the transit industry

ISO 19083 Standard Background

What is the ISO 19083?

International Standards Organization (ISO) technical report for developing the requirements for an:

Emergency Evacuation and Disaster Response and Recovery Decision Support System (EEDRR-DSS)

Purpose

- Present **Framework** and **Concept of Operations** for a decision support system to support transit planning for EEDRR
- **Define** information flows, data interchange requirements, message descriptions
- **Support** disaster drills and exercises

ISO 19083 Standard Background

ISO 19083 Series of Standards

Public transport — Emergency evacuation and disaster response and recovery

http://www.iso.org/iso/catalogue_detail.htm?csnumber=64752

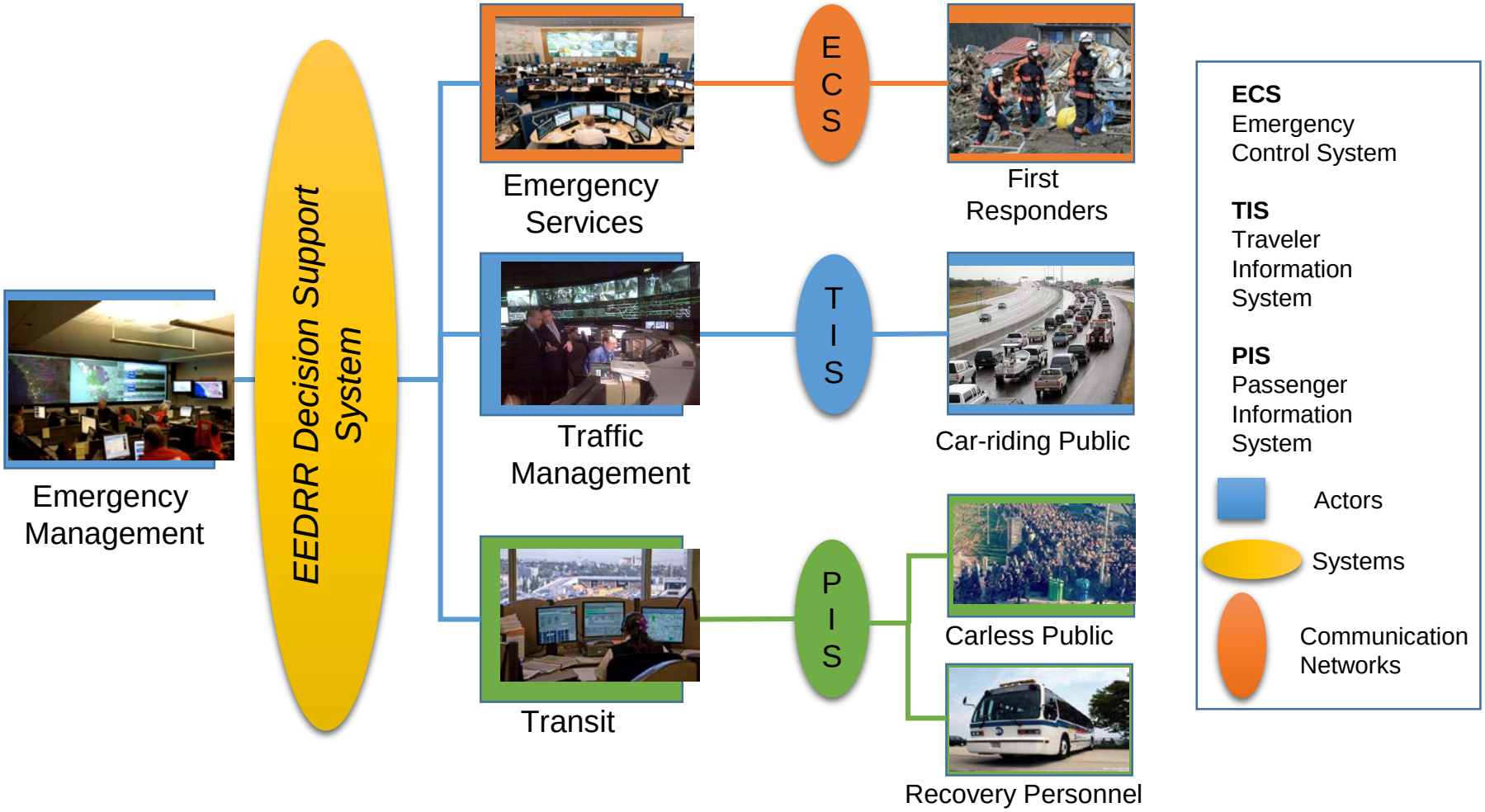
Part 1: Standard's Framework and Concept of Operation for a Public Transport Decision Support System for Emergency Evacuation and Disaster Response and Recovery

Part 2: Information Flow between Decision Support Systems, Passenger Information Systems, Command and Control Systems, and Emergency Operation Centers during an evacuation/disaster

Part 3: Use Cases needed to support Disaster Drills/Exercises

Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework Overview

What is the EEDRR Framework?



Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework Overview

EEDRR Scope

- Focus on ITS for ground transportation
  - Covers ground transportation for disaster
    - evacuation
    - response
    - recovery
- Does not cover:
  - Societal issues (sheltering, aid, security)
  - Railway (commuter and intercity rail)
  - Airports
- Foundation for developing a Decision Support System

Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework Overview

EEDRR Purpose

Paradigm shift

- Transit is *primary mobility agent* for all transportation-related actions
  - Prepares
  - Responds
  - Recovers

- Uses common terminology to communicate
  - Standard language from ISO 22330 Security and resilience - Business continuity management systems - Guidelines for people aspects on business continuity

Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework Overview

Primary Objective of EEDRR Framework

- Support Transit providers in design of a coordinated Decision Support System (DSS) to deliver **Transportation Services**
- This includes:
  - Moving people from harms way **(evacuation**)
  - Moving emergency responders into area (**response**)
  - Providing transportation for recovery efforts (**recovery**)
- **Concern** is needs overwhelm available transit resources
  - Coordination between multiple transit providers
  - Other resource i.e. school buses may fall under other entities
  - Agency to coordinate and deploy multiple suppliers

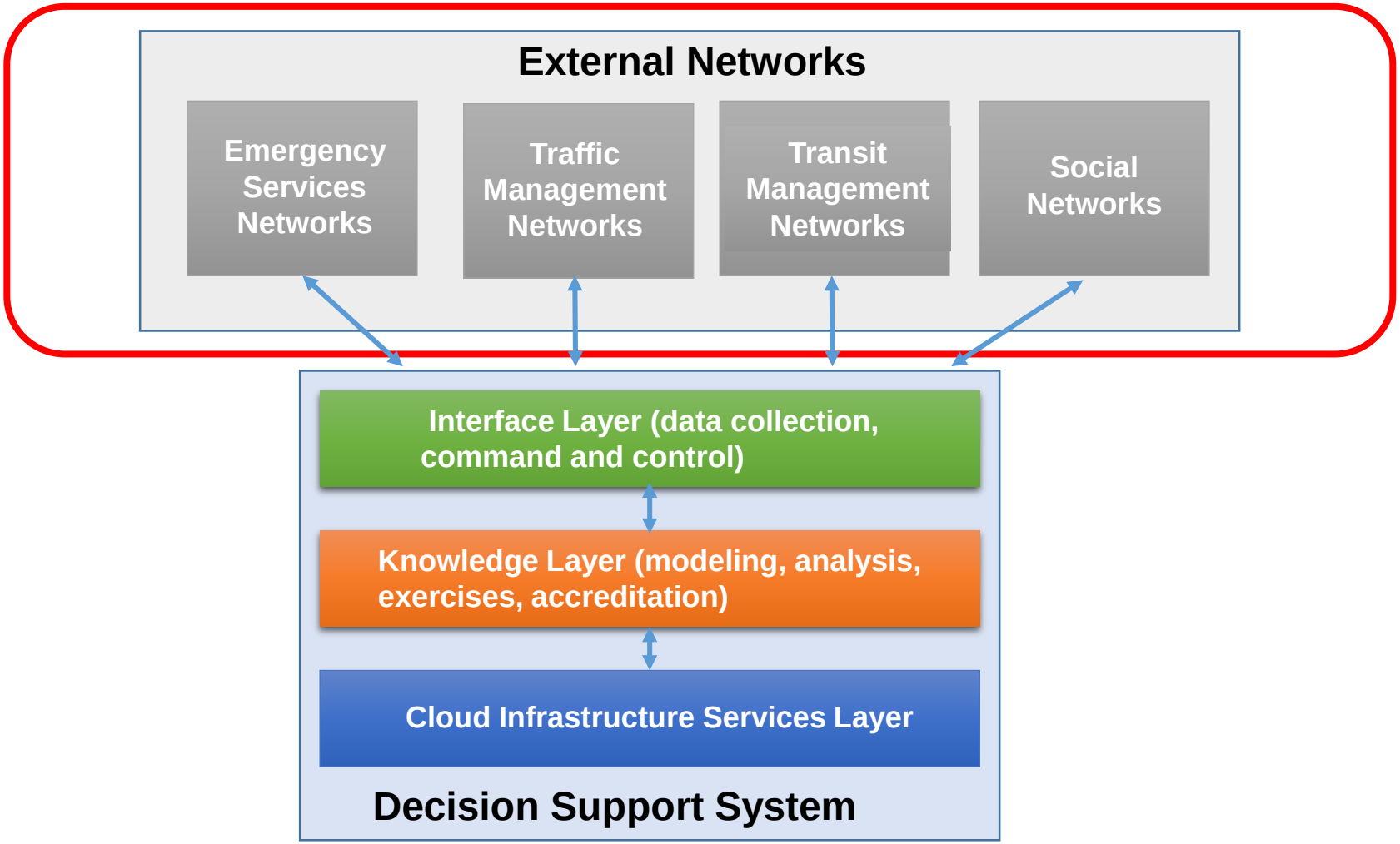
Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework Overview

EEDRR Decision Support System Approach

- DSS computer-based information system that supports organizational decision-making activities
- Scope of organizational decision-making activities is organized in the Concept of Operations (CONOPS)
- Step 1 for the CONOPS
  - Understand your planning assumptions
  - Identify your needs

Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework Overview

EEDRR Stakeholders



Planning Assumptions

Planning Assumptions for Evacuation

Elements that factor into planning:

- Identify **needs**
- Calculate and analyze **response times**
- Assign **resources**

Planning Assumptions

Needs Identification

Identify populations to be evacuated:

- Permanent residents and transient populations
- Public transit dependent permanent residents
- Special facility residents (e.g., hospitals, nursing homes)
- Schools

Where to acquire information:

- Surveys
- Patrons who are issued special media or use special services
- Ridership demographics

Planning Assumptions

Planning Assumptions for Evacuation – **Response Times**

Estimate time to evacuate identified populations

- Calculate evacuation route timing for each population group
- Requires staging equipment, developing routes and technology

How

- Modeling software (e.g., flexible/dynamic scheduling software and traffic models for evacuation)

Planning Assumptions

Planning Assumptions for Evacuation – **Resource Assignments**

Resource assignments based on total number of available

- Operators
- Buses / Vehicles
- Safe staging areas for vehicles and personnel
- Monitoring operations personnel and facilities

How

- Modeling software
- Trained operators
- Technology tools that are hardened for a disaster

Other Key Considerations for Disaster Response and Recovery Efforts

Plan for the Unexpected

- Events with and without warning
- Critical infrastructure
  - Loss of % fleet
  - Fuel supply
  - Facilities
  - Communications
- Limits in disaster forecasting
- Environmental contamination
- Victim contamination
- Animals

Other Key Considerations for Disaster Response and Recovery Efforts

Elements that factor into planning for disaster and response

- Interdependencies between shelters and transportation
- Interdependencies between response and recovery efforts
- Special needs populations

ACTIVITY

STANDARDS ITS TRAINING TRANSIT

U.S. Department of Transportation
Office of the Assistant Secretary for
Research and Technology

Question

Which of the following is a part of ISO 19083 standard?

Answer Choices

a) Sheltering, aid, and security
b) Railways, airports, and ports
c) Evacuation, response and recovery
d) Organizations, policies, and procedures

Review of Answers

a) Sheltering, aid, and security

Incorrect. ISO 19083 pertains to transportation related activities see ISO 22300 Societal Security for these topics.

b) Railways, airports, and ports

Incorrect. ISO 19083 pertains to ground transportation. The reader is directed to ISO TC 20 SC 17 Airport infrastructure and ISO TC 269 Railway application for air and rail transportation issues associates with disasters. No ISO TC exist for Ports.

c) Evacuation, response and recovery

Correct! ISO 19083 includes transportation related functions before, during and after for disasters.

d) Organizations, policies, and procedures

Incorrect. ISO 19083 pertains to the development of a decision support system that collects and analyzes ITS data.

Learning Objective 2

Explain **roles and responsibilities** of organizations (including Transit) in EEDRR

Agencies and Organizations Involved in a Regionally Supported EEDRR

Step 2 for CONOPS identifying the Actors

Local

- City or County
- Examples –fire, police, EMS, public works, traffic department

Regional and State

- County, District or State
- Examples – state police, emergency management, military reserve, transportation department, transit, human services

National Agencies

- Federal and International
- Examples – Federal Emergency Management Administration, National Guard

Non-Governmental Organizations

- Examples – Red Cross, media

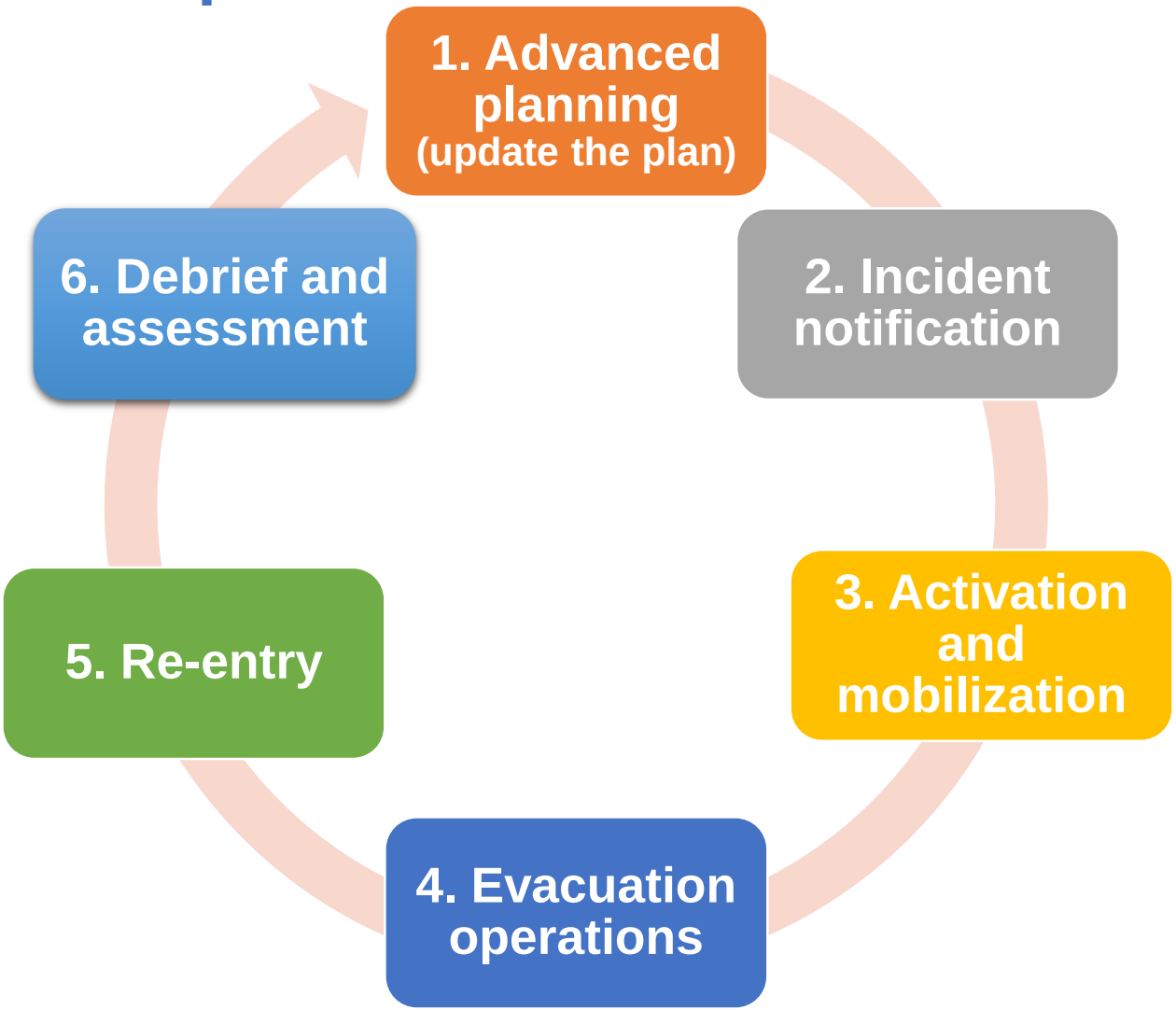
Roles and Responsibilities

Stakeholder/ Actors Groups

- Emergency Management
  - Lead organization
- Emergency Services
  - First Responders
- Traffic Management
  - Car-riding public
- Transit
  - ***Primary mobility agent*** for all transportation-related actions

Roles and Responsibilities

Disaster Response Phases and Activities



Roles and Responsibilities

Disaster Response Phases and Activities

Advanced Planning

- Transit role – planning and organization of transportation services for identified populations

Incident Notification

- Transit role – activate Transit Emergency Operations Center (EOC); alert personnel and identify equipment

Activation and mobilization

- Transit role – Transit briefed by EOC; identify needs -- populations, route and time estimates, and resources

SUPPLEMENT

Roles and Responsibilities

Disaster Response Phases and Activities

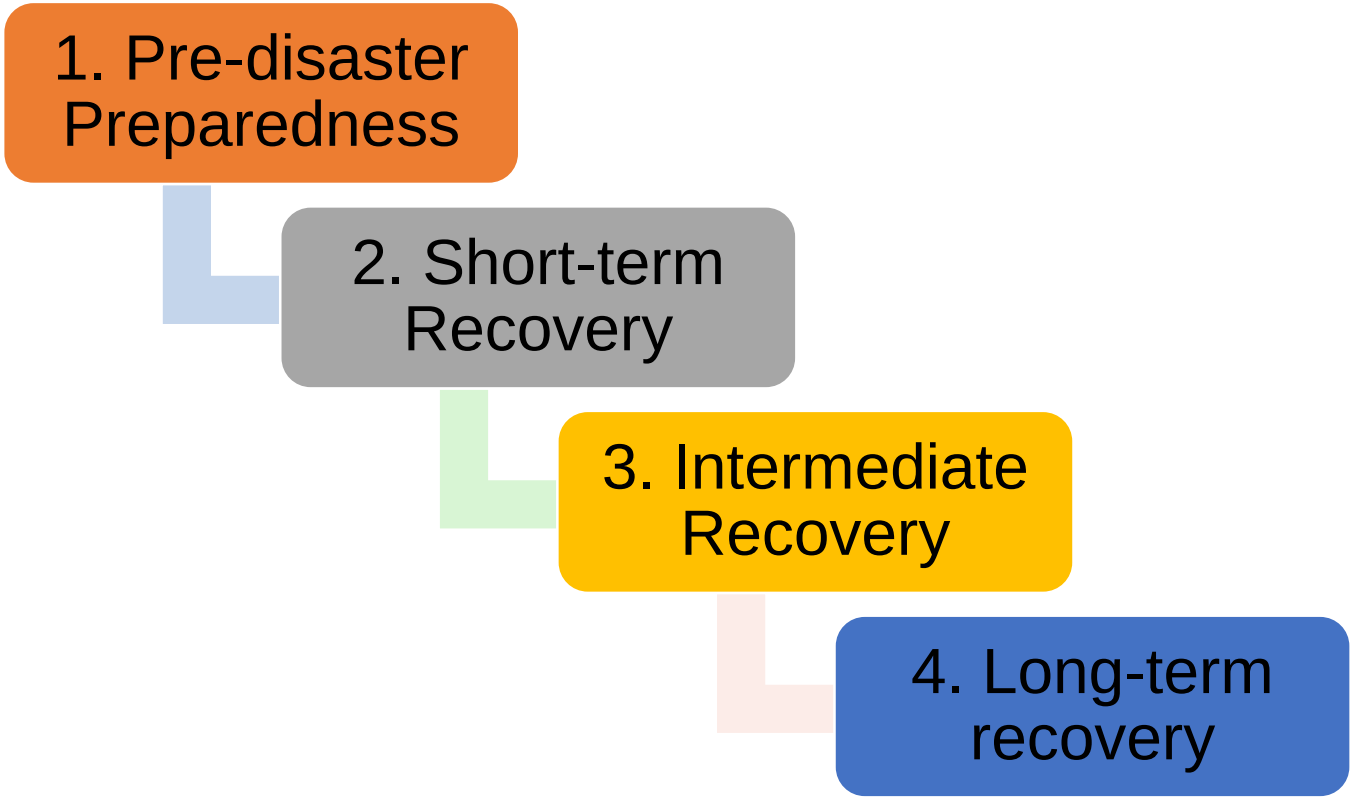
- **Evacuation or Response Operations**
  - Transit role – Deploy personnel and equipment as needed; move remaining vehicles and personnel outside of evacuation zone

- **Re-Entry**
  - Transit role – notification, activation, mobilization and operations for re-entry into the evacuation zone. Identify needs – evacuees, route and time estimates, resources required

- **Debrief and Assessment**
  - Transit role – Participate with all agencies involved to evaluate overall operations. Update planning assumption (see advanced planning)

Roles and Responsibilities

Recovery Phases and Activities



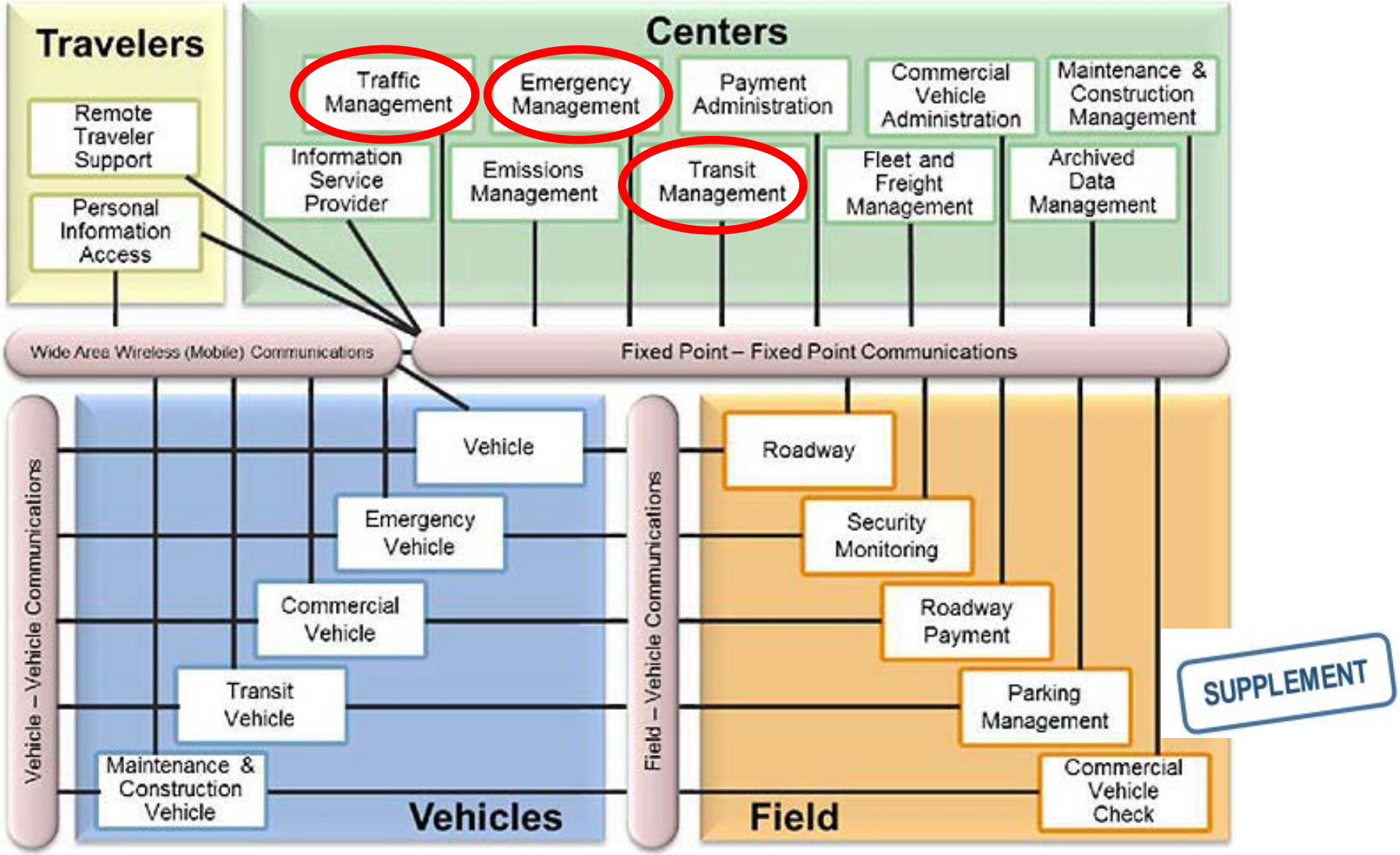
Roles and Responsibilities

Recovery Phases and Activities -- Roles

- Build partnerships, identify capacity needs and limitations
- Activate recovery teams, staging areas, mutual service needs/ agreements with other transit agencies
- Assess costs and mutual aid needs
- Identify recovery goals, coordinate with local/ regional organizations, and compile lessons learned

Criteria for Using Transit

Using the National ITS Architecture Version 7.1



Criteria for Using Transit

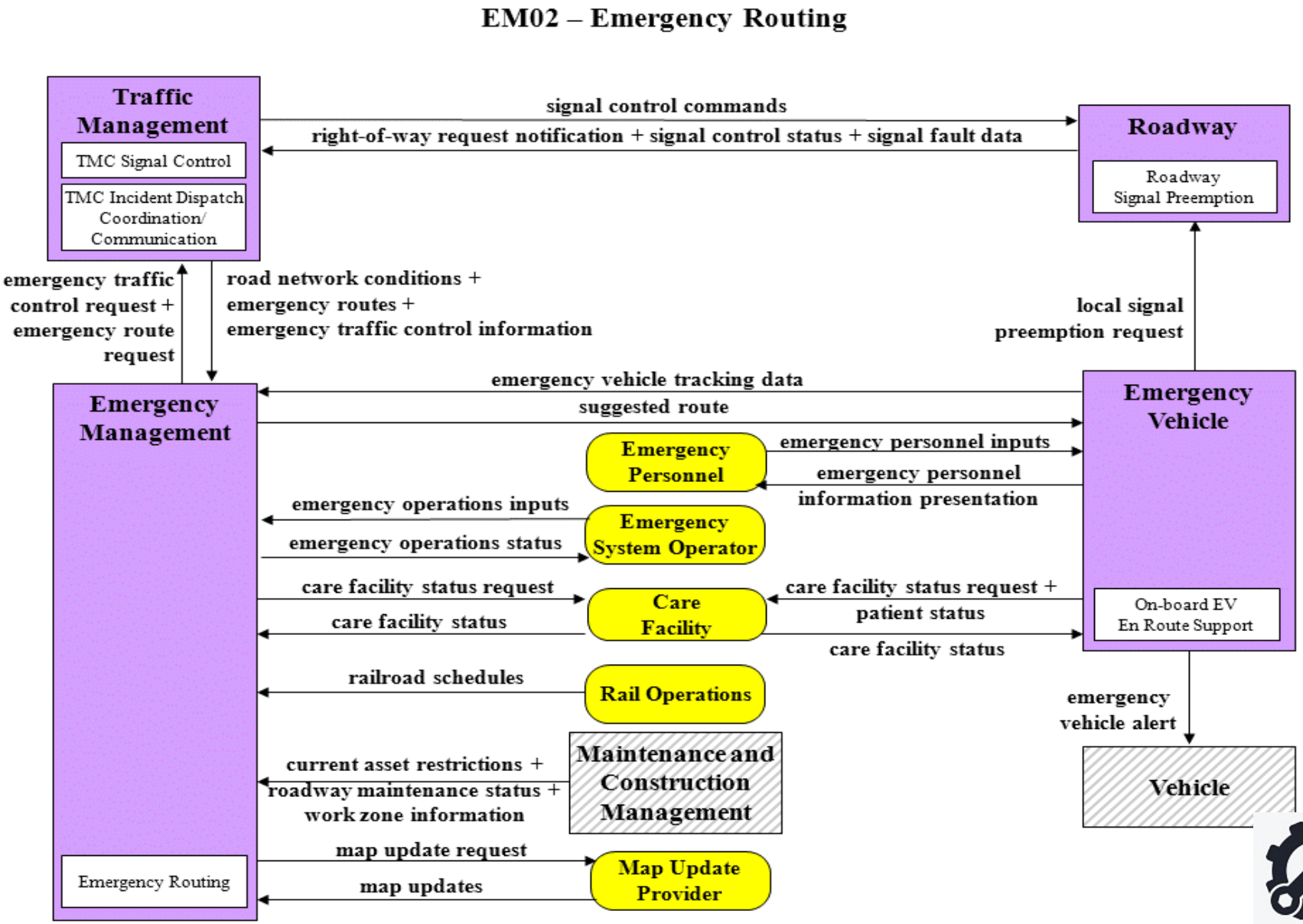
Finding Stakeholders in the Regional ITS Architecture

- Look for Emergency Management Service Packages (10 in all)
- Service Packages-represent slices of the Physical Architecture that address specific services like:

EM 2 – Emergency Routing

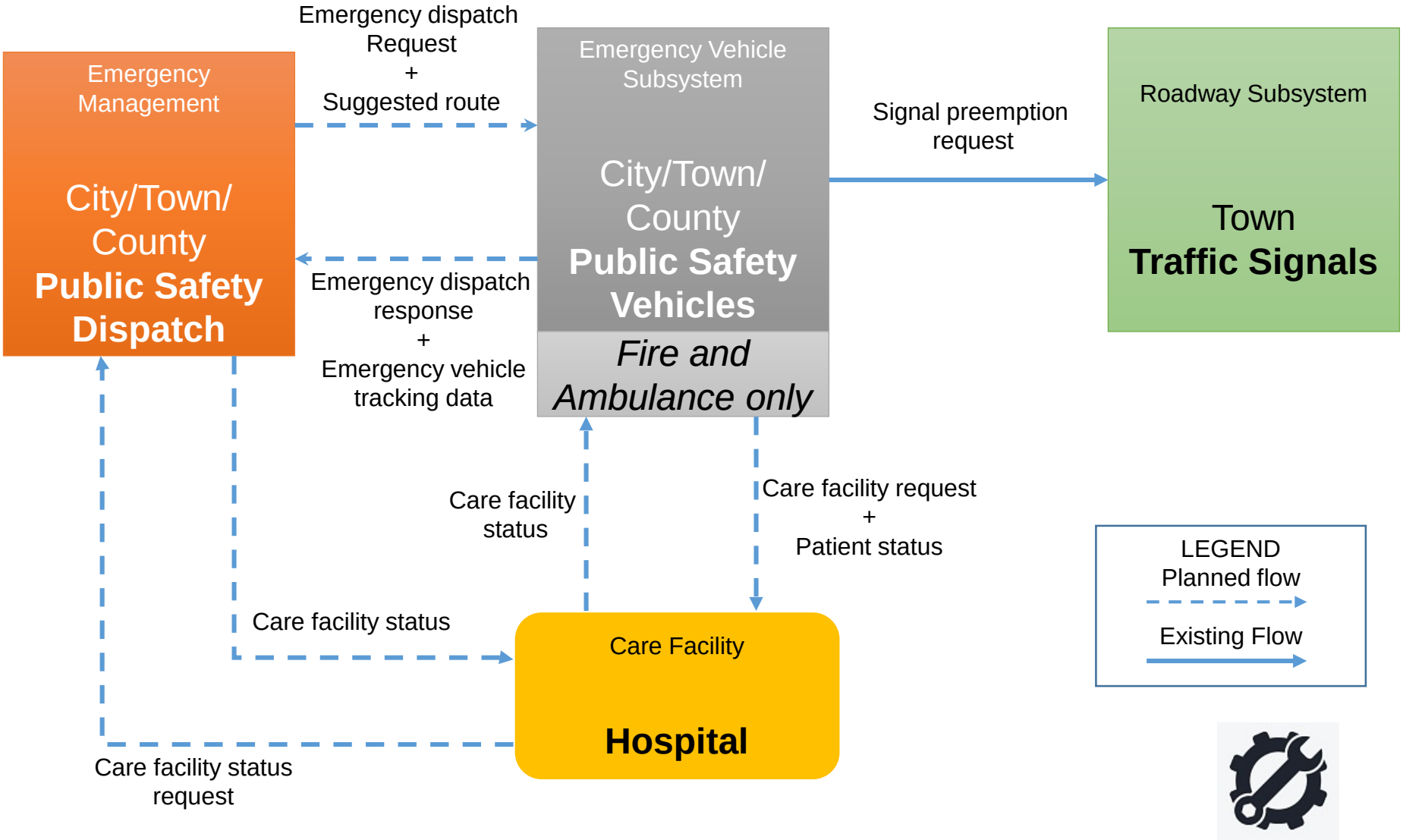
"This … package supports routing of emergency vehicles and enlists support from the Traffic Management … to facilitate travel along these routes. Routes may be determined by this … package based on real-time traffic information and road conditions or routes may be provided by the Traffic Management … on request. Vehicles are tracked and routes are based on current vehicle location. This equipment package may coordinate with the Traffic Management … to provide preemption or otherwise adapt the traffic control strategy along the selected route"

Criteria for Using Transit



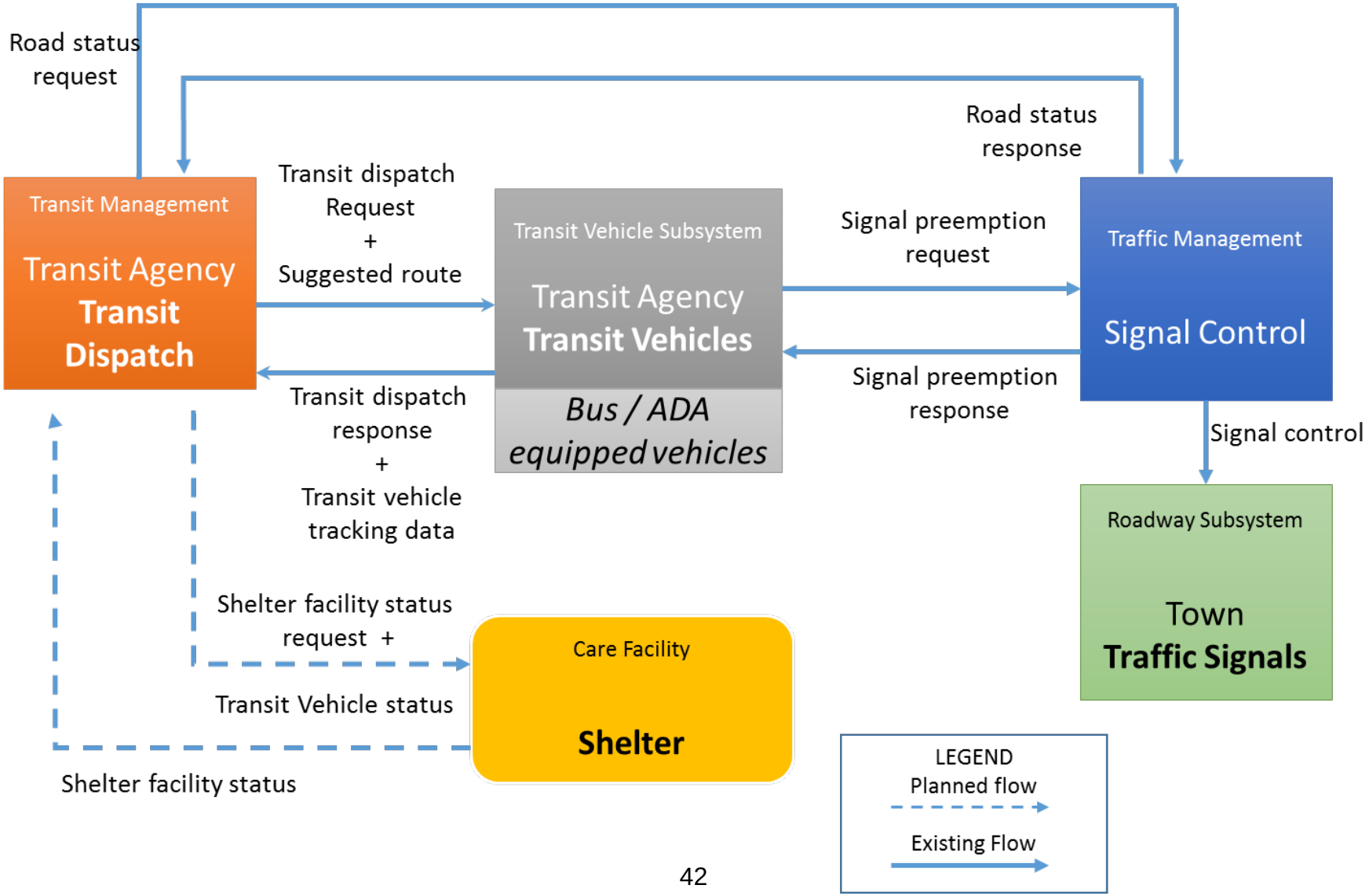
EEDRR in the Context of the Regional ITS Architecture

EEDRR Framework Related to EM Services



EEDRR in the Context of the Regional ITS Architecture

EEDRR Framework Related to EM Service with Transit



EEDRR in the Context of the Regional ITS Architecture

Transit Role Related to EM Services

- Transit not listed for evacuation services

- Human service transportation operators and paratransit services typically not included in the regional ITS architectures for evacuation services

- Transit has defined service schedules and routes for weather events; however EM / Fire has responsibility for evacuations

Decision Support Concept of Operations

Using Systems Engineering to Describe Transit's Role in a Concept of Operations DSS

- **Purpose of "ConOps"**
  - Define a decision support tool that is repository of Preparations and Plans that provides checklists, modeling tools, inventories and information to support Disaster Response and Recovery activities

- **Characteristics**
  - Non-technical
  - Vision of stakeholder plans
  - Needs definition -- assessment data and modeling tools needed to implement response and recovery plans

Decision Support Concept of Operations

Using Systems Engineering to Describe Transit's Role in a Concept of Operations DSS

- Obtain stakeholder agreement on who is responsible for developing the ConOps
- Manage stakeholder collaboration and needs
- Define the environment
- Derive high-level user requirements
- Provide criteria for validation of the completed Decision Support System

ACTIVITY

STANDARDS ITS TRAINING TRANSIT

U.S. Department of Transportation
Office of the Assistant Secretary for
Research and Technology

Question

What paradigm change does the EEDRR propose for *emergency evacuation* and *disaster response and recovery*?

Answer Choices

a) Transit is the primary mobility agent for all transportation-related actions

b) Transit supports emergency evacuations

c) Transit does not participate in disaster recovery

d) Emergency management relinquishes control of the Emergency Operations Center to Transit Emergency Manager

Review of Answers

a) Transit is primary mobility agent for all transportation related actions

Correct! Transit has the most experience and the resources to move large numbers of people efficiently and in a timely manner which is paramount before, during and after a disaster.

b) Transit supports emergency evacuations

Incorrect. This does not represent a paradigm shift as it is what a majority of organizations currently practice.

c) Transit does not participate in disaster recovery

Incorrect. Transit should be a key player in transportation related recovery activities.

d) Emergency Managers relinquish control of the Emergency Operations Center

Incorrect. Emergency Managers will remain in charge of the Emergency Operations Center.

Learning Objective 3

Developing a Concept of Operations

Scope of the Transit – EEDRR Decision Support System

Developing the Concept of Operations

- Purpose is to develop the **scope of the Decision Support System**
- Outline
  - Operational Concepts
  - Needs
  - Operational environment
  - Actors
  - Roles and Responsibilities
  - Operational Scenarios
    - User-Oriented Operational Approach
    - High-Level Operational Requirements

Scope of the Transit – EEDRR Decision Support System

Developing the Concept of Operations

- Purpose is to develop the **scope of the Decision Support System**
- Outline
  - Operational Concepts
  - Needs
  - Operational environment
  - Actors
  - Roles and Responsibilities
  - Operational Scenarios
    - **User-Oriented Operational Approach**
    - High-Level Operational Requirements

Scope of the Transit – EEDRR Decision Support System

Defining an Operational Approach

- Scope of Transportation Services
  - Buses, subway, light rail, bridges, tunnels, roads, highways, ferries, stations
- Command-Level Roles for response and recovery
- Primary Goals
  - Save lives
  - Preserve property
  - Evacuate or move people quickly and efficiently to safety
  - Move responders into and out of the affected areas
  - Provide resources (i.e., routes, services)

Scope of the Transit – EEDRR Decision Support System

Defining an Operational Approach

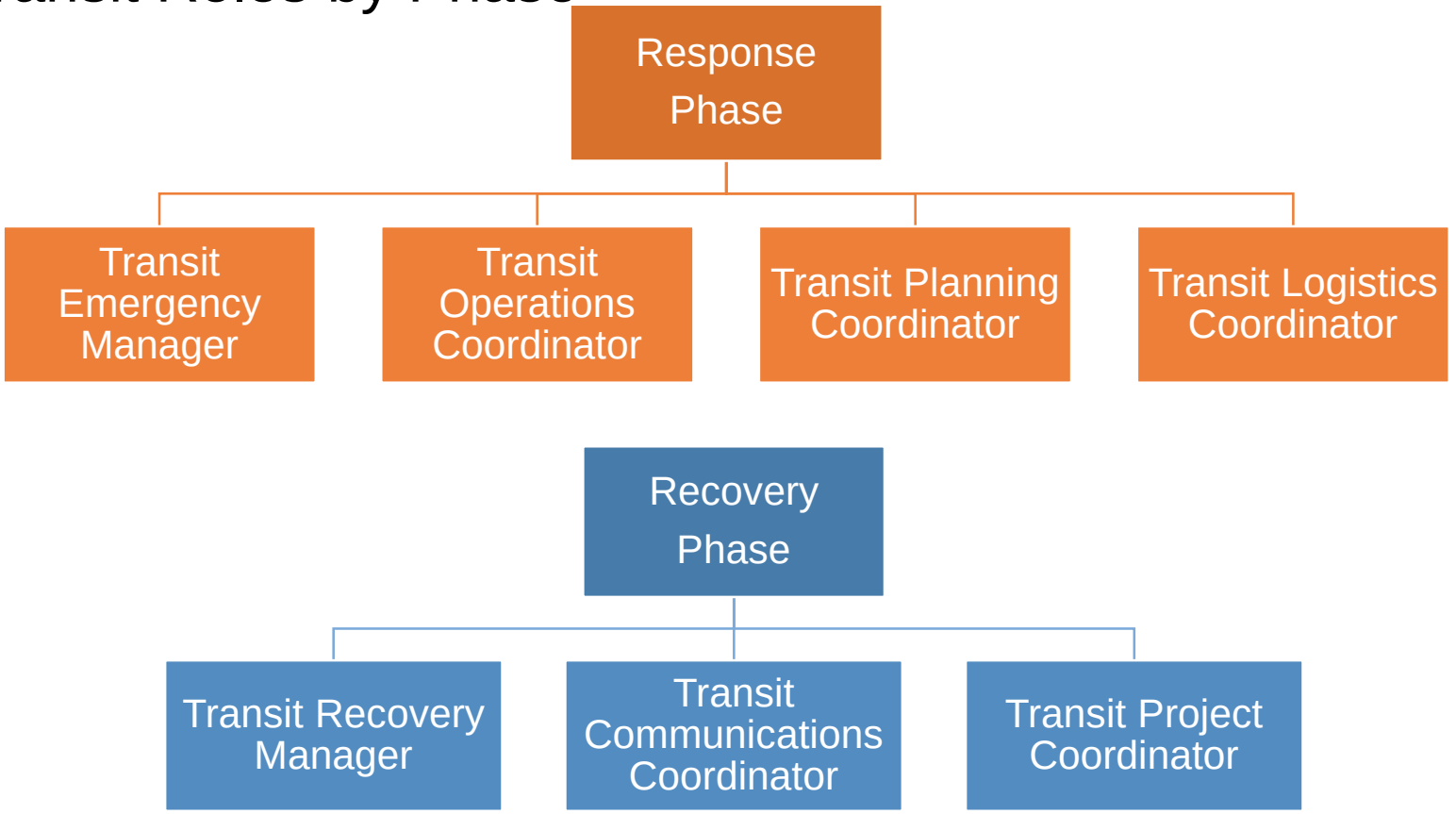
Cognitive Processes

Assessment Develop Situational Awareness	• Identify, gather and prioritize information to understand situation • Recognize context and predict future needs
Scheduling Synchronize Information and Resources	• Coordinate and communicate internally and externally • Acquire, prioritize and allocate available assets to meet transportation needs of the public
Implementation Execute Actions and Decisions	• Recognize decision points • Maintain mission priorities

Scope of the Transit – EEDRR Decision Support System

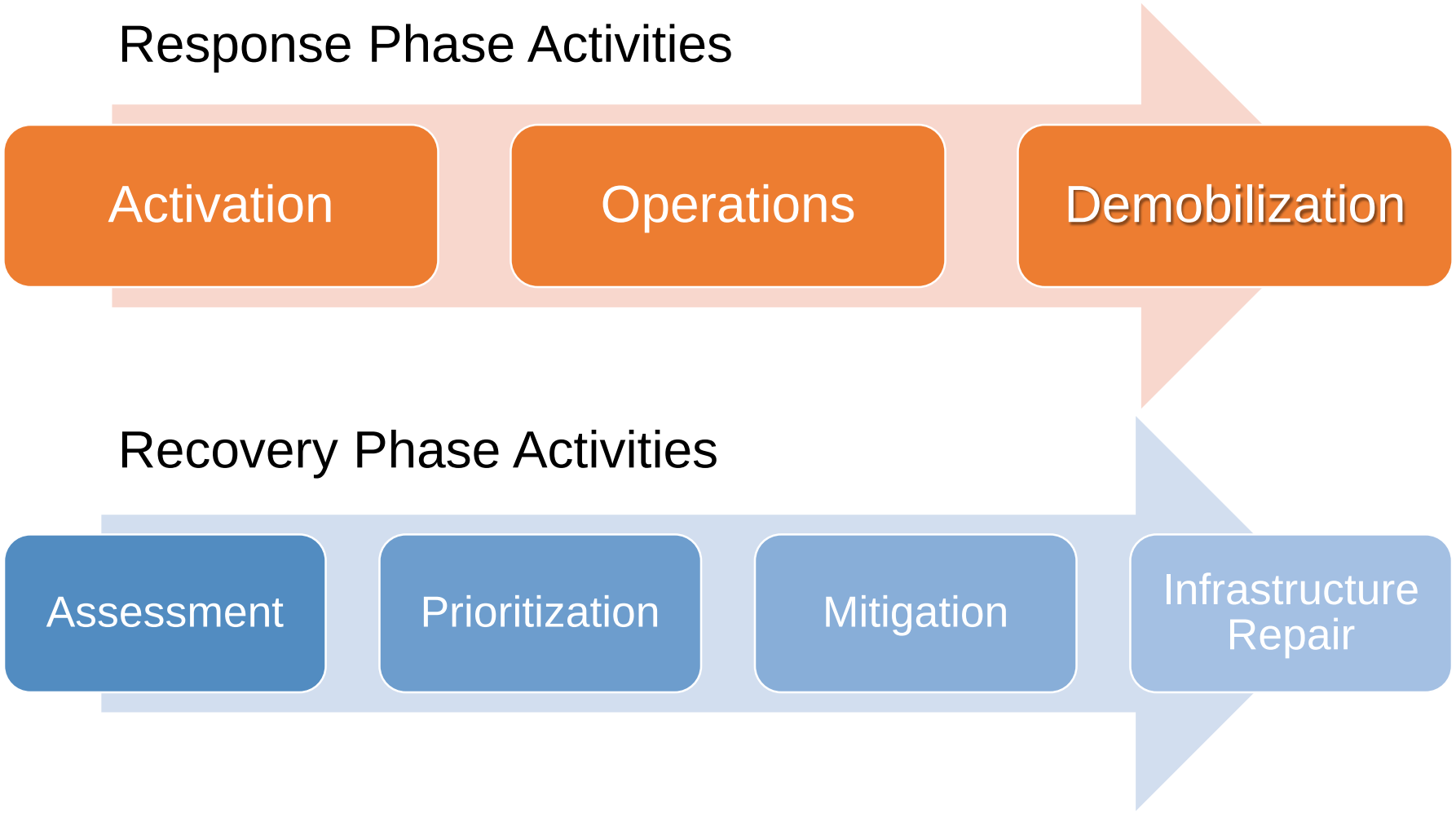
Defining an Operational Approach

- Transit Roles by Phase



Scope of the Transit – EEDRR Decision Support System

Defining an Operational Approach



Scope of the Transit – EEDRR Decision Support System

Detailed Transit Objectives

Phase	Role	Objectives
Activation	Transit Emergency Manager	**1.1** Given an incident that requires a response from the Transit Emergency Manager, the user will immediately gather information to gain situation awareness.
Activation	Transit Emergency Manager	**1.2** Given an incident that requires a response from the Transit Emergency Manager, the user will activate and staff the Transit EOC.
Operations	Transit Emergency Manager	**2.1** Given an incident that requires a response from the Transit Emergency Manager, the user will maintain appropriate documentation during all phases of the response.

SUPPLEMENT

Scope of the Transit – EEDRR Decision Support System

Operational Approach Template

OBJECTIVE:

1.2 Given an incident that requires a response from the PT Emergency Manager, the user will activate and staff the PT EOC.

TASK:

Identify and notify all personnel involved in the emergency response.

CONDITION:

Inform each section and member assigned to respond to the emergency incident.

STANDARD:

Given the emergency, the user (1) notifies the PT Coordinator assigned for responding to emergency incidents, (2) requests staffing lists, (3) designs a check-in process for each PT EOC department.

EXPECTED ACTIONS:

Call, email or meet with each PT EOC member working on the response effort.

ENABLING REQUIREMENTS(ER)

1.2.1. When presented with the task of activating and staffing the PT EOC, the user notifies PT Coordinators who are responding to the incident.

1.2.2. When presented with the task of activating and staffing the PT EOC, the user designs a check-in procedure and distributes it to each department.

MEASUREMENT METHODS:

ER	Cognitive Process	Decision Support System Strategy	Performance Measure
1.2.1	CP3 - Implementation	Send an email or call using the address book	The user will notify PT Coordinators responding to the incident within 10 min of activation of the PT EOC
1.2.2	CP3 - Implementation	Retrieve/modify sample check-in for situation and email results	The user will design and implement a check-in procedure for each department within 30 min activation of the PT EOC

Scope of the Transit – EEDRR Decision Support System

Developing Operational Requirements – Completing the Template

- **Tasks** – actions to be performed
- **Condition** – criteria for measuring how task will be performed
- **Standard** – guidelines for tasks
- **Expected Actions** – step by step activities
- **Enabling Requirements** – decision support requirements derived from objective
- **Measurement Methods**
  - **Enabling Requirements** – numbered requirement
  - **Cognitive Process** – assessment, scheduling, etc.
  - **DSS Strategy** – action or procedure to be performed by DSS tool
  - **Performance Method** – metric to measure DSS strategy

Scope of the Transit – EEDRR Decision Support System

Developing Operational Requirements – **Completing the Template** Objective, Task, Condition, Standard

Objective	**2.9** Given an incident that requires a response from a Transit Planning Coordinator, the user will support planning for Transit EOC response. [role: transit planning coordinator] [phase: response] [activity: operations]
Task	Develop evacuation routes
Condition	Develop routes and service schedule for transit vehicles to pickup populations and take them to safe locations.
Standard	Given the designated evacuation roads, bridges, tunnels, population pickup locations, and transit resources, the user maps path, number of transit vehicles, and operators needed to evacuate populations.

Scope of the Transit – EEDRR Decision Support System

Developing Operational Requirements – **Completing the Template** Measurement Methods

Measurement Methods			
ER	CP	DSS Strategy	Performance Measures
2.9.1	Assessment	Search in database using geographic areas	Data completeness, technical and timing performance measures
2.9.2	Assessment	Access TOC assessment and evaluation path information	See above
2.9.3	Assessment	Retrieve assessment from Transit logistics coordinator	See above
2.9.4	Scheduling	Apply data from assessment and run modeling software	See above

EXAMPLE

Scope of the Transit – EEDRR Decision Support System

Scenario Generation – 4 in ISO 19083

- Name / class of major events
- Define operational scenario using several types of entries
  - Name / Class
  - Casualties
  - Infrastructure Damage
  - Evacuation / Displaced Persons
  - Contamination
  - Economic Impact
  - Potential for Multiple Events Hazards
  - Recovery Time
  - Details
  - Service Disruptions
  - Transit Tasks

EXAMPLE

Example of Scenario Template for Events

Hazmat Scenario	
Casualties	Zero death, one injury
Infrastructure Damage	Bus station windows broken, fire damage
Evacuations / Displaced Persons	600 people evacuated from nearby office buildings
Contamination	Ammonia spill, bleach spill
Economic Impact	Minimal
Potential for Multiple Event Hazardous	None
Recovery Time	Hours for the initial danger to pass, 1 to 2 days for cleanup

Details: A bus station employee accidentally knocks over a barrel of hazardous materials in an attempt to remove the barrels from a storage closet after a small fire breaks out. HAZMAT Teams are immediately dispatched and develop a Hot, Warm, and Cold Zone. Nearby buildings and residences should be evacuated, and all persons who were located in the Bus Station when the evacuation was ordered should be checked for contamination.

Service Disruptions: *Train Service*: Not affected. *Air Travel:* Not affected.
Roads: The call for residents of nearby buildings to evacuate and the shutdown of the city streets cause traffic delays, which make it more difficult for emergency responders to reach their destinations during the first hour.

Transit Task:
- Preservation of the lives of drivers and passengers who may be exposed
- Decontamination of people and station
- Certification of decontamination of station
- Help in evacuation of the residential area
- Help in relocation of bus station commuters

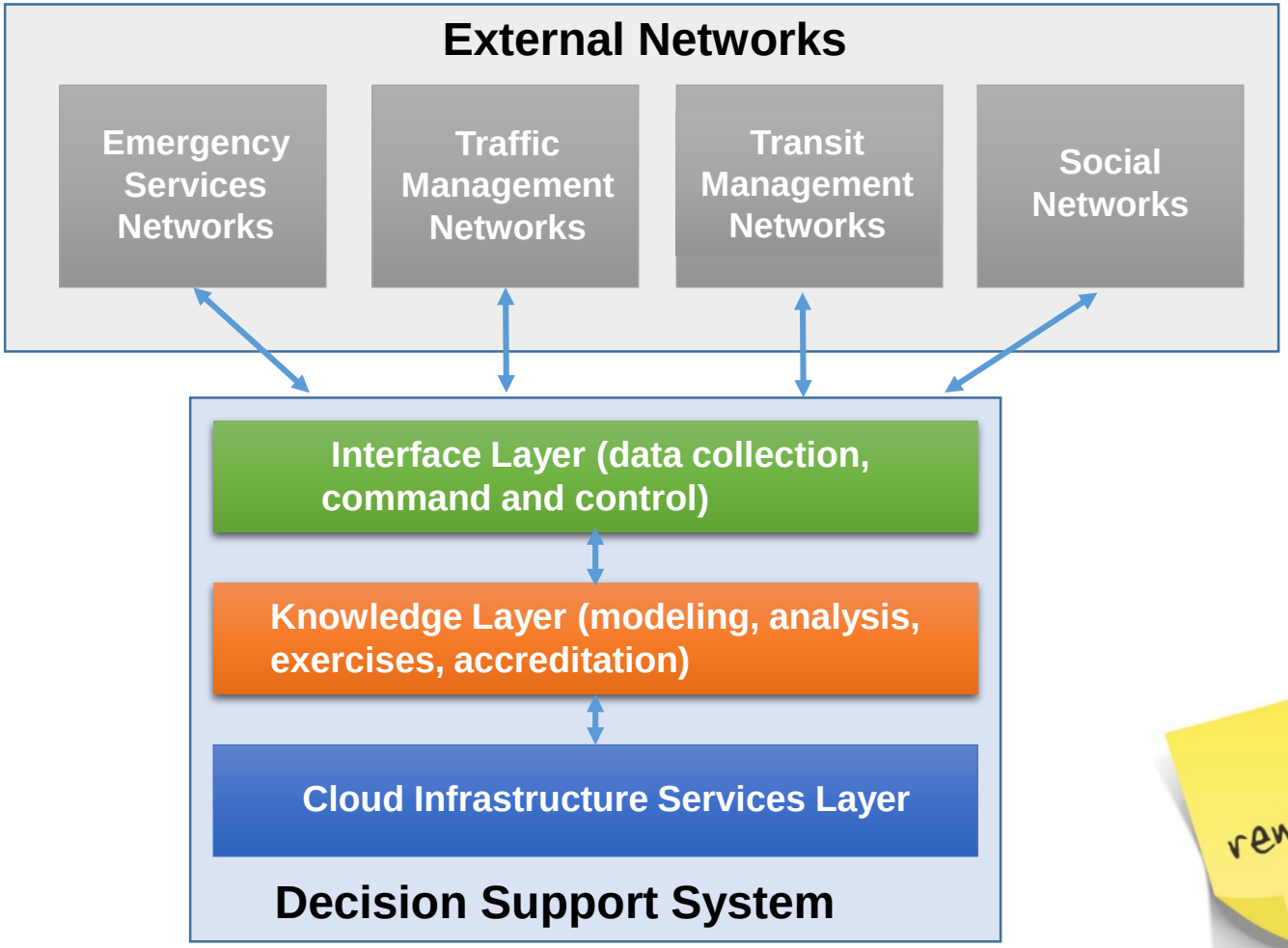
System Overview

EEDRR Decision Support Environment

- Why a Cloud Architecture?
- Cloud-based Architecture
  - Accessed from anywhere
  - Mobile
  - Stores scenarios and templates
  - Communicates with external partners
  - Analyzes “big data” from social networks

System Overview

EEDRR Decision Support System Architecture



Operational Impacts

Assess Operational Impact to Organization

- Acquire real time data including probe data
- Establish command and control
- Process data and devise an optimum strategy
- Coordinate / control evacuation, response, recovery efforts
- Test and update through exercises and lessons learned

ACTIVITY

STANDARDS ITS TRAINING TRANSIT

U.S. Department of Transportation
Office of the Assistant Secretary for
Research and Technology

Question

What is the purpose of developing a concept of operation for EEDRR?

Answer Choices

a) Find support for funding a system
b) Resolve labor issues associated with operating a system
c) Identify size of operational force needed for disasters
d) Develop the scope of a decision support system

Review of Answers

a) Find funding for a system

Incorrect. Used to determine amount of funding for the system

b) Resolve labor issues associated with operating a system

Incorrect. Labor issue may be identified as a result of the scope but not resolved.

c) Identify size of operational force needed for disasters

Incorrect. Resource identification is a product of the system not the concept of operation.

d) Develop the scope of a decision support system

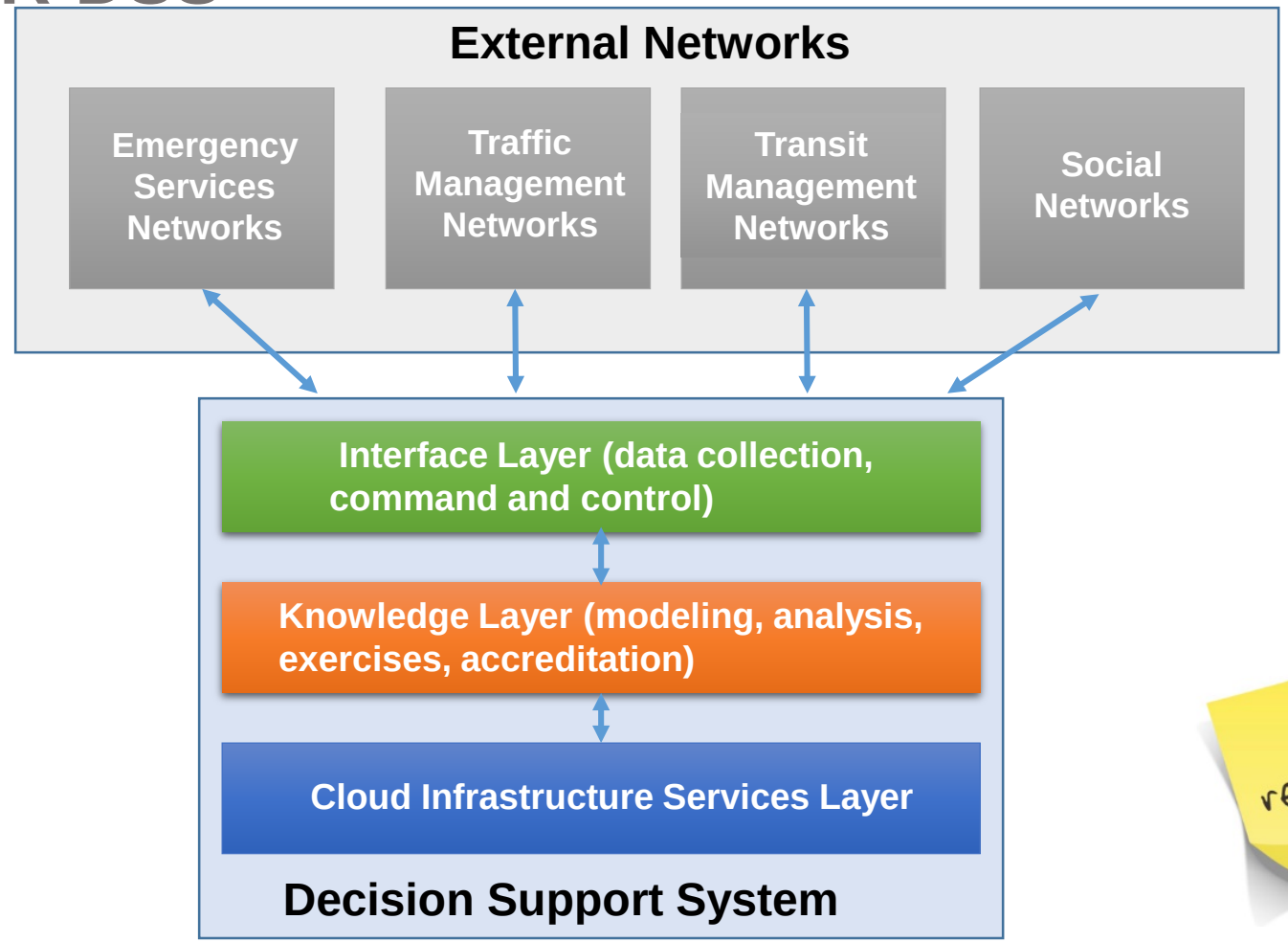
Correct. A fully developed concept of operations determines the scope of the decision support system.

Learning Objective 4

Applying the DSS to Transit

Identify the Information Flows in the EEDRR-DSS

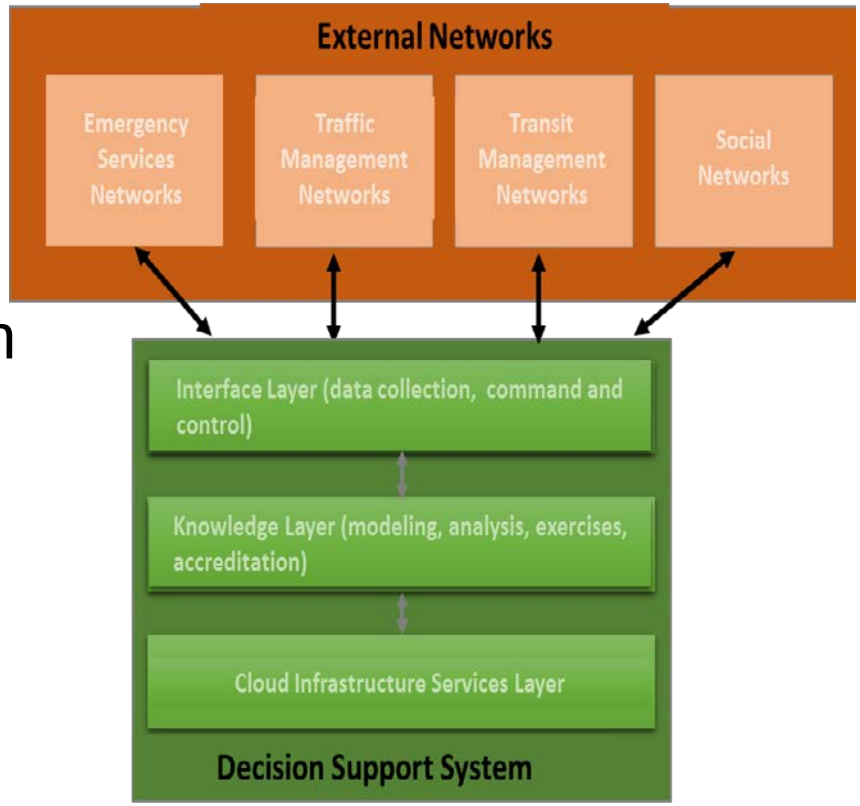
Information Sharing and Communications in the EEDRR-DSS



Methods for Information Sharing

Emergency Communications Methods

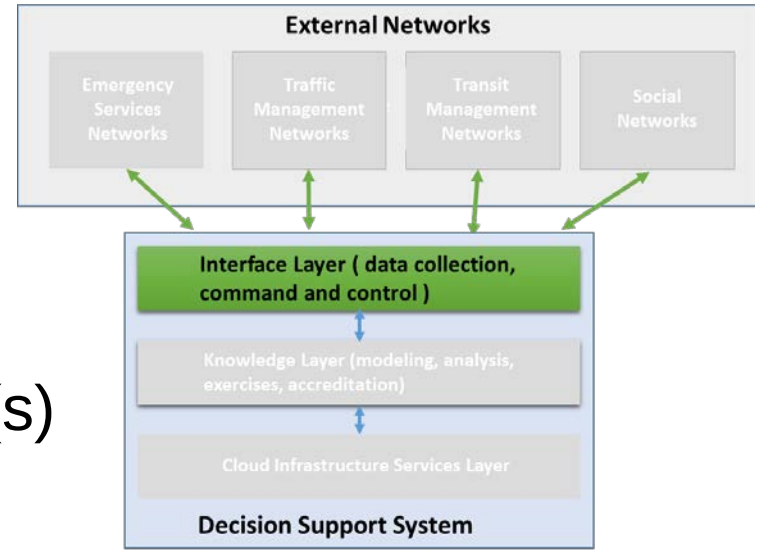
- **Key communications networks**
  - Information Networks
  - Open Sources
- **Private Sources**
- **Voice Networks**
  - Emergency Communication
  - Cellular Communications
- **Social Networks**



Information Flow

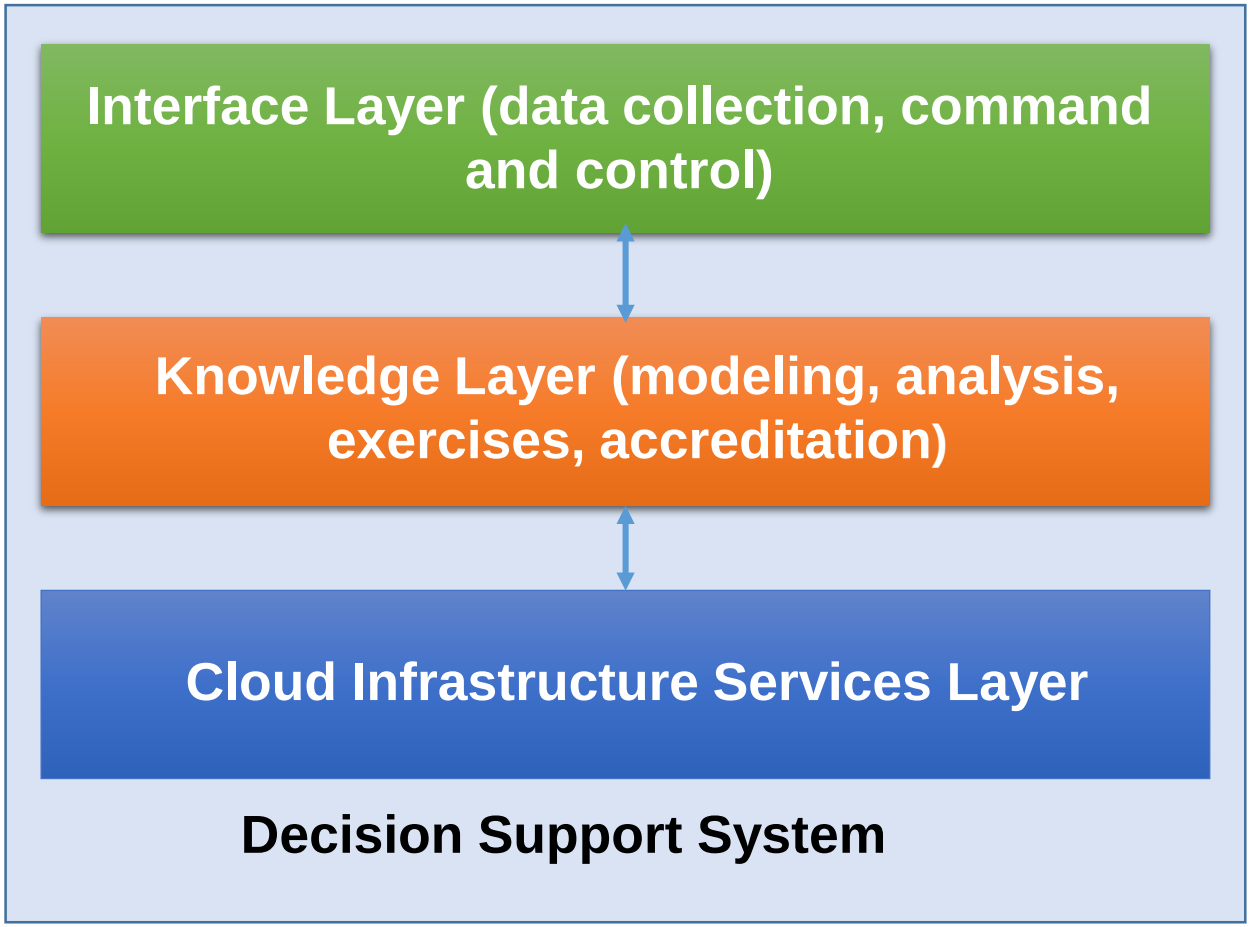
Information Flow Needs

- Stimuli Type
- Time
- Stimuli Content
- Incoming and Outgoing Recipient(s)
- Response(s)/Feedback
- Performance Standard
- Consequences

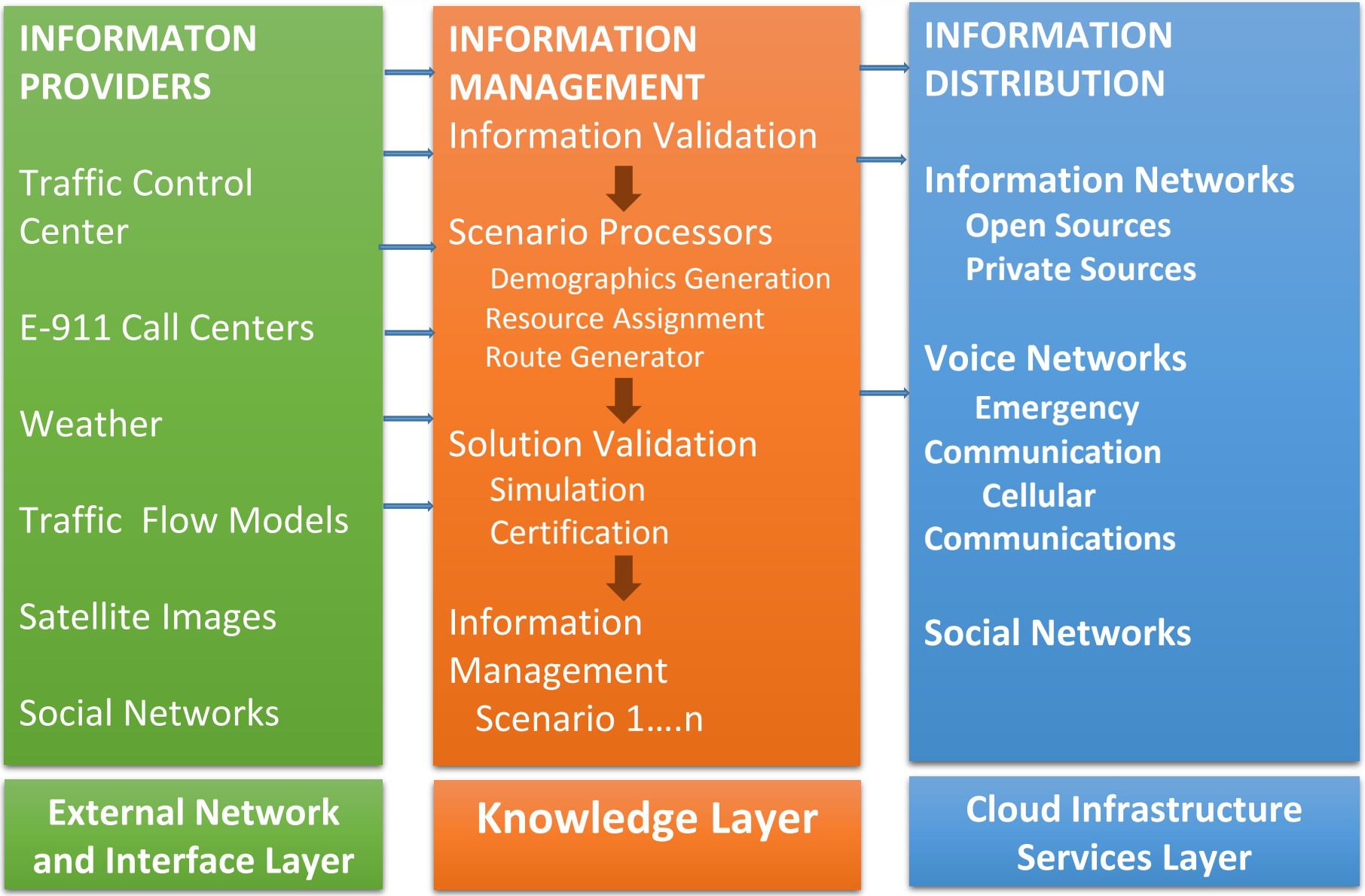


EEDRR-DSS Characteristics

EEDRR-DSS Layers



EEDRR-DSS Characteristics/ Personality



ACTIVITY

STANDARDS ITS TRAINING TRANSIT

U.S. Department of Transportation
Office of the Assistant Secretary for
Research and Technology

Question

Which layer is NOT a layer in the EEDRR-DSS?

Answer Choices

a) Network Layer

b) Interface Layer

c) Knowledge Layer

d) Cloud Infrastructure Services Layer

Review of Answers

a) Network Layer

Correct! The External Network is located outside the DSS.

b) Interface Layer

Incorrect. This layer supports the methods of information sharing among external network actors.

c) Knowledge Layer

Incorrect. This layer manages, aggregates and processes the information into solutions.

d) Cloud Infrastructure Service Layer

Incorrect. This layer distributes information using accessible infrastructure technologies.

Module Summary

What We Have Learned

1. Reviewed Elements of the **Emergency Evacuation and Disaster Response and Recovery (EEDRR) Framework** and the ISO 19083-1 standard
2. Discussed transit **roles and responsibilities** during the disaster response and recovery phases of an emergency
3. Used the **Concept of Operations Template** for specifying a Decision Support System (DSS) for Transit Emergency Management
4. Reviewed **Characteristics** of a Transit Emergency Management Decision Support System

Based on the ISO 19083 Part 1 standard

Thank you for completing this module.

Feedback

Please use the Feedback link below to provide us with your thoughts and comments about the value of the training.

Thank you