Technology to Leverage Services for Improved Mobility

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Surat Municipal Corporation

GOVERNMENT OF INDIA
MINISTRY OF HOUSING AND URBAN AFFAIRS

Digital India
Power To Empower

150 YEARS OF CELEBRATING THE MAHATMA

UPMRC

12th Urban Mobility India Conference & Expo 2019

INSTITUTE OF URBAN TRANSPORT (INDIA)

Surat City Profile

8th **Largest** in India as per population

4th fastest growing city globally

Termed as **Economic Capital** of Gujarat

9/10 Diamonds in the world are cut and polished here

40% of nations total **man-made fabric** & **28%** of nation's total **man-made fiber** production

- **Area: 326.5 sq.km**
- **Population: 2011- 44.6 Lakh (SMC)**
- **Density : 138 Persons/ Ha (Census-2011)**
- **Population Growth Rate : 59% increase in a decade (2001-2011)**
- **Admin Zones : 7**

- **2nd largest in Gujarat and 8th largest In India**
- **Fastest growing city in India**
- **Large number of migrant populations in the city from various parts of India due to economy generating textile and diamond industries**

Mobility Issues

Rapid Growth in Population

- 2001 – 28.0 Lac | 2011 – 44.6 Lac

Rapid Growth in Vehicles

- 16.7 Lakh Vehicles added in Last 10 Years

High City Mobility

- 38 Lac Passenger Trips per Day

Inadequacies in Road Network

- Incomplete Road Network and Constrains such as River, Canal, Railway

Increase in Congestion Time and Travel Time

- Decrease in travel speed from 28 kmph to 18 kmph, Increase in Travel Time from 13 mins to 25 mins

Vision, Strategic Goals and Policy Directions

SARAL means **"Simple"**

which also implies mobility being **Easy, Convenient and Accessible** aimed towards a **healthy living environment.**

The vision **"SARAL Mobility 2046"** is achieved through **five strategic goals** defined as:

1. **Improving quality of life of people** by providing for a Safe and Sustainable transport system
2. Supporting the **economic growth in the city** by enhancing Accessibility for people and goods to major activity centers.
3. **Ensuring efficient connections** by providing Reliable multi-modal travel options
4. **Optimizing transport system operations** and enhancing travel experience of people through Advanced Technological Applications in transport.
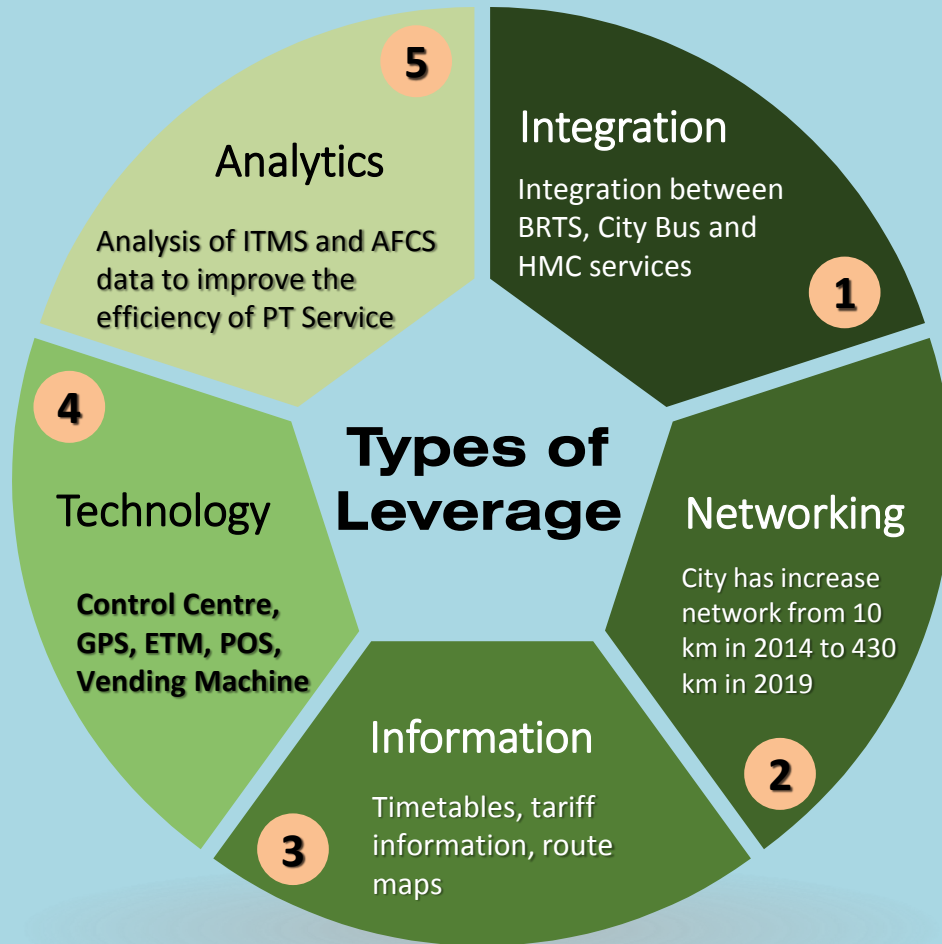5. **Contributing to the environment** by promoting Low carbon mobility

Vision, Strategic Goals and Policy Directions

"*Saral Parivahan, Samridh Janjivan*"
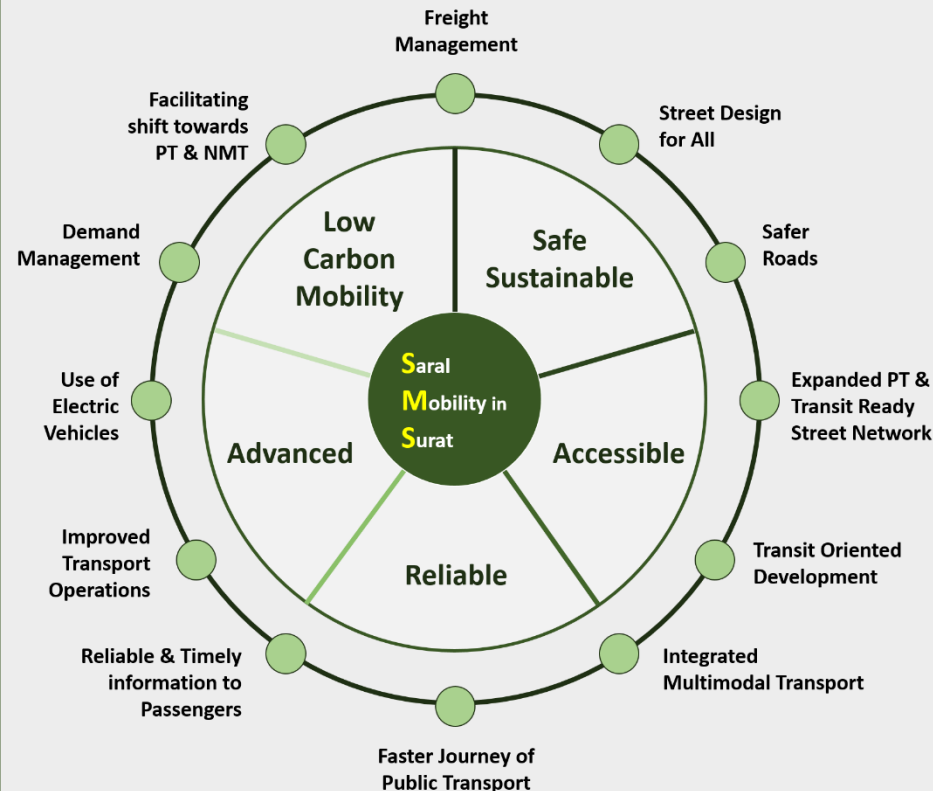
SARAL – **S**afe **A**ccessible **R**eliable **A**dvance and **L**ow – Carbon Mobility in Surat

Leveraging in Transportation

Types of Leverage

5 — Analytics
Analysis of ITMS and AFCS data to improve the efficiency of PT Service

1 — Integration
Integration between BRTS, City Bus and HMC services

4 — Technology
Control Centre, GPS, ETM, POS, Vending Machine

2 — Networking
City has increase network from 10 km in 2014 to 430 km in 2019

3 — Information
Timetables, tariff information, route maps

Transit Performance Indicator

- Ridership – Passenger/Bus
- Revenue – Revenue/Bus
- Vehicle Utilisation
- Earning Per Kilometer
- Cost per Kilometer
- Accident Rate
- Load Factor
- Occupancy Ratio

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How is Surat Adopting ITS Tools

Automatic Fare Collection System

Intelligent Transport Management System

Intelligent Traffic Control System

Intelligent Transport System (ITS) Leveraging
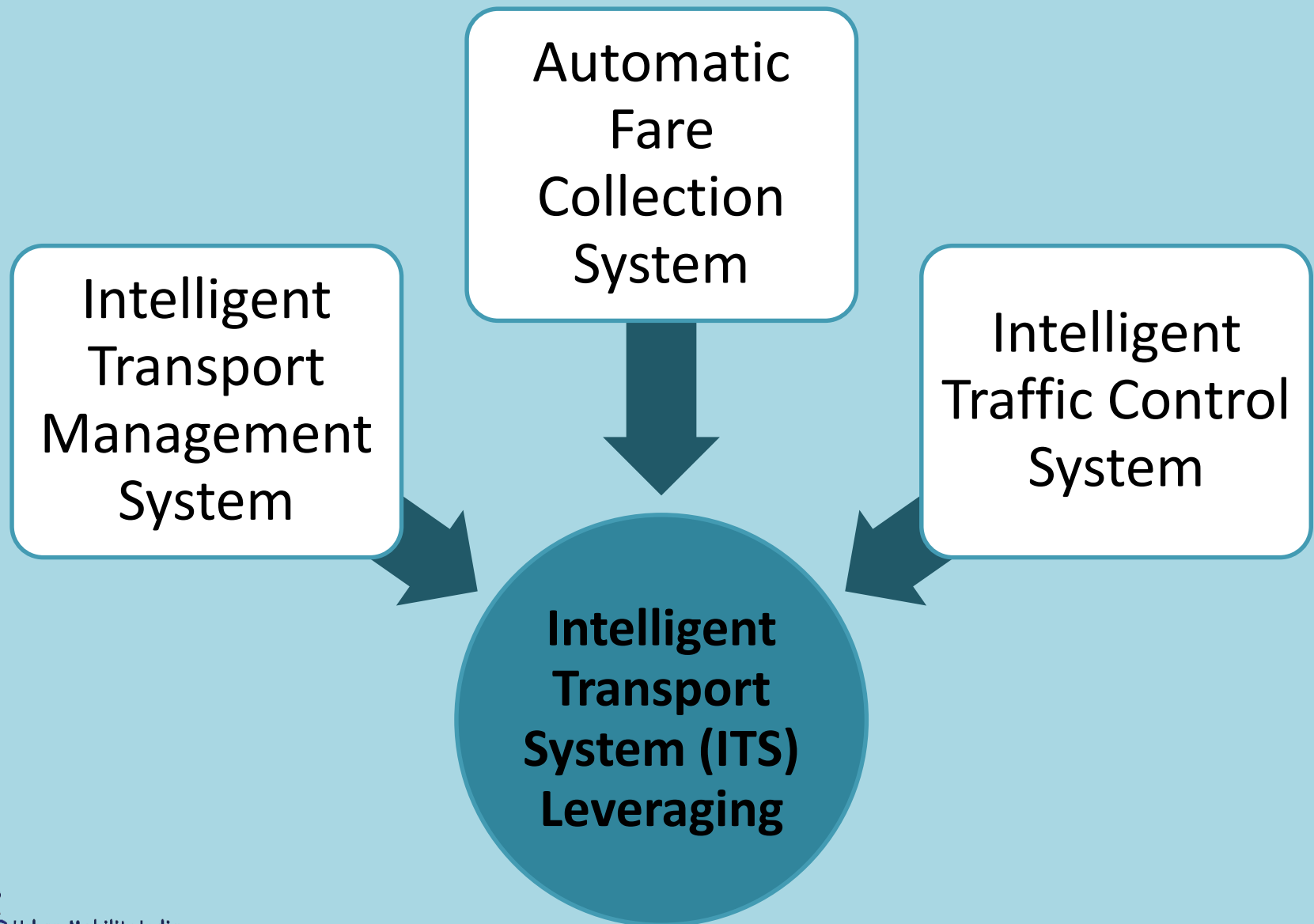
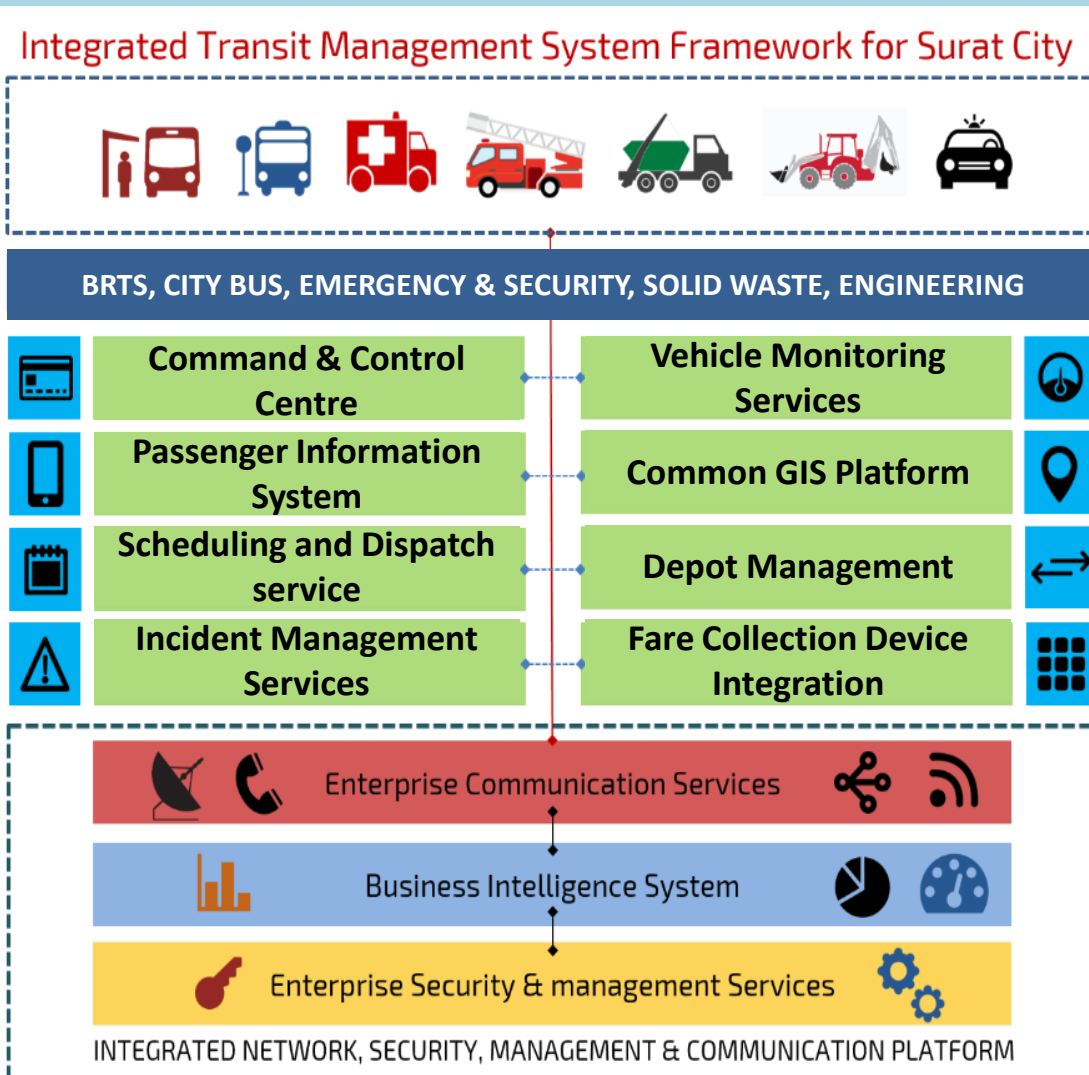# Intelligent Transport Management System
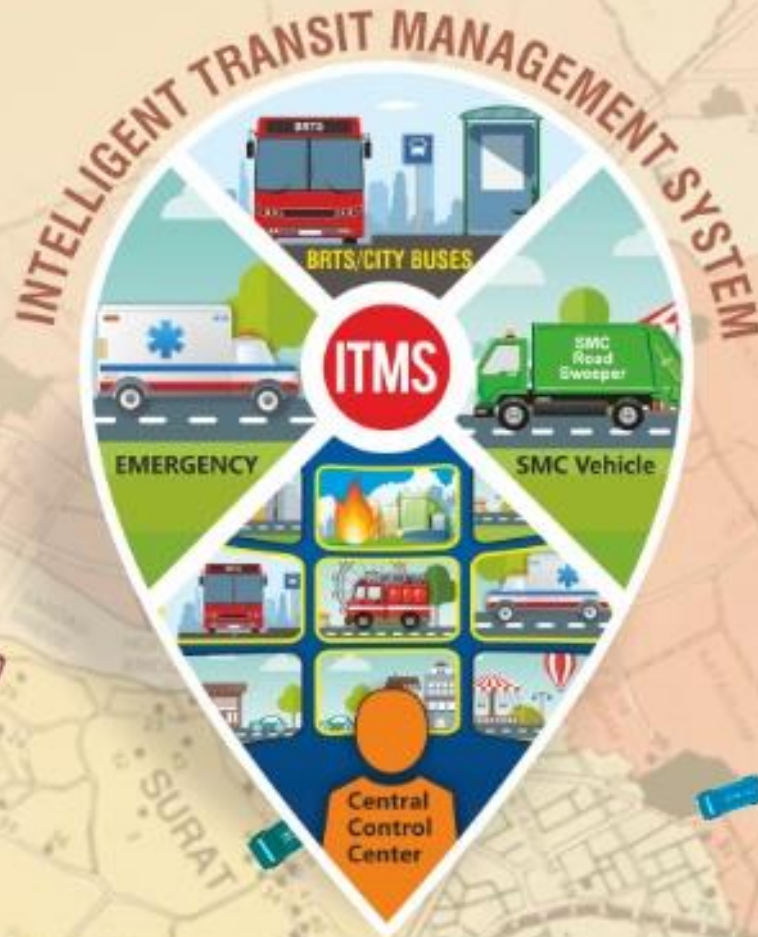
SMC is implementing a city wide integrated system – **"Intelligent Transit Management System" (ITMS),** to manage diverse set of transportation needs for the city – this includes:

(a) Public transport and

(b) Vehicles related to civic services like Solid Waste Management, Drainage, Heavy Engineering, Emergency Services.

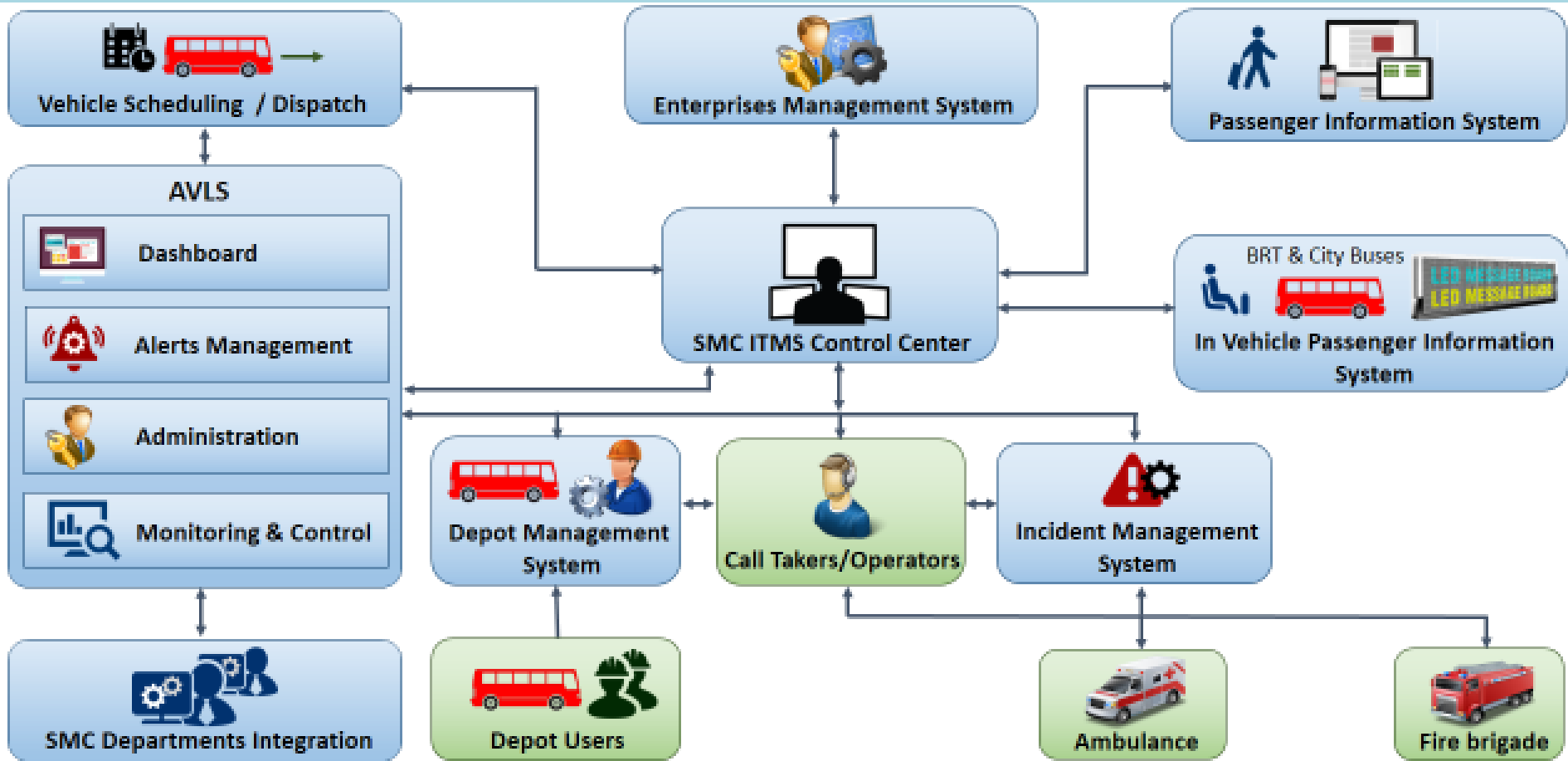# Intelligent Transport Management System

Scope & Coverage

Integrated Transit Management System Framework for Surat City

BRTS, CITY BUS, EMERGENCY & SECURITY, SOLID WASTE, ENGINEERING

Command & Control Centre	Vehicle Monitoring Services
Passenger Information System	Common GIS Platform
Scheduling and Dispatch service	Depot Management
Incident Management Services	Fare Collection Device Integration

Enterprise Communication Services

Business Intelligence System

Enterprise Security & management Services

INTEGRATED NETWORK, SECURITY, MANAGEMENT & COMMUNICATION PLATFORM

PROJECT SCOPE

Hardware

- **153 BRTS stations**
- **575 City Buses**
- **166 BRTS Buses**
- **6 Depots**
- **535 Department Vehicles**
- **50 Emergency Vehicles**

Software

- Automatic Vehicle Location System (AVLS)
- Depot Management System (DMS)
- Enterprise Management System (EMS)
- Website

12

Intelligent Transport Management System

Flow Diagram

Intelligent Transport Management System

Components
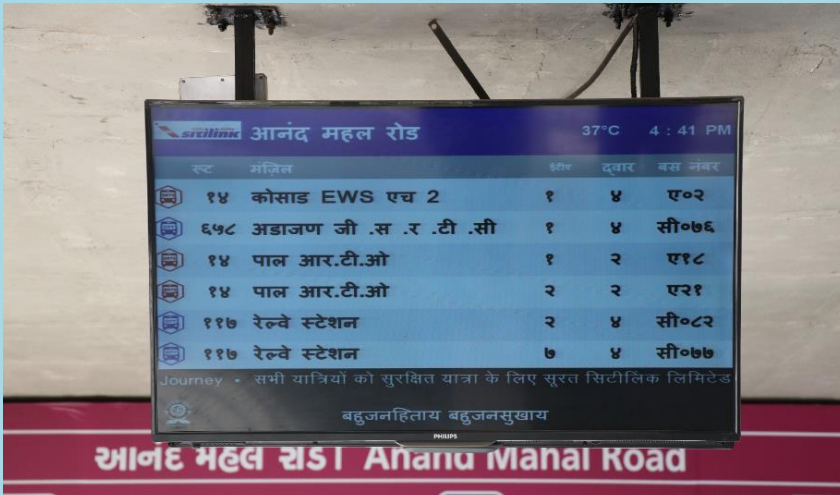
BRTS Station PIS

City Bus Shelter PIS

Bus Driver Console

In Bus PIS

Intelligent Transport Management System

Depot Management System (DMS)

Bus Allocation on schedule

Window for Available bus details

Window for available drivers
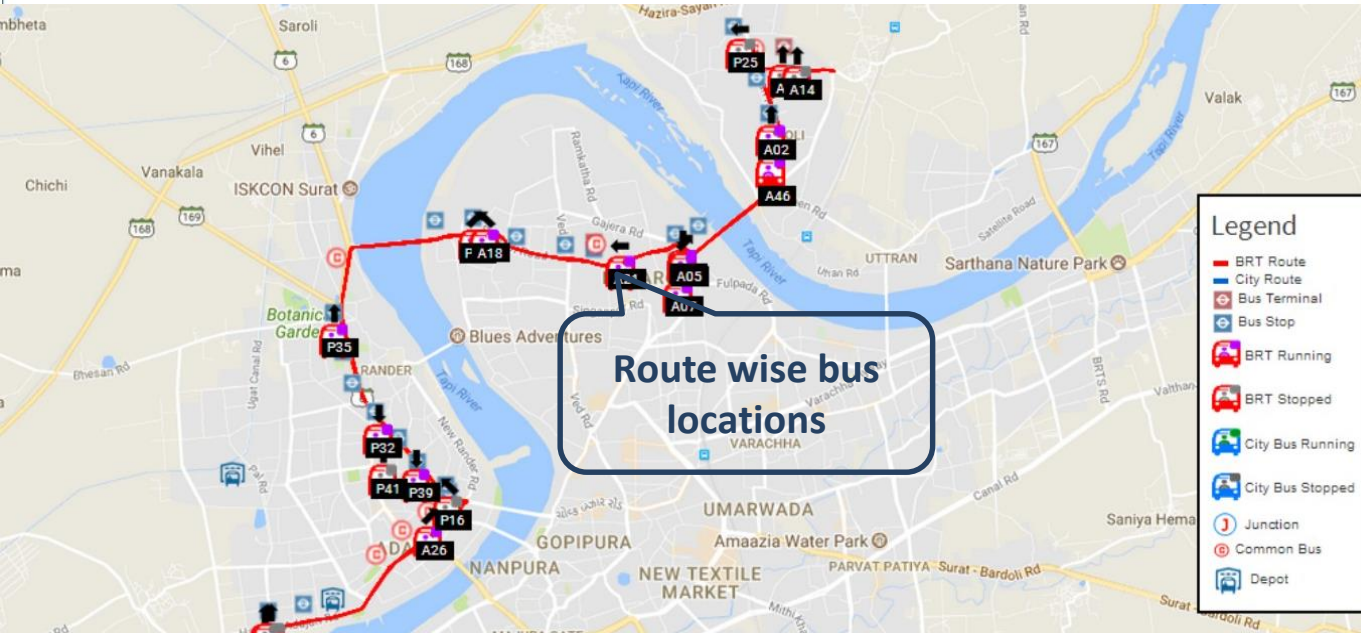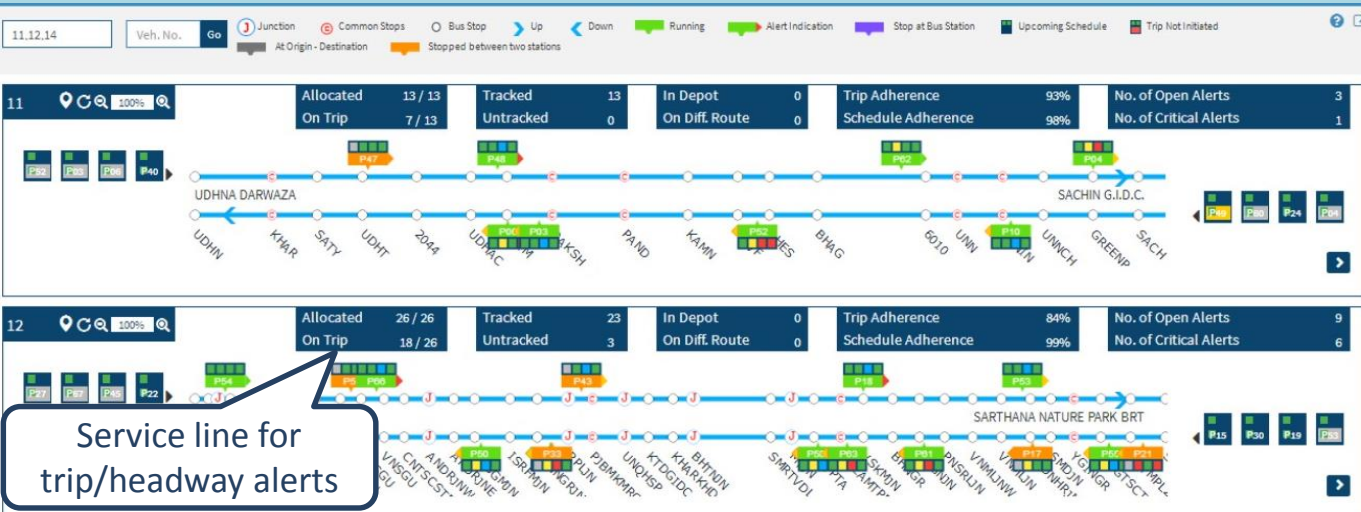
Characteristics:

- Human Resource Management
- Store Inventory
- Workshop Module
- Vehicle & Crew Allocation

Key Benefits:

- Reduced human involvement in allocation process – *Digitization of depots*
- *Single format* across all the operators for all Depot related activity
- *Database for allocation* – Bus, Driver, ETM & Conductor
- With inputs from AVLS data, Sitilink can *terminate or black list driver*
- *Driver Performance Assessment* program can be started with available data from DMS

Automatic Vehicle Location System (AVLS)

Service line for trip/headway alerts

Route wise bus locations

Characteristics:

- Vehicle tracking at every 3 sec in BRTS & 6 sec in CBS.
- Passenger Information System (PIS) & Passenger Announcement System (PAS)
- Two way communication with driver
- Alert management w.r.t. operational & real time issues

Key Benefits:

- *Real time monitoring* of public transport
- With inputs from AVLS, Sitilink started *system generated operator billing* after reconciliation
- *Availability of database* which can directly use for several Transit Performance Indicators
- *Panic message* to control center through BDC
- *Real time information* to users through PIS & PAS

Intelligent Transport Management System

Incident Management System (IMS)

Vehicle Incident Management System

Dispatch of Emergency Vehicle

Characteristics:

- capability to manage any incident from control center
- provide quickest route to reach location of incident location and provides location of nearby emergency service.

Key Benefits:

- Different *department work close* to resolve incident
- Provides *quick response & service* during critical duration of incident

Intelligent Transport Management System

Enterprise Management System (EMS)

Station PIS Server Up time

SETTINGS ▾

Custom Table for **Datasource 1** from **Today (Sep 27, 2017)**

NAME	NODE NAME	IP	TIMESTAMP	PERCENT AVAILABILITY	PERCENT LOSS	STATUS
BUSSTATION SERVER	Aai_Mata_Chowk_Idea	100.91.0.98	221	99.5475113122172	20 %	🔴 Up
BUSSTATION SERVER	Aaspas_Dada_Temple_	100.91.0.72	221	100	0 %	🟢 Up
BUSSTATION SERVER	APMC_Sardar_Market_	100.91.0.97	221	100	0 %	🟢 Up
BUSSTATION SERVER	Bapa_Sitaram_Chowk_	100.91.0.20	221	100	0 %	🟢 Up
BUSSTATION SERVER	Baroda_Pristage_Idea	100.91.0.106	221	99.0950226244344	0 %	🟢 Up
BUSSTATION SERVER	Bhagwati_Industrial_Es	100.91.0.37	221	66.5158371040724	0 %	🟢 Up
BUSSTATION SERVER	Bhaiya_Nagar_Idea	100.91.0.62	221	12.6696832579186	0 %	🟢 Up
BUSSTATION SERVER	Bhakti_Dham_Idea	100.91.0.101	221	94.1176470588235	30 %	🟢 Up

Website up time

6 ▾   ADMIN (LOGOUT)   ❓ HELP

lt ⭘ Play entire transaction now

Up

Municipal Corporation (SMC) Public Transport

/10.70.70.112/

: Web Site 1.2

ion Server (Location OK)

5 minutes

2017 4:32:27 PM

inutes 39 seconds

2/

d Routes'

::::::   EDIT HELP

Surat Municipal Corporation (SMC) Public Transport

Sep 26 2017, 4:30 pm - Sep 27 2017, 4:30 pm

Zoom 1h 12h 24h

AVAILABILITY

80 %

60 %

40 %

20 %

0 %
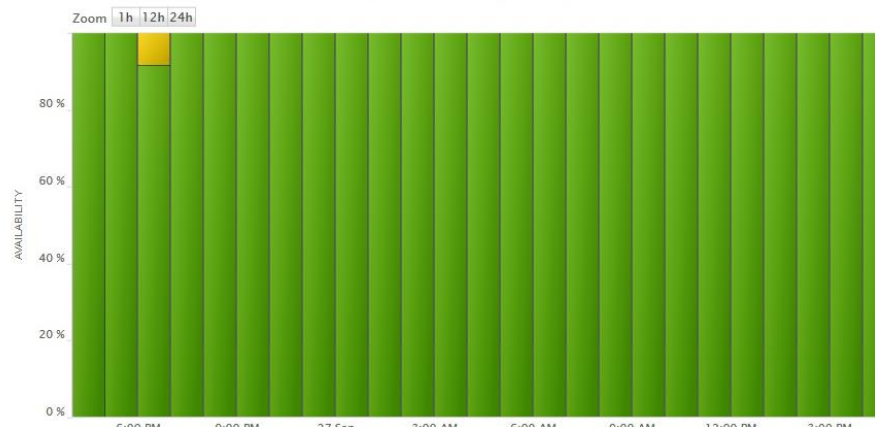
Characteristics:

- Monitors assets owned by Sitilink
- Provide working status of all equipment such as GPS, BDC, station server, etc

Key Benefits:

- Sitilink is *able to monitor all the equipment* from control center

Intelligent Transport Management System

Passenger Information System (PIS)

BUS PIS

- Bus front and Rear PIS show the Route Number, Origin & Destination and Via Stops

- Next Bus stop, various public awareness messages and route diversion details, New Route Details, Complaint Number, etc.

BRTS STATION PIS

- Route wise ETA is displayed through Station PIS on all BRTS Station
- Poster for New Route, Diverted Route, Event, Public Awareness Message
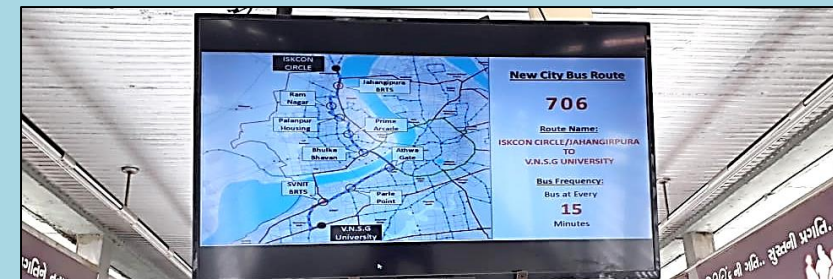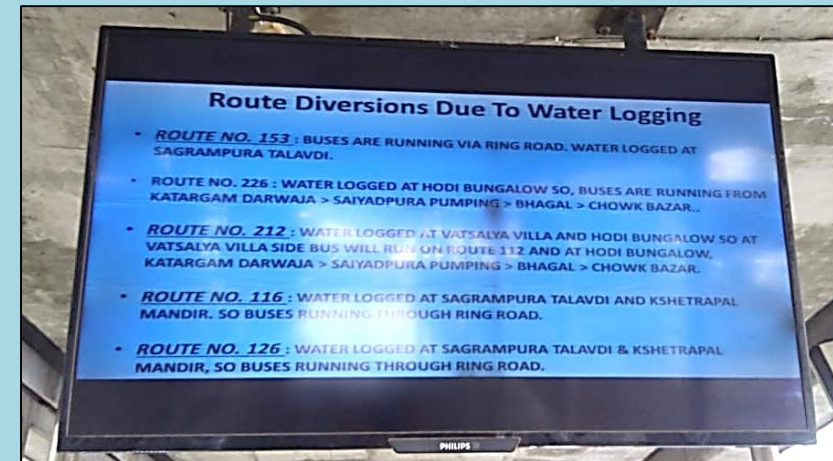
Automatic Fare Collection System

AUTOMATIC FARE COLLECTION SYSTEM

ETM

TURNSTILE WITH FGV

MOBILE TICKETING

POLE VALIDATOR

POS

Automatic Fare Collection System (AFCS) project aims to automate the fare collection mechanism and technology within Surat's transport ecosystem (BRTS & City Bus Services) and enhance operational capability, citizen's satisfaction, reliability and ease of operations for its services offered through various transits.

Automatic Fare Collection System

Scope & Coverage

| ETM's HTT 1430 | → | POS 206 | → | Pole Validator 1300 | → | Turnstiles 414 | → | Fare Gate Validator 414 |

AUTOMATIC FARE COLLECTION SYSTEM

| Swing Gate 195 | → | UPS 195 | → | Station Server 195 | → | Mobile Application 1 | → | AFCS Software 1 |

153 BRTS Station   **166 BRTS Buses**   **575 City Buses**

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Automatic Fare Collection System

Flow Diagram
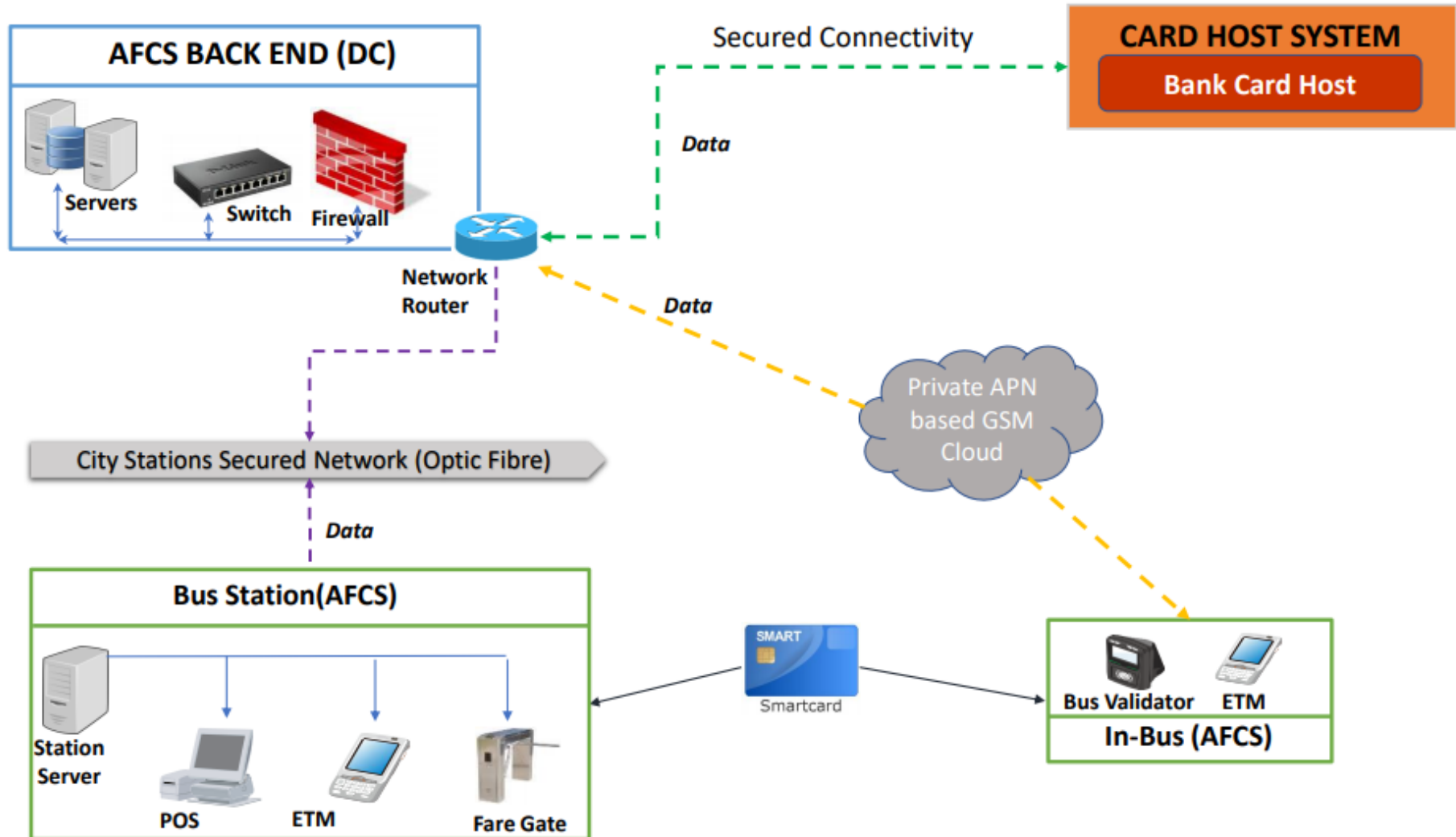
Automatic Fare Collection System

Components

BRTS Station ETM with POS

Turnstile with Fare gate Validator

City Bus Pole Validator

Surat Money Card

Automatic Fare Collection System

Dashboard Data
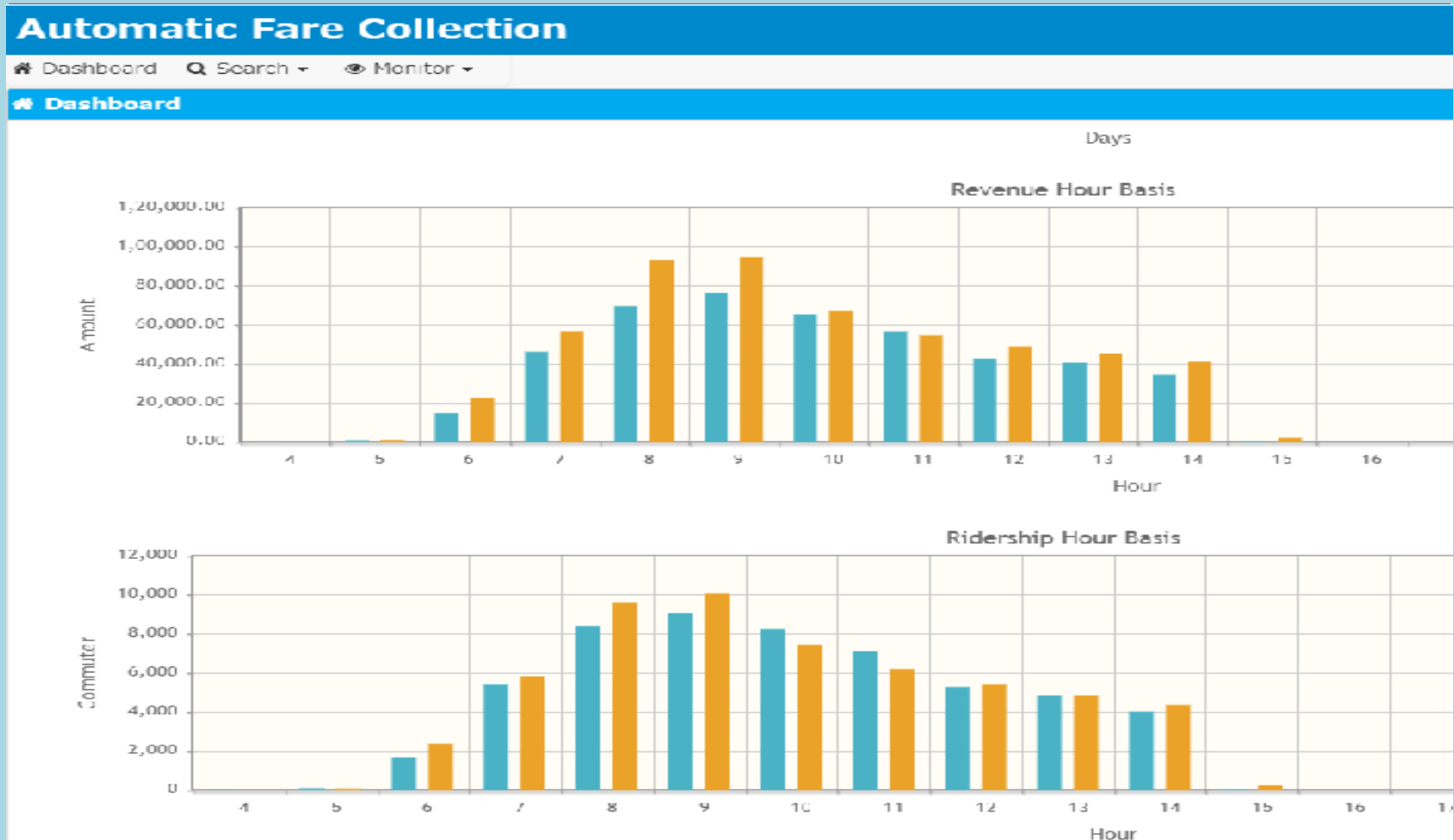
Hour basis Ridership and Revenue

Automatic Fare Collection System

Mobile Application and M - Ticketing
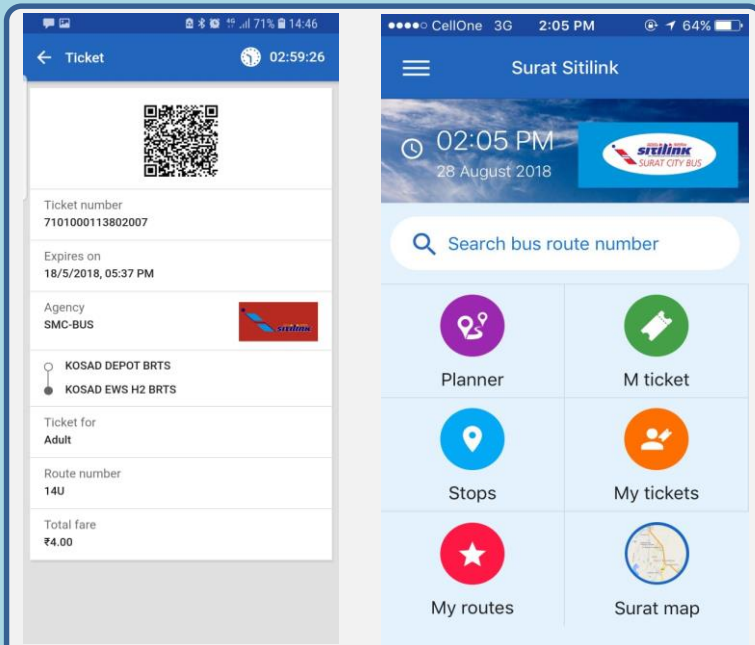
Sitilink mobile application offers citizen **to plan their journey in an efficient way**. Surat Sitilink application provides multiple options listed as below:

Journey Planners , M-ticketing, Route and Stops Information, Route Map
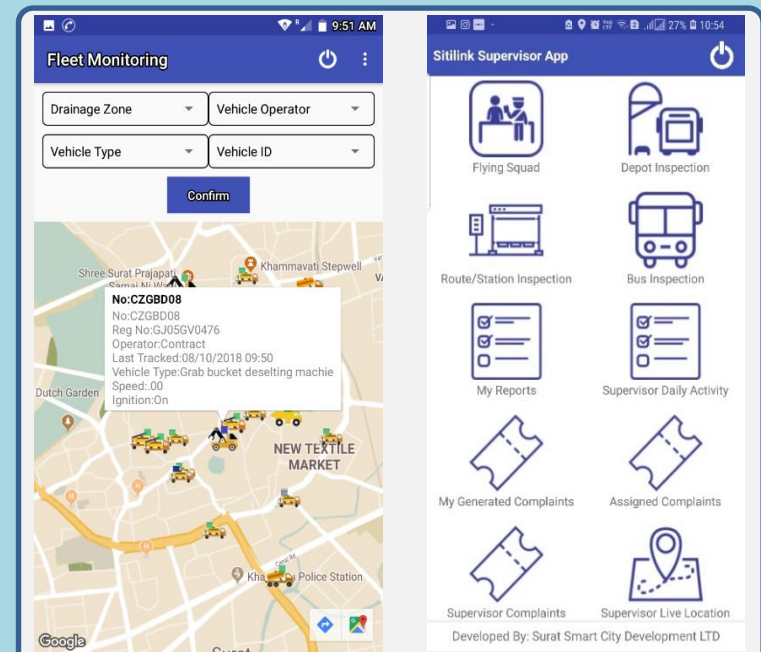
SMC **Department vehicle application** is developed for the real time vehicle tracking and reporting. Also used for the operator billing based on AVLS Data.

Sitilink Supervisor application is developed for Sitilink operations.

Intelligent Traffic Control System

Objectives

- Improve Journey Time Reliability
- Safety Improvement & real time information
- Accident Reduction
- Traffic Enforcement & Increased Traffic Signal Efficiency
- Increase Operational Efficiency
- Reduction in Traffic Congestion & Pollution Control
- Public Awareness
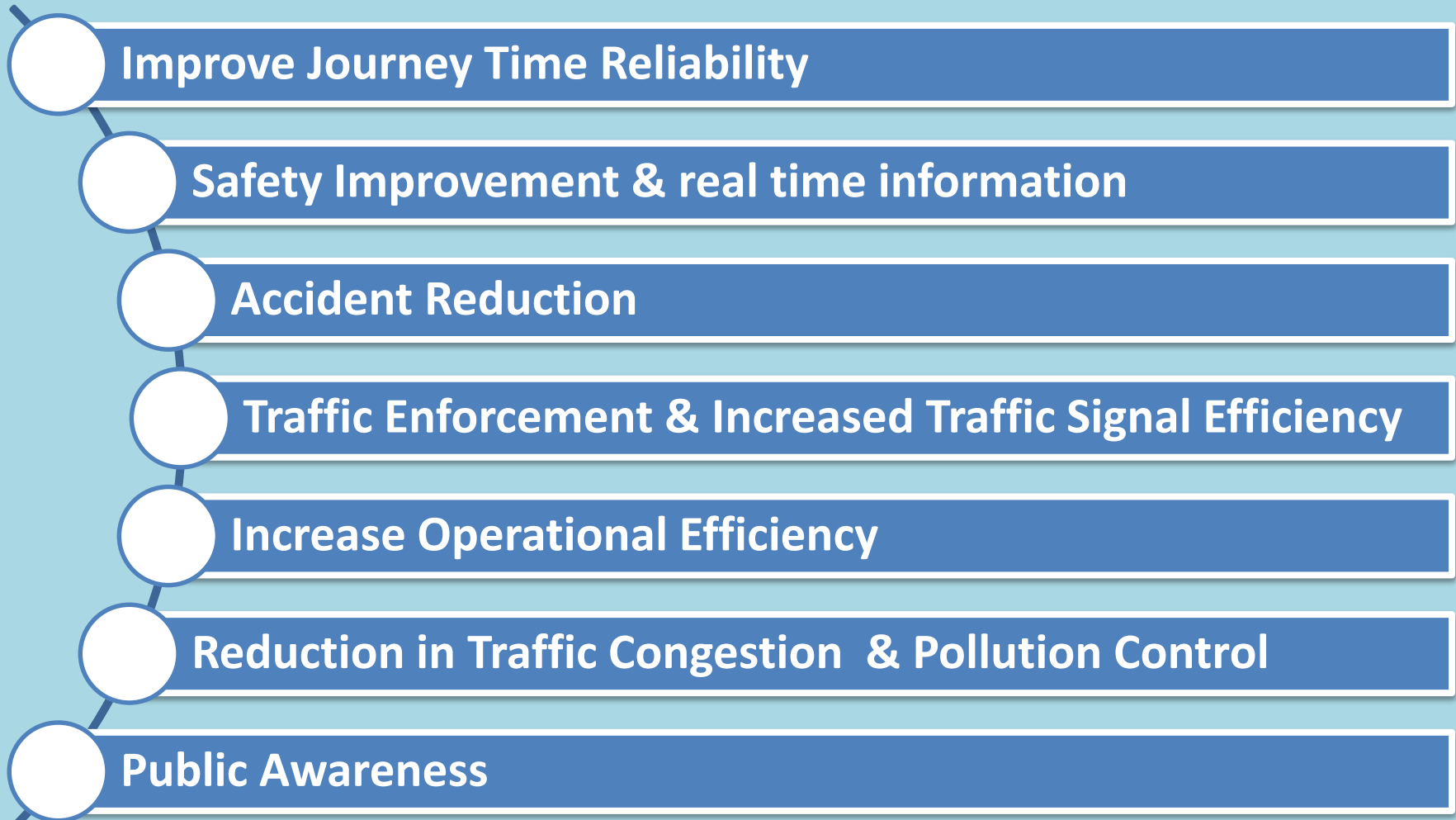
Intelligent Traffic Control System

Scope

Traffic Junction Component

- Adaptive Traffic Controller
- Vehicle Detector
- Pedestrian and BRTS Signals
- Zebra Crossing and Stop Lane Marking

Traffic Enforcement and Surveillance

- Red Light Violation detection system
- Speed violation detection system
- Traffic Violation cameras and E challan devices
- Traffic surveillance and ANPR

Information Dissemination

- Speed control sign board and VMS system
- ECB system
- Mobile application and traffic portal
- Traffic control centre

Intelligent Traffic Control System

Coverage

#	Particular	Junction/Location/Number	Geographical Coverage
1	Adaptive Traffic Control System (ATCS)	Junctions	267
2	Red Light Violation Detection (RLVD) Systems	Junctions	25
3	Automatic Number Plate Recognition (ANPR) System	Junctions	17
4	Speed Violation Detection (SVD) System	Locations	15
5	Traffic Violation Cameras (Illegal Parking & Wrong side Detection System	Locations	31
6	Traffic Surveillance System	Locations	55
7	Variable Message Signboards (VMS) System	Locations	20
8	Speed Control Signboard (SCS) System	Locations	15
9	Emergency Call Box (ECB) System	Locations	20
10	Zebra and stop line marking	Junctions	267
11	E-Challan Hand Held Device	Number	125
12	Traffic Command Center	Location	1

Application of ITS Tools

Bus Station analysis (Peak - off Peak Load)

↓

- OD Analysis, Passenger Transfer Analysis

↓

- Route wise and Bus wise Conductor analysis to improve the revenue collection

↓

- Driver Analysis to improve the reliability

Accident and Breakdown analysis

(Operator wise)

↓

- **Schedule Optimization**
  - (Route direction wise and peak hour wise)

↓

- **Trip and Schedule Adherence Analysis** (Route and Operator wise)

↓

- **Operator wise and Bus wise Schedule and Actual Arrival/Departure**

Route Performance Analysis

(Route wise - Ridership, Revenue, vehicle utilization, dead kilometer, revenue kilometer)

↓

- **Interchange Station & Infrastructure requirement**

↓

- **Guiding Emergency Vehicle** (Ambulance and Fire Fighter) for Short and Less traffic route to reach incident point/hospital.

ITS Integration for PT/SMC Services

- **Integrated Fare**
  - (Single ticket to travel in BRTS, City Bus and HMC)

- **Integrated Schedules**
  - (schedules prepared considering integrated corridors for BRTS, City bus and HMC)

- **Passenger Information System**
  - In Bus and Station: Passenger information such as next stop indicator, Bus estimated time of arrival.

- **Passenger Announcement System (PAS)**
  - (in Bus)

- **General Transit Feed Specification**
  - (GTFS – Integration with Google)

- **SMC Department Vehicle and Emergency vehicles integration**

ITS Project Benefits

CITIZEN

Faster Ticket Issuance:

- Shorten payment time for QR ticket.
- No need to prepare change for Surat Money Card
- Passengers don't need to calculate the fare
- Mobile Ticketing
- Increased reliability and User satisfaction
- Boarding & alighting complete with one tap for Surat Money Card simple & speedy for everyone (barrier free)

SOCIETY

Shift from private vehicle to public transportation:

- Reduce traffic congestion
- Ease air pollution
- Provide more business opportunities to the
- Area around public transportation
- Surat money card :
- Contribute to environment by reduce paper tickets for AFCS system

IMPROVED OPERATIONS

Automatization of fare calculation/collection:

- Accurate and strict fare collection
- ⑩Reduce manual fare collection.
- ⑩Improve on-time operation by shortening passenger boarding & alighting times
- ⑩Lower equipment & operation cost by reducing cash handling
- ⑩Single established system across the operators
- ⑩Transit violations monitoring

SMC/SSCDL

Data Driven Decision Making

- Passenger/origin- destination/sales assisting in better
- Bus services and Frequency planning including last mile connectivity.
- Reduction in personal vehicles with better utilization of Public transport infrastructure
- Aid multi-modal integration

Unique Features

6. Helpline Number for Complain Management (18002330233) throughout operational hours

For Complaints related to BRTS and City bus, feel free to call on Sitilink toll free number
18002330233

Towards Vision Achievement

Surat has increased their ITMS scope by spending more amount in the project to avail maximum benefit

Integrated the Public Transport system, SMC department vehicles and emergency services using ITMS and AFCS system

Increase in Travel Time reliability and Reduction in Congestion through ITCS. Increase the efficiency and utilization of services.

By using Intelligent Transportation System (ITS), Surat Municipal Corporation is aiming towards achieving their Vision and Goal "SARAL" mobility for Surat City.

Safe & Sustainable

Advanced

Reliable

Accessible

Low Carbon

THANK YOU

Visit Surat to Experience World Class Public Transportation System

Email: dmc.rjp@suratmunicipal.org