

Independent Estimate Report:

Transit Scheduling and Dispatching Technology

The purpose of an independent estimate is to provide an understanding of the reasonable price range for the product or service to be procured. This independent estimate is based upon two sources: (1) the quotes submitted in the Request for Information (RFI) process and (2) information from a procurement conducted by the Nebraska Department of Transportation (NDOT) in 2020. Agencies in Nebraska, while generally smaller than those in Tennessee, are currently purchasing software through the NDOT procurement, a procurement which resulted in selection of multiple vendors.

The following analysis was completed to show the range of reasonable costs that could be expected for transit scheduling and dispatching systems similar to the system described in the TDOT RFI System Requirements. Table 1 summarizes the outcome of the analysis and provides the overall estimated cost of a system for each of the three agency sizes addressed in TDOT's RFI. The values provided include the initial implementation and three years of system operation for the core demand response system described in TDOT's RFI. Table 1 provides a per-vehicle unit cost. The table does not attempt to provide a per-vehicle cost for the fixed route module because it is not clear what assumptions the vendors were using when these costs were provided.

Table 1. Summary of Findings from Independent Estimate of Transit Scheduling and Dispatching Software: System Implementation (Core + Options) and Three Years of Service by Agency Size

Agency Size	Demand-Response Package Estimate (3 Years)	Per Vehicle Estimate for Demand-Response Package (3 Years)	Fixed Route Module Estimate per Vehicle (3 Years)
Small systems	\$173,000 to \$306,000	\$8,700 to \$15,300	\$2,100 to \$3,700
Medium systems	\$369,000 to \$653,000	\$5,300 to \$9,300	\$1,700 To \$3,100
Large systems	\$573,000 to \$1,014,000	\$4,800 to \$ 8,500	\$1,400 To \$2,600

The summary data above for illustrative transit agencies was interpolated to provide a high-level per-vehicle estimate for agencies with varying numbers of vehicles. The upper limit of the range was used for interpolation because the prices vary between vendors based on system functionality, vendor support, ease of use, etc. Table 2 allows agencies to look up an estimated cost for three years of core system operation by looking up the number of vehicles operating in maximum service (VOMS) in their fleet in the “#” column. Agencies with over 120 vehicles operating during maximum service should multiply VOMS by the 3-year per-vehicle estimate for a 120-vehicle fleet.

Table 2. Interpolated Estimate of Per-Vehicle Cost for System Operation (Core + Options) for 3 Years of Service for Agencies with Varying Numbers of Vehicles Operating in Maximum Demand-Response Service (#)

#	Per Vehicle	3-Year Price	#	Per Vehicle	3-Year Price	#	Per Vehicle	3-Year Price
1	\$15,300	\$15,300	41	\$12,780	\$523,980	81	\$9,124	\$739,044
2	\$15,300	\$30,600	42	\$12,660	\$531,720	82	\$9,108	\$746,856
3	\$15,300	\$45,900	43	\$12,540	\$539,220	83	\$9,092	\$754,636
4	\$15,300	\$61,200	44	\$12,420	\$546,480	84	\$9,076	\$762,384
5	\$15,300	\$76,500	45	\$12,300	\$553,500	85	\$9,060	\$770,100
6	\$15,300	\$91,800	46	\$12,180	\$560,280	86	\$9,044	\$777,784
7	\$15,300	\$107,100	47	\$12,060	\$566,820	87	\$9,028	\$785,436
8	\$15,300	\$122,400	48	\$11,940	\$573,120	88	\$9,012	\$793,056
9	\$15,300	\$137,700	49	\$11,820	\$579,180	89	\$8,996	\$800,644
10	\$15,300	\$153,000	50	\$11,700	\$585,000	90	\$8,980	\$808,200
11	\$15,300	\$168,300	51	\$11,580	\$590,580	91	\$8,964	\$815,724
12	\$15,300	\$183,600	52	\$11,460	\$595,920	92	\$8,948	\$823,216
13	\$15,300	\$198,900	53	\$11,340	\$601,020	93	\$8,932	\$830,676
14	\$15,300	\$214,200	54	\$11,220	\$605,880	94	\$8,916	\$838,104
15	\$15,300	\$229,500	55	\$11,100	\$610,500	95	\$8,900	\$845,500
16	\$15,300	\$244,800	56	\$10,980	\$614,880	96	\$8,884	\$852,864
17	\$15,300	\$260,100	57	\$10,860	\$619,020	97	\$8,868	\$860,196
18	\$15,300	\$275,400	58	\$10,740	\$622,920	98	\$8,852	\$867,496
19	\$15,300	\$290,700	59	\$10,620	\$626,580	99	\$8,836	\$874,764
20	\$15,300	\$306,000	60	\$10,500	\$630,000	100	\$8,820	\$882,000
21	\$15,180	\$318,780	61	\$10,380	\$633,180	101	\$8,804	\$889,204
22	\$15,060	\$331,320	62	\$10,260	\$636,120	102	\$8,788	\$896,376
23	\$14,940	\$343,620	63	\$10,140	\$638,820	103	\$8,772	\$903,516
24	\$14,820	\$355,680	64	\$10,020	\$641,280	104	\$8,756	\$910,624
25	\$14,700	\$367,500	65	\$9,900	\$643,500	105	\$8,740	\$917,700
26	\$14,580	\$379,080	66	\$9,780	\$645,480	106	\$8,724	\$924,744
27	\$14,460	\$390,420	67	\$9,660	\$647,220	107	\$8,708	\$931,756
28	\$14,340	\$401,520	68	\$9,540	\$648,720	108	\$8,692	\$938,736
29	\$14,220	\$412,380	69	\$9,420	\$649,980	109	\$8,676	\$945,684
30	\$14,100	\$423,000	70	\$9,300	\$651,000	110	\$8,660	\$952,600
31	\$13,980	\$433,380	71	\$9,284	\$659,164	111	\$8,644	\$959,484
32	\$13,860	\$443,520	72	\$9,268	\$667,296	112	\$8,628	\$966,336
33	\$13,740	\$453,420	73	\$9,252	\$675,396	113	\$8,612	\$973,156
34	\$13,620	\$463,080	74	\$9,236	\$683,464	114	\$8,596	\$979,944
35	\$13,500	\$472,500	75	\$9,220	\$691,500	115	\$8,580	\$986,700
36	\$13,380	\$481,680	76	\$9,204	\$699,504	116	\$8,564	\$993,424
37	\$13,260	\$490,620	77	\$9,188	\$707,476	117	\$8,548	\$1,000,116
38	\$13,140	\$499,320	78	\$9,172	\$715,416	118	\$8,532	\$1,006,776
39	\$13,020	\$507,780	79	\$9,156	\$723,324	119	\$8,516	\$1,013,404
40	\$12,900	\$516,000	80	\$9,140	\$731,200	120	\$8,500	\$1,020,000

Project Context

TDOT solicited information from transit scheduling and dispatching software vendors on their products, services, and prices through an RFI. TDOT's intent was to gather information about vendor capabilities and pricing so that Tennessee transit agencies could later purchase software/services through a NASPO contract. TDOT emailed the RFI to 19 vendors, inviting them to submit responses. The full list is attached to this report (Attachment 1). The following list identifies the firms that responded to the RFI.

Vendors Responding to RFI
Ecolane
HBSS
RideCo
Shah
Spare Labs
TripMaster
TripSpark
Via Mobility

The RFI identified information about Tennessee's transit agencies that would be expected to purchase the software, giving vendors an understanding of fleet size and types of operations. It also identified the specific modules and functionalities that Tennessee agencies require and requested information on the availability and cost of each vendor's products meeting these requirements.

The RFI requested information for illustrative systems of three different sizes as each will require different levels of effort to implement and maintain. One objective was the ability to compare apples-to-apples for different sizes of systems. The sizes illustrated below, reflect the Tennessee transit agencies with roughly a third of the agencies falling into each category.

- Small system – 20 demand response vehicles and five user licenses
- Medium system – 70 demand response vehicles and 15 user licenses
- Large system – 120 demand response vehicles and 24 user licenses

The RFI requested information on a variety of modules while identifying that not all systems will require all modules. Requesting information in this manner allows for comparison between vendors. However, it is recognized that individual systems may have different specific requirements that can be addressed via unit prices. The RFI also detailed the required functionality for each module.

Methodology

Evaluating Core System Pricing Using Data from the NDOT and the TDOT RFI

The NDOT procurement provides a good set of data points as it is current (prices were set in February 2020) and agencies are currently purchasing at these prices. Prices were increased by 15% to reflect the inflation between February 2020 and October 2022 based on the U.S. Bureau of Labor Statistics' Consumer Price Index (CPI). The NDOT RFP requested information for (a) system design and planning, (b) implementation, and (c) costs by year for five years. These costs can be grouped in a way that makes it possible to compare. Only the core demand response service module is comparable to the system requirements identified in TDOT's RFI, but this is the largest cost item. Nebraska did not request an app for non-emergency medical transportation (although a customer-facing app was one option) and training was structured somewhat differently. Nebraska requested prices for a simple system for small providers and an advanced system for providers with more complex services. The advanced system bids were used in this analysis as they are more comparable to TDOT's system requirements.

NDOT's procurement asked proposers to submit bids for smaller systems than average Tennessee transit agencies. The vendors were asked to provide a bid for a system with 10 vehicles, requiring 2 user licenses, and that carried an average of 25,000 trips annually. To compare costs with those identified in the TDOT RFI, the NDOT unit prices were applied across the board, built up to reflect comparable bids for systems with the same number of vehicles and user licenses as the small, medium, and large agencies identified in the TDOT RFI.

In comparing pricing between the NDOT procurement and the TDOT RFI, it is important to be aware of additional factors that impact vendors' bidding practices.

- [Bid-Specific Pricing Strategy](#). Software vendors respond to the type and size of systems, the existing market, and even the available funding. Vendors assess what the market will bear, looking at the price points they believe the agencies can justify and what their competition may bid. Because NDOT was paying for 100% of implementation and year 1 costs, TripSpark appears to have front-loaded its costs into the first year in the Nebraska procurement. Their operating costs for subsequent years are on par with other systems that have much lower first-year costs.
- [Market Conditions](#). There have been significant changes in the market for transit technology between the NDOT procurement (February 2020) and the TDOT RFI (October 2022).
 - One vendor for NDOT, Routematch, is no longer in the market. Overall, Routematch had a full-featured product but was at the low end of the price scale, so Routematch tended to draw prices down as other vendors competed with Routematch for contracts.
 - Routematch was the dominant vendor for transit technology in the demand-response sector for many years. Nationwide, many agencies that have been using Routematch are now seeking alternatives. Given the spike in demand for new system implementation, vendors are positioned to charge higher prices today than they were in early 2020. It is a "seller's market," so to speak.

- There is great demand for software developers, so their salaries have risen much more than the overall rate of inflation, resulting in upward pressure on vendor pricing.
- Ecolane, TripMaster, and Passio have formed a partnership with a private equity firm to support research and development. The only observable difference is that Ecolane may have reassessed its market position as their pricing provided to TDOT is noticeably lower than the pricing provided to NDOT.

Evaluating Pricing for a Package of Add-On Modules/Services

In addition to analyzing the cost for the core system, an analysis of reasonable cost was developed for a package of services that might be purchased by Tennessee agencies that included both the core system and the add-on modules/services identified in TDOT's RFI, as shown in Table 3. The standard package does not include the fixed route module, which is evaluated separately.

Table 3. Items Included in the Package for Demand Response Systems

Item	Covers
Scheduling system	Core system with implementation and three-year licensing and maintenance fees
TennCare app	Three years of service
Messaging and reminder calls	Three years
Electronic fare payment	Implementation and three-year licensing and maintenance fees
Remote device management	Three years
Training	New employee onboard training over three years
Custom reports	Additional reports for three years

The items in the system package were not broken out in the NDOT procurement so data from TDOT's RFI was used. The analysis focused on key items rather than all items for which prices were requested in the RFI. If an item was less than about 5% of the purchase price or not likely to be a determining factor in the purchasing decision, it was dropped to make this analysis easier to understand. In each case, the costs for implementation and year one service were combined with two years of ongoing service (identified as year 2 costs in the RFI). Although three years is a short period for such a contract, costs were not solicited for outlying years. This approach spreads the implementation costs over a three-year period.

Several things merit consideration as pricing is compared among vendors.

- Each vendor has a different pricing structure. Some vendors group all required functionalities in a single system cost while others break out the costs by module. Some charge for items like creating extra reports or device management while others do not.
- Although additional detail can be found in the spreadsheet (such as costs per unit on SMS messages), they are not included in the analysis as they were not determined to be a significant factor impacting cost.
- It is also noted that there are critical comments in RFI responses from vendors that describe how costs were calculated or if the systems will assume other costs. These were not included as the purpose of this analysis is only to understand the reasonable cost range.

Evaluating Pricing for a Fixed Route Module

The costs of a fixed route module were considered separately from the other optional services in TDOT's RFI. Note that three respondents, RideCo, Shah, and TripSpark, did not submit pricing for a fixed route module as their core system can provide some basic features. Since they did not provide separate pricing for a fixed route module, they are excluded from the analysis. While the prices submitted by the vendors that did provide pricing specific to the fixed route module are reasonable, transit agencies should carefully consider the details of each vendor's fixed route module functionalities. There are significant differences in functionality among this group of vendors.

While only a few of Tennessee's rural systems will use a fixed route module, there is a significant cost associated with it. There is a significant difference in functionality between a system with a full fixed route module and systems that just allow fixed route vehicles and operators to be tracked using the same functionality as in the core demand response system. A full module can do driver and vehicle run cuts and send all needed information to the NTD reports. A full module is also expected to have the ability to automatically generate automatic vehicle location/general positioning system (AVL/GPS) data to use in real-time technology systems such as those that allow riders to track the location of the bus from a mobile app or a sign at a bus stop. These modules are complex functionality and have a significant cost. The costs, from no extra cost to moderate costs to significant costs, reflect the functionality and ease of use.

Analysis

Cost Estimate for a Core System for Demand Response Service

A summary of core system costs from the NDOT procurement and the information provided via the TDOT RFI process is provided in Table 4. Arrows are provided next to the TDOT RFI prices that indicate if they are higher or lower than the NDOT prices. Additional detail is available in an Excel spreadsheet that differentiates between the cost of initial implementation and ongoing licensing and maintenance costs. Note that the TDOT prices shown here are only for the core demand response system and do not include the add-on modules/services identified in the TDOT RFI.

Table 4. Three-Year Pricing for a Demand Response Core System

NDOT Pricing*				TDOT RFI Prices - DR System Only					
Base System	Small	Medium	Large	DR Base System	Small		Medium		Large
Ecolane	\$251,011	\$661,561	\$946,117	Ecolane	\$87,960	↓	\$273,980	↓	\$460,000
HBSS	\$152,807	\$421,746	\$690,017	HBSS	\$163,394	↑	\$449,960	↑	\$723,279
Passio	\$100,826	\$258,376	\$415,926	RideCo	\$216,000	-	\$775,000	-	\$1,315,000
Shah	\$59,455	\$118,105	\$175,203	Shah	\$81,790	↑	\$156,940	↑	\$215,590
RouteMatch	\$205,200	\$550,085	\$885,483	Spare Labs	\$321,060	-	\$752,520	-	\$1,226,820
TripMaster	\$93,225	\$209,375	\$468,499	TripMaster	\$93,150	↓	\$251,550	↑	\$365,670
TripSpark	\$341,682	\$478,900	\$613,942	TripSpark	\$198,066	↓	\$281,616	↓	\$446,637
Via Mobility	\$241,500	\$770,500	\$1,299,500	Via Mobility	\$433,200	↑	\$1,206,800	↑	\$1,937,800
* Bid Feb 2020, increased by 15% to account for inflation.									
Average	\$180,713	\$433,581	\$686,836	Average	\$199,328	↑	\$518,546	↑	\$836,350
Median	\$179,004	\$450,323	\$651,980	Median	\$180,730	↑	\$365,788	↓	\$591,640

These two sets of data points identify an expected and reasonable range of expenditures for the systems that are being examined. The average and median prices are close for the smallest systems (and indeed, the vendors in Nebraska knew there were a few systems with 20 vehicles) but are not as close when looking at the prices for medium and large systems. This is likely due, in large part, to how the vendors structured their bids in Nebraska. There is a large variation in prices among vendors so transportation providers will need to consider the products that best meet their needs.

To determine a reasonable cost range, the median cost was considered and then the low end of the range was set at [MEDIAN – 35%] and the high end of the range was set at [MEDIAN + 15%]. The median value was used as the measure of central tendency to reduce the impact of outlying values on the result. Notably, the pricing provided by Via was significantly higher than all other vendors, inflating the average cost. Based on this methodology, TDOT could expect prices in the following ranges for the core system only:

Table 5. Cost Estimate for a Demand Response Core System for a Three-Year Period

Agency Size	Demand-Response Core System Estimate (3 Years)	Per Vehicle Estimate for Core System (3 Years)
Small systems (20 Vehicles):	\$117,000 to \$208,000	\$5,900 to \$10,400
Medium systems (70 Vehicles):	\$238,000 to \$421,000	\$3,400 to \$6,000
Large systems (120 vehicles):	\$385,000 to \$680,000	\$3,200 to \$5,700

Cost Estimate for a Package of Services for Demand Response Service

An analysis was performed to estimate a reasonable cost range for a package of services that includes both the core system for a demand response agency and several of the add-on modules included in the TDOT RFI (identified in Table 3). Note that the package of add-on modules does not include the fixed route module, which is addressed separately below. Table 6 through Table 8 present the data used in this analysis for small, medium, and large transit agencies.

Table 6. Three-Year Pricing for a Package of Services for a Small Agency by Vendor

DR - SMALL SYSTEMS	Ecolane	HBSS	RideCo	Shah	Spare Labs	TripMaster	TripSpark	Via Mobility
Base DR System	\$87,960	\$163,394	\$216,000	\$81,790	\$321,060	\$93,150	\$198,066	\$433,200
Tenn Care App	\$17,196	\$18,929	0	\$88,985	0	\$16,200	\$47,813	0
IVR Calls and SMS	\$59,691	\$12,365	0	\$39,170	0	\$10,000	\$49,801	0
Elec. Fare Payment	0	\$28,600	0	\$62,985		\$7,800	\$20,652	0
Remote Device Mgmt	0	\$4,500	0	0	0	\$0	0	\$19,588
Training	\$6,720	\$6,000	\$5,760	\$7,200	0	\$7,200	\$14,400	\$7,520
Custom Reports	0	\$4,725	0	\$13,500	0	\$14,400	\$28,800	0
TOTAL	\$171,567	\$238,513	\$221,760	\$293,630	\$321,060	\$148,750	\$359,533	\$460,308

Table 7. Three-Year Pricing for a Package of Services for a Medium Agency by Vendor

DR - MEDIUM SYSTEMS	Ecolane	HBSS	RideCo	Shah	Spare Labs	TripMaster	TripSpark	Via Mobility
Base DR System	\$273,980	\$449,960	\$775,000	\$156,940	\$752,520	\$251,550	\$281,616	\$1,206,800
Tenn Care App	\$17,196	\$43,613	0	\$94,985	0	\$39,600	\$72,303	0
IVR Calls and SMS	\$59,691	\$35,570	0	\$39,170	0	\$17,510	\$72,481	0
Elec. Fare Payment	0	\$83,200	0	\$94,985	0	\$10,800	\$27,254	0
Remote Device Mgmt	0	\$15,750	0	0	0	\$0	0	\$0
Training	\$6,720	\$6,000	\$5,760	\$7,200	0	\$7,200	\$14,400	\$7,520
Custom Reports	0	\$4,725	0	\$13,500	0	\$14,400	\$28,800	0
TOTAL	\$357,587	\$638,818	\$780,760	\$406,780	\$752,520	\$341,060	\$496,854	\$1,214,320

Table 8. Three-Year Pricing for a Package of Services for a Large Agency by Vendor

DR - LARGE SYSTEMS	Ecolane	HBSS	RideCo	Shah	Spare Labs	Tripmaster	TripSpark	Via Mobility
Base DR System	\$460,000	\$723,279	\$1,315,000	\$215,590	\$1,226,820	\$365,670	\$446,637	\$1,937,800
Tenn Care App	\$17,196	\$72,998	0	\$96,985	0	\$61,200	\$96,794	0
IVR Calls and SMS	\$59,691	\$63,195	0	\$39,170	0	\$30,000	\$97,561	0
Elec. Fare Payment	0	\$148,200	0	\$126,985	0	\$15,000	\$33,855	0
Remote Device Mgmt.	\$0	\$27,000	0	0	0	\$0	0	\$40,006
Training	\$6,720	\$6,000	\$5,760	\$7,200	0	\$7,200	\$14,400	\$7,520
Custom Reports	0	\$4,725	0	\$13,500	0	\$14,400	\$28,800	0
TOTAL	\$543,607	\$1,045,397	\$1,320,760	\$499,430	\$1,226,820	\$493,470	\$718,047	\$1,985,326

Table 9 summarizes the average and median prices for the agency sizes included in the TDOT RFI.

Table 9. Summary of Three-Year Pricing for a Package of Services (Core + Options)

	<i>Small Systems</i>	<i>Medium Systems</i>	<i>Large Systems</i>
Average	\$276,890	\$623,587	\$979,107
Median	\$266,072	\$567,836	\$881,722

Based upon this analysis, Table 10 presents a reasonable expected price range for a package that includes a core system for demand response service and the add-on modules identified in Table 3 (3 years):

Table 10. Cost Estimate for a Package of Services (Core + Options) for a Three-Year Period (Rounded)

Agency Size	Demand-Response Core System Estimate (3 Years)	Per Vehicle Estimate for Core System (3 Years)
Small systems (20 Vehicles):	\$173,000 to \$306,000	\$8,700 to \$15,300
Medium systems (70 Vehicles):	\$369,000 to \$653,000	\$5,300 to \$9,300
Large systems (120 vehicles):	\$573,000 to \$1,014,000	\$4,800 to \$8,500

Pricing for a Fixed Route Module

The optional fixed route module is treated separately in this analysis of reasonable cost. A number of Tennessee agencies do not have a need for the fixed route module or already have a software provider. Additionally, the basis for pricing the fixed route module as an add-on to a core package in the TDOT RFI is less straightforward than other components identified in the RFI's system requirements. The pricing data on which the fixed route module analysis is based is shown in Table 11.

Table 11. Three-Year Pricing for a Fixed Route Module by Vendor

	Ecolane	HBSS	RideCo	Shah	Spare Labs	TripMaster	TripSpark	Via Mobility
Small	\$53,607	\$64,350	n/a	n/a	n/a	\$150,716	\$22,580	\$97,500
Medium	\$155,139	\$187,200	n/a	n/a	n/a	\$239,766	\$28,412	\$215,300
Large	\$264,071	\$266,760	n/a	n/a	n/a	\$405,736	\$32,786	\$354,800

Table 12 summarizes the average and median prices for a fixed route module for each of the agency sizes included in the TDOT RFI.

Table 12. Summary of Three-Year Pricing for a Fixed Route Module (Rounded)

	<i>Small Systems</i>	<i>Medium Systems</i>	<i>Large Systems</i>
Average	\$77,800	\$165,200	\$264,800
Median	\$64,400	\$187,200	\$266,800

Based upon this analysis, the following could be considered a reasonable expected price range for a fixed route module:

Table 13. Cost Estimate for a Fixed Route Module for a Three-Year Period (Rounded)

Agency Size	Fixed Route Module Estimate (3 Years)
Small systems (20 Vehicles):	\$42,000 to \$74,000
Medium systems (70 Vehicles):	\$122,000 to \$215,000
Large systems (120 vehicles):	\$173,000 to \$307,000

ATTACHMENT 1:

Companies That Received an Invitation to Participate in the RFI

1. Uber Technologies, Inc. (Routematch by Uber)
2. Mentz GmbH
3. Trapeze Software Group, Inc. (TripSpark)
4. Via Mobility LLC
5. Foxster Opco, LLC, dba CTS Software (TripMaster)
6. Ineo Systrans USA Inc. (Engie)
7. ETA Phi Systems, Inc dba ETA Transit Systems
8. Moovit, Inc.
9. Optibus, Inc.
10. DPK Systems
11. Ecolane USA, Inc.
12. HBSS Connect Corp. (QRyde)
13. Passio Technologies
14. Shah Software
15. Intelligent Bits
16. Mode Shift
17. KPS Transit
18. Kaizen Health
19. Code Choppers