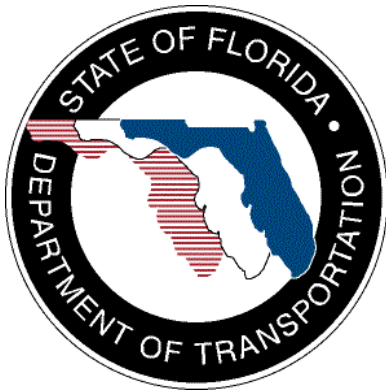


SunGuide®:

Pricing System Interface Control Document

SunGuide-PS-ICD-4.3.0



Prepared for:

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List of Acronyms

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

REVISION HISTORY

Revision	Date	Changes
3.1.0	March 10, 2008	Initial Release
4.3.0	January 21, 2010	Release 4.3.0 Final Version

1. Scope

1.1 Document Identification

This Interface Control Document (ICD) describes the interface between individual SunGuide™ clients and the Pricing System (PS) subsystem and between the PS subsystem and other SunGuide subsystems. The general base architecture of the XML communications including connection information, byte order and base transaction classes is delineated in the general ICD. 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:

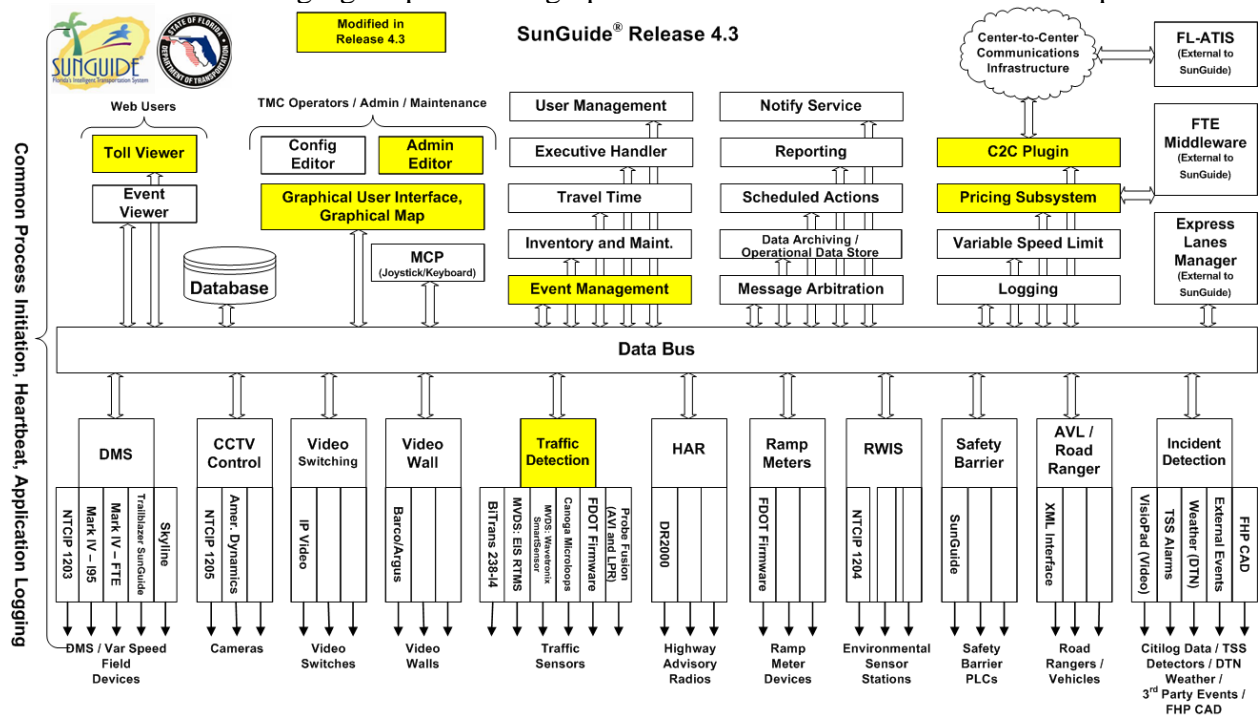


Figure 1-1 - High-Level Architectural Concept

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.

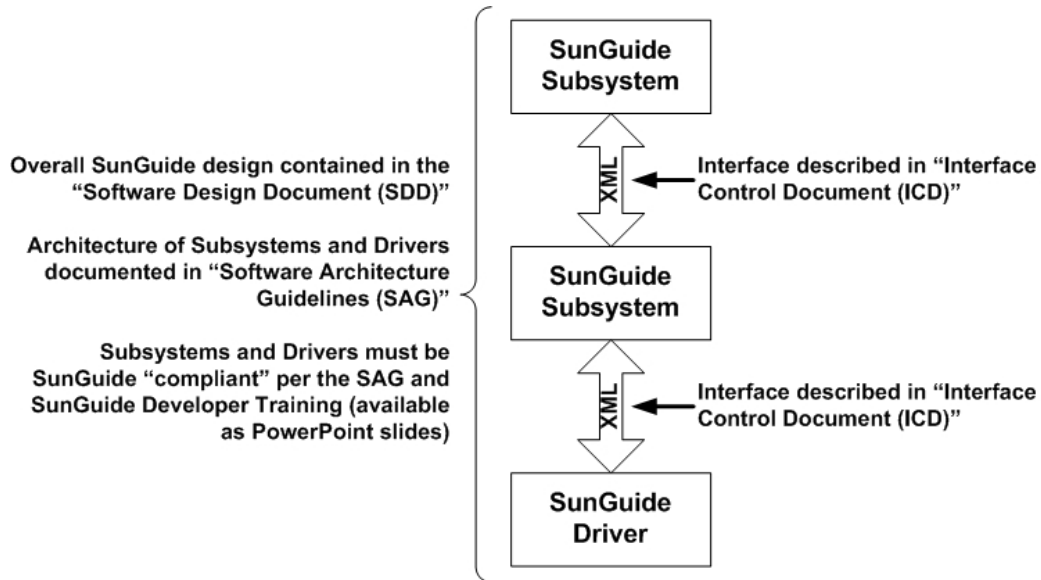


Figure 1-2 - SunGuide Developer Documentation

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[®] 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.
- *Standard Written Agreement Modification #21 for SunGuide[®] Software Release 4.3*, September 30, 2009
- *SunGuide V4.3 Software Requirements for Express Lanes Operations Version 3.13*, December 17, 2009.
- *Floodgate Multi-Set Interface Design Proposal*, November 30, 2009
- *Floodgate Pre-Recorded Messages*, June 23, 2009
- *Footprints #102 Development of Enhancement for Polling Failed Devices*, April 29, 2009
- *Footprints #1096 Excessive TSS Alarms “Recover Threshold” Enhancment*, August 17, 2009.
- *Footprints #1280, Incident Severity Definition for FLATIS*, December 17, 2009.
- *Footprints #497, Allow Congestion to Cross County Lines*, November 30, 2009.
- World Wide Web Consortium (W3) website: <http://www.w3.org>.
- SunGuide Project website: <http://sunguide.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, 850-410-5606
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- Steve Dellenback, SwRI Project Manager, sdellenback@swri.org, 210-522-3914
- Robert Heller, SwRI Software Project Manager, 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 requests/responses. Schemas are organized in the following tree structure:

- messages
 - dmsAttemptArchiveMsg.xsd
 - heartbeatArchiveMsg.xsd
 - modeArchiveMsg.xsd
 - rateUpdateMsg.xsd
 - tollAlertAcknowledgeMsg.xsd
 - tollAlertMsg.xsd
 - tollRateArchiveMsg.xsd
- objects
 - dailyRateSchedule.xsd
 - defaultMessage.xsd
 - expressSegment.xsd
 - holiday.xsd
 - mode.xsd
 - pricingSystemConfiguration.xsd
 - rateAdjustment.xsd
 - segmentRateSchedule.xsd
 - tollAlert.xsd
 - tollRateSign.xsd
- requests
 - acknowledgeTollAlertReq.xsd
 - addDailyRateScheduleReq.xsd
 - addExpressSegmentReq.xsd
 - addHolidayReq.xsd
 - addSegmentRateScheduleReq.xsd
 - addTollRateSignReq.xsd
 - approveRestartModeReq.xsd
 - deleteDailyRateScheduleReq.xsd
 - deleteExpressSegmentReq.xsd
 - deleteHolidayReq.xsd
 - deleteSegmentRateScheduleReq.xsd
 - deleteTollRateSignReq.xsd
 - dmsCorrectionAlertReq.xsd
 - generateOfflineSynchronizationReq.xsd
 - loadOfflineSynchronizationReq.xsd
 - middlewareRateAdjReq.xsd
 - modifyDailyRateScheduleReq.xsd

- modifyExpressSegmentReq.xsd
- modifyHolidayReq.xsd
- modifySegmentRateScheduleReq.xsd
- modifyTollRateSignReq.xsd
- retrieveDataReq.xsd
- setSegmentStateReq.xsd
- setSystemConfigurationReq.xsd
- subscribeReq.xsd
- responses
 - acknowledgeTollAlertResp.xsd
 - addDailyRateScheduleResp.xsd
 - addExpressSegmentResp.xsd
 - addHolidayResp.xsd
 - addSegmentRateScheduleResp.xsd
 - addTollRateSignResp.xsd
 - approveRestartModeResp.xsd
 - deleteDailyRateScheduleResp.xsd
 - deleteExpressSegmentResp.xsd
 - deleteHolidayResp.xsd
 - deleteSegmentRateScheduleResp.xsd
 - deleteTollRateSignResp.xsd
 - dmsCorrectionAlertResp.xsd
 - generateOfflineSynchronizationResp.xsd
 - loadOfflineSynchronizationResp.xsd
 - middlewareRateAdjResp.xsd
 - modifyDailyRateScheduleResp.xsd
 - modifyExpressSegmentResp.xsd
 - modifyHolidayResp.xsd
 - modifySegmentRateScheduleResp.xsd
 - modifyTollRateSignResp.xsd
 - retrieveDataResp.xsd
 - setSegmentStateResp.xsd
 - setSystemConfigurationResp.xsd
 - subscribeResp.xsd

Requests may be sent from a client to a subsystem. Responses may be sent from 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 PS, the initial dataset is retrieved from the database on startup: this includes segments, schedules, holidays, signs, system configuration parameters, alert list, startup configuration, and users. Once a client has initiated the connection to PS, additional data items may be added and existing data may be modified and deleted.

If any data have been added, modified, or deleted, the response messages which indicate these changes will be sent to subscribed clients as well.

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.

Subscription	Description	Updates Received
expressSegmentData	Receive updates to express segment data	addExpressSegmentResp, deleteExpressSegmentResp, modifyExpressSegmentResp, retrieveDataResp
tollRateSignData	Receive toll rate sign data	addTollRateSignResp, deleteTollRateSignResp, modifyTollRateSignResp, retrieveDataResp
dailyRateScheduleData	Receive daily rate schedule data	addDailyRateScheduleResp, deleteDailyRateScheduleResp, modifyDailyRateScheduleResp, retrieveDataResp
segmentRateScheduleData	Receive segment rate schedule data	addSegmentRateScheduleResp, deleteSegmentRateScheduleResp, modifySegmentRateScheduleResp, retrieveDataResp
holidayData	Receive holiday data	addHolidayResp, deleteHolidayResp, modifyHolidayResp, retrieveDataResp
systemConfigurationData	Receive system configuration data	setSystemConfigurationResp, approveRestartModeResp, retrieveDataResp
alertData	Receive alerts	acknowledgeTollAlertResp, retrieveDataResp, tollAlertMsg
segmentStatusData	Receive segment status updates	addExpressSegmentResp, modifyExpressSegmentResp, deleteExpressSegmentsResp, setSegmentStateResp, middlewareRateAdjResp, rateUpdateMsg
archiveData	Receive data archive updates	dmsAttemptArchiveMsg, modeArchiveMsg, tollRateArchiveMsg
userData	Receive updates to user configuration	retrieveDataResp, updateSystemDataMsg

2.1.2 Driver communication

Initial communication from a subsystem to a driver is described in the general ICD. For PS, the DMS subsystem is analogous to a driver. PS can display messages on DMS's in the system.

2.2 Examples

For example, if a client wishes to add an express segment to the system, the client sends an addExpressSegmentReq to the subsystem. The subsystem adds the segment and sends an addExpressSegmentResp to the client and to any clients who have subscribed to segment data.

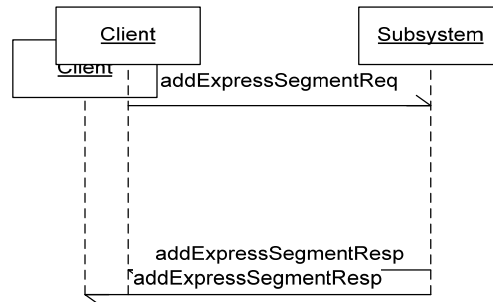


Figure 2-1 Sample Transaction

The tables below show which requests can be sent from client to subsystem. The responses sent from 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)

Usage Description	Requests	FC	Responses	TC	Messages	FC	TC
Used for a client to acknowledge a toll alert.	acknowledgeTollAlertReq	X	acknowledgeTollAlertResp	X			
Used for a client to add a daily rate schedule to the subsystem.	addDailyRateScheduleReq	X	addDailyRateScheduleResp	X			
Used for a client to add an express segment to the subsystem.	addExpressSegmentReq	X	addExpressSegmentResp	X			
Used for a client to add a holiday to the subsystem.	addHolidayReq	X	addHolidayResp	X			
Used for a client to add a segment rate schedule to the subsystem.	addSegmentRateScheduleReq	X	addSegmentRateScheduleResp	X			
Used for a client to add a toll rate sign to the subsystem.	addTollRateSignReq	X	addTollRateSignResp	X			
Used for a client to set the startup state of segments	approveRestartModeReq	X	approveRestartModeResp	X			

Usage Description	Requests	FC	Responses	TC	Messages	FC	TC
Used for a client to delete a daily rate schedule from the subsystem.	deleteDailyRateScheduleReq	X	deleteDailyRateScheduleResp	X			
Used for a client to delete an express segment from the subsystem.	deleteExpressSegmentReq	X	deleteExpressSegmentResp	X			
Used for a client to delete a holiday from the subsystem.	deleteHolidayReq	X	deleteHolidayResp	X			
Used for a client to delete a segment rate schedule from the subsystem.	deleteSegmentRateScheduleReq	X	deleteSegmentRateScheduleResp	X			
Used for a client to delete a toll rate sign from the subsystem.	deletetollRateSignReq	X	deleteTollRateSignResp	X			
Message is sent for archiving purposes when a new attempt to send a message to a DMS is made.					dmsAttemptArchiveMsg		X
Used for a client to generate an alert for a DMS correction	dmsCorrectionAlertReq	X	dmsCorrectionAlertResp	X			
Used for a client to generate the offline	generateSynchronizationFileReq	X	generateSynchronizationFileResp	X			

Usage Description	Requests	FC	Responses	TC	Messages	FC	TC
file needed to submit rates to Middleware while there is a communication failure							
Message is sent for archiving purposes when a heartbeat attempt to the Middleware.					heartbeatArchiveMsg		X
Used for a client to send manually approved rates sent by Middleware while there was a communication failure	loadOfflineSynchronizationReq	X	loadOfflineSynchronizationResp	X			
Used for a client to send a Middleware Rate Adjustment to the Middleware	middlewareRateAdjReq	X	middlewareRateAdjResp	X			
Used for a client to modify a daily Rate schedule in the subsystem.	modifyDailyRateScheduleReq	X	modifyDailyRateScheduleResp	X			
Used for a client to modify an express segment in the subsystem.	modifyExpressSegmentReq	X	modifyExpressSegmentResp	X			
Used for a client to modify a holiday in	modifyHolidayReq	X	modifyHolidayResp	X			

Usage Description	Requests	FC	Responses	TC	Messages	FC	TC
the subsystem.							
Used for a client to modify a segment rate schedule in the subsystem.	modifySegmentRateScheduleReq	X	modifySegmentRateScheduleResp	X			
Used for a client to modify a toll rate sign in the subsystem.	modifyTollRateSignReq	X	modifyTollRateSignResp	X			
Message is sent for archiving purposes when an override is made.					modeArchiveMsg		X
Message is sent to broadcast new rates for an express segment.					rateUpdateMsg		X
Used for a client to retrieve data from the subsystem.	retrieveDataReq	X	retrieveDataResp	X			
Used for a client to override segment state data in the subsystem.	setSegmentStateReq	X	setSegmentStateResp	X			
Used for a client to set system configuration data used by the subsystem.	setSystemConfigurationReq	X	setSystemConfigurationResp	X			
Used for a client to subscribe to updates	subscribeReq	X	subscribeResp	X			

Usage Description	Requests	FC	Responses	TC	Messages	FC	TC
from the subsystem.							
Message sent to users when a toll alert is acknowledged.					tollAlertAcknowledgedMsg		X
Message sent to users for new alert conditions for an express segment.					tollAlertMsg		X
Message is sent for archiving purposes when a toll rate attempt is made.					tollRateArchiveMsg		X

2.4 Driver Schemas

The PS subsystem does not communicate with drivers in the typical sense. The PS subsystem utilizes the Subsystem Interfaces of the DMS subsystem to make command requests to display DMS messages. Refer to the DMS ICD (SunGuide-DMS-ICD-1.0.2) for further information on this interface.

3. Notes

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