Regional Transportation Authority

Multi-Modal Information Kiosk (MMIK) Project

Task 1:
Concept of Operations
Technical Memorandum

Revised
November 20, 2002
## Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Revision</th>
<th>Date</th>
<th>By</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Document created</td>
<td>9/16/02</td>
<td>JS/RK</td>
</tr>
<tr>
<td>1.1</td>
<td>Revised based on internal and RTA comments</td>
<td>9/27/02</td>
<td>JS/RK</td>
</tr>
<tr>
<td>2.0</td>
<td>Revisions based on service board meetings</td>
<td>11/20/02</td>
<td>JS/RK</td>
</tr>
</tbody>
</table>
1. Overview

1.1. Introduction and Background

This document describes a Concept of Operations for the Regional Transportation Authority (RTA) Multi-Modal Information Kiosk (MMIK) project. The purpose of this project is to develop a web-enabled information delivery system that will support the region’s multi-modal traveler information system. A kiosk database will provide basic networking of the service boards, RTA and the Gateway Multi-Modal Traveler Information Systems (“Gateway”).

The goals of the initial system deployment are to establish a core system that is consistent with the Regional and National ITS architecture and vision that has been developed for the region. This core system will:

- Provide a kiosk portal to disseminate transit information in the RTA region;
- Establish data connectivity between the RTA and its three Service Boards to automate information flow;
- Incorporate existing systems and functionality, including information from the RTA service boards (e.g. schedules and fares) and existing traveler information tools (e.g. the Itinerary Planning System provided by the RTA’s TIC);
- Provide a foundation for integrating new multi-modal travel information, tourism, or directory sources (within, or outside of, the RTA) as they come online, either as new systems or as extensions to existing systems; and
- Establish an interface to supply data to the Illinois Transit Hub (ITH), consistent with the regional ITS architecture.

Background

The MMIK project was conceived as a method of distributing real time and static information to ‘en route’ or ‘pre-trip’ travelers making inquiries at RTA and service board facilities. The kiosks will allow access to multiple types of information including schedules, maps, real-time service bulletins, general transit information, and trip planning functions.

Benefits of the MMIK project include:

- Providing the ability to answer many frequent customer inquiries in an automated fashion, allowing customer service personnel to focus on more specialized inquiries;
- Reducing customer-waiting times to obtain information. Customers who use the kiosks themselves will benefit by not waiting. In addition, customers who do not
or cannot use the kiosks will benefit from the reduced waiting times that result from other customers’ use of the kiosks.

- Reducing or eliminating the need for the Customer Service Centers (CSCs) to stock paper schedules and maps, because this information can be printed on demand from the kiosks;

- Providing customer access at the CSCs to RTA and service board web-based tools and information, such as the RTA trip planner, transit service bulletins, schedules, maps, and fare information.

- Developing a foundation for service board data integration through the MMIK database as a step towards the eventual development of the Illinois Transit Hub (ITH). This database can provide information to numerous other passenger information systems in the future, and also facilitate sharing of operations data among the service boards and the RTA.

The MMIK project is the first initiative under the Regional Transit ITS Plan (RTIP, 2001) to integrate static and real-time data from the service boards into a shared database for automatic retrieval by a networked application (the kiosks). The MMIK constitutes the first deployment of the Illinois Transit Hub (ITH), identified in the RTIP as ITH1.

The MMIK project will leverage other transit ITS initiatives that are emerging in the region. Each of the RTA service boards has developed, or is in the process of developing, one or more systems that can serve as a source for real-time transit information to the MMIK database. An even larger amount of static information (e.g., schedules, fare information) is also available. Access to these real-time and static data sources is subject to the development of appropriate interfaces and data exchange protocols. A discussion of specific ITS systems and data sources are provided in Section 2 of this document.

The Illinois Transit Hub’s intended function is to coordinate and process data from Northeastern Illinois transit providers. The ITH in turn interfaces with the Gary-Chicago Milwaukee Gateway by way of the multi-modal Illinois Hub (IH). As the facilitating system for integration of transit information, the ITH will be a critical component of the multi-modal Gateway TIS concept.

The MMIK system shall be developed in a manner that is consistent with the National ITS Architecture, the Gary-Chicago-Milwaukee (GCM) Corridor Architecture and its subcomponents, and the requirements of the RTIP, including but not limited to:

- ITH Functional Requirements;
- General Requirements;
- National Standards (NTCIP/TCIP) Compliance;
• Hardware Requirements;
• Software Requirements (COTS and custom ITH); and
• Web Interface Requirements.

The project is organized with two streams of general activity—one phase focuses on design and installation of the kiosk hardware and development of the traveler graphical user interface (GUI), while the other focuses on development of the MMIK Database and the integration of data from the service boards.

1.2. Project Elements

The MMIK Project includes three principal components:

• An **MMIK Database**, including real time and static information from each of the service boards in a single location. The MMIK Database represents the initial data integration phase of the Illinois Transit Hub (ITH) project, known as ITH1.

• Two (2) **RTA Customer Service Center (CSC) Information Kiosks**, that will provide transit schedules published on service board websites and transit itinerary planning through the RTA’s TripsWeb; and

• Four (4) **External Use Information Kiosks**, including consolidated service board information from the MMIK Database, a customized GUI. The kiosk system will serve as the first information ‘appliance’ to utilize the data consolidated under the MMIK Database. In addition, the kiosks at the RTA headquarters will be upgraded to include all access to this database when the external use kiosks are installed.

1.3. Project Timetable and Objectives

The following is a timetable for the phased deployment of the MMIK project covering the project’s Immediate Objectives (by November 1, 2002), Short Term Objectives (by April 2003), and Expansion Plan Objectives (summer of 2003 and beyond) objectives. The Expansion Plan will likely be divided into additional sub-phases to accomplish a full regional build-out and integration of the MMIK Database and kiosks.

**Immediate Objectives (November 2002)**

The objective of the initial system deployment is to establish a core system that is consistent with the Regional and National ITS architecture and the ITH vision. This core system will:
- Provide a kiosk portal to transit information in the RTA region using existing RTA and service board web sites, including information from the RTA service boards (e.g. schedules and fares) and existing traveler information tools (e.g. the RTA’s Itinerary Planning System (IPS));

- Provide two (2) kiosk units to allow customers to retrieve the above information and print service board schedules via a user-friendly kiosk interface that ties together the existing data and information available through the RTA and service board web sites.

**Short Term Objectives (April 2003)**

The short-term objective (i.e., Phase II of this project) is to begin to integrate service board data into the MMIK Database through a combination of automated and manual electronic processes over a real-time network, and to expand the functionality of the information kiosk system.

Other short-term objectives include:

- Establishing data connectivity (static/real-time customer and operations data) between the RTA and its three Service Boards to automate information flow;

- Establishing a central MMIK Database that consolidates available sources of static and real-time data from ITS online by this phase;

- Developing an interface to supply data to the Illinois Hub, consistent with the regional ITS architecture.

- Providing a foundation for integration of new multi-modal travel information, tourism, or directory sources (within, or outside of, the RTA) as they come online, either as new systems or as extensions to existing systems;

- Providing four (4) additional kiosk units for deployment at service board facilities, and upgrade the capabilities of the two existing kiosks in the RTA CSC; and

- Initiating an evaluation period to monitor the performance of the system, the suitability of the hardware, and customer acceptance of the system.

The purpose of the expansion plan for the MMIK database (i.e., beyond the timeframe of the current project) is to provide increased information delivery through integration with other initiatives both inside and outside the RTA, including:

- Build-out of latter phases of the Illinois Transit Hub (ITH2 and ITH3) to provide enhanced integration of service board data as it becomes available;
  - Integration with the Illinois Gateway Hub facilitating information exchange with other transportation providers through the Gateway Multi-Modal Traveler Information Systems (MMTIS).

- Integration of other information of interest to travelers, including;
  - Directions, maps and trip planning information;
  - Tourist and visitor information;
  - Sponsorship and advertising links

- Regional deployment of information kiosks throughout the RTA service area to provide travelers with real-time and static multimodal travel information.
2. MMIK Database

2.1. Existing Data Sources

The data that populates the MMIK system shall be collected from existing and near term planned systems within each of the three service boards. Some of this data is currently delivered to the RTA in a ‘manual’ fashion, i.e. using electronic storage media such as compact disks. Furthermore, some of this data is manipulated manually at the RTA or matched with custom data sets developed at the RTA (an example is the CTA’s stop location database, for which RTA has developed a customized version). The MMIK presents an opportunity to eliminate such manual processes to ensure data consistency across the RTA system.

The following discussion describes existing data sources within each of the service boards, and the information that will be provided to the MMIK system.

Chicago Transit Authority

The CTA is currently developing a data distribution tier known as the ‘CTA Hub.’ This is the assumed channel for all data exchanges between ITH and the CTA. The CTA envisions the development of standardized specifications for many of its data types, including a generic schedule format, though this is seen as a longer-term effort.

Rail Schedule Information

The RSMS system currently exports schedule and schedule adherence data to an Oracle database on the CTA Hub for use by the Active Transit Station Signs (ATSS) System. The ATSS system also makes the enhanced adherence data available to the web via an XML interface.

Bus Schedule Information

The Hastus software is used by the CTA for developing bus and train schedules. Presently, the CTA bus schedule data used in the RTA’s TIC is exported manually to the RTA on a quarterly basis using information from static schedules generated by Hastus. This data is includes timepoint data (not stop level) and is based on a variant of Hastus’ standard vehicle schedule output. Data expiration dates, if included in the data sets, are believed not to be accurate as effective dates because schedule changes are not always predictable.

Minor ‘tweaking’ of schedules occurs through issuance of supervisory guide updates as required. These changes are not usually entered into Hastus, and are used primarily for internal operations purposes (i.e., not distributed to RTA or the public).
Other forms of schedule data, such as crew information, stop IDs, and timepoints, are also available through Hastus exports.

_Schedule Adherence_

The RSMS is an AVL/CAD system covering CTA’s rail operations. It provides AVL capabilities through track sensors, linked with the control center and CAD system via wireline connections. In addition to CAD and AVL, RSMS includes schedule and headway adherence monitoring and extensive service restoration capabilities.

Active Transit Station Signs (ATSS) are variable message signs designed to provide real-time “next train” arrival information in countdown format, as well as transit advisory messages like service delays. Through an interface with the CTA’s automatic train dispatching and monitoring (ATDMS) control and tracking system, ATSS will collect real-time train location and schedule adherence information based off of the active schedule. This information will be displayed on electronic signs to be installed at station entrances and platforms.

CTA’s Buswatch/BSMS system uses Automatic Vehicle Location (AVL) to generate raw time-stamped driver and run status data. This raw data is made available through the centralized distribution tier. This information could be used to calculate schedule adherence; however, the logic does not currently exist to process this data and compare it with trip, block, and static schedule information.

The BusInfo system will be using this raw data to generate schedule adherence data. Adherence will be calculated for every route at a central location, though only specific route information will be displayed on a limited number of electronic signs. This data is only stored for a limited period of time before being overwritten due to the sheer volume of data.

_Service Bulletins and Incidents_

Incident information and detours can be generated at the garage or operations level depending on the timing and severity. Service and incident bulletins are not coordinated at the present time, and not all bulletins are available electronically or in real time. There is, however, a recognized need for standardization and a central data source. Additionally, there are currently no internal procedures to centrally authenticate, format, and approve all types of service bulletins.

A centralized incident management system (Oracle database) is available to bus operations to enter incident information. Expansion of this system to rail operations is planned. The database records event types (bus breakdowns are the most common), as well as operators, routes, runs, missed runs, and other information. Information can be exported from the incident management system to the data distribution tier for use by the...
MMIK system; however, not all incident information is appropriate for public distribution.

Technology penetration at the garage level varies from garage to garage. Historically little communications between the garages and bus operations have occurred electronically. Intranet (e.g., GroupWise email) is available, but the Internet may not be available at all locations for incident data entry.

Minor planned detours and reroutes are often handled at the garage level rather than centrally through Hastus. There is currently not a standard CTA procedure for the creation and distribution of this type of information. The Scheduling Department only becomes involved in such changes if they represent major detours or long-term construction notifications from CDOT or IDOT.

Facility Status Information

The MP2 work order management package is used at the CTA to track maintenance requests and information. Some of this information, such as elevator outages, may be useful to CTA passengers. A newer SCADA system will likely replace the MP2 system within a year. In the long term, it may be beneficial to interface with this system to keep passengers informed about outages and closures involving the physical plant.

Metra

[At the time of writing, information pertaining to existing Metra systems has not been collected in sufficient detail. This section shall be updated following a planned meeting with Metra technical staff.]

Pace

Bus Schedule Information

Pace, like CTA, uses Hastus for bus scheduling. A standard vehicle export file is currently sent to RTA to support the TIC. Schedule updates for the nine Pace operating divisions are staggered and occur at irregular intervals (up to once per month for a given division). RTA maintains a distinct stop file for Pace routes.

Pace is planning a centralized dispatch computer system called the Intelligent Bus System (IBS) that will support physically distributed dispatchers and control AVL, on-board processors, audio and visual information display, and passenger counting functions. The IBS uses manually imported standard and customized Hastus files. IBS data formats are proprietary, though Pace can develop queries to provide external access to the data. The
IBS system is currently being tested at the North Shore garage and will be operational system wide in 2003. ‘Contract routes,’ representing a large part of Pace service, will not be included in IBS.

**Schedule Adherence**

The IBS system creates schedule adherence information for Pace, which is currently shared with the BusInfo application. The BusInfo system is not anticipated to be online until after the conclusion of this initial MMIK project.

Real-time run cancellation information is currently provided to the RTA via telephone call from the garage. Other reporting requirements are completed manually, usually some time after the incident. Pace is seeking ways to automate these processes.

**Service Bulletins and Incidents**

Most passenger bulletins are generated manually by the planning department and forwarded to the webmaster for posting as HTML files. Notices are removed manually upon expiration. Only long-term detours are processed using Hastus. Notices may be general or route-specific, and occasionally include graphics such as maps or schedule tables. Pace can provide an Access-format database listing all current notices and routes affected.

Pace anticipates that the IBS’s recording capabilities will eclipse certain manual procedures for reporting incidents (for non-contract carriers). However, it is not clear at this time exactly what procedures will be implemented once IBS is fully operational.

### 2.2. MMIK Data Integration Needs

The MMIK is part of the Illinois Transit Hub (ITH) that serves as consolidation point for all transit information in northwestern Illinois and facilitates information sharing with other transportation modes. The following diagram illustrates the relationship between the MMIK system and the Multi-Modal Traveler Information architecture flows (as defined in the RTIP), and also the relationship of the MMIK to existing systems that shall serve as data sources in the Short Term.
Regional Interfaces

The deployment of regional inter-agency data and information sharing ITS systems is currently in a preliminary stage, though the RTIP clearly maps the planned interrelationship of transit, highway, and multi-modal ITS systems. The ITH will link with the planned Illinois Gateway Hub to share information with the street/highway information network and roadway event information. Additionally, the ITH will provide the interface with other transportation providers in the region, including Amtrak,
Greyhound, and the DuPage Paratransit Coordinator. The RTA’s existing Trip Planning System is also interfaced directly with the MMIK through the ITH.

Data Provision by the Service Boards

The RTIP identifies that the MMIK and the Illinois Transit Hub interface with each service board via a single portal at each service board (the service board ‘Hub’). The most important benefit of this approach is that all the data is consolidated at a single point within each service board, facilitating exchange of information within each service board. Furthermore, it provides for a complete and more reliable interface as opposed to polling individual sub-systems within the service boards.

Data Standards

To help ensure the integrity of the high-level MMIK Database, it is desired that the MMIK Database uses a single set of standards (NTCIP and TCIP where possible) so that all data adheres to a consistent format at the regional level. However, the development of standards within the RTA is a long-term process, so the MMIK Database must provide the ability to translate service board data into the desired MMIK Database standard. The MMIK Database standards shall be documented in a data dictionary as part of the system design.

The long-term development of common data standards will protect the integrity of regional systems that use shared data in the event of a low-level change in the data format of a particular system. (e.g., changing bus AVL equipment or software.)

2.3. Data Requirements

The RTIP provides a high level description of the categories of data that should be collected by the MMIK database from each of the service boards. These data categories are described using architecture flows from the National ITS Architecture as follows:

Chicago Transit Authority

CTA will provide the following architecture flows to the ITH:

- *Transit and fare schedules* – all static and real time aspects, covering both bus and rail services
- *Transit incident information* – this flow includes reports of bus transit incidents that may impact transportation flows.
- *Transit Management Systems Coordination (TRMS coord)* – Coordination information between local/regional transit organizations including schedule, on-time information, incident information, and ridership.
- *Transit and fare schedules and TRMS coordination* from CTA para-transit contractors, if they need to be switched through the CTA Control Center hub.


- *TRMS coordination and transit and fare schedules* for CTA Paratransit Operators may also be reported, and may be switched to the ITH via the CTA Control Center. These messages may include requests for transfer connection protection for trips involving fixed route connections, and ETA updates for such trips, respectively.

**Metra**

Metra will provide these architecture flows to the ITH:

- *Transit and fare schedules* – all static and real time aspects, and including annulments and late train starts.

- *Railroad Schedules* – scheduled track occupancy and other information to allow forecasting of HRI closures.

- *Railroad Advisories* – Notification of rail incidents or advisories.

- *Transit Management Systems Coordination (TRMS Coord)* – Coordination information between local/regional transit organizations including schedule, on-time information, incident information, and ridership.

- *Parking Information* – occupancy data from Metra Parking Guidance Management Systems (PMGS). This information may be switched through the Metra Hub.

**Pace**

Pace will provide architecture flows that are analogous to those provided by CTA:

- *Transit and fare schedules* – all static and real time aspects, covering both bus and rail services.

- *Transit incident information* – this flow includes reports of bus transit incidents that may impact traffic flow.

- *Transit Management Systems Coordination (TRMS Coord)* – Coordination information between local/regional transit organizations including schedule, on-time information, incident information, and ridership.


The National ITS Architecture defines these architecture flows using more detailed data flows that must be reviewed for relevance to the MMIK. The following paragraphs identify and describe the relevant data flows and provide comments for each in terms of phasing, applicability to each service board, the internal service board sources for the
given data flows and any other implementation related information. An additional relevant data flow has been identified that is necessary for providing complete desired information to travelers but is not specifically part of the architecture flows in the RTIP. This is addressed at the end of the following table.

<table>
<thead>
<tr>
<th>Data flow</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit_fare_data</td>
<td>contains details of the fares being currently charged for transit services.</td>
</tr>
<tr>
<td>Phasing: Short Term</td>
<td></td>
</tr>
<tr>
<td>Applicability to each service board</td>
<td>Applicable to all service boards</td>
</tr>
<tr>
<td>Data sources</td>
<td>No system data sources are available to provide this information. Provide this data through HTML links for the short term.</td>
</tr>
<tr>
<td>Comments</td>
<td>Both standard fare data and temporary special event fare data need to be supported. Fare data is complex and does not adhere to a simple set of standards and is not updated frequently</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data flow</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit_services_for_advisory_data</td>
<td>contains a complete set of all the transit routes and the services that run upon them, including timings, etc. that are provided by the transit fleet. For use in the preparation of driver and traveler advisory information for output on-board vehicles.</td>
</tr>
<tr>
<td>Phasing: Expansion</td>
<td></td>
</tr>
<tr>
<td>Applicability to each service board</td>
<td>This data is targeted at on-board output. It is anticipated that, in the short term, most on-board output will come directly from the service boards’ own systems rather than through the MMIK database.</td>
</tr>
<tr>
<td>Data sources</td>
<td>N/A</td>
</tr>
<tr>
<td>Comments</td>
<td>Not needed in MMIK database</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data flow</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit_services_for_guidance</td>
<td>contains a complete set of all the transit routes and the services that run upon them, including timings, etc. that are provided by the transit fleet from which the data was requested, for use in the preparation of data for output as on-line driver and traveler guidance data.</td>
</tr>
<tr>
<td>Phasing: Short Term</td>
<td></td>
</tr>
<tr>
<td>Applicability to each service board</td>
<td>This data will form the core of the MMIK database for all service boards.</td>
</tr>
<tr>
<td>Data sources</td>
<td>CTA</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pace</td>
</tr>
<tr>
<td></td>
<td>Metra</td>
</tr>
</tbody>
</table>
Comments: Each service board’s system identified above will provide data for normal operations. However, during special events or holidays these systems will not necessarily be updated with actual operations information. A service update data entry tool for collecting this data will need to be provided. The manually collected data will not be as granular as that provided by the system links but should be able to be keyed to user requests.

### Data flow

<table>
<thead>
<tr>
<th>Data flow</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit_vehicle_deviations_details</td>
<td>Contains details of the deviations of transit vehicles from their published routes and schedule.</td>
</tr>
</tbody>
</table>

**Phasing:** Short Term

**Applicability to each service board**

This schedule adherence data is applicable to all service boards. The data includes current performance and predicted arrival times for transit vehicles. The actual data that will be used is divided into two categories: real-time performance of individual routes derived from AVL systems and real-time changes and cancellations to routes and runs based on changing road network conditions.

**Data sources**

- **CTA**
  - Bus: Schedule adherence information from BusInfo. Run cancellations can be retrieved from the incident management system. No current data source for other real-time operational changes.
  - Rail: RSMS
- **Pace**
  - Schedule adherence information from BusInfo.
- **Metra**
  - TIMS

**Comments**

The NITSA data flow deals primarily with vehicle arrival times (achieved and expected) and vehicle locations. Depending on the data available in each system, this may be supplemented with end-user specific data such as current headways or general route status.

---

### Architecture flow: Transit incident information

**Data flow**

<table>
<thead>
<tr>
<th>Data flow</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit_incident_data</td>
<td>Information about an incident that has occurred within part of the transit operations network, e.g. transit stop or mode interchange point. The location and details of the incident will be included in the information, subject to any constraints applied by the transit agency on providing information to outside sources.</td>
</tr>
</tbody>
</table>

**Phasing:** Short Term

**Applicability to each service board**

Applicable to all service boards

**Data sources**

- **CTA**
  - Bus: Incident management system
  - Rail: Future incident management system
- **Pace**
  - No real-time system
- **Metra**
  - No system

**Comments**

Incidents are primarily of interest to travelers if they disrupt service. Service disruptions are not specifically entered into the CTA bus incident management system. A manual data tool supporting short-term, limited impact incidents will be provided.

---

### Architecture flow: Parking information
### Data flow

**Parking_lot_availability** - contains details of the number of spaces available in the lot in response to a previous request for this data. It also contains data on the hours of operation of parking lots.

<table>
<thead>
<tr>
<th>Phasing:</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability to each service board</td>
<td>Primarily applicable to Metra and CTA Rail but will be available for all service boards in the future.</td>
</tr>
</tbody>
</table>
| Data sources | CTA Future Parking management system  
               Pace Future Parking management system  
               Metra Pilot parking management system |
| Comments | The systems will provide real-time availability data as a baseline. The designs of these systems should ensure that the more static information (e.g. total number of spaces, location, hours of operations, etc.) are also made available through the system interface. |

**Parking_lot_price_data** - This data flow contains the prices being charged by each parking lot for each of its spaces, together with the time and date for which they apply.

<table>
<thead>
<tr>
<th>Phasing:</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability to each service board</td>
<td>Applicable to Metra, CTA rail and Pace.</td>
</tr>
<tr>
<td>Data sources</td>
<td>None</td>
</tr>
<tr>
<td>Comments</td>
<td>No system data sources are available to provide this information. Provide this data through HTML links for the expansion term.</td>
</tr>
</tbody>
</table>

#### Architecture flow: Railroad schedules

**Fro_railroad_schedules** - This data flow is sent from the Rail Operations to the Manage Maintenance and Construction function. It contains train schedules, maintenance schedules, and other information from the railroad that supports forecast of HRI closures and assists in maintenance and construction activity scheduling.

<table>
<thead>
<tr>
<th>Phasing:</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability to each service board</td>
<td>Applicable to Metra and CTA rail.</td>
</tr>
</tbody>
</table>
| Data sources | CTA None  
               Metra None |
| Comments | This information is primarily used by public agencies for planning activities and would not be used directly for traveler information. The traveler information related data will likely be sent through the **Transit_vehicle_deviations_details** described above. This data flow will not be implemented as part of the MMIK short term. |

#### Architecture flow: Railroad Advisories
### Data flow: fro_incident_notification

- **fro_incident_notification** - used by a rail operator to notify an ITS traffic management function that a rail incident has been detected that will impact vehicle traffic. This could be an HRI collision incident or merely a stalled train that is blocking an HRI. It could also be a rail incident NOT associated with an HRI, but that may cause abnormal traffic patterns, or blockage of a non-crossing or grade separated roadway.

<table>
<thead>
<tr>
<th>Phasing:</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability to each service board</td>
<td>Applicable to Metra and CTA rail.</td>
</tr>
<tr>
<td>Data sources</td>
<td>CTA: Future rail incident management system; Metra: None; Pace: None</td>
</tr>
<tr>
<td>Comments</td>
<td>This data flow concerns the sharing of rail incidents for incident management purposes. The traveler information related data will likely be sent through the <code>Transit_vehicle_deviations_details</code> described above. This data flow will not be implemented as part of the MMIK short term.</td>
</tr>
</tbody>
</table>

### Architecture flow: TRMS Coord

- **fotrm_transit_services** - This data flow is sent by the other TRM (other transit center) to the Manage Transit function and contains data from the other transit center about services which have an interface into the area covered by services from the local center.

<table>
<thead>
<tr>
<th>Phasing:</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability to each service board</td>
<td>Applicable to Metra, CTA rail and Pace.</td>
</tr>
<tr>
<td>Data sources</td>
<td>CTA: None; Metra: None; Pace: None</td>
</tr>
<tr>
<td>Comments</td>
<td>In the short term, each service board will have access to the MMIK database which will provide real-time status information where available. This information can be used for coordination in the short term.</td>
</tr>
</tbody>
</table>

### Architecture flow: transit system data

- **transit_services_for_demand** - This data flow contains a complete set of all the transit routes and the services that run upon them, including timings, etc. that are provided by the transit fleet from which the data was requested, for use in the calculation of demand forecasts by the Manage Demand facility.

<table>
<thead>
<tr>
<th>Phasing:</th>
<th>Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability to each service board</td>
<td>Applicable to Metra, CTA rail and Pace.</td>
</tr>
<tr>
<td>Data sources</td>
<td>CTA: None; Metra: None</td>
</tr>
<tr>
<td>Comments</td>
<td></td>
</tr>
</tbody>
</table>

### Architecture flow: Other information relating to transit services
2.4 Service Board Interfaces

There are three potential data collection methods for obtaining data automatically from the service boards: direct interface to service board hub, manual data entry and web page retrieval. These three methods are illustrated in Figure 2. and discussed in more detail in the following paragraphs.

<table>
<thead>
<tr>
<th>Data flow</th>
<th>Other static and service data relating to transit services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phasing:</td>
<td>Expansion</td>
</tr>
<tr>
<td>Applicability to each service board</td>
<td>Applicable to Metra, CTA rail and Pace.</td>
</tr>
<tr>
<td>Data sources</td>
<td>CTA Web site</td>
</tr>
<tr>
<td></td>
<td>Metra Web site</td>
</tr>
<tr>
<td></td>
<td>These data would cover items such as station open times, services offered at each station/stop and handicap accessibility. These data are used in the service board web sites and can be extracted on a regular basis if basic tagging information can be adhered to in the web site design.</td>
</tr>
</tbody>
</table>
Figure 2. Service Board Interface Methods.

Direct Interface

Each service board hub to be provided by each service board should provide a portal for retrieving the various data from that system. In the future it is anticipated that all data will be retrieved from these hubs using National Standards protocols and messages sets. However, it is recognized that, in the near term, some modification of source data systems may have to be made to provide data over the network or that some translation of this data will be required. These details will be investigated during the design stage of this project.

Manual Data Recording and Distribution System

There are a number of data elements that are currently manually shared within the services boards, between the service boards and RTA and regionally. The MMIK/ITH will provide on-line data entry, management and distribution tools to allow these data to be recorded, shared and stored as appropriate. The data entry will be via password protected web pages that capture data in a standards compliant format. In addition to
making the data available in the MMIK/ITH database, the tool will also provide the ability for data to be shared with appropriate users or systems by email or by web (including the service board’s own web site if desired.)

Implementation of this aspect of the system will require service board cooperation to ensure:

- Resources are allocated to the data entry task. The task effort will be minimized and, since data is shared with other systems, may allow automation of currently manual notification processes; and

- Data entry makes best use of coded data rather than free text that can be hard to make useful for automated processes.

**Web Page Retrieval**

Some data, such as station open times, is currently made available through the service boards own web sites. Since this data does not change very often and varies in type and quantity between service boards, it is proposed that the data be retrieved from the service board’s web pages by an automated process. In order to achieve this, the service boards will need to agree to correctly tag the relevant information on there web pages and communicate any changes to the location of data or the structure of their web site.

Implementation of this aspect of the system will require service board cooperation to ensure that resources are allocated to maintaining the timeliness and accuracy of the web sites.

**2.5 Data Exchange Architecture**

This section identifies the MMIK data exchange architecture for planned implementation in the short term. This architecture is based on the synthesis of data included in the previous sections which identified: the existing and near term planned service board data sources, the general requirements for MMIK data exchange, the data types to be exchanged and the different methods available for collecting this data. The short term architecture resulting from this synthesis is illustrated in Figure 3.
2.5 System and General Requirements

The RTIP identifies a number of requirements for the ITH that apply to the MMIK database implementation to ensure deployment of a database system that is flexible, scalable, secure, and reliable. These have been summarized in the following paragraphs.

- **Data Acquisition**: Data will enter the MMIK through a secure Internet connection with the data hubs of the respective service boards, including appropriate networking/security (“firewall”) features.

---

**Figure 3.** Short-Term Architecture for MMIK.
Data Validation, Fusion, and Error Detection: The MMIK Database shall include algorithms to ensure that service board/external information is in the proper syntax and within a reasonable data range. Occurrences of deviant data shall be reported to the system administrator or operator. Data shall be filtered and/or fused as appropriate.

Data Storage Subsystem: Data shall be stored in a scalable database that allows the addition of additional data types or sources without altering preexisting data or data-dependent processes.

Data Distribution: Similar to data acquisition, data shall be distributed from the MMIK through a secure Internet connection to service boards, information systems, and external entities.

Monitoring/Logging/Notification: The MMIK Database shall allow for automatic monitoring of its internal processes and report discrepancies to the system administrator. This may include, but is not limited to: communication failures, data validation failures, and non-availability of data sources or recipients. Such occurrences shall be automatically logged.

Administration: Authorized users shall administer The MMIK through a subsystem that permits system configuration, log viewing, and related functions. This includes login authentication, network administration, system start-up and shutdown, data import/export, and communications configuration.

Backups: The MMIK shall provide for redundant storage of data and hardware, to prevent against data loss and maximize system availability, including regular data backups, redundant hardware, and UPS power backup.

Open Systems: The MMIK Database shall employ recognized ITS standards and architecture protocols where available to ensure an open system architecture for all hardware, software, and communications protocols.

Topology: The MMIK shall use a 3-tier client-server configuration to facilitate interfacing with external systems.

Object Orientation: To facilitate scalability, portability, and future system integration, the MMIK Database shall incorporate an object-oriented design.

Security: The system shall protect the integrity of data and of the systems that rely on it by providing login authentication of users, data encryption capabilities, and various levels of data access permission (e.g., read-only) that can vary by user.
• **Accessibility and Reliability:** The system shall be available 24 hours a day, 7 days per week. It should be capable of providing reasonable response times during periods of peak demand for information.

### 2.6 Communications Requirements

• **Use of Existing Links:** This project shall utilize existing communications links established by other projects for all communications needs within the RTA or with the service boards. A communications analysis shall occur as part of the system design to ensure adequate bandwidth is available through the chosen routing.

• **Standards and Protocols:** This project shall utilize standard IP and TCIP protocols where relevant to ensure openness of the system.

• **Kiosks Network Interface:** The kiosk shall be provided with a high-speed (>256k), persistent (“always on”) Internet connection. This connection may be provided through the RTA intranet if desired.
3. Kiosk Hardware and Software Functional Requirements

3.1. Overview

The long-term vision for the multi-modal information kiosks is a regional deployment of units throughout the RTA service area at important transportation and destination nodes. These kiosks will provide access to the integrated data held within the MMIK Database, as well as links to external information sources. Additionally, RTA kiosk content may be provided as content on kiosks owned and operated by others (e.g., Chicago Airport Authority or privately-owned kiosks.)

Within this project, the Phase I and II kiosks will provide limited content based on data available within the existing service board websites and MMIK Database, as described below:

The functional requirements listed here are based on the project goal of “Providing a kiosk portal to disseminate transit information in the RTA region.”

Initial RTA Customer Service Kiosks

The initial kiosks are designed to provide very specific functions using existing information available through a modified version of the current RTA website interface. Those functions are:

- Viewing of trip planning, static information, and service updates available through the RTA website currently, as a self-service customer information aid; and

- Retrieval and printing of RTA service board schedules and maps from the PDF (portable document format, a common web format used by the RTA and service boards for many text/graphics documents posted on the web) format files that are presently provided on the web. This is intended to eliminate the need to stock pre-printed, time-sensitive service board schedules.

External Use Kiosks

The external use kiosks will provide all initial kiosk functionality as well as:

- Retrieval of limited information from the MMIK database based on the availability of data from the service boards at this time; and
• An enhanced kiosk GUI that uses a combination of “kiosk-friendly” service board websites (to eliminate the need for a trackball), and/or more customized kiosk GUI content.

The kiosks from these first two phases, while limited in capabilities, will provide a very important evaluation opportunity, specifically:

• The public acceptance and utilization of the kiosks;

• The presentation/format of data on the kiosk and in the MMIK database; and

• The performance of kiosk hardware, in terms of operations, maintenance, and availability.

An Evaluation Plan shall be developed as part of this project to monitor these and other performance measures.

**User Skills Assumptions**

The MMIK kiosks will be designed to require a minimal set of computer literacy skills. Usage requirements shall be comparable to those required to operate a bank automated teller machine (ATM) machine (e.g., following on-screen instructions and using touch screen buttons).

Because the immediate deployment kiosks deployed at the RTA customer service centers will utilize an as-is version of the RTA on-line trip planner, users will be required to use a trackball and keyboard to access this function. The Short Term phase kiosks will eliminate these features in favor of complete touch screen operation.

User acceptance of the kiosk GUI will be one of the evaluation criteria used to assess this project, and insights from this evaluation may be used to determine if modifications or enhancements to the GUI are required. Additionally, early customer feedback about the RTA Customer Service Center GUI shall be taken into consideration in the development of the Short-Term kiosk GUI.

**3.2. Kiosk Graphical User Interface (GUI)**

The kiosk Graphical User Interface (GUI) must be a simple, user-friendly navigation system that allows unfamiliar users to quickly interpret the functionality of the kiosk and retrieve the desired information in on-screen or (when allowed) printable format.

The Phase I kiosk GUI shall use a modified version of the RTA and service board websites with a simple introductory kiosk overlay menu, as illustrated below (Figure 3):
A short-term goal of the kiosk project is to provide complete touch-screen operation without the need for a keyboard/trackball. This will require modifications to the existing RTA and service board websites to enlarge the active links and buttons, and to eliminate drop-down menus. The required changes to the RTA and service board websites will not be in place prior to the November 1, 2002 initial kiosk deadline; therefore these two kiosks will be required to have a “ruggedized” (wear and abuse resistant) keyboard and trackball.

Alphanumeric entries by kiosk users (e.g., to enter trip planner addresses) will also be facilitated through an on-screen touch keyboard available through a number of kiosk operation system packages.

### 3.3. Kiosk Software

At the core of kiosk implementation is the software, a.k.a. “kiosk operating system,” that provides the presentation to the user and monitors interaction and system status. Most kiosk software has a watchdog feature that monitors usage and system operability. The software contains a menu-driven interface that provides many features including on-screen keyboards for data input, navigation buttons, and directories. There are three possibilities for public access kiosks: Internet, local multimedia/non-Internet, or a combination of both.

The MMIK kiosks are envisioned to be “Internet kiosks.” Internet kiosks are the most popular because they leverage existing websites. All kiosks in the field are easily updated by updating a centralized server. A second option is to store a copy of the web sites locally on the kiosk (called “mirroring”). This speeds the display of information and eliminates the need to have a constant connection to the Internet.

### Kiosk Software Requirements

The software on the user terminals will serve three functional areas: user interface, security features, and administrative features. The software functionality for these three areas is defined in the following subsections.
User Interface

- The software shall support the display of a multi-media, graphic or video loop in a standby mode. Standby mode shall be ended upon detection of user input via keystroke, pointer movement, mouse click, or touch of the terminal screen, at which point the kiosk home page shall be displayed. The software shall revert to standby mode after a customizable period of inactivity.

- The software shall support the browsing of HTML, Adobe, and Macromedia Flash files both from a local drive and via the Internet.

- The software shall hide application menus and any components of the underlying operating system. On-screen buttons for common browsing functions, including “home,” “back,” and “forward,” shall be provided.

- The user interface shall be customizable by the system administrator, allowing specification and modification of buttons, icons, graphics, layout, and colors.

- The software shall support printing of web pages in HTML or Adobe PDF format via the integrated printer. The software shall allow restrictions on printing, such as limiting printing to certain pages. On pages that can be printed, an on-screen button shall be provided that will send the file to the printer.

- The software shall provide the capability for future application enhancement. The kiosk software shall allow seamless linking to and from third-party software applications installed on the kiosk computer.

- The software shall support text-to-speech capabilities, to address ADA requirements. An HTML reader shall be provided that can read webpage text and provide audio feedback for navigation. The audio output from this feature shall be accessible via the audio output jack.

Security Features

- The software shall prevent public users from accessing the underlying operating system directly. It shall be impossible for users to exit the kiosk front-end software. Keyboard commands such as Ctrl-Alt-Delete and Alt-Tab shall be disabled to prevent rebooting of the computer or switching to other programs.

- In the event of lock-up of the kiosk or applications running on the kiosk due to a software crash or hardware failure, the system shall automatically reboot and re-
run the kiosk front-end software. The configuration shall prevent users from accessing the operating system or BIOS settings during boot-up.

- Internet access shall be restricted to an approved set of websites. Users shall not be able to access sites to which these external sites link unless they are on the approved list.

- Users shall be limited to HTTP and SHTTP access to Internet content. Other protocols, such as FTP and Telnet, shall not be accessible by public users.

- All data entered by a user and cookies written to the browser shall be deleted at the end of a user session to prevent subsequent users from accessing this data or personal information of previous users.

- Remote access to the kiosks shall be protected by proper configuration and update of the kiosk operating system. The kiosk software shall include features to prevent unauthorized users getting access to configuration parameters. These features could include account lock-out for failed password attempts and restricting external access to certain IP addresses.

Administrative Features

- Administrative access to the operating system of the kiosk computers shall be allowed via entry of a password via the kiosk keyboard and via an off-site network connection.

- The kiosk software shall maintain a log that tracks all aspects of system usage. This log shall time-stamp all system events and user requests. The log data shall be transmitted on a configurable schedule to central administration software to allow system-wide usage and other reports to be generated.

Operating Requirements

- The browsing software shall be based on Internet Explorer (version 6 or higher) or a browser offering similar functionality and compatibility with the RTA website.

- The software shall run on a PC operating system that can support the required functions and that is compatible with RTA systems.

3.4. Kiosk Hardware

Phases I and II shall use commercial off-the-shelf (COTS) kiosk units that can be procured within a relatively short period. Kiosk hardware for the Phase I implementation
is discussed extensively in a separate technical memorandum, “Phase I Kiosk Evaluation” (September 13, 2002).

The basic requirements of the MMIK Phase I kiosks are as follows:

- **Internet Access:** The kiosks must be able to support Internet access via Ethernet connection.

- **Screen:** A minimum 15” LCD touch screen is required.

- **Keyboard and Trackball:** To permit navigation and data entry in the phase I kiosks until the GUI is fully converted to touch-screen operation in Phase II;

- **Printing:** The kiosks must be able to quickly (approx. 10 pages per minute) print schedules and maps from standard website .pdf files with minimal maintenance requirements. The printer should be integrated into the unit, providing printouts through a slot in the cabinet. Laser printing is preferred for Phase I and II application due to the quality of print and durability of the paper.

- **ADA Compliance:** The kiosk unit shall be ADA compliant based on established guidelines.

- **Cabinet:** A freestanding kiosk unit is preferable to a desktop unit. Extensive cabinet customization is not possible in this phase because of the abbreviated delivery timeline. A ‘stock’ cabinet design, colors, and details will be used as available from the selected vendor.

- **Durability:** A rugged, wear-resistant exterior and hardware that can withstand accidental or deliberate abuse and frequent use by the public, including a lockable cabinet, durable finishes, and heavy-duty touch screens, keyboards, and trackballs.

- **Delivery:** Available on site for testing and configuration by the respective delivery dates (i.e., mid-October for immediate phase).

- **Warranty:** The kiosk shall come with a manufacturer’s warranty, transferable to the RTA, on parts, materials, and workmanship for a period of not less than one (1) year.

A benefit of the phased regional deployment of information kiosks is the ability to evaluate and refine kiosks based on their performance in controlled environments in Phases I and II. Kiosks deployed at unattended locations in the expansion phase may
require additional features such as headphone jacks or Braille instructions to meet the requirements of the Americans with Disabilities Act (ADA).

The RTA may choose to deploy a customized kiosk cabinet for the regional build-out rather than using a COTS product. Custom kiosks can provide a more distinctive image that creates a unique RTA brand identity and blends more harmoniously with the future kiosks’ surroundings. Additionally, the units can be customized to account for special conditions or considerations that are identified during the evaluation or subsequent design activities.

3.5. Kiosk Maintenance

It is assumed that the RTA shall provide routine kiosk maintenance during the evaluation period. This includes replenishment of consumables (printer paper and toner), cleaning, and routine system maintenance to the kiosk hardware. Optional maintenance packages are available from kiosk hardware vendors to provide some of these services.
4. Kiosk Software and Hardware Evaluation

This section compares specific kiosk software and hardware products against the functional requirements outlined above to determine their suitability for the MMIK project. Additional information about specific vendors or vendor products may be found in separate technical memoranda (Phase I Kiosk Evaluation, September 13, 2002; and RTA Initial Kiosk Software, September 4, 2002).

4.1. Kiosk Software Evaluation

Four Commercial Off-the-Shelf (COTS) software packages were evaluated as part of this project: Kiosk-in-a-Box; NetShift; NetKey; and Kudos. The following chart compares the capabilities of each product against the kiosk software functional requirements:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Kiosk-in-a-Box</th>
<th>NetShift</th>
<th>NetKey</th>
<th>Kudos</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>User Interface</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display Multi-Media Standby Loop</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Browsing of HTML, Adobe, Macromedia Flash Files</td>
<td>Yes (allows pdf viewer buttons to be deactivated)</td>
<td>Yes (includes separate PDF viewer)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Customizable buttons, icons, graphics, layout, colors</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (greater programming required to achieve custom functionality)</td>
</tr>
<tr>
<td>Printing of HTML and Adobe .pdf files on integrated printer</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (print dialog appears with pdf files)</td>
<td>Yes (print dialog appears with pdf files)</td>
</tr>
<tr>
<td>Support future application enhancement</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevent public users from accessing OS</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Automatic reboot on system failure</td>
<td>Yes (with external watchdog hardware)</td>
<td>Yes</td>
<td>Yes (with monitored service)</td>
<td>Yes</td>
</tr>
<tr>
<td>Ability to restrict internet access</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Administrative</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access to OS via keyboard or off-site network connection</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Maintain exportable time-stamped log of system usage</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Operating Requirements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Based on MS Internet Explorer or similar compatible with RTA website  | Yes | Yes | Yes | Yes
| Run on a PC operating system (e.g., Windows)  | Yes | Yes | Yes | Yes

**OVERALL SUITABILITY**  
Yes  
Most suitable due to high usage of PDF files in this application  
Yes  
Yes

### Comparison of COTS Kiosk Software Packages to Functional Requirements

Each of the software packages reviewed was able to provide the basic software requirements. However, the detailed implementation within each was different requiring further investigation of the capabilities of each package. NetShift was chosen due to its ability to display PDF files in a full screen window, to hide the PDF viewer tool bar and to provide customizable PDF viewer buttons. These features were not offered by other packages without significant customization.

#### 4.2. Kiosk Hardware Evaluation

A total of seven products from three vendors were evaluated based on the vendors’ industry reputations and ability to deliver COTS solutions within the schedule constraints. These vendors and products are:

- **MontegoNet** (*Barbados* and *Grace Bay* models);
- **Kiosk Information Systems (KIS)** (*KT-125*, *KI-440*, and *KI-808* models); and
- **CeroView** (*CyberTouch* and *Philae* models).

The following chart compares the features of these models against the project functional requirements outlined above. Cost information has not been included in this document because of its proprietary nature.

<table>
<thead>
<tr>
<th>LCD Touchscreen</th>
<th>MontegoNet Barbados</th>
<th>MontegoNet Grace Bay</th>
<th>KIS KT-125</th>
<th>KIS KI-440</th>
<th>KIS KI-808</th>
<th>CeroView CyberTouch</th>
<th>CeroView Philae</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Printing</td>
<td>Available</td>
<td>Included</td>
<td>Available</td>
<td>Available</td>
<td>Available</td>
<td>Available</td>
<td>Available</td>
</tr>
<tr>
<td>Laser Printing</td>
<td>Available</td>
<td>Available</td>
<td>750 sheet</td>
<td>750 sheet</td>
<td>No</td>
<td>No</td>
<td>Only with</td>
</tr>
</tbody>
</table>
### Comparison of Kiosk Hardware to Functional Requirements

According to this evaluation, all kiosk models meet the basic functional requirements of the project except for the MontegoNet Grace Bay, which lacks a keyboard and trackball.
Thermal printing samples were requested from each vendor to determine the level of print quality was sufficient for the specific documents to be printed from the kiosk (i.e., service board schedules, maps, and trip planner output). Upon review of the thermal printing samples, the RTA decided that thermal printing did not provide sufficient print quality, and thus laser printing must be used. This eliminated three additional models: the KIS KI-808 and the two models from CeroView.

Of the three remaining models that support laser printing, only the KIS KT-125 offered a laser printer with large-capacity paper storage (750 sheets). For this reason, as well as cost, aesthetic factors, and the reputation of the unit in transit applications, the KT-125 was chosen as the hardware for the Phase I kiosk deployment.