Olympic Candidate File of 2016 Rio

Extensive and realistic testing will ensure readiness

Rio 2016 will take advantage of testing to refine and finalize plans. Thus, the testing plan, which includes competition, non-competition and functional testing, allows for successive unit, system and integration tests, as follows:

- Unit tests will assess focused or stand-alone operations, such as venue-specific transport operations, or operations of a specific transport facility (e.g. the media hub)
- System tests will focus on an entire system (e.g. the athletes' transport system). In this case, system command and control, depot operations, mall operations and the integration with venues will be fully tested
- Integration tests will involve multiple systems: for example, combined testing of public transport operations to assess performance of rail modes, BRTs and their interconnections. Furthermore, Games transport and traffic command and control, including the management of emergencies, will be thoroughly tested through a series of operational readiness exercises.

All testing will assess and refine client services, organizational learning, workforce readiness, operating plans, procedures, communication flows and technology. Suitable test events have already been identified and will be conducted during the last two years prior to Games-time, for example, system and integration testing will capitalize on the 2014 FIFA World Cup.

15.22 GAMES-TIME RESPONSIBILITIES

CLEAR RESPONSIBILITIES AND ACCOUNTABILITIES

OTTD's Traffic and Transport Coordination Center (TTCC) will provide coordination and communications for spectator and workforce transport, and traffic operations during Games-time. Rio 2016's Games Transport Operation Center (GTOC) will assume full responsibility for managing Games Family transport. The respective responsibilities are:

TTCC

- Coordinate spectator and workforce transport
- Coordinate traffic management
- Prioritize Games Family vehicles while keeping Rio moving
- Manage the response to possible incidents and emergencies related to traffic and public transport
- Provide a central point for monitoring, communicating and coordinating information regarding all transport, traffic and security operations.

GTOC

- Communicate with IOC management
- Provide central command and control for real-time Games Family operations
- Provide exceptions and emergency management for Games Family transport
- Liaise with the Sports Command Center
- Collaborate with Main Operations Center (MOC) on appropriate transport issues and crisis management
- Collaborate with the SENASP Games Command and Control Center on security exceptions management
- Report to MOC, including related input for media and public communications.

To successfully perform this responsibility TTCC will take advantage of the infrastructure and organization of the city's new Traffic and Transport Control Center (CCO) (refer to question 15.23). The GTOC staff will include top executives of all Games Family systems, venue transport and security. Coordination between TTCC and GTOC will be provided by reciprocal representation in each control center.

Special coordination processes and mechanisms, aligned with the highest security standards, will be set up between the TTCC, the GTOC, the SENASP Games Security Command and Control Center and the MOC to support exceptions management and effective and efficient response to emergencies. The response will be guided by robust contingency plans, and the MOC will be constantly updated.

Olympic Candidate File of 2016 Rio and Transport Strategic Plan

15.23 INFORMATION AND COMMUNICATION

COMMITTED INVESTMENT IN TRAFFIC MANAGEMENT

Rio is committed to the efficient use of technology to manage traffic and already operates an integrated Traffic Control Management Center (CTA) covering critical areas of the city.

A guaranteed two-phased upgrade program that exceeds USD110 million investment is currently being implemented. This program is summarized in the table below. On completion of phase two, traffic conditions will be remotely monitored and controlled throughout the planned Olympic Lanes, traffic-related information will be communicated over the internet to media and commuters, and all city control centers - including those of public transport and motorways - will be integrated under a new Traffic and Transport Control Center (CCO).

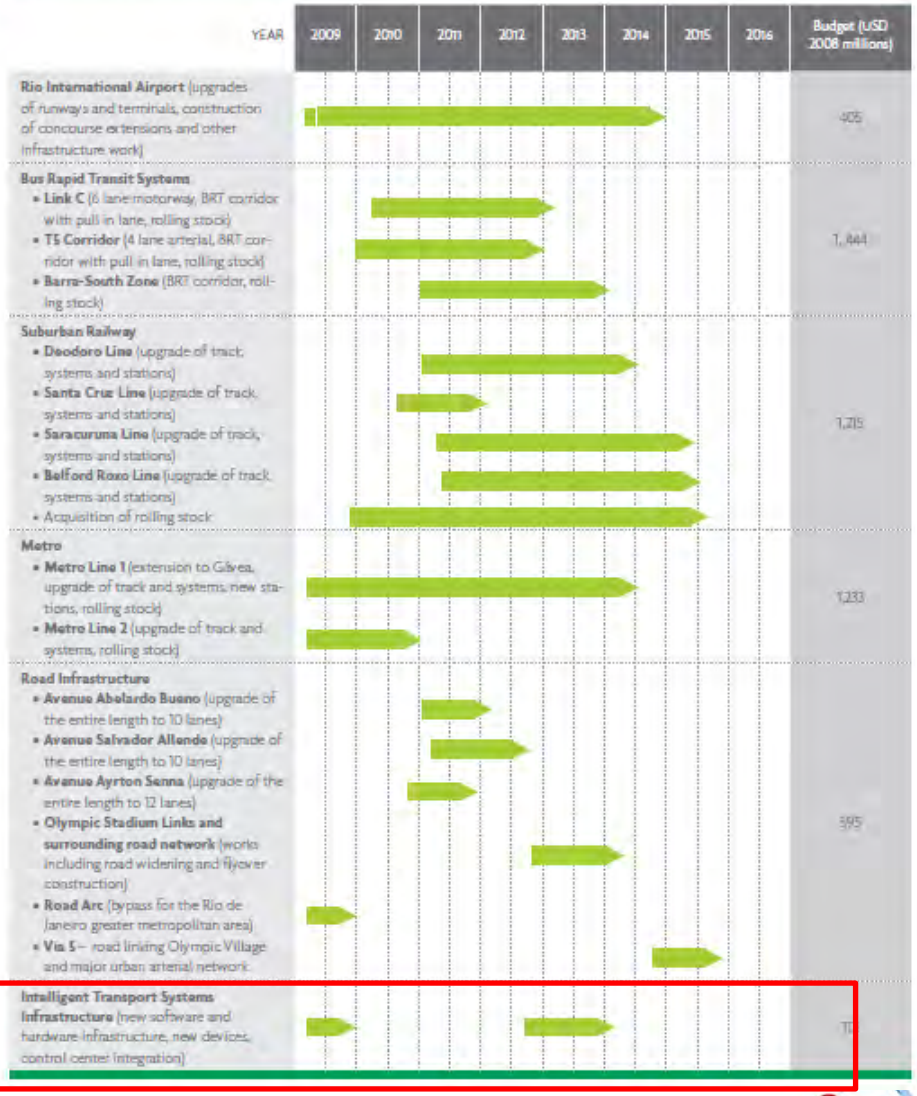
KEY DATA ON THE CITY ITS UPGRADE PROGRAM

	Completion date	Junctions managed	Monitoring cameras	Traffic loops	Variable Message Signs (VMS)	Licence plate identification (OCR)	Control Centers
Current Infrastructure		1,100	93	200	-	-	1
Upgrade – Phase 1	Oct 2009	-	73	120	13	61	Upgrade program
Upgrade – Phase 2	2014	1,500	100	1,000	10	302	1 Traffic and Transport Control Center (CCO)
	Total	2,600	266	1,320	23	363	2

This infrastructure will provide all required real-time information and will form a solid basis to support the Games traffic and transport management hierarchy described in question 15.22. Responses to expected and unexpected incidents will be enacted under the umbrella of CCO.

Information to spectators and city commuters will be provided in real-time using the CCO infrastructure (for example, internet link and Variable Message Systems) and through radio and television broadcasting. Complementary to this, transport guides, a special website and information kiosks will be available to facilitate the daily route planning of all people impacted by Olympic and Paralympic Games.

FIGURE 4.1: PLANNED TRANSPORT INVESTMENTS



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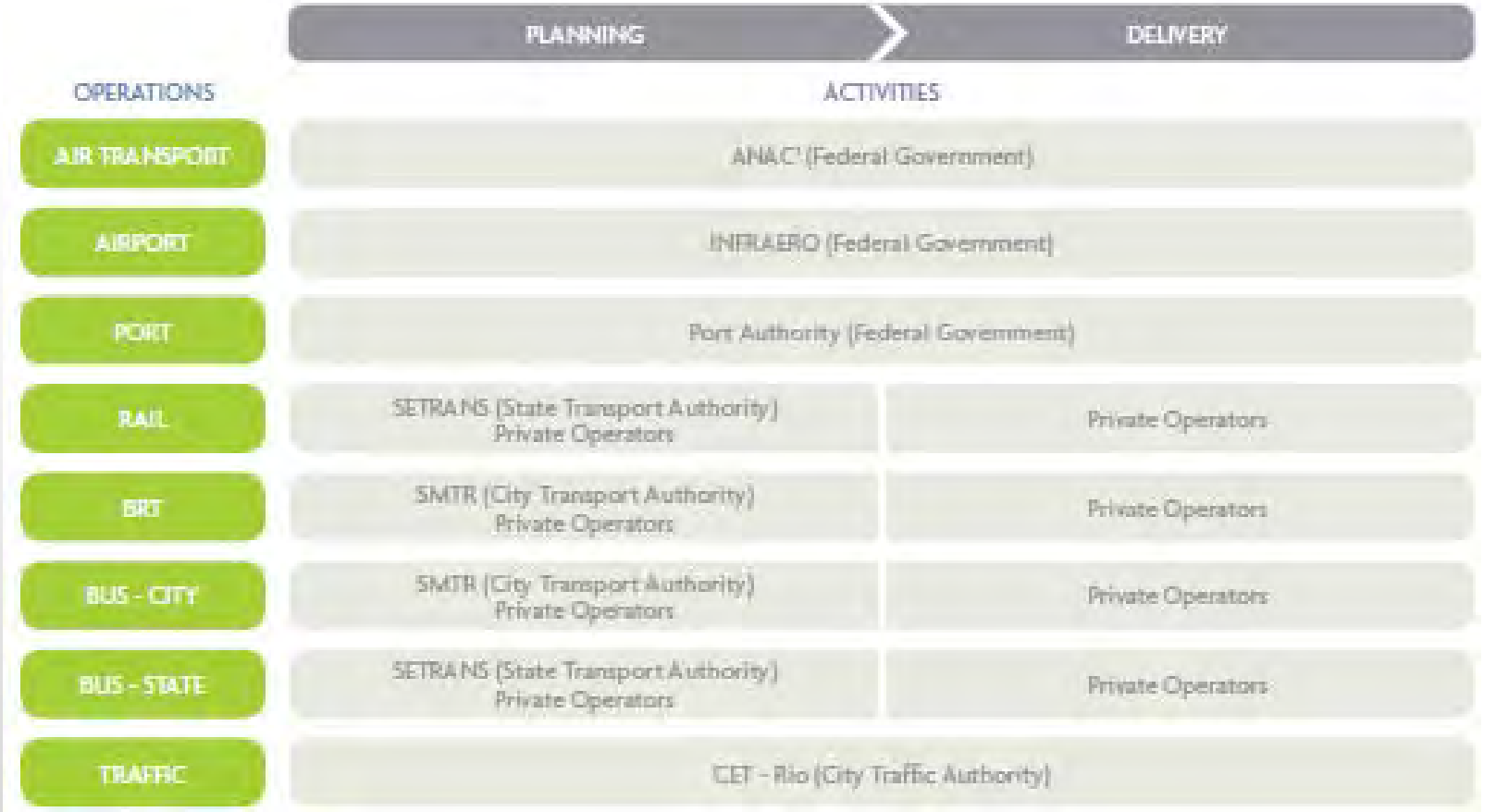
Olympic Candidate File of 2016 Rio and Transport Strategic Plan



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Summary of Transport Aspect of Olympic Cities

	Sydney 2000	ATHENS 2004	Beijing 2008	London	Rio 2016
Main Olympic Area	89 ㎢	128 ㎢	159 ㎢	155 ㎢	511 ㎢
Population	4.6 Million	3 Million	7.5 Million	8.2 Million	6.3 Million
Main Transit for Olympic Transport	Rail/Metro Bus	Metro/Tram Bus	Rail/Metro Bus	Metro - improvement- Bus	4 BRT Metro –line4- Rail-new vehicle
Dedicated Lane Buses	Some	3 Routes	34 Routes 285.7km	240km	More than 150km
ITS	-Traffic Control Center, Field Equipment and systems -R$65million -Co-Operation with Security Transit and Olympic Stadium Management	-Traffic Control Center, Field Equipment and systems -Co-Operation with Security, Transit and Olympic Stadium Management	-Traffic Control Center, Field Equipment and systems -Co-Operation with Security, Transit and Olympic Stadium Management	-Traffic Control Center, Field Equipment and systems -Co-Operation with Security, Transit and Olympic Stadium Management	*-**Traffic** Control Center, Field Equipment and systems -Co-Operation with **Security**, **Transit** and Olympic Stadium Management* Progress?

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Issues and Key

-Size of Olympic Area

Rio 2016 has Largest and Widest Main Olympic Area

⇒Minimizing Travel Time with Traffic/Transportation/Transit Mgmt

-Core of Venues

It will generate traffic of Spectators and Athletes Participants

⇒How to assure the linkage of each Venue and Accommodation

-Main Transit

Main Transit for Spectators is BRTs connecting with Metro and Rail in Other Cities; Metro or Tram or Rail

⇒ Secure Smooth Traffic On the Road

⇒ Ensure Connection of Different Mode

⇒ Traffic/Transport/Transit Operators Cooperation is most important

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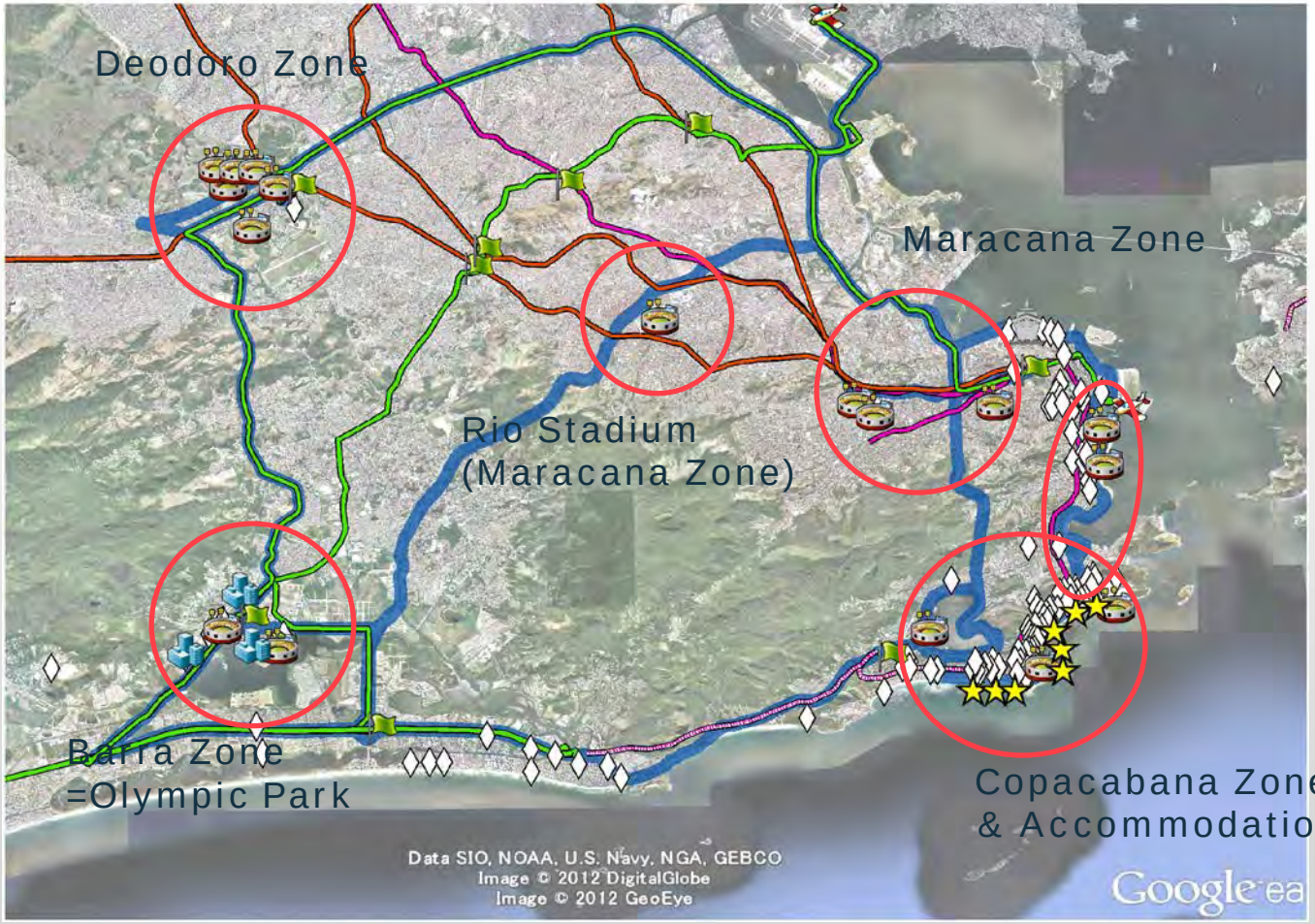
2. Demand Characteristics for Rio 2016

Olympic Main Area



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Key Issues (Summary)

Background traffic characteristics (based on PDTU and travel speed survey)

- Internal Demand in the Rio City by car and bus
- Car Demand between Rio City and Other Cities
- Congestion Points are concentrated in Olympic Area

Olympic demand characteristics (based on Transport Strategic Plan)

- Overlap between background and Olympic demands
- Games Family will be 78,000 in whole period
- Spectators will be more than 60,000 per hour in maximum

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Games Family Demand

- 78,000 visitors in total
- 850 buses, 2,900 sedans and coach service

Client	Number	Accommocation
Athletes and Team Officials	15,500	Olympic Village
Technical Officials	3,500	Barra
Media	22,000	Barra Media Village
T1 - T3 (IOC member etc.)	5,000	Games Family Hotel (Copacabana)
Marketing Partners	32,000	Various

Olympic Lanes

Games Family Hotel

Parking Space

Depot

Source: Transport Strategic Plan for the Rio 2016 Olympic and Paralympic Games

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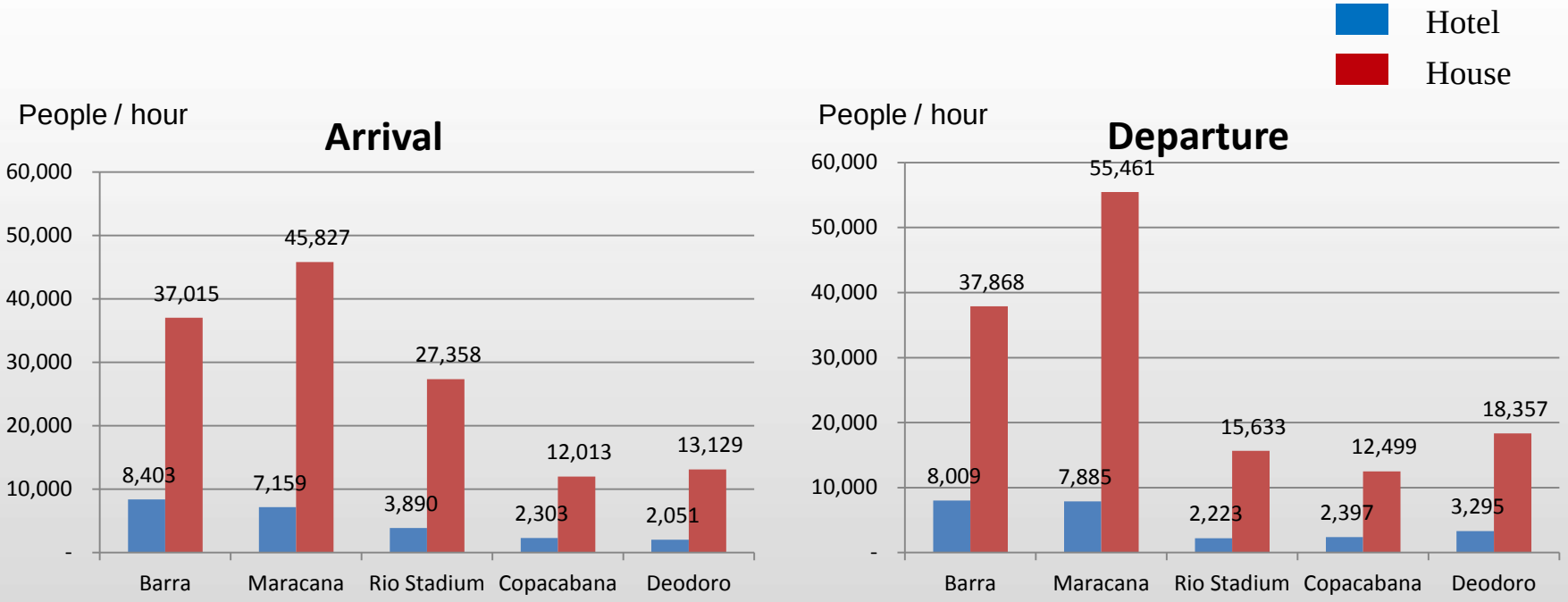
Peak Spectators Demand by Zone

- More than 60,000 spectators in a peak one hour
- Barra and Maracana



Source: Atualização do Plano Estratégico de Transportes para os Jogos Olímpicos e Paraolímpicos de 2016 (provided by SMTR)

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Transportation System around the venues in Barra Zone

Venue
RIO OLYMPIC PARK
RIOCENTRO

Peak demand: about 45,000 per hour

Demand Characteristics

- **Many Competition venues are located (Olympic Park)**
  → Event information and Access information are necessary for Spectators
- **Accommodation for athletes is located (Olympic Village)**
  → Traveler information is necessary at accommodation area
- **Spectators access by BRT**
  → To ensure smooth BRT operation and Games Family Transportation

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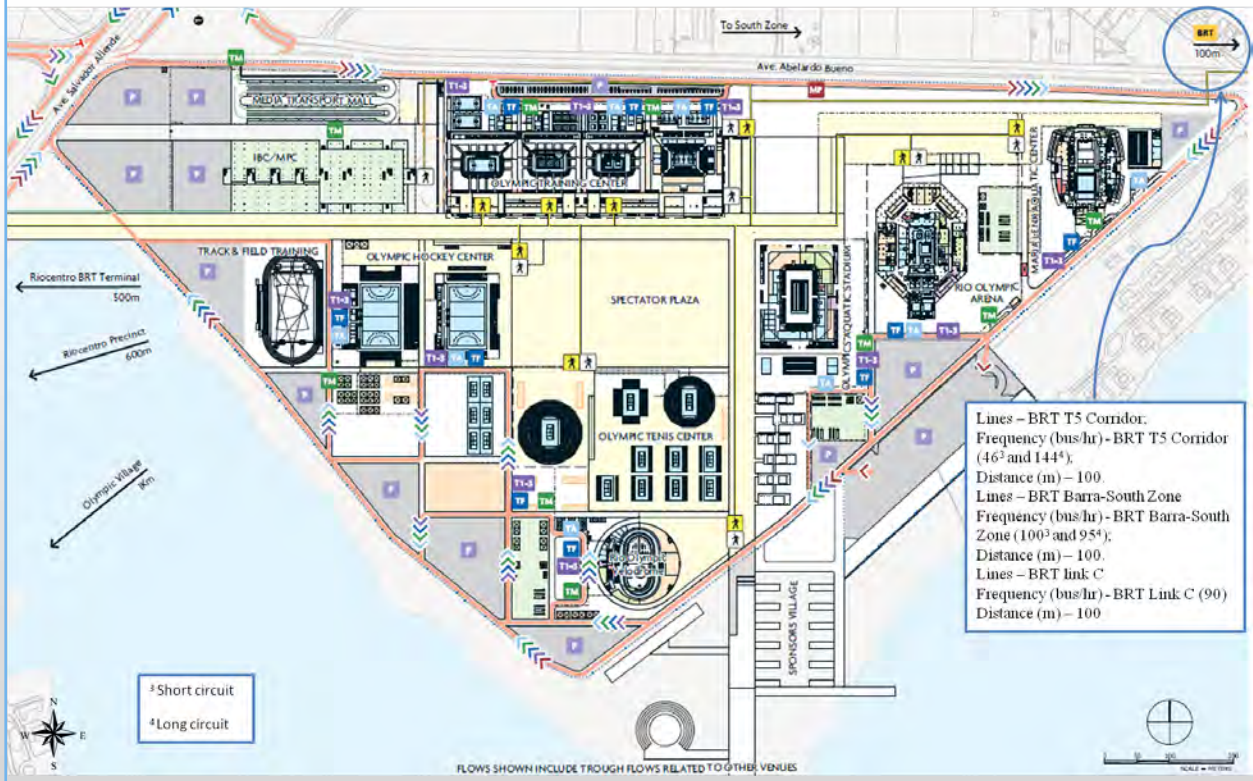
Transportation System for Rio Olympic Park (example)

Venue	RIO OLYMPIC PARK
Gross Seat	OTC – Hall 1 (Basketball) – 6,000 OTC – Hall 2 (Judo) – 10,000 OTC – Hall 2 (Taekwondo) – 10,000 OTC – Hall 3 (Wrestling) – 10,000 OTC – Hall 4 (Handball) – 12,000 Olympic Hockey Center – 15,000 Olympic Tennis Center – 19,750 Rio Olympic Velodrome (Cycling - Track) – 5,000 Maria Lenk Aquatic Center (Diving) – 6,500 Maria Lenk Aquatic Center (Water Polo) – 6,500 Olympic Aquatics Stadium (Swimming, Synchronized Swimming) – 18,000 Rio Olympic Arena (Gymnastics Artistic, Rhythmic) – 12,000 Rio Olympic Arena (Trampoline) – 12,000



Source: Transport Strategic Plan for the Rio 2016 Olympic and Paralympic Games

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Transportation System around the venues in Maracana Zone

Venue
MARACANÃ
Sambódromo
São Januário Stadium

Peak demand: 50,000 – 60,000 per hour

Demand Characteristics

- **Large stadium for Ceremonies and football match (Capacity: 90,000) and large event venue**
  → Crowd management is necessary

- **Metro station, SuperVIA station and local bus stops are located**
  → Integrate transport operation info. and provide traveler info.

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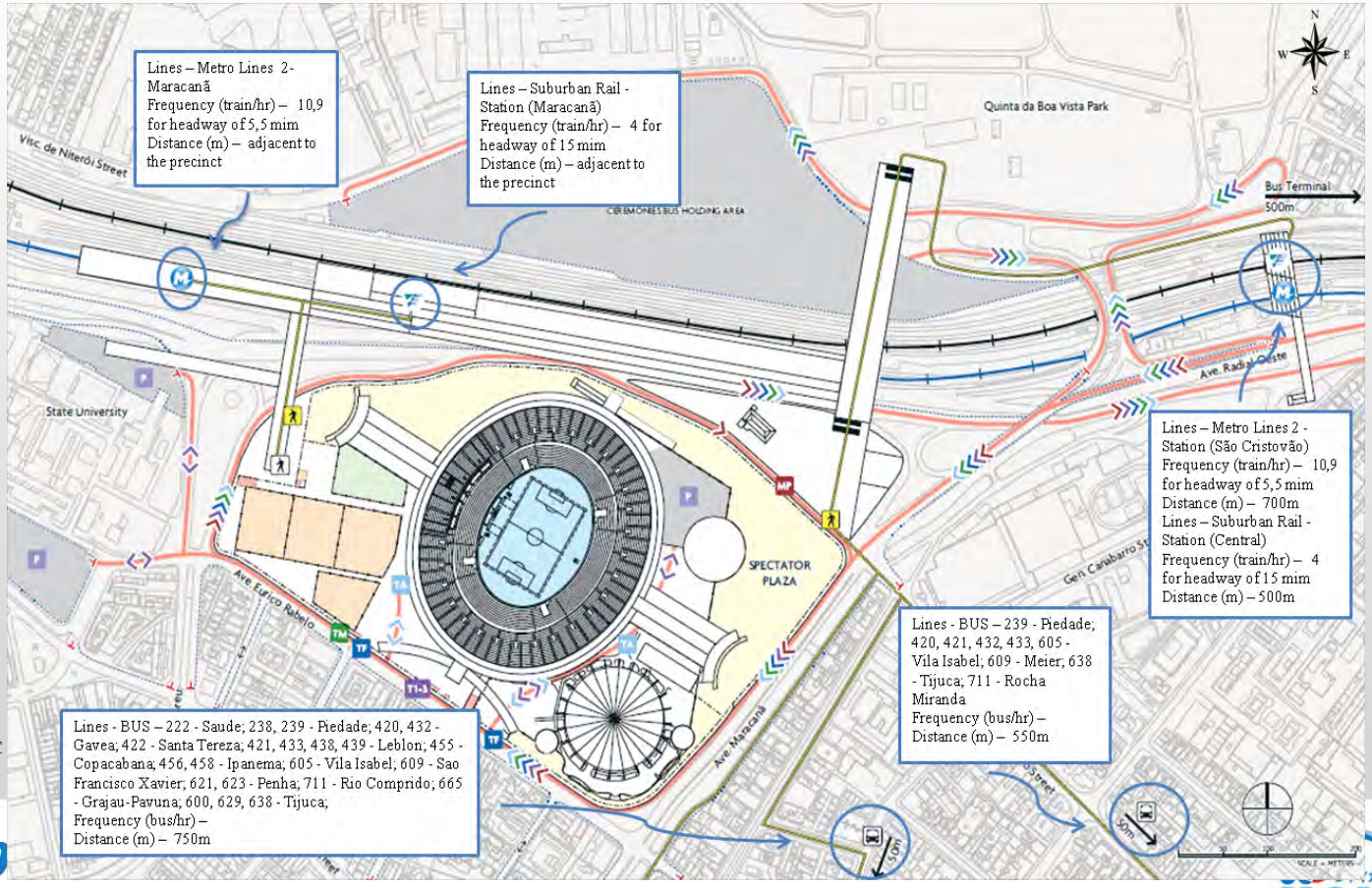
Transportation System for Maracata Stadium (example)

Venue	MARACANÃ STADIUM and MARACANÃZINHO ARENA
Gross Seat	Maracanã Stadium (Football Finals) – 90,000 Maracanãzinho Arena (Volleyball) – 12,000 Maracanã Stadium (Opening and Closing Ceremonies) – 90,000



Source: Transport Strategic Plan for the Rio 2016 Olympic and Paralympic Games

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Proposals

- Traffic Management (Background and Games Family Demand)

1. Travel Time information along Olympic Lanes
2. Traffic control along the BRT corridor (especially TransOlympica, TransOeste)
   ex. Priority signal control and BRT fleet operation
3. Information of parking occupation

- Transport Management (Spectators Demand) Customized for each Zone

1. Approaching and operation info. of public transport
2. Integration and information exchange between modes

- Event Management

1. Event information for hotel guests
2. Event information of multi venues in Barra zone and Copacabana zones
3. Assess information from stations to venues

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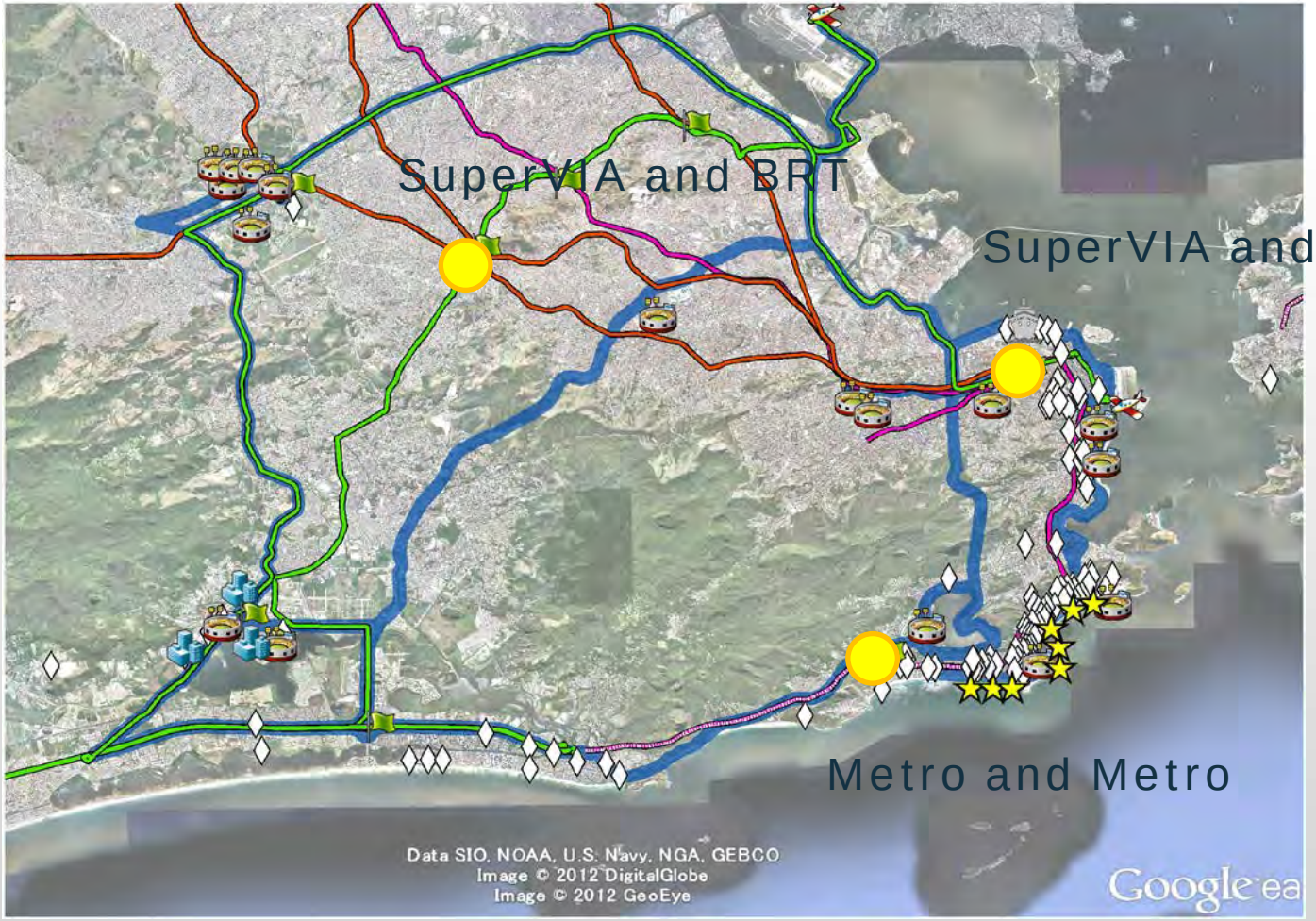
Important Integration Points for Olympic Transport



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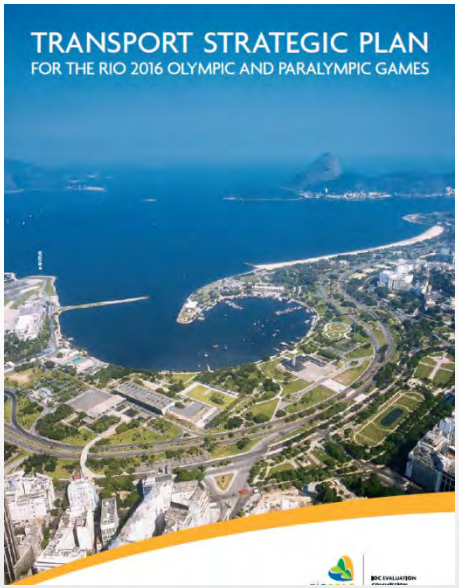
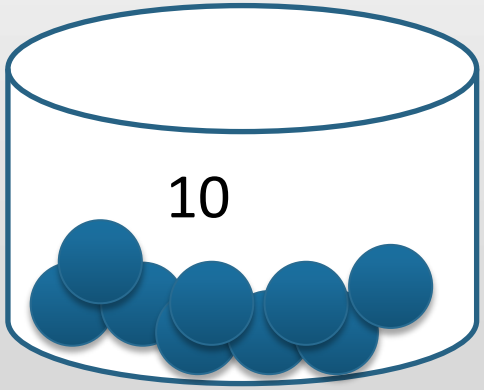
Elements for ITS Master Plan Policy Setting

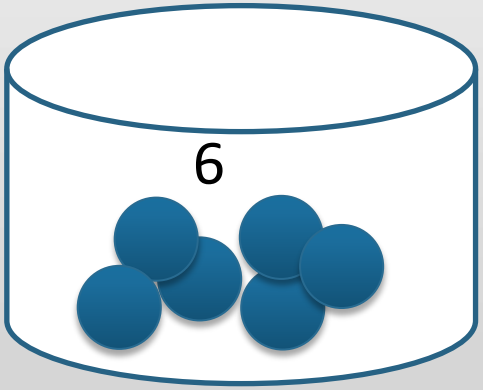
Key Words from two Plans

Equitable
Plural
Educated
Healthy
Safe
Prosperous
Efficient
Innovative
Sustainable
Solidary

Safety
Comfort
Quality
Reliability
Efficiency
All Client







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6. Policy Setting for ITS Master Plan

Policy Setting

Equitable
Plural
Educated
Healthy
Safe
Prosperous
Efficient
Innovative
Sustainable
Solidary

Safety
Comfort
Quality
Reliability
Efficiency
All Client

1. Promote efficient system management and operation

2. Enhance the integration and connectivity of the transportation system

3. Promote and enhance the environmental and economical sustainable development

4. Develop the economic diversity of the metropolitan area by enhancing productivity, and efficiency

5. Increase the safety and Security of the transportation system

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Volume II
Rio de Janeiro Metropolitan Area ITS Master plan

13th of November, 2012

JICA Study Team

Volume II
Table of Contents

Volume II
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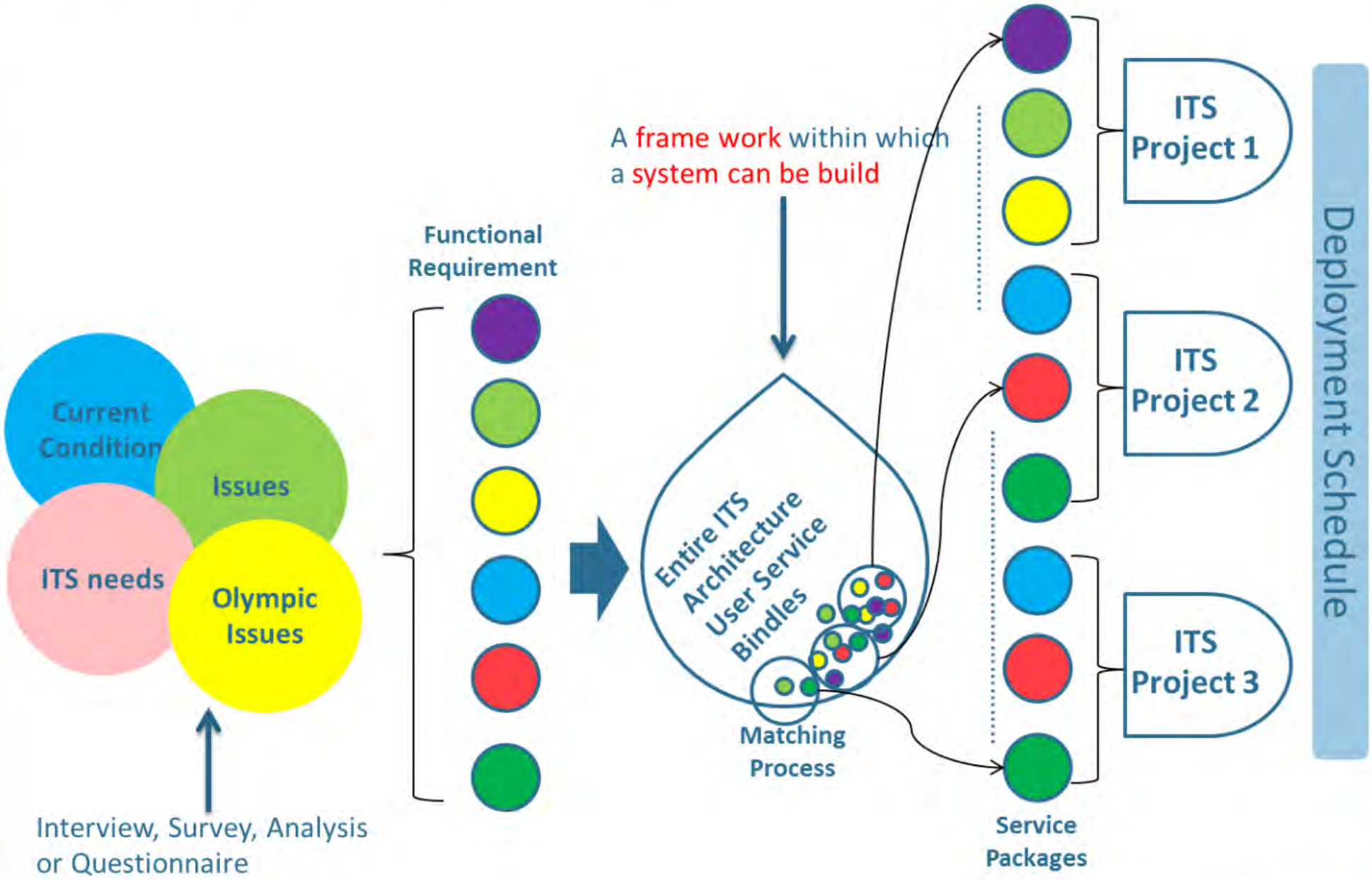
8.Functional Requirement for ITS
9.ITS Projects for RMRJ
10.Deployment Schedule
11.ITS Evaluation
12.Short Term ITS Projects
13.Conclusion

Our Study Methodology -Review-



7. ITS Architecture
-User Services Bundles and Service Packages-

- User services document what ITS should do from the user's perspective.

- The service packages, provide an accessible, service-oriented perspective to the ITS Architecture. They are tailored to fit, separately or in combination, real world transportation problems and needs.

7. ITS Architecture
-User Services Bundles and Service Packages-

8 Bundles and 33 Services

*Security and HAZMAT are included Emergency Management

**Entire ITS architecture is based on U.S. National ITS Architecture,
Because U.S. Architecture
is the World Newest ITS Architecture (Updated at 10/3/2012)
is aligned ISO 14813-1 User Service Reference, means its adaptive ISO 14813-1

Ex)1.6 Traffic Control

The Traffic Control user service provides for the integration and adaptive control of the freeway and surface street systems to improve the flow of traffic, give preference to transit and other high occupancy vehicles, and minimize congestion while maximizing the movement of people and goods. This service gathers data from the transportation system, fuses it into usable information, and uses it to determine the optimum assignment of right-of-way to vehicles and pedestrians. The real-time traffic information collected by the Traffic Control service is also disseminated for use by many other user services.

7. ITS Architecture
-User Services Bundles and Service Packages-

8 Service Area and 97 Service Packages

7. ITS Architecture
-User Services Bundles and Service Packages-

Ex) Relation of User Service 1.6 Traffic Control and Service Packages Traffic Management

1. Travel and Traffic Management

1.6 Traffic Control

Service Packages

Traffic Management

- ATMS01;Network Surveillance
- ATMS02;Traffic Probe Surveillance
- ATMS03;Traffic Signal Control
- ATMS04;Traffic Metering
- ATMS05;HOV Lane Management
- ATMS06;Traffic Information Dissemination
- ATMS07;Regional Traffic Management
- ATMS08;Traffic Incident Management System
- ATMS09;Transportation Decision Support and Demand Management
- ATMS10;Elecronic Toll Collection
- ATMS11;Emissions Monitoring and Management
- ATMS12;Roadside Lighting System Control
- ATMS13;Standard Railroad Grade Crossing
- ATMS14;Advanced Railroad Grade Crossing
- ATMS15;Railroad Operation Coordination
- ATMS16;Parking Facility Management
- ATMS17;Regional Parking Management
- ATMS18;Reversible Lane Management
- ATMS19;Speed Warning and Enforcement
- ATMS20;Drawbridge Management
- ATMS21;Roadway Closure Management
- ATMS22;Variable Speed Limits
- ATMS23Dynamic Lane Management and Shoulder Use
- ATMS24;Dynamic Roadway Warning
- ATMS25;VMT Road User Payament
- ATMS26;Mixed Use Warning Systems

7. Functional Requirement of ITS

Category	Items	Current Condition	Issues
Regional Characteristic	Population	Population is Increasing	To Avoid Congestion Caused by Population Explosion
		Urban Sprawl	To Avoid Congestion Caused by Increasing Long Trip
		High Density Population at City Area	To Avoid Congestion Caused by Increasing High Density
	Economic	High Rate of Growth of GDP	Fulfillment of Smoother Traffic to avoid Economic Stagnant
	Global Competitiveness	World53th Position and It's Increasing	Effective Infrastructure Control is needed to grow Competitiveness
	Tourism	Growth of number of Foreign Tourists	Collect and Provision of Useful Travel Information
	International Events	World 27th Position	Information Provision Demand is increasing for International People
	Large Scale Events	A lot of Large Scale Events will be held	Proper Information Management and Traffic/Transportation Control is Expected
	Climate	Flood-Heavy Rain, Land Slope	Early Detection and Provision of Weather and Disaster Information
	Environmental	Excess Limitation of SPM/Nox/Ox	Traffic Control from Environmental Aspect
Road Infrastructures	Road	Lack of Ring Roads and Radial: by comparison in pop. Due to topographical constraint	Utilizing Existing Road Network
		Improper Condition of Road Payment	Pavement Condition Monitoring and Maintenance
		Various Administrators/Operators	Lack of Information Exchange
		Tunnels	Traffic/Infrastructure Monitoring
		Bridges	
		Rail Crossing	Coordination with Rail Operators
		Sharp Curves at Mountain Pass	Provision Safety Guide Information
		Lack of Equipment for Traffic Basic Data	Deployment of Metering and Monitoring Equipment
		Shortage of Traffic/Transportation Info Provision Equipment	Deployment of Information Provision Equipment
		Congestion at Toll Plaza	Low Utilization Ratio of ETC
		Bicycle Network is Under Developing	Comfortable Mobilization for Bicycle Users
		Lack of Consideration for Valuable People	Universal Designing for Road Infrastructure
		Car-Parking	No Parking Information at Roadway
Regional Transportation Characteristic	Demand	Large Number of In-Bound Trip to RJ Municipality	Utilizing Existing Infrastructure
	Vehicle Registration	Rapid Growth of No. of Vehicle Registration	Prompt Response to Plan New Infrastructure Building
	Modal Splits	Mass-Transit: High Proportion of Modal Split	More Comfortable Transportation System
		Private Car: High Proportion of Modal Split in Niteroi	To Control/Regulate Private Car
	Traffic Volume	Heavy Traffic Volume: Arterial Roads	Encourage to shift Mass-Transit System
		Heavy Traffic Volume: Important Intersections	Traffic Demand Management via Providing Congestion Information
	Travel Time Speed	Chronically Traffic Jam at Peak Time	Dynamic Signal Optimization for Major Intersection
		Travel Speed Reduction at Major Intersections	Provision of Congestion Information
	Accident	Accident Trend of Road Traffic: Collision	To Promote Road Safety
Traffic Manner	Vehicles	Signal Jumping	Enlighten and Enforcement
		Lane Hogging	
		Driving Over Speed Limit	Emergency Vehicles should have Priority in road
		No Yielding for Emergency Vehicle	
Logistics	Commercial Vehicles	Weigh-in Points are Existing on Roads	More Smoother Check on Roadway
		Vehicle Location Monitoring is Operated	Lack of Traffic Related Information
			Prompt Incident Management
Regional Transit Characteristic	Over All Condition	New Mass-Transit Under Preparation	Seamless Travelling and Integration
	Inner Municipality Bus	Limited Information Provision At Bus Station/Stop	
		Occupancy Level of Passenger is Vary Quite Among Buses	Equalization of Bus Passenger Occupancy
		Ticket Transaction in Bus	Reinforcement Provision Travel Related Information
		¼ people is still paying the fare in cash	Cashless/ Seamless Travel
		Lack of Route Information Provision in the Bus	Efficient Mass-Transit Control
		Over 3 Million Trips are made by BUS in Daily	Comfortable and Secure Mobility for Users
	BRT	4 lines are planned, 1 is under operation	Cashless/ Seamless Travel
		Accidents are often Happened BRT Line	Enlighten and Enforcement
		New Line is Under Construction	Reduce Traffic/Transportation Impact During Construction
	Tram	Santa Teresa: Out of Service	Repair and Secure Operation
		Corcovado: Heavily Congested on Week-End	Demand Managing and Information Provision
	Cable Car Teleferico	Lack of Information to Connect to Other Mode	Seamless Travel Info.
	Taxi	Approx. 30000 Taxies are running	Controlling and Dispatching
	LRT	Under Planning	
	METRO	Information Provision of In-side Metro Vehicle is Limited	Provision of Current Position and Next Station Info. In Metro Vehicle
		New Line is Under Construction	Reduce Traffic/Transportation Impact During Construction
		Information Provision of Station and Plat Home are Limited	Expansion of Provision of Train Approaching info at Plat Home
			Provision of Transit of Other Mode at Connecting Station
	Rail Super VIA	Information Provision of In-side Vehicle is Limited	Provision of Current Position and Next Station Info. In Metro Vehicle
		Information Provision of Station and Plat Home are Limited	Expansion of Provision of Train Approaching info at Plat Home
			Provision of Transit of Other Mode at Connecting Station
	Inter Municipality Inter State International Bus	Various Direction of Arrival and Departure	Efficient Mass-Transport Control and Monitoring
		Bus Arrival Info is not provision	
		Limited Departing Info at Departing Plat Home	Provision of Essential Info to Passengers
	Ferry Barcas	Important Mass-Transit for Niteroi Residence	More Seam less Connection
		Lack of Information to Connect to Other Mode	More Enlighten for Private Car Users
Concession Supervision	SMTR	Inner-City Bus Concession Supervision System	Service Level is not Automatically Figured Out
	SECONSERVA	To be Confirmed	To be Confirmed
	ANTT	System is Under Planning	System is Under Planning
	DETRO	System is Under Planning	System is Under Planning
	CODERTE	Terminal Security System Operated by Concessionaire	Terminal Security System Operated by Concessionaire
	AGENTRANSP	Monitoring System of Ferry, Metro, SuperVIA and State Roads	Monitoring System of Ferry, Metro, SuperVIA and State Roads
	NITTRANS	System is Under Planning	System is Under Planning

Needs -Information & System- (U:Users O:Operators A:Administrators)	Functional Requirement
U:Traffic Congestion Information on Real Time	Function to Enable Real Time Congestion Information Provision
U:Traffic Information to Destination	Function to Enable Specific Route Guidance
U:Properly New Infrastructure Building	Function to Enable Support Infrastructure Planning
U:Weather/Disaster Information	Function to Enable Real Time Weather Information Provision Promptly
U:Sightseeing Spot/ Destination Information	Function to Enable Real Time Disaster Information Provision Promptly
U:Real Time Air/Noise Pollution Info.	Function to Enable Travel Information Provision
A:Manage Traffic Demand	Function to Enable Air/Noise Pollution Information Provision
	Function to Enable Traffic Demand Management
U:Traffic Congestion Information on Real Time	Function to Enable Real Time Congestion Information Provision
O:Traffic Demand Management System	Function to Enable Support Infrastructure Planning
A:Planning Support Tool/Data/System	Function to Enable Traffic Demand Management
O:Monitoring and Control Traffic Stream/Congestion	Function to Enable Detecting Traffic Volume Online and other Road Related Conditions
O:Providing Traffic Congestion Information	Function to Enable Collecting, Storing and Traffic/Transit Related Data and Exchange
O:Automated Traffic Counting/ Reversible Lane	Function to Enable Monitoring Condition of Infrastructure Real Time
A,O:Related Data Exchange and Integration	Function to Enable Manage Incident
A,O,U :Prompt Correspond Accident Info gathering and provision	Function to Enable Signal Coordination and Optimization Linked with Congestion Information
O:Traffic Monitoring	Function to Enable Flexible Lane Operation by Time/ Congestion
O:Real Time Infrastructure Monitoring	Function to Enable Go Trough Toll Gate Without Stopping
O:Signal Coordination/Optimization According to Congestion Level	Function to Enable Guide Route and Parking Availability
O, A, U: More Deployment of OBU and ETC Gate	
U: Parking Location and Availability information	
U: Introduction to Driving Assistance for Vehicles	Function to Enable Black Spot Information Provision
U: Black Spot Information in Advance	Function to Enable Automated Enforcement
O:Total System Operation/Maintenance	Function to Enable Total Traffic Control/Management including O/M
A: Enforcement Traffic Rules	Function to Enable Avoiding for Accident
O: Supporting Tool for Mobility Management	Function to Enable Transit/Transportation Information Provision via Web
A,O: Signal Coordination from Emergency Vehicle	Communication to Optimize Signal Vehicle to Roadway Equipment
U: Seamless Transit Information	Information Provision for Handicapped People
U: Total Transit Information	Information Provision for Transit
A,O: Transit Operation and Coordination	Function to Enable Operate Transit
U: Route information for Handicapped people	
A,O: Prompt Check of Weight and Cargo	Function to Enable Prompt Checking Weigh and Cargo at Roadway
O: Provision of Traffic Related Information	Function to Enable Provision Essential Information for Commercial Vehicles such as Weather, Traffic Condition, Speed info or etc.
O: Information and Operation Management for Secure Operation	Function to Enable Operate Commercial Vehicles in Safe
U: Occupancy Level Information	Function to Enable Counting Passengers
U: Travel Destination Information	Function to Enable Sufficient Travel/Destination Information at Transit Station
A,O: Related Data Exchange and Integration	Function to Enable Cashless/Seamless Transit
U: Cashless Seamless Tool for Passengers	Function to Manage and Integrate Data for Operator and Users
U: Transit Vehicle Location Information	Function to Enable Bus Location Information Provision Bus Terminal and Station
A,O: Transit Operation Control/Management	Function to Enable Operate Transit
A,O: Work Zone Control/Management	Function to Enable Manage and Monitor Safety Work Zone
O: On Time Operation	
A,O: Secure Transit Condition	Function to Enable Monitor Safety in Transit Vehicle and Station
A: Enforcement Traffic Rules	Function to Enable Automated Enforcement
O,U:Pre Trip Information	Function to Enable Provide Information in Advance
A:Automatically Supervise Performance of Concessionaires	Function to Enable Supervise More Efficiently Performance of Concessionaires
A:System Integration for Several Concessionaires	Function to Enable Supervise Concessionaire At Once

User Services Bundle

1. Travel and Traffic Management
- 1.1 Pre-Trip Information
- 1.2 En-Route Driver Information
- 1.3 Route Guidance
- 1.4 Ride Matching and Reservation
- 1.5 Traveler Service Information
- 1.6 Traffic Control
- 1.7 Incident Management
- 1.8 Travel Demand Management
- 1.9 Emission Testing and Mitigation
- 1.10 Highway Rail Intersection

2. Public Transport Management
- 2.1 Public Transportation Management
- 2.2 En-Route Transit Information
- 2.3 Personalized Public Transport
- 2.4 Public Travel Security

3. Electric Payment
- 3.1 Electric Payment Services

4. Commercial Vehicle Operations
- 4.1 Commercial Vehicle Electric Clearance
- 4.2 Automated Roadside Safety Inspection
- 4.3 On-board Safety And Security Monitoring
- 4.4 Commercial Vehicle Administrative Processes
- 4.5 Hazardous Security And Incident Response
- 4.6 Freight Mobility

5. Emergency Management
- 5.1 Emergency Notification And Personal Security
- 5.2 Emergency Vehicle Management
- 5.3 Disaster Response And Evacuation

6. Advanced Vehicle Safety Systems
- 6.1 Longitudinal Collision Avoidance
- 6.2 Lateral Collision Avoidance
- 6.3 Intersection Collision Avoidance
- 6.4 Vision Enhancement For Crash Avoidance
- 6.5 Safety Readiness
- 6.6 Pre-Crash Restraint Deployment
- 6.7 Automated Vehicle Operation

7. Information Management
- 7.1 Archived Data

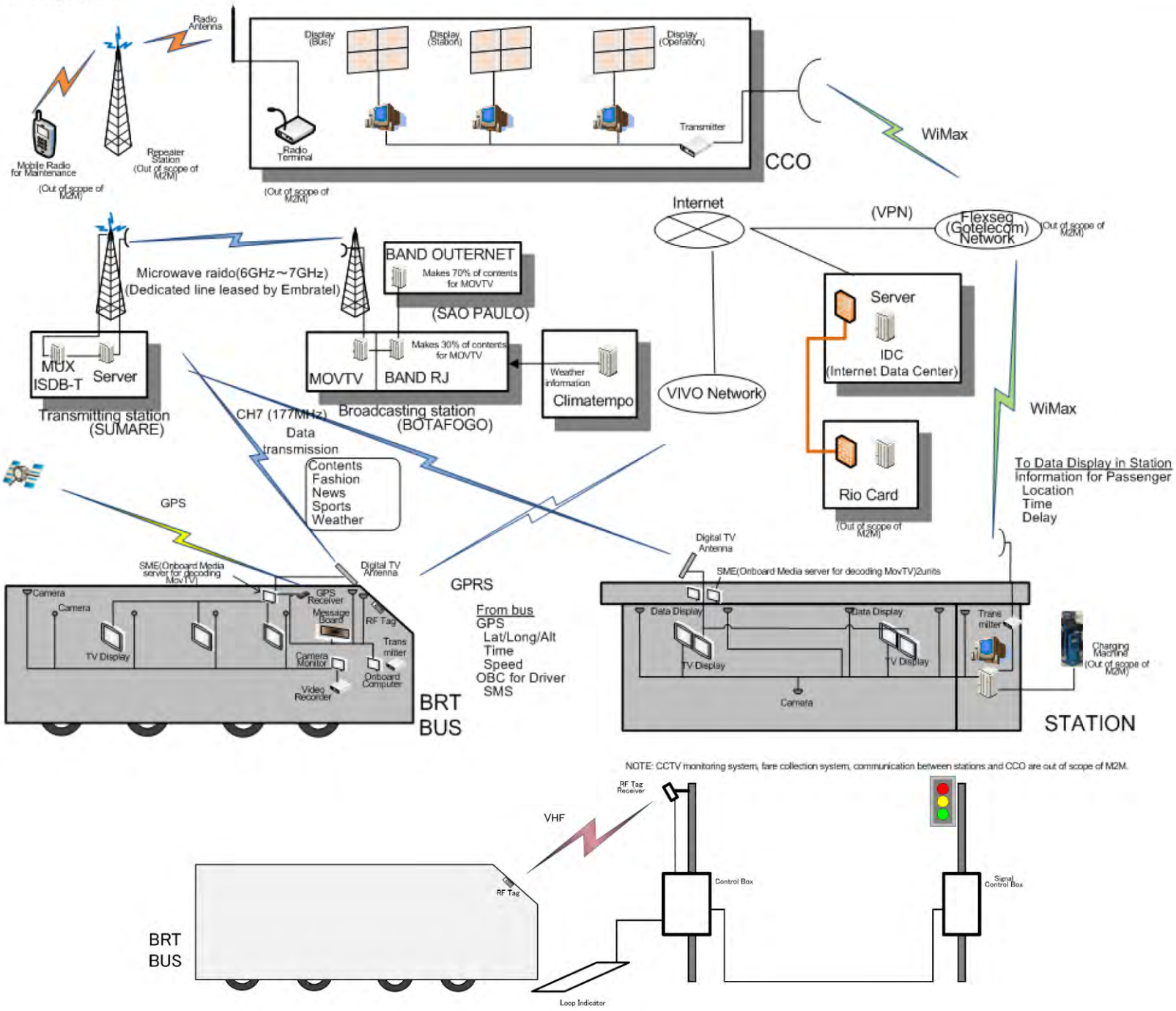
8. Maintenance And Construction Management
- 8.1 Maintenance And Construction Operations

7. Functional Requirement of ITS

Existing System Evaluation 1

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

System Diagram



System Composition	1. Vehicle Tracking System 2. Transit Operation and Management 3. Electric Ticketing System 4. BRT Approaching Information 5. Security Monitoring in Bus	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 via 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	

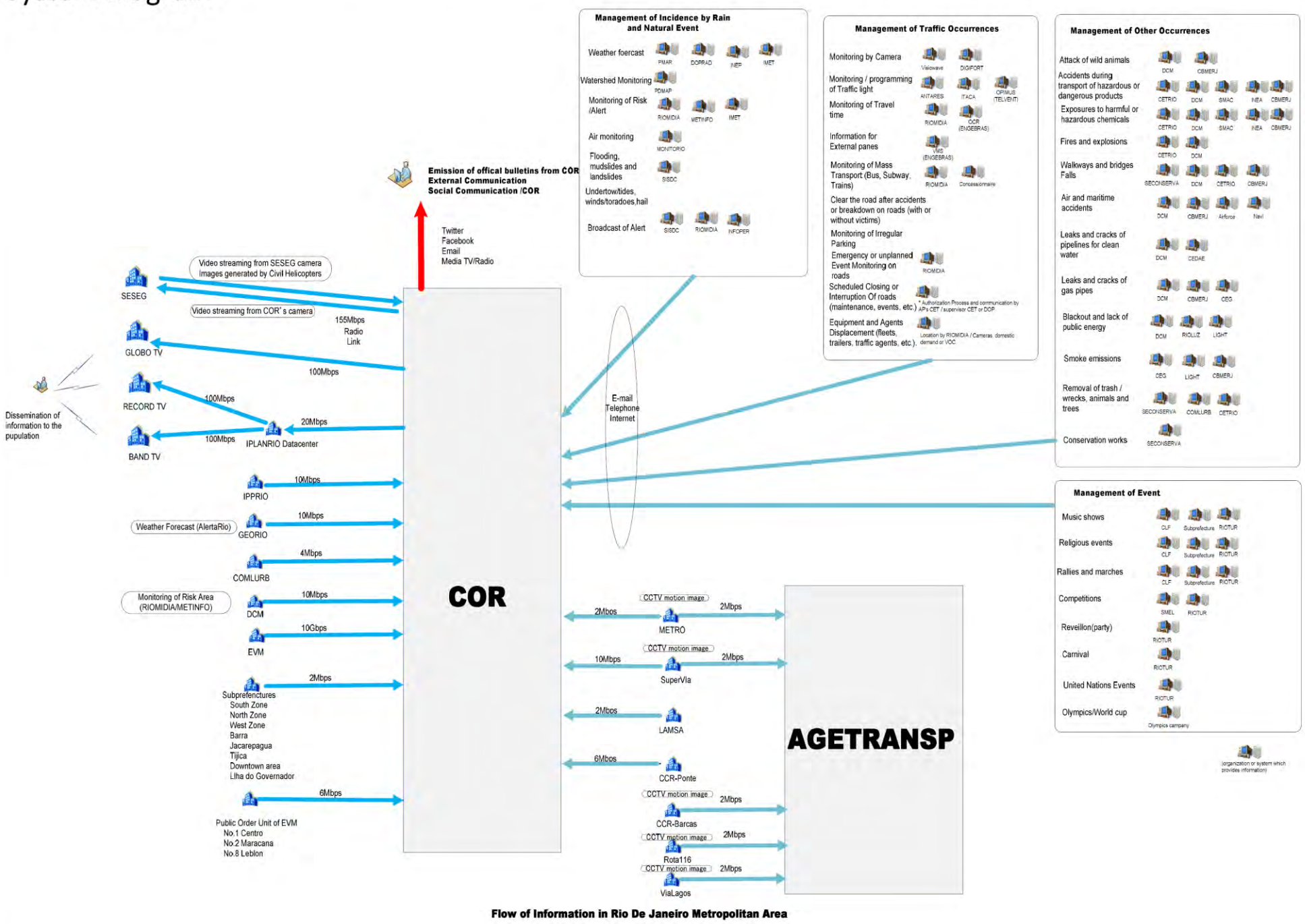
See also ITS Project Architecture 2.Existing System Evaluation Page 11

7. Functional Requirement of ITS

Existing System Evaluation 2

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	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

See also ITS Project Architecture 2.Existing System Evaluation Page 21

7. Functional Requirement of ITS

Current Deployment Condition in RMRJ

Developed Developing Not Planned Planned

Some are already Developed

Service Package			Service Package Name	Current Condition of RMRJ																					
				Federal in State of Rio	State of RJ	RJ Municipality	NITEROI	SAO GONCALO	MARICA	TANGUA	ITABORAI	MAGE	DUAPIMIM	BELFORD ROXO	MESQUITA	NILOPOLIS	S.J.DEMERITI	NOVA IGUACU	QUEIMADOS	JAPERI	PARACAMBI	SEROPEDICA	ITAGUAI	DUQUE DECAXIA
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	Vehicle Mile Traveled Road User Payment (VMT TAX)																					
	50	ATMS26	Mixed Use Warning Systems																					
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 Vehicles 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																					

7. Functional Requirement of ITS

Key Issues

- Information Integration and Utilization
- Operational Integration
- Disseminate ITS Equipment
- Further Expansion

ITS Projects for RMRJ

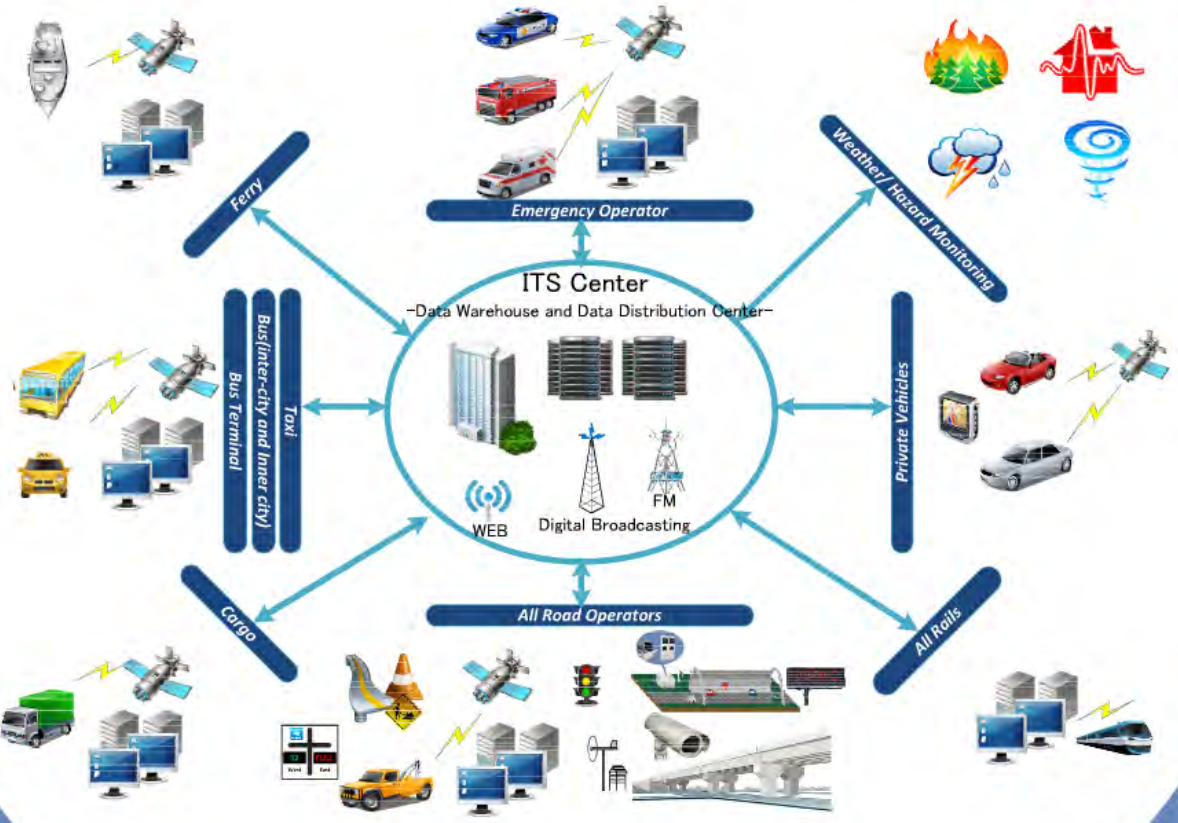
-Keywords;
Integration, Information Exchange, Utilization, Dissemination, Cooperation

-ITS Projects are consisted of several Service Packages

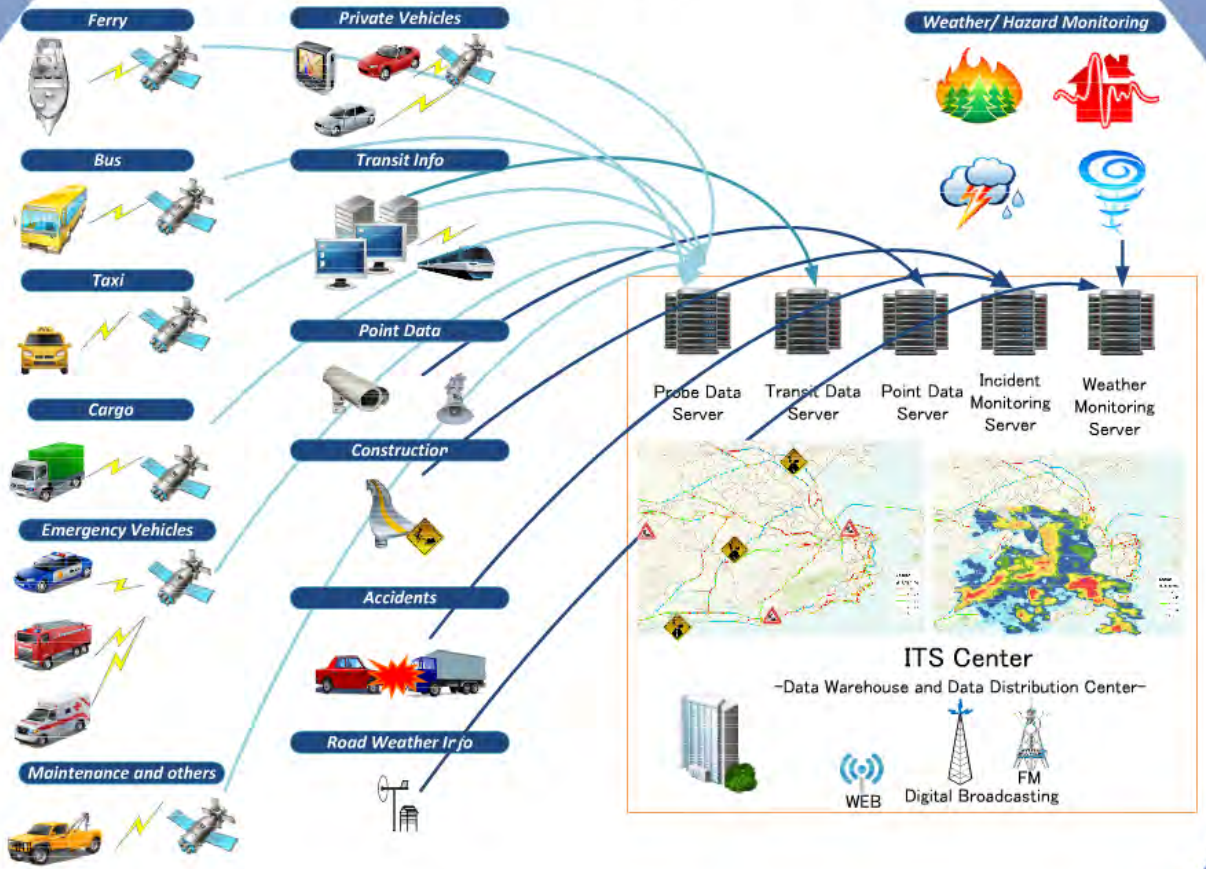
See also The Handout named -ITS PROJECT ARCHITECTURE-

ITS CENTER

for information integration and dissemination



REAL TIME TRAFFIC/ TRANSPORT CONDITION INFORMATION PROCESSING



OLYMPIC SECURITY and TRANSPORT COORDINATION

Security Monitoring/Emergency Control

CICC

Entire Traffic Condition and Transit Operational Condition info from ITS Center

!! Need to be Improved Connection between Traffic Operators and Transit Operators !!

CET-RIO and Rio Onibus shall cooperate in same place for securing comfortable transport/transit

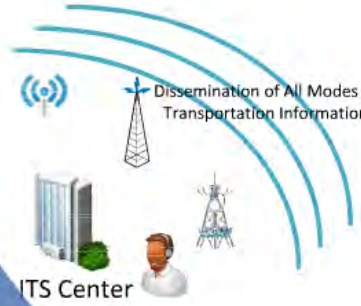
COR

Signal ↔ BRT

Entire Traffic Condition and Transit Operational Condition info from ITS Center

Entire Traffic Condition
Delay and Passenger Occupancy Ratio of BRT

Next Bus Info at Bus Stop and Terminal from ITS Center



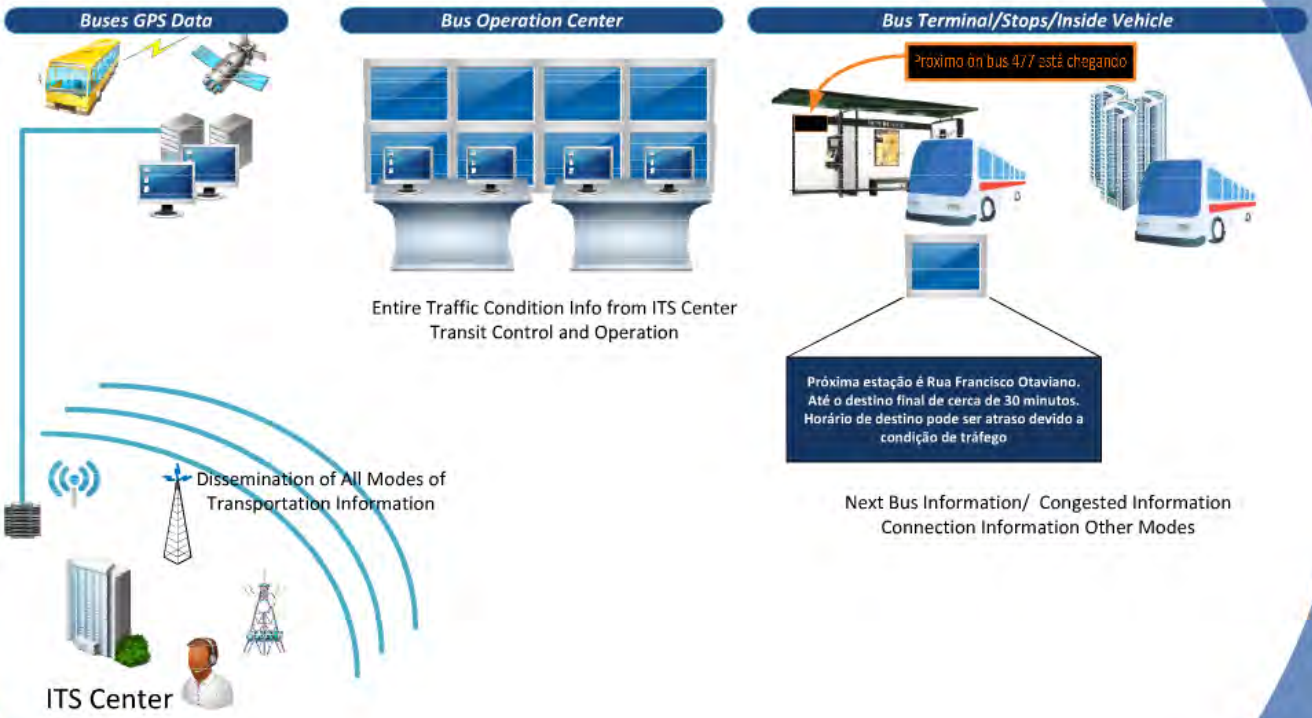
Dissemination of All Modes of Transportation Information

ITS Center

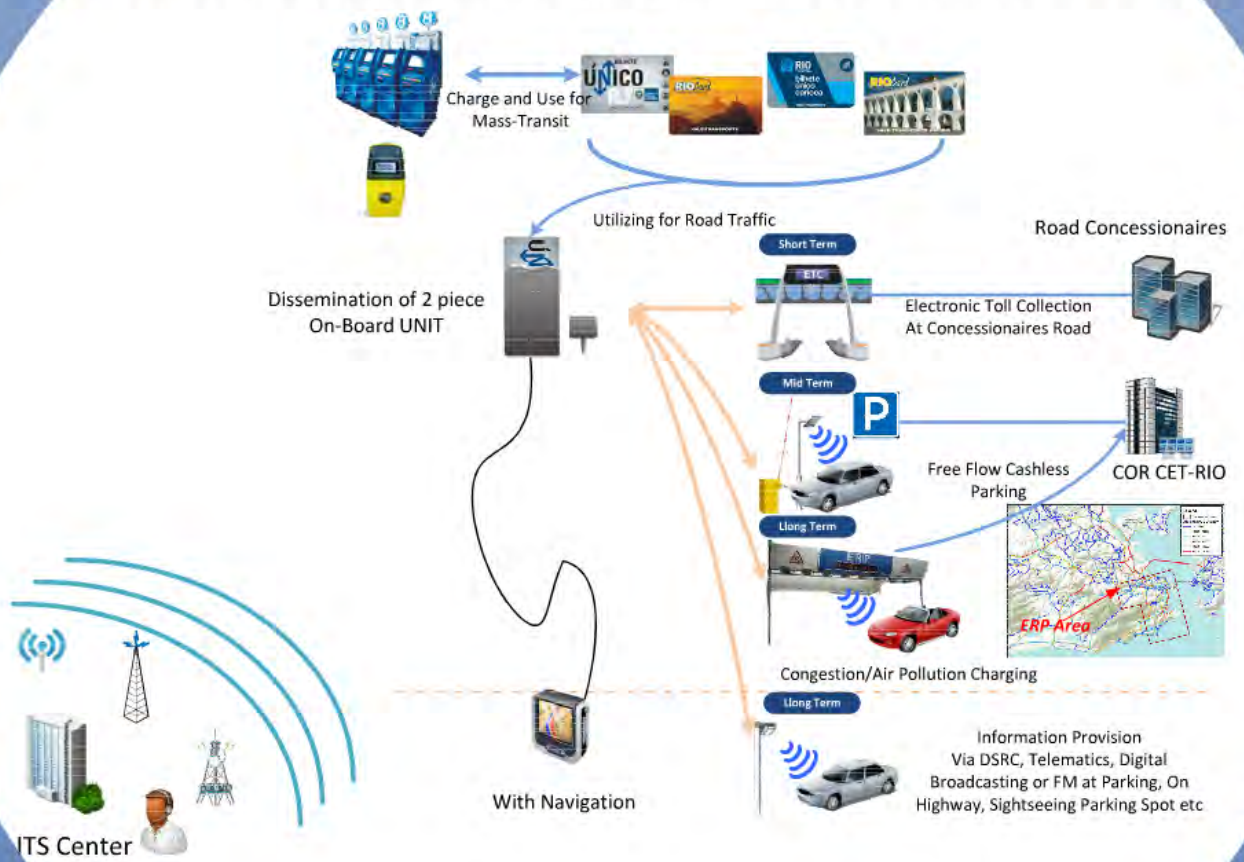
Next Bus, Train or METRO Information Exchange And Provision is necessary for Users

Train Approaching Info
Shall be provisioned at each platform

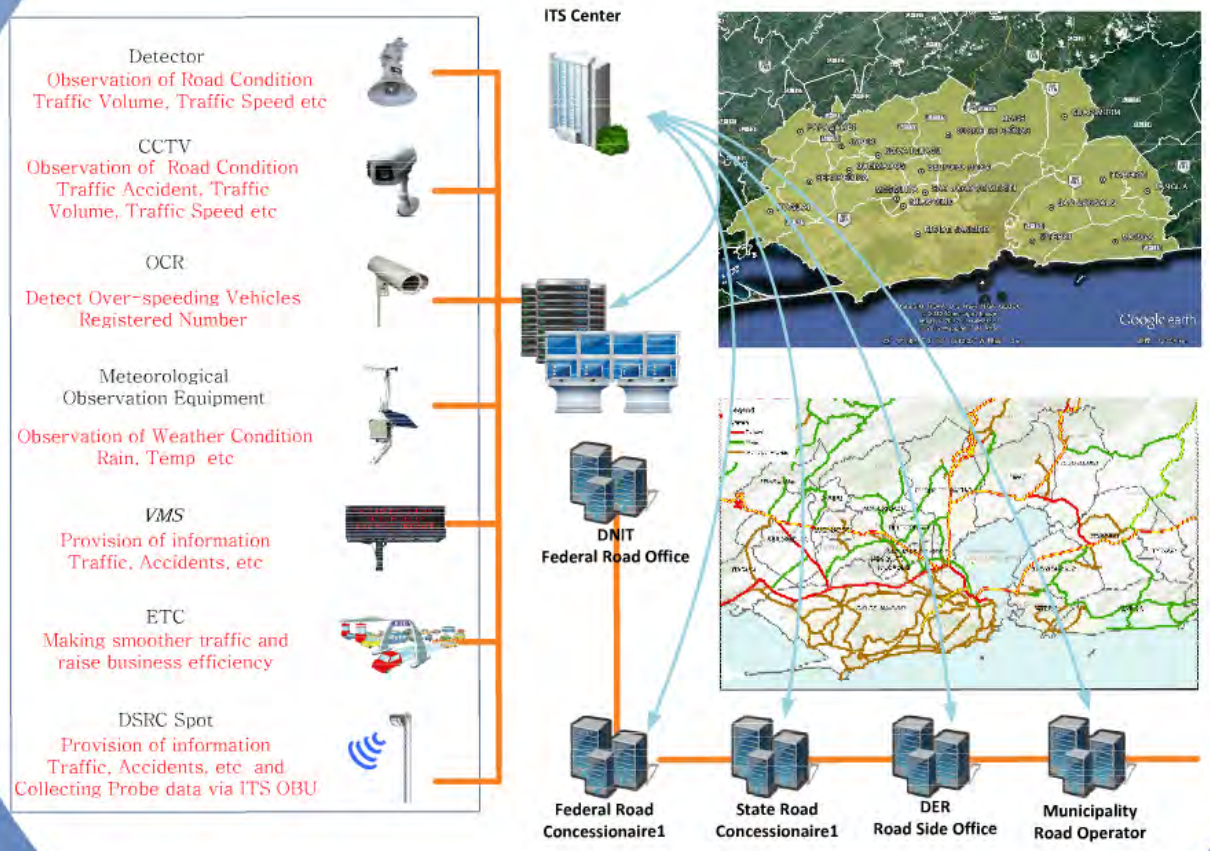
BUS CONDITION INFORMATION PROVISION



DISSEMINATION of ON-BOARD UNIT for MORE INTEGRATED TRANSPORT



INFORMATION EXCHANGE of ROAD OPERATORS



INFORMATION EXCHANGE VIA ITS CENTER BETWEEN MUNICIPALITIES

ITS Center

Municipality
Traffic/Transit Operator
Rio de Janeiro
Municipality
CET-RIO(at COR)
SMTR
Bus Operators

Municipality
Traffic/Transit Operator
Sao Concalo
Bus Operators

Municipality
Traffic/Transit Operator
Duque de Caxias
Bus Operators

Municipality
Traffic/Transit Operator
Nova Iguacu
Bus Operators

Municipality
Traffic/Transit Operator
NITTRANS
Bus Operators

Municipality
Traffic/Transit Operator
Belford Roxo
Bus Operators

Further Deployment

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

TOC for smoother Traffic/Transit Operation

IMPROVEMENT of TRAFFIC/TRANSIT OPERATION CENTER WITH DEPLOYING ESSENTIAL ITS EQUIPMENT at RIO MUNICIPALITY AREA

Now → Proposed Plan

TOC for smoother Traffic/Transit Operation — Not Sufficient → Exchange and integration

Exchange info nearest important road operators, integration BRT operators.

Further Deployment

Adaptive Signal Control
For More Smoother Traffic
30/2265 → 1400/2265
ITAKA is already installed 30 locations, more expansion is needed for more smoother traffic

Concentrated Infrastructure Monitoring
Existing → Improved
Accuracy improvement for detecting incidents

VMS for More Information Provision
34 → 100
Gathered information from several systems shall disseminate via VMSs

MOE for Weather and Air Monitoring
None → Installed
Road side weather information shall be gathered operators to provision road side weather information to users

CCTV for Infrastructure Monitoring
585+120 → 585+350
CCTVs for ITAKA are installed 120, Other585 CCTVs installed already. Utilizing CCTVs Motion Picture Analysis Software shall be added

DYNAMIC LANE MANEGAMENT
For More Utilization of Existing Road Network
ID location Manual → Dynamic Operation
Traffic Detector shall deploy to count traffic volume to determine lane direction dynamically

OCR for Enforcement and Monitoring Traffic Condition
387 → 487
OCR and other systems are separated.
The data shall be utilized as centralized management for traffic metering, real time point speed data monitoring

Bus Related ITS for Bus Location info, Passenger Counting, Travel Time Info.
Not integrated Insufficient Information → Need to be improved
Bus related information disseminate via ITS Center.
BRT Operation shall be integrated traffic operation for comfortable journey

Work Zone Monitoring for Safer Road Work and Information Provision
SECONSERVA
None → Prepared
All of Work Zone Information shall be gathered in advance and disseminate information users and operators

Taxi Dispatching for Response to Taxi Customers, Monitoring Traffic Condition
Some operators already installed → Utilization
GPS data shall be utilized for monitoring current traffic condition on time

Parking Availability Information Provision
SECONSERVA and Private Companies
None → Prepared
Parking Availability Information shall be collect and provision via VMS, Web, Car Navigation

Rail Crossing Management
for More Safer and Secure Traffic
With SUPERVIA
None → Prepared
Rail Crossing shall be controlled by Rail Operator and also coordinated with Traffic Operator

IMPROVEMENT of TRAFFIC/TRANSIT OPERATIONAL CENTER with DEPLOYING ESSENTIAL ITS EQUIPMENT at MUNICIPALITIES in RMRJ

Municipality
Traffic/Transit Operator
NITTRANS
Bus Operators

ITS Center

Now → Proposed Plan

NITTRANS and other municipalities almost same condition

Further Deployment

Adaptive Signal Control
For More Smoother Traffic

None → Should be Prepared

VMS for More Information Provision

None → Should be Prepared

CCTV for Infrastructure Monitoring

None → Should be Prepared

OCR for Enforcement and Monitoring Traffic Condition

None → Should be Prepared

Work Zone Monitoring for Safer Road Work and Information Provision

None → Should be Prepared

All of Work Zone Information shall be gathered in advance and disseminate information users and operators

Parking Availability Information Provision

None → Prepared

Parking Availability Information shall be collect and provision via VMS, Web, Car Navigation

MOE for Weather and Air Monitoring

None → Should be Prepared

Road side weather information shall be gathered operators to provision road side weather information to users

DYNAMIC LANE MANEGAMENT
For More Utilization of Existing Road Network

None → To be determined

Traffic Detector shall deploy to count traffic volume to determine lane direction dynamically

Bus Related ITS for Bus Location info, Passenger Counting, Travel Time Info.

None → Should be Prepared

Bus related information disseminate via ITS Center.
BRT Operation shall be integrated traffic operation for comfortable journey

Taxi Dispatching for Response to Taxi Customers, Monitoring Traffic Condition

None → Should be Prepared

GPS data shall be utilized for monitoring current traffic condition on time

TOC for smoother Traffic/Transit Operation

Not Sufficient → Exchange and integration

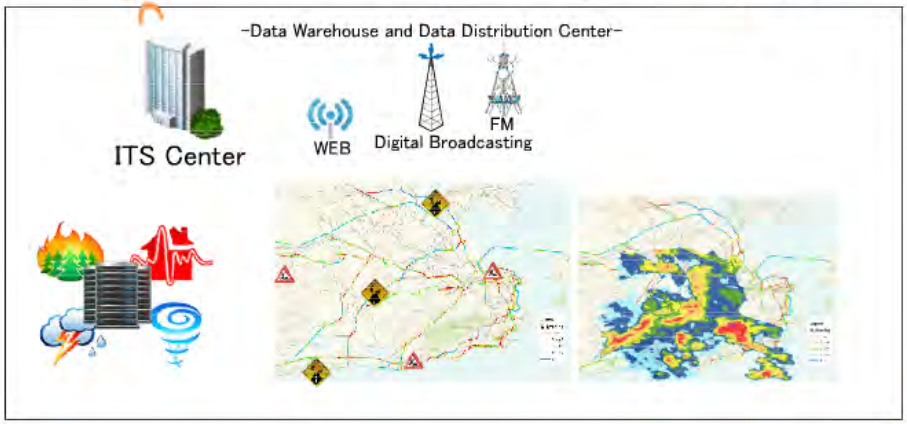
Improvement of Traffic Operation Control center need to be improved. Transit Operation Center shall be established in near future

Rail Crossing Management
for More Safer and Secure Traffic
With SUPERVIA

None → Prepared

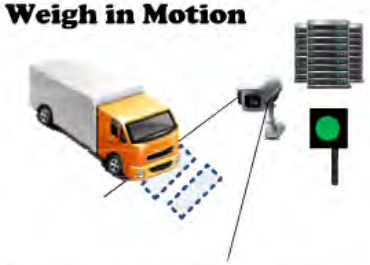
Rail Crossing shall be controlled by Rail Operator and also coordinated with Traffic Operator

EMERGENCY VEHICLE OPERATING MANAGEMENT



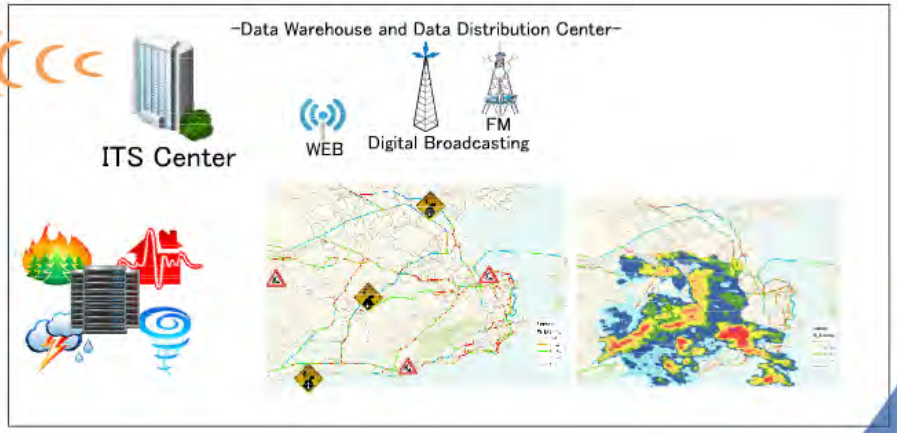
COMMERCIAL VEHICLE OPERATION and MANAGEMENT

Weigh in Motion



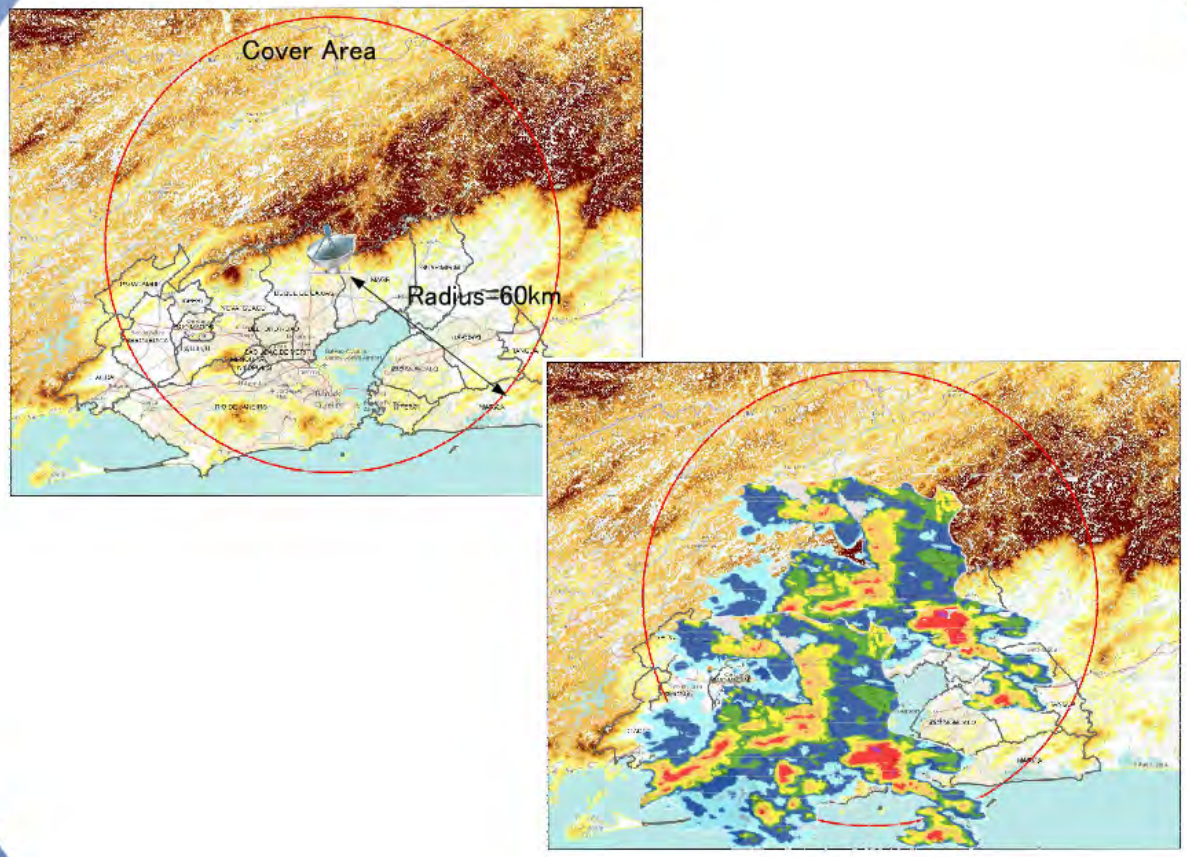
Information Provision via On-Board UNIT

More ITS Projects will be considered in next phase



ADVANCED VEHICLE SAFETY SYSTEMS

DEPLOYMENT of X-BAND RADARS for GRASPING PRECISE SPOT WEATHER



10. Deployment Schedule

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																			
2 Real Time Traffic/Transport Condition Information Processing	PQ,TENDERING/ DD								Construction/Deployment																			
3 Olympic Security and Transport Coordination Center	PQ,TENDERING/ DD								Construction/Deployment																			
4 Bus Condition Information Provision	PQ,TENDERING/ DD								Construction/Deployment																			
5 Dissemination of On-Board UNIT for more Integrated Transport	PQ,TENDERING/ DD								Construction/Deployment																			
6 Information Exchange of Road Operator									PQ,TENDERING/ DD								Construction/Deployment											
7 Information Exchange via ITS Center between Municipalities	PQ,TENDERING/ DD								Construction/Deployment								PQ,TENDERING/ DD				Construction/Deployment							
8 Improvement of Traffic/Transit Operational Center with Essential ITS Equipment at Rio de Janeiro Municipality Area	PQ,TENDERING/ DD								Construction/Deployment																			
9 Improvement of Traffic/Transit Operational Center with Essential ITS Equipment at Other Municipality Area in RMRJ									PQ,TENDERING/ DD								Construction/Deployment											
10 Emergency Vehicle Operating Management	PQ,TENDERING/ DD								Construction/Deployment								Construction/Deployment											
11 Commercial Vehicle Operation and Management									PQ,TENDERING/ DD								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

11. Economical Evaluation

Evaluated Projects

-ITS Center

-Olympic Security and Transport Coordination Center

  -BRT Priority System

-Bus Condition Information Provision

  -Bus Location System

-Dissemination of On-Board Unit for more Integrated Transport

  -ETC and ERP

RED Caption;Evaluated Systems

11. Economical Evaluation -Methodology-

The impact of each system will emerge as;

-Reduction of Travel Time Cost -TTC-

-Reduction of Vehicle Operating Cost -VOC-

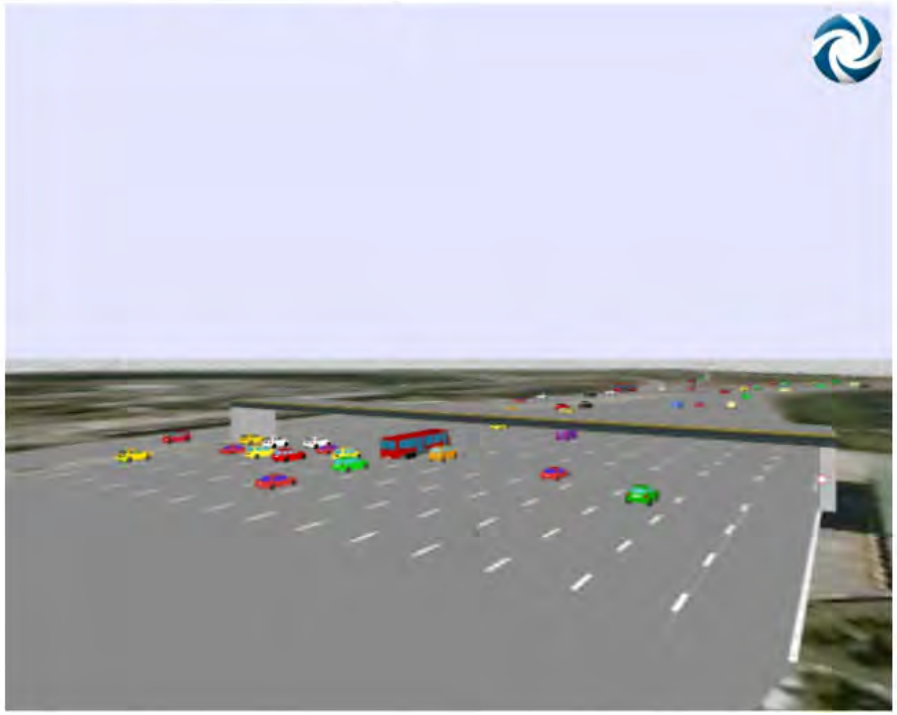
Simulation cases are;

if systems are installed or not -with project, without project-

DCF Method is applied for analyzing economic impact of ITS

DCF; Discount Cash Flow

11. Economical Evaluation -Simulation-



11. Economical Evaluation -Result-

PROJECTS	NPV	B/C	EIRR
ITS CENTER	233.13	4.92	43.0%
BRT PRIORITY SYSTEM	216.13	6.64	61.9%
BUS LOCATION INFORMATION PROVISION	197.80	4.21	32.7%
ETC	75.28	5.89	52.0%
ERP	724.09	6.18	23.2%

NPV;Net Present Value

B/C; Cost Benefit

EIRR;Economic Internal Rate Return

12. Short Term ITS Projects for RIO Olympic

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																							
2 Real Time Traffic/Transport Condition Information Processing	PQ,TENDERING/ DD				Construction/Deployment																							
3 Olympic Security and Transport Coordination Center	PQ,TENDERING/ DD				Construction/Deployment																							
4 Bus Condition Information Provision	PQ,TENDERING/ DD				Construction/Deployment																							
5 Dissemination of On-Board UNIT for more Integrated Transport	PQ,TENDERING/ DD				Construction/Deployment																							
6 Information Exchange of Road Operator					PQ,TENDERING/ DD												Construction/Deployment											
7 Information Exchange via ITS Center between Municipalities	PQ,TENDERING/ DD				Construction/Deployment												PQ,TENDERING/ DD				Construction/Deployment							
8 Improvement of Traffic/Transit Operational Center with Essential ITS Equipment at Rio de Janeiro Municipality Area	PQ,TENDERING/ DD				Construction/Deployment																							
9 Improvement of Traffic/Transit Operational Center with Essential ITS Equipment at Other Municipality Area in RMRJ					PQ,TENDERING/ DD												Construction/Deployment											
10 Emergency Vehicle Operating Management	PQ,TENDERING/ DD				Construction/Deployment												Construction/Deployment											
11 Commercial Vehicle Operation and Management					PQ,TENDERING/ DD												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

Short Term ITS Projects are;

1,2,3,4,5,7,8 and 10

Conclusion

- integration/Information Exchange
- Operational Integration for Road Transit and Traffic Operation
- Interoperability for Security, Transport, Transit
- Economic Effect of ITS is High
- 8 ITS Projects Selected as Short Term

Short of Time!! BUT Keep Calm and Carry On