



Version 1.0



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Draft Concept Note of proposed GNSS based ETC in India

1. Introduction

- a. Global Navigation Satellite System (GNSS) based Tolling is a barrier free method of Electronic Toll Collection wherein the road users are charged on the distance they have travelled on the tolled Highway stretch. The system uses Satellite or Constellation of Satellites to track vehicle's movement and calculate tolls based on the distance travelled on tolled Highways.
- b. The Ministry of Road Transport & Highways envisages to implement Global Navigation Satellite System (GNSS) based Electronic Toll Collection (ETC) in India to increase the efficiency of the Tolling operation in line with the global practices. In this regard, the National Highways Authority of India (NHAI) through its promoted Company M/s Indian Highways Management Company Ltd (IHMCL), which oversees the National Electronic Tolling Collection (NETC) program, has been entrusted with the responsibility to devise the action plan and implement the GNSS based ETC across India.

2. General

- a. The proposed Indian GNSS based Tolling Solution is a hybrid system in which the existing Toll Plazas will have two or more dedicated "GNSS Lanes" wherein the default position of barriers will be open for free flow of GNSS Vehicles. The lanes will have advance readers to identify GNSS vehicles. Additional fees will be charged from non-GNSS vehicles entering GNSS lanes.
- b. The Toll Plaza will itself act as the Stationary Enforcement Gantry in the system.
- c. The system architecture includes a Centralized Toll Charger responsible for distance & toll calculation of GNSS vehicles travelling on GNSS stretch.
- d. The Toll Charger will receive pings (distance and time stamp) of GNSS vehicles through On Board Unit (OBU) fitted in the GNSS vehicles.
- e. The OBUs of GNSS vehicles will be onboarded with the Toll Charger through Fintechs to be called "Issuer Entity" similar to the Issuer Banks under FASTag System.
- f. The payment mechanism shall be similar to the existing FASTag ecosystem.

- g. It is also proposed to start GNSS based Tolling with Commercial Vehicles. Private Car/Jeep/Van may be included in phased manner.

3. Role of Centralized Toll Charger

- a. **Map Making of GNSS stretch-** The Toll Charger entity shall make the geo-referenced map of the GNSS stretches and nearby roads/highways with precision upto decimeter level. The map shall clearly demarcate the median edges, main-carriageway edges (upto shoulder) and service road on each side. The Geo-reference shall also capture the elevation which would ensure that the distance is calculated on the flyovers/elevated portions and not on the service road below it. The ownership of the map shall lie with NHAI.
- b. **Correlation / Validation of Chainage and Geo-Reference:** The Toll Charger shall validate the chainage wise details given by NHAI with the geo-referenced map.
- c. **Receiving Anonymised Pings from AIS AIS 140 VLT Device (OBU) -** Fully compliant AIS AIS 140 VLT Device (OBU) fitted in a vehicle shall be the OBU for GNSS based Tolling. The Toll Charger shall be capable of receiving per second anonymised pings from the OBU consisting of Time-Location Stamp of OBU, Virtual-ID associated with Vehicle/Vehicle Class etc. Any data not falling on the National Highway network shall be not be stored or processed further and discarded immediately. The toll-charger will operate with principle of purpose-limitation with objectivity of calculating toll. The customer information will be with the IssuerEntity.
- d. **Map Matching -** Tracing the precise location of the vehicle on the geo-referenced map through the time-location stamp received from the OBU. With state of art AI based digital routing/Gap analysis tools to validate de-routing / fraud / loss of signal / OBU malfunction cases.
- e. **Network based Digital Routing:** The Toll Charger should have capability of AI based digital routing of Vehicles through Cellular Network also.
- f. **Calculation of Distance travelled:** The Toll Charger shall calculate the distance travelled by the OBU fitted vehicle based on the time-location stamp. The software shall ensure that the distance is measured only on the tollable portion of highway i.e the distance shall be measured only on the main carriageway and not on the service road. For elevated Highways where service road is under the elevated portion the distance shall be

calculated only on the elevated portion and not if the vehicles is travelling on service road below it.

- g. **Toll Parameter:** The Toll Charger shall calculate the User Fee based on Toll Parameters defined by the Authority from time to time. The Toll Parameter varies stretch to stretch depending upon type of structures, bypass, expressway etc. The Toll parameter for every stretch is revised once in a year.
- h. **Calculation of User Fee based on distance travelled:** The Toll Charger shall calculate user fee based on the distance travelled by the GNSS Vehicle using the Vehicle Class of OBU and toll parameter. The User Fee is proposed to be calculated real time on following occasions although the list is not exhaustive:
- 1) Whenever Vehicle crosses the influence length of particular Toll Plaza(s)
 - 2) Whenever vehicle makes a U-Turn
 - 3) Whenever vehicle leaves the GNSS stretch
 - 4) Whenever OBU turns red (no balance/OBU malfunctions)
 - 5) Vehicle Stopped on Highway beyond defined time limit
 - 6) Any other occasion decided by the Authority

The calculation of User Fee should trigger payment module and conclude with SMS being sent to the Road User by Issuer Entity.

- i. **Send calculated User Fee to Acquirer Bank:** The Toll Charger shall send the calculated User Fee to be charged to a GNSS Vehicle to the Acquirer Bank which will then follow same payment protocol as FASTag system. The Toll Charger will also facilitate the road user to see the path travelled by their GNSS vehicle on a map by clicking a link shared to them by Issuer Entity through SMS.
- j. **Creation of User Fee Portal for each Toll Plaza:** The Toll Charger shall create a Web based Portal for each Toll Plaza on the GNSS Stretch to provide the GNSS based toll transaction of each GNSS based vehicle in the influence length of the toll plaza.
- k. **Exemption of minimum distance travelled:** The Toll Charger shall ensure that no toll is charged if vehicles are travelling less than minimum Tollable length of the GNSS stretch. Say 'X' km per day in each direction.

- l. **AIS-AIS 140 VLT Device VLT Device Device (OBU) Onboarding Protocols:** The Toll Charger in consultation with the Authority, shall prepare necessary software level protocols (like FIFO, Information sequence, encryption etc) required to onboard AIS AIS 140 VLT Device (OBU) fitted in vehicle to the Toll Charger through Issuer Entity. The Toll Charger shall create a central mapper for onboarding all registered OBUs with Issuer Entity.
- m. **AIS AIS 140 VLT Device (OBU) Status Protocols:** The Toll Charger shall define the AIS AIS 140 VLT Device (OBU) status protocols (green/red cases) for the Issuer Entity. The red OBU cases should be reported to the Issuer Entity through open standard APIs.
- n. **Integration with GNSS Lane:** The Toll Charger shall integrate with the GNSS Lanes of the Toll Plaza
- o. **Setting up of Dispute Redressal Setup:** The Toll Charger shall set up an Online Dispute Redressal mechanism/Support Center which will integrate data from Enforcement Gantries, OBUs, Toll Plazas and Issuer/Acquirer Entity to allow for easy resolution of customer complaints. The same shall be integrated with NHA 1033 Helpline/Rajmarg Yatra App.
- p. **Adhere to the SLAs:** The Toll Charger shall adhere with the highest standards of uptime/availability, precision, integrity, dispute redressal and other SLAs defined in Contract Agreement.
- q. **Redundancy and Disaster Recovery:** The Toll Charger shall have appropriate redundancy, availability and disaster recovery protocols so that there is no loss of Toll Revenue.
- r. **Interoperability among Toll Chargers:** The Authority may appoint region / pan India wise multiple Toll Chargers. The Toll Charger shall have open standard API based interoperable solution with other Toll Charger to ensure seamless GNSS based Toll collection between different region/pan India.
- s. **Data Center / Cloud:** The Toll Charger shall establish Data Center in India for the purpose of all the services under the Contract. For any Cloud Services, the Toll Charger shall comply with the latest guidelines of Ministry of Electronics and Information Technology (MeitY), Government of India. The Toll Charger shall retain the data as per the archival policy decided by the Authority.

- t. **Operation & Maintenance, Development and Training:** The Toll Charger shall operate & maintain the Toll Charger services for the entire contract period. The Toll Charger shall also make important developments in the Software so as to meet the latest requirement. The Toll Charger shall impart trainings to the officials/representatives of the Authority so that they can undertake operation of the Toll Charger.

4. GNSS On Board Unit (OBU):

- a. **OBU:** Fully compliant AIS 140 VLT Device fitted in a vehicle shall be the OBU for GNSS based Tolling in India.
- b. **Proposed modification in AIS 140 VLT Device (OBU) Specifications:** The Authority also aims modify few attributes of AIS 140 VLT Device (OBU) specifications like increasing the inbuilt memory for storage of geo-polygons and time-location stamp in no network/power scenario, increasing an IP port for TCP/IP communication with Toll Charger, etc along with Virtual-ID and other necessary information.
- c. **Onboarding of OBUs with Toll Charger:** The Issuer Entity shall onboard the Vehicle fitted with AIS 140 VLT Device (OBU) to the Toll Charger after doing KYC, mapping its FASTag and generating Virtual-ID.
- d. **Identification of GNSS Vehicle at Toll Plaza/GNSS Stretch:** The GNSS Vehicle shall be identified through the Virtual-ID linked with the OBU device and ANPR Cameras that will be installed at GNSS Lanes. An OBU with Valid FASTag shall find free flow at GNSS lane whereas an OBU with blacklisted FASTag shall find the barrier closed based on the reading of FASTag by reader/VRN by ANPR Camera.
- e. The AIS 140 VLT Device (OBU) shall be suitably programmed as per the protocols set by Toll Charger like FIFO (first in first out) pings etc.
- f. The existing version of AIS 140 VLT Device VLT Device Device specifications are enclosed at **Annexure-1**

5. Role of Issuer Entity:

- a. **Accreditation of Issuer Entity:** Fintechs/Banks/Insurance Cos etc who wish to act as Issuer Entity needs to get accredited by IHMCL.

- b. **Onboarding of OBUs with Toll Charger:** The Issuer Entity shall onboard the Vehicle fitted with AIS 140 VLT Device (OBU) to the Toll Charger after doing KYC, mapping its FASTag and generating Virtual-ID. The Issuer Entity shall register the Vehicles fitted with fully compliant AIS 140 VLT Device (OBU) with the Toll Charger after thorough checking of the AIS 140 VLT Device (OBU). The Issuer Entity shall also retrofit the fully compliant AIS 140 VLT Device (OBU) in vehicles registering with the Toll Charger.
- c. **Anonymised Pings:** The Issuer Entity shall ensure transfer of anonymised pings from the onboarded Vehicle OBU/proxy server to the Toll Charger. The Issuer Entity may empanel/tie up with compliant OBU Manufacturers in this regard.
- d. **Link with FASTag ID:** The Issuer Entity shall maintain with itself the link between the existing FASTag of the Vehicle and the Virtual-ID generated.
- e. **AIS 140 VLT Device (OBU) Status Management:** The Issuer Entity shall ensure that a vehicle fitted with Valid OBU (FASTag with balance + Functional OBU) shall be charged only per km wise if it crosses the toll plaza or otherwise. Suitable mechanism shall be developed to ensure that there is no double charging when the vehicle fitted with valid OBU crosses the Toll Plaza.
- f. **Linking of Payment System:** The Issuer Entity shall be responsible for linking Bank Account / Wallet /Credit Card of the GNSS Vehicle with FASTag wallet linked to the OBU of GNSS Vehicle. The Issuer-Entity will be responsible to reveal the FASTag ID mapped to Virtual-ID when requested by Acquirer Bank for processing payment.
- g. **Payment Creditor:** The Issuer Entity shall be obliged to credit the calculated User Fee to the Acquirer Bank whenever demand raised through the Central Clearing House (CCH) / NPCI.
- h. **Commercial Terms with Owner:** The Issuer Entity may provide value added services like free OBU, free Insurance etc based on consent-based data sharing and other commercial terms with the owner.
- i. **Customer Support:** The Issuer Entity shall send SMS, Voice Call, IVR based reminders to its customers in case there is OBU malfunction/low balance/power snap of OBU or other issues with OBU. The Issuer Entity shall also provide Customer Support and dispute redressal for chargeback /wrong deduction and other ETC related disputes

j. **SMS Information:** Issuer Entity shall send SMS to the Customer whenever Toll is Charged under following scenario:

- 1) Whenever Vehicle crosses the influence length of particular Toll Plaza(s)
- 2) Whenever vehicle makes a U-Turn
- 3) Whenever OBU turns red (no balance/OBU malfunctions)
- 4) Vehicle Stopped on Highway beyond defined time limit
Whenever vehicle leaves the GNSS stretch
- 5) Any other occasion decided by the Authority

Typically the SMS should contain the following information:

- Vehicle Number
- Distance Travelled
- User Fee Charged
- Link provided by Toll Charger showing path of vehicle on map

Illustration:

Rs.30.98 charged for 16.57 km travelled by vehicle DL1LAG1162. For trip details click <https://t.ly/9owgU> For enquiry call 1033. Kotak Bank.

The Issuer Entity shall also create APIs to integrate with Rajmargyatra such that User can use Rajmargyatra app to access above information within app.

6. Role of Acquirer Bank

- a. **Validation of Toll Parameter:** The Acquirer Bank will validate the Toll Parameter of particular stretch.
- b. **Payment to Toll Collection Agency:** Acquirer Bank shall pay the settled User Fee to the Toll Collecting Agency similar to FASTag system

7. Role of NPCI

- a. **CCH and User Fee feed to TMCC:** NPCI shall continue to act as the Centralised Clearing House (CCH) for the Acquirer-Issuer system in GNSS ecosystem similar to FASTag system. NPCI shall create a separate GNSS head for GNSS based user fee collection and send the information to TMCC.
- b. **Onboarding of GNSS Lanes:** NPCI shall make necessary integrations to onboard the GNSS Lanes as per defined protocols at plaza level.

8. Role of NHAI

- a. **To furnish the list of proposed GNSS Stretches to the Toll Charger:** NHAI shall provide the list of stretches proposed under GNSS Tolling to the Toll charger with all the details like structures, bypasses, location of Toll Plaza etc.

- b. **To Furnish Toll Parameter:** NHA shall furnish Toll Parameter to the Toll Charger for each GNSS stretch.
- c. **Validation of GNSS Stretch:** NHA shall validate the geo-reference of the GNSS Stretch with the chainages of the Highway.
- d. **Lane Level Changes at Toll Plaza:** NHA shall undertake required lane level changes at the Toll Plazas.
- e. **Develop GNSS Toll Collection field in TMCC:** NHA shall develop a GNSS User Fee field in the existing TMCC wherein the user fee collection from GNSS based ETC shall be reflected as shared by NPCI.

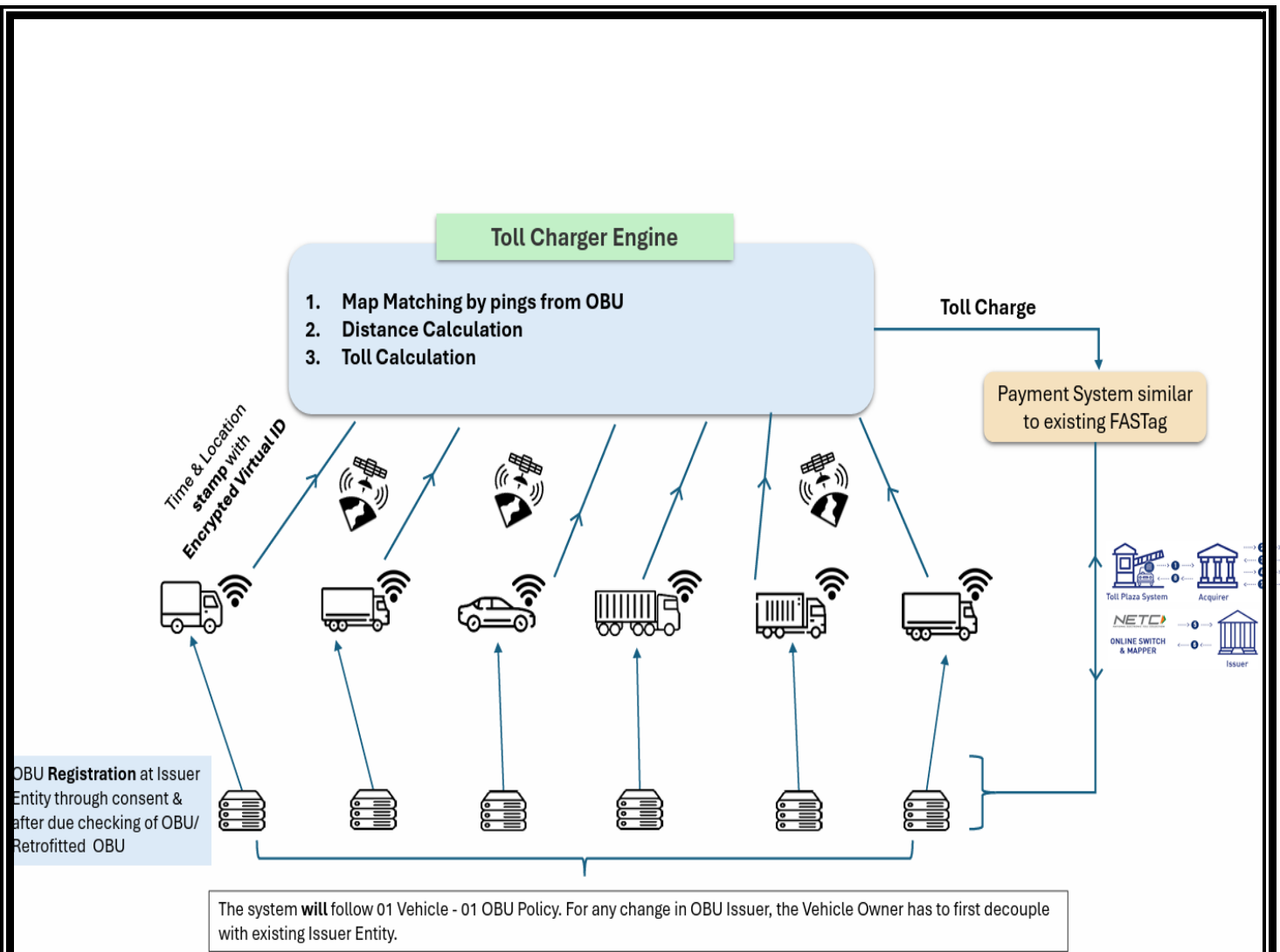


Fig 1 GNSS System Architecture

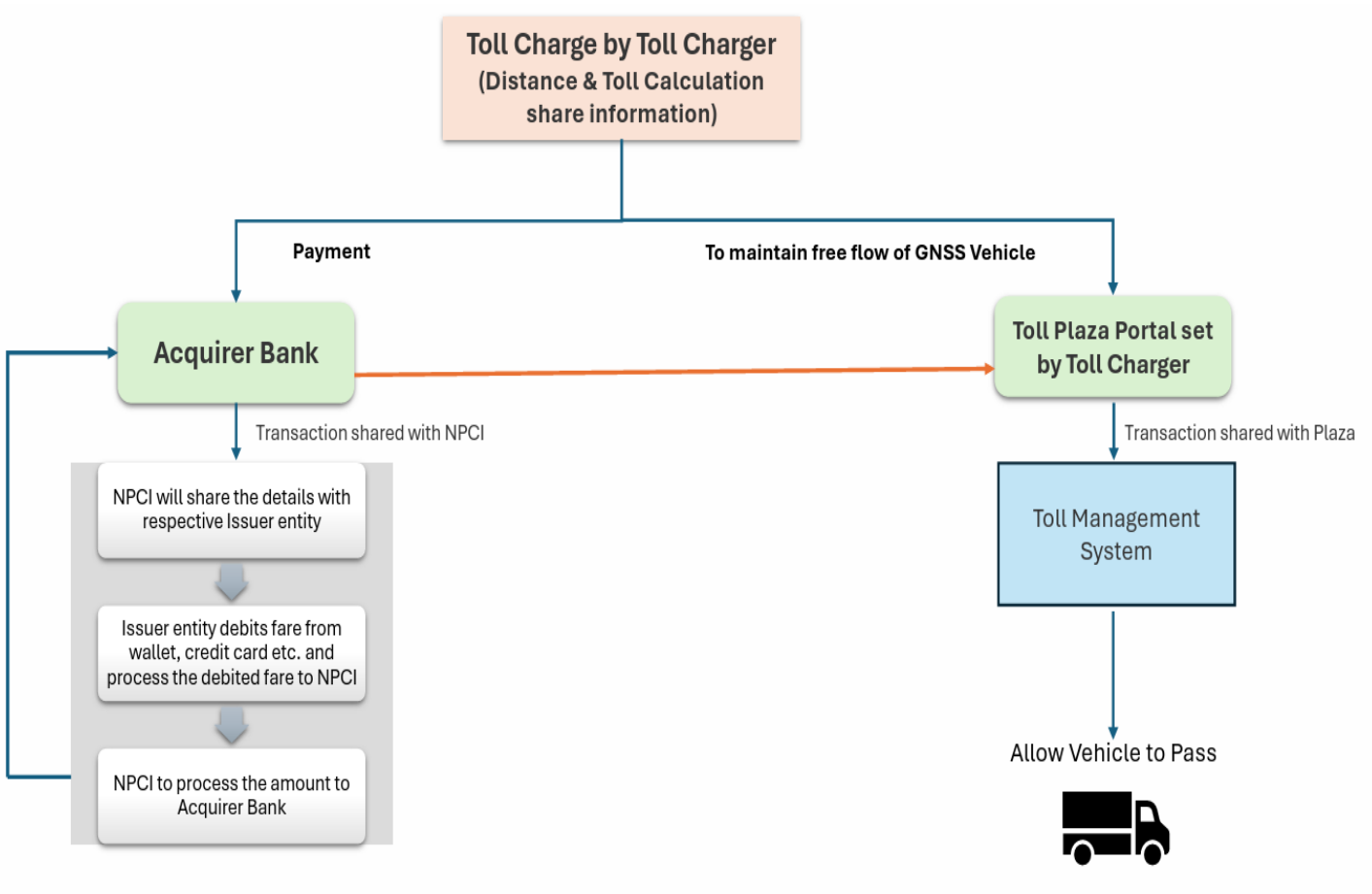


Fig 2 Payment Architecture