

Basic GTS Enterprise User's Guide

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<i>Manual Revision History</i>			
Rev	Date	Changed	Author
0.1.0	2009/01/01	Initial Release	MDF
0.1.1	2009/02/20	Added report creation information.	MDF
0.1.2	2009/03/20	Added "RuleFactoryLite" implementation information. Added "Configuration Assistant Tool" information. Added "Database Administration Tool" information.	MDF
0.1.3	2009/08/17	Added Appendix ("Device Communication Server Load Testing", and "GPS Accuracy")	MDF
0.1.4	2009/12/10	Added email notification replacement variable documentation	MDF

GTS Basic 'Enterprise'

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1) Introduction

The Basic 'Enterprise' version of **GTS** contains some additional features not available in the open-source version of **OpenGTS**. This manual is a supplement to the Installation/Configuration manual already available in the open-source OpenGTS, and describes these additional features.

Very briefly, the additional features are described below. Please refer to their specific respective chapters for detailed information regarding the additional feature.

1.1) Role Administration

Role administration allows creating authorized access 'roles' which define the capabilities of a particular logged-in user. When a role is assigned to a user, the user then takes on the rights granted to the role for accessing various pages and reports within the GTS system.

1.2) StatusCode Administration

StatusCode administration allows defining custom descriptions to be displayed on maps and reports for a specific StatusCode. For instance, in the case of a digital input status code, instead of displaying "InputOn #7", you may define a custom description, such as "Ignition On".

1.3) System Administration

A new "System Administration" tab is available for the system-administrator account user to perform system-wide maintenance. Viewing system-wide information and managing accounts are two of the options available under the "System Administration" tab.

2) Role Administration

Role administration allows creating authorized access 'roles' which define the capabilities of a particular logged-in user. When a role is assigned to a user, the user then takes on the rights granted to the role for accessing various pages and reports within the GTS system.

View/Edit Role Information

Select a Role:

Select	Role ID	Description	Has Users
<input checked="" type="radio"/>	new	New Role	No
<input type="radio"/>	test	New Role	Yes

Create a new role:

Role ID:

Once created, a role may be assigned to any number of users to define their rights and capabilities when logged-in to the GTS system.

2.1) Access-Control-List

The Access-Control-List defines a set of capabilities that control access right to specific features. Each individual access-control item typically provides the following selectable levels of access:

- **None** No access is allow for the specified item.
- **Read/View** Only Read or View access is allow for the specified item. The user may not edit or change information related to the specific item.
- **Write/Edit** The user is allow to Edit and change information related to the specific item.
- **Delete/All** The user has all access rights to the specific item, including view, edit, and delete.

Main Mapping Reports Administration

View/Edit Role Information

Role ID:

Description:

Role Access Control:

Account Administration:	Default	[Default is 'Read/View']
User Administration (Current user):	Default	[Default is 'Read/View']
User Administration (All users):	Default	[Default is 'None']
User Administration (ACL access):	Default	[Default is 'None']
User Administration (Group):	Default	[Default is 'Read/View']
User Administration (Role):	Default	[Default is 'Read/View']
Role Administration:	Default	[Default is 'None']
Device Administration:	Default	[Default is 'Read/View']
Device Administration (Device UniqueID):	Default	[Default is 'Read/View']
Device Administration (Notification Rules):	Default	[Default is 'Read/View']
Group Administration:	Default	[Default is 'Read/View']
Geozone Administration:	Default	[Default is 'Read/View']
StatusCode Administration:	Default	[Default is 'Read/View']
Rule Administration:	Default	[Default is 'Read/View']
Change Password:	Default	[Default is 'Write/Edit']
System Administration:	Default	[Default is 'None']

2.2) Assigning a Role to a User

The "User Administration" page now has a new field, "Default ACL Role", which allow selecting a defined "Role". The selected role then defines the default access write for the specific user.

Default ACL Role:

3) StatusCode Administration

StatusCode administration allows defining custom descriptions to be displayed on maps and reports for a specific StatusCode. For instance, in the case of a digital input status code, instead of displaying "InputOn #7", you may define a custom description, such as "Ignition On".

3.1) Creating/Editing a Custom StatusCode Description

Create a new StatusCode entry by entering a status-code ID, or by selecting the specific status code id you wish to change, then clicking "New". The pull-down menu allows you to select one of the existing status code descriptions you might wish to change, or you can enter a different code if your device uses a status code that is not already defined by **GTS** in the standard status code list. The status-code is a numeric value, and can be entered as a hex value of the form "0x#####" (where '#' is one of the hex digits "0123456789ABCDEF"), or as a base-10 integer.

The screenshot shows the 'View/Edit StatusCode Descriptions' interface. At the top, there are navigation tabs: Main, Mapping, Reports, and Administration. The main heading is 'View/Edit StatusCode Descriptions'. Below this, there is a section 'Select a StatusCode:' containing a table with columns 'Select', 'StatusCode ID', 'Name', and 'Description'. The table lists three entries: 0xDFFF (GPS.IGN.TRUCK), 0xEA0E, and 0xF010 (DMT.INITIALIZED). Below the table are 'View', 'Edit', and 'Delete' buttons. Below the table is a section 'Create a new StatusCode:' with a 'StatusCode ID:' input field and a dropdown menu for 'select a standard code:' set to 'None'. A 'New' button is located below the input field.

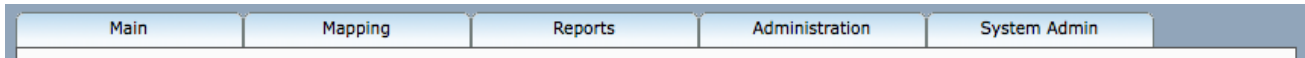
Select	StatusCode ID	Name	Description
<input checked="" type="radio"/>	0xDFFF	GPS.IGN.TRUCK	GPS_Ignition_Truck
<input type="radio"/>	0xEA0E		
<input type="radio"/>	0xF010	DMT.INITIALIZED	Initialized

The created StatusCode can then be edited to set the custom description to be viewed on maps and reports.

The screenshot shows the 'View/Edit StatusCode Descriptions' interface in edit mode. The main heading is 'View/Edit StatusCode Descriptions'. Below this, there is a section 'Create a new StatusCode:' with a 'StatusCode ID:' input field containing '0xF010'. Below the input field are 'Name:' (DMT.INITIALIZED), 'Description:' (Initialized), and 'Icon Name:' (orange) fields. Below these fields are 'Change' and 'Cancel' buttons.

4) System Administration

A new "System Administration" tab is available for the system-administrator account to perform system-wide maintenance. The creation and deletion of Accounts, and resetting their respective passwords, is currently the only available system administrative function.



4.1) Creating the 'sysadmin' Account

The system-administrator account must be created using the command-line tools as follows:

```
bin/admin.pl Account -account=sysadmin -pass=adminpass -create
```

Where 'sysadmin' is the reserved name for the System Administrator account (specified in 'default.conf/webapp.conf' on the "sysAdmin.account" property), and 'adminpass' is a convenient password of your choosing.

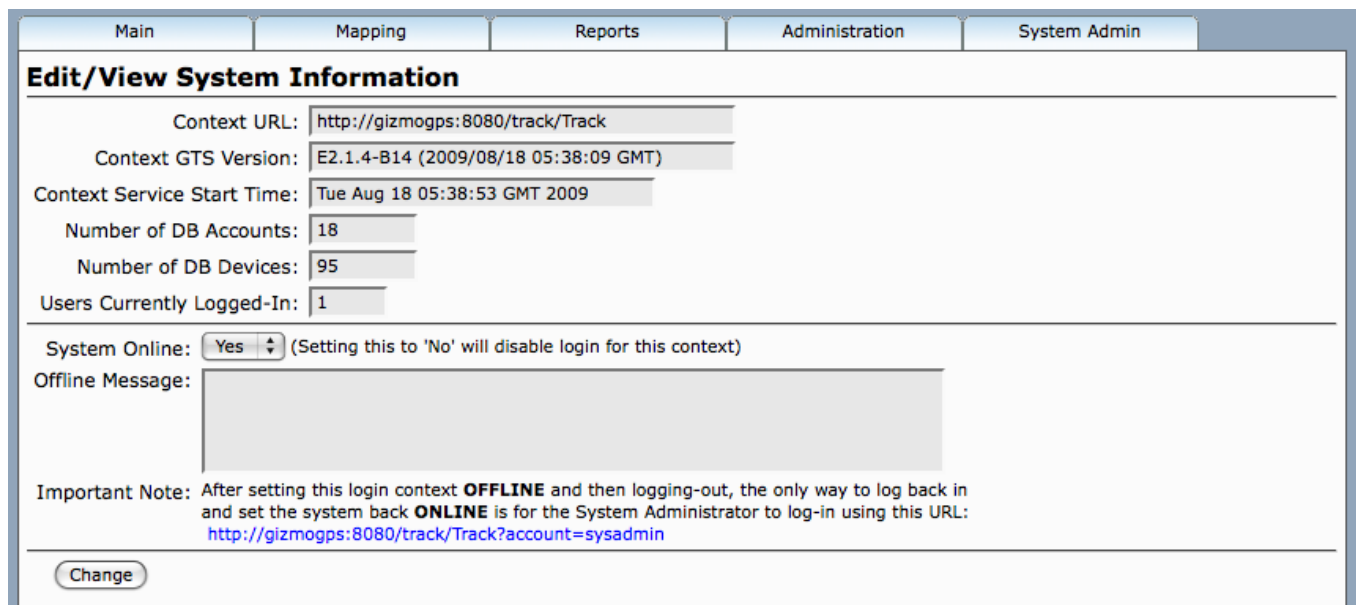
If the 'sysadmin' password was forgotten, you can also edit this account with the following command to view or reset the system-administrator password:

```
bin/admin.pl Account -account=sysadmin -edit
```

The 'sysadmin' account is recognized by **GTS** as the System Administrator, and automatically displays additional menu tabs and options for this account which are not available to non-sysadmin accounts.

4.2) Viewing System Information

The "System Info" menu options displays a page showing system-wide information such as the number of accounts, and number of devices, currently contained within the system, and the current number of logged-in users.

A screenshot of the "Edit/View System Information" page. At the top, there is a navigation bar with tabs for "Main", "Mapping", "Reports", "Administration", and "System Admin". The "System Admin" tab is active. Below the navigation bar, the page title is "Edit/View System Information". The page contains several fields for system information, each with a text input field and a label: "Context URL:" with value "http://gizmogps:8080/track/Track", "Context GTS Version:" with value "E2.1.4-B14 (2009/08/18 05:38:09 GMT)", "Context Service Start Time:" with value "Tue Aug 18 05:38:53 GMT 2009", "Number of DB Accounts:" with value "18", "Number of DB Devices:" with value "95", and "Users Currently Logged-In:" with value "1". Below these fields, there is a "System Online:" section with a dropdown menu set to "Yes" and a note "(Setting this to 'No' will disable login for this context)". Below that is an "Offline Message:" section with a large empty text area. At the bottom, there is an "Important Note:" section with text: "After setting this login context **OFFLINE** and then logging-out, the only way to log back in and set the system back **ONLINE** is for the System Administrator to log-in using this URL: <http://gizmogps:8080/track/Track?account=sysadmin>". At the very bottom, there is a "Change" button.

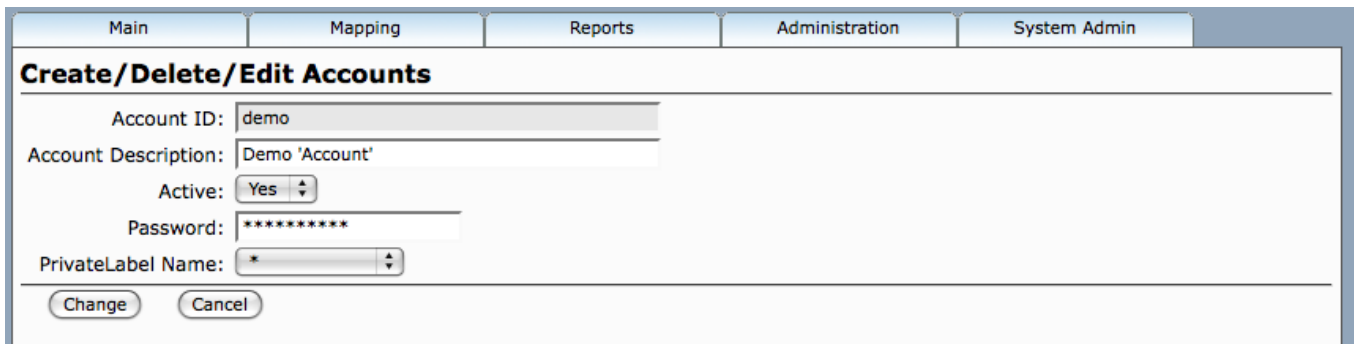
This page also provide the ability to set an "Offline" message, should you wish to temporarily bring the system down for maintenance purposes.

4.3) Creating/Deleting Accounts

Selecting "System Accounts" from the "System Admin" tab will allow viewing all currently existing accounts. The list will also show which account currently have logged-in users.

Entering an Account-ID, and clicking "New" will allow you to create a new account.

To edit an existing account, select the desired account and click "Edit". A page will be displayed allowing you to change selected information, such as the account description, the account password, and whether the account is currently active, or not (setting an account to inactive will prevent the account users from logging in).



The screenshot shows a web application interface with a navigation bar at the top containing tabs for 'Main', 'Mapping', 'Reports', 'Administration', and 'System Admin'. The 'System Admin' tab is selected. Below the navigation bar is a form titled 'Create/Delete/Edit Accounts'. The form contains the following fields and controls:

- Account ID: A text input field containing the value 'demo'.
- Account Description: A text input field containing the value 'Demo 'Account''.
- Active: A dropdown menu with 'Yes' selected.
- Password: A text input field containing a series of asterisks '*****'.
- PrivateLabel Name: A dropdown menu with a single asterisk '*' selected.
- At the bottom of the form are two buttons: 'Change' and 'Cancel'.

For system installations which serve more that one domain name look-and-feel, the "PrivateLabel Name" field allows selecting which domain this account is allow to log in to.

4.4) Finding Assigned Unique-IDs

As devices are created and deleted, and moved from one account to another, it is very possible to lose track of the account to which a specific device was assigned. The "Find Assigned Unique-IDs" page allows searching the database for a specific device mobile ID (ie. IMEI#, etc), to see which Account currently is holding on to a specific device.

Enter the device IMEI# (or other pertinent ID), such as "123456789012345", into the "Search Mobile ID" field, then click "Find". A list of matching Devices will be displayed. Ideally, the list will only show a single Device entry (or no entry, if the mobile ID is not yet defined), however, if more than one entry exists (such as "imei_123456789012345" and "id_123456789012345"), this may indicate a conflict in unique-ids that could result in incoming data from the device being routed to the incorrect Account/Device record. Any such conflicts should be corrected.

Main	Mapping	Reports	Administration	System Admin
Find Assigned Unique-IDs				
Search Mobile-ID :: <input type="text"/>				
<input type="button" value="Find"/>				
Devices matching specified Mobile-ID:				
Account	Device ID	Unique ID	Device Description	Server ID
demo	demo	imei_123456789012345	Demo Device	enfora
1 Device Found				

5) Creating/Modifying Reports

(Note: This section is still under construction)

OpenGTS comes with a very simple and configurable report generation engine. Reports are comprised of 3 main components: the report layout, the report data iterator, and the report specification XML.

The report specification XML specifies a report data iterator, reporting constraints, and the columns which are to appear on the report. The report data iterator constructs the data which will be included in the report based on the reporting constraints. The report data layout then iterates through the report data and generates a report based on the column formatting information provided by the report specification XML.

The "Report Layout" and "Report Data Iterator" components must be implemented in Java code by a Java programmer, and should be configurable for a general use. The "Report Specification XML" is a report configuration text file that specifies the type, columns, and constraints for a specific report. Provided the report layout and data iterator are implemented for general use, many different kinds of reports may be created that utilize the same layout and data iterator.

5.1) Report Layout

The Report Layout is a Java module that defines what columns are available for a given report, and their respective formatting options.

A report layout must extend the abstract Java class `"org.opengts.war.report.ReportLayout"` and must define a `"DataRow"` subclass that understands how to parse report columna/fields from report row objects provided by the report data iterator.

The class `"org.opengts.war.report.event.EventDataLayout"` is an example `ReportLayout` subclass that defines the available columns and formatting options for the Event Detail and Summary reports.

5.2) Report Data Iterator

The Report Data Iterator is a Java module that constructs the list of records that are to be included in the report based on the constraints specified in the report specification XML.

A report data iterator must extend the abstract Java class `"org.opengts.war.report.ReportData"` and provide implementations for the `"getBodyDataIterator"` and `"getTotalDataIterator"` methods. It must also bind to a specific `ReportLayout` by providing an implementation for the `"getReportLayout"` method.

The class `"org.opengts.war.report.event.EventDetailReport"` is an example `ReportData` subclass that generates the Event Detail report.

5.3) Report Definition XML

The file "report.xml" defines the html style used for a column defined in a ReportLayout. It also defines specific reports by specifying which ReportData iterator, and which columns will be included in a given report. It also specifies the constraints that are to be applied to the data which the report will contain.

Here is an example report definition from the 'report.xml' file for the "Event Detail" report:

```
<!--
=== The 'name' provides a name for the report, referenced in 'private.xml'
=== The 'type' provides a report group name, referenced in 'private.xml'
=== The 'class' specifies the report data iterator used to generate the report
-->
<Report name="EventDetail" type="device.detail"
  class="org.opengts.war.report.event.EventDetailReport">
  <!-- The description of the report display on the reporting menu -->
  <MenuDescription i18n="ReportsXML.eventDetail.menu">
    Event Detail
  </MenuDescription>
  <!-- The title displayed above the report -->
  <Title i18n="ReportsXML.eventDetail.title">
    Event Detail
  </Title>
  <!-- The subtitle displayed above the report -->
  <Subtitle i18n="ReportsXML.eventDetail.subtitle">
    ${deviceDesc} [ ${deviceId} ] \n ${dateRange}
  </Subtitle>
  <!-- The columns included in the report -->
  <Columns>
    <Column name="index" />
    <Column name="date" />
    <Column name="time" />
    <Column name="statusDesc" />
    <Column name="latitude" arg="" />
    <Column name="longitude" arg="" />
    <Column name="speedH" arg="1" />
    <Column name="altitude" />
    <Column name="odometer" arg="0" />
    <Column name="address" />
  </Columns>
  <!-- The report data constraints -->
  <Constraints>
    <SelectionLimit type="first">1000</SelectionLimit>
    <ReportLimit>1000</ReportLimit>
    <OrderAscending>true</OrderAscending>
  </Constraints>
  <!-- the map icon selector (if map display is enabled) -->
  <MapIconSelector>
    <!-- this section requires an installed "RuleFactory" implementation -->
    <![CDATA[ ( (mph<4)?"reddot":(speed<15)?"yellow":"heading") ]]>
  </MapIconSelector>
</Report>
```

5.4) Available Report Specification

Once a report has been defined in the 'report.xml' file, it can be made available for user selection in the web-interface by referencing the report name in the 'private.xml' file in the "Reports" tag.

Here is an example report specification from the 'private.xml' file:

```
<Reports>
  <Report name="EventDetail">
    <AclName>acl.report.eventDetail</AclName>
  </Report>
  <Report name="EventSummary">
    <AclName>acl.report.eventSummary</AclName>
  </Report>
</Reports>
```

6) "RuleFactoryLite" Implementation

(Note: This section is still under construction)

A simple implementation of the "RuleFactory" interface may be provided with your installation of the basic "GTS Enterprise" system. To see which "RuleFactory" implementation is installed on your system, examine the output of the "bin/checkInstall.sh" command for the line beginning with "(RuleFactory)". You may see one of the following values:

- **None** No RuleFactory implementation is installed
- **GTSRulesEngine** The fully functional "Event Notification Rules Engine" is installed.
- **RuleFactoryLite** The "RuleFactoryLite" implementation is installed.
- **<other>** A custom RuleFactory implementation may be installed.

This section of this document only covers the "RuleFactoryLite" implementation of the "RuleFactory" interface.

6.1) Supported Rule Selector Types

This "RuleFactoryLite" implementation supports the following selector types:

- **arrive** Triggers a notification for STATUS_GEOFENCE_ARRIVE events.
- **depart** Triggers a notification for STATUS_GEOFENCE_DEPART events.
- **speed(LIMIT)** Triggers a notification if the vehicle speed exceeds *LIMIT* (km/h).
- **code(StatusCode)** Triggers a notification if the event statusCode matches *StatusCode*.
- **true** Will always trigger a notification.
- **false** Never triggers a notification.

These supported rule selector items must be specified in the Device Admin field "Notify Rule" (or "Notification Selector" field if using the command-line editor) to be effective for incoming events for that specific device. Multiple rule selector items may be specified by separating them with commas. For instance, to cause a notification trigger for geozone arrival or departure, you may specify the value "arrive,depart" in the "Notification Rule" field in the Device record (accessible from the "Device Admin" page).

6.2) Outbound SMTP Email Delivery Setup

In order to deliver outbound email notification, you need to make sure that the outbound SMTP service is set up properly in the runtime configuration files "common.conf" and/or "custom.conf" ("config.conf" should only be modified by the "Configuration Assistance Tools" described in detail below). Within this file, the property keys that set up outbound SMTP service are those that begin with "smtp.". Once this file is changed, make sure that any servlets (ie. 'track.war', etc) are rebuilt and redeployed to make the changes effective.

Email notifications are sent to the recipients specified in the Account Admin "Notify Email" and Device Admin "Notify Email" fields. Multiple email addresses may be specified by separating them with commas.

6.3) Installing the "RuleFactoryLite" Implementation

If the "RuleFactoryLite" implementation is available in your basic "GTS Enterprise" system, it is likely already installed, and displayed in the "bin/checkInstal.sh" output. However, if you are attempting to upgrade a pre-installed system, and have your own customized copy of "StartupInit.java", then you may need to manually install the "RuleFactoryLite" module into the Device 'setRuleFactory' method.

To enable the RuleFactoryLite implementation to provide email notification triggering, add the following line near the end of the StartupInit method "addTableFactories()":

```
Device.setRuleFactory(new org.opengts.extra.rule.RuleFactoryLite());
```

6.4) Setting up notification email

Email notifications are sent to the recipients specified in the Account Admin "Notify Email" and Device Admin "Notify Email" fields. Multiple email addresses may be specified by separating them with commas.

The email which is sent to the various recipients can be customized using the "Notify Subject" and "Notify Message" fields on the Device Admin page. You can insert certain values which will be replaced with the actual value obtained from the event record that triggered the event. For instance, if you place "\${device}" into the email subject or message, it will be replaced with the specified device description (eg. "Jane's Car").

For example, you may specify a notify subject and message as follows:

Subject:

```
Vehicle "${device}" has arrived at "${geozone}
```

Message:

```
Vehicle: ${device}  
Address: ${address}  
Location: ${latitude}/${longitude}  
Speed: ${speed}
```

Here is a list of the available 'replacement variables' that can be specified in the "Notify Subject" and "Notify Message" fields:

Name:	<code>\${account}</code>
Description:	Event account description.
Example:	Acme Incorporated
Name:	<code>\${device}</code>
Description:	Event device description.
Example:	Taxi #123
Name:	<code>\${dateTime}, \${date}</code>
Description:	Event date/time displayed in the preferred format.
Example:	2008/11/01 12:53:01 PDT
Name:	<code>\${dateYear}, \${year}</code>
Description:	Event date year
Example:	2008

Name: \${dateMonth}, \${month}
Description: Event date month
Example: 11

Name: \${dateDay}, \${day}
Description: Event date day-of-month
Example: 17

Name: \${dateDow}, \${dayOfWeek}
Description: Event date day-of-week.
Example: Sunday

Name: \${time}
Description: Event date time.
Example: 12:15:47

Name: \${status}
Description: Event status code description.
Example: InMotion

Name: \${geopoint}
Description: Event GPS location.
Example: 39.12345, -142.12345

Name: \${latitude}
Description: Event GPS latitude (full resolution)
Example: 39.123456789

Name: \${longitude}
Description: Event GPS longitude (full resolution)
Example: -142.123456789

Name: \${speed}
Description: Event speed in the account preferred units.
Example: 45.6 mph

Name: \${speedLimit}
Description: Reverse-Geocoded Event posted speed limit in the account preferred units (if available).
Example: 65.0 mph

Name: \${direction}
Description: Event direction (bearing) abbreviation.
Example: SE

Name: \${bearing}, \${heading}
Description: Event bearing.
Example: 123.4

Name: \${odometer}
Description: Event odometer value in account preferred units
Example: 12776.3 miles

Name: \${distance}
Description: Event distance/tripometer value in account preferred units
Example: 976.3 miles

Name: \${altitude}, \${alt}
Description: Event altitude value in account preferred units
Example: 1329 feet

Name: \${geozoneID}
Description: Event arrival/departure Geozone ID (if any)
Example: home

Name: \${geozone}
Description: Event arrival/departure Geozone Description (if any)
Example: Home Base

Name: \${address}, \${fullAddress}
Description: Reverse-Geocoded Event full address
Example: 123 Somewhere St, Anywhere, CA 12345 USA

Name: \${street}, \${streetAddress}
Description: Reverse-Geocoded Event street address (if available)
Example: 123 Somewhere St

Name: \${city}
Description: Reverse-Geocoded Event city address (if available)
Example: Anywhere

Name: \${state}, \${province}
Description: Reverse-Geocoded Event state/province address (if available)
Example: CA

Name: \${postalCode}, \${zipCode}
Description: Reverse-Geocoded Event postal code address (if available)
Example: 12345

7) Configuration Assistance Tool

A Configuration assistance tool has been included to help with minor configuration changes. Currently this tool has only been tested to work on Linux or Mac OS X based platforms. A configuration assistance tool which has been tested for Windows platforms is planned for a future release.

7a) Note for Windows users:

Not all features described in this chapter will be available on a Windows platform due to some of the missing operating system utilities.

This tool is still in the process of being updated and changed to improve its usability. If you have any suggestions for improvements, please let us know.

7.1) Starting the Configuration Assistance Tool

To start the configuration assistance tool, enter the following from the command-line:

```
bin/gtsConfig.pl -config
```

A Java-based UI will display allowing various selectable options on the left-hand side of the window. As different options are selected or traversed (by selecting the "Back"/"Next" buttons on the bottom-left of the window, or by selecting an option directly), the panel at the right will change to display a data entry or information screen which pertains to the selected item.

Note that the configuration change items in the upper portion of the frame may only be traversed by using the "Back"/"Next" buttons. This allows better data entry validation as configuration changes are made.

Once all configuration changes have been made, the application can be started at a later time without the configuration "wizard" section by omitting the "-config" argument at the end of the command.

7.2) Simple Configuration Changes

To walk through the various available simple configuration changes, start by clicking on the "Welcome" item in the list, then follow the on screen instructions from there. Click "Next" to advance to the next item in the list. If necessary you may click "Back" to go back to a previous configuration screen.

When the final "Save Configuration" item is selected (by click "Next" though all of the configuration screens), you will have the option of saving your changed configuration. Once saved, if Tomcat is running, and your 'track.war' file has already been deployed, the changed should become effective immediately.

7.3) Running UpdateTables

The "Run UpdateTables" page allows initializing the database, and updating columns in existing tables. Select the item in the list labeled "Run UpdateTables" to display the UpdateTables page.

To initialize the database and/or update existing table columns, click the "Run UpdateTables" button. A dialog windows will be displayed which asks for the database (ie. MySQL) root user/password (Note: This is the user that has been granted rights within the database provider to create databases and other users. This is not the same user/password that represents the root/superuser on your computer system). If a root user/password is required to initialize the database, then enter the required values and click "Ok". If no root user/password is required, then leave the values blank and click "Ok". The results of the initialization/update process will be displayed, and may be copied to the clipboard for for pasting to another document, or even have the results automatically emailed to the OpenGTS support center.

Note that emailing the results of the CheckInstall output requires that the SMTP configuration is complete and correct, otherwise an error will occur while attempting to send the email.

7.4) Running CheckInstall

To run "CheckInstall" from within the Configuration Assistance Tool, select the item in the list labeled "Run CheckInstall". From the displayed screen on the right, you can press the button "Run CheckInstall" to run the CheckInstall process and display the output into the text log output area. Once displayed you can examine the result, copy the results to the clipboard for pasting to another document, or even have the results automatically emailed to the OpenGTS support center.

Note that emailing the results of the CheckInstall output requires that the SMTP configuration is complete and correct, otherwise an error will occur while attempting to send the email.

7.5) Starting/Stopping Tomcat

The upper portion of the screen frame shows the Tomcat "run" status. This will display either "Running" or "Stopped". If Tomcat is stopped, you may press the "Start Tomcat" button to start Tomcat. If Tomcat is running, you may press the "Stop Tomcat" button to stop Tomcat.

The upper log-output text area displays the status of the Start or Stop process.

The lower log output text area displays the last few lines of the Tomcat log "catalina.out" file, and will automatically display any changes as they occur in the log file.

7.6) Repackaging/Redeploying the 'track.war' Servlet

To repackage and redeploy the 'track.war' servlet, select the item in the list labeled "Track Web Servlet".

The "Build" button allows you to repackage the 'track.war' servlet file. Check the "Deploy" button to also cause the repackaged 'track.war' servelet to also be copied to the Tomcat 'webapps' directory when the "Build" button is pressed. Note that the Tomcat "auto-redeploy" option must be enabled to actually have the new 'track.war' file automatically be redployed and made available to the web-interface.

8) Database Administration Tool

(Note: This section is still under construction)

The database administration tool allows you to view the table relationship hierarchy, view table and field attributes, and view/edit table records.

8.1) Starting the Database Administration Tool

To start the configuration assistance tool, enter the following from the command-line:

```
bin/gtsAdmin.pl
```

A Java base UI will display. The left half of the window displays a tree showing the hierarchical relationship of the various tables with the GTS system. You can click on the items in the tree to display their corresponding information or data entry screen on the right. You can also right-click on the tree nodes to display a "context menu" allowing the selection of other functions that can be performed on the selected tree node.

8.2) Displaying Table Fields and Attributes.

The "DB Information" tree displays all tables in the GTS system, and their relationship to other tables. When clicking on a specific table node, the screen to the right of the tree will allow you to display the "Table Information", the "Actual Columns" as described in the table itself, and the "Defined Columns" as specified in the Java GTS code. Columns marked in red indicate a column that is defined in the Java GTS code, but not yet defined in the database table itself. Right-clicking on the table node will allow you to update/create these missing columns in the database. Columns marked in yellow indicate table columns that exist in the database, but are not reference from within the Java GTS table code. These table columns can be dropped by right clicking on the individual yellow columns and selecting "drop column", however, leaving these unused columns in the database will not adversely effect the behavior of the GTS system.

8.3) Viewing/Editing Table Records

Right clicking on a table tree node will allow you to create new entries, or edit/delete existing entries.

To open an existing entry, right-click on a node and select "Open". A window dialog will be displayed allowing you to select an existing entry in the database table which can be opened. Note that a table record cannot be opened until the parent record on which it is dependent is also opened. For a given table, only one entry may be opened at a time. To open a different table entry, the first entry must be closed.

To create a new table entry, right-click on a table node and select "New". A dialog window will be displayed allow you to enter the appropriate key field for which the table entry will be created.

Whether creating a new or opening an existing table entry, the values may be changed, and saved, by again right-clicking on the opened table node and selecting "Save".

For safety and security precautions, records may not be deleted unless the "bin/gtsAdmin.pl" command is started with the command-line option "-allowDelete".

Appendix)

A) Device Communication Server Load Testing

Device communication server load testing attempts to answer the question "How many remote tracking devices can my computer system handle?". There are many factors in determining the "load" that a system can handle. Here is a list of a few of them:

- Do the devices transmit data via TCP(duplex) or UDP(simplesx).
A TCP 'session' consumes more resources and time than an incoming UDP packet.
- What is the interval between data packet transmissions.
If 1000 devices transmit location data once every 5 minutes (300 seconds), that averages about 3.33 messages per second arriving at the server (1000 devices / 300 seconds). However, if the same 1000 devices needed to transmit data every 20 seconds, that averages about 50 messages per second (1000 devices / 20 seconds), creating a much higher load on the system.
- If the devices send data via a TCP 'session' how much time does the session require.
If the communication protocol with the device requires a lot of bi-directional communication (acknowledgements, server initiated strings, etc), then the time-length of the session may necessarily increase. Most devices communicate over a GPRS connection, which can have inherent delays to and from the remote device.
- The speed and number of the processors in the server hardware, and the amount of RAM.
The performance of the server hardware itself has a lot to do with the overall performance of the device communication servers running on the machine. The faster the machine (faster/multiple processors, plenty of RAM, etc), the faster it will be able to parse the incoming data, insert it into the database, and perform any other event analysis that it needs to perform.
- The amount of available disk space on the server hardware.
*With the available low-cost disk drives, this is less of an issue now. But this may still be a factor if you wish to keep event data for a long period of time. If 1000 devices transmit location data every 2 minutes, and are in operation 10 hours a day (600 minutes), they will produce about 300000 events every day (1000 devices * 600 minutes per day / 2 minutes). The MySQL database EventData table consumes about 250 bytes per event (account, device, cached reverse-geocoded information, etc). This means that the 300K events will consume about 75Mb per day. With only 80Gb of dedicated space available for the database, this will store almost 3 years worth of data (however, I would recommend not storing more than 12 months online, and backing up and removing older data).*
- The speed of the network into the server hardware.
The Internet service provider, and/or local Intranet speeds also effect the ability of the server to receive data from the remote devices, and still perform other network queries that it may need to perform for any required event analysis.
- Is the reverse-geocoding performed over an external Internet service, or is it performed locally.
An Internet-based reverse-geocoding web service can sometimes take up to a full second (or more) to complete. At a rate of 50 incoming events per second, will start getting backlogged very quickly. Having a reverse-geocoding service that is installed locally, so that no external network service is required, can usually complete a reverse-geocode in a few milliseconds, and should be able to easily keep up with high data volumes.

In general, you will need to perform your own "load" testing for your specific installation to determine if the capacities and speeds are adequate. Since server machines are fairly low-cost today, it's safer to "over-specify" a machine to perform your required tasks.

Load-Balancing is another factor that should be considered, especially if more than about 10 events per second are arriving at your server. You will need to eventually take a server down for maintenance, you'll need to be able to have data communication 'switched' over to a second machine while servicing the first machine.

B) GPS Accuracy

When displaying the latitude/longitude to a user, the question "how many decimal places should be displayed" is often asked. This section attempts to briefly explain the differences in displaying 4 vs. 5 decimal places, and the capabilities of GPS receivers today. There are many good references on the web that do a much better job of describing all of the details regarding the factors that can effect GPS accuracy. Please refer to the references included below for additional in-depth information.

Most GPS receivers have a standard accuracy of +/- 20 meters, or approximately +/- 3 meters if the GPS receiver incorporates WAAS (Wide Area Augmentation System). For fleet vehicle tracking purposes +/- 20 meters often provides enough accuracy to determine geofence arrival departure, and general location information. While having +/- 3 meter accuracy can provide "parking space" accuracy (not just knowing that it is in the parking lot).

The environment can also effect the accuracy of a GPS receiver as well. One of the main environmental issues is the "urban canyon effect". This is where the vehicle is traveling in a city environment with large buildings surrounding the vehicle. The signals received from the GPS satellites can bounce off of buildings and create inaccuracies in the reporting of the vehicle location.

So how many decimal places is enough? Between each degree of latitude is 60 nautical miles (about 111 km, or 69 statute miles), and between each degree of longitude at the equator is about 60 nautical miles (as the longitude increases or decreases at the poles, the distance between longitude lines approaches 0). So for simplicity sake, we'll assume we are calculating distances at the equator. If 1 degree equals 60 nautical miles, then 0.0001 (4 decimal places) of a degree equals 0.006 (0.0001 x 60) nautical miles, which is about 11.1 meters. So 0.00001 (5 decimal places) of a degree is about 1.1 meters, well within the accuracy of most WAAS enabled GPS receivers. So displaying latitude/longitude to 4 decimal places provides about 11 meters of accuracy, while displaying 5 decimal places provides about 1 meter of accuracy.

References:

Latitude/Longitude definition:

<http://en.wikipedia.org/wiki/Longitude>

<http://en.wikipedia.org/wiki/Latitude>

http://en.wikipedia.org/wiki/Global_Positioning_System

WAAS (Wide Area Augmentation System):

http://en.wikipedia.org/wiki/Wide_Area_Augmentation_System

Dilution of Precision (HDOP, VDOP, PDOP):

[http://en.wikipedia.org/wiki/Dilution_of_precision_\(GPS\)](http://en.wikipedia.org/wiki/Dilution_of_precision_(GPS))