Metropolitan Council

Program Evaluation and Audit

GoTo Regional Fare Collection System

February 14 , 2008

INTRODUCTION

Background

When planning for the implementation of light rail train service, Metro Transit reviewed various fare media options. The Cubic system, with contactless smart cards (CSCs) and proof of payment paper tickets, was selected by Metro Transit to be the new regional fare collection system. The Cubic system will allow Metro Transit to replace several forms of magnetic strip fare media with a contactless smart card referred to as the Go-To Card. The GFI fare boxes on buses continue to accept tokens and cash fares. Some of the highlights of Go-To Card implementation are as follows:

- In 2004, ticket vending machines (TVMs) were placed into service at the light rail stations.
- Metropasses were converted to smart cards in 2005.
- In July 2006, smart cards with stored values were tested. The passengers taking part in the pilot were able to add value to their Go-To cards at the TVMs.
- During April 2007, the stored value Go-To cards were made available to the general public and the cards could be purchased or recharged at the various outlets that sold fare media.
- The ability to use the Go-To Card for a 31 Day Pass became available in June 2007.
- Since October 2007, customers have been able to purchase or recharge Go-To Cards online. Credit card payments are accepted for Go-To Card purchases on-line, by mail, and at the Transit Stores. Credit cards may be used to purchase the proof of payment tickets for the light rail or to recharge Go-To cards at the TVMs.
- As of December 1, 2007 more than 99,000 smart cards had been issued.

In addition to providing fare data the Cubic system also provides detailed ridership data, allowing Transit to collect more detailed information about trip starting and ending locations and commuting patterns.

Appendix A is the Metro Transit GoTo Program Update that was presented to the Transportation Committee of the Council on January 14, 2008, outlining some key features of the program and its implementation.

Purpose

The purpose of this review was to determine whether regional fare and ridership data generated through the Cubic system is accurate, secure and complete. The security of the credit card data handled through Metro Transit was also reviewed. The review identifies potential risks and weakness in controls as well as identifying solutions to mitigate risks and strengthen controls.

Scope

The audit included testing of several operational components of the smart card system. Components tested include retail sales terminals, TVMs, onboard smart card processors, onboard smart card communications with the central computer, transaction management, reporting, and smart card functions. Credit card processes were reviewed as to security of credit card data and accuracy of transactions. System access control and security as well as business continuity plans were also reviewed.

Methodology

Data Collection

Interviews were conducted with:

- Project administrators
- IS staff
- Finance department staff
- Garage operations staff
- Contracted transit service providers

The following were reviewed:

- Contracts with Cubic and Metavante
- Pre and post implementation testing data
- Ongoing issues documentation
- Service level agreements
- Control process documentation
- System access control and security
- Business continuity plan

Testing

- Smart cards, TVMs, retail sales devices, rail smartcard validators and bus smartcard validators to confirm accuracy of transactions
- Credit card purchase processes were reviewed to determine level of controls, speed and accuracy.

Evaluation

The following areas were evaluated during the course of this review:

- Overall accuracy of the system
- Accuracy of key components in reporting revenue, sales and ridership information
- The ability to recover from unexpected shutdowns while maintaining data integrity.
- Security of credit card data.

Assurances

This review was conducted in conformance with *Government Auditing Standards* and the *Standards for the Professional Practice of Internal Auditing* of the Institute of Internal Auditors. Findings are reported to auditee, senior management, the Regional Administrator and Audit Committee of the Council.

OBSERVATIONS

Data Integrity

Audit reviewed over 500 GoTo card transactions along with 2,000 hand held unit (HHU) transactions. The GoTo card transactions were reviewed for completeness. In each case the transaction was traceable within the GoTo card system. There was one instance where a GoTo card was missing a sequence number in the card history. This was the result of the tester swiping the card multiple times on the same bus smartcard validator. In this instance, the transaction went into a suspense account. The card had the correct amount deducted for the fare and the ride was correctly counted as one ride.

Review of the HHU transactions found one rail smartcard validator that was not correctly transmitting information. In this instance the GoTo Stored Value cards had the correct fare taken from the card but the card history did not reflect the transaction and internal sequence number was missing. Review of the rides reported from this rail station found that rides were being correctly recorded. Upon notification of the problem the GoTo system repair staff was able to fix the machine and included it on their ongoing issues to list be addressed buy Cubic staff.

Detailed data points are maintained for every transaction. A limited number of transactions were traced from the GoTo card transaction history to the bus or rail smartcard validator to the ticket vending machine or the retail sales outlet. In all cases reviewed, we were able to trace the data throughout the transaction history.

As part of the ongoing implementation Metro Transit staff is evaluating what their future data needs are so that they can more fully utilize the capabilities of the new system.

Metro Transit has performed extensive testing of each phase and fare tool of the GoTo system prior to implementation. New options were not put into service until they achieved satisfactory results in testing.

Equipment Reliability

The onboard equipment for the GoTo system for buses consists of a GoTo card reader for each vehicle. The Metro Transit Farebox Repair Department maintains detailed records of both GFI fare boxes and GoTo equipment repairs. The fareboxes have approximately 8,000 transactions between failures whereas the GoTo card readers averaged over 15,000 transactions between failures for the last five months of 2007. The time needed to correct malfunctions is also significantly less for the GoTo card readers compared with fareboxes. In many instances, a reboot of the Cubic system resolves a malfunction. In other instances, the equipment is replaced with spares from Transit's stock, ensuring timely return to functionality.

The ticket vending machines now have sufficient history to enable repair staff to plan for regular, preventive maintenance to keep the system and its components in working order. Regular maintenance items can include things like replacing the rollers on the ticket dispensers as they wear.

The hand held units used by the police department for fare enforcement were initially found to be unreliable[1]. The GoTo Business Analyst has been maintaining weekly records of each unit's functionality and any problems or malfunctions that occur. Records show that during the last seven weeks of 2007, there were two machines that were unusable. The last week of the year showed 11 HHUs not reporting data. The machines were rebooted on January 2, 2008 and all but four were then in working order. The devices may now be outdated and the Farebox Repair Department is investigating other alternatives for checking ticket validity during fare enforcement activities.

The suburban providers echoed the results that had been recorded by the fare box repair department. They stated that the reliability of the card readers far exceeds that of the GFI fareboxes. The ease of replacing the readers was also viewed as an efficiency enhancement.

As the equipment remains in use, Metro Transit is looking for cost effective solutions for the future. This is evidenced by the Farebox Repair Department researching and trying to develop cost effective alternatives to replacement parts for the various Cubic equipment.

Security

Cubic Transportation Systems Inc. has root access to our data base server.

Cubic staff has user root access to the Council's database server where Cubic data resides. The user root is the Unix system administrator's account for managing the Unix database server. This account is a superuser administrator account, which is the most privileged account on the Unix database server. The root can create user accounts, grant or revoke privileges from these accounts, startup and shutdown the server, change into any other user on the system, and bypass Unix security. Through one Unix command the root user can become the oracle database user.

The database administrator and system administrator work in concert to assure the Unix server is functioning properly and is secure. The system administrator is responsible for the functioning of the Unix server (hardware, operating system software, security, operating system tuning, and system backups) while the database administrator is responsible for the operations which occur within the database environment. These include at the database level, software, security, performance monitoring and tuning, and database backups. The database administrator should have control over who accesses the database and what level of privileges they have within the database environment. The contractor, Cubic Transportation Systems, Inc., should be allowed only the access defined by the Council's database administrator. Currently, with Cubic staff having root access to the database server, this allows complete and total access to both the database, the server it is running on, and an access point to the Council's network.

A formal process for termination of access rights to NextFare and Hummingbird does not exist.

NextFare is the computer system on which the Council's GoTo cards are managed. Hummingbird is a software reporting tool used by the Council for GoTo system reports.

[1] 2007-A09 Hiawatha Light Rail Ridership and Fare Compliance

In order to access the NextFare and Hummingbird systems, an employee must complete a form which is also approved by their supervisor. The system administrators then create and activate user names and passwords.

On a monthly basis, the GoTo Business Analyst reviews the current list of users and their access rights to the system. In addition, a report is also run that shows where the users have been on the system. Any apparent irregularities are then reviewed to determine if access rights should be changed. In the event that an employee is terminated the employee's supervisor has a checklist which includes turning off access rights to various computer systems. The list does not reference either the Nextfare or Hummingbird systems. In the case of a change in an employee's duties, termination or an employee transfer there isn't a defined process in place to identify the need to change the employee's access rights.

Backup systems have not been tested.

The GoTo Card system is expected to be the major component of the Regional Fare Collection system. As GoTo card options expand, it expected that the majority of riders will use the GoTo card system to pay their fares. At the current time, there has been no comprehensive testing of the ability to bring the GoTo card system up from a hard crash. This type of testing would be done through Cubic Transportation Systems, Inc. until such time as the test lab for the GoTo system is completed at Metro Transit.

Currently backups of the system are regularly scheduled. In addition, the GoTo system equipment can store up to seven days data.

Process for handling fare media purchased with a credit card by mail has an area of risk.

Credit cards may be used for purchases of all fare media. The Council contracts, through a competitive bid process, for the credit card services. International Organizational Standardization standards for financial card transactions were incorporated into both the RFP and the awarded contract.

The system in place for purchasing fare media through the internet, transit stores and ticket vending machines does not allow transit staff to see more than the last four digits of the credit card number. All receipts and computer records blank out all but the last four digits.

There is one type of transaction that bypasses these safeguards. Customers have the option of ordering fare media through the mail. There is a very limited number of customers who order fare media with a credit card via the mail. Review of the processes in place for the mail order credit card orders found one area of risk. While there is limited access to these orders (one of two staff members have access to the information), there is one point in the process where up to eight staff members could access the data without detection. The risk occurs when data is stored in a secured room at Metro Transit. The secured room has limited access (eight employees) and is also under security cameras. The credit card transactions are in a notebook, on a shelf in the secured room. The cameras do not currently cover this space.

Communications

Metropolitan Transit Services (MTS), suburban providers and Metro Transit have communication issues regarding the implementation of the GoTo Card system.

The suburban providers have experienced a high level of GoTo card usage among their passengers. For some providers, more than 70% of their riders utilize GoTo cards. Although the suburban providers have been generally pleased with the implementation of the GoTo Card system, they did have concerns that they did not know who they should contact if they had issues that needed to be addressed. The suburban providers also stated that they were not provided training assistance when the GoTo system was implemented. There was also frustration about the amount of time it took to address some initial issues with the system.

MTS contracts with private carriers for some regional transit service. They expressed a high level of frustration about computer systems that were not ready for implementation when contractors were changed. MTS staff provided audit with some of the emails they sent to Metro Transit concerning the transfer of the service.

Metro Transit, MTS and the suburban providers all felt that they were taking steps to address the outstanding issues. However, there were several issues. Lines of communication for the suburban providers with Metro Transit were unclear and inconsistent. At the same time, MTS conveyed their needs for contracted providers, but did not understand the amount of time needed to fully wire and install equipment at a contractor's garage to fully utilize the Go-To system. The Senior Manager of Revenue Operations for Metro Transit did not have the historical information about what had been promised to the other regional providers prior to his tenure.

The Senior Manager of Revenue Operations at Metro Transit began holding meetings with MTS and the suburban providers to discuss and resolve any issues related to thesystem. These meetings are now held monthly, providing a communication forum to ensure that outstanding issues are resolved for all of the providers in the region.

System Issues

During testing, audit found some issues that were previously identified by Metro Transit, and are part of the GoTo Support Issues list maintained by the Business Analyst. The issues were:

The hand held units display a message of "insufficient value" in cases where the GoTo card was first swiped on a bus. In each of these instances, the card history showed appropriate use of the card. This issue has existed since the HHUs were first used. The police officers are aware of the situation and handle fare validations accordingly.

The rail smartcard validators recognize a 31 day pass with a $1.50 ride value as full payment, during rush hour when the fare is $2.00. If the pass has stored value on the card, the difference is deducted from the stored value for a rush hour ride. If the pass has been set up as both a pass and a stored value card but no longer has any stored value, it will show as "short fare".

Rail ticket vending machines allow customers to purchase downtown zone fares at all stations. This has been identified as a costly fix which will be considered when upgrades and enhancements are made to the system.

In one instance the fare table the driver had set was for “local rush” when it should have been set at “express rush” the device records indicate that the driver caught the mistake and corrected after two stored value cards were used to pay the fare.

The GoTo Support Issues list is used to document all problems that are brought before GoTo Support. This is a complete tracking of who identified the issue, what the issue is, who is responsible for dealing with the issue, the priority of the issue, and whether or not it is an open issue, in process, resolved or closed. Weekly meetings are held internally with staff to review and reprioritize the issues. A teleconference is held with Cubic Transportations Systems, Inc. staff on a weekly basis to address the issues with the contractor.

An electronic room has been created to record and document all system changes.

The Support Services contract with Cubic Transportation Systems, Inc. clearly defines the service level between them and Metro Transit. The IS department is working cooperatively with Metro Transit’s GoTo team to address system and network issues.

CONCLUSIONS

Overall, the GoTo system is functioning effectively. Based on our testing and the results of prior testing that we reviewed, data collected for Go-To users is complete and accurate. In addition, Metro Transit has implemented the system with effective internal and security controls. As each new component is rolled out there exists the possibility that problems may occur. However, at this time, clear, documented processes are in place to address issues as they occur and ensure that the system continues to function within acceptable parameters for accuracy, timeliness and security.

RECOMMENDATIONS

Program Evaluation and Audit recommendations are categorized according to the level of risk they pose for the Council. The categories are:

- **Essential** – Steps must be taken to avoid the emergence of critical risks to the Council or to add great value to the Council and its programs. Essential recommendations are tracked through the Audit Database and status is reported twice annually to the Council's Audit Committee.
- **Significant** – Adds value to programs or initiatives of the Council, but is not necessary to avoid major control risks or other critical risk exposures. Significant recommendations are also tracked with status reports to the Council's Audit Committee.
- **Considerations** – Recommendation would be beneficial, but may be subject to being set aside in favor of higher priority activities for the Council, or may require collaboration with another program area or division. Considerations are not tracked or reported. Their implementation is solely at the hands of management.

1. **Root access to the Council's Cubic server should be terminated for Cubic employees. All access should be coordinated through the database administrator and the Senior Manager for Revenue Operations. (Essential*)***

Cubic staff with root access to the database server can access the database, the server it is running on, and the Council's network. Allowing unrestricted access to the root server could grant the user inappropriate access to Council data. There is also the risk that data could be lost or corrupted. Changes to the system could cause a significant system down time with the potential for permanent loss of data. The Council's network could be compromised by an unauthorized user accessing it through the Council's Cubic server.

Management response:
We agree that access to the system needs to be limited and continuously review the appropriate balance of system access vs. support responsiveness. Database root password access has been utilized by Cubic staff to support the implementation and operations of the Go-To system for over three years as internal staff developed the capacity and expertise to assume control and responsibility for the database support and maintenance. Internal resources now feel confident in supporting the system with Cubic assuming the role of consultant rather than owner. Information Systems personnel have determined it is now appropriate to eliminate this root access for Cubic personnel and will do so as part of the upcoming Database Server Conversion currently scheduled for April implementation.

2. A process should be defined for addressing the termination of a user's rights, if the user is terminated or no longer has a need to access the computer system. (Significant)

A formal process for termination of access rights to NextFare and Hummingbird does not exist.

The NextFare system can be used to add value to GoTo cards, determine number of paid fares and record transactions for the GoTo Cards, the TVMs, the BIVx, BSVs and the RSVs. This information is critical from both revenue and a ridership standpoint. Users have the ability to modify data in the system. When a user no longer has a business need to access the system their rights should be terminated utilizing a documented process.

Management response:
We do agree that System access and responsibilities need to be closely controlled and monitored to ensure system integrity and have been implementing and upgrading processes to ensure the appropriate safeguards are in place and functioning as intended. Nextfare system access is limited to select employees as required by job functions and only provided upon request of the department manager and approval of the Go-To System Owner. The Hummingbird Reporting Tool is provided more widely, but subject to the same approvals, to those internal and external (some Suburban Providers) personnel who utilize the system information for decision making. Hummingbird users are not able to modify, add value or adjust any system data as it is a reporting tool only.

A status change request is included in the "Employee Access Form "used for Fare Collection Systems for manager/supervisor use if a change is necessary. Additionally, The "Fare Collection Systems" termination requirement is being added to the access rights terminated or changed (Network access, Email access etc….) when an employee change form or termination of employment request is processed by the Information Systems (I.S.) department. Information Systems is informed of necessary employee changes via the existing Human Resources Form required for all employee change activity.

3. Mail order credit card information should be secured in a locked container within the secured room at Metro Transit to ensure that only a minimal number of people have access to it. (Essential)

Eight people currently have physical access to the credit card mail order data. The credit card data should have the highest level of security to guard against data loss or theft. Given current camera angles, there is even a risk that one of the eight people could remove credit card information from the notebook without being observed. Although the number of mail order credit card transactions is relatively small, even theft of a single cardholder's information would be a significant breach of security for Metro Transit and would likely damage its credibility with its customers.

Management response:
The mail order forms described in this comment are now secured inside a locked cabinet within the secured storage room. Mail order information for Go-To system utilized the same processes and controls established for other mail order activities (Magnetic Stored Value Cards, Mobility etc…).

4. Metro Transit and the IS department should develop business continuity plans for the GoTo system. The plans should be tested to ensure the ability to continue operations within the shortest timeframe possible. (Essential)

The GoTo Card system is expected to be the most significant component of the Regional Fare Collection system. As GoTo card use increases, it is expected that the majority of

riders will use the GoTo card system to pay their fares. At the current time, there has been no testing of the ability to bring the GoTo card system up from a hard crash. Until Metro Transit's testing lab is fully functional, this type of testing would be done through Cubic Transportation Systems, Inc. Currently, backups of the system are regularly scheduled. In addition, the GoTo system equipment can store up to seven days of data.

There is the risk of losing essential operational and revenue data in the event of a major system crash. This could cause both financial and reputational damage to the Council.

There should be a business continuity plan in place for every major enterprise system. The plan should be tested at least annually and after any major system upgrade to ensure that systems could be restarted in the event of a major emergency where the Transit computer room is not accessible to run it.

Management response:
Business Continuity plans for the Go-To system are included as a principal system necessary for Metro Transit Operations. It is included in the current effort to formalize Business continuity plans across Met Council in cooperation with the consultant services utilized from the office of enterprise technology.

5. Metro Transit should identify the appropriate contacts for the various types of issues with the GoTo card system. (Significant)

The GoTo Card System is a part of the Regional Fare Collection System. The users of the system are Metro Transit, MTS and the suburban providers. The Senior Manager of Revenues is responsible for the GoTo Card System He should identify the appropriate contacts for the various types of issues. If any of the parties feel their issues are not being addressed the best line of communication is to contact the Senior Manager of Revenue directly.

Management response:
Support Contacts were formally communicated to users in February and will be updated and re-communicated if needs or roles should change.

Key Contact information was re-affirmed at the last monthly communication meeting with the Suburban Providers held February 20 as follows:

- *Tom Randall – Overall Responsibility for Go-To/Regional Fare Collection Operations, Systems, Maintenance and Reporting . Contact in case of not knowing where to go or who to ask.*
- *Nick Eull – Fare Collection Equipment Maintenance and Repair (Farebox and Go-To Equipment)*
- *John Harper – Regional Fare Data, Suburban Provider Equipment Planning*
- *Fare Media – Mary Capistrant*

General Support email implemented in 2007: gotosupport @metc.state.mn.us

6. Metro Transit should continue to utilize the GoTo Support Issues process that they have developed. (Significant)

Metro Transit has implemented a structure and communication process to address system issues. The GoTo support issue tracking process provides accountability for dealing with

issues as they arise. The continued use of this process cooperatively with the users, IS and Cubic staff should ensure that issues are identified and addressed promptly and effectively.

Management response:
The process developed to identify, prioritize and address system implementation and operational issues with the appropriate resources and personnel has contributed significantly to the success of the Go-To program expansion. Metro Transit is committed to continuing to utilize this successful format for the foreseeable future.