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TRANSPORTATION
COMMISSION

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June 20, 2005

REQUEST FOR QUALIFICATIONS
Transit Trip Planning Software

Dear Vendor:

The Metropolitan Transportation Commission ("MTC") invites your firm to submit a Statement of Qualifications ("SOQ") describing the functionality of your transit trip planning software relative to MTC's needs. MTC is seeking to replace the transit trip planning software it currently operates and is requesting qualifications from firms that provide currently operational, commercially available transit trip planning software.

This letter, together with its enclosures comprises the Request for Qualifications (RFQ) for Transit Trip Planning Software. Responses to this RFQ should be submitted in accordance with the instructions stated herein.

Request for Qualifications Meeting

A meeting to answer any questions from potential submitters will be held on June 29th at 2:00 PM in the Claremont Conference Room at 1999 Harrison Street, 17th Floor, Oakland, California. Please email or otherwise send written notice to the Project Manager if you are interested in submitting an SOQ but cannot attend the meeting.

Statement of Qualifications Due Date

Interested firms are asked to submit an original and seven (7) hard copies, and one (1) Word copy and one (1) PDF copy of their SOQ on CD, by **4:00 p.m., Wednesday, July 20, 2005.**

MTC Point of Contact

SOQs and all inquiries relating to this RFQ shall be submitted to the address shown below. For telephone inquiries, call (510) 817-3219; fax is (510) 817-3299. E-mail inquiries may be directed to: tspiekerman@mtc.ca.gov.

Thomas Spiekerman
Project Manager
Metropolitan Transportation Commission
Joseph P. Bort MetroCenter
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Background

MTC's trip planning software is part of a system called the Regional Transit Information System (RTIS) developed by MTC to manage transit service data for the transit operators in the nine-county Bay Area and produce inter and intra-agency transit trip itineraries. The trip planning software is described in more detail in *Appendix A,* Current Trip Planning Software and Context.

In August 2005, MTC plans to issue a Request for Proposal (referred to in this RFQ as "the RFP") for an RTIS Project Contractor to design, develop, implement and maintain the RTIS. The RFP will request respondents to propose currently operational transit trip planning software to replace RTIS' current trip planner. MTC will provide information collected through this RFQ as supporting documentation to the RFP.

We anticipate that prospective proposers for the RFP will team with respondents to this RFQ, and we encourage RFQ respondents to join multiple RFP teams, if invited. Firms wishing to respond to the RFP are not required to respond to this RFQ, and firms responding to this RFQ are not precluded from taking additional, appropriate roles in an RFP response.

The RTIS procurement process, including the RFQ and the RFP, is described in detail in *Appendix B*, Regional Transit Information System (RTIS) Project Contractor Procurement.

SOQ Minimum Qualifications and Transit Trip Planning Software Functional Needs

SOQ Minimum Qualifications

For MTC to include your SOQ as supporting documentation to the RFP, a vendor must meet the following minimum qualifications.

1. The vendor must have transit trip planning software currently in use by at least one transit agency or other public agency, preferably in a region with multiple transit operators and modes.
2. The vendor must currently be under contract with a public agency currently using its transit trip planning software application to support and maintain the application.

Trip Planning Software Functional Needs

Appendix C, Trip Planning Software Functional Needs, explains the desired features and functions of the new transit trip planning software system. Because the new trip planning software is expected to be incorporated into the RTIS and use data maintained in the Regional Transit Database (RTD), *Appendix C* also describes the interface and data exchange requirements for the new trip planning software. MTC developed *Appendix C* with input from the RTIS Technical Advisory Committee, made up of transit operator representatives. A firm may submit a response to this RFQ if its software does not include all of the desired features and functions specified in *Appendix C*.

RFQ Schedule and RFP Budget

Schedule

Wednesday, June 29, 2005 @ 2:00 PM	RFQ Q&A Session at Lake Merritt Plaza 1999 Harrison St, Ste. 1700, Oakland Claremont Conference Room
Wednesday, July 6, 2005	Final date for receipt of written questions
Wednesday, July 20, 2005 @ 4:00PM	**Requested date/time for receipt of SOQs**

Budget

There is no budget associated with this RFQ. In the RFP for an RTIS Project Contractor, the budget related to the new trip planning software is anticipated to be as described below. MTC reserves the right to alter these budget figures.

- Approximately $1 million to $1.5 million for acquisition and integration of the new trip planning software, including necessary updates to the Regional Transit Database, and
- Approximately $1 million to $1.3 million per year for RTIS design, development, implementation and maintenance, including ongoing maintenance of the new trip planning software.

Statement of Qualifications Form

Each SOQ shall include:

1. Cover Letter: A cover letter signed by the individual authorized to solicit business and enter into contracts for your firm, including the name, address and telephone number of a contact person, if different from the signatory. The cover letter should also describe the basis for a determination that your firm meets the SOQ minimum qualifications set forth on page 2 of this RFQ.
2. Firm Description: A description of your firm including the firm business functions, the number of years in business, office location(s), and staffed full time employees (FTEs) by functional area. We are particularly interested in the number of staff you employ to support your transit trip planning product(s).
3. Software Overview: A general description of the proposed software product including performance standards, achievement of performance standards, the platforms and operating systems on which it is used, and a summary of the client installations. For each installation location, provide the following information:
   - Location name,
   - Client reference including client agency, contact name/title, phone number and email address,
   - Value and period of performance of your firm's contract,
   - Population of market area,
   - Number of transit operators involved,
   - Number and type of transit modes included (bus, rail, ferry, etc.),
   - Approximate number of routes and stops included,

- How long the trip planner has been live at the location in transit operator call centers and/or on websites serving the general public,
- History of the software at the location, i.e., the implementation schedule and status, customizations/software modifications, maintenance agreements, etc.
- Number and types of interface formats from which data is transferred to the trip planner (e.g., direct manual input, spreadsheet data, automated data exchange), and
- Average number of trip itineraries generated per month.

4. Functional Needs: A completed *Appendix C-1* signed by the vendor, establishing how, and to what extent, the vendor's software meets MTC's functional needs described in *Appendix C*. Respondents should complete *Appendix C-1* electronically to format the table as needed. The Word version is available at http://www.mtc.ca.gov/jobs/.

Because MTC will post SOQs on the Internet, SOQs shall not include any proprietary information that vendors do not wish to make public.

MTC Evaluation

SOQs meeting the minimum qualifications described on page 2 will be posted on MTC's website as resource materials for potential bidders to the RTIS Project Contractor RFP. MTC will not evaluate or rank the information provided in *Appendix C-1*. SOQs submitted past the specified due date may not, at MTC's sole discretion, be provided as supporting documentation to the RFP.

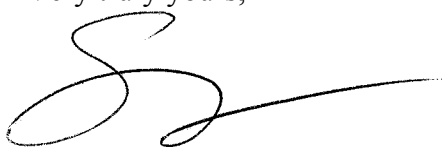
General Conditions

MTC will not reimburse any firm for costs related to preparing and submitting a Statement of Qualifications.

Materials submitted by respondents are subject to public inspection under the California Public Records Act (Government Code § 6250 *et seq*.).

Thank you for your interest.

Very truly yours,



Steve Heminger
Executive Director

Attachments
SH:TS:BL
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Appendix A
Current Trip Planning Software and Context

MTC's Current Trip Planner

To generate inter- and intra-agency transit trip itineraries from the transit data maintained in the Regional Transit Database (RTD), MTC licenses trip planning software (TranStar) from the Southern California Association of Governments (SCAG).

To plan a trip, users access the transit trip planner at 511.transit.org and enter the trip origin and destination, the day and time of the trip, select the fare category and choose user preferences. Users may specify the time of their trip through a number of pre-set choices, such as, "I must arrive at my destination by __:__ AM/PM." User preferences allow users to stipulate the maximum distance they are willing to walk and to ask the system to generate the fastest itinerary, the one with the least number of transfers or the least costly trip. Users may print both an itinerary and map.

MTC is seeking to replace TranStar for the following reasons:

- The application, operating system and hardware platform are obsolete and costly to maintain.
- As new transit agencies are added to the RTIS, TranStar is performing below expectations in its ability to manage multiple large data sets, and
- The system's internal architecture cannot be easily adapted to work with external databases, such as MTC's Regional Transit Database (RTD) and GIS base maps, as improvements are needed,

MTC has been in discussions with agencies in other regions of the country about our mutual interests in trip planning system functionality and future mutual use of the products that result from the future RTIS procurement. We would like to implement a software system that could potentially be used in other regions.

The Trip Planner as Part of the RTIS

The trip planning software is part of a system called the Regional Transit Information System (RTIS) developed by MTC to manage transit data from the Bay Area's transit operators and produce transit itineraries and other transit service information. The central RTIS database currently includes service data for about 25 transit providers. We estimate that there are 60 providers within the region that will someday be included. RTIS includes four key system components:

1. The Regional Transit Database (RTD), which contains the transit service data for transit providers in the nine-county Bay Area;
2. Spatial data and GIS services;
3. A set of software applications, including the trip planner, that displays the data in the RTD as schedules, route information, or interagency transit itineraries on websites and at transit agency telephone information centers; and
4. A communications system to connect the public and transit agencies to the software programs.

RTIS gathers, organizes and disseminates schedule, route and fare information for all public transit services in the region. More information about RTIS, including system diagrams, is provided in *Appendix C,* Transit Trip Planning Software Functional Needs.

The Trip Planner as Part of the Bay Area's 511 Traveler Information Program

The public can access the trip planner by calling 511 or through the Internet at 511.org. When calling 511, the public talks to transit agency telephone operators who provide transit trip itineraries by accessing the trip planner through a streamlined interface with a high-speed, dedicated Frame-Relay connection to the TranStar servers. There are varying levels of usage of the trip planner by the Bay Area's transit operators, depending on their needs, ability to provide data to the system, and perspective on the functionality of the trip planner. At 511.org, a person can access the trip planner directly by selecting "Transit" and then selecting the "511 TakeTransit Trip Planner[SM]."

In addition to transit trip itineraries, the Bay Area's 511 Traveler Information Program provides other transit information as well as traffic, rideshare and bicycle information. While the 511 Program is presented to the customer as a single, comprehensive service, multiple projects (and their corresponding contractors) provide content as well as operational and maintenance support, including:

- Transit – Regional Transit Information System contract with bd Systems;
- Traffic – TravInfo® contract with PB Farradyne; and
- Rideshare and bicycle – Regional Rideshare Program contract with Parsons Brinckerhoff. Other smaller contracts are in place for some portions of bicycle services.

MTC's contract with the current RTIS Project Contractor (bd Systems) expires in June 2006. The scope of the new contract will include on-going maintenance and data update support for RTIS as well as replacing the TranStar transit trip planning application. This RFQ supports the upcoming RTIS Project Contractor procurement by collecting information about the functionality of existing trip planning software applications relative to MTC system needs.

Appendix B
Regional Transit Information System (RTIS) Project Contractor Procurement

Overview

Replacing the transit trip planning software that MTC currently licenses will ultimately be a task of the proposer that is awarded MTC's Regional Transit Information System (RTIS) Project Contractor contract. MTC intends to release a Request for Proposal (RFP) for this contract in August 2005. MTC will provide the information about the functionality of currently operational, commercially available transit trip planning software gathered through this RFQ as supporting documentation to the RFP.

The RFP will seek an RTIS Project Contractor to design, develop, implement and maintain the RTIS, including replacing RTIS' current trip planning software. MTC's intent in issuing this RFQ prior to the RFP is to ensure that RFP respondents have access to information about available transit trip planning software packages. MTC anticipates that firms intending to respond to the RFP will invite RFQ respondents to join their teams. We encourage RFQ respondents to join multiple RFP teams, if invited.

If an RFQ respondent has the capabilities and wants to be a prime bidder to the RFP, MTC would not preclude this arrangement.

RFP respondents may also propose a trip planning software vendor that did not respond to the RFQ if:

A. The software vendor completes an SOQ to be included with the proposal, *and*
B. The SOQ meets the minimum qualifications described on page 2 of the RFQ.

The following section generally describes the RFP process. The anticipated timeline showing the full procurement process is provided in Table B-1.

Request for Proposal (RFP) for a Regional Transit Information System (RTIS) Project Contractor

MTC will issue an RFP for the design, development, implementation and maintenance of the RTIS, including managing the continual data update process, maintaining the central database and website, supporting the hardware and software infrastructure of the project and monitoring the communications network. Firms responding to the RFP may use the SOQs to identify potential software vendors for their proposals.

Firms wishing to respond to the RFP are not required to have responded to this RFQ in order to be eligible to respond to the RFP. In fact, MTC anticipates that the two requests will, for the most part, solicit responses from firms with different areas of expertise.

The project tasks described in the RFP will be grouped into the following project elements:

1. Project Maintenance
2. System Maintenance and Support
3. Database Maintenance and Development

4. Website Maintenance and Development
5. Data Collection
6. Application Development and Support
7. GIS Maintenance and Development

Within the sixth element, "Application Development and Support," the RFP will use a two-step process to ask proposers to recommend a software system to replace the existing TranStar software system used by RTIS.

Step 1: Proposals with Trip Planner "Buy" Recommendations

Under Step 1, the RFP will ask respondents to propose currently operational, commercially available transit trip planning software to replace TranStar. This is referred to as the Trip Planner "Buy" Recommendation, or "Step 1" of the RFP. To facilitate proposers' recommendations, MTC will provide information about different software packages that MTC collected through this RFQ. Proposers should team with software providers to propose an "off-the-shelf" software product. MTC envisions that software vendors will work with the primary RFP respondent to build a responsive proposal based on the commercial, off-the-shelf (COTS) trip planners initially described in their SOQs. MTC will request vendor costs for each functional need described in this RFQ.

MTC will review the Step 1 proposals against the RFP's evaluation criteria to determine if currently operational software substantially meets the functional needs and can be adapted to the RTIS. If yes, MTC will recommend award to a Step 1 proposal.

Step 2: Proposals with Trip Planner "Build" Recommendations

If MTC finds that proposals with the buy recommendations do not best meet MTC's needs, MTC at its sole discretion, may move to Step 2, asking prime proposers to submit proposals with Trip Planner "Build" Recommendations, (i.e., propose how to build a new trip planner software application to meet MTC's needs). All "Buy" proposals from Step 1 will remain under consideration, pending completion of Step 2.

Step 1 proposers are not required to submit a Step 2 proposal, since Step 1 proposals will remain under consideration if MTC moves to Step 2; however, only proposers who submitted a Step 1 proposal are eligible to propose Step 2. A firm that responds to Step 2 will have two proposals under consideration by MTC.

MTC will review the Step 1 and Step 2 proposals against the evaluation procedures set forth in the RFP.

Table B-1 shows the timeline of the full procurement process.

Table B-1 Proposed RTIS Procurement Schedule

Dates are subject to change.

Transit Trip Planning Software RFQ	
Wednesday, June 29, 2005 @ 2:00 p.m.	RFQ Q & A
Wednesday, July 6, 2005	Final date for receipt of questions
Wednesday, July 20, 2005 @ 4:00PM	**Requested date/time for receipt of SOQs**
RTIS Project Contractor RFP	
Step 1	
August 2005	Issue RFP
August or September 2005	Proposer's Conference
September or October 2005	**Receipt of Step 1 proposals**
November or December 2005	MTC Administration Committee Approval if MTC awards following Step 1
December 2005	Execution of contract
Step 2 (if implemented)	
October or November 2005	Request Step 2 proposals
November or December 2005	**Receipt of Step 2 proposals**
December 2005 or January 2006	MTC Administration Committee Approval if MTC awards following Step 2
January 2006	Execution of contract

Appendix C
Transit Trip Planning Software
Functional Needs

Appendix C
Transit Trip Planning Software Functional Needs
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1.0 Overview

This document forms part of MTC's Request for Qualifications (RFQ) that is being distributed to firms with commercially available, operational transit trip planning systems. The RFQ process is an initial step in the procurement of a new transit trip planning system for the San Francisco Bay region.

1.1 Document Scope

The purpose of this document is to describe the desired features and functions of the new transit trip planning system that MTC intends to acquire. Because the new trip planning system is expected to be incorporated into the Regional Transit Information System (RTIS) and use data maintained in the Regional Transit Database (RTD), this document also describes the interface and data exchange requirements for the new trip planning software. MTC developed the functional needs described in *Appendix C* with input from the RTIS Technical Advisory Committee (TAC). The RTIS TAC is made up of transit operator representatives and provides RTIS guidance to MTC.

1.2 Trip Planning Goals and Objectives

Goal 1
Develop the best possible transit trip planning system for the Bay Area.

Objectives:

- Improve the existing trip planner's functionality.
- Improve the existing trip planner's multi-modal trip planning capabilities.
- Maintain a flexible, contemporary operating platform.
- Ensure compliance with industry standards.

Goal 2
Minimize the cost and risks associated with developing, operating and maintaining the trip planning system.

Objectives:

- Share design responsibility and cost with partner agencies.
- Begin simple and add complexity to a proven product.
- Carefully monitor software development and integration.
- Ensure the new system meets high performance standards.

Goal 3
Ensure long-term support and maintenance of the trip planning software.

Objectives:

- Use accepted standards to facilitate technology sharing.
- Create a management structure that ensures expert, long-term, efficient and cost-effective support.

- Develop trip planning software that can be maintained and supported by more than one vendor.
- Share the rights to use the software implemented by MTC with other partner agencies.

1.3 Current Trip Planning Environment

MTC currently uses transit trip planning software called TranStar to provide transit itinerary planning services for the San Francisco Bay Area. The TranStar software, licensed to MTC by the Southern California Association of Governments (SCAG), will be replaced by the new system being procured as a result of an RFP that will be issued in late 2005.

Connections to the existing trip planner are provided through the Internet for the general public and, for telephone information centers, through a private communication network. The general public accesses TranStar through the Internet using Web browsers that connect through MTC's 511 Web Portal (www.511.org) or directly to the Transit Information Website (http://transit.511.org). Telephone operators, working in transit agency information centers, can access the same trip planning system using a custom (Visual Basic) interface. This interface provides some of the larger transit operators with a high-speed, private Frame-Relay connection to the TranStar servers.

When the new trip planning system is implemented, MTC wants to minimize the disruption to the general public and also to telephone operators working in transit information centers. Since the current system has been in place for several years and is widely used, change is likely to create difficulties for many users. Implementation of a carefully laid out transition plan will facilitate the move to the new trip planning system. Likewise, the enhanced features and functions of the new system and the attractive and easy to use interfaces will help make the transition a positive experience for all.

1.4 RTIS Background

The Regional Transit Information System (RTIS) is a set of inter-related components that work together to facilitate compilation, maintenance and dissemination of up-to-date, comprehensive transit information in a user friendly way to the general public and to MTC's transportation partners. The major components of the RTIS include a central, spatially enabled database, a GIS database and services, a website, a transit trip planning system, a process (and tools) for collecting and updating transit information and a communications network.

The central, spatially enabled database used by the RTIS is called the Regional Transit Database (RTD). The RTD serves as the repository for transit service data for a growing number of transit providers in the San Francisco Bay Area (approximately 30 at the current time). Data is updated and maintained in the RTD using tools developed by MTC. MTC and transit agencies work together to update schedule and route data as often as necessary. The RTD can support multiple applications. It provides the data needed by the automated trip planning application (TranStar) to generate custom transit itineraries. Similarly, MTC's Transit Information Website accesses the RTD to dynamically generate route and schedule data maintained in the RTD. The trip planner and the website also access centralized GIS services for geocoding and mapping. The RTIS includes a private wide-area-network (WAN) that links six transit agency telephone information centers to the centralized trip planning application.

1.4.1 Data processing tools

The RTIS includes a number of tools and applications that are utilized by MTC, transit providers and MTC's RTIS contractors (bd Systems Inc. and ACEx Technologies, Inc.) to collect and maintain transit data. Primary among these tools are the:

Data Maintenance Suite (DMS) – An integrated GIS application used primarily by MTC and its contractors to directly edit data entities (routes, patterns, stops, schedules, trips, fares, landmarks, holidays, etc.) within the RTD.

XML Loader/Generator – The XML data transfer process facilitates the export of transit service data from transit agency scheduling software/databases for importing into the RTD. Based on an XML schema developed by MTC, transit agencies create an XML export file that contains comprehensive, inter-related transit service data. One transit agency has been using this process and another is currently implementing it. MTC will expand the use of this XML process to an additional three or four transit agencies in the near future. The XML generator is used to move data from the RTIS maintenance environment to the production environment and can also be used to create an XML file that provides data back to a transit agency.

Transit Stop Maintenance Application (TSMA) – An application developed by MTC and used by small agencies to build, manage and export their route, pattern and stop data to MTC.

Data Exchange Application – Software developed by MTC to import and load data from HASTUS into the RTD. This software has limited use and will eventually be replaced by the XML interface described below.

1.4.2 Conceptual design

The high level RTIS conceptual diagram (Figure 1) shows the various environments of RTIS and how they fit together. The system can be divided into three layers: Public Interfaces, Production Environment (housed at MTC/ABAG computer facilities) and the Maintenance Environment (housed within the contractor's site). As can be seen from the Public Interface section of this diagram, the RTIS website (transit.511.com) supports the 511 system by serving as the transit page for the 511 web portal. The production environment consists of the RTD servers, application servers for itinerary generator (TranStar) and web servers. The maintenance layer shows that the transit data can come in various forms from the transit providers and through various tools/formats depending on the agency. It is compiled, validated and checked in the maintenance RTD before it is transferred to the production environment using the XML loader/generator. Together these three layers form what is collectively referred to as the RTIS.

2.0 General Trip Planning System Requirements

2.1 RTIS Integration

The new trip planning system shall be designed in such a manner that it can be integrated into the existing RTIS data structure. The transit service data needed for itinerary planning is currently maintained and updated in MTC's Regional Transit Database (RTD). The existing trip planning system uses this data source and the new trip planner is expected to access the same

system. In order to support multiple applications, MTC's GIS services (address matching, geocoding and mapping) are maintained as a separate system. The new trip planning system shall also be required to access existing resources for GIS data and services. Detailed interface requirements for the new trip planner are described in Section 7 of this document.

2.2 System Hardware Configuration

The trip planning system shall be compatible with the existing hardware and software environment used by MTC to maintain the RTIS. MTC currently houses the RTIS equipment in the joint MTC/ABAG computing facility located in its MetroCenter facility (101 8th Street in Oakland, California). The logical network layout of the RTIS system is described in Figure 2.

A detailed description of the RTIS physical architecture is described in Figure 3. The servers used to support the RTIS are described in Table 1. The new trip planner is expected to replace the servers currently supporting the TranStar system.

Figure 1
RTIS Environments

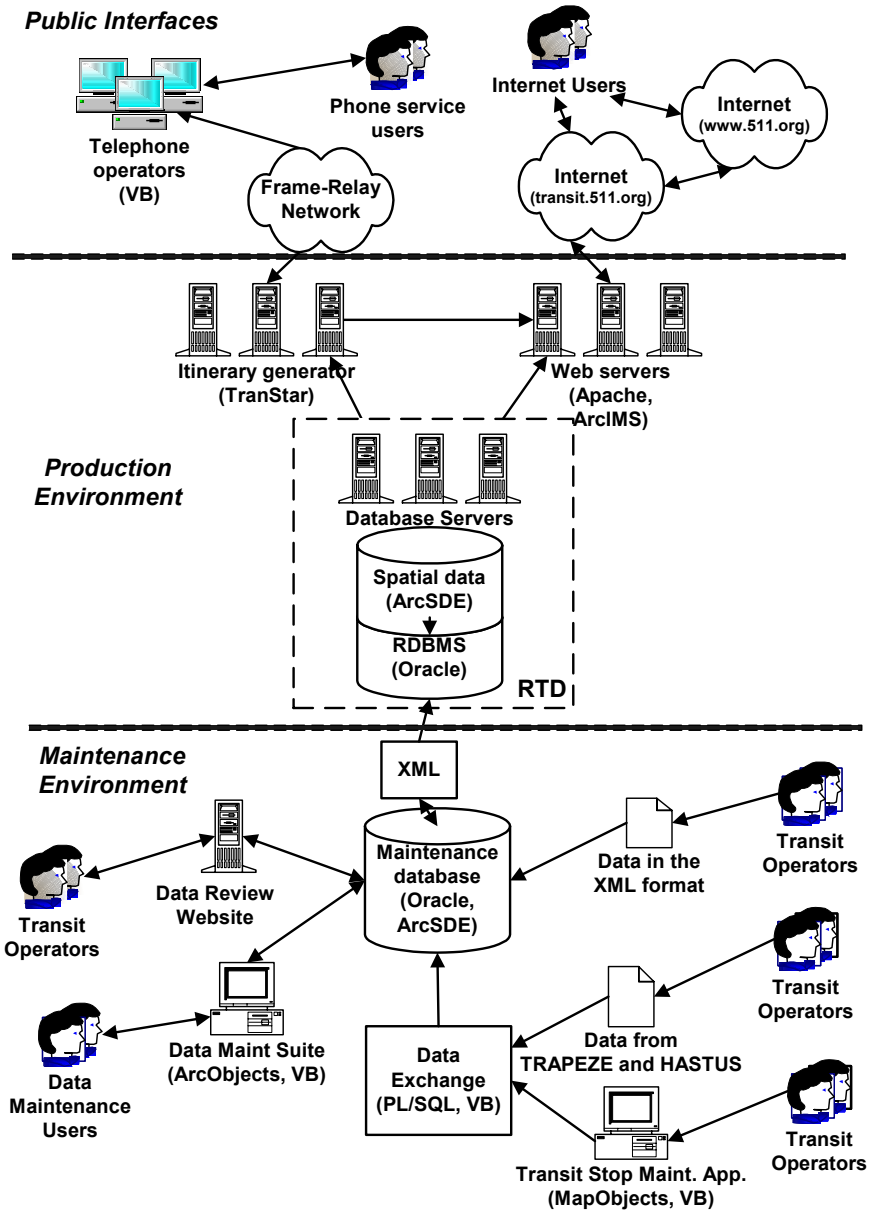


Figure 2
Regional Transit Information System (RTIS)
Logical Network Layout

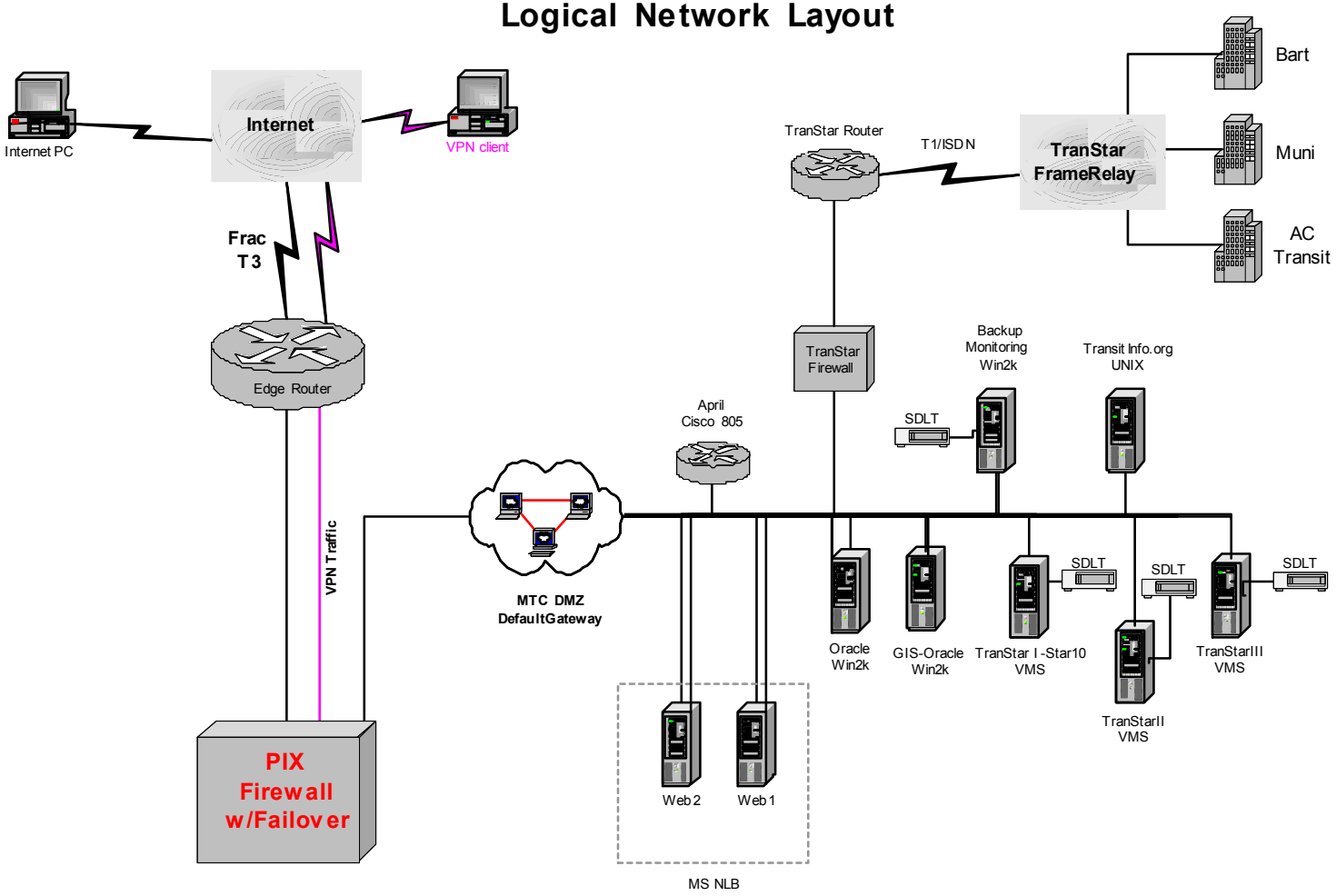


Figure 3

Regional Transit Information System (RTIS)

Physical Architecture

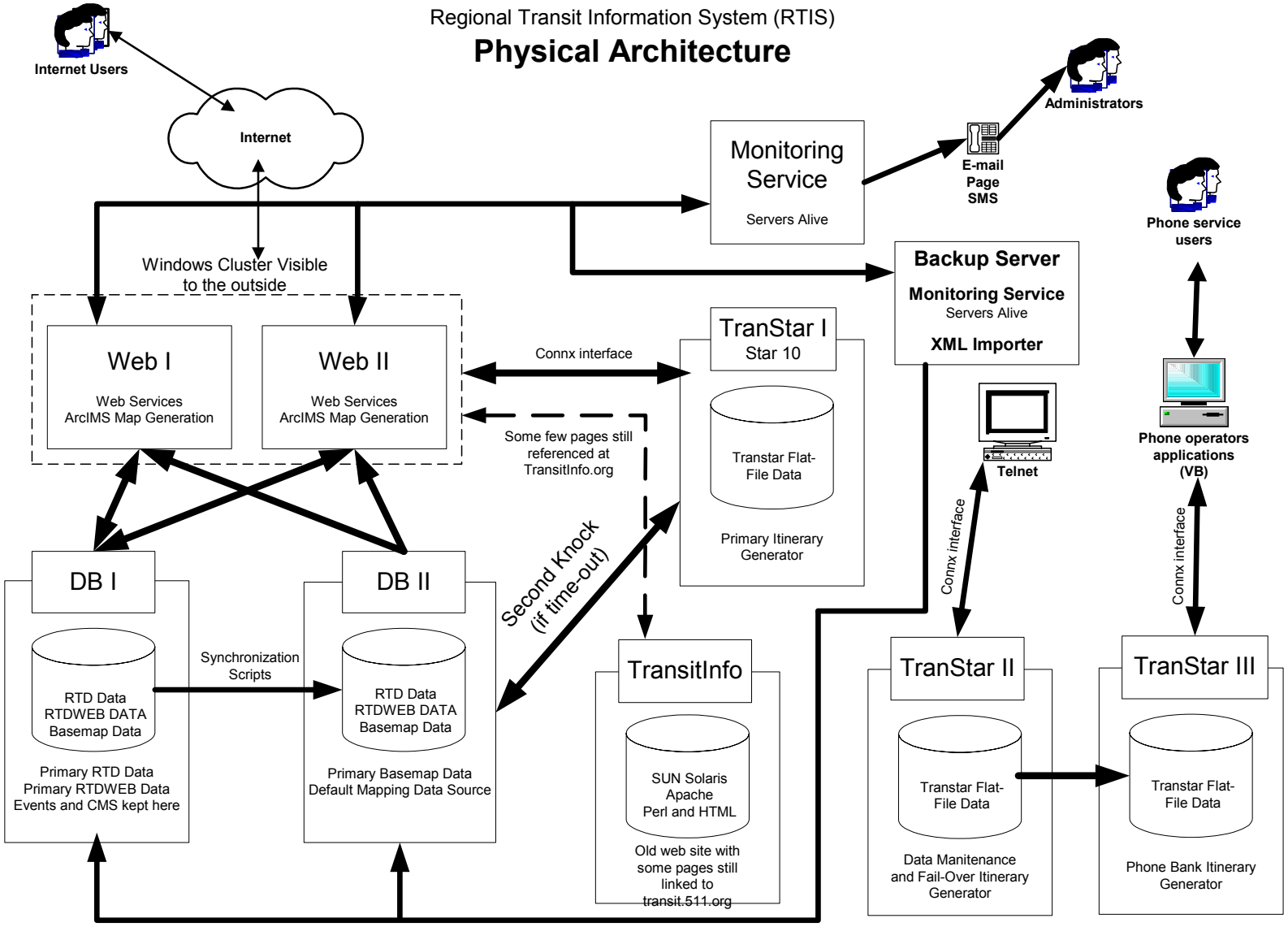


Table 1

RTIS

Server Descriptions

	Operating System	Memory	Disk Storage
TranStar – I (Star10) Primary transit.511.org	OpenVMS v7.3	1Gb	2 x 18.2 Gb System (Shadowed) + 2 x 18.2 Gb Data (Shadowed)
TranStar – II Maintenance and Fail-Over	OpenVMS v7.3	128 Mb	1Gb System + 500Mb Data + 1Gb Data
TranStar – III Phone Banks	OpenVMS v7.3	512Mb	4.2Gb System + 4.2Gb Data

Machine	OS	CPUs	Memory	Disc (data only)
DB-I	Windows 2000 Server	2 x 700 MHZ P4	2GB	4 x 9GB unmirrored
DB-II	Windows 2000 Server	2 x 3 GHz Xeon	4GB	2 x 70GB mirrored

Machine	OS	CPUs	Memory	Disc (data only)
Web-I	Windows 2000 Server	2 x 3 GHz Xeon	2GB	12GB System 22GB Data
Web-II	Windows 2000 Server	2 x 3 GHz Xeon	2GB	12GB System 22GB Data

Machine	OS	Processor	Memory
Backup Monitoring	Windows 2000 Server	4 processors Pentium III 500MHz	2GB

2.3 Web Access

The transport medium for accessing the regional transit trip planner shall be the Internet. All trip planner interfaces shall be browser-based and written to World Wide Web Consortium (W3C) standards and not limited by the requirements of Microsoft's Internet Explorer (IE). For telephone information centers and other users requiring secure connectivity, the trip planner shall also be accessible through a secured web interface.

2.4 User Interfaces

Although the general public is expected to be the primary user of the trip planner, telephone operators working in transit agency information centers will also be heavy users of the system. Because the needs of these two groups are different, the trip planner shall provide distinct browser-based interfaces that are designed, configured and optimized for the particular user group. MTC also wants to develop a trip planning interface that can be licensed to agencies or businesses that maintain their own Websites (e.g., the San Francisco, Oakland and San Jose airports) and wish to provide trip planning services through a browser window residing on their own Websites. All interfaces shall access the same central trip planning software and present itinerary information in a uniform manner.

While the interface screens may look different, the input requirements for all shall essentially be the same. Likewise the output (the itinerary information) generated by the trip planner shall also be the same in content. Any differences between the interfaces shall be limited to how the design and screen layout of the interfaces are optimized for quick comprehension and ease of use by the major user groups.

2.4.1 Trip Planner Interface for the General Public

In the same way that it is done today, the general public will access the regional trip planner through an Internet interface residing on MTC's 511 traveler information system. Regardless whether the system is being accessed by a first-time transit user or by a transit regular, the screens viewed by the public shall be designed for clarity, quick comprehension, ease of use and efficient access to the desired information.

2.4.2 Interface for Transit Agency Customer Information Centers

Because telephone operators in transit information centers are constantly using the trip planner to provide travel information to the public, the layout and design of these screens shall be optimized for performance and streamlined for high volume, repetitive use. This trip planner interface shall be Internet browser based and shall not use the private (Frame-Relay) circuits currently supported by MTC for providing access for transit agency telephone information centers.

2.4.3 Trip Planner Interface for Licensing to Other Websites

In addition to the above, MTC wants to develop a trip planner interface that can be licensed to transit agencies and others that wish to provide trip planning services from within their own Websites to their intranet and Internet users. This interface will be similar to the interface used by the general public, but will be sufficiently flexible to allow the agency or business to frame

the browser screens on the host Website. This interface shall include some customizable features that allow the licensee to enter and maintain a limited set of predetermined origin and destination information. This interface will access the regional trip planning system and publish the itineraries generated by the regional system.

2.5 Languages

All user interfaces shall have multiple language capability. The default language shall be English, but initially users shall have the option of also viewing the interfaces in Spanish. MTC's intent is to provide trip planning services in multiple languages. The interfaces shall, therefore, be developed in such a manner that the future inclusion of other languages can be accomplished without the need for costly reprogramming.

A standard non-proprietary character set such as iso-8859-1 (rather than a closed Windows character set) shall be used for English. Non-Latin characters (e.g., Chinese, Arabic, Vietnamese) shall be implemented using standard Unicode encoding (see http://www.unicode.org/standard/WhatIsUnicode.html).

2.6 Compliance with Accessibility Standards

The trip planner must be accessible to the disabled community in a manner consistent with the level of accessibility that the RTIS currently provides or better. The RTIS uses Section 255 of the Telecommunications Act of 1996 and Section 508 of the Rehabilitation Act of 1998 as guidelines for providing accessible services.

2.7 Accommodation for Future Industry Data Standards

Over the life of the RTIS, it is anticipated that data exchange standards in the transit industry will continue to evolve and that the trend toward open standards will continue. The various components within the RTIS, including the trip planner and processes used by the transit providers, may adopt those standards. Several of the interfaces shown in Figure 4 (Section 7.1) and future applications listed in Section 8 could potentially make use of such standards as the underlying components and processes incorporate them.

3.0 Features and Functions Common to All User Interfaces

Unless otherwise specified, the features and functions described below apply to all trip planner interfaces, i.e., the public interface, the interface used by transit telephone information operators and the interface to be licensed to other websites.

3.1 Trip Planning Data Needed to Generate an Itinerary (Data Entry Screen)

The data entry screen contains the input fields that a user must fill in to generate a transit itinerary.

3.1.1 Origin and Destination

The trip planner interface will permit the user to identify the location of the trip origin and trip destination in the following ways:

3.1.1.1 Street address

The trip planner shall use the address matching and geocoding services supported by the RTIS. The ESRI products used by the RTIS for address matching and geocoding require that the street address be entered in the following manner: street number, street name and street type (e.g., 200 Market St.). Street numbers and street names are required and street type (written out or abbreviated) is an optional entry. For quick data entry, the trip planner interface shall automatically populate a drop down list with several of the last entered origins and destinations. Alternatively, the trip planner shall display origins and destinations that have been previously saved by the web user as a list of favorites.

3.1.1.2 Street intersection

The interface shall accept two street names as a valid entry for an intersection, e.g., 20th and Harrison, College and Ashby. Street type is an optional entry.

3.1.1.3 Landmark name

The trip planner interface shall recognize place names that identify places of interest and popular destinations, e.g., Golden Gate Park, Union Square, UC Berkeley. Because users may not know how to describe or spell landmark names exactly, the trip planner shall provide an easy way of searching for landmarks and resolving ambiguities.

3.1.1.4 Ambiguous results

In cases where an entry (e.g., street address, street intersection or landmark) has multiple possibilities (e.g., 100 Market, City Hall), the trip planner shall list the ambiguous results in a manner that the user can review options and select the correct one. A map shall be associated with each possibility to help the user accurately locate the desired origin or destination.

3.1.1.5 City (Optional)

Although the interface shall provide a data entry field for city name (e.g, San Bruno), by itself, a city name is not sufficient to identify an origin or destination. While city name is not a required entry, it can be used to reduce the number of duplicate locations found in the geocoding process.

3.1.1.6 Zip code (Optional)

Like city name, the 5-digit zip code (e.g., 94611) is not a required entry; but if available, it can be used to reduce the number of duplicate locations found in the geocoding process.

3.1.1.7 Map location

For persons who are unfamiliar with the Bay Area or do not know a specific street address or intersection, the trip planner interface shall display a map that will help locate a desired origin or destination. This feature shall permit the user to use standard navigation tools to find and identify a point on the map that the trip planning system will recognize as the coordinates of either an origin or destination. The itinerary request form being filled out by the user shall note that the origin or destination have been selected from a map.

3.1.2 Date and Time of Departure and Arrival

To enable users to identify the date and time of travel, the trip planner interface shall provide data input fields for the following information:

3.1.2.1 Day of Trip.

A user shall have a number of options for selecting the day of travel. The interface shall provide a range of choices that include traveling on the current day (i.e., today) up to at least four (4) weeks into the future. The interface shall also identify the day of travel by day of week (e.g., Monday, Tuesday, etc.) and date in order to confirm the choice made by the user.

3.1.2.2 Time of Trip.

The trip planner interface shall provide a number of options for identifying the time of travel. The user shall be able to select from a set of mutually exclusive options including the following :

- *I am leaving my starting point now.* "Now" is defined by the trip planner computer clock when an itinerary request is received. The definition of "now" is updated each time a new itinerary request is received. To minimize possible misunderstandings about the departure time, the clock time generated by the "now" feature shall be clearly reflected on the trip itinerary.

- *I am leaving my starting point at* [fill in time]. If this option is selected, the user shall be required to specify the hour and whether the departure is in the morning (am) or in the afternoon (pm).

- *I am leaving my starting point as early as possible*. By selecting this option, the user is understood to be requesting the earliest possible transit connection between origin and destination.

- *I am leaving my starting point as late as possible*. By selecting this option, the user is understood to be requesting the latest possible transit connection between origin and destination.

- *I must arrive at my destination by* [fill in time]. A user shall be able to select the precise time of arrival at the specified destination. The user will be required to specify the hour and whether the time is in the morning (am) or the afternoon (pm). The time of arrival at the destination shall be defined as including the estimated time it will take to walk between the last transit stop and the actual destination.

In cases where the user is required to enter a time, the interface shall use features that facilitate entering and editing clock time and morning or afternoon travel (i.e., "am." and "pm."). To

quickly check transit availability around the desired departure or arrival times, the interface shall also include a feature that makes it easy to move the clock forward or back by 5 or 10 minute increments.

3.1.3 Other Travel Conditions

The trip planner interface shall include a number of required fields that will help tailor the itineraries to the specific needs of the traveler. While these are required fields, each shall be implemented with a default value that can be overridden by the user.

3.1.3.1 Itinerary preference

The user shall be given the option of requesting transit itineraries that are optimized for the following mutually exclusive conditions:

- *Least transit travel time.* The least travel time for the trip on transit shall be the sum of the travel time for each leg of the trip plus the wait time between transit connections. The time to the first connection and from the last transit connection to the destination shall not be included in the transit travel time (See Section 3.3.1.9 for the distinction between transit travel time and total travel time).
- *Fewest transfers*. The fewest number of transit connections (trip legs) required to complete the trip between the origin and the destination.
- *Least cost*. The lowest total cost of the trip including base fares and transfer costs.

3.1.3.2 Fare category

The trip planner shall display the common fare categories maintained in the RTD for all transit agencies in the region. These include adult, senior, disabled, youth, child, small child, active military, student and school trip. If no fare category is selected, the adult fare shall be used as the default category to estimate the trip cost.

3.1.3.3 Maximum walking distance to make a transit connection

The trip planner will give the user a number of preferences for calculating maximum walking distance, i.e., 1/8 mile, 1/4 mile, ½ mile, 3/4 mile and 1 mile. The maximum walking distance shall be used as a threshold that cannot be exceeded in any one of the following situations: a) the distance from the origin to the first transit connection, b) the distance between any two transit transfer points, and c) the distance from the last transit stop to the destination.

3.1.3.4 Mode choice or transit provider preference

For any transit trip, a user shall have the option of specifying several preferred transit modes (e.g., bus, light rail, train, cable car and ferry) or several preferred transit providers. If no choice is made, the default value will be any mode and any transit provider. If the user wishes to select a mode or transit provider, the trip planner will present a drop down list that includes the available transit modes and the names of all transit providers in the trip planning system. The user shall be given four options to include or exclude a particular mode or transit provider from the requested itinerary.

"Prefer to Include:" The user sees the trips that include their preferred mode or provider sorted as the first choices in the list of available trips. Other trips that do not include the preferred mode or provider are also be displayed but sorted further down the list of available trips.

"Must Include:" All trips shown must have the user's preferred mode or provider in at least one leg of the itinerary.

"Exclude:" The user's excluded mode or provider will not appear in any portion of any displayed itinerary.

"Only:" Trips that can be taken on *only* the selected mode or transit provider are displayed. Any trip that includes a leg made on another mode or provider would not be displayed.

Users shall be cautioned to use these options thoughtfully because, by limiting transit connectivity, the trip planner may generate no travel options at all or a less than optimal transit connection, such as an itinerary with an unusually long travel time or cost.

3.1.3.5 Accessibility information

The user shall have the option of requesting accessible stop information that may be available and relevant to the itineraries generated by the trip planner. While some transit agencies maintain accessibility information for individual stops, users shall be cautioned that this information may not be uniformly available throughout the region.

3.1.3.6 Bicycle information

The user interface shall provide the option of requesting information about the use of bicycles on transit. The user should be cautioned that although this kind of information may be maintained by some transit providers, it may not be available or consistently updated across all transit services in the region.

3.2 Process and Logic Used to Generate and Present Transit Itineraries

The following requirements describe how the trip itinerary building logic is expected to function. Regardless of the interface used to provide the basic input information, the list of trip parameters is always the same and the process followed to generate itineraries is always the same.

3.2.1 GIS Mapping Services

The trip planner must have the capability of accessing existing GIS data and mapping services provided by the RTD. These external services will enable map based geocoding and the display of maps with itinerary information. Other available GIS features include flexible data display that allows a user to turn map layers on or off and the availability of map navigation features like centering, panning and zooming.

3.2.2 Address Matching and Geocoding Services

The trip planner is expected to use existing RTD address matching and geocoding services for identifying the spatial locations of origins, destinations and landmarks (see Section 7.1.5). These services use optional entries such as street type, city and zip code to reduce the probability of an ambiguous result or multiple address matches. In the event that the spatial extent of the transit

service area (and basemap) were to cover more than one state, state name would also be used to further discriminate in the address matching process.

To identify cross streets (intersections), the trip planner shall allow the use of multiple characters to link the two street names, e.g., @, :, &, AT, AND).

The trip planner shall include "power search" or "wildcard" capabilities that allow the user to use special characters (e.g., the question mark ? or asterisk *) to search for and list entries that may have other characters preceding or appended to the selected word.

The address matching services are expected to incorporate "sounds like" and soundex technologies to help the public find a street or city name that may have a difficult spelling or is simply misspelled. The trip planner shall use current successful industry practices to ensure optimal user ability.

3.2.3 Itinerary generation

The trip planner shall consider all transit routes, schedules and stops for all modes and all carriers in evaluating the possible transit connectivity between an origin and a destination. Using a predetermined radius and the locations of the origin and the destination as centroids, the trip planner shall draw a circle around the origin and the destination and identify all transit stops within the circumference of the computed circles. The trip planner shall then identify all possible transit connections between each origin stop and all destination stops.

The search radius used to compute circles around the origin and the destination shall be a variable distance to assure that a minimal number of stops are identified in areas where the transit network is sparse and to limit the number of stops in areas where there is a very dense transit network. The maximum radius shall not be greater than a reasonable walking distance, e.g., one mile. The minimum radius shall be a distance that will limit the number of one-to-many computations in order not to adversely affect system performance and response time.

3.2.4 Accessibility data

Accessibility data for transit vehicles and stops is not currently maintained in a regionally uniform, consistent and reliable manner. However, because some transit agencies expend considerable effort to maintain accurate accessible transit stop data, this information should be used whenever possible. Nevertheless, for itineraries where a trip involves multiple providers some of whom do maintain accessible data and some who do not, the trip planner shall notify the public to use these data with caution to avoid giving misleading information. When available, relevant accessible stop information and vehicle information shall be displayed on transit itineraries, but initially, the logic used to generate a transit itinerary (described in Section 3.2.3) shall not be required to incorporate an accessibility factor in generating the itinerary. When accessibility data are consistently defined, regularly updated by transit providers and reliable, the trip planner shall be modified to make better use of these data and possibly include accessibility factors in the algorithm used to generate a transit itinerary for a user requesting an accessible trip.

3.2.5 Multiple schedules for a single provider

The routes and schedules to be used by the trip planner to compute itineraries shall be those that are in effect on the day, date and time of the departure and the arrival specified by the user. To

be consistent with the date and time of travel, the trip planner shall be able to use both current and future route, schedule, stop and fare data. If a user requests a transit itinerary for a future transit trip, but the effective schedule for that date has not yet been entered in the system, then the trip planner shall notify the user that the necessary data is not yet available in the system.

3.2.6 Mode choice and transit provider selection

The default process for the trip planner shall be to include all modes and all transit providers in the search for an optimal connection between the specified origin and destination. The list of modes and transit providers shall be those that are identified, labeled and maintained in the RTD.

Because some users may have a preference for a particular transit mode (e.g., a cable car or a ferry connection) or for traveling with a particular transit agency, the trip planner shall provide users with the means for including or excluding a particular transit mode or transit provider from the requested itineraries. A multiple select or exclude feature is desirable. Users shall also be able to request an "only" option that returns itineraries for the exclusively selected mode or transit provider.

The "Prefer to Include" option will sort the itineraries with the user-preferred mode or transit provider first on the list. The "Must Include" option will display only itineraries that include the selected mode or transit provider in at least one portion of the itinerary. The "Exclude" option will not include the user-excluded mode or transit provider in any portion of the displayed itineraries. The "Only" option will display itineraries that include only ~~for~~ the selected mode or provider. When "Only" is selected, all other modes and transit providers are dropped from the list of itineraries.

Users shall be advised to exercise caution when using this trip planner feature because it may result in less than optimal itineraries including multiple transfers, unusually long travel times or high cost. If the desired mode or provider are not listed at the top of the itinerary list when the "include" or "only" options are requested, users should be advised to alter the trip options (e.g., walking distance, day of the week, time of travel, etc.) as a means of finding the desired connection.

3.2.7 Linked modes and routes

The trip planner shall have the ability to link modes in cases where a passenger is required by a transit provider to use more than one mode to complete a single transit trip. For example, Amtrak provides both rail and bus service. A single trip on Amtrak may require a passenger to board a feeder bus on either or both ends of a long distance rail connection. This connectivity between bus and rail modes also has implications for fare calculation which may be based on a combined through trip that includes a bus and a train connection.

The trip planner shall also have the ability to link routes down to the level of individual runs or trips. Transit providers sometimes design route time tables in such a way as to make transfers from one line to another, or from one vehicle to another, as convenient as possible. Because transferring from one line to another may involve only a few steps (e.g., a cross platform transfer at a transit rail station), the time tables for the two routes may have simultaneous arrival and departure times. In the example where one train waits for the arrival of another, if the default transfer time is greater than zero, the trip planner would skip over the train waiting across the

platform and look for a next best connection. The ability to link routes at the run level would override the transfer time requirement and assure optimal connectivity.

The trip planner shall provide tools that enable individual providers to link transit modes and routes for which they are responsible.

3.2.8 Time required to make a transfer

In computing possible itineraries between an origin and a destination, the trip planner shall use the default transfer times associated with the individual stops. The trip planner shall not suggest a transit connection if the time for making the connection falls within the time required to make the transfer. For example, if the arrival of a bus at a particular stop is estimated to be 2:15 p.m. and the transfer time at the stop is 4 minutes, then the soonest transfer to be suggested will be a connection leaving on or after 2:19 p.m. In some cases, a transit agency may have modified the default transfer time value to reflect more accurately the actual time required to make a transit connection at a particular stop. Also, the transfer time rule would not apply in cases where a transit provider has linked modes or routes (Section 3.2.7).

3.2.9 Limited use and null stops

When generating transit itineraries, the trip planner shall recognize and use information that may limit the availability of individual stops. For example, during most of the day an individual stop may be used by a particular provider for on and off-boarding, but during certain times of the day, the same stop may not available at all or perhaps only available for off-boarding passengers. The same stop, however, at the same time of day for another provider may not have any restrictions. If a stop has availability restrictions, the individual restrictions would determine whether or not the stop is included in the computations necessary for generating itineraries.

3.2.10 Computation of times at stops between time points

Using the time tables associated with any route pattern, the trip planner shall compute the arrival or departure times for stops between time points. In calculating travel times between stops, the algorithms used shall take into account factors such as distance, vehicle speeds and peak and off-peak congestion patterns.

3.2.11 Trip length and time threshold

Although feasible, some transit trips may be unrealistically long. Based on the conditions specified by a user, if the time required to travel between an origin and destination takes more than a certain number of hours (a threshold determined by the system administrator), the trip planner shall present the user with options on how to modify the trip conditions to produce a more realistic itinerary.

3.2.12 First and last trip of the day

When a user requests an itinerary based on the first or last trip of the day, the trip planner shall provide this information in the way the transit agency defines (usually in published schedules) the first and last trip of the day. This means that the day is not strictly defined by the 24-hour clock. For example, in some cases the first trip might be scheduled before 12:00 am of the

current day. Likewise, the last trip of the day might be scheduled after midnight of the current day.

3.2.13 Network routing

When building transit itineraries, calculating distance and walking times and generating walking instructions, the trip planner shall use the existing street network as represented by a GIS base map. Instructions on how to get to the first transit connection, where to go to make a transfer or how to get from the last transit connection to the destination shall be based on the street network familiar to the public. For transit itineraries and for walking directions, the trip planner shall make appropriate use of turn restrictions, one-way designations, barrier data and other navigation information when available as part of the GIS database. Depictions of transit routes shall conform to the GIS street centerline network.

3.2.14 Total walking distance

Using street network distances acquired from the basemap maintained in the RTIS, the trip planner shall compute walking distance between the origin and the first transit connection, between transit connections and also between the final transit stop and the destination. The sum of all these distances is the total walking distance that shall be represented on the transit itinerary. The trip planner shall use total walking distance as a sorting parameter for listing itinerary options.

3.2.15 Unusual or unrealistic itineraries

In some cases, the trip planner might generate an unusual itinerary, one which a reasonable person familiar with transit would reject as an unrealistic option for traveling between an origin and destination. The trip planner shall compare itineraries against a set of threshold limits (e.g., number of transfers exceeding x, travel or transfer waiting time exceeding y, total walking distance exceeding z) and for those that exceed acceptable limits, flag them as problematic, weight them in a manner that they are presented only at the bottom of a listing or exclude them altogether from being presented. For these kinds of itineraries, the trip planner shall suggest options for improving the connectivity between origin and destination.

3.2.16 Comprehensive computation of fare

In computing the total fare of each transit trip, the trip planner shall take into account the fare category selected by the person requesting the trip (e.g., adult, child, senior), the cost of any required transfers, the fare structure of the transit service and the possibility that fares are also computed based on travel zones. The number of fare zones used by a transit agency should not be unreasonably restricted. Because some transit agencies may have more than one mode and more than one fare structure for a single mode, the trip planner shall be able to recognize these different fare structures and compute an accurate total fare for each itinerary. In cases where a transit fare is computed based on a round trip (e.g., some ferries), this information should be noted when the fare is reported. If a fare requires pre-purchase of a ticket or fare card (e.g., BART discount tickets must be purchased before going to the BART station in order to receive the discounted fare), this should also be reported.

3.2.17 Landmark information

If a user identifies a landmark as an origin or destination, the trip planner will access a landmark file in the RTD to verify that such a place exists in the database and to acquire the spatial coordinates needed for generating alternate itineraries. In the event a landmark shares a portion of its name with another landmark (e.g., City Hall) or is associated with other nearby places, the trip planner shall list the possible options that might satisfy the user's entry and request that the user make a selection.

3.2.18 Logical hierarchy for sorting and presenting itineraries

The trip planning system shall calculate all possible connections between stops near the specified origin and stops near the destination. Itinerary preferences (i.e., least travel time, fewest transfers, etc.), mode choice, preference for a particular transit provider and other parameters are factors to be used only to determine the order in which itineraries are displayed.

The itinerary options presented by the trip planner shall be sorted and presented in a manner that reflects the following order of user preferences:

- Day and time of travel
- If specified, preferred transit mode or transit provider
- Itinerary preference (fastest, fewest transfers, least cost)
- Total walking distance

3.2.19 Notices and messages

When the travel parameters entered by a user are problematic (e.g., inconsistent with input requirements or other itinerary planning rules), the trip planner shall provide automated feedback regarding corrective action. When an itinerary cannot be generated or when the itinerary exceeds certain reasonable thresholds (e.g., headways exceeding 60 minutes, travel times and transfers exceeding a certain maximum), the trip planner shall be able to provide feedback with suggestions that might result in more realistic travel options.

In cases where there is no transit connection between an origin and a destination, the trip planner shall respond with a message that clearly explains the absence of service. Where there is service, but the user preferences (i.e., date, time, maximum walking distance, including or excluding a particular provider or mode, transfer restrictions, etc.) greatly reduce or eliminate all possible alternatives or perhaps create unusual or bizarre itineraries, the trip planner shall provide a message that acknowledges the existence of service, and suggests that the user modify the trip parameters and submit another request. Notices shall be specific so that the user understands what corrective action to take, e.g., "There is no service available at the time (or within the walking distance) you selected for your trip. You may want to consider traveling earlier or later (or selecting a longer walking distance) or changing other travel parameters."

3.3 Information Generated by the Trip Planner

Once the trip planning system has generated a series of possible transit connections between the user specified origin and destination, the itinerary options are sent back to be formatted and

displayed on the different user interfaces. Although the content shall generally be the same, the presentation of the data depends on the design objectives of the different interfaces. In some cases, the information generated by the trip planning software may be presented in a simplified manner.

3.3.1 The Trip Itinerary

3.3.1.1 Summary of transit travel options

In response to a travel request submitted by a user, the initial information presented by the trip planner shall be the total number of itineraries generated and a summary of the four or five options that most closely meet the travel criteria specified by the user. Each summary travel option is linked to a page that presents complete itinerary information.

In many cases, the trip planner is likely to generate more itineraries than the four or five listed in the initial set of best connections. To review all summary travel options at once, the user shall have the ability to list all the itineraries that have been generated and sort them according to the initially selected travel options. (The trip planner shall place a reasonable limit on the number of itineraries it will display.) The table in which the brief itinerary options are summarized shall have a feature that allows the user to sort the itineraries on total travel time, transit travel time, number of transfers, cost and total walking distance.

3.3.1.2 Trip parameters entered by the user

The itinerary generated by the trip planner will clearly show the origin (leave from) and destination (go to) specified by the user. Because itineraries can vary greatly from minute to minute, the initial departure time specified by the user shall be displayed on the itinerary. Travel time information is especially important if the user specifies “now” as the time of requested travel and is not aware that, if the itinerary is resubmitted a few minutes later, the clock time corresponding to “now” may be different and therefore the possible transit connections may also be different. Other parameters (e.g., day, maximum walking distance and mode or provider selection) shall also be clearly displayed.

3.3.1.3 Walking directions

The itinerary generated by the trip planner will include text giving turn by turn directions on how the user walks from the origin to the first transit stop, how to walk from one transit connection to another and finally how to walk from the last transit stop to the destination. The text-based walking directions shall correspond to the walking maps generated by the system (see Section 3.3.1.4 below).

3.3.1.4 Walking maps

On the transit itinerary, the trip planner shall include links to GIS-generated maps that depict the full extent of the transit trip and each leg of the itinerary. The maps shall be incorporated into the itinerary information provided by the trip planner. The maps shall represent the proposed transit route as a line feature superimposed on a street network. The maps shall also provide navigation features that allow the user to examine the areas surrounding the suggested transit route and transfer points.

3.3.1.5 Transit provider and route descriptors

The itinerary generated by the trip planner will clearly describe each leg of the transit trip by identifying the transit provider, the mode, the route number, the route name and the head sign of the transit vehicle. The labels for routes, patterns and vehicle head signs are maintained in the RTD in the manner chosen by the individual transit provider. The trip planner shall not limit or otherwise change the labels from the manner the data are stored in the RTD.

3.3.1.6 Transit connection times

Referencing the current schedules maintained in the RTD, the itinerary will identify the connection times for each leg of the transit trip and the times of the next scheduled vehicle for the individual routes in the itinerary. The itinerary will also provide links to partial or full schedules for the recommended route.

3.3.1.7 Transfer information

If a transit trip involves more than a single leg, the itinerary shall provide directions on where to get off one vehicle, where to go to board the next and other information needed to correctly identify the connecting route and vehicle.

3.3.1.8 Fare calculation and transfer information

The itinerary generated by the trip planner shall compute the fare (and transfer cost) for each leg of the proposed trip and the total cost of the trip. The itinerary will also provide other fare and transfer information (e.g., where and when to acquire transfers, how to use them and other rules) that will help the user successfully complete the transit trip. When transfers are necessary, the trip planner shall advise the traveler (possibly in a footnote) to refer to the transfer policies of the individual provider for precise information about transfer expiration time limits and other restrictions regarding the use of transfers. Because of the complexity of accurately calculating the exact cost of a trip, fare information on the itinerary shall be presented as an estimate.

3.3.1.9 Transit travel time and total travel time

The trip planner shall compute and present two travel times on the itinerary: a) the total travel time on transit from the initial boarding of the first transit vehicle to the final alighting from the last transit vehicle and b) the total elapsed travel time of the trip (including an estimate for walking time from the origin to the first transit connection and from the last transit stop to the destination).

3.3.1.10 Total walking distance

The trip planner shall display the total walking distance which is the sum of the distance from the origin to the first stop, the distance between transfers and finally the distance between the last stop and the destination.

3.3.1.11 Travel advisory information

The itineraries generated by the trip planner shall include travel advisory information relevant to the proposed transit trip. Notices about the transit provider, the route or some other aspect of the trip are maintained in the RTD and can be represented as textual footnotes or as links to more information about travel conditions (e.g., “Expect delays on Sunday, March 15.”). As the

capabilities of the RTD are expanded, travel advisories shall be possible for a geographical area or corridor, a transit provider, a route, a pattern, an individual run or a transit stop.

3.3.1.12 Accessibility and bicycle information

If the user has requested that accessibility information be included in the generation of a trip itinerary, the relevant information about a vehicle's accessibility or the accessibility of a transit stop shall be clearly displayed. If the data needed to determine the accessibility of a route, vehicle or stop is not available in the RTD, the itinerary shall note this lack of information in a prominent manner. The itinerary shall also include a link to the appropriate transit provider and a recommendation that the user verify the accessibility information.

Likewise, if requested in the trip parameters, bicycle accessibility information shall be provided if the appropriate data are available in the RTD. If the data are not available, the itinerary shall display an appropriate notice in a prominent place.

3.3.1.13 Return trip option

The trip planner shall provide the option of generating a return trip using the same origin and destination chosen by the user, but in reverse sequence. As defaults (which can be overridden), the return itinerary shall use the same parameters as those selected in the original itinerary, except for time of travel which the user will have to reenter.

3.3.1.14 Links to other information

The itinerary shall provide links to other information that may be useful for planning a trip on transit, e.g., information associated with individual stops that may provide information about curb cuts, shelters or nearby popular destinations and landmarks.

3.3.2 Links to Other Information

3.3.2.1 Announcements

A comprehensive list of service announcements is maintained in the RTD. The transit itinerary shall include a link to these announcements in order to alert the user to additional information that may be relevant to the current trip and future transit travel.

3.3.2.2 Links to more complete schedule, route and provider information

When specific route and schedule information is identified on a transit itinerary, the trip planner shall also provide links to more complete information about the transit provider and the referenced routes and schedules. The trip planner shall also provide links that allow the user to explore other routes that may serve the same stops and other nearby routes and transit services.

3.3.2.3 Comments

The RTIS currently includes a feature whereby users can submit comments to the system administrator about experiences using the transit information Website. In order to make it convenient for users to give MTC feedback about their experiences using the trip planner, the itinerary page and the trip planner interface shall place links to the RTIS comment service where they can be easily seen.

The trip planner shall include a feature that captures the parameters used to generate an itinerary and also the detailed itinerary generated by the system. When a user wishes to submit a

comment about an itinerary, this captured information shall be attached to or included in the body of the user's comments. The trip parameters and the itinerary generated by the system will help MTC reproduce the itinerary in question and diagnose potential problems.

3.4 Other Features

3.4.1 Help Features

The trip planner shall include an extensive help feature that provides step-by-step instructions on how to generate a transit itinerary and access other useful features. Transit terminology and labels used in the trip planner (e.g., last trip of the day, maximum walking distance, etc.) shall be defined and, where possible, examples provided. While the help features should be geared to new users, they should also be relevant to regular transit users.

3.4.2 Print, save and e-mail capability

The trip planner shall include features that make it possible to print, save or e-mail an itinerary generated by a user. The trip planner shall allow the user to convert itinerary information to a format that can be saved or sent by e-mail or FAX.

4.0 Features and Functions Unique to the Transit Information Center User Interface

Telephone information center operators require a trip planner interface that is optimized for ease of use and quick retrieval of itinerary information. The call center interface will include all the functionality of the interface used by the general public and also incorporate the special features described below.

4.1 Operator Activity and Information Monitoring

Telephone operators are often required to keep logs of their activities including, for example, the type of information looked up for a caller and the number of itineraries generated per call and over the course of the day. Instead of having to manually compile this information, the trip planner interface used in information centers shall monitor operator activity automatically and generate usage information as needed. The call center interface shall be able to track and summarize the following information:

- Total and average number of itineraries generated per call by individual operators and by the entire call center reported by variable time periods.
- Number of transit itineraries by transit agency, mode, etc.
- Other transit information generated per call by individual operators and by the entire call center reported by variable time periods.

4.2 Interface Design

4.2.1 Secure access

The call center interface shall incorporate a security module and other protocols necessary to assure secure access to trip planning services.

4.2.2 Ease of use

Once an initial itinerary is generated by the trip planner, the person requesting transit travel information often will ask the call center operators to modify the parameters of the trip. The interface used by call center operators shall be designed so that trip parameters can be quickly changed and itineraries easily regenerated. It shall also provide comprehensive and quick access to basic transit service information that a caller might request.

4.2.3 Schedules

Transit call center personnel shall have the capability of quickly displaying any transit schedule maintained in the RTD. This feature should include a simple way to identify the carrier, the route and the desired pattern. The operators should be able to display full or partial schedules for an entire pattern or for any stop on the pattern.

4.2.4 Routes serving a stop or a map location

In text form and also graphically, the trip planner shall have the capability of identifying transit routes serving a particular stop or other map location that the user identifies by entering a street address, street intersection or landmark or by pinpointing a specific spot on a map. The trip planner shall be able to display schedule information associated with the individual routes corresponding to the selected location. For a location that is not a stop, nearby routes shall be sorted by proximity to the map-based selection.

4.2.5 Stop characteristics

In text form and also graphically, the trip planner shall be capable of displaying all stops associated with an individual route pattern and also all the characteristics (attributes) available for a particular stop.

4.2.6 Maps

The call center interface shall have enhanced GIS mapping capabilities. By entering location information (address, intersection or landmark) or by pointing to a particular location on a map, call center operators shall be able to identify and display (in text form and graphically) route, route pattern, stop and associated schedule information.

4.2.7 Itinerary diagnosis

At times, a call center operator may want to confirm that an itinerary generated by the trip planner is indeed the best alternative given the parameters chosen by a caller. To make this testing possible, the call center interface shall include tools for analyzing the correctness of an itinerary. The diagnostic tool shall be capable of analyzing each leg of an itinerary against an alternative that the operator might think is a better option. The diagnostic process shall step

through an itinerary link by link displaying the logic behind the discrete decisions that led to the selection of a particular route, transfer, etc. This diagnostic tool will help determine whether problems with an itinerary are due to faulty data, excessively narrow travel parameters set by the user, itinerary building logic, calibration issues, a software bug or other causes.

The itinerary diagnostic tool shall include reporting capabilities for documenting the analysis process if a problem (i.e., less than optimal itinerary) is identified by the operator. The diagnostic reports shall be capable of being logged and forwarded to a system administrator for resolution.

4.3 Print, E-Mail and Fax Materials

For persons requesting a copy of the information provided over the telephone, the call center interface shall incorporate several options for sending information to a user. The interface shall be capable of printing itinerary and schedule information and also sending the same information by e-mail or FAX.

4.4 Contact and Other Service Information

The call center interface shall include a feature that allows each transit provider to enter and edit its own contact and service information so that it can be accessed by other transit providers using the same interface. This feature will enable transit providers to maintain current contact information and other relevant service information (e.g., ticket sales outlets) that operators in other call centers may find useful for providing comprehensive (regional) travel information services. The same database feature shall also be available to the system administrator to maintain contact information at the regional level, e.g., lists of hospitals and emergency services.

4.5 Announcements and Travel Advisories

The call center interface shall include a feature that permits a call center operator (with appropriate administrative clearance) to post announcements and travel advisories that can be linked to specific routes, patterns, runs, stops or time periods. These notices or travel advisories shall be included in any itinerary that includes transit services that have been flagged by a transit provider.

4.6 Customer and Administrative Feedback

The call center interface shall include a feature that permits an operator to log customer feedback and report bugs or other trip planner problems. The reporting feature shall log the incident, forward the information to appropriate persons and provide the means for tracking the resolution of the individual reports. This feature shall also include the ability to manage the feedback process and generate reports that address how feedback is being handled at the transit provider level and at the regional level.

5.0 Features and Functions Unique to the Licensed User Interface

The trip planner shall include an interface that can be licensed to public or private entities wishing to incorporate an itinerary planning feature into the overall content provided by their websites. This interface will permit a person visiting the licensee's website to quickly generate a transit itinerary to or from the locations identified on the website. Potential users of this interface include transit agencies, airports, sports arenas, public buildings, large employers and retail facilities. The objectives of this interface are to make planning a trip on transit as easy as possible, to encourage transit operators and popular destination operators to actively use/include transit trip planning on their websites, and to increase the use of transit.

5.1 Features and Design

The licensed interface shall have all the features and functionality incorporated into the interface used by the general public on the Internet.

5.1.1 Secure access

The licensed interface shall incorporate a security module and other protocols necessary to assure secure access to trip planning services.

5.1.2 Trademark

The licensed interface shall be trademarked with the 511 logo to identify the origin of the trip planning services being provided, but it shall otherwise be free of specific information or design features that would make it difficult to integrate into a licensee's website.

5.1.3 Customizable origin and destination data

The licensed interface shall have a customizable feature that allows the licensee to enter and maintain a predetermined list of origins and destinations. This list of pre-programmed locations shall not, however, prevent the public from entering other locations as origins and destinations.

5.1.4 Unbiased information

Other than the customizable lists of origins and destinations, the input requirements for the licensed interface will be the same as those for the other trip planner interfaces. The itinerary information generated by the licensed interface shall be unbiased and identical in content to that produced by the other trip planner interfaces.

5.2 Implementation and Support

The licensed interface shall be developed so that it could be available to any public or private entity that agrees to the conditions set by MTC in a license agreement. It is expected that MTC, through its contractor, will provide user support and technical assistance in the same manner as it supports other trip planner interfaces.

6.0 System Administration Features and Functions

6.1 Tools for Entering and Editing Data

As part of the on-going data update process for the RTIS, MTC has developed a number of tools for entering and editing transit provider service data. These tools have been incorporated into a robust set of data management utilities called the Data Maintenance Suite (DMS). The administrative features and functions of the trip planner shall be coordinated with existing data editing tools to provide a well-designed and integrated way to quickly and easily edit relevant service data in the RTD. Examples of the editing capability of the trip planner include:

- allowing a transit provider the ability to deactivate a route pattern, individual runs, or stops
- changing the type of service provided on a particular day, e.g., changing regular weekday service to a Saturday or holiday service
- entering and editing changes to a holiday schedule
- editing fares.

6.2 Setting Default Values

The trip planner shall include features that permit the system administrator to set and modify default values. In relation to the screens for itinerary input data, setting a default may be as straightforward as selecting from a list of preselected options, e.g., least travel time is set as a default for itinerary preference. In other cases (the itinerary display screen), setting a default may be a more involved process, i.e., defining the logic for ordering how itineraries are initially presented to a user and selecting the values that control the display and sorting parameters.

6.2.1 Itinerary input and presentation defaults

The system administrator shall be responsible for setting the defaults for the trip planner input and output screens.

6.2.2 Walking speed

The trip planner shall have features that allow walking speed to be set at the system level and modified by transit providers for individual stops or groups of stops.

6.2.3 Maximum walking distance

Since the density of transit service can vary considerably, the trip planner shall have features that allow the default maximum walking distance to be set at the system level and modified by transit providers to reflect local service characteristics.

6.2.4 Linked modes and routes

For the services they provide, transit agencies shall be able to link individual modes and routes, down to the run level, in order to ensure the desired connectivity of service.

6.2.5 Transfer times - systemwide and at the local stop level

The system administrator shall define and set the default transfer time that applies to all stops in the system. To more accurately represent the unique circumstances of making transfers at a particular stop, the system administrator or a transit provider (with the appropriate authority and training) shall have the ability to override the default transfer time for groups of stops or for individual stops. In cases where transit agencies provide interconnecting services where a bus or train must wait for the arrival of another vehicle, the transit providers shall have the ability to minimize the transfer time to zero minutes.

At individual stops, the administrator or transit provider shall be able to set transfer times for connecting routes, patters and runs. While transit providers shall have the ability to set transfer times in their own service areas, modifying transfer times for inter-agency connections shall be the responsibility of the system administrator.

6.2.6 Transit modes

The transit modes recognized by the trip planner shall reflect the naming conventions used by MTC and reflected in the RTD. When the new trip planner is implemented, the designation of modes is expected to include but not be limited to the following: bus, express bus, light rail, train, ferry, cable car and historic street car.

6.2.7 Fare category definitions

Transit providers do not always use the same fare categories and sometimes define similar categories in different ways. In the RTD, MTC identifies fare categories and uses definitions that best match the greatest number of users. The fare categories currently used in the RTD include the following: adult, senior, disabled, youth, child, small child, active military, student and school trip. Using data editing tools, transit providers shall be able to change fare data, but the default categories, definitions and values used in the trip planner shall be those maintained in the RTD.

6.3 Reports

The trip planner shall include flexible reporting capabilities. While compilation of data (report content) shall be an automated process, the system administrator shall have the ability to edit report content and structure reports for internal or public distribution.

6.3.1 Transit and trip planning activity

Reports summarizing trip planning activities shall include the following:

- Using information maintained in the RTD, a summary of the listing of the last data update and effective dates of service data maintained for all transit providers (routes, schedules, fares, etc.).
- The total number of itineraries generated by interface type reported by variable time period.
- The total number of itineraries generated by transit providers reported by variable time period.

- The total number of itineraries generated by individual agencies using the licensed interface reported by variable time period.
- The total number of times a transit provider's service appears on transit itineraries reported by variable time period. Often more than one provider will appear on a single itinerary.
- The total number of itineraries with origins and destinations aggregated to zip code, city and county and reported by variable time period.
- A listing of landmark hits reported by variable time period.
- A list of origins and destinations which failed to geocode during itinerary generation process reported by variable time period.
- Time taken to generate itineraries.

6.3.2 Administrative information

Administrative level reports shall include:

- System availability and status
- Error reports (e.g., itinerary generation problems, failure to geocode, mapping errors).
- Customer and administrative feedback

6.4 Performance

The transit service data needed to compute trip itineraries is maintained externally in the RTD. Address matching, geocoding and mapping services are also provided by external systems. The trip planner is expected to access these external data and services, generate and sort itinerary options based on user defined parameters and export itinerary information for display by the various Internet-based interfaces–all within a matter of seconds. In areas where there is very dense, multi-modal transit service, the trip planner shall be capable of computing and delivering alternative itineraries with no significant delays.

The following performance requirements are preliminary and will be refined in MTC's procurement of a new trip planning system:

- Accessing transit service data maintained in external systems (i.e., the RTD) - standards TBD
- Accessing and incorporating information generated by external GIS services (address matching, geocoding and mapping) - standards TBD
- Exporting itinerary information for display on Internet browser-based interfaces - standards TBD
- Itinerary generation engine processing speed (e.g., two itinerary requests per second or 7,200 average itineraries per hour) - standards TBD
- Ability to support queued requests (e.g., 1,000 queries at any one time) - standards TBD
- Average time to generate an itinerary from input request to itinerary display (e.g., less

than 4 seconds) - standards TBD.

7.0 System Interface Requirements

The primary purpose of the following section is to describe the interface requirements that the new trip planning system must comply with in order to be successfully integrated into the existing system architecture of the RTIS and the 511 Transit Website. As background, this section also describes how the existing trip planning system (TranStar) currently interfaces with the various components of the RTIS.

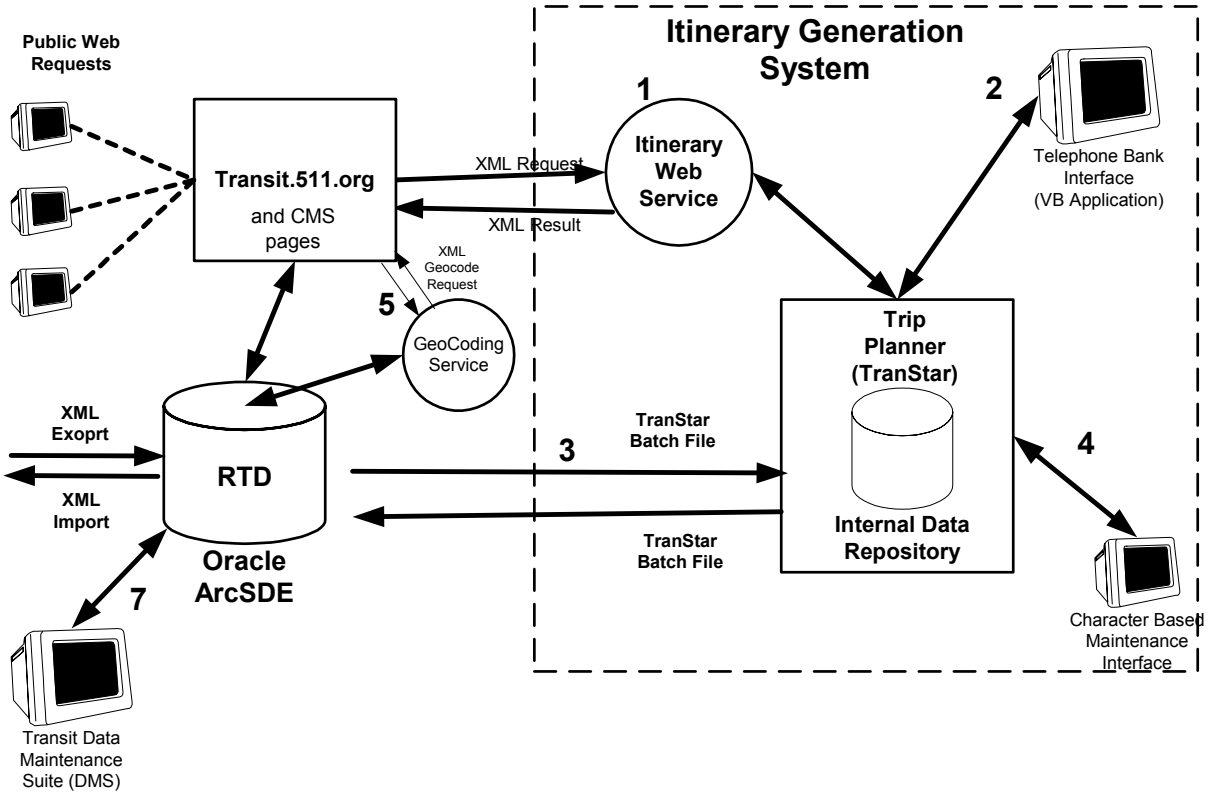
To achieve a successful interface between the RTIS and the new trip planning system, the RTIS contractor might need to acquire and adapt third party COTS software or it might need to develop a customized software solution. In either case, the interface requirements will be the same. The new trip planner will need to conform to the interfaces defined in this document in order to interact with the systems already in place.

Two possible scenarios, outlined in Section 7.2, describe how the existing interfaces can be utilized by a new trip planner to take advantage of the current development and minimize significant changes.

7.1 Existing System Interface

The current RTIS system is exposed through a Web service (www.transit.511.org) that supports online trip planning and through client software supporting telephone operators in transit information centers. The current trip planner application (TranStar) interacts with various RTIS system elements or users through existing interfaces. It has in internal data repository which is flat-file based. Data importing and exporting to the trip planner is supported through record-based formatted text files (TranStar batch file format). Direct editing and maintenance of the content within the trip planner application is supported through a VT-100 character-based interface. The trip planner interacts with an external itinerary web service that serves as an interface to the transit.511.org website. Figure 4 shows the relationship between the seven interfaces currently in place in the existing RTIS system.

Figure 4
Existing RTIS System



7.1.1 Itinerary Web Service

This interface supports Web based XML itinerary requests and responses. This interface accepts a set of request parameters in the form of XML tags and values, and returns an itinerary result in the form of XML tags and values. It would be convenient, but not essential for the XML definition to be the same as that used in the existing Web service. Otherwise, the Web service should support essentially the same parameters for requests and results, by function if not by name. See Section 3 and 4 in the Appendix for details of the existing itinerary Web service XML request and response interface.

7.1.2 Telephone Information Center Interface

This interface supports numerous functions that are available to telephone bank operators. This is a client-server visual basic application that interacts with the trip planner application over the dedicated frame-relay network. With the exception of some advanced features, most of the basic functions available here are also available independently through the 511 Transit web interface. The numerous telephone bank functions are detailed in Section 6 of the Appendix. Items that are already available independently through the www.transit.511.org public web site are categorized separately as well as items that would require additions to the RTD schema to support.

7.1.3 Batch File Interface

The current trip planner supports a record-based formatted text for import and export of trip planning data. A user can upload a text based file in the specified TranStar batch format for an entire agency including routes, stops, landmarks and fares. TranStar can also export the data in the same format. The RTD has a PL/SQL utility that can similarly export data for a selected agency in the TranStar batch file format. Similarly, RTD can also import data from a TranStar batch file. Though this mechanism serves the purpose of transferring/loading data into TranStar from RTD or other sources – this interface may not be the preferred means for data transfer when MTC implements a new trip planner.

7.1.4 VT Interface for Direct Editing and Administration

TranStar has a VT-term (character) interface that provides the ability to edit/update individual arbitrary data records such as single fares or schedule times where the updates would become immediately available in the trip planner. The interface allows editing of the records listed in Table 2 in the trip planning data repository:

Table 2
TranStar Records

1. Agency Data	7. Pattern Stop Data	13. Fare Amounts
2. Landmark Data	8. Trip Data	14. Rider Category Data
3. Stop Data	9. Schedule Times	15. Fare Instrument Data
4. Day Type Data	10. Peak Hour Data	16. Fare Instrument Value Data
5. Route Data	11. Fare Zone Data	17. Fare Instrument Cost Data
6. Pattern Data	12. Fare Definition Data	18. Fare Instrument Price Data

The existing trip planner includes tools that allow for the maintenance and editing of several parameters and settings that affect the generation of all itineraries. These parameters and settings are listed in Table 3 and will be required for any future trip planner. These are parameters and settings not available or represented through any Web interface.

7.1.5 Geocoding Web Service

An XML based Web service for geocoding that works directly with data in the RTD is already in place. It is currently used extensively to support itinerary planning on the Transit.511.org Web site for the public.

The existing interface currently used in telephone information centers to provide trip planning information uses a different geocoding process that is internal to the TranStar system. The new trip planner shall use the same geocoding service available through the RTD for the interface used by the general public on transit.511.org and also the interface used in telephone information

centers. Details of the geocoding XML interface are available in the Appendix to this document (Sections 1.0 and 2.0).

Table 3
User Maintained Trip Planning Parameters

1. Impassable areas	6. Average driving speed	11. Create/edit Special Access Types for Routes
2. Maximum walking distance to/from a stop	7. Default optimization type on trip information entry form (fastest itinerary, least transfers, lowest fare)	12. Create/edit Street Synonyms
3. Maximum walking distance for transfers	8. Default mail state (for addressing)	13. Footnotes
4. Maximum time allotted for transfers	9. Customer Feedback Form Format	14. Canceled/Delayed Service
5. Average walking speed	10. Create/edit Service Locations and Types	

7.1.6 XML Interface to the RTD

The RTD has a Visual Basic data exchange tool that allows import/export of agency transit data to/from the RTD in a fully formed XML format. The XML schema for this import/export is a standard developed and defined by MTC (see Section 8 in the Appendix for additional details). The schema represents RTD objects, including routes, patterns, stops, trips, schedules, fares, landmarks, ride categories, etc. in a hierarchical format. The XML incorporates GML standard to represent spatial objects (e.g. route shapes). The tool facilitates transfer of transit agency data (entire agency or a subset) between servers.

7.1.7 Transit Data Maintenance Suite (DMS) for the RTD

The Transit Data Maintenance Suite is a comprehensive desktop application (Visual Basic, ArcObjects) that allows direct manipulation of transit data (spatial and tabular) inside the RTD. For example, this application allows users to create, view, delete and update stops, routes, patterns, trips, schedules, fares and landmarks. Through the use of a graphical interface the user can also edit the sequence of stops in a pattern and generate a route shape. All edits made to the RTD through this interface become immediately effective and available to other users of the system. This tool is currently being used only by the RTIS contractor.

7.2 New System Interface Requirements

Based on the interfaces described earlier, there are several requirements for a new trip planning system. However, depending on a proposed system alternative some of those interfaces may

become critical, while others may be de-emphasized. Two alternative scenarios and also the potential existing interfaces already in place in the RTIS that could be utilized under each one of those scenarios are described below.

7.2.1 New Trip Planning System with Direct Database Access (Scenario 1)

If the new Trip Planner can directly access the RTD database as its primary source for trip planning data, it could leverage the investment and utility of RTIS components already in place.

In addition it would minimize data duplication as all data is accessed directly from the central data repository. This architecture also assures that any changes to the database are reflected immediately in the trip planner.

This scenario will use several existing interfaces. For example, the DMS direct editing application, the RTD database itself, and the Web based trip planner (or a modified version of it which could serve both public Web access and telephone operator access) would be utilized extensively in this architecture option. In this configuration, some changes to the existing RTD schema as well as further Web development (for telephone bank centers) may be required. See Figure 5 for a diagram of the component architecture for this potential configuration.

7.2.1.1 Interface Requirements

This scenario will require the following new interfaces:

New Telephone Bank Interface - A new web based interface for the telephone operators would replace the current Telephone Bank Interface (See Section 7.2.2). Its purpose and functionality will be similar to the current Telephone Bank Interface.

Direct Database Access to RTD - The new trip planning system would need to have a direct interface into the RTD. Preferably this interface will take advantage of the design and architecture used by the RTIS DB Gateway business objects.

Under this scenario, the following interfaces will be used by the new RTIS systems with no or minimal enhancements:

a. Itinerary Web Service

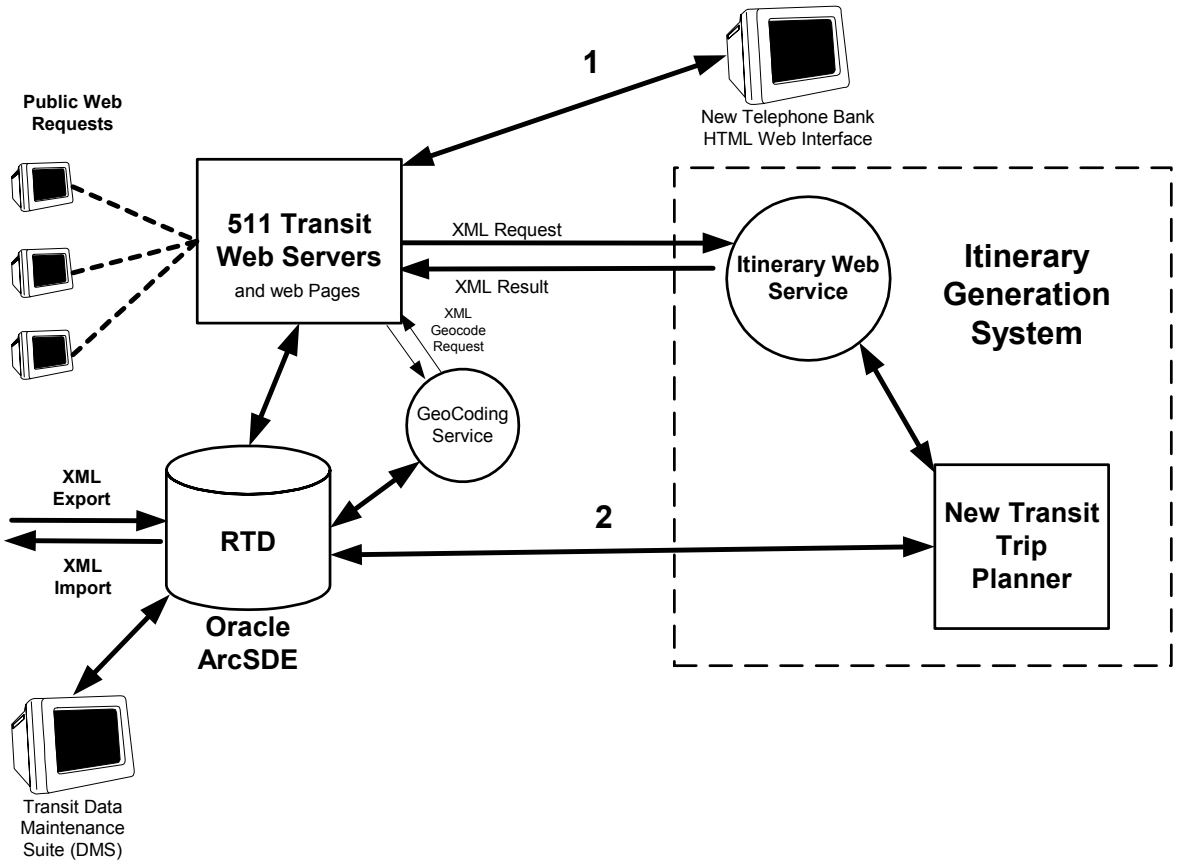
b. Geocoding Web Service

c. XML Interface to RTD

d. Transit Data Maintenance Suite (DMS) for RTD

All these interfaces were described earlier in this report. As mentioned earlier, under this scenario some changes may be required to the RTD schema in order to incorporate any missing pieces of information required by the new trip planner. Corresponding changes would then be needed to these existing interfaces.

Figure 5
New Trip Planning System with Direct Database Access

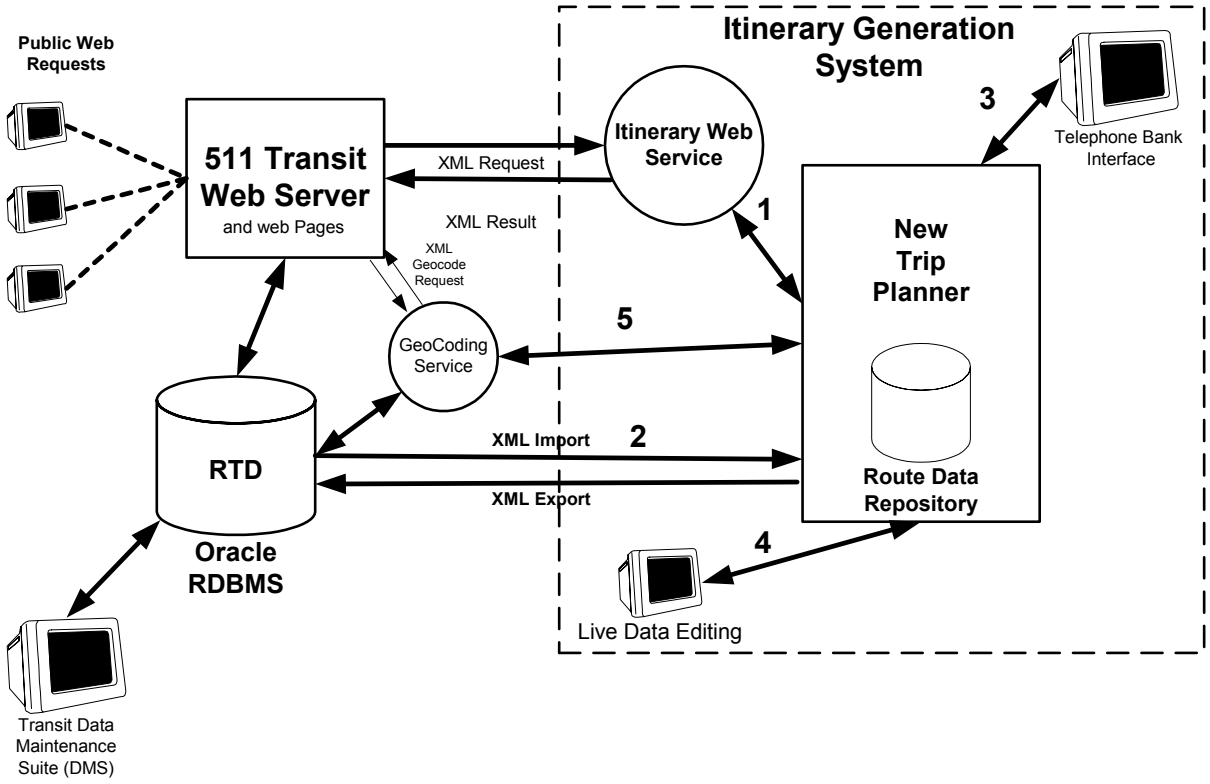


7.2.2 New Trip Planning System without Direct RTIS Access (Scenario 2)

If the Trip Planner cannot directly access the RTD database, it would have to maintain its own copy of the trip planning data. In this case, a process for regularly synchronizing the RTD data with the trip planner and vice versa will also be needed so that changes made in the trip planner would be echoed in the RTIS, and conversely.

RTIS already has an XML import/export utility in place for transferring data to/from RTD. Any new trip planner put into service that cannot directly access the RTD would need to use this XML interface as a format for its trip planning data, either directly or by means of some developed intermediate application. Also, the new trip planner would need to provide an interface for directly editing the data within the trip planner, as well as a comprehensive interface for the telephone bank operators. Figure 6 shows the architecture of the system without direct RTIS access.

Figure 6
New Trip Planning System without Direct RTIS Access



7.2.2.1 Interface Requirements

This scenario will require the following interfaces (bullet numbers refer to the interfaces in Figure 6):

a. *Itinerary Web Service* - The new trip planner will use the Itinerary Web Service implemented by RTIS. Please see Section 7.1.1 for further details.

b. *XML Interface to RTD* - In the absence of a direct interface to the RTD, the new trip planning system would need to utilize the current XML interface to transfer data from the RTD to its internal format on a regular basis. Please refer to section 7.1.6 for further description of the XML interface.

c. *New Telephone Bank Interface* - A new web based interface for the telephone operators would replace the current Telephone Bank Interface (See Section 7.1.2). It purpose and functionality will be similar to the current Telephone Bank Interface.

d. *Direct Editing and Administration Interface* - If the trip planner cannot directly access the RTIS database a method for directly editing the trip planning data would be required. This interface will allow an administrator to modify parameters or change trip planning data for immediate updates.

e. *Geocoding Web Service* - An XML based Web service is already independently available. Phone bank operations require the geocoding of addresses. This could be done through the existing service currently used for geocoding on the public Web site or by some other means.

8.0 Other (Optional) Applications Related to the Transit Trip Planner

One objective of MTC's RTIS procurement is to replace the existing trip planning system (TranStar) with new software that incorporates the features and functions described in the above sections. Respondents to this RFQ are required to describe how their trip planning systems conform to the features and functions described above in Sections 2 through 7. Development of the applications described below is not part of the current RFQ.

To improve its transit information website (transit.511.org) and provide more useful information to help the public make better use of the region's transit network, MTC intends to continue improving the trip planner and developing applications like those listed below. Expanding the capabilities of the transit trip planner to include multi-modal itinerary planning is of interest to MTC and others that may want to use the MTC system. Personal Digital Assistant (PDA) downloads of route and schedule information, wireless connectivity for itinerary planning and instant messaging about real time arrivals and service disruptions are examples of applications MTC might consider implementing in the future.

Although not a requirement, respondents to this RFQ may address in their Statement of Qualifications whether their trip planning systems incorporate similar features and functions as those described below.

8.1 Future Trip Planning Enhancements

The initial focus of the transit trip planner is to integrate all transit modes and the many transit providers in the Bay Area into a unified transportation network. Once this objective has been achieved, additional enhancements will be made. Improvements shall be cumulative, i.e., they will build on and expand the capabilities of the existing system.

8.1.1 Auto-Transit Itinerary Planning

Many people get to a bus or train by driving from home to a transit station, to a park and ride lot near a major arterial or to some other intermediate point where a convenient connection is possible. In many cases, a person has multiple options for where and when to make the first transit connection. To assist this decision process, an integrated driving and transit itinerary planner must be capable of analyzing driving alternatives in conjunction with the best transit options. Driving times, congestion delays and parking availability at specific lots are some of the variables that must be factored into an itinerary that includes an automobile connection at one or both ends of a trip. As a future enhancement of the transit trip planner, MTC will explore different methods for incorporating driving and transit into a single itinerary planner and the data needs of this kind of enhancement.

8.1.2 Bicycle-Transit Itinerary Planning

Many transit hubs and stations provide racks, storage facilities or even valet parking services for bicycles. These kinds of accommodations make it easier to ride a bicycle to make the first transit connection. In addition, the ability to put bicycles on special racks on buses or to carry bicycles on trains further encourage the integration of bicycling and transit as a convenient way of commuting or simply getting around for recreation. While MTC is interested in exploring methods for integrating bicycling and transit in a single itinerary planner, it is also aware that developing integrated itinerary building logic may present numerous challenges. The data needs of this kind of a system can also be significant. For example, specially designated bicycle routes and other information of interest to cyclists must be collected and kept current. In addition, not all buses carry bicycle racks and bicycles are sometimes not permitted on trains especially during peak commute periods. Having this information available on a transit itinerary would be helpful.

8.1.3 Carpool and Vanpool Options

Sometimes a user's trip parameters may be more conducive to a carpool or vanpool trip or to car sharing (e.g., when few transit options exist or when the trip is long). In the future, the trip planner might connect these users to the Regional Ridematching System (RMS) or incorporate the RMS. This option may become even more logicial in the future as the region explores dynamic (i.e., instant) ridematching capabilities.

8.1.4 Licensed Interface - Special Options

Some transit agencies have requested that the Licensed Interface to the trip planner (described in *Appendix C,* Article 5.0) include features that are not currently included in the proposed configuration. One of these features includes the ability to integrate the code for the licensed interface in the transit agency's own website so that itineraries appear to be generated by the transit agency's own trip planning services. Integration of the trip planner code into the transit agency's website also includes the ability to modify the parameters used to request and display itineraries. Of interest to some transit agencies is the ability to modify the code in such a manner that the trip planner favors the display of those itineraries that include the services provided by the agency.

8.1.5 A Personalized Transit Web Page

To enhance the usability of the 511 Transit Website, MTC is considering developing a feature that would allow users to build a personal "My Transit" web page in which links to frequently requested information and personalized information could be saved for future use. To minimize the search process and to keep frequently viewed information just a keystroke away, this web page would allow the user to customize the display of transit information. Links to specific routes, schedules and transit announcements would make relevant information easily accessible. Likewise, the ability to save favorite origins and destinations and automatically insert these in the trip planner, as described in 3.1.1.1, would make generating transit itineraries easier and faster.

8.2 Applications for Handheld Devices

MTC is considering developing applications that provide transit information to handheld devices. The specifications for these applications are still at a conceptual level.

8.2.1 Static Data Retrieval

8.2.1.1 Route and Schedule Information

MTC maintains current route and schedule information for all transit providers in the region and displays this information on its transit website. In the future, MTC intends to develop the capability for an individual to dynamically generate a set of transit schedules and download them as static images (or text) for installation in a PDA device. The interface on the transit information website would include features for pulling schedules from multiple providers, collapsing the timetables to suit the needs of the transit user and saving the download parameters for future use when schedules change.

8.2.1.2 Map Information

Similar to the PDA downloads of schedule information, MTC intends to develop graphical capabilities for downloading route shape information that can be installed and viewed as route maps on a PDA device. The maps displayed on a PDA will have panning, zooming and scrolling capabilities that enable the user to see a the details of a line feature representing the route pattern displayed on the street network. Additional capabilities include the ability to display the stops associated with a particular route.

8.2.2 Dynamic Data Retrieval

8.2.2.1 Route and Schedule Information

MTC may consider using wireless technologies to provide route and schedule information to transit users. Possible uses of this technology include wireless itinerary planning and information searches that identify the transit providers and routes near a particular location that is entered by the user. Using the instant text messaging capabilities of a wireless device (PDA or phone), MTC is considering developing applications that the public can use to query schedule information by entering a route and stop number.

8.2.2.2 Instant Messaging

For registered users electing to be notified about service problems, delays or other changes to particular transit routes, MTC may consider developing wireless instant messaging capabilities that broadcast notices entered by transit agencies into a regional message management and notification system.

8.2.2.3 Real-Time Transit Information

As real-time transit data becomes available in the Bay Area, MTC intends to make this information available in a number of ways. The methods for making real-time arrival information available to the public are being explored with the transit agencies implementing these systems. Browser-based interfaces are a likely method. Another method being considered is expanding the capabilities of the wireless application used to display route and schedule

information (Section 8.2.2.1 above) to also display the anticipated (real-time) arrival of the bus or train next to the scheduled arrival time.

8.2.2.4 IVR Generated Information

MTC may expand its 511 Transit capabilities to include interactive voice response (IVR) capabilities for retrieving transit route and schedule information. The transit service data maintained in the RTD would be the source from which the IVR system would draw its information.

8.3 Other Applications

8.3.1 Station to Station Schedule Finder

This application retrieves agency, route and schedule information between any two stations in the region that are connected by rail service. Using either a map or a list of stations, the user selects an origin, a destination and the day and time of travel. The Web-based application creates a travel time window (e.g., 15 minutes before and 45 minutes after the selected time) and returns a corresponding set of departure and arrival times that connect the two stations. The application includes a feature that makes it easy to display times for the return trip and also provides links to the full schedules.

8.3.2 Point to Point Route and Schedule Finder

Some transit users want to know what routes (and agencies) provide transit services along a particular street or corridor. Instead of generating a discrete transit itinerary between two points for a specific time on a particular carrier, this application generates level of service information by identifying all the transit providers and routes that serve the two identified points. If the user specifies a particular day and a travel time frame, the application will list only those carriers and routes (and associated schedule information) that provide service along the corridor for the identified time period. In addition to accepting text entry for geocoding the extent of the area to be searched, the application will include a map that will allow users to point to the areas (corridors, arterials or street segments) of interest.

8.3.3 Interactive Station Maps

Using maps maintained in the RTD, this graphical application will identify the entrances and exits of a transit station in relation to the surrounding street network, provide views of the station layout and facilitate navigation through the station using internal circulation information.

8.3.4 External Data Sources and Search Capabilities

To provide comprehensive travel information, MTC may explore the possibility of using external data sources (e.g., business directories like Yahoo Yellow Pages and other listings of popular destinations) to help users identify where they may want to travel on transit.

8.3.5 Links to Using Alternative Travel Modes

The objective of MTC's transit information website is to encourage the use of transit, especially where bus or rail provide good alternatives to driving. However, in cases where there is no practical alternative to driving, MTC will explore ways to offer additional travel information that

can help make driving (or driving alone) more efficient and cost effective. Once a user has entered origin and destination information for generating a transit itinerary, the same information can be used in relation to other travel services provided by MTC's 511 traveler information system. For exploring a rideshare alternative, the transit itinerary might include a convenient link to the 511 Rideshare website where the user could explore alternatives to driving alone. A similar link to the 511 Traffic website could use the previously entered origin and destination to generate a driving map that displays real-time congestion information.

Appendix

Background Documentation

1.0 Geocoding Request XML

```
<GeocodeRequest>
     <MaxResultCount>25</MaxResultCount>
     <MinScore>85</MinScore>
     <Address>1330 broadway,oakland</Address>
     <GeocodeAddressAsLandmark>true</GeocodeAddressAsLandmark>
     <LandmarkNormalizingLevel>90</LandmarkNormalizingLevel>
     <ReturnExactOnlyIfAny>true</ReturnExactOnlyIfAny>
</GeocodeRequest>
```

2.0 Geocoding Result XML

```
<?XML version="1.0" encoding="UTF-8"?>
<GeocodingResultset Count="2" Total="101" Type="1" MinScore="85"
MaxCount="25" LandmarkNormalizingLevel="90"> <Warning
WarningID="0"></Warning>
     <Request>101 Broadway,oakland</Request>
     <GeocodeResult id="0">
          <Address>2 - 133 BROADWAY, OAKLAND</Address>
          <Street>2 - 133 BROADWAY</Street>
          <Zone>OAKLAND</Zone>
          <Score>100</Score>
          <X>-122.276907682806</X>
          <Y>37.795210128364</Y>
          <GeocodeType>1</GeocodeType>
     </GeocodeResult>
     <GeocodeResult id="1">
          <Address>2 - 133 BROADWAY, OAKLAND</Address>
          <Street>2 - 133 BROADWAY</Street>
          <Zone>OAKLAND</Zone>
          <Score>100</Score>
          <X>-122.276907682806</X>
          <Y>37.795210128364</Y>
          <GeocodeType>1</GeocodeType>
     </GeocodeResult>
</GeocodingResultset>
```

3.0 Itinerary Web Request XML

```
<?xml version="1.0" encoding="UTF-8"?>
<Itinerary Type="Best/NextBest1/..." Status="">
   <Request>
       <FromLocation Street="" City="" ZIP="" X=""
Y=""></FromLocation>
       <ToLocation Street="" City="" ZIP="" X=""
Y=""></ToLocation>
```

```
        <When></When>
        <Day></Day>
        <Time></Time>
        <RouteNum></RouteNum>
        <Preferences></Preferences>
        <Fare></Fare>
        <SpecialAccess></SpecialAccess>
        <Language></Language>
        <WalkingDistance></WalkingDistance>
    </Request>
</Itinerary>
```

4.0 Itinerary Web Result XML

```
<?xml version="1.0" encoding="UTF-8"?>
<Itinerary Type="Best/NextBest1/..." Status="">
    <Request>
        <FromLocation Street="" City="" ZIP="" X=""
Y=""></FromLocation>
        <ToLocation Street="" City="" ZIP="" X=""
Y=""></ToLocation>
        <When></When>
        <Day></Day>
        <Time></Time>
        <RouteNum></RouteNum>
        <Preferences></Preferences>
        <Fare></Fare>
        <SpecialAccess></SpecialAccess>
        <Language></Language>
        <WalkingDistance></WalkingDistance>
    </Request>
    <ItineraryEntries TripCost="" TripTime="" EntriesCount="">
        <ItineraryEntry ID="">
            <GoTo></GoTo>
            <Board BoardTime=""></Board>
            <Fare></Fare>
            <GetOff></GetOff>
            <Route></Route>
            <TransitType></TransitType>
            <PickupLocation x="" y=""></PickupLocation>
            <PickupCorner></PickupCorner>
            <PickupRoute></PickupRoute>
            <PickupStop></PickupStop>
            <PickupTime></PickupTime>
            <DropoffLocation x="" y=""></DropoffLocation>
            <DropoffRoute></DropoffRoute>
            <DropoffStop></DropoffStop>
            <DropoffTime></DropoffTime>
```

```
            <CarrierCode></CarrierCode>
        </ItineraryEntry>

            .........

    </ItineraryEntries>
    <ItineraryMessages Count="">
        <Message Type="" ID=""></Message>

            .........

    </ItineraryMessages>
</Itinerary>
```

5.0 RTD Relational Database Schema

The "RTD schema and data dictionary" is an intellectual property of MTC. MTC can provide a copy of the "RTD schema and data dictionary" document after receiving a signed copy of the agency's Non-Disclosure Agreement.

6.0 Trip Planning Telephone Interfaces

The following parameters should be available for telephone operation requests. Items not supported through the Web interface are shown in **bold**.

6.1 Itinerary Generation Requests

a. Origin
b. Destination
c. Date (*default current date*)
d. Departure Time (*default current time*) or
e. Arrival Time or
f. First Trip of the Day or
g. Last Trip of the Day
h. Accessible Trip Required (wheel chair or bicycle) (currently in place but disabled on the Web interface)
i. Optimization Type (fastest itinerary, least transfers, lowest fare (*default fastest itinerary*))
j. Fare Category (Adult (18-64), Senior (65+), Disabled, Youth (12-17), Child (5-11), Small Child (under 5), Active Military, Student (K-12), School Trip (*default Adult*))
k. Maximum Walking Distance between Transit Points (1/8, ¼, ½, 1 mile (*default ½ mile*))
l. Carrier (include specific carrier or mode in itinerary, exclude specific carrier or mode in itinerary, only include specific carrier or mode in itinerary (*default Any carrier or mode*))

6.2 Origin and destination information

a. A street address with city and zip (optional)

b. Intersection information (e.g., 12th and Broadway or using the following operators: @, :, &, AT)

c. Landmark name

d. Set from clicking on a location on a map.

6.3 Other Requests

a. Route Schedules & Announcements by Carrier, route name, direction and day of week headsign.

b. Stop characteristics and routes servicing a stop

c. Routes by location (is displayed on Web Maps)

d. Closest Fare Sales outlet to location

e. Diagnosis itinerary – Stop to Stop schedules by route.

6.4 Itinerary Generation Results

a. Routing

b. Schedule

c. Transfer information

d. Next scheduled departure

e. Side of the street or corner of the intersection

f. Service announcements

g. Candidate list for similar spellings or variations when entered information is not found.

h. Candidate list for street addresses geocoded without city or zip code.

i. Alternative itineraries

j. Elapsed time

k. Walking time

l. Transfer waiting time

m. Fare

6.5 Map Displays

a. Origin to the first transit stop location,

b. Route transfer points, and

c. Last transit stop location to the destination

6.6 Miscellaneous

a. Customer Feedback

7.0 TranStar Batch File Format

```
CHBHARBOR BAY        5107695500                                                                                      01010307040311270311280312250301010 4
HHB  82
LBART EMBARCADERO                         298 MARKET ST                         SAN FRANCISCO              94111122397294 37792518
LBAYSIDE PLAZA                            188 THE EMBARCADERO ST                SAN FRANCISCO              94111122394416 37796017
LCHEVRON                                  225 BUSH ST                           SAN FRANCISCO              94104122401403 37791130
LEMBARCADERO/PIER 3 5                     THE EMBARCADERO:MISSION ST.           SAN FRANCISCO              94105122393106 37793242
LEMBARCADERO STATION                      298 MARKET                            SAN FRANCISCO              94111122397294 37792518
LLAGOON (AUGHINBAUGH WAY-BAY FARM)        AUGHINBAUGH WAY:BAYWALK RD            ALAMEDA                    94502122251977 37739359
LMARITIME PLAZA                           CLAY:FRONT                            SAN FRANCISCO              94111122399138 37795172
LPIER 1                                   WASHINGTON ST:THE EMBARCADERO         SAN FRANCISCO              94111122395487 37796681
LPIER 5                                   BROADWAY:THE EMBARCADERO              SAN FRANCISCO              94111122397636 37799275
LSAN FRANCISCO FERRY BUILDING             THE EMBARCADERO:MISSION ST            SAN FRANCISCO              94105122393106 37793242
LTRANSBAY TERMINAL                        1ST ST:NATOMA ST                      SAN FRANCISCO              94105122396513 37789018
LTRANSBAY TERMINAL UPPER LEVEL            TRANSBAY TERMINAL                     SAN FRANCISCO              94105122396513 37789018
R            HBFERRY         HARBOR BAY ISLE       EAST      I         W,B                 2FN
S   1SAN FRANCISCO FERRY BUILDING                                                                                  WB S122393106 37793242
S   2HARBOR BAY FERRY TERMINAL                                                                                     WB S122257152 37737972
T1   1   2
6
N                        700A 725A
N                        800A 825A
N                        435P 500P
N                        535P 600P
N                        635P 700P
N                        735P 800P
R            HBFERRY     SAN FRANCISCO      WEST   I     W,B            2FN
S   1HARBOR BAY FERRY TERMINAL                                                                                     WB S122257152 37737972
S   2SAN FRANCISCO FERRY BUILDING                                                                                  WB S122393106 37793242
T1   1   2
6
N                        630A 655A
N                        730A 755A
N                        830A 855A
N                        505P 530P
N                        605P 630P
N                        705P 730P
YCHB         080700                       SBM ID REQUIRED       C   AGE 5-12
WCHB         090401      1Y
M  500
M  300
M  225
EHB1HARBOR BAY 10 TICKET BOOK
OCHB         090401      1O
M 4000
M 4000
```

```
M 4000
VCHB          090401          1NO10   Y
M  500
M  300
M  225
EHB2HARBOR BAY 20 TICKET BOOK
OCHB          090401          1O
M 7000
M 7000
M 7000
VCHB          090401          1NO20   Y
M  500
M  300
M  225
EHBMHARBOR BAY MONTHLY PASS
OCHB          090401          1O
M13000
M13000
M13000
VCHB          090401          1 O     Y
M  500
M  300
M  225
```

8.0 RTD XML Schema

The "RTD XML schema" is MTC intellectual property. MTC can provide a copy of the "RTD XML schema" document after receiving a signed copy of the agency's Non-Disclosure Agreement.

Appendix C-1
Regional Transit Information System (RTIS)
Transit Trip Planning Software Functional Needs

Vendor Name: _____

Product Name: _____

Authorized Signature:_____**Date**: _____

Instructions: *Please refer to the corresponding section in Appendix C for a description of each trip planner requirement. For each requirement, indicate "**Yes**," "**Partial**" or "**No**" in the appropriate column and describe your system's feature/function in the column labeled "Vendor's Corresponding Feature/Function". Vendors should reply "**Yes**" only when the Vendor's Corresponding Feature "**fully meets requirements**". If the Vendor's Corresponding Feature partially satisfies the requirement or if simple changes could satisfy the requirement, the vendor should reply "**Partial**" and provide further discussion/explanation in the last column. A "**No**" response with no explanation will be interpreted as meaning "**requirement is not satisfied**". If left **blank**, the response will be interpreted as "**No**". The last column may also be used for additional information the vendor wishes to provide.*

Vendors should access the Word version of the following table at http://www.mtc.ca.gov/jobs/trip_planner_rfq.htm to complete it electronically. Vendors should reformat the table as needed to best utilize space (e.g., resize column widths, reorient the page layout, etc.).

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
1	2.1 a, 7.0, 7.2	System requirement	**RTIS integration, data structure**. The trip planner can be integrated into the RTIS data structure.			
2	2.1 b	System requirement	**RTIS integration, GIS system**. The trip planner can access an external GIS system for spatial data and GIS services.			
3	2.2	System requirement	**Hardware and software compatibility**. The trip planner shall be compatible with RTIS hardware and software environment.			
4	2.3 a	System requirement	**Interfaces, browser-based**. The trip planner interfaces are			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
			browser based.			
5	2.3 b	System requirement	**Standards, W3C**. The trip planner interfaces are consistent with W3C standards.			
6	2.3 c	System requirement	**Secure web interface**. The trip planner interfaces can be used through a private, secure web interface.			
7	2.4	System requirement	**Interfaces, support for multiple versions**. The trip planner supports multiple interfaces, each designed for a particular type of user.			
8	2.4.1	System requirement	**Interface, public use version**. The trip planner shall have a browser-based interface for use by the general public.			
9	2.4.2	System requirement	**Interface, call center version**. The trip planner shall have a secure call center, browser-based interface.			
10	2.4.3	System requirement	**Interface, licensed version**. The trip planner shall have a customizable interface that can be licensed for use by other websites.			
11	2.5 a	System requirement	**Languages**. The trip planner interfaces are available in different languages.			
12	2.5 b	System requirement	**Language: Standard Unicode encoding**. The trip planner supports Unicode encoding to facilitate			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
			adding new languages.			
13	**2.6**	**System requirement**	**Accessibility – 508 compatibility**. The trip planner interfaces are compatible with Section 255 and Section 508 accessibility guidelines.			
14	**2.7**	**System requirement**	**Transit industry data standards.** The trip planner can easily adapt to and incorporate changing industry standards.			
15	**3.1.1.1 a**	**General interface requirement**	**Address matching and geocoding**. The trip planner can use RTIS address matching and geocoding services.			
16	**3.1.1.1 b**	**General interface requirement**	**Address formats**. The trip planner accepts street numbers, street names and street types.			
17	**3.1.1.1 c**	**General interface requirement**	**Address drop down list**. The trip planner can populate a drop down list with recently entered addresses.			
18	**3.1.1.1 d**	**General interface requirement**	**Address favorites**. The trip planner can save a users favorite origins and destinations.			
19	**3.1.1.2**	**General interface requirement**	**Street intersections**. The trip planner accepts street intersections.			
20	**3.1.1.3**	**General interface requirement**	**Landmarks**. The trip planner accepts landmark names.			
21	**3.1.1.4**	**General interface requirement**	**Ambiguous results**. When a unique address cannot be			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
			found, the trip planner shall list possible alternatives from which to choose.			
22	**3.1.1.5**	**General interface requirement**	**City names**. The trip planner accepts city names.			
23	**3.1.1.6**	**General interface requirement**	**Zip codes**. The trip planner accepts zip codes.			
24	**3.1.1.7**	**General interface requirement**	**Map-based geocoding**. The trip planner shall have map-based geocoding capabilities that allow an origin or destination to be pin pointed on a map.			
25	**3.1.2.1 a**	**General interface requirement**	**Day of week, future date**. The trip planner allows day of travel to be identified up to at least 4 weeks into the future.			
26	**3.1.2.1 b**	**General interface requirement**	**Date and day of week**. The trip planner identifies the date with the corresponding day of the week.			
27	**3.1.2.2**	**General interface requirement**	**Travel time choices**. The trip planner includes the five identified options for selecting a desired travel time.			
28	**3.1.3.1**	**General interface requirement**	**Itinerary sorting options**. The trip planner shall provide the user with options for sorting itineraries including least travel time, fewest transfers and least cost.			
29	**3.1.3.2**	**General interface**	**Fare categories**. The trip planner shall			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
		requirement	allow the user to select from a list of fare categories.			
30	**3.1.3.3**	**General interface requirement**	**Walking distance**. The trip planner shall allow the user to select from a list of walking distances to the first stop.			
31	**3.1.3.4 a**	**General interface requirement**	**Prefer to include, must include and exclude mode choice**. The trip planner shall allow including (prefer to and must) or excluding up to two transit modes.			
32	**3.1.3.4 b**	**General interface requirement**	**Prefer to include, must include and exclude, transit providers**. The trip planner shall allow including (prefer to and must) or excluding up to two transit providers.			
33	**3.1.3.4 c**	**General interface requirement**	**Mode or provider choice**. The trip planner shall have the capability of allowing the user to select a single mode or a single transit provider (the "only" option).			
34	**3.1.3.5**	**General interface requirement**	**Accessibility information**. The trip planner shall provide the user the option of requesting accessibility information.			
35	**3.1.3.6**	**General interface requirement**	**Bicycle information**. The trip planner shall provide the user the option of requesting bicycle information.			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
36	**3.2.1**	**Process and logic**	**Mapping services**. The trip planner shall use the GIS services maintained within the RTIS.			
37	**3.2.2**	**Process and logic**	**Address matching and geocoding**. The trip planner shall use existing RTIS address matching and geocoding services.			
38	**3.2.3 a**	**Process and logic**	**Itinerary calculations use all available service.** The trip planner shall evaluate all schedules and routes in generating an itinerary.			
39	**3.2.3 b**	**Process and logic**	**Stops near the origin and destination**. The trip planner shall make one to many computations for all stops near the starting point to all end points of the trip.			
40	**3.2.3 c**	**Process and logic**	**Itinerary search radius**. The trip planner shall use a flexible search radius to ensure an adequate number of one to many comparisons.			
41	**3.2.5 a**	**Process and logic**	**Schedules, current and future**. The trip planner shall be capable of using current and future schedules in computing itineraries.			
42	**3.2.5 b**	**Process and logic**	**Schedules, unavailable data**. The trip planner shall notify users when future schedules are not available.			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
43	**3.2.6 a**	**Process and logic**	**Mode and provider list**. The trip planner shall provide users with the ability to select from a list of all available modes and providers			
44	**3.2.6 b**	**Process and logic**	**Include and exclude**. The trip planner shall provide the option to "prefer to include," "must include" and/or exclude multiple modes and providers.			
45	**3.2.6 c**	**Process and logic**	**Include and exclude, the "only" option**. The trip planner shall have the ability to select a single mode and/or transit provider.			
46	**3.2.6 d**	**Process and logic**	**Notices to use caution**. The trip planner shall provide cautionary notices regarding the use of the include/exclude/only feature.			
47	**3.2.7 a**	**Process and logic**	**Linked modes**. The trip planner shall be able to link modes to define a single service.			
48	**3.2.7 b**	**Process and logic**	**Linked routes**. The trip planner shall be able to link routes to define a preferred travel pattern.			
49	**3.2.7 c**	**Process and logic**	**Data editing tools linked service.** The trip planner shall provide tools for defining and editing linked modes and routes.			
50	**3.2.8 a**	**Process and logic**	**Transfer times**. The trip planner shall not			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
			suggest a transfer when the scheduled connection is less than or equal to the default transfer penalty.			
51	**3.2.8 b**	**Process and logic**	**Data editing tools, transfer times.** The trip planner shall provide tools for editing the default stop transfer time.			
52	**3.2.9 a**	**Process and logic**	**Stops with limited availability**. The trip planners shall provide tools for limiting the availability of a particular stop.			
53	**3.2.9 b**	**Process and logic**	**Stops, restricted availability.** The trip planner shall not consider a restricted stop in the computation of itineraries.			
54	**3.2.10 a**	**Process and logic**	**Times between stops**. The trip planner shall compute travel times between all stops.			
55	**3.2.10 b**	**Process and logic**	**Time, computing**. The trip planner shall include distance, speed and congestion in computing times between stops.			
56	**3.2.11**	**Process and logic**	**Trip length and time thresholds**. The trip planner shall flag itineraries exceeding length and time thresholds and suggest alternatives.			
57	**3.2.12**	**Process and logic**	**First and last trip of the day**. When the user requests the first or last trip of the day, the trip planner shall			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
			use the provider defined first and last trip.			
58	**3.2.13 a**	**Process and logic**	**Network routing**. The trip planner shall use the GIS basemap for generating itineraries and walking directions and calculating distance and time.			
59	**3.2.13 b**	**Process and logic**	**Routes conform to street network**. The trip planner shall map routes to conform to the GIS street network.			
60	**3.2.14**	**Process and logic**	**Walking distance**. The trip planner shall compute total walking distance as defined in the requirements.			
61	**3.2.15**	**Process and logic**	**Itineraries, unusual results**. The trip planner shall flag unusual itineraries and suggest options for improving the identified problem.			
62	**3.2.16**	**Process and logic**	**Fare computation**. The trip planner shall compute fares as defined in the requirements.			
63	**3.2.17**	**Process and logic**	**Landmarks**. The trip planner shall access landmark information from the RTD, list ambiguities and incorporate map coordinates for itinerary planning.			
64	**3.2.18**	**Process and logic**	**Sorting logic**. The trip planner shall have the flexibility for listing itineraries as			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
			stated in the requirements.			
65	**3.2.19**	**Process and logic**	**Notices and messages**. The trip planner shall have the capability of generating the various notices and messages as identified in the requirements.			
66	**3.3.1.1 a**	**Itinerary**	**Itinerary summaries**. The trip planner shall summarize 4 or 5 itineraries that closely match the trip request.			
67	**3.3.1.1 b**	**Itinerary**	**Itineraries, full descriptions**. The trip planner shall generate a full itinerary for each summary itinerary.			
68	**3.3.1.1 c**	**Itinerary**	**Sorting table**. The trip planner shall permit sorting of summary itineraries.			
69	**3.3.1.2 a**	**Itinerary**	**Itinerary, summary of trip parameters**. The trip planner shall summarize the requested trip parameters.			
70	**3.3.1.2 b**	**Itinerary**	**Time (Now) is updated with each submission**. With each submission, the trip planner shall update the "now" option to reflect current clock time.			
71	**3.3.1.3 a**	**Itinerary**	**Walking directions**. The trip planner shall provide written walking directions.			
72	**3.3.1.3 b**	**Itinerary**	**Walking directions and maps**. The trip planner walking directions shall			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
			correspond to the maps generated by the system.			
73	**3.3.1.4 a**	**Itinerary**	**Walking maps**. The trip planner shall generate walking maps for each leg of the trip.			
74	**3.3.1.4 b**	**Itinerary**	**Maps, route information**. The trip planner walking maps shall display transit route information.			
75	**3.3.1.4 c**	**Itinerary**	**Map navigation features**. The trip planner maps shall provide useful navigation features.			
76	**3.3.1.5**	**Itinerary**	**Trip description**. The trip planner shall clearly identify the provider, route and other information needed for making the appropriate connections.			
77	**3.3.1.6 a**	**Itinerary**	**Transit connect times**. The trip planner shall identify the connection times for each leg of the trip.			
78	**3.3.1.6 b**	**Itinerary**	**Next connection time**. The trip planner shall provide the next connection time for the same route.			
79	**3.3.1.6 c**	**Itinerary**	**Links to schedules**. The trip planner shall provide links to full and partial schedules for the recommended routes.			
80	**3.3.1.7**	**Itinerary**	**Transfer information**. For itineraries with one or more transfers, the trip planner shall provide			

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			text describing how to connect with the next leg of the trip.			
81	**3.3.1.8 a**	**Itinerary**	**Fare computation**. The trip planner shall compute a total fare and a fare for each leg of a transit itinerary.			
82	**3.3.1.8 b**	**Itinerary**	**Transfers.** The trip planner shall provide information about acquiring transfers and rules for their use.			
83	**3.3.1.8 c**	**Itinerary**	**Transfers, more complete information**. The trip planner shall advise the user where to get comprehensive information about transfers.			
84	**3.3.1.9 a**	**Itinerary**	**Travel time**. The trip planner shall compute the total travel time for the transit trip.			
85	**3.3.1.9 b**	**Itinerary**	**Travel time, transit**. The trip planner shall compute the travel time on transit for each itinerary.			
86	**3.3.1.10**	**Itinerary**	**Walking distance**. The trip planner shall compute the total walking distance for each itinerary.			
87	**3.3.1.11**	**Itinerary**	**Travel advisories**. The trip planner shall provide travel advisory information relevant and specific to each itinerary it computes.			
88	**3.3.1.12 a**	**Itinerary**	**Accessibility information**. The trip planner shall provide accessibility			

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			information relevant to each itinerary.			
89	**3.3.1.12 b**	**Itinerary**	**Accessibility information, use with caution**. When accessibility information is not available, the trip planner shall post an appropriate notice and provide a link to where the information can be acquired.			
90	**3.3.1.13**	**Itinerary**	**Return trip**. The trip planner shall make it easy for the user to generate a return trip itinerary.			
91	**3.3.1.14**	**Itinerary**	**Links, other useful information**. The trip planner shall provide links to other information that may be useful.			
92	**3.3.2.1**	**Itinerary**	**Announcements**. The trip planner shall link to announcements that are relevant to each itinerary.			
93	**3.3.2.2**	**Itinerary**	**Transit service links**. The trip planner shall provide links to more complete information about the transit service identified on each itinerary.			
94	**3.3.2.3 a**	**Itinerary**	**Feedback**. The trip planner shall provide a link to the public comment feature maintained by the RTIS.			
95	**3.3.2.3 b**	**Itinerary**	**Data capture capability**. The trip planner shall have the ability to capture			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
			information on the user's screen to help diagnose problems.			
96	**3.4.1**	**Itinerary**	**Help features**. The trip planner shall provide a comprehensive help feature for new and regular transit users.			
97	**3.4.2**	**Itinerary**	**Print, save and e-mail capabilities**. The trip planner shall provide features that permit printing, saving and e-mailing a transit itinerary.			
98	**4.0**	**Call center interface**	**Performance, optimized for frequent users**. The call center interface shall be optimized for ease of use and quick data retrieval.			
99	**4.1**	**Call center interface**	**Monitoring**. The trip planner shall have the capability of monitoring call center trip planning activity.			
100	**4.2.1**	**Call center interface**	**Secure access**. The trip planner shall include features that provide secure access for call center operators.			
101	**4.2.2**	**Call center interface**	**Interface, easy to use**. The call center interface shall be configured to reflect how telephone operators respond to calls.			
102	**4.2.3**	**Call center interface**	**Schedules**. The trip planner shall provide enhanced capabilities for displaying schedule information.			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
103	**4.2.4 a**	**Call center interface**	**Routes serving a location**. The trip planner shall be capable of identifying routes serving a selected location.			
104	**4.2.4 b**	**Call center interface**	**Schedule information**. The trip planner shall be capable of displaying schedules associated with routes serving a selected location.			
105	**4.2.5**	**Call center interface**	**Stop characteristics**. The trip planner call center interface shall be capable of displaying service information associated with individual stops.			
106	**4.2.6**	**Call center interface**	**Mapping capabilities**. The call center interface shall be capable of displaying route, stop and other service data.			
107	**4.2.7**	**Call center interface**	**Itinerary diagnosis**. The call center interface shall be capable of diagnosing problematic itineraries.			
108	**4.3**	**Call center interface**	**Itinerary distribution**. The call center interface shall be capable of multiple ways of distributing itineraries.			
109	**4.4**	**Call center interface**	**Data management, contact information**. The call center interface shall provide the ability for transit agencies to enter and edit contact and other service information.			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
110	**4.5**	**Call center interface**	**Itinerary travel advisories and announcements**. The call center interface shall provide the means for transit agencies to post and manage announcements and travel advisories.			
111	**4.6**	**Call center interface**	**Feedback management.** The call center interface shall provide the means for telephone operators to log and manage customer and other feedback.			
112	**5.1.1**	**Licensed interface**	**Secure access**. The licensed interface shall incorporate features that assure a private, secure connection between the user and the RTIS.			
113	**5.1.2**	**Licensed interface**	**Trademark.** The licensed interface shall be trademarked with the 511 logo.			
114	**5.1.3**	**Licensed interface**	**Lists, customized.** The licensed interface shall provide a feature for creating customizable lists of origins and destinations.			
115	**5.1.4**	**Licensed interface**	**Unbiased information**. The licensed interface shall generate itineraries identical in content to those of the other interfaces.			
116	**5.2**	**Licensed interface**	**Implementation and support**. The licensed interface shall be			

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			administered and supported by MTC through its contractor.			
117	**6.1**	**System administration**	**Data maintenance tools**. The trip planner shall integrate all data maintenance tools into a well-designed interface.			
118	**6.2.1**	**System administration**	**Data editing, default values**. The trip planner data administration interface shall allow entering and editing itinerary defaults.			
119	**6.2.2**	**System administration**	**Walking speed**. The trip planner data administration interface shall allow entering and editing of walking speed.			
120	**6.2.3**	**System administration**	**Walking distance, maximum**. The trip planner data administration interface shall allow entering and editing maximum walking distance.			
121	**6.2.4**	**System administration**	**Linked modes and routes**. The trip planner data administration interface shall allow linking of transit modes and routes.			
122	**6.2.5**	**System administration**	**Transfer times**. The trip planner data administration interface shall allow entering and editing of transfer times.			
123	**6.2.6**	**System administration**	**Transit modes, defined**. The transit modes recognized by			

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			the trip planner shall be those defined by the RTD.			
124	**6.2.7**	**System administration**	**Fare category definitions**. The fare categories used in the trip planner shall be those used in the RTD.			
125	**6.3.1**	**System administration**	**Reports, trip planning activity**. The trip planner shall be capable of producing reports summarizing itinerary-related information.			
126	**6.3.2**	**System administration**	**Reports, administrative**. The trip planner shall be capable of producing reports summarizing administrative information.			
127	**6.4**	**System administration**	**Performance**. The trip planner shall be able to meet required performance standards.			
128	**8.1.1**	**Optional applications**	**Auto-transit itinerary planning.** Does the trip planner have the capability of incorporating auto-transit trip planning?			
129	**8.1.2**	**Optional applications**	**Bicycle-transit Itinerary Planning.** Does the trip planner have the capability of incorporating bicycle-transit itinerary planning?			
130	**8.1.3**	**Optional applications**	**Carpool and vanpool options.** Does the trip planner have the capability of incorporating carpool and vanpool options in			

	App. C, Sect. #	Requirement Area	RTIS Trip Planner Requirement	Yes Partial No	Vendor's Corresponding Feature/Function	Discussion / Explanation
			the itinerary planning process?			
131	**8.1.4**	**Optional applications**	**Customizable licensed interface.** Does the trip planner have an interface that can be integrated into an existing website and customized by the licensees?			
132	**8.1.5**	**Optional applications**	**Personalized transit web page.** Does the trip planner have the ability to allow users to build individualized web pages or save "favorites" within the trip planner?			
133	**8.2.1.1**	**Optional applications**	**Retrieval of static route data.** Does the trip planner have the capability of retrieving route & schedule information for display?			
134	**8.2.1.2**	**Optional applications**	**Retrieval of static map data.** Does the trip planner have the capability of retrieving static map information for display?			
135	**8.2.2.1**	**Optional applications**	**Dynamic route and schedule information.** Does the trip planner have the capability of retrieving dynamic route & schedule information for display?			
136	**8.2.2.2**	**Optional applications**	**Instant messaging.** Does the trip planner have the ability to use instant messaging capabilities?			
137	**8.2.2.3**	**Optional**	**Real time transit**			

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		applications	**information.** Does the trip planner have the capability of displaying real time transit information?			
138	**3.2.2.4**	**Optional applications**	**IVR generated information.** Does the trip planner have the ability of being integrated with IVR capabilities?			
139	**8.3.1**	**Optional applications**	**Station to station schedule finder.** For transit stations, does the trip planner have the capability of generating and displaying schedule information?			
140	**8.3.2**	**Optional applications**	**Corridor level service information.** Does the trip planner have the capability of retrieving and displaying transit corridor service information?			
141	**8.3.3**	**Optional applications**	**Interactive station maps.** Does the trip planner have the capability of displaying detailed station maps?			
142	**8.3.4**	**Optional applications**	**External data search capabilities.** Does the trip planner have the ability to search external data sources for transit trip planning purposes?			
143	**8.3.5**	**Optional applications**	**Linking to other travel planning applications.** Does the trip planner have the capability of linking to other travel			

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			planning applications?			