Leadership in Urban Transport Project on **Integrated Ticketing System** for Mumbai Metropolitan Region

**Urban Mobility India Conference**

**Presented by:**
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3. Shri. Goraksha V. Jagtap, Dy Chief Personnel Officer, Central Railway
# Mumbai Metropolitan Region (MMR)

<table>
<thead>
<tr>
<th>Particulars</th>
<th>India</th>
<th>Maharashtra</th>
<th>MMR</th>
<th>MCGM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population 2011 Census (in millions)</td>
<td>1,210 (1.21 billion)</td>
<td>112 (0.112 billion)</td>
<td>23 (0.023 billion)</td>
<td>12 (0.012 billion)</td>
</tr>
<tr>
<td>Area Sq. km</td>
<td>3,287,240</td>
<td>307,713</td>
<td>4,253</td>
<td>438</td>
</tr>
<tr>
<td>Density - Persons per sq. km</td>
<td>382</td>
<td>370</td>
<td>5,361</td>
<td>28,310</td>
</tr>
<tr>
<td>Urban Pop in %</td>
<td>32%</td>
<td>45.23%</td>
<td>94%</td>
<td>100%</td>
</tr>
<tr>
<td>GDP Per Capita (USD/annum)</td>
<td>$1,626.62</td>
<td>$1,963.33</td>
<td>$2,120.18</td>
<td>$2,570.73</td>
</tr>
</tbody>
</table>
Public transport system in Mumbai Metropolitan Region (MMR)...
### Operated by 14+ Public Transport Operators (PTOs)

*Mix of Central, State & Local Governments as well as Private operators*

<table>
<thead>
<tr>
<th>Bus</th>
<th>Railways</th>
<th>Metro</th>
<th>Monorail</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brihanmumbai Electric Supply and Transport (BEST)</td>
<td>Western Railways</td>
<td>Mumbai Metro One Private Limited (MMPOL)</td>
<td>Mumbai Monorail (MMRDA)</td>
<td>Mumbai Maritime Board</td>
</tr>
<tr>
<td>Navi Mumbai Municipal Transport (NMMT)</td>
<td>Central Railways</td>
<td>Mumbai Metro Rail Corporation (MMRC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thane Municipal Transport (TMT)</td>
<td>Mumbai Rail Vikas Corporation (MRVC)</td>
<td></td>
<td>Navi Mumbai Metro</td>
<td></td>
</tr>
<tr>
<td>Vasai Virar Municipal Transport (VVMT)</td>
<td></td>
<td></td>
<td></td>
<td>MMRDA Metro</td>
</tr>
<tr>
<td>Kalyan Dombivali Municipal Transport (KDMT)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mira Bhayandar Municipal Transport (MBMT)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulhasnagar Municipal Transport (UMT)</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
Railways- Key Statistics

- 7.5 million daily trips
- 70% of the journeys completed through season tickets
- Around 30-40% of the suburban rail commuters uses other motorized transport modes (primarily bus and autos) to connect and from the railway stations
- Ridership saturated likely to be same till 2020 - 21
- Average ticket size of each journey is in slab of 05-20 Kms i.e.- INR 6
## Railways - Existing Ticketing System

<table>
<thead>
<tr>
<th>Fare Medium</th>
<th>Paper and Mobile Tickets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ticketing Channels</td>
<td>Ticket Counters, ATVMs, Online and Mobile App</td>
</tr>
<tr>
<td>Payment Type</td>
<td>Cash, Smartcard, Credit/ Debit cards, Mobile Wallets</td>
</tr>
<tr>
<td>Inspection mechanism</td>
<td>Spot checking at the station and inside the trains</td>
</tr>
</tbody>
</table>
Metro - Key Statistics

- 0.3 million trips on a week day
- Per annum ridership growth is 5%
- Average ticket size of each journey is INR21
- New metro lines expected to be operational by 2021-2022
- The overall daily ridership expected to increase to 3-4 million by 2022
- No season tickets available, only Pay As You Go (PAYG)
Major Projects Currently Under Implementation

• Metro Line 2A : DN Nagar – Dahisar
• Metro Line 7 : Dahisar – Andheri
• Metro Line 2B : DN Nagar – Mandale
• Metro Line 4 : Wadala-Kasarwadvli
• Metro Line 3 : Colaba to SEEPZ
• Metro Line 5 : Thane Bhiwandi - Kalyan
• Metro Line 6 : Jogeshwari – Kanjurmarg
• Monorail Line Extension
## Metro - Existing Ticketing System

<table>
<thead>
<tr>
<th>Fare Medium</th>
<th>Smartcards and tokens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ticketing Channels</td>
<td>Ticket Counters, TVMs, Online and Mobile App</td>
</tr>
<tr>
<td>Payment Type</td>
<td>Cash, Credit/ Debit cards, Mobile Wallets</td>
</tr>
<tr>
<td>Inspection mechanism</td>
<td>Gated system, No inspection required</td>
</tr>
</tbody>
</table>
Monorail- Key Statistics

- 17000-18000 regular commutes
- 2nd line to be operational by 2018
- The ridership by 2021 expected to reach 0.18 million
- No season tickets available, only Pay As You Go (PAYG)
- Average ticket size of each journey is 3.5km i.e. -INR 9
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</table>
Buses- Key Statistics

- 7 Bus Operators in Mumbai Metropolitan Region
- 3.5 million daily trips
- BEST Undertaking is the largest Bus Operator in the city with ~2.8 million daily trips
- Around 20% of the trips completed through season tickets
- Around 10% of the suburban rail commuters use bus to connect and from the railway stations
- Estimated growth of 15% per annum
- Average ticket size of journey is INR 12.84 for normal Buses
- Average ticket size of INR 82.40 for AC buses
### Buses- Existing Ticketing System

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</tr>
</thead>
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<tr>
<td><strong>Ticketing Channels</strong></td>
<td>Ticket Counters, ETMs with conductors and Mobile App</td>
</tr>
<tr>
<td><strong>Payment Type</strong></td>
<td>Cash, Credit/ Debit cards and Mobile Wallets</td>
</tr>
<tr>
<td><strong>Inspection mechanism</strong></td>
<td>Spot checking inside and outside the buses</td>
</tr>
</tbody>
</table>
The objective of Integrated Ticketing System (ITS) is to provide a seamless travel experience to commuters.

The Integrated Ticketing System aims to promote the use of public transport in Mumbai Metropolitan Region (MMR) by making ticketing system easy and attractive.

PricewaterhouseCoopers Pvt Ltd & Consult Hyperion were appointed as the consultant for ITS.

ITS shall assist to:
- Combination of modes and transfer
- Reduce time to purchase tickets
- Reduce fraud and revenue leakage
- Reduce administrative and fare collection cost
- Accurate and reliable information to people
- Data to develop fare policies and products
ITS Systems around the world

Chicago
Chicago card plus & Ventra
Hybrid Architecture

San Francisco
Clipper
Standards based Account based Closed system

Utah
Farepay
Hybrid Architecture

London
Oyster
Hybrid Architecture

New York
Metrocard
Proprietary Card Based – Closed loop

Washington DC
Smartrip
Standards based Account Based – Closed loop

Hong Kong
Octopus
Proprietary Card based Closed loop

Tokyo
Pasmo, Suica
Proprietary Account based – Closed loop

Dubai
Nol
Proprietary Card based Closed loop

Seoul
U Pass, T - Money
Standards based Card Based open loop

Singapore
Ez – Link, CEPAS
Standard based Account based Closed

Helsinki
Travel Card
Card Based Close loop
Layered AFC Architecture for ITS (1/2)

- **Level 0** — Fare media
  - **Level 1** — Reader devices
  - **Level 2** — Station/depot systems
  - **Level 3** — PTO central systems
  - **Level 4** — ITS systems
Layered AFC Architecture for ITS (2/2)

**Level-0:** The fare medium available with the passengers. These may include smartcard, mobile phones, wearables etc.

**Level-1:** Front-end devices with which passengers interact. These include Ticket Vending Machines (TVMs), Ticket Office Machines (TOMs), Fare Gates, Fare Readers etc.

**Level-2:** Station/depot level servers for data aggregation. The data from all Level-1 devices installed at a station are aggregated at its respective Level-2 server.

**Level-3:** These are PTO level servers which collect the data from all Level-2 servers. The aggregated data is passed on to the common city level server and also used for reconciliation.

The Level-1 to Level-3 devices come under PTO domain.

**Level-4:** This is a common ITS server, which comes under a central scheme operator. This Level-4 will performs the function of tap aggregation, fare calculation, risk management and interact with the acquiring bank for the settlement of the transactions with the issuing banks.
Commercial structure for the ITS setting out clear roles and responsibilities of each group of stakeholders needs to be developed

- SLAs to be agreed with PTOs and payment service agreements with third party users
- Scheme Operator can issue hardware specifications and testing criteria for PTOs to deploy own hardware
- Transaction charges to be paid by PTOs to the Scheme Operator depending on levels of service taken
Components of ITS

1. **Technical features**
   - Fare Architecture
     - Card based or Account based system
   - Payment Architecture
     - Open loop or Closed loop
   - Fare Medium
     - Smartcard
     - Mobile phones
     - Wearable etc.
   - Banking system
     - Single or multiple acquiring bank
     - Single or multiple issuing bank

2. **Institutional arrangement**
   - Organisational structure for Scheme Operator (SO)?
     - MMRDA’s department
     - SPV under State Govt.
   - Roles and responsibilities
     - What will be the roles and responsibilities of SO and PTOs
   - Outsourcing
     - What functions to do in-house and what functions to outsource

3. **Commercial plan features**
   - Financing options
     - PTOs to pay for their own AFC hardware
     - SO to arrange for PTO’s hardware
   - Sharing of revenue
     - How to share the SO revenue between PTOs
   - Transaction charges
     - Transaction charges to be paid to the SO and banks
# Challenges with Rail, Metro/Monorail & Buses

<table>
<thead>
<tr>
<th>Rail</th>
<th>Metro</th>
<th>Bus</th>
</tr>
</thead>
</table>
| • Very high footfall  
• Lack of space  
• Architectural design limits horizontal expansion of stations  
• Fraud and revenue leakage | • Long queues at the ticket counter and fare gates  
• Slow online top-ups  
• Tokens increase the cost of fare collection | • Very high footfall  
• Old Electronic Ticketing Machines (ETMs)  
• Fraud due to cash transactions  
• Revenue leakage |
## Strategy for Railways

### Phase-1

Installation of tap-in fare readers

- Suburban Stations are segregated into Zones
- Fares are Calculated based on transit between zones for Single journey
- Ticket stored in Customer account at Backend
- Traditional Paper Single Journey Tickets can be purchased in counter like existing ticketing system

### Phase-2

- Redevelopment/ modification of stations
- Installation of Fare Gates
Conceptual layout plan to be developed for 12 stations under High, Medium and Low footfall category

<table>
<thead>
<tr>
<th>Station</th>
<th>Category</th>
<th>Peak Hour Passengers</th>
<th>Fare Gates required</th>
</tr>
</thead>
<tbody>
<tr>
<td>CST</td>
<td>High</td>
<td>77,387</td>
<td>29</td>
</tr>
<tr>
<td>Dadar</td>
<td></td>
<td>70,195</td>
<td>26</td>
</tr>
<tr>
<td>Andheri</td>
<td></td>
<td>73,446</td>
<td>27</td>
</tr>
<tr>
<td>Kurla</td>
<td></td>
<td>46,302</td>
<td>17</td>
</tr>
<tr>
<td>Mulund</td>
<td>Medium</td>
<td>31,082</td>
<td>12</td>
</tr>
<tr>
<td>Dombivili</td>
<td></td>
<td>34,443</td>
<td>13</td>
</tr>
<tr>
<td>Goregaon</td>
<td></td>
<td>34,667</td>
<td>13</td>
</tr>
<tr>
<td>Vashi</td>
<td></td>
<td>28,536</td>
<td>11</td>
</tr>
<tr>
<td>Airoli</td>
<td>Low</td>
<td>10,472</td>
<td>4</td>
</tr>
<tr>
<td>Khar Road</td>
<td></td>
<td>8,500</td>
<td>3</td>
</tr>
<tr>
<td>Wadala</td>
<td></td>
<td>10,000</td>
<td>4</td>
</tr>
<tr>
<td>Titwala</td>
<td></td>
<td>9,600</td>
<td>4</td>
</tr>
</tbody>
</table>

*Source: PwC Analysis*
Way forward

- Finalisation of technical architecture for ITS for MMR
- Specifications, Business Case & Implementation Plan
- Finalisation of Tender Documents
- Selection of vendors and partners
Thank You