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YORK REGION TRANSIT
COMPUTER AIDED DISPATCH/AUTOMATIC VEHICLE LOCATION SYSTEM FOR CONVENTIONAL TRANSIT BUSES

The Transit Committee recommends:

1. The presentation by Rajeev Roy, Manager, Transit Management Systems be received; and

2. The recommendations contained in the following report, April 4, 2006, from the Commissioner of Transportation and Works be adopted, subject to amending Recommendation 2 to read as follows:

"2. York Region Transit staff report back to Council in June 2006, such report to include the following information:

(a) The outcome of negotiations with INIT Inc.;
(b) The cost of implementing transit signal priorities at additional locations within the Region of York;
(c) The cost for buses in 2007 given the provincial subsidy programs available; and
(d) The results of investigating alternative products by consulting with other suppliers and transit authorities."

1. RECOMMENDATIONS

It is recommended that:

1. The Region enter into negotiations with INIT Inc., for the installation, integration and testing of a Computer Aided Dispatch and Automatic Vehicle Location system for conventional York Region Transit buses pursuant to the sole source provisions of the Purchasing By-Law.

2. York Region Transit staff report back to Council on the outcome of negotiations with INIT Inc.

2. PURPOSE

The purpose of this report is to seek Council authorization to enter into negotiations with INIT Inc., vendor of the Computer Aided Dispatch (CAD) and Automatic Vehicle Location (AVL) system currently installed on the Viva bus rapid transit service, for the installation of CAD/AVL on conventional York Region Transit (YRT) buses.

3. BACKGROUND

The INIT CAD/AVL system is a widely recognized industry standard system used by many transit agencies. In addition to the York Region Viva bus rapid transit service, INIT has successfully installed their products in more than 250 public transit authorities in ten different countries.

INIT's CAD/AVL system has been in operation in York Region on Viva buses since the initial launch in September, 2005. The INIT in-vehicle system and other components are installed on 85 Viva buses and are operated and maintained by Connex, the Region's contractor. INIT's integrated central system consolidates the various functionalities and other software solutions for analyzing, planning, implementing and improving internal operating processes with the mobile system in the vehicle. The performance of the INIT CAD/AVL system has been very satisfactory and widely appreciated by customers.

The CAD/AVL solution is divided into several subsystems which focus on the specific tasks of the transit service. Each of these components helps to optimize the transit service performance, provides passengers with better service, and increases service reliability in general. INIT's CAD/AVL system provides the following functionalities:

- CAD/AVL system for real-time tracking of vehicles at the transit control centre
- Voice and data communication with vehicles
- In-vehicle variable message sign (VMS) and audio announcement
- Driver public address (PA) system and a covert microphone and emergency switch
- Automatic passenger counters (APC)
- Central data processing and analysis software
- Variable message sign (VMS) at stops displaying next bus arrival information on a real-time basis
- Transit Signal Priority (TSP) at intersections

Extending the above technologies to the conventional buses will enable the provision of a more consistent, reliable and seamless service to YRT customers.

4. ANALYSIS AND OPTIONS

4.1 CAD/AVL System

The INIT CAD/AVL system has already been implemented on the Viva bus rapid transit service. The system provides real-time tracking capability of vehicles from a control centre located at 50 High Tech Road in Richmond Hill. The control centre is operated by Connex dispatchers who closely monitor the service, including schedule adherence and the safety of the passengers and drivers.

Extending the CAD/AVL system and some of its subcomponents to conventional transit buses and operation and maintenance contractors will help to provide enhanced quality of service across all of York Region. The CAD/AVL system will optimize the performance of the service, increase reliability, passenger safety and the economic viability of public transit services.

The conventional transit buses are operated by three operations and maintenance contractors, Can-ar, Laidlaw and Miller. They will manage the respective control centres at their maintenance facilities. At the same time, the service operation and monitoring for the system as a whole will be supervised from the York Region Transit facility at High Tech Road to ensure that quality service is provided.

4.2 Voice and Data Communications with Vehicles

Currently, conventional transit operations and maintenance contractors utilize separate technologies and methods for real-time voice communication between the dispatch office and vehicles. Can-ar utilizes the Telus "Mike" push-to-talk (PTT) system, while Laidlaw and Miller both have private Mobile Radio systems allowing flexible communications.

The INIT system currently on Viva provides an integrated driver public address (PA) system, voice and data communication with the control centre, and a covert microphone and emergency switch. It also provides voice and data communications capability with the control centre using Rogers wireless GPRS network. The voice and data communications system provides the following benefits:

- Clear and precise instructions to drivers
- Better control of the route headway and layover times
- Improved response time between the drivers and dispatchers
- Frequent status updates

This has proven to be a reliable and satisfactory means of communication between the vehicles and the control centre. Therefore, it is proposed to extend the same capability to the conventional transit buses.

4.3 In-vehicle Variable Message Sign and Audio Announcements

Passenger satisfaction and the attractiveness of transit services are increased considerably if reliable and clear passenger information is available on and off the buses. Currently, in-vehicle variable message signs (VMS) and in-vehicle audio announcements are installed on all Viva buses. The in-vehicle VMS displays destination information when the bus is stationary at a stop or terminal. The in-vehicle VMS starts displaying the next stop information when it departs from the stop or terminal. The system makes an audio announcement while approaching the next stop, therefore, the passengers are always aware of the name of the next stop and the destination of the route while in the vehicle

through the VMS and audio announcements. These features are very helpful for visual and hearing impaired passengers.

Therefore, it is proposed to extend the same capability to the conventional transit buses.

4.4 Driver Public Address (PA) System, Covert Microphone and Emergency Switch

The INIT system on Viva provides an integrated driver public address (PA) system, voice and data communication with the control centre, and a covert microphone and emergency switch. The driver PA system also provides the capability of making ad-hoc announcements. The existing conventional buses have the driver PA system, however, being an older system, it will be difficult to integrate it with other functionalities such as voice and data communication to the control centre and automated next stop announcements. Therefore, it is proposed that an integrated PA system be installed on the conventional transit buses.

The INIT system on Viva includes an emergency switch and a covert microphone. In the event of an emergency, the driver has the ability to press an emergency button and the control centre can listen to the on-going activities on the bus through the covert microphone. These are very important components of the system which provide security assurance to the drivers and passengers, and timely emergency calls to police, ambulance and fire departments. Therefore, it is proposed to extend the same capability to the conventional buses.

4.5 Automatic Passenger Counters

All Viva buses are equipped with Automatic Passenger Counters (APC). The APC is an infrared-based detection system which counts boarding and alighting passengers and also classifies them in two different categories, adult and child. The APC system provides the following:

- Automatic transmission and processing of the data recorded
- Convenient options for evaluation over long periods of time
- Calculation of route usage, services and bus stops
- Data export to third party software
- Export and import of data for archiving
- Extrapolation of data from equipped vehicles for fleet surveys

APC data assists the Service Planning and Operations sections of YRT to extract and determine accurate ridership information, which in turn enables reliable planning for the future. Questions like “how many passengers board the bus at certain bus stops”, “what transfer points are most used by customers?”, and “what is the most efficient route?” can be answered reliably by the passenger counting system.

Currently, this information is collected manually by Service Planning. It is estimated that the installation cost of APC would pay for itself over the next five to seven years. Based on the experience of other transit agencies, automatic passenger counters (APC) should be installed on approximately 30% of the conventional transit buses. The buses installed with APC will be rotated on different routes to capture system-wide ridership and on/off information.

4.6 Central Data Processing and Analysis

The Viva system provides comprehensive off-line statistics software, based on Oracle technology, for data analysis of the overall system performance. This extensive reporting and statistics software tool allows for evaluation and analysis with a complete suite of standard reports and views.

4.7 Variable Message Sign (VMS) at Bus Stops

The Viva system provides real-time information about the next bus arrival through a variable message sign (VMS) installed at each stop. Installation of VMS requires a secure equipment module inside which the VMS can be housed. It also requires power at each stop and GPRS connection with the transit control centre for communicating the real-time status of the bus. Approximate capital cost of VMS, equipment module, civil construction, power and communications would be $40,000 - $45,000 per stop, depending upon the site specific requirements. With approximately 3,800 stops for conventional buses, this would be a major capital investment.

Therefore, it is not proposed to install VMS at all bus stops for the conventional transit CAD/AVL system. The VMS currently installed at Viva stops can be used to display real-time information on the conventional buses when the CAD/AVL system is installed on the conventional fleet.

4.8 Transit Signal Priority (TSP)

The Viva system provides the buses with priority (green extension or red truncation) at signalized intersections, depending on how late the bus is operating. The bus transmits a wireless signal which is detected at the intersection, and traffic signal controllers installed at each intersection provide the priority. The traffic signal controller must be designed for this feature to work. For most of the routes on which conventional buses operate, the traffic signal controllers will have to be modified to provide transit signal priority to the buses. The approximate cost of modifying traffic signal controllers would be $15,000 - $20,000 per intersection, depending upon the site specific requirements. The approximate cost of installation of equipment on each bus would be be $2,500.

Therefore, it is not proposed to install TSP equipment on the conventional buses at this time. New buses will be pre-wired for the installation of traffic signal priority equipment and, in the future, if a decision is made to upgrade the traffic signal controllers, installation of equipment on buses could be achieved in a cost effective manner.

4.9 INIT Use in the Transit Industry

INIT Inc. has installed transit CAD/AVL systems, and all of the above mentioned subcomponents, across North America and Europe including some of the following transit properties:

- TransLink – Vancouver, British Columbia
- Houston, Texas
- Albany, New York
- Denver, Colorado
- Copenhagen, Denmark
- London, Great Britain
- Lisbon, Portugal

4.10 Sole Source Justification

It is recommended that YRT enter into negotiations with INIT Inc. for the installation, integration, testing and training of a CAD/AVL system for the Region's conventional transit services. Justification for the sole sourcing of this equipment is outlined below.

4.10.1 Cost Savings

It is expected that the Region would achieve significant savings in terms of cost and time, based on experience with INIT on the Viva project, based on the following examples:

- Approved System Design Documentation (SDD) and testing procedures from the Viva project can be used.
- All proposed in-vehicle hardware and software have been vigorously tested and accepted through the Viva project; hence the Region will save significant time in system testing and acceptance.
- One set of spare parts could be used which will ensure consistency of components throughout the system.
- Savings in terms of project management costs as INIT and YRT teams are familiar with each other.
- Any future upgrades will need to be done on one system only.
- Overall savings in the terms of tendering, contract negotiations, etc.

4.10.2 Operations and Staff Training

The Viva CAD/AVL system has been in operation since September, 2005. Installation of a CAD/AVL system on conventional buses will have the following operational advantages:

- YRT staff are very well acquainted with the system features, capabilities and issues.
- The existing transit control centre could also be used by YRT operations staff.
- YRT staff are fully trained in troubleshooting software and hardware related issues.

Some additional training may be required for the conventional transit operations and maintenance contractors, but no additional training will be required for others using the system.

4.10.3 Proven Technology

By extending the technology already installed on Viva to conventional transit services, the Region will be taking advantage of proven state-of-the-art ITS technology. Adding additional buses with up-to-date technology on conventional transit buses will allow the Region's conventional transit services to provide a consistent and reliable service to its customers.

4.10.4 Existing Interfaces

The CAD/AVL system is required to have an interface with the scheduling system in order for changes in the schedules to be easily implemented. Significant effort has been invested in developing the interface between the Viva CAD/AVL system and the scheduling software used by YRT, which is provided by Trapeze. It is advantageous to procure the INIT CAD/AVL system as the interface has been thoroughly tested and proven, and meets YRT's specific needs.

4.10.5 Traveler Information System

The Viva service provides real-time information about the next bus arrival through a variable message sign (VMS) installed at each stop. These VMSs can be used to display real-time information about the conventional transit buses if the CAD/AVL system is provided by INIT. It will be impossible to use the existing Viva infrastructure if the CAD/AVL system is provided by a vendor other than INIT.

In the near future, YRT will be installing real-time interface between the CAD/AVL system and the traveler information system to provide real-time status to customers. If there are two CAD/AVL systems, the traveler information system would have to interface with two different technologies for real-time information, which would not be feasible.

4.10.6 Central System

All of the central software and hardware is already installed and in operation. The same servers will be used for extending the CAD/AVL system to the conventional transit buses. Only additional software licenses will be required for the CAD/AVL system to handle more buses. Some additional workstations for the conventional transit operators will need to be purchased. Another CAD/AVL system will require additional sets of hardware which will not only increase the installation cost, but also the maintenance cost in the long run.

All in-vehicle hardware and software have been vigorously tested and accepted by the Region, so minimal effort will be required in hardware testing.

4.11 Implementation Plan

Implementation of the CAD/AVL system on conventional buses will require an extensive time commitment from YRT Operations, Service Planning and Transit Management Systems staff. Therefore, it is proposed to phase the implementation over the next three years in order that staff resources can be properly committed to the project, and the capital investment can be staggered.

The project is planned to be implemented in accordance with the following schedule:

1. Phase 1 (Year 2006) - Division 4, Vaughan, Can-ar, approximately 110 buses
2. Phase 2 (Year 2007) - Division 1, Markham and Division 3 Richmond Hill, Miller, approximately 120 buses
3. Phase 3 (Year 2008) - Division 2, Newmarket, Laidlaw, approximately 35 buses

4.12 Relationship to Vision 2026

Vision 2026 includes a goal statement on technology relating to the transformation of communications, service delivery methods and how people will live and work in the future. Installation of the CAD/AVL system on conventional transit buses will help provide enhanced quality of service across all of York Region. The CAD/AVL system will optimize the performance of the service, increase reliability, passenger safety and the economic viability of public transit services.

5. FINANCIAL IMPLICATIONS

The cost of installation, integration and testing of the CAD/AVL system and other associated equipment and training of staff and contractors, is estimated below and includes all license fees and implementation costs:

1. Phase 1 (Year 2006) – Capital - $5,320,000, Operating - $350,000/year
2. Phase 2 (Year 2007) – Capital - $4,420,000, Operating - $300,000/year
3. Phase 3 (Year 2008) – Capital - $2,100,000, Operating - $150,000/year

Sufficient capital and operating funding is contained in the 2006 Business Plan and Budget to complete Phase 1 of this project. Expenditures on Phase 2 and Phase 3 are subject to the approval of subsequent budgets. An agreement with INIT would be drafted so that future expenditures on Phase 2 and Phase 3 are subject to the approval of future budgets.

6. LOCAL MUNICIPAL IMPACT

There is no direct municipal impact associated with this project. It is anticipated that the quality of transit services will significantly improve as a result of the project.

7. CONCLUSION

It is recommended that YRT staff be authorized to enter into negotiations with INIT Inc. for the installation, integration and testing of a CAD/AVL system for conventional YRT buses. Staff will report back to Transit Committee and Regional Council on the outcome of the negotiations.

The Senior Management Group has reviewed this report.