

Intelligent Mobility

Convergence of disruptive technologies delivering innovative solutions that support smart, connected and liveable cities

Prof. H. M. Shivanand Swamy

200 People in 170 Cars



Indian Cities:

- They are big
- High Density
- Doubling of population in 25-35 yrs
- Trip rates – Low but increasing (1.6)
- High NMT share – declining (45%)
- Vehicle ownership – Low?
 - Cars – Low (50-100/ 1000 persons)
 - 2-wheelers (200-300/1000 persons)
- Rising Incomes
- Motorisation rates – Rapid (>10%)
- 2-wheeler predominant (>75% of stock)
- Cars share is on the rise
- Road Length / person – Low (<1meter)

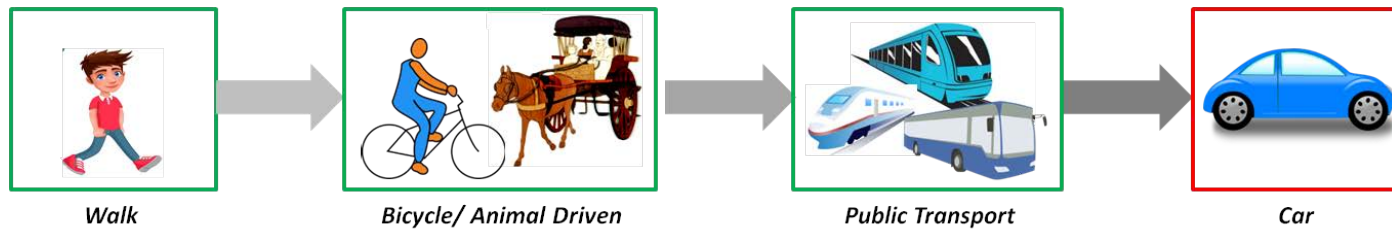


Photo: Rahagiri in Gurugao (WRI)

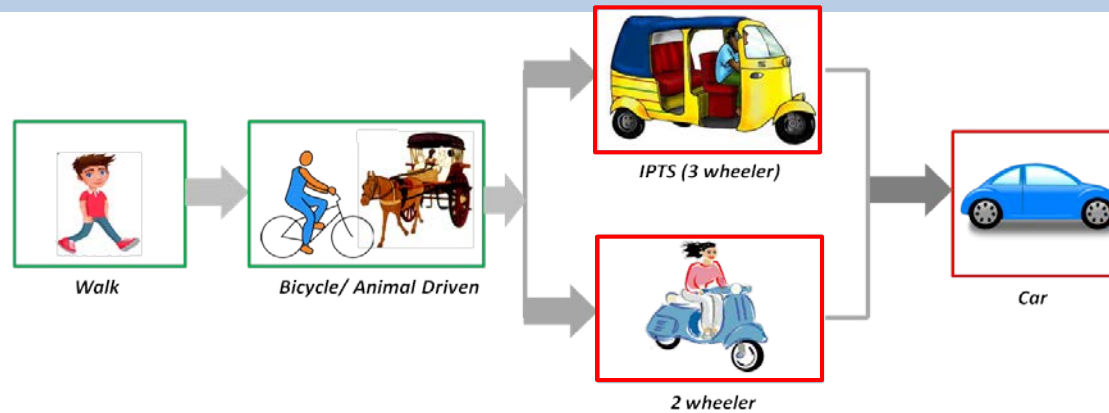
Indian cities are designed for community living and collective mobility



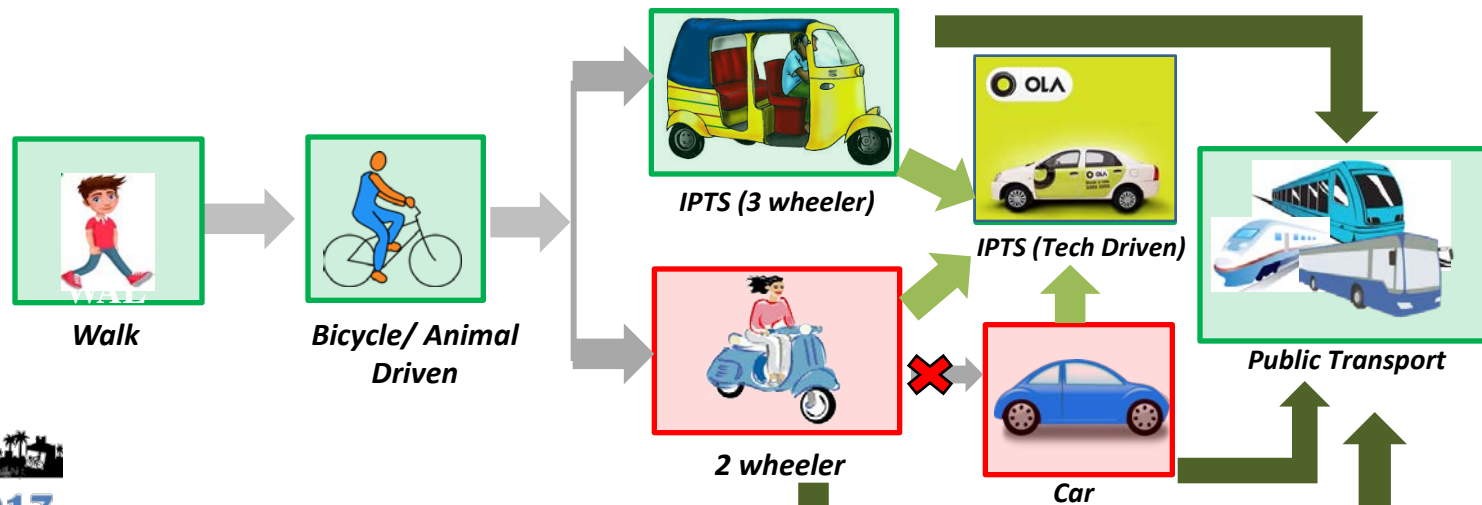
Transport Modes Trajectory – **Developed World**



Transport Modes Trajectory – **Developing World**



Transport Modes Trajectory – **Developing World - Goal**

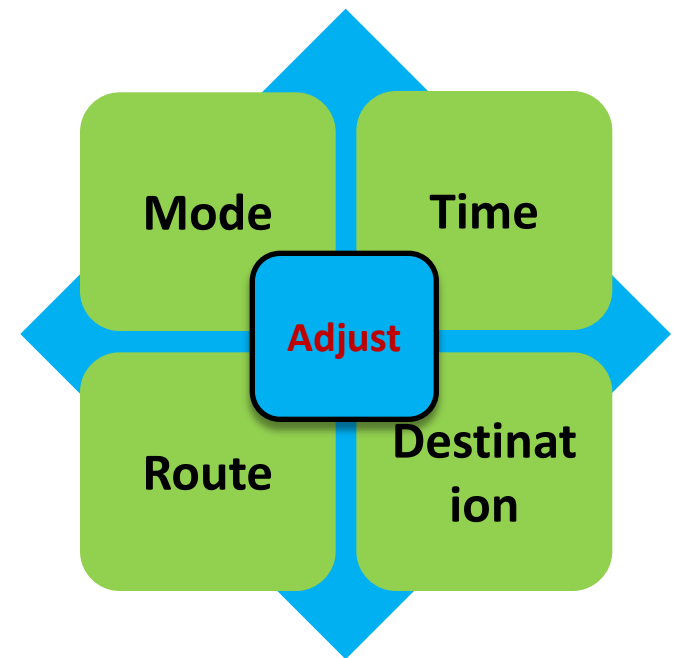


What does Intelligent mobility Deliver?

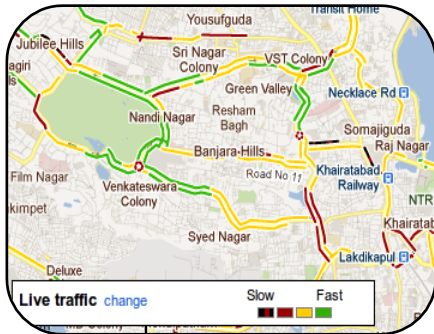
Providing travellers with **travel choices**, such as work location, route, time and mode

A range of measures aimed at **reducing** the **adverse impacts of car use**

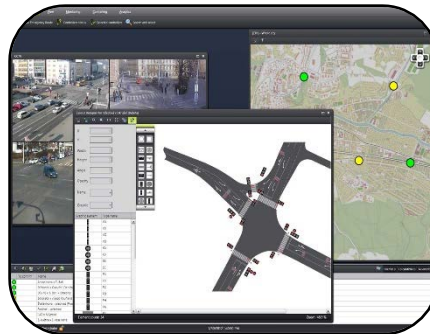
strategies that results in more **efficient use of transportation resources**



ITS Applications



Traffic Information



Traffic Management



Public Transport



Public Utility Vehicles



Safety



Electronic payments

Technologies behind ITS?



GPS



**Wireless
communication**



Sensors



Internet



**Electronic
payment**



**Big Data and
Analytics**



Crowdsources



Probes

TRAFFIC MESSAGE

Prev. message
M6 Hilton Park S
Junction B M5 Int
Birmingham M5
heavy traffic

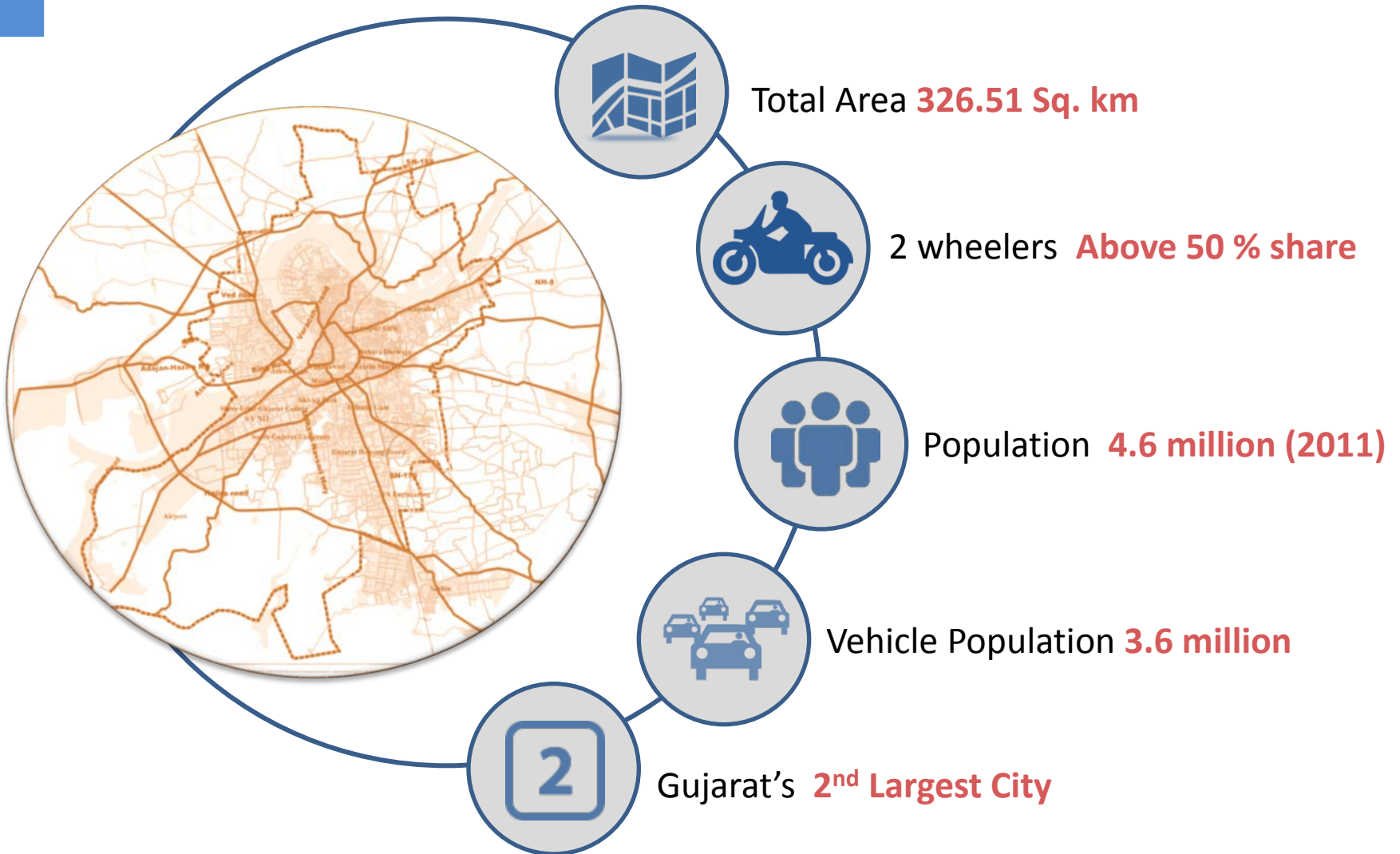
ENTER for next, B/



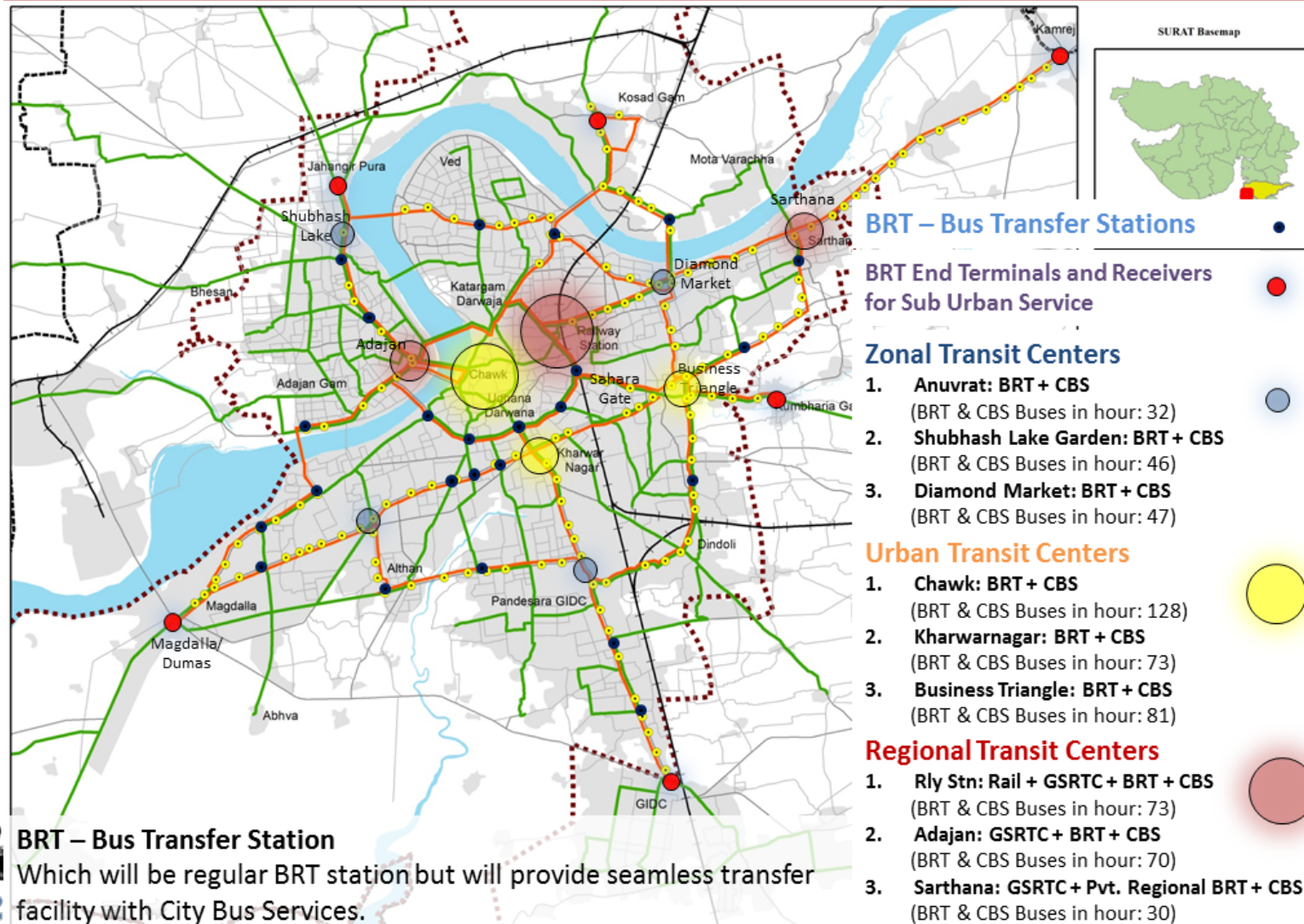
Integrated city mobility and
INTELLIGENT TRANSIT MANAGEMENT SYSTEM

SURAT MUNICIPAL CORPORATION

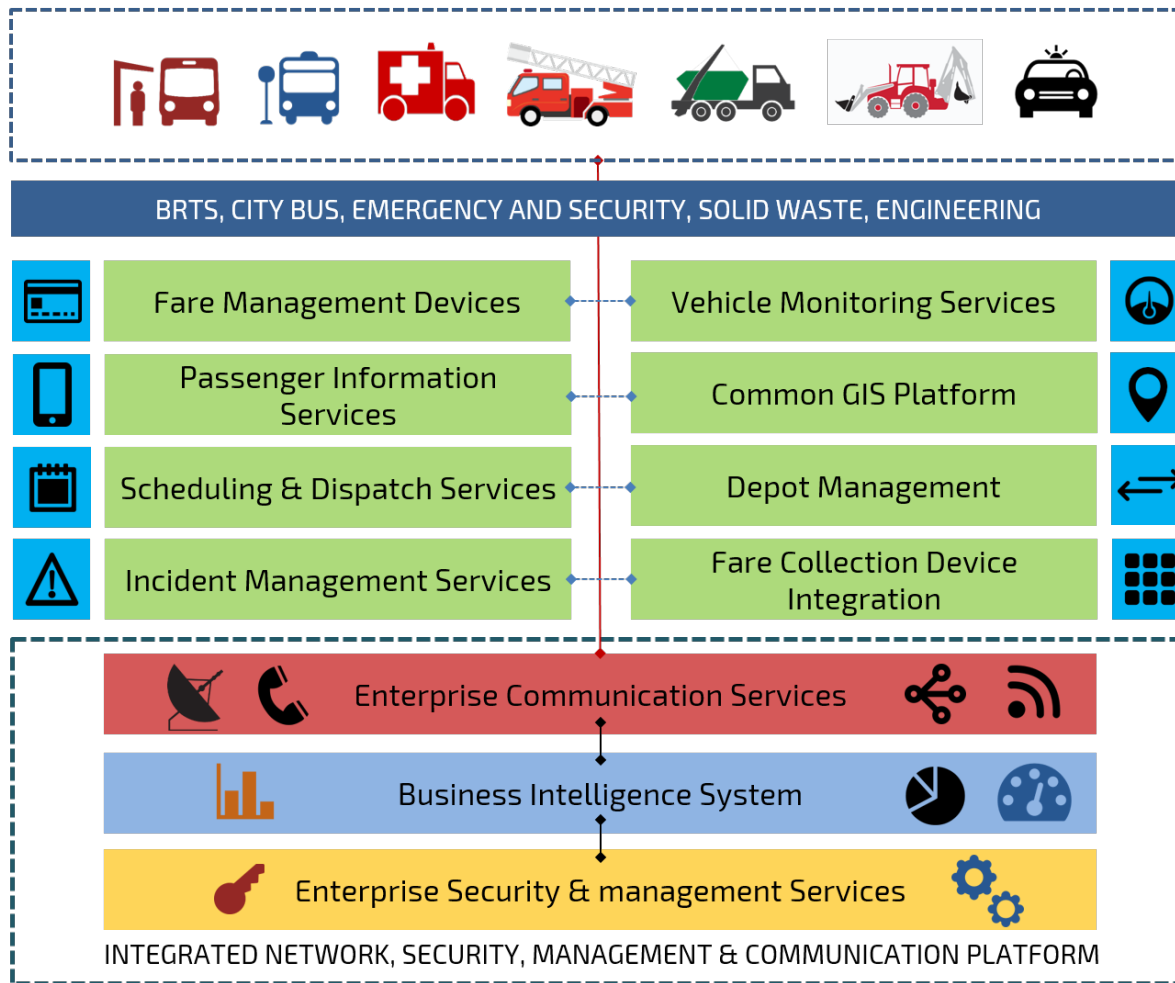
Surat City Demographics



Development of transport in surat

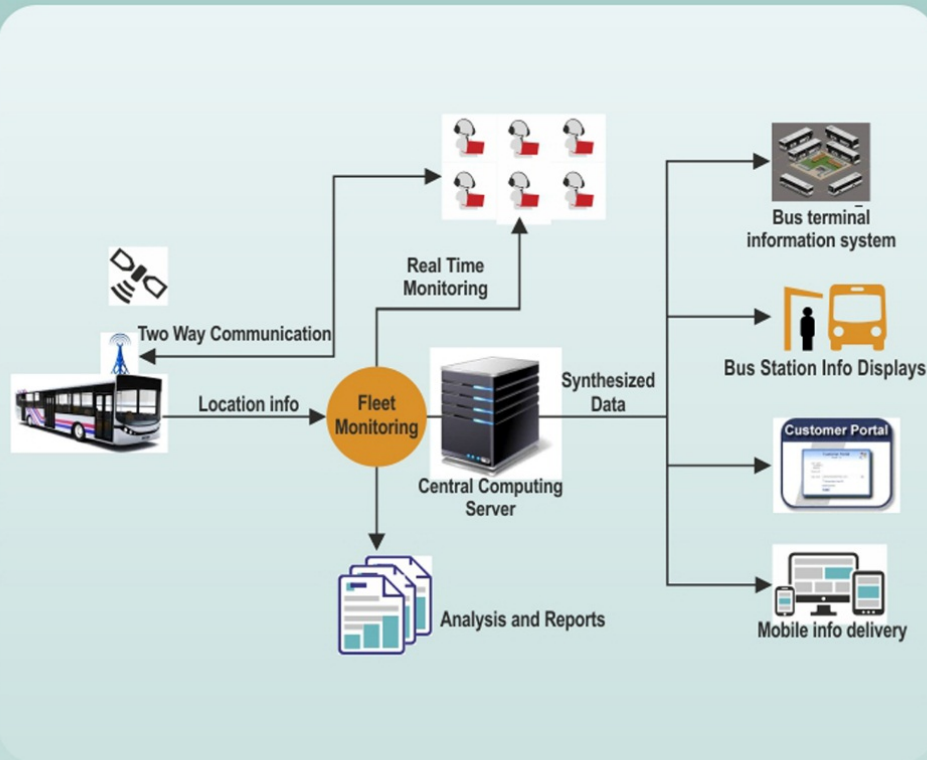


Integrated Transit Management System Framework for Surat City



First city in India to implement city wide common mobility management platform for urban local body and as well as private service operators. Common Incident management platform similar to 911 in The USA.

AVL



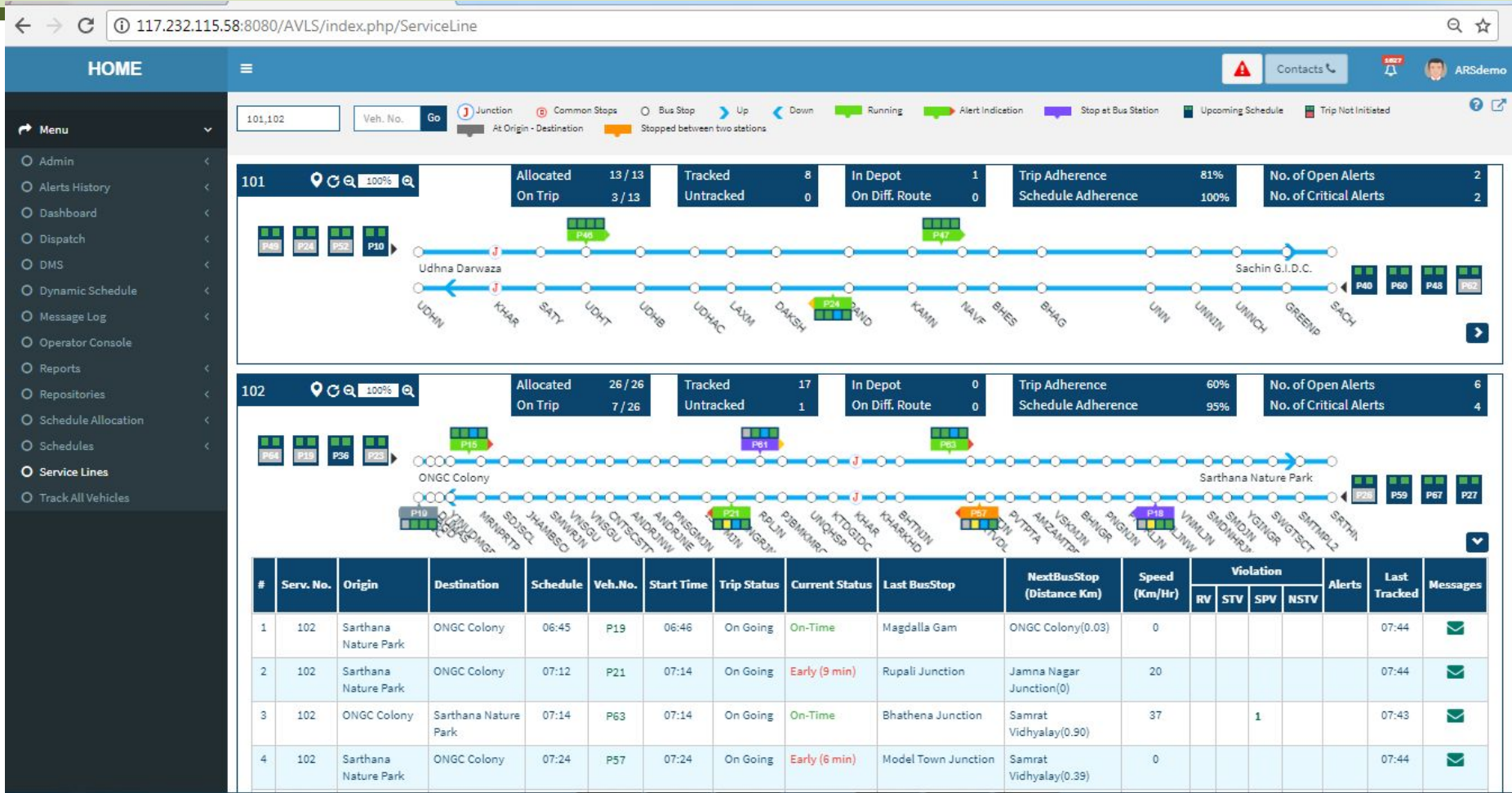
AUTOMATIC VEHICLE LOCATING SYSTEM FEATURES

- Facility to view current location of buses.
- Two way communication between bus drivers and users at central location.
- Real Time monitoring for stoppage, speed and off route violations.
- Reports for violations
- Mobile application that provides information about the buses.

Source: Surat Municipal Corporation



Trips monitoring, violation monitoring, Adherence– By AVLS system



AVLS key functions

- Operator Billing
- Travel speeds as inputs to schedule
- Service Monitoring

Speed

Schedule

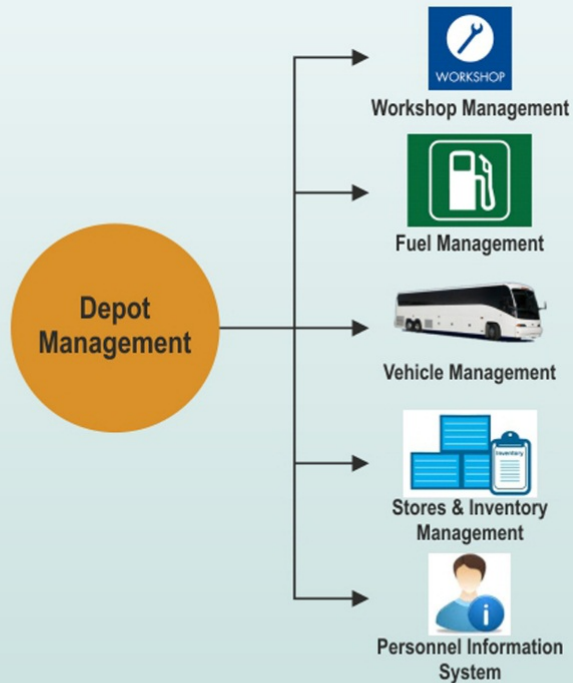
Missed Stop

Un authorized stoppage

Routes



DEPOT MANAGEMENT



DEPOT FEATURES

- Management of Vehicles
- Asset Management and Inventory Control.
- Fuel Management.
- User Management.

Source: Surat Municipal Corporation



Schedule Allocation (by operator) DMS Conductor & ETM Allocation

117.232.115.58:8080/AVLS/index.php/DMS_Timeline

HOME

Menu

- Admin
- Alerts History
- Dashboard
- Dispatch
- DMS
 - HRMS
 - Inventory
 - Master
 - Operation
 - Duty Scheduler
 - Fuel Log
 - Incident
 - Maintenance Log
 - Trip Sheet
 - Vehicle Driver Allocation
 - Timeline
 - Work Order
 - Dynamic Schedule
 - Message Log
 - Operator Console
 - Reports
 - Repositories
 - Schedule Allocation
 - Schedules
 - Service Lines

Vehicle Driver Allocation - Timeline

Select All

ROUTE FILTER STATUS FILTER TIME FILTER

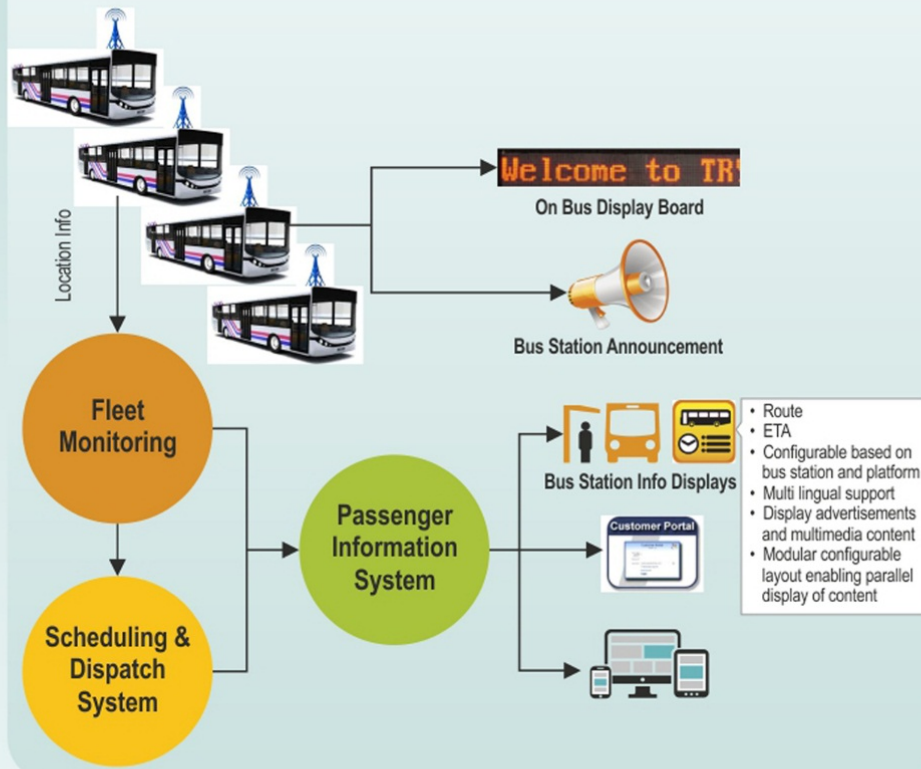
06:00 AM

Route ID	Route Name	Time	Vehicle	Operator	Status
A031 (DC 1)	Railway Station loop (Clockwise)	06:00 AM - 02:00 PM	C139 - GJ05BX2911	Imran Mustak Shaikh	Allocated
A041 (DC 13)	Railway Station loop (Anti-clockwise)	06:00 AM - 02:00 PM	C085 - GJ05BX3024	Azruddin I Pathan	Allocated
C1531 (DC 25)	Gopi Talao to Kapodara	06:00 AM - 01:40 PM	C031 - GJ05BX2161	Rajubhai P.Domadiya	Allocated
C2041 (DC 37)	Chowk to Godadara gaam	06:00 AM - 02:01 PM	C143 - GJ05BX3011	VINOD RAMESH THAKUR	Allocated
C216K1 (DC 63)	Chowk to Kaadi Faliya Dumas	06:00 AM - 01:30 PM	C118 - GJ05BX2695	IRFAN AHMED	Allocated
C254-1 (DC 81)	Katargam to Limbayat	06:00 AM - 01:01 PM	C188 - GJ05BX3439	RAMESH DAMAR VARMA	Allocated
C4021 (DC 101)	Parvat Patiya to Mansarovar	06:00 AM - 02:08 PM	C160 - GJ05BX3189	SHURAKAN SANKAR PATIL	Allocated
C403-1 (DC 119)	Parvat Patiya to Sarthana Nature Park BRT	06:00 AM - 01:52 PM	C192 - GJ05BX3128	CHARPOT HITESHKUMAR	Allocated
C504-1 (DC 129)	Nilgiri circle to Sonari Unn lake	06:00 AM - 02:16 PM	C074 - GJ05BX2654	AYUB SHAIKH	Allocated
CD1 (DC 149)	Chowk to Kharavasa	06:00 AM - 01:53 PM	C069 - GJ05BX2464	Natvar Bhai RupaBhai Taviyad	Allocated
CG1 (DC 171)	Chowk to Gajera	06:00 AM - 02:20 PM	C007 - GJ05BX2020	DIGPAL SINGH	Allocated
CL1 (DC 191)	Chowk to Laxmidham Soc loop	06:00 AM - 01:54 PM	C093 - GJ05BX3214	Rohitbhai R Gautar	Allocated
CU1 (DC 205)	Chowk to Unn Industrial Estate	06:00 AM - 02:06 PM			
KR1 (DC 271)	Railway Station to Khajod Gaam	06:00 AM - 02:29 PM			
RA1 (DC 421)		06:00 AM - 02:33 PM			
RD2 (DC 443)		06:00 AM - 01:12 PM			

Legends: Crew/Bus not allocated, Crew/Bus allocated from previous day, Crew/Bus allocated manually, Crew/Bus allocation Frozen



PIS



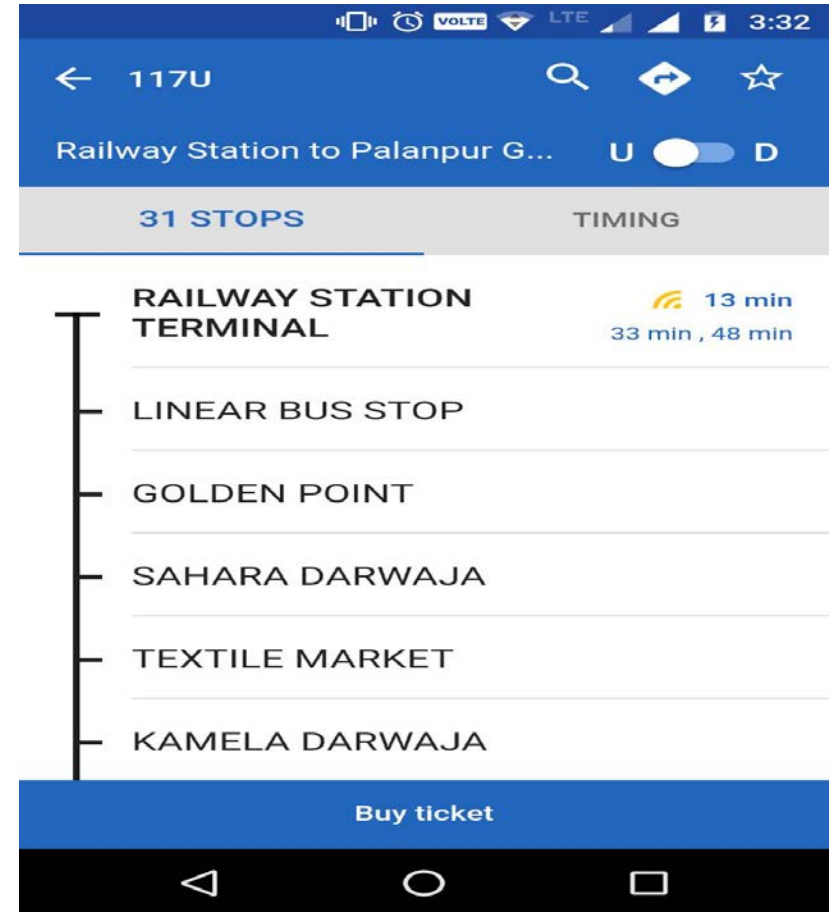
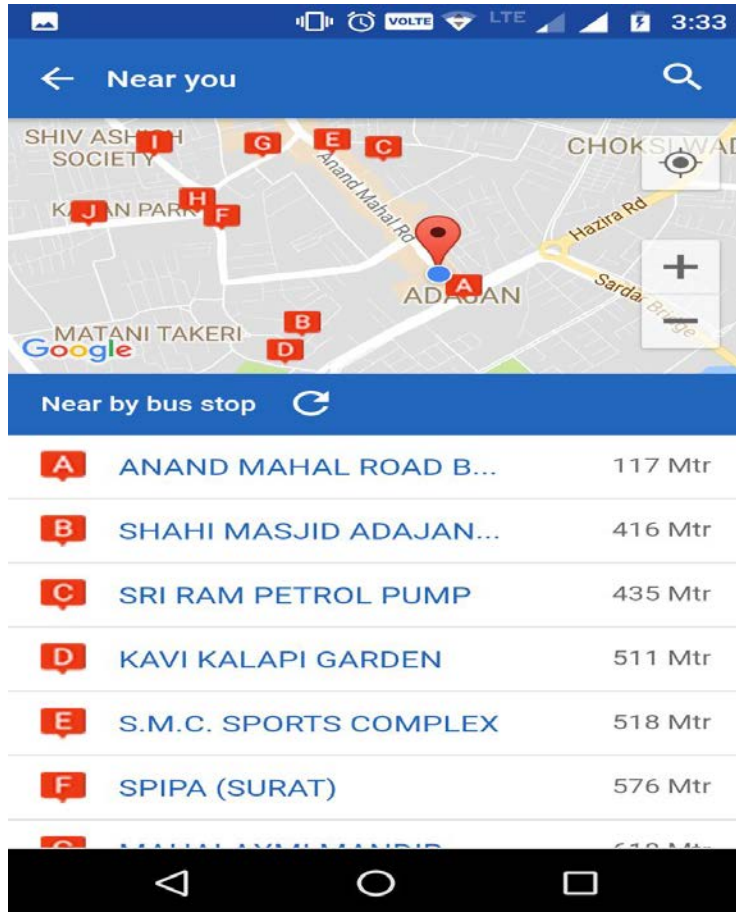
PASSENGER INFORMATION SYSTEM FEATURES

- On Bus Display Board showing information about bus stations followed by voice announcement.
- Display of Advertisements based on location and time.
- Display boards at bus stations showing expected time of arrival.
- Multilingual support.
- Modular Layout enabling parallel display of content.

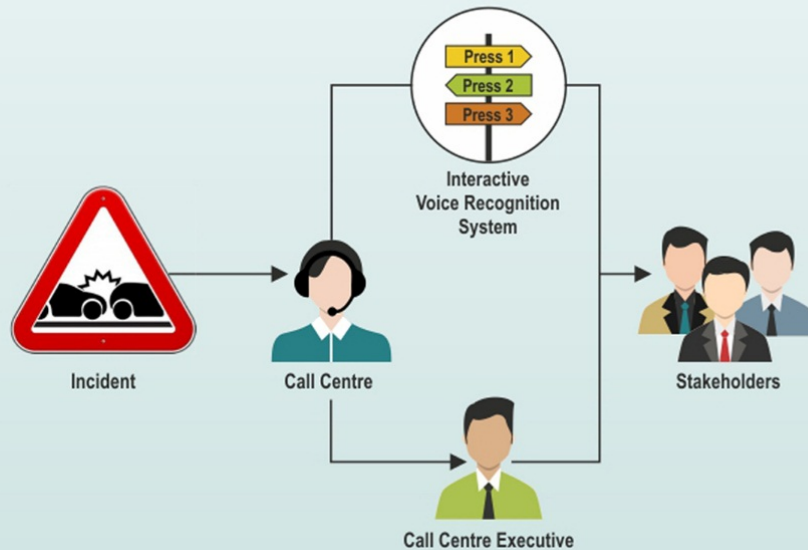
Source: Surat Municipal Corporation



Nearest Bus Stop & Next Bus To



INCIDENT MANAGEMENT



INCIDENT FEATURES

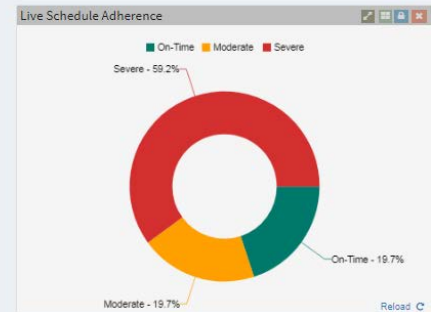
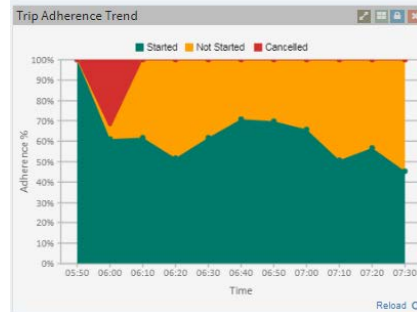
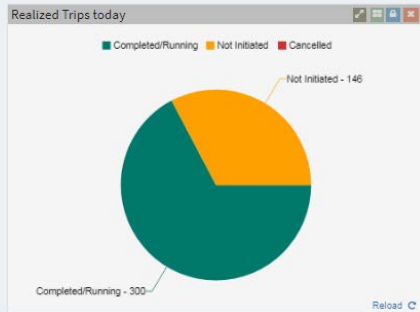
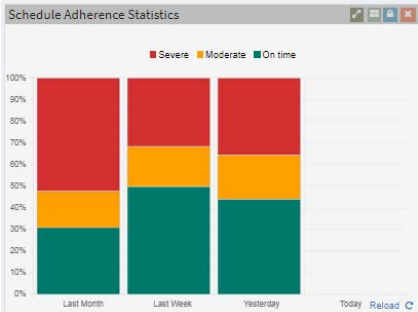
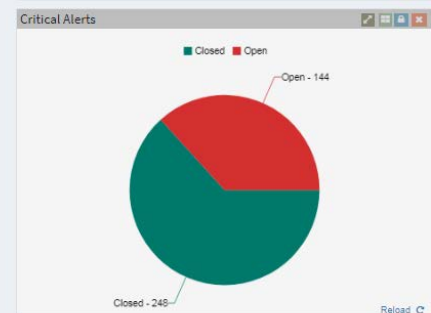
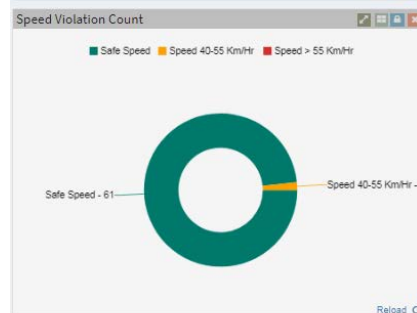
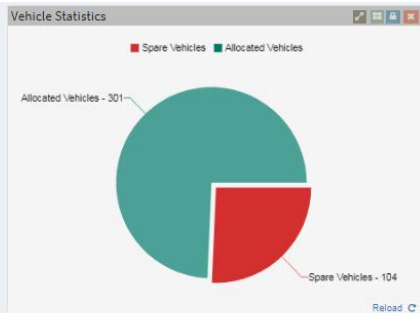
- CTI module for receiving calls
- Registration of grievances
- Interactive voice response system
- User Management.
- Dispatch of emergency services such as Police, ambulance, crane etc.

Source: Surat Municipal Corporation



Dash Boards

Integrated Automated Vehicle Location Monitoring System



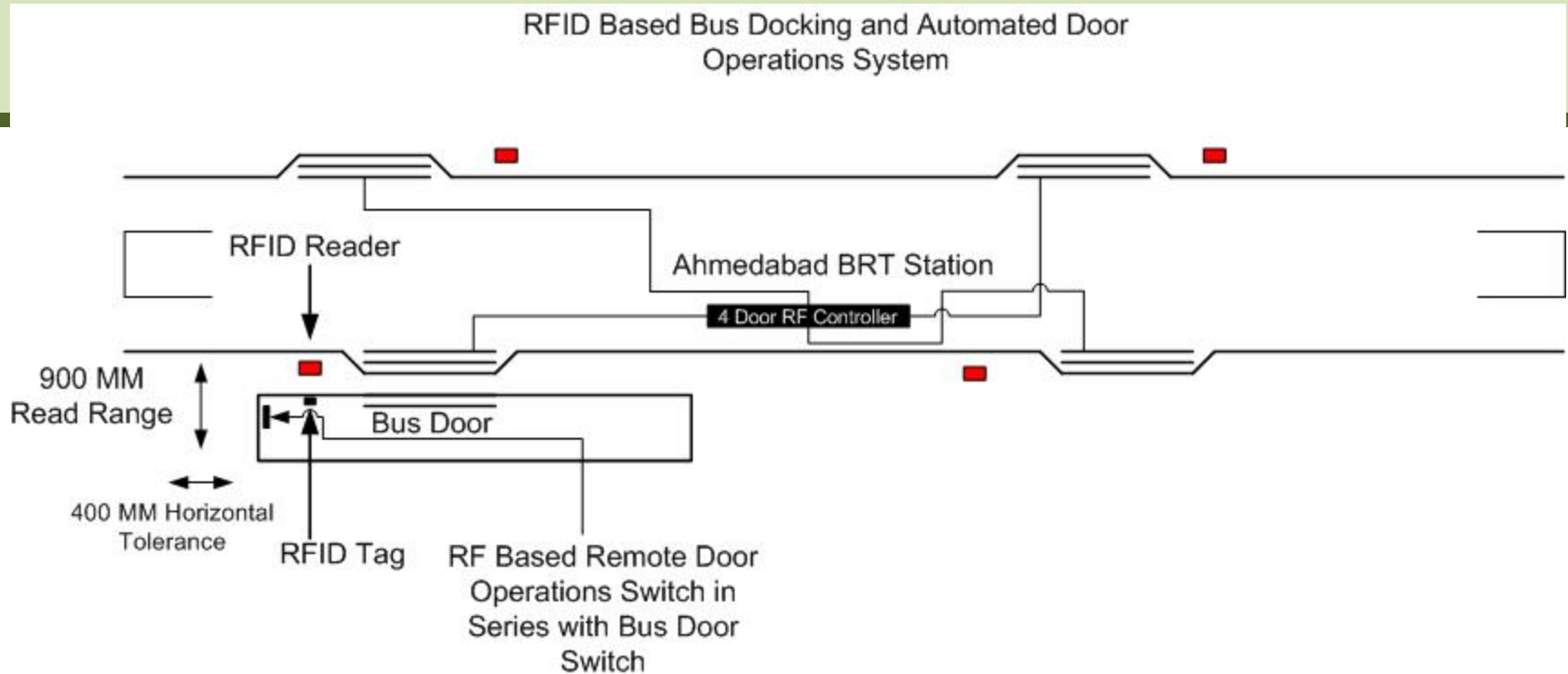
Dash Boards

- Trip statistics
- Vehicle utilization Statistics
- Period Schedule Adherence
- Speed

- Alerts Statistics
- Hourly Trip Adherence Trend
- Live Schedule Adherence



Automatic doors : Components and operations



- Controlled by the driver
- Can be operated only when the bus aligns at designated location
- Built in design redundancy
- Safe user interface



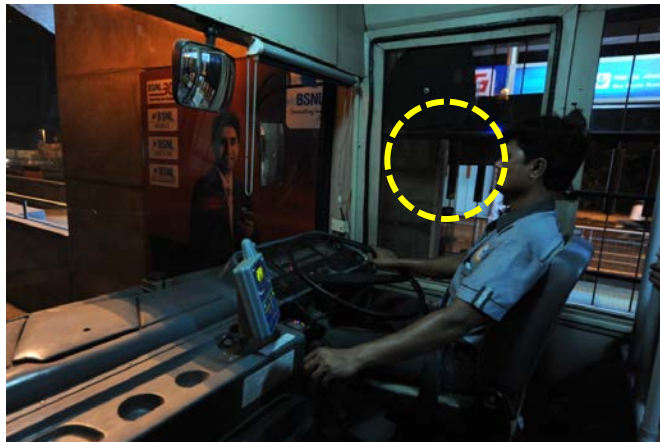
Door Operations : Driver controls

Driver controls – Door operation

Driver controls – GPS device



RFID reader and sensors (non synchronized) at approach



RFID reader and sensors (synchronized) at halt



Integrated Fare System

**One ticket for one journey –
Single ticket between System**

**Hassle free transfer between
systems**

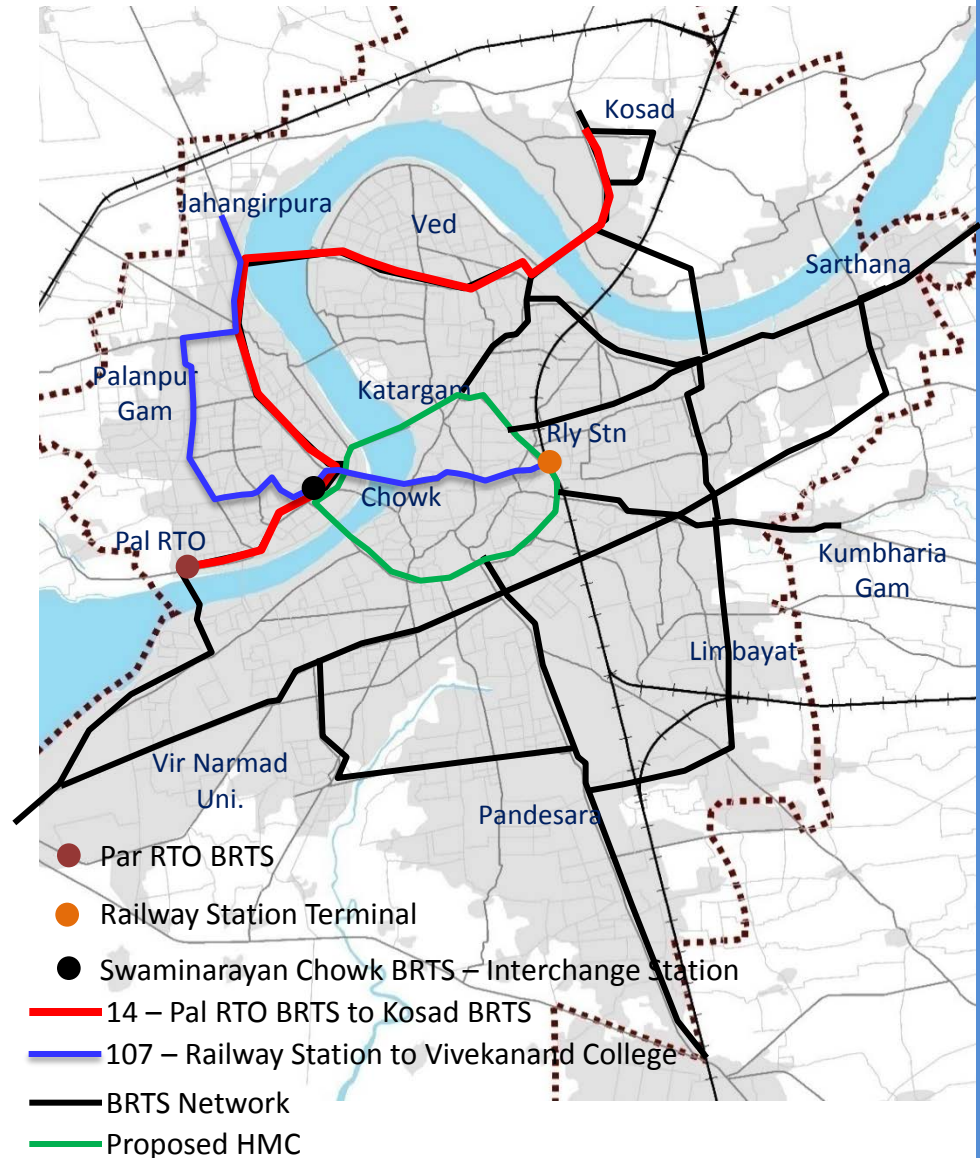
Reduced fare:

**Integrated fare for Pal RTO to
Railway Station: **Rs. 10****

Without integrated fare: **Rs: 12**

**(Pal RTO BRTS to Swaminarayan
Chowk BRTS: **Rs. 6**)**

**(Swaminarayan Chowk BRTS to
Railway Station: **Rs. 6**)**



Mobile Ticketing

QR Based M-Ticket through Mobile Application

Features of Mobile Application

Static Route Information

Journey Planner with ETA & Fare details

Near by Station information

M-Ticket

M-Ticket



Ticket number

7101000130000063

Expires on

27/10/2017, 02:11 PM

EXPIRED

Agency

SMC-BUS



○ ADAJAN PATIYA BRTS

● MORA BHAGAL

Ticket for

Adult

Route number

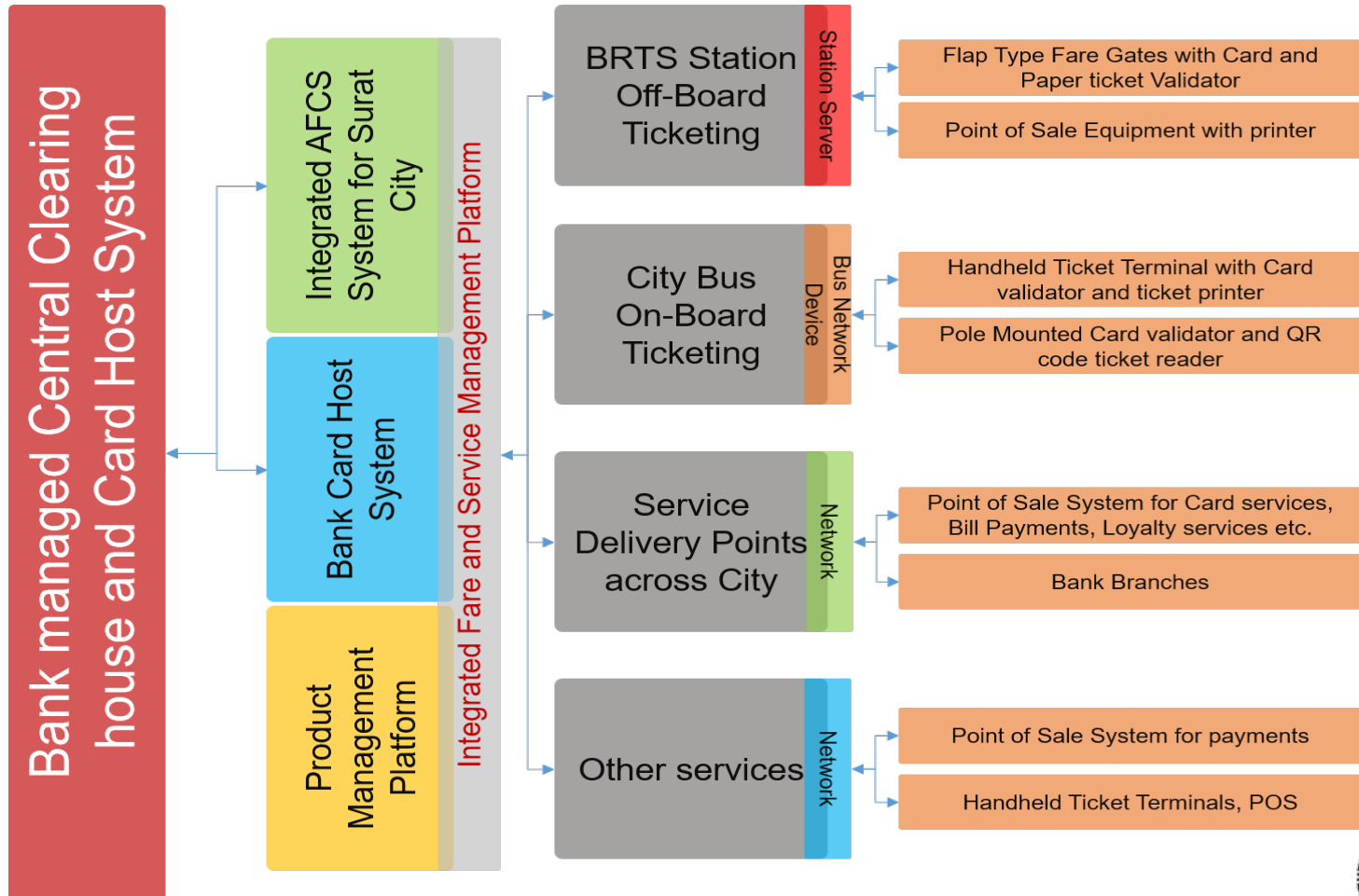
14U

Total fare

₹6.00

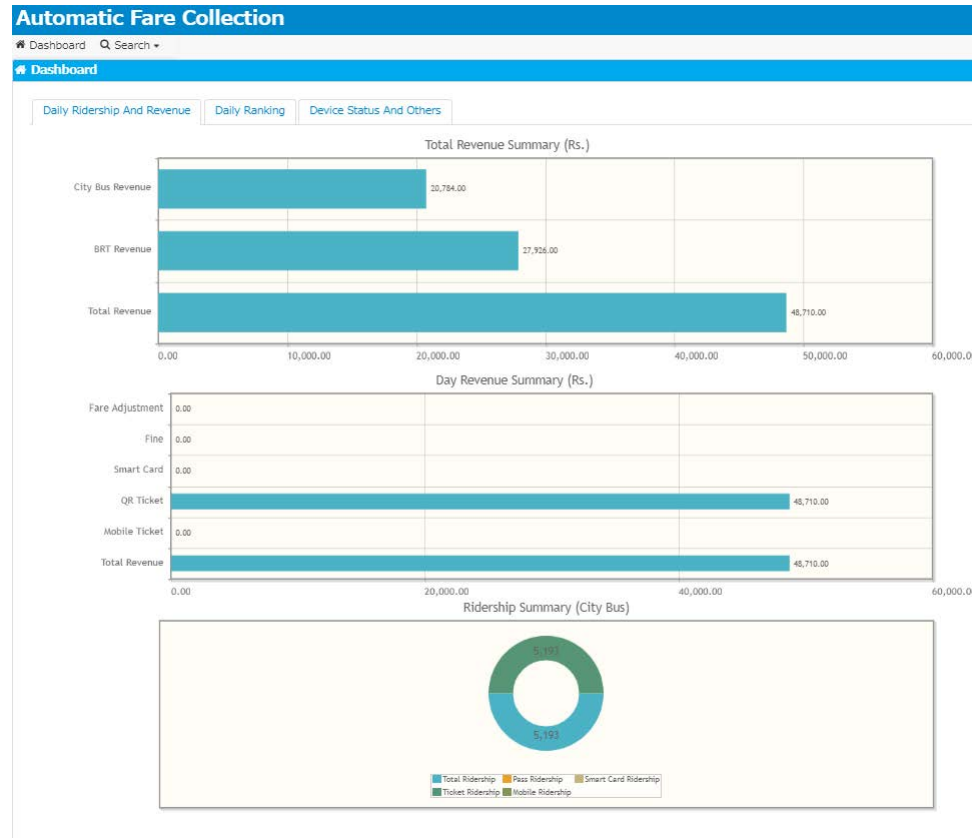
Integrated Fare Management

- Automatic Fare Collection



Dashboard for AFCS

- Real time information of ridership & revenue collection
- Status of active/inactive devices, Synchronization status of ETM devices with pending data
- Reconciliation window – to eliminate human intervention in the process
- Availability of database such as route wise/station wise ridership & collection – For quick analysis & decision making



Integrated Fare Management

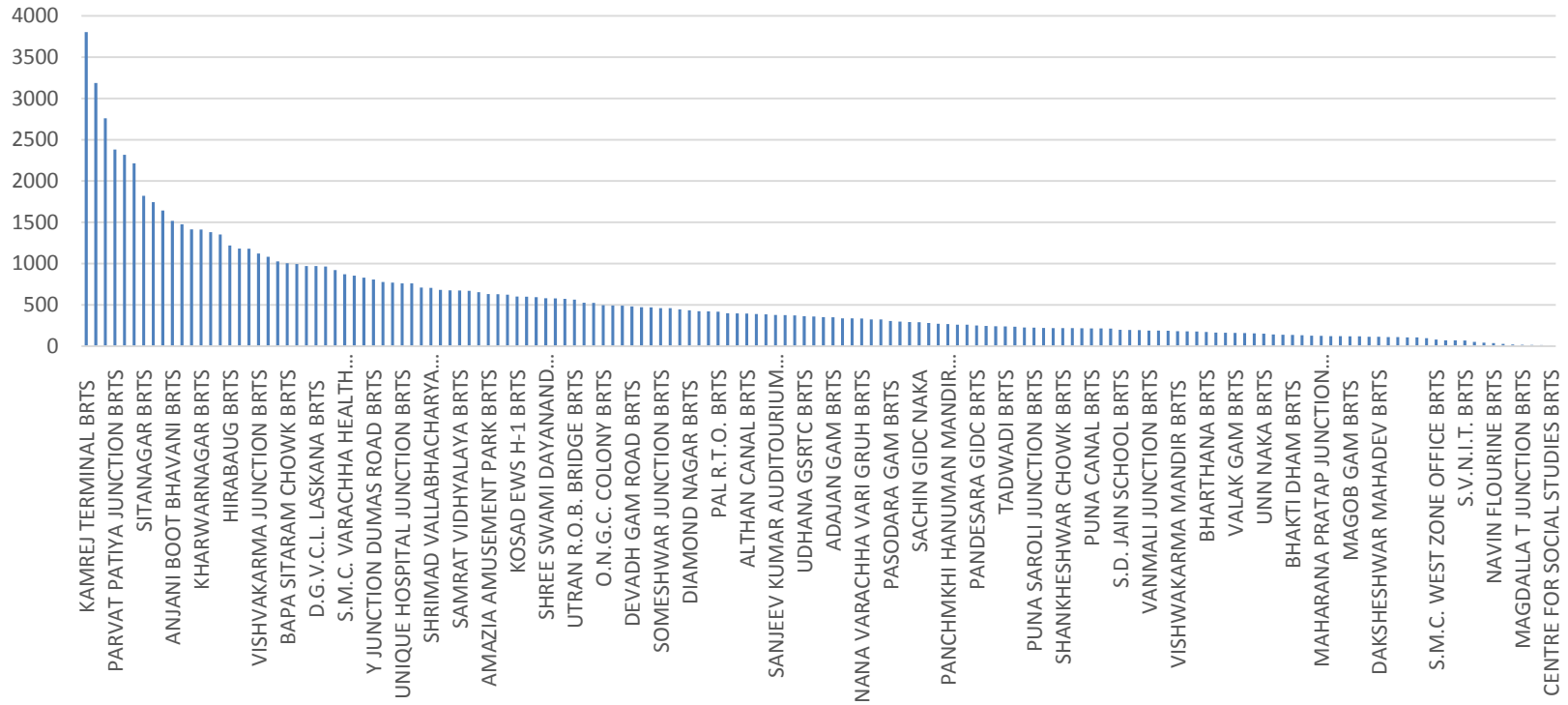
- Automatic Fare Collection - S-Connect Card Services



Boardings at BRTS Stations

Total Boardings: **84,782** as on 27th May, 2017

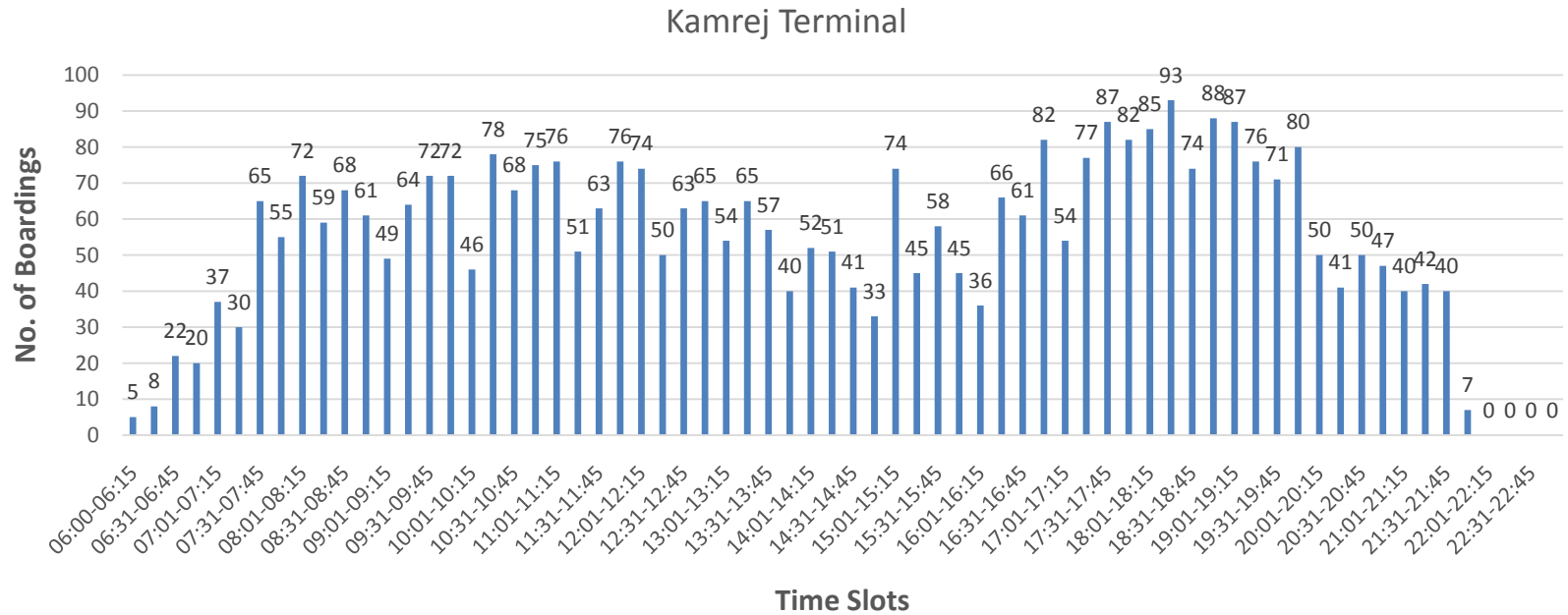
Boardings at BRTS Stations



Boardings at Kamrej Terminal

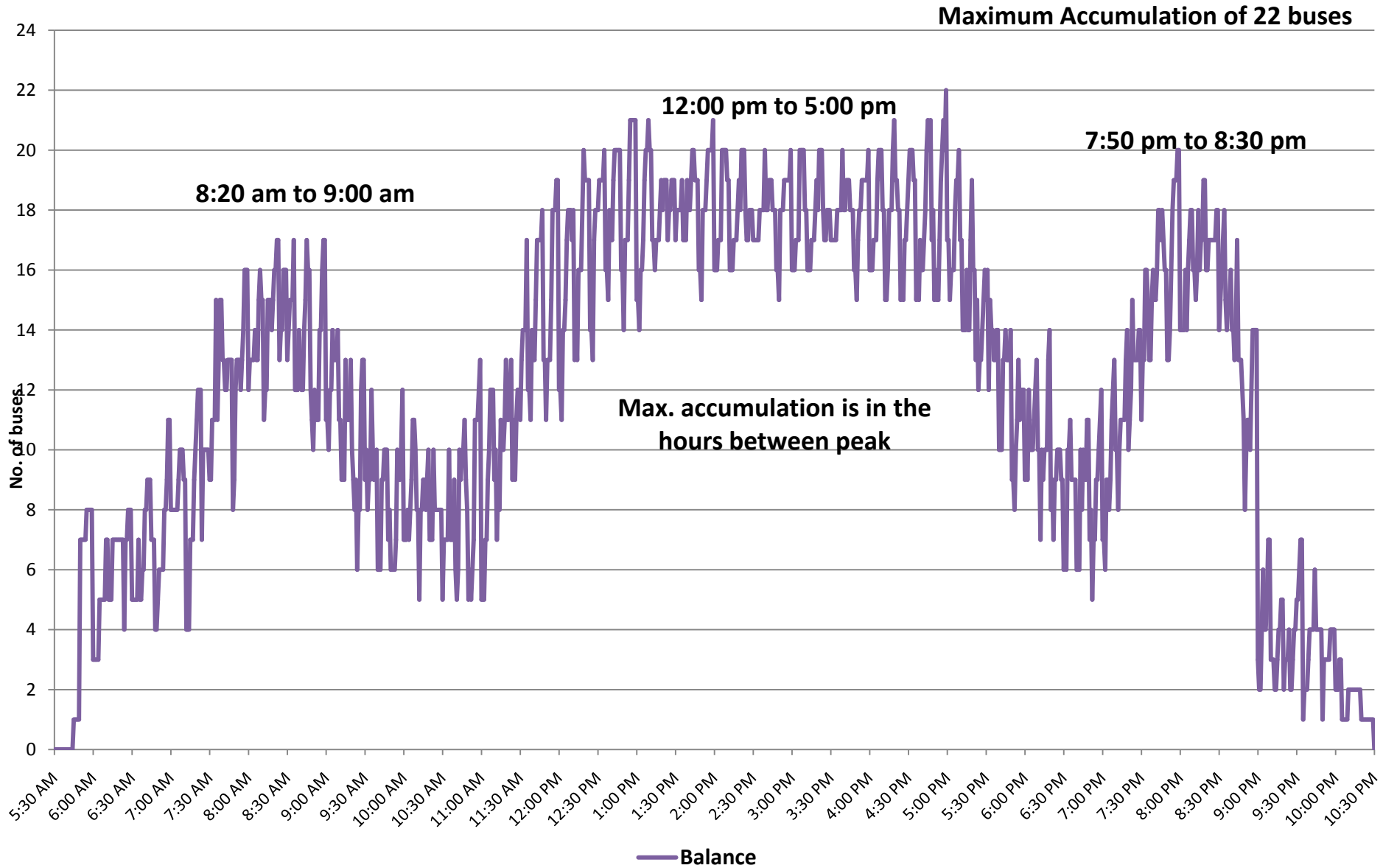
Total Boardings: **3804**

Max boarding at 15 mins interval: **93 between 18:30 to 18:45**



Accumulation at Railway Station

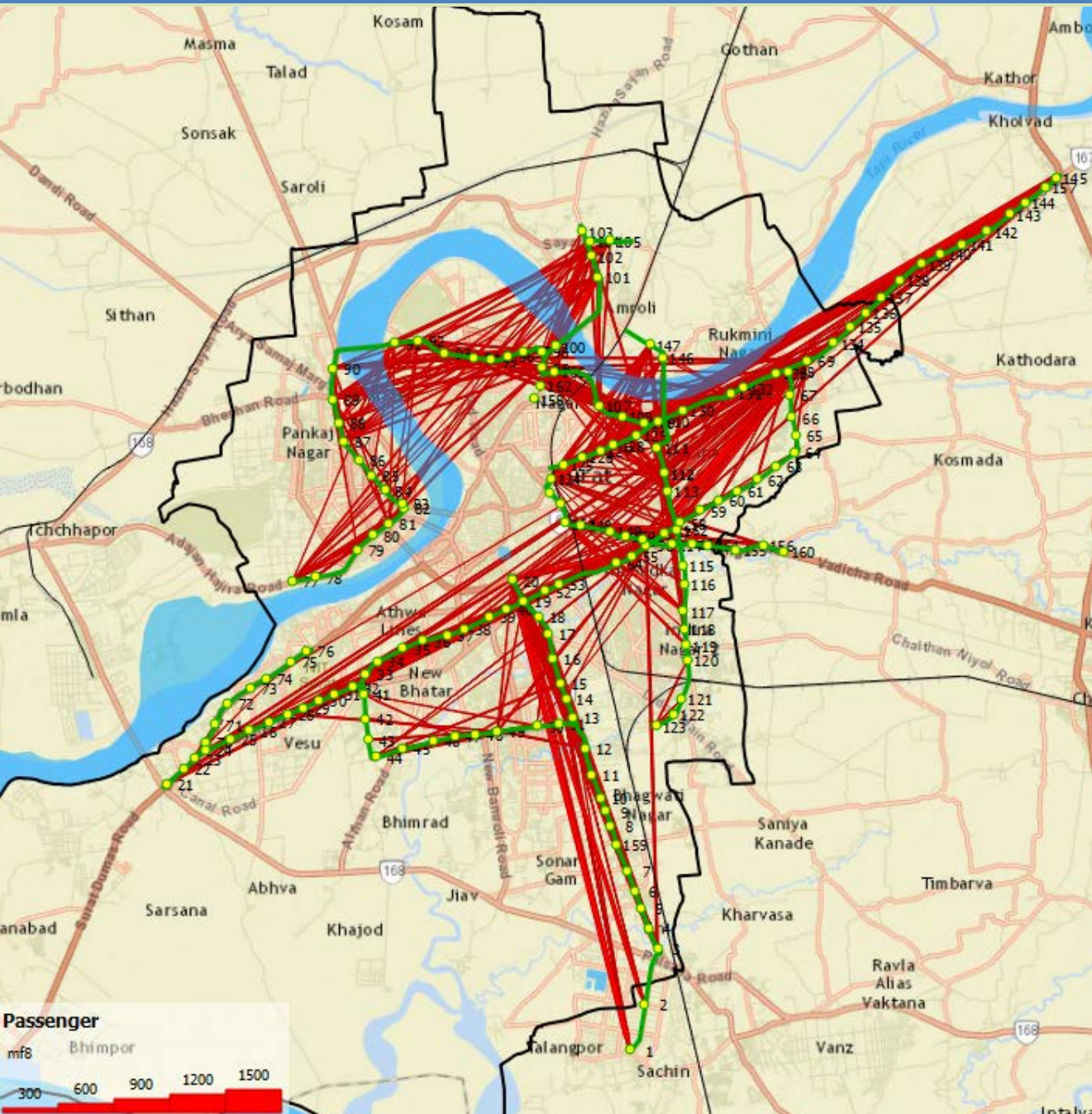
Data sheet per minute basis



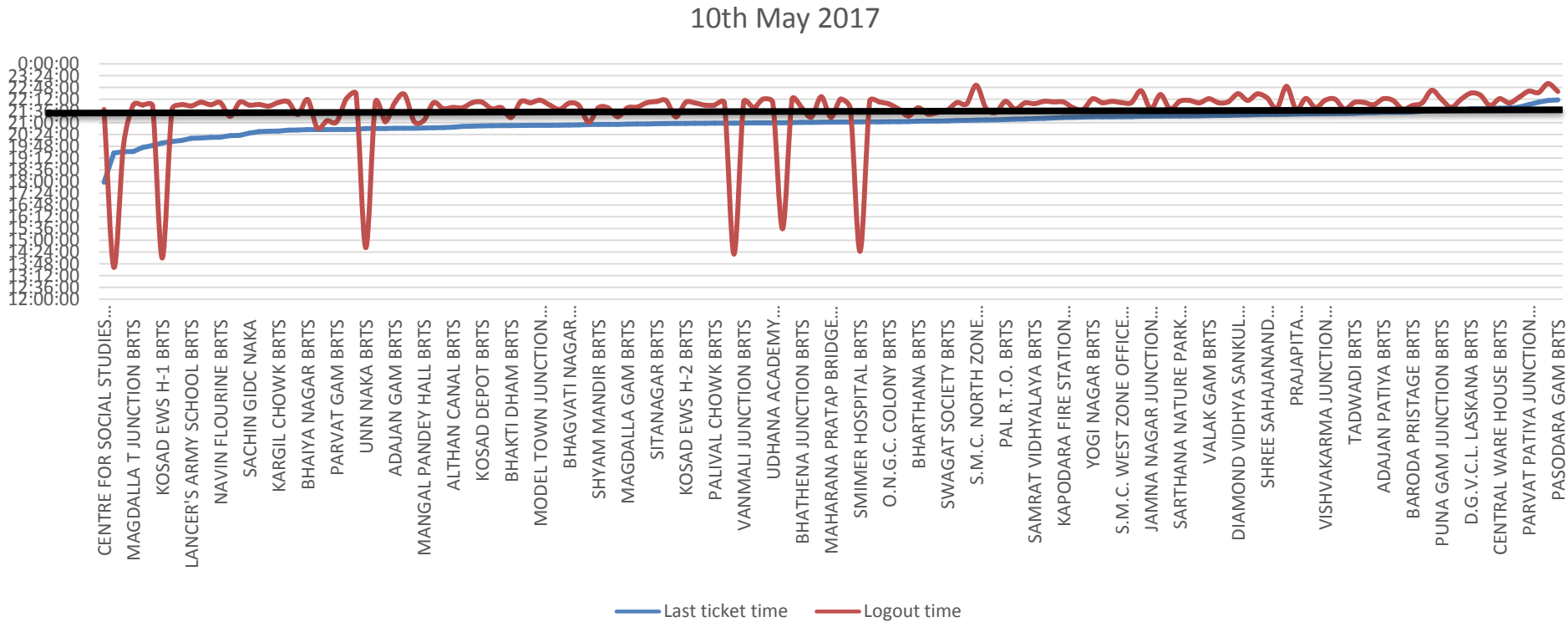
BRT Passenger OD – >25 Trips

Dt. 10/4/2017

Total trips >25 = 42,825
(58%)



Station wise last ticket time and logout time on 10th May 2017



Conductor Performance – Plugging Revenue Leakages

Methodology:

- Route wise conductor collection & passenger for 5 days
- Marking conductors with difference more than 25% in collection & average on that route
- Monitoring identified conductors for week

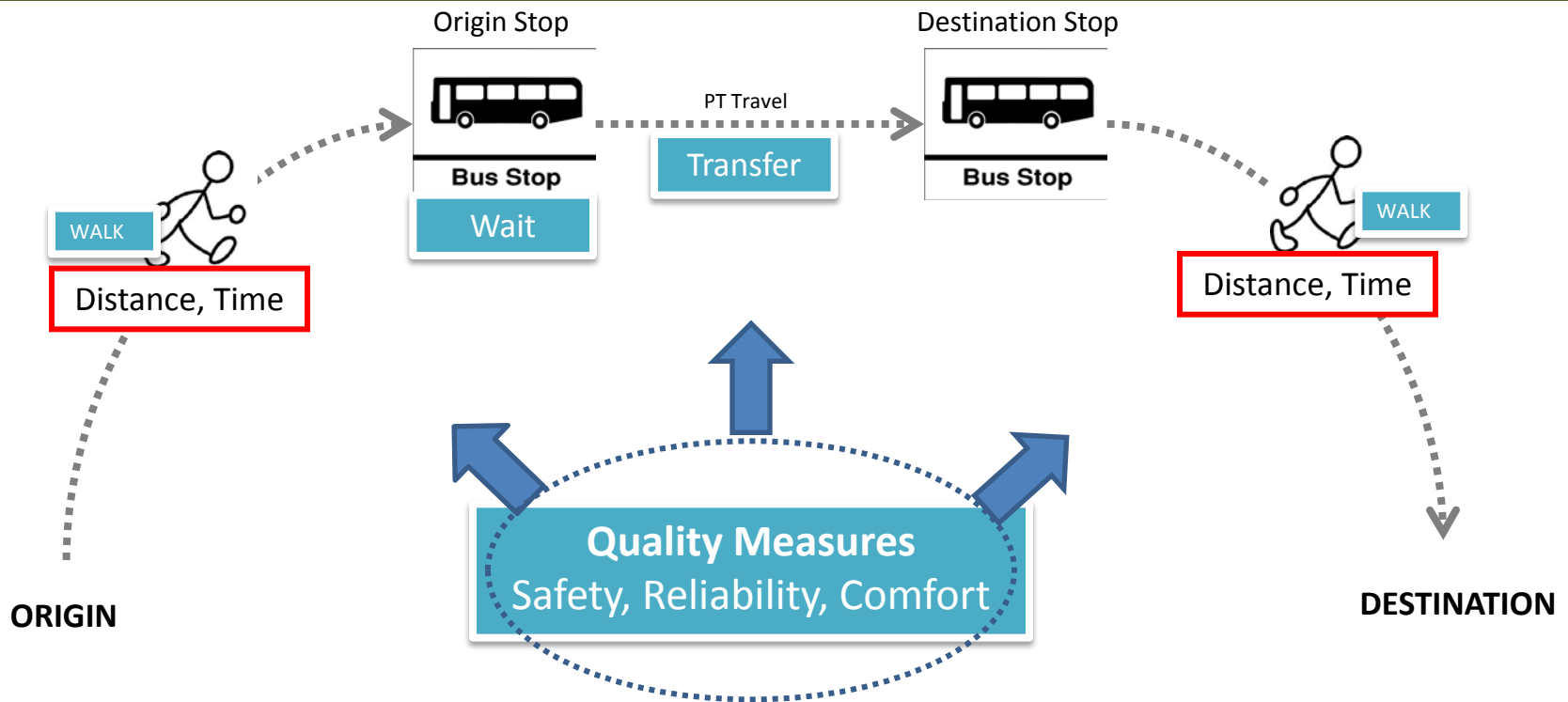
Key Outputs:

- Availability of conductor performance
- Decreased revenue leakage

Conductor ID	Conductor User Name	Employee Code	Conductor Name	Remark	Difference in collection from average on particular route (%)					Number of days where difference is more than -25%
					04-09-2017	06-09-2017	07-09-2017	08-09-2017	09-09-2017	
30000232	user000626	SRATB17000626	MUKESH	Male Conductor	48.22	5.02	13.69	17.93	26.91	0
30000233	user000627	SRATB17000627	YOGESH	Male Conductor	2.40	10.46	36.35	9.27	20.95	0
30000234	user000628	SRATB17000628	GANESH	Male Conductor		9.29	0.07	20.02	45.67	0
30000235	user000629	SRATB17000629	KESHAV	Male Conductor	6.32	7.10	80.19	45.84	26.03	1
30000236	user000630	SRATB17000630	VIKASH	Male Conductor	19.08	10.34	20.09	19.06	7.20	0
30000237	user000631	SRATB17000631	SAMEER	Male Conductor	58.52	43.30	25.71	53.37	17.34	4
30000238	user000632	SRATB17000632	SURESH	Male Conductor	41.72	4.99	18.92	8.13	20.33	1
30000239	user000633	SRATB17000633	VINAY BHAI	Male Conductor	9.54		2.04	10.80	27.83	1
30000240	user000634	SRATB17000634	VIPUL	Male Conductor	6.83	18.46	0.94	7.54	11.30	0
30000241	user000635	SRATB17000635	MEHUL	Male Conductor	19.92	33.71	9.93	7.90	10.71	0
30000242	user000636	SRATB17000636	KHANDU	Male Conductor	7.60	4.40	2.64		8.55	0
30000243	user000637	SRATB17000637	KALPESH	Male Conductor	3.65		3.42	23.61	4.62	0
30000245	user000639	SRATB17000639	ROHIT	Male Conductor	27.88	4.88	26.59	12.00	11.36	0
30000246	user000640	SRATB17000640	RAJU	Male Conductor	1.66	27.78	43.39	20.90		0
30000247	user000641	SRATB17000641	ANAND	Male Conductor	50.58		17.22	30.31	17.91	0



Complete Journey



- Different legs of journey may be valued differently
- Quality of service offered may have an effect on the value
- Passengers perceive public transport as a bundle of service and place different valuations on various components



Thank You!

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