National Common Mobility Card Ecosystem

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Centre for Development of Advanced Computing

Premier R&D organization of the Ministry of Electronics & Information Technology (MeitY) to carry out R&D in ICT, Electronics & associated domains

1988

Established Year

11

Locations

2700+

Professionals

High Performance Computing

Multilingual and Heritage Computing

Professional Electronics, VLSI & Embedded Systems

Software Technologies including FOSS

Cyber Security & Cyber Forensics

Health Informatics

Education and Training

Development of NCMC Ecosystem – The Need

Fare collection in cash poses challenges
- Cash handling & reconciliation
- Revenue leakages …

Digitization of fare collection using Closed Loop Cards has its set of problems
- Proprietary
- Mostly imported – Expensive
- Vendor Lock-in – High Maintenance Costs, Monopoly
- Not Interoperable

Development of NCMC Ecosystem – The Solution

Goals
- One card for all transit needs – travel, parking, toll …
- Also useable for retail transactions
- Specify complete ecosystem
- Make In India

MoHUA constituted an Expert Committee to make recommendations for a Transit Fare Collection system
- Based on a Common Mobility Card
- Vendor Agnostic – based on standard interfaces
- Indigenous

One Vision. One Goal... Advanced Computing for Human Advancement…

Expert Committee's Recommendations

Extensive deliberations by committee on the possible models for NCMC after studying the various models being followed across the world

- Develop and publish NCMC Standard and Specification around EMV open loop card with stored value

- Engage domestic agency for developing specification of NCMC Ecosystem - AFC System, Card, Metro Gate, Validator, and banking interface.

- Create certification mechanism for each component of NCMC Ecosystem.

- Initiate indigenous development of Metro Gates / Validators

Development of NCMC Ecosystem – The Beginning

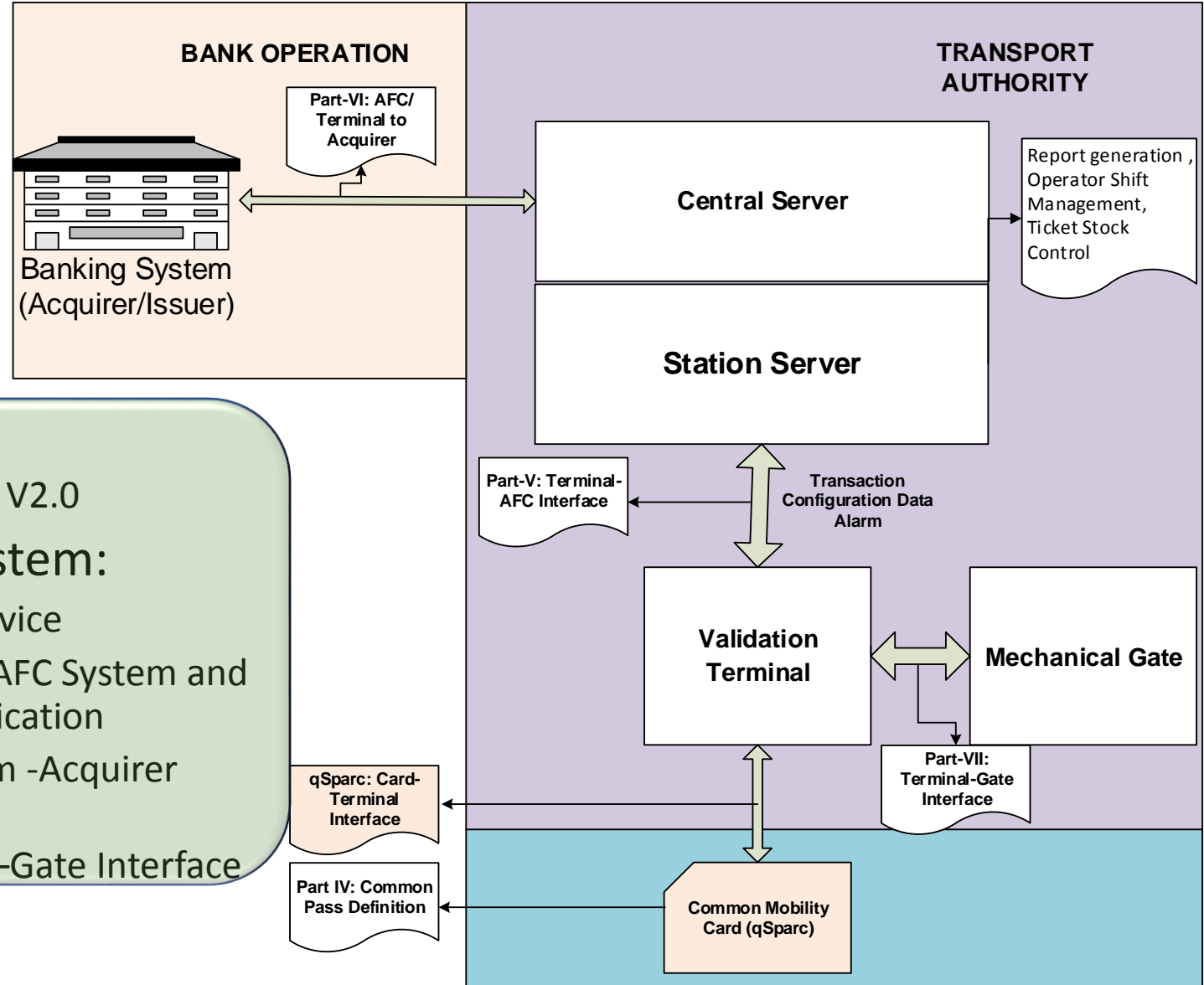- Standardization of all interfaces of NCMC Ecosystem
  - ✓ Automatic Fare Collection System (AFC)
  - ✓ Mechanical Gate
  - ✓ Validation Terminal
  - ✓ Financial Settlement
- Develop a prototype of NCMC system
- Deploy a Proof of Concept (PoC) with a Transport Operator

- Develop the hardware components – Mechanical Gates and Validators

- Develop Card specifications
- Payment settlement system

NCMC based AFC Ecosystem for Metro Rail

BANK OPERATION

TRANSPORT AUTHORITY

Part-VI: AFC/ Terminal to Acquirer

Banking System (Acquirer/Issuer)

Central Server

Report generation , Operator Shift Management, Ticket Stock Control

Station Server

Part-V: Terminal-AFC Interface

Transaction Configuration Data Alarm

Validation Terminal

Mechanical Gate

Part-VII: Terminal-Gate Interface

qSparc: Card-Terminal Interface

Part IV: Common Pass Definition

Common Mobility Card (qSparc)

NCMC Card:
RuPay qSparc V2.0

NCMC Eco-System:
Part-IV: Transit Service

Part-V: Terminal - AFC System and Acquirer Communication

Part-VI: AFC System -Acquirer Interface

Part-VII: Terminal –Gate Interface

NCMC based AFC – Status @ Metro Rail

Development Status

- Metro Gates and Validation Terminal Hardware developed by BEL
  - L1 certification achieved
- Validation Terminal Software Kernel and AFC Software Developed by CDAC
  - L2 and L3 certification achieved
- Soft Launch of NCMC based AFC by Secretary MoHUA 31 Jan '19
- AFC Ecosystem - NCMC Card, *Sweekar* (Swachalit Kiraya) AFC and *Swagat* (Swachalit Gate), launched by Honourable PM on 04 March 2019

NCMC Pilot

- Field trials ongoing at 3 Metro Stations of DMRC
- More than 20 banks issuing NCMC cards
- Field trials at 2 stations of Bengaluru Metro in December
- Retro fitment of BMRC Ph 1 gates by Aug 2020
- Rollout on 44 Stations of BMRC Ph 1 by Dec 2020
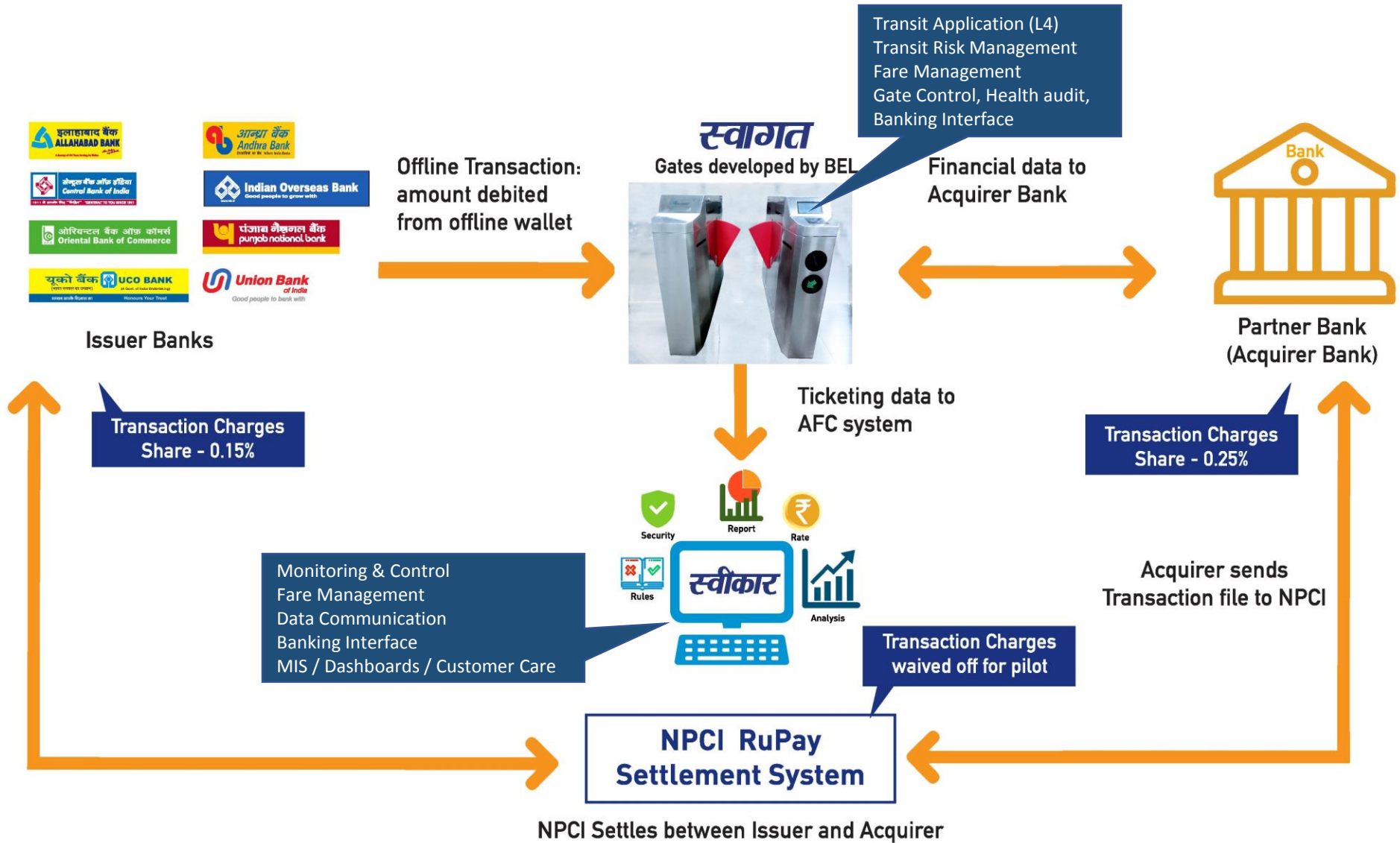
Standardization Status

NCMC

- All NCMC interfaces specified (Part IV – VII)
- Common service Governance and Data sets specification defined after detailed deliberation among NPCI , CDAC, DMRC and BEL
- NCMC qSparcV2.0 Specs
- STQC to set-up testing and certification facilities

QR Code

- Drafting of QR Code Specification by NPCI, CDAC in progress

NCMC compliant AFC System overview

Issuer Banks

Offline Transaction:
amount debited
from offline wallet

स्वागत
Gates developed by BEL

Transit Application (L4)
Transit Risk Management
Fare Management
Gate Control, Health audit,
Banking Interface

Financial data to
Acquirer Bank

Bank

Partner Bank
(Acquirer Bank)

Transaction Charges
Share - 0.15%

Ticketing data to
AFC system

Transaction Charges
Share - 0.25%

Monitoring & Control
Fare Management
Data Communication
Banking Interface
MIS / Dashboards / Customer Care

Security   Report   Rate

स्वीकार

Rules   Analysis

Acquirer sends
Transaction file to NPCI

Transaction Charges
waived off for pilot

NPCI RuPay
Settlement System

NPCI Settles between Issuer and Acquirer

Key Items and Players

Item	Specification	Certification
Card	NPCI	NPCI, EVMCo
Terminal	NPCI, CDAC / MoHUA	EVMCo, NPCI, STQC*
Mechanical Gate Interface	CDAC / MoHUA	STQC*
AFC System Interface	CDAC / MoHUA	STQC*

* Action Ongoing with STQC

NCMC based Centralized AFC for Buses

Development and Proof of Concept deployment for an NCMC compliant Centralized AFC solution for Road Transport Operators

First PoC at BEST Mumbai

Advantages

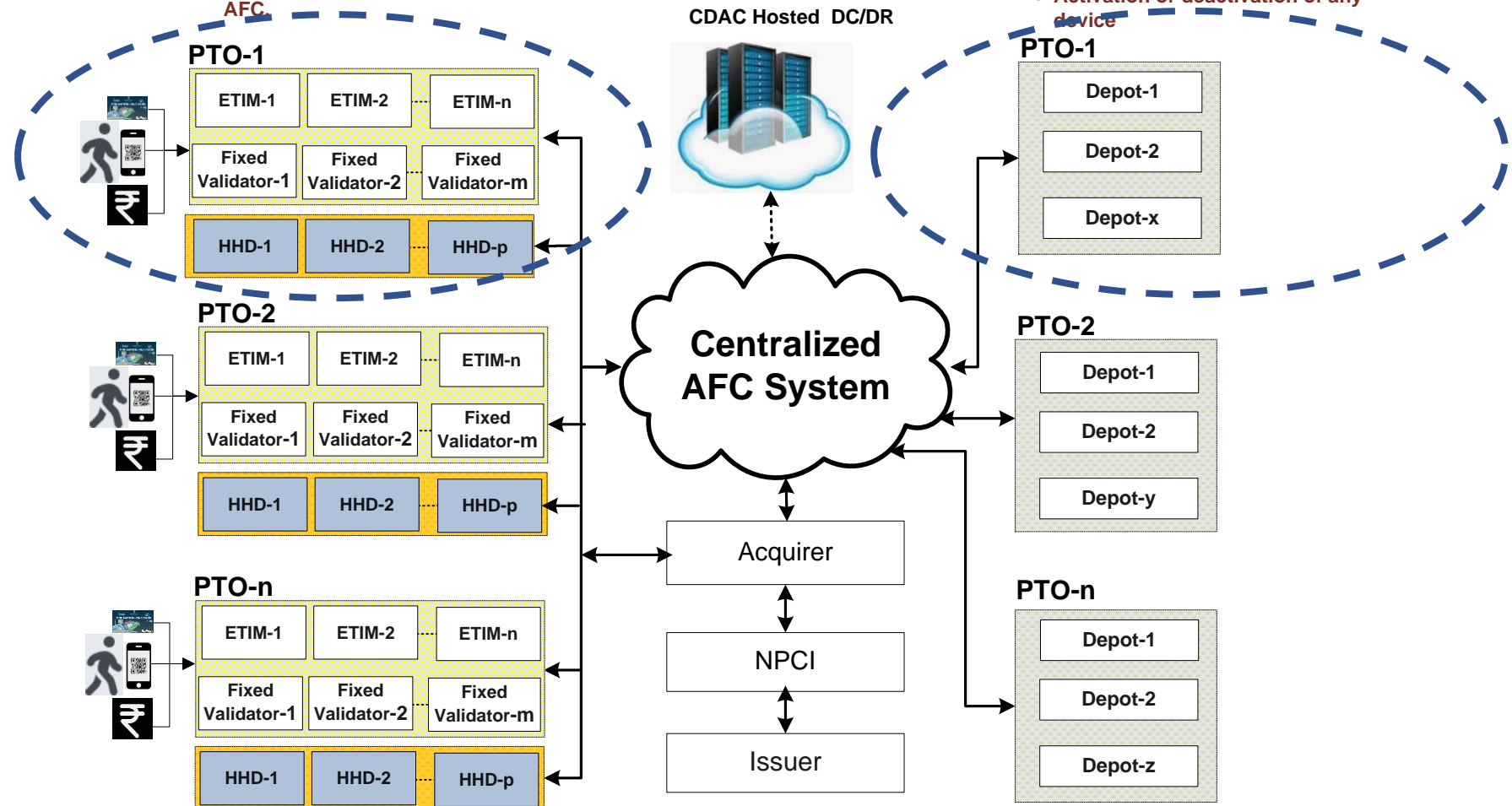| Low Initial Expenditure (Validators / Ticketing Machines to be procured / leased)	Low Operation and Maintenance Cost	High availability of system	Quick Implementation of NCMC Solution for on-boarding any new PTO	Easy Inter PTO integration for common ticketing / data sharing

Top Level Architecture – Centralized AFC System

- **Data flow from each and every terminal (ETIM, HHD & Fixed Validator) installed in field**
- **Online configuration and other controls from centralized AFC to any terminal device**
- **Alarm/event messages from terminals to AFC**

- **Centralized dashboard**
- **Status of Depot wise buses and terminal machines**
- **Txn settlement report**
- **Reconciliation**
- **Activation or deactivation of any device**

CDAC Hosted DC/DR

PTO-1

ETIM-1	ETIM-2	ETIM-n
Fixed Validator-1	Fixed Validator-2	Fixed Validator-m

HHD-1	HHD-2	HHD-p

PTO-2

ETIM-1	ETIM-2	ETIM-n
Fixed Validator-1	Fixed Validator-2	Fixed Validator-m

HHD-1	HHD-2	HHD-p

PTO-n

ETIM-1	ETIM-2	ETIM-n
Fixed Validator-1	Fixed Validator-2	Fixed Validator-m

HHD-1	HHD-2	HHD-p

Centralized AFC System

Acquirer

NPCI

Issuer

PTO-1

Depot-1
Depot-2
Depot-x

PTO-2

Depot-1
Depot-2
Depot-y

PTO-n

Depot-1
Depot-2
Depot-z

Baseline AFC software features

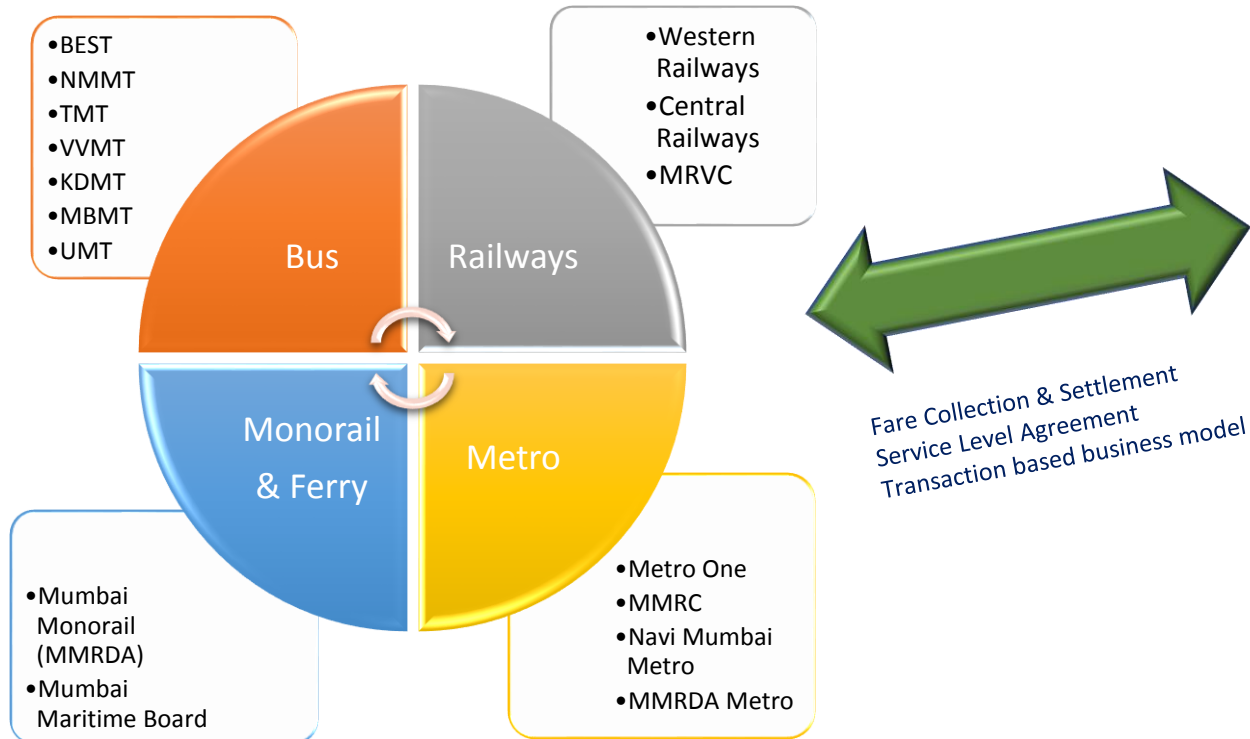| Central System	• User Management • Configuration Management • Transaction Management • Reconciliation
Depot System	• Monitoring of device health • ETIM Issuance • Revenue Reconciliation • Dashboards and MIS reports
Mobile Application for QR ticketing	• Interface with existing Mobile App (if already exisitng)
Third party system Integration	• Vehicle Tracking System (VTS) • Integrated Transit Management System (ITMS)

Hand Held Terminals (HHT)

ETIM/HHD   Validator

NCMC based Integrated Ticketing System for Mumbai

Bus:
- BEST
- NMMT
- TMT
- VVMT
- KDMT
- MBMT
- UMT

Railways:
- Western Railways
- Central Railways
- MRVC

Monorail & Ferry:
- Mumbai Monorail (MMRDA)
- Mumbai Maritime Board

Metro:
- Metro One
- MMRC
- Navi Mumbai Metro
- MMRDA Metro

Fare Collection & Settlement
Service Level Agreement
Transaction based business model

Integrated Ticketing System

- Card Services Management
- Interface with Clearing House
- Scheme operations and Maintenance

A setp towards Mobility as a Service (MaaS)

PTO	Ridership (Lakhs)
Mumbai Suburban	74
BEST Buses	31.2
MMRDA Metro	17.4
Metro 3	12
Metro One	3.2
CIDCO Metro	2.4
NMMT Buses	2.4
Others	3.4
Total	146

Thank You !

One Vision.
     One Goal..
          Advanced Computing
               for Human Advancement…