FASTAG System Design

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Functional requirements

1. Process payment - accept / decline
   - (a) success, let the vehicle pass through
   - (b) failure, hold vehicle and provide functionality of offline payment.
2. Notification to user

NFR

1. Latency < 2 sec
2. Availability - no downtime
3. Scalable - onboard any new number of tolls
4. Idempotency

PI requirements

1. Analytics
2. vehicle Image capture
   - ↳ can we make sure the vehicle mapped to Fastag is correct/valid?

High level view of System

How Fastag works?
Reference & Image credits - npci.org.in

NETC FASTag TRANSACTION PROCESS FLOW

The above diagram illustrates transaction flow of the NETC system. The Transaction from the Toll Plaza is sent to the acquiring system. The Acquiring System validates these transactions and send it to NETC Switch. NPCI route these transactions to the respective Issuer Bank which in turn debit the tag holder account.

what All these steps Do?

LEG 1

Whenever the vehicle passes through the ETC lane of the Toll Plaza, the Toll Plaza system captures the FASTag details like (Tag ID, TID, Vehicle class, etc.) and sends it to the Acquiring bank for processing.

LEG 2

The Acquiring bank sends a request to the NETC Mapper to validate the tag details.

LEG 3

Once the Tag ID is validated, NETC Mapper responds with details like Vehicle class, VRN, Tag Status etc. If the Tag ID is absent in NETC Mapper, it will respond that the Tag ID is not registered.

LEG 4

After successful validation of Tag ID from NETC Mapper, acquirer host calculates the appropriate toll fare and initiate a debit request to NETC system.

LEG 5

NETC System will switch the debit request to the respective issuer bank for debiting the account of the customer.

LEG 6

Issuer host shall debit the linked tag holder account and sends a SMS alert to the tag holder. The Issuer host shall send the response message to NETC system. If the response is not sent within the defined TAT, the transaction are considered as Deemed Accepted.

LEG 7

NETC system will notify the response to acquirer host.

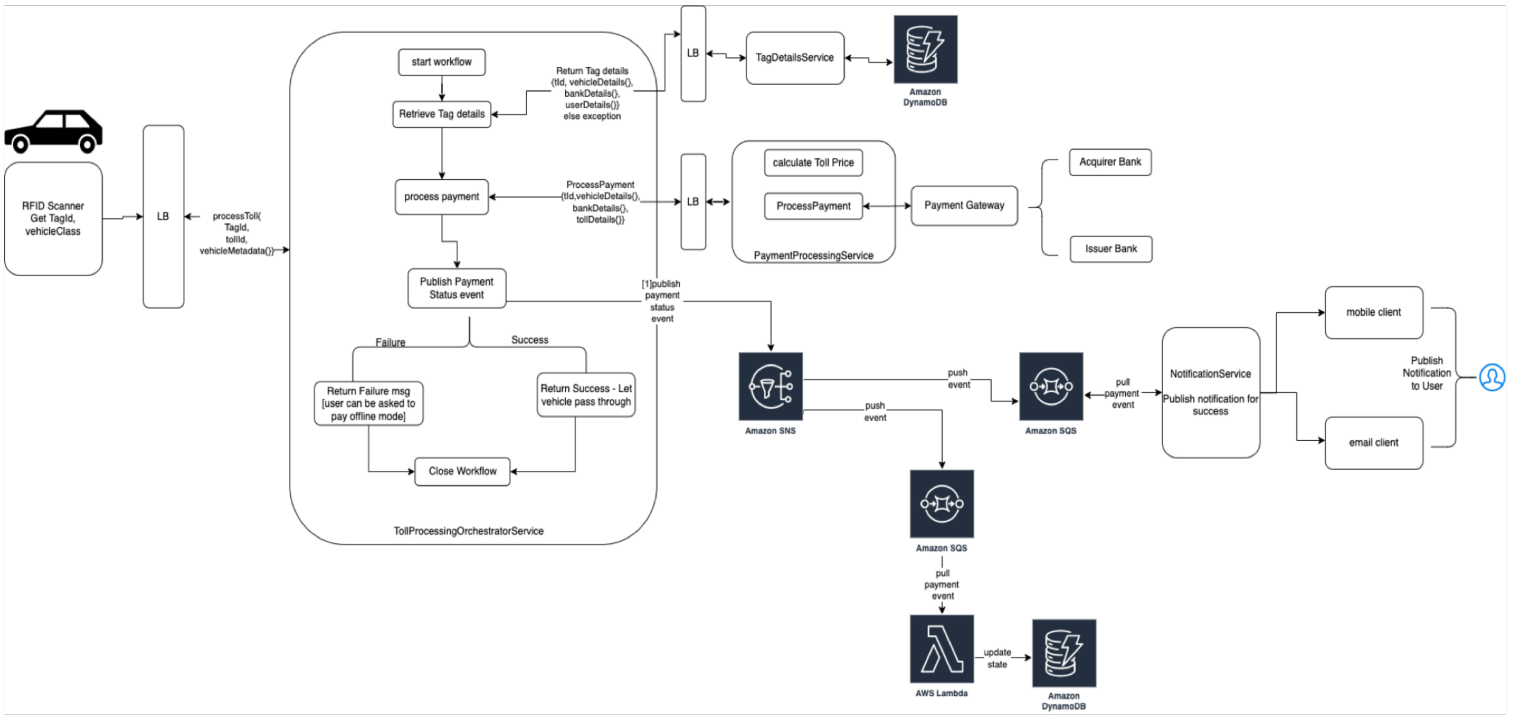
LEG 8

Acquirer host will notify to respective toll plaza system.

How we can actually design this system?

NOTE - ① The system I designed is little different from how it is explained in diagram by NPCI.

② Please share your thoughts if you think of any alternate design in YT video comments or DM me - Instagram - @msdeep14



Major Components -

① TollProcessingOrchestratorService → Orchestrator service built on top of AWS step function to execute set of sequential steps for Fastag processing.

② TagDetailsService → Retrieves tag details basis TagId. It interacts with DynamoDB to retrieve details

Sample Structure -

```
{ tagId - P.K.
  vehicle Details { }
  Bank Details { }
  user Details { }
}
```

③ Payment Processing Service → Process payment from Issuer Bank to acquirer bank.

④ Asyn workflow → process payment states and update state DB.

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* Refer other system design notes from GitHub - github.com/msdeep14/getAheadWithMe