Mass Transit Router Functional Specification

Preliminary

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Tim Holloway <timh@mousetech.com>

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1 Introduction

1.1 Purpose

The JTA application system is intended to provide a working implementation of state-of-the-art J2EE components working in harmony to implement a mass transit routing system (bus routes and schedules).

Features

Primary program features are:

- Editing and maintenance of route maps and schedules
- Viewing of maps graphically via Google Maps
- Public-facing site featuring the ability to output schedule information via PDFs and downloadable mobile device files (*e.g.*, PalmOs PDB).

1.2 Future Features

TBD

1.3 Platform

The application has been tested on Tomcat 5 and Tomcat 6. Future releases may mandate a full J2EE container such as JBoss.

2 Use Cases

2.1 Definitions

TBD

2.2 Cast of characters

Internal User. The casual application user who creates, edits and views route and schedule information.

Public User. An external user who employs the unsecured parts of the app to obtain schedule information.

Site Administrator. A user who manages users and services.

2.3 Technology Requirements

The application should perform smoothly on a 2.3GHz Intel-compatible processor with 512MB of RAM or more or an equivalently powerful system of a supportive platform (*e.g.*, SPARC).. Ideally, it should function reasonably well on a 500MHz 256MB machine.

The application will require open HTTP communications channels. Use of the administrative functions will require open HTTPS communications channels.

The application will not require specialized hardware.

3 User Considerations

4 Operational Considerations

4.1 General

The application operates as a standard J2EE web application. The primary interface is the public-facing system. The secondary interface is the administrative system. For demo purposes, both are members of the same deployment unit, but they could be separated for security reasons. If separated, there are certain shared resources. Most notably, the custom Facelets tag for Google Maps and the Object Datamodel.

5 Subsystems

5.1 Primary subsystems

There are 2 primary subsystems, as follows:

1. Public-facing site where users (riders) can obtain bulletins, schedules, *etc.*
2. Planning site, where route planners define, link, and schedule the bus routes, stops, and trip schedules.

6 Planning Site

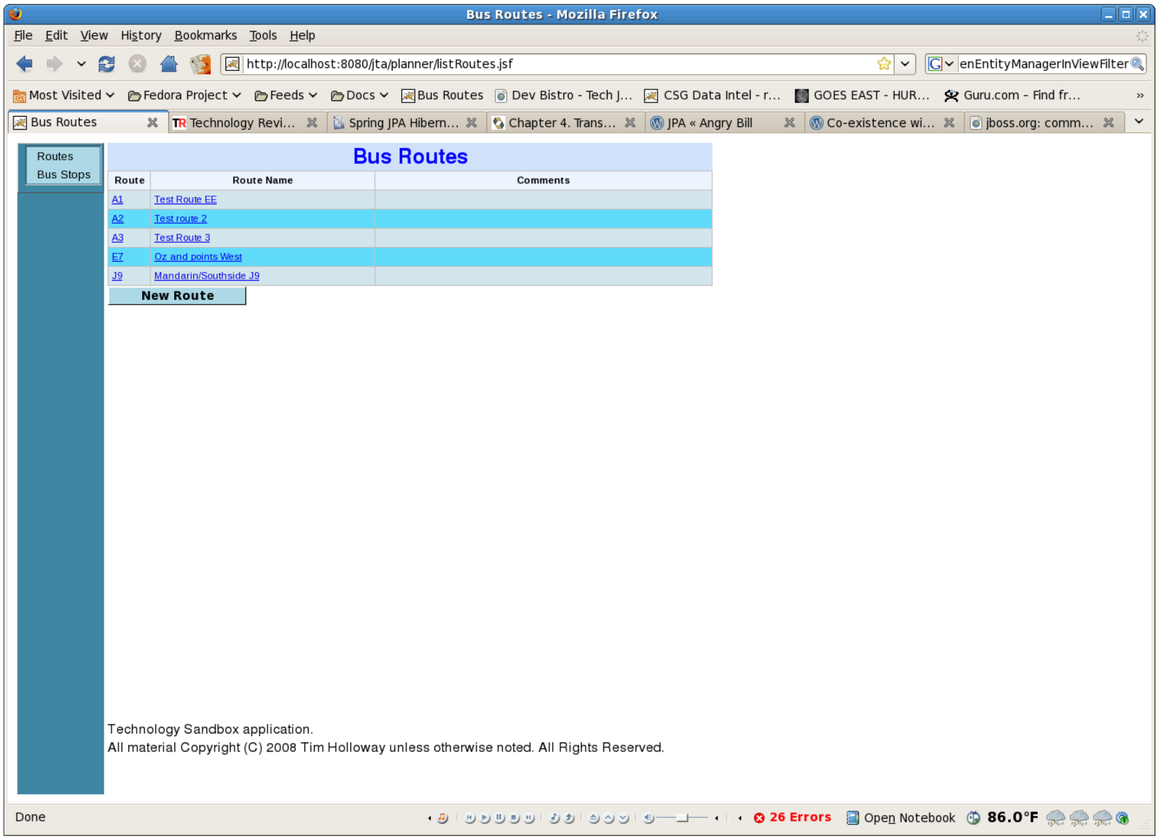
6.1 Menu options

The planning site has 2 menu options:

1. Routes
2. Bus Stops

6.2 Routes Editor

The route editor is responsible for tying together lists of bus stops in space and time in order to provide itineraries and schedules. The top level of this editor is the Routes Selection page:



Bus Routes

Route	Route Name	Comments
A1	Test Route EE	
A2	Test route 2	
A3	Test Route 3	
E7	Oz and points West	
J9	Mandarin/Southside J9	

New Route

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There are 2 options on this page, New Route and edit. Both of them direct to the Route Editor Page, but the displayed options are slightly different, since not all elements of a route exist or can be created until after the route itself has been created.

1.1.1 New Route

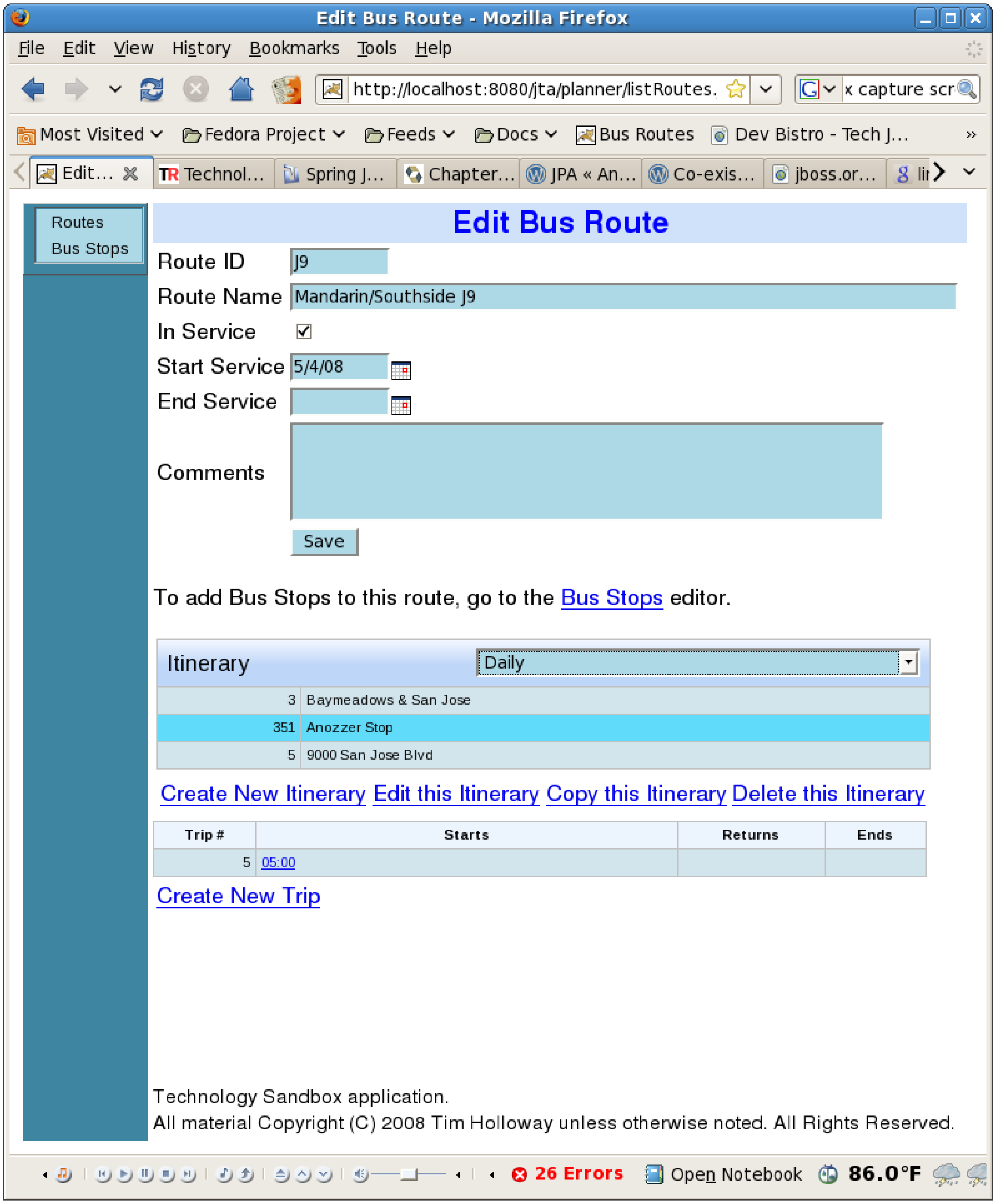
The Route Editor for a route to be created looks like this:

TBS

A route has to be defined before it can be assigned itineraries or schedules. Once this is done, the view switches to the Edit Route mode.

1.1.2 Edit Route

The Edit Route display mode of the Route Editor page adds the ability to manipulate itineraries and schedules. It looks like this:



Edit Bus Route

Route ID	J9
Route Name	Mandarin/Southside J9
In Service	☑
Start Service	5/4/08
End Service	
Comments	

Save

To add Bus Stops to this route, go to the Bus Stops editor.

Itinerary: Daily

3	Baymeadows & San Jose
351	Anozzer Stop
5	9000 San Jose Blvd

Create New Itinerary Edit this Itinerary Copy this Itinerary Delete this Itinerary

Trip #	Starts	Returns	Ends
5	05:00		

Create New Trip

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The two new sections are for Itineraries and Trips. The Trips section will not display unless at least one Itinerary has been created. The dropdown list in the Itinerary section allows the selection of which itinerary is to be displayed. The table below it lists the stops defined on this Itinerary. The Trips section will list the trips for this Itinerary.

Likewise, the commands “Edit this Itinerary”, “Copy this Itinerary” and “Delete this Itinerary” use the Itinerary selected in the drop-down list of Itineraries for this Route as a basis.

When no Itineraries have been defined for the route, only the “Create New Itinerary” option will be displayed. The drop-down list and Trips section will be hidden and no Itinerary Bus Stops will be listed.

☞**Important:**

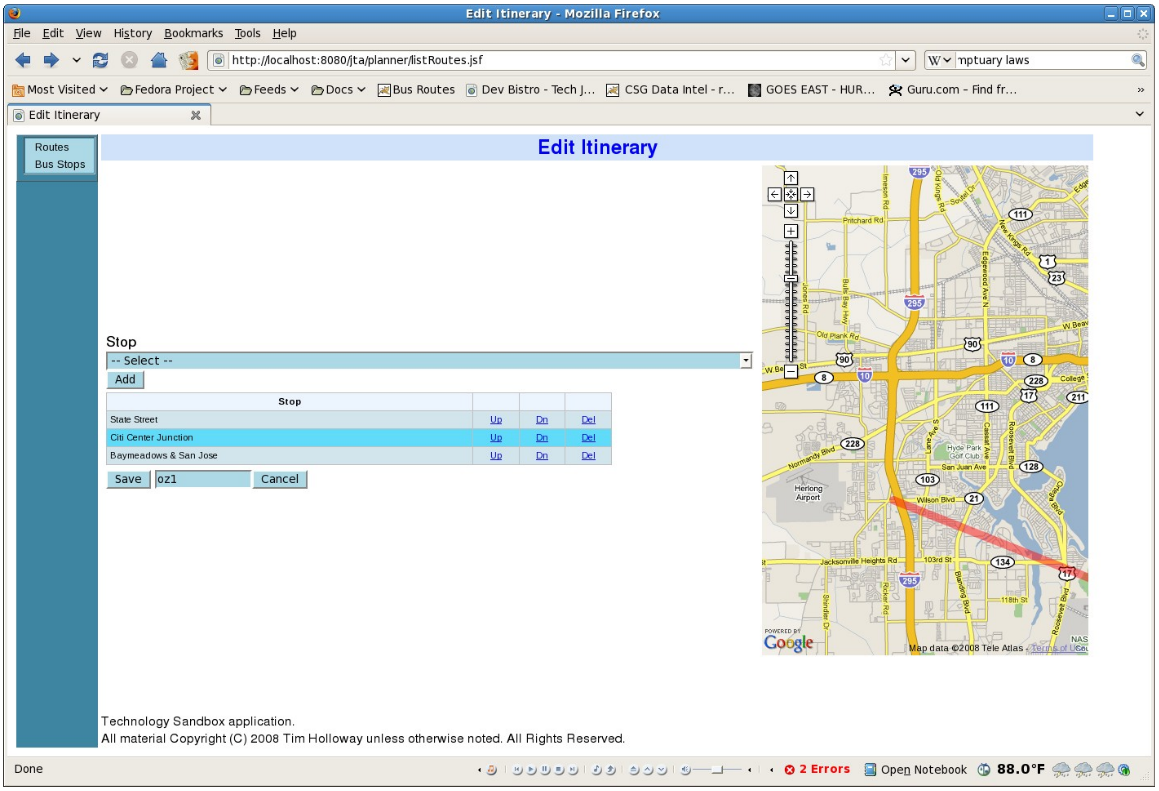
At the present time, only Bus Stops defined as belonging to the Route being edited may be used on an Itinerary. Use the Bus Stops editor to assign Bus Stops to the Route before creating Itineraries.

1.1.3 Itinerary Editor

The Itinerary editor supports creating and editing of an Itinerary. An Itinerary is a sequence of Bus Stops for a Route in chronological order from first to last. There can be multiple Itineraries assigned to a Route. Generally all Itineraries follow the same basic path, with slight variations, such as the stops that are skipped on weekend schedules.

Itineraries define only the path traveled and not the time. The Itinerary serves as a plan for mapping Trips. **TBS definitions**

The Itinerary editor looks like this:



Edit Itinerary

Stop

-- Select --

Add

Stop			
State Street	Up	Dn	Del
Citi Center Junction	Up	Dn	Del
Baymeadows & San Jose	Up	Dn	Del

Save oz1 Cancel

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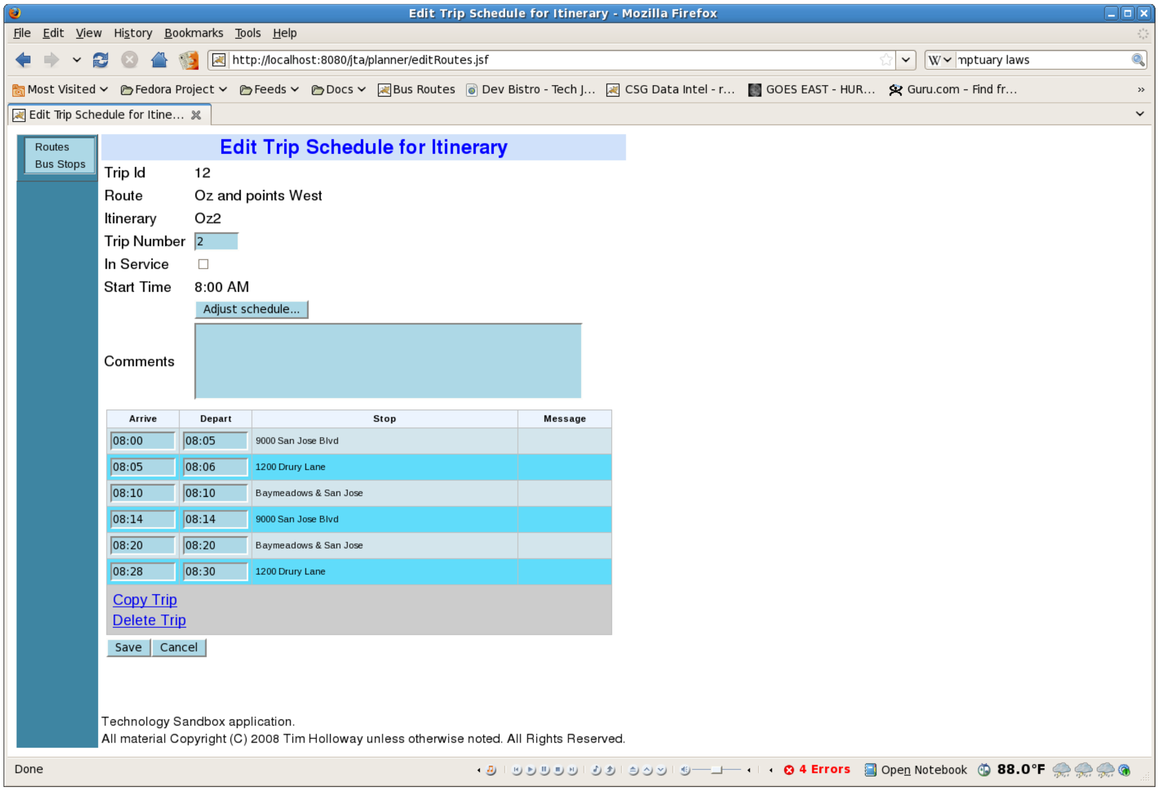
The route planner has the ability to add or remove stops from an Itinerary and to re-order the stop sequence. The use of **waypoint** stops helps to chart a course that conforms to the actual map.

Note: in this release, Itineraries can be created or renamed but not deleted. An Itinerary can only be inactivated if it has no scheduled Trips.

1.1.4 Trip Editor

The Trip Editor is used to define scheduled vehicle trips based on an Itinerary. When a new Tip is created, it gets its list of stops from the Itinerary definition. The Route Planner then assigns the times of arrival and departure for each stop on the trip.

The Trip Schedule page looks like this:



Edit Trip Schedule for Itinerary

Trip Id 12

Route Oz and points West

Itinerary Oz2

Trip Number 2

In Service □

Start Time 8:00 AM

Adjust schedule...

Comments

Arrive	Depart	Stop	Message
08:00	08:05	9000 San Jose Blvd	
08:05	08:06	1200 Drury Lane	
08:10	08:10	Baymeadows & San Jose	
08:14	08:14	9000 San Jose Blvd	
08:20	08:20	Baymeadows & San Jose	
08:28	08:30	1200 Drury Lane	

Copy Trip
Delete Trip

Save Cancel

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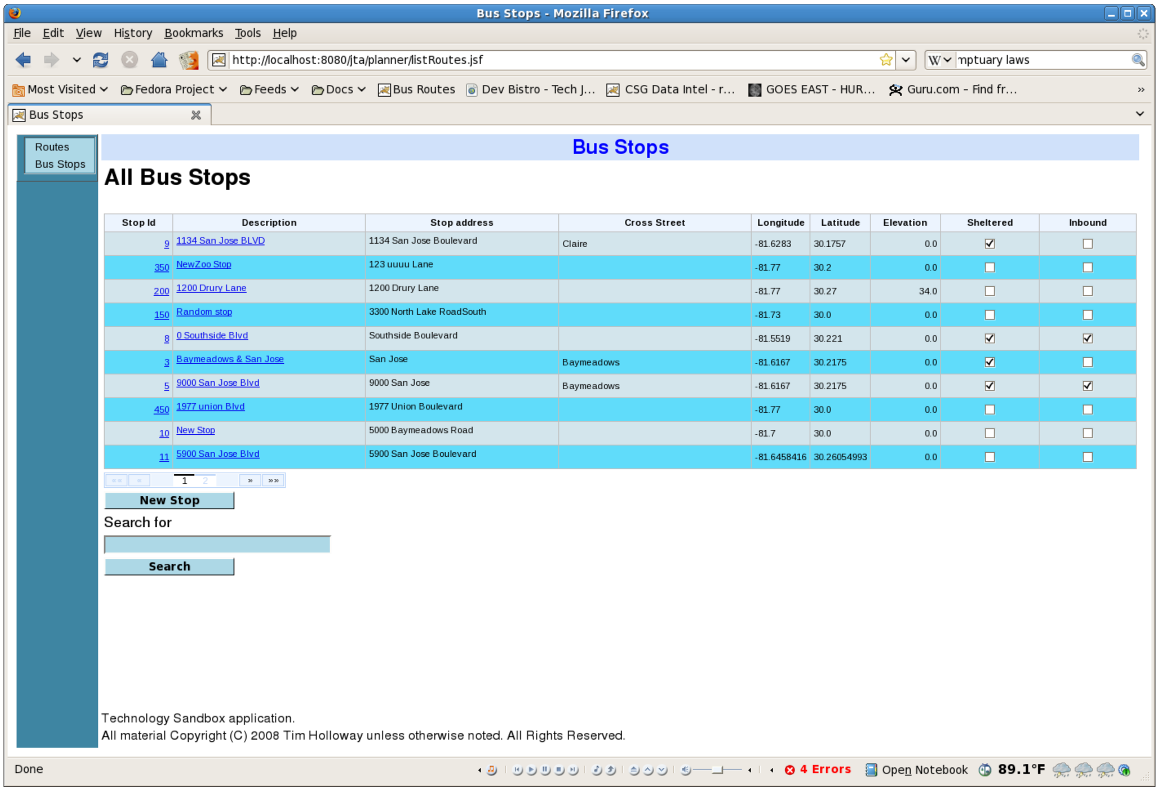
A Trip can be edited, copied, or deleted. Arrival and departure times can be manually entered. Once defined, the entire trip schedule can be moved forward or backwards in time by clicking the “Adjust Schedule...” button, which prompts for a new Arrive Time for the stop on the list. The difference between the currently-displayed value and the new time is applied to all other arrival and departure times on the Trip.

6.3 Bus Stop Editor

Significant geographical nodes in the system are defined as Bus Stops and Turning Points, also known as waypoints. A Turning Point is simply a marker containing a set of geographic co-ordinates. The primary use of a Turning Point (waypoint) is to indicate a place where one or more vehicles travel but do not stop. Use of Turning Points aids in proper plotting of routes on a map, since simply connecting bus stops would lead to route displays that did not follow the actual streets.

1.1.1 *Bus Stops List*

The Bus Stops List page looks like this:



Bus Stops

All Bus Stops

Stop Id	Description	Stop address	Cross Street	Longitude	Latitude	Elevation	Sheltered	Inbound
9	1134 San Jose BLVD	1134 San Jose Boulevard	Claire	-81.6283	30.1757	0.0	☑	□
350	NewZoo Stop	123 uuuu Lane		-81.77	30.2	0.0	□	□
200	1200 Drury Lane	1200 Drury Lane		-81.77	30.27	34.0	□	□
150	Random stop	3300 North Lake RoadSouth		-81.73	30.0	0.0	□	□
8	0 Southside Blvd	Southside Boulevard		-81.5519	30.221	0.0	☑	☑
3	Baymeadows & San Jose	San Jose	Baymeadows	-81.6167	30.2175	0.0	☑	□
5	9000 San Jose Blvd	9000 San Jose	Baymeadows	-81.6167	30.2175	0.0	☑	☑
450	1977 union Blvd	1977 Union Boulevard		-81.77	30.0	0.0	□	□
10	New Stop	5000 Baymeadows Road		-81.7	30.0	0.0	□	□
11	5900 San Jose Blvd	5900 San Jose Boulevard		-81.6458416	30.26054993	0.0	□	□

«« « 1 2 » »»

New Stop

Search for

Search

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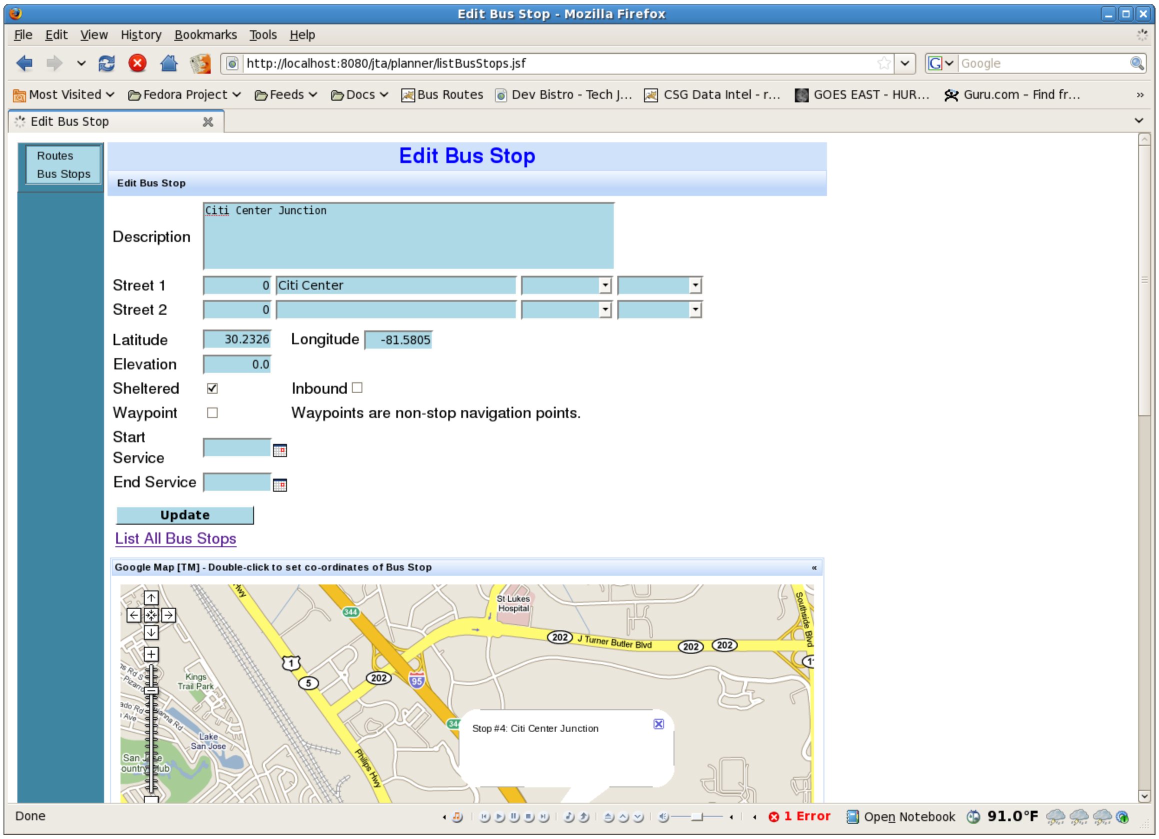
This is a pageable display, but for convenience, the listing may be narrowed by entering all or part of the Bus Stop description in the "Search For" box and pressing the Search button. To clear a search, simply delete all text in the "Search For" box and click Search.

Description searches ignore upper/lowercase distinctions.

Clicking on a Bus Stop Id or Description invokes the Bus Stop Editor page.

1.1.2 *Bus Stop Editor*

The Bus Stop Editor page looks like this:



Edit Bus Stop

Edit Bus Stop

Description: Citi Center Junction

Street 1: 0 Citi Center

Street 2: 0

Latitude: 30.2326 Longitude: -81.5805

Elevation: 0.0

Sheltered ☑ Inbound □

Waypoint □ Waypoints are non-stop navigation points.

Start Service

End Service

Google Map [TM] - Double-click to set co-ordinates of Bus Stop

The page is split into 3 parts:

1. The Bus Stop Information Editor
2. The Map View
3. The Route and Itinerary View

Bus Stop Information Editor

The Bus Stop Information Editor is where the basic characteristics of the Bus Stop are defined, including its name as listed on schedules (description), the primary street address and the cross street address (if any). The dates it enters and leaves service are also defined here.

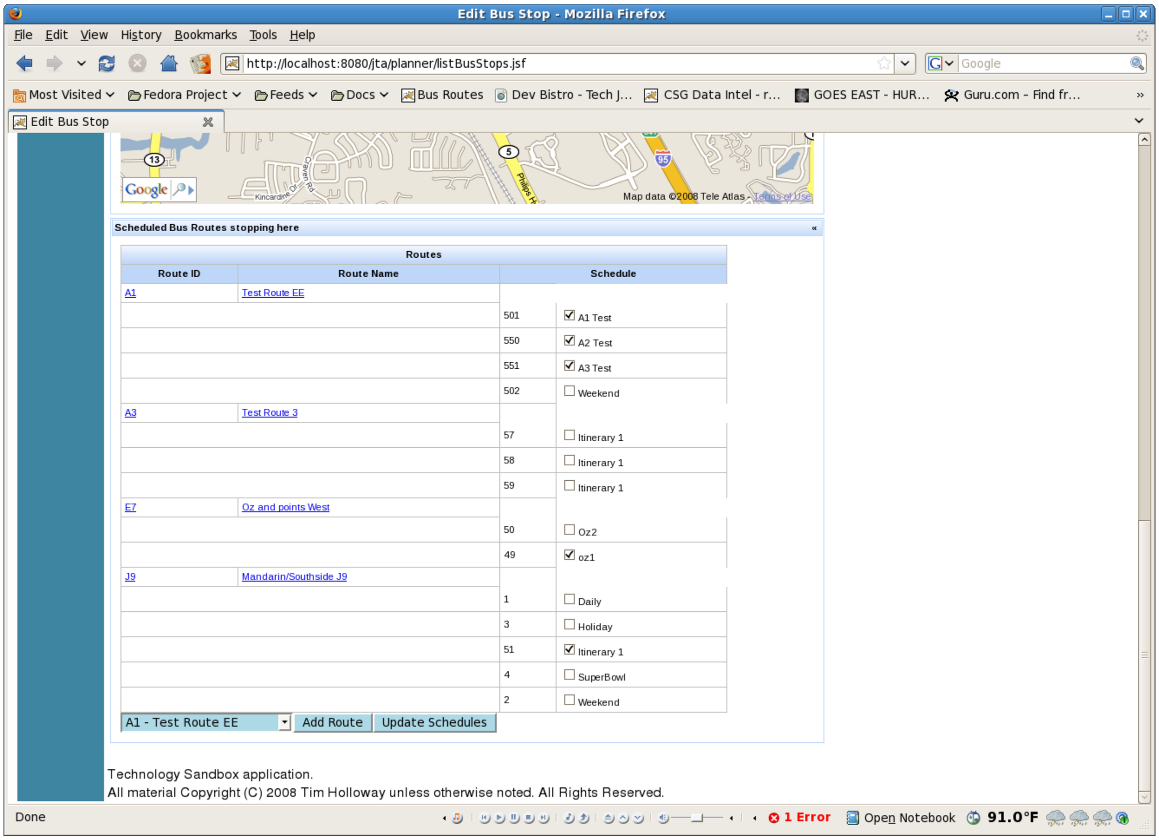
Additionally, the stop may be marked as a Waypoint, meaning that there is no physical stop there. Waypoints are a convenience that may be used to help plot out map views more accurately (especially if there are bends in the road) and to plot intermediate route timings.

By double-clicking on a point on the map view, the Bus Stop editor can be updated with the latitude and longitude of the location clicked.

The bus stop location may actually apply to two or more different physical stop markers, as in the case where one marker is on the outbound side of the road and the other is on the inbound side. In this case, the actual map co-ordinates are to be set to the approximate midpoint between the physical marker locations.

1.1.3 *Route and Itineraries for a Bus Stop*

At the bottom of the Bus Stops Editor page is a listing of the Routes that use this stop and their itineraries:



Scheduled Bus Routes stopping here

Routes			
Route ID	Route Name	Schedule	
A1	Test Route EE		
		501	☑ A1 Test
		550	☑ A2 Test
		551	☑ A3 Test
		502	□ Weekend
A3	Test Route 3		
		57	□ Itinerary 1
		58	□ Itinerary 1
		59	□ Itinerary 1
E7	Oz and points West		
		50	□ Oz2
		49	☑ oz1
J9	Mandarin/Southside J9		
		1	□ Daily
		3	□ Holiday
		51	☑ Itinerary 1
		4	□ SuperBowl
		2	□ Weekend

A1 - Test Route EE [Add Route] [Update Schedules]

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The Add Route button can be used to add the Bus Stop to a new Route as indicated by the list of Routes to the left of the Add Route button.

7 PDF Generator

PDFs are generated using Apache FOP

7.1 Mobile device files

TBS

8 Site Plan

8.1 Home Page Internal/External

The application will support multiple application windows. An application window will support one stencil sub-window and one or more document sub-windows.

8.2 Menus

The administrative site features a sidebar menu including the following options:

1. Routes – lists and provides edit access to bus routes.
2. Bus Stops – lists and provides edit access to bus stops.

8.3 Toolbars

None presently provided.

8.4 Dialogs

As needed. Attempting to delete an object will pop up an “Are you sure?” dialog.

9 Persistence

To be defined in detail. See 7.1 M for overview.

10 Google Maps

A generic Facelets custom tag allows the definition of a Google Maps object on a JSF page. An alternate master page layout is defined to use this so that the HTML BODY onload method will invoke JavaScript cleanup for the maps object.

Apendix A. Application Programming Interface

NOTE: This is dummy data used to hold the basic shape of items not added.

The primary API transport is REST-format, where the requests are http GETs and the results are in MIME type text/text. Exceptions are listed where applicable.

API Functions

10.1 Standard parameters, data types and return values

10.1.1 Data Types

Type	Description
yes/no	The values “yes” or “no”. Case should be observed.
text/xml	The values “text” or “xml”. Case should be observed.
timestamp	Time and date in format yyyy-mm-dd hh:mm:ss

10.1.2 UUIDs

A UUID is an identification sequence which is virtually guaranteed to be unique everywhere. They are used to unambiguously name resources.

10.1.3

10.1.4 Standard parameters

The following request parameters and reply values occur in many functions:

Name	Type	Description

Name	Type	Description

10.1.5 Standard Responses

Apendix B. Route and schedule object relationships

Dotted lines indicate items that are referenced to create other items.

2 JSF Bean relationships and injections

3 Index

Alphabetical Index