Whatcom Council of Governments

Whatcom Regional ITS Architecture Reference Document

6/20/2012

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1 Introduction

Intelligent Transportation Systems (ITS) are technology solutions to improve the functionality, safety, and cost-effectiveness of transportation systems.

This architecture serves as a plan to illustrate what ITS systems are currently in place in the Bellingham and Whatcom County Metropolitan Planning Organization (MPO) and Regional Transportation Planning Organization (RTPO) boundaries. It also illustrates what systems are planned for deployment over the next five years, and highlights opportunities for sharing resources and improved coordination between agencies to improve overall system functionality.

The architecture has been developed as per the specifications developed by the U.S. Department of Transportation Federal Highway Administration (FHWA) Rule and Federal Transit Administration (FTA) Policy requiring regions with existing ITS applications to have a regional ITS architecture.[1] This document meets these federal requirements.

In addition to this document, more specific information about functional requirements, standards, and information flows can be found in the Turbo Architecture version of the Whatcom Regional ITS Architecture, available through Whatcom Council of Governments.

Process for developing the architecture

Following outlines suggested by National ITS Architecture guidelines, these steps were taken to develop this architecture:

1. A stakeholder meeting and follow-up individual meetings were held to identify current and future ITS needs which should be incorporated into the architecture.
2. Relevant service areas, or market packages, were identified with the stakeholder agencies responsible. Information flows between services were mapped.
3. Market packages were mapped to subsystems and terminators as specified in the National Architecture.
4. A draft version of the architecture was distributed to stakeholder agencies for feedback and revised accordingly.
5. The architecture will be submitted to the Whatcom Transportation Policy Board as part of the Whatcom Transportation Plan the summer of 2012 for final approval.

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[1] January 8, 2001, U.S. Department of Transportation, Federal Highway Administration, 23 CFR Part 940, FHWA Docket No. FHWA-99-5899

2 Architecture Scope

The Whatcom County Regional ITS Architecture is a roadmap for transportation systems integration. The architecture was developed through a cooperative effort by the region's transportation agencies, covering all modes and all roads in the region. It represents a shared vision of how each agency's systems will work together in the future, sharing information and resources to provide a safer, more efficient, and more effective transportation system for travelers in the region.

The architecture provides an overarching framework that spans all of the region's transportation organizations and individual transportation projects. Using the architecture, each transportation project can be viewed as an element of the overall transportation system, providing visibility into the relationship between individual transportation projects and ways to cost-effectively build an integrated transportation system over time. This chapter establishes the scope of the architecture in terms of its geographic breadth, the scope of services that are covered, and the time horizon that is addressed.

Description

This regional ITS Architecture documents existing and planned ITS deployments throughout Whatcom County, with a focus on the integration and coordination of data-sharing between stakeholders

Timeframe

5 years

Geographic Scope

This architecture encompases the geographic boundaries of Whatcom County in Washington State.

Developer

Whatcom Council of Governments

Version

2012

3 ITS Stakeholders

Identifying stakeholders is an important task in ITS architecture development since effective ITS involves the integration of multiple stakeholders and their transportation systems. This section describes the stakeholders who either participated in the creation of the Whatcom County Regional ITS Architecture or whom the participating stakeholders felt were needed to be included in the architecture. Some stakeholders have been grouped in order to better reflect mutual participation or involvement in transportation services and elements. Every stakeholder in this section is related to one or more of the transportation inventory elements described in the next chapter, either as an individual stakeholder or as a member of a stakeholder group.

Table 1: ITS Stakeholders

Stakeholder Name	Stakeholder Description
B.C. Ministry of Transportation (MOT)	The provincial agency that is responsible for managing, operating, and/or maintaining province-owned transportation infrastructure (roads, airports, transit, railways). Services provided include advanced traffic management, traveller information, and other ITS services.
Border Inspection Agencies	Enforcement agencies operating at ports-of-entry and along the U.S. - Canada border.
Canadian Border Services Agency	Canadian Border Services Agency (CBSA) is responsible for border services including customs.
Canadian Municipalities	A group consisting of jurisdictions north of Whatcom County that are important partners in cross-border ITS planning.
City of Abbotsford, BC	Municipal government agency in British Columbia.
City of Bellingham	Municipal government agency in Whatcom County.
City of Blaine	Municipal government agency in Whatcom County.
City of Everson	Municipal government agency in Whatcom County.
City of Ferndale	Municipal government agency in Whatcom County.
City of Lynden	Municipal government agency in Whatcom County.
City of Nooksack	Municipal government agency in Whatcom County.
City of Sumas	Municipal government agency in Whatcom County.
City of Surrey, BC	Municipal government agency in British Columbia.
City of White Rock, BC	Municipal government agency in British Columbia.
Lummi Nation	Lummi Indian Nation provides transportation services in Lummi tribal lands.
Other Databases and Applications	Other online systems which query and use the Border Data Warehouse through the Application Programming Interface (API).
Port of Bellingham	Regional port authority overseeing marine and airport transportation in Whatcom County.
Private Sector Probe Information Providers	Stakeholders who have vehicle probe information that can be shared with other agencies in the region. This would include stakeholders that generate probe information from commercial vehicle fleets, cell phones, or from general traveler information system
Township of Langley, BC	Municipal government agency in British Columbia.
U.S. Border Patrol	Inspection agency for enforcing the U.S.- Canada border between ports-of-entry and up to 100 miles from the border crossing itself.
US Bureau of Transportation Statistics	Agency of US government charged with data gathering, analysis and distribution of transportation data.

Stakeholder Name	Stakeholder Description
US Customs and Border Protection	US Customs and Border Protection (CBP) is a part of the Department of Homeland Security (DHS) and is responsible for managing the nation's borders and ports-of-entry, preventing the passage of individuals or goods from entering the United States unlawfully.
US Federal Highway Administration (FHWA)	Federal transportation planning and funding agency.
WA State Department of Transportation (WSDOT)	WA State Department of Transportation is responsible for managing, operating, and/or maintaining state-owned transportation infrastructure. Services provided include advanced traffic management, traveler information, and other ITS services.
WA State Patrol (WSP)	Statewide highway transportation public safety agency. Also administers commercial vehicle registration, licensing, and enforcement.
Whatcom Council of Governments (WCOG)	The Whatcom Council of Governments is the US, Metropolitan Planning Organizations (MPO) and Regional Transportation Planning Organization (RTPO) for Whatcom County, WA. It is also the lead agency of the International Mobility & Trade Corridor Project (IMTC).
Whatcom County	Jurisdiction overseeing unincorporated Whatcom County.
Whatcom Transportation Authority (WTA)	The Whatcom County regional transportation authority.

4 ITS System Inventory

An inventory of existing and planned transportation systems is the basis for the Whatcom County Regional ITS Architecture. The transportation system inventory was developed based on input from stakeholders throughout the region. The inventory includes a list of ITS elements and the associated stakeholder responsible for system operation.

This section describes every surface transportation inventory element for the region. A transportation element can be either a center, vehicle, traveler or field equipment. Each transportation element listed below has one or more stakeholders associated with it. In order to reduce the complexity of the architecture, some transportation elements with like functionality have been grouped together. Each transportation inventory element is mapped to at least one National ITS Architecture entity.

Table 2: ITS Inventory

Element Name	Element Description	Stakeholder	Element Status	Associated Entity
BC MOT Field Equipment	Represents field equipment such as sensors, CCTV, and Dynamic Message Signs, traffic signal controllers, etc., operated and managed by provincial traffic agencies.	B.C. Ministry of Transportation (MOT)	Existing	Roadway
Bellingham Surface Street Control	Traffic signal systems within the City of Bellingham.	City of Bellingham	Existing	Roadway
Bellingham Traffic Management Center (TMC)	Bellingham's Traffic Management Center.	City of Bellingham	Existing	Traffic Management
Border Clearance - Commercial	Commercial e-manifest system and other technology for submitting clearance information prior to trucks arrival at the U.S./Canada Border.	Border Inspection Agencies	Existing	Border Inspection Administration
Border Clearance - Passenger	Pre-approved travel programs for passengers crossing the U.S. - Canada border. In this region it is the NEXUS program.	Border Inspection Agencies	Existing	Border Inspection Administration
Cascade Gateway Border Data Warehouse	Data collection and warehousing system to collect transportation related information from the region. Archived data used to support planning activities.	Whatcom Council of Governments (WCOG)	Existing	Archived Data Management
CBP Inspection Systems	Field equipment used to determine lane type (Standard car, NEXUS, bus, commercial vehicle, FAST, etc).	US Customs and Border Protection	Planned	Other Border Inspection Systems
CBSA Inspection Systems	Field equipment used to determine lane type (Standard car, NEXUS, bus, commercial vehicle, FAST, etc).	Canadian Border Services Agency	Planned	Other Border Inspection Systems
Ferndale Surface Street Control	Traffic signal system within the City of Ferndale.	City of Ferndale	Existing	Roadway
I-5/Bellingham Traffic Signals	On and off-ramp signalization along Interstate 5 in Whatcom County.	WA State Department of Transportation (WSDOT)	Existing	Roadway

Element Name	Element Description	Stakeholder	Element Status	Associated Entity
Interstate 5 Monitoring	ITS improvements to I-5 for better monitoring and safety.	WA State Department of Transportation (WSDOT)	Planned	Roadway
Lynden Surface Street Control	Traffic control signals in the City of Lynden.	City of Lynden	Existing	Roadway
Northbound Border Traveler Information System	Northbound Advanced Traveler Information System run by WSDOT which includes border wait times for passenger and commercial vehicles on two variable message signs and the WSDOT website. System extends to all four Cascade Gateway ports-of-entry.	WA State Department of Transportation (WSDOT)	Existing	Alerting and Advisory Systems
Northbound Border Traveler Information System	Northbound Advanced Traveler Information System run by WSDOT which includes border wait times for passenger and commercial vehicles on two variable message signs and the WSDOT website. System extends to all four Cascade Gateway ports-of-entry.	WA State Department of Transportation (WSDOT)	Existing	Archived Data Management
Northbound Border Traveler Information System	Northbound Advanced Traveler Information System run by WSDOT which includes border wait times for passenger and commercial vehicles on two variable message signs and the WSDOT website. System extends to all four Cascade Gateway ports-of-entry.	WA State Department of Transportation (WSDOT)	Existing	Information Service Provider
Private Sector Probe Information Systems	Systems that provide vehicle probe information. These might be from companies providing support to commercial vehicle fleets, cellular phone companies, or general traveler information companies.	Private Sector Probe Information Providers	Planned	Information Service Provider
Southbound Border Traveler Information System	Southbound Advanced Traveler Information System run by BCMOT which includes border wait times for passenger vehicles on three variable message signs and the BCMOT website. System will extend to all four Cascade Gateway ports-of-entry.	B.C. Ministry of Transportation (MOT)	Existing	Alerting and Advisory Systems
Southbound Border Traveler Information System	Southbound Advanced Traveler Information System run by BCMOT which includes border wait times for passenger vehicles on three variable message signs and the BCMOT website. System will extend to all four Cascade Gateway ports-of-entry.	B.C. Ministry of Transportation (MOT)	Existing	Archived Data Management
Southbound Border Traveler Information System	Southbound Advanced Traveler Information System run by BCMOT which includes border wait times for passenger vehicles on three variable message signs and the BCMOT website. System will extend to all four Cascade Gateway ports-of-entry.	B.C. Ministry of Transportation (MOT)	Existing	Information Service Provider
SR 539 ITS System	ITS improvements along Guide Meridian.	WA State Department of Transportation (WSDOT)	Planned	Roadway
SR 543 ITS System	ITS improvements along the truck route at Pacific Highway.	WA State Department of Transportation (WSDOT)	Planned	Roadway
SR 9 ITS System	ITS improvements along SR 9 and Cherry Street in Sumas.	WA State Department of Transportation (WSDOT)	Existing	Roadway
Sumas Border VMS Sign	The variable message sign in Sumas will be used to re-direct trucks and NEXUS lane users around lengthy passenger vehicle backupos at the border.	City of Sumas	Planned	Roadway

Element Name	Element Description	Stakeholder	Element Status	Associated Entity
Systems Using Warehouse API	Agency Systems that use data put into data warehouses or archives. The agencies that might make use of the data are DOT, MOT, CBP, CBSA,, and MPOs. Some of the systems that might access the data are: Border Wizard (a planning tool), and CanSim (another planning tool). Other possible uses are for the Compendium (a list of projects), Facility Planning, and feedback to Operations (TMCs, CBP/CBSA) for lane assignments and staffing.	Other Databases and Applications	Planned	Archived Data User Systems
US Bureau of Transportation Statistics Systems	Bureau of US government that would collect data from Border Information administration systems (e.g. ACE) and then provide that data to archives in the architecture.	US Bureau of Transportation Statistics	Existing	Archived Data Management
User Information Device	Personal Computers, PDAs, web-enabled cell phones, etc. used by individuals to access information concerning traffic conditions, incidents, weather, routing, trip planning, and border crossing information.	Private Travelers	Existing	Personal Information Access
Whatcom County Surface Street Control	Traffic signal system within unincorporated Whatcom County.	Whatcom County	Existing	Roadway
WSDOT Field Equipment	Represents field equipment such as sensors, CCTV, and Dynamic Message Signs, traffic signal controllers, etc., operated and managed by state traffic agencies.	WA State Department of Transportation (WSDOT)	Existing	Roadway
WSDOT Traffic Management Center (TMC)	Traffic Management Center in Bellingham and in Seattle that monitors the entire WSDOT system, including all State Routes and the Northbound Border Traveler Information System.	WA State Department of Transportation (WSDOT)	Existing	Traffic Management
WTA Automatic Vehicle Location	Tracking for paratransit fleet. Planned expansion to fixed route fleet at later date.	Whatcom Transportation Authority (WTA)	Existing	Transit Vehicle
WTA Demand Response	This demand response system is for the paratransit fleet only.	Whatcom Transportation Authority (WTA)	Existing	Transit Management
WTA Station Monitoring	WTA has monitoring abilities at all their transit centers (Downtown Bellingham, Cordata, Ferndale, and Lynden). Images can be shared with the City of Bellingham.	Whatcom Transportation Authority (WTA)	Existing	Security Monitoring
WTA Transit Management	WTA has long-term plans to deploy additional transit management elements that may include e-fare collection management, fleet management, operations management, and passenger counting.	Whatcom Transportation Authority (WTA)	Planned	Transit Management
WTA Transit Signal Priority	WTA has a transit signal prioritization system built on the City of Bellingham traffic management system, operational within the city limits at selected intersections.	Whatcom Transportation Authority (WTA)	Existing	Transit Vehicle
WTA Trip Planning	WTA has deployed an online trip planning tool to assist users in better planning transit trips. As the WTA Automatic Vehicle Location and Transit Management elements expand, additional trip planning tools may become available, including possible use of real time vehicle location.	Whatcom Transportation Authority (WTA)	Existing	Information Service Provider

5 ITS Services

ITS services describe what can be done to improve the efficiency, safety, and convenience of the regional transportation system through better information, advanced systems and new technologies. Some services are specific to one primary stakeholder while others require broad stakeholder participation. This section describes the ITS services that meet the transportation needs in the region.

Table 3: ITS Services

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
AD2	AD2-ITS Data Warehouse - US-Canadian Planning (Instance 1)	This market package includes collection of archived data by US or Canadian state, provincial, or regional organizations from multiple agencies and data sources spanning modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this market package in addition to the basic query and reporting user access features.	Existing	Yes	BC MOT Field Equipment
AD2	AD2-ITS Data Warehouse - US-Canadian Planning (Instance 1)	This market package includes collection of archived data by US or Canadian state, provincial, or regional organizations from multiple agencies and data sources spanning modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this market package in addition to the basic query and reporting user access features.	Existing	Yes	Cascade Gateway Border Data Warehouse
AD2	AD2-ITS Data Warehouse - US-Canadian Planning (Instance 1)	This market package includes collection of archived data by US or Canadian state, provincial, or regional organizations from multiple agencies and data sources spanning modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this market package in addition to the basic query and reporting user access features.	Existing	Yes	Systems Using Warehouse API

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
AD2	AD2-ITS Data Warehouse - US-Canadian Planning (Instance 1)	This market package includes collection of archived data by US or Canadian state, provincial, or regional organizations from multiple agencies and data sources spanning modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this market package in addition to the basic query and reporting user access features.	Existing	Yes	US Bureau of Transportation Statistics Systems
AD2	AD2-ITS Data Warehouse - US-Canadian Planning (Instance 1)	This market package includes collection of archived data by US or Canadian state, provincial, or regional organizations from multiple agencies and data sources spanning modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this market package in addition to the basic query and reporting user access features.	Existing	Yes	WSDOT Field Equipment
AD2	AD2-ITS Data Warehouse - US-Canadian Planning (Instance 1)	This market package includes collection of archived data by US or Canadian state, provincial, or regional organizations from multiple agencies and data sources spanning modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this market package in addition to the basic query and reporting user access features.	Existing	Yes	WSDOT Traffic Management Center (TMC)

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
APTS01	Transit Vehicle Tracking	This service package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle (e.g., through GPS) and relayed to the infrastructure or may be determined directly by the communications infrastructure. A two-way wireless communication link with the Transit Management Subsystem is used for relaying vehicle position and control measures. Fixed route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The Transit Management Subsystem processes this information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider.	Existing	No	WTA Automatic Vehicle Location
APTS02	Transit Fixed-Route Operations	This service package performs automated dispatch and system monitoring for fixed-route and flexible-route transit services. This service performs scheduling activities including the creation of schedules, blocks and runs, as well as operator assignment. This service determines the transit vehicle trip performance against the schedule using AVL data and provides information displays at the Transit Management Subsystem. Static and real time transit data is exchanged with Information Service Providers where it is integrated with that from other transportation modes (e.g. rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.	Planned	No	WTA Transit Management

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
APTS03	Demand Response Transit Operations	This service package performs automated dispatch and system monitoring for demand responsive transit services. This service performs scheduling activities as well as operator assignment. In addition, this service package performs similar functions to support dynamic features of flexible-route transit services. This package monitors the current status of the transit fleet and supports allocation of these fleet resources to service incoming requests for transit service while also considering traffic conditions. The Transit Management Subsystem provides the necessary data processing and information display to assist the transit operator in making optimal use of the transit fleet. This service includes the capability for a traveler request for personalized transit services to be made through the Information Service Provider (ISP) Subsystem. The ISP may either be operated by a transit management center or be independently owned and operated by a separate service provider. In the first scenario, the traveler makes a direct request to a specific paratransit service. In the second scenario, a third party service provider determines that the paratransit service is a viable means of satisfying a traveler request and makes a reservation for the traveler.	Existing	No	WTA Automatic Vehicle Location
APTS04	Transit Fare Collection Management	This service package manages transit fare collection on-board transit vehicles and at transit stops using electronic means. It allows transit users to use a traveler card or other electronic payment device. Readers located either in the infrastructure or on-board the transit vehicles enable electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem. Two other service packages, ATMS10: Electronic Toll Collection and ATMS16: Parking Facility Management, also provide electronic payment services. These three service packages in combination provide an integrated electronic payment system for transportation services.	Planned	No	WTA Transit Management

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
APTS05	Transit Security	This service package provides for the physical security of transit passengers and transit vehicle operators. On-board equipment is deployed to perform surveillance and sensor monitoring in order to warn of potentially hazardous situations. The surveillance equipment includes video (e.g., CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g., chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g., metal detectors). Transit user or transit vehicle operator activated alarms are provided on-board. Public areas (e.g., transit stops, park and ride lots, stations) are also monitored with similar surveillance and sensor equipment and provided with transit user activated alarms. In addition this service package provides surveillance and sensor monitoring of non-public areas of transit facilities (e.g., transit yards) and transit infrastructure such as bridges, tunnels, and transit railways or bus rapid transit (BRT) guideways. The surveillance equipment includes video and/or audio systems. The sensor equipment includes threat sensors and object detection sensors as described above as well as, intrusion or motion detection sensors and infrastructure integrity monitoring (e.g., rail track continuity checking or bridge structural integrity monitoring). The surveillance and sensor information is transmitted to the Emergency Management Subsystem, as are transit user activated alarms in public secure areas. On-board alarms, activated by transit users or transit vehicle operators are transmitted to both the Emergency Management Subsystem and the Transit Management Subsystem, indicating two possible approaches to implementing this service package. In addition the service package supports remote transit vehicle disabling by the Transit Management Subsystem and transit vehicle operator authentication.	Existing	No	WTA Automatic Vehicle Location

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
APTS05	Transit Security	This service package provides for the physical security of transit passengers and transit vehicle operators. On-board equipment is deployed to perform surveillance and sensor monitoring in order to warn of potentially hazardous situations. The surveillance equipment includes video (e.g., CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g., chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g., metal detectors). Transit user or transit vehicle operator activated alarms are provided on-board. Public areas (e.g., transit stops, park and ride lots, stations) are also monitored with similar surveillance and sensor equipment and provided with transit user activated alarms. In addition this service package provides surveillance and sensor monitoring of non-public areas of transit facilities (e.g., transit yards) and transit infrastructure such as bridges, tunnels, and transit railways or bus rapid transit (BRT) guideways. The surveillance equipment includes video and/or audio systems. The sensor equipment includes threat sensors and object detection sensors as described above as well as, intrusion or motion detection sensors and infrastructure integrity monitoring (e.g., rail track continuity checking or bridge structural integrity monitoring). The surveillance and sensor information is transmitted to the Emergency Management Subsystem, as are transit user activated alarms in public secure areas. On-board alarms, activated by transit users or transit vehicle operators are transmitted to both the Emergency Management Subsystem and the Transit Management Subsystem, indicating two possible approaches to implementing this service package. In addition the service package supports remote transit vehicle disabling by the Transit Management Subsystem and transit vehicle operator authentication.	Existing	No	WTA Station Monitoring
APTS06	Transit Fleet Management	This service package supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Subsystem. Hardware and software in the Transit Management Subsystem processes this data and schedules preventative and corrective maintenance. The service package also supports the day to day management of the transit fleet inventory, including the assignment of specific transit vehicles to blocks.	Planned	No	WTA Automatic Vehicle Location

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
APTS06	Transit Fleet Management	This service package supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Subsystem. Hardware and software in the Transit Management Subsystem processes this data and schedules preventative and corrective maintenance. The service package also supports the day to day management of the transit fleet inventory, including the assignment of specific transit vehicles to blocks.	Planned	No	WTA Transit Management
APTS07	Multi-modal Coordination	This service package establishes two way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transit transfer points and clusters (a collection of stops, stations, or terminals where transfers can be made conveniently) and also improve operating efficiency. Transit transfer information is shared between Multimodal Transportation Service Providers and Transit Agencies.	Planned	No	WTA Transit Management
APTS08	Transit Traveler Information	This service package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this service package.	Planned	No	WTA Automatic Vehicle Location
APTS08	Transit Traveler Information	This service package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this service package.	Planned	No	WTA Transit Management
APTS09	Transit Signal Priority	This service package determines the need for transit priority on routes and at certain intersections and requests transit vehicle priority at these locations. The signal priority may result from limited local coordination between the transit vehicle and the individual intersection for signal priority or may result from coordination between transit management and traffic management centers. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network.	Existing	No	Bellingham Traffic Management Center (TMC)

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
APTS09	Transit Signal Priority	This service package determines the need for transit priority on routes and at certain intersections and requests transit vehicle priority at these locations. The signal priority may result from limited local coordination between the transit vehicle and the individual intersection for signal priority or may result from coordination between transit management and traffic management centers. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network.	Existing	No	WTA Automatic Vehicle Location
APTS10	Transit Passenger Counting	This service package counts the number of passengers entering and exiting a transit vehicle using sensors mounted on the vehicle and communicates the collected passenger data back to the management center. The collected data can be used to calculate reliable ridership figures and measure passenger load information at particular stops.	Planned	No	WTA Transit Management
ATIS01	Border Traveler Information	This market package collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadcasts the information to travelers using technologies such as FM subcarrier, satellite radio, cellular data broadcasts, and Internet web casts. The information may be provided directly to travelers or provided to merchants and other traveler service providers so that they can better inform their customers of travel conditions. Different from the market package ATMS6 - Traffic Information Dissemination, which provides localized HAR and DMS information capabilities, ATIS1 provides a wide area digital broadcast service. Successful deployment of this market package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.	Existing	Yes	Northbound Border Traveler Information System

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATIS01	Border Traveler Information	This market package collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadcasts the information to travelers using technologies such as FM subcarrier, satellite radio, cellular data broadcasts, and Internet web casts. The information may be provided directly to travelers or provided to merchants and other traveler service providers so that they can better inform their customers of travel conditions. Different from the market package ATMS6 - Traffic Information Dissemination, which provides localized HAR and DMS information capabilities, ATIS1 provides a wide area digital broadcast service. Successful deployment of this market package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.	Existing	Yes	Southbound Border Traveler Information System
ATIS02	ATIS2-Interactive Traveler Information - US 511	This market package for a US-based 511-type service provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding border crossing wait times, traffic conditions, roadway maintenance and construction, detours and pricing information. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal, kiosk, Personal Digital Assistant, personal computer, and a variety of in-vehicle devices. This market package also allows value-added resellers to collect transportation information that can be aggregated and be available to their personal devices or remote traveler systems to better inform their customers of transportation conditions. A traveler may also input personal preferences and identification information via a "traveler card" that can convey information to the system about the traveler as well as receive updates from the system so the card can be updated over time.	Planned	Yes	Northbound Border Traveler Information System

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATIS02	ATIS2-Interactive Traveler Information - US 511	This market package for a US-based 511-type service provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding border crossing wait times, traffic conditions, roadway maintenance and construction, detours and pricing information. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal, kiosk, Personal Digital Assistant, personal computer, and a variety of in-vehicle devices. This market package also allows value-added resellers to collect transportation information that can be aggregated and be available to their personal devices or remote traveler systems to better inform their customers of transportation conditions. A traveler may also input personal preferences and identification information via a "traveler card" that can convey information to the system about the traveler as well as receive updates from the system so the card can be updated over time.	Planned	Yes	User Information Device
ATIS02	ATIS2-Interactive Traveller Information - Border Traveller Info Sys	This market package for a regional traveller border information system service provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding border crossing wait times, traffic conditions, roadway maintenance and construction, detours and pricing information. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal, kiosk, Personal Digital Assistant, personal computer, and a variety of in-vehicle devices. This market package also allows value-added resellers to collect transportation information that can be aggregated and be available to their personal devices or remote traveler systems to better inform their customers of transportation conditions. A traveler may also input personal preferences and identification information via a "traveler card" that can convey information to the system about the traveler as well as receive updates from the system so the card can be updated over time.	Planned	Yes	Northbound Border Traveler Information System

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATIS02	ATIS2-Interactive Traveller Information - Border Traveller Info Sys	This market package for a regional traveller border information system service provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding border crossing wait times, traffic conditions, roadway maintenance and construction, detours and pricing information. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal, kiosk, Personal Digital Assistant, personal computer, and a variety of in-vehicle devices. This market package also allows value-added resellers to collect transportation information that can be aggregated and be available to their personal devices or remote traveler systems to better inform their customers of transportation conditions. A traveler may also input personal preferences and identification information via a "traveler card" that can convey information to the system about the traveler as well as receive updates from the system so the card can be updated over time.	Planned	Yes	User Information Device
ATIS02	ATIS2-Interactive Traveller Information - Border Traveller Info Sys	This market package for a regional traveller border information system service provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding border crossing wait times, traffic conditions, roadway maintenance and construction, detours and pricing information. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal, kiosk, Personal Digital Assistant, personal computer, and a variety of in-vehicle devices. This market package also allows value-added resellers to collect transportation information that can be aggregated and be available to their personal devices or remote traveler systems to better inform their customers of transportation conditions. A traveler may also input personal preferences and identification information via a "traveler card" that can convey information to the system about the traveler as well as receive updates from the system so the card can be updated over time.	Planned	Yes	WSDOT Traffic Management Center (TMC)

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATIS02	Interactive Traveler Information	This service package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours and pricing information. Although the Internet is the predominate network used for traveler information dissemination, a range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications between the traveler and Information Service Provider. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal and web pages via kiosk, personal digital assistant, personal computer, and a variety of in-vehicle devices. This service package also allows value-added resellers to collect transportation information that can be aggregated and be available to their personal devices or remote traveler systems to better inform their customers of transportation conditions. Successful deployment of this service package relies on availability of real-time transportation data from roadway instrumentation, transit, probe vehicles or other means. A traveler may also input personal preferences and identification information via a "traveler card" that can convey information to the system about the traveler as well as receive updates from the system so the card can be updated over time.	Planned	No	<None>
ATIS06	Transportation Operations Data Sharing	This service package makes real-time transportation operations data available to transportation system operators. The Information Service Provider collects, processes, and stores current information on traffic and travel conditions and other information about the current state of the transportation network and makes this information available to transportation system operators, facilitating the exchange of qualified, real-time information between agencies. Using the provided information, transportation system operators can manage their individual systems based on an overall view of the regional transportation system. The regional transportation operations data resource represented by the Information Service Provider may be implemented as a web application that provides a web-based access to system operators, an enterprise database that provides a network interface to remote center applications, or any implementation that supports regional sharing of real-time transportation operations data.	Planned	No	Bellingham Traffic Management Center (TMC)

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATIS06	Transportation Operations Data Sharing	This service package makes real-time transportation operations data available to transportation system operators. The Information Service Provider collects, processes, and stores current information on traffic and travel conditions and other information about the current state of the transportation network and makes this information available to transportation system operators, facilitating the exchange of qualified, real-time information between agencies. Using the provided information, transportation system operators can manage their individual systems based on an overall view of the regional transportation system. The regional transportation operations data resource represented by the Information Service Provider may be implemented as a web application that provides a web-based access to system operators, an enterprise database that provides a network interface to remote center applications, or any implementation that supports regional sharing of real-time transportation operations data.	Planned	No	Southbound Border Traveler Information System
ATIS06	Transportation Operations Data Sharing	This service package makes real-time transportation operations data available to transportation system operators. The Information Service Provider collects, processes, and stores current information on traffic and travel conditions and other information about the current state of the transportation network and makes this information available to transportation system operators, facilitating the exchange of qualified, real-time information between agencies. Using the provided information, transportation system operators can manage their individual systems based on an overall view of the regional transportation system. The regional transportation operations data resource represented by the Information Service Provider may be implemented as a web application that provides a web-based access to system operators, an enterprise database that provides a network interface to remote center applications, or any implementation that supports regional sharing of real-time transportation operations data.	Planned	No	WSDOT Traffic Management Center (TMC)

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS01	ATMS01-Network Surveillance - Regional TMC	This market package for Regional (cross-border) Transportation Organizations includes traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Subsystem). The data generated by this market package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.	Planned	Yes	Northbound Border Traveler Information System
ATMS01	ATMS01-Network Surveillance - State DOT	This market package for US State Departments of Transportation includes traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Subsystem). The data generated by this market package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.	Planned	Yes	Northbound Border Traveler Information System
ATMS01	ATMS01-Network Surveillance - State DOT	This market package for US State Departments of Transportation includes traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Subsystem). The data generated by this market package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.	Planned	Yes	WSDOT Field Equipment

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS02	ATMS02-Probe Surveillance	This market package provides an alternative approach for surveillance of the roadway network for Provincial MoTs or State DOTs. This market package provides dedicated short range communications between the vehicle and roadside is used to provide equivalent information directly to the Traffic Management Subsystem. This approach utilizes vehicle equipment that supports toll collection, in-vehicle signing, and other short range communications applications identified within the architecture. The market package enables traffic managers to monitor road conditions, identify incidents, analyze and reduce the collected data, and make it available to users and private information providers. It requires one of the communications options identified above, roadside beacons and fixed-point to fixed-point communications for the short range communications option, data reduction software, and utilizes fixed-point to fixed-point links between the Traffic Management Subsystem and Information Service Provider Subsystem to share the collected information. Both "Opt out" and "Opt in" strategies are available to ensure the user has the ability to turn off the probe functions to ensure individual privacy. Due to the large volume of data collected by probes, data reduction techniques are required, such as the ability to identify and filter out-of-bounds or extreme data reports.	Planned	Yes	Private Sector Probe Information Systems

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS02	Traffic Probe Surveillance	This service package provides an alternative approach for surveillance of the roadway network. Two general implementation paths are supported by this service package: 1) wide-area wireless communications between the vehicle and center is used to communicate vehicle operational information and status directly to the center, and 2) dedicated short range communications between passing vehicles and the roadside is used to provide equivalent information to the center. The first approach leverages wide area communications equipment that may already be in the vehicle to support personal safety and advanced traveler information services. The second approach utilizes vehicle equipment that supports toll collection, in-vehicle signing, and other short range communications applications identified within the architecture. The service package enables transportation operators and traveler information providers to monitor road conditions, identify incidents, analyze and reduce the collected data, and make it available to users and private information providers. It requires one of the communications options identified above, on-board equipment, data reduction software, and fixed-point to fixed-point links between centers to share the collected information. Both "Opt out" and "Opt in" strategies are available to ensure the user has the ability to turn off the probe functions to ensure individual privacy. Due to the large volume of data collected by probes, data reduction techniques are required, such as the ability to identify and filter out-of-bounds or extreme data reports.	Planned	No	Private Sector Probe Information Systems
ATMS03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Existing	No	Bellingham Surface Street Control

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Existing	No	Bellingham Traffic Management Center (TMC)
ATMS03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Existing	No	Ferndale Surface Street Control

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Existing	No	I-5/Bellingham Traffic Signals
ATMS03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Existing	No	Interstate 5 Monitoring

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Existing	No	Lynden Surface Street Control
ATMS03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Existing	No	SR 539 ITS System

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Existing	No	SR 543 ITS System
ATMS03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Existing	No	SR 9 ITS System

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Existing	No	Sumas Border VMS Sign
ATMS03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Existing	No	Whatcom County Surface Street Control

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Existing	No	WSDOT Field Equipment
ATMS03	Traffic Signal Control	This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.	Existing	No	WSDOT Traffic Management Center (TMC)

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS04	ATMS04-Highway Control - MoT	This market package provides the Canadian Provincial Ministries of Transport with central monitoring and control, communications, and field equipment that support freeway management. It supports a range of highway management control strategies including ramp metering, interchange metering, mainline lane controls, mainline metering, and other strategies including variable speed controls. This package also includes lane management using dynamic message signs on the lanes leading up to the border and dynamic warning systems indicating the queues. This package incorporates the instrumentation included in the Network Surveillance Market Package to support freeway monitoring and adaptive strategies as an option. This market package also includes the capability to utilize surveillance information for detection of incidents. Typically, the processing would be performed at a traffic management center; however, developments might allow for point detection with roadway equipment. For example, a CCTV might include the capability to detect an incident based upon image changes. Additionally, this market package allows general advisory and traffic control information to be provided to the driver while en route.	Planned	Yes	BC MOT Field Equipment
ATMS06	ATMS06-Traffic Information Dissemination - State DOT	This market package for US State DOTs provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Information Service Providers. A link to the Maintenance and Construction Management subsystem allows real time information on road/bridge closures due to maintenance and construction activities to be disseminated.	Planned	Yes	Northbound Border Traveler Information System

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS06	ATMS06-Traffic Information Dissemination - State DOT	This market package for US State DOTs provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Information Service Providers. A link to the Maintenance and Construction Management subsystem allows real time information on road/bridge closures due to maintenance and construction activities to be disseminated.	Planned	Yes	Sumas Border VMS Sign
ATMS06	ATMS06-Traffic Information Dissemination - State DOT	This market package for US State DOTs provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Information Service Providers. A link to the Maintenance and Construction Management subsystem allows real time information on road/bridge closures due to maintenance and construction activities to be disseminated.	Planned	Yes	WSDOT Traffic Management Center (TMC)

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS07	Regional Traffic Management	This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the ATMS03-Traffic Signal Control and ATMS04-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.	Planned	No	Bellingham Surface Street Control
ATMS07	Regional Traffic Management	This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the ATMS03-Traffic Signal Control and ATMS04-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.	Planned	No	Bellingham Traffic Management Center (TMC)

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS07	Regional Traffic Management	This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the ATMS03-Traffic Signal Control and ATMS04-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.	Planned	No	Ferndale Surface Street Control
ATMS07	Regional Traffic Management	This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the ATMS03-Traffic Signal Control and ATMS04-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.	Planned	No	I-5/Bellingham Traffic Signals

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS07	Regional Traffic Management	This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the ATMS03-Traffic Signal Control and ATMS04-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.	Planned	No	Interstate 5 Monitoring
ATMS07	Regional Traffic Management	This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the ATMS03-Traffic Signal Control and ATMS04-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.	Planned	No	Lynden Surface Street Control

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS07	Regional Traffic Management	This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the ATMS03-Traffic Signal Control and ATMS04-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.	Planned	No	SR 539 ITS System
ATMS07	Regional Traffic Management	This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the ATMS03-Traffic Signal Control and ATMS04-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.	Planned	No	SR 543 ITS System

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS07	Regional Traffic Management	This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the ATMS03-Traffic Signal Control and ATMS04-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.	Planned	No	SR 9 ITS System
ATMS07	Regional Traffic Management	This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the ATMS03-Traffic Signal Control and ATMS04-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.	Planned	No	Whatcom County Surface Street Control

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS07	Regional Traffic Management	This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the ATMS03-Traffic Signal Control and ATMS04-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.	Planned	No	WSDOT Traffic Management Center (TMC)
ATMS13	Standard Railroad Grade Crossing	This service package manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported. (Note that passive systems exercise only the single interface between the roadway subsystem and the driver in the architecture definition.) These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.	Planned	No	Bellingham Surface Street Control

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS13	Standard Railroad Grade Crossing	This service package manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported. (Note that passive systems exercise only the single interface between the roadway subsystem and the driver in the architecture definition.) These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.	Planned	No	Bellingham Traffic Management Center (TMC)
ATMS13	Standard Railroad Grade Crossing	This service package manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported. (Note that passive systems exercise only the single interface between the roadway subsystem and the driver in the architecture definition.) These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.	Planned	No	Ferndale Surface Street Control

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS13	Standard Railroad Grade Crossing	This service package manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported. (Note that passive systems exercise only the single interface between the roadway subsystem and the driver in the architecture definition.) These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.	Planned	No	Whatcom County Surface Street Control
ATMS13	Standard Railroad Grade Crossing	This service package manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported. (Note that passive systems exercise only the single interface between the roadway subsystem and the driver in the architecture definition.) These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Health monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.	Planned	No	WSDOT Traffic Management Center (TMC)

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
ATMS21	ATMS21-Roadway Closure Management - MoT	This market package for Provincial MoTs closes roadways to vehicular traffic when driving conditions are unsafe, maintenance must be performed, and other scenarios where access to the roadway must be prohibited. The market package includes automatic or remotely controlled gates or barriers that control access to roadway segments including ramps and traffic lanes. Remote control systems allow the gates to be controlled from a central location or from a vehicle at the gate/barrier location, improving system efficiency and reducing personnel exposure to unsafe conditions during severe weather and other situations where roads must be closed. Surveillance systems allow operating personnel to visually verify the safe activation of the closure system and driver information systems (e.g., DMS) provide closure information to motorists in the vicinity of the closure. The equipment managed by this market package includes the control and monitoring systems, the field devices (e.g., gates, warning lights, DMS, CCTV cameras) at the closure location(s), and the information systems that notify other systems of a closure. This market package covers general road closure applications; specific closure systems that are used at railroad grade crossings, drawbridges, reversible lanes, etc. are covered by other ATMS market packages.	Planned	Yes	BC MOT Field Equipment
ATMS21	ATMS21-Roadway Closure Management - State DOT	This market package for State DOTs closes roadways to vehicular traffic when driving conditions are unsafe, maintenance must be performed, and other scenarios where access to the roadway must be prohibited. The market package includes automatic or remotely controlled gates or barriers that control access to roadway segments including ramps and traffic lanes. Remote control systems allow the gates to be controlled from a central location or from a vehicle at the gate/barrier location, improving system efficiency and reducing personnel exposure to unsafe conditions during severe weather and other situations where roads must be closed. Surveillance systems allow operating personnel to visually verify the safe activation of the closure system and driver information systems (e.g., DMS) provide closure information to motorists in the vicinity of the closure. The equipment managed by this market package includes the control and monitoring systems, the field devices (e.g., gates, warning lights, DMS, CCTV cameras) at the closure location(s), and the information systems that notify other systems of a closure. This market package covers general road closure applications; specific closure systems that are used at railroad grade crossings, drawbridges, reversible lanes, etc. are covered by other ATMS market packages.	Planned	Yes	WSDOT Field Equipment

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
CVO05	International Border Electronic Clearance	This service package provides for automated clearance at international border crossings. It augments the Electronic Clearance service package by allowing interface with border administration and border inspection related functions. This service package processes the entry documentation for vehicle, cargo, and driver, checks compliance with import/export and immigration regulations, handles duty fee processing, and reports the results of the crossing event to manage release of commercial vehicle, cargo, and driver across an international border. It interfaces with administrative systems used by customs and border protection, immigration, carriers, and service providers (e.g., brokers) and inspection systems at international border crossings to generate, process, and store entry documentation.	Existing	No	Border Clearance - Commercial
MC03	Road Weather Data Collection	This service package collects current road and weather conditions using data collected from environmental sensors deployed on and about the roadway (or guideway in the case of transit related rail systems). In addition to fixed sensor stations at the roadside, sensing of the roadway environment can also occur from sensor systems located on Maintenance and Construction Vehicles. The collected environmental data is used by the Weather Information Processing and Distribution service package to process the information and make decisions on operations. The collected environmental data may be aggregated, combined with data attributes and sent to meteorological systems for data qualification and further data consolidation. The service package may also request and receive qualified data sets from meteorological systems.	Planned	No	Interstate 5 Monitoring
MC03	Road Weather Data Collection	This service package collects current road and weather conditions using data collected from environmental sensors deployed on and about the roadway (or guideway in the case of transit related rail systems). In addition to fixed sensor stations at the roadside, sensing of the roadway environment can also occur from sensor systems located on Maintenance and Construction Vehicles. The collected environmental data is used by the Weather Information Processing and Distribution service package to process the information and make decisions on operations. The collected environmental data may be aggregated, combined with data attributes and sent to meteorological systems for data qualification and further data consolidation. The service package may also request and receive qualified data sets from meteorological systems.	Planned	No	WSDOT Traffic Management Center (TMC)

Service Package	Service Package Name	Service Package Description	Service Package Status	Service Package Instance	Included Elements
MC08	MC08-Work Zone Management - State DOT	This market package manages work zones, controlling traffic in areas of the roadway where maintenance, construction, and utility work activities are underway. Traffic conditions are monitored using CCTV cameras and controlled using dynamic message signs (DMS), Highway Advisory Radio (HAR), gates and barriers. Work zone information is coordinated with other groups (e.g., ISP, traffic management, other maintenance and construction centers). Work zone speeds and delays are provided to the motorist prior to the work zones. This market package provides control of field equipment in all maintenance and construction areas, including fixed, portable, and truck-mounted devices supporting both stationary and mobile work zones.	Planned	Yes	WSDOT Field Equipment

6 Operational Concept

The Operational Concept lists the roles and responsibilities that each participating agency must take on to provide the ITS services included in the ITS Architecture. Changing needs may arise that will require an agreement to be formed between all affected parties that defines new or additional roles. Defining the roles and responsibilities of the participating stakeholders in the region and the willingness of agencies to accept their roles and responsibilities is an important step in realizing the common goal of an interoperable ITS system throughout the region.

Table 4: Operational Concept

RR Area Name	RR Area Description	Stakeholder	RR Description	RR Status
Cascade Gateway Archived Data Systems		B.C. Ministry of Transportation (MOT)	Collect and disseminate data from highway weigh-in-motion volume counters.	Existing
Cascade Gateway Archived Data Systems		B.C. Ministry of Transportation (MOT)	Collect and disseminate information on border crossing status and delays.	Planned
Cascade Gateway Archived Data Systems		WA State Department of Transportation (WSDOT)	Collect and disseminate information on border crossing status and schedules.	Existing
Cascade Gateway Archived Data Systems		WA State Department of Transportation (WSDOT)	Collect and disseminate data from highway weigh-in-motion volume counters.	Planned
Cascade Gateway Archived Data Systems		Whatcom Council of Governments (WCOG)	Collect transportation related data (traffic counts, accident history, etc.) to provide basic data quality, data privacy, and metadata management.	Existing
Cascade Gateway Archived Data Systems		Whatcom Council of Governments (WCOG)	Sharing data with other archived data systems in US and along the border - either transfering the data or providing catalogs of the data housed in each archive to create a virtual data warehouse.	Existing
Transit Services for Whatcom County Regional ITS Architecture		City of Bellingham		
Transit Services for Whatcom County Regional ITS Architecture		Whatcom Transportation Authority (WTA)		

7 Functional Requirements

Each ITS system operated by the stakeholders must perform certain functions to effectively deliver the ITS services desired by the region. The primary functions that each system needs to perform are broadly defined in the Whatcom County Regional ITS Architecture architecture. The high-level requirements are grouped into functional areas that identify requirements associated with each selected ITS service.

Table 5: Functional Requirements

Element Name	Entity Name	Functional Area	Functional Area Description	FA User Defined
BC MOT Field Equipment	Roadway	Field Barrier System Control	Field elements that control barrier systems such as gates and other systems that manage entry to roadways, transportation facilities and infrastructure.	No
BC MOT Field Equipment	Roadway	Roadway Basic Surveillance	Field elements that monitor traffic conditions using loop detectors and CCTV cameras.	No
BC MOT Field Equipment	Roadway	Roadway Data Collection	Field elements to collect traffic, road, and environmental conditions information for use in transportation planning, research, and other off-line applications. Includes the sensors, supporting roadside infrastructure, and communications equipment.	No
BC MOT Field Equipment	Roadway	Roadway Environmental Monitoring	Environmental sensors, surface and sub-surface, that collect weather and road surface information. Weather conditions measured include temperature, wind, humidity, precipitation, and visibility. Sensors measure road surface temperature, moisture, icing, salinity, etc.	No
BC MOT Field Equipment	Roadway	Roadway Equipment Coordination	Field elements that control and send data to other field elements (such as environmental sensors that send data to a DMS or coordination between traffic controllers on adjacent intersections), without center control.	No
BC MOT Field Equipment	Roadway	Roadway Probe Data Communications	Field elements that collect probe data from vehicles using short range communications.	No
BC MOT Field Equipment	Roadway	Roadway Traffic Information Dissemination	Driver information systems, such as dynamic message signs and Highway Advisory Radio (HAR).	No
BC MOT Field Equipment	Roadway	Roadway Traffic Metering	Control equipment including ramp, interchange, and mainline meters and the dynamic message signs that provide information about the meters and any special bypass lanes.	No
BC MOT Field Equipment	Roadway	Roadway Work Zone Traffic Control	Field elements in maintenance and construction areas including CCTV cameras, driver information systems (such as DMS), and gates/barriers that monitor and control traffic and provide information directly to drivers in affected areas.	No
Bellingham Surface Street Control	Roadway	Field Management Stations Operation	Supports direct communications between field management stations and the local field equipment under their control.	No

Element Name	Entity Name	Functional Area	Functional Area Description	FA User Defined
Bellingham Surface Street Control	Roadway	Roadway Basic Surveillance	Field elements that monitor traffic conditions using loop detectors and CCTV cameras.	No
Bellingham Surface Street Control	Roadway	Roadway Equipment Coordination	Field elements that control and send data to other field elements (such as environmental sensors that send data to a DMS or coordination between traffic controllers on adjacent intersections), without center control.	No
Bellingham Surface Street Control	Roadway	Roadway Signal Controls	Field elements including traffic signal controllers for use at signalized intersections; also supports pedestrian crossings.	No
Bellingham Surface Street Control	Roadway	Standard Rail Crossing	Field elements at highway-rail intersections (HRIs) where operational requirements do not dictate advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Includes traditional HRI warning systems augmented with other standard traffic management devices.	No
Bellingham Traffic Management Center (TMC)	Traffic Management	Collect Traffic Surveillance	Management of traffic sensors and surveillance (CCTV) equipment, collection of current traffic conditions, and distribution of the collected information to other centers and operators.	No
Bellingham Traffic Management Center (TMC)	Traffic Management	HRI Traffic Management	Remotely monitor and control highway-rail intersection (HRI) equipment, includes 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.	No
Bellingham Traffic Management Center (TMC)	Traffic Management	TMC Multimodal Coordination	Provides traffic signal priority for transit vehicles based on center-to-center communications with the transit management center; also exchange traffic and transit information.	No
Bellingham Traffic Management Center (TMC)	Traffic Management	TMC Regional Traffic Management	Coordination between traffic management centers in order to share traffic information between centers as well as control of traffic management field equipment. This may be used during incidents and special events and during day-to-day operations.	No
Bellingham Traffic Management Center (TMC)	Traffic Management	TMC Signal Control	Remotely controls traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, emergency vehicle preemptions, pedestrian crossings, etc.	No
Bellingham Traffic Management Center (TMC)	Traffic Management	TMC Traffic Information Dissemination	Controls dissemination of traffic-related data to other centers, the media, and travelers via the driver information systems (DMS, HAR) that it operates.	No
Bellingham Traffic Management Center (TMC)	Traffic Management	TMC Traffic Metering	Remotely controls ramp meters, interchange connector meters, and mainline meters, covering all types of metering as well as management of bypass lanes.	No
Bellingham Traffic Management Center (TMC)	Traffic Management	TMC Transportation Operations Data Collection	Collects real-time information on the state of the regional transportation system for operational use by the center. It establishes communications with a regional repository, requests or subscribes to information relevant to the center, and distributes the received information for use.	No
Bellingham Traffic Management Center (TMC)	Traffic Management	Traffic Equipment Maintenance	Monitoring and remote diagnostics of field equipment - detect failures, issue problem reports, and track the repair or replacement of the failed equipment.	No

Element Name	Entity Name	Functional Area	Functional Area Description	FA User Defined
Border Clearance - Commercial	Border Inspection Administration			No
Border Clearance - Passenger	Border Inspection Administration			No
Cascade Gateway Border Data Warehouse	Archived Data Management	Government Reporting Systems Support	Selects and formats data residing in an ITS archive to facilitate local, state, and federal government data reporting requirements.	No
Cascade Gateway Border Data Warehouse	Archived Data Management	ITS Data Repository	Collect and maintain data and data catalogs from one or more data sources. May include quality checks, error notification, and archive coordination.	No
Cascade Gateway Border Data Warehouse	Archived Data Management	On-Line Analysis and Mining	Advanced data analysis and mining features to support discovery of information, patterns, and correlations in large ITS archives.	No
Cascade Gateway Border Data Warehouse	Archived Data Management	Traffic and Roadside Data Archival	Collects and archives traffic and environmental information directly from the roadside for use in off-line planning, research, and analysis.	No
Cascade Gateway Border Data Warehouse	Archived Data Management	Virtual Data Warehouse Services	Provides access to data from geographically dispersed archives and coordinates information exchange with a local data warehouse. Also provides the specialized publishing, directory services, and transaction management functions associated with coordinating remote archives.	No
CBP Inspection Systems	Other Border Inspection Systems			No
CBSA Inspection Systems	Other Border Inspection Systems			No
Ferndale Surface Street Control	Roadway	Field Management Stations Operation	Supports direct communications between field management stations and the local field equipment under their control.	No
Ferndale Surface Street Control	Roadway	Roadway Basic Surveillance	Field elements that monitor traffic conditions using loop detectors and CCTV cameras.	No
Ferndale Surface Street Control	Roadway	Roadway Equipment Coordination	Field elements that control and send data to other field elements (such as environmental sensors that send data to a DMS or coordination between traffic controllers on adjacent intersections), without center control.	No
Ferndale Surface Street Control	Roadway	Roadway Signal Controls	Field elements including traffic signal controllers for use at signalized intersections; also supports pedestrian crossings.	No
Ferndale Surface Street Control	Roadway	Standard Rail Crossing	Field elements at highway-rail intersections (HRIs) where operational requirements do not dictate advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Includes traditional HRI warning systems augmented with other standard traffic management devices.	No
I-5/Bellingham Traffic Signals	Roadway			No
Interstate 5 Monitoring	Roadway	Field Management Stations Operation	Supports direct communications between field management stations and the local field equipment under their control.	No
Interstate 5 Monitoring	Roadway	Roadway Basic Surveillance	Field elements that monitor traffic conditions using loop detectors and CCTV cameras.	No

Element Name	Entity Name	Functional Area	Functional Area Description	FA User Defined
Interstate 5 Monitoring	Roadway	Roadway Environmental Monitoring	Environmental sensors, surface and sub-surface, that collect weather and road surface information. Weather conditions measured include temperature, wind, humidity, precipitation, and visibility. Sensors measure road surface temperature, moisture, icing, salinity, etc.	No
Interstate 5 Monitoring	Roadway	Roadway Equipment Coordination	Field elements that control and send data to other field elements (such as environmental sensors that send data to a DMS or coordination between traffic controllers on adjacent intersections), without center control.	No
Interstate 5 Monitoring	Roadway	Roadway Signal Controls	Field elements including traffic signal controllers for use at signalized intersections; also supports pedestrian crossings.	No
Interstate 5 Monitoring	Roadway	Roadway Traffic Information Dissemination	Driver information systems, such as dynamic message signs and Highway Advisory Radio (HAR).	No
Lynden Surface Street Control	Roadway	Field Management Stations Operation	Supports direct communications between field management stations and the local field equipment under their control.	No
Lynden Surface Street Control	Roadway	Roadway Basic Surveillance	Field elements that monitor traffic conditions using loop detectors and CCTV cameras.	No
Lynden Surface Street Control	Roadway	Roadway Equipment Coordination	Field elements that control and send data to other field elements (such as environmental sensors that send data to a DMS or coordination between traffic controllers on adjacent intersections), without center control.	No
Lynden Surface Street Control	Roadway	Roadway Signal Controls	Field elements including traffic signal controllers for use at signalized intersections; also supports pedestrian crossings.	No
Northbound Border Traveler Information System	Alerting and Advisory Systems			No
Northbound Border Traveler Information System	Archived Data Management	Virtual Data Warehouse Services	Provides access to data from geographically dispersed archives and coordinates information exchange with a local data warehouse. Also provides the specialized publishing, directory services, and transaction management functions associated with coordinating remote archives.	No
Northbound Border Traveler Information System	Information Service Provider	Basic Information Broadcast	Broadcast dissemination of traffic, transit, maintenance and construction, event, and weather information to traveler interface systems and vehicles.	No
Northbound Border Traveler Information System	Information Service Provider	Interactive Infrastructure Information	Personalized dissemination of traffic, transit, maintenance and construction, multimodal, event, and weather information to traveler interface systems and vehicles, upon request.	No
Northbound Border Traveler Information System	Information Service Provider	ISP Traveler Data Collection	Collects traveler information from other centers, consolidates and refines the collected data, and makes this data available to traveler information applications.	No
Northbound Border Traveler Information System	Information Service Provider	ISP Traveler Information Alerts	Provides personalized traveler information alerts, notifying travelers of relevant congestion, incidents, transit schedule delays. and other actionable information that may impact a trip. Relevant alerts are selected based on user-configurable parameters and thresholds.	No

Element Name	Entity Name	Functional Area	Functional Area Description	FA User Defined
Northbound Border Traveler Information System	Information Service Provider	Traveler Telephone Information	Distribution of traveler information and wide-area alerts to traveler telephone information systems such as 511, based on voice-based traveler requests.	No
Private Sector Probe Information Systems	Information Service Provider	ISP Probe Information Collection	Collection and aggregation of vehicle probe data, including calculation and dissemination of route travel times and usage. Includes environmental probe data collection, aggregation and dissemination.	No
Private Sector Probe Information Systems	Information Service Provider	ISP Traveler Data Collection	Collects traveler information from other centers, consolidates and refines the collected data, and makes this data available to traveler information applications.	No
Southbound Border Traveler Information System	Alerting and Advisory Systems			No
Southbound Border Traveler Information System	Archived Data Management	Virtual Data Warehouse Services	Provides access to data from geographically dispersed archives and coordinates information exchange with a local data warehouse. Also provides the specialized publishing, directory services, and transaction management functions associated with coordinating remote archives.	No
Southbound Border Traveler Information System	Information Service Provider	Basic Information Broadcast	Broadcast dissemination of traffic, transit, maintenance and construction, event, and weather information to traveler interface systems and vehicles.	No
Southbound Border Traveler Information System	Information Service Provider	ISP Operational Data Repository	Processes, stores, and distributes real-time information on the state of the regional transportation system to transportation system operators.	No
Southbound Border Traveler Information System	Information Service Provider	ISP Traveler Data Collection	Collects traveler information from other centers, consolidates and refines the collected data, and makes this data available to traveler information applications.	No
SR 539 ITS System	Roadway	Field Management Stations Operation	Supports direct communications between field management stations and the local field equipment under their control.	No
SR 539 ITS System	Roadway	Roadway Basic Surveillance	Field elements that monitor traffic conditions using loop detectors and CCTV cameras.	No
SR 539 ITS System	Roadway	Roadway Equipment Coordination	Field elements that control and send data to other field elements (such as environmental sensors that send data to a DMS or coordination between traffic controllers on adjacent intersections), without center control.	No
SR 539 ITS System	Roadway	Roadway Signal Controls	Field elements including traffic signal controllers for use at signalized intersections; also supports pedestrian crossings.	No
SR 543 ITS System	Roadway	Field Management Stations Operation	Supports direct communications between field management stations and the local field equipment under their control.	No
SR 543 ITS System	Roadway	Roadway Basic Surveillance	Field elements that monitor traffic conditions using loop detectors and CCTV cameras.	No
SR 543 ITS System	Roadway	Roadway Equipment Coordination	Field elements that control and send data to other field elements (such as environmental sensors that send data to a DMS or coordination between traffic controllers on adjacent intersections), without center control.	No

Element Name	Entity Name	Functional Area	Functional Area Description	FA User Defined
SR 543 ITS System	Roadway	Roadway Signal Controls	Field elements including traffic signal controllers for use at signalized intersections; also supports pedestrian crossings.	No
SR 9 ITS System	Roadway			No
Sumas Border VMS Sign	Roadway	Field Management Stations Operation	Supports direct communications between field management stations and the local field equipment under their control.	No
Sumas Border VMS Sign	Roadway	Roadway Basic Surveillance	Field elements that monitor traffic conditions using loop detectors and CCTV cameras.	No
Sumas Border VMS Sign	Roadway	Roadway Equipment Coordination	Field elements that control and send data to other field elements (such as environmental sensors that send data to a DMS or coordination between traffic controllers on adjacent intersections), without center control.	No
Sumas Border VMS Sign	Roadway	Roadway Signal Controls	Field elements including traffic signal controllers for use at signalized intersections; also supports pedestrian crossings.	No
Sumas Border VMS Sign	Roadway	Roadway Traffic Information Dissemination	Driver information systems, such as dynamic message signs and Highway Advisory Radio (HAR).	No
Systems Using Warehouse API	Archived Data User Systems			No
US Bureau of Transportation Statistics Systems	Archived Data Management	Government Reporting Systems Support	Selects and formats data residing in an ITS archive to facilitate local, state, and federal government data reporting requirements.	No
US Bureau of Transportation Statistics Systems	Archived Data Management	ITS Data Repository	Collect and maintain data and data catalogs from one or more data sources. May include quality checks, error notification, and archive coordination.	No
US Bureau of Transportation Statistics Systems	Archived Data Management	On-Line Analysis and Mining	Advanced data analysis and mining features to support discovery of information, patterns, and correlations in large ITS archives.	No
US Bureau of Transportation Statistics Systems	Archived Data Management	Traffic and Roadside Data Archival	Collects and archives traffic and environmental information directly from the roadside for use in off-line planning, research, and analysis.	No
User Information Device	Personal Information Access	Personal Basic Information Reception	Personal traveler interface that provides formatted traffic advisories, transit, event, and other traveler information, as well as broadcast alerts. Devices include personal computers and personal portable devices such as PDAs and pagers.	No
User Information Device	Personal Information Access	Personal Interactive Information Reception	Personal traveler interface that provides traffic, transit, yellow pages, event, and trip planning information, and other personalized traveler information services upon request. Devices include personal computers and personal portable devices such as PDAs.	No
Whatcom County Surface Street Control	Roadway	Field Management Stations Operation	Supports direct communications between field management stations and the local field equipment under their control.	No
Whatcom County Surface Street Control	Roadway	Roadway Basic Surveillance	Field elements that monitor traffic conditions using loop detectors and CCTV cameras.	No

Element Name	Entity Name	Functional Area	Functional Area Description	FA User Defined
Whatcom County Surface Street Control	Roadway	Roadway Equipment Coordination	Field elements that control and send data to other field elements (such as environmental sensors that send data to a DMS or coordination between traffic controllers on adjacent intersections), without center control.	No
Whatcom County Surface Street Control	Roadway	Roadway Signal Controls	Field elements including traffic signal controllers for use at signalized intersections; also supports pedestrian crossings.	No
Whatcom County Surface Street Control	Roadway	Standard Rail Crossing	Field elements at highway-rail intersections (HRIs) where operational requirements do not dictate advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Includes traditional HRI warning systems augmented with other standard traffic management devices.	No
WSDOT Field Equipment	Roadway	Field Barrier System Control	Field elements that control barrier systems such as gates and other systems that manage entry to roadways, transportation facilities and infrastructure.	No
WSDOT Field Equipment	Roadway	Field Management Stations Operation	Supports direct communications between field management stations and the local field equipment under their control.	No
WSDOT Field Equipment	Roadway	Roadway Basic Surveillance	Field elements that monitor traffic conditions using loop detectors and CCTV cameras.	No
WSDOT Field Equipment	Roadway	Roadway Data Collection	Field elements to collect traffic, road, and environmental conditions information for use in transportation planning, research, and other off-line applications. Includes the sensors, supporting roadside infrastructure, and communications equipment.	No
WSDOT Field Equipment	Roadway	Roadway Equipment Coordination	Field elements that control and send data to other field elements (such as environmental sensors that send data to a DMS or coordination between traffic controllers on adjacent intersections), without center control.	No
WSDOT Field Equipment	Roadway	Roadway Probe Data Communications	Field elements that collect probe data from vehicles using short range communications.	No
WSDOT Field Equipment	Roadway	Roadway Signal Controls	Field elements including traffic signal controllers for use at signalized intersections; also supports pedestrian crossings.	No
WSDOT Field Equipment	Roadway	Roadway Traffic Information Dissemination	Driver information systems, such as dynamic message signs and Highway Advisory Radio (HAR).	No
WSDOT Field Equipment	Roadway	Roadway Traffic Metering	Control equipment including ramp, interchange, and mainline meters and the dynamic message signs that provide information about the meters and any special bypass lanes.	No
WSDOT Field Equipment	Roadway	Roadway Work Zone Traffic Control	Field elements in maintenance and construction areas including CCTV cameras, driver information systems (such as DMS), and gates/barriers that monitor and control traffic and provide information directly to drivers in affected areas.	No
WSDOT Traffic Management Center (TMC)	Traffic Management	Collect Traffic Surveillance	Management of traffic sensors and surveillance (CCTV) equipment, collection of current traffic conditions, and distribution of the collected information to other centers and operators.	No

Element Name	Entity Name	Functional Area	Functional Area Description	FA User Defined
WSDOT Traffic Management Center (TMC)	Traffic Management	HRI Traffic Management	Remotely monitor and control highway-rail intersection (HRI) equipment, includes 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.	No
WSDOT Traffic Management Center (TMC)	Traffic Management	TMC Environmental Monitoring	Management of environmental sensors and assimilation of collected data with other current and forecast road conditions and surface weather information from weather service providers and roadway maintenance operations.	No
WSDOT Traffic Management Center (TMC)	Traffic Management	TMC Regional Traffic Management	Coordination between traffic management centers in order to share traffic information between centers as well as control of traffic management field equipment. This may be used during incidents and special events and during day-to-day operations.	No
WSDOT Traffic Management Center (TMC)	Traffic Management	TMC Signal Control	Remotely controls traffic signal controllers to implement traffic management strategies at signalized intersections based on traffic conditions, incidents, emergency vehicle preemptions, pedestrian crossings, etc.	No
WSDOT Traffic Management Center (TMC)	Traffic Management	TMC Traffic Information Dissemination	Controls dissemination of traffic-related data to other centers, the media, and travelers via the driver information systems (DMS, HAR) that it operates.	No
WSDOT Traffic Management Center (TMC)	Traffic Management	TMC Traffic Metering	Remotely controls ramp meters, interchange connector meters, and mainline meters, covering all types of metering as well as management of bypass lanes.	No
WSDOT Traffic Management Center (TMC)	Traffic Management	TMC Transportation Operations Data Collection	Collects real-time information on the state of the regional transportation system for operational use by the center. It establishes communications with a regional repository, requests or subscribes to information relevant to the center, and distributes the received information for use.	No
WSDOT Traffic Management Center (TMC)	Traffic Management	Traffic Data Collection	Collection and storage of traffic management data. For use by operations personnel or data archives in the region.	No
WSDOT Traffic Management Center (TMC)	Traffic Management	Traffic Equipment Maintenance	Monitoring and remote diagnostics of field equipment - detect failures, issue problem reports, and track the repair or replacement of the failed equipment.	No
WTA Automatic Vehicle Location	Transit Vehicle	On-board Maintenance	On-board systems to collect and process transit vehicle maintenance data including mileage and vehicle operating conditions for use in scheduling future vehicle maintenance.	No
WTA Automatic Vehicle Location	Transit Vehicle	On-board Paratransit Operations	On-board systems to manage paratransit and flexible-route dispatch requests, including multi-stop runs. Passenger data is collected and provided to the center.	No
WTA Automatic Vehicle Location	Transit Vehicle	On-board Schedule Management	Collecting of data for schedule generation and adjustment on-board a transit vehicle. Supports communication between the vehicle, operator, and center.	No

Element Name	Entity Name	Functional Area	Functional Area Description	FA User Defined
WTA Automatic Vehicle Location	Transit Vehicle	On-board Transit Information Services	On-board systems to furnish next-stop annunciation as well as interactive travel-related information, including routes, schedules, transfer options, fares, real-time schedule adherence, current incidents, weather conditions, non-motorized transportation services, and special events.	No
WTA Automatic Vehicle Location	Transit Vehicle	On-board Transit Security	On-board video/audio surveillance systems, threat sensors, and object detection sensors to enhance security and safety on-board a transit vehicles. Also includes silent alarms activated by transit user or vehicle operator, operator authentication, and remote vehicle disabling.	No
WTA Automatic Vehicle Location	Transit Vehicle	On-board Transit Signal Priority	On-board systems request signal priority through short range communication directly with traffic control equipment at the roadside (intersections, ramps, interchanges, etc.).	No
WTA Automatic Vehicle Location	Transit Vehicle	On-board Transit Trip Monitoring	Support fleet management with automatic vehicle location (AVL) and automated mileage and fuel reporting and auditing.	No
WTA Demand Response	Transit Management			No
WTA Station Monitoring	Security Monitoring	Field Secure Area Sensor Monitoring	Security sensors monitoring facilities (e.g. transit yards) and transportation infrastructure (e.g. bridges, tunnels, interchanges, and transit railways or guideways) for environmental threats, intrusion and motion, object detection, and infrastructure integrity.	No
WTA Station Monitoring	Security Monitoring	Field Secure Area Surveillance	Security surveillance devices (audio/video) that monitor facilities (e.g. transit yards) and transportation infrastructure (e.g. bridges, tunnels, interchanges, and transit railways or guideways).	No
WTA Transit Management	Transit Management	Transit Center Fare Management	Management of fare collection at the center - includes setting and distributing fare information, central processing of fares for transit as well as other ITS services, links to financial institutions and enforcement agencies.	No
WTA Transit Management	Transit Management	Transit Center Fixed-Route Operations	Management of fixed route transit operations. Planning, scheduling, and dispatch associated with fixed and flexible route transit services. Updates customer service operator systems, and provides current vehicle schedule adherence and optimum scenarios for schedule adjustment.	No
WTA Transit Management	Transit Management	Transit Center Information Services	Provide interactive traveler information to travelers (on-board transit vehicles, at stops/stations, using personal devices), traveler information service providers, media, and other transit organizations. Includes routes, schedules, transfer options, fares, real-time schedule adherence, current incidents, weather conditions, yellow pages, and special events.	No
WTA Transit Management	Transit Management	Transit Center Passenger Counting	Receives and processes transit vehicle loading data using two-way communications from equipped transit vehicles.	No
WTA Transit Management	Transit Management	Transit Garage Maintenance	Collect operational and maintenance data from transit vehicles, manage vehicle service histories, automatically generate preventative maintenance schedules, and provide information to service personnel.	No

Element Name	Entity Name	Functional Area	Functional Area Description	FA User Defined
WTA Transit Management	Transit Management	Transit Vehicle Assignment	Assigns individual transit vehicles to vehicle blocks and downloads this information to the transit vehicle, updating assignments as necessitated by changes. It also provides an inventory management function that stores attributes about each of the transit vehicles.	No
WTA Transit Management	Transit Management	Transit Vehicle Operator Assignment	Assignment of transit operators to runs in a fair manner while minimizing labor and overtime services, considering operator preferences, qualifications, accumulated work hours, and other information about each operator.	No
WTA Transit Signal Priority	Transit Vehicle			No
WTA Trip Planning	Information Service Provider			No

8 Standards

Standardizing the flow of information between the systems is essential to cost-effectively integrating ITS throughout the region. ITS standards are fundamental to the establishment of an open ITS environment that achieves the goal of interoperability for ITS. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances and new approaches evolve.

Establishing standards for exchanging information among ITS systems is important not only from an interoperability point of view; it also provides interchangeability and expandability thereby reducing risk and cost. Since an agency using standardized interfaces can select among multiple vendors for products and applications, competition is maintained and prices are lower in the long term.

Standards Development Organizations (SDO) are developing ITS standards that support interoperability and interchangeability. Several of the communication standards overlap in applicability. This provides flexibility in the design of ITS systems allowing agencies to choose the most applicable standard for their needs. Before systems are designed, all stakeholders involved in the applicable ITS service(s) should decide upon the standards and their specifics that will be used. Once a decision is made, all future systems should use the agreed upon standards.

Table 6: ITS Standards

SDO	Document ID	Standard Title	Standard Type	Standard Version	User Defined
AASHTO/ITE	ITE TMDD	Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC)	Message/Data		No
AASHTO/ITE/NEMA	NTCIP 1201	Global Object Definitions	Message/Data		No
AASHTO/ITE/NEMA	NTCIP 1202	Object Definitions for Actuated Traffic Signal Controller (ASC) Units	Message/Data		No
AASHTO/ITE/NEMA	NTCIP 1203	Object Definitions for Dynamic Message Signs (DMS)	Message/Data		No
AASHTO/ITE/NEMA	NTCIP 1204	Object Definitions for Environmental Sensor Stations (ESS)	Message/Data		No
AASHTO/ITE/NEMA	NTCIP 1205	Object Definitions for Closed Circuit Television (CCTV) Camera Control	Message/Data		No
AASHTO/ITE/NEMA	NTCIP 1207	Object Definitions for Ramp Meter Control (RMC) Units	Message/Data		No
AASHTO/ITE/NEMA	NTCIP 1208	Object Definitions for Closed Circuit Television (CCTV) Switching	Message/Data		No
AASHTO/ITE/NEMA	NTCIP 1209	Data Element Definitions for Transportation Sensor Systems (TSS)	Message/Data		No
AASHTO/ITE/NEMA	NTCIP 1210	Field Management Stations (FMS) - Part 1: Object Definitions for Signal System Masters	Message/Data		No

SDO	Document ID	Standard Title	Standard Type	Standard Version	User Defined
AASHTO/ITE/NEMA	NTCIP 1211	Object Definitions for Signal Control and Prioritization (SCP)	Message/Data		No
AASHTO/ITE/NEMA	NTCIP 1214	Object Definitions for Conflict Monitor Units (CMU)	Message/Data		No
AASHTO/ITE/NEMA	NTCIP C2F	NTCIP Center-to-Field Standards Group	Group		No
APTA	APTA TCIP-S-001 3.0.4	Standard for Transit Communications Interface Profiles	Message/Data		No
ASTM	ASTM E2665-08	Standard Specifications for Archiving ITS-Generated Traffic Monitoring Data	Message/Data		No
ASTM	DSRC 915MHz	Dedicated Short Range Communication at 915 MHz Standards Group	Group		No
ASTM/IEEE/SAE	DSRC 5GHz	Dedicated Short Range Communication at 5.9 GHz Standards Group	Group		No
SAE	ATIS General Use	Advanced Traveler Information Systems (ATIS) General Use Standards Group	Group		No
SAE	ATIS Low Bandwidth	Advanced Traveler Information Systems (ATIS) Bandwidth Limited Standards Group	Group		No

9 Agreements

This section identifies the list of existing and future agreements between each of the stakeholder organizations whose ITS systems will be exchanging information was generated prior to implementing relevant projects. This list identifies the agreements that should be established but does not define the agreements themselves.

Table 7: Agreements

Agreement Title	Agreement Status	Description	Lead Stakeholder	Associated Stakeholders
Bellingham - Ferndale Signal Maintenance Interlocal Agreement	Existing	Interlocal agreement for operating and maintaining traffic signals.	City of Bellingham	City of Ferndale
Bellingham - Lynden Signal Maintenance Interlocal Agreement	Existing	Interlocal agreement for operating and maintaining traffic signals.		City of Lynden
Bellingham - Whatcom County Signal Maintenance Interlocal Agreement	Existing	Interlocal agreement for operating and maintaining traffic signals.		Whatcom Council of Governments (WCOG)
Cascade Gateway Border Data Warehouse Upgrade and BIFA Integration Project Canadian Funding Agreement	Existing	Agreement between Transport Canada and Whatcom Council of Governments to complete the Cascade Gateway Border Data Warehhouse Upgrade & BIFA Integration project.		Whatcom Council of Governments (WCOG)
Cascade Gateway Border Data Warehouse Upgrade and BIFA Integration US Funding Agreement	Existing	Agreement between WA State Department of Transportation and Whatcom Council of Governments to complete the Cascade Gateway Border Data Warehhouse Upgrade & BIFA Integration project.	WA State Department of Transportation (WSDOT)	Whatcom Council of Governments (WCOG)
WCOG - BCMOT Data Sharing Agreement	Planned	This data sharing agreement will formally define data sharing between the B.C. Ministry of Transportation's border traveller information system and the Cascade Gateway Border Data Warehouse system. The document may also include data sharing agreements for the weigh-in-motion detector data systems as well.	Whatcom Council of Governments (WCOG)	B.C. Ministry of Transportation (MOT)
WCOG - WSDOT Data Sharing Agreement	Planned	This data sharing agreement will formally define data sharing between the WA State Department of Transportation's border traveler information system and the Cascade Gateway Border Data Warehouse system. The document may also include data sharing agreements for the weigh-in-motion detector data systems as well.	Whatcom Council of Governments (WCOG)	WA State Department of Transportation (WSDOT)
WSDOT - Whatcom County Signal Maintenance Agreement	Existing	Interlocal agreement between Whatcom County and WSDOT.		WA State Department of Transportation (WSDOT)
WSDOT - Whatcom County Signal Maintenance Agreement	Existing	Interlocal agreement between Whatcom County and WSDOT.		Whatcom County

Agreement Title	Agreement Status	Description	Lead Stakeholder	Associated Stakeholders
WSDOT - WSP Joint Operating Agreement	Existing	Existing agreement allows for the sharing of information between agencies.		WA State Department of Transportation (WSDOT)
WSDOT - WSP Joint Operating Agreement	Existing	Existing agreement allows for the sharing of information between agencies.		WA State Patrol (WSP)

10 ITS Projects

The Whatcom County Regional ITS Architecture is ultimately implemented one ITS project at a time. This chapter lists the projects that have been identified as part of the regional ITS architecture definition. Additional detail for each of these ITS projects is included in the Turbo Architecture database.

Table 8: ITS Projects

Name	Description	Status	Timeframe	Geographic Scope	Service Scope
Cascade Gateway Border Data Warehouse Upgrade	This project ITS architecture describes the information sharing between transportation, planning, and inspection agencies at the Cascade Gateway border crossings as part of the Cascade Gateway Border Data Warehouse Upgrade & BIFA Integration project. This project will improve functionality and user access to the existing online Cascade Gateway data archive at www.CascadeGatewayData.com; increase the amount and types of data available to all users; document how a binational project can use the BIFA architecture to improve cross-border ITS planning; and develop a manual for BIFA integration usable by other regions looking to strategically assess and respond to data sharing and system integration opportunities. This architecture is based on the BIFA project ITS architecture, developed to provide a representation of transportation services at the US-Canadian border.	Planned	5 years	The Cascade Gateway is the system of four border crossings between Whatcom County, Washington State in the United States and the Lower Mainland of British Columbia in Canada. The crossings include: Peace Arch/Douglas (and the connecting roads Interstate 5 and B.C. Hwy 99); Pacific Highway (SR 543/BC Hwy 15); Lynden/Aldergrove (SR 539/BC Hwy 13); and Sumas/Huntingdon (SR 9/BC Hwy 11).	

Appendix A.   Interfaces Details

The interfaces of the transportation systems in the Whatcom County Regional ITS Architecture are based on the National ITS Architecture and tailored to reflect the plan for the region. Architecture diagrams display the transportation systems in the Whatcom County Regional ITS Architecture, and more importantly, how these systems are and will be connected with one another so information can be exchanged and transportation services can be coordinated. Stakeholders may use these diagrams to identify integration opportunities. Each system in the region is represented with two types of diagrams, a context diagram and an architecture flow diagram.

A context diagram shows a particular system and all other systems with which it shares information. Interconnects are represented as single lines and indicate information sharing without specifying the type of information being shared or the direction of the information movement.

Following each interconnect context diagram are a series of architecture flow diagrams showing the information (i.e. architecture flows) movement between the various systems. Descriptions of the architecture flows are included at the end of the chapter.

Information about the interfaces of the systems in the region is contained in the Turbo Architecture™ database. Turbo Architecture™ can be used to create tailored interconnect and architecture flow diagrams for any system in the database.

Whatcom County Regional ITS Architecture Context Diagrams

B.C. Ministry of Transportation (MOT)
BC MOT Field Equipment

weigh-in-motion data

Whatcom Council of Governments (...
Cascade Gateway Border Data
Warehouse

Planned
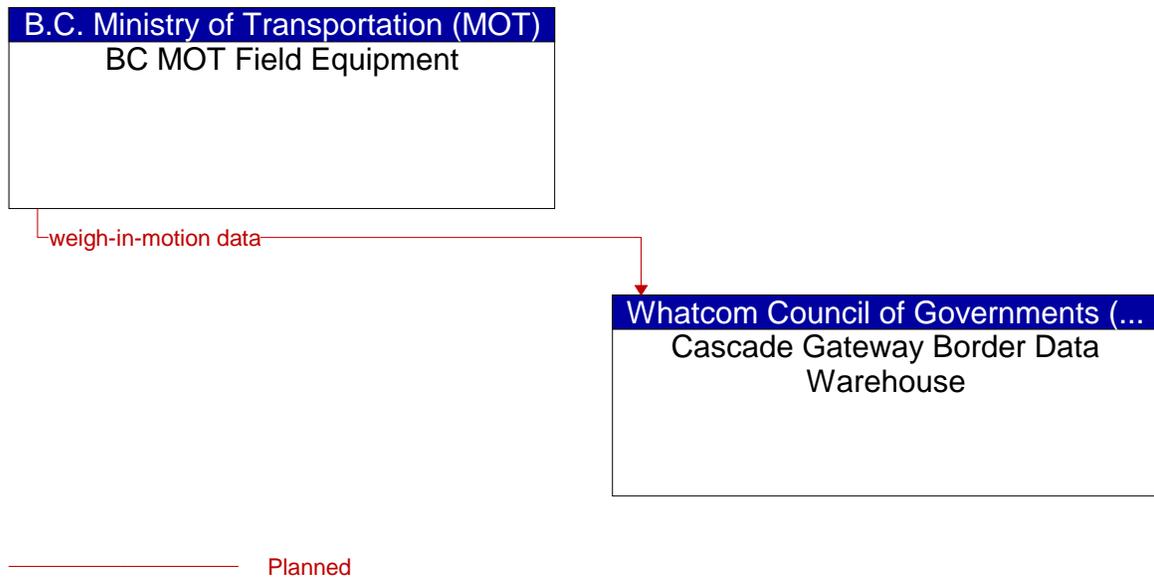
Figure 1: BC MOT Field Equipment Context Diagram
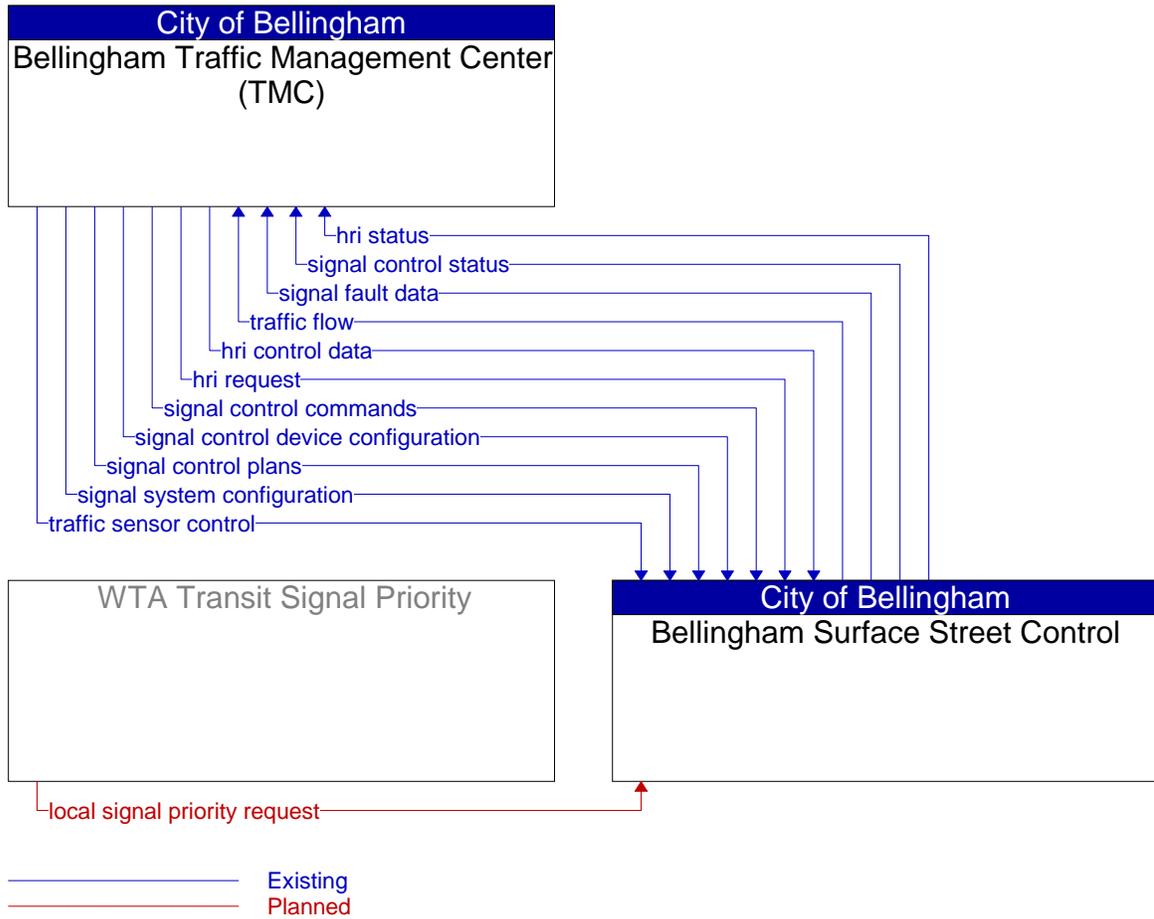
Figure 2: Bellingham Surface Street Control Context Diagram
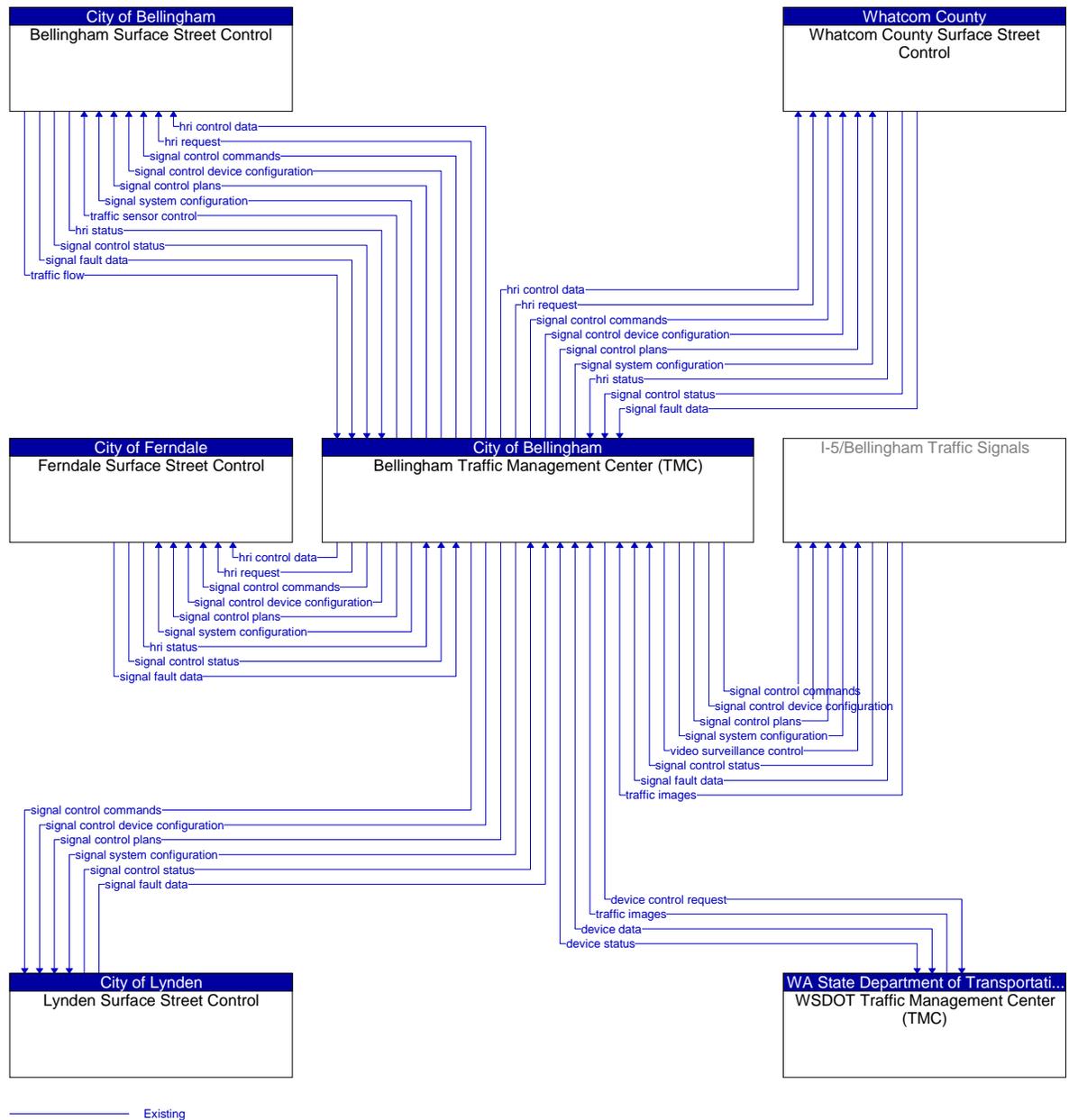
Figure 3: Bellingham Traffic Management Center (TMC) Context Diagram
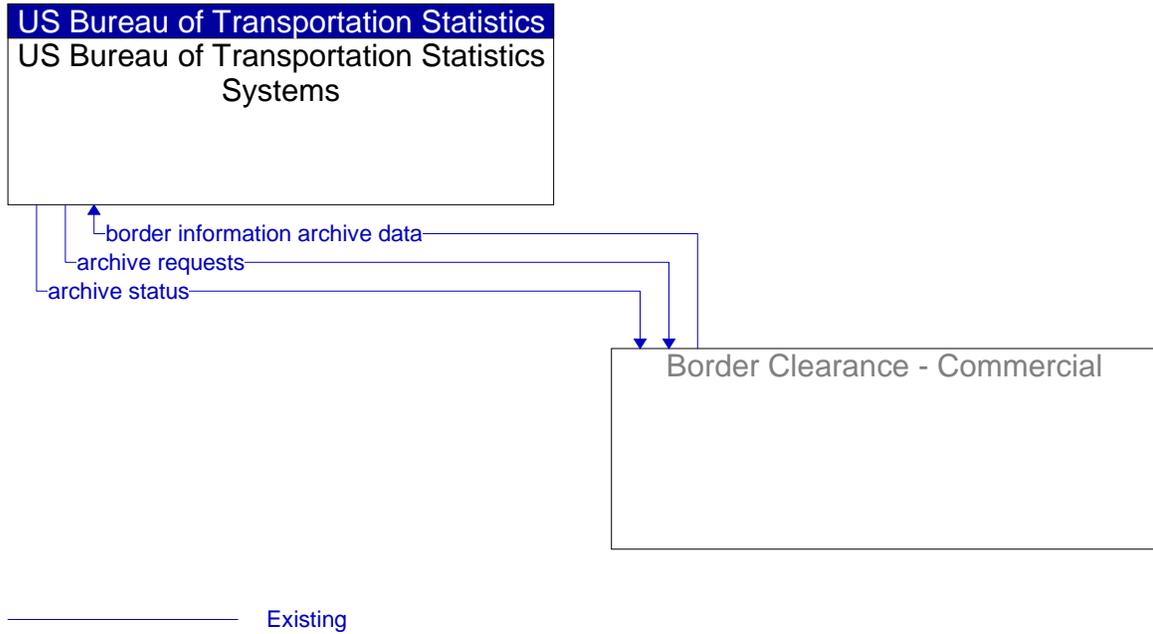
Figure 4: Border Clearance - Commercial Context Diagram
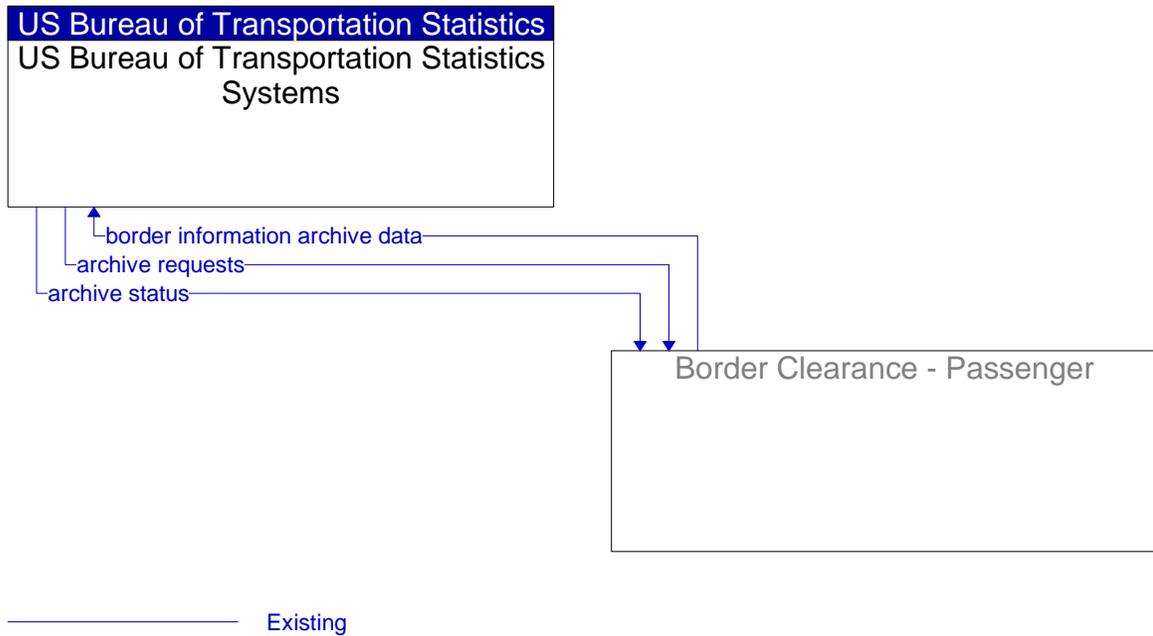
Figure 5: Border Clearance - Passenger Context Diagram
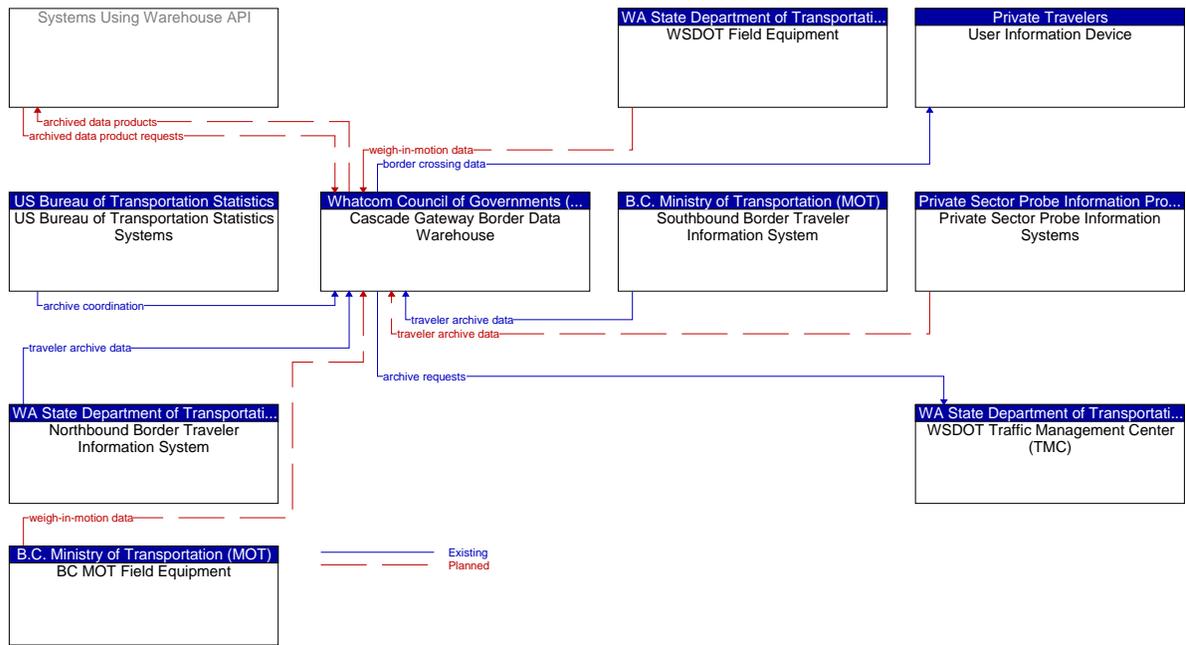
Figure 6: Cascade Gateway Border Data Warehouse Context Diagram
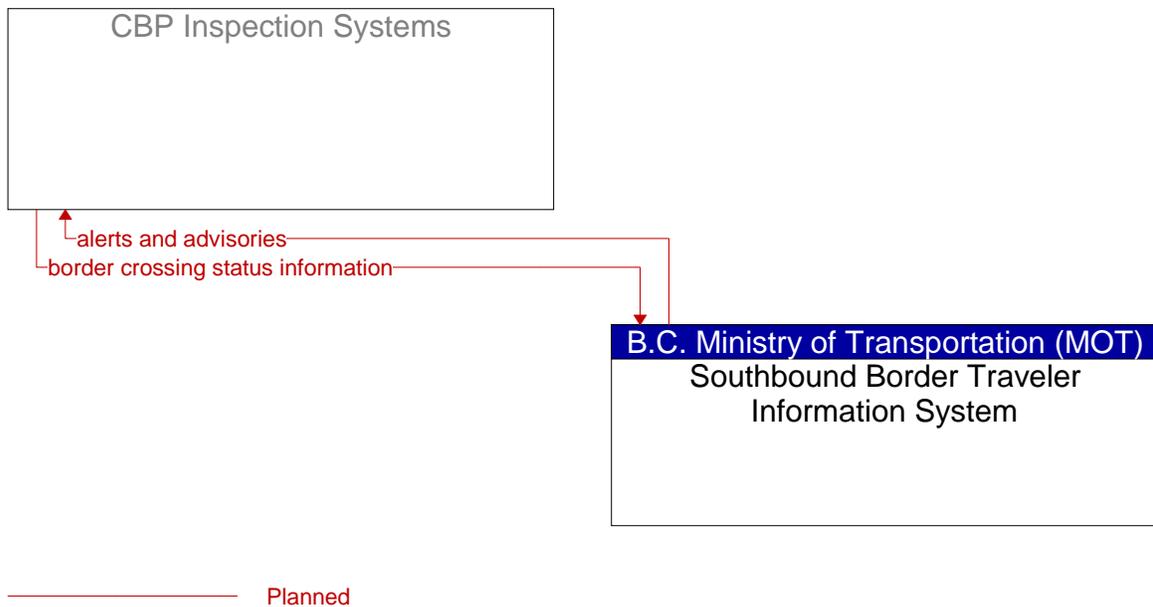
Figure 7: CBP Inspection Systems Context Diagram
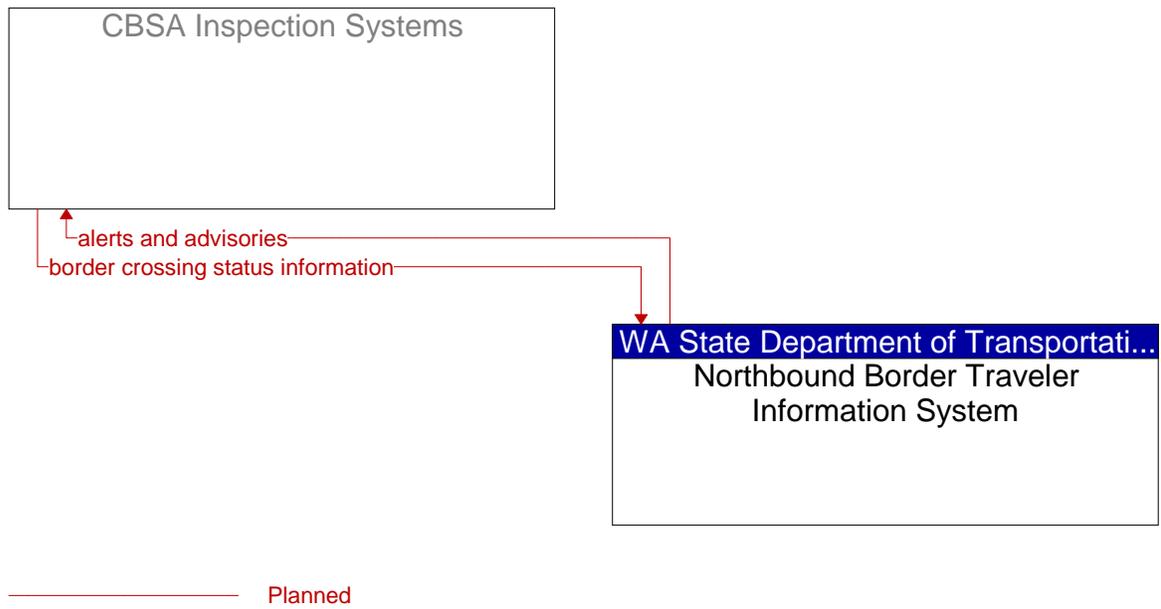
Figure 8: CBSA Inspection Systems Context Diagram

City of Bellingham
Bellingham Traffic Management Center (TMC)

hri status
signal control status
signal fault data
hri control data
hri request
signal control commands
signal control device configuration
signal control plans
signal system configuration

City of Ferndale
Ferndale Surface Street Control

————————— Existing
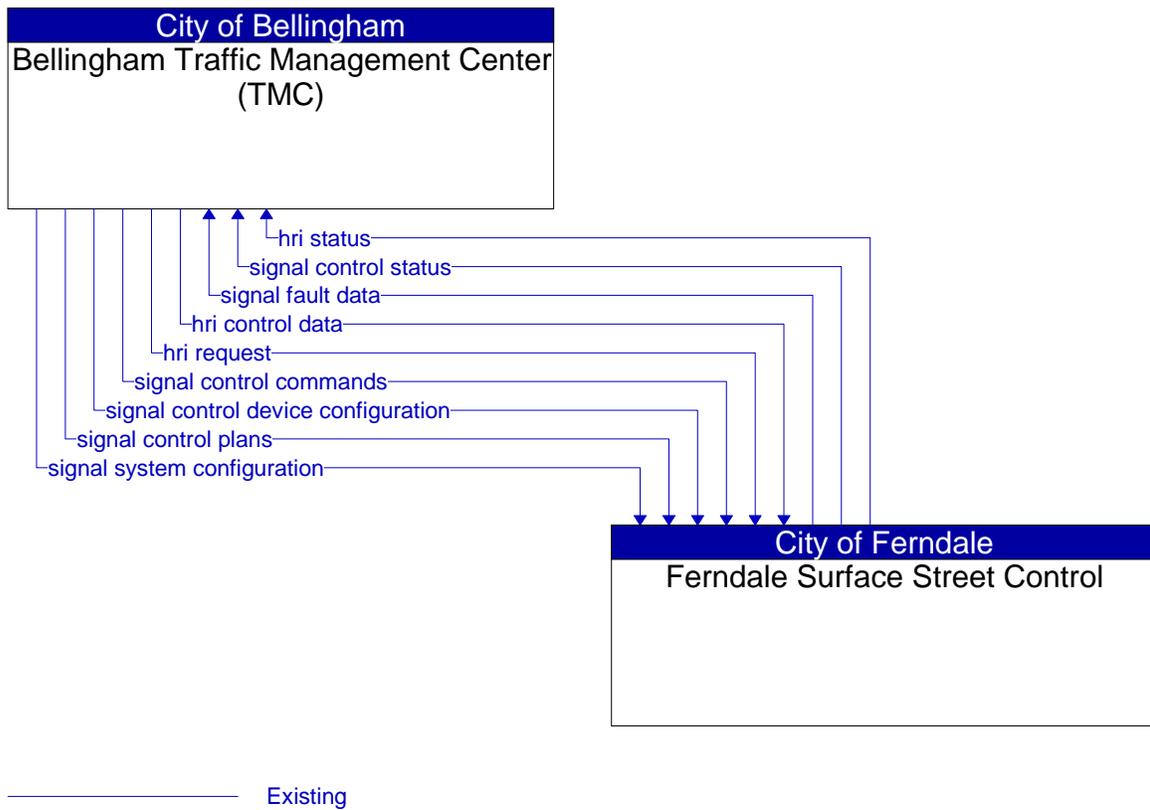
Figure 9: Ferndale Surface Street Control Context Diagram
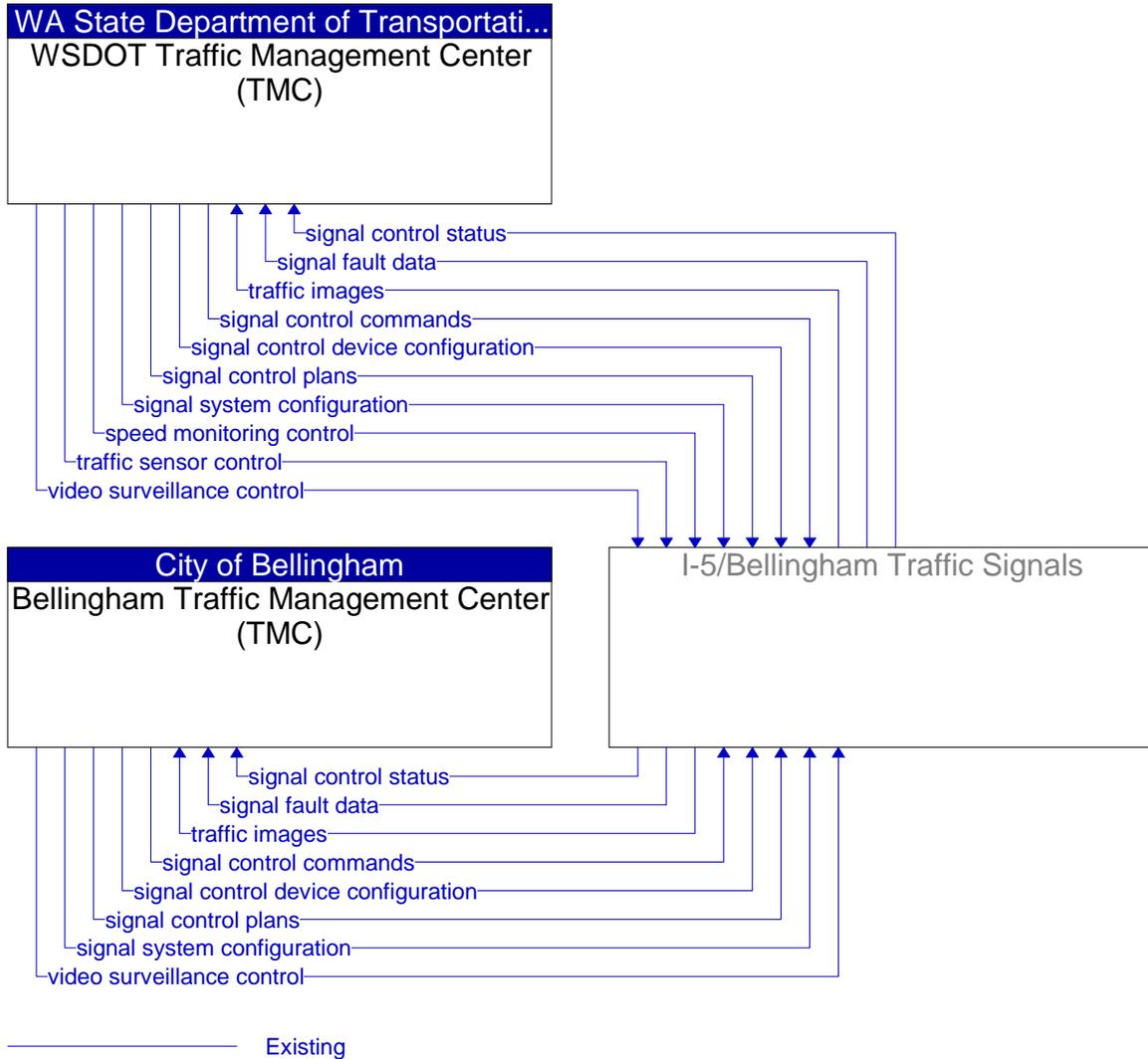
Figure 10: I-5/Bellingham Traffic Signals Context Diagram
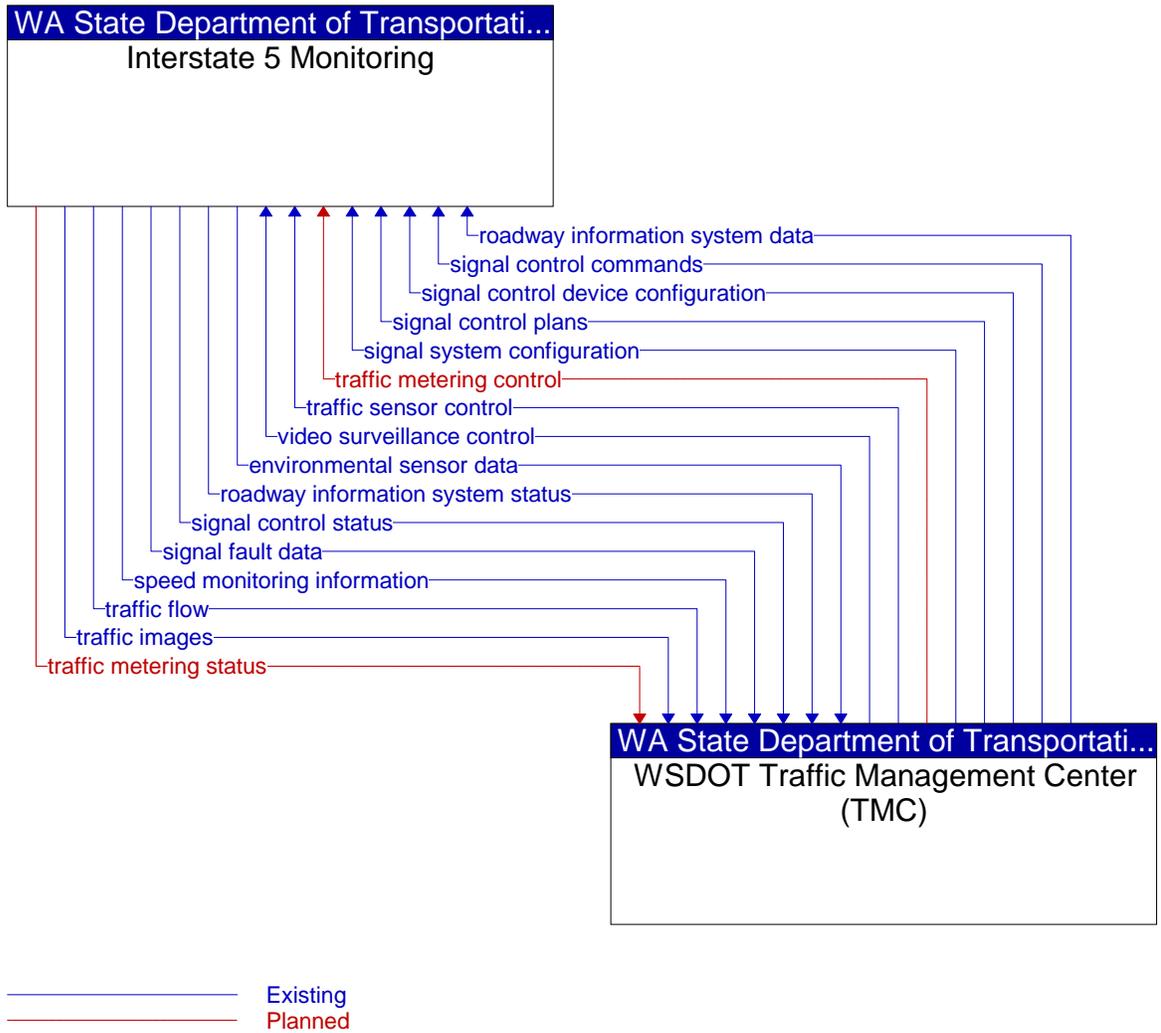
Figure 11: Interstate 5 Monitoring Context Diagram

Existing
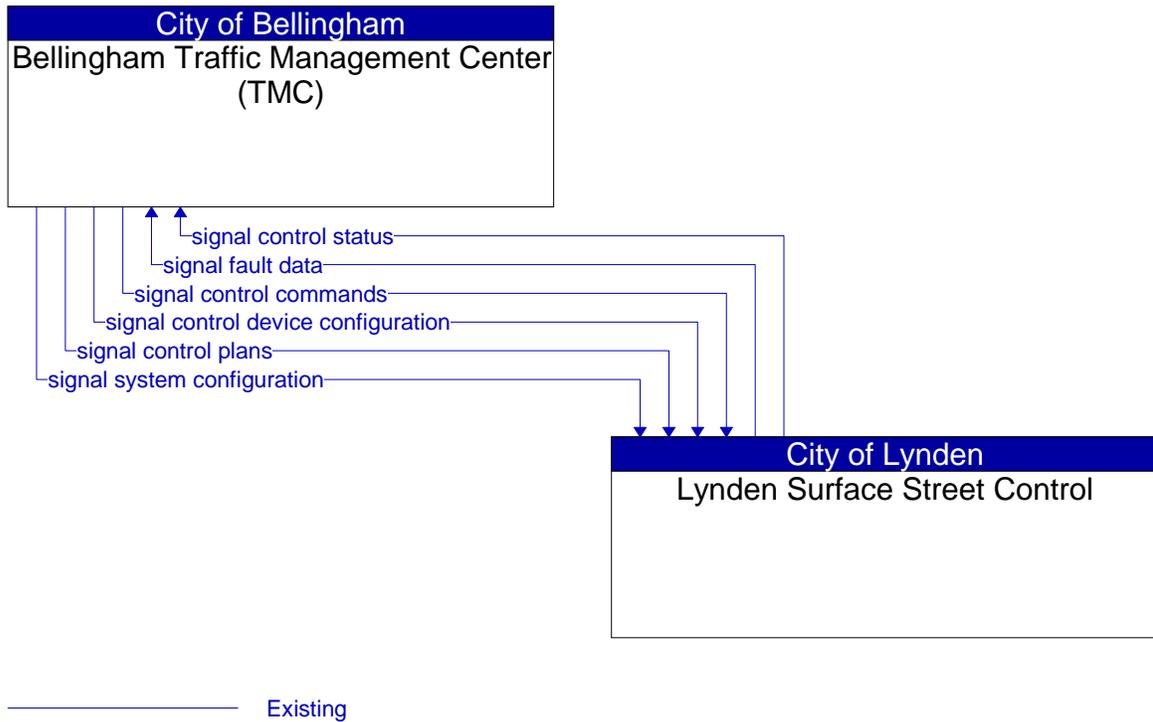
Figure 12: Lynden Surface Street Control Context Diagram

Existing
Planned
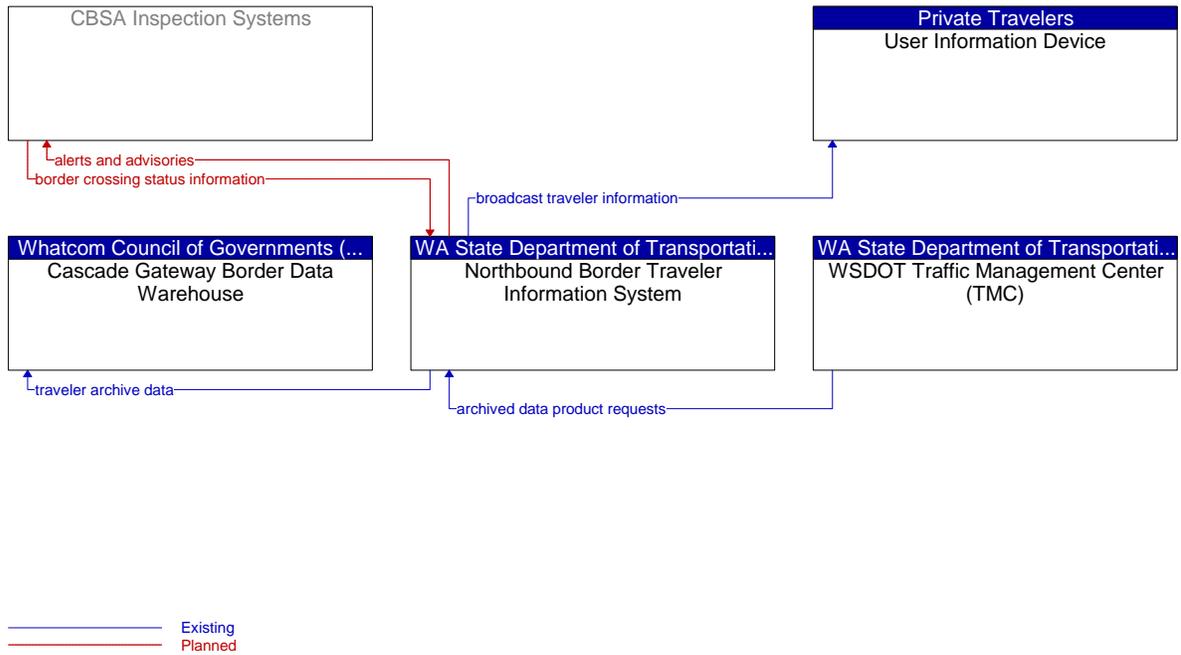
Figure 13: Northbound Border Traveler Information System Context Diagram

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┌─────────────────────────────────────────┐
│ Whatcom Transportation Authority (W...   │
│        WTA Transit Management            │
│                                          │
│                                          │
│                                          │
└─────────────────────────────────────────┘
     │ │ │ └─transit information request──────────┐
     │ │ └──transit and fare schedules──────────┐ │
     │ └───transit request confirmation────────┐│ │
     └────transit schedule adherence information─┐││ │

┌────────────────────────────────┐  ┌──────────────────────────────────┐
│ Whatcom Council of Governments │  │ Private Sector Probe Information │
│ (...                           │  │ Pro...                           │
│   Cascade Gateway Border Data  │  │   Private Sector Probe           │
│          Warehouse             │  │   Information Systems            │
│                                │  │                                  │
└────────────────────────────────┘  └──────────────────────────────────┘
   └─traveler archive data──────────────┘
```

────────────── Planned
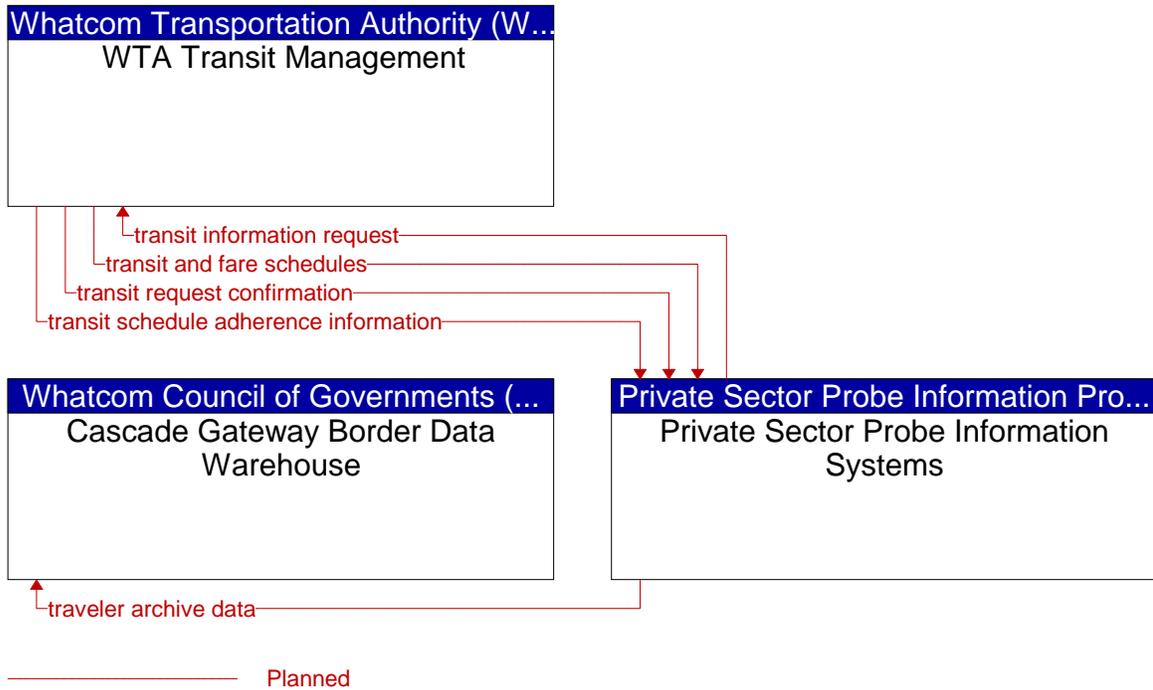
Figure 14: Private Sector Probe Information Systems Context Diagram
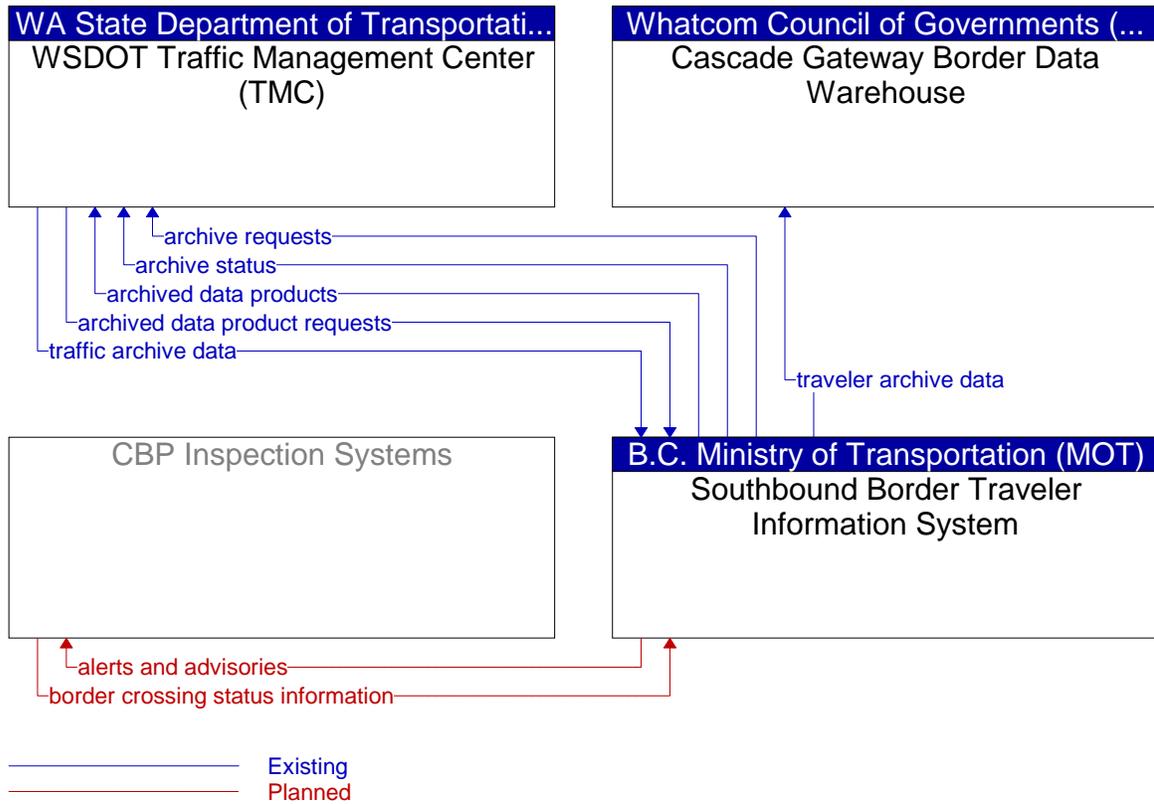
Figure 15: Southbound Border Traveler Information System Context Diagram
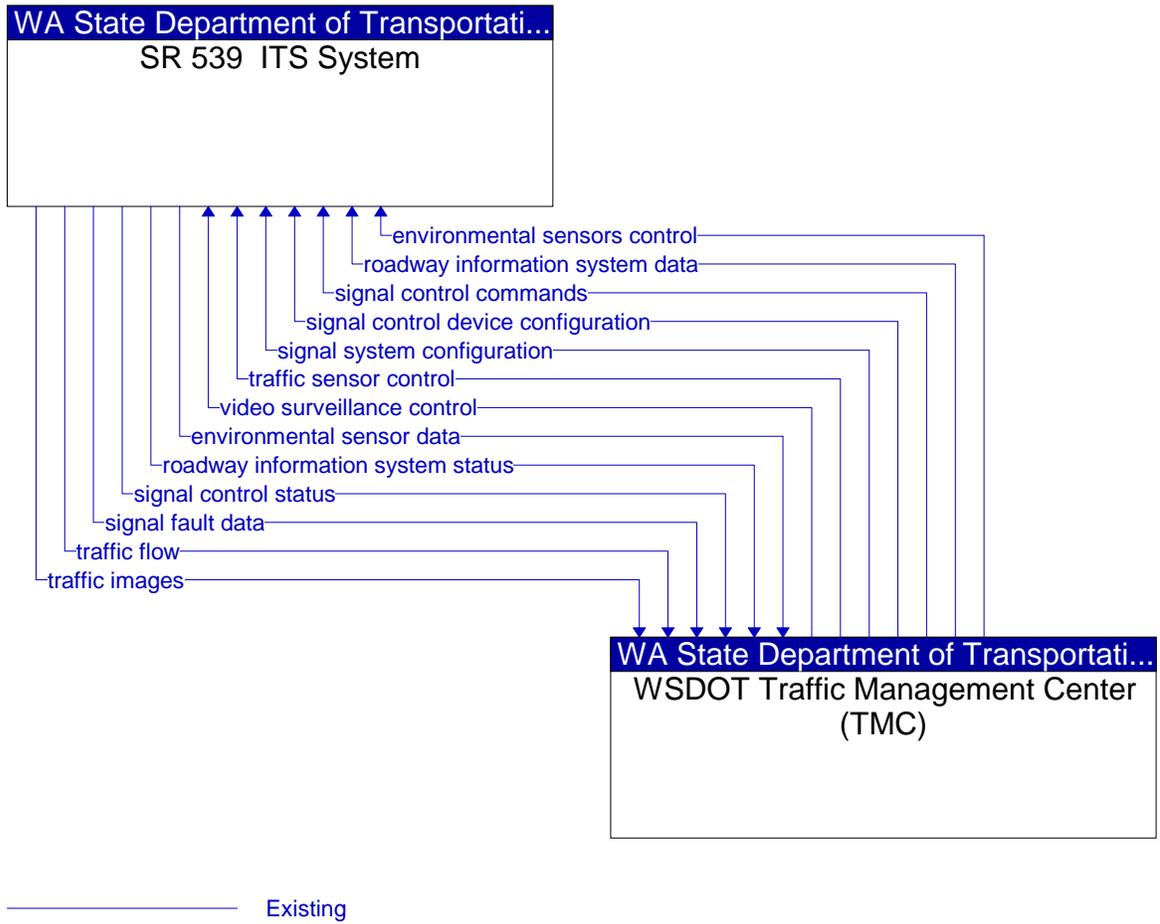
Figure 16: SR 539 ITS System Context Diagram
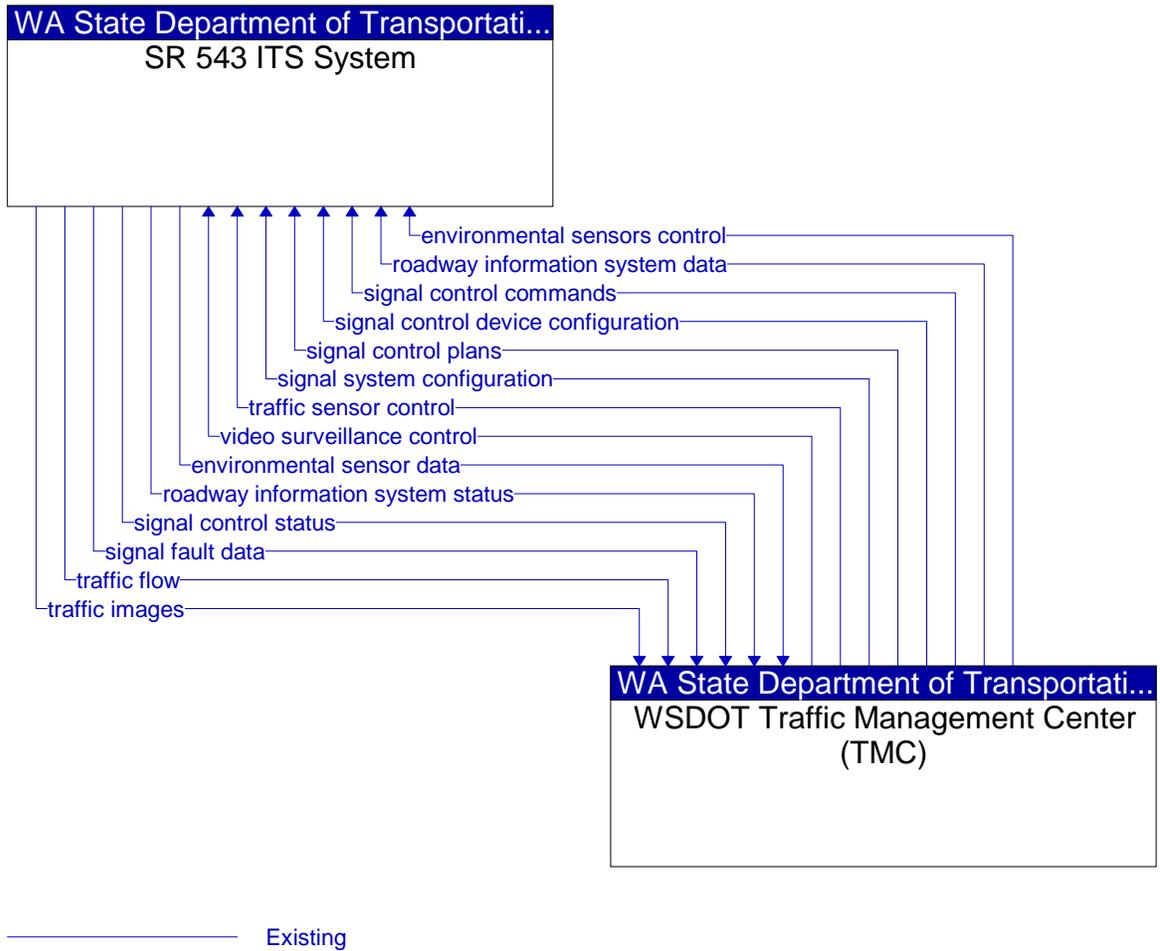
Figure 17: SR 543 ITS System Context Diagram

WA State Department of Transportati...
WSDOT Traffic Management Center
(TMC)

environmental sensor data
roadway information system status
signal control status
signal fault data
traffic flow
traffic images
environmental sensors control
roadway information system data
signal control commands
signal control device configuration
signal control plans
signal system configuration
traffic sensor control
video surveillance control

SR 9 ITS System

Existing

Figure 18: SR 9 ITS System Context Diagram

```
┌─────────────────────────────────────┐
│          City of Sumas              │
│      Sumas Border VMS Sign          │
│                                     │
│                                     │
│                                     │
└─────────────────────────────────────┘
   ↑└─roadway information system data────────┐
   └─roadway information system status──────┐│
                                            ││
                                            ▼│
                          ┌─────────────────────────────────────┐
                          │ WA State Department of Transportati...│
                          │   WSDOT Traffic Management Center    │
                          │              (TMC)                   │
                          │                                     │
                          └─────────────────────────────────────┘
```

—————————— Planned
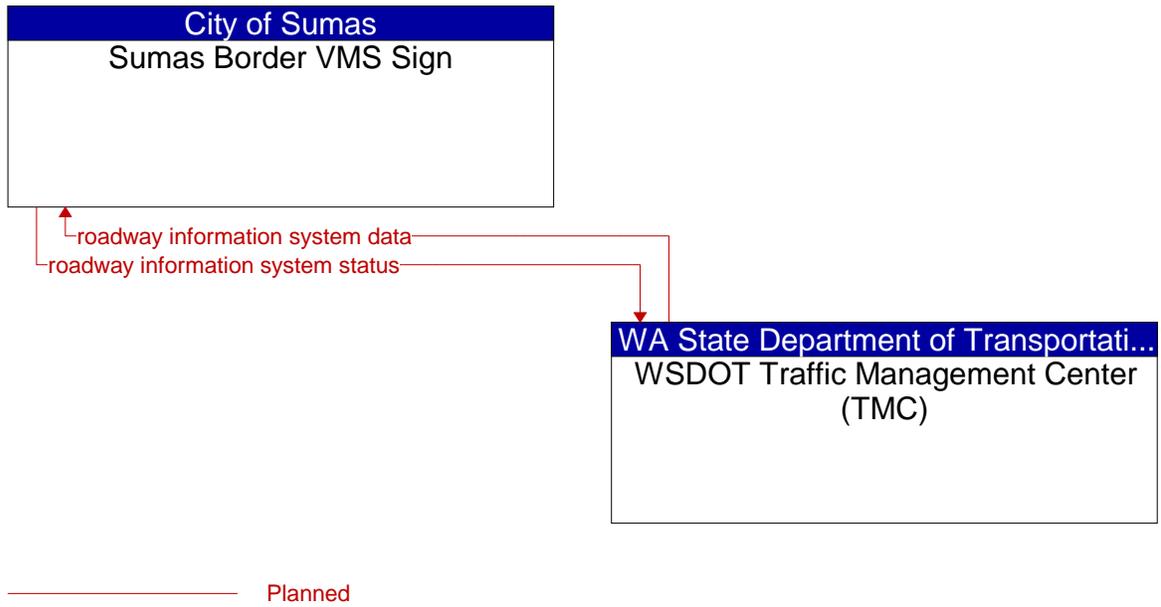
Figure 19: Sumas Border VMS Sign Context Diagram

```
┌─────────────────────────────────────┐
│ Whatcom Council of Governments (...  │
│   Cascade Gateway Border Data        │
│            Warehouse                 │
│                                     │
│                                     │
└─────────────────────────────────────┘
   ↑└─archived data product requests────────┐
   └─archived data products─────────────┐  │
                                        │  │
                                        ▼  │
                          ┌─────────────────────────────────────┐
                          │      Systems Using Warehouse API     │
                          │                                     │
                          │                                     │
                          │                                     │
                          └─────────────────────────────────────┘
```

—————————— Planned
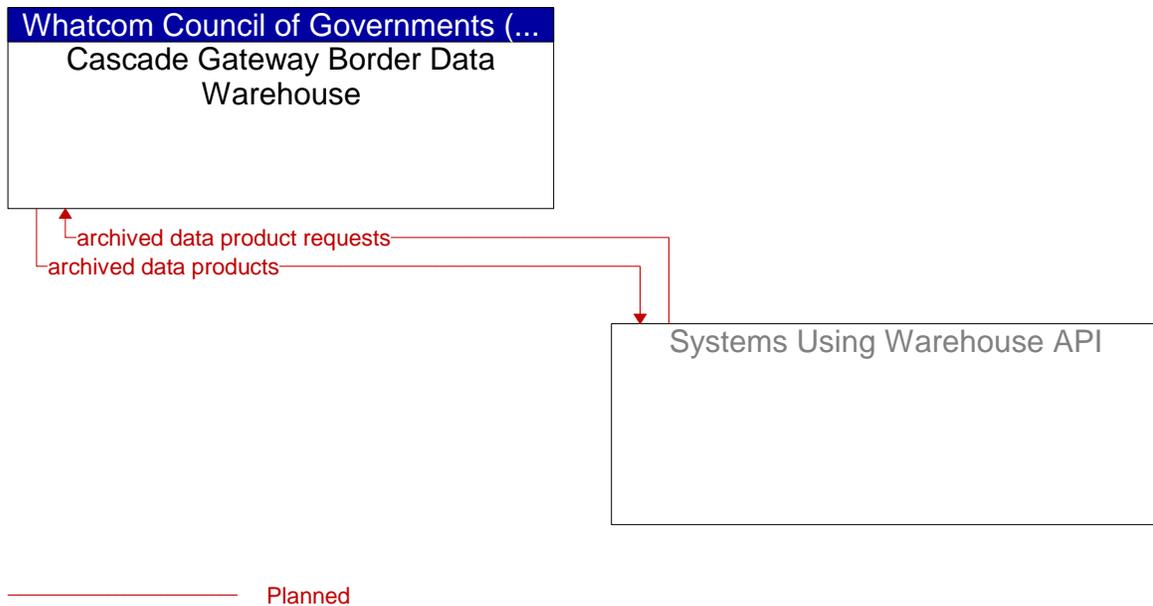
Figure 20: Systems Using Warehouse API Context Diagram

75
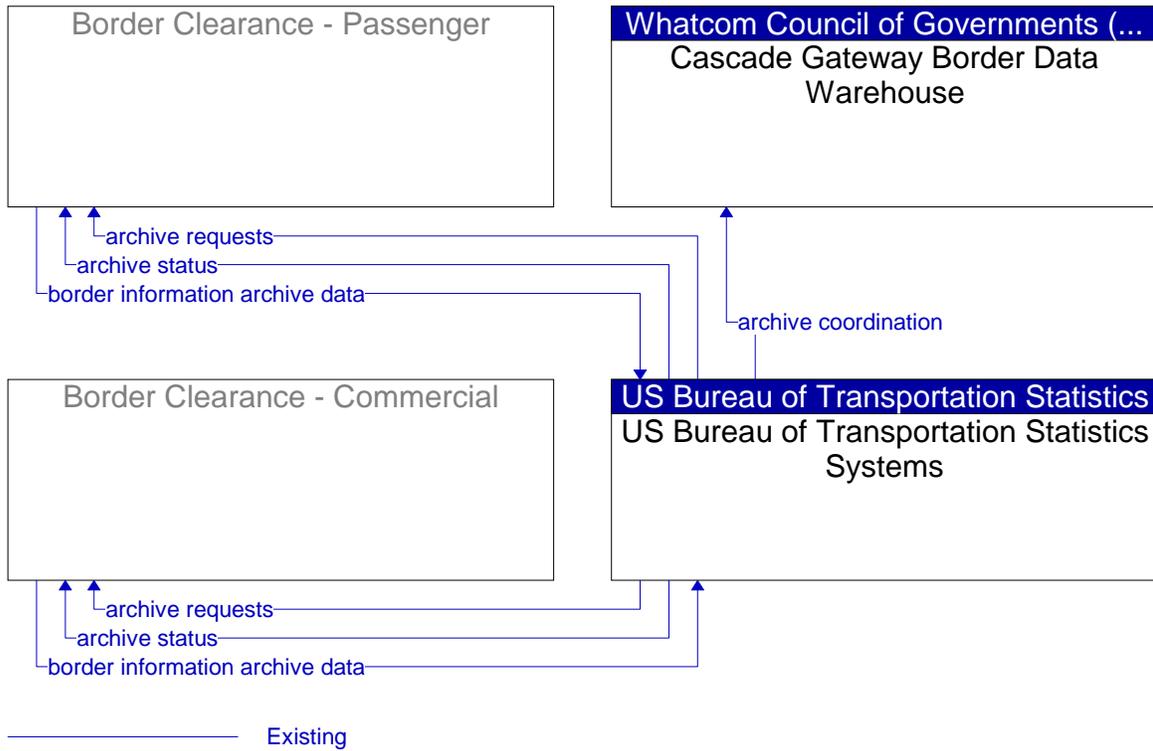
Figure 21: US Bureau of Transportation Statistics Systems Context Diagram
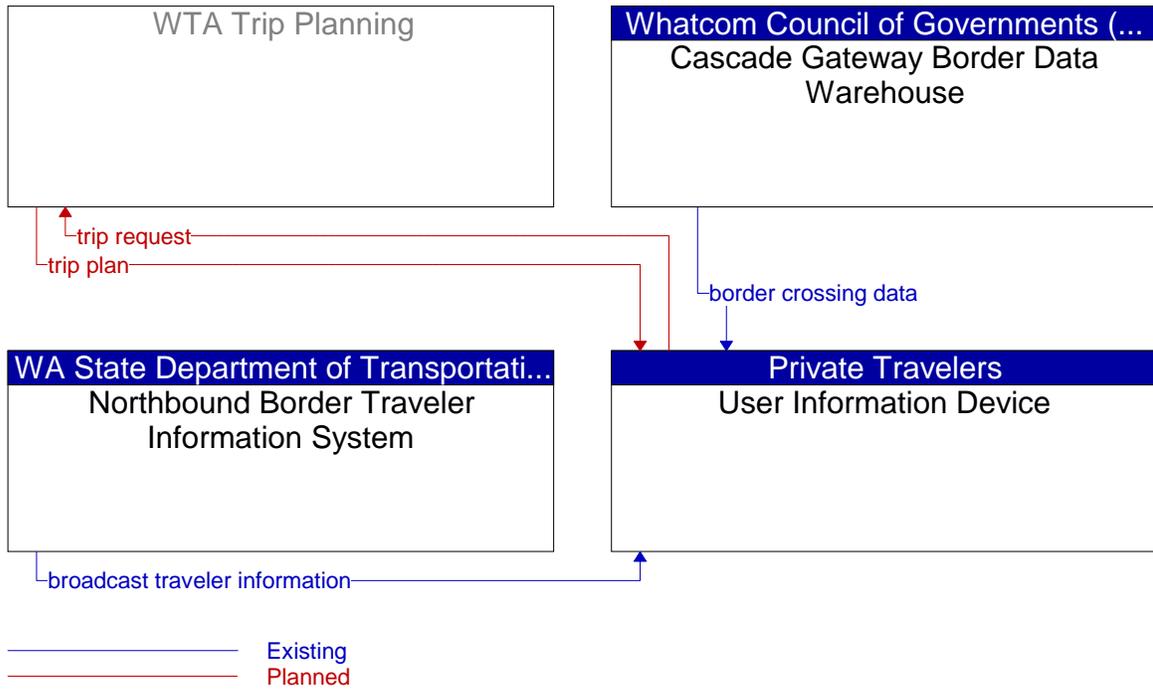
Figure 22: User Information Device Context Diagram
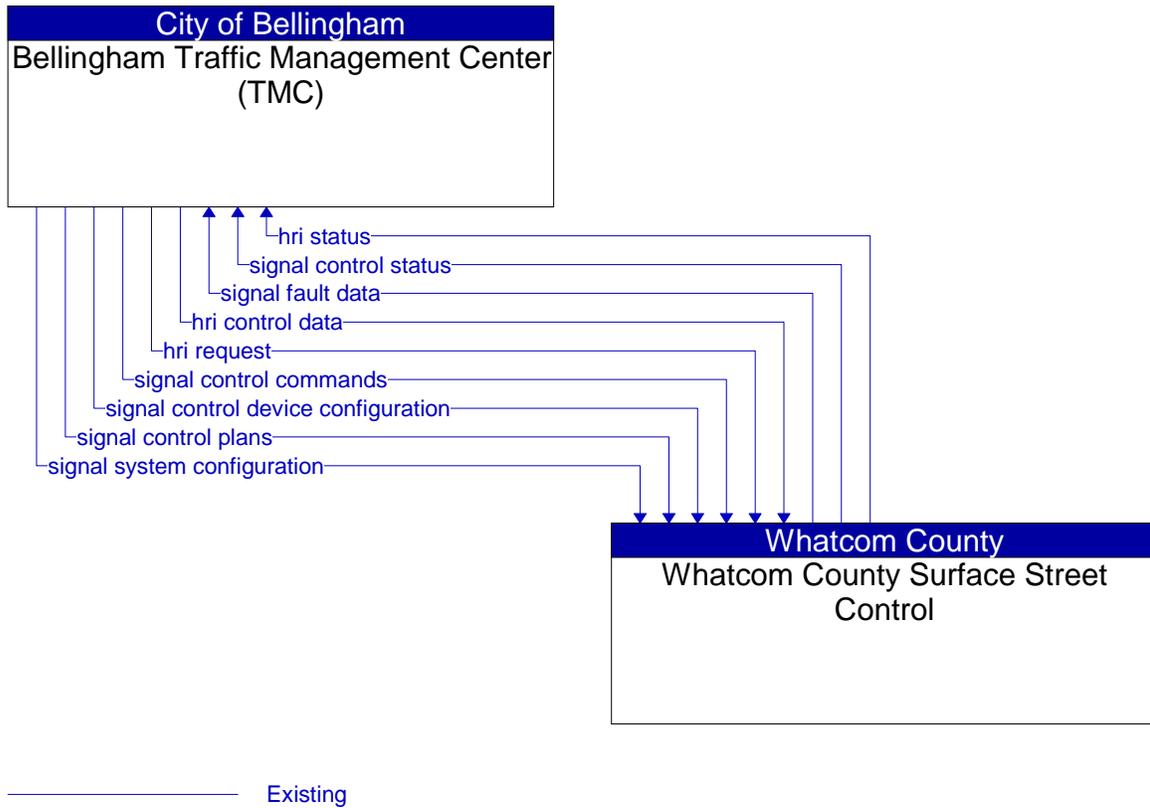
Figure 23: Whatcom County Surface Street Control Context Diagram
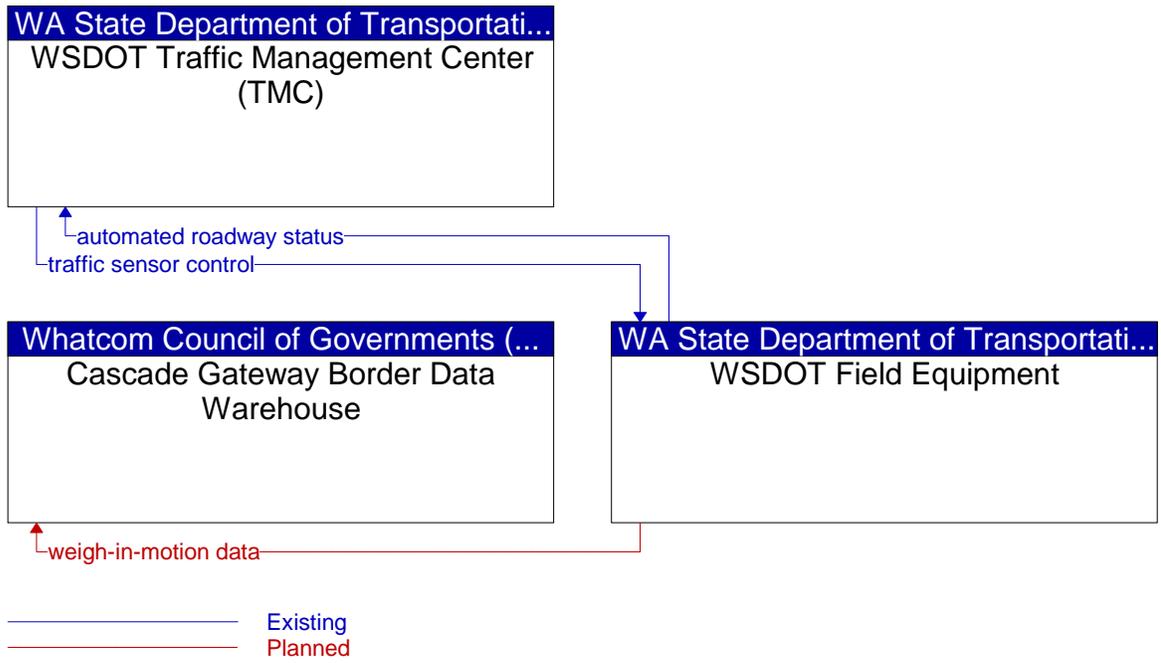
**Figure 24: WSDOT Field Equipment Context Diagram**
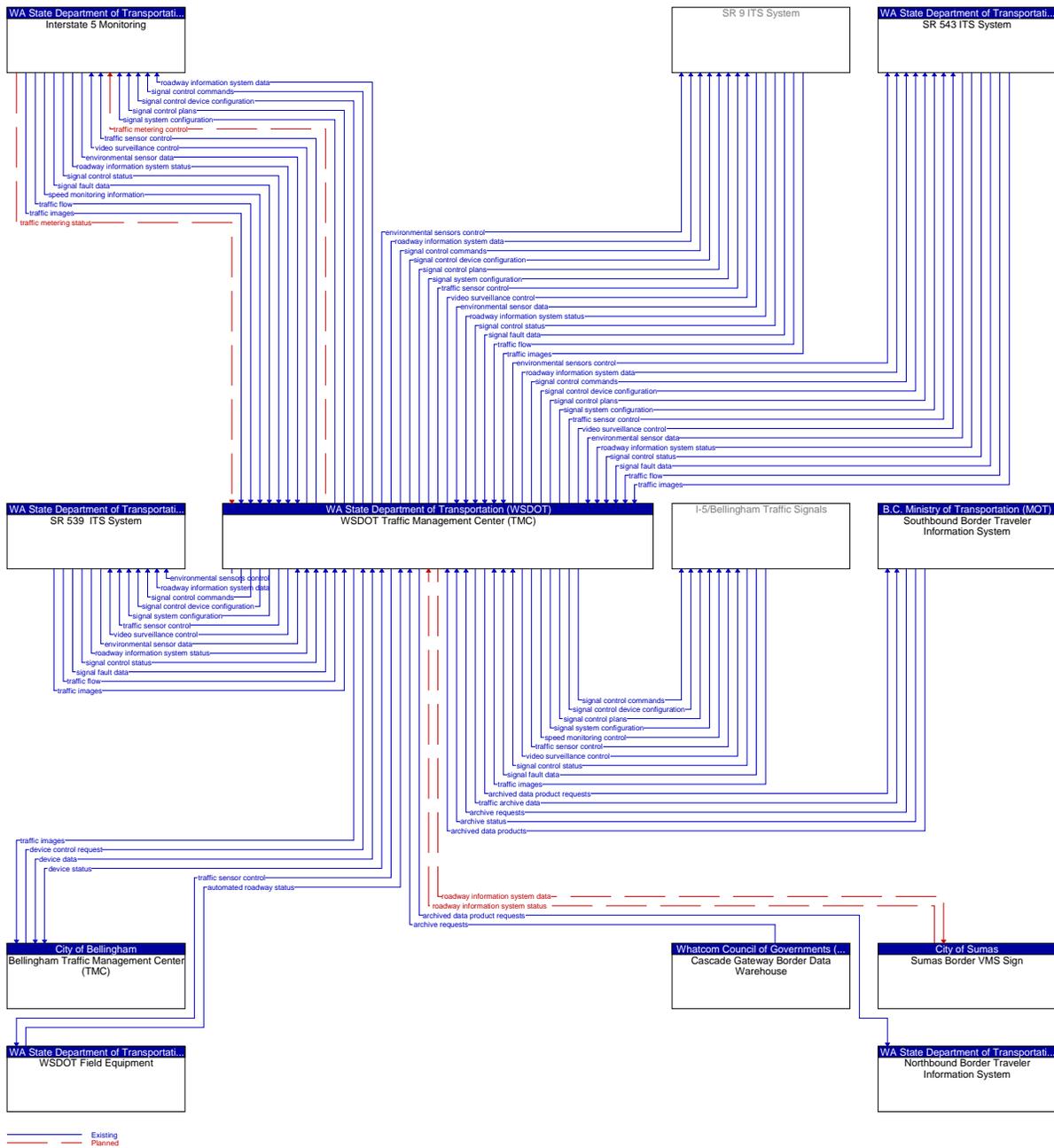
**Figure 25: WSDOT Traffic Management Center (TMC) Context Diagram**
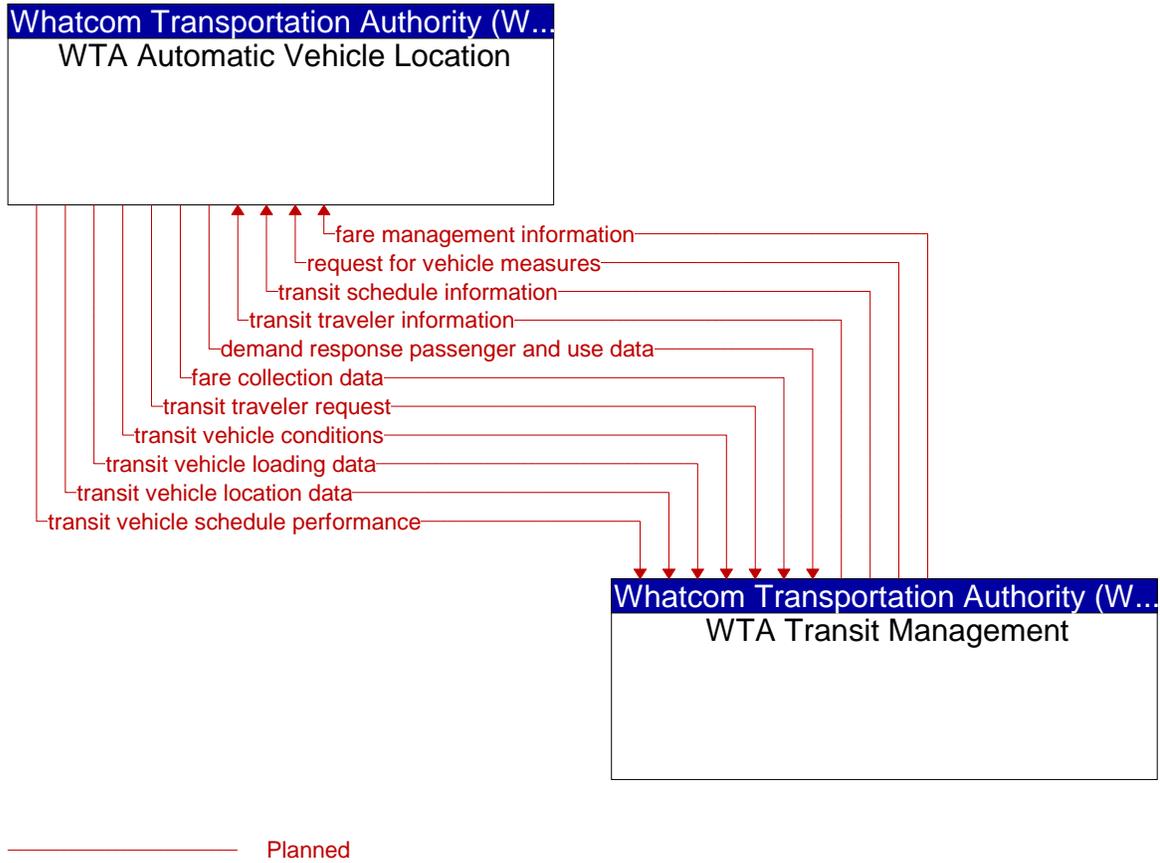
**Figure 26: WTA Automatic Vehicle Location Context Diagram**
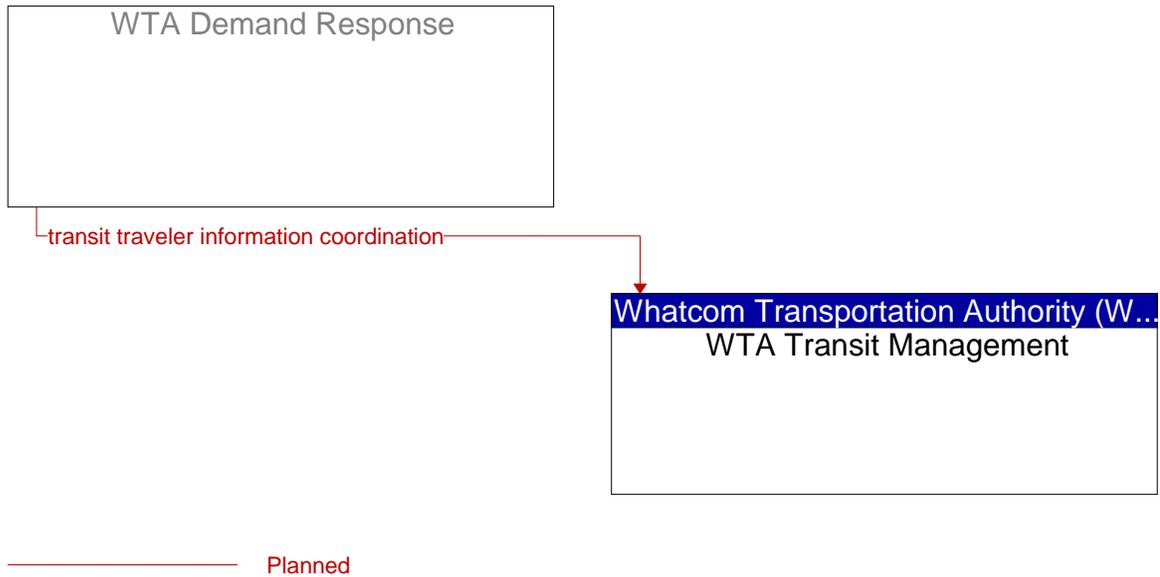
**Figure 27: WTA Demand Response Context Diagram**
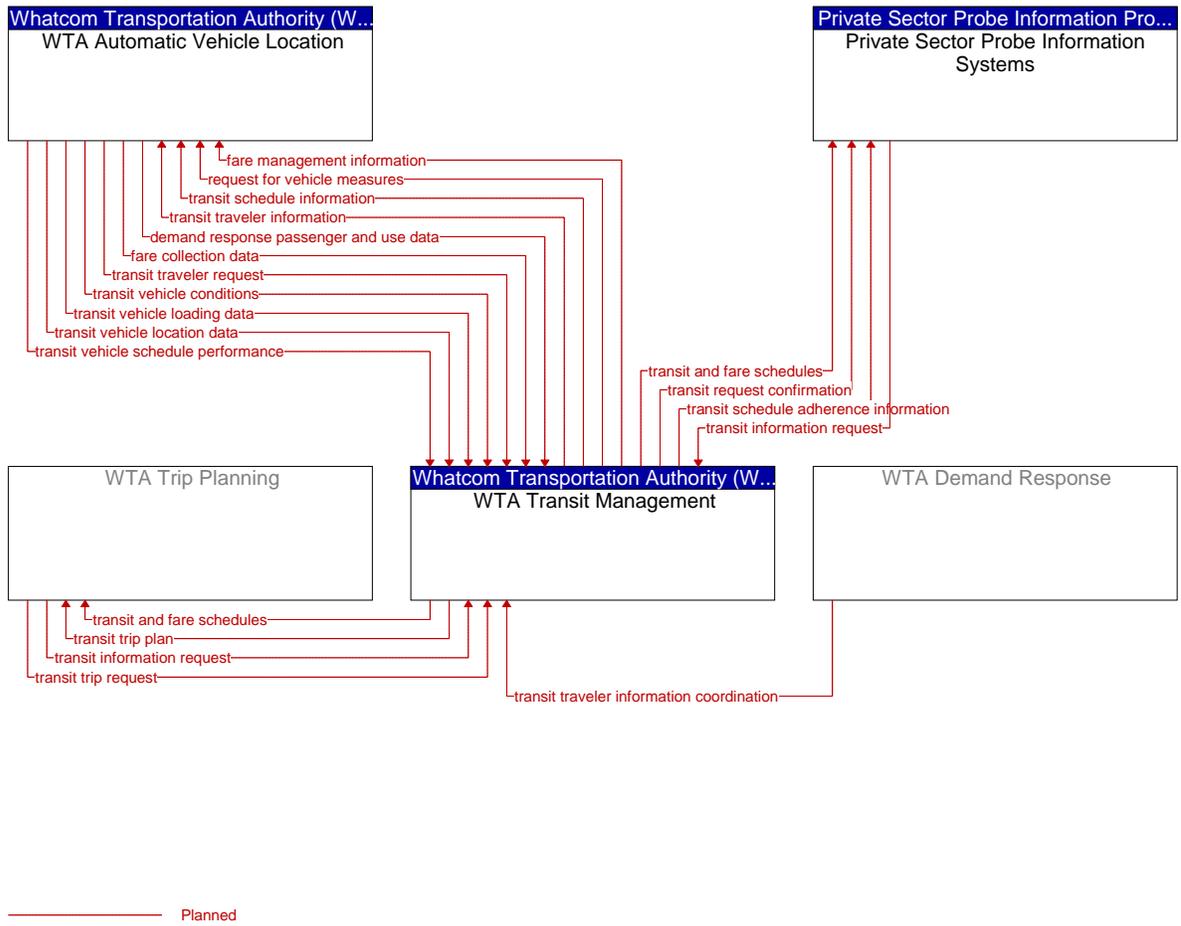
Figure 28: WTA Transit Management Context Diagram

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┌─────────────────────────────────────────┐
│           City of Bellingham             │
│     Bellingham Surface Street Control     │
│                                          │
│                                          │
│                                          │
└─────────────────────────────────────────┘
   ↑
   └local signal priority request──────────────┐
                                               │
                            ┌──────────────────┴──────────────────┐
                            │       WTA Transit Signal Priority    │
                            │                                      │
                            │                                      │
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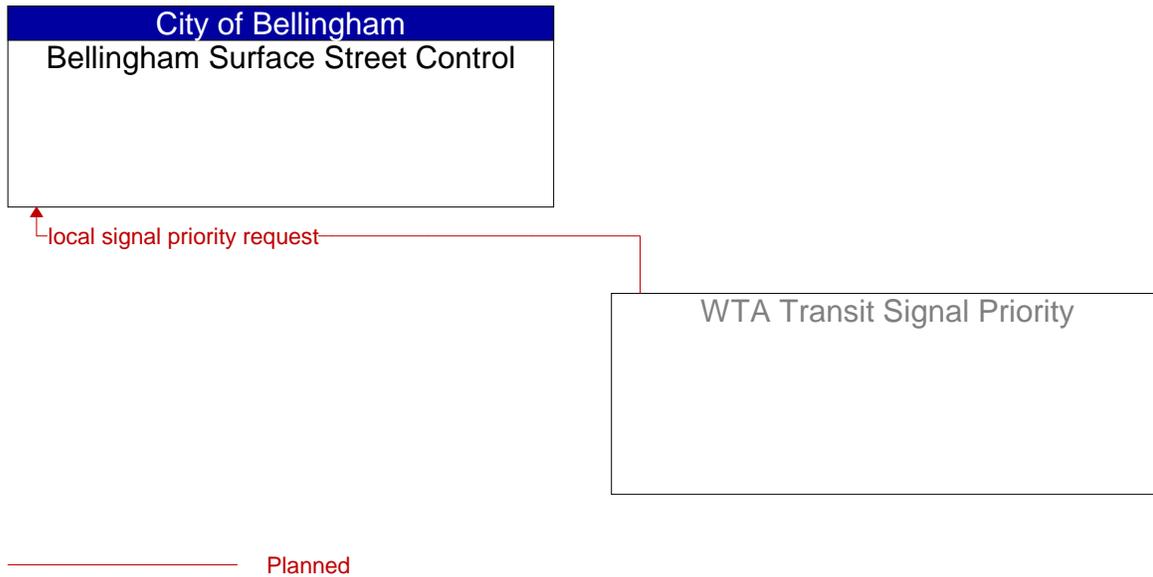
Figure 29: WTA Transit Signal Priority Context Diagram

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│ Whatcom Transportation Authority (W...   │
│        WTA Transit Management            │
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   │  │ └transit information request──────────────┐
   │  └transit trip request─────────────────────┐ │
   │ └transit and fare schedules──────────────┐ │ │
   └transit trip plan──────────────────────┐  │ │ │
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┌─────────────────────────────────────────┐ │ ┌─┴─┴────────────────────┐
│           Private Travelers             │ │ │   WTA Trip Planning      │
│        User Information Device          │ │ │                          │
│                                          │ │ │                          │
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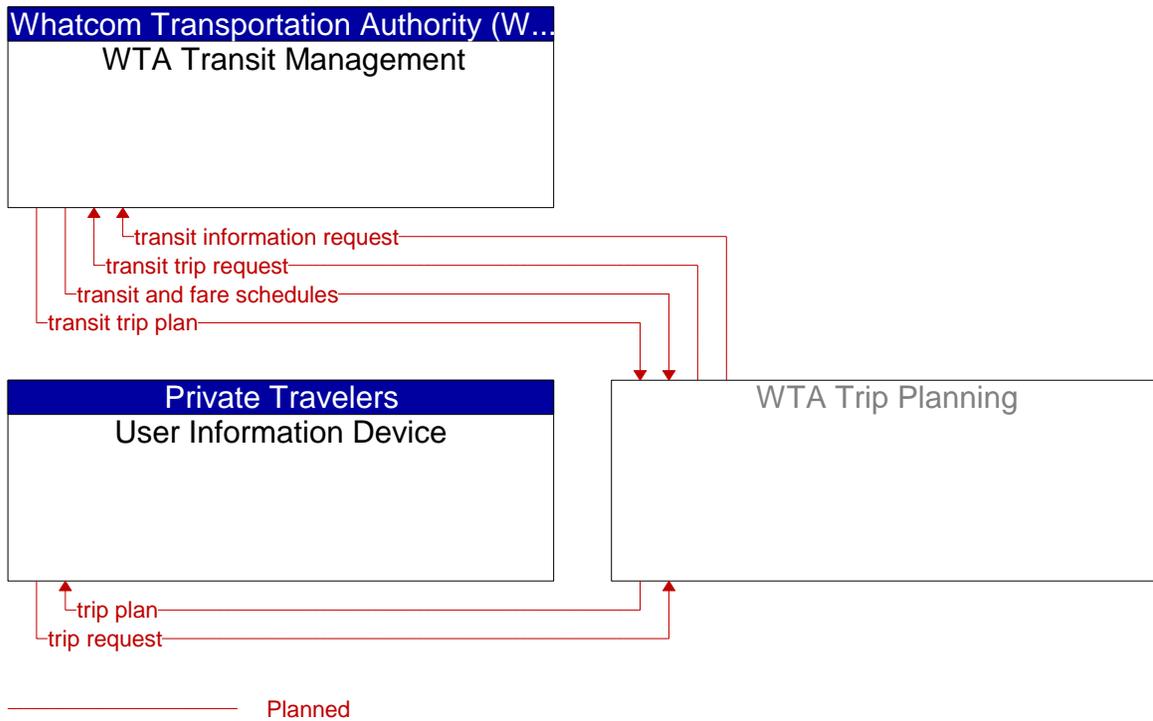
Figure 30: WTA Trip Planning Context Diagram

Architecture Flow Definitions

Flow Name	Description
alerts and advisories	Assessments (general incident and vulnerability awareness information), advisories (identification of threats or recommendations to increase preparedness levels), and alerts (information on imminent or in-progress emergencies). This flow also provides supporting descriptive detail on incidents, threats, and vulnerabilities to increase preparedness and support effective response to threats against the surface transportation system.
archive coordination	Catalog data, meta data, published data, and other information exchanged between archives to support data synchronization and satisfy user data requests.
archive requests	A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.
archive status	Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.
archived data product requests	A user-specified request for archived data products (i.e. data, meta data, or data catalogs). The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.
archived data products	Raw or processed data, meta data, data catalogs and other data products provided to a user system upon request. The response may also include any associated transaction information.
automated roadway status	Current operational status of an automated vehicle operations facility, including the status of the field equipment and vehicles using the facility.
border crossing data	data from archive to end user.
border crossing status information	Port of entry status including current wait-times, lane configuration and status including closures and restrictions, and notification of incidents at the border
border information archive data	Border inspection activities data. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
broadcast traveler information	General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.
demand response passenger and use data	Data collected on board a demand response vehicle relating to the picking up and discharging of passengers.
device control request	Request for device control action
device data	Data from detectors, environmental sensor stations, and traffic control devices including device inventory information.
device status	Status information from devices
environmental sensor data	Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.
environmental sensors control	Data used to configure and control environmental sensors.
fare collection data	Fare collection information including the summary of on-board fare system data and financial payment transaction data.
fare management information	Transit fare information and transaction data used to manage transit fare processing on the transit vehicle.
hri control data	Data required for HRI information transmitted at railroad grade crossings and within railroad operations.
hri request	A request for highway-rail intersection status or a specific control request intended to modify HRI operation.
hri status	Status of the highway-rail intersection equipment including both the current state or mode of operation and the current equipment condition.

Flow Name	Description
local signal priority request	Request from a vehicle to a signalized intersection for priority at that intersection.
request for vehicle measures	Request for vehicle performance and maintenance data collected by onboard sensors.
roadway information system data	Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.
roadway information system status	Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.
signal control commands	Control of traffic signal controllers or field masters including clock synchronization.
signal control device configuration	Data used to configure traffic signal control equipment including local controllers and system masters.
signal control plans	Traffic signal timing parameters including minimum green time and interval durations for basic operation and cycle length, splits, offset, phase sequence, etc. for coordinated systems.
signal control status	Operational and status data of traffic signal control equipment including operating condition and current indications.
signal fault data	Faults from traffic signal control equipment.
signal system configuration	Data used to configure traffic signal systems including configuring control sections and mode of operation (time based or traffic responsive).
speed monitoring control	Information used to configure and control automated speed monitoring, speed warning, and speed enforcement systems.
speed monitoring information	System status including current operational state and logged information including measured speeds, warning messages displayed, and violation records.
traffic archive data	Information describing the use and vehicle composition on transportation facilities and the traffic control strategies employed. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
traffic flow	Raw and/or processed traffic detector data which allows derivation of traffic flow variables (e.g., speed, volume, and density measures) and associated information (e.g., congestion, potential incidents). This flow includes the traffic data and the operational status of the traffic detectors.
traffic images	High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.
traffic metering control	Control commands and operating parameters for ramp meters, interchange meters, mainline meters, and other systems equipment associated with roadway metering operations.
traffic metering status	Current operational status and operating parameters for ramp meters, interchange meters, mainline meters and other control equipment associated with roadway metering operations.
traffic sensor control	Information used to configure and control traffic sensor systems.
transit and fare schedules	Transit service information including routes, schedules, and fare information.
transit information request	Request for transit operations information including schedule and fare information. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.
transit request confirmation	Confirmation of a request for transit information or service.
transit schedule adherence information	Dynamic transit schedule adherence and transit vehicle location information.
transit schedule information	Current and projected transit schedule information used to initialize the transit vehicle with a vehicle assignment, monitor schedule performance, and develop corrective actions on-board.
transit traveler information	Transit information prepared to support transit users and other travelers. It contains transit schedules, real-time arrival information, fare schedules, alerts and advisories, and general transit service information.

Flow Name	Description
transit traveler information coordination	Transit schedules, real-time arrival information, fare schedules, and general transit service information shared between transit organizations to support transit traveler information systems.
transit traveler request	Request by a Transit traveler to summon assistance, request transit information, or request any other transit services.
transit trip plan	An origin-destination transit trip that may involve multiple modes and connections. (could use current trip plan that is PIAS to ISP, but since this is center to center a separate AF might be called for).
transit trip request	Request for a transit trip plan that is responsive to traveler requirements such as schedule, cost, or duration.
transit vehicle conditions	Operating conditions of transit vehicle (e.g., engine running, oil pressure, fuel level and usage).
transit vehicle loading data	Data collected on board the transit vehicle relating to passenger boarding and alighting.
transit vehicle location data	Current transit vehicle location and related operational conditions data provided by a transit vehicle.
transit vehicle schedule performance	Estimated times of arrival and anticipated schedule deviations reported by a transit vehicle.
traveler archive data	Data associated with traveler information services including service requests, facility usage, rideshare, routing, and traveler payment transaction data. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
trip plan	A travel itinerary identifying a route and associated traveler information and instructions identifying recommended modes and transfer information, ride sharing options, and transit and parking reservation information.
trip request	Request for trip planning services that identifies the trip origin, destination(s), timing, preferences, and constraints. The request may also include a request for transit and parking reservations and ridesharing options associated with the trip.
video surveillance control	Information used to configure and control video surveillance systems.
weigh-in-motion data	The data output of weigh-in-motion stations that is collected by data warehouses or archives..