

CONCEPT OF OPERATIONS FOR A ROUTE-BUILDER BASED TOLL ROAD/MANAGED LANES INFORMATION SYSTEM

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DISCLAIMER

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This report is not intended for construction, bidding, or permit purposes. The engineer in charge of the project was Nick Wood, P.E. #117258.

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CONCEPT OF OPERATIONS FOR A ROUTE-BUILDER BASED TOLL ROAD/MANAGED LANES INFORMATION SYSTEM

The following is a Concept of Operations for using a Route Builder, similar to route builders on mapping platforms like Google® and Bing®, to provide users comprehensive information about the tolled and managed lane facilities, operational nature of these systems, and the costs of a proposed trip. This approach would allow multiple tolling agencies throughout Texas to provide their information to a single system, which users can use to plan trips and identify costs for routes that traverse multiple facilities and multiple tolling agencies.

THE ROUTE BUILDER APPROACH

A Route Builder approach would essentially mimic an actual trip on the facility. When a vehicle passes a tolling point on the system, the vehicle's transponder communicates its presence to the toll system. The toll system accesses a database to determine the amount to be charged and assesses the charge to the account associated with the vehicle. For the calculator, the Route Builder will reach a tolling point on the map. The intersection with this tolling point would trigger communication to the toll system's database, which instead of charging the toll to an account, would charge the toll amount to the calculator. A trip involving multiple tolling points would accrue multiple charges. The calculator would tally the charges and provide a total cost for use of the facility.

The Route Builder would operate as follows:

- The Map APIs has tolled facilities mapped and included in their mapping platforms.
- The tolling agency will have transmitted rate and facility information via Feed Specifications (discussed below) to the hosting entity that will be associated with the tolling locations.
- The tolling agency will provide exact locations of tolling locations that line up with the toll route.
- Based on user-entered Start and End Points, the Route Builder API will establish a route.
- If a route passes a tolling point, the Route Builder will capture information associated with that point, including toll costs by payment method and high-occupancy vehicle (HOV) availability, based on the user's inputs.
- The Route Builder will calculate all the individual toll amounts captured on the route and provide the total amount for the trip.
- The Route Builder will display a map of the route with tolling points highlighted.
- The Route Builder will display a set of directional instructions for the trip, which will also contain tolling points passed with their associated toll amounts.

This approach would allow capture of toll information from multiple participating agencies for trips using more than one tolling agency's systems, including potential trips using tolled facilities in multiple metropolitan areas. This proposed Route Builder approach would not only provide cost figures for a proposed route, it would also provide comprehensive trip information, including door-to-door route information. In addition, with future communications between vehicles and road infrastructure, routing cost information could broadcast into a vehicle's navigation system.

USER INTERFACE AND OUTPUT

The proposed system will use a simple user interface requiring minimal inputs:

- The start and end points of the trip.
- The number of axles for the vehicle.
- The vehicle classification type.

The Route Builder will provide the user the following information after running its calculations:

- The total cost of the trip based on payment options.
- A list of all individual tolling point assessments on the trip route.
- Information about HOV availability on the system.
- Complete trip routing information, including non-tolled facilities.
- A corresponding map displaying the route.

DEVELOPMENT OF A TOLL FEED SPECIFICATION FOR DATA TRANSFER

A set of toll feed specifications, similar to a General Transit Feed Specification, will need development to allow for the transfer of toll road information between the tolling agency's system and the Route Builder. These feeds will consist of a static toll feed specification for static rates and a dynamic toll feed specification for dynamic toll facilities.

Data Table

Participating tolling agencies will need to provide data for the feed specifications in a single table format that will contain pertinent information for the Route Builder and toll calculating components. The toll feed specification table would contain the following information:

- Tolling agency operating toll facility.
- Toll facility name.
- Direction of flow.
- Tolling location name.
- Latitude/longitude of tolling location (to line up with the toll route on the mapping platform).

- Time stamp of toll data (with day and time).
- Charge by vehicle classification (if not charged by classification, state N/A).
- HOV charge (if HOV is not operational, state CLOSED; if no HOV exists, state N/A).
- Cash charge (if toll road does not accept cash, state N/A).
- Pay-by-mail charge (if toll road does not have a pay-by-mail feature, state N/A).

Static Feed

The Static Feed Specification will allow tolling agencies operating with static rate structures to upload data tables to the hosting entity's system for integration into the Route Builder. Tolling agencies would only need to load a new table when its policy board approves new rates.

Dynamic Feed

The Dynamic Feed Specification will allow tolling agencies to transmit toll rate data to the Route Builder similar to how it transmits toll rate data from its backoffice system to its road signage. The dynamic specification will include programming that translates the toll rate data from the backoffice system into the feed specification format and facilitate the data transfer to the Route Builder's hosting agency via one of two protocols:

- Fetch – where the tolling agency can either host its data on its webserver and the hosting entity pulls the data every 30 seconds, or
- Push – where the tolling agency automatically uploads its data and specifies the timing of these uploads (recommended at 30-second intervals).

The data, when provided to the Route Builder via one of the Feed Specifications (Figure 1), will feed the route calculations with the toll amounts and other route information that will display on the results screen.

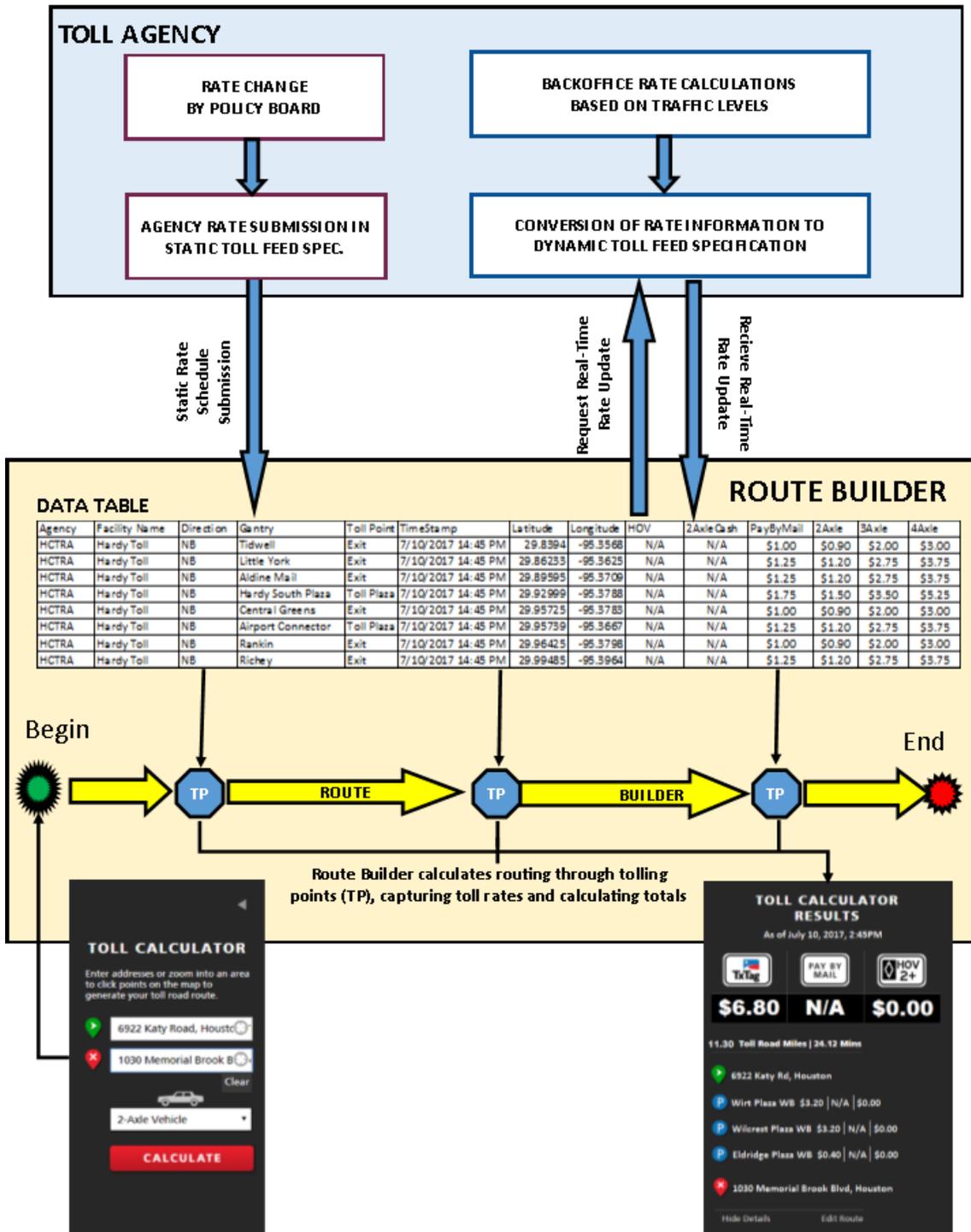


Figure 1. Flow of Route Builder Concept with Feed Specifications.