

ITS PROJECT ARCHITECTURE

*ITS Master Plan of
Rio de Janeiro*



**GOVERNO DO
Rio de
Janeiro**

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1. ITS PROJECT ARCHITECTURE

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ITS Project Name	2013				2014				2015				2016				2017				2018				2019			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
1 ITS Center	PQ,TENDERING/ DD				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment							
2 Real Time Traffic/Transport Condition Information Processing	PQ,TENDERING/ DD				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment							
3 Olympic Security and Transport Coordination Center	PQ,TENDERING/ DD				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment							
4 Bus Condition Information Provision	PQ,TENDERING/ DD				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment							
5 Dissemination of On-Board UNIT for more Integrated Transport	PQ,TENDERING/ DD				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment							
6 Information Exchange of Road Operator					PQ,TENDERING/ DD				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment							
7 Information Exchange via ITS Center between Municipalities	PQ,TENDERING/ DD				Construction/Deployment				Construction/Deployment				PQ,TENDERING/ DD				Construction/Deployment				Construction/Deployment							
8 Improvement of Traffic/Transit Operational Center with Essential ITS Equipment at Rio de Janeiro Municipality Area	PQ,TENDERING/ DD				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment							
9 Improvement of Traffic/Transit Operational Center with Essential ITS Equipment at Other Municipality Area in RMRJ					PQ,TENDERING/ DD				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment							
10 Emergency Vehicle Operating Management	PQ,TENDERING/ DD				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment							
11 Commercial Vehicle Operation and Management					PQ,TENDERING/ DD				Construction/Deployment				Construction/Deployment				Construction/Deployment				Construction/Deployment							
12 Advanced Vehicle Safety Systems	Car Maker's Technological Development Field																											
13 Deployment of X-band Radar	Need to confirm development policy for weather monitoring in RMRJ																											

Construction/Deployment : Priority Project
Construction/Deployment : Secondary Project
 : Further Expansion and Integration for Interaction Projects

1Q; From January. **PQ; Procurement DD; Detailed Design

ITS Project Name	1.ITS Center -for Information Integration and Dissemination-
Objectives	Is to integrate all transport/transit related information in one place, Is to process for making useful information all of stake holders, Is to disseminate information various way of media for everyone
<p>Graphic</p>	
Target Area (Area to be applied)	Rio de Janeiro Metropolitan Area
Required System	1. Information Exchange System 2. ITS Center Building (COR or CICC or New building)
Rough order of magnitude estimate	R\$ 59.900.000/JPY 2,371,000,000
Implementation Period	From short-term to long-term -Stepwise development-
ITS Service Packages Reference No.	AD area, ATIS area, ATMS06, ATMS09
Remarks	Intensively, quickly development shall be done in a short term for Olympic preparation. After Olympic games, it shall expand and improve in a stepwise manner along with other related system development.



ITS Project Name	2.Real Time Traffic/Transport Condition Information Processing
Objectives	Gathering information and processing to monitor actual real time condition of Rio de Janeiro Metropolitan Area
Graphic	
Target Area (Area to be applied)	Rio de Janeiro Metropolitan Area
Required System	<ol style="list-style-type: none"> 1. Probe Data System 2. Transit Data System 3. Point Data System 4. Incident Monitoring System 5. Weather Monitoring System
Rough order of magnitude estimate	R\$45.900.000/JPY1,815,000,000
Implementation Period	Short Term; RJ municipality area Long term; step wise development
ITS Service Packages	AD area, ATIS area, ATMS06, ATMS09
Reference No.	
Remarks	For fulfillment of Traffic/Transit management, real time traffic/transit data shall be gathered, processed and supervised intensively. Weather, Disaster information is also important.



ITS Project Name	3.Olympic Security and Transport Coordination Center
Objectives	Expand and Improve Function of Existing ITS Equipment for more Smoother and Smarter Transportation and Transit
Graphic	<p>!! Need to be Improved Connection between Traffic Operators and Transit Operators !!</p> <p>CET-RIO and Rio Onibus shall cooperate in same place for securing comfortable transport/transit</p> <p>Signal ↔ BRT</p> <p>Entire Traffic Condition and Transit Operational Condition info from ITS Center</p> <p>Entire Traffic Condition and Transit Operational Condition info from ITS Center</p> <p>Entire Traffic Condition Delay and Passenger Occupancy Ratio of BRT</p> <p>Next Bus Info at Bus Stop and Terminal from ITS Center</p> <p>Dissemination of All Modes of Transportation Information</p> <p>ITS Center</p> <p>Next Bus, Train or METRO Information Exchange And Provision is necessary for Users</p> <p>Train Approaching Info Shall be provisioned at each platform</p>
Target Area (Area to be applied)	Rio de Janeiro Municipality Area
Required System	<ol style="list-style-type: none"> 1. System Integration for Olympic Security and Transport Coordination 2. Information Exchange System
Rough Order of Magnitude Estimate	R\$48.900.000/JPY1,936,000,000
Implementation Period	Short Term
ITS Service Packages Reference No.	ATIS01, APTS 05,06,07,08,09,10 and 11 ATMS06 and EM area
Remarks	Integration of Traffic/Transit and Security for Olympic success. The project shall be commenced immediately.



ITS Project Name	4. Bus Condition Information Provision
Objectives	Is to enhance passenger satisfaction,
Graphic	
Target Area (Area to be applied)	Rio de Janeiro Municipality Area to RMRJ
Required System	<p>1. Bus Condition Provision System</p> <ul style="list-style-type: none"> - Bus Information Panel for Bus stop (500 Bus stops) - Information Display in Bus Terminal (44 Bus Terminal) - Information Display in Bus (3000 Buses) - Bus Operation Center (3 Bus Operation Centers) - GPS for Bus (8000 Buses)
Rough order of magnitude estimate	R\$122.300.000/JPY4,840,000,000
Implementation Period	Short-term; RJ municipality area Long-term; other municipalities and inter buses
ITS Service Packages Reference No.	APTS05,06,07,08,09,10 and 11
Remarks	<p>Bus arrival information is useful for every bus user. This project is also important for spectators of Olympic games.</p> <p>More precisely deployment planning shall be done before installing equipment each bus stops.</p>

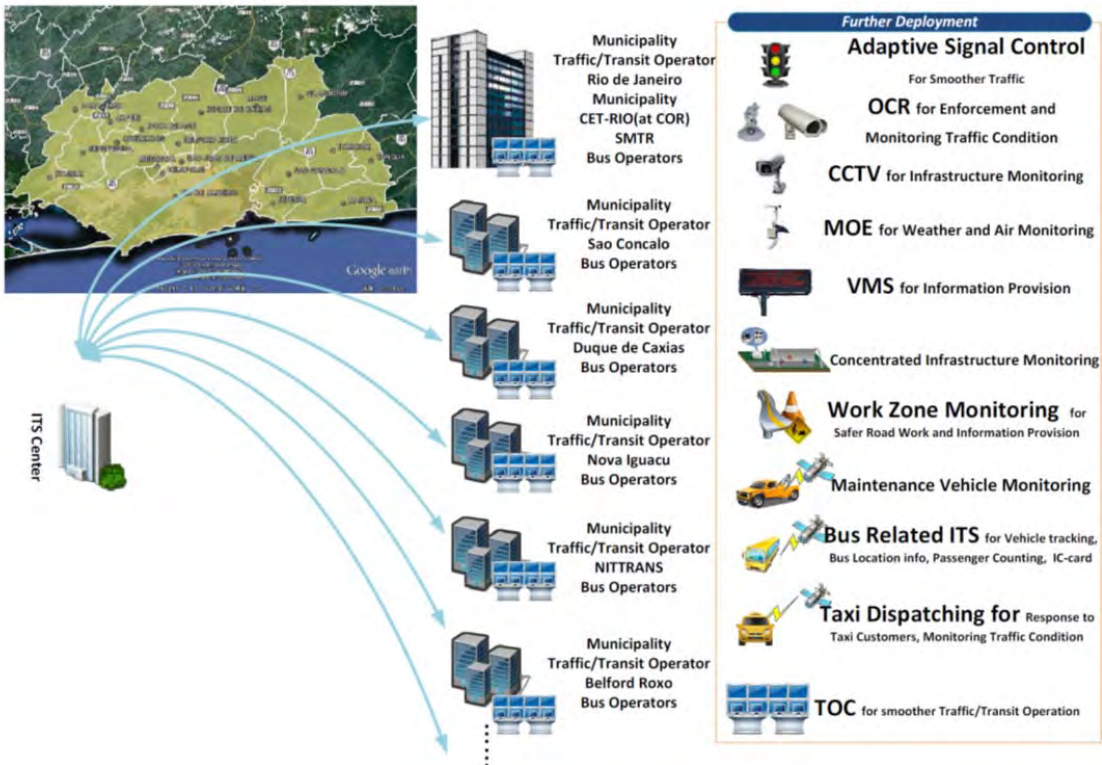


ITS Project Name	5.Dissemination of On-Board Unit for more integrated Transport
Objectives	<p>Is to reduce congestion at toll gate</p> <p>Is to manage traffic demand</p> <p>Is to enhance more connectivity of all of modes of transport</p>
Graphic	
Target Area (Area to be applied)	Rio de Janeiro Metropolitan Area
Required System	<ol style="list-style-type: none"> 1. ETC system (8 locations) 2. Free Flow Cashless System (50 parking areas) 3. ERP System (35 locations) 4. On-Board Unit (200000 vehicles)
Rough order of magnitude estimate	R\$344.900.000/JPY13,643,000,000
Implementation Period	<p>Short-term; OBU Dissemination, ETC promotion of utilization, Parking DSRC electronic payment and integration of IC-Card.</p> <p>Long-term; ERP and DSRC information dissemination.</p>
ITS Service Packages Reference No.	ATMS10,ATIS04 and 10
Remarks	It is important for to disseminate on-board unit for further utilization of traffic/transport information systems.



ITS Project Name	6.Information Exchange of road operators							
Objectives	Is to connect road operators in terms of traffic information Is to enhance essential information provision for road users Is to ensure more smoother traffic flow							
Graphic	<p>The diagram illustrates the ITS architecture. On the left, a list of sensors and their functions is provided: <ul style="list-style-type: none"> Detector: Observation of Road Condition, Traffic Volume, Traffic Speed etc. CCTV: Observation of Road Condition, Traffic Accident, Traffic Volume, Traffic Speed etc. OCR: Detect Over-speeding Vehicles, Registered Number Meteorological Observation Equipment: Observation of Weather Condition, Rain, Temp etc. VMS: Provision of information, Traffic, Accidents, etc. ETC: Making smoother traffic and raise business efficiency DSRC Spot: Provision of information, Traffic, Accidents, etc and Collecting Probe data via ITS OBU These sensors are connected to an ITS Center (represented by a server rack). The ITS Center is connected to a DNIT Federal Road Office (represented by a computer monitor). This office is then connected to a network of road operators: Federal Road Concessionaire1, State Road Concessionaire1, DER Road Side Office, and Municipality Road Operator. Two maps are shown: a Google Earth satellite view of the Rio de Janeiro Metropolitan Area and a schematic map of the road network with color-coded routes.</p>							
Target Area (Area to be applied)	Rio de Janeiro Metropolitan Area							
Required System	<table border="0"> <tr> <td>1. Information Exchange System</td> <td>4. OCR (21 sets)</td> </tr> <tr> <td>2. VMS (36 sets)</td> <td>5. MOE (10 sets)</td> </tr> <tr> <td>3. CCTV (11 sets)</td> <td>6. Rail Crossing Management (4 sets)</td> </tr> </table>		1. Information Exchange System	4. OCR (21 sets)	2. VMS (36 sets)	5. MOE (10 sets)	3. CCTV (11 sets)	6. Rail Crossing Management (4 sets)
1. Information Exchange System	4. OCR (21 sets)							
2. VMS (36 sets)	5. MOE (10 sets)							
3. CCTV (11 sets)	6. Rail Crossing Management (4 sets)							
Rough order of magnitude estimate	R\$55.400.000/JPY2,193,000,000							
Implementation Period	From mid-term to long-term							
ITS Service Packages Reference No.	AD1,2,3 ATIS06 ATMS01,02,04,06,07,08,10,23							
Remarks	Highways related information shall be exchanged to manage and control traffic. Other essential equipment shall be installed on federal and state government road.							



ITS Project Name	7.Information Exchange via ITS center between municipalities
Objectives	Is to monitor traffic and transit for more secure transport Is to control traffic and transit for more smoother transport
Graphic	 <p>The diagram illustrates the ITS Project Architecture. On the left, an 'ITS Center' is shown as a server rack. A map of the Rio de Janeiro Metropolitan Area is in the top left. Arrows point from the ITS Center to several municipalities, each with its own Traffic/Transit Operator and Bus Operators. The municipalities listed are: Rio de Janeiro (Municipality CET-RIO(at COR) SMTR), Sao Concalo, Duque de Caxias, Nova Iguacu, and Belford Roxo. To the right, a box titled 'Further Deployment' lists various services: Adaptive Signal Control (for smoother traffic), OCR for Enforcement and Monitoring Traffic Condition, CCTV for Infrastructure Monitoring, MOE for Weather and Air Monitoring, VMS for Information Provision, Concentrated Infrastructure Monitoring, Work Zone Monitoring (for safer road work and information provision), Maintenance Vehicle Monitoring, Bus Related ITS (for vehicle tracking, bus location info, passenger counting, IC-card), Taxi Dispatching for (response to taxi customers, monitoring traffic condition), and TOC for smoother Traffic/Transit Operation.</p>
Target Area (Area to be applied)	Rio de Janeiro Metropolitan Area
Required System	1.Information Exchange System
Rough order of magnitude estimate	R\$58.100.000/JPY2,299,000,000
Implementation Period	Short-term; Rio de Janeiro municipalities Mid-term to long-term; other municipalities in RMRJ
ITS Service Packages Reference No.	AD1,2,3 ATIS06, ATMS06
Remarks	All municipalities share information and cauterized data is processed at ITS center. After processing, center of all municipalities in RMRJ can receive traffic/transit related information via ITS center.




ITS Project Name	8.Improvement of Traffic/Transit Operational Center with Essential ITS Equipment at Rio Municipality Area
Objectives	Expand and Improve Function of Existing ITS Equipment for more Smoother and Smarter Transportation and Transit

Graphic



Target Area (Area to be applied)	Rio Municipality Area	
Required System	1. Adaptive Signal Control (400 Intersections) 2. VMS (58 sets) 3. CCTV (5 sets) 4. OCR (68 sets) 5. Parking Availability Information Provision (10 system)	6. MOE (5 sets) 7. Dynamic Lane Management (10 locations) 8. Taxi Dispatching System(10 system) 9. Rail Crossing Management (11 sets)
Rough order of magnitude estimate	R\$ 245.600.000/JPY9,716,000,000	
Implementation Period	Short-term; Data integration and adaptive signal expansion and VMS Mid-term; others	
ITS Service Packages Ref No.	ATMS area, MC area, AD1, APTS01,02,04,05,06,07,08,09,10 and11	
Remarks	System integration, new VMSS, data utilization is necessary.	


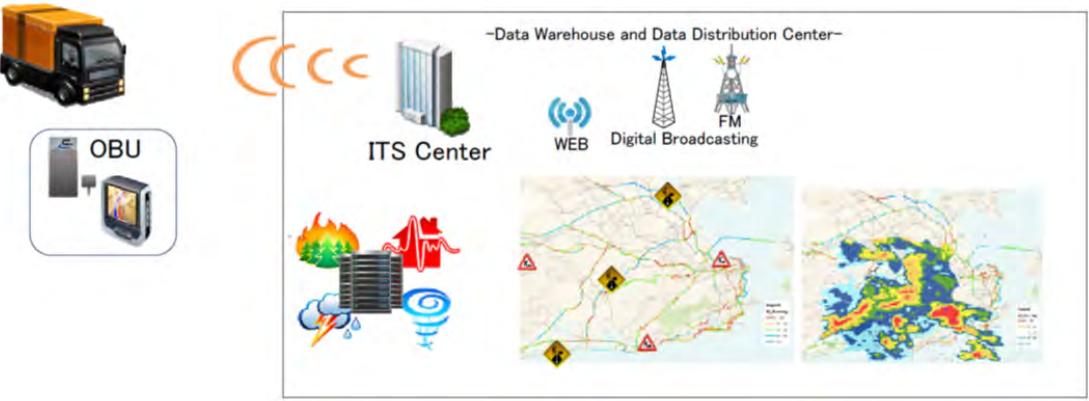


ITS Project Name	9.Improvement of Traffic/Transit Operational Center with Essential ITS Equipment at Other Municipality Area in RMRJ																																					
Objectives	Expand and Improve Function of Existing ITS Equipment for more Smoother and Smarter Transportation and Transit																																					
Graphic	 <p>Further Deployment</p> <table border="1"> <tr> <td>Adaptive Signal Control For More Smoother Traffic</td> <td>None</td> <td>Should be Prepared</td> <td>MOE for Weather and Air Monitoring</td> <td>None</td> <td>Should be Prepared</td> </tr> <tr> <td>VMS for More Information Provision</td> <td>None</td> <td>Should be Prepared</td> <td>DYNAMIC LANE MANEGAMENT For More Utilization of Existing Road Network</td> <td>None</td> <td>To be determined</td> </tr> <tr> <td>CCTV for Infrastructure Monitoring</td> <td>None</td> <td>Should be Prepared</td> <td>Bus Related ITS for Bus Location info, Passenger Counting, Travel Time Info.</td> <td>None</td> <td>Should be Prepared</td> </tr> <tr> <td>OCR for Enforcement and Monitoring Traffic Condition</td> <td>None</td> <td>Should be Prepared</td> <td>Taxi Dispatching for Response to Taxi Customers, Monitoring Traffic Condition</td> <td>None</td> <td>Should be Prepared</td> </tr> <tr> <td>Work Zone Monitoring for Safer Road Work and Information Provision</td> <td>None</td> <td>Should be Prepared</td> <td>TOC for smoother Traffic/Transit Operation</td> <td>Not Sufficient</td> <td>Exchange and integration</td> </tr> <tr> <td>Parking Availability Information Provision</td> <td>None</td> <td>Prepared</td> <td>Rail Crossing Management for More Safer and Secure Traffic With SUPERVIA</td> <td>None</td> <td>Prepared</td> </tr> </table>		Adaptive Signal Control For More Smoother Traffic	None	Should be Prepared	MOE for Weather and Air Monitoring	None	Should be Prepared	VMS for More Information Provision	None	Should be Prepared	DYNAMIC LANE MANEGAMENT For More Utilization of Existing Road Network	None	To be determined	CCTV for Infrastructure Monitoring	None	Should be Prepared	Bus Related ITS for Bus Location info, Passenger Counting, Travel Time Info.	None	Should be Prepared	OCR for Enforcement and Monitoring Traffic Condition	None	Should be Prepared	Taxi Dispatching for Response to Taxi Customers, Monitoring Traffic Condition	None	Should be Prepared	Work Zone Monitoring for Safer Road Work and Information Provision	None	Should be Prepared	TOC for smoother Traffic/Transit Operation	Not Sufficient	Exchange and integration	Parking Availability Information Provision	None	Prepared	Rail Crossing Management for More Safer and Secure Traffic With SUPERVIA	None	Prepared
Adaptive Signal Control For More Smoother Traffic	None	Should be Prepared	MOE for Weather and Air Monitoring	None	Should be Prepared																																	
VMS for More Information Provision	None	Should be Prepared	DYNAMIC LANE MANEGAMENT For More Utilization of Existing Road Network	None	To be determined																																	
CCTV for Infrastructure Monitoring	None	Should be Prepared	Bus Related ITS for Bus Location info, Passenger Counting, Travel Time Info.	None	Should be Prepared																																	
OCR for Enforcement and Monitoring Traffic Condition	None	Should be Prepared	Taxi Dispatching for Response to Taxi Customers, Monitoring Traffic Condition	None	Should be Prepared																																	
Work Zone Monitoring for Safer Road Work and Information Provision	None	Should be Prepared	TOC for smoother Traffic/Transit Operation	Not Sufficient	Exchange and integration																																	
Parking Availability Information Provision	None	Prepared	Rail Crossing Management for More Safer and Secure Traffic With SUPERVIA	None	Prepared																																	
Target Area (Area to be applied)	Rio de Janeiro Metropolitan Area																																					
Required System	<ol style="list-style-type: none"> Adaptive Signal Control (150 Intersections) VMS (13 sets) CCTV (2 sets) OCR (8 sets) MOE (3 sets) Taxi Dispatching System (5 system) Rail Crossing Management (88 sets) 																																					
Rough order of magnitude estimate	R\$204.700.000/JPY9,716,000,000																																					
Implementation Period	From mid-term to long-term																																					
ITS Service Packages	ATMS area, MC area, AD1, APTS01,02,04,05,06,07,08,09,10 and11																																					
Reference No.																																						
Remarks	Objective cities shall be determined with considering trend of population increasing, production of OD.																																					

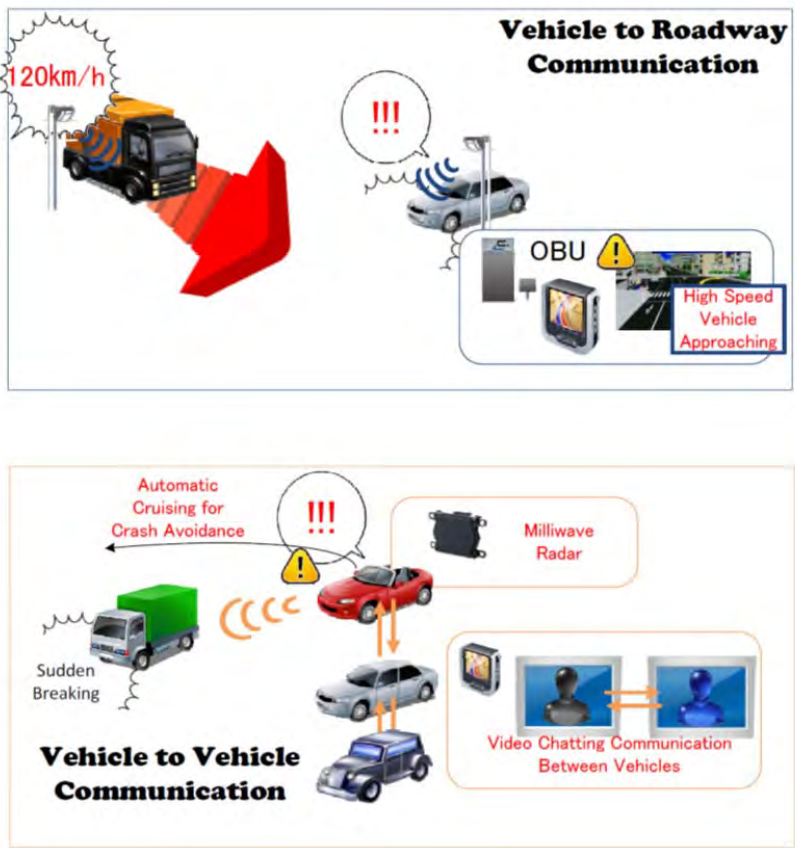


ITS Project Name	10. Emergency Vehicle Operating Management
Objectives	-Prioritize all of emergency vehicles for more quick emergency response
Graphic	
Target Area (Area to be applied)	Rio de Janeiro Metropolitan Area
Required System	1. Traffic Light Prioritizing System for Emergency Vehicle (for 200 Vehicles)
Rough order of magnitude estimate	R\$18.500.000/JPY733,000,000
Implementation Period	Short-term
ITS Service Packages	ATIS10, ATMS06,08, AVSS12 and EM area especially EM02
Reference No.	
Remarks	CICC will be in charge of emergency and hazardous information management center. CICC, is a core of emergency management, and Traffic/Transit center and ITS center shall coordinate several systems for more efficient operation.

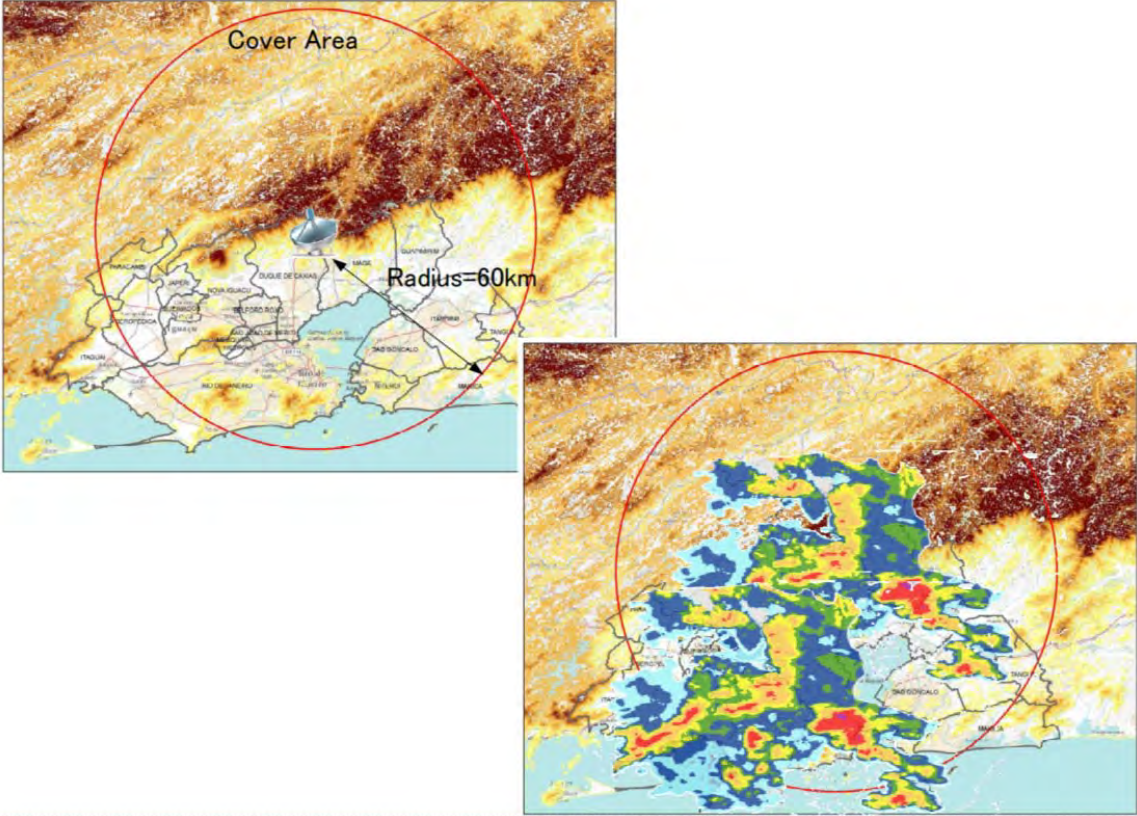


ITS Project Name	11.Commercial Vehicle Operation and Management
Objectives	<ul style="list-style-type: none"> -Enhance automated monitoring for overloaded commercial vehicles -Disseminate traffic related information for more efficient logistics
<p>Graphic</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Weigh in Motion</p>  </div> <div style="background-color: #003366; color: white; padding: 5px; text-align: center;"> <p>More ITS Projects will be considered in next phase</p> </div> </div> <div style="margin-top: 20px;"> <p>Information Provision via On-Board UNIT</p>  </div>	
Target Area (Area to be applied)	Rio de Janeiro Metropolitan Area
Required System	<ol style="list-style-type: none"> 1. Weigh in Motion System 2. On-Board Unit to obtain traffic/transport related information
Rough order of magnitude estimate	<p>R\$17.600.000/ JPY696,000,000</p> <p>WIM 6 locations and OBU 1000 vehicles</p>
Implementation Period	From Mid-term to long term
ITS Service Packages	CVO Service Area
Reference No.	
Remarks	Needs of information, operation and supervision are shall be clarified more clearly and precisely in January (in study team's next assignment)



ITS Project Name	12. Advanced Vehicle Safety Systems
Objectives	<ul style="list-style-type: none"> - Prevent traffic accident - More comfortable driving
Graphic	 <p>The graphic contains two diagrams. The top diagram, titled 'Vehicle to Roadway Communication', shows a truck moving at 120km/h towards a car. A red arrow indicates the truck's path. A speech bubble with three exclamation marks '!!!' is above the car. Below the car, there is an inset showing an On-Board Unit (OBU) and a monitor displaying a 'High Speed Vehicle Approaching' warning. The bottom diagram, titled 'Vehicle to Vehicle Communication', shows a truck performing 'Sudden Breaking' and a car with 'Automatic Cruising for Crash Avoidance'. A speech bubble with three exclamation marks '!!!' is above the car. A 'Milliwave Radar' is shown emitting waves towards the truck. An inset shows 'Video Chatting Communication Between Vehicles' with two screens displaying car models.</p>
Target Area (Area to be applied)	Rio de Janeiro Metropolitan Area
Required System	<ol style="list-style-type: none"> 1. Vehicle to Roadway Communication System 2. Vehicle to Vehicle Communication System
Rough order of magnitude estimate	Up to car industrial maker's technological development
Implementation Period	Up to car industrial maker's technological development
ITS Service Packages Reference No.	AVSS01 to 12
Remarks	Up to car industrial maker's technological development



ITS Project Name (Actually not ITS Project)	13.Deployment of X-Band Radars
Objectives	<p>Is to grasp more accurate nimbus condition real-time</p> <p>Is to get a date for more precise simulation and weather forecasting</p> <p>Is to provide information for transportation related agencies, entities and concessionaires</p> <p>Is to prepare hazardous incident in advance</p>
Graphic	
Target Area (Area to be applied)	Rio de Janeiro Metropolitan Area
Required System	1. X-Band Radar for Rainfall Measurement
Rough order of magnitude estimate	R\$4.600.000/JPY182,000,000
Implementation Period	Implementation shall be coordinated development policy of weather monitoring in RMRJ.
ITS Service Packages Reference No.	Part of ATIS01 (as terminator) MC03,04,06,07 and 11
Remarks	C-band radar is wide area for rainfall observation. X-band MP radar even tough observation area is narrower than C-band radar but can detect rain fall condition more precisely. In addition, X-band radar can information delivery cycle is 1min.

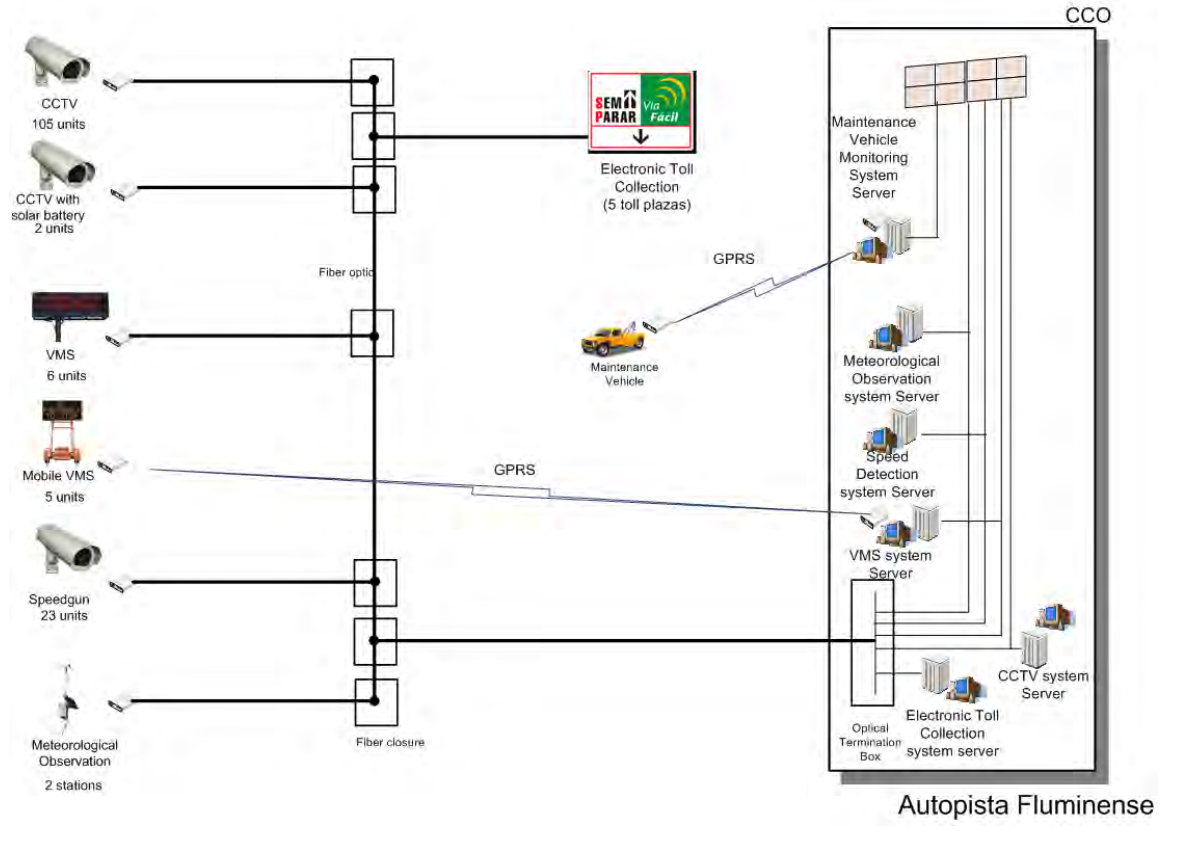


2. EXISTING SYSTEM EVALUATION

Existing System Evaluation

Name of Agency or Entity: Autopista Fuluminense 101 -Federal Road Operator(Concessionaire)-

System Diagram

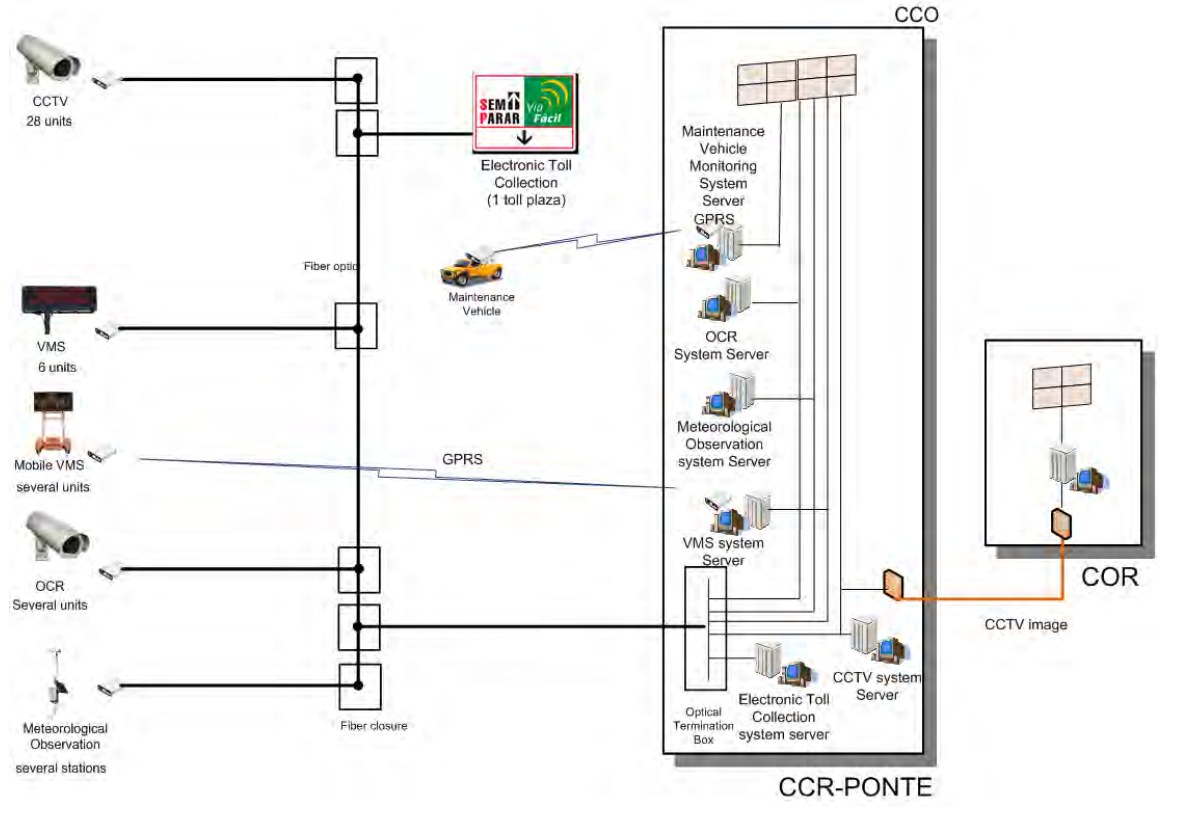


System Composition	1. CCTV Traffic Metering 2. VMS Information Provision 3. Speed Monitoring 4. Maintained Vehicle Monitoring	5. ETC
Equipment	CCTV;107 VMS; 6 mVMS;5 MO;2 GPS; each vehicle	Speed Radar;23 ETC gate;5
Inter-Connecting Other Systems	-CCTV data is transmitted to Autopista (Spain) occasionally.	
Communication Network	Fiber Optic, GPRS, DSRC	
Keys for Further Development	-Information exchange shall be commenced between road operators such as federal, state, municipality and other concessionaires. - More traffic related Information shall be metered, collected and disseminated to road users.	
Keywords	INFORMATION EXCHANGE, METERING, DISSEMINATION	

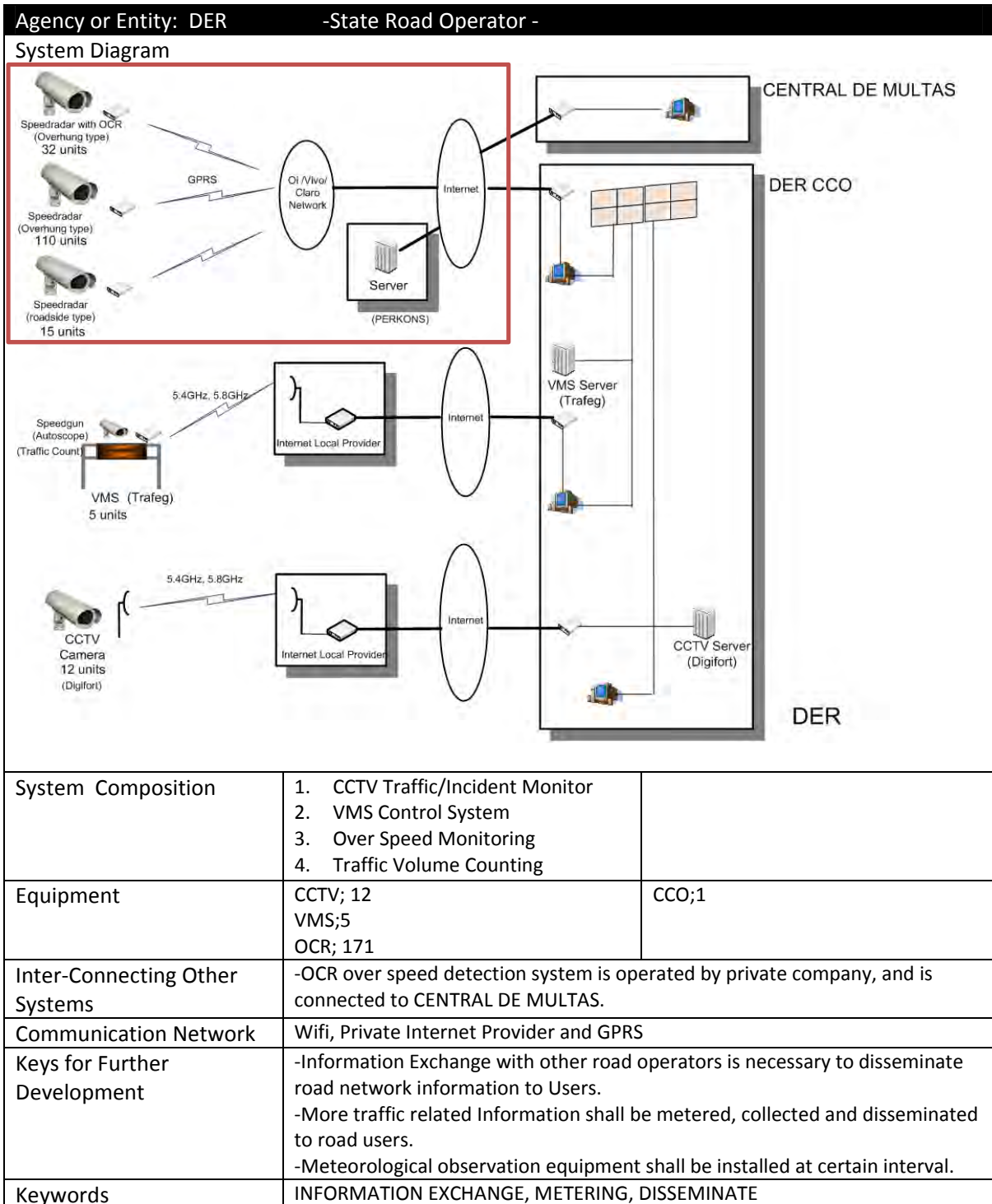
Existing System Evaluation

Name of Agency or Entity: CCR PONTE -Federal Road Operator(Concessionaire)-

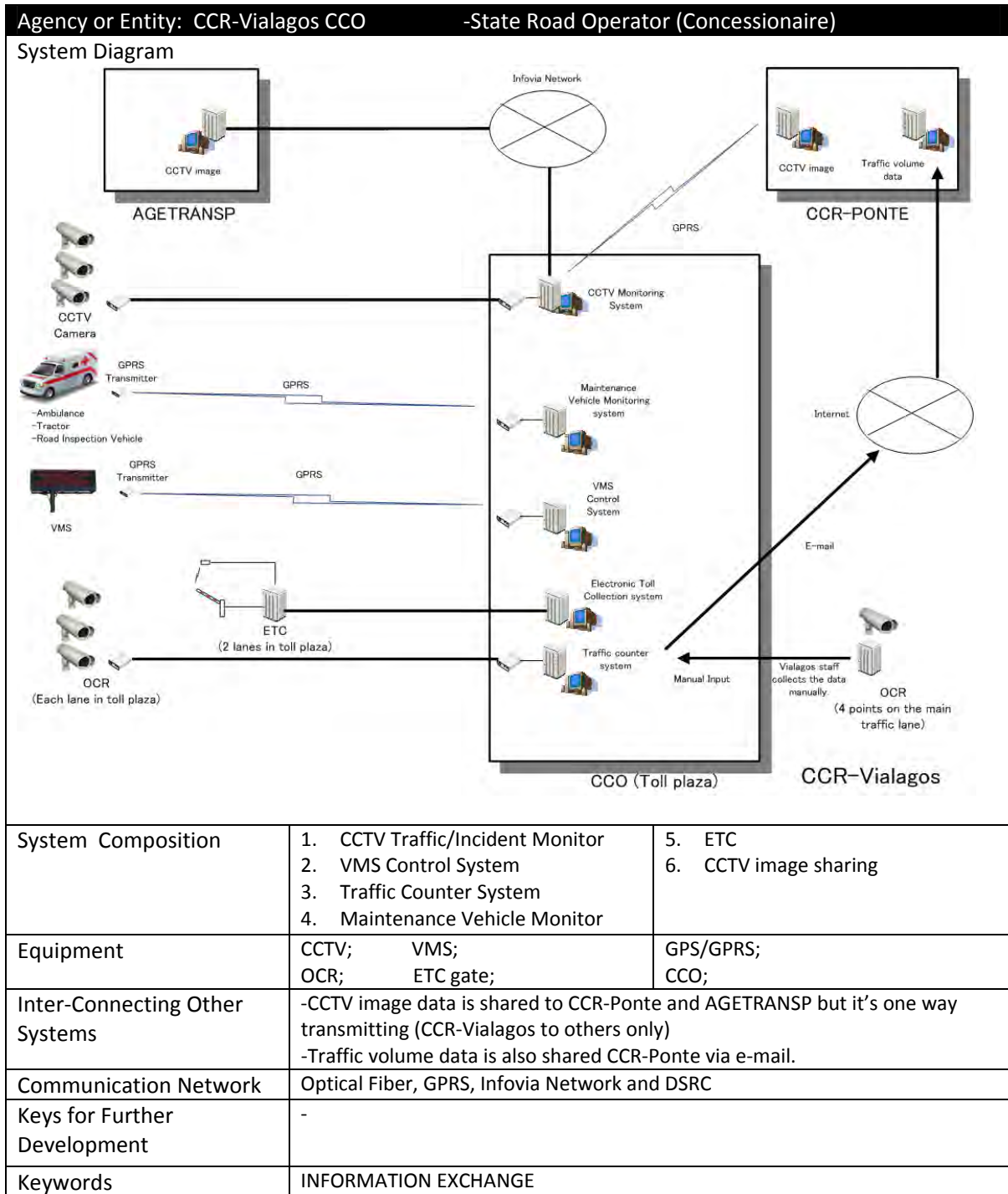
System Diagram



System Composition	1. CCTV Traffic Metering 2. VMS Information Provision 3. Speed Monitoring 4. Maintained Vehicle Monitoring	5. ETC
Equipment	CCTV; 28 VMS; 6 mVMS; some MO; several GPS; each vehicle	Speed Radar; ETC gate;2
Inter-Connecting Other Systems	-CCTV data is transmitted to COR.	
Communication Network	Fiber Optic, GPRS, DSRC	
Keys for Further Development	-Information exchange shall be commenced between road operators such as federal, state, municipality and other concessionaires. - More traffic related Information shall be metered, collected and disseminated to road users.	
Keywords	INFORMATION EXCHANGE, METERING, DISSEMINATION	

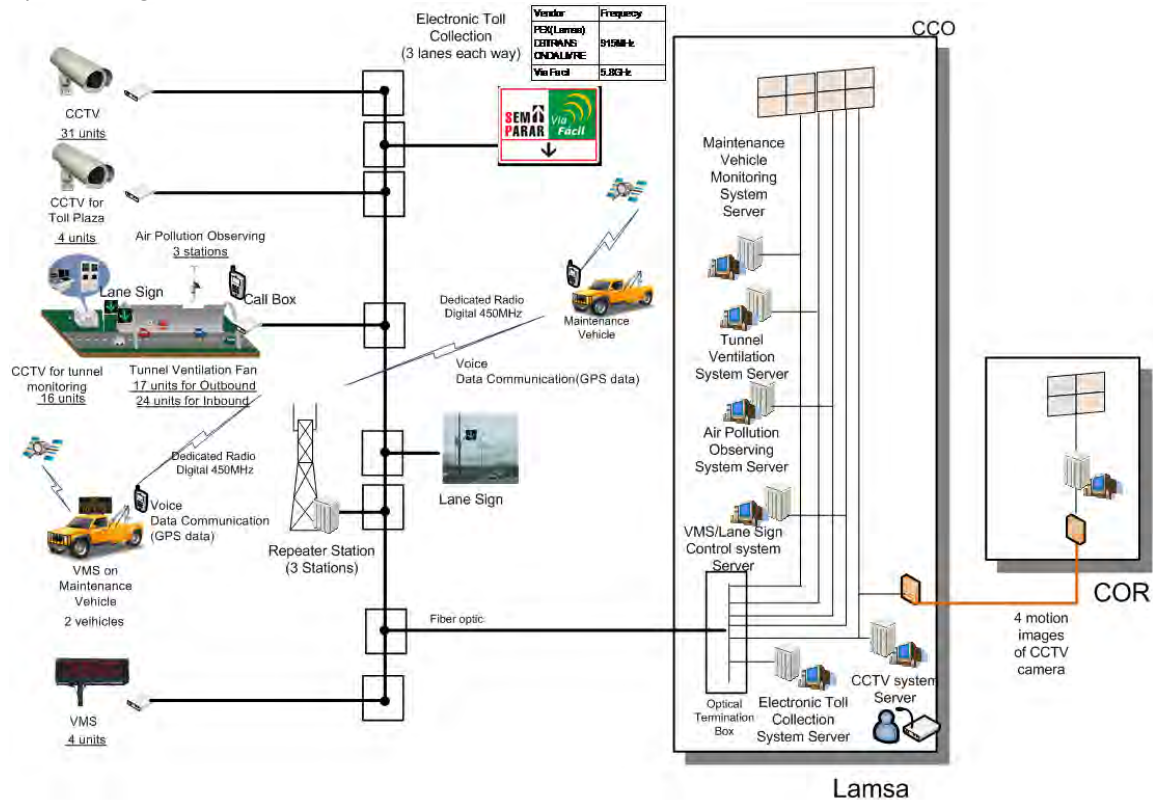


Existing System Evaluation



Agency or Entity: CCR-Vialagos CCO -State Road Operator (Concessionaire)

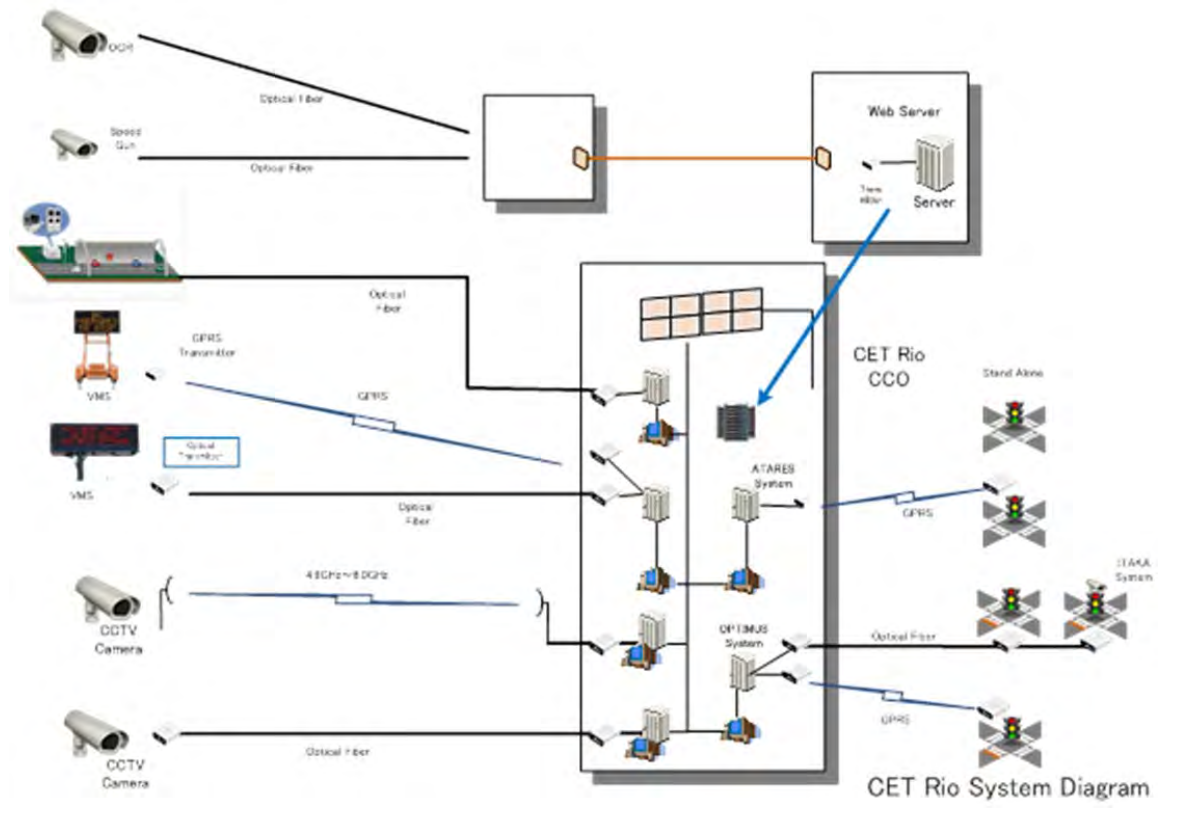
System Diagram



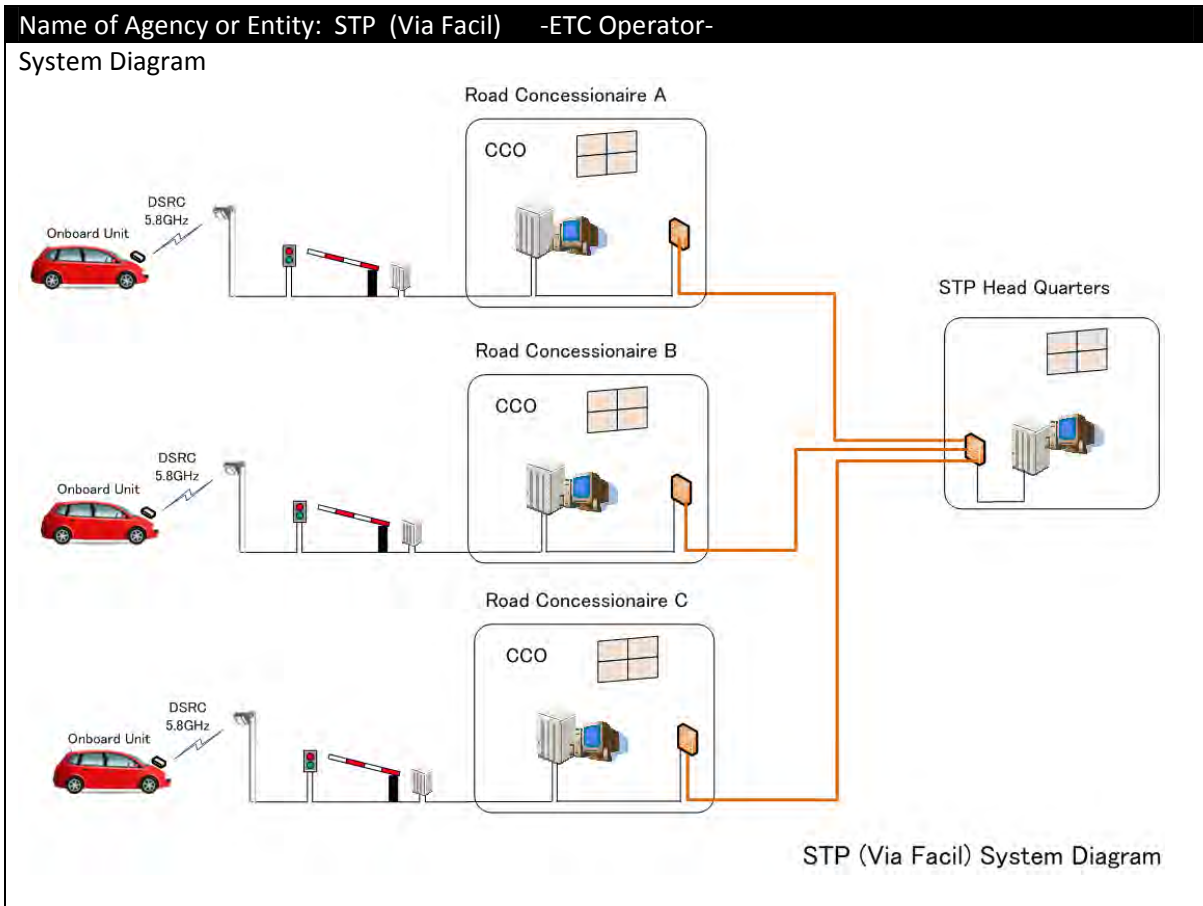
System Composition	1. CCTV Traffic/Incident Monitor 2. VMS Control System 3. Maintenance Vehicle Monitor 4. Arrow Signal System	5. ETC 6. CCTV image sharing
Equipment	CCTV; 6 VMS; 3 OCR; 5 ETC gate; 1 lane each way	GPS/GPRS; each vehicle CCR; 1
Inter-Connecting Other Systems	-4 CCTVs image data is shared to COR	
Communication Network	Optical Fiber, GPRS	
Keys for Further Development	-Important road information such as Av. Brazil which is connected to LAMSA shall exchange for road users and their effective maintenance operation -Traffic volume monitoring is important to maintain important road infrastructure such as Raised Road and Tunnel. Especially Raised Road proper maintenance and monitoring is needed to prevent salt erosion.	
Keywords	INFORMATION EXCHANGE, TRAFFIC METERING, MAINTENANCE/ INFRASTRUCTURE MONITORING,	

Name of Agency or Entity: CET-Rio CCO -Municipality Road Operator-

System Diagram



System Composition	<ol style="list-style-type: none"> 1. CCTV Traffic Metering 2. Signals 3. VMS Information Provision 4. Speed Radar and OCR 	<ol style="list-style-type: none"> 5. Tunnel Monitoring(CCTV Incident Detection, Arrow Signals) 6. CET-Rio CCO
Equipment	CCTV; 705 VMS;34 mVMS;14 Signals;2265	Speed Radar;387
Inter-Connecting Other Systems	This CCO is Located in COR. Physically gathered but not Integrated. Systems in CCO are respectively developed. Each system is independent.	
Communication Network	Optical Fiber, Wimax and GPRS	
Keys for Further Development	<ul style="list-style-type: none"> -CCO shall be integrated other road operators (Federal, State and concessionaires), transit operators for cooperating land transport. -Expand a function of traffic/transport and transit information dissemination via broad casting FM or other media. -Dedicated short range communication also shall be utilized for information dissemination, traffic demand management etc. 	
Keywords	INTEGRATION, COOPERATION, DISSEMINATION	

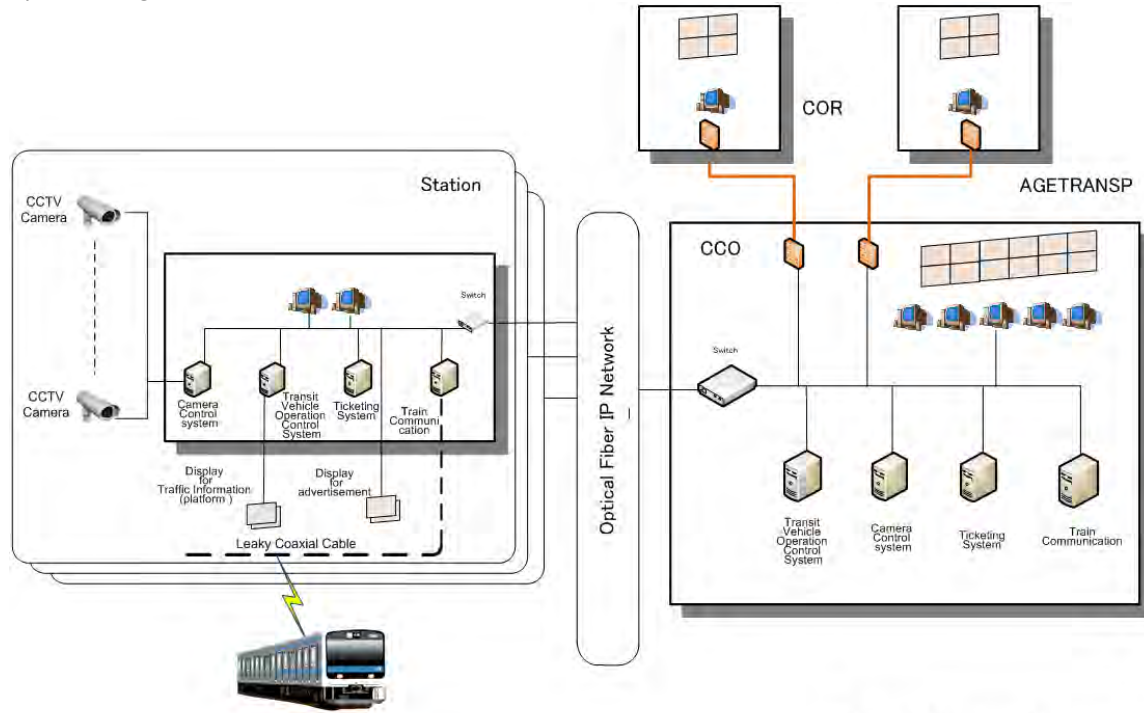


System Composition	1. Electric Payment System Via DSRC	
Equipment	-DSRC 5.8 Passive Antenna -OBU(Rental) -Signal	-Gate Pole -Data Server
Inter-Connecting Other Systems	-This system is connected from road concessionaire roadway to STP headquarters to verify electronic payment	
Communication Network	Fiber Optic, DSRC	
Keys for Further Development	<ul style="list-style-type: none"> -OBU rental system might be obstruction to spread ETC OBU -It is an one piece type of OBU which can be only dedicated for electric payment and has no room for functional expansion -Two piece OBU unit shall disseminate for further development to integrate electric payment system. -Active DSRC shall be installed for security and further development 	
Keywords	DISSEMINATION RATE OF OBU/ETC, TWO PIECE ON-BOARD UNIT, FUNCTIONAL EXPANSION , ACTIVE DSRC	

Existing System Evaluation

Name of Agency or Entity: METRO -Subway Operator (Concessionaire)-

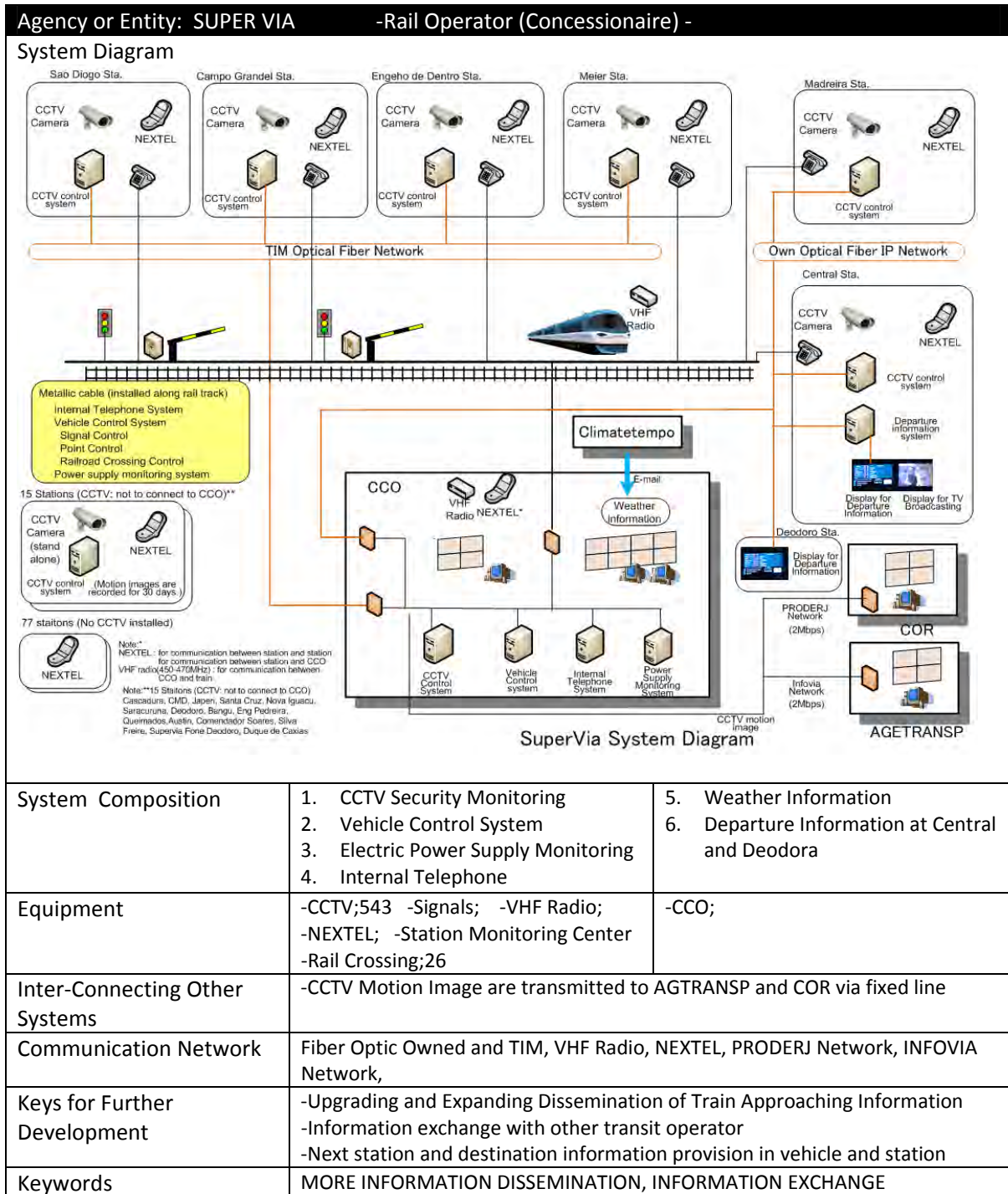
System Diagram

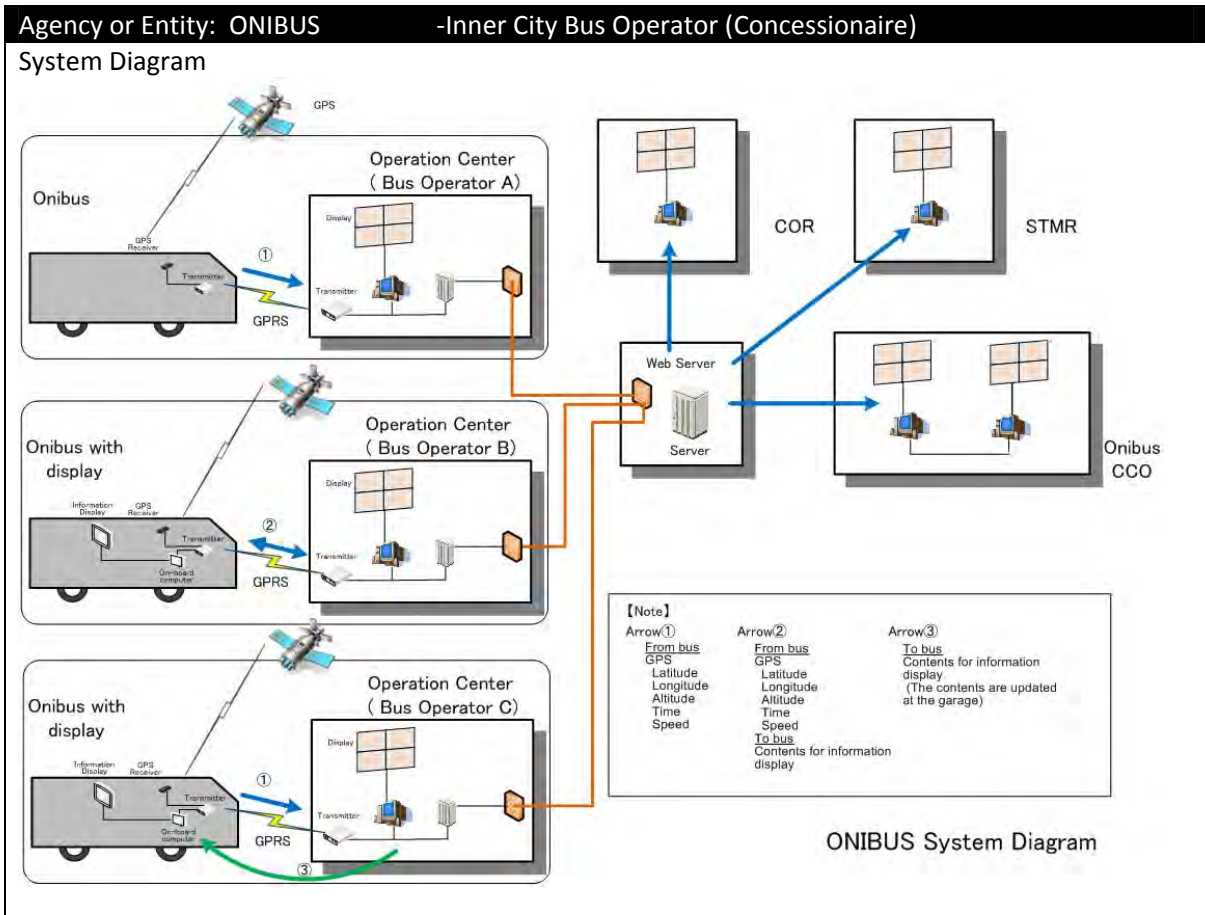


METRO System Diagram

System Composition	<ol style="list-style-type: none"> 1. CCTV Security Monitoring 2. Transit Vehicle Operation and Control 3. Ticketing System 	<ol style="list-style-type: none"> 4. Train Communication 5. Train Approaching Information Provision 6. Ads Dissemination
Equipment	CCTV;1050(Average30/station) VMS; Ticketing Machine; each station Sub Control Center; each station	CCO;1
Inter-Connecting Other Systems	-CCTV image data is shared to COR and AGETRANSP	
Communication Network	Fiber Optic,	
Keys for Further Development	-More information dissemination like train approaching information each station, other mode connect information for transit users. -Information exchange to other transit operator	
Keywords	-INFORMATION DISSEMINATION, EXCHANGE	

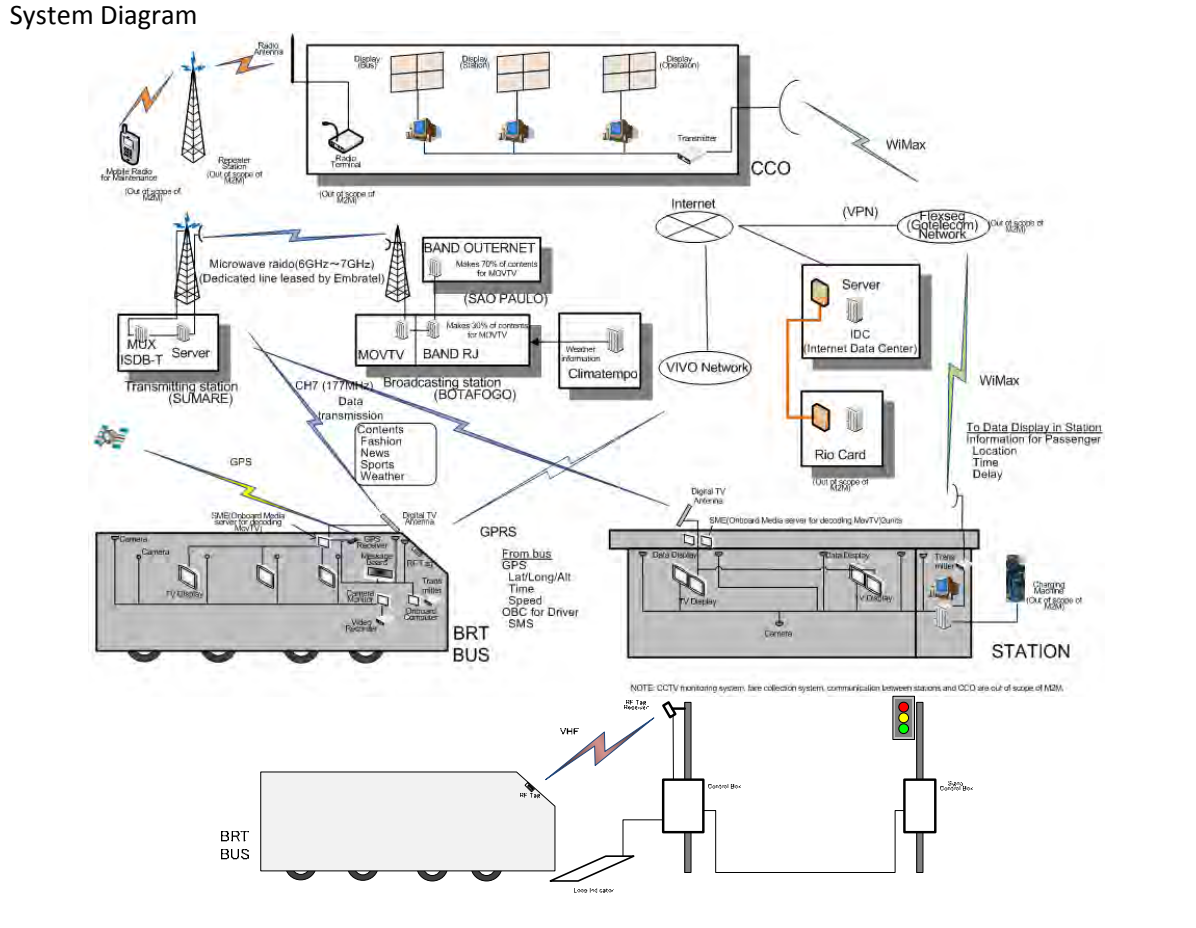
Existing System Evaluation





System Composition	1. Transit Vehicle Tracking 2. OBU Transit Vehicle Monitoring	3. In-Vehicle Display Information Dissemination 4. Transit Operation Control
Equipment	Bus -On-Board Computer -GPS	-Display -RFID Reader Writer CCO
Inter-Connecting Other Systems	-Bus positioning data is transmitted to SMTR, COR The Data Server is located in U.S. and is supervised by system developer	
Communication Network	GPRS, Fixed line	
Keys for Further Development	-Next Bus information shall provisioned at important bus stops -Next Bus stop information and area related information shall be provisioned in Bus -Passenger counting also important for users to avoid congested vehicles -More effective fleet management system shall be deployed to avoid making traffic jam caused buses - V to V communication would be important to achieve more smooth traffic -Information exchange for supporting user travel is needed	
Keywords	MORE EFFECTIVE INFORMATION PROVISION, FLEET MANAGEMENT, INFORMATION EXCHANGE	

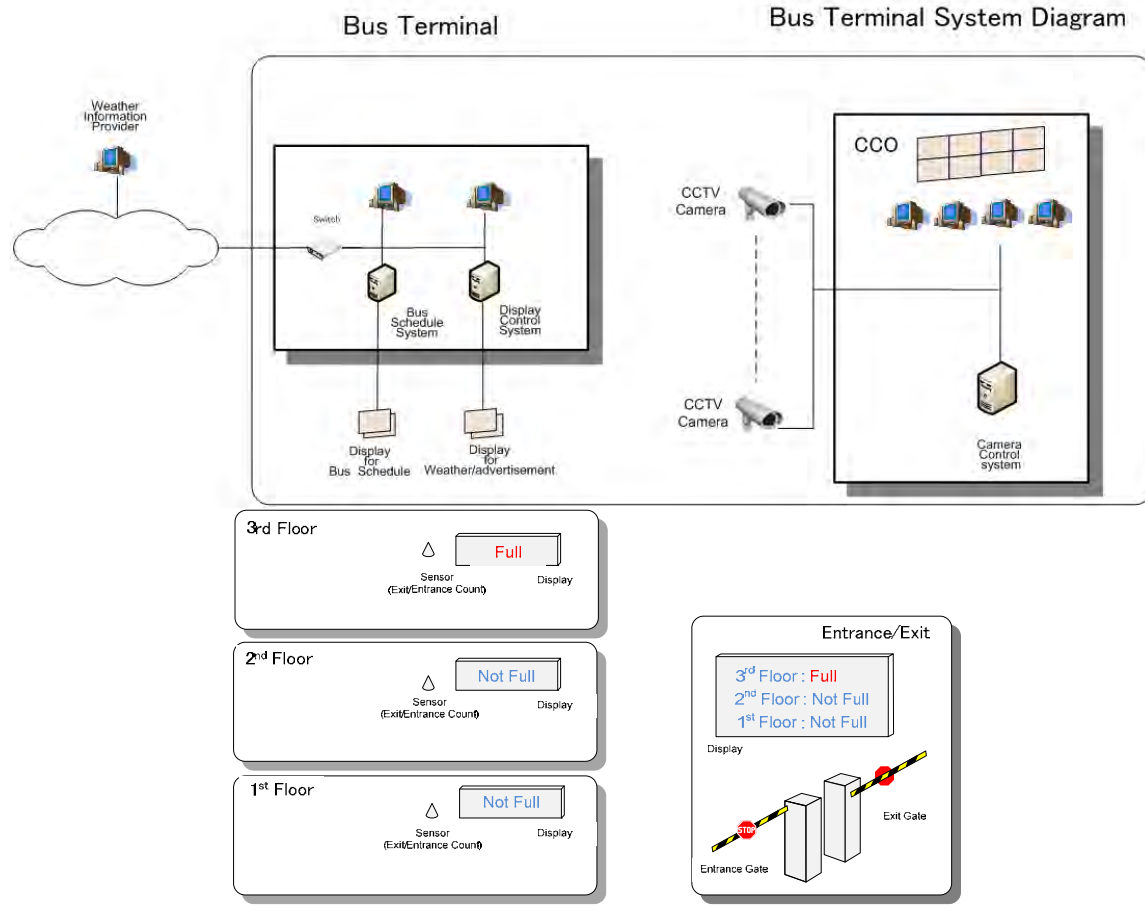
Name of Agency or Entity: BRT RIO ONIBUS - BRT Operator (Concessionaire)-



System Composition	<ol style="list-style-type: none"> 1. Vehicle Tracking System 2. Transit Operation and Management 3. Electric Ticketing System 4. BRT Approaching Information 5. Security Monitoring in Bus 	<ol style="list-style-type: none"> 6. BRT Priority Signal 7. On Board Computer for Communication with Driver and CCO 8. Radio Communication for Maintenance Vehicles
Equipment	Station IC-Card Charging, -Display	BUS - Display; -GPS Receiver - CCTV - OBC -RF Tag - Road -RFID Reader/Writer Control Box Signal and Signal Control Box
Inter-Connecting Other Systems	It's connected to CET-Rio Signal to prioritize BRT by RFID tag but it is untouchable from BUS operator side.	
Communication Network	GPRS, Wimax, Internet Network Private Company, Digital Broad Casting	
Keys for Further Development	-System Integration with Municipality Road Operator (CET-Rio) -Travel Time Information for Destination shall be disseminated -Passenger Counting System shall be deployed for information dissemination -Other Transit Information shall be disseminated in the future	
Keywords	INTEGRATION, MORE INFORMATION, INFROMATION EXCHANGE	

Existing System Evaluation

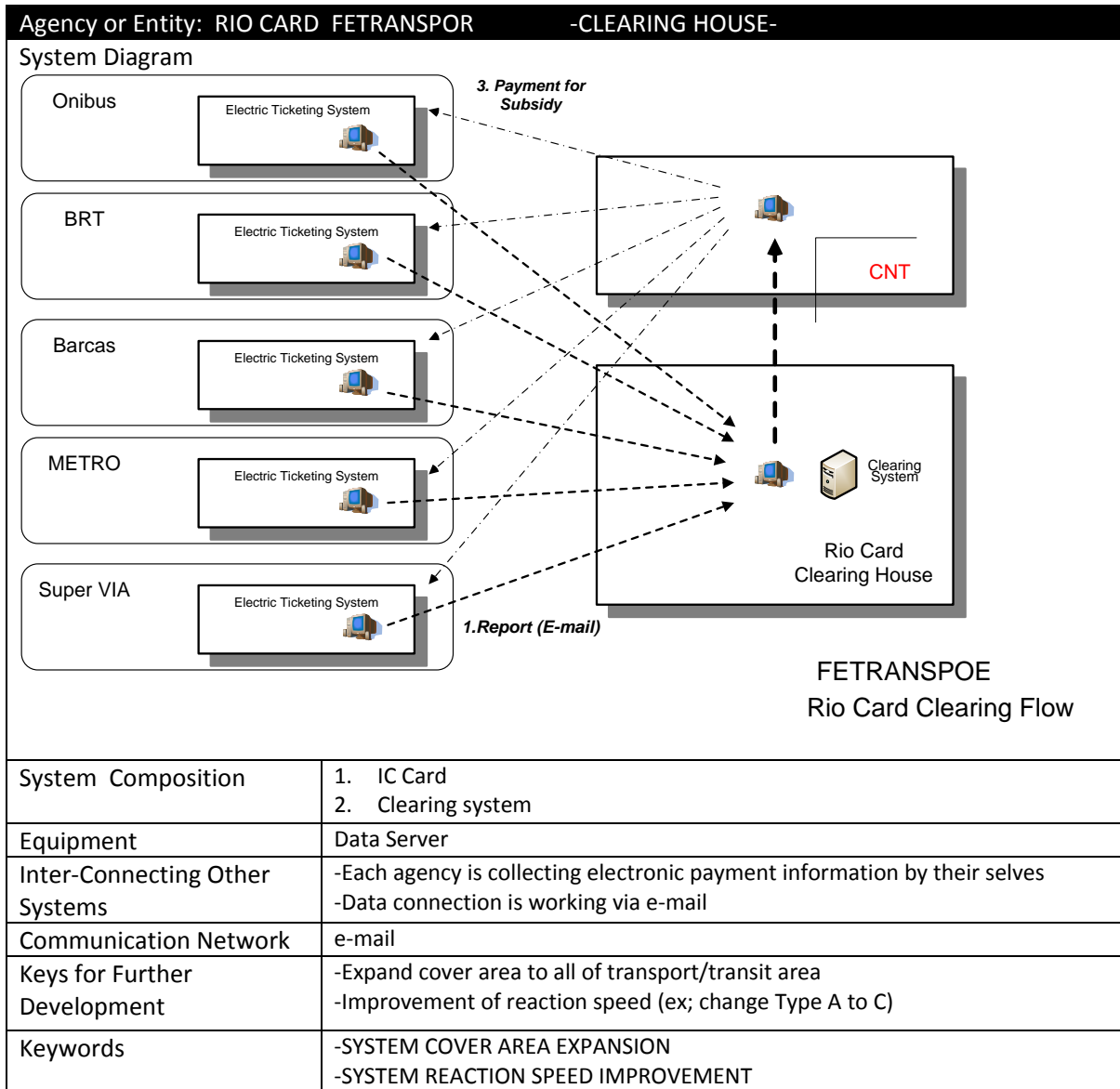
Agency or Entity: NOVO RIO SOCICAM -Inter City Inter State International BUS Terminal Concessionaire-
System Diagram



NOVO RIO Car Park System Diagram

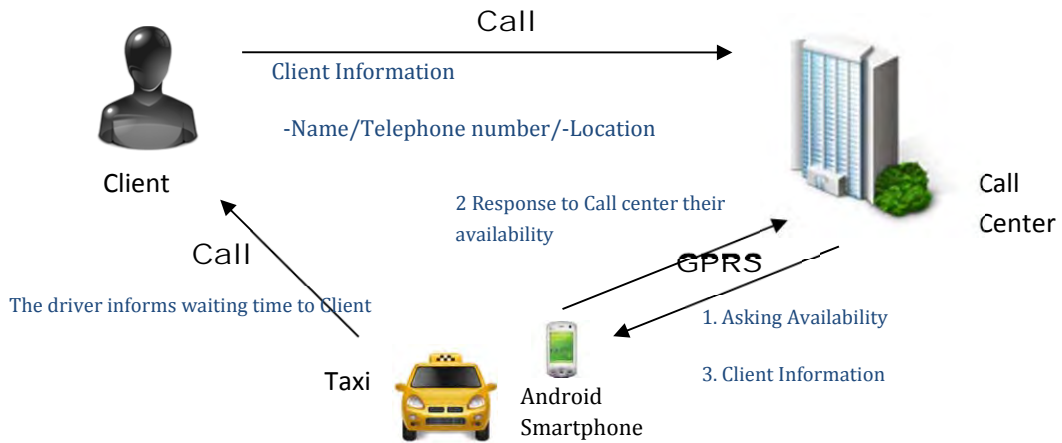
System Composition	1. Bus Terminal Security Monitoring 2. Parking System Management
Equipment	-CCTV;56 Display; CCO;1 -Parking Gate; VMS for Parking;
Inter-Connecting Other Systems	-Stand Alone
Communication Network	Fixed Line
Keys for Further Development	-Bus positioning information for provision of bus arrival -Electric Payment System via DSRC -Information exchange with other transit operator
Keywords	-VEHICLE TRACKING INFORMATION, ELECTRIC PAYMENT FOR PARKING, INFORMATION EXCHANGE

Existing System Evaluation



Agency or Entity: TAXI service in Rio de Janeiro Municipality -RADIO TAXI-

System Diagram



AUTOCAB is the system for android smartphone based automatically taxi dispatching system. Basic flow of the system is below;

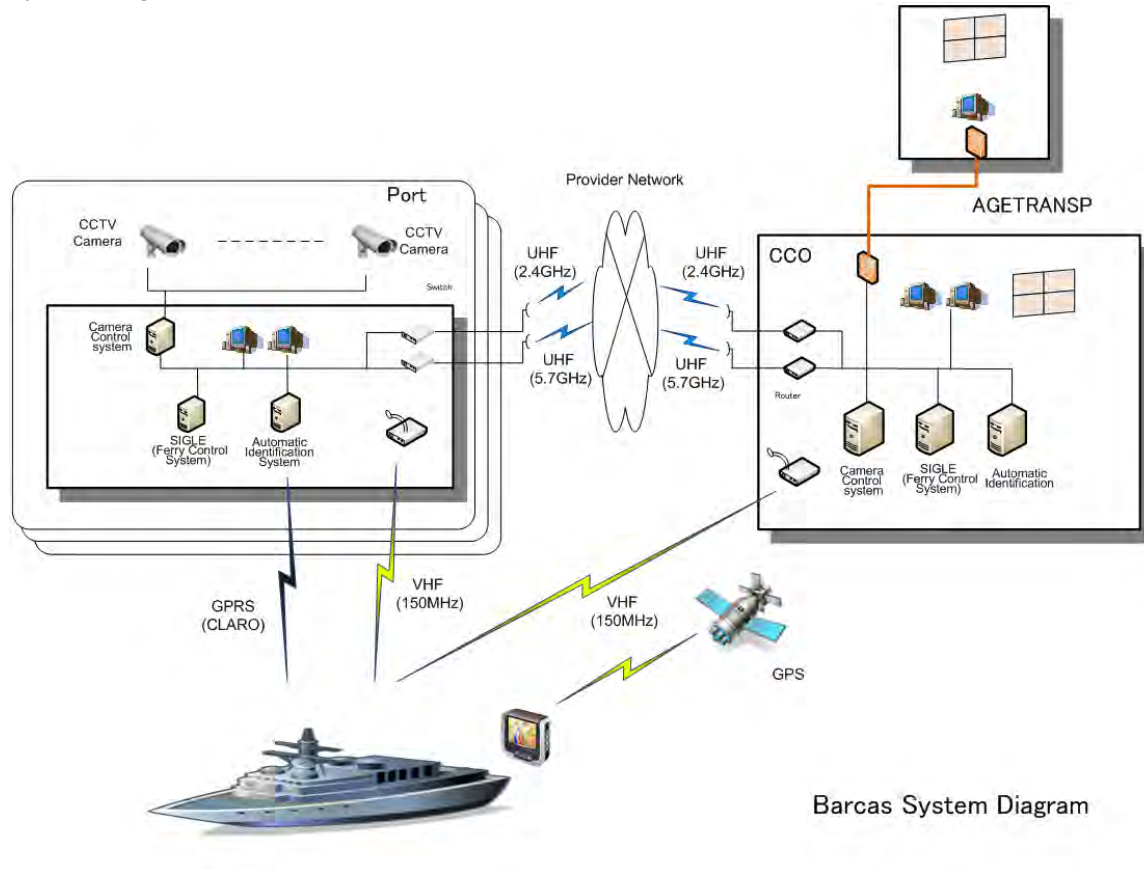
1. Client call to taxi with their location and call center input location information AUTO CAB system
2. Call Center asks availability of the nearest taxi from client via SMS automatically
3. Taxi driver respond to call center their availability, if yes; call center send client information to driver, if no; call center send a request to 2nd nearest taxi from client

Conceptual Diagram of Autocab Dispatching system

System Composition	1. Taxi Dispatching System
Equipment	-Android Smartphone; -Call Center -GPS data Server
Inter-Connecting Other Systems	None
Communication Network	GPRS
Keys for Further Development	-Data utilization for monitoring current road traffic condition
Keywords	-UTILIZATION

Agency or Entity: TAXI service in Rio de Janeiro Municipality -RADIO TAXI-

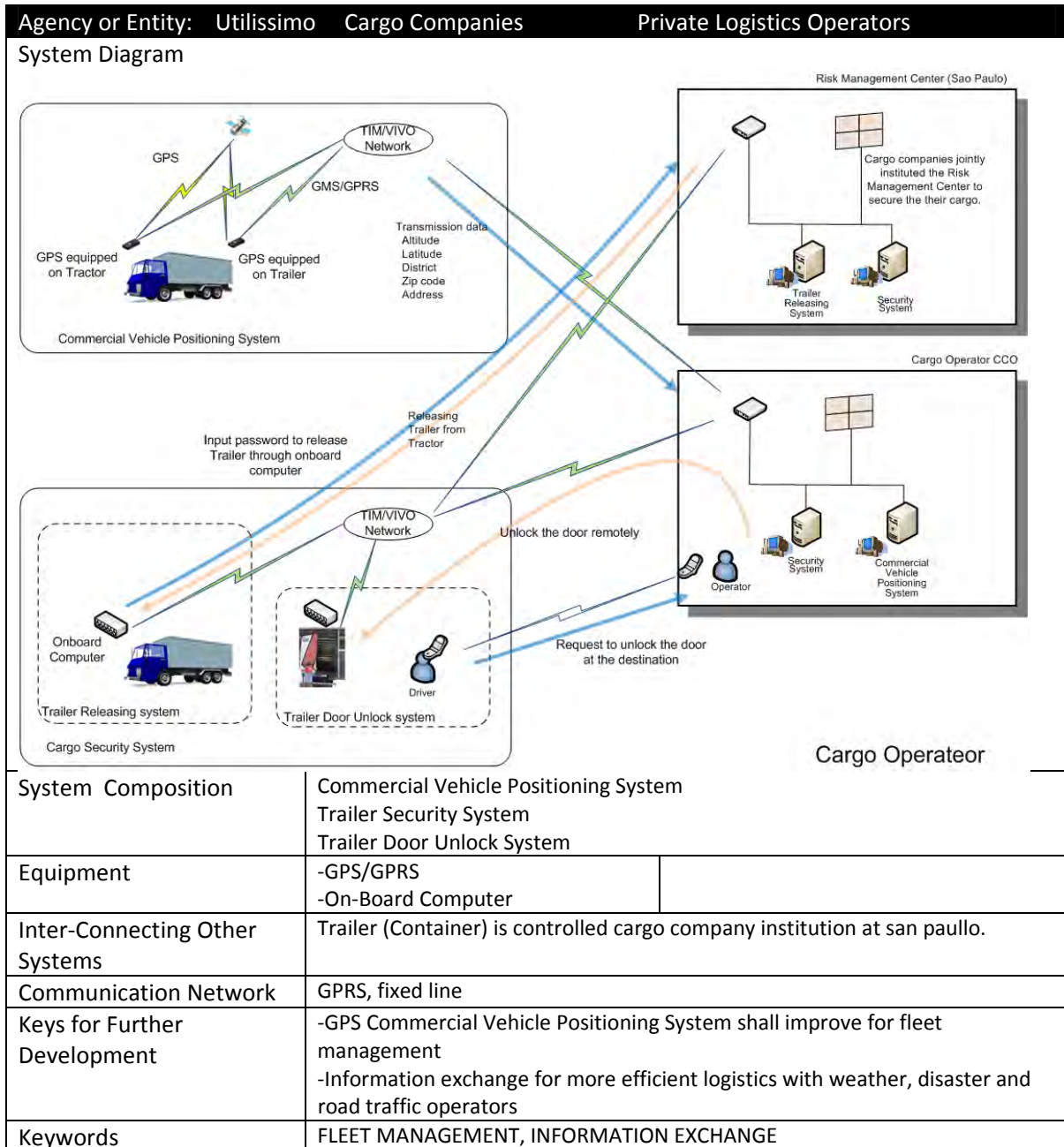
System Diagram



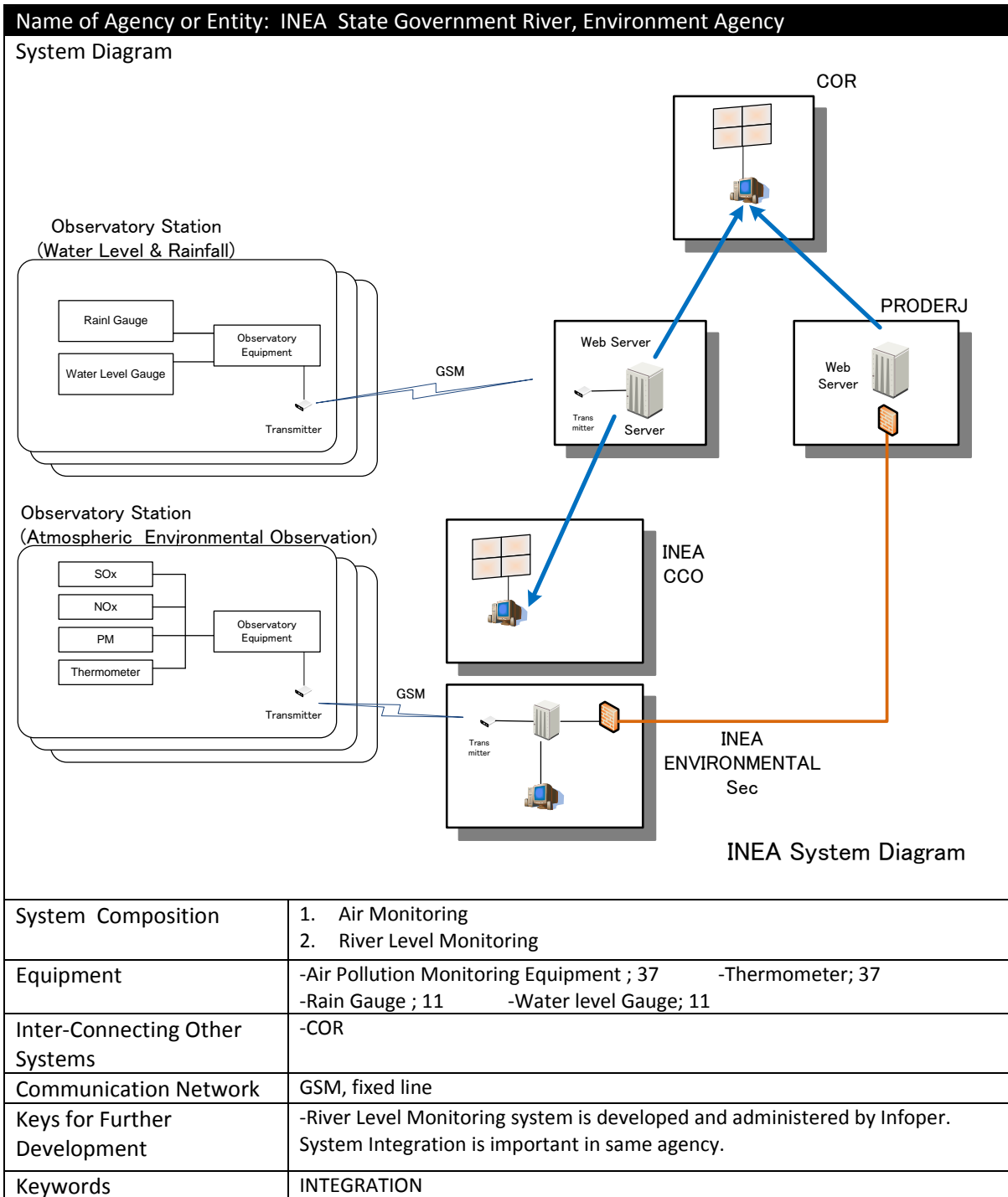
Barcas System Diagram

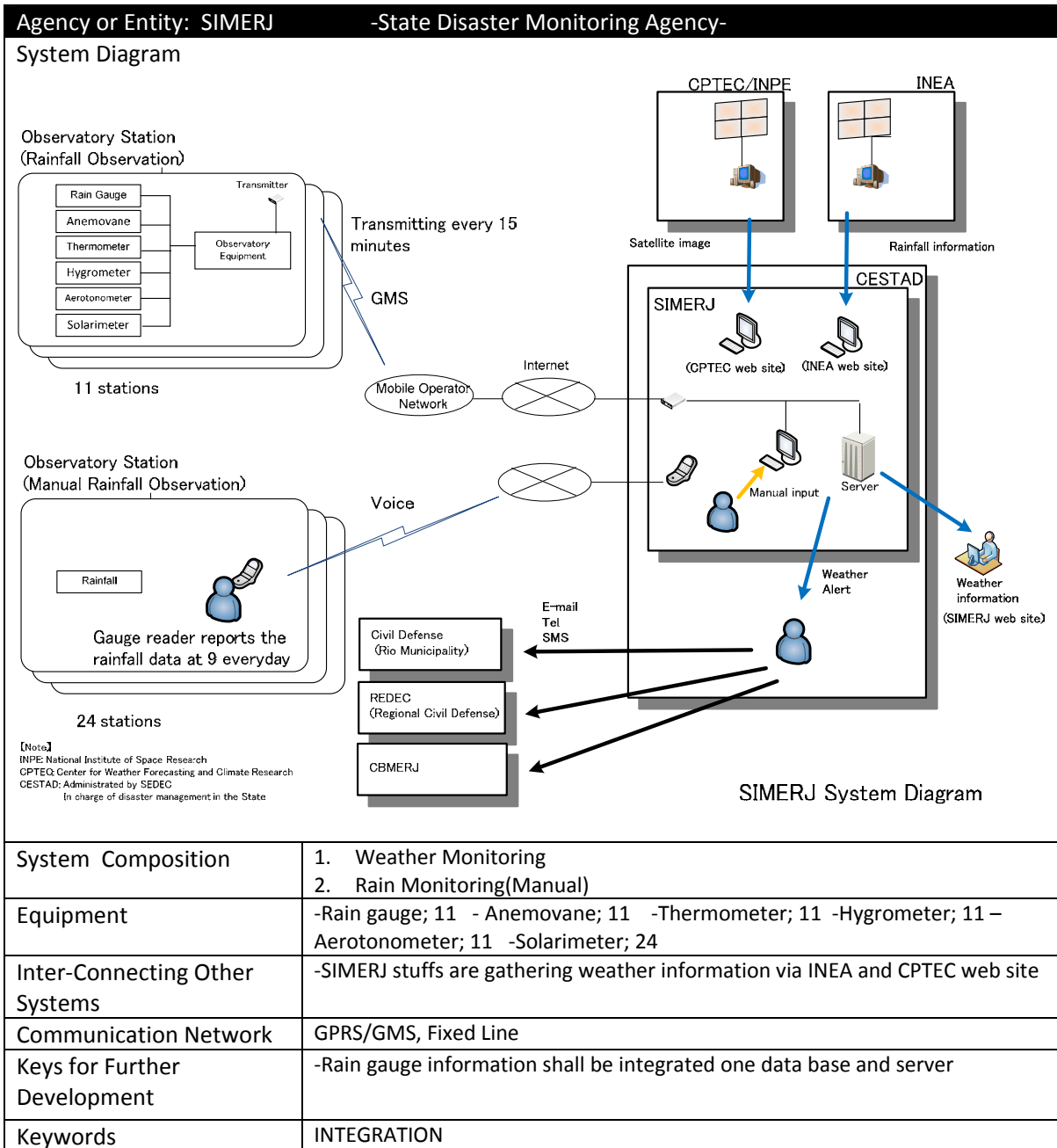
System Composition	Ferry Positioning/Collision Avoidance System	
Equipment	Ferry -GPS; each ferry -VHF Radio; each ferry	Port -CCTV; 157 -Electric Ticketing System; each port CCO;1
Inter-Connecting Other Systems	Location information and CCTV image are shared to AGETRANSP	
Communication Network	GPRS, VHF, UHF and Fixed Line	
Keys for Further Development	-Information provision to advantage of mass transit than private transport -Information exchange with CCR-PONTE to disseminate information for Niteroi Residential	
Keywords	INFORMATION PROVISION, INFORMATION EXCHANGE	

Existing System Evaluation

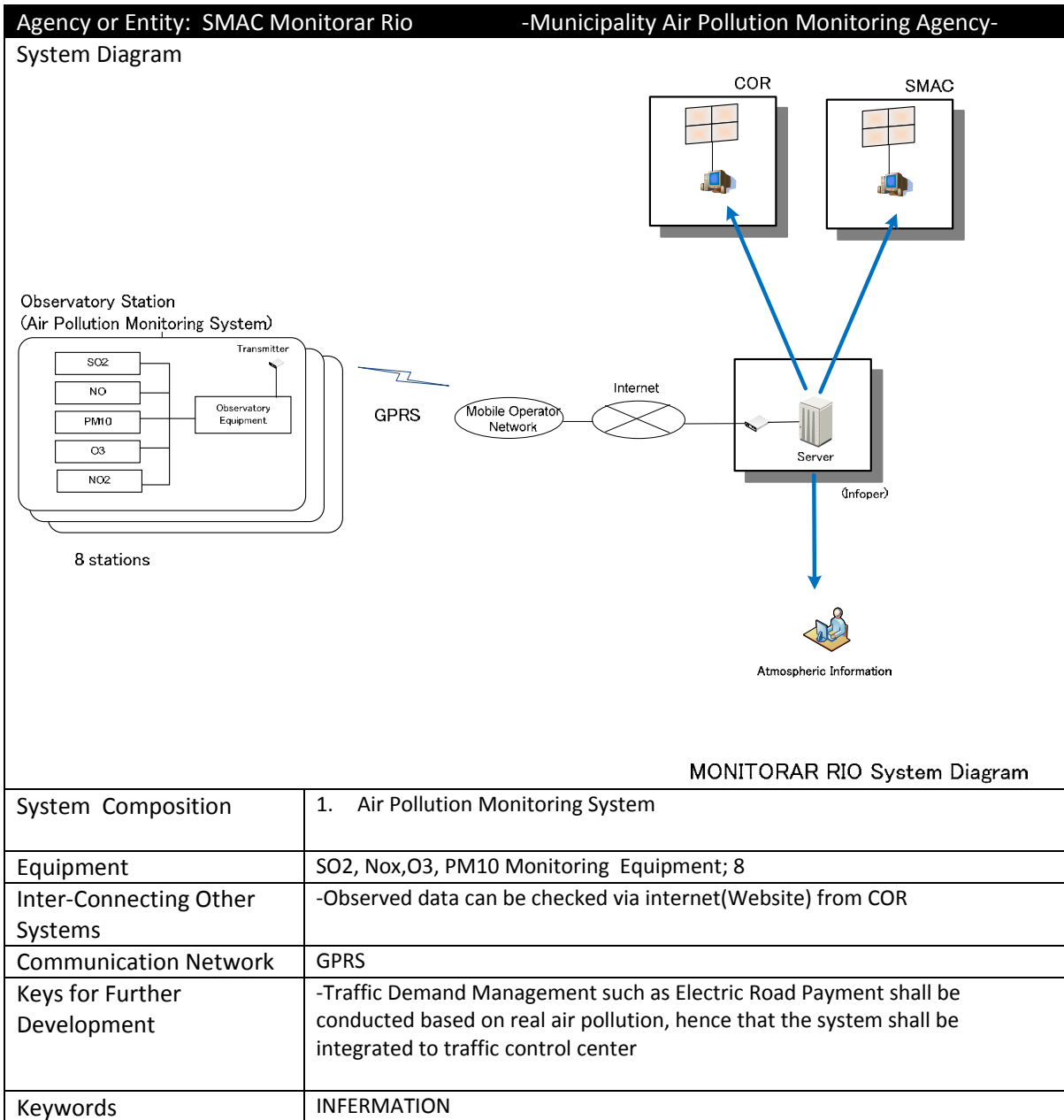


Existing System Evaluation

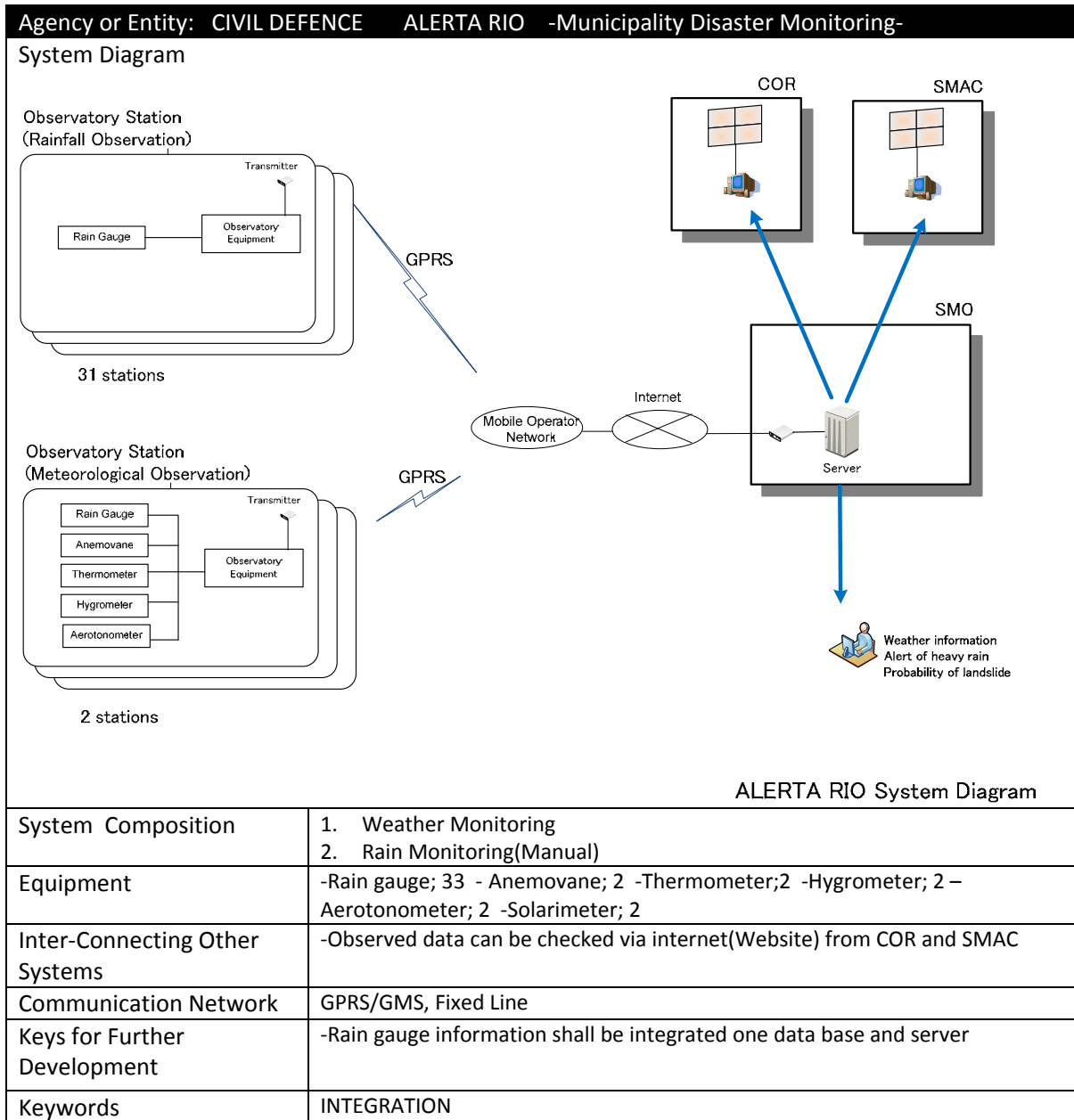




Existing System Evaluation

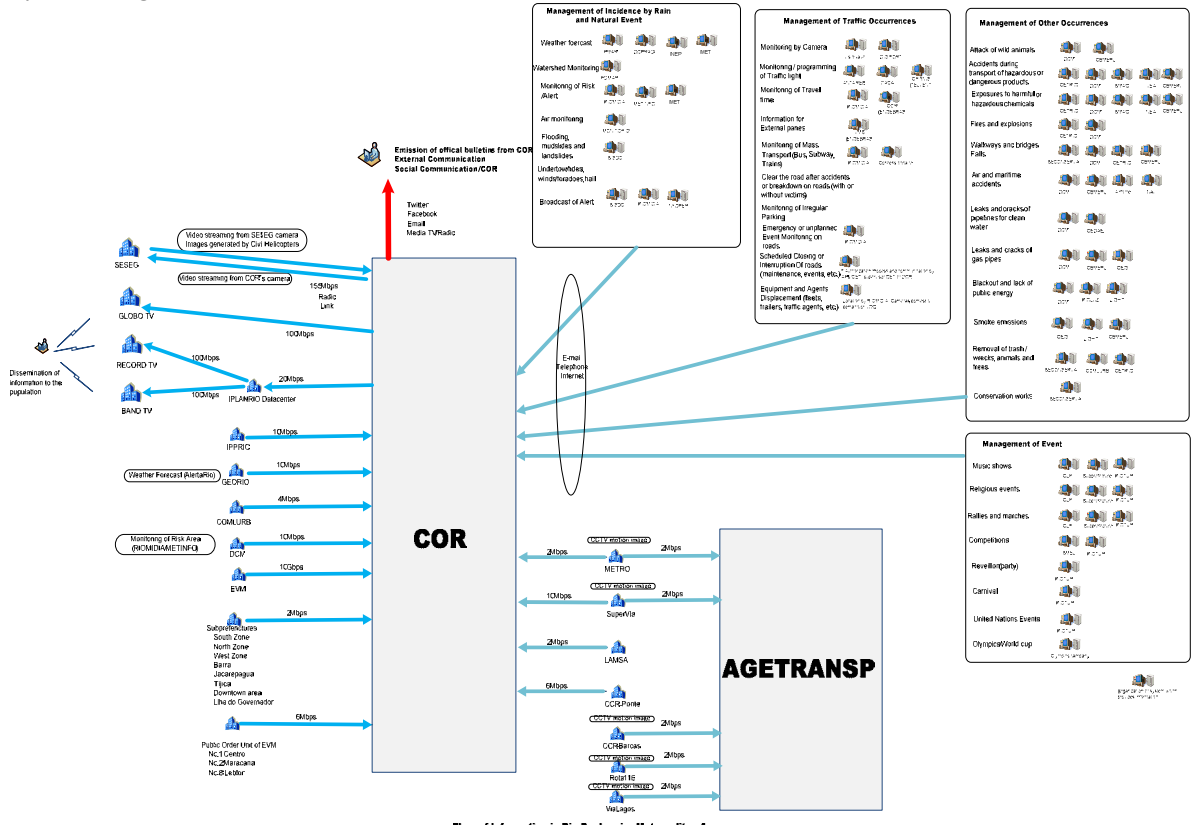


Existing System Evaluation



Name of Agency or Entity: COR Rio de Janeiro Municipality Control Center and AGETRANSP

System Diagram



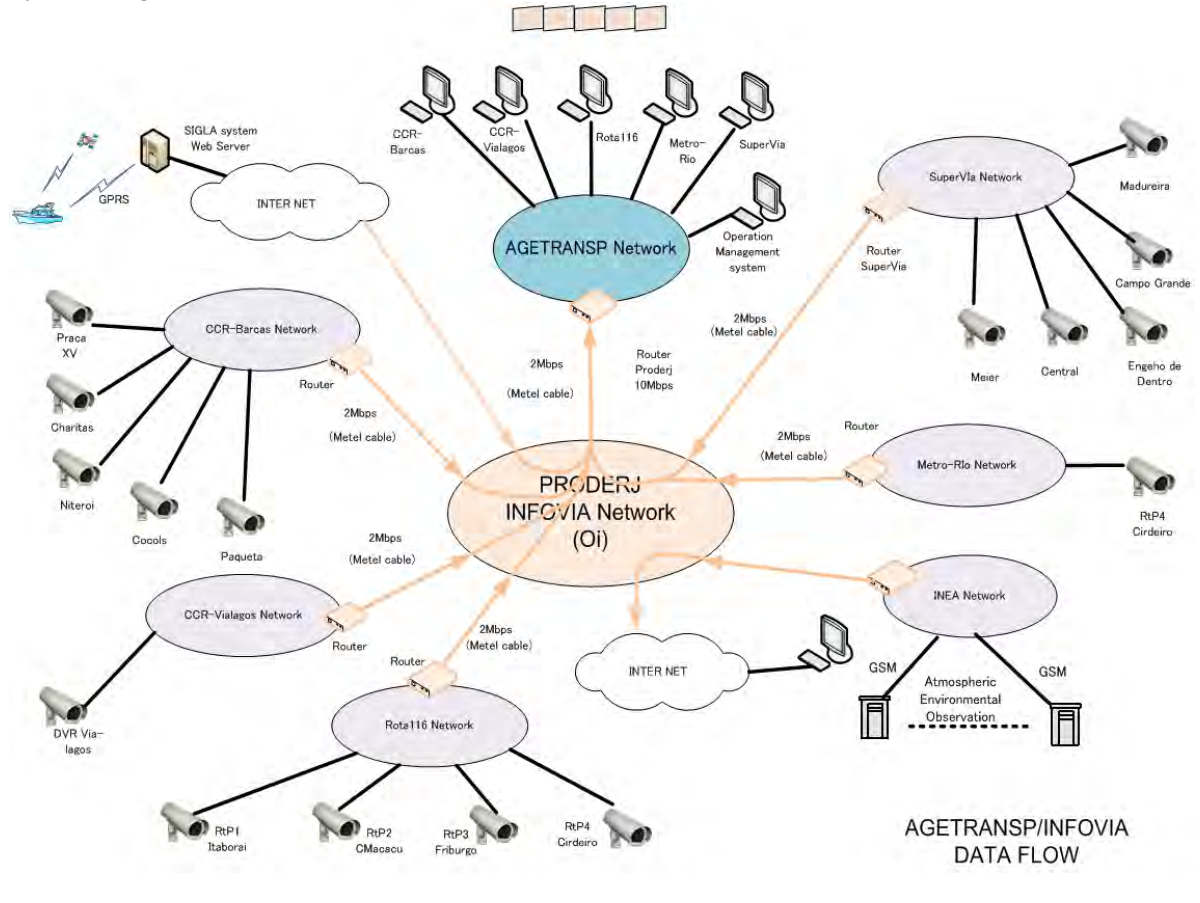
Flow of Information in Rio De Janeiro Metropolitan Area

System Composition	<ol style="list-style-type: none"> 1. Weather Forecasting System 2. Browser based Integration System 3. CCTV Information Exchange
Equipment	At COR -Display, Servers and Desktops
Inter-Connecting Other Systems	-Weather Monitoring Agencies Traffic Operator(CET-Rio) Traffic operators (CCTV only like CCR PONTE) -Transit Operators(CCTV only) - Media -Hazard Monitoring Agencies -Infrastructure Management and Monitoring Agencies
Communication Network	Fixed line, Internet, Cell Phone, e-mail
Keys for Further Development	-All data from agencies shall be integrated one place in the COR -Land Transport on the road such as Bus, Van and Taxi control shall be integrated. (Currently, Traffic Control System and Transit Control System are separated.) -Air pollution information can be utilized for TDM (ex; ERP)
Keywords	INTEGRATION, ITS DATABASE

Existing System Evaluation

Agency or Entity: AGETRANSP and PRODERJ NETWORK -State Concessionaire Monitoring-

System Diagram



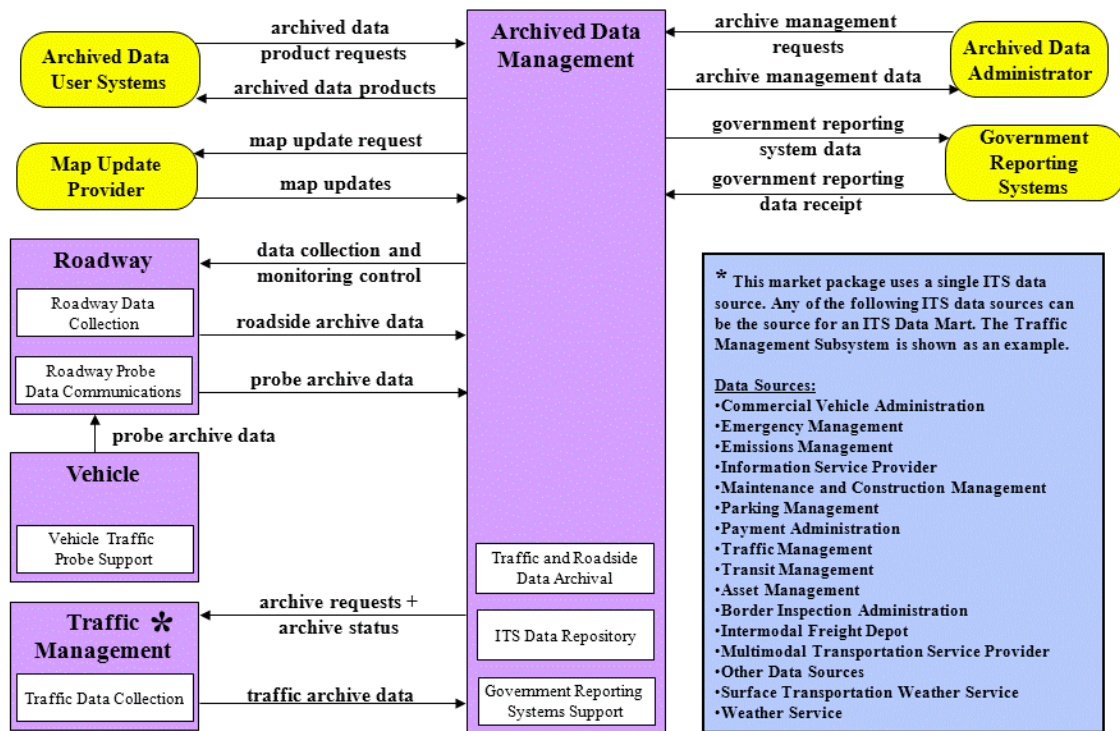
System Composition	1. Concessionaire Monitoring System
Equipment	-Display, Desktop
Inter-Connecting Other Systems	-INFOVIA NETWORK (Oi)
Communication Network	GPRS/GMS, Fixed Line
Keys for Further Development	-To monitor and supervise concessionaires effectively, quantitative indicators shall be gathered and checked automatically. *now under planning as SITRANS
Keywords	AUTOMATED CHECKING INDICATORS, INTEGRATION

3. SERVICE PACKAGES REFERENCE

Service Area	No.	Service Package	Service Package Name
Archived Data Management	1	AD1	ITS Data Mart
	2	AD2	ITS Data Warehouse
	3	AD3	ITS Virtual Data Warehouse
Public Transportation	4	APTS01	Transit Vehicle Tracking
	5	APTS02	Transit Fixed-Route Operations
	6	APTS03	Demand Response Transit Operations
	7	APTS04	Transit Fare Collection Management
	8	APTS05	Transit Security
	9	APTS06	Transit Fleet Management
	10	APTS07	Multi-modal Coordination
	11	APTS08	Transit Traveler Information
	12	APTS09	Transit Signal Priority
	13	APTS10	Transit Passenger Counting
	14	APTS11	Multimodal Connection Protection
Travel Information	15	ATIS01	Broadcast Traveler Information
	16	ATIS02	Interactive Traveler Information
	17	ATIS03	Autonomous Route Guidance
	18	ATIS04	Dynamic Route Guidance
	19	ATIS05	ISP Based Trip Planning and Route Guidance
	20	ATIS06	Transportation Operations Data Sharing
	21	ATIS07	Travel Services Information and Reservation
	22	ATIS08	Dynamic Ridesharing
	23	ATIS09	In Vehicle Signing
	24	ATIS10	Short Range Communications Traveler Information
Traffic Management	25	ATMS01	Network Surveillance
	26	ATMS02	Traffic Probe Surveillance
	27	ATMS03	Traffic Signal Control
	28	ATMS04	Traffic Metering
	29	ATMS05	HOV Lane Management
	30	ATMS06	Traffic Information Dissemination
	31	ATMS07	Regional Traffic Management
	32	ATMS08	Traffic Incident Management System
	33	ATMS09	Transportation Decision Support and Demand Management
	34	ATMS10	Electronic Toll Collection
	35	ATMS11	Emissions Monitoring and Management
	36	ATMS12	Roadside Lighting System Control
	37	ATMS13	Standard Railroad Grade Crossing
	38	ATMS14	Advanced Railroad Grade Crossing
	39	ATMS15	Railroad Operations Coordination
	40	ATMS16	Parking Facility Management
	41	ATMS17	Regional Parking Management
	42	ATMS18	Reversible Lane Management
	43	ATMS19	Speed Warning and Enforcement
	44	ATMS20	Drawbridge Management
	45	ATMS21	Roadway Closure Management
	46	ATMS22	Variable Speed Limits
	47	ATMS23	Dynamic Lane Management and Shoulder Use
	48	ATMS24	Dynamic Roadway Warning
	49	ATMS25	VMT Road User Payment
	50	ATMS26	Mixed Use Warning Systems

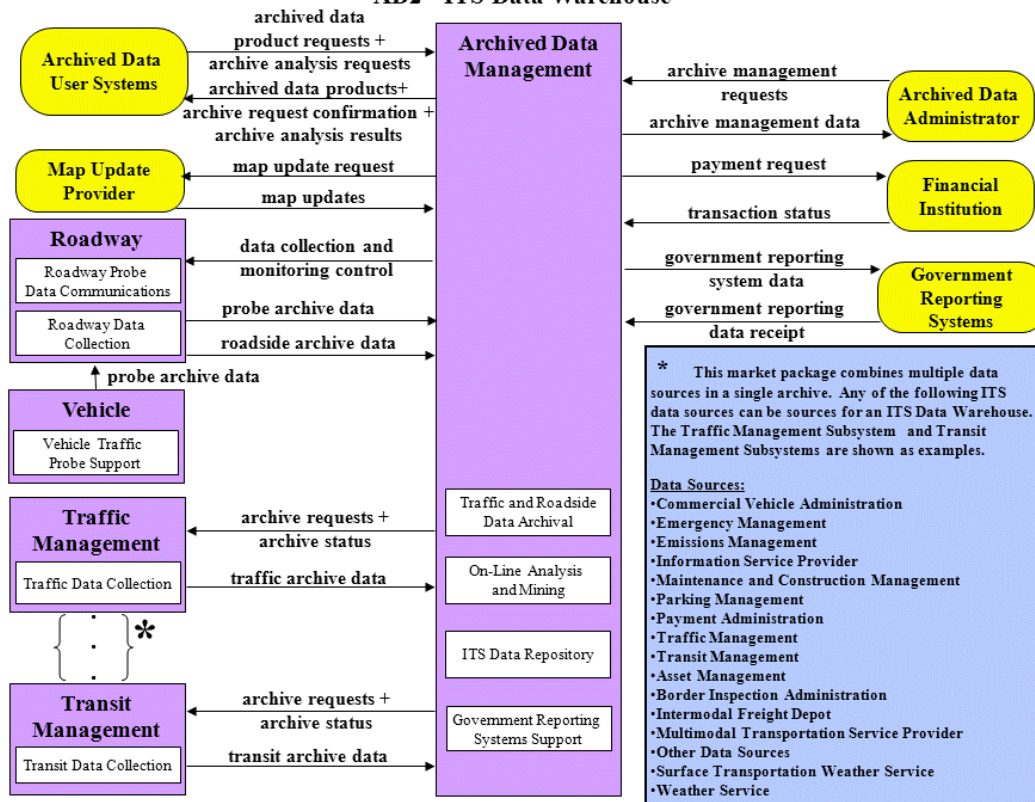
Service Area	No.	Service Package	Service Package Name
Vehicle Safety	51	AVSS01	Vehicle Safety Monitoring
	52	AVSS02	Driver Safety Monitoring
	53	AVSS03	Longitudinal Safety Warning
	54	AVSS04	Lateral Safety Warning
	55	AVSS05	Intersection Safety Warning
	56	AVSS06	Pre-Crash Restraint Deployment
	57	AVSS07	Driver Visibility Improvement
	58	AVSS08	Advanced Vehicle Longitudinal Control
	59	AVSS09	Advanced Vehicle Lateral Control
	60	AVSS10	Intersection Collision Avoidance
	61	AVSS11	Automated Vehicle Operations
	62	AVSS12	Cooperative Vehicle Safety Systems
Commercial Vehicle Operations	63	CVO01	Carrier Operations and Fleet Management
	64	CVO02	Freight Administration
	65	CVO03	Electronic Clearance
	66	CVO04	CV Administrative Processes
	67	CVO05	International Border Electronic Clearance
	68	CVO06	Weigh-In-Motion
	69	CVO07	Roadside CVO Safety
	70	CVO08	On-board CVO Safety
	71	CVO09	CVO Fleet Maintenance
	72	CVO10	HAZMAT Management
	73	CVO11	Roadside HAZMAT Security Detection and Mitigation
	74	CVO12	CV Driver Security Authentication
	75	CVO13	Freight Assignment Tracking
Emergency Management	76	EM01	Emergency Call-Taking and Dispatch
	77	EM02	Emergency Routing
	78	EM03	Mayday and Alarms Support
	79	EM04	Roadway Service Patrols
	80	EM05	Transportation Infrastructure Protection
	81	EM06	Wide-Area Alert
	82	EM07	Early Warning System
	83	EM08	Disaster Response and Recovery
	84	EM09	Evacuation and Reentry Management
	85	EM10	Disaster Traveler Information
Maintenance & Construction Management	86	MC01	Maintenance and Construction Vehicle and Equipment Tracking
	87	MC02	Maintenance and Construction Vehicle Maintenance
	88	MC03	Road Weather Data Collection
	89	MC04	Weather Information Processing and Distribution
	90	MC05	Roadway Automated Treatment
	91	MC06	Winter Maintenance
	92	MC07	Roadway Maintenance and Construction
	93	MC08	Work Zone Management
	94	MC09	Work Zone Safety Monitoring
	95	MC10	Maintenance and Construction Activity Coordination
	96	MC11	Environmental Probe Surveillance
	97	MC12	Infrastructure Monitoring

AD1 - ITS Data Mart



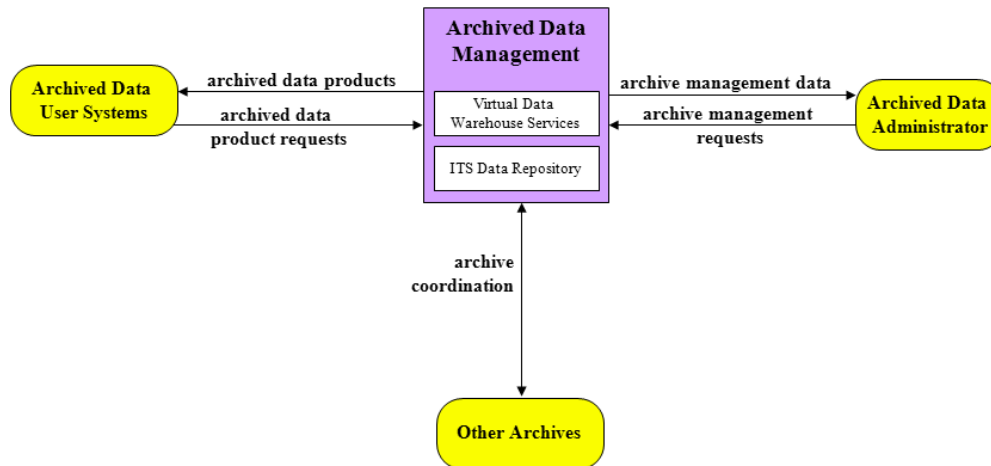
This service package provides a focused archive that houses data collected and owned by a single public/government agency,, private sector provider, research institution, or other organization. This focused archive typically includes data covering a single transportation mode and one jurisdiction that is collected from an operational data store and archived for future use. It provides the basic data quality, data privacy, and meta data management common to all ITS archives and provides general query and report access to archive data users.

AD2 - ITS Data Warehouse



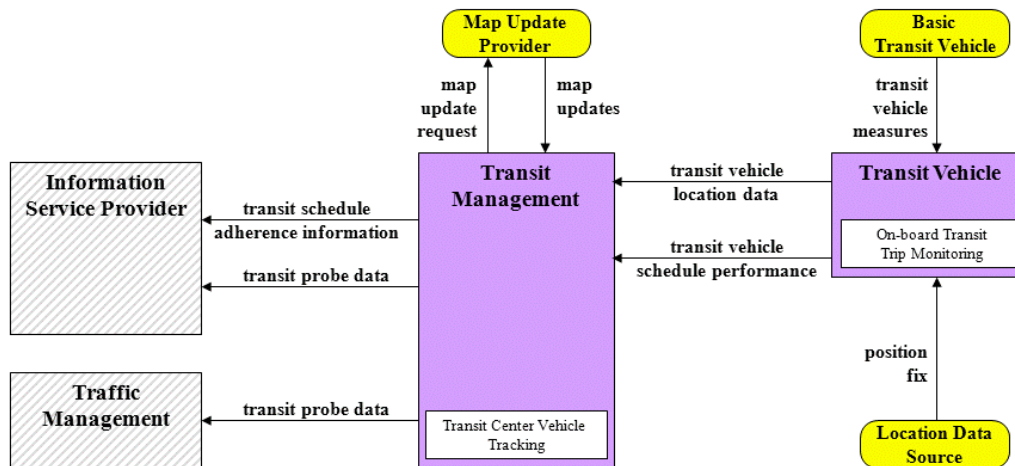
This service package includes all the data collection and management capabilities provided by the ITS Data Mart, and adds the functionality and interface definitions that allow collection of data from multiple agencies and data sources spanning across modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this service package in addition to the basic query and reporting user access features offered by the ITS Data Mart.

AD3 - ITS Virtual Data Warehouse



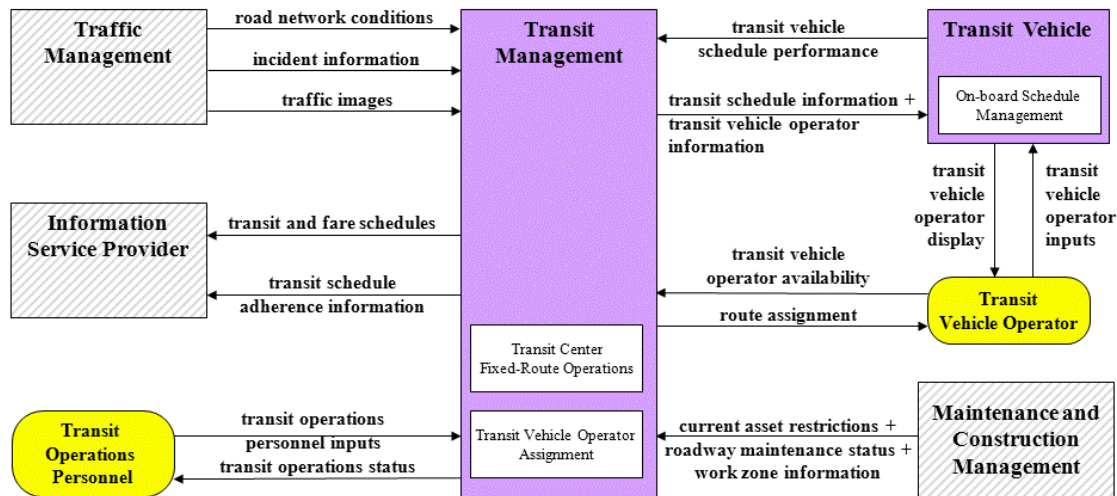
This service package provides the same broad access to multimodal, multidimensional data from varied data sources as in the ITS Data Warehouse service package, but provides this access using enhanced interoperability between physically distributed ITS archives that are each locally managed. Requests for data that are satisfied by access to a single repository in the ITS Data Warehouse service package are parsed by the local archive and dynamically translated to requests to remote archives which relay the data necessary to satisfy the request.

APTS01 – Transit Vehicle Tracking



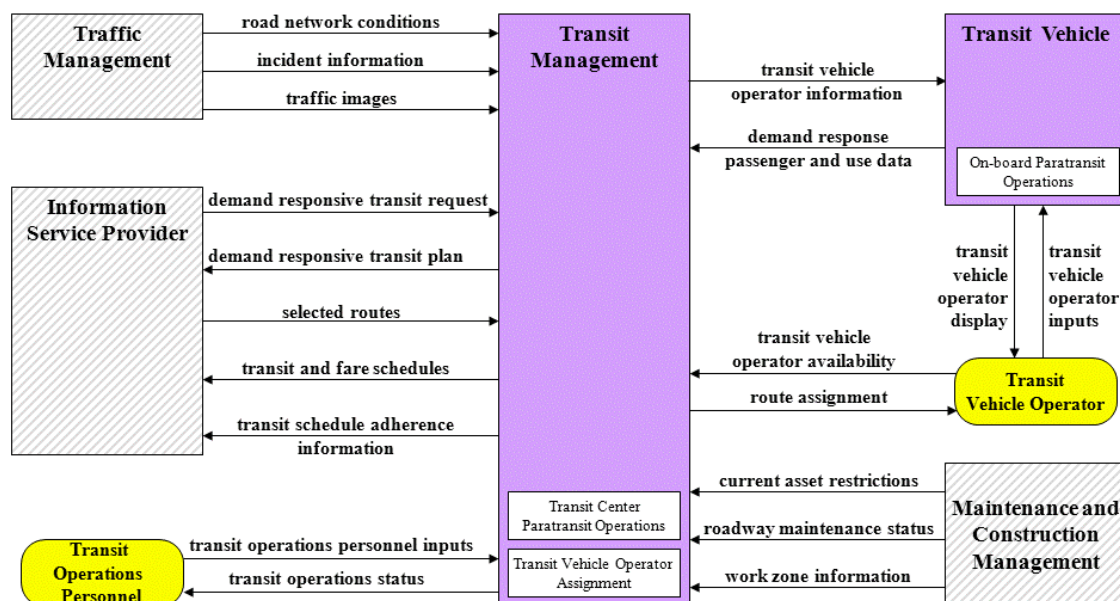
This service package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle (e.g., through GPS) and relayed to the infrastructure or may be determined directly by the communications infrastructure. A two-way wireless communication link with the Transit Management Subsystem is used for relaying vehicle position and control measures. Fixed route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The Transit Management Subsystem processes this information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider.

APTS02 – Transit Fixed-Route Operations



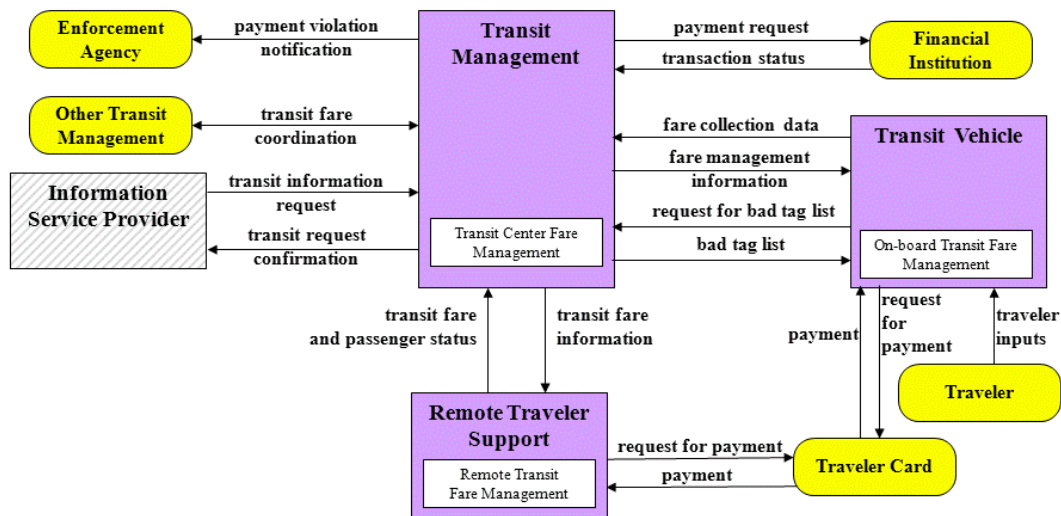
This service package performs automated dispatch and system monitoring for fixed-route and flexible-route transit services. This service performs scheduling activities including the creation of schedules, blocks and runs, as well as operator assignment. This service determines the transit vehicle trip performance against the schedule using AVL data and provides information displays at the Transit Management Subsystem. Static and real time transit data is exchanged with Information Service Providers where it is integrated with that from other transportation modes (e.g. rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.

APTS03 – Demand Response Transit Operations



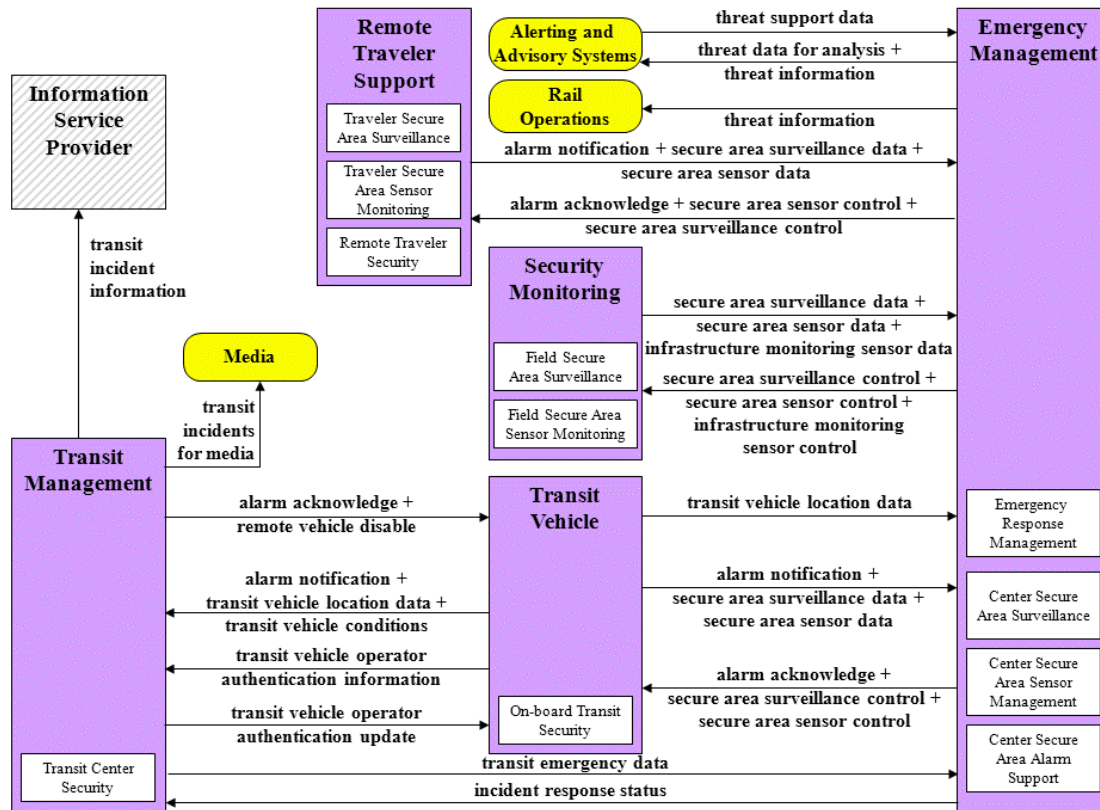
This service package performs automated dispatch and system monitoring for demand responsive transit services. This service performs scheduling activities as well as operator assignment. In addition, this service package performs similar functions to support dynamic features of flexible-route transit services. This package monitors the current status of the transit fleet and supports allocation of these fleet resources to service incoming requests for transit service while also considering traffic conditions. The Transit Management Subsystem provides the necessary data processing and information display to assist the transit operator in making optimal use of the transit fleet. This service includes the capability for a traveler request for personalized transit services to be made through the Information Service Provider (ISP) Subsystem. The ISP may either be operated by a transit management center or be independently owned and operated by a separate service provider. In the first scenario, the traveler makes a direct request to a specific paratransit service. In the second scenario, a third party service provider determines that the paratransit service is a viable means of satisfying a traveler request and makes a reservation for the traveler.

APTS04 – Transit Fare Collection Management



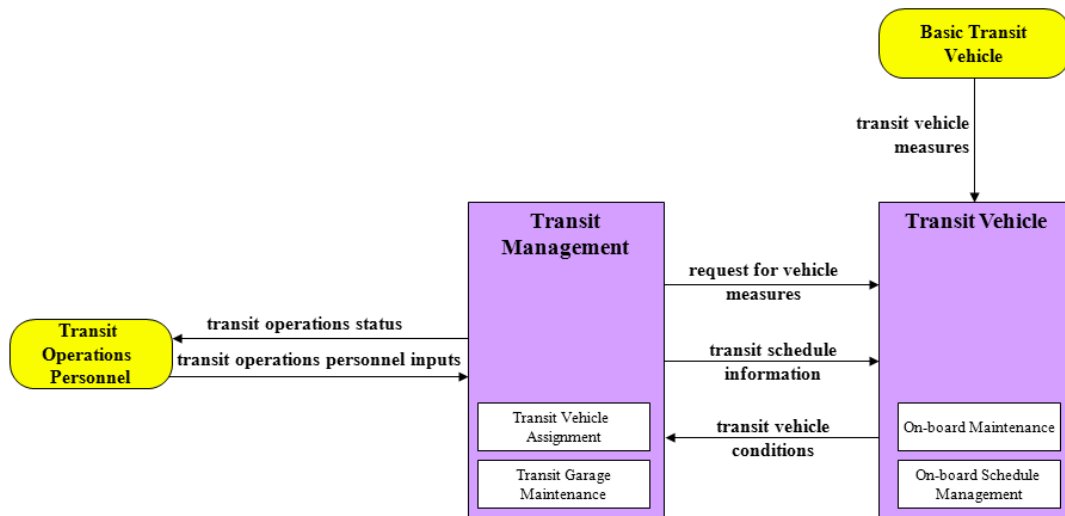
This service package manages transit fare collection on-board transit vehicles and at transit stops using electronic means. It allows transit users to use a traveler card or other electronic payment device. Readers located either in the infrastructure or on-board the transit vehicles enable electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem. Two other service packages, ATMS10: Electronic Toll Collection and ATMS16: Parking Facility Management, also provide electronic payment services. These three service packages in combination provide an integrated electronic payment system for transportation services.

APTS05 - Transit Security



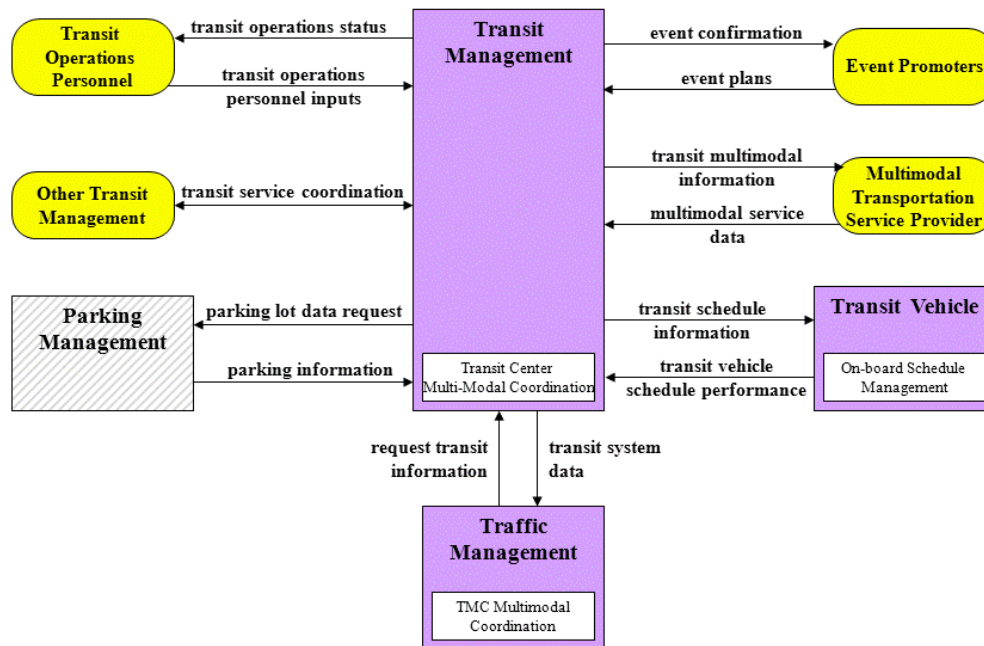
This service package provides for the physical security of transit passengers and transit vehicle operators. On-board equipment is deployed to perform surveillance and sensor monitoring in order to warn of potentially hazardous situations. The surveillance equipment includes video (e.g., CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g., chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g., metal detectors). Transit user or transit vehicle operator activated alarms are provided on-board. Public areas (e.g., transit stops, park and ride lots, stations) are also monitored with similar surveillance and sensor equipment and provided with transit user activated alarms. In addition this service package provides surveillance and sensor monitoring of non-public areas of transit facilities (e.g., transit yards) and transit infrastructure such as bridges, tunnels, and transit railways or bus rapid transit (BRT) guideways. The surveillance equipment includes video and/or audio systems. The sensor equipment includes threat sensors and object detection sensors as described above as well as, intrusion or motion detection sensors and infrastructure integrity monitoring (e.g., rail track

APTS06 - Transit Fleet Management



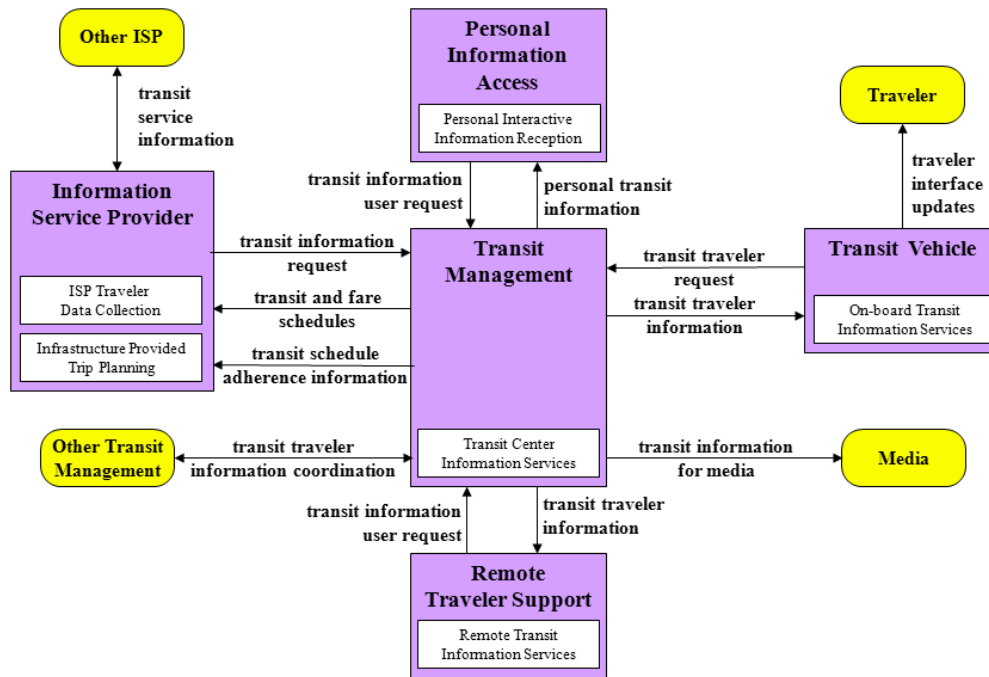
This service package supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Subsystem. Hardware and software in the Transit Management Subsystem processes this data and schedules preventative and corrective maintenance. The service package also supports the day to day management of the transit fleet inventory, including the assignment of specific transit vehicles to blocks.

APTS07 – Multi-modal Coordination



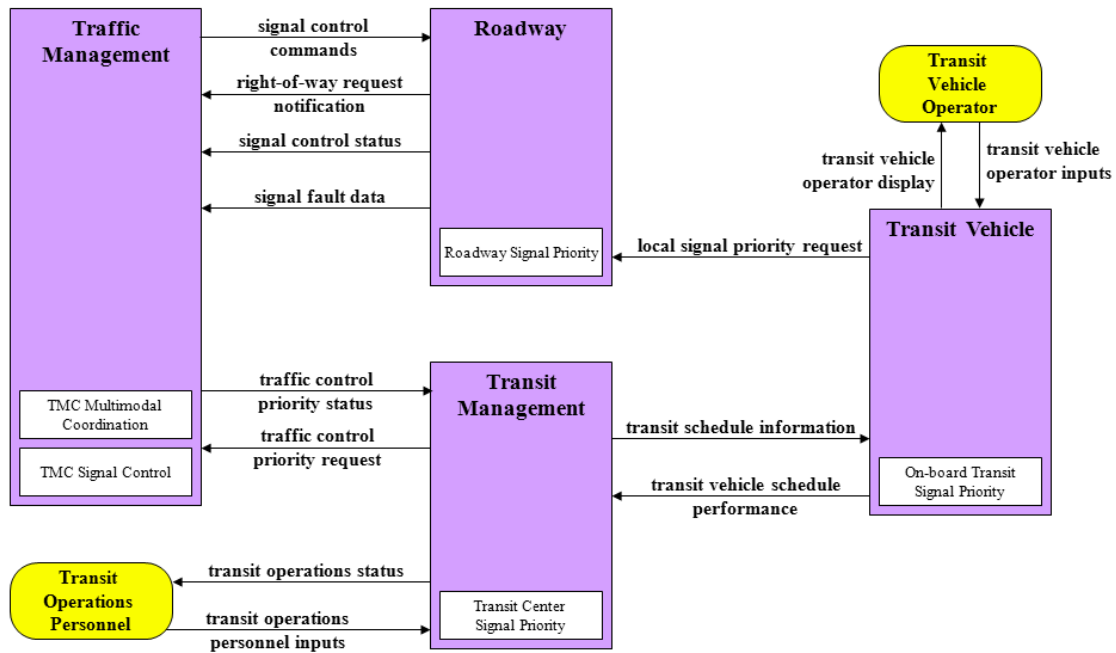
This service package establishes two way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transit transfer points and clusters (a collection of stops, stations, or terminals where transfers can be made conveniently) and also improve operating efficiency. Transit transfer information is shared between Multimodal Transportation Service Providers and Transit Agencies.

APTS08 - Transit Traveler Information



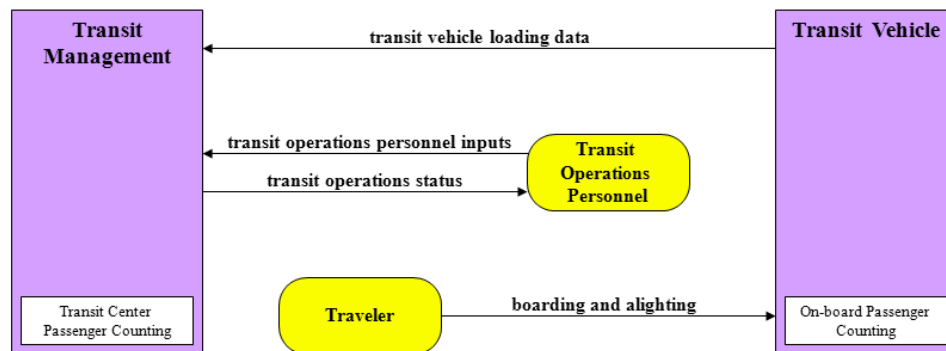
This service package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this service package.

APTS09 – Transit Signal Priority



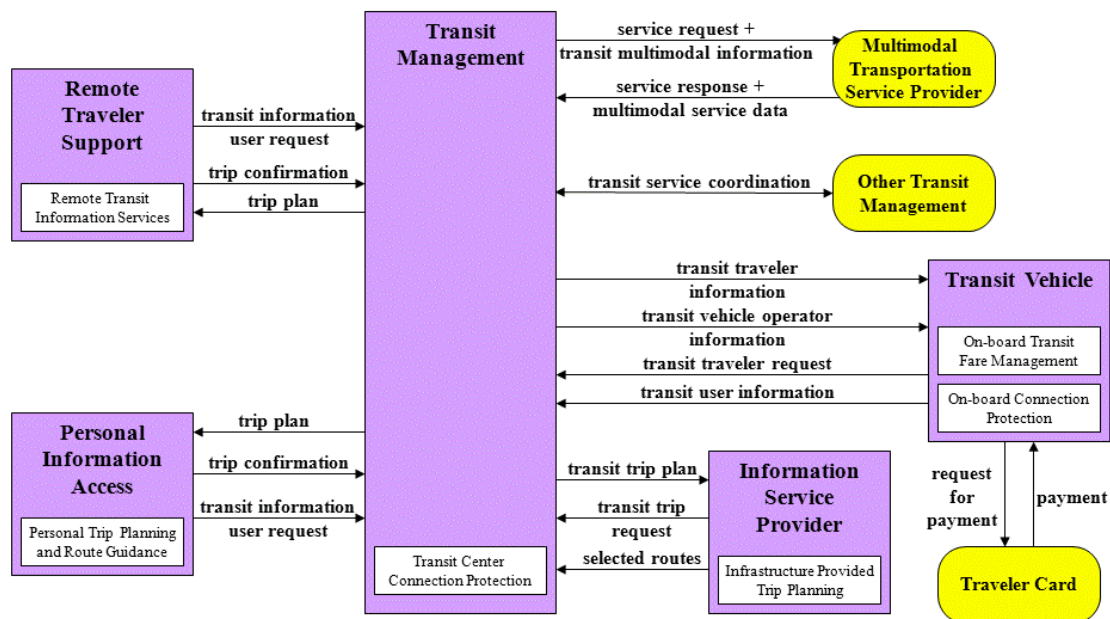
This service package determines the need for transit priority on routes and at certain intersections and requests transit vehicle priority at these locations. The signal priority may result from limited local coordination between the transit vehicle and the individual intersection for signal priority or may result from coordination between transit management and traffic management centers. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network.

APTS10 – Transit Passenger Counting



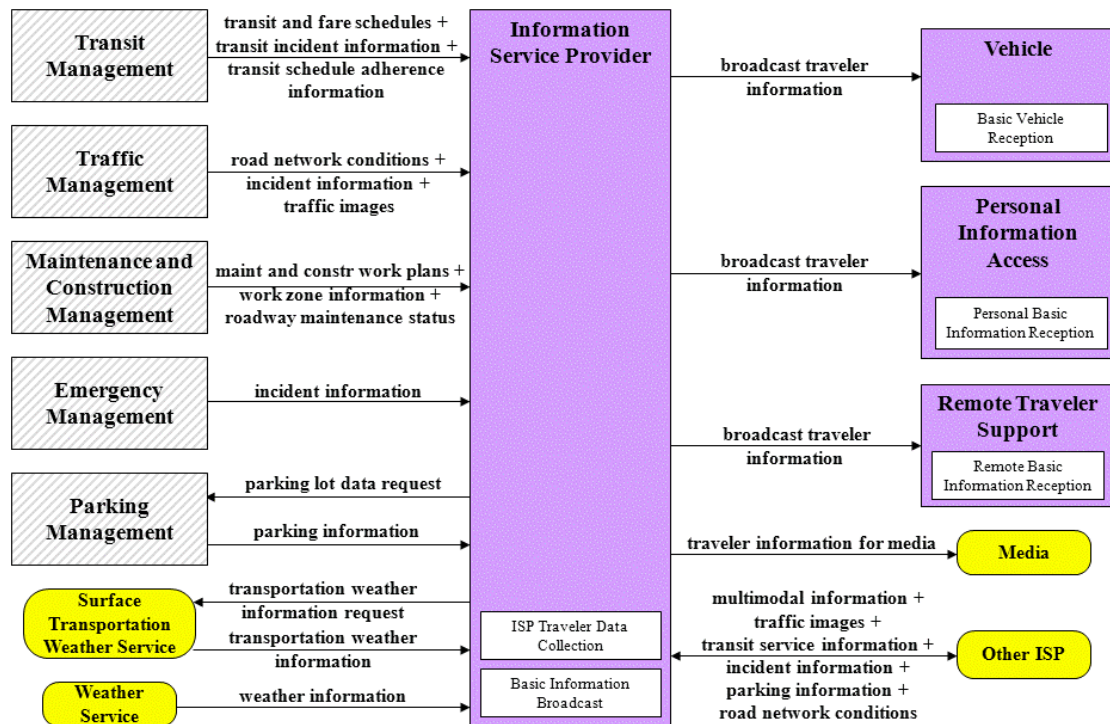
This service package counts the number of passengers entering and exiting a transit vehicle using sensors mounted on the vehicle and communicates the collected passenger data back to the management center. The collected data can be used to calculate reliable ridership figures and measure passenger load information at particular stops.

APTS11 – Multimodal Connection Protection



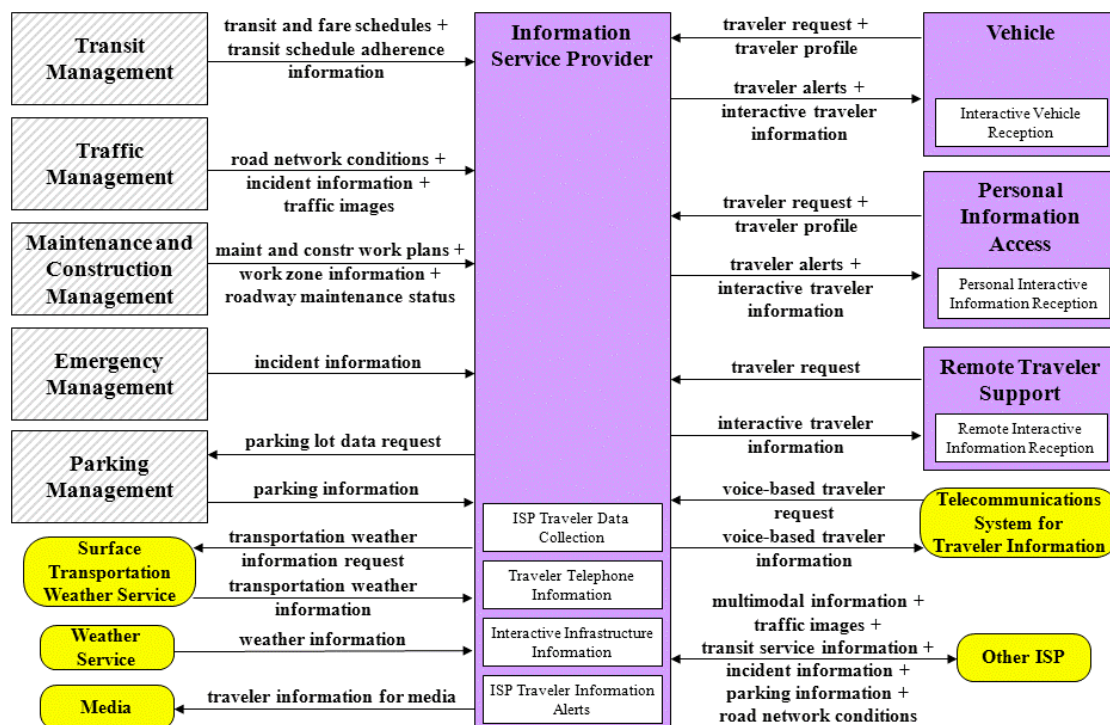
This service package supports the coordination of multimodal services to optimize the travel time of travelers as they move from mode to mode (or to different routes within a single mode). A near term function supported by this service package would be for a single transit agency to coordinate crossing routes so that passengers on one route would have the opportunity to transfer with minimum wait time to another route within the same transit system. The next level of complexity of this service package would be for this coordination to occur across transit agencies, or between transit agencies and other modes of transportation. The most advanced functions of this service package would be to track the route of an individual traveler and ensure that connections are properly scheduled on an individual basis. This final capability represents a long-term functionality, which could be managed either through an Information Serviced Provider or through a Transit Management subsystem.

ATIS01 – Broadcast Traveler Information



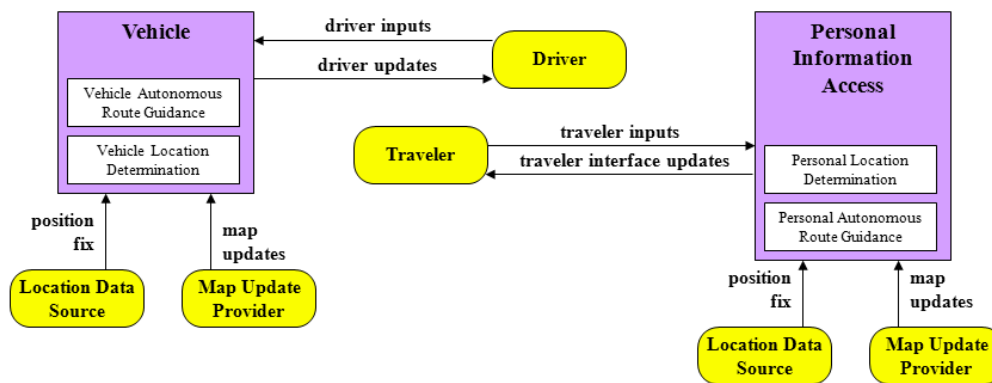
This service package collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadcasts the information to travelers using technologies such as FM subcarrier, satellite radio, cellular data broadcasts, and Internet web casts. The information may be provided directly to travelers or provided to merchants and other traveler service providers so that they can better inform their customers of travel conditions. Different from the service package ATMS06 - Traffic Information Dissemination, which provides localized HAR and DMS information capabilities, ATIS01 provides a wide area digital broadcast service. Successful deployment of this service package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.

ATIS02 – Interactive Traveler Information



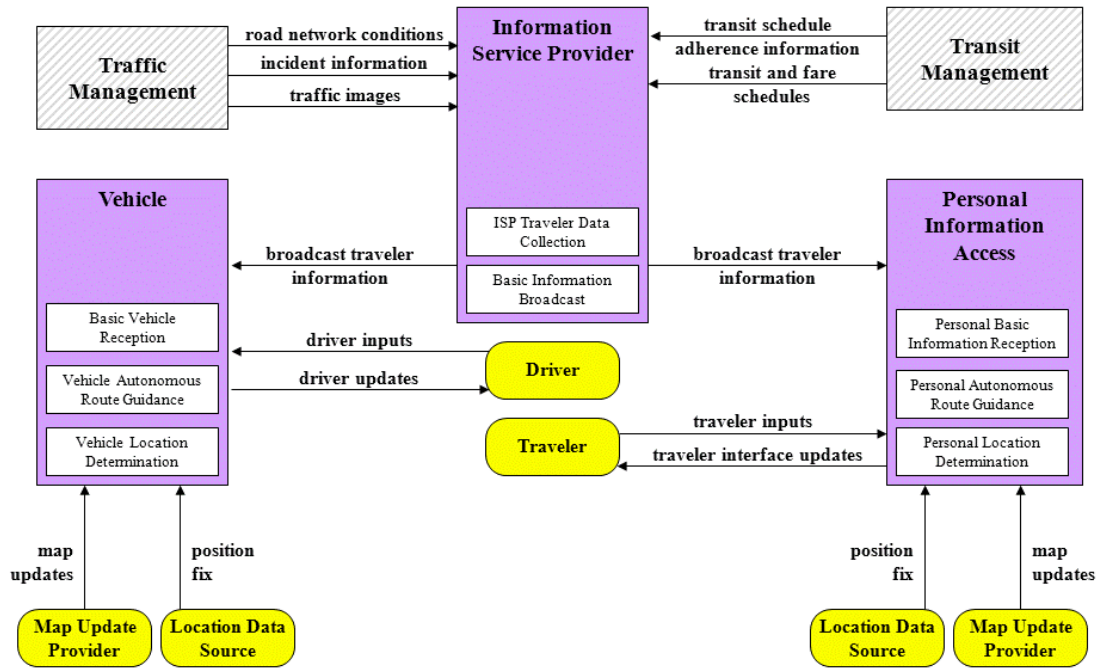
This service package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours and pricing information. Although the Internet is the predominate network used for traveler information dissemination, a range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications between the traveler and Information Service Provider. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 0800-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.

ATIS03 – Autonomous Route Guidance



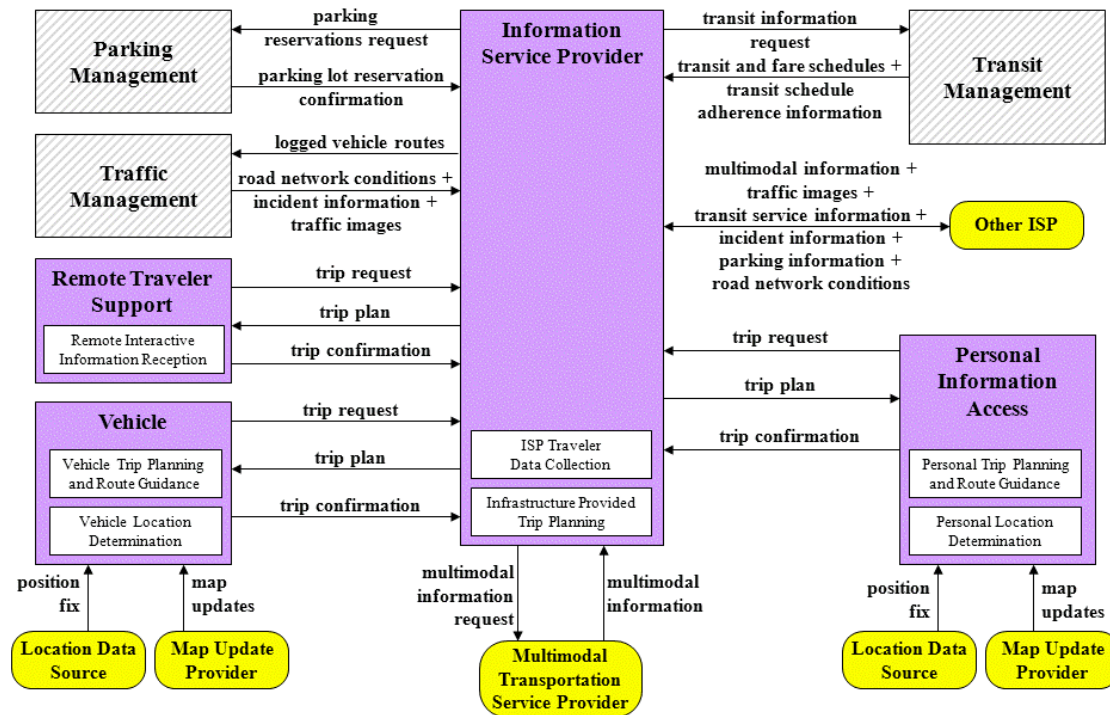
This service package relies on in-vehicle sensory, location determination, computational, map database, and interactive driver interface equipment to enable route planning and detailed route guidance based on static, stored information. No communication with the infrastructure is assumed or required. Identical capabilities are available to the traveler outside the vehicle by integrating a similar suite of equipment into portable devices.

ATIS04 – Dynamic Route Guidance



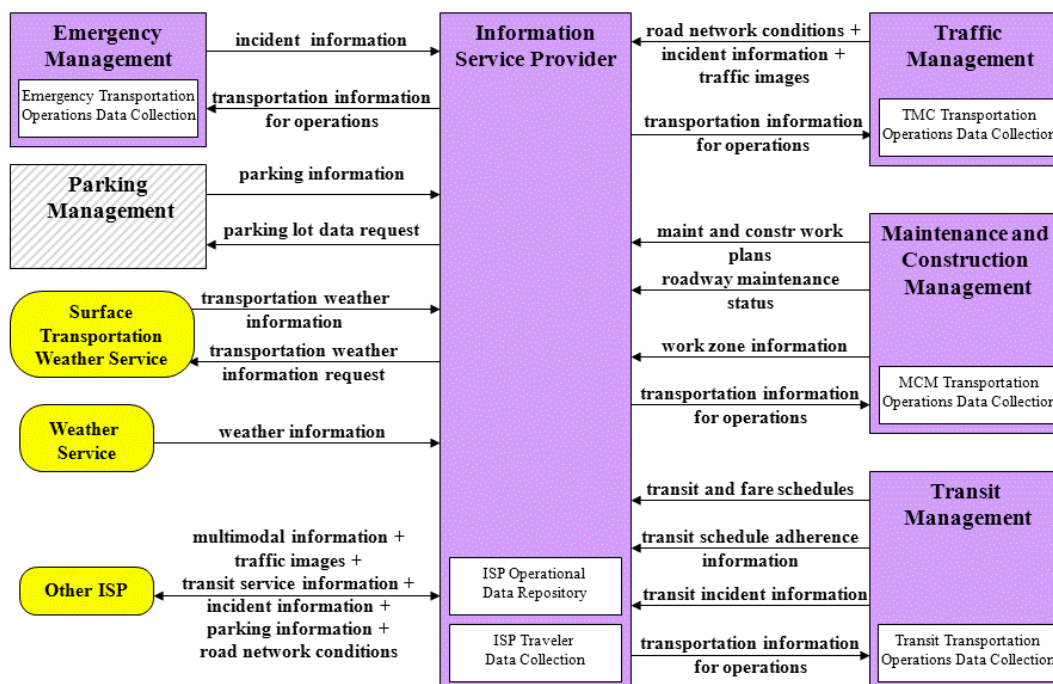
This service package offers advanced route planning and guidance that is responsive to current conditions. The package combines the autonomous route guidance user equipment with a digital receiver capable of receiving real-time traffic, transit, and road condition information, which is considered by the user equipment in provision of route guidance.

ATIS05 – ISP Based Trip Planning and Route Guidance



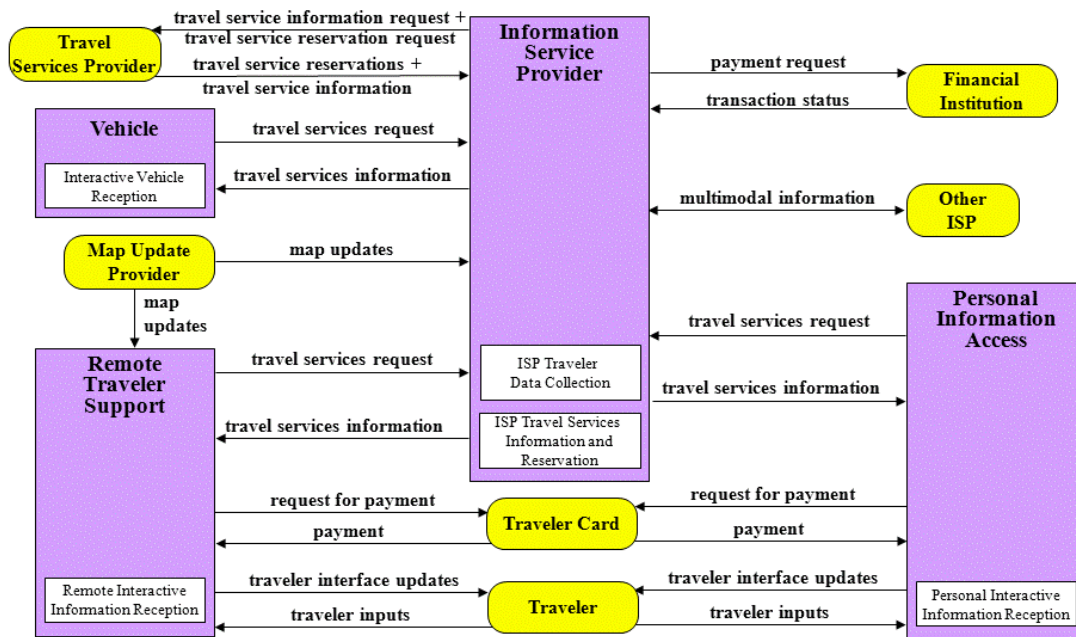
This service package offers the user trip planning and en-route guidance services. It generates a trip plan, including a multimodal route and associated service information (e.g., parking information), based on traveler preferences and constraints. Routes may be based on static information or reflect real time network conditions. Unlike ATIS3 and ATIS4, where the user equipment determines the route, the route determination functions are performed in the Information Service Provider Subsystem in this service package. The trip plan may be confirmed by the traveler and advanced payment and reservations for transit and alternate mode (e.g., airline, rail, and ferry) trip segments, and ancillary services (e.g., parking reservations) are accepted and processed. The confirmed trip plan may include specific routing information that can be supplied to the traveler as general directions or as turn-by-turn route guidance depending on the level of user equipment.

ATIS06 –Transportation Operations Data Sharing



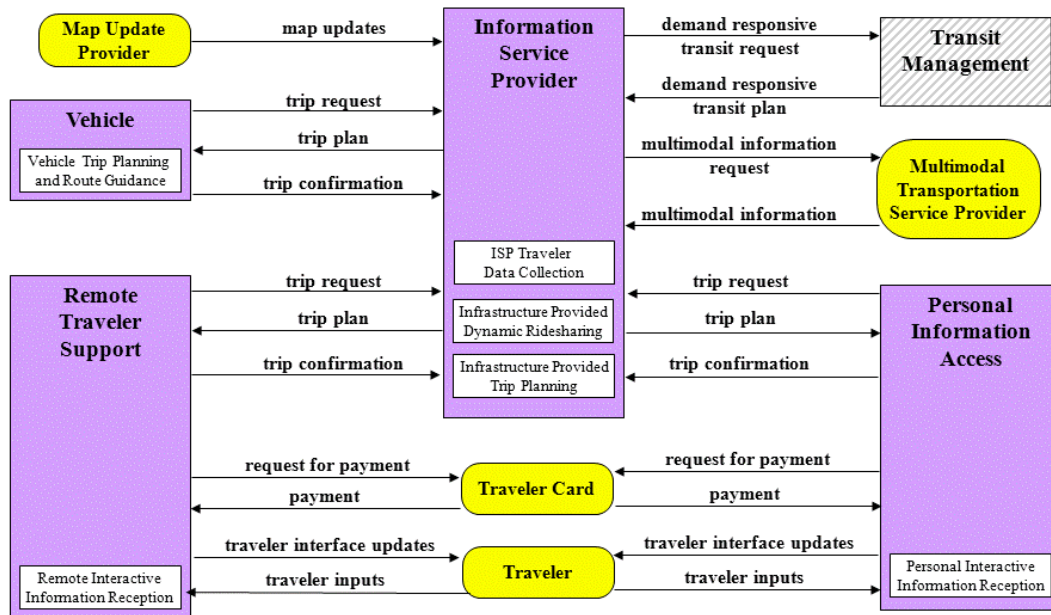
This service package makes real-time transportation operations data available to transportation system operators. The Information Service Provider collects, processes, and stores current information on traffic and travel conditions and other information about the current state of the transportation network 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.

ATIS07 – Travel Services Information and Reservation



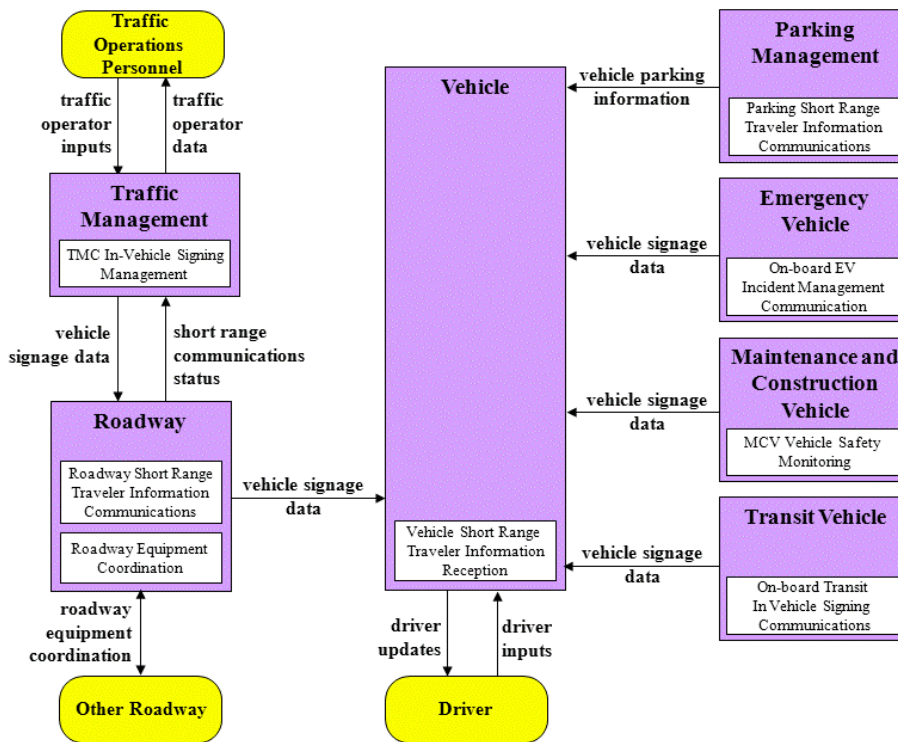
This service package provides travel information and reservation services to the user. These additional traveler services may be provided using the same basic user equipment used for Interactive Traveler Information. This service package provides multiple ways for accessing information either while en route in a vehicle using wide-area wireless communications or pre-trip via fixed-point to fixed-point connections.

ATIS08 - Dynamic Ridesharing



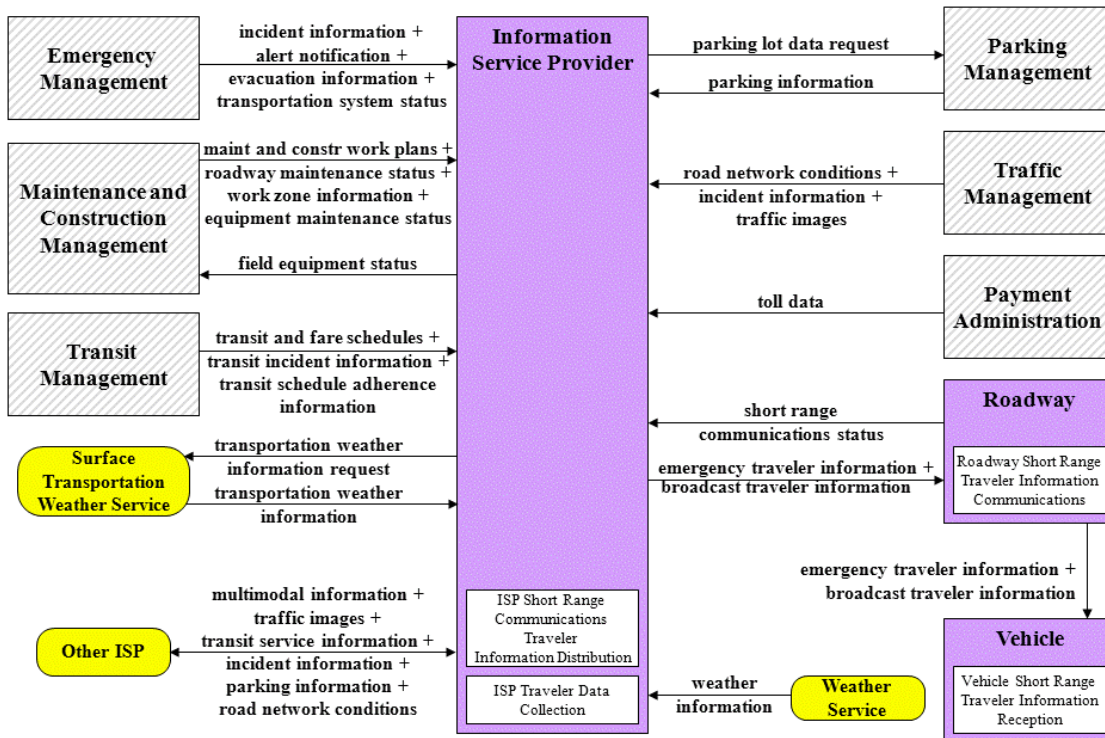
This service package provides dynamic ridesharing/ride matching services to travelers. This service could allow near real time ridesharing reservations to be made through the same basic user equipment used for Interactive Traveler Information. This ridesharing/ride matching capability also includes arranging connections to transit or other multimodal services.

ATIS09 - In Vehicle Signing



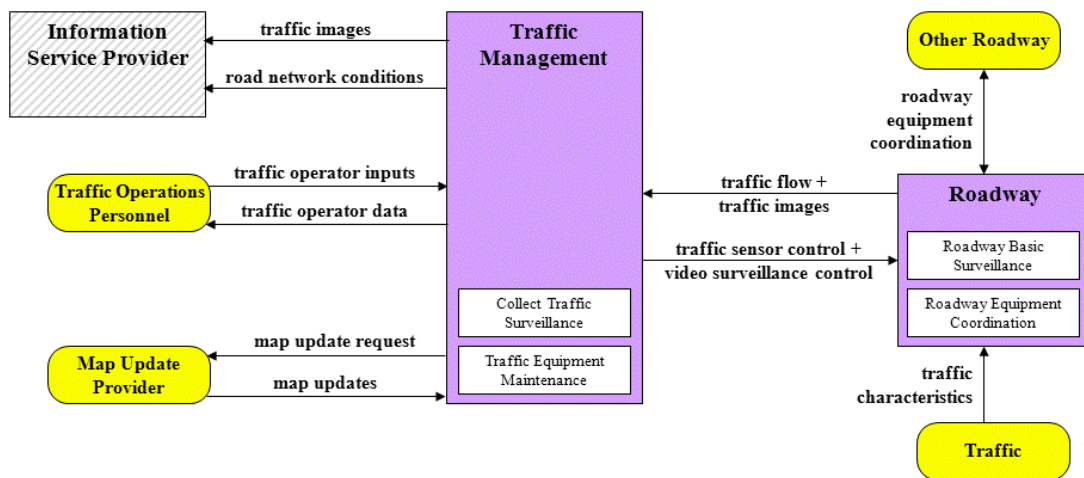
This service package augments regulatory, warning, and informational signs and signals by providing information directly to drivers through in-vehicle devices. The information provided would include static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states including highway intersection and highway-rail intersection status and local conditions warnings identified by local environmental sensors). It includes short range communications between field equipment and the vehicle and connections to the Traffic Management Subsystem for monitoring and control. This service package also includes the capability for maintenance and construction, transit, and emergency vehicles to transmit sign information to vehicles in the vicinity so that in vehicle signing can be used without fixed infrastructure in work zones, around incidents, and in areas where transit operations impacts traffic.

ATIS10 – Short Range Communications Traveler Information



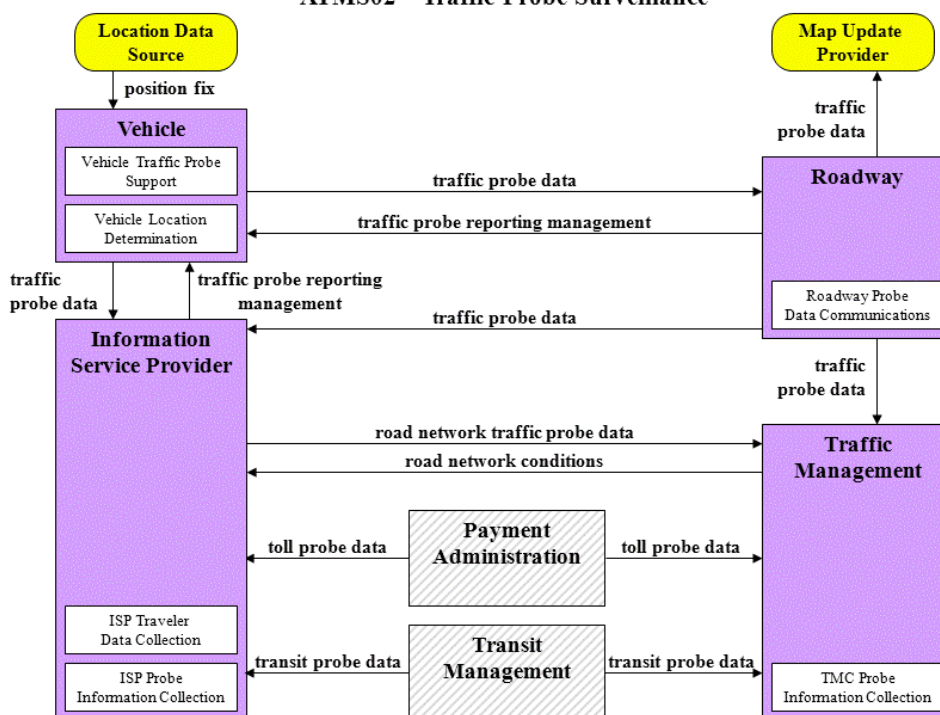
This service package provides location-specific or situation-relevant information to travelers in vehicles using Dedicated Short Range Communications (DSRC) infrastructure supporting mobility applications for connected vehicles. DSRC is used to deliver real-time traveler information including travel times, incident information, road conditions, and emergency traveler information to vehicles as they pass DSRC roadside equipment along their route. This service package provides public information that is available to all equipped vehicles in the vicinity of the roadside equipment.

ATMS01 – Network Surveillance



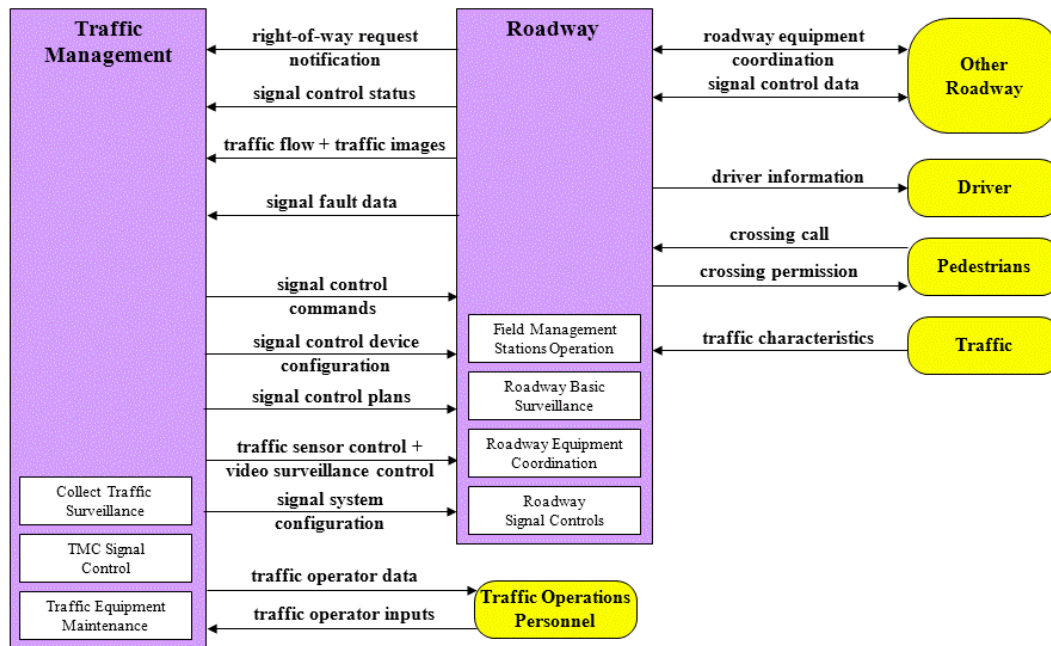
This service package includes traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Subsystem). The data generated by this service package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and master plan/long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.

ATMS02 – Traffic Probe Surveillance



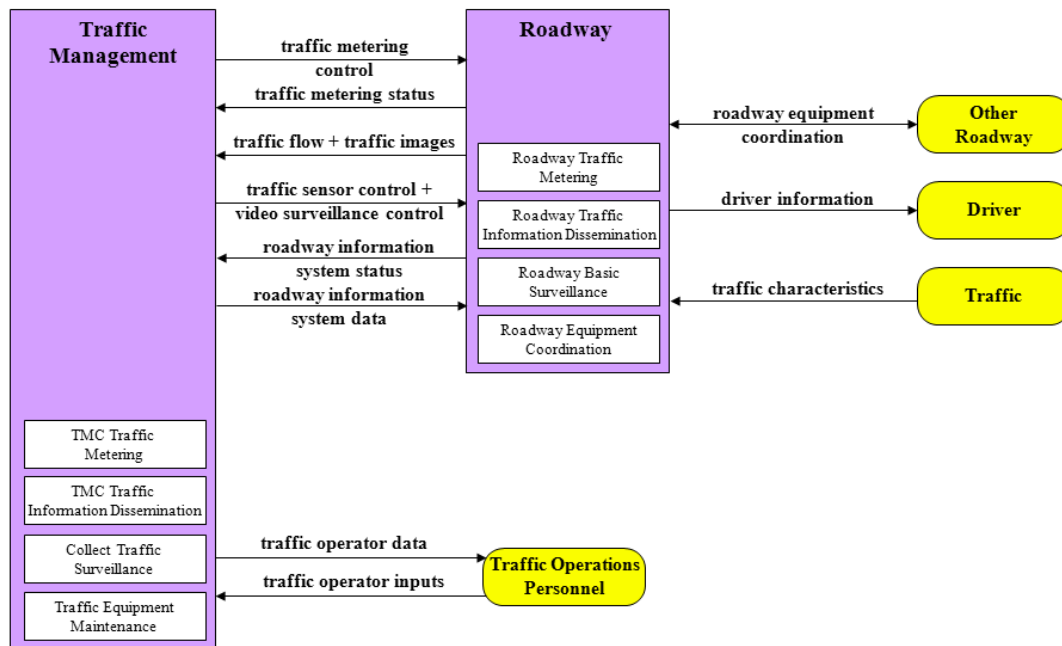
This service package provides an alternative approach for surveillance of the roadway network. Two general implementation paths are supported by this service package: 1) wide-area wireless communications between the vehicle and center is used to communicate vehicle operational information and status 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

ATMS03 – Traffic Signal Control



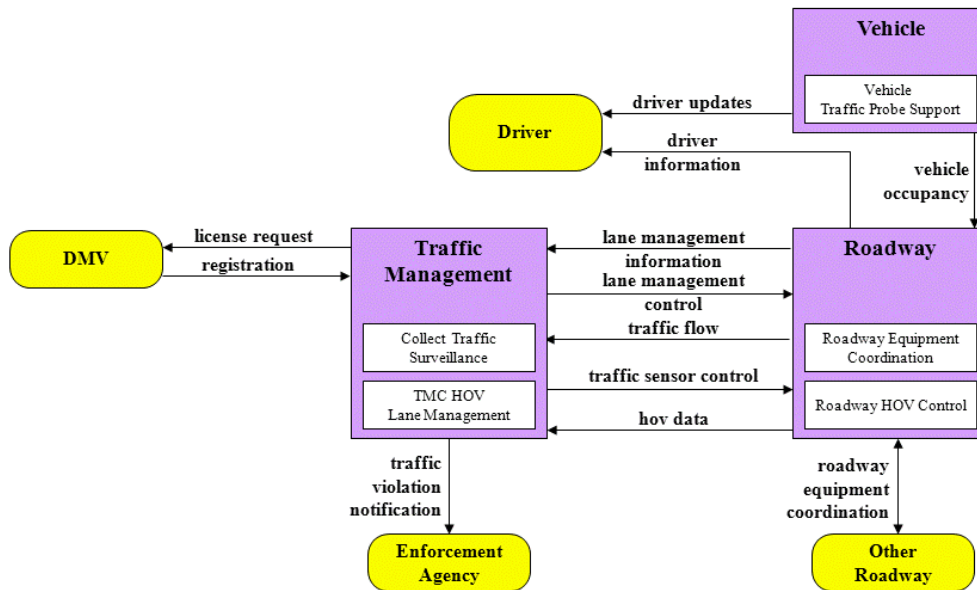
This service package provides the central control and monitoring equipment, communication links, and the signal control equipment that support traffic control at signalized intersections. A range of traffic signal control systems are represented by this service package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This service package is generally an intra-jurisdictional package. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would also be represented by this package. Coordination of traffic signal systems using real-time communications is covered in the ATMS07-Regional Traffic Management service package. This service package is consistent with typical traffic signal control systems.

ATMS04 – Traffic Metering



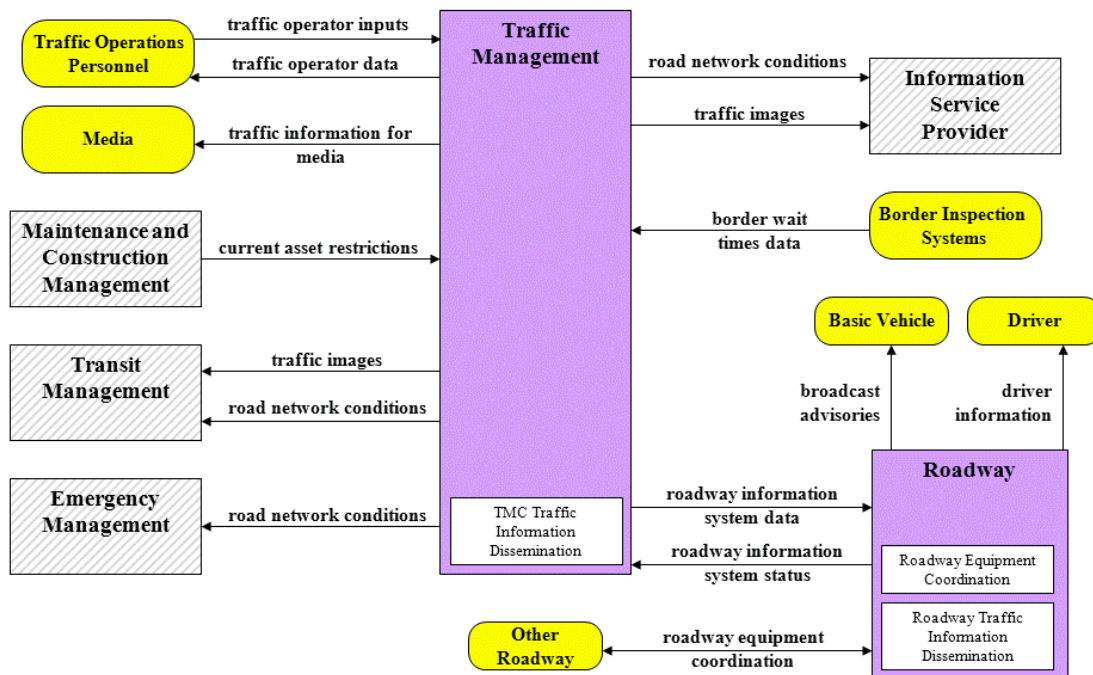
This service package provides central monitoring and control, communications, and field equipment that support metering of traffic. It supports the complete range of metering strategies including ramp, interchange, and mainline metering. This package incorporates the instrumentation included in the Network Surveillance service package (traffic sensors are used to measure traffic flow and queues) to support traffic monitoring so responsive and adaptive metering strategies can be implemented. Also included is configurable field equipment to provide information to drivers approaching a meter, such as advance warning of the meter, its operational status (whether it is currently on or not, how many cars per green are allowed, etc.), lane usage at the meter (including a bypass lane for High Occupancy Vehicles (HOV)s) and existing queue at the

ATMS05 – HOV Lane Management



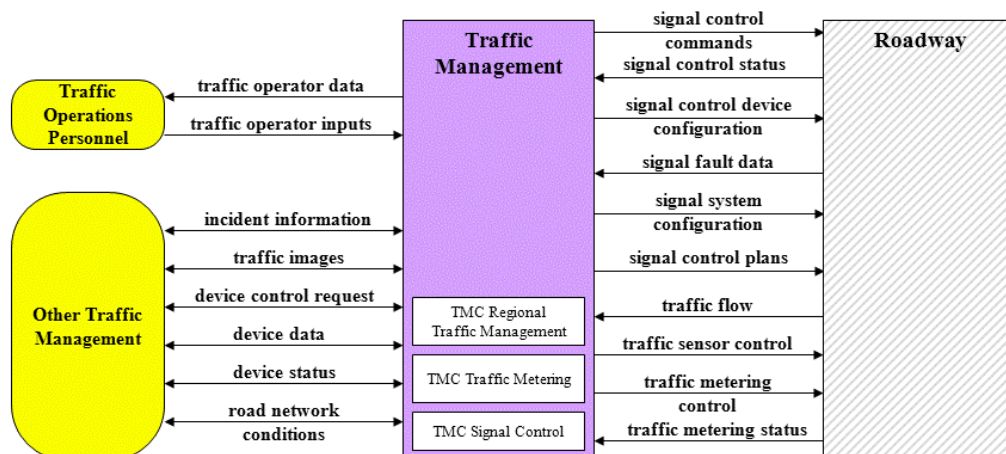
This service package manages High Occupancy Vehicle (HOV) lanes by coordinating freeway ramp meters and connector signals with HOV lane usage signals. Preferential treatment is given to HOV lanes using special bypasses, reserved lanes, and exclusive rights-of-way that may vary by time of day. Vehicle occupancy detectors may be installed to verify HOV compliance and to notify enforcement agencies of violations.

ATMS06 – Traffic Information Dissemination



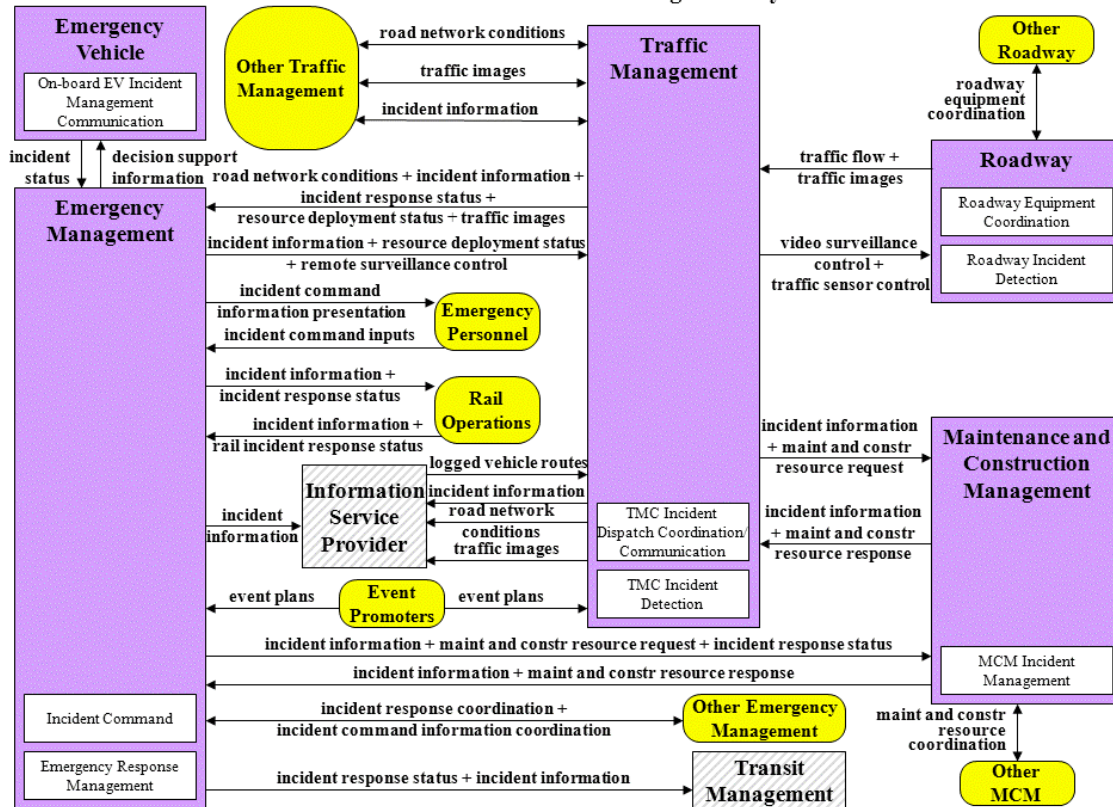
This service package provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, travel restrictions, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Information Service Providers. A link to the Maintenance and Construction Management subsystem allows real time information on road/bridge closures and restrictions due to maintenance and construction activities to be disseminated. The sharing of transportation operations data described in this service package also supports other services like ATMS09- Traffic Decision Support and Demand Management.

ATMS07 – Regional Traffic Management



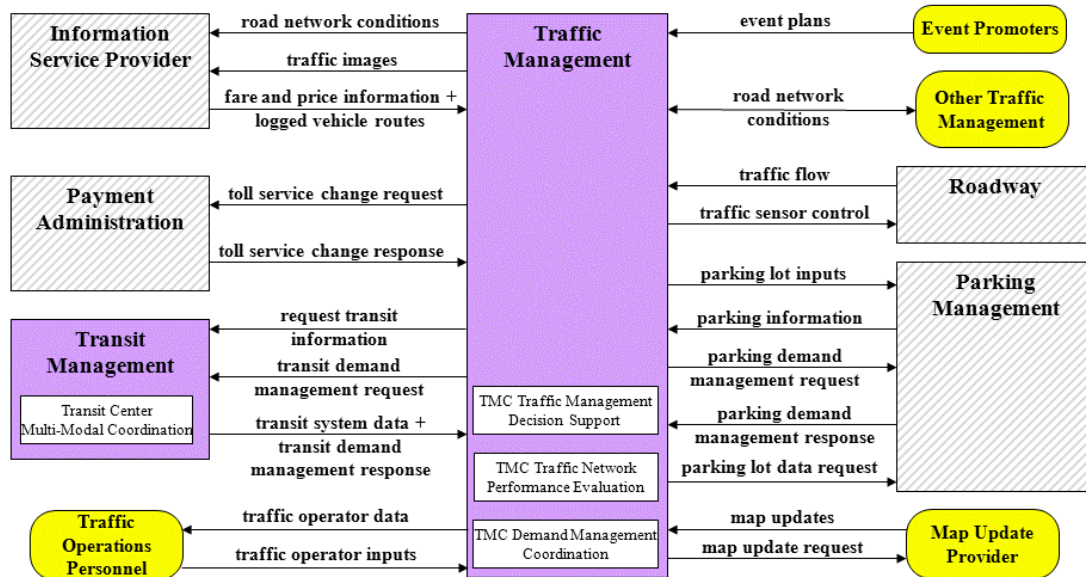
This service package provides for the sharing of traffic information and control among traffic management centers to support regional traffic management strategies. Regional traffic management strategies that are supported include inter-jurisdictional, real-time coordinated traffic signal control systems and coordination between freeway operations and traffic signal control within a corridor. This service package advances the ATMS03-Traffic Signal Control and ATMS04-Traffic Metering service packages by adding the communications links and integrated control strategies that enable integrated, interjurisdictional traffic management. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Traffic Signal Control and Traffic Metering service packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.

ATMS08 – Traffic Incident Management System



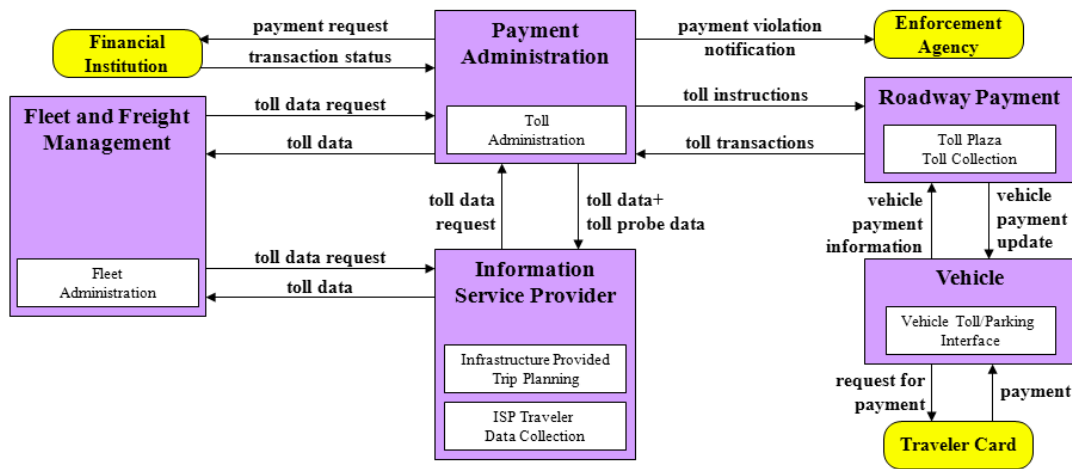
This service package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The service package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters. Information from these diverse sources is collected and correlated by this service package to detect and verify incidents and implement an appropriate response. This service package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications or resource coordination between center subsystems. Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination service package and dissemination of incident information to travelers through the Broadcast Traveler Information or Interactive Traveler Information service packages. The roadside equipment used to detect and verify incidents also allows the operator to monitor incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency field personnel. The coordination can also extend to tow trucks and other allied response agencies and field service personnel.

ATMS09 – Transportation Decision Support and Demand Management



This service package recommends courses of action to traffic operations personnel based on an assessment of current and forecast road network performance. Recommendations may include predefined incident response plans and regional surface street and freeway control strategies that correct network imbalances. Where applicable, this service package also recommends transit, parking, and toll strategies to influence traveler route and mode choices to support travel demand management (TDM) programs and policies managing both traffic and the environment. TDM recommendations are coordinated with transit, parking, and toll administration centers to support regional implementation of TDM strategies. Incident response and congestion management recommendations are implemented by the local traffic management center and coordinated with other regional centers by other service packages (see ATMS07-Regional Traffic Management and ATMS08-Traffic Incident Management). All recommendations are based on historical evaluation, real-time assessment, and forecast of the roadway network performance based on predicted travel demand patterns. Traffic data is collected from sensors and surveillance equipment as well as other transportation management centers (see ATIS06-Transportation Operations Data Sharing). Forecasted traffic loads are derived from historical data and route plans supplied by the Information Service Provider Subsystem. This service package also collects air quality, parking availability, transit usage, and vehicle occupancy data to support TDM, where applicable.

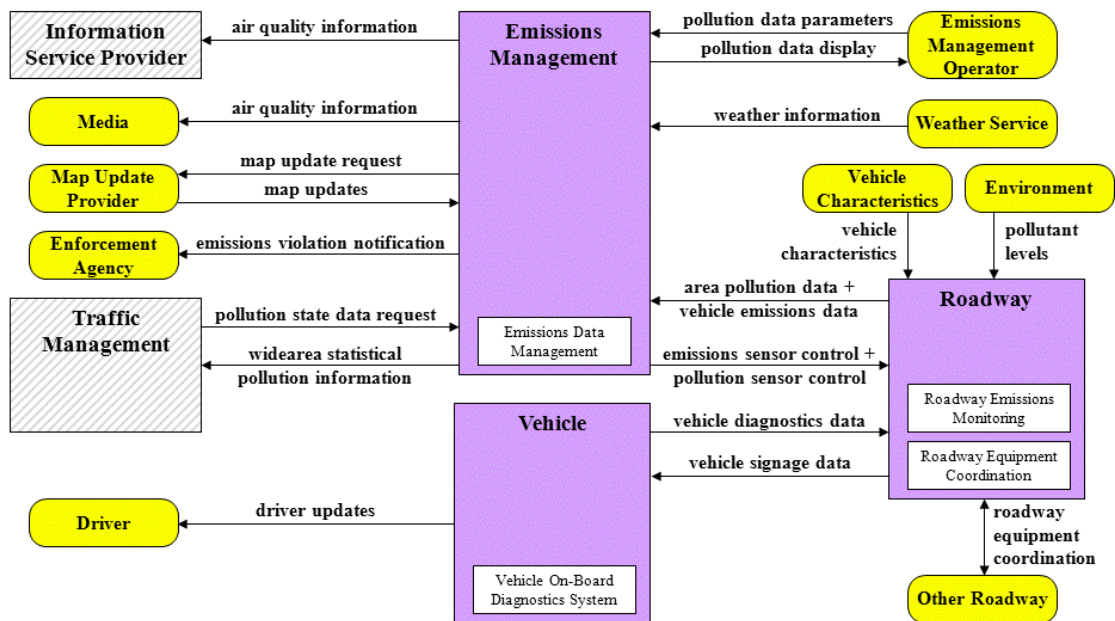
ATMS10 – Electronic Toll Collection



This service package provides toll operators with the ability to collect tolls electronically and detect and process violations. The fees that are collected may be adjusted to implement demand management strategies. Field-Vehicle Communication between the roadway equipment and the vehicle is required as well as Fixed Point-Fixed Point interfaces between the toll collection equipment and transportation authorities and the financial infrastructure that supports fee collection. Toll violations are identified and electronically posted to vehicle owners. Standards, inter-agency coordination, and financial clearinghouse capabilities enable regional, and ultimately national interoperability for these services. Two other service packages, APTS04: Transit Fare Collection Management 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.

The vehicle equipment and roadside readers that these systems utilize can also be used to collect road use statistics for highway authorities. This data can be collected as a natural by-product of the toll collection process or collected by separate readers that are dedicated to probe data collection.

ATMS11 – Emissions Monitoring and Management



This service package monitors individual vehicle emissions and provides general air quality monitoring using distributed sensors to collect the data. The collected information is transmitted to the emissions management subsystem for processing. Both area wide air quality monitoring and point emissions monitoring are supported by this service package. For area wide monitoring, this service package measures air quality, identifies sectors that are non-compliant with air quality standards, and collects, stores and reports supporting statistical data. For point emissions monitoring, this service package collects data from on-board diagnostic systems and measures tail pipe emissions to identify vehicles that exceed emissions standards and/or clean vehicles that could be released from standard emissions tests, depending on policy and regulations. Summary emissions information or warnings can also be displayed to drivers. The gathered information can be used to implement environmentally sensitive TDM programs, policies, and regulations.