# Smart City , Smart Transportation & IoT

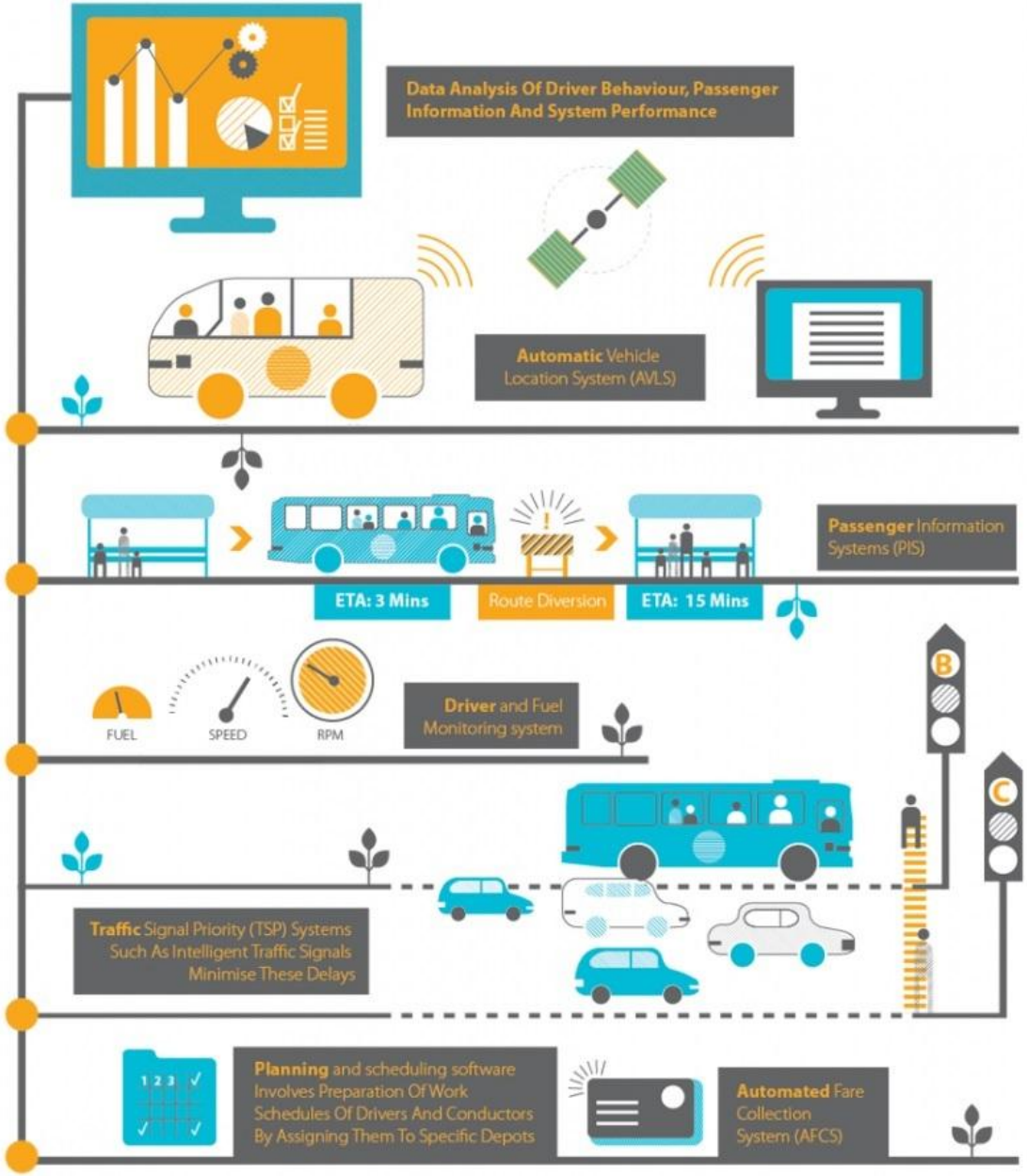
- Tariq Mustafa
  Head - Data Analytics (DIMTS)

*We help people move*

**Joint Venture of Govt. of NCT of Delhi and IDFC Foundation**

**An ISO 9001, 14001, OHSAS 18001,ISO 27001 & CMMI L3 Certified Company**

# Intelligent Traffic Systems (ITS) & Applications for City Bus Operations



# IoT in Public Transit – Typical Use Cases

- **Enhanced Passenger Experiences**
  - **Real Time Vehicle Tracking & ETA Information**
  - **Seat Availability**
  - Personalized Travel Information
  - Alert for Unexpected Events: Manage Disrupted Schedules
  - Passenger Safety and Security
- **Improved Vehicle Performance/efficiency**
  - **Real time detection of wear & tear and proactive maintenance**
- **Ensure environmental responsibility**
  - **Green initiatives and reducing carbon footprint**
- **Dynamic Route Planning**
- **Route Optimization**

# Challenges in Deployment of Intelligent Traffic Systems (ITS)

- limited market share of applications for public transport
- complexity involved in urban bus operations
- budgetary limitations of operating agencies in this segment
- limited functional and technical specifications to guide the development of ITS in this field; and
- the need for knowledge and experience among agencies
- Inadequate understanding about the implications of procuring a certain technology in a fast-changing ecosystem
- awarding of its contracts purely based on the lowest costing proposals rather through a quality and cost-based criteria

# IT Solutions Portfolio

## Automatic Vehicle Location

- Vehicle tracking & Fleet Management -> Public transport, Railway wagons, Cabs, Trucks
- Passenger Information Displays -> Kiosk, BQS
- Intelligent Routing -> Traffic information & Congestion Modelling

## Mobile Applications

- NextBus Delhi App -> For expected time of arrival of the bus, seat availability
- Poochh-O -> For Travel convenience
- Telltaill -> Citizens Safety

## Automatic Fare Collection

- ETMs (Electronic Ticketing Machines) ->Parking payments using Credit/Debit Cards
- Smart Card based Ticketing and Pass -> Fare Collection Modules
- Mobile based Ticketing (NFC, RFID)

## Identity Management

- Smart Card Based
  - Driving License
  - Registration Certificates
  - Permits – state and national level for various entities
  - PSV Badge

# Real-time Data and Volumes Handled

**Unique IP of Developing and managing AVLS**

- Single Device Agnostic Platform

**Centralized Monitoring (Common Control Center)**

- 24x7 Real time tracking
- 100k + Vehicles @ Frequency 10 Sec

**Huge Backend capabilities**

- More than 100 GB
- More than 150 Million Locations Update
- **Processed…..Everyday**

**Leading contributor to GPS Standardization and evaluation parameters**

- GPS Standards and evaluation parameters
- More than 30 GPS Models Integrated
- Empanelment Process ongoing

# Operations Control Centre (OCC)

DIMTS has set-up a state-of-the-art **Operations Control Centre** for efficient management of traffic flow. It will be the kernel for real-time operation of traffic through Intelligent Signaling System, operation of stage carriage buses, the Automatic Vehicle Location System and more.

# DIMTS in Nos.

- 100,000+ connected vehicles , sending data feed every 10 secs
- 3,00,000+ Kms/day, Bus routes
- 50,00,000+ Kms/day, Paratransit
- 50,00,000+ Kms/day ,PSV
- 40,000+ Kms/day, Tankers
- 800,000+ passengers /day

40,00,000 Smart Card License

12,00,000 Vehicle Registration

# Snapshot: AVL Programs

## AVL System for Buses

- GPS program in Public / Private Operated Bus fleet across the state of New Delhi.
- Route / Speed Tracking
- Duty Management / Driver performance monitoring.

## AVL System for Public Service Vehicles

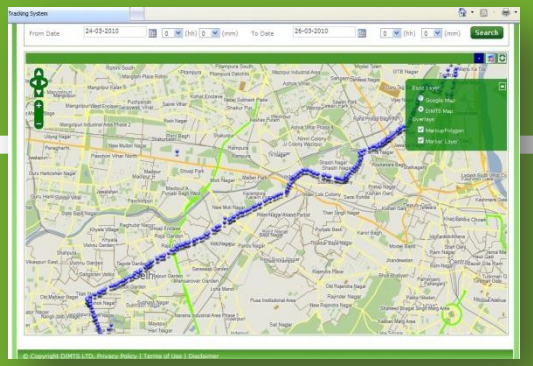
- GPS Implementation for the entire PSV segment of NCT of Delhi.
- One Platform for all non metered public service vehicles across the NCT of Delhi.
- Chartered Buses/ School Buses .
- Gramin Sewa / RTV/ Maxi Cab/ Mega Cab

## AVL System for Paratransit

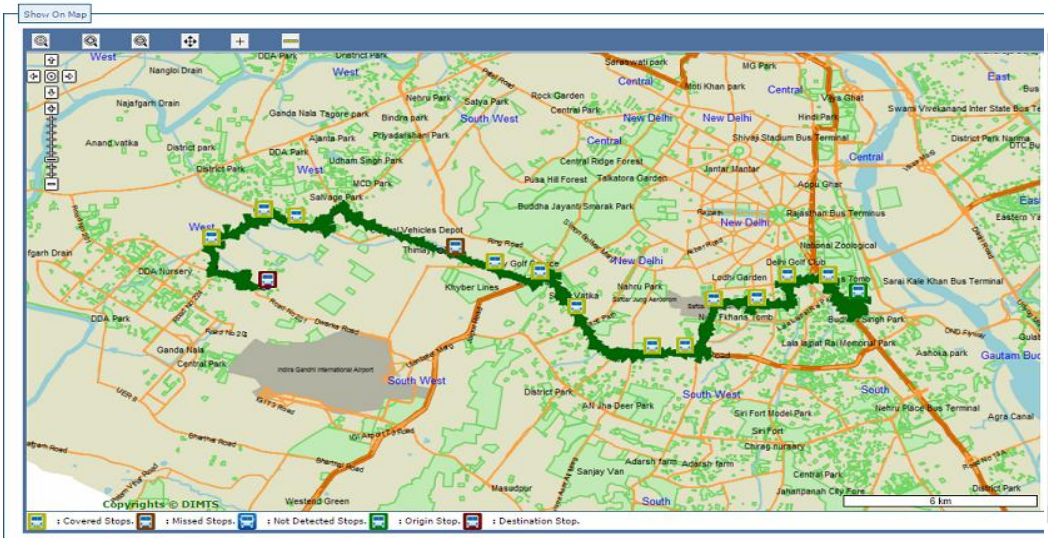
- Large Paratransit GPS Implementation.
- Centralized Control Center – 75K Vehicles
- Users – Transport, Enforcement, Auto owners, Police etc.

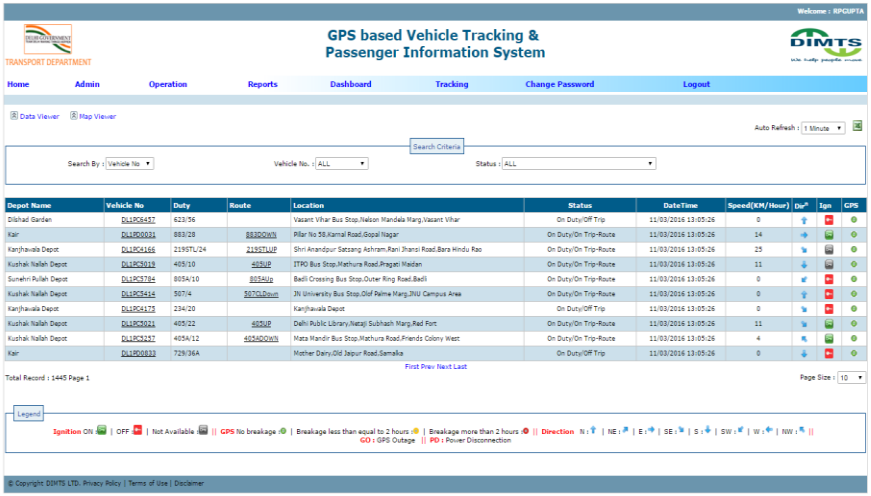
## Water Tanker Distribution Management System

- Vehicle Tracking
- Water Distribution Monitoring
- Smart Card Based Hydrant Automation



# Fleet Management Systems: AVLS → Cluster




GPS based **Automatic Vehicle Location (AVL) System** has been deployed on all the buses. System is being used to monitor operations of the fleet

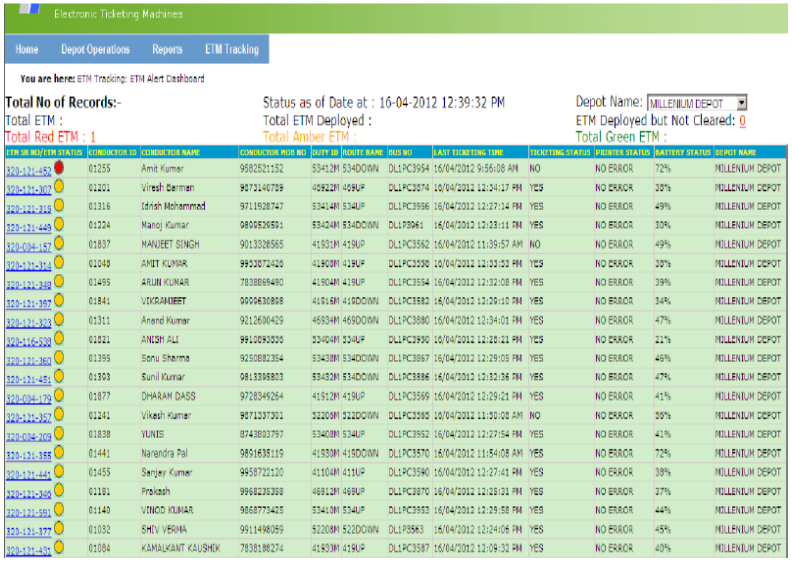
Alerts Dashboard manages alerts and responds to deviation/violations

- Over-speeding reports
- Depot, vehicle and route wise reports
- Missed stops reports
- Route deviation reports
- Trip status reports (Cut/Short/Missed)
- Distance travelled

# Automatic Fare Collection Systems: ETM

**We have deployed New Generation Electronic Ticketing Machines (ETMs)**

- Real Time data transfer through GPRS
- Smart Card Enabled
- Over the air configuration & update of master data, configuration data and application
- Total Transactions generated in a day:
  - 9,00,000 tickets
  - 13000 trips
  - 2500 shifts




| ETM ID/ BUS/TIM STATUS | CONDUCTOR ID | CONDUCTOR NAME | CONDUCTOR MOB NO | DUTY ID | ROUTE NAME | BUS NO | LAST TICKETING TIME | TICKETING STATUS | PRINTER STATUS | BATTERY STATUS | DEPOT NAME |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 320-121-452 | 01255 | Amit Kumar | 9582521152 | 53412M 534DOWN | 534DOWN | DL1PC3954 | 16/04/2012 9:56:08 AM | NO | NO ERROR | 72% | MILLENIUM DEPOT |
| 320-121-307 | 01201 | Viresh Barman | 9873140709 | 46922M 469UP | 469UP | DL1PC3874 | 16/04/2012 12:34:17 PM | YES | NO ERROR | 38% | MILLENIUM DEPOT |
| 320-121-318 | 01316 | Idrish Mohammad | 9711928747 | 53414M 534UP | 534UP | DL1PC3956 | 16/04/2012 12:27:14 PM | YES | NO ERROR | 49% | MILLENIUM DEPOT |
| 320-121-449 | 01224 | Manoj Kumar | 9899526591 | 53424M 534DOWN | 534DOWN | DL1P3961 | 16/04/2012 12:23:11 PM | YES | NO ERROR | 39% | MILLENIUM DEPOT |
| 320-094-157 | 01837 | MANJEET SINGH | 9013328565 | 41501M 419UP | 419UP | DL1PC3562 | 16/04/2012 11:39:57 AM | NO | NO ERROR | 49% | MILLENIUM DEPOT |
| 320-121-314 | 01049 | AMIT KUMAR | 9953072426 | 41909M 419UP | 419UP | DL1PC3506 | 16/04/2012 12:33:03 PM | YES | NO ERROR | 38% | MILLENIUM DEPOT |
| 320-121-388 | 01495 | ARUN KUMAR | 7838866490 | 41904M 419UP | 419UP | DL1PC3554 | 16/04/2012 12:32:08 PM | YES | NO ERROR | 39% | MILLENIUM DEPOT |
| 320-121-367 | 01841 | VIKRAMJEET | 9000630898 | 41916M 419DOWN | 419DOWN | DL1PC3582 | 16/04/2012 12:29:10 PM | YES | NO ERROR | 34% | MILLENIUM DEPOT |
| 320-121-323 | 01311 | Anand Kumar | 9212630429 | 46934M 469DOWN | 469DOWN | DL1PC3880 | 16/04/2012 12:34:01 PM | YES | NO ERROR | 47% | MILLENIUM DEPOT |
| 320-116-538 | 01021 | ANISH ALI | 9910693036 | 53404M 534UP | 534UP | DL1PC3990 | 16/04/2012 12:28:21 PM | YES | NO ERROR | 21% | MILLENIUM DEPOT |
| 320-121-360 | 01395 | Sonu Sharma | 9250882354 | 53438M 534DOWN | 534DOWN | DL1PC3867 | 16/04/2012 12:29:05 PM | YES | NO ERROR | 46% | MILLENIUM DEPOT |
| 320-121-451 | 01303 | Sunil Kumar | 9813396803 | 53430M 534DOWN | 534DOWN | DL1PC3886 | 16/04/2012 12:32:36 PM | YES | NO ERROR | 47% | MILLENIUM DEPOT |
| 320-094-179 | 01877 | DHARAM DASS | 9728346264 | 41912M 419UP | 419UP | DL1PC3569 | 16/04/2012 12:29:21 PM | YES | NO ERROR | 41% | MILLENIUM DEPOT |
| 320-121-357 | 01241 | Vikash Kumar | 9971337301 | 52209M 522DOWN | 522DOWN | DL1PC3565 | 16/04/2012 11:50:08 AM | NO | NO ERROR | 39% | MILLENIUM DEPOT |
| 320-094-209 | 01838 | YUNIS | 8743803797 | 53408M 534UP | 534UP | DL1PC3952 | 16/04/2012 12:27:54 PM | YES | NO ERROR | 41% | MILLENIUM DEPOT |
| 320-121-355 | 01441 | Narendra Pal | 9891635119 | 41530M 415DOWN | 415DOWN | DL1PC3570 | 16/04/2012 11:54:08 AM | YES | NO ERROR | 72% | MILLENIUM DEPOT |
| 320-121-441 | 01455 | Sanjay Kumar | 9958722120 | 41104M 411UP | 411UP | DL1PC3590 | 16/04/2012 12:27:41 PM | YES | NO ERROR | 38% | MILLENIUM DEPOT |
| 320-121-369 | 01181 | Prakash | 9968235369 | 46912M 469UP | 469UP | DL1PC3870 | 16/04/2012 12:29:21 PM | YES | NO ERROR | 37% | MILLENIUM DEPOT |
| 320-121-361 | 01140 | VINOD KUMAR | 9868773425 | 53410M 534UP | 534UP | DL1PC3563 | 16/04/2012 12:29:58 PM | YES | NO ERROR | 44% | MILLENIUM DEPOT |
| 320-131-377 | 01032 | SHIV VERMA | 9911498069 | 52208M 522DOWN | 522DOWN | DL1P3563 | 16/04/2012 12:24:06 PM | YES | NO ERROR | 45% | MILLENIUM DEPOT |
| 320-121-431 | 01084 | KAMALKANT KAUSHIK | 7838198274 | 41930M 419UP | 419UP | DL1PC3587 | 16/04/2012 12:09:32 PM | YES | NO ERROR | 40% | MILLENIUM DEPOT |

Pre-printed ticket

Ticket through ETM

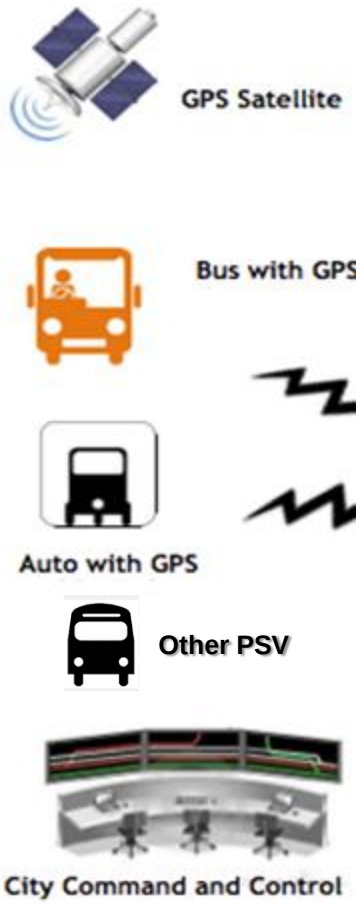
**DELHI TRANSIT**

**TOTAL: Rs.15**

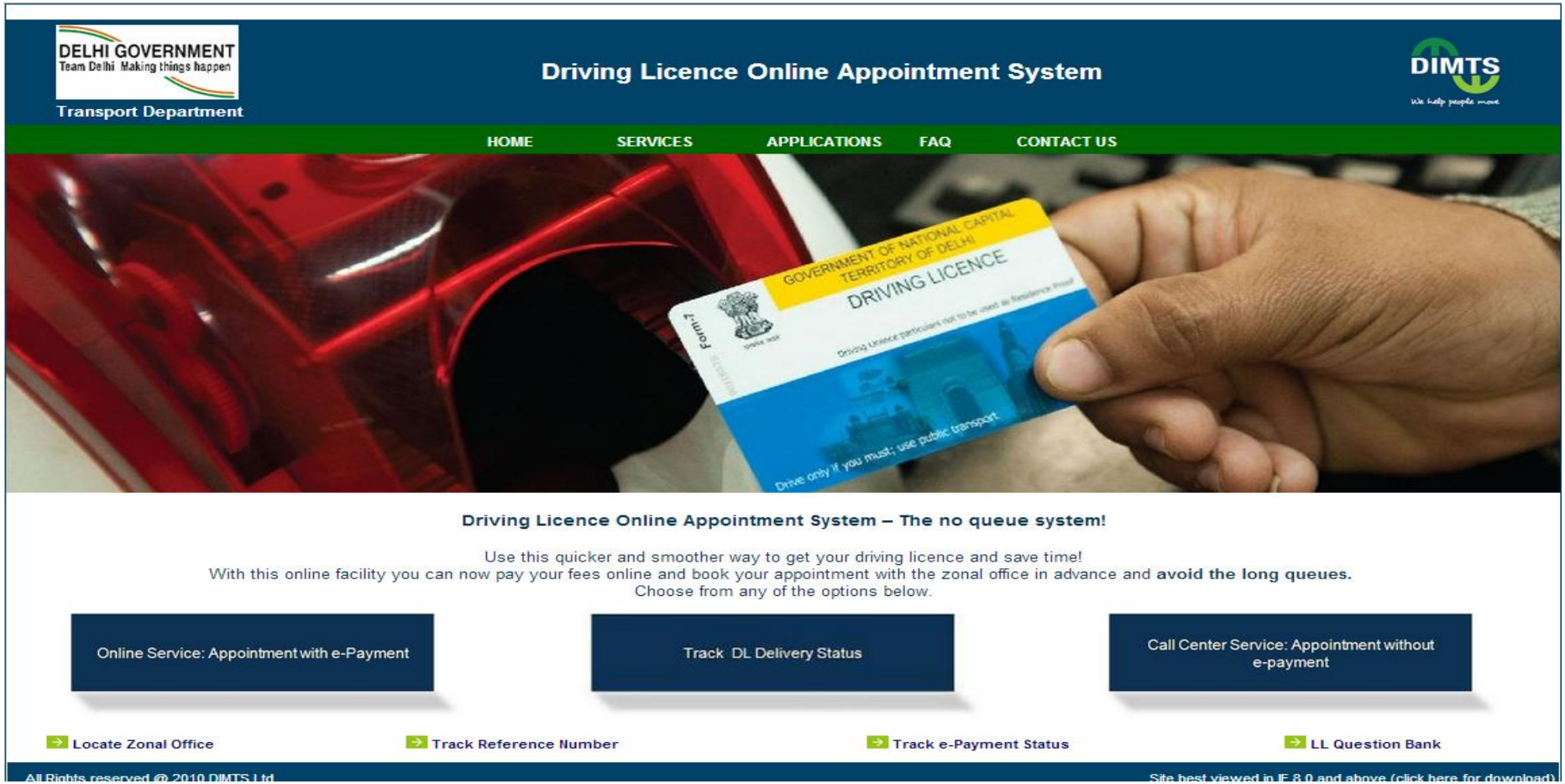
DL1PB9761 02/07/2011 12:22
No. T943881101111213011-0004
Route Number :**411UP**
**Mori Gate Trml. - > DDA Flat Kalkaji**
Adult : 1 x 15=Rs 15

## Worlds Largest GPS Implementation in Passenger Vehicles

- Paratransit Vehicles:
  - Centralized Control Center equipped for 1 Lac TSR and Taxis
  - Electronic Fare meter device integrated with GPS/GPRS and Printer with panic button and tempering alerts. Option for printed fare receipts.
  - Total EFM devices empaneled : 16
  - Backend integration already done for 75000+ TSRs and 20000+ Taxis and ongoing
  - Users – Transport, Enforcement, Auto drivers, & Police
- Public Service Vehicles:
  - One Platform for all non-metered public service vehicles across the NCT of DelhiRural Vehicles (Gramin Sewa and RTV), Chartered Buses, School Buses, Other Cabs viz. Maxi Cabs, Mega Cabs, Phat Phat Sewa etc.
  - Stand Alone GPS Device.
  - Total GPS device empaneled: 24
  - Backend integration already done for 20000+ and ongoing



# Driving Licence Online Appointment System

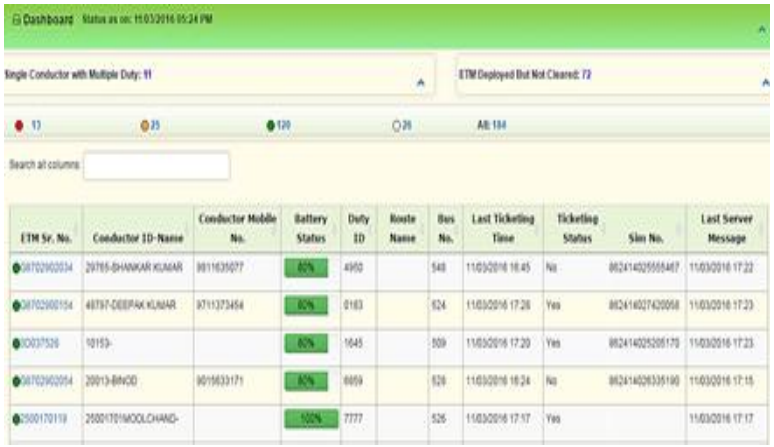


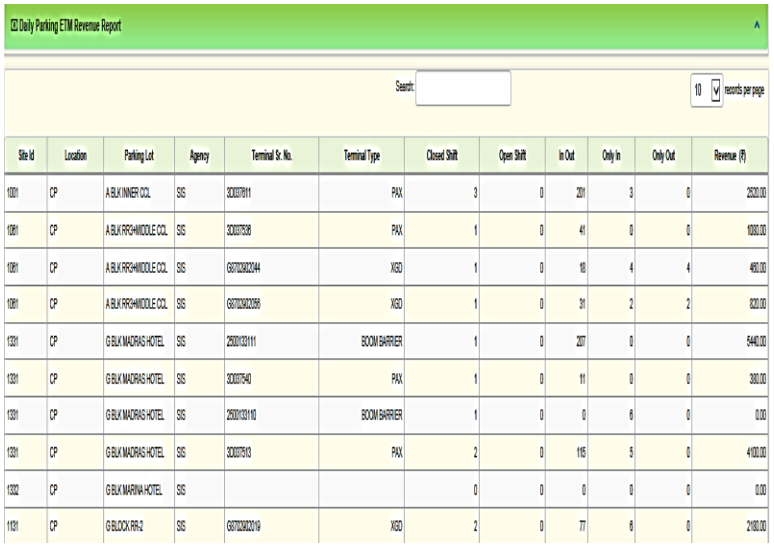

**Smart Card Driving Licenses = 40,00,000 + issued till date**

**Registration Certificates = 12,00,000 + issued till date**

# IT enabled Parking – Central Delhi

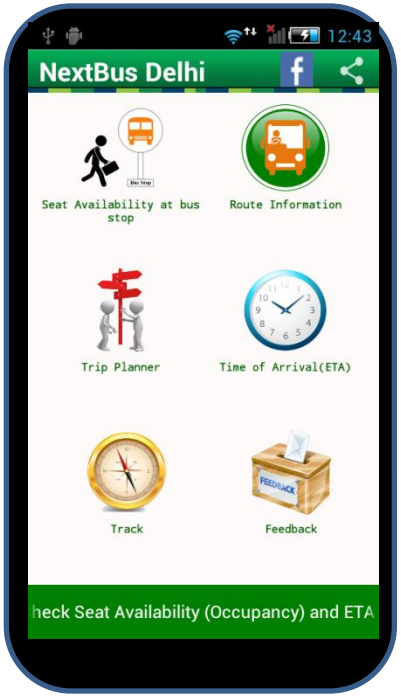
- 90+ sites, 220+ ETMs, 35 BB, Average 14K tickets/day
- Electronic Ticketing
  - ETM based e-Ticketing
  - Boom Barrier based e-Ticketing
  - Barcode Based e-Ticketing
- Field devices send the tickets' information and alerts OTA to a back-end processing system in real-time
- Field Devices can be used in offline as well as online mode.
- Backend server provides the following services:
  - Validation, Segregation and Archival of the incoming transactional messages
  - ETM Device Inventory Management
  - Handling the Pass / Exempt Vehicles
  - Provides following Online, real-time Reports
    - Device health Dashboard
    - Daily Parking Revenue Summary Report
    - Detailed Transaction Report
    - Site-wise, Shift-wise Summary Reports
    - Capacity Summary Report
  - Provides following scheduled auto-emailer reports
    - Hourly, Daily, Monthly Parking Revenue
    - Hourly device health



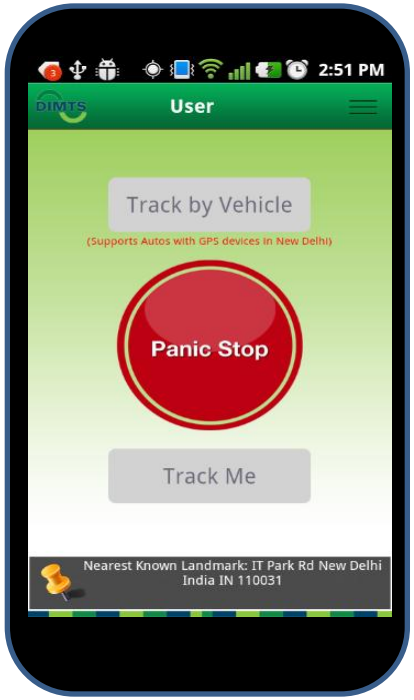
# Mobile Applications- NextBus, Poocho & TellTail

NextBus Delhi App




- NextBus Features:
  - Seat Availability
  - Estimated Time of Arrival
  - Real Time Bus Location
  - Trip Planner

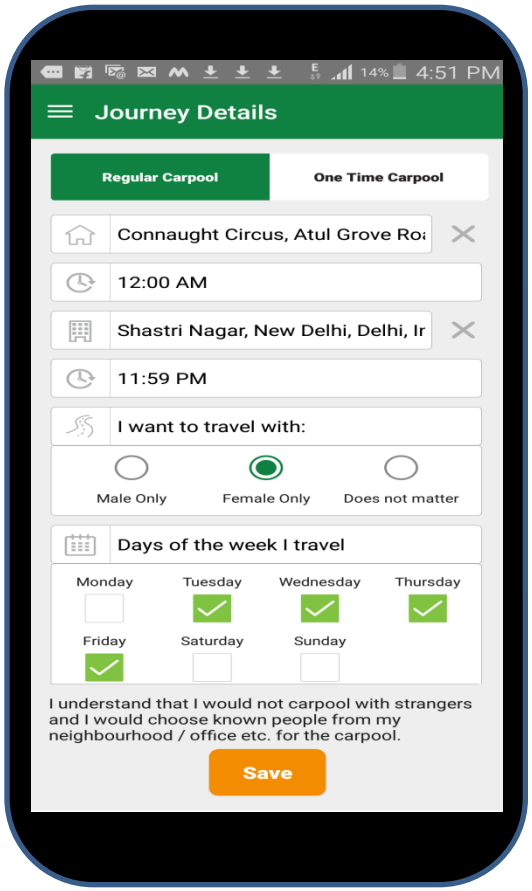
- One Transit App for Delhi
  - Auto/Taxi
  - NextBus
  - Car Pool
  - Parking
  - Traffic




- A security application that allows the user to track herself and alert family in case of emergency

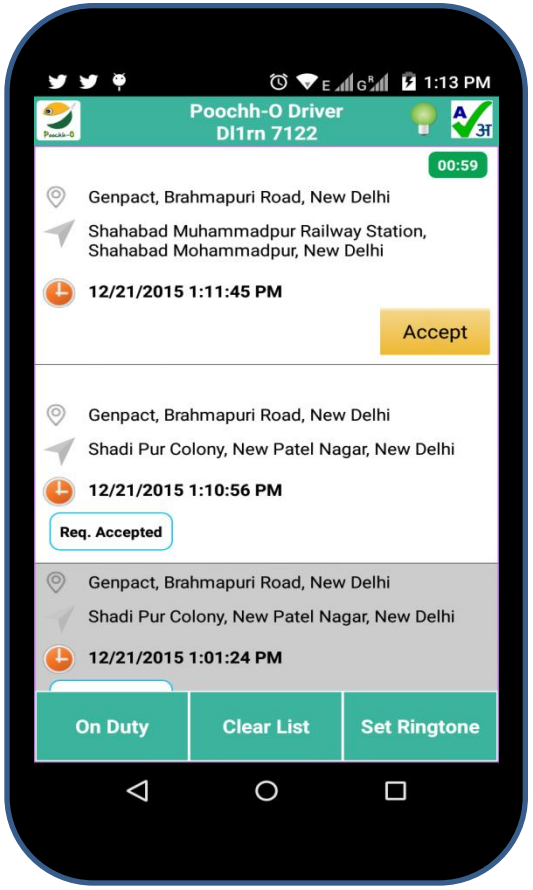
# Mobile Applications- Carpool, Driver app

Poochh-O Car pool



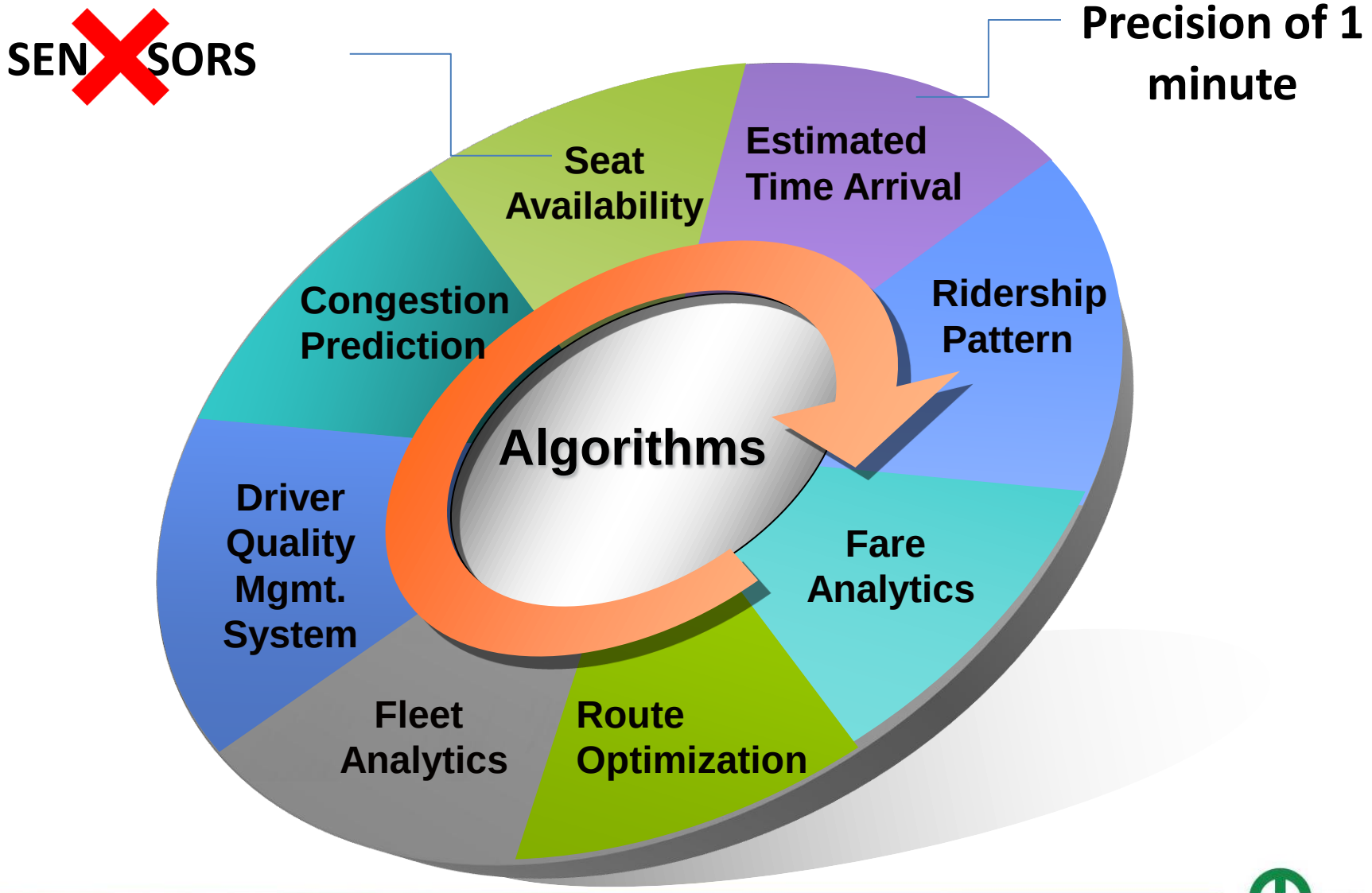

- For car owners and riders to share their commuting schedules and find carpool members

Poochh-O **Driver App**



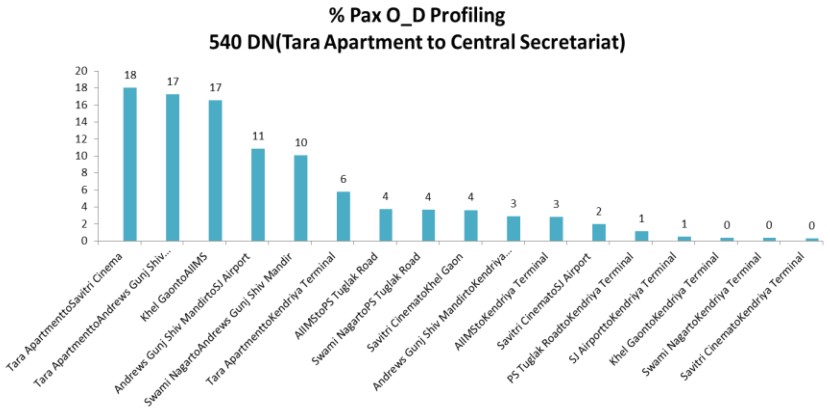

- App for Auto/Taxi drivers in Delhi to get messages for trip request from commuters using Poochho.
- On accepting the request, the commuters can call the drivers back.

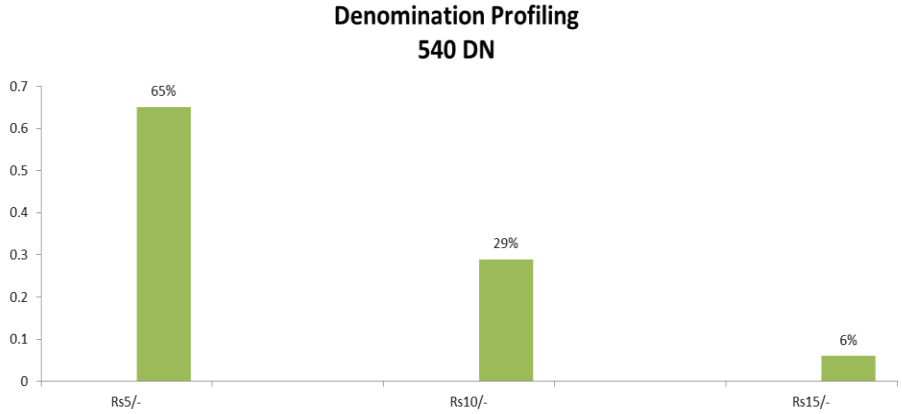
# Data Analytics @ DIMTS

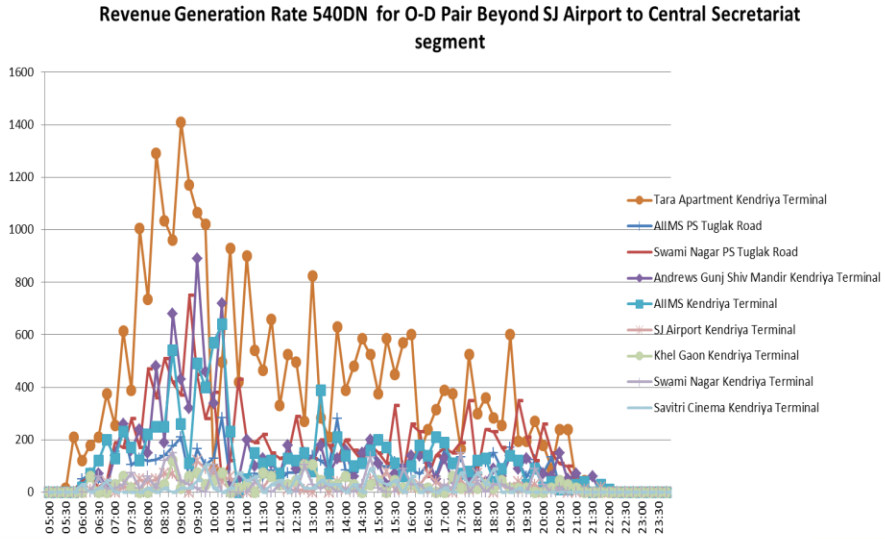


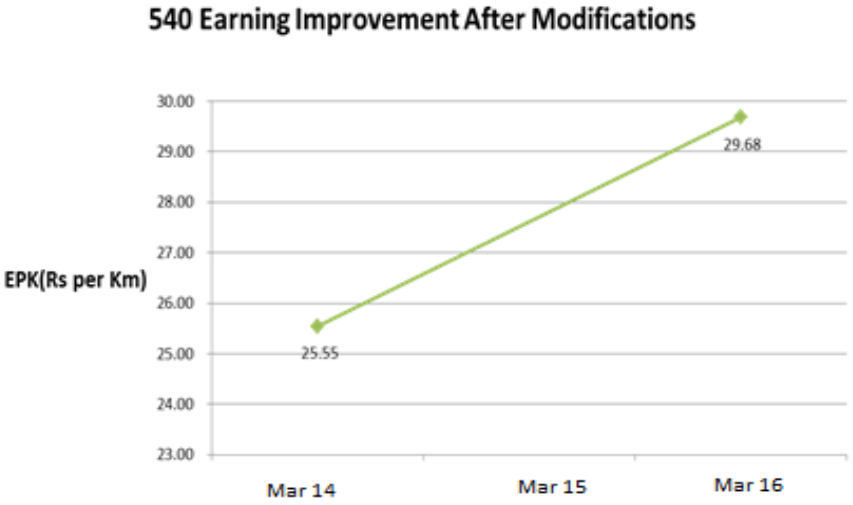
# Route Optimization Analytics

## Detailed Analysis of Low Ridership Sectors

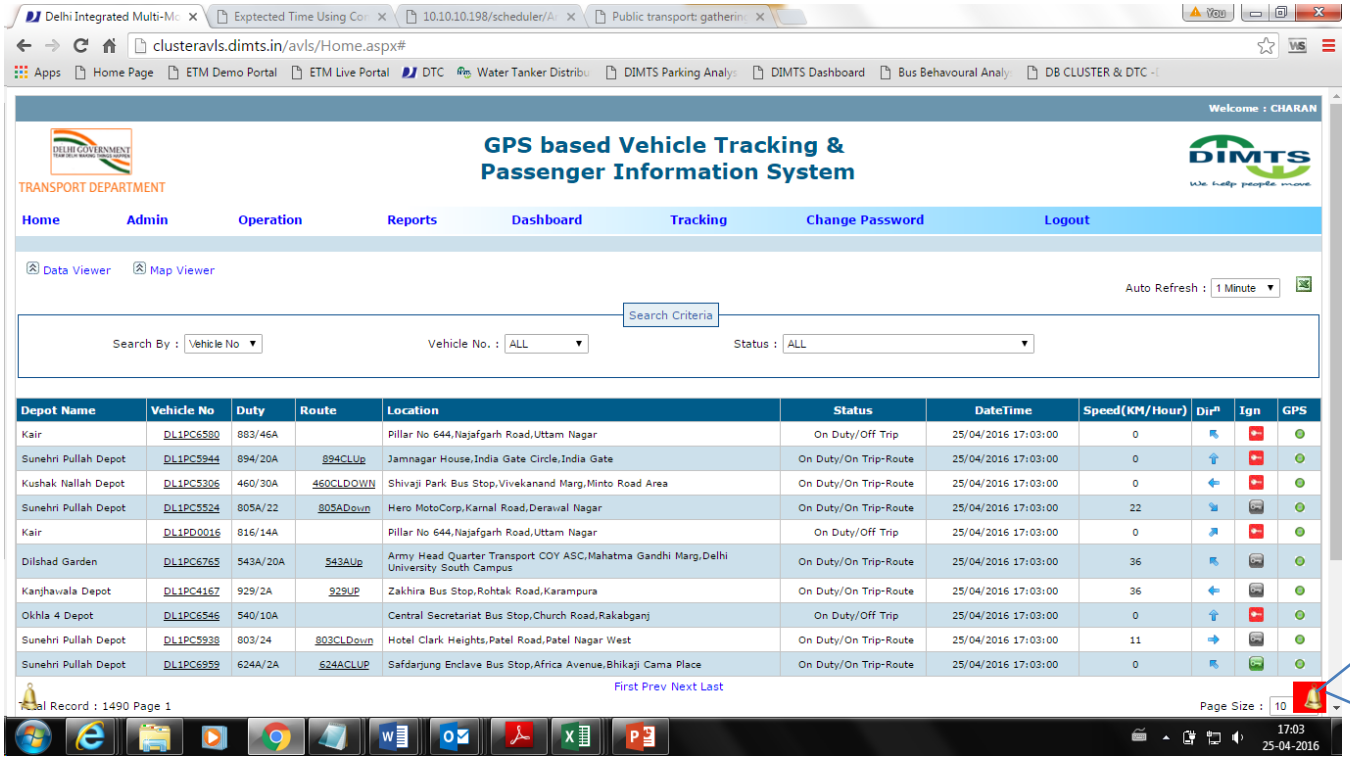


# Route Deviation & Bunching Alerts

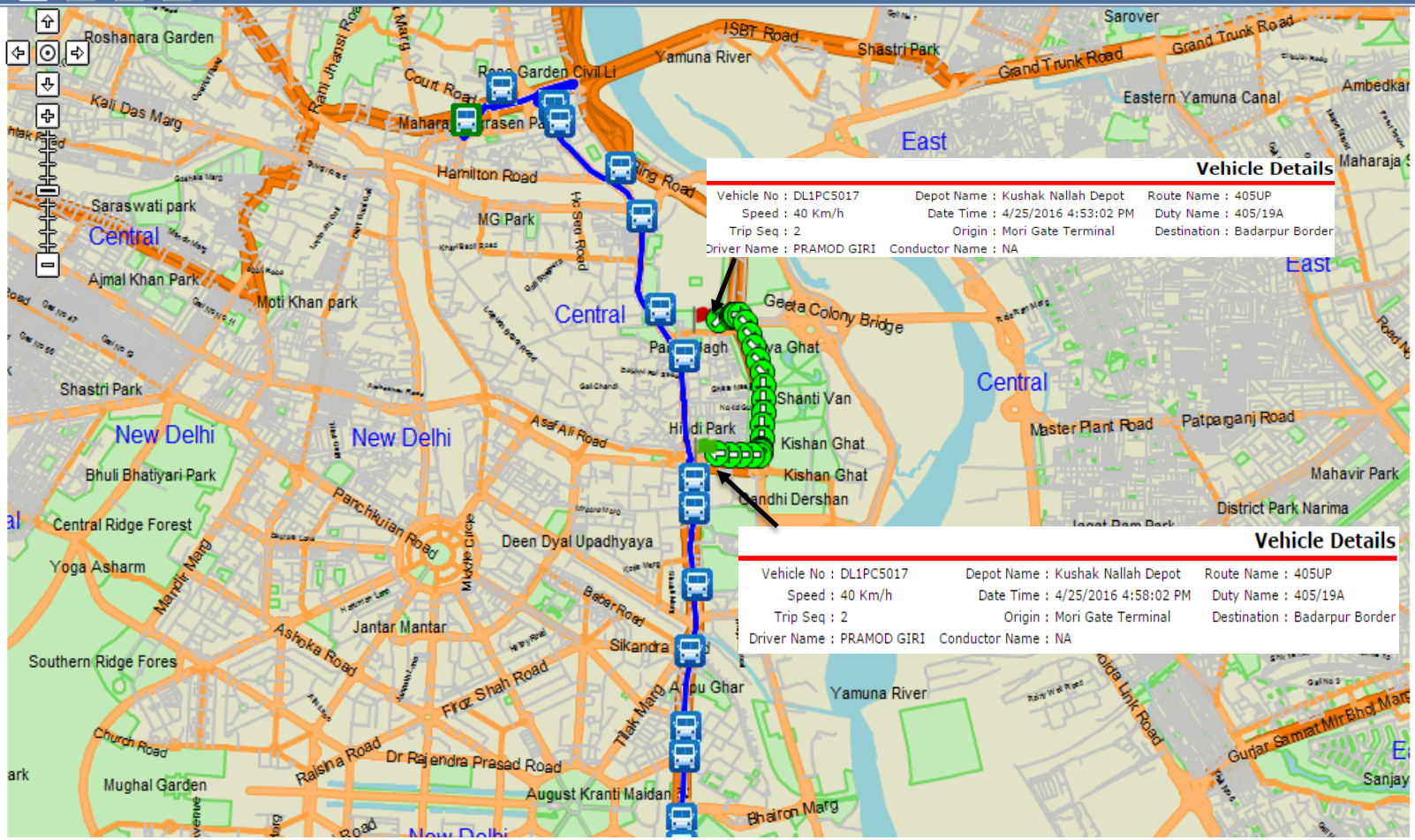



Route Deviation
&
Bunching Alerts

| Alert | Vehicle No | Route Name | Datetime |
|---|---|---|---|
| Deviated | DL1PD0216 | 807ExtDown* | 25/04/16 17:03 |
| Deviated | DL1PC4220 | 990CLDOWN* | 25/04/16 17:03 |
| Deviated | DL1PD0649 | 816Down* | 25/04/16 17:02 |
| Deviated | DL1PC6729 | 236DOWN* | 25/04/16 16:57 |
| Deviated | DL1PC4829 | 78DOWN* | 25/04/16 16:55 |
| Deviated | DL1PD0691 | 85UP* | 25/04/16 16:53 |
| Deviated | DL1PC5017 | 405UP* | 25/04/16 16:52 |
| Deviated | DL1PC6702 | 429CLDown* | 25/04/16 16:52 |
| Deviated | DL1PD1694 | RL-77DOWN* | 25/04/16 16:51 |
| Deviated | DL1PC6846 | 611BDOWN* | 25/04/16 16:51 |
| Bunching | DL1PC5413 | 507CLUp | 25/04/16 16:49 |
| Bunching | DL1PC6329 | 717AUP | 25/04/16 16:48 |
| Bunching | DL1PD1443 | 990E_CL_DN | 25/04/16 16:46 |
| Bunching | DL1PD1156 | 753UP | 25/04/16 16:43 |
| Bunching | DL1PC4857 | 108UP | 25/04/16 16:43 |
| Bunching | DL1PC6308 | 717AUP | 25/04/16 16:42 |
| Bunching | DL1PC4165 | TMS+Punjabi Bagh | 25/04/16 16:42 |
| Bunching | DL1PD0270 | 165UP | 25/04/16 16:41 |
| Bunching | DL1PC4712 | 108UP | 25/04/16 16:41 |

# Route Deviation & Bunching Alerts

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Vehicle:** | DL1PC5017 | **Depot Name:** Kushak Nallah Depot | | **Duty Name:** | 405/19A | **Driver:** | PRAMOD GIRI |
| **Conductor:** | NA | **Trip Seq.:** | 2 | **Route Name:** | 405UP | **Origin Stop:** | Mori Gate Terminal |
| **Destination Stop:** | Badarpur Border | | | | | | |




DIMTS

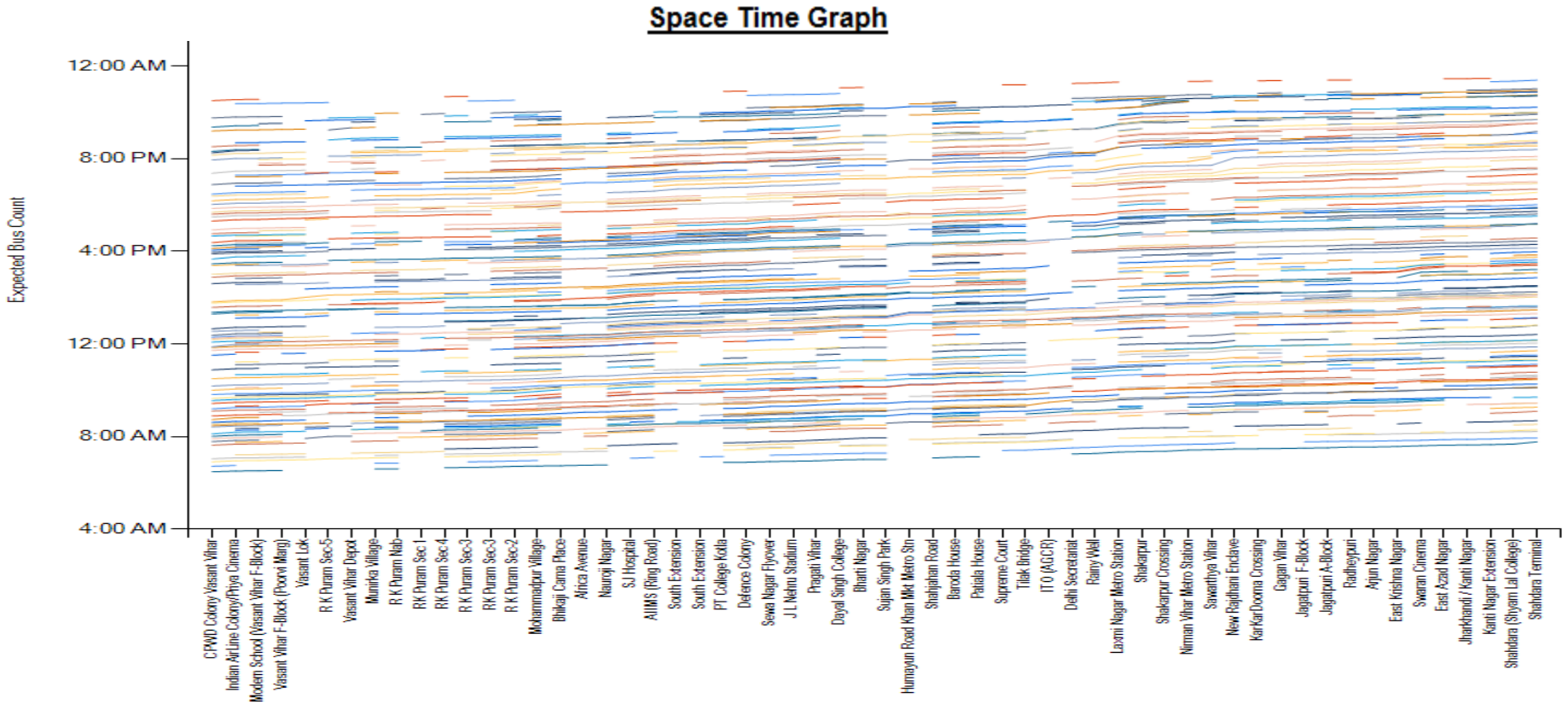
# Route Analytics

- Bunching Analysis
- Missed Bus Stop Analysis
- Route Deviation &
- Congestion

Space Time of a Route

**Route No.** 623DOWN

**Date:** 05-09-2016 Find




DIMTS

# Thank You

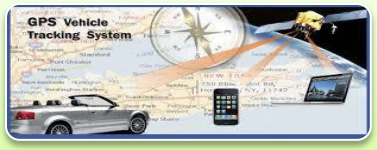
# Solutions Portfolio Transport Technologies

## Transport Management Systems

- ITS – Intelligent Traffic Systems
- ISS – Intelligent Signaling Systems
- Smart Card Based Driving License Issuance
- Issuance of Vehicle Registration and eChallans
- Hand Held Based Enforcement System for Traffic Police
- HSRP – High Security Registration Plate

## RFID Based Toll Systems

- ETC – Electronic Toll Collection Systems (RFID & Camera Based)
- Intelligent Parking and Access Control System
- Readers and Systems, Toll Tags




## Vehicle Tracking Systems

- AVLS – Automatic Vehicle Location Systems (Including Wagon Tracking,
- Trucks In Transport Companies, Tankers In Oil Companies, PSVs)
- Weigh In Motion

## Payment Solutions

- Hand Held Payment Devices
- Automatic Fare Collection Systems
- e-Payment Solutions – Mobile Based

## Identity Solutions

- Smart Card Based National ID/Citizenship Card
- ePassport

## Smart City Surveillance Systems (For Police)