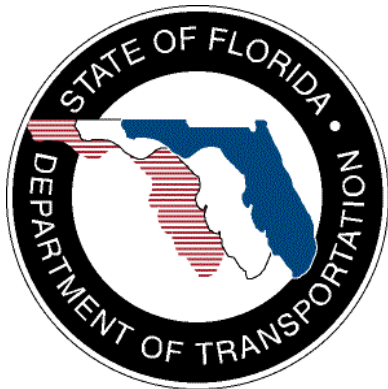


**SunGuide™:**

# **Travel Times Interface Control Document**

**SunGuide-TVT-ICD-4.1.0**



Prepared for:

Florida Department of Transportation  
Traffic Engineering and Operations Office  
605 Suwannee Street, M.S. 90  
Tallahassee, Florida 32399-0450  
(850) 410-5600

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Reviewed By:	Steve Dellenback, SwRI	SWD	11/10/04
	Steve Novosad, SwRI	SEN	11/10/04
	Steve Dellenback, SwRI	SWD	11/15/05
	Steve Dellenback, SwRI	SWD	11/14/07
	Steve Dellenback, SwRI	SWD	9/17/08
Modified By:	Meredith Moczygemba, SwRI	MRM	11/17/05
	Meredith Moczygemba, SwRI	MRM	10/3/07
	Steve Dellenback, SwRI	SWD	11/12/07
	Lynne Randolph, SwRI	LAR	9/17/08
Completed By:			

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## **List of Acronyms**

ATMS	Advanced Traffic Management System
DOT	Department of Transportation
FDOT	Florida Department of Transportation
ITS	Intelligent Transportation Systems
ITN	Invitation to Negotiate
SwRI	Southwest Research Institute
TMC	Traffic Management Center
TVT	Travel Time
XML	Extensible Markup Language

## **REVISION HISTORY**

<b>Revision</b>	<b>Date</b>	<b>Changes</b>
1.0.0	November 10, 2004	Initial Release
1.0.2	November 17, 2005	Added generation of messages.
3.0.0	October 16, 2007	Updated for Release 3.
3.0.1	November 14, 2007	Added “how to use this document” section
4.1.0	September 17, 2008	Added new schema information

# 1. Scope

## 1.1 Document Identification

This Interface Control Document (ICD) describes the interface between individual SunGuide™ clients and the Travel Times (TVT) subsystem and between the TVT subsystem and the associated drivers. The general base architecture of the XML communications including connection information, byte order and base transaction classes is delineated in this document. This ICD defines Extensible Markup Language (XML) schemas upon which XML requests shall be based in communicating amongst the various processes. Refer to the SunGuide-General-ICD document for details regarding data transfer.

## 1.2 Project Overview

The Florida Department of Transportation (FDOT) is conducting a program that is developing SunGuide software. The SunGuide software is a set of Intelligent Transportation System (ITS) software that allows the control of roadway devices as well as information exchange across a variety of transportation agencies. The goal of the SunGuide software is to have a common software base that can be deployed throughout the state of Florida. The SunGuide software development effort is based on ITS software available from the state of Texas; significant customization of the software is being performed as well as the development of new software modules. The following figure provides a graphical view of the software to be developed:

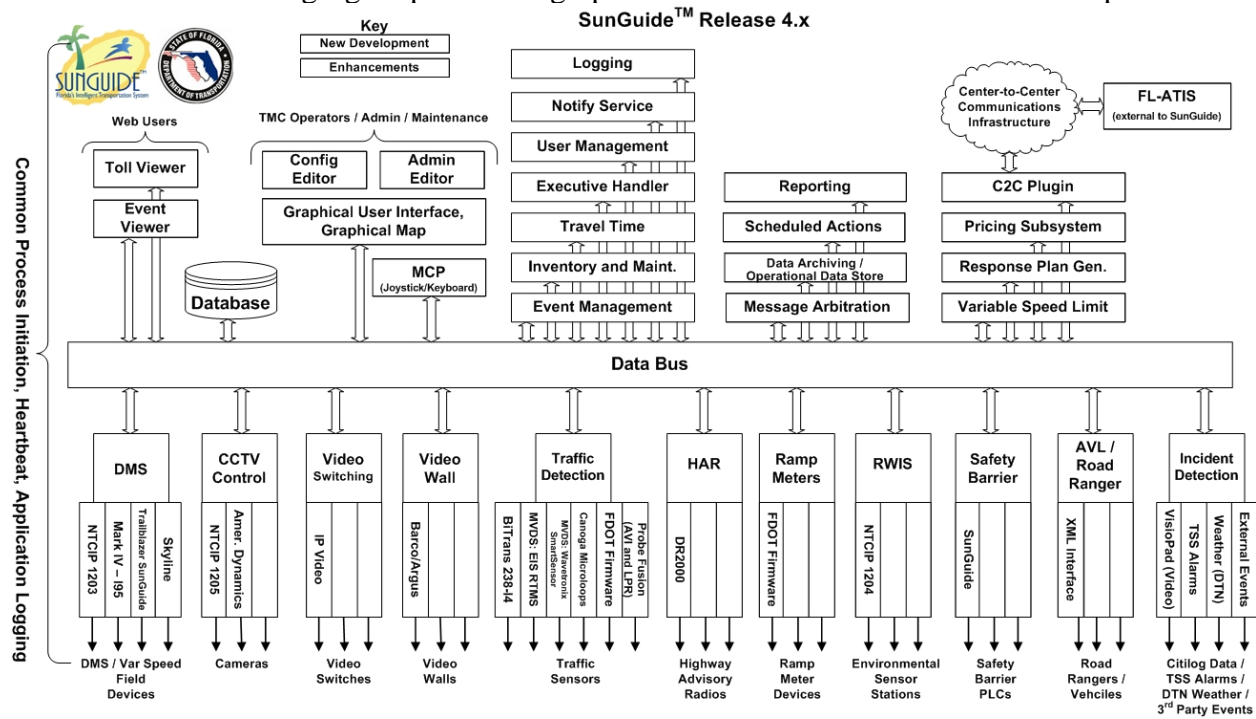


Figure 1-1 - High-Level Architectural Concept

### 1.3 How to Use This Document

The ICDs describe the specific interface between two SunGuide subsystems or between a SunGuide subsystem and a SunGuide driver. The relationship of appropriate documents is shown in the Figure 1-2.

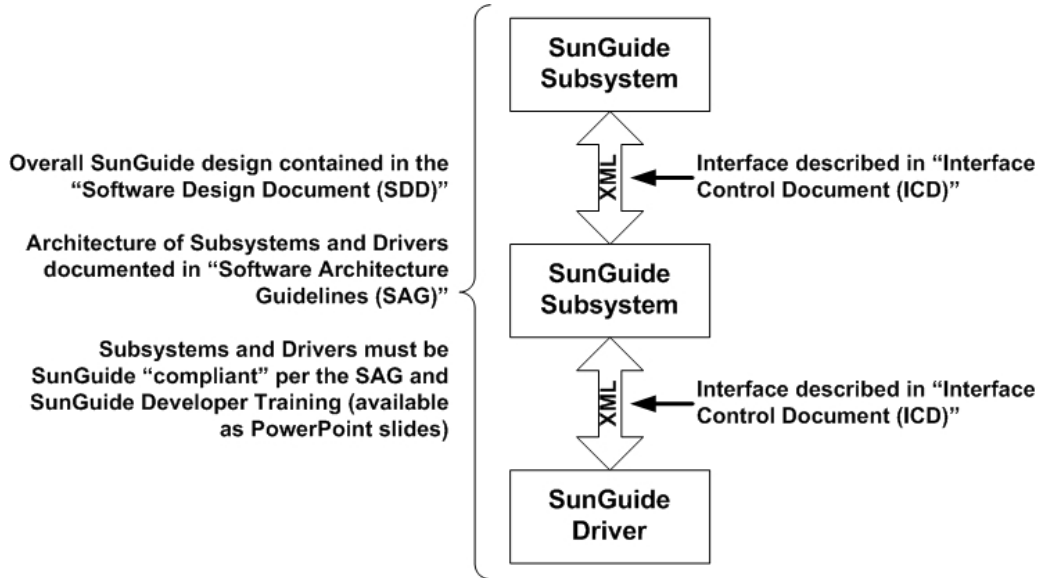


Figure 1-2 - SunGuide Developer Documentation

This document describes an *internal* SunGuide interface. The interface described is between two SunGuide compliant processes. The reader should review the following document to gain an understanding of how SunGuide compliant application is created (this will vary if the application is a driver or subsystem):

#### *SunGuide Software Architecture Guidelines (SAG)*

The SAG describes what needs to be included in a SunGuide application to assure that it will work cooperatively in the SunGuide environment. Once the SAG is reviewed, the following document should be reviewed:

#### *SunGuide Software Design Document (SDD)*

The SDD will provide an understanding of how individual components of SunGuide were designed. Finally the ICD, along with the associated schema should be reviewed to determine what data needs to be exchanged on the interface being defined in this document.

Additionally, a SunGuide “Developer Training” class is available that provides the students with an introduction into developing SunGuide processes. The SunGuide source code repository has a generic subsystem and a generic driver available that can be used as the basis for developing a new application.

### 1.4 Related Documents

The following documents were used to develop this document:



- SwRI Qualification Response: *Response to the Invitation to Negotiate (ITN): Statewide Transportation Management Center Software Library System, Negotiation Number: ITN-DOT-02/03-9025-RR*, SwRI Proposal No. 10-35924, dated: November 18, 2002.
- SwRI Technical Proposal: *Technical Proposal for Invitation to Negotiate (ITN): Statewide Transportation Management Center Software Library System, Negotiation Number: ITN-DOT-02/03-9025-RR*, SwRI Proposal No. 10-35924, dated: January 31, 2003.
- SwRI Cost Proposal: *Cost Proposal for Invitation to Negotiate (ITN): Statewide Transportation Management Center Software Library System, Negotiation Number: ITN-DOT-02/03-9025-RR*, SwRI Proposal No. 10-35924, dated: January 31, 2003.
- SwRI BAFO letter: *Southwest Research Institute<sup>®</sup> Proposal No. 10-35924, “Invitation to Negotiate (ITN): Statewide Transportation Management Center Software Library System”, Reference: Negotiation Number: ITN-DOT-02/03-9025-RR*, dated: May 5, 2003.
- FDOT procurement document: *Invitation To Negotiate (ITN), Negotiation Number: ITN-DOT-02/03-9025-RR, Statewide Transportation Management Center Software Library System*, dated: October 21, 2002.
- FDOT Scope of Services: *Statewide Transportation Management Center Software Library System: Scope of Services*, September 22, 2003.
- FDOT Requirements Document: *Statewide Transportation Management Center Software Library System: Requirements Specification*, June 3, 2003.
- Southwest Research Institute, *TMC Software Study*, November 15, 2001.
- Southwest Research Institute, *Introduction to an Operational Concept For the Florida Statewide Library*, FDOT – OCD – 1.0, March 31, 2002.
- World Wide Web Consortium (W3) website: <http://www.w3.org>.
- SunGuide Project website: <http://suguide.datasys.swri.edu>.

## **1.5 Contacts**

The following are contact persons for the SunGuide software project:

- Elizabeth Birriel, ITS Central Office, [elizabeth.birriel@dot.state.fl.us](mailto:elizabeth.birriel@dot.state.fl.us), 850-410-5606
- Trey Tillander, FDOT SunGuide Project Manager, [trey.tillander@dot.state.fl.us](mailto:trey.tillander@dot.state.fl.us), 850-410-5617
- David Chang, PBS&J Project Manager, [David.Chang@dot.state.fl.us](mailto:David.Chang@dot.state.fl.us), 850-410-5622
- Khue Ngo, Senior ITS Analyst, [khue.ngo@dot.state.fl.us](mailto:khue.ngo@dot.state.fl.us), 850-410-5579
- Steve Dellenback, SwRI Project Manager, [sdellenback@swri.org](mailto:sdellenback@swri.org), 210-522-3914
- Robert Heller, SwRI Software Project Manager, [rheller@swri.org](mailto:rheller@swri.org), 210-522-3824

## **2. Data**

The following sections detail the XML transactions that can be exchanged between client and server applications.

### **2.1 Schema**

The schemas for these transactions may be located in the Schemas directory. The objects directory contains common data schemas that are used by the various request, messages, and responses. Schemas are organized in the following tree structure:

- tvf
  - messages
    - addTravelTimeMessageMsg.xsd
    - deleteTravelTimeMessageMsg.xsd
    - updateTravelTimeMsg.xsd
    - updateTvfMessageMsg.xsd
  - objects
    - alternateRoute.xsd
    - deviceTemplate.xsd
    - matchingRoute.xsd
    - msgTemplate.xsd
    - travelTimeInfo.xsd
    - travelTimeLink.xsd
    - tssLink.xsd
    - tvfOptions.xsd
  - requests
    - addAlternateRouteReq.xsd
    - addMatchingRouteReq.xsd
    - addMsgTemplateReq.xsd
    - addTravelTimeLinkReq.xsd
    - clearDeviceTemplateReq.xsd
    - deleteAlternateRouteReq.xsd
    - deleteMatchingRouteReq.xsd
    - deleteMsgTemplateReq.xsd
    - deleteTravelTimeLinkReq.xsd
    - modifyAlternateRouteReq.xsd
    - modifyMatchingRouteReq.xsd
    - modifyMsgTemplateReq.xsd
    - modifyTravelTimeLinkReq.xsd
    - retrieveDataReq.xsd
    - setDeviceTemplateReq.xsd
    - setDeviceTvfStatusReq.xsd
    - setTvfOptionsReq.xsd
    - setTvfStatusReq.xsd
    - subscribeReq.xsd
  - responses
    - addAlternateRouteResp.xsd

- addMatchingRouteResp.xsd
- addMsgTemplateResp.xsd
- addTravelTimeLinkResp.xsd
- clearDeviceTemplateResp.xsd
- deleteAlternateRouteResp.xsd
- deleteMatchingRouteResp.xsd
- deleteMsgTemplateResp.xsd
- deleteTravelTimeLinkResp.xsd
- modifyAlternateRouteResp.xsd
- modifyMatchingRouteResp.xsd
- modifyMsgTemplateResp.xsd
- modifyTravelTimeLinkResp.xsd
- retrieveDataResp.xsd
- setDeviceTemplateResp.xsd
- setDeviceTvtStatusResp.xsd
- setTvtOptionsResp.xsd
- setTvtStatusResp.xsd
- subscribeResp.xsd

Requests may be sent from a client to a subsystem or from a subsystem to a driver. Responses may be sent from a driver to a subsystem or a subsystem to a client. A message can be sent from any process to another process.

### *2.1.1 Subsystem communication*

Initial communication to a subsystem is described in the general ICD. For TVT, the travel times links, message templates and device templates are retrieved from the database on startup. Once a client has initiated the connection to TVT, the following requests may be made:

- TVT links may be added, modified or deleted.
- Message templates may be added, modified or deleted.
- Device templates may be assigned.
- Travel times may be enabled or disabled for a device or system-wide.
- When travel times are generated, two messages are sent to subscribed clients at the intervals specified by configuration parameters: updateTravelTimeMsg and updateTvtMessageMsg.

The following table shows the various subscriptions a client may request. The last column shows the XML updates that will be received if a client has subscribed to this data.

<b>Subscription</b>	<b>Description</b>	<b>Updates Received</b>
travelTimeData	Receive updates to travel time information.	updateTravelTimeMsg,

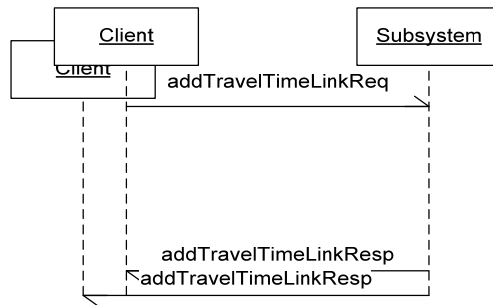
<b>Subscription</b>	<b>Description</b>	<b>Updates Received</b>
travelTimeLinkData	Receive updates to travel time link information.	addTravelTimeLinkResp, modifyTravelTimeLinkResp, deleteTravelTimeLinkResp, setTvtStatusResp
travelTimeMsgData	Receive updates to travel time message data.	updateTvtMessageMsg, addMsgTemplateResp, addTravelTimeMessageMsg, deleteMsgTemplateResp, deleteTravelTimeMessageMsg, modifyMsgTemplateResp
travelTimeOptionData	Receive updates to travel time options.	setTvtOptionsResp
travelTimeDeviceData	Receive updates to travel time device data.	clearDeviceTemplateResp, setDeviceTemplaterResp, setDeviceTvtStatusResp,
alternateRouteData	Receive updates to alternate route information	addAlternateRouteResp, deleteAlternateRouteResp, modifyAlternateRouteResp
matchingRouteData	Receive updates to matching route information	addMatchingRouteResp, deleteMatchingRouteResp, modifyMatchingRouteResp
receiveUserNotifications	Receive user alert messages	userNotificationMsg
userData	Receive notification of changes to user permissions.	updateSystemDataMsg

### *2.1.2 Driver communication*

Initial communication from a subsystem to a driver is described in the general ICD. For TVT, the DataBus is analogous to a driver. TVT sends a subscribeReq for linkData and device status to DataBus. Once subscribed, TVT receives link updates and creates travel times and travel time messages for dissemination.

## **2.2 Examples**

For example, if a client wishes to add a TVT link to the system, the client sends an addTravelTimeLinkReq to the subsystem. Upon successfully adding the TVT link, an addTravelTimeLinkResp is generated and the subsystem sends this response back to the appropriate client and to any clients who have subscribed to TVT link data.



**Figure 2-1 - Sample Transaction**

The tables below show which requests can be sent from client to subsystem and subsystem to driver. The responses sent from driver to subsystem and subsystem to client are also specified. Messages are sent when a response is not required.

### 2.3 Subsystem Schemas

*FC (From client), TC (To client), TD (To driver), FD (From driver)*

Usage Description	Requests	FC	TD	Responses	FD	TC	Messages	TC
Used for a client to add a new alternate route	addAlternateRouteReq	X		addAlternateRouteResp		X		
Used for a client to add a new matching route	addMatchingRouteReq	X		addMatchingRouteResp		X		
Used for a client to add a new travel time message template to the subsystem.	addMsgTemplateReq	X		addMsgTemplateResp		X		
Used for a client to add a new travel time link to the subsystem.	addTravelTimeLinkReq	X		addTravelTimeLinkResp		X		
Sent to inform a client that a new travel time message has been created when a device template is set							addTravelTimeMessageMsg	X
Used for a client to clear a travel time message template currently set for a device.	clearDeviceTemplateReq	X		clearDeviceTemplateResp		X		
Used for a client to delete an alternate route	deleteAlternateRouteReq	X		deleteAlternateRouteResp		X		
Used for a client to delete a matching route	deleteMatchingRouteReq	X		deleteMatchingRouteResp		X		

<b>Usage Description</b>	<b>Requests</b>	<b>FC</b>	<b>TD</b>	<b>Responses</b>	<b>FD</b>	<b>TC</b>	<b>Messages</b>	<b>TC</b>
Used for a client to delete an existing travel time message template from the subsystem.	deleteMsgTemplateReq	X		deleteMsgTemplateResp		X		
Used for a client to delete an existing travel time link from the subsystem.	deleteTravelTimeLinkReq	X		deleteTravelTimeLinkResp		X		
Sent to inform a client that a travel time message has been deleted when a device template is cleared							deleteTravelTimeMessageMsg	X
Used for a client to modify an alternate route	modifyAlternateRouteReq	X		modifyAlternateRouteResp		X		
Used for a client to modify a matching route	modifyMatchingRouteReq	X		modifyMatchingRouteResp		X		
Used for a client to modify an existing travel time message template.	modifyMsgTemplateReq	X		modifyMsgTemplateResp		X		
Used for a client to modify an existing travel time link in the subsystem.	modifyTravelTimeLinkReq	X		modifyTravelTimeLinkResp		X		
Used to retrieve data from TVT, data includes travel times, messages travel time links, templates, users, and travel time status.	retrieveDataReq	X		retrieveDataResp		X		

<b>Usage Description</b>	<b>Requests</b>	<b>FC</b>	<b>TD</b>	<b>Responses</b>	<b>FD</b>	<b>TC</b>	<b>Messages</b>	<b>TC</b>
Used to set a travel time message template for a device.	setDeviceTemplateReq	X		setDeviceTemplateResp		X		
Used to set the status for a particular device to activate or deactivate travel time messages.	setDeviceTvtStatusReq	X		setDeviceTvtStatusResp		X		
Used to set the options for the TVT subsystem (e.g. message priority and travel time message frequency).	setTvtOptionsReq	X		setTvtOptionsResp		X		
Used to set the status for the entire travel time system to activate or deactivate travel time messages.	setTvtStatusReq	X		setTvtStatusResp		X		
Used to subscribe to updates from the system. Data includes travel times, messages, travel time links, templates and users.	subscribeReq	X		subscribeResp		X		
Sent from the subsystem at publishing rate interval, client must subscribe to travel times to receive this update.							updateTravelTimeMsg	X
Sent from the subsystem at the generation rate to update a travel time message.							updateTvtMessageMsg	X



## 2.4 Driver Schemas (sent to DataBus)

*TD (To driver), FD (From driver)*

Usage Description	Requests	TD	Responses	FD	Messages	TD	FD
Subsystem sends this request to subscribe to link and device status data.	subscribeReq	X	subscribeResp	X			
The driver sends this message if subsystem has successfully subscribed to link data.					statusUpdateMsg		X

### **3. Notes**

Information about XML and schemas can be found at the World Wide Web Consortium (W3) website at <http://www.w3.org>.