

AMNEX

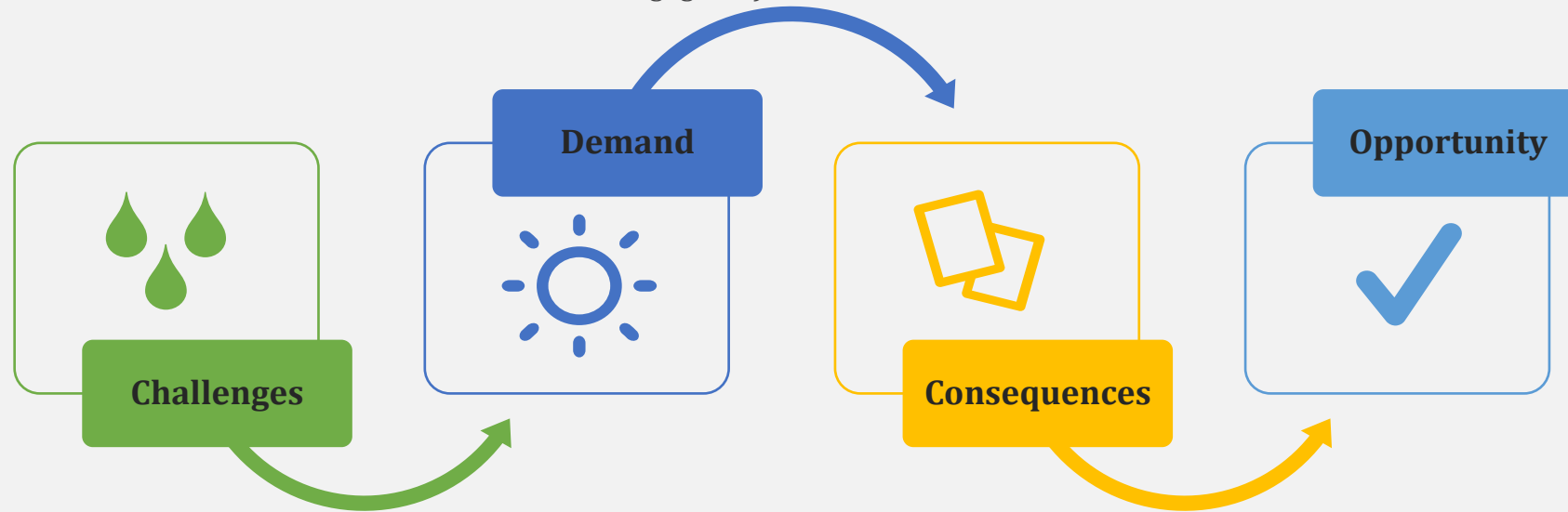
# **Integrated Transit Management System**

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Annex InfoTechnologies

# Need of transformative reforms in smart mobility

- **84 Crore** people to live in urban area by 2050
- Carbon emission by transportation contributes **50%** of the total emissions
- **Driver Assistance** Technologies to reduce accidents due to driver negligence (55% accidents due to driver negligence)

- Boost in **Smart Transportation investment** via Smart Cities
- **Niti Ayog's** vision on transformative mobility solutions



- Country's **increasing population**
- Increasing **urbanisation**
- **Immense pressure** on the existing infrastructure
- Policy Level Decision needs **data points**
- **Limited technological interventions**
- Inadequate service delivery to end use

- High Traffic congestion causes loss of **60,000 Crore INR annually**
- **10% of PTO's** cost is spent for maintenance of fleet owing to buses breakdown
- Delayed **Emergency response**
- **4 out of 5** women feel unsafe on public transport

# Country's Smart Mobility Paradigm



*“Country’s trajectory towards an advanced mobility future that is affordable, clean, safe and accessible, leapfrogging the traditional mobility paradigm”*

- *Ability to build right the first time*
- *Dynamic entrepreneurial culture*
- *Public and private sector leadership*
- *Confluence of IT and manufacturing skills*



# How to plan for transformative reforms

## Define Objectives

1. Enhanced Commuters Satisfaction
2. Enhance Operational Efficiency
3. Better Fleet Management
4. Enhance Accessibility
5. Reduced Carbon foot prints

## Build Ecosystem

1. State of the Art Infrastructure
2. Communication Network – Connected Stations & Bus Stops

## Frame Policies & Regulations

1. Interoperable transport data
2. Central data sharing institution
3. Unified metropolitan planning authority
4. Networked city-level innovation and incubation centres
5. Mobility as a Service
6. Integrated transport hubs
7. Regulations that enable Electric Vehicle

## Implementation of Technology

1. Track, Trace and Communicate
2. Fare Collection
3. Passenger Information
4. Planning and Scheduling
5. Financial Management
6. Facility Management
7. Ensuring Accessibility to all
8. Safety

**Feedback**

ANNEX

# Benefits of Technological Transforms



## Reducing traffic fatalities

Deployment of new technology will reduce accidents that currently claim more than 150,000 lives per year



## Decongesting roads

Connecting modes through data platforms will improve the efficiency of vehicle usage through next generation public transit.



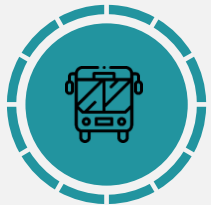
## Improving air quality

Electric vehicles, ride-sharing and better public transit could help India address the problem of growing pollution in its cities.



## Reducing Cost of Transportation

Optimized transportation systems reduce needs in road, parking, and other infrastructure this by reducing overall cost.



## Better access to public transit

Leveraging new technologies will complement an integrated approach to city planning and road network design for better access of public transit.



## Stimulating technology development and manufacturing

Rapidly scale markets for new types of vehicles will opens the door for rapid economic development and job creation

# Key Objectives- ITMS

## Enhanced Commuters Satisfaction

- Better insight in passenger's transit pattern
- Instill confidence in commuters in transit services
- Bring in commuter market approaches
- Accurate and Easy Fare collection
- Improving Accessibility
- Improving the security of passengers and staff

Enhanced  
Commuter  
Satisfaction

1

Enhanced  
Operational  
Efficiency

2

Solution  
Objectives

4

Enhance Service  
Standards

## Enhance Service Standards

- Automation of Financial Transactions
- Manage flow of passenger in transit system in effective and sustainable manner
- Systematic Operational Management

- Support to Multi-Modal Transport Services
- Prompt & Effective Incidents Management
- Supply of Dynamic Services to cater Passenger Load and other affecting parameters

Better Fleet  
Management

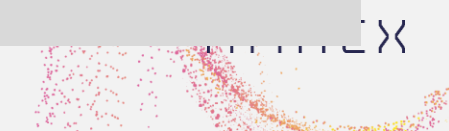
## Enhance Operational Efficiency

- Effective Operational Planning
- Better Analysis and Decision Making
- Real-time Information to all Stakeholders
- Reduce Fleet downtime
- Immediate actions on Incidents
- Effective one-to-one communication
- Reduce Expenditure & Optimize Revenue

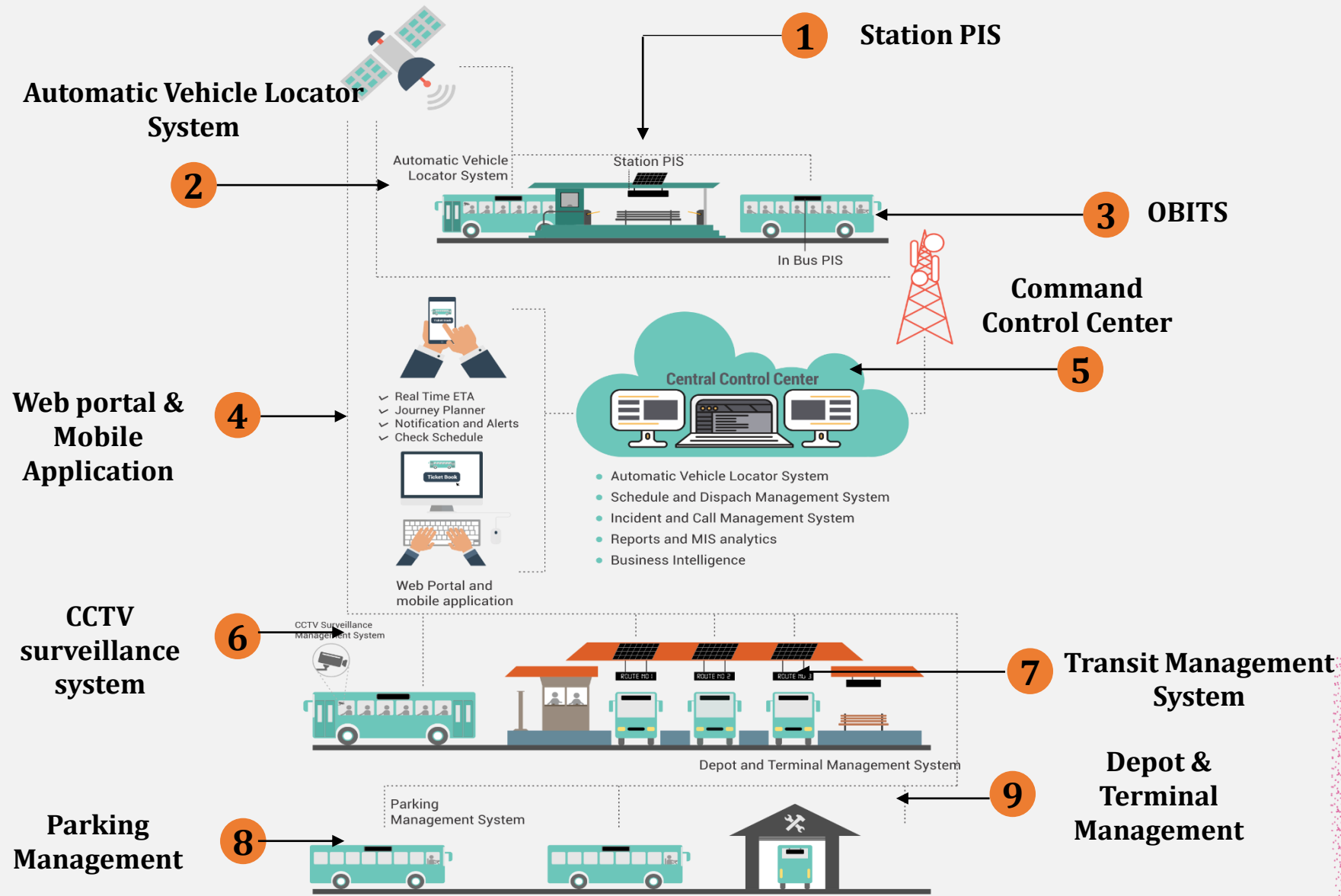
## Better Fleet Management

- Real-time Fleet Status
- Reliability and punctuality of bus services
- Optimized Fleet Scheduling and Dispatch Management
- Reduction in Incidents frequency
- Making best use of existing infrastructure

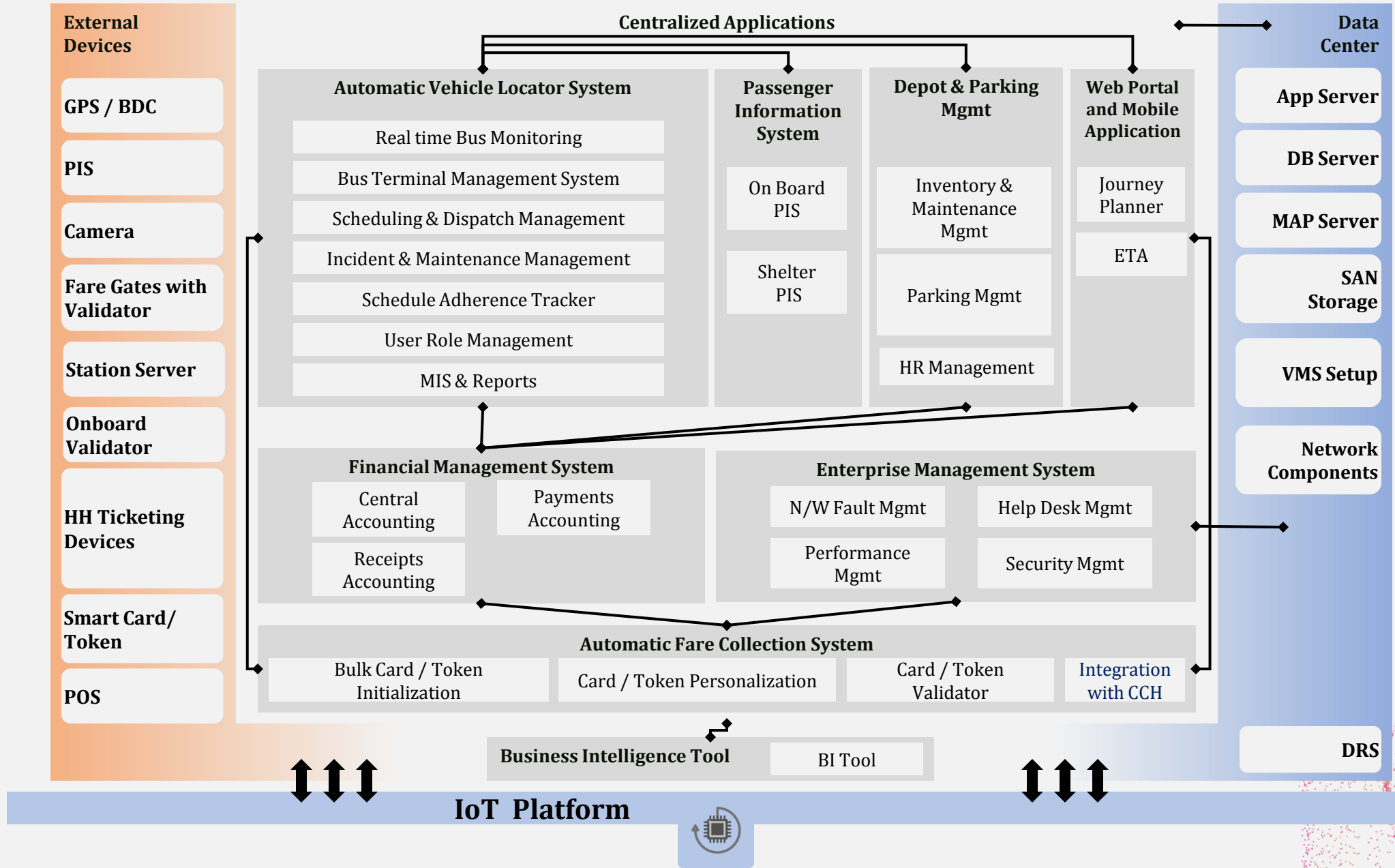
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# Solution Architecture



# Technical Architecture





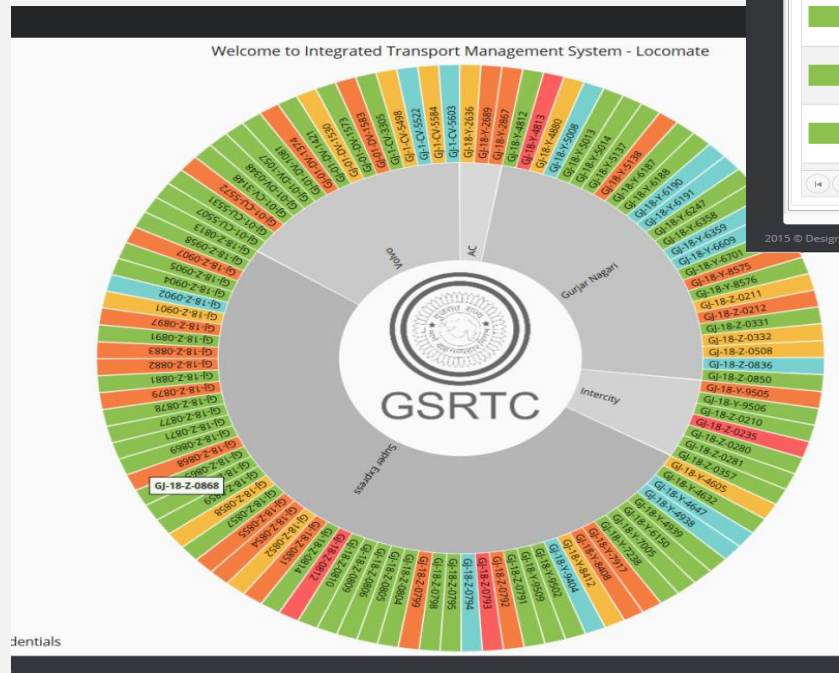
# Solution Features

- **Fleet Performance Dashboard**
  - Locating a particular bus in the fleet
  - Auto pan facility for tracking a particular bus
  - Sending online messages to an individual bus or group of buses selected on a map
  - Real time Violations / Alerts / Incidents
  - Fleet Performance Summary
  - Multi Fleet Support
- **Live Vehicle/Real Time Tracking**
  - Real-time Tracking and Monitoring
  - Schedule Adherence Track
  - ETA / ETD
  - Trip / Transit Route Replay
  - Line Tracker and Map based representation
- **Tightly Integrated with Scheduling & Dispatch, Incident, Depot / Terminal Management System**
- **Admin Panel**
  - Multi-operator System - Different rights for different team.
  - Master Data Management
  - User Management
  - Data Synchronization
  - POI Management



# Screens - Dashboard

Group wise Vehicle Status



AVLS - Screens - Dashboards

Locomate
13/06/2016 12:03:02
Asmita

Dashboard
Fleet Overview

Fleet Performance Overview

Fleet Summary

<b>1146</b> Running	<b>309</b> Idle	<b>613</b> Stand By	<b>0</b> BreakDown	<b>381</b> No-Comm	<b>0</b> Others
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Total Vehicles : 2449

Buses in Operation

Vehicle Details	Service Type	Depot	Division	Last Update	Last Location	Status	Alert Indications	Map
GJ-18-Y-8039 Running 54 km/h	Super Express ServiceType	Dehgam Depot	Ahmedabad Division	06/13/2016 12:02:43 PM Last Update	Dhansura Last Known Location	On Trip	[Alert Icons]	[Map]
GJ-18-Y-6195 Running 28 km/h	Super Express ServiceType	Dehgam Depot	Ahmedabad Division	06/13/2016 12:02:33 PM Last Update	Pardhol Last Known Location	On Trip	[Alert Icons]	[Map]
GJ-18-Y-7642 Running 10 km/h	Super Express ServiceType	Dehgam Depot	Ahmedabad Division	06/13/2016 12:02:33 PM Last Update	Khokhara Last Known Location	On Trip	[Alert Icons]	[Map]
GJ-18-Y-6286 Running 61 km/h	Super Express ServiceType	Dehgam Depot	Ahmedabad Division	06/13/2016 12:02:43 PM Last Update	Patan Last Known Location	On Trip	[Alert Icons]	[Map]
GJ-18-Y-6283 Running 42 km/h	Super Express ServiceType	Dehgam Depot	Ahmedabad Division	06/13/2016 12:02:03 PM Last Update	Lunavada Last Known Location	On Trip	[Alert Icons]	[Map]
GJ-18-Z-0160 Running 9 km/h	Gurjar Nagari ServiceType	Dehgam Depot	Ahmedabad Division	06/13/2016 12:02:33 PM Last Update	Anupam Cinema Road Last Known Location	On Trip	[Alert Icons]	[Map]

1 - 20 of 2449 items

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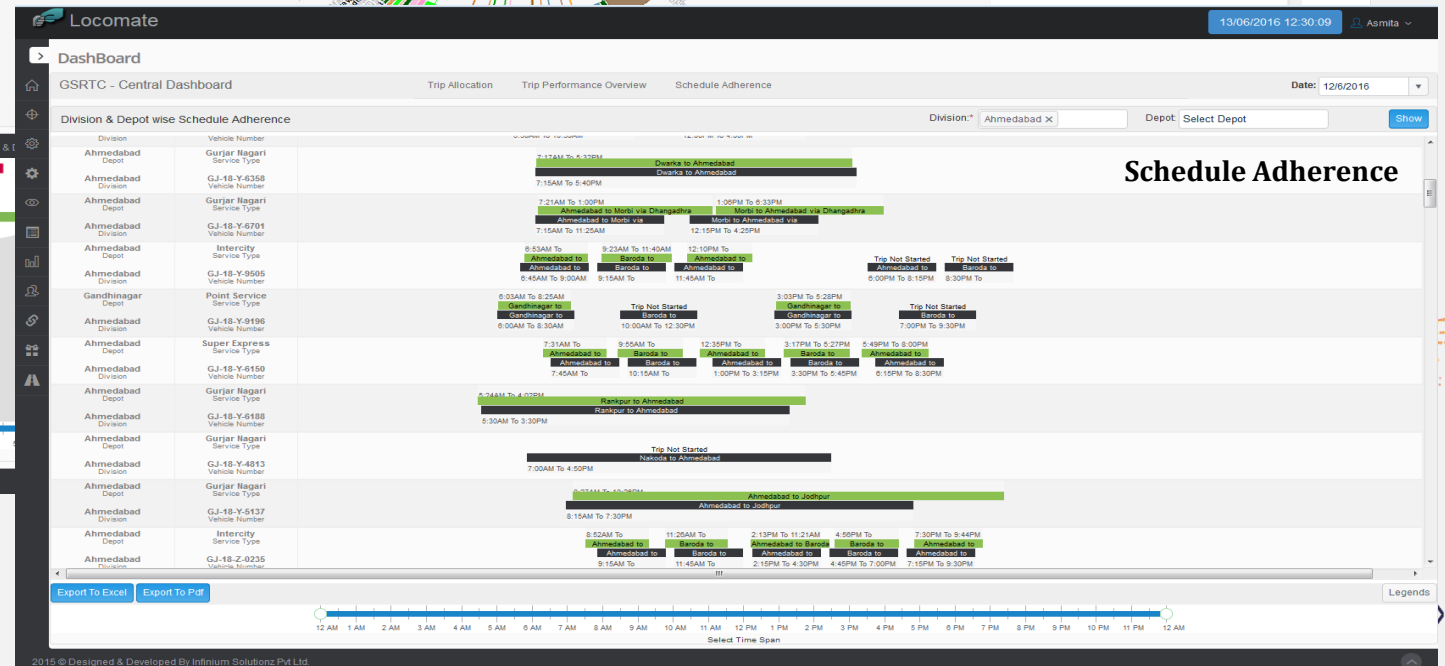
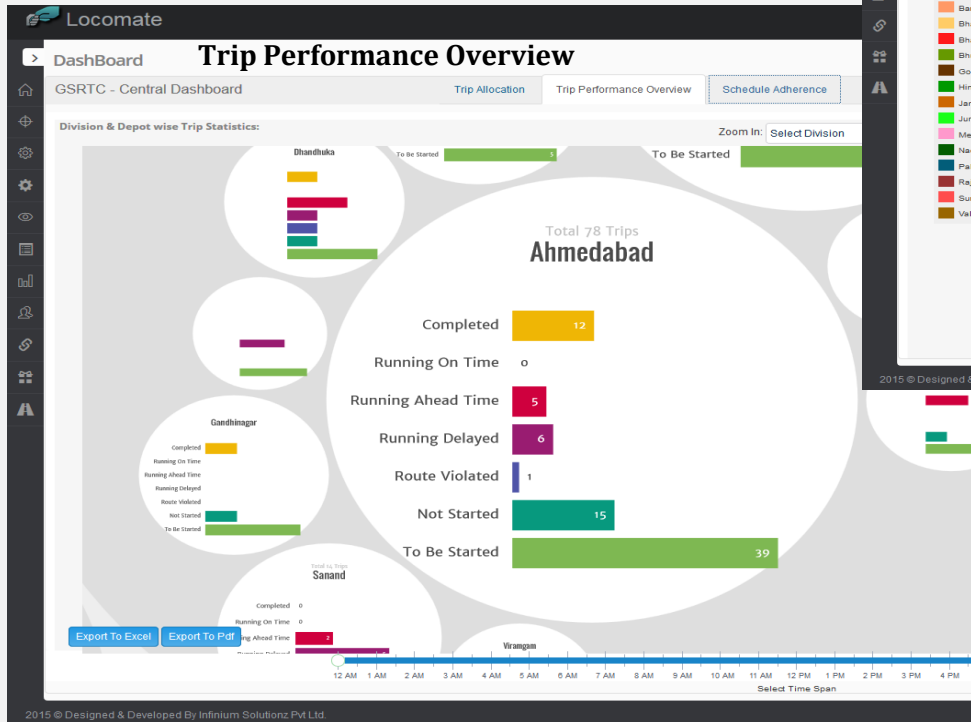
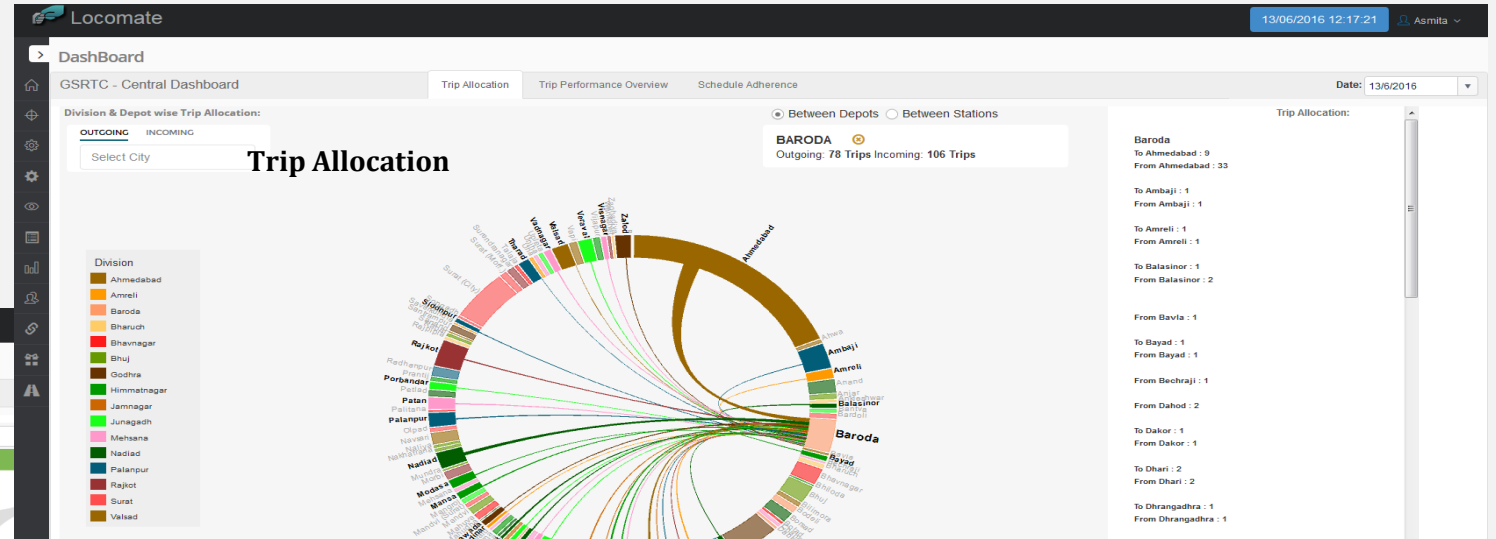
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Vehicle Details	Status	Route Details	Location Details	Alert Indications	Violation	Map
Super Express GJ-18-Y-6286 Running 57 km/h	Connected	Route Name: Patan to Ahmedabad Depot: Dehgam Patan - Ahmedabad Depot Last Updated : 06/13/2016 11:52:13 AM	Patan Last Known Location	[Alert Icons]	0 Violation	[Map]
Super Express GJ-18-Y-6283 Running 58 km/h	Connected	Route Name: Nehrunagar to Santrampur Depot: Dehgam Nehru Nagar - Santrampur Last Updated : 06/13/2016 11:52:33 AM	Bamrod Last Known Location	[Alert Icons]	0 Violation	[Map]
Gurjar Nagari GJ-18-Z-0160 Running 22 km/h	Connected	Route Name: Dehgam to Nizar via Ahmedabad Depot: Dehgam Dehgam - Nizar Last Updated : 06/13/2016 11:51:13 AM	Ahmedabad Depot Last Known Location	[Alert Icons]	0 Violation	[Map]
Super Express GJ-18-Y-6157 Running 3 km/h	Connected	Route Name: Ahmedabad to Sanchari via Disha Depot: Sanand Ahmedabad Depot - Sanchari Last Updated : 06/13/2016 11:53:03 AM	Toli Plaza Ahmedabad-Meh... Last Known Location	[Alert Icons]	0 Violation	[Map]
Gurjar Nagari GJ-18-Y-7767 Running 3 km/h	Connected	Route Name: Ahmedabad to Udaipur Depot: Sanand Ahmedabad Depot - Udaipur Last Updated : 06/13/2016 11:52:43 AM	Himmatnagar Last Known Location	[Alert Icons]	0 Violation	[Map]
Super Express GJ-18-Y-6246 Running 61 km/h	Connected	Route Name: Ahmedabad to Nizar Depot: Sanand Ahmedabad Depot - Nizar Last Updated : 06/13/2016 11:52:43 AM	Between Kandari to GIDC Last Known Location	[Alert Icons]	0 Violation	[Map]
Gurjar Nagari GJ-18-Y-8410 Running	Connected	Route Name: Sanand to Saputara via Nehrunagar Depot: Sanand	Between Alamair to lambuva	[Alert Icons]	0 Violation	[Map]

1 - 20 of 561 items

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# Screens - Dashboard



# Screens – Live Tracking On Map

**Live Tracking**

**Running Profile**

Running	Idle	Parked	Stand By	No Comm	Breakdown
04:57:20	01:22:30	00:00:00	05:29:00	00:00:00	00:00:00

**Trip Summary**

1	0	200
Total Trips (Count)	Total Violations (Count)	Total Kms

**Depot Info**

- Depot Name: Dehgam
- Route Name: Nehrunagar to Santrampur
- Bus No: GJ-18-Y-6283
- Location: Gujarat, India
- Speed: 53 kmph
- Time: 6/13/2016 11:53:43 AM
- Conductor Name: Pathan Umedkhan Asrafkhan
- Conductor Number: N/A

**Route Replay**

**Running Profile**

Running	Idle	Parked	Stand By	No Comm	Breakdown
03:39:30	00:42:30	00:00:00	00:00:00	00:00:00	00:00:00

**Trip Summary**

1	0	49
Total Trips (Count)	Total Violations (Count)	Total Kms

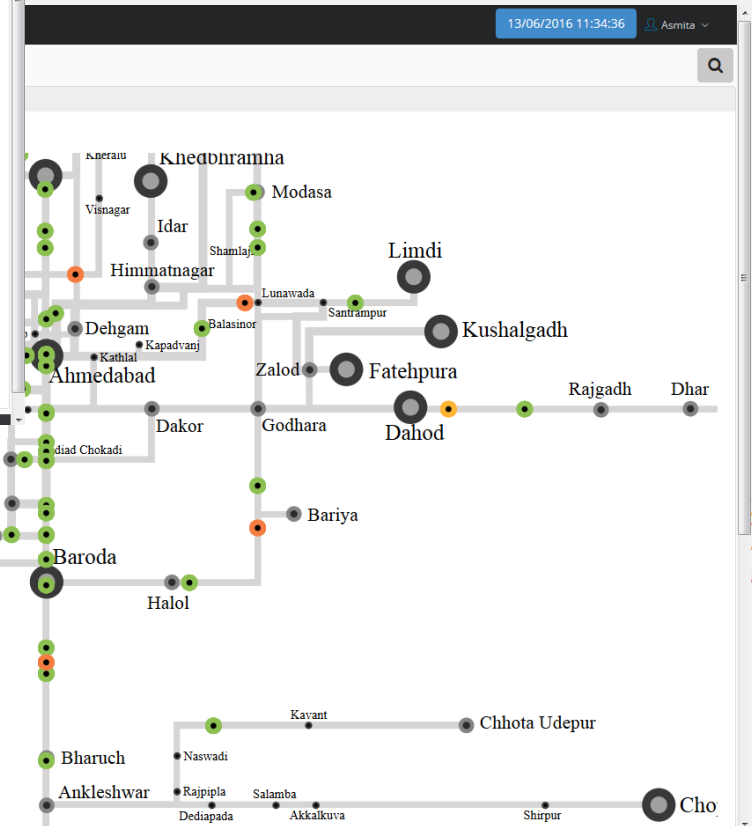
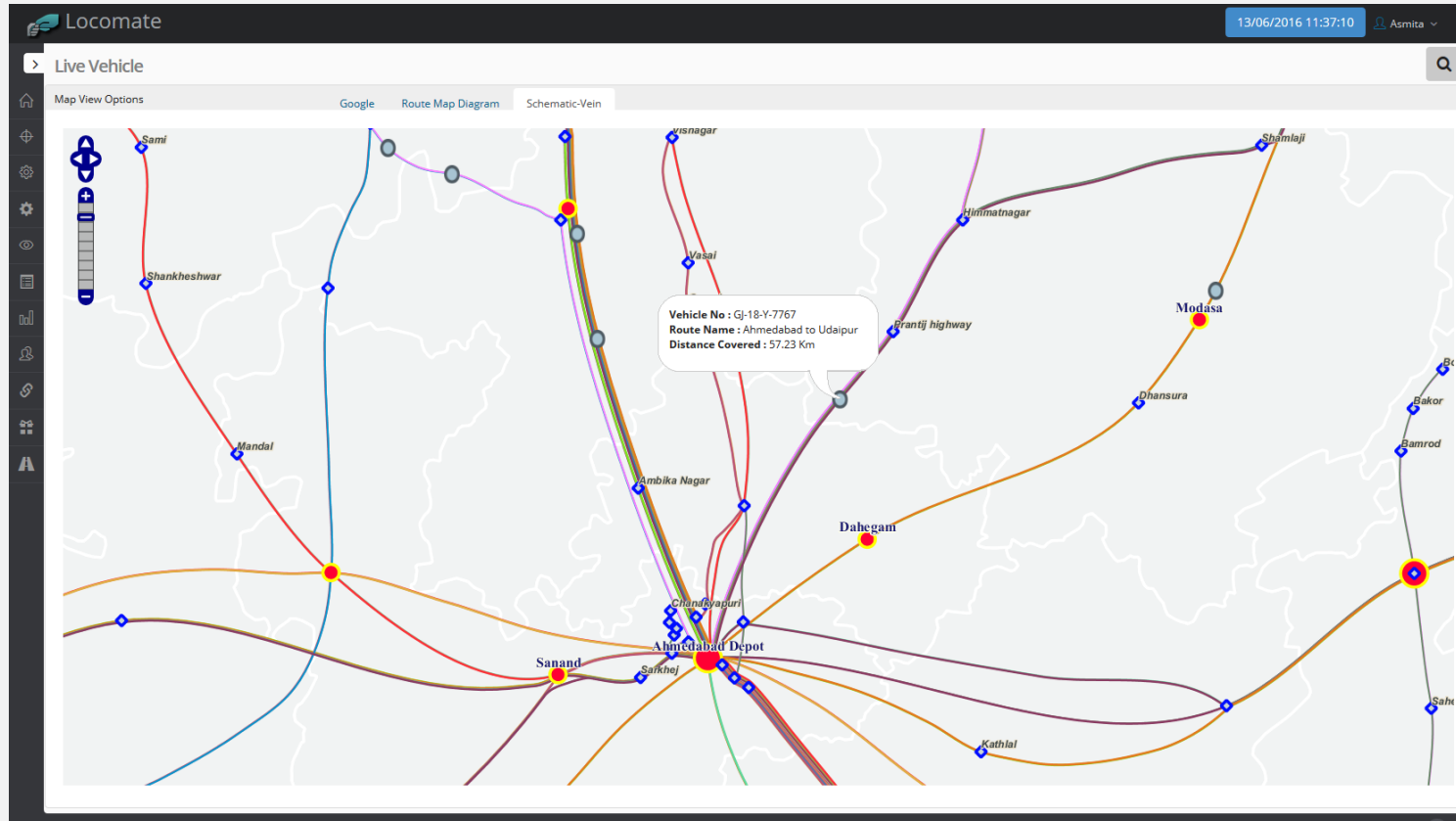
**Depot Info (Dehgam)**

- Depot Name: Dehgam
- Route Name: Nehrunagar to Santrampur
- Current Location: Gujarat, India
- Longitude: 72.899963
- Stoppage Start Time: 13/6/2016, 9:00:43 AM
- Stoppage End Time: 13/6/2016, 9:00:53 AM
- Stoppage Time: 00:00:10
- Kms From Start Point: 49 Kms
- Time From Start Point: 01:41:10

**Depot Info (Santrampur)**

- Depot Name: Dehgam
- Route Name: Nehrunagar to Santrampur
- Current Location: Gujarat, India
- Station No: 5283
- Time: 13/6/2016, 11:40:53 AM
- Conductor Name: Pathan Umedkhan Asrafkhan
- Conductor Number: N/A

# Screens – Live Tracking On Schematic Map





# Reports

- Different Analytical, Revenue Management and Alert reports (Through Data received from legacy Revenue Collection System)
- Speed Log
- Stoppage Log
- Summary Report Day Wise
- Summary Report Vehicle Wise
- Performance Day Wise, Week Wise, Monthly
- Performance Vehicle Wise
- Monthly Performance
- Calculation of the actual distance (in Kilometers) traveled by the vehicle using the digitized map
- Deviation from schedule route or timing
- Missing Bus stops,
- Zone violation reports for both no entry and no exit zones



# Incident Management

## Incident Management

- Incident Management System shall manage multi-agency, multi-jurisdictional responses to disruptions.
- Efficient and coordinated management of incidents reduces their adverse impacts on public safety, traffic conditions, and the local economy
- Incident Management yields significant benefits through reduced vehicle delays and enhanced safety to motorists through the reduction of incident frequency and improved response and clearance times.
- The incident management process includes:
  - Detection
  - Verification
  - Motorist Information
  - Response
  - Site Management
  - Traffic Management
  - Clearance
- Incident Management System shall cover incidents such as:
  - Crashes
  - Disabled or abandoned vehicles
  - Debris in the roadway
  - Work zones
  - Adverse weather
  - Other events and emergencies

## Incident Recorded by Field Equipments / System

- ❖ **Fleet Performance**
  - Running with Over Speed
  - Running with Minimum Speed
  - Route Deviation
  - Unidentified Stoppage
  - Miss out Stoppage
  - Miss out Trip
  - Bus Bunching / Headway
  - Trips with least Passengers
  - Delayed Trip Start
  - Re-Scheduling Requirement
  - Maintenance Due
  - Bus Break down
  - Accident
  - Driver License Renewal
  - Re-fueling Requirement
- ❖ **Equipment Performance**
  - GPS Device not Connected
  - Low Battery
  - Shelter PIS Out of order
  - Onboard PIS Out of order

## Incidents Recorded by External Entities

- Damaged Lane
- Riots
- Blocked Lane due to Lane side Accident
- Blocked Lane due to Lane side Work in Progress
- Excess Passenger Flow due to Event/Festival



# Passenger Information System

## Facilities to Commuter by Onboard PIS:

### Front side PIS Display

- Installed on the front side of the bus
- Display of Route Number (Duel Language)
- Display of Destination

### Side PIS Display

- Installed on the side of the bus
- Display of Route Number, Source, Destination, Fair and any other customized messages

### Rear PIS Display

- Installed on the Rear/Back side of the bus
- Display of Route number

### Internal PIS Display


- Installed inside the bus
- Display of next approaching Bus Stop
- Fare and other general messages
- Driver name and ID Display
- Route Information
- Social and Advertising message



## Facilities to Commuter by Shelter PIS:

### PIS Display at Shelter

- Information of Upcoming Buses like;
- Display of Route Number (Duel Language)
- Display of Source
- Display of Destination
- Expected time of Arrival
- Expected Dock Door
- Display of Bus Approaching Message
- Other customized messages

 <b>GUJARAT STATE ROAD TRANSPORT CORPORATION</b>									
DEPOT NAME : AHMEDABAD DEPOT					DATE : 11/05/2016		TIME : 08:39 PM		
BUS ROUTE	SERVICE TYPE	ETA	ETD	LAST LOCATION	VEHICLE	PF	Current Location	Trip Type	Last Updated
Radhanpur to Ahmedabad	Super Express	20:48	-	Nehru Nagar Cross Road - Ahmedabad	GJ-18-Y-9511	12	Nehru Nagar Cross Road - Ahmedabad	RUNNING	11/May/2016 08:39 PM
Zalod to Ahmedabad	Super Express	21:00	21:05	-	GJ-18-Y-8430	21	Gujarat,India	SCHEDULE	10/May/2016 11:00 PM
Baroda to Nehrunagar via Express Highway	Volvo	21:00	21:05	-	GJ-01-DV-1057	24	Gujarat,India	SCHEDULE	11/May/2016 08:40 PM
Ahmedabad to Indore Via Nadiad	Super Express	-	21:00	-	GJ-18-Y-6141	28	Gujarat,India	SCHEDULE	11/May/2016 08:39 PM



# Transit Management System

## ❖ Cover All Trips

- Buses should cover all the given routes, irrespective of passenger load

## ❖ Optimize Fleet Size

- Buses need to be scheduled to such that minimum buses can cater to the needs of the system

## ❖ Trip Management

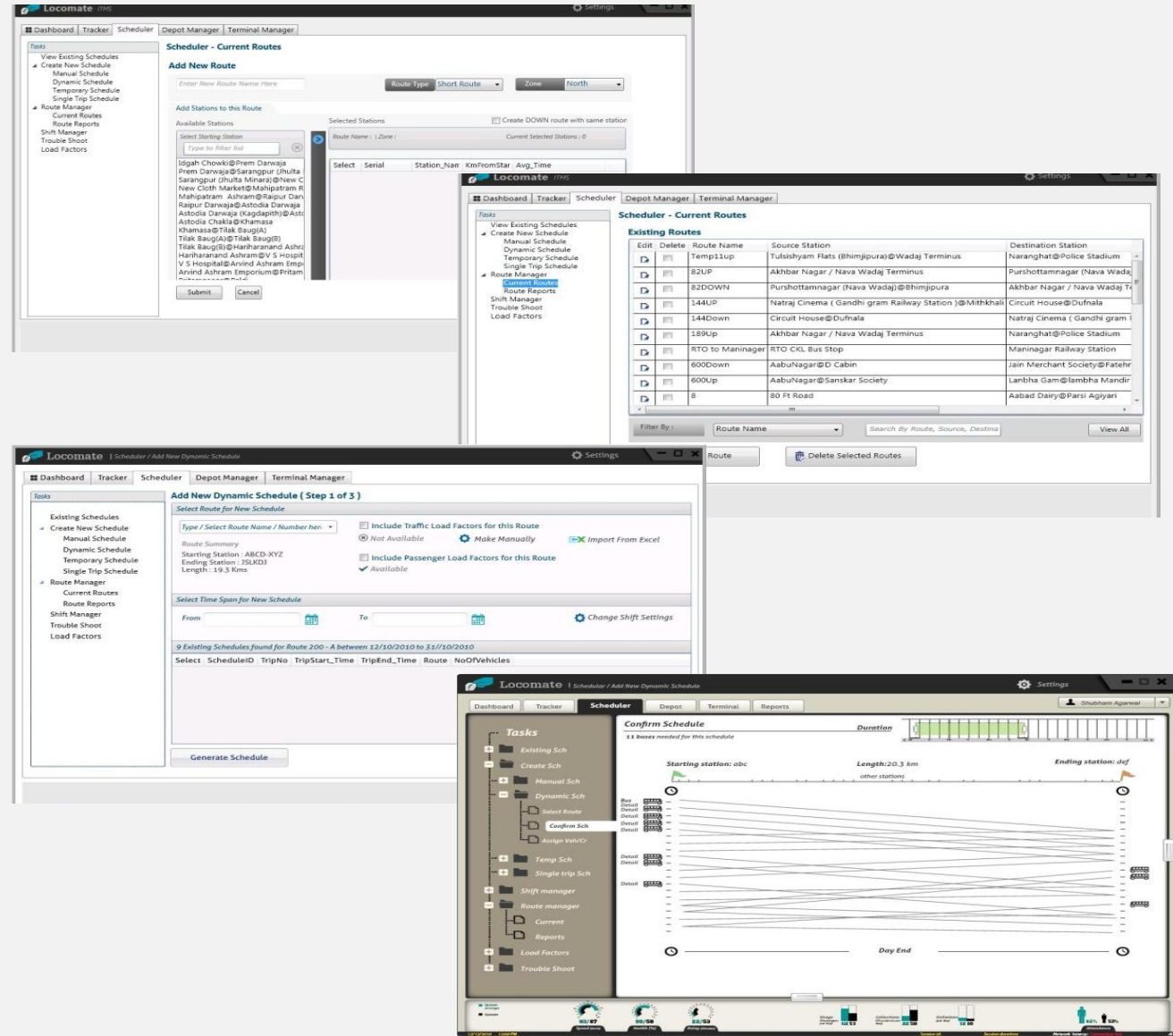
- Route and assigned bus management, Missed Bus stop Analysis, Route Violation

## ❖ Dynamic Scheduling – 2 Way Communication

- In case of Emergency , traffic congestion and special occasions driver can communicate to the control room and alter regular schedule

## ❖ Alerts

- Alert warnings will be given for every violation of schedule such as:- scheduled route, speed, time of arrival, missed bus stop, wrong parking, etc



Scheduling & Dispatch Management – Screens

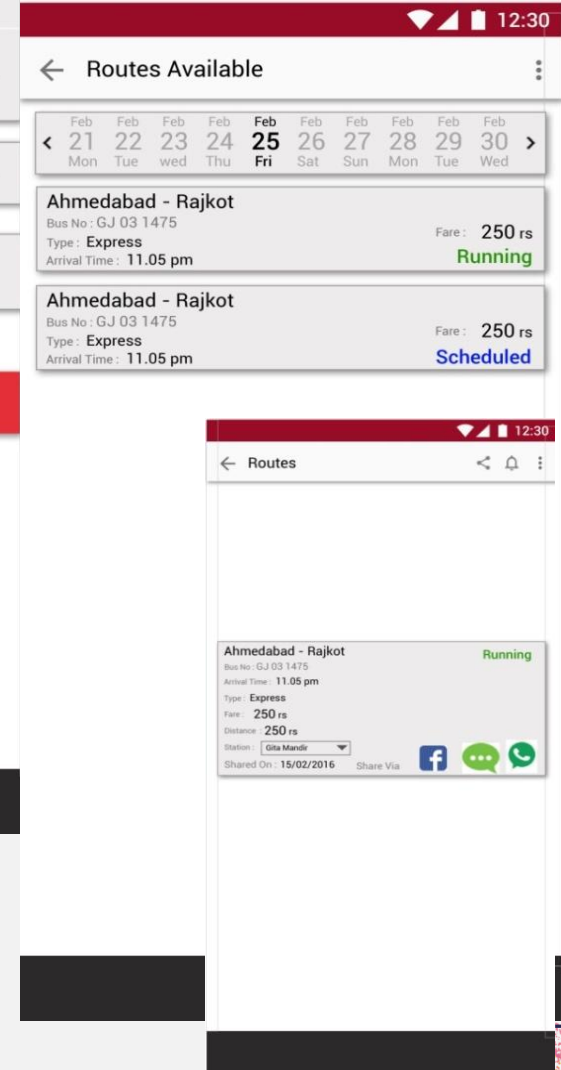
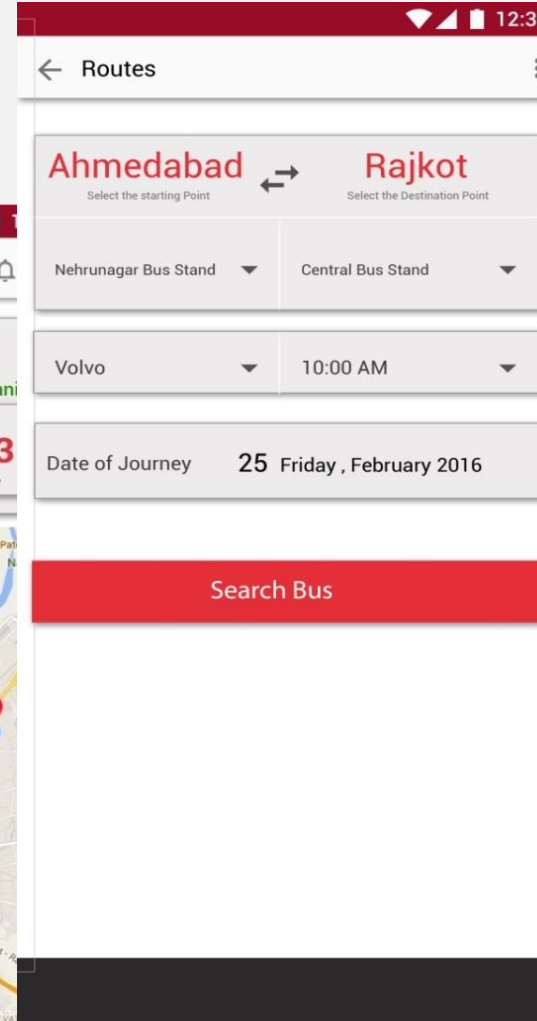
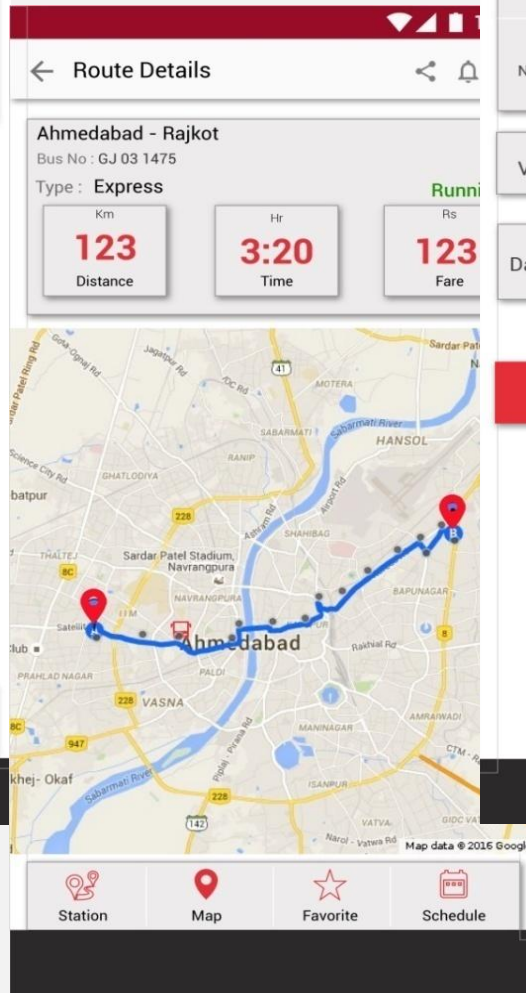
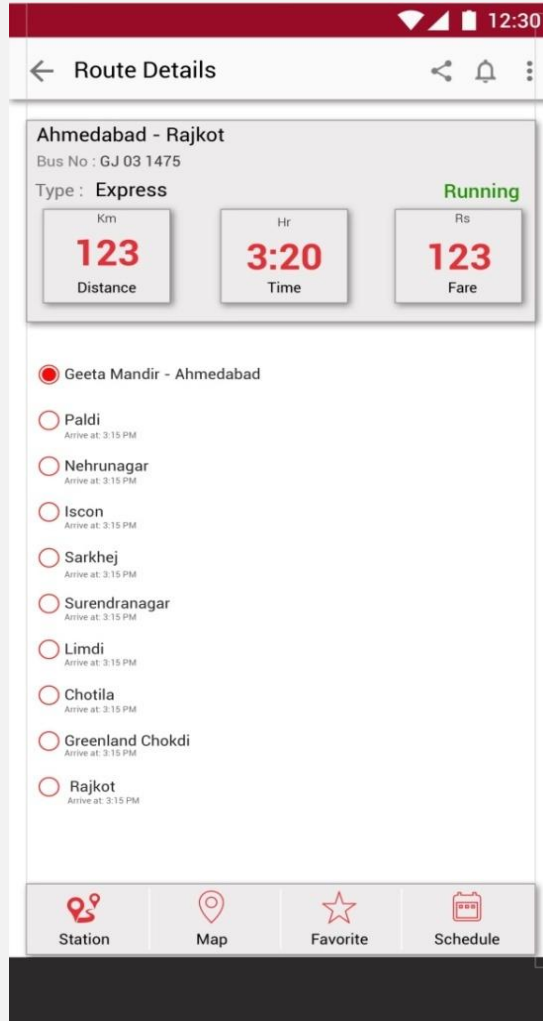
# Web Portal & Mobile Application

## Web Portal & Mobile Application

- Achieve collaboration & central control of existing real fleet tracking system
- Provide value added fleet information to the public; such as
  - Bus routes and Schedules
  - Bus Arrival Time
  - Route Location Information
  - Search by route
  - Advance booking of ticket
  - Cancelled ticket
  - Refund status
- Online real time system for management and control of fleets traffic
- Simple Graphical User Interface for general passengers
- Enables citizens to travel more intelligently which leads to better utilization of web portal services
- Provides seamless access to information and applications which improves commuter responsiveness
- Provides more updated information about the trip routes and schedules on regulatory basis to the commuters

The screenshots illustrate the BRTS Journey Planner interface, which includes a search form, a map view, and a results table. The search form allows users to specify 'Where?' (Station or Region) and 'When?' (Leave How or Leave At Time). The results table provides details such as Transportation Mode, Route Name, Source, Aboard at, Distance, Trip Time, and Fare. The interface also features a 'Real-Time Service Updates' section and a 'Downloads' section with links to Maps, Timetables, and Fares.

# Mobile Application - Screens



# Management Information System

## FEATURES :

Interactive Visualization

Searching & Filtering

Reporting

Data Retrieval & Management

ETL (extract, transform, and load)

Real-Time Integration with data sources

File Transfer

Data Quality Management

BI Configuration Management

Dashboard and Reporting Requirement for ITMS

- Category: Bus Maintenance and Availability
- Category: On Time Performance
- Category: Station and Passenger Information

Transit Performance Measures

- Service Offered / Utilization
- Economics
- Availability
- Convenience
- Vehicular Capacity
- Speed / Delay



MIS - Screens

# **A step ahead in Smart Mobility – Indian Context**

*Travel Chat bots*

*Mobility As A Service*

*On Demand Transportation*

*All in one Transit Assistance*

*Last mile connectivity via alternate urban transport*

*Ride Sharing & E-hailing*

*Single Payment for all legs of trips*

*Artificial Intelligence*

*Big Data Analytics and insights*

*Ticketing with Biometrics*

*BYOD (Bring Your Own Device)*

*Be In Be Out Ticketing*



**Thank you**



# Global Cases - Brazil

“focus on putting people first and integrated planning”



## Process and factors to replicate

- Created municipal authority to implement plans, monitor performance, and perform research
- Integrated public transit and land use in legislation and planning, with a focus on citizens and multiple benefits
- Focused: continuity, aligned visions, inexpensive, creative urban solutions and reflecting local values

## Results

- 75% use public transit to commute; that is roughly 1.9 million passengers per weekday
- 55 m<sup>2</sup> green space per resident (16 m<sup>2</sup> recommended by World Health Organization)
- A role model: Curitiba's success has been replicated by other cities, including Bogotá, Colombia



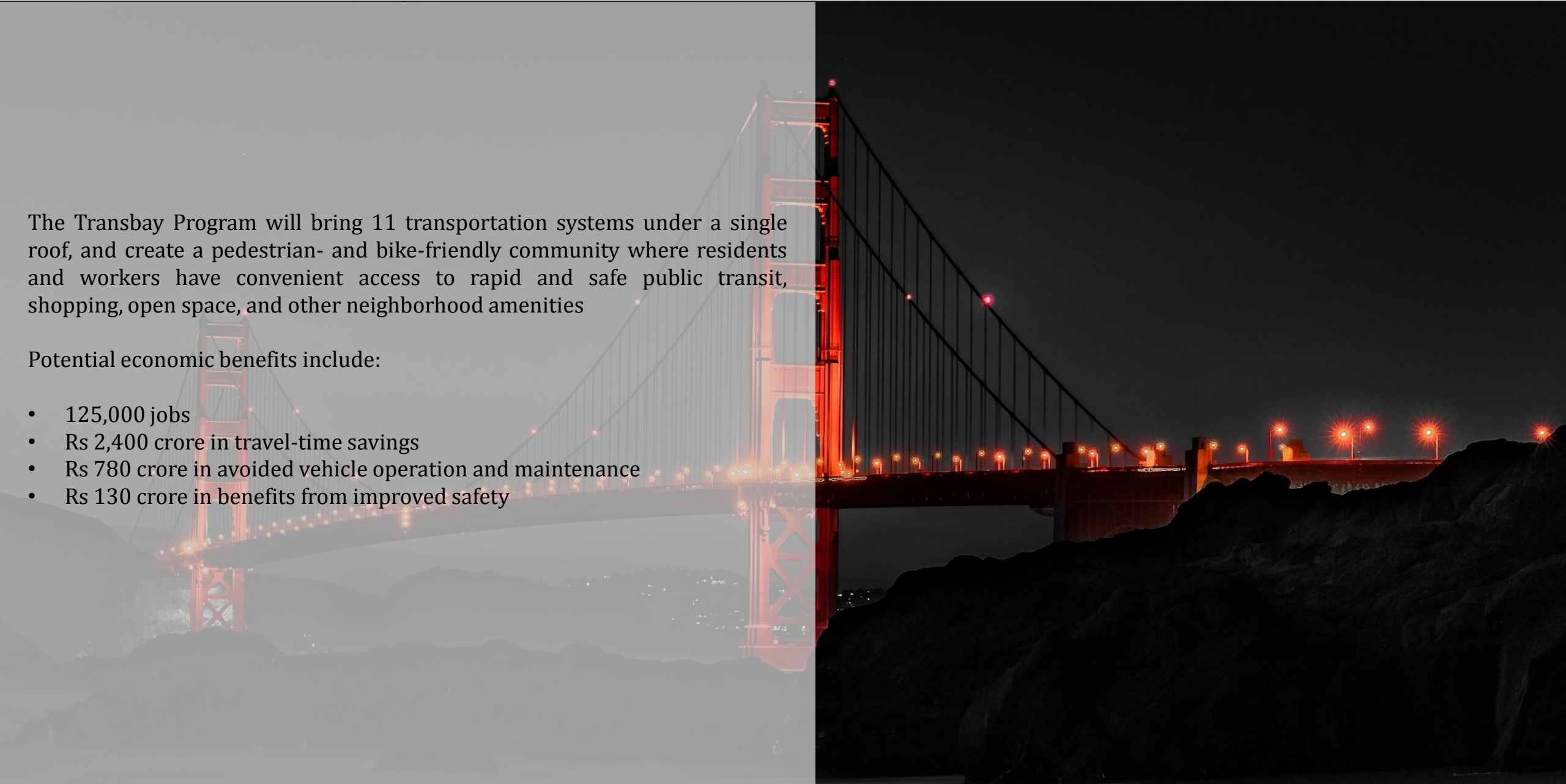
# San Francisco, California

## Integrated Transport Hub

The Transbay Program will bring 11 transportation systems under a single roof, and create a pedestrian- and bike-friendly community where residents and workers have convenient access to rapid and safe public transit, shopping, open space, and other neighborhood amenities

Potential economic benefits include:

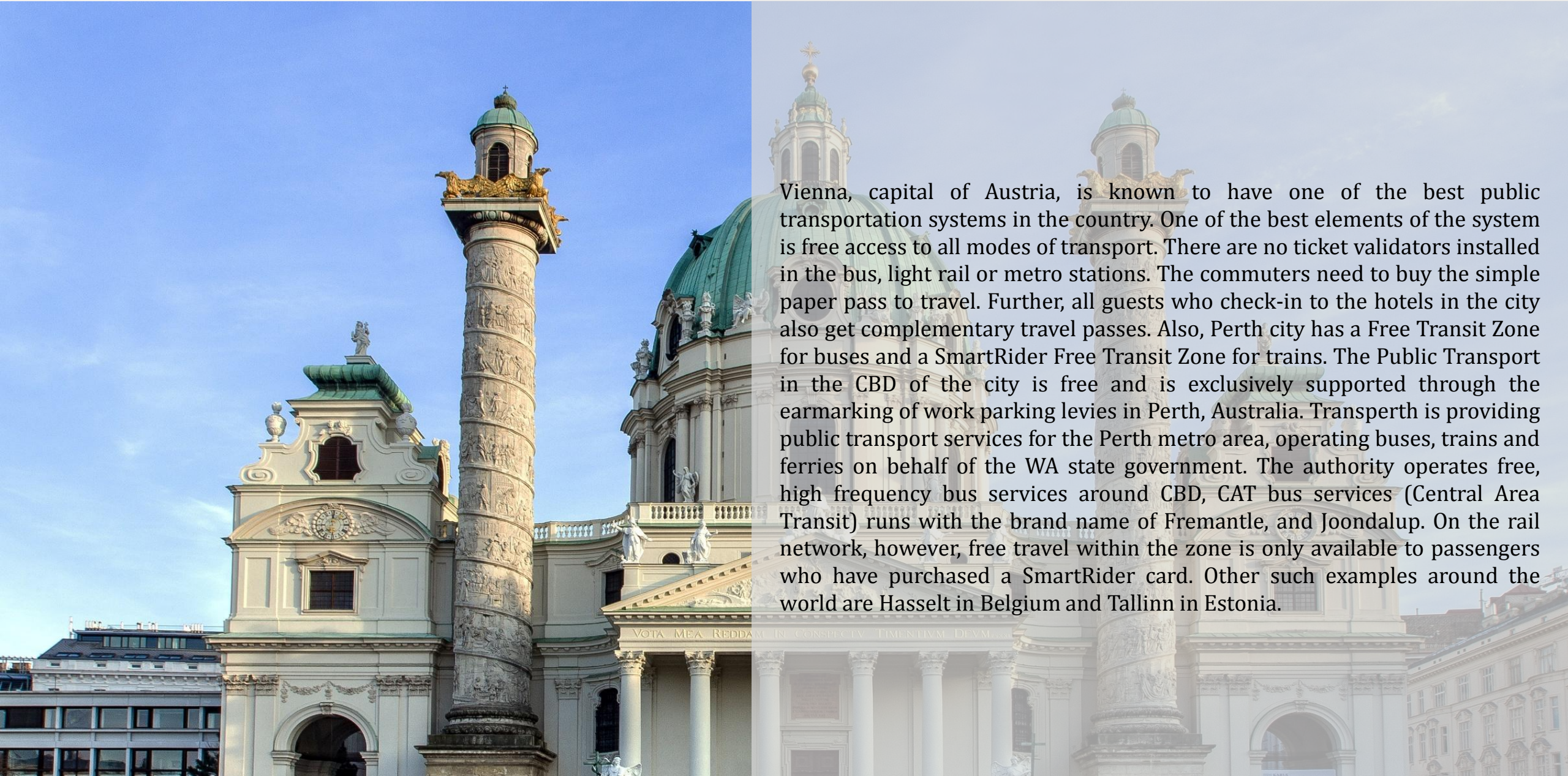
- 125,000 jobs
- Rs 2,400 crore in travel-time savings
- Rs 780 crore in avoided vehicle operation and maintenance
- Rs 130 crore in benefits from improved safety





# Vienna, Perth

## Free Public Transport



Vienna, capital of Austria, is known to have one of the best public transportation systems in the country. One of the best elements of the system is free access to all modes of transport. There are no ticket validators installed in the bus, light rail or metro stations. The commuters need to buy the simple paper pass to travel. Further, all guests who check-in to the hotels in the city also get complementary travel passes. Also, Perth city has a Free Transit Zone for buses and a SmartRider Free Transit Zone for trains. The Public Transport in the CBD of the city is free and is exclusively supported through the earmarking of work parking levies in Perth, Australia. Transperth is providing public transport services for the Perth metro area, operating buses, trains and ferries on behalf of the WA state government. The authority operates free, high frequency bus services around CBD, CAT bus services (Central Area Transit) runs with the brand name of Fremantle, and Joondalup. On the rail network, however, free travel within the zone is only available to passengers who have purchased a SmartRider card. Other such examples around the world are Hasselt in Belgium and Tallinn in Estonia.



# Public Rapid Transit @ Heathrow Airport

**Personal rapid transit (PRT)**, also called pod car, is a public transport mode featuring small automated vehicles operating on a network of specially built guided ways. The system consists of a fleet of driver-less electric vehicles that follow a network of guided routes that are located at street level, above or below ground. The first such contemporary system is launched at London's Heathrow Airport – **ULTRa (Urban Light Transport)**. The system was developed by Advanced Transport Systems (ATS), Ltd., in association with the University of Bristol, to provide efficient personalized public transportation with little or no waiting time.



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**Thank You...**