Rogue Valley *Regional* ITS Plan

Prepared for

RVMPO

Middle Rogue MPO
METROPOLITAN PLANNING ORGANIZATION

Oregon Department of Transportation

Prepared by
December 2016

DKS

REVISIONS

Previous ITS Plans

- Regional ITS Operations & Implementation Plan for the Rogue Valley Metropolitan Area, 2004
    - Prepared by DKS Associates and Castle Rock Consultants
- Rogue Valley Regional ITS Plan, 2016
    - Prepared by DKS Associates

ACKNOWLEDGEMENTS

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INTRODUCTION

WHAT IS ITS AND WHY IS IT BENEFICIAL?

Intelligent Transportation Systems (ITS) encompasses a broad set of strategies that optimize the safe, efficient, and reliable use of existing and planned transportation infrastructure for all modes. ITS is undertaken from a systems perspective, which means that these strategies are coordinated with related strategies and collaboration occurs across many stakeholders and modes. ITS strategies range from managing operational systems, like traffic signals, to managing travel demand, like traveler information. ITS proactively addresses a variety of transportation system user needs by:

- Influencing travel demand in terms of location, time, and intensity of demand
- Effectively managing the traffic or transit crowding
- Anticipating and responding to planned and unplanned events (e.g., traffic incidents, work zones, inclement weather, and special events)
- Providing travelers with high-quality traffic and weather information
- Ensuring that the unique needs of the freight community are considered

ITS strategies are supported by both institutional and technology-based activities. On the institutional side, ITS strategies are enabled by agreements between agencies, operations policies and procedures, and shared resources (e.g. interoperable communications systems, centralized traffic signal operations, and closed circuit television video sharing). Technology enables real-time operations of the transportation system by controlling traffic flow, delivering pre-and en route travel information, and delivering data for optimizing system efficiency. ITS strategies help transportation agencies address transportation issues in the near-term, with lower-cost strategies.

OVERVIEW OF THE PLAN

The Rogue Valley Regional ITS Plan provides a 10-year road map for improving transportation system operations by enhancing safety, addressing congestion hotspots, providing traveler information, and assisting transportation system operators in implementing traffic management strategies that meet the needs of the region. The plan's focus is on maximizing the efficiency of existing transportation infrastructure, which enhances the overall system performance and reduces the need to add roadway capacity.

The first Rogue Valley ITS Plan was completed for the Rogue Valley metropolitan planning organization (MPO) area in 2004. Since the first planning effort, the greater Rogue Valley area has grown to include a new MPO area, Middle Rogue centered on the communities of Grants Pass, Gold Hill, and Rogue River. This planning effort incorporates both an update of the 2004 plan for the Rogue Valley MPO and the addition of the Middle Rogue MPO. Figure 1 displays a map of the planning area.

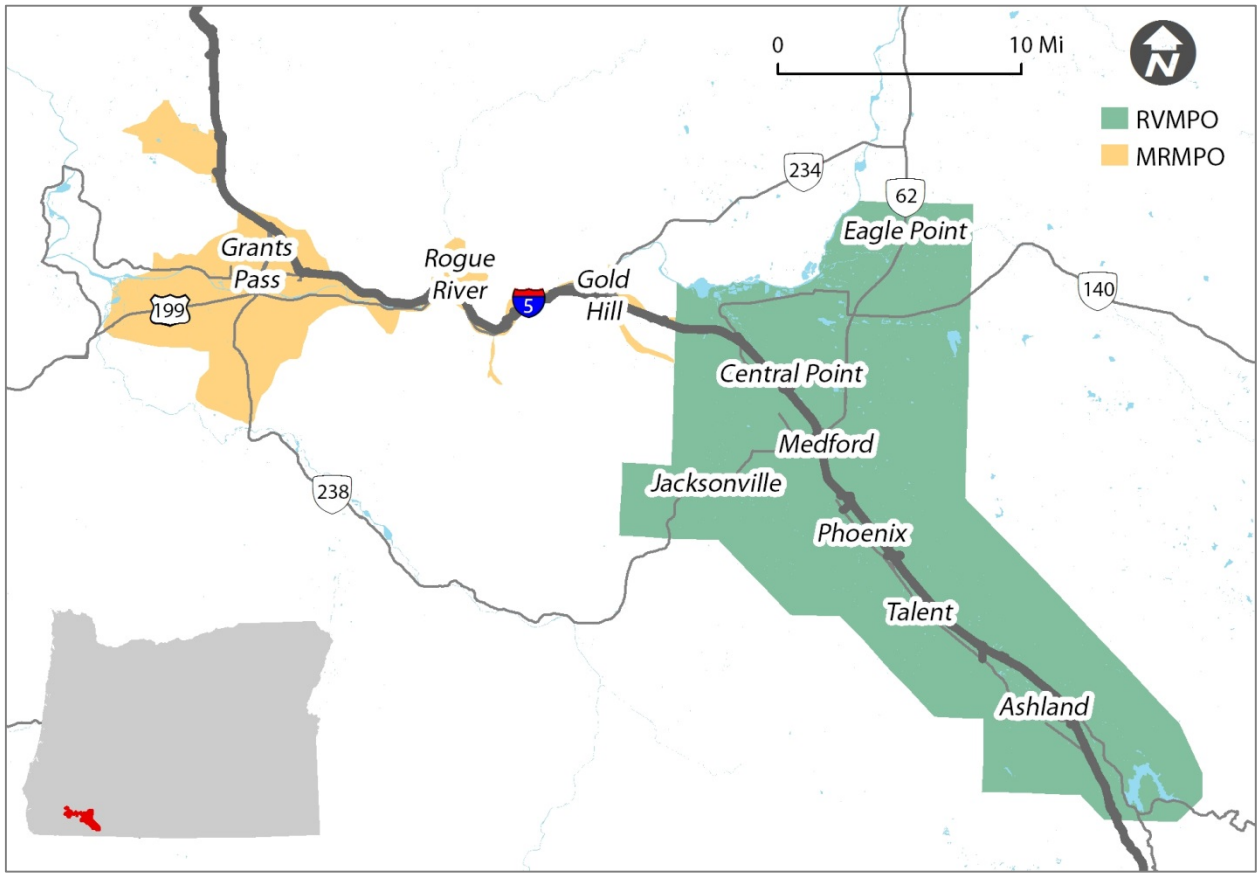

Figure 1. Plan Area

The plan update was guided by the Rogue Valley Council of Governments (RVCOG) staff and an advisory committee comprised of key staff from the cities, counties and transit agencies operating transportation facilities and services within the planning area. Figure 2 describes the process used to develop the plan. The key elements of this plan include:

- **Vision, Goals, and Operations Objectives** – guides the selection and implementation of strategies for managing and operating the transportation system
- **ITS Architecture** – provides the conceptual framework for the deployment and integration of ITS in the Rogue Valley region
- **Operational Concept** – describes current and future roles and responsibilities of regional transportation and emergency management agencies and summarizes how agencies and their systems work together in the present and future to deliver ITS services
- **Deployment Plan** – describes the strategies selected by the region to address needs including lead agencies, benefits, and estimated costs for implementation, operations, and maintenance

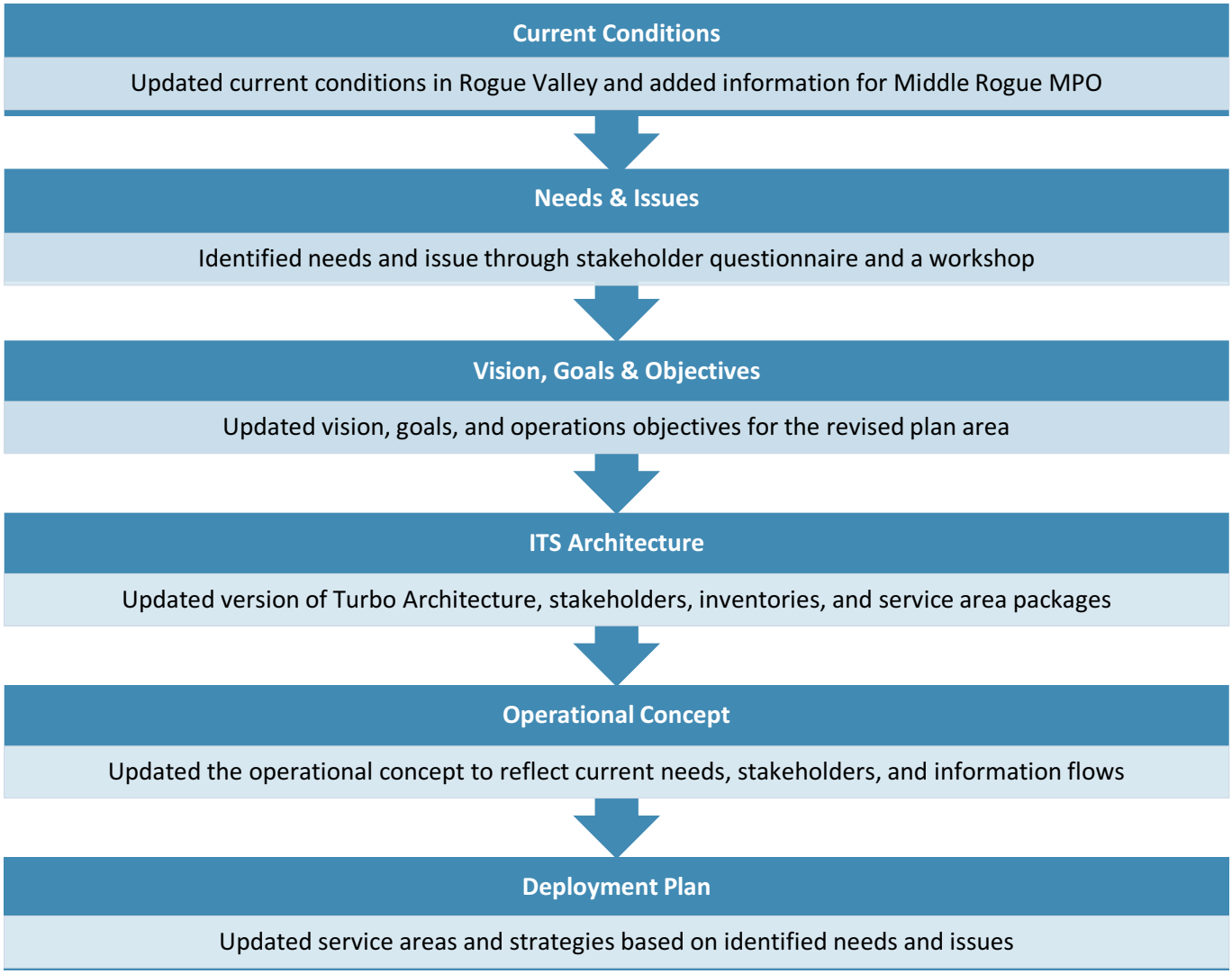

Figure 2. Planning Process

This document represents a compilation and summarization of the key elements of the plan. The Technical Appendix (a separate document) provides the detailed background information that supports this plan.

PLAN IMPLEMENTATION AND MAINTENANCE

This section describes process for implementing and maintaining the Rogue Valley Regional ITS Plan and ITS Architecture including the lead agency roles, the regional ITS architecture maintenance process, and project implementation steps necessary for the successful implementation of this ITS Plan within the Middle Rogue and Rogue Valley metropolitan planning areas.

LEAD AGENCY ROLES

The RVCOG will serve as the lead agency for the ITS plan implementation and maintenance. Key roles that the RVCOG will perform include the following:

- Incorporate the ITS Plan into the next update of the *Regional Transportation Plan* (*RTP*)
- Incorporate ITS projects into regional project prioritization lists
- Coordinate funding applications for ITS projects.
- Coordinate and track project implementation
- Maintain the regional architecture, including the Turbo Architecture file
- Arrange public outreach sessions as needed
- Provide updates to the RVMPO and MRMPO policy committees, technical advisory committees (TAC), and public advisory councils (PAC) as needed

REGIONAL ITS ARCHITECTURE MAINTENANCE

One of the keys to successful ITS plan implementation is the maintenance of the plan and architecture as ITS projects are implemented, as regional ITS needs and services evolve, and as new technologies emerge. The architecture must be maintained per federal requirements and the FHWA recommends updating the regional architecture for the following primary reasons[1]:

- Changes in regional needs
- Addition of new stakeholders
- Changes in scope of services considered
- Changes in the statewide architecture or other architectures in adjoining regions
- Addition or deletion of projects
- Changes in project priority

The architecture maintenance will be led by the RVCOG, who will maintain the Turbo Architecture file in partnership with ODOT. Additionally, the RVCOG will coordinate with the ODOT ITS Unit so that ODOT can update the statewide architecture accordingly. Updates to the architecture will take place every three years at a minimum in conjunction with updates to the RTP. Significant changes to the architecture may be made at any time deemed necessary by RVMPO or MRMPO.

PROJECT IMPLEMENTATION AND CONFORMITY

The implementation of ITS projects in the Rogue Valley shall conform with the regional architecture per FHWA requirements. If the final design of an ITS project varies from the regional architecture, then the

[1] National ITS Architecture Team. Regional ITS Architecture Maintenance White Paper. Prepared for U.S. Department of Transportation. FHWA-HOP-04-004. Jan. 31, 2004.

regional architecture shall be updated as described in this section. The FHWA requires a systems engineering analysis[2] for all ITS projects on a scale commensurate to each project. The systems engineering analysis shall include:

- Identification of portions of the regional ITS architecture being implemented
- Roles and responsibilities of participating agencies
- Definition of functional requirements
- Analysis of alternative system configurations and technology options to meet functional requirements
- Procurement options
- List of applicable ITS standards and testing procedures
- Operations and management procedures and resources

VISION, GOALS, AND OPERATIONS OBJECTIVES

This section documents the updated vision, goals and operations objectives prepared for the Rogue Valley Regional ITS Plan that guide the selection and prioritization of ITS strategies to be deployed in the region. The vision, goals, and objectives were updated from the 2004 plan under the direction of the Project Advisory Committee (PAC) with input gathered through the stakeholder questionnaires and workshop.

VISION

Enhance the safety, mobility, reliability, and efficiency of multi-modal travel using advanced, connected technologies and coordinated management techniques to actively operate the Greater Rogue Valley transportation system.

GOALS AND OPERATIONS OBJECTIVES

Goal 1: Enhance safety for all system users

- Reduce frequency, duration, and effects of incidents
- Improve coordination between local and regional agencies during an incident
- Improve safety for pedestrians and bicyclists at conflict points
- Improve safety during inclement weather
- Improve safety for transit users

[2] Title 23, Code of Federal Regulations (CFR), Highways, Chapter 1: Federal Highway Administration, Department of Transportation, Part 940: Intelligent Transportation System Architecture and Standards.

Goal 2: Enable the efficient management and operation of the transportation system

- Actively manage congestion
- Improve travel time and travel time reliability for all modes
- Reduce fuel consumption and environmental impacts
- Increase efficiency of operations and maintenance activities
- Actively monitor the performance of the transportation system

Goal 3: Enhance multi-modal traveler information

- Enhance and maintain real-time transit information
- Deliver accurate and reliable real-time road condition and weather information to all travelers
- Provide information about construction activities and incidents on local facilities

Goal 4: Deploy secure, functional, and cost efficient ITS infrastructure

- Deploy systems that fit in with future improvements
- Deploy systems that maximize the use of existing infrastructure
- Deploy systems with minimal use of maintenance and operational support

Goal 5: Build cooperation and partnership across public and private stakeholders who manage, operate, and use the transportation system

- Incorporate Rogue Valley ITS working group as part of the regional planning process
- Share resources between local and regional agencies
  Coordinate and integrate ITS projects across agencies and service providers Promote public and private partnerships for ITS deployment, operations, and maintenance

USER NEEDS

Identifying user needs in the plan area is a critical step to articulating the vision, goals, and operations objectives and, ultimately, the range of TSMO strategies available to advance the objectives. For the Rogue Valley Regional ITS Plan, user needs were captured through a stakeholder workshop, questionnaire, and the Project Advisory Committee (PAC) meetings.
The user needs are organized into to one of eight categories. This assessment of current and future transportation user needs provides the foundation for developing ITS strategies and projects for the Concept of Operations and Deployment Plan.
The eight needs categories include:

- Traffic Operations and Management

- Weather Event Management
- Traveler Information
- Maintenance and Construction Management[3]
- Emergency and Incident Management
- Data Management and Performance Measurement
- Public Transportation Management
- Freight Management

Needs can either apply system wide, or to a specific location. An example of a system-wide need is "information sharing across agencies"; whereas an example of a location specific need is "ice on Foothill Road". Table 1 summarizes the high priority needs identified under each of the eight needs categories.

Table 1. Summary of High Priority Needs

Traffic Operations and Management
• Signal timing progression and coordination • Remote access to traffic signals • Traffic signal controller upgrades • Congestion and reliability issues around the south Medford interchange • Reliable communication between systems and devices • Central signal system • Improve pedestrian safety at key crossing locations (conflict points)
Weather Event Management
• Improve reliability of cameras during weather events • Actively monitoring of roadway pavement conditions • Additional Road Weather Information System (RWIS) sites
Traveler Information
• Variable message signs on I-5 and critical routes • Manage and be proactive with special events • Traveler information integration • Bus stop reader boards for next bus arrivals • Freight crashes – understand length of delay and share major impacts to off ODOT system users

[3] Needs in this category were combined into others for subsequent components of this plan.

Maintenance and Construction Management
• Information sharing across agencies
Emergency and Incident Management
• Real-time incident data sharing • Coordinate between 911 and dispatch centers • Communication between all affected parties during an incident • Public outreach regarding communicating during a major event • Training in incident command system ICS and emergency operations center EOC once or twice a year
Data Management and Performance Measurement
• Identify performance measures and data needs
Public Transportation Management
• Transit signal priority • Automated fare collection • Coordinate preemption technology across jurisdictions • Transit agency sharing use of radio/phones to communicate transfer points between transit agency lines • Practice lifecycle planning for ongoing replacement of software/hardware, and when available practical, automated vehicle locator (AVL), automated passenger counter (APC), automated stop announcement (ASA) and other on board devices.
Freight Management
• Manage I-5 truck traffic including coordination with California/Oregon issues • Unimproved rail crossings • Truck signal priority at key locations

REGIONAL ITS ARCHITECTURE

The ITS Architecture provides an overall vision and conceptual framework for the deployment and integration of ITS in the Rogue Valley. The ITS architecture is housed in an electronic database that contains detailed ITS architecture elements, service packages, and information flows. Turbo Architecture 7.1™ is the current version of the software used to customize regional or project ITS architectures, and it conforms to the USDOT National ITS Architecture 7.1.[4] The Rogue Valley Regional ITS Architecture also complements the Oregon Statewide ITS Architecture, developed and maintained by ODOT, where elements overlap.

The U.S. Department of Transportation (USDOT) developed the National ITS Architecture to ensure that intelligent transportation systems deployed around the country can communicate with one another and share information to maximize the return of investment in ITS. In Version 7.1, it has continued to evolve as the field of ITS has expanded and changed. The most recent version of the National Architecture addresses the Moving Ahead for Progress in the 21st Century (MAP-21) goals, objectives, and performance measures and integration of Connected Vehicle technology.[5] USDOT has released the Connected Vehicle Reference Implementation Architecture (CVRIA) Version 2.2, design specifically for identifying the key interfaces across the connected vehicle environment.[6] The Systems Engineering Tool to Intelligent Transportation (SET-IT) Version 1.2 software supports the CRVIA with database and drawing tools to prepare project architectures for connected vehicle project deployments.[7] The CVRIA is a related but separate architectural framework of the National ITS Architecture.

The Rogue Valley region has developed and maintained its regional ITS architecture to:

- Provide a framework for institutional agreements and technical integration for organized ITS project deployment that meets transportation user needs
- Build consensus among regional stakeholders about resource and information sharing and activity coordination
- Meet federal funding requirements

[4] Turbo Architecture, Version 7.1, USDOT, Intelligent Transportation Systems Joint Program Office, http://www.iteris.com/itsarch/html/turbo/turbomain.htm

[5] Note: Although the Fixing America's Surface Transportation (FAST) Act was passed in 2016, the associated updates to the USDOT National ITS Architecture and to Turbo Architecture (both to Version 8.0) are in progress at the time of this document. New items or modifications resulting from the FAST Act will be incorporated into the National Architecture and Turbo Architecture.

[6] Connected Vehicle Reference Implementation Architecture (CVRIA) Version 2.2, USDOT, Intelligent Transportation Systems Joint Program Office, http://www.iteris.com/cvria/html/about/about.html

[7] Systems Engineering Tool to Intelligent Transportation (SET-IT) Version 1.2, USDOT, Intelligent Transportation Systems Joint Program Office, http://www.iteris.com/cvria/html/resources/tools.html

The Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) published a Final Rule and Policy[8] that all agencies seeking federal funding for ITS projects must develop a regional architecture that is compliant with the National ITS Architecture, and can demonstrate that the funded project was included in that architecture.

KEY ELEMENTS OF THE NATIONAL ITS ARCHITECTURE

The National ITS Architecture[9] provides a common framework for planning, programming, and implementing ITS. It reflects the contributions of a broad cross-section of the ITS community (transportation practitioners, systems engineers, system developers, technology specialists, etc.). ITS Architectures are not intended to specify the technologies that will be used in ITS deployments. Instead, they define the functions that technologies must perform. The architecture provides the structure for defining general ITS functional requirements during the planning and design process. Key terms and concepts that are specific to, and used extensively in, the National ITS Architecture are discussed below. Figure 3 shows the architecture framework.

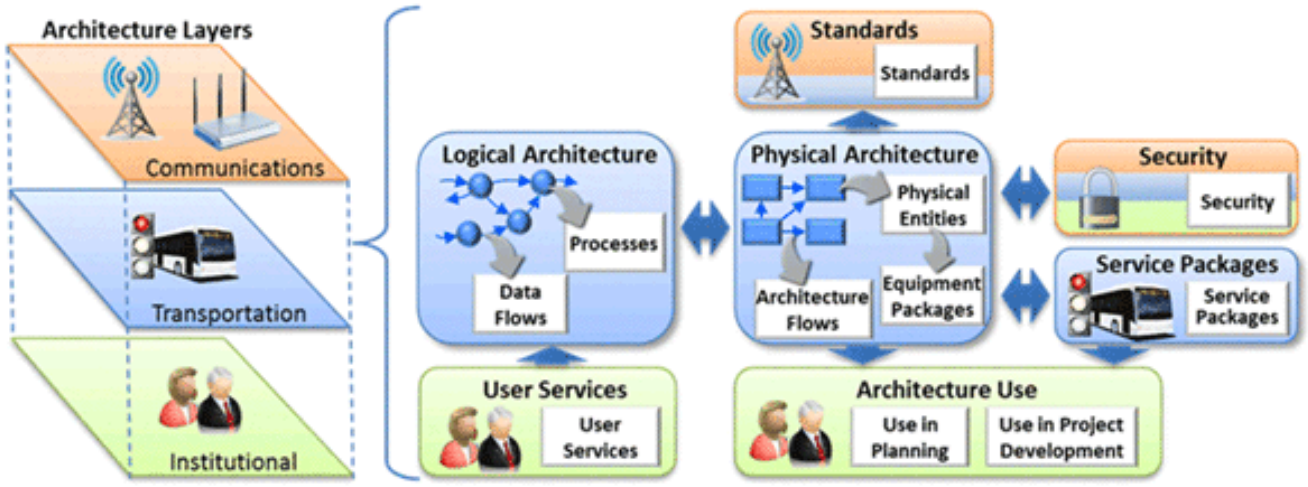

Figure 3. National ITS Architecture Framework

[8] *Intelligent Transportation System Architecture and Standards: Final Rule.* FHWA Docket No. FHWA-99-5899. U.S. Department of Transportation, Federal Highway Administration, Jan. 8, 2001.
Federal Transit Administration National ITS Architecture Policy on Transit Projects: Notice. FTA Docket No. FTA-99-6147. Federal Transit Administration, Jan. 8, 2001.
[9] National ITS Architecture, USDOT, Intelligent Transportation Systems Joint Program Office, http://itsarch.iteris.com/itsarch/

At the uppermost level, the architecture is organized into three layers:

- The **Institutional** layer includes the organizations, policies, funding mechanisms, and processes required for implementing, operating, and maintaining ITS. This layer establishes the operational objectives and requirements for ITS.
- The **Transportation** layer is where the ITS solutions are defined including the subsystems, interfaces, functionality, and data definitions.
- The **Communications** layer demonstrates the exchange of information between systems that support the ITS solutions.

LOGICAL ARCHITECTURE AND USER SERVICES

The National ITS Architecture utilizes "user services" to document what ITS applications should accomplish from a user's perspective; for example, "Provide pre-trip traveler information" or "Provide transit route guidance". User services for a region can be selected by considering the needs and problems in the region and looking at how ITS can provide services to address these issues. The logical architecture defines the requirements needed to provide the selected user services, in the form of process specifications ("p-specs") and data flow diagrams. The logical architecture provides the detailed underpinnings of the physical architecture. The physical architecture is composed of the components most commonly worked with in the development of a regional architecture.

PHYSICAL ARCHITECTURE

The physical architecture provides a framework for the systems and information exchanges that support ITS. This includes Physical Entities, Architecture Flows, and Equipment Packages.
The **Physical Entities** are the persons, places, and things that make up an intelligent transportation system. In the physical architecture, an entity represents a National ITS Architecture subsystem or terminator. These elements include automobiles, people, computers, buses, trucks, etc. Figure 4 provides an illustration of the overall physical architecture. The physical elements are broken into large groups called subsystem categories. These are categories that describe what their member physical entities (subsystems) do. The four major subsystem categories are:

1. **Traveler Subsystems**: Systems or applications that provide information to travelers (e.g., traffic conditions)
2. **Center Subsystems**: Systems or applications that process and use information to control the transportation network (e.g., signal timing, transit dispatch)
3. **Vehicle Subsystems**: Systems or applications that provide driver information and safety on vehicle platforms (e.g., in-vehicle signing)
4. **Field Subsystems**: Systems or applications deployed in the field that collect transportation data and are ideally controlled from a center (e.g., traffic signals)

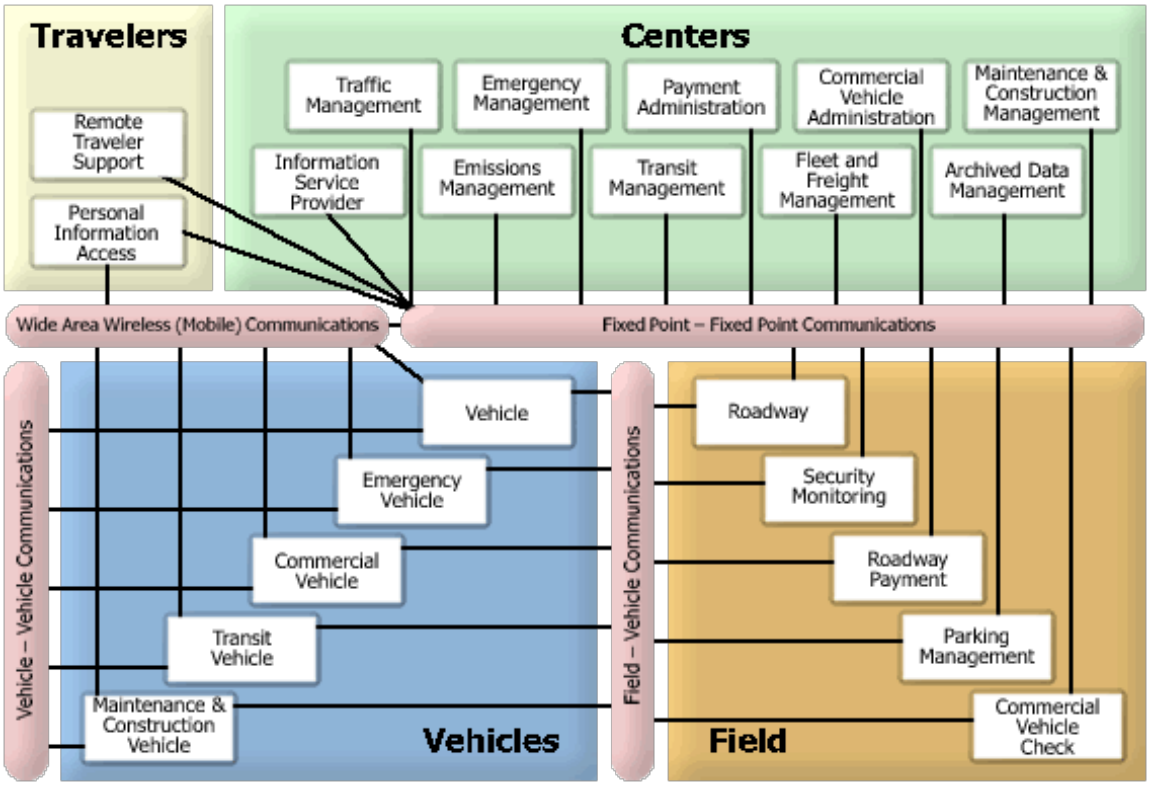

Figure 4. National ITS Architecture Subsystems[10]

The bubbles (or "sausages") between the subsystem categories represent the communications medium. For example, the Roadway subsystem (within the "Field" subsystem category) could potentially be communicating with the Vehicle, the Transit Vehicle, the Commercial Vehicle, and the Emergency Vehicle subsystems (within the "Vehicle" subsystem category) via short-range wireless links. Communications from the field devices to their respective center would be via fixed-point to fixed-point communications.

Terminators are generally defined as people, systems, and general environment that are outside the boundary or control of ITS but still impact ITS. Interfaces between subsystems and terminators need to be defined, but there are no ITS-related functional requirements associated with terminators. Since regional architectures are usually developed from a specific agency(s) perspective, an entity that impacts ITS but is out of the bounds of the primary agency's perspective is called a terminator. This is done to illustrate ownership/control of the proposed services. Examples of terminators include "Traveler", "Transit Vehicle Operator", "Other Traffic Management" (such as a traffic management

[10] Key Concepts of the National ITS Architecture, USDOT Intelligent Transportation System Joint Program Office, http://itsarch.iteris.com/itsarch/documents/keyconcepts/keyconcepts.pdf

center that is outside of the study area but that still interacts with entities within the study area), and "Financial Institution" (such as a bank that holds revenues from transit fares or toll collection).

ARCHITECTURE FLOWS

An **Architecture Flow** is the information that is exchanged between subsystems and terminators in the Physical Architecture. These architecture flows and their communication requirements define the interfaces that form the basis for much of the ongoing standards work in the National ITS Architecture program. The current USDOT guidelines require that a Regional ITS Architecture be developed at a sufficient level of detail to show subsystems and architecture flows.

EQUIPMENT PACKAGES

Equipment Packages break up the subsystems into deployment-sized pieces by grouping similar processes of a specific subsystem together. An example equipment package is Roadway Basic Surveillance, which is part of the Roadway Subsystem, and includes fixed equipment used to monitor traffic conditions, including loop detectors and CCTV cameras.

SERVICE PACKAGES

Service Packages (formerly called Market Packages) provide an accessible, deployment-oriented perspective to the National ITS Architecture. Service Packages group various elements of the physical architecture (subsystems, equipment packages, architecture flows, and terminators) together to provide a specific ITS service, like traffic signal control. A key step in the Regional ITS Architecture development process is selecting which Service Packages are applicable to the region and the status of deployment (existing or planned) of each. From that point, the Service Packages are reviewed individually to determine which physical architecture components in each are applicable to the region. Service Packages can be traced back to corresponding User Services to show how a given Service Package is relevant to a region. In Turbo Architecture, the subsystems and terminators assigned to a region's ITS Inventory lead to the selection of appropriate Service Packages.

Service Packages are organized into one of eight Services Areas:

- Archived Data Management
- Public Transportation
- Traveler Information
- Traffic Management
- Vehicle Safety
- Commercial Vehicle Operations
- Emergency Management
- Maintenance and Construction Management

ITS STANDARDS

Standards are fundamental to efficient and successful implementation and operation of ITS because they ensure interoperability of systems at the local, regional, state, and national level in an open ITS environment. The Logical and Physical layers of the ITS National Architecture are the focus of standards development as they denote the architecture and data flows that need standards and how information is exchanged. Frequently, architecture flows are mapped to several standards because communications protocol, data dictionary, and message set standards are all required to share information between systems.[11] ITS Standards are evolving regularly. There are many organizations that support standards development for specific National ITS Architecture interfaces as applicable to their areas of interest and expertise.

SECURITY

Security is increasingly essential for surface transportation as the system increases its reliance on information technologies to sense, collect, process, and share information. The National ITS Architecture addresses security in two ways:

Securing ITS reflects the need to protect the intelligent transportation system itself from intrusion and applies to subsystems and architecture flows. Securing a ITS is foundational to implementation.

ITS Security Areas address how ITS can be employed in the detection, response, and recovery from natural and man-made threats. Subsystems, architecture flows, and service packages have been defined for each of eight ITS Security Areas including:

- Disaster Response and Evacuation
- Freight and Commercial Vehicle Security
- HAZMAT Security
- ITS Wide Area Alert
- Rail Security
- Transit Security
- Transportation Infrastructure Security
- Traveler Security

ROGUE VALLEY REGIONAL ITS ARCHITECTURE

This section describes the key elements of the Rogue Valley Regional ITS Architecture including stakeholders, inventories, and service packages as defined by the regional stakeholders during the plan's development. The current architecture is housed in Turbo Architecture 7.1, which reflects the most recent National ITS Architecture elements.

[11] ITS Standards, USDOT, Intelligent Transportation Systems Joint Program Office, http://www.iteris.com/itsarch/html/standard/standard.htm

ROGUE VALLEY ITS STAKEHOLDERS

Table 2 describes the stakeholders that participated in the development of the Rogue Valley Regional ITS Architecture or were deemed necessary for inclusion in the architecture. Each stakeholder is related to one or more transportation inventory elements described in the next section. New additions to the ITS architecture are shown in bold.

Table 2. Rogue Valley ITS Stakeholders

Stakeholder Name	Stakeholder Description
Central Oregon and Pacific Railroad	The Central Oregon & Pacific Railroad is a Class III railroad operating between Northern California and Eugene, Oregon. It passes through Grants Pass, Rogue River, Gold Hill, Central Point, Medford, Phoenix, Talent, and Ashland.
City of Ashland	The City of Ashland Public Works department maintains city roadways.
City of Central Point	The City of Central Point Public Works department maintains city roadways.
City of Grants Pass	The City of Grants Pass Public Works department maintains city roadways.
City of Medford	The City of Medford Public Works department maintains city roadways.
Emergency Communications of Southern Oregon (ECSO – 911)	ECSO is a combined emergency dispatch facility and Public Safety Answering Point (PSAP) for the Jackson County Oregon 9-1-1 lines. The Center is also a regional "drop point" for emergency information that needs to be given to Jackson and Josephine counties, including natural and other disasters. This information is received through the National Air Warning Alert System (NAWAS) radio channel that covers the entire United States.
Jackson County	The Jackson County Roads department maintains county roadways.
Josephine County	The Josephine County Public Works department maintains county roadways.
Josephine County Transit (JCT)	JCT provides fixed route bus service and paratransit in Josephine County along with commuter bus service between Grants Pass and Medford.
Local Emergency Management Agencies	These organizations include, but are not limited to, Medford Fire and Rescue, Mercy Flights, and area hospitals.
Medford Police Department	The Medford Police Department enforces traffic regulations and responses to incidents.
NOAA National Weather Service Medford Office	National Weather Service provides forecasts for weather, fire weather, river stages, and radar images for Southern Oregon area.

Stakeholder Name	Stakeholder Description
Oregon Department of Transportation (ODOT)	ODOT Region 3 maintains the state highways within the Rogue Valley area.
Oregon State Police (OSP)	OSP has a regional command center in Central Point and a work site in Grants Pass. The Southern Command Center Dispatch is co-located in the Central Point Office.
Other Cities in Greater Rogue Valley	Includes City of Eagle Point, City of Gold Hill, City of Jacksonville, City of Phoenix, City of Rogue River, and City of Talent
Rogue Valley Council of Governments (RVCOG)	RVCOG oversees and staffs two MPOs in Jackson and Josephine County: Rogue Valley Metropolitan Planning Organization (RVMPO) and Middle Rogue Metropolitan Planning Organization (MRMPO). RVMPO encompasses the urbanized areas of Jackson County and includes the cities of Ashland, Central Point, Eagle Point, Jacksonville, Medford, Phoenix, and Talent, along with the unincorporated area of White City and surrounding areas of Jackson County, Oregon. MRMPO includes the cities of Gold Hill, Grants Pass, Rogue River, and adjacent parts of Josephine and Jackson Counties which are anticipated to become urbanized over the 20-year planning horizon.
Rogue Valley Transportation District (RVTD)	RVTD provides fixed route bus service and paratransit in the Cities of Ashland, Central Point, Eagle Point, Jacksonville, Medford, Phoenix, and Talent, as well as the unincorporated area of White City and the surrounding areas of Jackson County.
Special Event and Tourism Organizations	These organizations include, but are not limited to, Oregon Shakespeare Festival, Britt Festival, Jackson County Fairgrounds and Expo Center, and Southern Oregon Visitors Association.
Transportation Management Association	A non-profit, member-controlled organization that provides transportation services in a focused area. There is currently no active TMA in the Rogue Valley region.

ITS INVENTORY

An inventory of existing and planned transportation systems is the basis for the Rogue Valley Regional ITS Architecture. The transportation system inventory shown in

Table 3 was prepared based on input from regional ITS architecture stakeholders. The inventory includes a list of ITS elements and the associated stakeholder responsible for system operation.

Table 3. Rogue Valley ITS Inventory

Element Name	Element Description	Stakeholder	Element Status
TripCheck System	Website, Mobile, Twitter feed, TripCheck Traveler Information Portal (TTIP), TripCheck Local Entry (TLE), 511 telephone system, Highway advisory radio (HAR), Cable television broadcasts (TripCheck TV)	Oregon Department of Transportation (ODOT)	Existing
City of Ashland Emergency Operations Center (EOC)	Communications equipment in the EOC will be used to receive information, disseminate instructions, and coordinate emergency operations	City of Ashland	Existing
City of Ashland Maintenance and Construction Vehicles	A collection of maintenance vehicles that support road maintenance in the City of Ashland	City of Ashland	Existing
City of Ashland Public Works Traffic Signals and Field Equipment	The City of Ashland owns 7 traffic signals, which are operated and maintained by ODOT.	City of Ashland	Existing/Planned
City of Central Point Emergency Operations Center (EOC)	Communications equipment in the EOC will be used to receive information, disseminate instructions, and coordinate emergency operations	City of Central Point	Existing
City of Central Point Maintenance and Construction Vehicles	A collection of maintenance vehicles that support road maintenance in the City of Central Point	City of Central Point	Existing
City of Central Point Public Works Traffic Signals and Field Equipment	The City of Central Point owns 4 traffic signals, which are operated and maintained by ODOT.	City of Central Point	Existing/Planned
City of Grants Pass Maintenance and Construction Vehicles	A collection of maintenance vehicles that support road maintenance in the City of Grants Pass	City of Grants Pass	Existing/Planned

Element Name	Element Description	Stakeholder	Element Status
City of Grants Pass Traffic Signals and Field Equipment	The City of Grants Pass owns and operates signals. ODOT maintains signals.	City of Grants Pass	Existing/Planned
City of Medford Emergency Operations Center (EOC)	Communications equipment in the EOC will be used to receive information, disseminate instructions, and coordinate emergency operations.	City of Medford	Existing
City of Medford Maintenance and Construction Vehicles	A collection of maintenance vehicles that support road maintenance in the City of Medford.	City of Medford	Existing
City of Medford Public Works Traffic Signals and Field Equipment	The City of Medford operates and maintains all 108 traffic signals within the City limits including 15 ODOT-owned traffic signals.	City of Medford	Existing/Planned
Other Cities in Greater Rogue Valley Emergency Operations Center (EOC)	Includes EOCs for the City of Eagle Point, City of Gold Hill, City of Jacksonville, City of Phoenix, City of Rogue River, and City of Talent.	Other Cities in Greater Rogue Valley	Existing
Other Cities in Greater Rogue Valley Maintenance and Construction Vehicles	Includes maintenance and construction vehicles for the City of Eagle Point, City of Gold Hill, City of Jacksonville, City of Phoenix, City of Rogue River, and City of Talent.	Other Cities in Greater Rogue Valley	Existing
Commercial Vehicles	Commercial vehicles include ITS equipment that supports safe and efficient commercial vehicle operations. This equipment monitors vehicle operation, provides the driver and motor carrier real-time information, and supports mainline electronic screening. This element includes the Oregon Green Light program.		Existing

Element Name	Element Description	Stakeholder	Element Status
CVO Inspector	The Commercial Vehicle Operator (CVO) Inspector performs regulatory inspection of Commercial Vehicles by supporting the roadside inspection, weighing, and checking of credentials.	Oregon Department of Transportation (ODOT)	Existing
Emergency Communications of Southern Oregon (ECSO) 911 Center	Primary Rogue Valley PSAP, NAWAS Answering Point, Dispatch for Jackson County Sheriff's Office, Jacksonville Police Department, Phoenix Police Department, Talent Police Department, Eagle Point Police Department, Jackson County Fire Districts, Jacksonville Fire Department, Phoenix Fire Department, Mercy Flights, Medford Police Department, Central Point Police Department, Southern Oregon University Campus Security, and Medford Fire & Rescue. Also provide call-taking for the Oregon State Police, Ashland Police Department, and Ashland Fire & Rescue.	Emergency Communications of Southern Oregon (ECSO – 911)	Existing
Emergency Vehicles	Emergency vehicles include ITS equipment that provide the sensory, processing, storage, and communications functions necessary to support safe and efficient emergency response.	Local Emergency Management Agencies	Existing
Jackson County Emergency Operations Center (EOC)	Located at Sheriff's Office. Communications equipment in the EOC will be used to receive information, disseminate instructions, and coordinate emergency operations.	Jackson County	Existing
Jackson County Maintenance and Construction Vehicles	A collection of maintenance vehicles that support road maintenance in the Jackson County.	Jackson County	Existing

Element Name	Element Description	Stakeholder	Element Status
Jackson County Roads, Parks, and Planning Traffic Signals and Field Equipment	Jackson County owns and operates 8 traffic signals. These traffic signals are maintained by ODOT.	Jackson County	Existing/Planned
Josephine County Maintenance and Construction Vehicles	A collection of maintenance vehicles that support road maintenance in the Josephine County.	Josephine County	Existing/Planned
Josephine County Traffic Signals and Field Equipment		Josephine County	Existing/Planned
Josephine County Transit (JCT) Dispatch and Operations	Dispatch Center for JCT transit vehicles.	Josephine County Transit (JCT)	Existing
Josephine County Transit (JCT) Transit Vehicles	Transit vehicles include ITS devices that support the safe and efficient movement of passengers. These systems collect, manage, and disseminate transit-related information to the driver, operations and maintenance personnel, and transit system patrons.	Josephine County Transit (JCT)	Existing/Planned

Element Name	Element Description	Stakeholder	Element Status
Local Emergency Management Agencies	Local Police Agencies include Oregon State Police, Jackson County Sheriff's Office, Medford Police Department, Central Point Police Department, Ashland Police Department, Jacksonville Police Department, Phoenix Police Department, Talent Police Department, Eagle Point Police Department, and Southern Oregon University Campus Security. Local Fire & Rescue Agencies include Jackson County Fire Districts, Medford Fire & Rescue, Ashland Fire & Rescue, Jacksonville Fire Department, Phoenix Fire Department, Airport Fire & Rescue Department, and Mercy Flights.	Local Emergency Management Agencies	Existing
Local Media	The Media element represents the information systems that provide traffic reports, travel conditions, and other transportation-related news services to the traveling public through radio, TV, and other media.	Radio and cable stations, print media	Existing
NOAA National Weather Service Medford Office	This element provides weather, water, and climate predictions for Southern Oregon.	NOAA National Weather Service Medford Office	Existing
ODOT Region 3 Traffic Operations Center (TOC)	TOC is manned 24 hours a day and currently only supports ODOT roadways. Co-located with Oregon State Police Dispatch.	Oregon Department of Transportation (ODOT)	Existing
ODOT Region 3/District 8	This element assumes that access will be available through a workstation to the central signal system and video surveillance.	Oregon Department of Transportation (ODOT)	Existing

Element Name	Element Description	Stakeholder	Element Status
ODOT Region 3/District 8 Maintenance and Construction Vehicles	A collection of maintenance vehicles that support road maintenance for ODOT Region 3 facilities.	Oregon Department of Transportation (ODOT)	Existing
ODOT Region 3/District 8 Traffic Signals and Field Equipment	ODOT operates and maintains 127 traffic signals, which includes 9 owned by City of Grants Pass, 5 owned by Central Point, 1 owned by Talent, 1 owned by Rogue River, and 79 owned by Ashland. ODOT maintains the 11 traffic signals owned and operated by Jackson County.	Oregon Department of Transportation (ODOT)	Existing/Planned
ODOT Weigh Stations	NB I-5 at MP 17.87 (Ashland POE), SB I-5 at MP 18.11 (Ashland)	Oregon Department of Transportation (ODOT)	Existing
ODOT Weigh Stations Inspection Facility	The inspection facility includes any or all equipment that perform commercial vehicle screening and/or safety inspections.	Oregon Department of Transportation (ODOT)	Existing
Oregon State Police (OSP) Dispatch	Dispatch Center for OSP vehicles. Co-located with ODOT Region 3 Traffic Operations Center (TOC).	Oregon State Police	Existing
Regional Data Warehouse	A regional hub for archived transportation data.	All Local Transportation and Emergency Management Agencies	Planned
Rogue Valley Council of Governments (RVCOG)	Manages the MPOs for Rogue Valley and Middle Rogue metropolitan areas	Rogue Valley Council of Governments (RVCOG)	Existing

Element Name	Element Description	Stakeholder	Element Status
Rogue Valley Transportation District (RVTD) Dispatch and Operations	Dispatch Center for RVTD transit vehicles	Rogue Valley Transportation District (RVTD)	Existing
Rogue Valley Transportation District (RVTD) Transit Vehicles	Transit vehicles include ITS devices that support the safe and efficient movement of passengers. These systems collect, manage, and disseminate transit-related information to the driver, operations and maintenance personnel, and transit system patrons.	Rogue Valley Transportation District (RVTD)	Existing
Special Event Parking Management	COATS identified a parking management system project for the Britt Festival. Some local agencies have identified a need for parking management at the Jackson County Fairgrounds.	Special Event Organizations	Planned
Transportation Management Association (TMA)	Future TMA.	Transportation Management Association	Existing
User Personal Computing Devices	User Personal Computing Devices refers to equipment an individual owns and can personalize with their choices for information about transportation networks. Examples include smart phones, tablets, and computers.		Existing
Vehicles	A general element that represents personal automobiles and fleet vehicles that include ITS safety, navigation, and traveler information systems that may be applicable to any highway vehicle.		Existing

ITS SERVICES

ITS services describe what can be done to improve the efficiency, safety, and convenience of the regional transportation system through better information, advanced systems, and new technologies. Some services are specific to one primary stakeholder while others require broad stakeholder participation. Table 4 presents Service Packages included in the 2016 Rogue Valley Regional ITS Architecture. In this plan, service package statuses are defined as follows:

- **Existing**: items that currently exist or are in construction or design
- **Existing/planned**: items that currently exist, including partially, and are slated for deployment or expansion in the near future.
- **Planned**: items that are either funded for deployment in the near future or are included in regional plans and do not yet have funding
- **Future**: items that may occur within the ITS plan timeframe but are not included in regional plans and do not have funding

Table 4. Rogue Valley ITS Services

Service Package	Service Package Name	Service Package Status
AD1	ITS Data Mart	Planned
AD2	ITS Data Warehouse	Planned
AD3	ITS Virtual Data Warehouse	Planned
APTS01	Transit Vehicle Tracking	Existing
APTS02	Transit Fixed-Route Operations	Existing
APTS03	Demand Response Transit Operations	Planned
APTS04	Transit Fare Collection Management	Planned
APTS05	Transit Security	Planned
APTS06	Transit Fleet Management	Existing
APTS07	Multi-modal Coordination	Planned
APTS08	Transit Traveler Information	Planned
APTS09	Transit Signal Priority	Planned
APTS10	Transit Passenger Counting	Existing/Planned
ATIS01	Broadcast Traveler Information	Planned
ATIS02	Interactive Traveler Information	Existing
ATIS03	Autonomous Route Guidance	Future
ATIS04	Dynamic Route Guidance	Planned

Service Package	Service Package Name	Service Package Status
ATIS05	ISP Based Trip Planning and Route Guidance	Planned
ATIS08	Dynamic Ridesharing	Planned
ATIS09	In Vehicle Signing	Planned
ATIS10	Short Range Communications Traveler Information	Future
ATMS01	Network Surveillance	Existing
ATMS03	Traffic Signal Control	Existing/Planned
ATMS04	Traffic Metering	Planned
ATMS06	Traffic Information Dissemination	Existing/Planned
ATMS07	Regional Traffic Management	Planned
ATMS08	Traffic Incident Management System	Planned
ATMS09	Transportation Decision Support and Demand Management	Planned
ATMS13	Standard Railroad Grade Crossing	Existing
ATMS15	Railroad Operations Coordination	Planned
ATMS16	Parking Facility Management	Planned
ATMS17	Regional Parking Management	Planned
ATMS19	Speed Warning and Enforcement	Planned
ATMS21	Roadway Closure Management	Planned
ATMS22	Variable Speed Limits	Planned
ATMS24	Dynamic Roadway Warning	Future
ATMS26	Mixed Use Warning Systems	Future
EM01	Emergency Call-Taking and Dispatch	Existing
EM02	Emergency Routing	Planned
EM03	Mayday and Alarms Support	Existing/Planned
EM04	Roadway Service Patrols	Existing
EM05	Transportation Infrastructure Protection	Planned
EM06	Wide-Area Alert	Existing
EM07	Early Warning System	Existing
EM08	Disaster Response and Recovery	Planned
EM10	Disaster Traveler Information	Planned

Service Package	Service Package Name	Service Package Status
MC01	Maintenance and Construction Vehicle and Equipment Tracking	Planned
MC02	Maintenance and Construction Vehicle Maintenance	Existing
MC03	Road Weather Data Collection	Existing
MC04	Weather Information Processing and Distribution	Existing
MC06	Winter Maintenance	Existing
MC07	Roadway Maintenance and Construction	Existing
MC08	Work Zone Management	Planned
MC09	Work Zone Safety Monitoring	Planned
MC10	Maintenance and Construction Activity Coordination	Planned

ITS STANDARDS

ITS standards, developed through industry consensus, define how system components should work within the National ITS Architecture to support deployment of interoperable systems at local, regional, state, and national levels.

Table 5 shows key ITS standards recommended for the Rogue Valley Regional ITS Architecture and the associated interfaces to which the standards apply. Several standards refer to data dictionaries and message sets, which are defined as follows:

- *Data Dictionary Entry*: a description of a data flow, including data elements that comprise the data flow. Each data flow in the logical architecture has a data dictionary entry.
- *Message Set:* a set of individual messages in a specific format designed for information exchange between systems. Messages are comprised of groups of data elements.

The Oregon Statewide ITS Architecture provides an in-depth look at standards used by ODOT.[12]

Table 5. Key Standards Recommended for Rogue Valley

Standard Development Organizations	Applicable Architecture Interfaces	Key ITS Standards Recommended for Rogue Valley Regional ITS Architecture
AASHTO ITE	Traffic Management Centers to Other Centers	National Transportation Communications for ITS Protocol (NTCIP)

[12] https://www.oregon.gov/ODOT/HWY/ITS/Documents/Oregon ITS Architecture Report 2012.pdf

Standard Development Organizations	Applicable Architecture Interfaces	Key ITS Standards Recommended for Rogue Valley Regional ITS Architecture
NEMA	Traffic Management Center to Field Devices	
	Roadside Signal Controllers	Advanced Transportation Controller (ATC)
	Transit Center to Other Centers and Vehicles	Transit Communications Interface Protocol (TCIP)
ITE	Traffic Management Center to Other Centers	Traffic Management Data Dictionary (TMDD); Message Sets for External Traffic Management Center Communications (MS/ETMCC)
IEEE	Emergency Management Center to Other Centers	Standard for Incident Management Message Sets (IMSS) for Use by Emergency Management Centers
	General	Standard for Data Dictionaries for Intelligent Transportation Systems
ASTM	Archived Data Management Center Interfaces	Standard Guide for Archiving and Retrieving ITS-Generated Data
ASTM IEEE	Vehicle to Roadside	Dedicated Short Range Communications (DSRC)
SAE	Traveler Information (Information Service Provider (ISP) Interfaces)	Advanced Traveler Information Systems (ATIS) Data Dictionary; Advanced Traveler Information Systems (ATIS) Core Message List and Data Dictionary
	Location Referencing	Location Referencing Standards

ITS OPERATIONAL CONCEPT

This section describes the high level ITS operational concept for the Rogue Valley region. An operational concept was developed for the region in 2004 as part of the Intelligent Transportation Systems (ITS) planning effort. The 2016 update of the Rogue Valley Regional ITS Plan includes a review and update of the operational concept to reflect current needs and interests of regional stakeholders, including new stakeholders from the Middle Rogue Metropolitan Planning Organization (MPO) area.

ITS OPERATIONAL CONCEPT OVERVIEW

An ITS operational concept describes current and future roles and responsibilities of regional transportation and emergency management agencies, with specific interest in parties related to ITS implementation and operation requiring regional coordination. The operational concept provides a summary of how Rogue Valley agencies and their systems work together today and in the future to deliver ITS services.

The main objectives of the operational concept are to:

- Provide an overview of regional operations vision in the greater Rogue Valley region for key operational service areas
- Define current and future stakeholder roles and responsibilities in the implementation of operational strategies and regional ITS systems[13]
- Lay the groundwork for future agency agreements and project-level Concepts of Operations
- Illustrate how agency personnel, ITS systems, and other resources interact as a basis for updating the ITS Architecture

This ITS Operational Concept is intended to provide a regional, high-level perspective on the operational service areas identified for Rogue Valley. It is not intended as a substitute for project-level Concepts of Operations that should be developed as part of individual ITS project deployments, consistent with the U.S. DOT Systems Engineering process. The project-level Concept of Operations is far more detailed: it describes the operations of a specific ITS system as a basis for developing system functional requirements, specifications, designs, and agency roles and responsibilities associated with the delivery of that system.

For example, this regional ITS Operational Concept may discuss requirements for regional video sharing, as illustrated by a video sharing information flow between two agencies. A project concept of operations, by contrast, would elaborate on the granular details associated with that information flow, such as the agency with day-to-day maintenance responsibilities for the CCTV cameras, or situations where access to CCTV camera controls may be curtailed.

An operational concept is a required component of a regional ITS architecture per the FHWA Final Rule 940 and FTA Policy. This section documents the operational concept development approach and agency roles and responsibilities for the key regional ITS service areas.

OPERATIONAL CONCEPT UPDATE APPROACH

The update of the 2004 Operational Concept began with a review of its contents against the current National ITS Architecture and changes to the scope of the planning area. Since 2004, the National ITS

[13] Regional ITS Architecture Guidance: Developing, Using, and Maintaining an ITS Architecture for Your Region. Report FHWA-OP-02-024, Version 2.0. U.S. Department of Transportation, Federal Highway Administration and Federal Transit Administration, National ITS Architecture Team, July 2006.

Architecture has made changes to its service areas and service packages (referred to as market packages in 2004). The planning area for the Rogue Valley was expanded to include new stakeholders from the Middle Rogue MPO.
The project team refined details in the ITS Operational Concept based on input from the Project Advisory Committee (PAC), and information garnered from the stakeholder questionnaire and stakeholder workshop.

ITS OPERATIONAL CONCEPT ELEMENTS

The operational concept is defined by three elements: stakeholder relationships, stakeholder roles and responsibilities, and information flows. Following is an overview and definitions of each element.

ROLES AND RESPONSIBILITIES

The operational concept identifies the operational roles and responsibilities for each stakeholder within the service area, and the status of each. To do this, the roles and responsibilities are documented within the context of the general phases of an ITS deployment. Table 6matches the general phases of an ITS project deployment with agency roles and responsibilities during the phase.

Table 6. Roles and Responsibilities by ITS Deployment Phase

Phase	Definition
Design	This phase lays the framework for project implementation. It is comprised of all design aspects prior to project implementation. The key component is documentation. Design documents are needed for successful project execution and typically include: ○ operational concept ○ high-level requirements ○ detailed requirements ○ high-level design ○ detailed design ○ operations and maintenance plans Documentation provides structure and understanding for project implementation, traces project to initial goals and objectives, and provides a point of reference for testing and validating project outcomes.
Construction/Implementation	This phase uses the documents prepared in the design phase to construct and implement ITS. Tasks include developing and installing equipment, hardware and software; and integrating with existing systems.

Phase	Definition
Operational Planning	This phase consists of developing processes and procedures to support operations and future expansion of ITS technologies. Upkeep may be performed by a combination of one or more project partners or contracting with a third party.
Operations	Operations includes tasks related to operating ITS equipment after implementation. This includes training technical or information technology staff and understanding any warranties, licenses, or registration agreements with vendors.
Maintenance	Maintenance includes hardware and software upkeep. Maintenance roles include repairing equipment outages, routine testing to ensure proper functioning, and replacement of equipment subcomponents.

INFORMATION FLOWS

Information flows refer to the exchange of information between stakeholders. Information flows can occur between the central operations centers of two or more stakeholders, referred to as a center-to-center information flow. Information can also be exchanged between field device and a central operations center, referred to as center-to-field information flow. Table 7 describes the types of information flows that can occur between stakeholders. Informational diagrams shown in the sections that follow illustrate the existing and planned operations of different ITS service areas.

Table 7. Types of Information Flows

Information Flows	Definition
Data	Data are information captured by field devices automatically or entered manually into a central repository. Examples of data include, but are not limited to, incident, traffic, weather, parking, and transit data.
Video	Live video and/or still images captured by cameras.
Status	Status is information on the operational state of field devices. Examples include confirmation of message set postings to dynamic message signs, operational status of RWIS or cameras such as failed, on or off.
Request	The ability for an agency to solicit either a data or command change, such as DMS messaging or signal timings, from another party.

Information Flows	Definition
Control	Control is the ability to manipulate the current setting of a field device. Control may include, but is not limited to, changing DMS messages, changing traffic signal timing plans, and camera control (e.g., pan, tilt, zoom).

ITS OPERATIONAL CONCEPT SERVICE AREAS

The ITS Operational Concept is organized into seven service areas that elaborate on the Rogue Valley region's vision for transportation management and operations. The 2004 areas were refined to reflect changing needs and goals of the region. They include the following:

- Traffic Operations Management
- Weather Event Management
- Regional Traveler Information
- Emergency and Incident Management
- Data Management and Performance
- Public Transportation
- Freight Management

ORGANIZATION OF THE ITS OPERATIONAL CONCEPT

For each service area, the ITS Operational Concept includes the following sections:

- *Overview*: defines the service area and explains its purpose
- *Information flow diagram*: depicts the information flows between agency centers, field devices and information portals
- *Needs*: describes identified user needs in the service area. These needs reflect the vision toward which the region aims to reach in the future
- *Roles and responsibilities*: describes the roles and responsibilities for each stakeholder

TRAFFIC OPERATIONS MANAGEMENT OPERATIONAL CONCEPT

OVERVIEW

Traffic Operations Management strategies target ways to improve communications, traffic signal operations, surveillance, and traveler information throughout the roadway network. Figure 5 shows the existing and planned flow of information for traffic operations activities across key stakeholders.

NEEDS

Stakeholders identified several needs in the traffic operations management service area:

- Implement reliable communication between systems and devices
- Gain access to remote traffic signals
- Implement a central signal system
- Improve signal timing progression and coordination
- Upgrade traffic signal controllers
- Install traffic signal detection
- Address congestion and reliability issues around the south Medford interchange
- Improve pedestrian safety at key crossing locations (conflict points)
- Design infrastructure like signals and lighting systems to be flexible and accommodating of emerging technologies in the future
- Improve bicycle detection at key locations

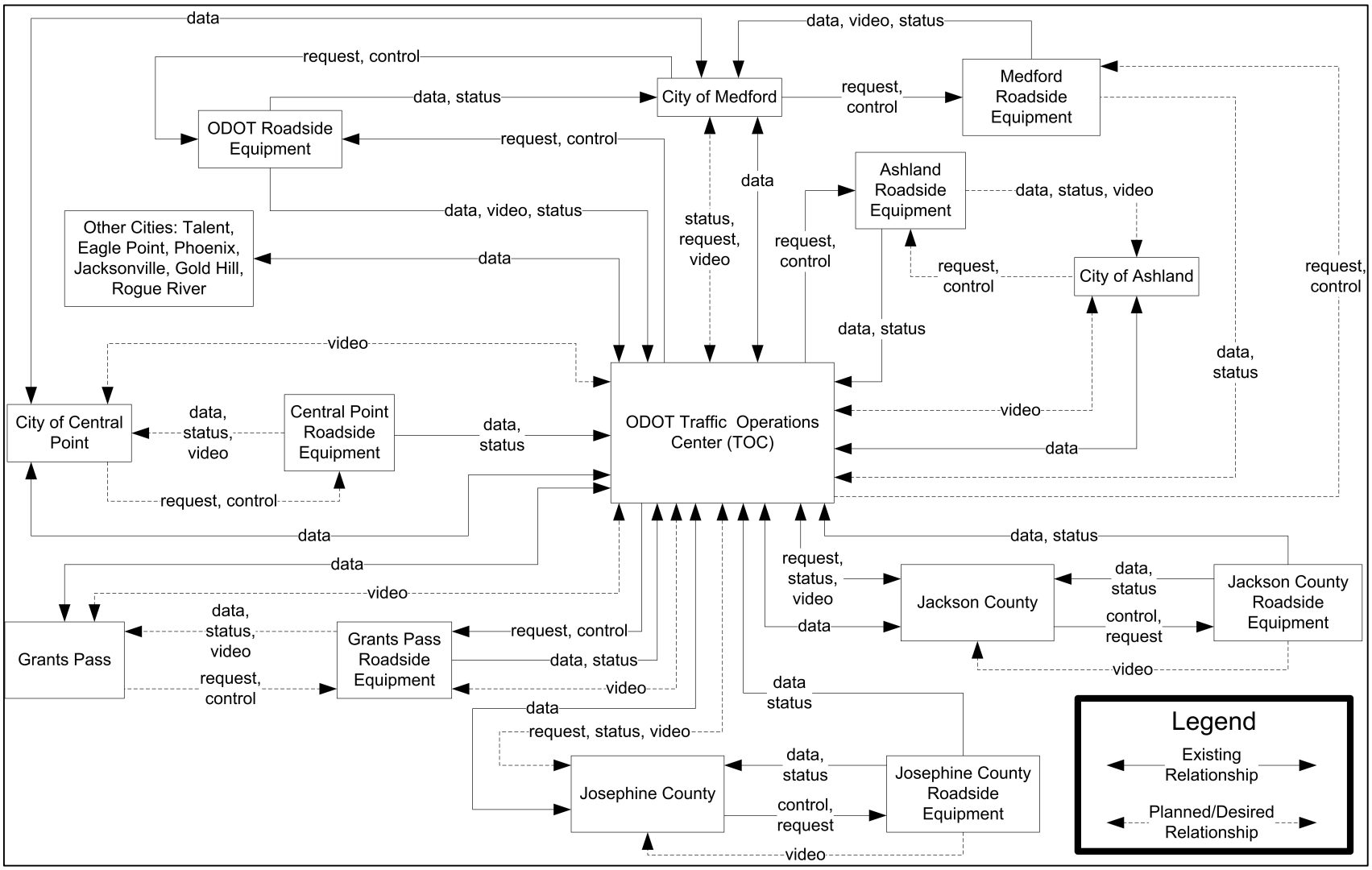

Figure 5. Traffic Operations Management Flow Diagram

Table 8. Traffic Operations and Management Stakeholders and Responsibilities

Stakeholder	Responsibilities
City of Ashland	• Manage City of Ashland-designed projects and procure field devices • Lead construction and implementation of field devices on City facilities • Lead operational planning of field devices and communications networks for Ashland-owned equipment • Participate in regional operational planning and congestion mitigation plans • Operate City-owned field devices
City of Central Point	• Manage City of Central Point-designed projects and procure field devices • Lead construction and implementation of field devices on City facilities • Participate in regional operational planning and congestion mitigation plans
City of Grants Pass	• Manage City of Grants Pass-designed projects and procure field devices • Lead construction and implementation of field devices on City facilities • Lead operational planning of field devices and communications networks for Central Point-owned equipment • Participate in regional operational planning and congestion mitigation plans • Operate City-owned field devices
City of Medford	• Manage City of Medford-designed projects and procure field devices • Lead construction and implementation of field devices on City facilities • Lead operational planning of field devices and communications networks for Medford-owned equipment • Participate in regional operational planning and congestion mitigation plans • Operate Medford's field devices • Maintain Medford's field devices

Stakeholder	Responsibilities
Jackson County	• Manage Jackson County-designed projects and procure field devices • Lead construction and implementation of field devices on County facilities • Lead operational planning of field devices and communications networks for Jackson County equipment • Participate in regional operational planning and congestion mitigation plans • Operate Jackson County's field devices
Josephine County	• Manage Josephine County-designed projects and procure field devices • Lead construction and implementation of field devices on County facilities • Lead operational planning of field devices and communications networks for Josephine County equipment • Participate in regional operational planning and congestion mitigation plans • Operate Josephine County's field devices
ODOT	• Manage ODOT-designed projects and lead design of field devices • Lead construction and implementation of field devices on ODOT facilities • Lead operational planning of field devices and communications networks for ODOT equipment • Participate in regional congestion mitigation plans • Operate ODOT field devices • Maintain ODOT field devices and other agency field devices per agreements
Other Cities in Greater Rogue Valley	• Manage agency-designed projects and procure field devices • Lead construction and implementation of field devices on agency facilities • Lead operational planning of field devices and communications networks for agency equipment • Participate in regional operational planning and congestion mitigation plans • Operate field devices • Maintain field devices

WEATHER EVENT MANAGEMENT OPERATIONAL CONCEPT

OVERVIEW

Weather Event Management strategies address ways to detect hazardous roadway conditions early and communicate that information to travelers. These strategies also target operational efficiencies during hazardous weather conditions. Figure 6 shows the existing and planned information flows for weather event management activities across key stakeholders.

NEEDS

Stakeholders identified several needs in the weather event management service area:

- Improve reliability of cameras during weather events
- Actively monitor roadway pavement conditions
- Install additional RWIS sites
- Implement real-time snow plow location information and route tracking

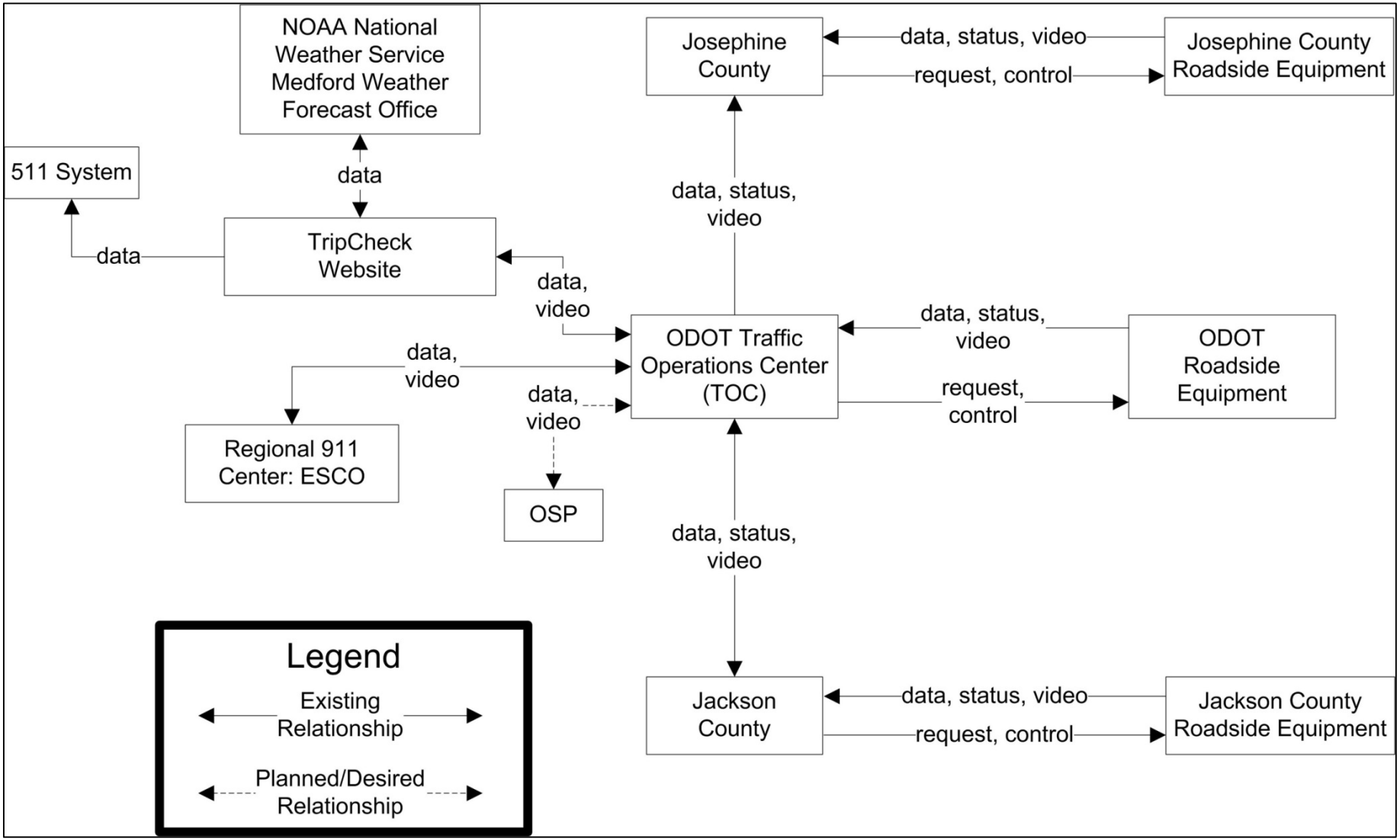

Figure 6. Weather Event Management Flow Diagram

ROLES AND RESPONSIBILITIES – WEATHER EVENT MANAGEMENT

Table 9. Weather Event Management Stakeholders and Responsibilities

Stakeholder	Responsibilities
All local transportation and emergency management agencies	• Manage agency-designed projects and procure field devices for weather monitoring systems • Lead construction and implementation of field devices on agency facilities • Participate in regional operational planning for adverse weather • Operate and maintain field devices to measure conditions and alert travelers of weather-related information
Emergency Communications of Southern Oregon (ECSO) 911	• Share data with ODOT TOC • Participate in regional operational planning
Jackson County	• Manage Jackson County-designed projects and procure field devices weather monitoring systems • Lead construction and implementation of field devices on County facilities • Participate in regional operational planning for adverse weather • Operate and maintain field devices to monitor roadway weather conditions • Operate snow plows on County facilities
Josephine County	• Manage Josephine County-designed projects and procure field devices weather monitoring systems • Lead construction and implementation of field devices on County facilities • Participate in regional operational planning for adverse weather • Operate and maintain field devices to monitor roadway weather conditions • Operate snow plows on County facilities
NOAA National Weather Service Medford Office	• Provide data to ODOT TripCheck website • Participate in regional operational planning for adverse weather

Stakeholder	Responsibilities
ODOT	• Manage ODOT-designed projects and procure field devices for weather monitoring systems • Lead construction and implementation of field devices on ODOT facilities • Participate in regional operational planning for adverse weather • Operate and maintain field devices to monitor roadway weather conditions • Operate and maintain TripCheck and TripCheck Traveler Information Portal (TTIP) disseminate weather event information • Operate snow plows on ODOT facilities

TRAVELER INFORMATION OPERATIONAL CONCEPT

OVERVIEW

Traveler information strategies provide travelers with real-time information about travel conditions including delays, incidents, weather, travel times, emergencies, and alternate routes. This allows travelers to make choices about departure times, modes, routes, and destinations for more efficient roadway use. Figure 7 shows existing and planned information flows for traveler information across key stakeholders.

NEEDS

Stakeholders identified several needs in the traveler information service area:

- Improve traveler information on I-5 and critical routes
- Manage and proactively provide information to travelers about special events
- Improve traveler information sharing between ODOT and local agencies
- Integrate traveler information with transportation services and activities

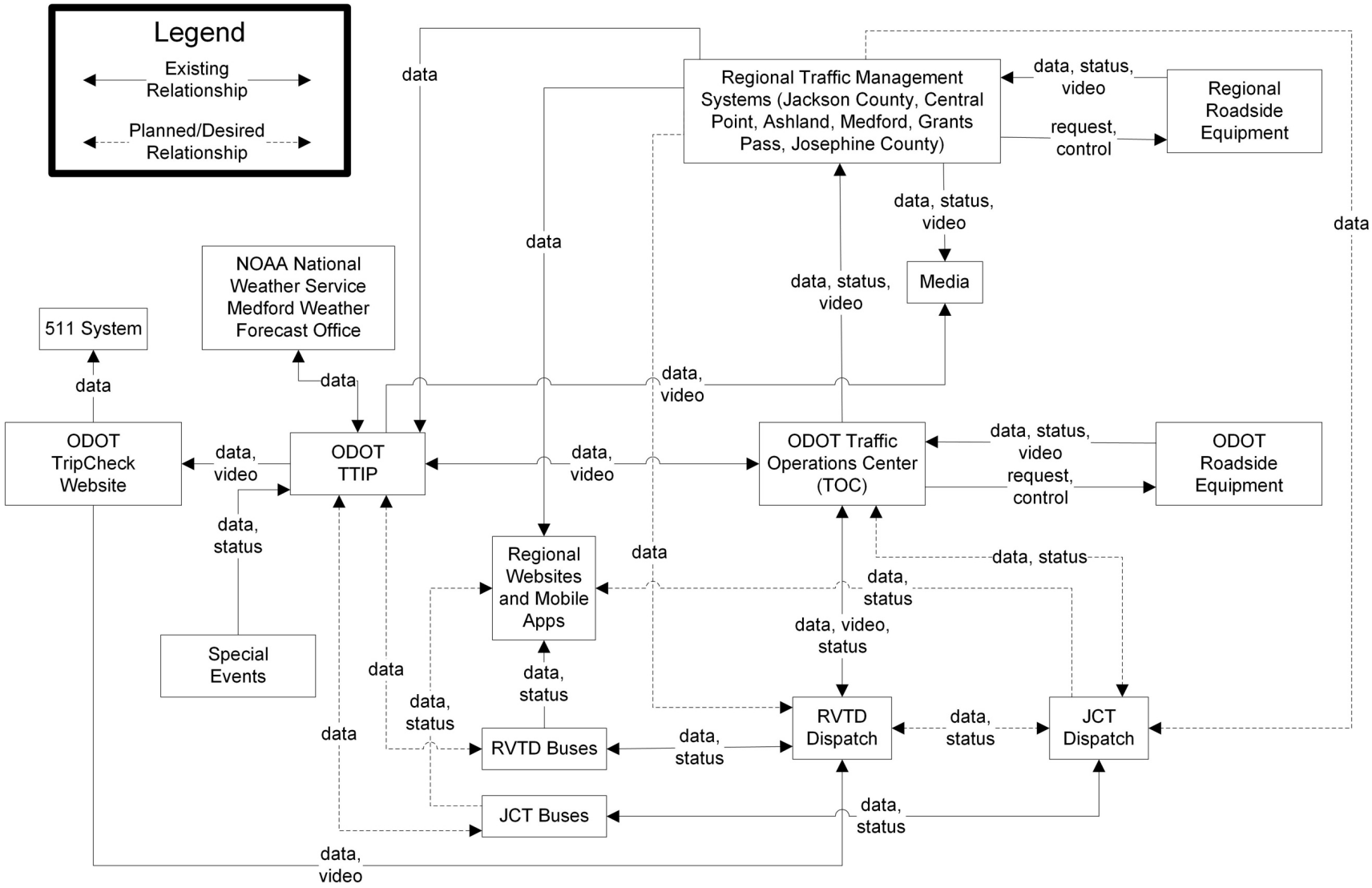

Figure 7: Traveler Information Flow Diagram

Table 10. Traveler Information Management Stakeholders and Responsibilities

Stakeholder	Responsibilities
All local transportation and emergency management agencies	• Construct and implement City traveler information projects • Participate in regional traveler information systems planning and development • Provide input on regional implementation of traveler information projects • Provide travel information to TTIP • Operate and maintain field equipment for traveler information
Josephine Community Transit (JCT)	• Participate in regional traveler information systems planning and development • Provide travel information to TTIP • Operate and maintain JCT website • Operate and maintain devices to provide real-time traveler information
Medford Police Department	• Participate in regional traveler information systems planning and development • Make relevant traveler information available to TTIP
ODOT	• Manage ODOT-led traveler information projects • Construct and implement ODOT traveler information projects • Lead development of operational planning and interagency agreements for regional traveler information • Operate traveler information devices on ODOT facilities • Maintain ITS equipment on ODOT facilities • Operate and maintain TripCheck website, TTIP, TLE, and related systems
Other Cities in Greater Rogue Valley	• Participate in regional traveler information systems planning and development • Construct and implement City traveler information projects

Stakeholder	Responsibilities
RVCOG	• Lead facilitation of regional traveler information systems planning and development • Provide input on regional implementation of traveler information projects
Rogue Valley Transit District (RVTD)	• Participate in regional traveler information systems planning and development • Provide travel information to TTIP • Operate RVTD website including real-time service alerts • Operate and maintain CAD/AVL devices to provide real-time traveler information
Special Event & Tourism Organizations	• Participate in regional traveler information systems planning and development • Provide special events traveler information to TTIP
Transportation Management Association	• Participate in regional traveler information systems planning and development

EMERGENCY AND INCIDENT MANAGEMENT OPERATIONAL CONCEPT

OVERVIEW

Emergency and Incident Management strategies focus on improving response during a transportation-related emergency or incident, reducing incident clearance times and increasing safety for responders and travelers. Figure 8 shows existing and planned information flows for emergency and incident management activities across key stakeholders.

NEEDS

Stakeholders identified several needs in the emergency and incident management service area:

- Implement real-time incident data sharing
- Coordinate between 911 and dispatch centers
- Communicate between all affected parties during an incident
- Improve public outreach regarding communicating during a major event
- Train staff in ICS and EOC once or twice a year
- Upgrade communication bandwidth to accommodate greater data transmission
- Monitor system for work zones to identify reckless driving and notify workers and 911

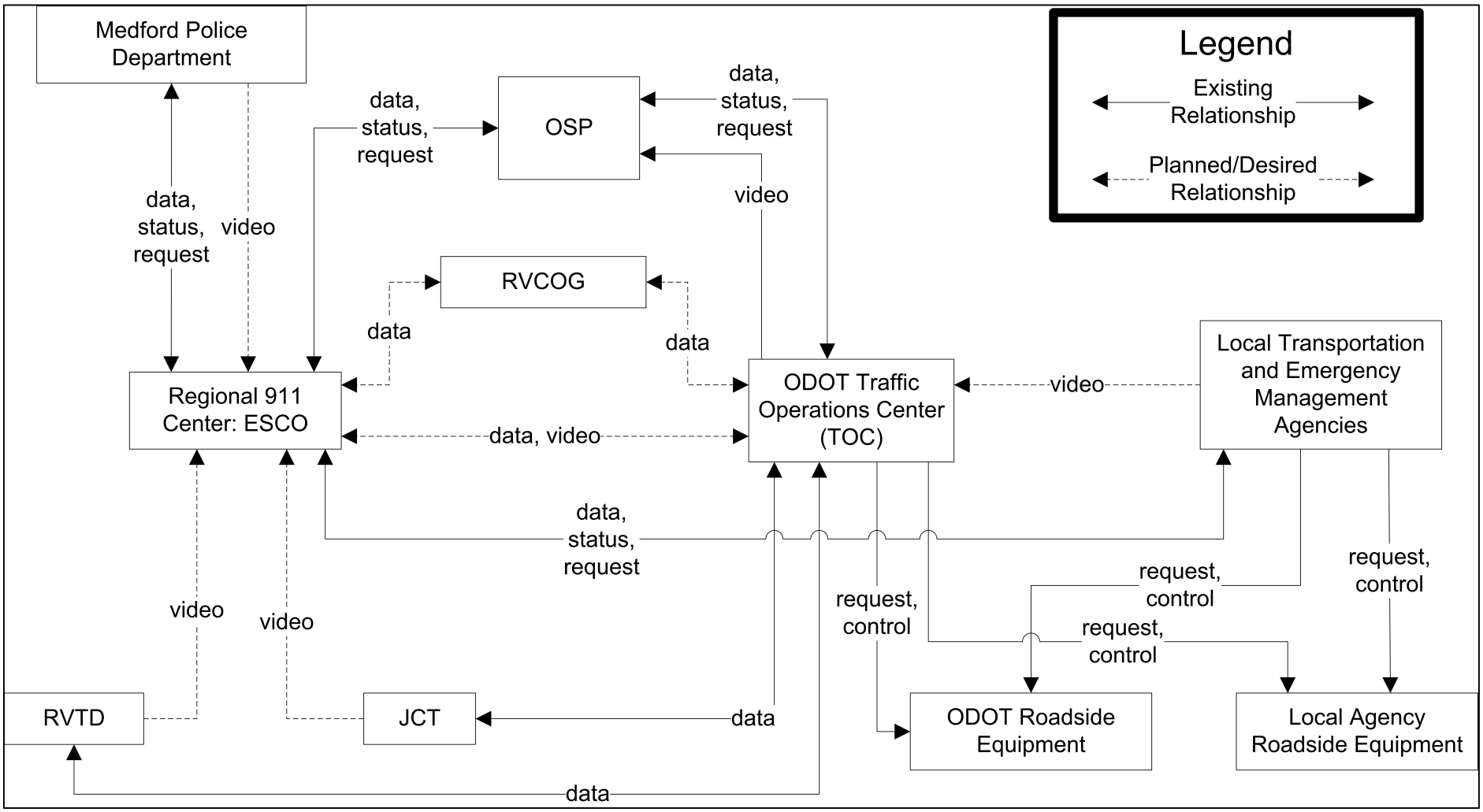

Figure 8: Emergency and Incident Management Flow Diagram

Table 11. Emergency and Incident Management Stakeholders and Responsibilities

Stakeholder	Responsibilities
All local transportation and emergency management agencies	• Participate in regional emergency and incident response planning • Provide input on implementation of incident management projects • Participate in regional TIM team meetings • Participate in developing inter-agency agreements for emergency and incident management • Coordinate with emergency responders to clear incidents • Operate and maintain field equipment to alert travelers of detours and incidents
ECSO 911	• Participate in regional emergency and incident response planning • Provide input on implementation of incident management projects • Participate in regional TIM team meetings • Participate in developing inter-agency agreements for emergency and incident management • Coordinate with other agencies to respond to incidents • Operate and maintain CAD system
Josephine Community Transit (JCT)	• Participate in regional emergency and incident response planning • Provide input on implementation of emergency response projects • Participate in developing inter-agency agreements for emergency management • Coordinate with other agencies to respond to emergencies

Stakeholder	Responsibilities
Medford Police Department	• Participate in emergency and incident response planning for the City of Medford • Provide input on implementation of incident management projects • Participate in developing inter-agency agreements for emergency and incident management • Coordinate with other agencies to respond to incidents • Operate and maintain response vehicles
ODOT	• Manage incident response planning on ODOT facilities • Design incident response technology on ODOT facilities • Lead construction of field devices on ODOT facilities • Participate in regional TIM team meetings • Deploy incident response teams during incidents on ODOT facilities • Coordinate with emergency responders to clear incidents • Participate in developing inter-agency agreements for emergency and incident management • Operate field devices during emergencies and incidents on ODOT facilities and elsewhere per agency agreements • Maintain field devices
Oregon State Police (OSP)	• Participate in regional emergency and incident response planning • Provide input on implementation of incident management projects • Participate in developing inter-agency agreements for emergency and incident management • Coordinate with other agencies to respond to incidents • Operate and maintain response vehicles

Stakeholder	Responsibilities
RVCOG	• Lead development of regional emergency and incident response plans • Provide input on implementation of emergency and incident management projects • Facilitate development of inter-agency agreements for emergency and incident management
RVTD	• Participate in regional emergency and incident response planning • Provide input on implementation of emergency response projects • Participate in developing inter-agency agreements for emergency management • Coordinate with other agencies to respond to emergencies

DATA MANAGEMENT AND PERFORMANCE MEASUREMENT OPERATIONAL CONCEPT

OVERVIEW

Data Management and Performance Measurement strategies focus on organizing transportation data and provide indicators of how well the transportation system is performing. Figure 9 shows existing and planned information flows for data management and performance measurement activities across key stakeholders.

NEEDS

Stakeholders identified several needs in the data management and performance measurement service area:

- Identify performance measures and supporting data needs
- Share information across agencies
- Monitor system and evaluate performance on a regular basis
- Leverage existing and new data sources for performance and analysis evaluation
- Evaluate RVTD CAD/AVL data availability and (if applicable) share with other agencies
- Create a repository for data across agencies and develop standards and procedures
- Practice lifecycle planning for ongoing replacement of software/hardware
- Implement real-time data collection for autos, bikes, pedestrians, and trucks
- Provide real-time information about maintenance activities and upcoming preventative maintenance needs to ODOT

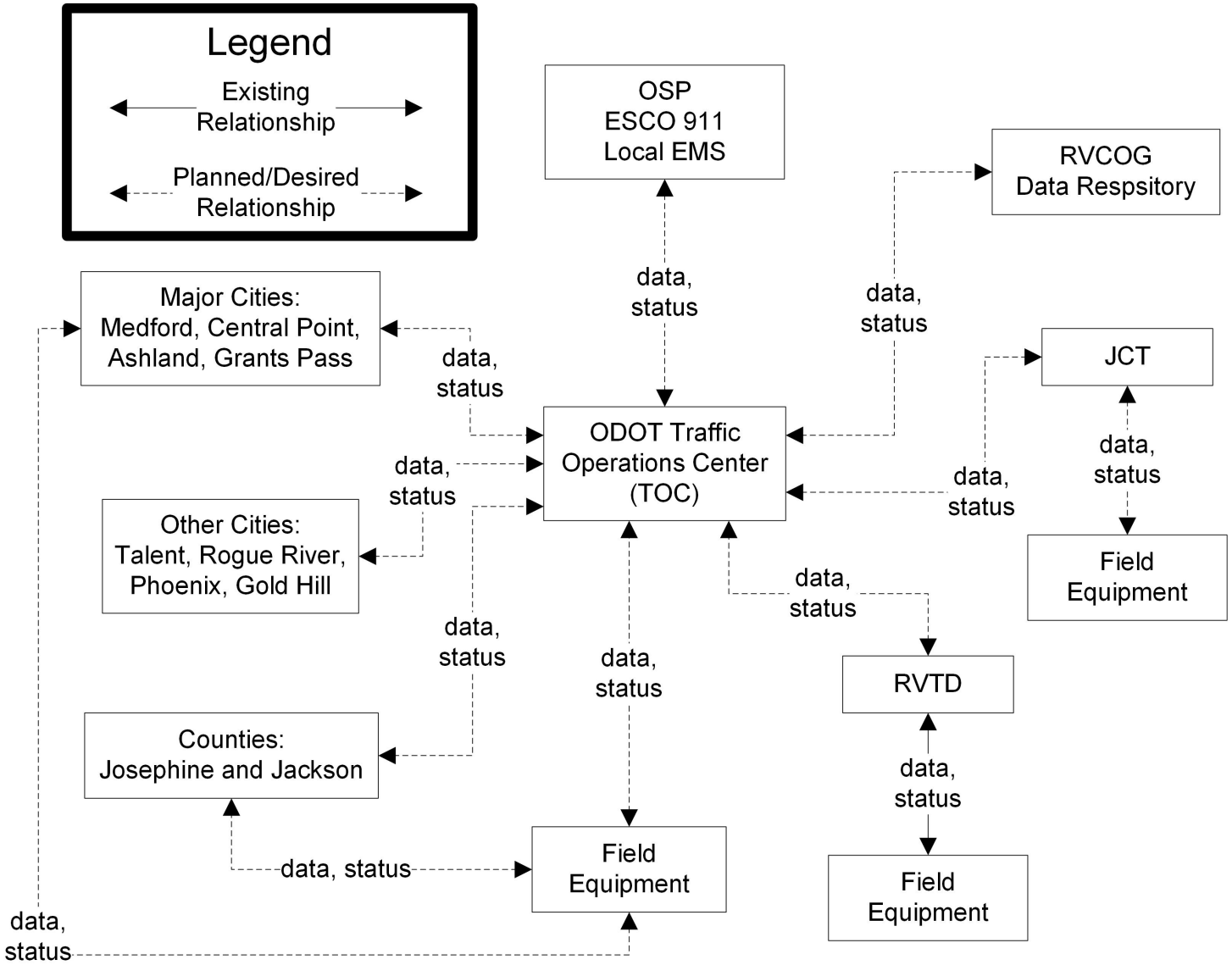

Figure 9: Data Management and Performance Measurement Flow Diagram

ROLES AND RESPONSIBILITIES – DATA MANAGEMENT AND PERFORMANCE MEASUREMENT

Table 12. Data Management and Performance Measurement

Stakeholder	Responsibilities
All local transportation and emergency management agencies (including Cities in Greater Rogue Valley, Jackson County, Josephine County)	• Participate in developing regional performance measures • Monitor performance of the system • Share data with other agencies
Central Oregon and Pacific Railroad	• Participate in developing regional performance measures • Monitor performance of the system • Share data with other agencies
ECSO 911	• Participate in developing regional performance measures • Monitor performance of the system • Share data with other agencies
JCT	• Participate in developing regional performance measures • Monitor performance of the system • Share data with other agencies
Medford Police Department	• Participate in developing regional performance measures • Monitor performance of the system • Share data with other agencies
ODOT	• Lead the development of regional performance measures • Monitor performance of the system • Share data with other agencies
OSP	• Participate in developing regional performance measures • Monitor performance of the system • Share data with other agencies
RVCOG	• Facilitate the development of regional performance measures • Lead a regional performance monitoring program

Stakeholder	Responsibilities
RVTD	• Participate in developing regional performance measures • Monitor performance of the system • Maintain Google Transit Feed Specification (GTFS) • Share data with other agencies
Special events and tourism organizations	• Participate in developing regional performance measures • Monitor performance of the system • Share data with other agencies
Transportation Management Association	• Participate in developing regional performance measures

PUBLIC TRANSPORTATION MANAGEMENT OPERATIONAL CONCEPT

OVERVIEW

Public Transportation Management strategies target ways to improve the transit experience for riders and transit fleet operations. Figure 10 shows the existing and planned flow of information for public transportation management activities across key stakeholders.

NEEDS

Stakeholders identified several needs in the public transportation management service area:

- Implement (or expand) transit signal priority (TSP)
- Deploy automated fare collection systems
- Share use of radio communication systems across public agencies
- Provide bike rack/capacity availability on bus before trip
- Provide real-time bus arrival and ride tracking for all transit agencies
- Provide weather and weather related transit conditions available from a single source
- Provide a multimodal trip planning solution
- Allow traveler to access to transit schedules and routes with mobile devices for all transit agencies
- Develop a system to access diagnostics of mechanical issues with buses remotely
- Increase security on transit and at stops
- Upgrade backend computer system
- Practice lifecycle planning for ongoing replacement of software and hardware for AVL, APC, ASA and other on board equipment.

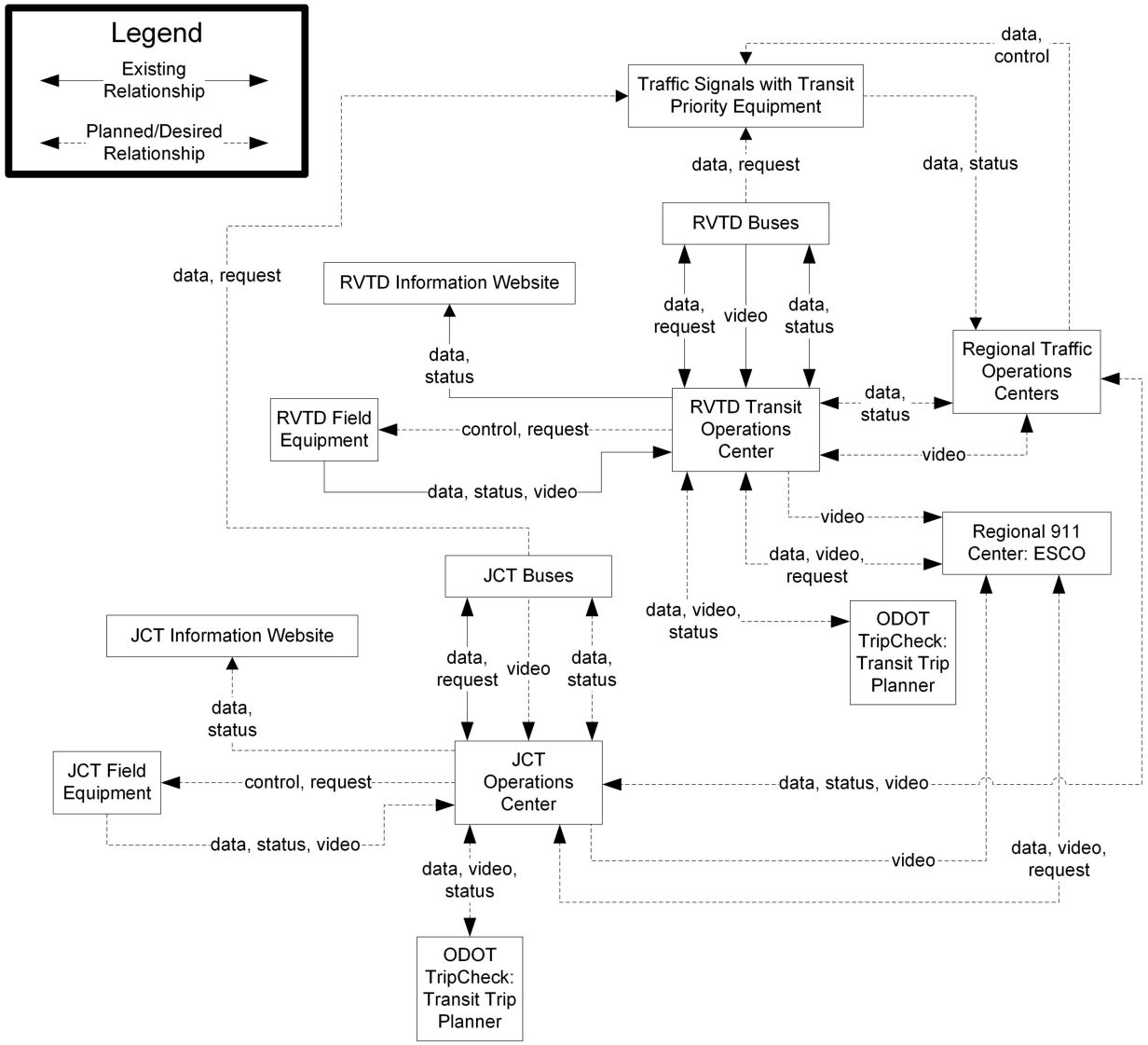

Figure 10: Public Transportation Management Flow Diagram

ROLES AND RESPONSIBILITIES – PUBLIC TRANSPORTATION MANAGEMENT

Table 13. Public Transportation Management Stakeholders and Responsibilities

Stakeholder	Responsibilities
All local transportation and emergency management agencies (including Cities in Greater Rogue Valley, Jackson County, Josephine County)	• Participate in coordinating TSP technology across jurisdictions • Implement TSP in key corridors • Maintain TSP equipment at agency traffic signals
JCT	• Participate in coordinating TSP technology across jurisdictions • Design, implement, operate, and maintain automated fare collection system • Operate and maintain CAD/AVL systems • Design, implement, operate, and maintain systems to monitor real-time vehicle status (ex: location, bike rack availability, diagnostics) • Maintain TSP equipment on buses • Operate and maintain vehicle arrival information systems
ODOT	• Participate in coordinating TSP technology across jurisdictions • Implement TSP in key corridors • Maintain TSP equipment at agency traffic signals
RVTD	• Participate in coordinating TSP technology across jurisdictions • Design, implement, operate, and maintain transit automated fare collection system • Operate and maintain CAD/AVL systems • Design, implement, operate, and maintain systems to monitor real-time vehicle status (ex: location, bike rack availability, diagnostics) • Maintain TSP equipment on buses • Operate and maintain vehicle arrival information systems
RVCOG	• Participate in coordinating TSP technology across jurisdictions

FREIGHT MANAGEMENT OPERATIONAL CONCEPT

OVERVIEW

Freight Management strategies target improved safety for all roadway users as well as providing information to freight drivers to make more efficient decisions. Figure 11 shows the flow of information for freight management.

NEEDS

Stakeholders identified several needs in the freight management service area:

- Make improvements to unimproved rail crossings
- Install truck signal priority at key locations
- Enhance information about truck parking availability
- Collect and share more freight data

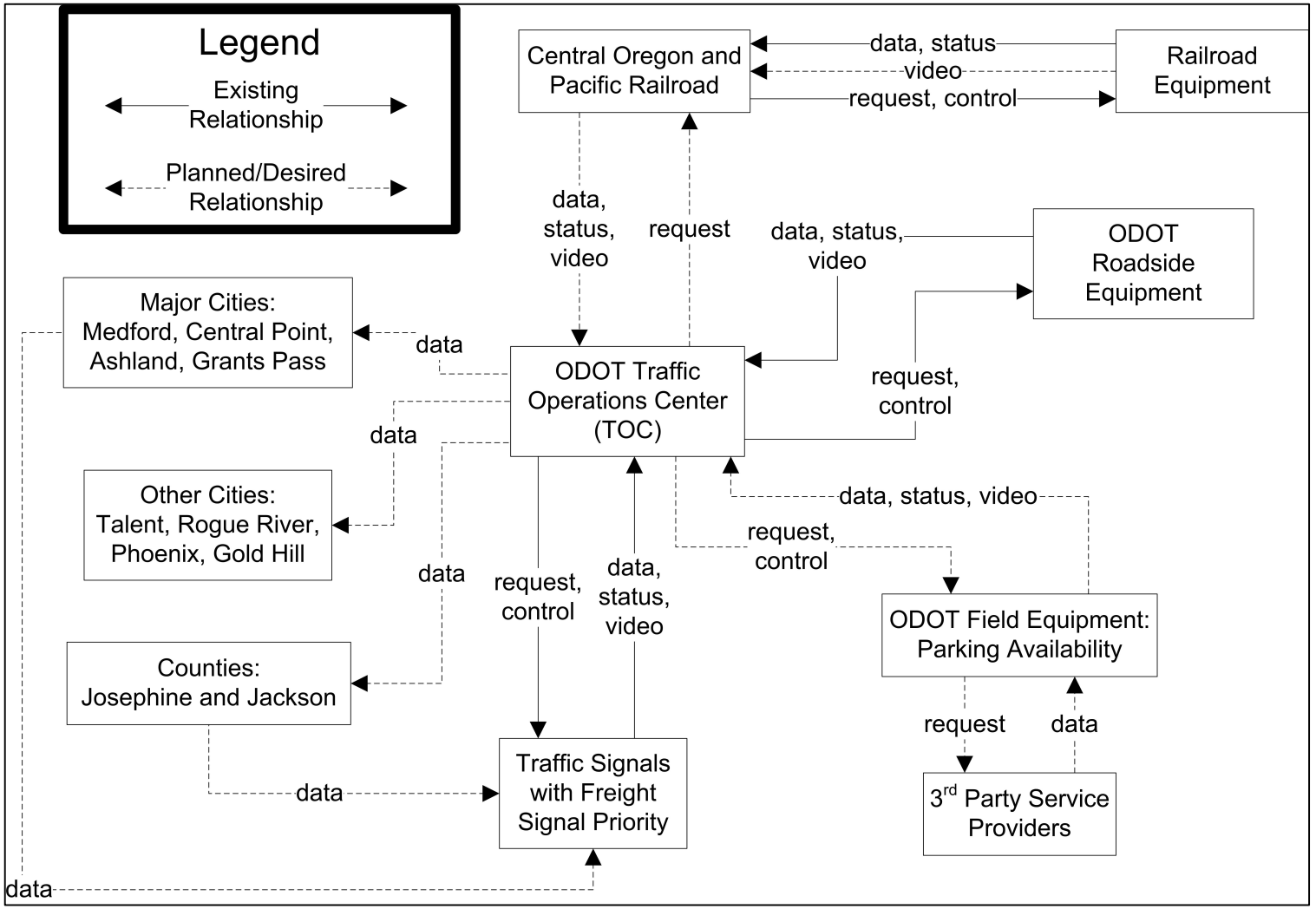

Figure 11: Freight Management Flow Diagram

ROLES AND RESPONSIBILITIES – FREIGHT MANAGEMENT

Table 14. Freight Management Stakeholders and Responsibilities

Stakeholder	Responsibilities
All local transportation and emergency management agencies (including Cities in Greater Rogue Valley, Jackson County, Josephine County)	• Participate in regional freight planning • Design, implement, operate, and maintain field equipment to detect and monitor truck parking availability • Provide information on truck parking availability to freight stakeholders • Participate in coordinating truck signal priority across jurisdictions • Design, implement, operate, and maintain improved rail crossings at key locations
Central Oregon and Pacific Railroad	• Participate in regional freight planning
ODOT	• Lead development of regional freight management plans • Design, implement, operate, and maintain field equipment to detect and monitor truck parking availability • Provide information on truck parking availability to freight stakeholders • Participate in coordinating truck signal priority across jurisdictions • Design, implement, operate, and maintain improved rail crossings at key locations • Operate and maintain weigh-in-motion equipment
RVCOG	• Participate in regional freight planning

ITS DEPLOYMENT PLAN

This section describes the ITS Deployment Plan for greater Rogue Valley. This plan includes the mix of management and operational strategies identified by the Project Advisory Committee that support the regional ITS vision and goals. The strategies are organized in seven service areas and then grouped by priority (high, medium, or low).
The seven service areas, consistent with the needs assessment organization, are:

- Traffic Operations Management (TM)
- Weather Event Management (W)
- Traveler Information (T)
- Emergency and Incident Management (EM)
- Data Management and Performance (DM)
- Freight Management (F)
- Public Transportation Management (P)

The letter(s) following each category are used to note the reference number of projects within a service (example TM01, TM02, etc.).

SUMMARY OF PROJECT INFORMATION

The ITS Deployment Plan matrix of projects is presented in table format in Appendix A. For each deployment strategy, the following information is provided:

- **Priority**: High, medium, or low. High priority represents strategies targeted for implementation within the next two-three years; medium priority represents strategies targeted for implementation within the next three to five years; and low priority strategies correlate to implementation beyond five years.
- **Project Number**: For reference purposes only
- **Project Name:** Title of the strategy
- **Description**: Describes the purpose of the strategy and identifies specific locations where the strategy will be implemented if applicable.
- **Responsible party(s)**: These parties are identified as being the key champions to pursue and implement the strategy
- **Expected benefits and costs**: Both qualitative and quantitative benefits are included, and costs are broken down into initial capital cost and ongoing annual operations and maintenance costs

(such as ongoing maintenance, staffing, and equipment replacement costs). The benefits and costs were derived from a combination of four key resources:

- ITS benefits database[14].This database houses case studies from all over the world including both benefits and costs associated with specific deployments. A detailed cost spreadsheet that includes both initial capital costs and ongoing operations and maintenance costs is maintained by this site.
- Crash Modification Factors (CMFs) Clearinghouse[2]provides information about how strategy (also called a countermeasure) will impact crashes. The CMFs are based on before and after studies that determine how a strategy effected crashes (types, severity, frequency) after it was implemented. That factor can then be applied to future applications to predict how the strategy effects future crashes at a given location or along a corridor.
- Tool for Operations Benefit Cost Analysis(TOPS-BC). This tool was created by the FHWA Office of Operations as a sketch-planning analysis tool for TSMO related strategies. It provides both costs and benefits on an annualized basis to produces a benefit: cost ratio.

- **Feasibility and project dependencies**: Describes information relevant to implementing the strategy.
- **Potential for connected vehicle application**: In the matrix, this category is either checked as a "yes" to highlight opportunities for connected vehicle technology or is left blank. Table 1 provides the detailed project list by service area.

CONNECTED VEHICLE CONSIDERATIONS

Many strategies identify in this plan have the potential to support a connected vehicle element, meaning that the strategy could involve vehicles communicating with roadside devices or with other vehicles. Connected vehicle technology is quickly advancing and will be a factor in transportation in the near term. Identifying strategies that are likely to have a connected vehicle element in this plan highlights the opportunity that can be addressed during project design. If a strategy has connected vehicle potential, the appropriate strategy from the Connected Vehicle Reference Implementation Architecture (CVRIA)5 is noted with a brief description of the application.

[14] Website maintained by the US DOT ITS Joint Program Office: http://www.itsbenefits.its.dot.gov/. Accessed July 12, 2016.

HIGH PRIORITY STRATEGIES

This section lists the strategies identified as high priority by the Policy Advisory Committee and other key stakeholders to the plan. High priority strategies are intended to be implemented in the near term, the next two-three years. In addition to feedback from stakeholders, the prioritization is based on feasibility of implementation, which is highly reflective of project cost and associated benefits. The "high" priority strategies are typically implemented before "low" priority strategies. However, if funding and opportunities arise to implement a lower priority strategy, the opportunity should be embraced.

TRAFFIC OPERATIONS MANAGEMENT

Traffic Operation and Management strategies target ways to improve communications, traffic signal operations, surveillance, and traveler information throughout the roadway network.

TM01 INSTALL OR UPGRADE COMMUNICATIONS

Description

Install communications to all ITS field devices, allowing agencies remote access to control and monitor devices. Options to consider include:

- Fiber communications
- Wireless options (cellular, Wi-Fi, DSRC, radio)
- Fiber sharing partnerships

Expected Benefits

- Operational Efficiency
- Safety

Lead Agencies	Capital Costs	Annual O&M
ODOT, Local agencies Variable	Variable by project (key cost variables: aerial vs. buried, and method)	Variable

TM02 TRAFFIC SIGNAL INTERCONNECT, CONNECTION TO ODOT CENTRAL TRAFFIC SIGNAL SERVER (CSS), SIGNAL TIMING IMPROVEMENTS, ADAPTIVE SIGNAL SYSTEMS

Description

Install traffic signal interconnect (as necessary) and connect traffic signals to ODOT Central Signal Server (CSS) for remote access to traffic signals. Update traffic signal timing along corridors to improve network efficiency and explore adaptive signal solutions.

Key locations for signal interconnect and connection to CSS:

- US 199 in Grants Pass area
- Hwy 62 in Medford area
- Hwy 238 in Grants Pass area

Key locations for updated signal timing and possible adaptive signals:

- Medford: Highway 62 (Crater Lake Highway - noted as project #5005 in the 2013-2038 RVMPO RTP), Barnett Road, McAndrews Road, Stewart Avenue, Siskiyou Blvd, Hwy 99
- Ashland - North Main, Main, and Siskiyou Blvd • Grants Pass - Hwy 199, 6th and 7th Streets
- Biddle / Pine - Exit 33 corridor
- Central Point - 10th Street/Pine Street/Freeman Road - add protective- permissive phasing to EB and WB left turn movements (noted as project #205 in the 2008 Central Point TSP), Hwy 99

Expected Benefits

Interconnect and CSS connection:

- Operational efficiency, allowing agencies to immediately view and respond to signal operation issues
- Signal timing optimization:
  - Decrease in delay of 13 to 94%
  - Decrease in travel time by 7 to 25%
  - Reduce fuel consumption by 2 to 9%
- Adaptive signal timing benefits:
  - Further reduction in vehicle delay and vehicle stops when applied to an appropriate corridor
  - Ability to handle unexpected fluctuations in traffic better than time of day plan

Lead Agencies	**Capital Costs**	**Annual O&M**
ODOT, local agencies	$3,000 per intersection (retiming) Adaptive system: varies by selected system, upwards of $500,000 for control software, processors, detectors, and controller upgrades	n/a Adaptive system: varies by system size $5,000 to $25,000

Connected Vehicle Potential

Intelligent Traffic Signal System or *Vehicle Data for Traffic Operations* applications use data from connected vehicles or infrastructure measurement of non-connected vehicles to manage signal operation and optimize traffic flow.

Pedestrian Mobility or *Pedestrian in Signalized Crosswalk Warning* applications – using mobile devices (such as smartphones) to detect pedestrians, warn motorists of pedestrian presence, and customize crossing times for persons with special needs.

TM03 UPGRADE SIGNAL CONTROLLERS

Description

Install updated traffic signal controllers to current standard, Advance Traffic Controllers (ATCs).
Key locations:

- Hwy 99 corridor - also consider TSP upgrades
- OR 99/Laurel Street (noted as project #18897 in the 2015 - 2018 STIP)

Expected Benefits

Capable of advance features, data collection, performance monitoring, and remote access

Lead Agencies	Capital Costs	Annual O&M
ODOT, local agencies	Dependent on intersection and required upgrades	Variable, dependent on communications

Connected Vehicle Potential

Installing 2070s or ATCs is foundational for allowing the use of any connected vehicle application that relies on traffic signals.

TM04 INSTALL TRAFFIC SIGNALS

Description

Investigate whether traffic signals are warranted at the following locations:

- Ashland:
  - OR 99/Wimer St/W Hersey St (noted as project R2 in the 2012 Ashland TSP)
  - OR 99/NB intersection with Oak Street (noted as project R11 in the 2012 Ashland TSP)
- Central Point:
  - OR 99/Scenic Avenue (noted as project #230 in the 2008 Central Point TSP)

- Table Rock Road/Wilson Road (noted as project #822 in the 2013-2038 RVMPO RTP and project #813 in the 2008 Central Point TSP)
- Table Rock Road/S Hamrick Road (noted as project 213 in the 2008 Central Point TSP)

Expected Benefits
Operational efficiencies (varies by device)

Lead Agencies	Capital Costs	Annual O&M
ODOT, local agencies	$250,000 per signal	$5,000

TM05 IMPROVE AND MONITOR TRAFFIC SIGNAL DETECTION

Description

Improve traffic signal detection for both vehicles and bicycles, and monitor for failed detection.

Expected Benefits
Improves system efficiency with faster notification to maintenance personnel and less equipment downtime

Lead Agencies	Capital Costs	Annual O&M
ODOT, local agencies	Varies based on detection technology used	Varies

TM06 SOUTH MEDFORD INTERCHANGE IMPROVEMENTS

Description
Investigate targeted solutions to the congestion that occurs around the south Medford interchange. Solutions to consider include:

- Queue warning
- Variable speeds
- Enhanced traveler information
- Ramp metering
- Adaptive signal timing

Expected Benefits
Improves system efficiency with faster notification to maintenance personnel and less equipment downtime

Lead Agencies	Capital Costs	Annual O&M
ODOT	Varies based on selected system. Variable message signs - $100,000 to $250,000 Ramp Meter - $20,000 to $40,000	Varies

TM07 INSTALL ENHANCED PEDESTRIAN CROSSINGS

Description

Review intersections or mid-block locations as necessary an install appropriate enhanced pedestrian crossing treatments. Options may include:

- Rectangular rapid flashing beacons
- HAWK signals
- Full traffic signals

Key Locations:

- OR 99/Wagner Creek Greenway Trail (noted as key 26 in the 2015 Talent TSP)
- OR 99/Northridge Terr and/or Walnut Way (noted as key P-1 in the 2015 Phoenix TSP)
- OR 99/Oak Street (key 18336 in the 2015 - 2018 STIP)

Expected Benefits

- Decrease in pedestrian crashes
- A study based on HAWK signals showed a 69% decrease in pedestrian-vehicle crashes, CMF ID: 2922). Note - this study placed HAWK signals AT intersections, not mid-block. Full traffic signals
- PHB can achieve 98% driver compliance and a 58% reduction in pedestrian crashes (ODOT)
- RRFB can achieve 85% driver compliance during the day and 90% at night.

Lead Agencies	Capital Costs	Annual O&M
ODOT, local agencies	$20,000 (RFFB) $100,000 (full signal mid-block	$1,000

Connected Vehicle Potential

Pedestrian Mobility or *Pedestrian in Signalized Crosswalk Warning* applications – using mobile devices (such as smartphones) to detect pedestrians, warn motorists of pedestrian presence, and customize crossing times for persons with special needs.

TM08 INSTALL ADDITIONAL PTZ CAMERAS

Description

Install additional pan-tilt-zoom (PTZ) cameras to monitor roadway conditions.

Expected Benefits

- Improves efficiency and reduces delay

Lead Agencies	Capital Costs	Annual O&M
ODOT, local agencies	$7,000 to $20,000 per camera. Additional Cost if mounting pole and foundation are needed (~$20,000)	$2,000 per camera

TM09 INSTALL SPEED FEEDBACK SIGNS

Description

Install dynamic feedback signs that measure the speed of individual vehicles and post messages such as "SLOW DOWN. YOUR SPEED IS OVER 60 MPH"

Expected Benefits

Addresses safety

Lead Agencies	Capital Costs	Annual O&M
ODOT	$15,000 to $20,000	$1,000

Connected Vehicle Potential

In-Vehicle Signage or *Curve Speed Warning* applications can be used to notify drivers that they are exceeding the speed limit or the advisory speed for a curve.

WEATHER EVENT MANAGEMENT

Adverse weather conditions have a major impact on the safety and operation of roads, from signalized arterials to Interstate highways. Weather affects driver behavior, vehicle performance, pavement friction, and roadway infrastructure. Weather affects roadway safety through increased crash risk, as well as exposure to weather-related hazards. Weather impacts roadway mobility by increasing travel time delay, reducing traffic volumes and speeds, increasing speed variance (i.e., a measure of speed uniformity), and decreasing roadway capacity (i.e., maximum rate at which vehicles can travel). Weather events influence productivity by disrupting access to road networks, and increasing road operating and maintenance costs. The following strategies are intended to address and manage road impacts of weather.

W01 BATTERY BACKUP FOR POWER TO CAMERAS

Description

Install battery backup for cameras so that cameras will function during power outages.
Key location:

- Siskiyou area

Expected Benefits

- Improve real-time information during storm events or other events that are likely to cause power outages

Lead Agencies	Capital Costs	Annual O&M
ODOT	$1,000 to $2,000	$100

W02 INSTALL GRIP FACTOR SENSORS AND WARNING SYSTEMS

Description

Install grip factor sensors at key locations along with a warning system (activated flashing beacons, VSM, or other means) to alert drivers when road conditions warrant slower travel speeds.
Key locations:

- Foothill Road (prone to icy conditions) - Jackson County
- McAndrew's (15% grade) - Medford

Expected Benefits

- Improve safety by informing travelers when reduced speed conditions are warranted.

Lead Agencies	Capital Costs	Annual O&M
Jackson County, Medford	$25,000 to $45,000 (ITS database and US DOT)	$2,000

Connected Vehicle Potential

In-vehicle signage can be used to warn drivers of road conditions

W03 ROAD WEATHER INFORMATION SYSTEM (RWIS)

Description

Install RWIS stations at key locations to provide information to agency personnel and travelers about road weather conditions.

Expected Benefits

- Travelers perceive enhanced safety by being better prepared for roadway conditions
- Lower traveler frustrations due to better real- time information
- Expected B:C ratios 2:1 to 10:1
- Improved weather information leads to more efficient application of anti-icing chemicals, reduced maintenance costs, reduced delay, and increases safety (US DOT)

Lead Agencies	Capital Costs	Annual O&M
ODOT	$25,000 to $40,000 (ITS database and US DOT)	$5,000 additional cost if communication services are leased

Connected Vehicle Potential

Road Weather Motorist Alert and Warning or *Spot Weather Impact Warning* applications – collect and distribute road weather warnings and information directly through connected vehicles.

TRAVELER INFORMATION

Traveler strategies focus on delivering pre- and en-route information about conditions for multimodal transportation routes and services including travel time, weather, incidents, closures, pricing.

TI01 INSTALL VARIABLE MESSAGE SIGNS

Description

Install variable message signs (VMS) to inform drivers of road conditions and detours.

Key locations for new signs:

- OR62 expressway / OR62 business route
- OR199 (throughout)
- I-5 (throughout)

Key location to replace VMS:

- I-5: North Mountain Ave (Ashland) and Table Rock Road (Central Point) - noted as project 18905 in the 2015 - 2018 STIP

Expected Benefits

- Improve traveler information and driver's ability to make informed decisions
- A study in rural Missouri showed that 94% of drivers took the action indicated on the VMS
- Decrease mean driving speed and crash severity when VMS are used to communicate weather information and roadway conditions
- Another study in rural Missouri used VMS to notify drivers about a significant detour during a bridge closure. 41% of drivers learned of the closure via VMS (media was also used to inform drivers - TV, radio, newspaper, etc.)

Lead Agencies	**Capital Costs**	**Annual O&M**
ODOT, local agencies	$40,000 to $100,000 per sign (ITS database) Additional costs: Mounting structure $100,000 to $200,000 range Communication cost is highly variable and dependent on location options	$5,000

Connected Vehicle Potential

In-Vehicle Signage or *Advanced Traveler Information Systems* application – send traveler information directly to vehicle.

TI02 IMPROVE REAL-TIME TRAVELER INFORMATION BY WORKING WITH THRID PARTY INFORMATION SERVICE PROVIDERS (ISP)

Description

Create partnerships with private ISPs to gain access to travel time data and related products to better provide travelers with real-time roadway information.

Expected Benefits

Improved traveler experience and expectations

Lead Agencies	Capital Costs	Annual O&M
ODOT, private partnerships, media	Varies	Varies

Connected Vehicle Potential

Advanced Traveler Information Systems can be used to update travelers with real time traffic, transit, road weather, work zone and connected vehicle related data using information provided by ISPs.

TI03 INCREASE USE OF TRIPCHECK TRAVELER INFORMATION PROTAL (TTIP) LOCAL ENTRY TOOL

Description

TTIP Local Entry Tool allows local agencies to input information that will be displayed through the TripCheck website. It allows travelers to visit a single website for both ODOT and local agency information. Agencies can enter information about planned events, such as maintenance and construction, parades, races, and other events that effect traffic.

Expected Benefits

Improved traveler experience and expectations

Lead Agencies	Capital Costs	Annual O&M
ODOT, private partnerships, media	N/A	Cost for staff time to train and implement process

EMERGENCY AND INCIDENT MANAGEMENT

Emergency and Incident Management strategies focus on improving response during an incident, reducing incident clearance times and increasing safety for both responders and travelers.

EM01 9-1-1 DISPATCH INTERCONNECT

Description

Connect the 9-1-1 dispatch center with ODOT and OSP. This system will automate data transfer between 9-1-1 dispatch, ODOT, and OSP. Each agency can choose (through automated filters) what information to publish to the system. Once the data is on the CAD system it is available to all subscribers. Each agency can determine what data they want to automatically pull from the database. For example, ODOT can create a setting for notifications of specific type of incident on an ODOT facility. Likewise, OSP can automate their side to only publish roadway related activity and not all police activity to the system.

Expected Benefits

- Based on Deschutes Co Pilot project:
- Reduce incident response time by 30%
- Shorten incident duration by 38%
- Reduce dispatch response time by 25%
- Reduce interagency calls by 60%

Lead Agencies	Capital Costs	Annual O&M
ODOT, Oregon State Police, ESCO	Varies depending on whether communications infrastructure is available	Cost for staff time

EM02 SITUATIONAL SOFTWARE

Description

Invest in situational software to use during incident or emergency response that shows where each of the response agencies/vehicles is (en route, at the scene, and during clean up)

Expected Benefits

- Faster incident clearance
- Improve on-scene communication
- Improve incident scene management

Lead Agencies	Capital Costs	Annual O&M
Oregon State Police, local emergency response agencies	n/a (annual license fee)	$56,000 (Currently paid for by a federal grant)

Connected Vehicle Potential

Incident Scene Pre-Arrival Staging Guidance for Emergency Responders application – provides situational awareness and coordination among emergency responders.

EM03 PORTABLE VARIABLE MESSAGE SIGNS (VMS)

Description

Purchase additional portable VMS to use during events and incidents to improve communication to travelers and public outreach during events.

Expected Benefits

- Reduce out of direction travel
- Reduce traveler frustration by improving traveler knowledge
- Reduce driver speeds by 3.6 mph upstream of work zones (study in rural Missouri)
- When used in conjunction with radar, a study in Virginia found a 50% reduction in speeding vehicles through work zones, with a decrease in vehicle speeds of up to 9 mph within a work zone
- When used in conjunction with incident management - reduce fuel consumption by 1.2% (San Antonio study)

Lead Agencies	Capital Costs	Annual O&M
ODOT	$15,000 to $20,000 (ITS database)	$1,500

Connected Vehicle Potential

In-Vehicle Signage provides travelers with warnings for emergency situations.

EM04 INTEROPERABLE COMMUNICATION PROCEDURES

Description

Implement standard protocols for using radios between agencies and train response Staff. This strategy could be a task for the TIM Team to develop. Coordinate with statewide effort to create standards for interoperability.

Expected Benefits

- Faster incident response and clearance
- Improve on-scene communication

Lead Agencies	Capital Costs	Annual O&M
ODOT	N/A	Staff time

EM05 EMERGENCY MANAGEMENT TRAINING

Description

Purchase additional portable VMS to use during events and incidents to improve communication to travelers and public outreach during events.

Expected Benefits

Institute regular Incident Command System (ICS) and Emergency Operation Center (EOC) training for appropriate staff. Include mock scenarios during training sessions.

Lead Agencies	Capital Costs	Annual O&M
ODOT	$8,000 to $20,000 (ITS database)	Staff time for training

Connected Vehicle Potential

In-Vehicle Signage provides travelers with warnings for emergency situations.

DATA MANAGEMENT AND PERFORMANCE

Data management and performance focuses on the collection, archiving, and publishing of sensor and operations data for measuring performance of the transportation system.

DM01 PERFORMANCE MEASURE REPOSITORY

Description

Develop a plan to identify performance measures and data needs for the Rogue Valley region. Determine a regular interval (annual, quarterly, etc.) to publish data. Develop coordination plan/policy for maintenance and construction information sharing across agencies and create a data repository (located at the DOT or MPO).

Expected Benefits

- Improved operational efficiency
- Decrease construction costs if agencies can combine efforts for a "dig once" policy in areas with joint agency equipment or projects

Lead Agencies	Capital Costs	Annual O&M
ODOT, local agencies, RVCOG	Maybe covered by the statewide initiative. Additional cost if installation of devices or communications are necessary to collect data	Staff time

Connected Vehicle Potential

Performance Monitoring and Planning application relies on connected vehicle data to support performance monitoring.

FREIGHT MANAGEMENT

Freight Management strategies target ways to improve reliability and safety for heavy vehicles.

FM01 IMPROVE RAIL CROSSINGS

Description

Railroad crossing signal installations and signal upgrades

Key Locations:

- Rapp Rd (Talent)

- Glen St. (Ashland)
- Private Drive (Ashland)
- OR 99/Beall Laine (Central Point)
- Pacific Ave (White City)

Expected Benefits

- Improve safety at rail crossing

Lead Agencies	Capital Costs	Annual O&M
ODOT, local agencies	$100,000 per rail crossing	$2,000

Connected Vehicle Potential

Railroad Crossing Violation Warning application will alert drivers that they are approaching a railroad crossing if they are on a crash imminent trajectory.

FM02 TRUCK SIGNAL PRIORITY

Description

Install detection at traffic signals along designated freight routes that identifies approaching heavy vehicles and speed, and either extends green or conflicting red to prevent collision potential.

Key Locations:

- OR 62 at I-5 exit 30
- I-5 exit 33 truck stop
- Phoenix exit 24 truck stop
- 99 in downtown Medford
- Truck stop in Central Point and Biddle

Expected Benefits

- Improve safety by 20% with dilemma zone protection (study based on all vehicles, not limited to trucks)
- Decrease truck stops and decrease emissions
- If used with truck signal priority, truck travel times would likely improve
-

Lead Agencies	Capital Costs	Annual O&M
ODOT, local agencies	$8,000 per intersection	$1,000

PUBLIC TRANSPORTATION

Public Transportation Management strategies target ways to improve the transit experience for a transit user as well as improve operations of the transit fleet.

P01 COORDINATE TRANSIT SIGNAL PRIORITY (TSP) ON KEY CORRIDORS

Description

Install TSP detection and transponders along select corridors and transit vehicles. TSP provide an early green, queue jump, or extended green for transit vehicles to help reduce transit delay. Efforts need to be coordinated across jurisdictions.

Expected Benefits

- Decrease transit delay - studies show up to a 40% reduction
- Improve transit travel time by 1.5 to 15%
- Decrease bus fuel use and emissions

Lead Agencies	Capital Costs	Annual O&M
RVTD, JCT, ODOT, local agencies	$5,000 per intersection if existing software and controllers can be used. $25,000 to $30,000 per intersection if new equipment is needed. Additional cost for transponders on buses	$1,000

P02 AUTOMATED FAIR COLLECTION SYSTEM

Description

Plan for and implement an e-fare system that could allow transit users to pay their fare in a variety of ways: prior to arriving at a transit station, using a mobile device, using a "smart pass", or some other means that does not require exchanging cash.

Expected Benefits

- Improve Reduction in boarding times by up to 38%
- Potential to increase ridership, decrease fare evasion, and reduce administrative cost

Lead Agencies	Capital Costs	Annual O&M
RVTD, JCT	Highly variable - $50,000 to $500,000 for system wide integration	Varies

P03 AUTOMATED COORDINATION OF TRANSIT TRANSFER POINTS

Description

Use scheduling software and GPS/AVL data to coordinate transfer points between routes, across transit agencies serving the Rogue Valley communities. Note: this is not demand-responsive or deviated service initiated by passengers; it is based on requests from bus operators.

Expected Benefits

- Integrating regional transit services
- Seamless transit rider experience regardless of transit operator
- More efficient operations

Lead Agencies	Capital Costs	Annual O&M
RVTD, JCT	n/a	n/a

Connected Vehicle Potential

Dynamic Transit Operations application – allows transit operators to coordinate schedules, routes, and stops.

P04 REAL TIME BIKE RACK AVAILABILITY INFORMATION

Description

Use sensors and a mobile app or website to inform travelers of bike rack availability at transit stops and possibly on transit vehicles.

Expected Benefits

- Bicycle/Transit users can improve their transportation choices through reducing unnecessary wait times

Lead Agencies	Capital Costs	Annual O&M
RVTD, JCT	n/a	n/a

APPENDICES

APPENDIX A: GLOSSARY OF ACRONYMS

Appendix A provides a list of acronyms used throughout the plan.

APC	Automated Passenger Counter
ASA	Automated Stop Announcement
AASHTO	American Association of State Highway and Transportation Officials
ASTM	American Society for Testing and Materials
ATC	Advanced Transportation Controller
ATIS	Advanced Traveler Information Systems
AVL	Automated Vehicle Locator
CAD	Computer Aided Dispatch
CVO	Commercial Vehicle Operator
CVRIA	Connected Vehicle Reference Implementation Architecture
DSRC	Dedicated Short Range Communications
ECSO	Emergency Communications of Southern Oregon
EOC	Emergency Operations Center
FAST	Fixing America's Surface Transportation (Act)
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GTFS	Google Transit Feed Specification (GTFS)
ICS	Incident Command System
IEEE	Institute of Electrical and Electronics Engineers
IMSS	Incident Management Message Sets
ISP	Information Service Provider
ITE	Institute for Transportation Engineers
ITS	Intelligent Transportation System
JCT	Josephine Community Transit
MAP-21	Moving Ahead for Progress in the 21st Century
MPO	Metropolitan Planning Organization
MRMPO	Middle Rogue Metropolitan Planning Organization
MS/ETMCC	Message Sets for External Traffic Management Center Communications
NAWAS	National Air Warning Alert System
NEMA	National Electrical Manufacturers Association

NTCIP	National Transportation Communications for ITS Protocol
ODOT	Oregon Department of Transportation
OSP	Oregon State Police
PAC	Policy Advisory Council
PSAP	Public Safety Answering Point
PTZ	Pan Tilt Zoom (camera)
RRFB	Rectangular Rapid Flash Beacons
RTP	Regional Transportation Plan
RVCOG	Rogue Valley Council of Governments
RVMPO	Rogue Valley Metropolitan Planning Organization
RVTD	Rogue Valley Transit District
RWIS	Road Weather Information System
SAE	Society of Automotive Engineers
SET-IT	Systems Engineering Tool to Intelligent Transportation
TAC	Technical Advisory Committee
TCIP	Transit Communications Interface Protocol
TLE	TripCheck Local Entry
TMDD	Traffic Management Data Dictionary
TSP	Transit Signal Priority
TTIP	Tripcheck Traveler Information Portal
VMS	Variable Message Sign
USDOT	United States Department of Transportation

APPENDIX B: SERVICE PACKAGE DESCRIPTIONS

Appendix B provides the detailed descriptions for the service packages included in the Rogue Valley Regional ITS Plan. The National ITS Architecture 7.1 is the source of the service package definitions.

Service Package	Description
AD1	**ITS Data Mart** This service package provides a focused archive that houses data collected and owned by a single agency, district, private sector provider, research institution, or other organization. This focused archive typically includes data covering a single transportation mode and one jurisdiction that is collected from an operational data store and archived for future use. It provides the basic data quality, data privacy, and meta data management common to all ITS archives and provides general query and report access to archive data users.
AD2	**ITS Data Warehouse** This service package includes all the data collection and management capabilities provided by the ITS Data Mart, and adds the functionality and interface definitions that allow collection of data from multiple agencies and data sources spanning across modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this service package in addition to the basic query and reporting user access features offered by the ITS Data Mart.
AD3	**ITS Virtual Data Warehouse** This service package provides the same broad access to multimodal, multidimensional data from varied data sources as in the ITS Data Warehouse service package, but provides this access using enhanced interoperability between physically distributed ITS archives that are each locally managed. Requests for data that are satisfied by access to a single repository in the ITS Data Warehouse service package are parsed by the local archive and dynamically translated to requests to remote archives which relay the data necessary to satisfy the request.
APTS01	**Transit Vehicle Tracking** This service package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle (e.g., through GPS) and relayed to the infrastructure or may be determined directly by the communications infrastructure. A two-way wireless communication link with the Transit Management Subsystem is used for relaying vehicle position and control measures.

Service Package	Description
	Fixed route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The Transit Management Subsystem processes this information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider.
APTS02	**Transit Fixed-Route Operations** This service package performs automated dispatch and system monitoring for fixed-route and flexible-route transit services. This service performs scheduling activities including the creation of schedules, blocks and runs, as well as operator assignment. This service determines the transit vehicle trip performance against the schedule using AVL data and provides information displays at the Transit Management Subsystem. Static and real time transit data is exchanged with Information Service Providers where it is integrated with that from other transportation modes (e.g. rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.
APTS03	**Demand Response Transit Operations** This service package performs automated dispatch and system monitoring for demand responsive transit services. This service performs scheduling activities as well as operator assignment. In addition, this service package performs similar functions to support dynamic features of flexible-route transit services. This package monitors the current status of the transit fleet and supports allocation of these fleet resources to service incoming requests for transit service while also considering traffic conditions. The Transit Management Subsystem provides the necessary data processing and information display to assist the transit operator in making optimal use of the transit fleet. This service includes the capability for a traveler request for personalized transit services to be made through the Information Service Provider (ISP) Subsystem. The ISP may either be operated by a transit management center or be independently owned and operated by a separate service provider. In the first scenario, the traveler makes a direct request to a specific paratransit service. In the second scenario, a third party service provider determines that the paratransit service is a viable means of satisfying a traveler request and makes a reservation for the traveler.
APTS04	**Transit Fare Collection Management** This service package manages transit fare collection on-board transit vehicles and at transit stops using electronic means. It allows transit users to use a traveler card or other electronic payment device. Readers located either in the infrastructure or on-board the transit vehicles enable electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem. Two other service packages, ATMS10: Electronic Toll Collection and ATMS16: Parking Facility Management, also provide electronic

Service Package	Description
	payment services. These three service packages in combination provide an integrated electronic payment system for transportation services.
APTS05	**Transit Security** This service package provides for the physical security of transit passengers and transit vehicle operators. On-board equipment is deployed to perform surveillance and sensor monitoring in order to warn of potentially hazardous situations. The surveillance equipment includes video (e.g., CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g., chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g., metal detectors). Transit user or transit vehicle operator activated alarms are provided on-board. Public areas (e.g., transit stops, park and ride lots, stations) are also monitored with similar surveillance and sensor equipment and provided with transit user activated alarms. In addition this service package provides surveillance and sensor monitoring of non-public areas of transit facilities (e.g., transit yards) and transit infrastructure such as bridges, tunnels, and transit railways or bus rapid transit (BRT) guideways. The surveillance equipment includes video and/or audio systems. The sensor equipment includes threat sensors and object detection sensors as described above as well as, intrusion or motion detection sensors and infrastructure integrity monitoring (e.g., rail track continuity checking or bridge structural integrity monitoring). The surveillance and sensor information is transmitted to the Emergency Management Subsystem, as are transit user activated alarms in public secure areas. On-board alarms, activated by transit users or transit vehicle operators are transmitted to both the Emergency Management Subsystem and the Transit Management Subsystem, indicating two possible approaches to implementing this service package. In addition the service package supports remote transit vehicle disabling by the Transit Management Subsystem and transit vehicle operator authentication.
APTS06	**Transit Fleet Management** This service package supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Subsystem. Hardware and software in the Transit Management Subsystem processes this data and schedules preventative and corrective maintenance. The service package also supports the day to day management of the transit fleet inventory, including the assignment of specific transit vehicles to blocks.
APTS07	**Multi-modal Coordination**

Service Package	Description
	This service package establishes two way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transit transfer points and clusters (a collection of stops, stations, or terminals where transfers can be made conveniently) and also improve operating efficiency. Transit transfer information is shared between Multimodal Transportation Service Providers and Transit Agencies.
APTS08	**Transit Traveler Information** This service package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this service package.
APTS09	**Transit Signal Priority** This service package determines the need for transit priority on routes and at certain intersections and requests transit vehicle priority at these locations. The signal priority may result from limited local coordination between the transit vehicle and the individual intersection for signal priority or may result from coordination between transit management and traffic management centers. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network.
APTS10	**Transit Passenger Counting** This service package counts the number of passengers entering and exiting a transit vehicle using sensors mounted on the vehicle and communicates the collected passenger data back to the management center. The collected data can be used to calculate reliable ridership figures and measure passenger load information at particular stops.
ATIS01	**Broadcast Traveler Information** This service package collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadcasts the information to travelers using technologies such as FM subcarrier, satellite radio, cellular data broadcasts, and Internet web casts. The information may be provided directly to travelers or provided to merchants and other traveler service providers so that they can better inform their customers of travel conditions. Different from the service package ATMS06 - Traffic Information

Service Package	Description
	Dissemination, which provides localized HAR and DMS information capabilities, ATIS01 provides a wide area digital broadcast service. Successful deployment of this service package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.
ATIS02	**Interactive Traveler Information** **This service package provides tailored information** in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours and pricing information. Although the Internet is the predominate network used for traveler information dissemination, a range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications between the traveler and Information Service Provider. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal and web pages via kiosk, personal digital assistant, personal computer, and a variety of in-vehicle devices. This service package also allows value-added resellers to collect transportation information that can be aggregated and be available to their personal devices or remote traveler systems to better inform their customers of transportation conditions. Successful deployment of this service package relies on availability of real-time transportation data from roadway instrumentation, transit, probe vehicles or other means. A traveler may also input personal preferences and identification information via a "traveler card" that can convey information to the system about the traveler as well as receive updates from the system so the card can be updated over time.
ATIS03	**Autonomous Route Guidance** This service package relies on in-vehicle sensory, location determination, computational, map database, and interactive driver interface equipment to enable route planning and detailed route guidance based on static, stored information. No communication with the infrastructure is assumed or required. Identical capabilities are available to the traveler outside the vehicle by integrating a similar suite of equipment into portable devices.
ATIS04	**Dynamic Route Guidance** This service package offers advanced route planning and guidance that is responsive to current conditions. The package combines the autonomous route guidance user equipment with a digital receiver capable of receiving real-time traffic, transit, and road condition information, which is considered by the user equipment in provision of route guidance.

Service Package	Description
ATIS05	**ISP Based Trip Planning and Route Guidance** This service package offers the user trip planning and en-route guidance services. It generates a trip plan, including a multimodal route and associated service information (e.g., parking information), based on traveler preferences and constraints. Routes may be based on static information or reflect real time network conditions. Unlike ATIS3 and ATIS4, where the user equipment determines the route, the route determination functions are performed in the Information Service Provider Subsystem in this service package. The trip plan may be confirmed by the traveler and advanced payment and reservations for transit and alternate mode (e.g., airline, rail, and ferry) trip segments, and ancillary services (e.g., parking reservations) are accepted and processed. The confirmed trip plan may include specific routing information that can be supplied to the traveler as general directions or as turn-by-turn route guidance depending on the level of user equipment.
ATIS08	**Dynamic Ridesharing** This service package provides dynamic ridesharing/ride matching services to travelers. This service could allow near real time ridesharing reservations to be made through the same basic user equipment used for Interactive Traveler Information. This ridesharing/ride matching capability also includes arranging connections to transit or other multimodal services.
ATIS09	**In Vehicle Signing** This service package augments regulatory, warning, and informational signs and signals by providing information directly to drivers through in-vehicle devices. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states including highway intersection and highway-rail intersection status and local conditions warnings identified by local environmental sensors). It includes short range communications between field equipment and the vehicle and connections to the Traffic Management Subsystem for monitoring and control. This service package also includes the capability for maintenance and construction, transit, and emergency vehicles to transmit sign information to vehicles in the vicinity so that in vehicle signing can be used without fixed infrastructure in work zones, around incidents, and in areas where transit operations impacts traffic.
ATIS10	**Short Range Communications Traveler Information** This service package provides location-specific or situation-relevant information to travelers in vehicles using Dedicated Short Range Communications (DSRC) infrastructure supporting mobility applications for connected vehicles. DSRC is used

Service Package	Description
	to deliver real-time traveler information including travel times, incident information, road conditions, and emergency traveler information to vehicles as they pass DSRC roadside equipment along their route. This service package provides public information that is available to all equipped vehicles in the vicinity of the roadside equipment.
ATMS01	**Network Surveillance** This service package includes traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Subsystem). The data generated by this service package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.
ATMS03	**Traffic Signal Control** This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.
ATMS04	**Traffic Metering** This service package provides central monitoring and control, communications, and field equipment that support metering of traffic. It supports the complete range of metering strategies including ramp, interchange, and mainline metering. This package incorporates the instrumentation included in the Network Surveillance service package (traffic sensors are used to measure traffic flow and queues) to support traffic monitoring so responsive and adaptive metering strategies can be implemented. Also included is configurable field equipment to provide information to drivers approaching a meter, such as advance warning of the meter, its operational status (whether it is currently on or not, how many cars per green are

Service Package	Description
	allowed, etc.), lane usage at the meter (including a bypass lane for HOVs) and existing queue at the meter.
ATMS06	**Traffic Information Dissemination** This service package provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, travel restrictions, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Information Service Providers. A link to the Maintenance and Construction Management subsystem allows real time information on road/bridge closures and restrictions due to maintenance and construction activities to be disseminated. The sharing of transportation operations data described in this service package also supports other services like ATMS09-Traffic Decision Support and Demand Management.
ATMS07	**Regional Traffic Management** This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the ATMS03-Traffic Signal Control and ATMS04-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.
ATMS08	**Traffic Incident Management System** This service package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The

Service Package	Description
	service package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters. Information from these diverse sources is collected and correlated by this service package to detect and verify incidents and implement an appropriate response. This service package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications or resource coordination between center subsystems. Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination service package and dissemination of incident information to travelers through the Broadcast Traveler Information or Interactive Traveler Information service packages. The roadside equipment used to detect and verify incidents also allows the operator to monitor incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency field personnel. The coordination can also extend to tow trucks and other allied response agencies and field service personnel.
ATMS09	**Transportation Decision Support and Demand Management** This service package recommends courses of action to traffic operations personnel based on an assessment of current and forecast road network performance. Recommendations may include predefined incident response plans and regional surface street and freeway control strategies that correct network imbalances. Where applicable, this service package also recommends transit, parking, and toll strategies to influence traveler route and mode choices to support travel demand management (TDM) programs and policies managing both traffic and the environment. TDM recommendations are coordinated with transit, parking, and toll administration centers to support regional implementation of TDM strategies. Incident response and congestion management recommendations are implemented by the local traffic management center and coordinated with other regional centers by other service packages (see ATMS07-Regional Traffic Management and ATMS08-Traffic Incident Management). All recommendations are based on historical evaluation, real-time assessment, and forecast of the roadway network performance based on predicted travel demand patterns. Traffic data is collected from sensors and surveillance equipment as well as other transportation management centers (see ATIS06-Transportation Operations Data Sharing). Forecasted traffic loads are derived from historical data and route plans supplied by the Information Service Provider Subsystem. This service package also collects air quality, parking availability, transit usage, and vehicle occupancy data to support TDM, where applicable.

Service Package	Description
ATMS13	**Standard Railroad Grade Crossing** This service package manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported. (Note that passive systems exercise only the single interface between the roadway subsystem and the driver in the architecture definition.) These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.
ATMS15	**Railroad Operations Coordination** This service package provides an additional level of strategic coordination between freight rail operations and traffic management centers. Rail operations provides train schedules, maintenance schedules, and any other forecast events that will result in highway-rail intersection (HRI) closures. This information is used to develop forecast HRI closure times and durations that may be used in advanced traffic control strategies or to enhance the quality of traveler information.
ATMS16	**Parking Facility Management** This service package provides enhanced monitoring and management of parking facilities. It assists in the management of parking operations, coordinates with transportation authorities, and supports electronic collection of parking fees. This service package collects current parking status, shares this data with Information Service Providers and Traffic Management, and collects parking fees using the same in-vehicle equipment utilized for electronic toll collection or contact or proximity traveler cards used for electronic payment. Two other service packages, APTS04: Transit Fare Collection Management and ATMS10: Electronic Toll Collection also provide electronic payment services. These three service packages in combination provide an integrated electronic payment system for transportation services.
ATMS17	**Regional Parking Management** This service package supports communication and coordination between equipped parking facilities and also supports regional coordination between parking facilities and traffic and transit management systems. This service package also shares information with transit management systems and information service providers to

Service Package	Description
	support multimodal travel planning, including parking reservation capabilities. Information including current parking availability, system status, and operating strategies are shared to enable local parking facility management that supports regional transportation strategies.
ATMS19	**Speed Warning and Enforcement** This service package monitors vehicle speeds and supports warning drivers when their speed is excessive. Also the service includes notifications to an enforcement agency to enforce the speed limit of the roadway. Speed monitoring can be made via spot speed or average speed measurements. Roadside equipment can display the speed of passing vehicles and/or suggest a safe driving speed. Environmental conditions and vehicle characteristics may be monitored and factored into the safe speed advisories that are provided to the motorist. For example, warnings can be generated recognizing the limitations of a given vehicle for the geometry of the roadway such as rollover risk for tall vehicles. This service focuses on monitoring of vehicle speeds and enforcement of the speed limit while the variable speed limits service (covered in ATMS22-Variable Speed Limits service package) focuses on varying the posted speed limits to create more uniform speeds along a roadway, to promote safer driving during adverse conditions (such as fog) and/or to reduce air pollution.
ATMS21	**Roadway Closure Management** This service package closes roadways to vehicular traffic when driving conditions are unsafe, maintenance must be performed, and other scenarios where access to the roadway must be prohibited. The service package includes automatic or remotely controlled gates or barriers that control access to roadway segments including ramps and traffic lanes. Remote control systems allow the gates to be controlled from a central location or from a vehicle at the gate/barrier location, improving system efficiency and reducing personnel exposure to unsafe conditions during severe weather and other situations where roads must be closed. Surveillance systems allow operating personnel to visually verify the safe activation of the closure system and driver information systems (e.g., DMS) provide closure information to motorists in the vicinity of the closure. The equipment managed by this service package includes the control and monitoring systems, the field devices (e.g., gates, warning lights, DMS, CCTV cameras) at the closure location(s), and the information systems that notify other systems of a closure. This service package covers general road closure applications; specific closure systems that are used at railroad grade crossings, drawbridges, reversible lanes, etc. are covered by other ATMS service packages
ATMS22	Variable Speed Limits This service package closes roadways to vehicular traffic when driving conditions are unsafe, maintenance must be performed, and other scenarios

Service Package	Description
	where access to the roadway must be prohibited. The service package includes automatic or remotely controlled gates or barriers that control access to roadway segments including ramps and traffic lanes. Remote control systems allow the gates to be controlled from a central location or from a vehicle at the gate/barrier location, improving system efficiency and reducing personnel exposure to unsafe conditions during severe weather and other situations where roads must be closed. Surveillance systems allow operating personnel to visually verify the safe activation of the closure system and driver information systems (e.g., DMS) provide closure information to motorists in the vicinity of the closure. The equipment managed by this service package includes the control and monitoring systems, the field devices (e.g., gates, warning lights, DMS, CCTV cameras) at the closure location(s), and the information systems that notify other systems of a closure. This service package covers general road closure applications; specific closure systems that are used at railroad grade crossings, drawbridges, reversible lanes, etc. are covered by other ATMS service packages.
ATMS24	**Dynamic Roadway Warning** This service package includes systems that dynamically warn drivers approaching hazards on a roadway. Such hazards include roadway weather conditions, road surface conditions, traffic conditions including queues, obstacles or animals in the roadway and any other transient event that can be sensed. These dynamic roadway warning systems can alert approaching drivers via warning signs, flashing lights, in-vehicle messages, etc. Such systems can increase the safety of a roadway by reducing the occurrence of incidents. The system can be centrally monitored and controlled by a traffic management center or it can be autonomous. Speed warnings that consider the limitations of a given vehicle for the geometry of the roadway (e.g., rollover risk for tall vehicles) are not included in this service package but are covered by the ATMS19 – Speed Warning and Enforcement service package. Roadway warning systems, especially queue warning systems are an Active Traffic Management (ATM) strategy and are typically used in conjunction with other ATM strategies (such as ATMS22-Variable Speed Limits and ATMS23-Dynamic Lane Management and Shoulder Use).
ATMS26	**Mixed Use Warning Systems** This service package supports the sensing and warning systems used to interact with pedestrians, bicyclists, and other vehicles that operate on the main vehicle roadways, or on pathways which intersect the main vehicle roadways. These systems could allow automated warning or active protection for this class of users.
AVSS01	**Vehicle Safety Monitoring**

Service Package	Description
	This service package will diagnose critical components of the vehicle and warn the driver of potential dangers. On-board sensors will determine the vehicle's condition, performance, on-board safety data, and display information.
AVSS02	**Driver Safety Monitoring** This service package will determine the driver's condition, and warn the driver of potential dangers. On-board sensors will determine the driver's condition, performance, on-board safety data, and display information.
AVSS03	**Longitudinal Safety Warning** This service package allows for longitudinal warning. It utilizes safety sensors and collision sensors. It requires on-board sensors to monitor the areas in front of and behind the vehicle and present warnings to the driver about potential hazards.
AVSS04	**Lateral Safety Warning** This service package allows for lateral warning. It utilizes safety sensors and collision sensors. It requires on-board sensors to monitor the areas to the sides of the vehicle and present warnings to the driver about potential hazards.
AVSS10	**Intersection Collision Avoidance** This service package will determine the probability of an intersection collision and provide timely warnings to approaching vehicles so that avoidance actions can be taken. This service package builds on the Intersection Safety Warning field and in-vehicle equipment and adds equipment in the vehicle that can take control of the vehicle to avoid intersection violations and potential collisions. The same sensors and communications equipment in the roadway infrastructure are used to assess vehicle locations and speeds near an intersection. This information is determined and communicated to the approaching vehicle using a short range communications system. The vehicle uses this information to develop control actions which alter the vehicle's speed and steering control and potentially activate its pre-crash safety system.
CVO03	**Electronic Clearance** This service package provides for automated clearance at roadside check facilities. The roadside check facility communicates with the Commercial Vehicle Administration subsystem to retrieve infrastructure snapshots of critical carrier, vehicle, and driver data to be used to sort passing vehicles. This allows a good driver/vehicle/carrier to pass roadside facilities at highway speeds using transponders and Field-Vehicle Communications to the roadside. Results of roadside clearance activities will be passed on to the Commercial Vehicle Administration. The roadside check facility may be equipped with Automated Vehicle Identification (AVI), weighing sensors, transponder read/write devices and

Service Package	Description
	computer workstations.
CVO04	**CV Administrative Processes** This service package supports program administration and enrollment and provides for electronic application, processing, fee collection, issuance, and distribution of CVO credential and tax filing. Through this process, carriers, drivers, and vehicles may be enrolled in a variety of programs including electronic clearance and wireless inspection programs which allow commercial vehicles to be screened at mainline speeds. Through this enrollment process, current profile databases are maintained in the Commercial Vehicle Administration subsystem and snapshots of this data are made available to the roadside check facilities. Current program status is maintained and made available to carriers, drivers, and other authorized users of the data. Enrolled carriers are provided the option to review and challenge the collected data. Commercial Vehicle Administration subsystems can share current program status and credential information with other Commercial Vehicle Administration subsystems, so that it is possible for any Commercial Vehicle Administration subsystem to have access to all credentials, credential fees, credentials status and safety status information. In addition, it is possible for one Commercial Vehicle Administration subsystem to collect HAZMAT route restrictions information from other Commercial Vehicle Administration subsystems and then act as a clearinghouse for this route restrictions information for Information Service Providers, Map Update Providers, and Fleet and Freight Management subsystems.
CVO06	**Weigh-In-Motion** This service package provides for high speed weigh-in-motion with or without Automated Vehicle Identification (AVI) capabilities. This service package provides the roadside equipment that could be used as a stand-alone system or to augment the Electronic Clearance (CVO03) service package. It also supports virtual weigh station configurations that do not require continuous staffing and are monitored from another location. These sites may include a variety of sensor components to collect data in addition to the weigh-in-motion sensors and include a camera system and communications with the remote monitoring location.
CVO10	**HAZMAT Management** This service package integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT material and incidents. HAZMAT tracking is performed by the Fleet and Freight Management Subsystem. The Emergency Management subsystem is notified by the Commercial Vehicle if an incident occurs and coordinates the response. The response is tailored based on information that is provided as part of the original incident notification or derived from supplemental information provided by the Fleet and Freight Management

Service Package	Description
	Subsystem. The latter information can be provided prior to the beginning of the trip or gathered following the incident depending on the selected policy and implementation.
EM01	**Emergency Call-Taking and Dispatch** This service package provides basic public safety call-taking and dispatch services. It includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Subsystems supports emergency notification between agencies. Wide area wireless communications between the Emergency Management Subsystem and an Emergency Vehicle supports dispatch and provision of information to responding personnel.
EM02	**Emergency Routing** This service package supports automated vehicle location and dynamic routing of emergency vehicles. Traffic information, road conditions, and suggested routing information are provided to enhance emergency vehicle routing. Special priority or other specific emergency traffic control strategies can be coordinated to improve the safety and time-efficiency of responding vehicle travel on the selected route(s). The Emergency Management Subsystem provides the routing for the emergency fleet based on real-time conditions and has the option of requesting a route from the Traffic Management subsystem. The Emergency Vehicle may also be equipped with dedicated short range communications for local signal preemption and the transmission of alerts to surrounding vehicles. The service provides for information exchange between care facilities and both the Emergency Management Subsystem and emergency vehicles.
EM03	**Mayday and Alarms Support** This service package allows the user (driver or non-driver) to initiate a request for emergency assistance and enables the Emergency Management Subsystem to locate the user, gather information about the incident, and determine the appropriate response. The request for assistance may be manually initiated or automated and linked to vehicle sensors. This service package also includes general surveillance capabilities that enable the Emergency Management Subsystem to remotely monitor public areas (e.g., rest stops, parking lots) to improve security in these areas. The Emergency Management Subsystem may be operated by the public sector or by a private sector telematics service provider.
EM04	**Roadway Service Patrols** This service package supports roadway service patrol vehicles that monitor roads that aid motorists, offering rapid response to minor incidents (flat tire, accidents,

Service Package	Description
	out of gas) to minimize disruption to the traffic stream. If problems are detected, the roadway service patrol vehicles will provide assistance to the motorist (e.g., push a vehicle to the shoulder or median). The service package monitors service patrol vehicle locations and supports vehicle dispatch to identified incident locations. Incident information collected by the service patrol is shared with traffic, maintenance and construction, and traveler information systems.
EM05	**Transportation Infrastructure Protection** This service package includes the monitoring of transportation infrastructure (e.g., bridges, tunnels and management centers) for potential threats using sensors and surveillance equipment and barrier and safeguard systems to control access, preclude an incident, and mitigate the impact of an incident if it occurs. Threats can result from acts of nature (e.g., hurricanes, earthquakes), terrorist attacks or other incidents causing damage to the infrastructure (e.g., stray barge hitting a bridge support). Infrastructure may be monitored with acoustic, environmental threat (such as nuclear, biological, chemical, and explosives), infrastructure condition and integrity, motion and object sensors and video and audio surveillance equipment. Data from such sensors and surveillance equipment may be processed in the field or sent to a center for processing. The data enables operators at the center to detect and verify threats. When a threat is detected, agencies are notified. Detected threats or advisories received from other agencies result in an increased level of system preparedness. In response to threats, barrier and safeguard systems may be activated by Traffic Management Subsystems to deter an incident, control access to an area or mitigate the impact of an incident. Barrier systems include gates, barriers and other automated and remotely controlled systems that manage entry to transportation infrastructure. Safeguard systems include blast shields, exhaust systems and other automated and remotely controlled systems that mitigate impact of an incident.
EM06	**Wide-Area Alert** This service package uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather events, civil emergencies, and other situations that pose a threat to life and property. The alert includes information and instructions for transportation system operators and the traveling public, improving public safety and enlisting the public's help in some scenarios. The ITS technologies will supplement and support other emergency and homeland security alert systems such as the Emergency Alert System (EAS). When an emergency situation is reported and verified and the terms and conditions for system activation are satisfied, a designated agency broadcasts emergency information to traffic agencies, transit agencies, information service providers, toll operators, and others that operate ITS systems. The ITS systems, in turn, provide the alert information to transportation system operators and the traveling public using ITS technologies such as dynamic message signs, highway advisory radios, in-

Service Package	Description
	vehicle displays, transit displays, 511 traveler information systems, and traveler information web sites.
EM07	**Early Warning System** This service package monitors and detects potential, looming, and actual disasters including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and acts of terrorism including nuclear, chemical, biological, and radiological weapons attacks). The service package monitors alerting and advisory systems, ITS sensors and surveillance systems, field reports, and emergency call-taking systems to identify emergencies and notifies all responding agencies of detected emergencies.
EM08	**Disaster Response and Recovery** This service package enhances the ability of the surface transportation system to respond to and recover from disasters. It addresses the most severe incidents that require an extraordinary response from outside the local community. All types of disasters are addressed including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and national security emergencies such as nuclear, chemical, biological, and radiological weapons attacks). The service package supports coordination of emergency response plans, including general plans developed before a disaster as well as specific tactical plans with short time horizon that are developed as part of a disaster response. The service package provides enhanced access to the scene for response personnel and resources, provides better information about the transportation system in the vicinity of the disaster, and maintains situation awareness regarding the disaster itself. In addition, this service package tracks and coordinates the transportation resources - the transportation professionals, equipment, and materials - that constitute a portion of the disaster response. The service package identifies the key points of integration between transportation systems and the public safety, emergency management, public health, and other allied organizations that form the overall disaster response. In this service package, the Emergency Management subsystem represents the federal, regional, state, and local Emergency Operations Centers and the Incident Commands that are established to respond to the disaster. The interface between the Emergency Management Subsystem and the other center subsystems provides situation awareness and resource coordination among transportation and other allied response agencies. In its role, traffic management implements special traffic control strategies and detours and restrictions to effectively manage traffic in and around

Service Package	Description
	the disaster. Maintenance and construction provides damage assessment of road network facilities and manages service restoration. Transit management provides a similar assessment of status for transit facilities and modifies transit operations to meet the special demands of the disaster. As immediate public safety concerns are addressed and disaster response transitions into recovery, this service package supports transition back to normal transportation system operation, recovering resources, managing on-going transportation facility repair, supporting data collection and revised plan coordination, and other recovery activities. This service package builds on the basic traffic incident response service that is provided by ATMS08, the Traffic Incident Management service package. This service package addresses the additional complexities and coordination requirements that are associated with the most severe incidents that warrant an extraordinary response from outside the local jurisdictions and require special measures such as the activation of one or more emergency operations centers. Many users of the National ITS Architecture will want to consider both ATMS08 and this service package since every region is concerned with both day-to-day management of traffic-related incidents and occasional management of disasters that require extraordinary response. Disaster Response and Recovery is also supported by EM10, the "Disaster Traveler Information" service package that keeps the public informed during a disaster response. See that service package for more information.
EM10	**Disaster Traveler Information** This service package uses ITS to provide disaster-related traveler information to the general public, including evacuation and reentry information and other information concerning the operation of the transportation system during a disaster. This service package collects information from multiple sources including traffic, transit, public safety, emergency management, shelter provider, and travel service provider organizations. The collected information is processed and the public is provided with real-time disaster and evacuation information using ITS traveler information systems. A disaster will stress the surface transportation system since it may damage transportation facilities at the same time that it places unique demands on these facilities to support public evacuation and provide access for emergency responders. Similarly, a disaster may interrupt or degrade the operation of many traveler information systems at the same time that safety-critical information must be provided to the traveling public. This service package keeps the public informed in these scenarios, using all available means to provide information about the disaster area including damage to the transportation system, detours and closures in effect, special traffic restrictions and allowances, special transit schedules, and

Service Package	Description
	real-time information on traffic conditions and transit system performance in and around the disaster. This service package also provides emergency information to assist the public with evacuations when necessary. Information on mandatory and voluntary evacuation zones, evacuation times, and instructions are provided. Available evacuation routes and destinations and current and anticipated travel conditions along those routes are provided so evacuees are prepared and know their destination and preferred evacuation route. Information on available transit services and traveler services (shelters, medical services, hotels, restaurants, gas stations, etc.) is also provided. In addition to general evacuation information, this service package provides specific evacuation trip planning information that is tailored for the evacuee based on origin, selected destination, and evacuee-specified evacuation requirements and route parameters. This service package augments the ATIS service packages that provide traveler information on a day-to-day basis for the surface transportation system. This service package provides focus on the special requirements for traveler information dissemination in disaster situations.
MC01	**Maintenance and Construction Vehicle and Equipment Tracking** This service package will track the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities. These activities can include ensuring the correct roads are being plowed and work activity is being performed at the correct locations.
MC02	**Maintenance and Construction Vehicle Maintenance** This service package performs vehicle maintenance scheduling and manages both routine and corrective maintenance activities on vehicles and other maintenance and construction equipment. It includes on-board sensors capable of automatically performing diagnostics for maintenance and construction vehicles, and the systems that collect this diagnostic information and use it to schedule and manage vehicle maintenance.
MC03	**Road Weather Data Collection** This service package collects current road and weather conditions using data collected from environmental sensors deployed on and about the roadway (or guideway in the case of transit related rail systems). In addition to fixed sensor stations at the roadside, sensing of the roadway environment can also occur from sensor systems located on Maintenance and Construction Vehicles. The collected environmental data is used by the Weather Information Processing and Distribution service package to process the information and make decisions on operations. The collected environmental data may be aggregated, combined with data attributes

Service Package	Description
	and sent to meteorological systems for data qualification and further data consolidation. The service package may also request and receive qualified data sets from meteorological systems.
MC04	**Weather Information Processing and Distribution** This service package processes and distributes the environmental information collected from the Road Weather Data Collection service package. This service package uses the environmental data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc. so system operators and decision support systems can make decision on corrective actions to take. The continuing updates of road condition information and current temperatures can be used by system operators to more effectively deploy road maintenance resources, issue general traveler advisories, issue location specific warnings to drivers using the Traffic Information Dissemination service package, and aid operators in scheduling work activity.
MC06	**Winter Maintenance** This service package supports winter road maintenance including snow plow operations, roadway treatments (e.g., salt spraying and other anti-icing material applications), and other snow and ice control activities. This package monitors environmental conditions and weather forecasts and uses the information to schedule winter maintenance activities, determine the appropriate snow and ice control response, and track and manage response operations.
MC07	**Roadway Maintenance and Construction** This service package supports numerous services for scheduled and unscheduled maintenance and construction on a roadway system or right-of-way. Maintenance services would include landscape maintenance, hazard removal (roadway debris, dead animals), routine maintenance activities (roadway cleaning, grass cutting), and repair and maintenance of both ITS and non-ITS equipment on the roadway (e.g., signs, traffic controllers, traffic detectors, dynamic message signs, traffic signals, CCTV, etc.). Environmental conditions information is also received from various weather sources to aid in scheduling maintenance and construction activities.
MC08	**Work Zone Management** This service package manages work zones, controlling traffic in areas of the roadway where maintenance, construction, and utility work activities are underway. Traffic conditions are monitored using CCTV cameras and controlled using dynamic message signs (DMS), Highway Advisory Radio (HAR), gates and barriers. Work zone information is coordinated with other groups (e.g., ISP, traffic management, other maintenance and construction centers). Work zone speeds and delays are provided to the motorist prior to the work zones. This service package

Service Package	Description
	provides control of field equipment in all maintenance and construction areas, including fixed, portable, and truck-mounted devices supporting both stationary and mobile work zones.
MC09	**Work Zone Safety Monitoring** This service package includes systems that improve work crew safety and reduce collisions between the motoring public and maintenance and construction vehicles. This service package detects vehicle intrusions in work zones and warns crew workers and drivers of imminent encroachment or other potential safety hazards. Crew movements are also monitored so that the crew can be warned of movement beyond the designated safe zone. The service package supports both stationary and mobile work zones. The intrusion detection and alarm systems may be collocated or distributed, allowing systems that detect safety issues far upstream from a work zone (e.g., detection of over dimension vehicles before they enter the work zone).
MC10	**Maintenance and Construction Activity Coordination** This service package uses ITS to provide disaster-related traveler information to the general public, including evacuation and reentry information and other information concerning the operation of the transportation system during a disaster. This service package collects information from multiple sources including traffic, transit, public safety, emergency management, shelter provider, and travel service provider organizations. The collected information is processed and the public is provided with real-time disaster and evacuation information using ITS traveler information systems. A disaster will stress the surface transportation system since it may damage transportation facilities at the same time that it places unique demands on these facilities to support public evacuation and provide access for emergency responders. Similarly, a disaster may interrupt or degrade the operation of many traveler information systems at the same time that safety-critical information must be provided to the traveling public. This service package keeps the public informed in these scenarios, using all available means to provide information about the disaster area including damage to the transportation system, detours and closures in effect, special traffic restrictions and allowances, special transit schedules, and real-time information on traffic conditions and transit system performance in and around the disaster. This service package also provides emergency information to assist the public with evacuations when necessary. Information on mandatory and voluntary evacuation zones, evacuation times, and instructions are provided. Available evacuation routes and destinations and current and anticipated travel conditions along those routes are provided so evacuees are prepared and know their destination and preferred evacuation route. Information on available transit services and traveler services

Service Package	Description
	(shelters, medical services, hotels, restaurants, gas stations, etc.) is also provided. In addition to general evacuation information, this service package provides specific evacuation trip planning information that is tailored for the evacuee based on origin, selected destination, and evacuee-specified evacuation requirements and route parameters. This service package augments the ATIS service packages that provide traveler information on a day-to-day basis for the surface transportation system. This service package provides focus on the special requirements for traveler information dissemination in disaster situations.

APPENDIX C. STRATEGIES MATRIX

Appendix C. TSMO Strategies Matrix

Traffic Operations Management

Need Priority	Ref #	Proposed Strategy	Description/Location(s)	Responsible Party(s)	Expected Benefits	Feasibility (Institutional and Technical) and Project Dependencies	Connected Vehicle Potential?	Capital Cost	Annual O&M Cost
High	TM01	**Install or Upgrade Communications**	Install communications to all ITS field devices, allowing agencies remote access to control and monitor devices. Options to consider include: • fiber communications • wireless options (cellular, Wi-Fi, DSRC, radio) • fiber sharing partnerships	ODOT, local agencies	• Operational efficiencies (Varies by device) • Safety	• Few locations has some dedication short range radio for some signals. Works well for tying into fiber		variable by project (key cost variables: aerial vs buried, and method)	Variable
High	TM02	**Traffic Signal Interconnect, Connection to ODOT Central Traffic Signal Server (CSS), Signal Timing Improvements, Adaptive Signal Systems**	Install traffic signal interconnect (as necessary) and connect traffic signals to ODOT CSS for remote access to traffic signals. Key locations: • US 199 in Grants Pass area • Hwy 62 in Grants Pass area • Hwy 238 in Grants Pass area Update traffic signal timing along corridors to improve network efficiency and explore adaptive signal solutions. Key locations: • Medford: Highway 62 (Crater Lake Highway - noted as project #5005 in the 2013-2038 RVMPO RTP), Barnett Road, McAndrews Road, Stewart Avenue, Siskiyou Blvd, Hwy 99 • Ashland - North Main, Main, and Siskiyou Blvd • Grants Pass - Hwy 199, 6th and 7th Streets • Biddle / Pine - Exit 33 corridor • Central Point - 10th Street/Pine Street/Freeman Road - add protective-permissive phasing to EB and WB left turn movements (noted as project #205 in the 2008 Central Point TSP), Hwy 99	ODOT, local agencies	Interconnect and CSS connection: • Operational efficiency, allowing agencies to immediately view and respond to signal operation issues Signal timing optimization: • decrease in delay of 13 to 94% • decrease in travel time by 7 to 25% • reduce fuel consumption by 2 to 9% Adaptive signal timing benefits: • further reduction in vehicle delay and vehicle stops when applied to an appropriate corridor • ability to handle unexpected fluctuations in traffic better than time of day plans	• All but two traffic signals in Medford are interconnected • Data warehousing capabilities of traffic signal data need to be considered when determining appropriate communication methods • ODOT already has remote access to some traffic signals including some in Ashland • City of Ashland would like remote access to all agency traffic signals	Yes	$3,000 per intersection (retiming) Adaptive system: Varies by selected system, upwards of $500,000 for control software, processors, detectors, controller upgrades	n/a Adaptive system: Varies by system and size $5,000 to $25,000
High	TM03	**Upgrade Signal Controllers**	Install updated traffic signal controllers to current standard (2070s or ATCs). Key locations: • Hwy 99 corridor - also consider TSP upgrades • OR 99/Laurel Street (noted as project #18897 in the 2015 - 2018 STIP)	ODOT, local agencies	• Capable of advance features, data collection, performance monitoring, and remote access	• Medford would like to upgrade to an ATC controller, possibly an IP network • Also include ATC controllers for ODOT intersections	Yes	dependent on intersection and required upgrades	Variable, dependent on communications
High	TM04	**Install Traffic Signals**	Investigate whether traffic signals are warranted at the following locations: • Ashland: OR 99/Wimer St/W Hersey St (noted as project R2 in the 2012 Ashland TSP) • Ashland: OR 99/NB intersection with Oak Street (noted as project R11 in the 2012 Ashland TSP) • Central Point: OR 99/Scenic Avenue (noted as project #230 in the 2008 Central Point TSP) • Central Point - Table Rock Road/Wilson Road (noted as project #822 in the 2013-2038 RVMPO RTP and project #813 in the 2008 Central Point TSP) • Central Point - Table Rock Road/S Hamrick Road (noted as project 213 in the 2008 Central Point TSP)	ODOT, local agencies	• Operational efficiencies (Varies by device)			$250,000 per signal	$5,000
High	TM05	**Improve and Monitor Traffic Signal Detection**	Improve traffic signal detection for both vehicles and bicycles, and monitor for failed detection.	ODOT, local agencies	• Improves system efficiency with faster notification to maintenance personnel and less equipment downtime	• Upgrade traffic detection technologies to radar, video, or inductive loops • Consider GPS and bike detection		Varies based on detection technology used	Varies

High	TM06	**South Medford Interchange Improvements**	Investigate targeted solutions to the congestion that occurs around the south Medford interchange. Solutions to consider include: • Queue warning • Variable speeds • Enhanced traveler information • Ramp metering • Adaptive signal timing	ODOT	• Operational efficiencies (Varies by device)			Varies based on selected system Variable message signs -$100,000 to $250,000 Ramp meter - $20,000 to 40,000	Varies Ramp meter: $2,000
High	TM07	**Install Enhanced Pedestrian Crossings**	Review intersections or mid block locations as necessary an install appropriate enhanced pedestrian crossing treatments. Options may include: • Rectangular rapid flashing beacons • HAWK signals (partial signals) • full traffic signals Key Locations: • OR 99/Wagner Creek Greenway Trail (noted as key 26 in the 2015 Talent TSP) • OR 99/Northridge Terr and/or Walnut Way (noted as key P-1 in the 2015 Phoenix TSP) • OR 99/Oak Street (key 18336 in the 2015 - 2018 STIP)	ODOT, local agencies	• Decrease in pedestrian crashes • A study based on HAWK signals showed a 69% decrease in pedestrian-vehicle crashes, CMF ID: 2922). Note - this study placed HAWK signals AT intersections, not mid-block. • PHB can achieve 98% driver compliance and a 58% reduction in pedestrian crashes (ODOT) • RRFB can achieve 85% driver compliance during the day and 90% at night.	• Locations need to be evaluated to determine whether an RRFB is appropriate, or whether the location needs a full signal (such as locations with higher speeds and more than three lanes). Higher driver compliance is associated with a full signal.	Yes	$20,000 (RRFB) $100,000 (full signal mid-block)	$1,000
High	TM08	**Install Additional PTZ Cameras**	Install additional pan-tilt-zoom (PTZ) cameras to monitor roadway conditions.	ODOT, local agencies	• Improves efficiency and reduces delay			$7,000 to $20,000 per camera. Additional cost if mounting pole and foundation are needed (~$20,000)	$2,000 per camera
High	TM09	**Install Speed Feedback Signs**	Install dynamic feedback signs that measure the speed of individual vehicles and post messages such as "SLOW DOWN. YOUR SPEED IS OVER 60 MPH"	ODOT	• Addresses safety			$15,000 to $20,000	$1,000
Med	TM10	**Install Oversized Conduit**	Install oversized conduit with new project construction to allow for future wire or fiber additions to the conduit.	ODOT, local agencies	• Reduced cost for future projects	• Future proofing		up to an extra $1/ft conduit depending on size	n/a
Med	TM11	**Install bicycle detection**	Install bicycle detection at select locations. Detection could be either manual (bike push buttons) or automated. Automated methods include: loop detection, video, or microwave.	ODOT, local agencies	• Improves efficiency and reduces delay for bicycle travel • Can be used to prolong green phase to provide adequate time for bicyclists to clear intersection • Increases convenience and safety of bicycling	• Detection needs to be monitored and adjusted to ensure that bicyclists are being detected appropriately.	Yes	$6,000 (one radar detector)	$400/detector
Med	TM12	**System maintenance and replacement**	Maintain and replace ITS assets as needed.	ODOT, local agencies	Reduced technology failures and downtime			Varies	Varies

Weather Event Management

Need Priority	Ref #	Proposed Strategy	Description/Location(s)	Responsible Party(s)	Expected Benefits	Feasibility (Institutional and Technical) and Project Dependencies	Connected Vehicle Potential?	Capital Cost	Annual O&M Cost
High	W01	**Battery backup for power to cameras**	Install battery backup for cameras so that cameras will function during power outages. Key locations: • Siskiyou area	ODOT	• Improve real-time information during storm events or other events that are likely to cause power outages	• Need to identify critical cameras and provide backup power • Cameras at Siskiyou's impact the MPO		$1,000 to $2,000	$100
High	W02	**Install grip factor sensors and warning system**	Install grip factor sensors at key locations along with a warning system (activated flashing beacons, VSM, or other means) to alert drivers when road conditions warrant slower travel speeds. Key locations: • Foothill Road (prone to icy conditions) - Jackson County • McAndrew's (15% grade) - Medford	Jackson County, Medford	• Improve safety by informing travelers when reduced speed conditions are warranted.	• Option to add grip factor sensor to an RWIS station or mount to a VMS with power. • Consider installing warning signs or VMS to inform travelers when road conditions are slick.	Yes	$25,000 to $45,000	$2,000

Low	W04	**Telematics for fleet vehicles**	Equip fleet maintenance vehicles with telematics and AVL to automatically log vehicle location and activities. Activities to be logged include sanding, deicing, and pesticide spray information. The system should also be capable of tracking the amount of solution remaining in the maintenance vehicle tank.	ODOT and local agencies with maintenance vehicles	• Improve maintenance efficiency • Range of benefit to cost ratios from 2.6:1 to 24:1 • Improve planning capabilities and resource allocation	• Additional telematics capabilities to consider include tracking performance and fuel use, automatic notifications when vehicle maintenance is necessary, and improve routing efficiency.	Yes	$5,000 to $15,000 per vehicle (assumes some retrofitting necessary) If implemented with telematics there are cost	$1,000 per vehicle

Traveler Information

Need Priority	Ref #	Proposed Strategy	Description/Location(s)	Responsible Party(s)	Expected Benefits	Feasibility (Institutional and Technical) and Project Dependencies	Connected Vehicle Potential?	Capital Cost	Annual O&M Cost
High	TI01	**Install variable message signs (VMS)**	Install variable message signs (VMS) to inform drivers of road conditions and detours. Key locations for new signs: • OR62 expressway / OR62 business route • OR199 (throughout) • I-5 (throughout) Key locations to replace VMS: • I-5: North Mountain Ave (Ashland) and Table Rock Road (Central Point) - noted as project 18905 in the 2015 - 2018 STIP	ODOT and local agencies	• Improve traveler information and driver's ability to make informed decisions • A study in rural Missouri showed that 94% of drivers took the action indicated on the VMS • Decrease mean driving speed and crash severity when VMS are used to communicate weather information and roadway conditions • Another study in rural Missouri used VMS to notify drivers about a significant detour during a bridge closure. 41% of drivers learned of the closure via VMS (media was also used to inform drivers - TV, radio, newspaper, etc.)	• Additional technical support needs to be allocated to VMS maintenance	Yes	$40,000 to $100,000 per sign (ITS database) additional costs: • mounting structure $100,000 to $200,000 range • communication cost is highly variable and dependent on location options	$5,000 additional cost if communication is leased
High	TI02	**Improve Real-Time Traveler Information by working with third party information service providers (ISPs)**	Create partnerships with private ISPs in order to gain access to travel time data and related products to better provide travelers with real-time roadway information.	ODOT, Private Partnerships, Media	• Improved traveler experience and expectations	• Provide information early (radio, TV, flyers) • SMS alerts • public/private partnership potential • Provide information to traveling public from private information service providers (ISPs) such as Google or WAZE • 3rd Party integration for traveler information (for example, Connected Signals) • Link data between truck, transit, and Mercy flights	Yes	Varies	Varies
High	TI03	**Increase use of TripCheck Traveler Information Portal (TTIP) Local Entry tool**	TTIP Local Entry Tool allows local agencies to input information that will be displayed through the TripCheck website. It allows travelers to visit a single website for both ODOT and local agency information. Agencies can enter information about planned events, such as maintenance and construction, parades, races, and other events that effect traffic.	ODOT, local agencies	• Improved traveler experience and expectations	• Integrated with VMS, link to RVTD, provide alert feature, and automate system • Park and ride for events	Yes	N/A	Cost for staff time to train and implement process

Emergency and Incident Management									
Need Priority	**Ref #**	**Proposed Strategy**	**Description/Location(s)**	**Responsible Party(s)**	**Expected Benefits**	**Feasibility (Institutional and Technical) and Project Dependencies**	**Connected Vehicle Potential?**	**Capital Cost**	**Annual O&M Cost**
High	EM01	**9-1-1 Dispatch Interconnect**	Connect the 9-1-1 dispatch center with ODOT and OSP. This system will automate data transfer between 9-1-1 dispatch, ODOT, and OSP. Each agency can choose (through automated filters) what information to publish to the system. Once the data is on the CAD system it is available to all subscribers. Each agency can determine what data they want to automatically pull from the database. For example, ODOT can create a setting for notifications of specific type of incident on an ODOT facility. Likewise, OSP can automate their side to only publish roadway related activity and not all police activity to the system.	ODOT, OSP, ESCO	Based on Deschutes Co Pilot project: ▪ Reduce incident response time by 30% ▪ Shorten incident duration by 38% ▪ Reduce dispatch response time by 25% ▪ Reduce interagency calls by 60%	▪ Implemented in several other Oregon counties including Deschutes. ▪ Klamath County uses use the same CAD software as other agencies along the 97 corridor. Software updates have already been completed. ▪ Training and testing of the system would be necessary, requiring a time commitment from Staff. ▪ If situational software use expands, there are opportunities to interface it with 9-1-1 dispatch interconnect system • Project funding is currently available, but ongoing maintenance	Yes	Varies depending on whether communications infrastructure is available	Staff time
High	EM02	**Situational Software**	Invest in situational software to use during incident or emergency response that shows where each of the response agencies/vehicles is (en route, at the scene, and during clean up).		• Faster incident clearance • Improve on-scene communication • Improve incident scene management	• Keno Fire Department (in Klamath County) is already using Intterra Situational Awareness software. Access provided to several other counties (Wasco, Jackson, Josephine, and Deschutes). Responders can access the information on any mobile device. Software includes HazMat data. • Intterra is currently funded through a federal grant, the annual fee of $56,000 is fully covered for another 8 to 10 years. It is free to agencies right now. • Software is currently used for fires and flooding, but could be expanded to traffic incident management. • The software is currently connected to a federal CAD system. • There might be an opportunity to interface with a 9-1-1 CAD and interconnect system. • To implement for TIM, law enforcement vehicles would need to be equipped with AVL compatible with the software.	Yes	n/a (annual license fee)	$56,000 (currently paid for by a federal grant)
High	EM03	**Portable Variable Message Signs (VMS)**	Purchase additional portable VMS to use during events and incidents to improve communication to travelers and public outreach during events.	ODOT	• Reduce out of direction travel • Reduce traveler frustration by improving traveler knowledge • Reduce driver speeds by 3.6 mph upstream of work zones (study in rural Missouri) • When used in conjunction with radar, a study in Virginia found a 50% reduction in speeding vehicles through work zones, with a decrease in vehicle speeds of up to 9 mph within a work zone • When used in conjunction with incident management - reduce fuel consumption by 1.2% (San Antonio study)	• Coordination between agency PIO's required for agencies outside of ODOT to use		$15,000 to $20,000 (ITS database)	$1,500
High	EM04	**Develop Interoperable Communication Procedures**	Implement standard protocols for using radios between agencies and train response Staff. This strategy could be a task for the TIM Team to develop. Coordinate with statewide effort to create standards for interoperability.	ODOT	• Faster incident clearance, gets responders to the scene and where they are needed at the scene faster. • Improve on-scene communication	• Responders in Klamath Co currently operate on multiple frequencies and technologies (microwave, digital, radio). • Requires agencies to share frequencies • On-going training is critical • If a TIM Team is developed, this could be a task for the TIM Team	Yes	Staff time to prepare protocol and provide training	Ongoing staff time for training and updating
High	EM05	**Emergency Management Training**	Institute regular Incident Command System (ICS) and Emergency Operation Center (EOC) training for appropriate Staff. Include mock scenarios during training sessions.	ODOT				$1,000 plus Staff time	Staff time for training

Low	EM06	**Work Zone Temporary Speed feedback Signs**	In work zones a temporary speed feedback sign can be used to alert a driver about current speed compared to regulatory speed.		California Pilot project - Augmented speed enforcement • Reduction in vehicles traveling over 65 mph through a work zone by 6% • Majority of vehicles show a reduction in speed while in the detection range		Yes	$8,000 to $20,000	Staff time

Data Management and Performance									
Need Priority	**Ref #**	**Proposed Strategy**	**Description/Location(s)**	**Responsible Party(s)**	**Expected Benefits**	**Feasibility (Institutional and Technical) and Project Dependencies**	**Connected Vehicle Potential?**	**Capital Cost**	**Annual O&M Cost**
High	DM01	**Performance Measure Repository**	Develop a plan to identify performance measures and data needs for the Rogue Valley region. Determine a regular interval (annual, quarterly, etc.) to publish data. Develop coordination plan/policy for maintenance and construction information sharing across agencies and create a data repository (located at the DOT or MPO).	ODOT, local agencies, transit, RVCOG	• Improved operational efficiency • Decrease construction costs if agencies can combine efforts for a "dig once" policy in areas with joint agency equipment or projects	• There is a statewide ODOT effort currently underway, led by the ODOT ITS group, to review and propose TSMO Performance Measures. Follow yp with ODOT ITS group. • Need for data to meet federal reporting for the FAST ACT (MAP 21)	Yes	may be covered by statewide initiative additional cost if installation of devices or communicaitons are necessary to collect the data	Staff time (Varies depending on level of effort)
Med	DM02	**System Performance Monitoring and Reporting**	Based on the outcome of DM01, begin collecting and publishing the performance measures on a regular basis.	RVCOG, ODOT	• Better understanding of the transportation system • Improve funding opportunities	• Evaluate the transportation system with defined Measures of Effectiveness • Define why are we collecting data • Reference ODOT TSMO Performance Measurement Study • Data can be used to support grant applications • Workforce needed to collect, clean, and analyze data • Option to leverage existing and new data sources		n/a	$10,000 to $80,000 Staff time (Varies depending on level of effort)
Med	DM03	**CAD/AVL Systems Data Availability**	Develop plan to identify data availability of CAD/AVL and how to share with other agencies			• Not available in real time right now. Just schedule based.		n/a	Staff time (Varies depending on level of effort)
Med	DM04	**Asset Management Program**	Investigate and implement an asset management systems that can be used to monitor field equipment.	ODOT, local agencies	• Improve maintenance efficiencies	• Consider using the same system across multiple agencies to improve data sharing capabilities		n/a	Staff time (Varies depending on level of effort)
Med	DM05	**Maintenance Information Sharing**	Explore and create procedures for sharing information about maintenance activities between agencies	ODOT, local agencies	• Improve maintenance efficiencies	• Monitor traffic impacts of detours • Option to use TripCheck Local Entry Tool		n/a	Staff time (Varies depending on level of effort)

Freight Management									
Need Priority	**Ref #**	**Proposed Strategy**	**Description/Location(s)**	**Responsible Party(s)**	**Expected Benefits**	**Feasibility (Institutional and Technical) and Project Dependencies**	**Connected Vehicle Potential?**	**Capital Cost**	**Annual O&M Cost**
High	F01	**Improve Rail Crossings**	Railroad crossing signal installations and signal upgrades at key Locations: • Rapp Rd (Talent) • Glen St. (Ashland) • Private Drive in Ashland's TSP • Central Point: OR 99/Beall Laine (noted as project 221 in the 2008 Central Point TSP) • Pacific Ave, White City	ODOT, local agencies		• Power and communication needed to operate railroad crossing gates • Requires coordination with railroad operator and the ODOT rail group		$100,000	$2,000

High	F02	**Truck Signal Priority**	Install detection at traffic signals along designated freight routes that identifies approaching heavy vehicles and speed, and either extends green or conflicting red to prevent collision potential. Key Locations: • OR 62 at I-5 exit 30 • I-5 exit 33 truck stop • Phoenix exit 24 truck stop • 99 in downtown Medford • Truck stop in Central Point and Biddle	ODOT, local agencies	• Improve safety by 20% with dilemma zone protection (study based on all vehicles, not limited to trucks) • Decrease truck stops and decrease emissions • If used with truck signal priority, truck travel times would likely improve	• Additional detection (such as radar) would be necessary to enable traffic signals with this capability. • Current 2070 traffic signals operating Voyage software on the TransSuite central signal system can accommodate dilemma zone protection (170 Controllers cannot accommodate this feature). • Potential to also provide truck signal priority with this strategy	Yes	$8,000/intersection	$1,000
Med	F03	**Real-time Truck Parking Information**	Install devices that detect real-time available truck parking and relay that information to truck drivers through mobile application.	ODOT, Private Partnerships	• Reduce illegal truck parking • Reduce truck driver frustration • Improve freight route planning • Potential to reduce violations of truck drivers exceeding hours of service rules	• Requires coordination with private sector facilities that provide truck parking • Parking stalls could be equipped with sensors that allow truck drivers to access occupancy information remotely • Potential to provide parking reservation service • Potential to add a parking system in conjunction with a lighting system. Acuity Brands has a product that plugs into the light receptacle and can use cellular communications to monitor parking availability.	Yes	$50,000 to $100,000 (ITS database) monitoring system and database	$5,000
Low	F04	**Freight Data Archive**	Collect and archive truck activity data including volumes, origin-destination, parking to better plan for freight mobility.					Varies	Varies

Public Transportation

Need Priority	Ref #	Proposed Strategy	Description/Location(s)	Responsible Party(s)	Expected Benefits	Feasibility (Institutional and Technical) and Project Dependencies	Connected Vehicle Potential?	Capital Cost	Annual O&M Cost
High	P01	**Coordinate Transit Signal Priority (TSP) on Key Corridors**	Install TSP detection and transponders along select corridors and transit vehicles. TSP provide an early green, queue jump, or extended green for transit vehicles to help reduce transit delay. Efforts need to be coordinated across jurisdictions.	RVTD, JCT, ODOT, local agencies	• Decrease transit delay - studies show up to a 40% reduction • Improve transit travel time by 1.5 to 15% • Decrease bus fuel use and emissions	• Agencies aim to improve reliability and schedule adherence • Use any technique that is going to improve on-time performance *May want to have this in TM section. May require signal controller upgrades, updated technology, etc. * Explore queue jump	Yes	$5,000 per intersection if existing software and controllers can be used (such as the 2070s) $25,000 to $30,000 per intersection if new equipment is needed. Additional cost for transponders on buses	$2,000
High	P02	**Automated Fare Collection System**	Plan for and implement an e-fare system that could allow transit users to pay their fare in a variety of ways: prior to arriving at a transit station, using a mobile device, using a "smart pass", or some other means that does not require exchanging cash.	RVTD, JCT	• Reduction in boarding times by up to 38% • Potential to increase ridership, decrease fare evasion, and reduce administrative costs		Yes	highly variable $50,000 to $500,000 for system wide integration	Varies
High	P03	**Automated Coordination of Transit Transfer Points**	Use scheduling software and GPS/AVL data to coordinate tranfer points between routes, across transit agencies serving the Rogue Valley communities. Note: this is not demand-responsive or deviated service initiated by passengers; it is based on requests from bus operators.	RVTD, JCT		• RVTD's system (Motorola) can have another 900 subscribers. • Open up RVTD dispatch center to command response	Yes	n/a	n/a
High	P04	**Real-time Bike Rack Availability Information**	Use sensors and a mobile app or website to inform travelers of bike rack availability at transit stops and possibly on transit vehicles.	RVTD, JCT		• Public/private partnership potential	Yes	n/a	n/a

Med	P05	**Real-time Bus Arrival Information at Transit Stops**	Install reader boards at key transit stops to inform transit riders of the real-time bus arrival information.	RVTD, JCT	• Riders perceived wait times drop	• Plan for future transportation options (like Uber) • Not everyone has a mobile device • Low cost solution for people to access	Yes	$3,000 to $6,000 per sign Cost depends on quality, size, and controller capabilities	
Med	P06	**Real-time Bus Arrival Information via Website or Mobile App**	Provide real-time transit information via a website or mobile application. Capabilities should include real-time alerts when a bus is delayed due to weather or other events.	RVTD, JCT	• Riders perceived wait times drop • Increased use of transit services • Increased on-time reliability for transit user	• Rogue Community College needs to provide weather information to students • Ability to provide more information on transit during weather events • Maybe move to emergency response. How to share where people are and where they need to go. How to provide information to individuals		$1,000/vehicle for AVL device $20,000 to interface	$5,000
Med	P07	**Multimodal Trip Planning Application**	Implement an application for multimodal trip planning around the Rogue Valley region. Application should consider modes such as transit, bike sharing, and car sharing as well as identifying level of comfort for routes (traffic volumes and posted speed; multi-use path, protective bike lane, sidewalk)	Transit provider/ Private partnership	• Increased use of transit services • Increased on-time reliability for transit user	• Public/private partnership potential		Highly variable $138,000 to $4 million plus	
Low	P08	**Install Transit Vehicle Telematics with Engine Diagnostic Tools**	Telematics can monitor the maintenance needs of transit vehicles and remotely access diagnostics.					$5,000 to $15,000 per vehicle (assumes some retrofitting necessary. If implemented with AVL there may be some cost savings	$1,000 per vehicle
Low	P09	**Enhanced Camera System**	Install additional cameras and hardware at transit stops and on transit vehicles	RVTD, JCT			Yes	$1,000 to $3,000 per site (assumes 3-5 cameras) additional for security system hardware $8,000 to $12,000	Varies
Low	P10	**Upgrade Transit Software and Controller System**	Transit software can include vehicle scheduling and tracking, database and information storage, schedule adjustment software, real time traveler information, and integration.	RVTD, JCT				Highly variable Full system $1 to $2 million Upgrade: $20,000 to $400,000 (ITS database)	Varies