Spokane Regional ITS Architecture Plan

Submitted to:
Spokane Regional Transportation
Management Center Board

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GLOSSARY OF TERMS

A

ADMS	Archived Data Management Subsystems
Architecture Flows	Information that is exchanged between subsystems and terminators in the Physical Architecture.
ATMS	Advanced Traffic Management Systems
AVI	Automated Vehicle Identification
AVL	Automated Vehicle Location

C

Center Subsystems	Subsystems that provide management, administrative, and support functions for the transportation system. The center subsystems each communicate with other centers to enable coordination between modes and across jurisdictions.
CMS	Changeable Message Signs
CVISN	Commercial Vehicle Information Systems and Networks

D

Data Flow	Information that is transferred between processes or between a process and a terminator in the Logical Architecture.
DFD	*Data Flow Diagram*: The diagrams in the Logical Architecture that show the functions that are required for ITS and the information that moves between these functions.
DMS	Dynamic Message Signs
DSRC	Dedicated Short-Range Communications

E

EM	Emergency Management
EVS	*Emergency Vehicle Subsystems*: Resides in an emergency vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient emergency response.
Equipment Packages	The building blocks of the Physical Architecture subsystems. Equipment Packages group like processes of a particular subsystem together into an “implementable” package.

G

GIS	*Geographic Information Systems*: software/database/display systems containing geo-referenced data.

H

HAR	*Highway Advisory Radio*: dedicated radio frequencies carrying traffic information.

I

ISP	*Information Service Provider*: Collects, processes, stores, and disseminates transportation information to system operators and the traveling public.
ITS	Intelligent Transportation Systems
ITS Architecture	Provides the frame work for designing transportation systems that implement the ITS User Services.

L

Legacy Systems	Existing transportation systems, communications systems, and institutional processes.
Logical Architecture	The Logical Architecture defines what has to be done to support the ITS User Services. It defines the processes that perform ITS functions and the information or data flows that are shared between these processes.

M

Market Packages	Market packages provide an accessible, deployment oriented perspective to the national architecture. Market packages collect together one or more Equipment Packages that must work together to deliver a given transportation service and the Architecture Flows that connect them and other important external systems.

P

PIAS	*Personal Information Access Subsystem*: Provides the capability for travelers to receive formatted traffic advisories from their homes, place of work, major trip generation sites, personal portable devices, and over multiple types of electronic media.

P-Specs	*Process Specification*: The textual definition of the most detailed processes identified in the Logical Architecture. The specification includes an overview, a set of functional requirements, and a complete set of inputs and outputs.
Physical Architecture	The Physical Architecture provides agencies with a physical representation (though not a detailed design) of the important ITS interfaces and major system components. It provides a high-level structure around the processes and data flows defined in the Logical Architecture.

R

RS	*Roadway Subsystem*: Intelligent infrastructure distributed along the transportation network which perform surveillance, information provision, and plan execution control functions and whose operation is governed by center subsystems.
RWIS	*Road Weather Information Systems*: Collects weather condition data from roadway sensors.

S

SRTMC	Spokane Regional Transportation Management Center
Subsystems	The principle structural element of the Physical Architecture. There are 19 subsystems in the National ITS Architecture which are grouped into four classes: Centers, Roadside, Vehicles, and Travelers.

T

TEA-21	*The Transportation Equity Act for the 21st Century*: Authorizes the Federal surface transportation programs for highways, highway safety, and transit for the 6-year period 1998-2003.
Terminators	Terminators define the boundary of the National ITS Architecture. The terminators represent the people, systems, and general environment that interface to ITS.
TMC	Transportation Management Centers
TRMS	*Transit Management Subsystem*: Manages transit vehicle fleets and coordinates with other modes and transportation services. It provides operations, maintenance, customer information, planning and management functions for the transit property.

TRVS	*Transit Vehicle Subsystems*: Resides in a transit vehicle and provides the sensory, processing, storage, and communications functions necessary to support safe and efficient movement of passengers.
TSP	Transit Signal Priority

U

User Service Bundles	A logical grouping of user services that provides a convenient way to discuss the range of requirements in a broad stakeholder area.
User Services	User services document what ITS should do from the user's perspective. A broad range of users are considered, including the traveling public as well as many different types of system operators.
USR's	*User Service Requirements*: A specific functional statement of what must be done to support the ITS User Services.

V

VS	*Vehicle Subsystems*: Covers ITS related elements on vehicle platforms. Vehicle subsystems include general driver information and safety systems applicable to all vehicle types.

W

WIM	*Weigh In Motion*: Allows for roadside high speed weigh in motion.

1. INTRODUCTION

1.1 PROJECT BACKGROUND

The Spokane Regional Transportation Management Center Operating Board (Operating Board), cooperatively represents the City of Spokane, Spokane County, Spokane Transit Authority, Washington State Department of Transportation, and Spokane Regional Transportation Council. The Operating Board is operating on behalf of the regional transportation stakeholders on the development and deployment of a Regional Intelligent Transportation System for the Greater Spokane area. Transportation needs will be met by a multi-jurisdictional effort, through the process of sharing information and infrastructure control, as well as coordinating management plans. All stakeholders are entering into a mutual investment into the planning and operations of the future Spokane Region Transportation Management Center (SRTMC).

The SRTMC Operating Board, comprising representatives from each transportation stakeholder agency has been convened to oversee the management and operations of the SRTMC and to jointly make decisions pertaining to regional transportation initiatives. Each SRTMC Operating Board member has agreed to a joint Memorandum of Understanding (MoU) outlining the regional objectives and roles and responsibilities of each stakeholder.

This project is divided into two main tasks. Task 1 is the development of a Regional ITS Architecture (regional architecture) that is consistent with the National ITS Architecture, while Task 2 is the development of a Regional ITS Implementation Plan. The Regional ITS Implementation Plan will map existing ITS systems and address the needs of the region's stakeholders through the identification of ITS systems to be deployed in the future.

Successful implementation of ITS depends on bridging the technical and institutional gaps among numerous transportation agencies and across jurisdictional boundaries. The U.S. Congress has clearly affirmed the goal of developing integrated intelligent transportation systems that are consistent with the National ITS Architecture and corresponding standards.

"The National ITS Architecture is a framework for developing and deploying ITS. It consists of resources (knowledge) and tools that help facilitate the deployment of effective and inter-operable ITS."[1]

TEA-21 requires that all ITS projects using federal funding must "conform" to the National ITS Architecture. Federal Interim Guidance for the implementation of this statutory requirement was issued on October 2, 1999. The Interim Guidance stressed that ITS deployment should be "advanced in the context of goals and objectives adopted by the planning process." The Interim Guidance suggested that a "regional architecture" should be defined that would include subsystems and information flows forming a template for regional ITS integration.

[1] U.S. Department of Transportation (No date). *Streamlining ITS Planning: Identifying Common ITS Needs* [Online] Available: http://www.itsdocs.fhwa.dot.gov/jpodocs/brochure/5@P01!.pdf

To comply with the National ITS Conformance guidelines[2], and to take advantage of the benefits of information sharing and system to system (center to center) interoperability, the Spokane Region stakeholders have embarked on a joint effort to develop a Regional ITS Architecture for the Spokane area.

Recommendations stemming from this project will illustrate how advanced technology can provide traveler information and traffic control, manage the existing and future transportation infrastructure and integrate separate ITS control systems.

1.2. PURPOSE OF REGIONAL ITS ARCHITECTURE

The purpose of a regional architecture is to define interfaces and information flows among and between travelers, vehicles, roadside infrastructure, and transportation management centers; and to identify the need for institutional relationships. The regional architecture will define:

Transportation Layer: This layer consists of physical ITS entities. Several modules are used to define traveler, vehicles, management centers, and roadside equipment.

Communication Layer: This layer defines the connections between the Transportation Layer's modules. It details the communication requirements between subsystems and applications.

Institutional Layer: This layer provides the organizational structure, roles, and responsibilities of the many agencies compromising the SRTMC operating board. And how these relationships influence the planning, implementation, and operation of ITS projects.

1.3. PROCESS FOR DEVELOPING SPOKANE REGIONAL ITS ARCHITECTURE

The process that has been followed to date in preparation for this report is in-line with recommendations outlined in the National ITS Architecture which suggests the following approach:

- Engage stakeholders to define needs;
- Map existing systems and needs to the National ITS Architecture;
- Examine data flows and tailor to local systems;
- Select Market Packages to address future services needed/planned;
- Select subsystems/data flows and tailor to local needs/systems.

There are two "approaches" into the National ITS Architecture. The logical approach takes the needs identified by the Stakeholder meetings and assigns user services and user service requirements (USRs) to the needs. The USRs are then assigned specific functions or activities called process specifications (P-specs). Another approach is called the physical approach. In this approach, the Stakeholders needs are assigned to market packages. The market packages

[2] The thrust of this Guidance is aimed at ensuring Federal ITS funds are to be used to create technically and institutionally interoperable transportation systems.

are made up of subsystems, equipment packages, and architecture flows. These components working together comprise a set of activities to meet a desired need. In this project, both approaches were used to give a more complete view of how the system should function.

The way in which these steps have been followed for the Spokane Regional ITS Architecture and Implementation Plan Project is described below.

1. The consultant team conducted a series of stakeholder meetings (December, 1999, through March, 2000). The stakeholders interviewed included all the SRTMC Operating Board agencies and other public and private sector stakeholders who may have an impact on, or interest in, transportation activities (e.g. Washington State Patrol, Spokane Fire Department, etc.)The information obtained at the stakeholder meetings is summarized in Section 2: Transportation Needs and Issues.
2. The next step was to identify relevant ***Market Packages.*** The identification of Market Packages provides a method for entering into the National ITS Architecture. Information can be used as a starting point for defining project functional requirements and system specifications. Market Packages are elements of the Physical Architecture. The Spokane regional needs and existing/planned systems were mapped to their corresponding market packages. Market packages are defined by sets of ***Equipment Packages***[3] that work together (typically across different subsystems) to deliver a given transportation service. Major ***Architecture Flows*** between them and other important external systems (terminators) were also identified. *In other words, market packages identify the pieces of the National ITS Architecture required to implement a service.* Market packages, equipment packages and architecture flows are all physical architecture components. The relevant physical architecture components for each agency are included in Section 4.2.
3. Another activity recommended by the National ITS Architecture is to translate the user needs defined in the stakeholder outreach effort, into "National Architecture"-terminology. A good starting-point for "entering" the National Architecture is to translate the needs into ***User Service Requirements (USRs)***[4]. User services represent what the system(s) will do from the perspective of the user (i.e. transportation agency, system operator or member of the public). The concept of user services allows the process of system or project definition to begin, by thinking about what high level services need to be provided to address identified problems and needs. USRs are logical architecture components. The mapping of user needs into USRs is presented in Section 4.3
4. A ***Process Specification (P-spec)*** is an elemental function or activity that needs to be performed in order to satisfy a specific user service requirement (USR). After identifying the USRs, the USRs were mapped to relevant P-Specs. *(Note: This information will be very useful in future tasks pertaining to the identification of specific ITS projects.)* The identification of P-Specs is necessary to help summarize regional

[3] The term "equipment package" is used in the National ITS Architecture development effort to group like functions of a particular subsystem together into an "implementable" package of hardware and software capabilities.
[4] USRs describe the general functions that a region requires for implementation of potential ITS technologies. USRs are general statements of functional need defined by the National ITS Architecture. A typical USR would be "Incident Management shall provide an incident identification function.

functions and processes, and thus, is critical to the development of the regional architecture. P-specs are part of the logical architecture. Section 4.4 and Appendix B provide summaries of this exercise.

5. Both Market Packages (physical architecture) and USRs (logical architecture) were mapped to ***Subsystems/Terminators***.

   a. There are 19 subsystems in the National ITS Architecture, which are grouped into four classes: Centers, Roadside, Vehicles, and Travelers. Example subsystems are the Traffic Management Subsystem, the Vehicle Subsystem, and the Roadway Subsystem. These correspond to existing elements in the physical world: respectively traffic operations centers, automobiles, and roadside signal controllers. The way to map USRs to subsystems is by identifying relevant Process Specifications (P-Specs) and data flows. P-Specs and data flows are elements defined in the National Architecture, which define logical processes.

   b. Terminators define the boundary of the National ITS Architecture. The terminators represent the people, systems, and general environment that interface to ITS. Market Packages can be mapped directly to subsystems and terminators.

   Relevant Subsystems and Terminators are summarized in Section 4.5

6. Finally, the logical architecture components for the region were summarized in a logical regional architecture diagram. Additionally, relevant subsystems, terminators and high-level architecture flows (physical architecture) were consolidated into a physical regional architecture. The regional architecture representations (logical and physical) are illustrated in Section 4.6.2 and 4.6.3 respectively.

   The following exhibit illustrates the relationship between different components of the National ITS Architecture and how they have been addressed in this report.

Section 4.7 provides a brief description of several projects, which have been identified to meet the regional transportation needs and objectives as highlighted by the regional architecture. The projects will be analyzed and developed further in Task 2: Regional ITS Implementation Plan.

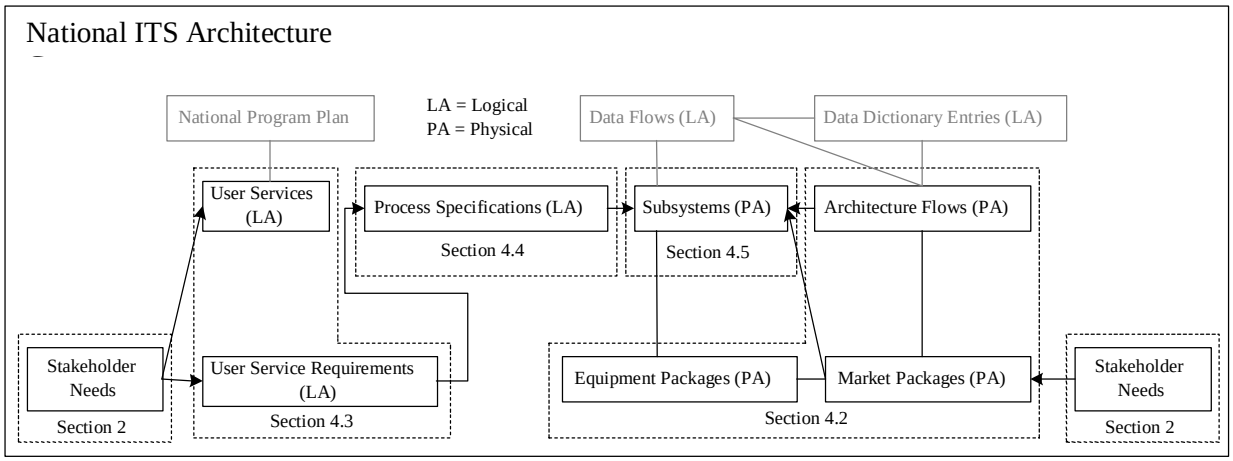


Figure 1. National ITS Architecture Components

2. TRANSPORTATION NEEDS AND ISSUES

2.1 STAKEHOLDER INTERVIEW SCOPE

The first step in developing a Regional ITS Architecture is to understand the regional transportation needs in the greater Spokane area. ITS offers another set of solutions to meet these needs. To be successful, ITS projects must also address these needs. One method of obtaining this information is through meetings with the Spokane Regional Transportation Management Center (SRTMC) Operating Board members and other stakeholders. The following individuals were interviewed representing each of the five major transportation stakeholders (i.e. SRTMC Operating Board).

- Bob Brueggeman; Spokane County (Dec 8th, 1999);
- Glenn Miles; SRTC (Dec 8th, 1999);
- Jack Sikes, Donald Ramsey, Robert Turner; City of Spokane (Dec 8th, 1999);
- Ted Trepanier & Mike Whiteaker ; WSDOT (Dec 9th, 1999);
- Christine Fueston; STA (January 11, 2000).

The purpose of these meetings was to collect and summarize information about agency roles and responsibilities, identify and discuss operational issues and identify the potential future need for operational and technology agreements. The discussions were also used to confirm and gather additional information about existing systems and confirm plans for the expansion of existing systems and/or the deployment of new ITS systems.

Additionally., meetings with other non-"SRTMC Operating Board" stakeholders were conducted.

The focus of all stakeholder meetings was to develop and confirm the collective **Regional Transportation Vision**. The participants discussed ITS data/video sharing requirements, and identified the need for redundant system/device control capabilities. Appendix A includes the minutes from each of these meetings. The Summary of Stakeholder Needs and Issues provides the following information in a table format:

- Key transportation issues;
- Available Infrastructure, Communications and Transportation Information;
- Existing/Future Control Capabilities;
- Data/Information Needs;
- Control Needs.

Strong stakeholder alliances must be constructed to share travel information, coordinate activities, and involve the private sector in developing effective, innovative information outlets. These issues are discussed in limited detail in the Operation and Technology Agreements section following the stakeholder needs and issues summary. The Operation and Technology

Agreements section provides a brief overview of operational and technical agreements that may need to be developed between the participating agencies to support the regional goals of sharing information and control capabilities between jurisdictions.

2.2 SUMMARY OF STAKEHOLDER NEEDS AND ISSUES

The following table provides a brief summary of the issues and needs identified during the stakeholder interviews. This information will provide a basis for the identification of relevant User Service Requirements. Identification of USRs is the first step towards the development of Regional ITS Architecture.

Table 1. Stakeholder Needs and Issues

Stakeholder Agency	Key Transportation Issues	Available Infrastructure, Communications and Transportation Information	Existing/Future Control Capabilities	Data/Information Needs	Control Needs
Spokane Regional Transportation Council (SRTC)	Responsible for collecting static, scheduled and real-time traffic data from Spokane Region Stakeholders and to Consolidate and process data Foster cooperation and coordination between local transportation agencies. Possibility to integrate the future Spokane Regional traffic management/control center with the SRTC GIS system.	**Data:** Historical travel-time data (from AVI) **Infrastructure:** GIS system AVI system **Communications**: Overhead fiber link from Division St. to Normandie St. *Plans to link this to the City's communications network – thereby achieving a link to the Regional TMC* Communications hop (SRTMC to Arena) – *Planned [This will act as a communications hub for KXLY, KREM, KHQ, and KAYU*	The SRTMC will be located on the SRTC premises. The SRTMC will be the hub for all transportation control and traveler information capabilities in the region.	All available static, historical, and real-time transportation data. Including but not limited to: Historical and real-time traffic and weather information; CCTV camera video images; Current and planned traffic management response strategies; Planned and real-time construction and event information. Desirable: Train crossing-gate information STA AVL data – *if/when this becomes available in the future*	

Stakeholder Agency	Key Transportation Issues	Available Infrastructure, Communications and Transportation Information	Existing/Future Control Capabilities	Data/Information Needs	Control Needs
Washington State Department of Transportation (WSDOT)	Coordination between (city/county/state) traffic control systems – Currently in the process of procuring a new integrated signal control system (county/state integration). Coordinated incident response capabilities Access to city, county and state radio systems from SRTMC. Expand existing web site or develop a regional site to disseminate real-time traffic information and event information (planned and unplanned)	**Data:** Highway Incident information (from state patrol) Traffic Data **Infrastructure:** Signal Control System CCTV cameras Web cameras Vehicle detection Highway Advisory Radio (HAR) Dynamic Message Signs Weather Sites **Communications:** Various (e.g. fiber, microwave, phone)	Control of all ITS equipment listed under Available Infrastructure Public Information Web Site Note: *WSDOT Area 1 (Spokane) maintenance department has ability to set DMS and HAR messages* WSP can set DMS messages.	Real-time traffic data from major arterials Real-time weather data Event data (planned and unplanned, traffic and weather) from other jurisdictions Expand communications network to Hwy 290 (Trent), and Sprague Hook into City's communications network (applies to region within City limits) *Desired:* video surveillance at WIM (Weigh in Motion) sites	Rural ITS system control capabilities to be available at the SRTMC Capability to control and access all WSDOT ITS infrastructure from the SRTMC SRTMC workstations at SRTMC, DOT signal shop, state patrol Access to CCTV images from other jurisdictions Ability to set coordinated signal response strategies

Stakeholder Agency	Key Transportation Issues	Available Infrastructure, Communications and Transportation Information	Existing/Future Control Capabilities	Data/Information Needs	Control Needs
City of Spokane	Need for coordination between (city/county/state) traffic control systems – especially in highway to/from surface street transition areas. Coordinated incident response capabilities	**Data:** Historical traffic sensor "table count" data – (fielded quarterly) Weather forecasts (from ISP) Weekly construction updates (communications department) **Infrastructure:** Signal Control System **Communications** Extensive citywide fiber and copper (>80 cable miles) communications network. *Opportunity:* to take advantage of communication capacity set-aside requirements of various communications providers.	Monarc ATMS Signal Control System – 240+ intersections (over 200 controllers) *Planned:* upgrade to the ACTRA (Monarc NT) operating system, using TS2 communications Peek VideoTrak video detection system (19 sites – 60 cameras) – Communications is via telephone dial-up connections. (midblock) Traffic loops Weather detection sites Recorded telephone message system (maintenance and service broadcasts) *Future:* video detection cameras could be used for surveillance if appropriate communications links were installed *Future:* a new video switch may be required	Additional CCTV camera surveillance on city streets (*note:* liability/privacy issues are a concern) Event data (planned and unplanned, traffic and weather) from other jurisdictions Knowledge of WSDOT DMS messages	CCTV camera feeds from other jurisdictions (WSDOT and County)

Stakeholder Agency	Key Transportation Issues	Available Infrastructure, Communications and Transportation Information	Existing/Future Control Capabilities	Data/Information Needs	Control Needs
			by the city to support access to video images from other agencies *Future:* there is a need to extend the fiber communications to allow live video to be brought back to center. *Future:* complete the design and installation of a physically separate Transportation Services LAN servicing Traffic Control functions only (for City and SRTMC needs). *Future:* The City is interested in procuring a centralized vehicle pre-emption system that would support all municipal vehicles (transit, ploughs, maintenance etc.). Pre-emption authorization would be provided by central.		

Stakeholder Agency	Key Transportation Issues	Available Infrastructure, Communications and Transportation Information	Existing/Future Control Capabilities	Data/Information Needs	Control Needs
Spokane County	Coordination between (city/county/state) traffic control systems – Currently in the process of procuring a new integrated signal control system (county/state integration). Need to disseminate planned, real-time, and historical traffic, and weather information to the general public via a web page (modify existing County Web site or create a regional web site)	**Data:** Weekly construction updates (from communications department) Real-time count data at select sites (*Future:* could be upgraded to include speed and volume data) Weather alerts (from NWS) **Infrastructure:** Signal Control System *Future:* Valley Corridor (Couplet) project will be designed to accommodate the future installation of ITS equipment. **Communications:**	Signal Control System (NEMA controllers) Signal Fire vehicle signal pre-emption capabilities Public Information Web Site (no real-time information is available) *Future:* a new video switch may be necessary to allow the county to access video images from other jurisdictions.	Event data (planned and unplanned, traffic and weather) from other jurisdictions Knowledge of messages current set on WSDOT DMS Real-time & historical traffic data from other jurisdictions CCTV camera feeds Weather information	Ability to set coordinated (county/state) signal response strategies *Possibly:* Ability to set DMS and HAR messages on the I-90 *Desirable:* Red-light enforcement at select locations. *Desirable:* Transit signal priority at select locations

Stakeholder Agency	Key Transportation Issues	Available Infrastructure, Communications and Transportation Information	Existing/Future Control Capabilities	Data/Information Needs	Control Needs
Spokane Transit Authority (STA)	There is a need to be able to communicate bus breakdowns to the Traffic Management Center Would like to implement GIS system in future Operating Agency of the Light Rail Transit Project. Integrated fare policies and scheduling between light rail and other transit.	**Data:** • Scheduling data • route information • transit fares, etc • AVL information (future) • CCTV camera images (security) **Infrastructure/Systems:** 1. Bus fleet: • Fixed route (143 vehicles) • Paratransit (59 directly operated vans & 34 contract operations vans) • Vanpool 2. AVI system (bus transponders, 6 readers, reader boards) 3. TRAPEZE system 4. CUBIC fare boxes 5. Automated phone system 6. STA Website 7. Video Surveillance (~90	Video Surveillance at Park and Ride and transit facilities. All fixed route buses are equipped with AVI tags. Some buses equipped with AVI tags as part of SRTC's probe vehicle program. *Future:* AVL System for fixed route buses and LRT.	Would like (TSP) capabilities (coordination with city/county/state required). STA is interested in having access to: 1. Images from WSDOT cameras along I-90; images from CCTV cameras along Division St. and other future sites 2. Real-time incident information/notification 3. Historical traffic data (for planning purposes).	

		cameras) **Communications** Two-way (driver/center) radio communication system. Mobile data communications for rideshare/ridematch.			
Spokane County Air Pollution Control Authority (SCAPCA)	Would like to access WSDOT's Road Weather Information Stations. Currently identical information is sent to each agency.	**Data:** Compile and archive CO and other pollutant levels. **Infrastructure:** In-field air quality monitoring devices Website for information dissemination and pollutant alerts		Real-time traffic volumes/flow data. Weather information from WSDOT RWIS.	
Washington State Patrol (WSP)	No direct communications connection between WSP and WSDOT (fiber, RF, etc). This prevents data sharing. Would be interested in interface between CAD and the regional incident response database. No pre-defined plans/routes for major closures (I-90)	**Data:** Compile incident records and statistics on CAD system. **Communications:** 800MHz radio communications with WSDOT.	Ability to set messages on WSDOT DMS. Receive weather information from WSDOT website and other internet sites	Real-time CCTV camera feeds.	Select CCTV camera control.

Spokane Fire Department	Have an interest in having pre-emption along certain identified corridors, but currently not a funding priority. Identified a need for AVL technology to provide vehicle status to the command center. Identified a need to transmit data between fire vehicles and the command center.	**Data:** Report information sent between dispatch and vehicles. **Infrastructure:** Wide area network (WAN) computer system. Localized pre-emption equipment near fire stations. **Communications:** Radio and pager communications between dispatch and vehicles.		Would like to receive recorded CCTV camera video for surveillance/evidence purposes	Would be interested in some control of CCTV cameras for real-time feeds
Burlington Northern Santa Fe	Several identified issues include: train location, hazardous waste tracking and signal pre-emption at at-grade rail crossings.	**Infrastructure:** RF tags on all rail cars carrying products. Website for client tracking.			

2.3 OPERATIONAL AND TECHNOLOGY AGREEMENTS

Currently there exists a Memorandum of Understanding (MoU) creating the Spokane Regional Transportation Center Operating Board which is made up of the SRTC, Spokane County, City of Spokane, WSDOT, and STA. This MoU outlines the Operating Boards powers and functions, as well as inter-relationships between the Operating Board and member engineering departments. A copy of the MoU is provided in Appendix C. As described in the MoU the Operating Board has the following functions:

- Perform the functions of the Spokane Regional Transportation Management Center for the metropolitan area.
- Prepare and update a Comprehensive Regional Transportation Management Center Operating Plan and Regional Transportation Incident Management Program.
- Administer regional transportation projects and programs that facilitate operations of the SRTMC.
- Participate in the collection and maintenance of transportation related databases and transportation related information.
- Contract with the WSDOT or other appropriate entities in order to meet requirements of State and/or Federal Transportation legislation.
- Perform such other transportation systems management related functions as the Operating Board finds to be in the best interest of the SRTMC.

Under this Memorandum of Understanding member traffic engineering departments continue their respective functions, individually forming traffic control plans to which the SRTMC plans will be coordinated. The MoU allows for the SRTMC to administer or implement these plans as agreed by the member agency and the Operating Board. All member agencies are also responsible for the preparation and updating of comprehensive transportation management plans as part of a Regional Transportation Congestion Management System.

There are various operational and technical issues associated with sharing information and device control between agencies. It is likely that there are no legal barriers to prevent the establishment of the interfaces necessary to accomplish the Spokane Regional goals, however, a joint document on standard operating procedures should be developed to clearly define roles and responsibilities of each agency as well as the SRTMC procedures. Additionally there are various technical issues pertaining to how the interoperability should be developed; for example, what functionality and firewalls should be designed into the system integration/interfaces.

The current Memorandum of Understanding provides the regional agencies with a foundation for initial coordination. From this level the Operating Board must proceed to more developed policies pertaining to coordinated response strategy development/approval, device control capabilities and operating procedures Issues that should be considered by the member agencies are described below:

- Liability for setting devices - who is responsible if a device is set incorrectly? What operational and technical safe-guards need to be put in place to minimize the potential for liability difficulty?
- Authority – there may be legal issues associated with who can set traffic control devices. It must be determined whether jurisdictional boundaries interfere.
- Ability to access data – who has access? level of access?;
- Ability to control devices; Control access levels? publish and subscribe service?
- Operational Failure – in the case of one agency providing operational back-up on behalf of another, the agreements should identify the types of faults that require a response and should describe the response including how faults and actions would be logged;
- Compensation for services (e.g. operational back-up);
- Maintenance - liability of equipment failure; especially important when dealing with shared infrastructure or contracted ISPs
- Security;
- Incident Management - establish the types of incidents for which a response would be required and the specific responses allowed. The agreement would also set out incident management tracking and reporting procedures (for liability and statistical purposes);
- Device conflict resolution;

These issues should be considered by the agencies involved, and resolved prior to any interface/integration design stage. This is crucial as all new and existing hardware and software must possess the capability to support these coordinated operational functions.

3. SYSTEM INVENTORY

The focus of this section is to inventory existing and planned ITS, based on document review and phone interviews. Phone interviews included the regional transportation stakeholders presented in the previous section, Stakeholder Needs and Issues. The primary documents that provided inventory data included the Spokane Regional Transportation Improvement Plan (TIP), the Spokane Metropolitan Area Transportation Plan (November 1999), and stakeholder internet web pages. Also stakeholder agencies provided maps and electronic documentation geo-referencing the locations of their existing infrastructure.

Developing a system inventory is a cost effective approach to capitalizing on existing systems and integrating planned improvements into the proposed regional Architecture, while simultaneously eliminating unnecessary system duplication. ITS projects identified by stakeholders may be able to piggyback on existing or planned infrastructure. Quite possibly existing systems may just need to be enhanced to serve the needs of a stakeholder group.

Many agencies in the Spokane Region may have implemented and demonstrated the use of ITS with little or no coordination with surrounding agencies. However, most ITS deployment in the Spokane region is still in the early stages and the number of deployments are limited. This technical memorandum will identify and inventory legacy systems within the Spokane Region. The legacy systems as well as the planned ITS deployments will be categorized under their appropriate "user service bundles" and jurisdictional authority to provide a consistent bases of technology reference.

As stated above the ITS technologies inventoried in this technical memorandum will be referenced to their ITS "user service bundles". This will provide a convenient reference for linking legacy systems to planned improvements, which will eventually be integrated in the ITS Architecture developed under this project. The ITS "user service bundles" are:

1) Travel and Transportation Management
2) Travel and Demand Management
3) Public Transportation Operations
4) Electronic Payment
5) Commercial Vehicle Operations
6) Emergency Management
7) Advanced Vehicle Control and Safety Systems
8) Information Management

The "user services" within the bundle categories, shown above, are typically related by institutional perspectives of organization or are categorized around common technical functionalities.

The legacy and planning ITS information in this section summarizes and provides a detailed discussion of the systems presented in the Stakeholder Needs and Issues section.

3.1 LEGACY SYSTEMS

There are five transportation providers that utilize some facet of ITS technology in their transportation system operations. The five groups are: 1) Washington Department of Transportation (WSDOT), 2) Spokane County, 3) Spokane Regional Transportation Council (SRTC), 4) Spokane Transit Authority (STA), and 5) the City of Spokane. The following is a description of ITS technologies deployed in the Spokane Region, discussed by jurisdiction and referenced by the appropriate "user service bundle".

3.1.1 Spokane Regional Transportation Council

The Spokane Regional Transportation Council (SRTC) is responsible for the regions transportation planning activity. They coordinate transportation planning activity with all jurisdictional transportation providers within the region. They facilitate communication with the various transportation regional stakeholders.

The SRTC currently is in the process of developing the Regional Traffic Management Center. At the present time the SRTC has a location to begin developing the center. The SRTC will be responsible for programming and oversight of the Regional Transportation System Center.

Currently, the SRTC is working on a Travel Time study that utilizes the Amtech System radio frequency identification tags (RFID) based on dedicated short-range communication (DSRC) systems. The SRTC has installed the tags in 400 vehicles within the Spokane area, including passenger vehicles, delivery trucks, and some STA buses. The tag readers were placed at key corridor locations. The readers read data from the tags as vehicles pass by, providing information coded into the tag as well as time and date.

3.1.2 Washington Department of Transportation

The WSDOT has an eastern region office located in Spokane, Washington. The WSDOT is responsible for building and maintaining the state-owned highway system. The WSDOT coordinates with other local jurisdictions to provide effective traffic control management on and around the state highway system. Currently, most of the WSDOT ITS services can be categorized under the Travel and Transportation Management bundle.

Under Travel and Transportation Management the WSDOT currently operates and maintains 30 traffic signals. Approximately half of the signals are along I-90 at key interchanges or near County traffic signals in the Spokane region. The States traffic signals are Type 170 controllers with Wapiti W4IKS software. Translink software has been used to monitor and control signal operations.

The WSDOT also operates and maintains a real-time freeway video surveillance system. The system includes 2 Autoscope 2004 video detection units, 1 Peek Videotrak 900 video detection,

2 Traficon VIP7 video detection, 2 RTMS microwave detectors, 5 closed circuit TV (CCTV), and 3 slow scan cameras. The system can be used to manage traffic and for incident detection. The real-time video can also be used by travelers to plan travel routes. The information is provided on WSDOT's web site. Camera shots are provided at SR2, Division, Arthur, Hamilton, Sprague, Broadway, and Pines. Travelers can also obtain construction and weather information from WSDOT's web site as well as through designated phone numbers. The information helps commuters and travelers plan trips around congested areas, and preparedness for adverse weather conditions.

The WSDOT currently operates 5 dynamic message signs (DMS). 4 of the DMS are located along the I-90 corridor and 1 is on Highway 2. Currently the DMS are used primarily by WSDOT maintenance and Washington State Patrol (WSP). The WSDOT maintenance uses the DMS to provide construction impacts, maintenance activity and weather information to drivers. The WSP uses the DMS to warn drivers of serious incidents. Occasionally the DMS are used during times of poor air quality. Messages are posted to encourage drivers to carpool or take the bus.

The WSDOT also operates 2 Highway Advisory Radio (HAR) locations within the Spokane Region. HAR is another tool used to provide travelers with roadway and weather information.

The WSDOT also operates 7 Road Weather Information Stations (RWIS) in the Spokane Region. RWIS are a network of weather monitoring stations located along WSDOT facilities at potential trouble spots (common ice, snow, etc.) such as bridges. RWIS monitor air and pavement temperatures. Currently, the stations are used by maintenance staff to monitor roadway conditions for the use of anti-icing activity.

The WSDOT operates a fire pre-emption system for it's traffic signals (either Opticom or Sonic Systems).

The WSDOT operates and maintains several automated data collection sites in the Region. Data collected currently consists of traffic and speed as well as weight and vehicle classification. The weight and vehicle classification data is collected at weigh-in-motion (WIM) bending plates located on I-90 at the Idaho border. (SR195 at Excelsior, SR27 at Mica, SR2 at Chattaroy, and SR2 and Walton) [Counts only]. Additionally, WSDOT owns and operates pager-activated ICE signs (Beware of Ice or Snow plow Ahead) and beacons.

The WIM data collection system is used to collect data on commercial vehicle weight compliance rates. Commercial vehicle operations (CVO) are regulated, monitored, and enforced by WSDOT Motor Carrier Division, Washington State Department of Licensing (WSDOL), WSP, and the Washington Utilities and Transportation Commission (WUTC). This technology falls under the Commercial Vehicle Operations user service bundle.

3.1.3 The City of Spokane

The City of Spokane currently maintains and operates an extensive traffic signal system. They operate 242 signals (over 200 controllers) controlled by central computers using the MONARC

ATMS Signal Control System. They are in the process of upgrading to a Windows NT operating system and will use the Eagle Actra System for signal operation management.

The City also has an extensive fiber optic communications network, and copper twisted pair (>80 cable miles) communications network.

The City also operates and maintains:
- several weather detection sites;
- Peek VideoTrak video detection system
- telephone information service (recorded telephone messages for maintenance and other municipal traffic information).

3.1.4 Spokane County

Spokane County Public Works (County) is responsible for building and maintaining County owned roadways and facilities. The County coordinates with the WSDOT and the City of Spokane to provide efficient transportation services.

Under the Travel and Transportation Management bundle the County operates and maintains 70 traffic signals. Many of the County's traffic signals are located next to WSDOT signals along I-90. Where appropriate signals are coordinated through time-base coordination, or sync pulses on twisted pair. The County and State use different traffic controllers. The County uses NEMA based controllers and plans to continue use of NEMA controllers. The County primarily uses inductance loops for vehicle detection.

Under the Emergency Management bundle, the County has installed 3M opticom at all traffic signal locations for emergency vehicle signal pre-emption.

In coordination with the Spokane Transit Authority, the County operates TransMatch. TransMatch is a computerized ridematching service. The service pairs commuters desiring carpool partners. The service helps fulfill the Washington States Commute Trip Reduction program. This existing program would be categorized under the Travel Demand Management bundle.

3.1.5 Spokane Transit Authority

The Spokane Transit Authority (STA) is a Public Transportation Benefit Area Authority providing the Greater Spokane Region with public transportation. The system provides 39 fixed routes which are serviced by 143 fixed route coaches. The STA also has 59 paratransit vans and 34 rideshare vans.

The STA is integrating ITS into their transit operations. The ITS tools integrated by the STA fall under the Public Transportation and Information Management user service bundles. The fixed route coaches carry two sets of vehicle transponders. One set of transponders is being used by the SRTC for a travel time study. Transponder receivers are located at key corridors

within the Spokane Region. The SRTC is collecting travel time data through the corridors for multiple traffic modes. The second set of onboard transponders are used for Automatic Vehicle Identification (AVI). The system tracks the fixed route buses, within the downtown vicinity only, and displays expected arrival and departure times at 6 AVI reader boards located in the downtown area.

The STA is also using a transit scheduling software (TRAPEZE) to develop routes and schedules and track buses. The software is being used on both the fixed-route and paratransit systems. The paratransit system is up and operating, the fixed-route systems are still being modified.

TRAPEZE is a demand-responsive scheduling and dispatching software system. The paratransit system uses the system to geographically batch passenger assignments with the most appropriate bus in the area. The system is demand-responsive and dispatches drivers to the most appropriate next stop based on the buses geographical location. After each stop drivers enter data into a mobile computer system. The system then geo-references the buses location and dispatches the driver to the next stop based on the geographical location of the next passenger. The system operates similar to an Automated Vehicle Locator (AVL) system, but is not real time.

It is anticipated that the system will be used to enhance the operations of the fixed-route system. TRAPEZE will automate the scheduling process and monitor bus operations. The system will geocode time points and bus stops and provide in-house monitoring capabilities. Although the system is not real time, it can geocode bus locations after each stop. This information will be used by STA and provided to the public online.

The STA also has 90 CCTV cameras installed in and around their facilities. The cameras are located at park and rides, the downtown central passenger facility (Plaza), and at bus parking/maintenance facilities. The cameras are primarily used for security surveillance.

3.1.6 Other Stakeholders

The Spokane County Air Pollution Control Authority (SCAPCA) is currently responsible for monitoring and reporting pollution levels and wood burning status. SCAPCA reports high pollutant level alerts to the media, transportation providers and businesses. This is part of the Airwatch program, in which SCAPCA coordinates with STA and the County's commute trip reduction program to promote transit and carpooling. SCAPCA also maintains a website which provides pollution-level information.

The Washington State Patrol (WSP) currently operates a Computer Aided Dispatch (CAD) system, which compiles incident records and statistics. This includes incident time, day, type, injuries, location, etc. The WSP also acts as a HAZMAT incident management command outside of Spokane. The WSP also has the ability to control WSDOT DMS, with free-text or pre-defined messages.

The Spokane County Fire Department (SCFD) currently has pre-emption equipment on their vehicles in Fire Districts #1 (Valley), and #9 (North County). SCFD also operate a Fire Dispatch Center for both fire and 911 emergency calls.

3.1.7 Private Sector

There are multiple private transportation operators in the area that utilize the various modes of transportation. It is possible that some of the larger commercial vehicle operators and deliver services use internal fleet management tools.

The Burlington Northern Santa Fe (BNSF) operates the areas rail line system, which is also utilized by the Union Pacific Railroad (UPR). The BNSF presently has radio frequency tags on all of their rail cars carrying products. Readers are located along the rail lines at specific geographic locations, typically entering and exiting large cities. The readers read the tags coded information and track when trains have past particular locations. There are readers in Spokane, which are able to track when trains have passed through the area. Clients can track the location of their products via the BNSF web site.

3.2 PROPOSED FUTURE SYSTEMS

This section of the technical memorandum summarizes ITS related projects that are proposed by the various regional transportation stakeholders. Many of the projects lack significant system details as many of them are in the infant idea/planning stages. Also, many of the future ITS projects will be established in the Architecture plan based on regional user needs.

3.2.1 Spokane Regional Transportation Council

The SRTC will be housing the future SRTMC on its current premises.

3.2.2 Washington Department of Transportation

The WSDOT is planning on improving some of their existing services and communication infrastructure, which is key for most ITS deployments. The four primary projects that involve the WSDOT are: 1) A Traffic Management and Signal Control System (joint effort with Spokane County), 2) Road Weather Information System (RWIS) improvements 3), the “Light Lanes” project and 4) future deployment of Commercial Vehicle Information Systems and Networks (CVISN).

The WSDOT and the County (lead agency) have released a RFP to develop and implement a Traffic Management and Signal Control System. This system would fall under the Travel and Transportation Management bundle. The Traffic Management and Signal Control System is the First Step in developing a Spokane Regional Advanced Traffic Management System (ATMS), which will be operated jointly by WSDOT and the County. It is proposed that the early

development of the center have an open architecture and provide maximum flexibility for future needs.

The WSDOT is also enhancing their use of their RWIS locations. In cooperation with the University of Washington's Department of Atmospheric Sciences, the WSDOT will use the RWIS sites to provide real time roadway conditions information to travelers. The information will be provided on the internet for highway travelers and used by maintenance crews for snow and ice removal operations. This system also incorporates other agency weather stations for improved weather forecasts.

Washington State is a CVISN demonstration state. The first CVISN and WIM site went into operation on I-5. It is expected that during 2001 to 2003 the North American Pre-clearance Automated Safety System (NORPASS) along with CVISN will be installed at I-90 Idaho border site. The NORPASS electronic pre-clearance system will be used for automatic vehicle identification, credential checks, weigh-in-motion checkpoints, and port of entry inspections. The NORPASS system is supported by TransCore. The NORPASS system is the result of a merge between the Multi-jurisdictional Automated Pre-clearance system (MAPS) and Advantage I-75. The CVISN will create a way for existing and future "pre-clearance" systems to exchange information electronically through the use of standards and commercially available communication systems. Its anticipated that by the year 2005, the vast majority of CVO business transactions will be handled electronically. WSDOT expects to have approximately 14 CVISN sites deployed on Key arterial locations, primarily the interstate system, within the next 4-to-6 years. This project falls with in the Commercial Vehicles Operations bundle.

The WSDOT is also benefiting from improved communication infrastructure along I-90, from Seattle to the Idaho border. The project is known as the "Washington Light Lanes" project. The project will install a new $100,000,000 fiber optic backbone throughout the state, along the full lengths of I-5, I-90, and I-82. The installation of the fiber optic service is being performed by Universal Communication Networks (UCN). The WSDOT is being provided with 48 fiber optic strands in exchange for use of WSDOT right-of-way. The Spokane WSDOT office will be connected to the network, and roughly 35 network nodes (drops) will be provided in the Spokane metropolitan area. Also, drops will be provided at two Spokane area rest areas for future surveillance and Kiosk deployment. This project provides the necessary communication backbone to support many ITS deployments and is not categorized under any one ITS user service bundle.

Prior the Light Lanes project, WSDOT had plans to expand their ITS operations along I-90 between SR 195 and Pines. The expanded operations would include more video surveillance, vehicle detection, and traffic management capabilities. Some of the funding for this project would have been used for fiber optic installation. However, due to the Light Lanes project, this project will not need to spend funds for fiber optic installation. WSDOT expects to use the additional funds to expand the boundaries of the ITS expansion along I-90 beyond SR 195 and Pines.

3.2.3 City of Spokane

The City currently has an extensive fiber optic communication backbone. Although no projects have been identified, it is anticipated that the City will use the fiber optic system to deploy ITS technologies such as real time video surveillance, vehicle detection and other traffic management tools (note: a new video switch may be required to provide the city with access to other agencies' CCTV video images). The city has the opportunity to take advantage of communication capacity set-aside requirements (i.e. franchise agreements) of various communications providers in the area.

The City is in the process of upgrading their MONARC ATMS signal management operations to the Eagle Actra system.

The City is interested in procuring a centralized vehicle pre-emption system that would support all municipal vehicles (transit, plows, maintenance etc.). Pre-emption authorization would be provided by central.

The City's communications network will likely provide a platform for the SRTMC's physically separate Transportation Services LAN, which will service traffic control functions only (for all regional transportation stakeholders).

3.2.4 Spokane County

The County is anticipating future ITS deployments that will assist in traffic management and transit operation issues. The County primarily uses inductance loops for vehicle detection, but also has upgraded to more advanced detection technologies such as video detection. The County also anticipates the implementation of transit priority logic along key arterial roadways. The County is also the lead agency in the joint effort with WSDOT to implement a Traffic Management and Signal Control System. The two agencies are working together to manage their adjacent traffic signal systems.

There are also plans, provided in the TIP, to interconnect key signals in the Spokane Valley. The signals are located at Argnne/I-90, Pines/I-90, and Sullivan/I-90. These signals will be coordinated and be the first step in providing the foundation for the regional traffic management center supported by the SRTC. The County also has plans to enhance there commute trip reduction (CTR) program and by assisting employers in encouraging and supporting employees in the use of the CTR.

3.2.5 Spokane Transit Authority

The STA is continuing their efforts to provide transit information to bus riders via the internet. The STA plans to continue the development of the TRAPEZE software to statically track bus progression after each scheduled stop. The STA is also anticipating the installation of bus pass/ticket vending machines to help reduce passenger riding delays. The vending machines will allow riders to pay for the ride in advance or after the trip. STA has received funding for an AVL system.

3.2.6 Other Stakeholders

A major project being implemented in the Spokane Region is the light rail transit (LRT) project. The LRT will be operated by the STA. This will include coordinated fare payment and scheduling with existing transit. Future ITS infrastructure added for this project could include signal pre-emption/priority outside the downtown area, possibly an electronic fare payment system and AVL technology.

4. HIGH-LEVEL ARCHITECTURE

4.1 PURPOSE

This section provides the preliminary "Regional ITS Architecture" ("regional architecture") for the Spokane area. This section summarizes transportation needs of the region and ways in which the needs can be met through the implementation of ITS solutions. The regional architecture should provide a structure for the regional ITS deployment plan. It should be supported by the region and, more specifically, have stakeholder buy-in. The regional architecture will lead to project definition and ultimately integration – of systems, services and information.

As a minimum, the regional architecture should identify ITS systems/sub-systems and information flows. In this section, these elements are further categorized in terms of existing capabilities and future needs. The primary objectives of a regional architecture include:

- Interoperability, integration and connectivity between systems and modes;
- Efficient system management and operation; and
- An emphasis on preserving the existing and future transportation system.

To the extent possible, the regional architecture should be designed to adhere to open architecture and non-proprietary interfaces.

4.2 MARKET PACKAGES

One approach to "entering" the National ITS Architecture is through market packages. This is known as the physical approach. A market package identifies the pieces of the National ITS Architecture required to implement a service.

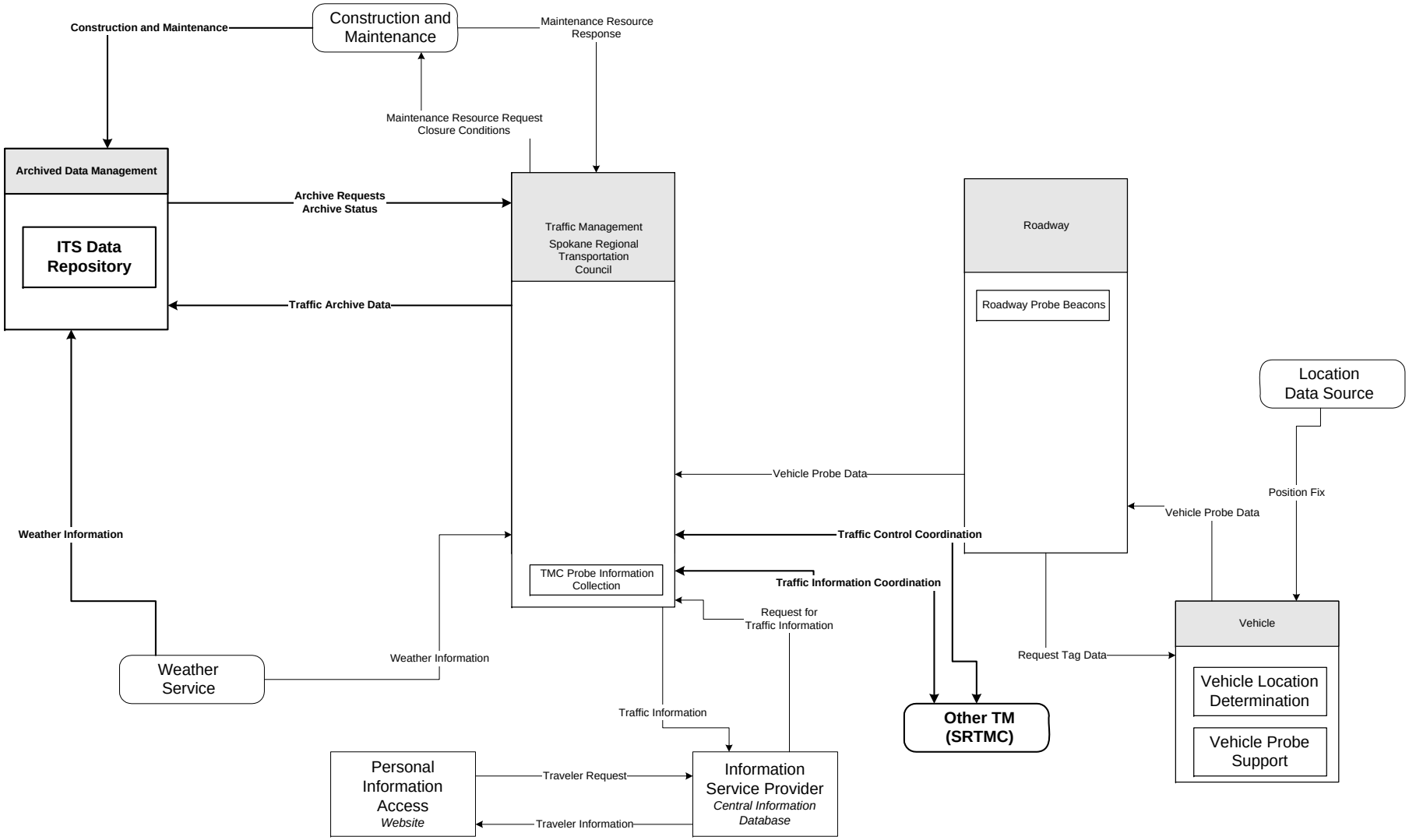
The services provided by, and systems owned/operated by each stakeholder can be represented by one or more market packages. For example, services provided by STA could be represented by the "Transit Fixed-Route Operations", "Transit Maintenance", and "Transit Passenger and Fare Management" market packages (to name a few). For each stakeholder, the market packages were identified and consolidated into a single "combined" agency-specific physical architecture.

The specific market packages relevant to each agency are summarized below, along with an illustrative representation of the agency-specific physical architecture.

4.2.1. Spokane Regional Transportation Council (SRTC)

The Spokane Regional Transportation Council supports some roadside devices and is active in information coordination, and data collecting. The SRTC supports several Market Packages as listed below. These Market Packages are illustrated in the following exhibit.

- AD1 – ITS Data Mart
- ATMS02 – Probe Surveillance
- ATMS06 – Traffic Information Dissemination



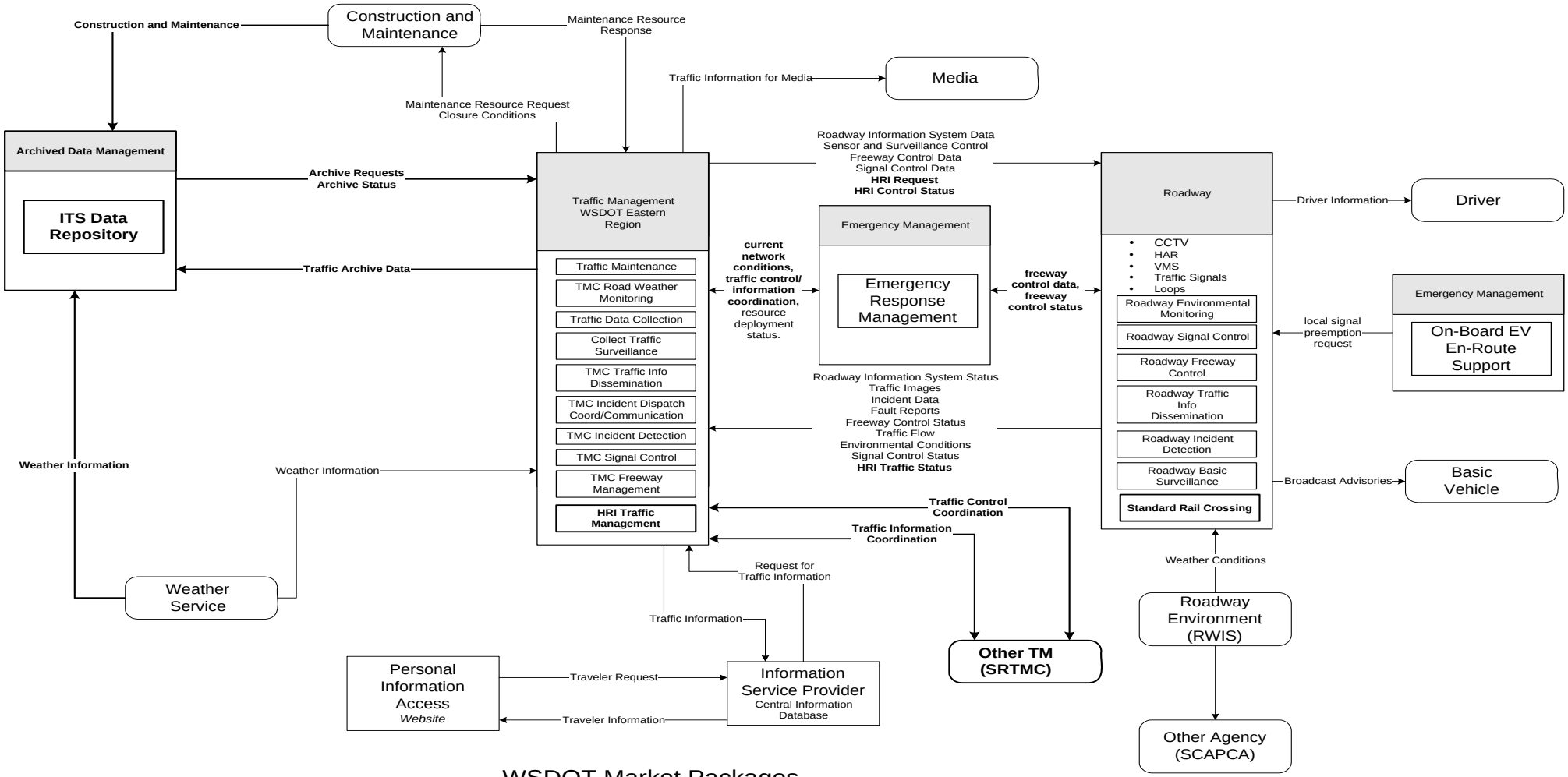
SRTC Market Packages

Figure 2. SRTC Market Packages

4.2.2 Washington State Department of Transportation (WSDOT)

WSDOT Eastern Region supports a wide range of Market Packages including device control on both freeways and surface streets, as well as information systems pertaining to traffic and weather conditions. The following Market Packages have been identified and are illustrated in the following exhibit.

- AD1 – ITS Data Mart
- ATMS01 – Network Surveillance
- ATMS03 – Surface Street Control
- ATMS04 – Freeway Control
- ATMS06 – Traffic Information Dissemination
- ATMS08 -- Incident Management System
- ATMS18 – Road Weather Information Service



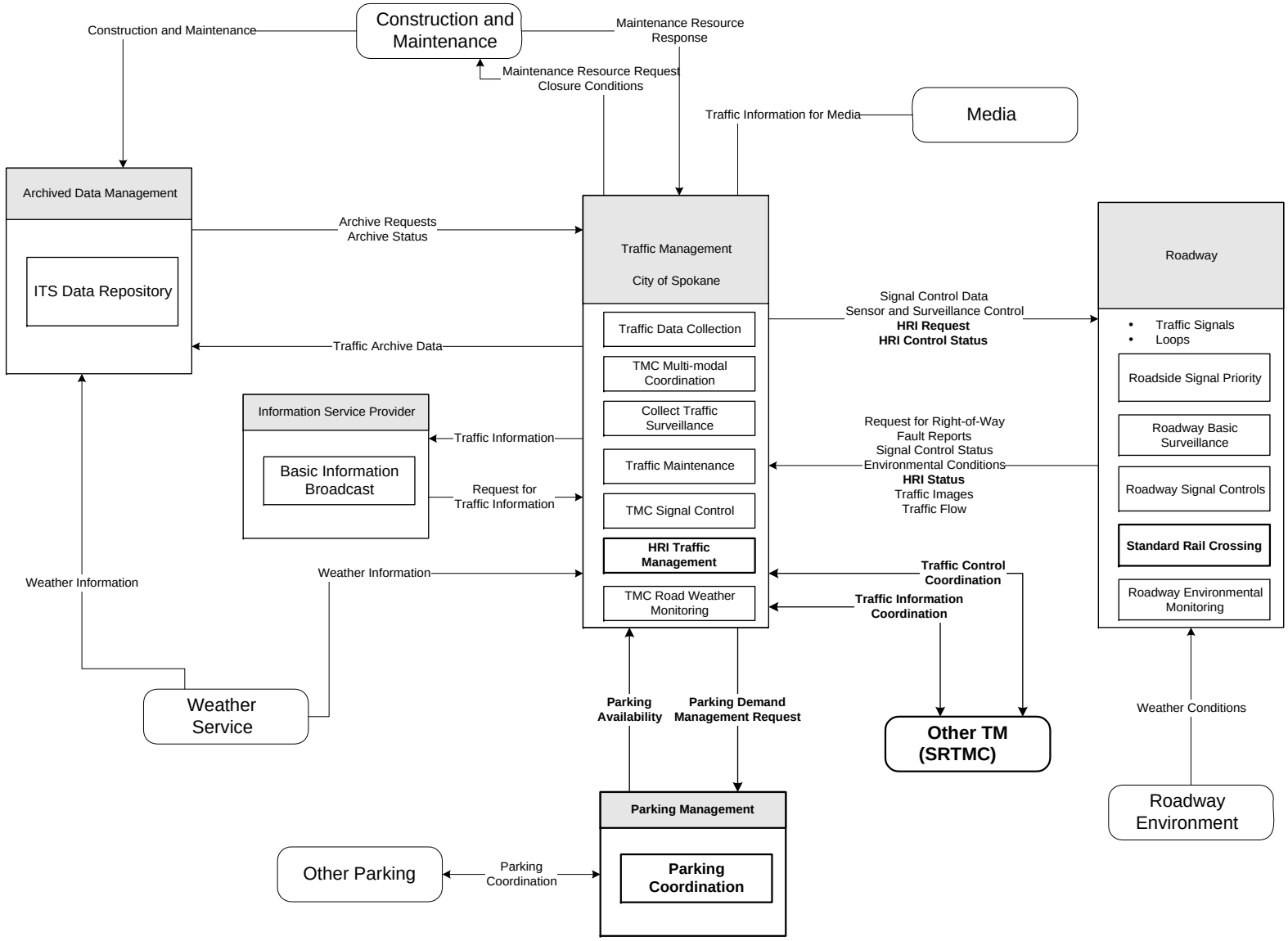
WSDOT Market Packages

Figure 3. WSDOT Market Packages

4.2.3 City of Spokane

The City of Spokane's transportation infrastructure supports device control, information collection, and an increasing level of data access/coordination in the future. These functions support several Market Packages. The following Market Packages have been identified and are illustrated in the following exhibit.

- AD1 – ITS Data Mart
- APTS7 – Multi-modal Coordination
- ATIS1 – Broadcast Traveler Information
- ATMS01 – Network Surveillance
- ATMS03 – Surface Street Control
- ATMS13 – Standard Railroad Grade Crossing
- ATMS18 -- Road Weather Information System
- ATMS19 -- Regional Parking Management
- EM2 – Emergency Routing



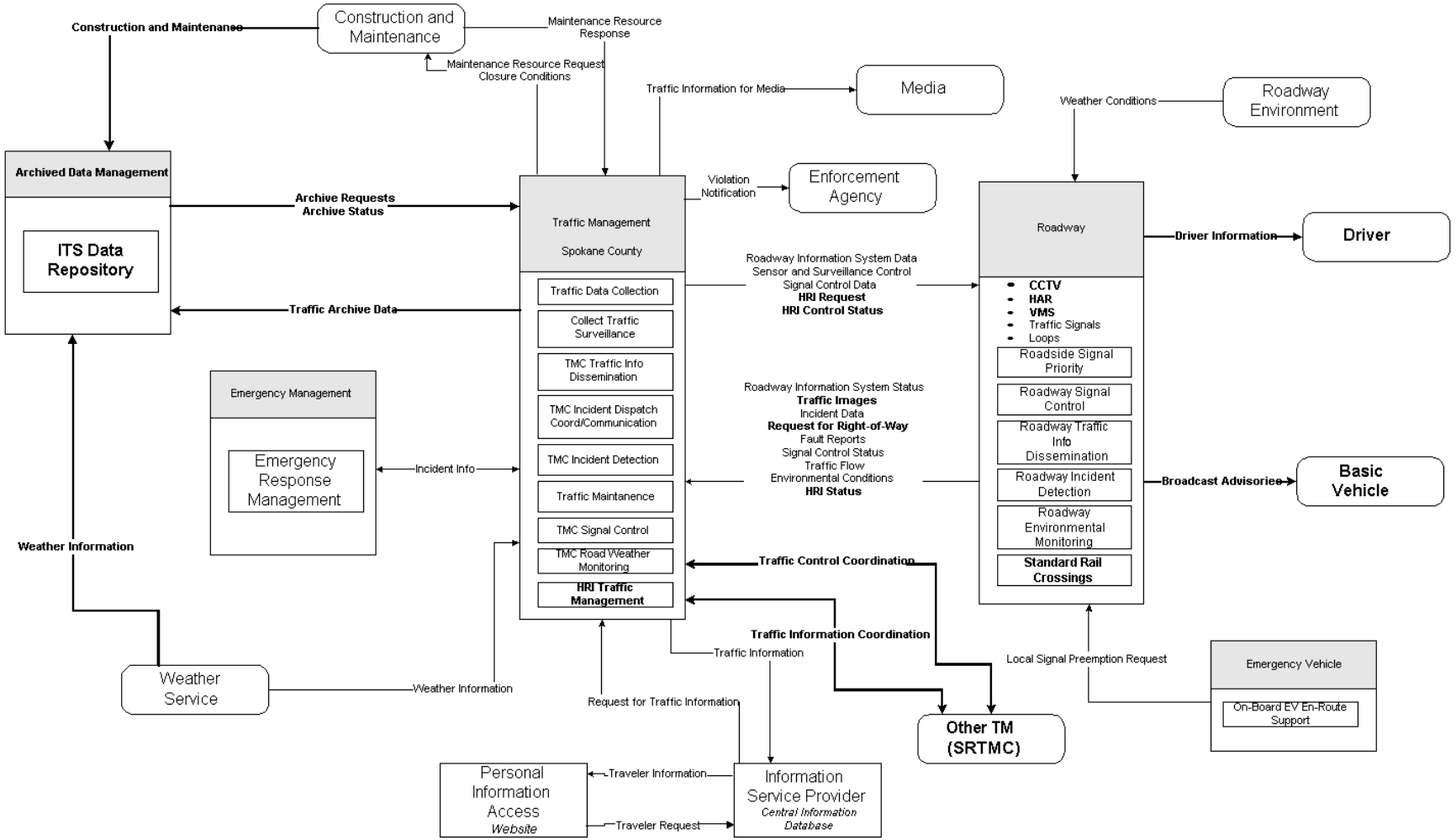
City of Spokane Market Packages

Figure 4. City of Spokane Market Packages

4.2.4 Spokane County

Spokane County's transportation infrastructure supports several Market Packages relating to roadside device control, and information dissemination/coordination. The following Market Packages have been identified and are illustrated in the following exhibit.

- AD1 – ITS Data Mart
- ATMS01 – Network Surveillance
- ATMS03 – Surface Street Control
- ATMS06 – Traffic Information Dissemination
- ATMS08 – Incident Management System
- ATMS18 – Road Weather Information System
- EM2 – Emergency Routing



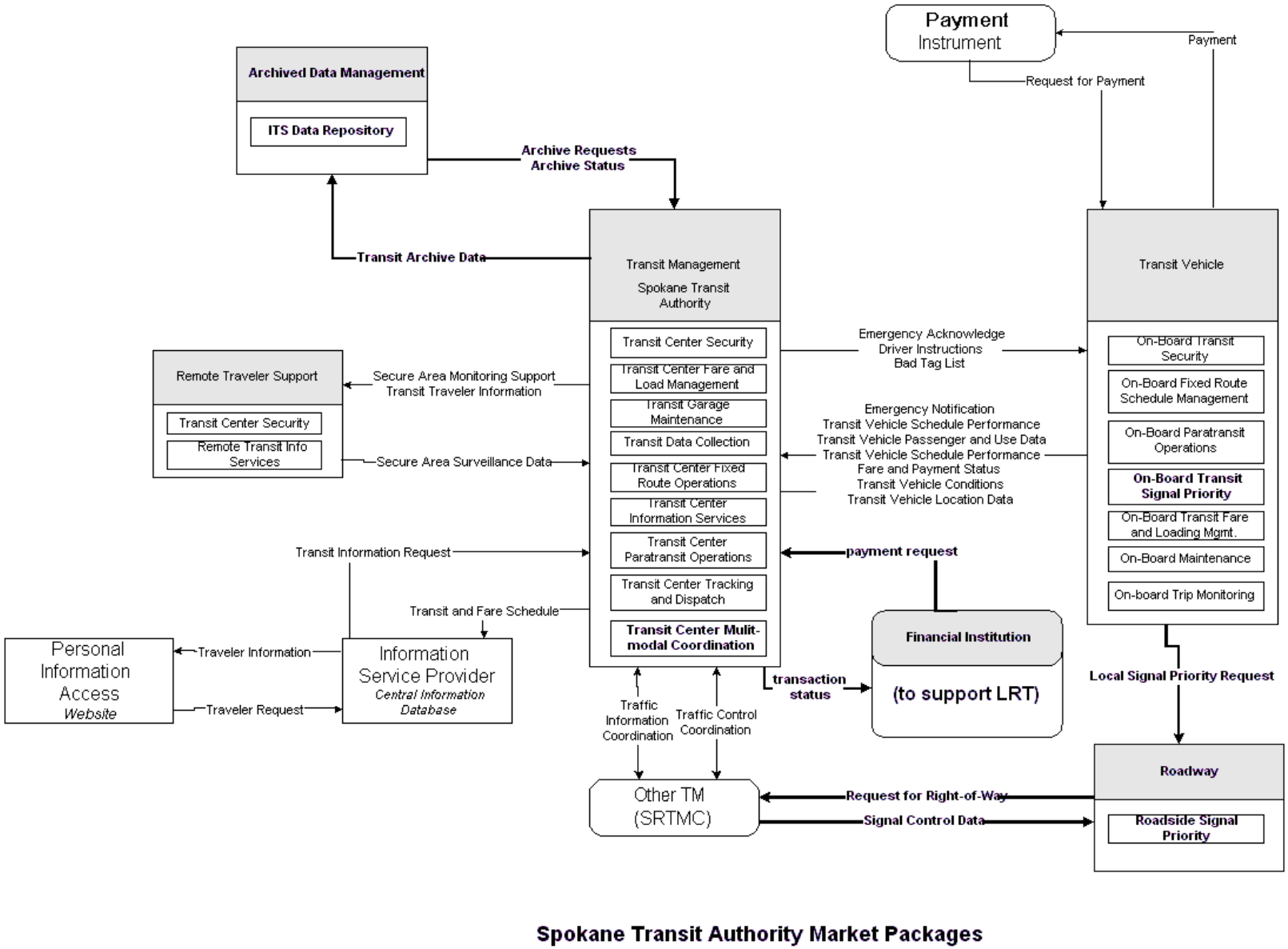
Spokane County Market Packages

Figure 5. Spokane County Market Packages

4.2.5 Spokane Transit Authority (STA)

The Spokane Transit Authority operations include several major aspects. These include vehicles, facilities, maintenance, security, information, and financial operations. These operations support several National Architecture Market Packages. The following Market Packages have been identified and are illustrated in the following exhibit.

- AD1 – ITS Data Mart
- APTS1 – Transit Vehicle Tracking
- APTS2 – Transit Fixed Route Operations
- APTS3 – Demand Response Transit Operations
- APTS4 – Transit Passenger and Fare Management
- APTS5 – Transit Security
- APTS6 – Transit Maintenance
- APTS7 – Multi-modal Coordination
- APTS8 – Transit Traveler Information



Spokane Transit Authority Market Packages

Figure 6. STA Market Packages

4.2.6 OTHER STAKEHOLDERS

Several other stakeholders were interviewed to determine how their needs and services could impact the regional architecture. The primary impacts identified involved data and control sharing with the SRTMC. Many of these stakeholders currently collect specialized information, which would be useful to the SRTMC Operating Board members to facilitate improved transportation management activities.

For the purpose of this report, only those services and functions provided by "other" stakeholders, that have an impact on the regional architecture have been included. The analysis has been performed from the perspective of the SRTMC and therefore, "other" stakeholder subsystems and terminators that are relevant to the regional architecture are reflected in the Regional Physical Architecture diagram in Section 4.6.3.

Subsystems and terminators that are relevant to each stakeholder's local architecture, are identified in the following sections.

4.2.6.1 Spokane County Air Pollution Control Authority (SCAPCA)

SCAPCA has identified several data/information needs from other agencies. These include real-time traffic volumes/flow data, as well as weather information from the WSDOT RWIS. Identifying relationships between traffic data and air pollutant levels could lead to traffic management plans during pollutant alerts. SCAPCA's role in the architecture includes the following subsystems:

- Traffic Management
- Roadway
- Archived Data Management
- Information Service Provider
- Personal Information Access

Terminators relevant to SCAPCA include:

- Roadway Environment
- Weather Service
- Media

In terms of the Spokane Regional ITS Architecture SCAPCA's interaction with other stakeholders will be limited to primarily the SRTMC. In the future, air quality alerts will likely be sent to the SRTMC – note all SRTMC Operating Board Member agencies will have access to these alerts through the SRTMC Traffic Management/Control System (see section 4.7) workstations. Likewise, SCAPCA has identified an interest in having access to real-time traffic conditions data and CCTV images. This would likely be achieved through a direct link between SCAPCA and the SRTMC (rather than separate interfaces to each agency). For example, it is

expected that SCAPCA will have the ability to access all Spokane regional road and weather information (including WSDOT RWIS data) through a link to the SRTMC database(s)[5].

4.2.6.2 Washington State Patrol (WSP)

The WSP identified the need for real-time CCTV feeds, as well as camera control at select locations. The WSP would be willing to supply incident records and statistics currently compiled on their CAD system. Also identified as a beneficial initiative was the development of an interface between the CAD system and the SRTMC Traffic Management/Control System. Functionally this could be used to develop and initiate ITS response strategies to accidents and planned events. WSP's role in the architecture include the following subsystems:

- Traffic Management
- Emergency Management
- Roadway
- Archived Data Management

The WSP would primarily interact with the SRTMC for all CCTV requests and data sharing. A link would most likely still exist between WSP and WSDOT, however, to account for WSP's existing control capabilities of the WSDOT DMSs (pager communications).

4.2.6.3 Spokane Fire Department (SFD)

The SFD identified the need for recorded CCTV camera images (during incidents) or for real-time video, with the ability to have some camera control. Signal pre-emption along major corridors was also identified. The SFD may be able to provide some incident information to other agencies. This would functionally serve to develop or deploy proper incident response plans. SFD's role in the architecture includes the following subsystems:

- Emergency Management
- Emergency Vehicle
- Traffic Management
- Roadway
- Archived Data Management

The SFD's involvement with other agencies will be primarily with the SRTMC. This is where requests would be made for CCTV camera control. However there may remain links between the SFD and the County, City, and/or State if pre-emption corridors are enabled.

[5] It is likely that the Spokane Regional Information Database/Warehouse will have a direct interface to the Washington State Weather Database being developed by University of Washington – this system will include an archive function for all statewide weather data.

4.2.6.4 Light Rail Transit (LRT)

The LRT is not a separate stakeholder, but can be best described as one when identifying its impacts on the regional architecture. The LRT project has been identified to have both coordination and technology impacts on the regional architecture. The LRT will likely have an integrated fare policy and fare payment with other STA operated transit. Outside the downtown area there is interest in signal pre-emption at at-grade crossings. AVL is another option being considered which could lead to real-time customer information such as next arrival times. Interactive traveler information is also expected and will probably be provided through the SRTMC server. The LRT will influence the following subsystems:

- Transit Management
- Transit Vehicle
- Traffic Management
- Roadway
- Information Service Provider
- Remote Traveler
- Archived Data Management

Terminators relevant to the LRT project include "Financial Institution" which could be necessary for the use of an integrated (bus/rail) electronic fare payment system.

The LRT will primarily interact with the STA and SRTMC for all coordination and information sharing. Other agencies such as the County, City, and State may be influenced by signal pre-emption.

4.2.6.5 Burlington Northern Santa Fe (BNSF) & Union Pacific (UP)

Rail operations is an issue that has direct affects on the regional architecture. Some issues that are of importance are train location, hazardous waste tracking, and signal pre-emption at at-grade rail crossings. These issues could have affects on several subsystems and terminators including:

- Traffic Management
- Roadway
- Archived Data Management
- Rail Operations (terminator)

The majority of rail operations interaction with other agencies will be with the SRTMC. There will likely also be a link with the Spokane Fire Department however for HAZMAT response.

4.3 NEEDS AND USER SERVICE REQUIREMENTS

Another approach to entering the National ITS Architecture is through the identification of User Services. Whereas market Packages are part of the Physical Architecture, User Services and User Service Requirements (USRs) are part of the Logical Architecture.

User services represent what the system will do from the perspective of the user. A number of functions (what has to be done) are required to accomplish each user service. To reflect this, each of the user services is broken down into successively more detailed functional statements, called user service requirements (USRs). The logical architecture defines the processes (functions) that are required to satisfy the user services. Many different processes must work together and share information to provide a user service. The following table has consolidated all the USRs into a single table. The USRs are identified as existing (E), planned (P), or needed (N). The translation of identified functionality and needs into USRs is an approach that is recommended by the National ITS Architecture documentation to be a good "entry" point into the National ITS Architecture.

Table 2. User Service Requirements

		Stakeholder	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
User Service Category	**User Service Requirement**	**USR Ref.**								
1.1 Pre-trip Travel Information	Provide travelers with information on those travel services available for their use (transit routes, schedules, schedule adherence, transfer options etc.)	1.1.1	N					E		
	Provide capability for users to access information on the current condition of transportation services (incident conditions/status, road construction, speeds on routes, parking conditions)	1.1.2	N		E, N		E,N			Most agencies provide a information to the public about planned events and road works. All agencies expressed the desire to update existing systems to include more real-time information (note: WSDOT's website includes real-time CCTV video).
	Current condition of incidents	1.1.2.1.1	N		N	N	N	N	N	WSP, SFD
	Current status of accidents or incidents	1.1.2.1.2	N		N	N	N	N	N	WSP, SFD
	Current condition of road construction	1.1.2.1.3	N	N	E, N	E, N	E, N	N	N	WSP, SFD
	Currently recommended alternative routes	1.1.2.1.4	N		N	N	N			
	Current speed	1.1.2.1.5	N		E, N		N			
	Schedules for current or soon to start events	1.1.2.1.7	N	N	N	N	N	N		

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
	Current weather situation	1.1.2.1.8	N		E, N	E, N	N		N	WSP, SCAPCA
	Trip Planning Service (mode choices, estimated travel time, etc.)	1.1.3						N		
	Real-time travel conditions and estimated conditions for time of travel	1.1.3.1.3	N		E, N				N	WSP
	Provide capability for user access (I.e. user may access the TI system from home, work, and other remote locations)	1.1.4	N	E,N	E,N	E,N	E,N	E,N		See note above
1.2 En-route Driver Information	Driver Information provides vehicle drivers with information, while enroute, which will allow alternative routes to be chosen for their destination (HAR, DMS)	1.2	N		E		P			
	General Requirements (improve highway safety, reduce air pollution, decrease congestion, etc.)	1.2.1	N	E	E	E	E	E		
	Driver advisory implemented in two phases (short-term [limited to areas with more immediate need/benefits] and long-term [all geographic areas])	1.2.2	N		N	N	N	N		
	In-vehicle signing capability	1.2.3			E	N	N	N		
1.3 Route Guidance	Capability to provide directions to travelers (current traffic conditions, status of transit, transit schedules, street closures etc.)	1.3.1	N	E, N	E, N	E, N	E, N	E, N		A Regional transportation web site (or other dissemination technology) which collects, consolidates and disseminates all regional traffic and

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
										weather data, is needed.
	Include static mode for issuing information to travelers (mapping, transit scheduling, provide directions)	1.3.2	N	E	E	E		E		
	Include real-time mode for issuing information to travelers (traffic conditions, mobile route selection devices, dynamic transit schedule etc.)	1.3.3						P		The STA is pursuing the implementation of an AVL system. This would allow them to collect and disseminate real-time vehicle location data and estimated vehicle arrival times, etc. The other stakeholder agencies would like to be able to disseminate real-time traffic data.

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
	Include a user interface function (e.g. visual displays, keypad, computer generated voice, mobile systems - allow customers to customize their routing selection.)	1.3.4	N	E	E	E	E	E		All agencies operate independent web sites. There is a need to create a regional site to consolidate all information.
1.4 Ride Matching and Reservation	Include a Rider Request capability	1.4.1						E		This is currently managed manually.
	Include a transportation service provider function	1.4.2						E		
	Include Information Processing function	1.4.3		E,N	E,N	E,N	E,N	E,N		All agencies currently collect and process historical data. There is a need for the collection/processing of real-time traffic data.
1.5 Traveler Services Information	Information Access function to allow traveler to access information such as lodging, food, parking, tourism, special events, hospital, gas stations. Access should be provided through various means such as HAR, PC, in-vehicle units, kiosks, etc.	1.5.2		N						
1.6 Traffic Control	Flow Optimization function (manage surface street and highway traffic, goal of minimizing delays/energy use/air quality impacts)	1.6.1	N		P		P			

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
	include wide area optimization capability (including several jurisdictions)	1.6.1.2	N		P	N	P			
	integrate control of network signal system with the control of freeways	1.6.1.2.1	N		P	N	P			
	provide preferential treatment for transit vehicles	1.6.1.2.2						N		
	provide preferential treatment for emergency vehicles	1.6.1.2.3			E	E				
	implemented in a manner that seeks to optimize traffic movement over a larger geographic area	1.6.1.3			P	N	P			
	control function responsive to both current demand and expected demand	1.6.1.4	N		N					
	capability to predict travel patterns	1.6.1.5	N		N	N	N			
	use data from surveillance as feedback to control strategies	1.6.1.6	N	E	E, N	N	N		N	WSP
	Traffic Surveillance function (detect vehicles in real-time, collect speed and flow data, process the data)	1.6.2	N		N	N	N	P		Although many agencies collect historical data - there is a need for real-time traffic data.
	Vehicle Detection function with the capability of accurately detecting vehicles in a real-time fashion	1.6.2.1	N		N	N	N	P		

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
	traffic surveillance shall include an area wide surveillance capability to include several jurisdictions	1.6.2.3	N	N	N	N	N	N		General need to share video feeds and traffic data (real-time). Note: Not all agencies will need access to all data - only data which affects conditions on or at the periphery of their jurisdiction.
	data process to combine and process data from multiple sources and times in order to improve accuracy of the view of current traffic conditions	1.6.2.5.2	N	N						
	Control function	1.6.3	N							
	real-time adaptive control portion shall be area wide to include several jurisdictions	1.6.3.2	N			N	N			
	area-wide control to be implemented in an integrated and consistent manner that avoids the issuance of conflicting controls	1.6.3.2.1	N		P	N	P			
	capability to control "traffic control" devices as follows:	1.6.3.3								
	traffic signalization	1.6.3.3.1	N		E	E	E			
	dynamic traffic signing	1.6.3.3.2	N		E	N	N		E	WSP

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
	ramp metering	1.6.3.3.3	N		N					Ramp metering is a "possible" future need - not a high priority at this time.
	communicate control data to traffic signals, ramp meters, information signs, HOV lanes and/or human operator support devices	1.6.3.4	N		E	E	E	E		
	capability to change system response in order to provide a coordinated support of other TMCs that are responding to incidents	1.6.3.6	N		N	N	N			
	Provide Control information to other elements of ITS such as trip planning applications, fleet management and in-vehicle navigation	1.6.4	N							
1.7 Incident Management	Provide Incident Identification Function	1.7.1	N	N	E, N	E, N	E, N	N	N	Most agencies are notified by police or state patrol of incidents on their respective network. There is a general need for an incident detection function (e.g. based on real time data and algorithms).
	Identify predicted incidents (determined by traffic sensors, environmental sensors, media, weather sources, transportation providers sponsors of special events etc.)	1.7.1.1	N	N	N	N	N			

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
	Incidents should be defined by the following characteristics - type, extent, severity, location, expected duration	1.7.1.1.2	N	N	N	N	N		E, N	WSP, SFD
	Provide a response formulation function to formulate appropriate response actions to each identified incident and raise those actions when necessary	1.7.2	N	N	N	N	N		N	WSP
	response application should be able to propose appropriate scheduling of incidents that can be scheduled (e.g. construction, street closures, maintenance etc.)	1.7.2.1	N	E, N	E, N	E, N	E, N			Currently the agencies are working together to coordinate the construction schedules in the network. This is currently done through the construction scheduling taskforce. An automated system - which each agency could access (e.g. via an intranet) would be beneficial.
	response application shall facilitate dispatch of emergency vehicles (e.g. ambulance)	1.7.2.2								Is this something that is desired? How is this currently handled - by police? State patrol? Both have

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
										dispatch centers.
	response application shall facilitate dispatch of service vehicles (e.g. police)	1.7.2.3	N	N	N	N	N	N	N	May be a need for the response application to be interfaced with the police and state patrol dispatch centers.
	response function shall propose and facilitate dissemination of information to travelers and potential travelers	1.7.2.4	N	N	N	N	N			
	response function shall propose and facilitate the appropriate control of traffic signals and other traffic control to reduce impact of incidents	1.7.2.5	N	N	N, P		N, P		N	WSP, SFD
	Response implementation - to implement coordinated incident response actions by all participating institutions. This function shall include the following capabilities:	1.7.3	N	N	N, P	N	N, P		N	Police/WSP call for incident response dispatch. Add AVL and Radio to SRTMC.
	coordinated selection/determination of procedures for resolution of each incident - provide procedures to agencies responding to incident	1.7.3.1 a	N	N	N	N	N		N	WSP, SFD

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
	status of all resources (e.g. devices, alternate routes, etc.) needed for incident resolution	1.7.3.1 b	N	N	N	N	N		N	WSP
	Capability to predict the time and location of hazardous conditions that may cause an incident	1.7.4							N	SFD, BNSF
1.8 Travel Demand Management	Include a communications function. This function should include the following capabilities:	1.8.1		E,N	E,N	E,N	E,N	E,N		Each agency currently owns/has access to a communications systems (various levels of coverage and different types of technology). Each agency could benefit from improved communications and integration.
	communications function to include capability for two-way communications with other ITS user services including:	1.8.1.6								
	pre-trip planning	1.8.1.6 a)						N		
	en-route transit advisory	1.8.1.6 b)						N		
	driver information	1.8.1.6 c)			E					
	ride-matching and reservation	1.8.1.6 d)						E		
	electronic payment	1.8.1.6 e)						P		

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
	traffic control	1.8.1.6 f)			E	E	E			
	Include a processing function	1.8.2								
	processing function shall provide capability to develop strategies for implementation of policies that will accommodate	1.8.2.5								
	public sector users and service providers	1.8.2.5 a)	N	N	N	N	N	N		
	private sector users and service providers	1.8.2.5 b)	N	N	N	N	N	N		It is expected that the dissemination of traffic/incident data to TV/radio stations will be done via the SRTMC.
	issues of legality	1.8.2.5 c)	N	N						
	privacy act	1.8.2.5 d)								
	multi-jurisdictional settings	1.8.2.5 e)	N	N	P, N	N	P, N			
	processing function's generation of management and control strategies for HOV facilities (e.g. for select vehicles at ramps, priority for selected vehicles at signalized intersections)	1.8.2.8						N		
	Include a sensors/control function (provide capability to gather information pertaining to vehicle occupancy, vehicle pollution levels, etc.)	1.8.3	N		N	N			E	SCAPCA

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
1.9 Emissions Testing and Mitigation	Wide Area Pollution Monitoring capability	1.9.1				N			E	Although DOE/SCAPCA have pollution monitoring in place, some agencies may want to augment these systems in key high-volume areas.
	Include Roadside Pollution Assessment (RPA) capabilities	1.9.2				N			E	SCAPCA
1.10 Highway-rail Intersection	Applicable to operational, at-grade highway-rail intersections with train operational speeds up to 125 mph.	1.10.1	N	N					N	BNSF
	provide interfaces between highway and rail management functions	1.10.2	N	N	N	N	N		N	BNSF
	provide information management interfaces between roadway and rail to coordinate traffic, demand and schedules	1.10.2.1	N	N	N	N	N		N	BNSF
	capability for interacting with traffic management functions	1.10.2.1.2	N	N	N	N	N		N	BNSF
	capability for interacting with traffic management functions for highway traffic coordination	1.10.2.2.2	N	N	N	N	N		N	BNSF
	capability to coordinate with trains approaching and crossing the HRI for traffic coordination	1.10.2.2.3	N	N	N	N	N		N	BNSF
	manage the traffic in the intersection at HRIs with active railroad warning systems	1.10.3	N	N	N	N	N		N	In metro area, all crossing have active control.

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
2.0 Public Transportation Management User Service Bundle										
2.1 Public Transportation Management	Computer assisted control of the operation of vehicles	2.1.1						E		
	Gather the following data:	2.1.1.1								
	vehicle passenger loading by bus stop and trip segment	2.1.1.1 a)						N		
	bus running times between stops	2.1.1.1 b)						P		
	fare collection by fare category	2.1.1.1 c)						E		
	real-time vehicle location reports	2.1.1.1 f)		N				P		
	Command and Control function	2.1.1.2						E		
	Real-time vehicle CC function	2.1.1.2.1						N		could be provided by an AVL system
	Compare real-time data to predetermined operating characteristics, and note deviations	2.1.1.2.1.1						N		could be provided by an AVL system
	Transmit deviations to central control	2.1.1.2.1.2						N		could be provided by an AVL system
	Display deviations	2.1.1.2.1.3						N		could be provided by an AVL system
	Automatically issue corrective instructions to driver	2.1.1.2.1.4						N		could be provided by an AVL system

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
	integrated traffic control function - traffic signal pre-emption when required for schedule adjustment	2.1.1.2.3						N		
	Automated planning and scheduling service	2.1.2						N		could be provided by an AVL system
	Personnel Management function - drivers and maintenance personnel	2.1.3						E		
	Communications Function	2.1.4								
	Two-way voice comms between bus drivers and central	2.1.4.1						E		
	Two-way data comms (sensor data, bus location etc.)	2.1.4.2						N		AVL
2.2 En-route Transit Information	Information distribution function to disseminate information to travelers	2.2.1								
	furnish users with real-time travel related information while they are traveling	2.2.1.1						E/N		
	include a user interface at fixed locations (e.g. transit stops, kiosks etc)	2.2.1.2						E/N		
	at transit stops	2.2.1.2.1.1.2								
	notification of imminent transit arrival	2.2.1.2.1.1.2 a)						E		
	identification of route of arriving transit vehicle	2.2.1.2.1.1.2. b)						E		
	kiosks at fixed locations	2.2.1.2.1.2						E		
	Information Processing for en-route transit information (e.g. schedule, next available vehicle, transfer options etc.)	2.2.3						E/N		

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
	Need for the following type of data	2.2.3.1.2								
	actual road data	2.2.3.1.2 a)						N		
	traffic data	2.2.3.1.2 b)						N		
2.3 Personalized Public Transit	Rider Request function (rider specifies trip origin, destination, time and date)	2.3.1						N		
	Vehicle Assignment function (utilizes vehicle availability, special requirements and rides requested - determines vehicle assignments and routing)	2.3.2						E		this function is currently done manually by an STA staff member
	Data Collection Function (vehicle location, passenger loading, fare collection, etc.)	2.3.3						E		
	Information Processing Function (minimize amount of time each travel has to ride, assignment of drivers etc.)	2.3.4						E		
	Communications Function	2.3.5								
	Two-way voice comms between bus drivers and central	2.3.5.2 a)						E		
	Two-way data comms (sensor data, bus location etc.)	2.3.5.2 b)						N		
2.4 Public Travel Security	Provide specific secure areas (e.g. bus stops, park & ride, on vehicles, kiosks etc.)	2.4.1						E		
	Provide security sensors (alert operators and police of potential incidents, video or audio systems at key locations)	2.4.2						E		

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
	Personal Sensor Items (electronic payment to eliminate the need for cash)	2.4.3						N		could be provided by a read/write fare payment media
	Security Management and Control function (alarms through electronic communications systems, response to terrorist incidents etc.)	2.4.4						E		
3.0 Electronic Payment User Service Bundle										
Not Applicable										
4.0 Commercial Vehicle Operations User Service Bundle										
4.1 Commercial Vehicle Electronic Clearance	Fixed Facilities including Ports of Entry, Inspection Stations, Weigh Stations and Toll Booths	4.1.1			E,N					Note: All CVO USR's are potential future projects. Confirmation of specific needs is required from each agency.
4.6 Commercial Fleet Management	Provides the capability for users to provide commercial drivers and dispatchers with real-time routing information in response to congestion or incidents	4.6.1	N							
5.0 Emergency Management User Service Bundle										

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
5.2 Emergency Vehicle Management	EVM provided by Signal Priority Systems	5.2.3			E		E		E, F	SFD Districts 1 and 9 currently equipped.
6.0 Advanced Vehicle Safety Systems User Service Bundle										
Not Applicable										
7.0 Information Management User Service Bundle										
7.1 Archived Data Function	Historical Data Archive System for ITS data	7.1.1	N	E	E	E	E	E	E	SCAPCA, WSP, SFD, BNSF
	Operational Control function - ensure integrity of operational data (received from field equip or data collection devices)	7.1.2	N		E	E	E		E	SCAPCA, WSP included
	Data Import and Verification (DIV) function - acquires historical operational data (e.g. traffic flows, freeway video information, flow metrics, signal pre-emptions, signal operation data, incident data, emergency response, roadway network characteristics, transit network data, equipment maintenance etc.)	7.1.3	N	E	E	E	E			
	Automatic Historical Archive Function - for permanently archiving data	7.1.4	N	E	E, N	E	E	E	E	Confirmation required from all agencies
	Data Warehouse Distribution function - to support ITS user functions (includes planning data, research data, analyses, reports, aggregations/summaries, etc.)	7.1.5	N	E	E	E	E	E	E	

Table 2. User Service Requirements		**Stakeholder**	Spokane Regional Transportation Management Center	Spokane Regional Transportation Council	Washington State DOT	City of Spokane	Spokane County	Spokane Transit Authority	Other Agencies	**Notes**
	Provide a ITS Community Interface	7.1.6								
	Common data interface for all ITS users to access Data Archives	7.1.6.1	N	N	N	N	N	N	N	Need for a Regional Transportation data management system.
	Manage user access and security across interface	7.1.6.2	N	N	N	N	N	N	N	
	Provide user interface for ITS transportation agencies for the following planning functions	7.1.6.4.1	N	N	N	N	N	N	N	
	MPO and state transportation planning	7.1.6.4.1 a)	N	N						
	transportation system monitoring	7.1.6.4.1 b)	N							
	transit planning	7.1.6.4.1 g)	N		N	N	N	N		
	Provide user interface for ITS transportation agencies for the following ITS Operations functions	7.1.6.4.2	N	N	N	N	N	N		
	traffic management	7.1.6.4.2 a)	N		N	N	N			
	transit management	7.1.6.4.2 b)	N					N		
	construction and maintenance	7.1.6.4.2 c)	N	N	N	N	N	N	N	WSP included

4.4 PROCESS SPECIFICATIONS

A Process Specification (P-spec) is the elemental function or activity to be performed in order to satisfy the user service requirements. As previously stated in the Introduction Section, the processes share information to provide a user service. The National ITS Architecture literature provides cross-referencing databases to map USRs to P-specs and subsystems. Appendix B provides a table that shows the USRs (summarized in Section 4.3) and relevant P-specs associated with the Spokane Regional needs. Additionally, the table includes a mapping to relevant subsystems and terminators. The identification of P-Specs is not necessary to develop a Regional architecture. This step was included in the process so as to provide input to upcoming tasks of the Spokane Regional ITS Architecture and Regional Implementation Plan Project – primarily the definition of ITS projects.

4.5 SUBSYSTEMS AND TERMINATORS

In this section, process specifications (P-specs) and market packages were mapped to subsystems and terminators. This provided two approaches (logical and physical respectively) to looking at the regional subsystem requirements. Either approach could have been used exclusively, but using both ensures a more complete and comprehensive view of the system.

4.5.1 Subsystem/Terminator Summary Table

The following table represents a mapping between the different agencies and corresponding subsystems and terminators.

* Subsystem Legend

TMS – Traffic Management
ADMS – Archived Data Management Subsystem
RS – Roadway Subsystem
VS – Vehicle
PIAS – Personal Information Access
ISP – Information Service Provider
TRMS – Transit Management
RTS Remote Traveler Support
TRVS – Transit Vehicle Subsystem
EM – Emergency Management
EVS – Emergency Vehicle Subsystem

Table 3. Subsystems and Terminators by Agency

Agency	Subsystem*	Existing System	Planned System	Terminator
Spokane Regional Transportation Council	• TMS • ADMS • RS • VS • PIAS/ISP (limited)	• AVI/Probe system • ArcInfo GIS database Probe Data Archives General Traffic Management Archive • Probe Transponders/Readers • Bus and Vehicle Tags • Web Site	• Regional TMC Integrated Traffic Management and Control System • Link to Arena (television stations – KXLY, KREM, KHQ, KAYU)	1. Weather Service (x58) 2. Media (x27) 3. Other TM (x35) 4. Construction and Maintenance (x09) 5. Location Data Source (x26)

Agency	Subsystem*	Existing System	Planned System	Terminator
Washington State Department of Transportation (Eastern Region)	• TMS • ADMS • EM • RS • EVS • PIAS/ISP (limited)	• Signal Control System • CCTV (Cohu) • HAR Control System • DMS Control System • Weather (RWIS) • General Traffic Management Archive • Signals • HAR Device • DMS Device • Weather Stations • Emergency Signal Pre-emption • Web Sites	• Integrated Signal Control System • Rural ITS system • Incident Coordination	1. Weather Service (x58) 2. Media (x27) 3. Other TM (x35) 4. Roadway Environment (x41) 5. Driver (x12) 6. Basic Vehicle (x03) 7. Construction and Maintenance (x09)
City of Spokane	• TMS • PMS • ADMS • RS • ISP	• Monarc ATMS Signal Control System (upgrading to ACTRA) • Peek video detection system • Weather (RWIS) • General Traffic Management Archive • Signals • Web Site	• Upgrade Peek 2000 video detection system to allow live video • Parking Coordination • Incident Coordination	1. Weather Service (x58) 2. Media (x27) 3. Other TM (x35) 4. Construction and Maintenance (x09) 5. Roadway Environment (x41) 6. Other Parking (x73)
Spokane County	• TMS • ADMS • RS • EVS • EM • PIAS/ISP (limited)	• Signal Control System (Peek NEMA) • General Traffic Management Archive • Signals • Weather (RWIS) • Emergency Signal Preemption • Web Sites	• Integrated Signal Control System • CCTV, HAR, DMS • Incident Coordination	1. Weather Service (x58) 2. Media (x27) 3. Enforcement Agency (x62) 4. Other TM (x35) 5. Driver (x12) 6. Basic Vehicle (x03) 7. Construction and Maintenance (x09) 8. Roadway Environment (x41)

Agency	Subsystem*	Existing System	Planned System	Terminator
Spokane Transit Authority	• TRMS • ADMS • RS • RTS • PIAS/ISP (limited) • TRVS	• Financial/Operational Transit System • Trapeze • Financial Data Archive • Ridership Data Archive • Other Transit Archives • Readerboards • Transponders/Reader • Cameras • Transit center security (CCTV cameras) • Web Sites • Kiosks • Fare Collecting • Multimodal Coordination	• AVL related systems • Read/Write fare payment system • Mobile Data Terminals	1. Payment Instrument (x61) 2. Other TM (x35)
SRTMC	• TMS • ADMS • TRMS • EMS • ISP • RS		• Integrated Signal Control System • Regional traffic/weather information database • Regional Integrated Incident Response System • Regional Web Site (and other information dissemination technologies) • Roadway Systems	1. Other TM (x35) 2. Media (x27) 3. Construction and Maintenance (x09) 4. Weather service (x58) 5. Other Agency (SCAPCA, emergency services etc.) 6. Other Emergency Management Subsystem (WSP, police, fire, ambulance) 7. Other Fleet and Freight Management System (BNSF) 8. Rail Operations (BNSF)
(x26) = National Architecture Terminator Number				

4.5.2 Regional "Sausage Diagram"

The following exhibits illustrate the current architecture and the future regional architecture in the form of "sausage diagrams". These diagrams, illustrate, at a high level, the subsystems and the relationships between them.

4.5.3 Current Architecture

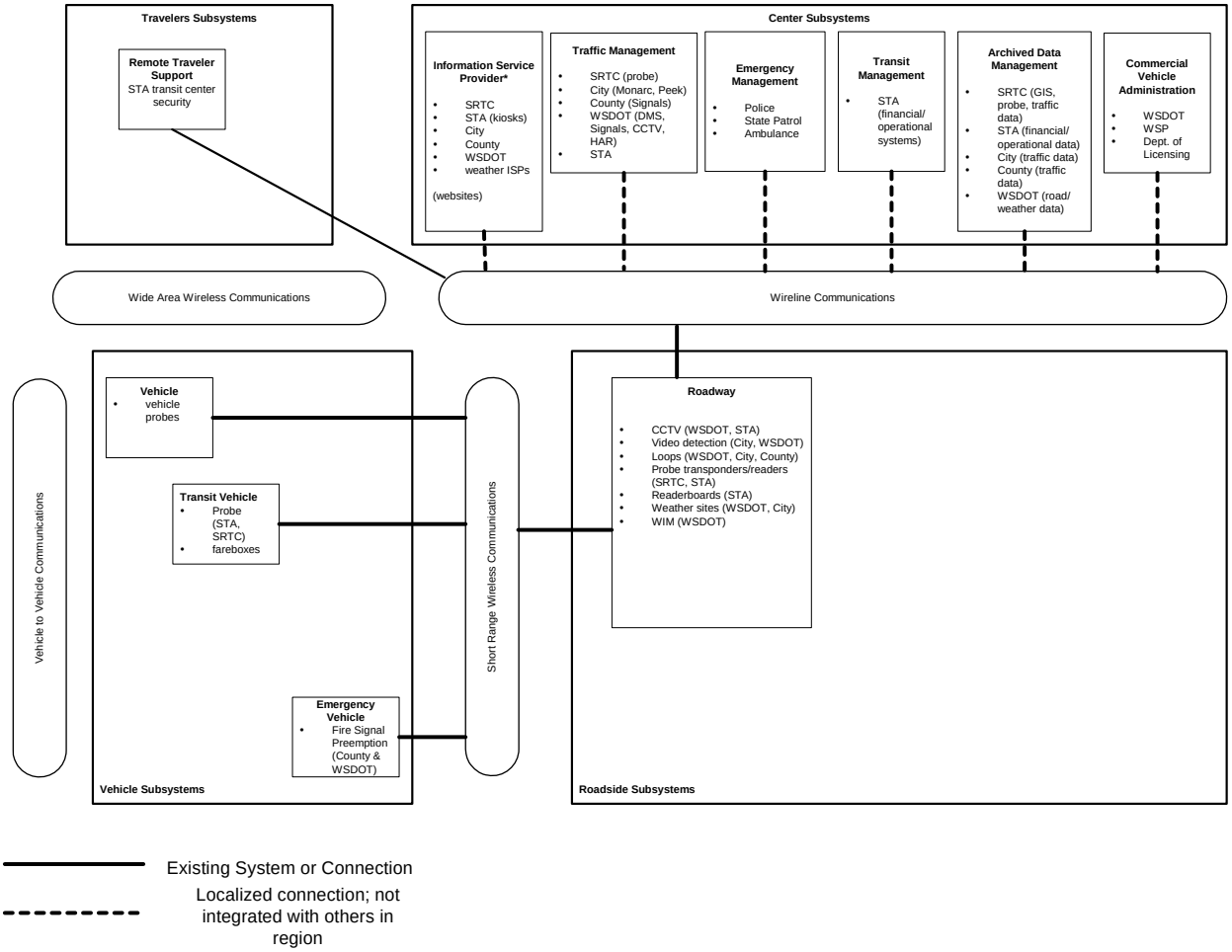


Figure 7. Spokane Regional Existing Architecture

4.5.4 Future "Regional" Architecture

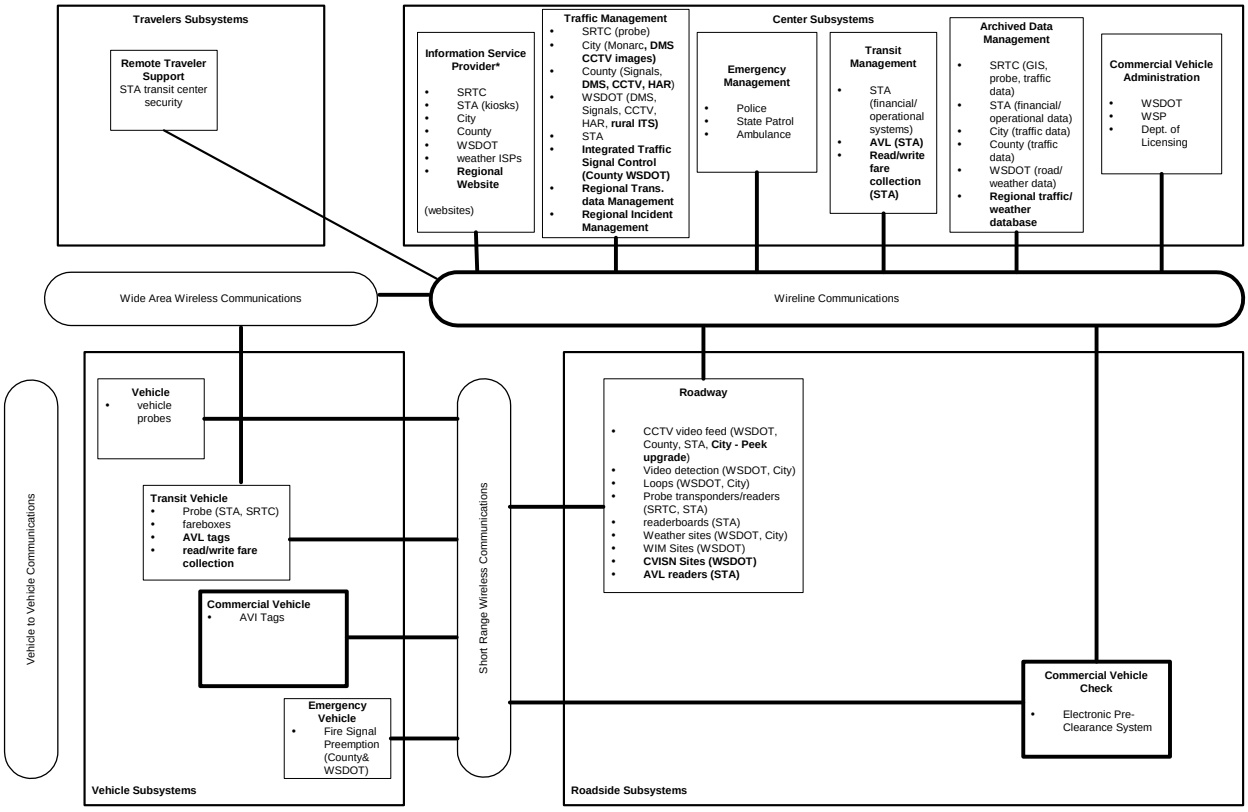


Figure 8. Planned "Future" Regional Architecture

4.6 Regional Architecture

The Regional ITS Architecture can be represented in two ways:

- Logical architecture: User Services and User Service Requirements from the National ITS Logical Architecture were used to define the functional requirements of regional transportation services. See Section 4.6.2.

- Physical architecture: The physical architecture (market packages and agency-specific physical architectures) was used to address the issues surrounding where the required functions would be performed. The physical architecture is based on sets of sub-systems and the architecture and data flows between them. See to Section 4.6.3.

Both methods have been used and are discussed in the following sections.

4.6.1 Regional Architecture Objectives

Both the logical and the physical architectures reflect the same **regional objectives** as described below.

a) Access to Transportation Information: There is a common desire, among all stakeholder agencies to have access to as much transportation information as possible. The primary information needs identified included, real-time traffic conditions, planned and unplanned traffic and weather events, construction information and CCTV camera images.

b) Capability to Access and Control ITS devices: The ability for SRTMC Operating Board stakeholder agencies to have access to ITS device status information, for devices that are owned and operated by other agencies, would be beneficial. For example, the City and County could benefit from knowing what message is currently set on a WSDOT-owned dynamic message sign on I-90. In certain situations, it may also be useful for some agencies to have limited control capabilities of other agencies' devices. For example, if a serious accident occurs on the city surface street network, the city may wish to set a certain message on an I-90 DMS or disseminate a traffic-information message on a state-owned Highway Advisory Radio (HAR). *Note: the "owner" agency would always have the highest level of control and would be able to override any device control request from another agency.*

***c)* Ability to Implement Coordinated Incident Management Strategies:** The road networks that are managed by the SRTMC Operating Board stakeholder agencies are geographically situated such that coordinated incident management strategies would be very beneficial (i.e. adjacent or overlapping networks). Many of the agencies have identified the benefits of implementing coordinated incident management strategies. A coordinated incident management strategy is one which utilizes infrastructure owned /operated by two or more agencies in a coordinated manner to maximize the traffic management benefits.

Note: Operationally, on-going coordination and cooperation between the agencies would be required. Coordinated incident management strategies (e.g. pre-defined plans) would need to be created and approved by relevant agencies. Together the agencies would identify and describe potential incidents that would warrant a coordinated traffic management strategy (e.g. type of incident, location, time of day etc.) and an appropriate response plan would be created (i.e. the response plan would include the devices and settings to be used). Ground rules would be established to govern the use of these strategies. The ground rules would identify situations when the strategies would or would not be implemented

d) Information Dissemination to the General Public: Each SRTMC Operating Board stakeholder agency is required to provide a service to the general public including the provision of information to the public to assist them in preparing for or during their trip. Information Dissemination is a service that is currently provided, by each agency individually. There is a significant benefit to the general public in providing region-wide transportation and weather information in a consolidated, consistent and easy-to-access manner.

These objectives are supported by the regional architecture - depicted in the logical regional architecture and the physical regional architecture as follows:

4.6.2 Logical Architecture

The overall logical architecture is depicted in the following diagram (Section 4.6.2.4).

At a basic level, all of the regional objectives are supported by four primary "logical" functions:

- Requests: Transmission of requests for data, device status and device control.
- Commands: Transmission of device control commands.
- Status: Transmission of device status information.
- Data: Transmission of information on traffic flow, incidents, and weather.

These four primary functions support three primary "logical" processes necessary to meet the regional objectives. Based on the descriptions found in the National ITS Architecture documentation[6], the processes are as follows:

[6] Prepared by Architecture Development Team of Lockheed Martin and Odetics Intelligent Transportation Systems Division, Prepared for Federal Highway Administration, US Department of Transportation, *ITS Logical Architecture -Volume I*, December 1999.

4.6.2.1 Provide Traffic Surveillance: (Information Management Function)

This process provides traffic surveillance, data storage, and communication with other TMCs. Traffic surveillance is provided through devices that obtain data about vehicles on the surface street and freeway network served by all stakeholder centers (e.g. traffic sensors, vehicle probes). Some of this information comes from other sources including ***weather services*** and information service providers. All data, is stored as current data and long-term data. Current data covers the last five minutes. The long-term data shows hourly values for the current day and a rolling period of at least two weeks. Both current and long-term data are provided to other TMCs. The current and long-term data are also available for dissemination to other ITS functions (e.g. incident detection), to the media, and to travelers and transit users. This process is often supported by an ***archived data*** system that would store and process the traffic and weather data. (See section 4.7.5: Regional Data Warehouse).

This process provides for the exchange of data between agencies. For the Spokane region, this could include all traffic and weather data including historical, real-time and future (e.g. planned events, construction) data. Furthermore geographical network data would also be collected and stored. This function would also consolidate, process and store Traffic/Weather Data in a database(s). This function also includes the dissemination of all traffic/weather data to stakeholder agencies (e.g. using a common GUI workstation), and other interested parties (e.g. fax/pager notification to the police). In addition, this application would consist of an information dissemination component to disseminate transportation information to the general public. This service could be provided through one or more technologies including pager, fax, and Internet.

For the Spokane region, the collection and sharing of data could be provided by the development of a regional database and information dissemination system (e.g. Intranet or Internet application). The stakeholder agencies will likely need more comprehensive data than the general public. Access to all traffic/weather data could be managed with different levels of security. The agencies may wish to use an Intranet platform, with access and security privileges, which reflect inter-agency needs. The primary dissemination technology for the general public will likely be via a ***traveler information*** system using technology such as the Internet. The stakeholder agencies have identified the desire to develop a **Regional Transportation Information web site.** Other dissemination technologies such as fax, e-mail and pager could also be supported.

4.6.2.2 Provide Device Control: (ITS Device Control Function)

This process enables traffic control through devices that output information to vehicle drivers on the surface street and freeway network served by the Spokane Region transportation providers. The devices comprise different types of devices, such as signal controllers, dynamic message signs (DMS), highway advisory radio (HAR), freeway ramp meter controllers (possible future application), etc. To support the agencies current traffic management functions, access and control of CCTV cameras throughout the region would be beneficial. Device Control supports various types of traffic management strategies (information dissemination, active diversions, and road closures).

The traffic surveillance process (see above) provides the traffic flow data required by these management strategies. This process would also facilitate the detection of equipment faults. This process includes the ability to select, view and control CCTV cameras, DMS, signals *(probably based on pre-defined signal timing plans*), and HAR owned by another agency. *Note: Priority usage and ability to control devices would need to be provided.* This process allows the selection of appropriate traffic control strategy to be implemented, for situations and during the times of day stipulated in operational agreements between the respective agencies. It also provides for the sharing of device status information such as functional/faulty, current settings etc.

It is expected that the new Integrated Signal Control System being procured by the Spokane County and WSDOT, will provide the basis for this function. The regional functionality (e.g. to control other ITS devices) and integration requirements (e.g. integration with the City's Monarc ATMS Signal Control System) will need to be investigated further. (see sections 4.7.4 Coordinated Incident Response Application and 4.7.6 Traffic Control System Integration).

4.6.2.3 Manage Incidents: (Coordinated Incident Management Function)

This process is responsible for incident management. This includes detection, recording and managing of both current incidents and planned events, and generating the responses to incidents, as they become current. The responses are generated automatically - either by selecting a plan from a library of pre-determined incident management plans or algorithmically using a combination of incident management plan components. Facilities are provided for the traffic operations personnel to review and manage incident data, respond to current incidents, provide operator interfaces for incidents, manage response plan database, and analyze incident log.

To support this process it is expected that an Incident Management Application will need to be developed. This application will include the logic necessary to review incident information and match the information to the most appropriate incident management plan. Ideally, this application will consider all regional ITS infrastructure available to respond to an event, regardless of infrastructure ownership – thus, the management of incidents would be, coordinated and truly "regional".

4.6.2.4 High-level Logical Regional Architecture Diagram

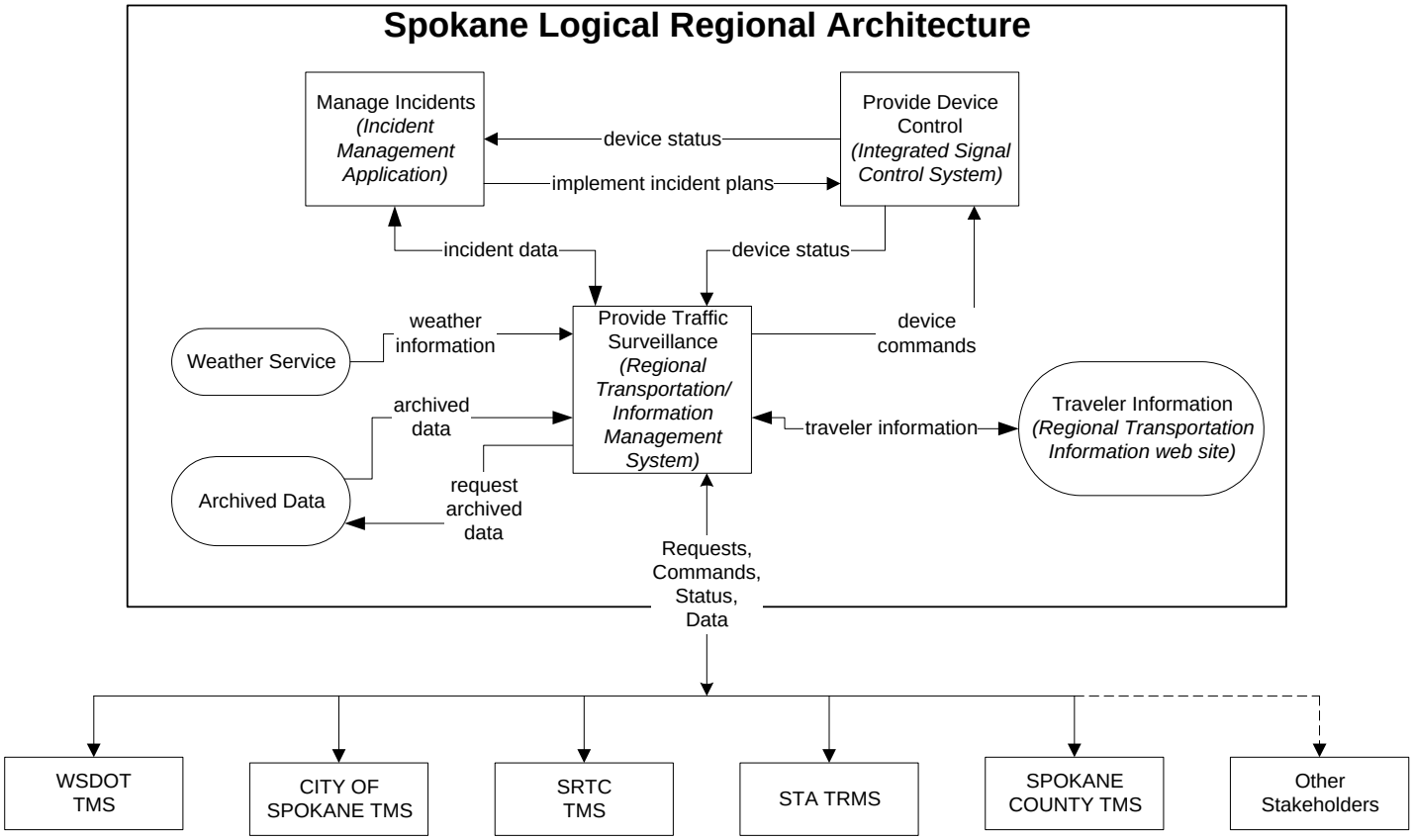


Figure 9. High-level Logical Regional Architecture Diagram

4.6.3 Physical Architecture

The physical architecture addresses the issues surrounding where the required functions (discussed in the logical architecture) should be performed. The physical architecture is based on the sub-systems/terminators and the architecture flows between them. Section 4.4 Market Packages, provides detailed physical architectures for each agency individually. This section focuses on the interconnectivity between each agency required to support the regional objectives (therefore not all subsystems included on the agency-specific architectures are included here).

The physical architecture has been developed to meet the primary regional architecture objectives identified in 4.6.1, and to support the functional processes described in Section 4.6.2

The physical architecture described in this section is based on the following assumptions:

- Each agency will have the ability to operate and maintain it's existing ITS system(s) from the existing (respective) traffic management centers.
- Most existing ITS control systems (hardware/software) will continue to be housed in the current locations (i.e. at agency TMCs). Some systems (e.g. WSDOT video switch) may move to SRTMC.
- The Spokane Regional Traffic Management Center (SRTMC) will act as a hub for all traffic management and control, and traffic/weather information dissemination capabilities.
- The Integrated Signal Control System will be located at the Spokane Regional Traffic Management Center (with workstations at the City, County and WSDOT TMCs).
- The Regional transportation management system(s) will be located at the SRTMC with workstations at the city, county, state, and STA centers. Other workstations with limited access/control capabilities may be located at other stakeholders premises (e.g. emergency services).

  *Note: the county/state integrated signal system may provide the platform for the Regional transportation system(s).
- Each agency will have the ability to access data and control other ITS devices through a communications link with the SRTMC.
- The sharing of information and control capabilities will reflect pre-defined operational and procedural agreements between the agencies.
- The operational and procedural agreements would be technically supported by a "publish/subscribe"-type technology. This technology would allow a "subscriber" agency to "subscribe" to information and/or control capabilities from the "owner" agency. The "owner" agency would have to ability to provide the capabilities requested (i.e. "publish" data/control) or decline the request.

The primary feature of the physical regional architecture is the interface(s) between ***existing Traffic Management Centers (TMCs)*** and the new ***SRTMC***. Furthermore, the physical architecture includes an ***Information Service Provider*** that deals with information dissemination

to all transportation users (i.e. the general public). The physical architecture also identifies the SRTMC as the hub for communications/coordination with the ***Media*** (*Note: this assumption requires further discussion with the stakeholders*), ***Emergency Response Management*** services (e.g. police, state patrol, ambulance etc.), ***Construction and Maintenance*** agencies and rail related operations.

The separate elements of the physical architecture are described in more detail below:

4.6.3.1 Regional Traffic Management Subsystem

This subsystem communicates with the other regional stakeholder Traffic Management Subsystems to facilitate the provision of coordinated traffic information and control strategies in the agencies' jurisdictions. The Spokane Regional TMC would include numerous equipment packages to meet all of the regional needs and goals. These equipment packages are not necessarily separate "systems" - rather they represent separate (but related) technical "applications" that will be housed at the Spokane Regional TMC. These are described in more detail below.

4.6.3.1.1 TMC Road Weather Monitoring

This equipment package assimilates current and forecast road conditions and weather information using a combination of weather service information and an array of environmental sensors deployed on and about the roadway. The collected road weather information is monitored and analyzed to detect and forecast environmental hazards such as icy road conditions and dense fog. For example, this equipment package would include any automatic incident detection capabilities that could be provided as a result of collecting and consolidating real-time, regional traffic data. This information can be used to more effectively deploy road maintenance resources, issue general traveler advisories, and support location specific warnings to drivers. For Spokane, this equipment package could be very beneficial for the management of construction and maintenance activities throughout the region. It would include information about planned construction activities and therefore assist in the scheduling of these activities so as to minimize disruption to the network users. This equipment package would be supported by a new **Spokane Regional Transportation Management Center.**

4.6.3.1.2 Traffic Data Collection

This equipment package collects and stores traffic information that is collected in the course of traffic operations performed by the Traffic Management Subsystem. This data can be used directly by operations personnel or it can be made available to other data users and archives in the region. This equipment package supports the collection of both real-time data (which would be used by agencies to provide traffic management services) and historical data (which could be used for planning purposes and also to analyze the effectiveness of certain traffic response strategies). This equipment package would be supported by a new **Spokane Regional Transportation Management Center.**

4.6.3.1.3 Collect Traffic Surveillance

This Equipment package collects, stores, and provides electronic access to the traffic surveillance data. This equipment package pertains primarily to CCTV camera images and traffic sensor data. This equipment package would be supported by a new **Spokane Regional Transportation Management Center.**

4.6.3.1.4 TMC Traffic Info Dissemination

This Equipment package provides the capability to disseminate real-traffic conditions and incident related information to travelers, potential travelers, and private information service providers. These capabilities shall be provided using a workstation type processor within a facility connected to traveler information providers by utilizing existing wire line links. Some important information links are as follows:

- Links to the ISP for dissemination to the general public
- Links to Construction and Maintenance for planning and scheduling C&M activities
- Links to Media

In addition to these links, dissemination of information between agencies is also important. This could possibly be accomplished through an Intranet.

4.6.3.1.5 TMC Incident Dispatch/Coordination

This Equipment package provides the capability for an incident response formulation function minimizing the incident potential, incident impacts, and/or resources required for incident management including proposing and facilitating the dispatch of emergency response *(note: link to Emergency Management Subsystem)* and service vehicles. In addition to this, it will include a new coordinated incident management application, allowing agencies to take supportive and cooperative measures when incidents occur within the region. For the Spokane Region, this could include the development of an Incident Management Application.

4.6.3.1.6 Incident Detection

This Equipment package provides the capability to traffic managers to detect and verify incidents. This capability includes analyzing and reducing the collected data from traffic surveillance equipment, including planned incidents and hazardous conditions. This equipment package is closely linked with the TMC Road Weather Monitoring and Traffic Data Collection Equipment packages. This function would be provided through the development of a new Incident Management Application.

4.6.3.1.7 TMC Signal Control

This Equipment package provides the capability for traffic managers to monitor and manage the traffic flow at signalized intersections. Control plans may be developed and implemented that coordinate signals at many intersections under the domain of a single traffic management subsystem. It is expected that coordinated signal control will be developed in phases. Initially the integrated county/WSDOT signal system and the City's Monarc ATMS Signal Control System will be separate – i.e. no coordinated signal timing plans will be supported. In the future,

it is expected that an interface between the City's Monarc ATMS Signal Control System and Integrated Signal Control System could be developed.

Initially, control of jurisdictional signal systems through the SRTMC will be limited to pre-determined signal timing plans.

4.6.3.1.8 TMC Freeway Management

This package provides a control system for efficient freeway management including integration of surveillance information with freeway road geometry, vehicle control such as ramp metering, DMS, HAR. Interface to coordinated traffic subsystems for information dissemination to the public. It is envisioned that the future integrated signal control systems will be able to operate all ITS devices (including WSDOT HAR, DMS, CCTV cameras etc.)

4.6.3.1.9 Traffic Maintenance

This Equipment package provides monitoring and remote diagnostics of field equipment to detect field equipment failures, issues problem reports, and tracks the repair or replacement of the failed equipment. Maintenance of all field equipment will continue to be the responsibility of the "owner" agency. However, having this function available at the SRTMC, will provide the ability for this function to be performed by the SRTMC if necessary, in the future (for example, equipment diagnostics/maintenance could be provide by SRTMC on behalf of another agency during non-working hours).

4.6.3.1.10 HRI Traffic Management

This equipment package monitors highway-rail intersection (HRI) equipment at the roadside which manages highway traffic. Various levels of roadside equipment may be interfaced to, and supported by, this equipment package to include standard speed active warning systems and high speed systems which provide additional information on approaching trains and detect and report on obstructions in the HRI. This equipment package remotely monitors and reports the status of this roadside equipment.

4.6.3.2 Regional Transit Management Subsystem

The transit management subsystem manages transit vehicle fleets and coordinates with other modes and transportation services. It provides operations, maintenance, customer information, planning and management functions for the transit property. Most of the transit management functions are currently, and will continue to be performed from the STA transit management center. A transit management subsystem element has been included at the Spokane Regional TMC to support the sharing of transit information and multi-modal services.

4.6.3.2.1 Transit Data Collection

This equipment package collects and stores transit information that is collected in the course of transit operations performed by the Transit Management Subsystem. This data can be used directly by operations personnel or it can be made available to other data users and archives in the region. Elements of this equipment package include data collection, organization, processing, and consolidation. Currently the transit data supported by this equipment package includes historical

operational and financial data. In the future, this could also include data from an AVL system (STA will be procuring an AVL system in the future). Some of this information could be useful to other stakeholder agencies for planning or real-time traffic management (e.g. AVL data) purposes.

4.6.3.2.2 Transit Center Multi-modal Coordination

This Equipment package provides the transit management subsystem the capability to determine the need for transit priority on routes and at certain intersections and request transit vehicle priority at these locations. It also supports schedule coordination between transit properties and coordinates with other surface and air transportation modes. Future projects such as the LRT and increased transit service would support this equipment package in regards to coordinated scheduling and fare collections. Additionally transit signal priority would be supported with coordination between transit vehicles and other vehicles.

4.6.3.3 Existing Traffic Management Centers

Each agency will continue to operate their systems and provide transportation services from their existing premises. The interface between the existing systems and the Regional TMC must support the sharing of information and control capabilities.

Two primary Architecture Flows connect multiple Traffic Management subsystems:

1. Traffic Control Coordination: Information transfers that enable remote monitoring and control of traffic management devices. This flow is intended to allow cooperative access to, and control of, field equipment during incidents, special events and during day-to-day operations. This flow also allows 24-hour centers to monitor and control assets of other centers during off-hours, allows system redundancies and fail-over capabilities to be established, and otherwise enables integrated traffic control strategies in a region. Access to other agencies devices either for control or viewing/status purposes is done by making a request to the "owner" agency. This establishes a publish/subscribe system for device operations between agencies. These are usually dictated by inter-agency operational agreements.
2. Traffic Information Coordination: Traffic information exchanged between TMCs. Normally would include incidents, congestion data, traffic data, signal timing plans, and real-time signal control information. This allows for all agencies to participate in coordinated response plans, and to support other agencies during incidents/congestion. By providing this coordination traffic can be managed on a more regional basis.

4.6.3.4 Regional Archived Data Management

4.6.3.4.1 ITS Data Repository

This equipment package collects data and data catalogs from one or more data sources and stores the data in a focused repository that is suited to a particular set of ITS data users. This equipment package includes capabilities for performing quality checks on the incoming data, error notification, and archive to archive coordination. There are many benefits associated with the

SRTMC having the ability to collect, store and manage a region-wide database of transportation/weather information.

4.6.3.4.2 Traffic and Roadside Data Archive

This equipment package collects and archives traffic, roadway, and environmental information for use in off-line planning, research, and analysis. The equipment package controls and collects information directly from equipment at the roadside, reflecting the deployment of traffic detectors that are used primarily for traffic monitoring and planning purposes rather than for traffic management. The SRTMC will maintain this database providing a single point of contact for any entity wishing to obtain regional traffic/weather information for planning purposes.

4.6.3.5 Regional Emergency Management Subsystem

The SRTMC would serve as a hub for incident/accident information and response information. This would allow emergency agencies such as police, state patrol and ambulance services to contact one "entity" if they become aware of a new incident. It would also be possible to provide emergency services agencies with notification of new incidents (or changes to existing/planned incident status). This could be done automatically (e.g. fax, e-mail, pager etc.) by the SRTMC Traffic Information Dissemination capabilities.

4.6.3.6 Regional Information Service Provider Subsystem

This subsystem collects, processes, stores, and disseminates transportation information to system operators and the traveling public. The subsystem can play several different roles in an integrated ITS. In one role, the ISP subsystem provides a general data warehousing function, collecting information from the transportation agencies and redistributing this information to other agencies in the region. In this information redistribution role, the ISP provides a bridge between the various transportation systems that produce and use the information. In Spokane this function will likely be provided through the development of a regional information database and website, which will be owned by and have oversight from the SRTMC Operating Board.

The second role of an ISP is focused on delivery of traveler information to subscribers and the public at large. Information provided includes basic advisories; real time traffic condition and transit schedule information, and possibly transit ridematching information. The regional database/transportation management system could be designed to include several dissemination technologies (fax, e-mail etc.) – these could be provided to subscribers for free or at cost (e.g. some public or private agencies may be willing to purchase "processed" or "formatted" traffic data for specific planning purposes.

Probably the most powerful technology application to disseminate information to the general public will be the Internet and this will be supported by the development of a regional transportation information web site. Although many of the Spokane agencies already maintain websites, there are significant benefits to the general public in providing a consolidated "regional" website. The regional website will probably not eliminate the need for the agency specific sites, as each agency will wish to provide additional information on their site. It is likely that the regional website will provide links to each agency-specific site.

4.6.3.7 Media

With a regional TMC, the media is able to contact one location for its information. Currently, the media must contact each agency. A single contact / source of information for all traffic and weather data, would ensure that the information provided to all media agencies would be current, comprehensive and consistent.

4.6.3.8 Construction and Maintenance

This category represents the information system that will be used to manage and track construction and maintenance of the all roadway infrastructure in the Spokane region. This Construction and Maintenance system will be used by roadway maintenance personnel, roadway construction personnel, or other work crew personnel assigned to highway construction and maintenance. Providing a centralized regional construction management system will also provide for improved quality and accuracy of information available to Travelers regarding closures and other roadway construction and maintenance activities.

4.6.3.9 Weather Service

The SRTMC will have access to all regional weather information (City, County and WSDOT weather sites) and will therefore have a complete and consolidated "picture" of regional weather conditions and any weather-related events that may require an ITS response.

4.6.3.10 Other Fleet and Freight Management

The Fleet and Freight Management Subsystem provides the capability for commercial drivers and dispatchers to receive real-time routing information and access databases containing vehicle and cargo locations as well as carrier, vehicle, cargo, and driver information. The development of a regional traffic/weather/construction information database and associated information dissemination applications (e.g. web-site, fax, pager etc.) could greatly assist freight operators in dispatch and routing operations. This subsystem also supports application for HAZMAT credentials and makes information about HAZMAT cargo available to agencies as required.

4.6.3.11 Rail Operations

There are significant benefits in providing coordination between rail operations and traffic management centers. Traffic management centers could receive train schedules, maintenance schedules, and any other forecast events that will result in highway-rail intersection (HRI) closures from Rail Operations. The provided information is used to develop forecast HRI closure times and durations that may be applied in advanced traffic control strategies or delivered as enhanced traveler information.

4.6.3.12 Physical Regional Architecture Diagram

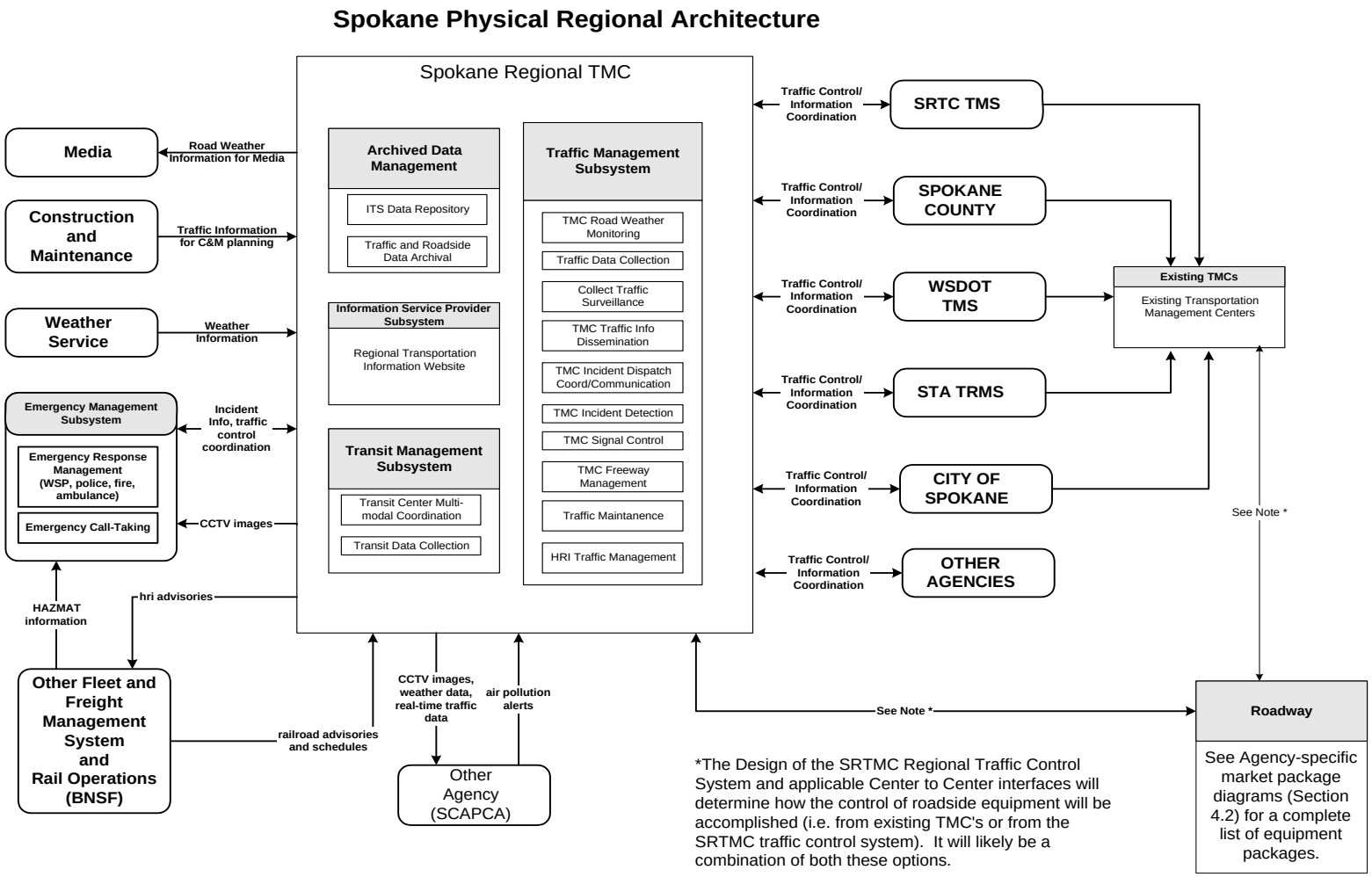


Figure 10. Physical Regional Architecture

4.7 PRELIMINARY PROJECT DESCRIPTIONS

After assessing regional stakeholder needs several regional projects were identified for the Spokane area. These projects are described below. More detailed project descriptions will be presented in the Spokane ITS Implementation Plan.

4.7.1 Communications Network Design

Trunk Communications Network Design

The City of Spokane has an existing extensive fiber communications network and a copper communications network. As part of the WSDOT Light Lanes project, WSDOT will be augmenting its existing fiber communications systems to provide full coverage of the regions interstate highway.

It is the intention of the SRTMC operating board to use the City's fiber network as a foundation for a dedicated, closed, fiber network to support the regional transportation needs. The city currently has at least 2 spare/dedicated fibers available for this purpose throughout the existing communications network.

This project consists of the development of a Spokane Regional Communications Network Design. It would likely focus on the development of the Trunk Communications System Master Plan.

The Spokane Regional Trunk Communications Master Plan would result in the identification of the truck communications requirements (likely to be fiber) to support the existing and planned transportation systems operational requirements (data and control) as well as inter-agency coordination and communication as defined in the Spokane Regional Architecture and Implementation Plan.

The tasks of this project would include:

- A thorough inventory of the existing communications system, including head-end, facilities and plant. The inventory would be conducted for all transportation agencies in the Spokane Region.
- Identification of basic communications requirements (capacity and loadings) for all the ITS infrastructure (existing and planned)[7] – on a per device basis.
- Identification of requirements for reliability and availability (will indicate whether there is a need for a redundant communications system).
- Technology assessment that would investigate the ability to utilize different technologies to meet the communications needs and network objects. The feasibility and impacts of combining different technologies should be investigated.

[7] The basic communications requirements will also address the requirements of the planned ITS equipment deployments along priority corridors in Spokane. The device quantities and locations will be defined as part of a separate project – ITS Deployment Initiatives.

- Identification and analysis of different communications network architecture and topology options. Architecture and topology recommendations (star, ring, etc.) will be made.

- Development of a system-wide communications Plan. To the extent possible, the plan will make use of the existing communications trunk, and will "close" any gaps resulting from insufficient communications capacity, or missing communications coverage.

Twisted Pair Communications Network Assessment

The City of Spokane has indicated a desire to migrate towards NTCIP-compliant signal control system field infrastructure. The County and State are currently in the process of procuring a new integrated signal control system that may require upgrade field infrastructure (e.g. signal controller upgrades). It is expected that the new system will be center to field (C2F) NTCIP compatible.

The move towards NTCIP compatible field infrastructure may have an impact on the center to field communications network. This project would involve an analysis of the C2F communication requirements based on the existing and planned signal system functionality. The analysis would investigate:

- Number of controllers per channel;
- Data loading requirements;
- Communications data rates

Additionally, the communication requirements for other ITS systems (e.g. VMS, Cameras, video detection etc.) would be required.

This analysis would result in the identification of C2F communication improvement needs to support the traffic management functional requirements. The Communications improvement options include:

- Increasing data transmission rate (subject to network limitations). This would potentially involve the replacement of central and field data modems, and possibly other central system enhancements;
- Reducing the number of controllers per communications channel, possibly requiring the use of/installation of additional pairs;
- Modifying the overall communications architecture and multiplexing multiple data channels over a new trunk.

4.7.2 Spokane Regional Traffic Management Center Design

This project consists of the identification of SRTMC physical and operational (i.e., staffing) requirements to support the anticipated near and long term TMC needs (i.e. planned ITS Implementation projects).

Based on this information, the SRTMC special requirements, for the control room, communications area, equipment room, office areas, workstations, emergency facilities, meeting and viewing rooms, and general circulation areas will be identified. In addition, this project will identify SRTMC staff functions based on an operational assessment (incident management, signal operations, major event support, inter-agency coordination, and hours of operation).

The SRTMC building, equipment and systems requirements such as CCTV monitors, workstations, computer/equipment racks, video switch, power back-up, fire protection, communications, disaster protection, etc. will be identified. Functions to performed at the SRTMC, as well as system implementation, staging, and scheduling issues will be identified.

4.7.3 Regional Traffic, Weather and Construction Website(s)

The SRTMC stakeholder agencies have identified the need for a Regional Transportation Information Website(s). This website could serve multiple functions including:

- Provide traffic and weather information to the general public
- Provide traffic and weather information to other Stakeholders (i.e. stakeholders that want access to traffic/weather data but do not need the ability to control ITS devices)
- Provide SRTMC Operating Board agencies access to the Regional Transportation Data Warehouse (see section 4.8.5)
- Provide a platform for, and access to, a consolidated Construction Schedule service.

This project would result in the development of functional requirements for the website, which could ultimately be used as a basis for website design specifications. The information made available to the website users would include traffic and weather data (obtained from the Regional Data Warehouse and the Archived Weather Information Database being developed by University of Washington – see section 4.8.5), construction planning information, and CCTV video images.

As part of this project user needs would be evaluated, and the type of information that would be made available to each user-group (i.e. SRTMC stakeholder agencies, other stakeholders and general public) would be determined. Other issues that would be addressed include how information would be presented, system architectures and public and agency access to data. This project could include an investigation of the benefits and impacts (e.g., security, presentation, data access, etc.) of a single website versus multiple separate sites - one for SRTMC Operating Board member agencies for traffic management purposes, one for the Regional Construction Scheduling Needs and one for the general public. Both Internet and Intranet sites should be considered for inter-agency information dissemination

This project would also investigate any liability issues that could be created by providing weather information to the public. This would include determining the level of detail of information that should be supplied, as well as developing a liability statement to appear on the website. Other state DOT sites, such as Washington, Colorado and Nevada's may be used as examples.

Once the operational requirements have been defined, a set of functional design requirements would be developed. The following needs would be taken into account when developing these functional requirements:

- Operational (primarily to support SRTMC Operating Board agency traffic management functions
- Maintenance Operations and Information
- Public Information

The functional requirements would highlight software application, communications, and user interface requirements for both the SRTMC Integrated Traffic Management System (see section 4.8.6) and the Spokane Regional website(s) interface. This effort would also determine the best website architecture design (i.e., would recommend either one consolidated website or multiple websites [one for intra-agency information dissemination and for public information and one for the construction scheduling activity]). The results of these activities would be a functional requirements document for the Spokane Regional Transportation and Weather Website.

4.7.4 Coordinated Incident Response Application

The Spokane Region identified the need to be able to respond quickly to incident situations at a regional level, while concurrently optimizing traffic flow around incident locations. Coordinated responses maximize benefits and eliminate negative impacts on adjacent jurisdictions resulting from localized response.

This project would facilitate the setting of pre-determined response strategies for both planned and unplanned events. Events could range from hockey games at the Arena to stalled vehicles or accidents. This would require network monitoring (e.g. identifying incidents), and the setting of traffic control devices to improve safety and traffic conditions. This would include providing pre-trip and en-route information to travelers.

Agencies would be required to identify and describe incidents that would warrant coordinated traffic management strategies. Device responses would be determined based on several factors such as type of incident, location, and time of day. This would likely lead to either a library of pre-defined response plans, or to the development of a coordinated response algorithm (preferred). Ground rules would need to be established to govern the implementation of these plans, and would most likely be set from the SRTMC. On-going operational coordination between agencies would be necessary.

There exist several methods by which to implement multi-jurisdictional incident response strategies, with differing levels of coordination. These include varying levels of technology and software development, and achieve varying levels of integration accordingly. Options would be identified and evaluated as part of this project.

There are many operational issues involved with the implementation of coordinated plans amongst agencies. Operational agreements need to be developed that outline and define these issues. Responsibilities for loading response plans as well as quality control, and liability issues should be addressed.

4.7.5 Development of a Regional Data Warehouse / Information Management System

This project involves the design and development of a Regional Data Warehouse and Information Management System. This project relates to the **Regional Transportation Management System** referred to in section 4.6.2.1. The development of the Spokane Regional ITS Architecture reinforced the need for a central location for regional traffic and weather data, from which all stakeholders can access information. Stakeholders that benefit from access to this database include the regional transportation agencies (i.e. SRTMC Operating Board members), other public sector agencies (WSP, Spokane Police, Fire etc.), private sector companies (ISPs) and the general public.

The University of Washington is in the process of developing a statewide weather information database. This project will result in a database containing archived weather data from weather detection sites throughout the state. The development of the Spokane Regional Data Warehouse would include the development of an interface to the Statewide weather database.

The first step of the Spokane Regional Data Warehouse project would involve the development of functional requirements. This effort would identify:

- Type of information to be stored in the regional database (real-time, historical, traffic, weather etc.);
- Aggregation of data (Note: this may be a significant effort given the need to relate all data to a common referencing system);
- Agency(s) from which data would be collected;
- Agency data needs (type of data, frequency, performance etc);
- Archiving requirements;
- Type of information/data that will be made available to non transportation-agency stakeholders.

There are two primary database architecture options that would be considered in this project including:

- A virtual/distributed database; and
- A centralized database.

A virtual/distributed database is one that would provide access to regional data using enhanced interoperability between physically distributed ITS archives that are each locally managed. A centralized database would comprise a single database where all transportation-related information would be collected and maintained. A centralized database would also provide the additional meta data management features that are necessary so that all regional data can be managed in a single repository with consistent formats.

This project would include an analysis of each of these options and would develop a design for the preferred database architecture option. The recommended strategy would be based on an analysis of benefits and impacts including operational issues, maintenance issues, technical issues (performance, reliability, expandability etc.) and costs. Technology options for each architecture option will be investigated (e.g. Intranet-technology for stakeholder agency access and a link to the Spokane Regional Website for the general public.)

The final task of this project would involve the development of functional requirements and preliminary design documentation for the preferred option. This documentation could be used as a basis for the Regional Data Warehouse Specifications.

4.7.6 Traffic Control System Integration

One of the primary requirements identified by the SRTMC Operating Board agencies was **shared control of ITS devices**. Furthermore there is a need for **Coordinated Incident Management capabilities** as described in section 4.7.4. To meet these requirements, there is a need for an Integrated Traffic Control System that provides interfaces between each of the stakeholders' traffic control systems. Currently WSDOT operates traffic signals, HAR, DMS, and CCTV cameras; while Spokane County and the City of Spokane operate independent signal systems. There is also a regional need to expand the ITS infrastructure coverage.

The purpose of this project is to define the way in which the inter-agency control capability will be provided. There are various options to be considered including:

- Single Centralized Traffic Management System: WSDOT and Spokane County are in the process of procuring a new Integrated Signal Control System. This system will provide the capability for coordinated signal control operations between the state and county traffic signal systems. It is possible that this system could be enhanced/expanded to provide "regional" traffic management functions – that is, it could be used to control the City's traffic signals as well as other ITS systems such as DMS, HAR and CCTV cameras. Equipment incompatible with the central system, including field controllers and communication equipment, would be replaced.

- Integrated Interface Option: This option would involve the specification and development of a integrated interface application that would communicate with all existing (and new) traffic control systems. The "integrated" interface would not replace any of the existing systems but would provide a common user interface to access all signal systems as well as other ITS subsystems, Communication between the systems would be accomplished by using emerging NTCIP standards (known as "center to center"). Each existing signal (including the integrated signal control system) or other ITS system would communicate to a Data Exchange Network (DEN) computer. Each operator would access all existing systems using the integrated interface workstation that communicates with the DEN.

- Porting Application: This option would involve developing a "porting" application that would allow the integrated signal control system (WSDOT and County) to control all the signals and other ITS devices in the network, rather than converting all signals and

associated equipment to the Integrated Signal Control System (see Single Centralized Traffic Management System option). The porting application would convert commands from the central system and data from the field equipment into the appropriate structures that can be understood by each, thereby effecting integrated operations.

This project will compare the potential integration options. Tradeoffs associated with each option will be categorized in terms of various criteria (full list to be developed) including:

- Approximate overall hardware and software impacts.
- Impacts on operations.
- Impacts on system maintenance and management, including trade-offs between increased maintenance of aging systems versus new capital investment.
- Compliance with current and emerging standards and trends, including NTCIP, the National Architecture, and modern computer system architecture.
- Expandability and the ability to accommodate new systems in the future.
- High-level interface, communications and network integration requirements.
- Options and requirements for user interfaces.

Based on this analysis, the preferred/recommended option would be identified and operational and functional requirements developed. The function requirements could be used as a basis for the System Integration Specifications.

4.7.7 Priority Corridor Equipment Deployment

This project will ultimately develop plans and specifications for the deployment of ITS equipment for priority projects. First, project functional requirements will be identified, allowing for the determination of required equipment and technology types. Some examples of high level functional requirements are:

- Provide Traffic Control
- Provide Surveillance Capabilities
- Provide En-Route Driver Information
- Improve CVO Efficiency
- Etc.

As equipment deployments are identified, technical assessments of equipment requirements necessary to meet project needs will be conducted. There are several high level requirements that must be determined including operational, physical, communication, and integration requirements. Operational requirements basically describe what the equipment is expected to be able to do. Physical aspects include equipment locations, necessary hardware/software, power requirements, as well as any other requirements or limitations of the equipment (i.e. equipment must be mounted at a certain height, etc.). Communications and integration requirements

include the communications media and how the deployment works and connects with other current and future projects. For any ITS deployment along I-90 for example it will be crucial to coordinate communications and integration with the Light Lanes fiber network. After these equipment requirements are determined, more specific detailed drawings, plans, and specifications will be created to form a suitable bid package for deployment.

5 NEXT STEPS:

This document, the Spokane Regional ITS Architecture Plan summarizes information collected to date, and provides a representation of the Regional ITS Architecture. This document also identifies, potential regional projects that are based on stakeholder needs.

The next step is to expand these preliminary project descriptions into more detailed implementation packages and to provide an implementation plan which considers project dependencies, establishes priorities, estimates time to complete projects and develops an implementation schedule for near (years 0-5) and medium (years 6-10) term ITS system deployments. Project prioritization will be based on several factors including perceived regional benefits, estimated project costs, technology developments, and available funding sources.

Appendix A

Stakeholder Meeting Minutes

Meeting Minutes

Agency: Spokane Regional Transportation Council (SRTC)

File No. S2-7629.02

Meeting Date: Dec. 8th, 1999

Time: 1:00 p.m.

Subject ***Stakeholder Interviews: Spokane Regional ITS Architecture***

ATTENDEES

NAME	ORGANIZATION	PHONE	Email
Glenn Miles	SRTC	(509) 343-6370	srtcadm@dmi.net
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PURPOSE OF THE MEETING

This meeting was one in a series of stakeholder meetings, which took place December 8th and 9th in Spokane. Members of the Transpo-team met with the Spokane County, Spokane Regional Transportation Council, City of Spokane and Washington State DOT (Eastern Region) [the meeting with STA will take place during the week of December 20th].

The purpose of this meeting was to:

- Gather information pertaining to SRTC's exiting responsibilities;
- Identify and discuss the scope of current and planned projects;
- Identify inter-agency data and control exchange needs and issues.

EXISTING RESPONSIBILITIES

- SRTC is the Municipal Planning Organization (MPO) for the Spokane Region.
- SRTC is responsible for developing the comprehensive long-range transportation plan for the Spokane Region. The transportation plan must support the mobility needs and economic development of the community.
- An integral part of the transportation plan is the identification of policies to guide the development of a balanced transportation system. These policies shall encourage preservation of neighborhoods, protect the environment, enhance the community's quality of life and promote public transportation.
- One of SRTC's key responsibilities is to foster cooperation and coordination between the local transportation agencies (City, County, State, Transit) and between the community and these agencies.
- SRTC is responsible for the Transportation Improvement Program and for preparing the Transportation Improvement Plan (TIP). Action: SRTC - provide Transpo-team with a current (updated November 1999) copy of the TIP and the Transportation Plan with graphics included.
- SRTC has developed and is maintaining an ArcInfo GIS database for the region.

CURRENT AND PLANNED PROJECTS

- SRTC implemented an Automatic Vehicle Identification (AVI) Project (initiated in 1995). This system uses Amtek technology. Several vehicles have been equipped with tags (including STA buses, Pony Express, private vehicles etc.). Over 400 tags have been distributed. The system includes 12 readers on key corridors. SRTC expects to expand this system in the future to additional primary corridors. Currently the system receives approximately 11,000 'hits' per month. The system has the ability to collect travel time information to be used for analysis purposes (e.g. effects of incident, weather, time of day etc.). It may be possible to obtain this information in real-time in the future – communications-dependant.
- SRTC is leading an effort to create a regional transportation management center (TMC). It is expected that this center will act as a "hub" for all transportation-related information and control facilities. Initially, the Regional TMC hours of operation will be 6:00 am to 6:00 pm, Monday through Friday. (Note: The design, build and operation of the TMC will be managed by Mike Whiteaker, WSDOT, Eastern Region, with project oversight provided by the TMC Operating Board including representatives from each participating agency).
- At a minimum, in the near term, it is expected that the Regional TMC will house workstations from each agency's "traffic management and control" system(s) - Alternatively, a terminal emulation application could be used to allow operators at the TMC to access all transportation systems from a single workstation.
- In the long-term, an integrated traffic management and control system may be developed to integrate all systems' information and control capabilities into a single system (i.e. this type of system could easily accommodate coordinated incident response capabilities and multiple-user access and security capabilities. Each participating agency will have a workstation for the Integrated TMS.
- There are plans to install a microwave communications hop between KXLY (television station) and the Regional TMC. Currently there is an overhead fiber link from Division St. to Normandie St. There are plans to link this to the City's communications network – thereby achieving a link to the Regional TMC

TRANSPORTATION ISSUES/NEEDS

- There is a need to share event information (planned and unplanned, traffic and weather events) between the state, county and city jurisdictions. This information should also be made available to the general public on a consolidated (information from all local transportation agencies) traffic event and construction information web site – or through the use of other dissemination technologies (e.g. pager, kiosks, automated telephone system). The information collected and disseminated should include events, anticipated effects and suggested alternatives (e.g. other routes, and other modes of transportation).
- There is a need for coordination between (city/county/state) transportation management and control systems. Coordinated incident response capabilities would be beneficial. These coordinated plans would be especially useful for large planned events, which significantly effect traffic conditions in Spokane (e.g. Bloomsday Run, State 'B' Basketball Tournament, Armed Forces Parade, Hoop-Fest etc.)
- The SRTC GIS system would provide a good basis for the integrated traffic management system's graphical user interface. (Note: this system will be housed at the TMC on SRTC's premises, with at least one workstation located at each local transportation agency).
- There is a need for additional CCTV camera coverage on the primary congestion management corridors and arterials (e.g. 3rd Ave, Sprague).
- Information dissemination service providers (including television, and radio stations) would benefit from CCTV camera feeds.
- The benefits of installing a ramp metering station at select locations (e.g. the Division St. on-ramp to I-90) may include implicit diversion of motorists, who, as a result of the metering choose to enter the freeway

network at an alternate entrance (e.g. Monroe). This would result in a decrease of congestion at the on-ramp site as well as a smoother merging of traffic onto the I-90.

- SRTC expressed a desire to obtain train crossing-gate information in real-time. This information could be used as an input to traffic management strategies (i.e. ensure that motorists are not diverted to a route which crosses train tracks, if the gates are down).
- There is a long-term need for ITS equipment on the North Spokane Corridor.
- The "Bridging the Valley" Project has identified the desire to combine the Union Pacific and Burlington Northern corridors. This would significantly reduce the at-grade crossing (from 60 to approximately 20).
- If STA procures an AVL system in the future, bus location information could be provided to the Regional TMC. This information could then be disseminated through various dissemination technologies or even to ISPs.

AGENCY DATA AND CONTROL EXCHANGE

The TMC will collect and disseminate information/data from all agencies including:

- All available historical and real-time traffic and weather information.
- CCTV camera video images.
- Knowledge of current and planned traffic management response strategies (e.g. messages set on the DMS and HAR; signal timing plans in effect, etc.)
- Planned and real-time construction and event information.

Traffic Management and Control capabilities that could be supported at the TMC include (note: each of these capabilities would require that operational and procedural agreements be developed between the TMC operating board and the respective "owner" agency.)

- Access to city, county and state signal control systems: initially this will consist of setting pre-defined, approved signal timing plans (in the future, more advanced signal control capabilities such as downloading timing plans may be incorporated).
- Control of WSDOT DMS: this will likely consist of setting predefined, approved DMS messages.
- Ability to set HAR messages.

Additional information that would be of interest to SRTC includes:

STA AVL data

Meeting Minutes

Agency: Washington State Department of Transportation (WSDOT), Eastern Region

File No. S2-7629.02

Meeting Date: Dec. 9th, 1999

Time: 10:00 am

Subject ***Stakeholder Interviews: Spokane Regional ITS Architecture***

ATTENDEES

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PURPOSE OF THE MEETING

This meeting was one in a series of stakeholder meetings, which took place December 8th and 9th in Spokane. Members of the Transpo-team met with the Spokane County, Spokane Regional Transportation Council, City of Spokane and Washington State DOT (Eastern Region) [the meeting with STA will take place during the week of December 20th].

The purpose of this meeting was to:

- Gather information pertaining to WSDOT'S exiting traffic management and control systems;
- Identify and discuss the scope of current and planned projects;
- Identify inter-agency data and control exchange needs and issues.

EXISTING SYSTEMS AND SERVICES

WSDOT currently operates and controls the following ITS devices:

- Signal control system: The WSDOT operates 30 traffic signals. The County and State (WSDOT) currently operate some time-base signal coordination – but there is no automatic signal coordination capability, other than sync pules
- PTZ CCTV cameras (Cohu 3500 DSP): The cameras are located on the I-90 at key interchanges (SR2, Division St., Arthur St., Hamilton, Custer pedestrian crossing).
- Web cameras – (Active Imaging MVNet+): these cameras are located on the I-90 at the Broadway interchange (one PTZ camera and one fixed) and Pines (PTZ).
- Vehicle detection: WSDOT operates several detection stations using various technologies (video, microwave) and communication options (fiber, microwave and phone lines).
- Highway Advisory Radio (HAR): HAR sites are located at the I-90/SR2 and I-90/Broadway.
- Dynamic Message Signs: WSDOT operates five DMS at key I-90 intersections (four), one sign is on SR2. The Washington State Patrol currently have the ability to set messages on the DMS.

- Weather sites: WSDOT has installed nine weather stations (RWIS). These are maintained by the City of Spokane.
- Traffic information Web site: WSDOT operates a web site which provides information to the public pertaining to current and planned construction/maintenance projects as well as CCTV camera images.

CURRENT AND PLANNED PROJECTS

- The WSDOT and Spokane County are in the process of procuring a new integrated signal control system to support integrated signal operations (RFP to be available in early 2000). The first phase of this project will consist of signals on three primary corridors including three (I-90) interchanges. There will be 8 county and 14 state controllers. The new system should support different level of access and control (e.g. control, view, data).
- WSDOT Area 1 (Spokane) maintenance department has the ability to set DMS and HAR messages.
- WSDOT intends to expand it's ITS coverage (including additional CCTV camera coverage).
- WSDOT is currently in the process of preparing the design for the North Spokane Corridor project – this design will accommodate future ITS systems/coverage (detectors, CCTV cameras and DMS).
- WSDOT is in the process of preparing PS&E documents for the Rural ITS system. This project consists of HAR and CCTV implementation as well as the incorporation of a weather site (RWIS).
- It should be noted that Washington State Patrol operates a pager/incident notification system.

TRANSPORTATION ISSUES/NEEDS

- There is a need to share event (planned and unplanned, traffic and weather events) information between the state, county and city jurisdictions. This information should also be made available to the general public on a consolidated (traffic event and construction information web site – or through the use of other dissemination technologies).
- There is a need for coordination between (city/county/state) traffic control systems. Coordinated incident response capabilities would be beneficial.
- WSDOT will require Regional TMC workstations at several locations including:
  - Headquarters (Mayfair)
  - DOT signal shop
  - State patrol
- There is a need for WSDOT to tie into the city's communications network – note this is for communications within the city limits only.
- WSDOT has expressed the need to expand the communications network to Hwy 2, Hwy 395, Trent (SR290) and Sprague.
- There is a need to obtain real-time traffic data from major arterials (especially for north/south traffic flow).
- There is a need to have access to city, county and state radio systems from SRTMC (note: this would require the development and implementation of operational and procedural agreements between the respective agencies).
- WSDOT expressed a desire for secondary control of the Rural ITS system to be available at the regional TMC.
- Ramp metering is not an immediate need although future implementation of metering at key sites may be an option in the future.

- WSDOT expressed the desire to expand their existing web site – or develop a "regional" web site (probably as part of the Regional TMC) to disseminate real-time traffic information including traffic conditions and incidents.
- WSDOT stated that there would be benefits to installing video surveillance equipment (CCTV cameras) at WIM (weigh-in-motion) sites.

AGENCY DATA AND CONTROL EXCHANGE

WSDOT is willing to share:

- Access to signal control system: this would allow other agencies to set pre-defined, approved signal timing plans.
- Access to all available historical and real-time traffic and weather data.
- Access to CCTV camera images.
- Planned and real-time construction and event information.
- Control of HAR, DMS and CCTV – note control of all ITS devices will be based on pre-defined agreements and procedures resulting in the ability for other agencies to set pre-approved devices settings (e.g. DMS messages and signal timing plans).

WSDOT is interested in having access to:

- CCTV camera feeds.
- Coordinated signal response strategies.
- Traffic data (detector information) – real-time and historical.
- Weather information.

Meeting Minutes

Agency: City of Spokane

File No. S2-7629.02

Meeting Date: Dec. 8th, 1999

Time: 3:00 pm

Subject ***Stakeholder Interviews: Spokane Regional ITS Architecture***

ATTENDEES

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Ryan Gulick	IBI Group	(206) 521-9091	rgulick@ibigroup.com
Karen Freund	IBI Group	(206) 521-9091	kfreund@ibigroup.com

PURPOSE OF THE MEETING

This meeting was one in a series of stakeholder meetings, which took place December 8th and 9th in Spokane. Members of the Transpo-team met with the Spokane County, Spokane Regional Transportation Council, City of Spokane and Washington State DOT (Eastern Region) [the meeting with STA will take place during the week of December 20th].

The purpose of this meeting was to:

- Gather information pertaining to the City of Spokane's exiting traffic management and control systems;
- Identify and discuss the scope of current and planned projects;
- Identify inter-agency data and control exchange needs and issues.

EXISTING SYSTEMS AND SERVICES

The City currently operates the following systems:

- Monarc ATMS Signal Control System: Currently the City operates signals at approximately 240 intersections with over 200 controllers linked to the City's Monarc ATMS Signal Control System. The city is in the process of upgrading the Monarc to a Windows NT operating system. This system also collects midblock traffic sensor (loops) information. Currently this data is collected from the field quarterly 'table' counts) – that is, the data is not being used for real-time traffic decisions.
- The city also has a Peek VideoTrak video detection system at 19 sites (60 CCTV cameras) at key intersections throughout the city (Six of the systems are along Division Street). Communications to the Peek systems is via telephone dial-up connections transported through the City's copper cable system. The cameras for these systems could be used for surveillance if appropriate communication links were installed.

- The city has traffic loops at 17 locations where quarterly data is returned to the Monarc ATMSl Signal Control System, but not used in any real time traffic control decisions.
- The city operates/maintains several weather detection sites (some city owned, some DOT-owned). This information (e.g. wind, temperature, opacity etc.) is used for road maintenance purposes. Weather forecasts are obtained from an ISP (Information Service Provider).
- The city operates a recorded telephone message system that is currently used for maintenance and service broadcasts such as snowplow services and leaf pick-up.
- The City's communications department provides weekly construction updates to various "information dissemination" organizations such as television stations, newspaper, radio etc.

CURRENT AND PLANNED PROJECTS

- The city owns an extensive citywide fiber network. The city has the opportunity to take advantage of communication capacity set-aside requirements (i.e. franchise agreements) of various communications providers in the area.
- The city owns an extensive citywide fiber and copper communications network (>80 cable miles) operated and maintained by the Transportation department. Communications services are provided to a variety of different City departments, and may be shared with the SRTMC functions.
- There will be a need to upgrade/expand the fiber communications system to allow live video (from Peek 2000 VideoTrak video detection system) to be brought back to center. A new video switch may also be necessary in order for the City to have access to video images from other agencies (e.g. WSDOT).

TRANSPORTATION ISSUES/NEEDS

- There is a need to share event (planned and unplanned, traffic and weather events) information between the state, county and city jurisdictions. This information should also be made available to the general public on a consolidated (traffic event and construction information) web site – or through the use of other dissemination technologies.
- There is a need for coordination between (city/county/state) traffic control systems especially in highway to/from surface street transition areas (e.g. at the exits and entrances to the I-90). Coordinated incident response capabilities would be beneficial.
- Although I-90/surface street areas become very congested during peak periods, there is limited storage on the ramps – therefore ramp metering may not offer significant benefits.
- There is a public perception of a significant parking problem in the downtown Spokane area. There is a lot of parking capacity available, primarily in surface street lots, but this parking is generally not in proximity to the key service areas (e.g. shopping district).
- Additional CCTV camera surveillance within the city would be useful – although liability/privacy issues are a concern.
- Transit signal priority 'could' be beneficial at select locations (primarily outside the CBD).
- Complete the design and installation of a physically separate Transportation Services LAN servicing Traffic Control functions only for City and SRTMC needs.

AGENCY DATA AND CONTROL EXCHANGE

City is willing share:

- Access to signal control system: this would allow other agencies to set pre-defined, pre-approve signal-timing plans.

- Access to all available historical and real-time traffic and weather data (note: weather forecasts received from ISP may require agreements to be set up between the City and/or other agencies and the ISP.
- Access to the City's extensive communications network.
- Planned and real-time construction and event information.

City is interested in having access to:

- WSDOT DMS (knowledge of currently set message and ability to set messages). Especially during city "planned events" taking place at the convention center, opera house and arena.
- CCTV camera feeds (from WSDOT, County);
- Freeway surveillance (detector information);
- Weather information.

Meeting Minutes

Agency: Spokane County

File No. S2-7629.02

Meeting Date: Dec. 8th, 1999

Time: 10:00 am

Subject ***Stakeholder Interviews: Spokane Regional ITS Architecture***

ATTENDEES

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Karen Freund	IBI Group	(206) 521-9091	kfreund@ibigroup.com

PURPOSE OF THE MEETING

This meeting was one in a series of stakeholder meetings, which took place December 8th and 9th in Spokane. Members of the Transpo-team met with the Spokane County, Spokane Regional Transportation Council, City of Spokane and Washington State DOT (Eastern Region) [the meeting with STA will take place during the week of December 20th].

The purpose of this meeting was to:

- Gather information pertaining to Spokane County's exiting traffic management and control systems;
- Identify and discuss the scope of current and planned projects;
- Identify inter-agency data and control exchange needs and issues.

EXISTING SYSTEMS AND SERVICES

The County currently operates the following systems:

- Signal control system: The County operates 70 traffic signals. The traffic control system uses Peek NEMA controllers (note: some of these controllers may require upgrades as a result of the up-coming State/County Coordinated Signal System project). The County and State (WSDOT) currently perform some time-base signal coordination – but there is no automatic signal coordination capability
- All County signals are equipped for fire vehicle signal pre-emption.

CURRENT AND PLANNED PROJECTS

- WSDOT (Eastern Region) and Spokane County are in the process of procuring a new integrated signal control system to support integrated signal operations (RFP to be available in early 2000). The first phase of this project will consist of signals on three primary corridors including three (I-90) interchanges. There will be 8 county and 14 state controllers.
- It is anticipated that the planned Valley Corridor (Couplet) project will be designed to meet long term needs – that is, the communications design will account for future ITS equipment such as traffic monitoring devices (e.g. loops), DMS and CCTV cameras. Spare conduit will be provided.

- The County's communications department provides weekly construction updates to various "information dissemination" organizations.
- The County currently maintains a web page that includes construction information (currently there is no real-time incident information available on this site).
- The County currently has the capability to collect real-time traffic count data at select sites (this could be upgraded to include speed and volume data).
- The County's maintenance department receives alerts from the National Weather Service.

TRANSPORTATION ISSUES/NEEDS

- There is a need to share event (planned and unplanned, traffic and weather events) information between the state, county and city jurisdictions. This information should also be made available to the general public on a consolidated (traffic event and construction) information web site – or through the use of other dissemination technologies.
- There is a need for coordination between (city/county/state) traffic control systems. Coordinated incident response capabilities would be beneficial.
- The use of red-light enforcement at high priority and/or high-incident intersections is desirable.
- Transit signal priority could be beneficial at select locations (primarily outside the CBD).

AGENCY DATA AND CONTROL EXCHANGE

County is willing share:

- Access to signal control system: this would allow other agencies to set pre-defined, approved signal timing plans.
- Access to all available historical and real-time traffic and weather.
- Planned and real-time construction and event information.

County is interested in having access to:

- Knowledge of DMS messages currently set on WSDOT DMS.
- CCTV camera feeds (from WSDOT).
- Traffic data (detector information) – real-time and historical.
- Weather information.
- Possibly, ability to set messages on DMS (I-90) and HAR.

Meeting Minutes

Agency: Spokane Transit Authority

File No. S2-7629.02

Meeting Date: Jan. 11th, 2000

Time: 2:00 pm

Subject ***Stakeholder Interviews: Spokane Regional ITS Architecture***

ATTENDEES

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PURPOSE OF THE MEETING

This meeting was one in a series of stakeholder meetings. Members of the Transpo-team met with the Spokane County, Spokane Regional Transportation Council, City of Spokane, Washington State DOT (Eastern Region) December 8th and 9th, 1999.

This meeting with Spokane Transit Authority (STA) was conducted by conference call on Jan 11th, 2000.

The purpose of this meeting was to:

- Gather information pertaining to STA's existing transit and information systems;
- Identify and discuss the scope of current and planned projects;
- Identify inter-agency data and control exchange needs and issues.

EXISTING SYSTEMS AND SERVICES

- STA currently operates three transit services:
  - Fixed Route: Includes 143 buses (increasing to 146)
  - Paratransit: 59 vans directly operated, and 34 contract operations
  - Vanpool:
    - Distance-based fares
- AVI
  - All fixed route buses are equipped with tags
  - Tags are scanned entering downtown zone

  - Time and zone information fed to reader board at the Plaza
  - Total of 6 readers (entrance and exit to facility on 3 different streets at the downtown plaza)

- TRAPEZE on both the fixed-route and paratransit systems. (The paratransit system is up and operating, the fixed-route system is still being modified.)
  - Collects operating data, schedule, used from tracking
  - Windows-based

- Fare collection
  - Fixed route buses equipped with CUBIC fare boxes with pass capabilities
  - Want to upgrade to read/write system in the future: e.g. stored value cards
  - Information scanned from fareboxes at end of day and downloaded to central system
  - Fare categories are: adult, youth, VIP (disabled)
  - Fare information is collected by route.

- All vehicles (except vanpools) equipped with two-way radio communications system (voice – driver/center)
- Fixed route buses equipped with on-board PA system
- Existing STA website: schedule and route information
- Existing automated phone system: schedule and route information
- STA operates a security force ("roving" and static)
- Video Surveillance at Park and Ride and transit facilities (garage, plaza)
  - Headquarters (control center) at the plaza
  - Approximately 90 cameras (both PTZ and fixed)
  - Human surveillance coordinated with police

- Interested in Transit Signal Priority
- Rideshare/Ridematch in conjunction with the Spokane County Trip Reduction Program
- Mobile Data Communications for Paratransit
- Some buses equipped with AVI tags as part of SRTC's probe vehicle program
  - STA receives travel times from this data

CURRENT AND PLANNED PROJECTS

- Received grant for AVL System for fixed route buses
- Lightrail
  - STA is a funding agency, may be operating agency
  - Estimated to be operational in 6-8 years

TRANSPORTATION ISSUES/NEEDS

- STA would like to have real-time incident/traffic conditions
- Video feeds from I-90 and Division St. would be useful
- There is a need to be able to communicate bus breakdowns to the Traffic Management Center

- Would like to implement GIS system in future
- Identified a need for formalized agreements between agencies, for equipment control etc.

AGENCY DATA AND CONTROL EXCHANGE

STA is willing share:

- Scheduling and route information, transit fares, etc. for regional website
- AVL information (future data availability)
- CCTV camera images

STA is interested in having access to:

- Images from WSDOT cameras along I-90
- Images from CCTV cameras along Division St. and other future sites
- Incident information/notification
- Historical Traffic data (for planning purposes)

NEXT STEPS

EVENT	DATE
Document/Plan Review performed by Transpo-team.	12/20/99 through 1/7/00
Preliminary Regional Architecture (exhibits and overview of existing/planned systems and transportation needs)	1/14/00
Joint stakeholder meeting to discuss comments and issues pertaining to the Preliminary Regional Architecture.	Week of 1/24/00
Prepare Complete Regional Architecture, addressing all stakeholder comments; and incorporating additional information provided, stakeholder decisions and agreements.	Week of 2/14/00

Meeting Minutes

AGENCY: Spokane County Air Pollution Control Authority (SCAPCA)

DATE: February 11, 2000 TIME: 11:00 AM

TG: 99078.00

SUBJECT: STAKEHOLDER INTERVIEWS: SPOKANE REGIONAL ITS ARCHITECTURE

ATTENDEES

NAME	ORGANIZATION	PHONE	Email
Ron Edgar	SCAPCA	(509) 477-4727	rjedgar@scapca.ort
Hicham Chatila	The Transpo Group	(425) 821-3665	hichamc@TheTranspoGroup.com
Russ Gomke	The Transpo Group	(425) 821-3665	russg@TheTranspoGroup.com
Ryan Gulick	IBI Group	(206) 521-9091	rgulick@ibigroup.com
Karen Freund	IBI Group	(206) 521-9091	kfreund@ibigroup.com

PURPOSE

The purpose of this meeting was to supplement the data gathering efforts from the previous stakeholder meetings with the primary transportation providers in the region including Spokane County, Spokane Regional Transportation Council (SRTC), City of Spokane, WSDOT (Eastern Region), and Spokane Transit Authority (STA). The intent of the meeting was to better understand the purpose and needs of SCAPCA, and how their purpose and needs might best be integrated into the Regional ITS Architecture.

The goal of the meeting was to:

1. Gather information pertaining to SCAPCA's role within the transportation system, and their use of transportation data.
2. Identify and discuss the scope of current and planned projects.
3. Identify inter-agency data and control exchange needs and issues.

EXISTING SERVICES

SCAPCA is the regional air quality monitoring agency. They are a special district within Spokane County governed by a board of directors. They are responsible for monitoring and reporting pollution levels and wood burning status. Pollution levels are related to weather conditions and traffic volumes/congestion. SCAPCA reports high pollutant level days to the media, and other transportation providers in the area. On these days they work with STA, and the County's commute trip reduction program to promote more transit rides and carpooling.

CURRENT AND PLANNED PROJECTS

Currently they are sponsoring the AirWatch program for the Greater Spokane Region. The program's components consist of :

- Daily air quality reports to the local media;
- Advertising campaign on television, radio, transit, billboards; and newspapers;
- Promotional materials for employer participation.

The program is aimed at monitoring the air pollutants during the winter months. When pollutants reach unacceptable levels a CO alert is relayed to the media and other participating agencies. Which in turn encourage alternative modes of transportation for the following days commute. STA, for example, provides free rides on fixed-route service on CO alert days. .

SCAPCA also maintains a website which provides pollution-level information. This information is updated daily.

ISSUES/NEEDS

- Better real-time/dynamic traffic volume/flow data.
- Access to data from WSDOT Road/ Weather Information Stations.
- Traffic management plans designed to react to changes in air quality situations – i.e. to limit the amount of traffic in high-pollution areas. *Note: SRTC has a list of priority locations/intersections.*
- Access to detailed historical traffic data (i.e. traffic counts) to be used for modeling purposes.

INFORMATION/DATA EXCHANGE

- Currently, all data and alerts provided to media and transportation agencies via phone or fax.
- They have a website for information dissemination and pollutant alerts.

- All information sent out is in the same format for each agency.
- Air quality data/alerts could be used as an input to regional traffic management plans (i.e. avoid directing traffic into high pollution areas).

INTERAGENCY DATA EXCHANGE

- Work with STA to increase transit trips on CO alert days.
- Work with County's Commute Trip Reduction program on CO alert days.
- Work with WSDOT with traffic information exchange.

Meeting Minutes

Agency: Washington State Patrol (WSP)

File No. S2-7629.02

Meeting Date: Feb. 15, 2000

Time: 1:00 pm

Subject ***Stakeholder Interviews: Spokane Regional ITS Architecture***

ATTENDEES

NAME	ORGANIZATION	PHONE	Email
Mike Doobie	WSP	(509) 456-4103	
Bob Jewell	WSP	(509) 456-4103	rjewell@wsp.wa.gov
Russ Gomke	The Transpo Group	(425) 821-3665	russg@TheTranspoGroup.com
Ryan Gulick	IBI Group	(206) 521-9091	rgulick@ibigroup.com
Karen Freund	IBI Group	(206) 521-9091	kfreund@ibigroup.com

PURPOSE OF THE MEETING

This (conference call) meeting was one in a series of stakeholder meetings, which took place within recent months. Members of the Transpo-team have met with the Spokane County, Spokane Regional Transportation Council, City of Spokane, Washington State DOT (Eastern Region), Spokane Transit Authority, and the Spokane County Air Pollution Control Authority (conference call). The purpose of this meeting was to:

- Gather information pertaining to WSP's existing responsibilities/infrastructure.
- Identify transportation issues and needs.
- Identify inter-agency data and control exchange needs and issues that should be reflected in the Spokane Regional ITS Architecture.

EXISTING RESPONSIBILITIES/INFRASTRUCTURE

WSP summarized their current responsibilities as follows:

- Main responsibility is to provide traffic law enforcement on state roads and interstate highways.

- Respond to emergencies which impact transportation on state and interstate highways. Note: 911 calls are handled by the city/county dispatch. Calls related to incidents on state/inter-state highways are routed to WSP.
- Operate CAD (Computer Aided Dispatch) which is used for record keeping and statistics
    - Incident Time
    - Day
    - Type
    - Injuries
    - Location—entered as free text (highway, direction, mile post - or - intersection)
    - Etc.
- Act as HAZMAT incident management command outside of Spokane. (Fire department has responsibility within Spokane.)
- Assist in HAZMAT management within Spokane.
    - Contacted by Fire Department
    - 911 call into city/county dispatch connects to WSP dispatch
- Currently have ability to control WSDOT VMS.
    - Ability to create and set "free text" messages or set pre-defined messages on WSDOT VMS
    - Requires WSDOT approval
    - Communications with WSDOT by phone or 800MHz radio communications
- Currently coordinate (by phone) with WSDOT for some planned events such as:
    - Wide loads
    - Vehicle processions
    - DUI enforcement
- Currently receive weather information from WSDOT website, and other internet sites.

TRANSPORTATION ISSUES/NEEDS

- There is no direct connection in Spokane between WSP and WSDOT (i.e. fiber, RF, etc). This prevents a direct sharing of CAD information (WSP) and CCTV images (WSDOT).
- WSP would be interested in an interface between CAD and the regional incident response database. WSP would be willing to provide incident/response data to the SRTMC and the SRTMC could provide WSP with information pertaining to current ITS responses and traffic conditions related to specific needs on the state/interstate highways. Note: There could be confidentiality issues with CAD information; information filtering/access would be necessary.
- Currently no pre-defined plans / routes for major closures (I-90).
- Want to receive real-time camera feeds and possibly some camera control.

AGENCY DATA AND CONTROL EXCHANGE

- Would be willing to provide filtered CAD information to the SRTMC.
- Would like to receive real-time camera feeds (WSDOT cameras) and possibly some control capabilities.
- Would like to receive traffic incident and response data, and real-time traffic conditions for freeways (from SRTMC).
- Communications infrastructure to other agencies (SRTMC) would be needed to support the above data/control needs.

Meeting Minutes

Agency: Spokane Fire Department

File No. S2-7629.02

Meeting Date: Feb. 29, 2000

Time: 2:00 pm

Subject ***Stakeholder Interviews: Spokane Regional ITS Architecture***

ATTENDEES

NAME	ORGANIZATION	PHONE	Email
Bobby Williams	SFD	(509) 625-7030	bwilliams@spokanecity.org
Mike Charter	SFD		
Hicham Chatila	The Transpo Group	(425) 821-3665	hichamc@TheTranspoGroup.com
Ryan Gulick	IBI Group	(206) 521-9091	rgulick@ibigroup.com
Karen Freund	IBI Group	(206) 521-9091	kfreund@ibigroup.com

PURPOSE OF THE MEETING

This (conference call) meeting was one in a series of stakeholder meetings, which took place within recent months. Members of the Transpo-team have met with the Spokane County, Spokane Regional Transportation Council, City of Spokane, Washington State DOT (Eastern Region), Spokane Transit Authority, Spokane County Air Pollution Control Authority (conference call), and Washington State Patrol (conference call). The purpose of this meeting was to:

- Gather information pertaining to the Spokane Fire Departments existing responsibilities/infrastructure.
- Identify transportation issues and needs.
- Identify inter-agency data and control exchange needs and issues that should be reflected in the Spokane Regional ITS Architecture.

EXISTING RESPONSIBILITIES/INFRASTRUCTURE

Signal Pre-emption:

- Currently Fire Districts #1 (Valley) and #9 (North County) have pre-emption equipment on their vehicles. The Fire Districts are responsible for equipping their own vehicles. There is currently no emergency pre-emption within the City of Spokane.

- There is some pre-emption near fire stations that are either hardwired to the station and are manually activated, or make use of a sensor (vehicles equipped with transponders).

Fire Dispatch Center:

Vehicles dispatched by radio and digital pagers
Fire or emergency 911 calls are forwarded from 911 dispatch to Fire dispatch.
Fire Department is the primary response to auto-auto accidents
95-98% of calls are routed through 911 service.

Dispatch has tie to ambulance company

- Both agencies can update reports
- Ambulance company must pay for hardware/software to coordinate with Fire Dept.
  - Report information dispatched to response teams include:
    - Time of Call
    - Resources Dispatched
    - Cross Streets
    - Telephone # of incoming call
    - Address of telephone of incoming call
    - Any dispatcher notes
  - This information is supplied by the CAD system.
  - All information included in voice dispatches
  - Digital page doesn't include any dispatcher notes.

Computer system operates on wide area network (WAN) and utilizes the following:

- City cable
- Leased lines
- TCI cables

HAZMAT Response

- Coverage area includes most of Eastern Washington
- Response teams have on-board computers for local data (no communications)
- The same dispatch process is used
- When responding outside of Spokane, they operate as a HAZMAT resource while the local jurisdiction controls the response.

Dispatch has tie to ambulance company

- Both agencies can update reports
- Ambulance company must pay for hardware/software to coordinate with Fire Dept.
  - Report information dispatched to response teams include:
    - Time of Call

        - Resources Dispatched
        - Cross Streets
        - Telephone # of incoming call
        - Address of telephone of incoming call
        - Any dispatcher notes
    - This information is supplied by the CAD system.
    - All information included in voice dispatches
    - Digital page doesn't include any dispatcher notes.

Two fire vehicles are equipped with in-vehicle video cameras

- Images are used for quality assurance and critiquing
- No video transmission to central

Receive daily construction information from the City.

TRANSPORTATION ISSUES/NEEDS

- Several key streets were identified as possible pre-emption traffic corridors. Currently however signal pre-emption is not a funding priority.

    - Division
    - Nevada
    - Hamilton
    - Maple
    - Ash
    - Monroe
    - Sprague
    - 2nd
    - 3rd
    - Trent
    - Mission
    - Indiana
    - Francis
    - Wellesley
    - Market-Green

    - Identified a need for AVL technology to provide vehicle status to the command center. Would consider using either satellite or 800 MHz communications.

    - Identified a need for the ability to transmit data between fire vehicles and the command center.

AGENCY DATA AND CONTROL EXCHANGE

- Would like to receive recorded CCTV camera feeds. These would be used for surveillance and crime/accident evidence.

- Would like real-time video feeds if they would have the ability to control and zoom.

- It is an issue of whether report information can be passed to a Traffic Management Center. Certain information like victim info cannot be shared. Information filtering/access would be necessary.

Appendix B

User Service Requirements

Appendix D

System Inventory Map

Appendix C

Memorandum of Understanding of Regional Transportation Systems Center Operating Board