SunGuide™:

Variable Speed Limit Interface Control Document

SunGuide-VSL-ICD-6.2

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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
MAS	Message Arbitration System
SwRI	Southwest Research Institute
TMC	Traffic Management Center
VSL	Variable Speed Limit
XML	Extensible Markup Language

REVISION HISTORY

Revision	Date	Changes
3.0.0	October 16, 2007	Initial Release
3.0.1	November 14, 2007	Added “how to use this document” section
6.2	February 3, 2016	Updated for 6.2 Release

1. Scope

1.1 Document Identification

This Interface Control Document (ICD) describes the interface between individual SunGuide™ clients and the Variable Speed Limit (VSL) subsystem and between the VSL 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 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) SunGuide Support, Maintenance and Development Contract addresses the necessity of supporting, maintaining and performing enhancement development efforts to the 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 and is deployed throughout the state of Florida. The SunGuide software is based on ITS software available from the state of Texas; with significant customization and development of new software modules to meet the needs of the FDOT. The following figure provides a graphical view of the software to be developed:

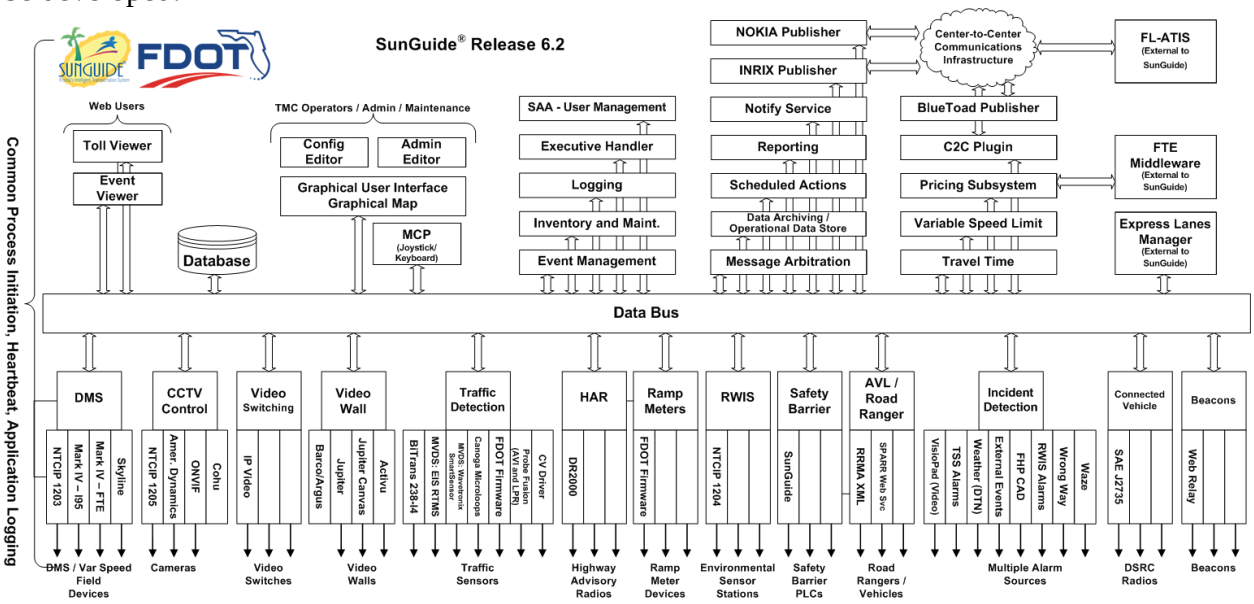

Figure 1.1 - High-Level Architectural Concept

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.

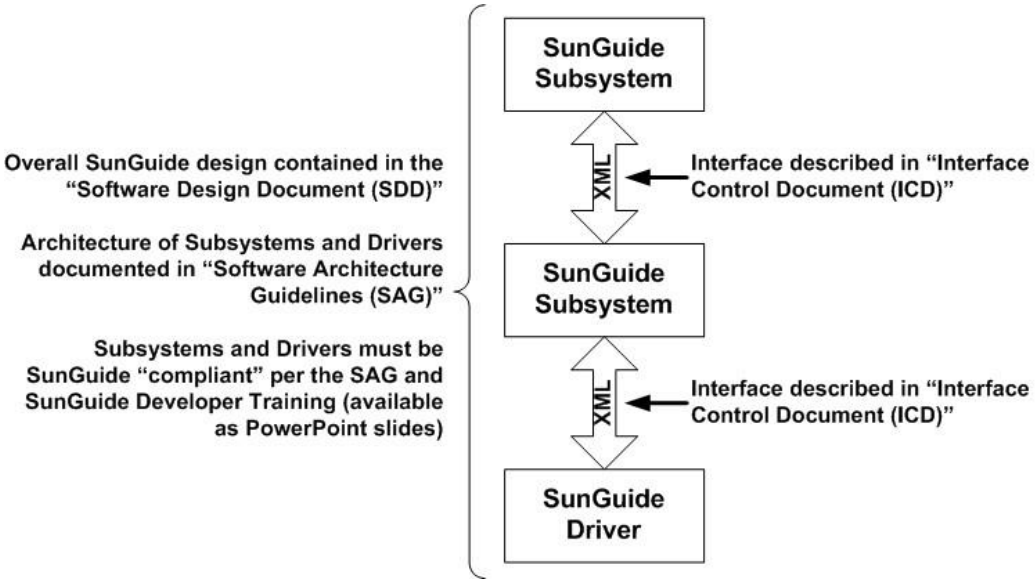

Figure 1-2 - SunGuide Developer Documentation

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:

- FDOT Scope of Services: *BDQ69, Standard Written Agreement for SunGuide Software Support, Maintenance, and Development, Exhibit A: Scope of Services.* July 1, 2010.
- Notice to Proceed: Letter to Southwest Research Institute® (SwRI®) for BDQ69, July 1, 2010.
- SunGuide Project website: http://sunguidesoftware.com.

1.5 Contacts

The following are contact persons for the SunGuide software project:

- Fred Heery, ITS Section, Traffic Engineering and Operations Office Central Office, fred.heery@dot.state.fl.us, 850-410-5606
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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, messages, and responses. Schemas are organized in the following tree structure:

VSL

- messages
  - approvePlanMsg.xsd
  - planResolutionMsg.xsd
  - recommendPlanMsg.xsd
- objects
  - vslGroupConfiguration.xsd
  - vslPlanConfiguration.xsd
  - vslZoneSettings.xsd
- requests
  - addVslGroupConfigurationReq.xsd
  - addVslPlanConfigurationReq.xsd
  - deleteVslGroupConfigurationReq.xsd
  - deleteVslPlanConfigurationReq.xsd
  - modifyVslGroupConfigurationReq.xsd
  - modifyVslPlanConfigurationReq.xsd
  - retrieveDataReq.xsd
  - setVslPlanReq.xsd
  - setVslZoneSettingsReq.xsd
  - subscribeReq.xsd
  - toggleVslRecommendationsReq.xsd
- responses
  - addVslGroupConfigurationResp.xsd
  - addVslPlanConfigurationResp.xsd
  - deleteVslGroupConfigurationResp.xsd
  - deleteVslPlanConfigurationResp.xsd
  - modifyVslGroupConfigurationResp.xsd
  - modifyVslPlanConfigurationResp.xsd
  - retrieveDataResp.xsd
  - setVslPlanResp.xsd
  - setVslZoneSettingsResp.xsd
  - subscribeResp.xsd
  - toggleVslRecommendationsResp.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 VSL, the lists of VSL groups, VSL plans, and the VSL zone settings in the system can be retrieved from the database on startup. Once a client has initiated the connection to VSL, the following requests may be made:

- VSL groups and VSL plans may be added whether they exist on startup or not.
- VSL groups and VSL plans may be modified and/or deleted.
- A particular plan may be put into effect for a group of VSLs, regardless of current traffic conditions.
- The zone traffic condition configuration data can be set.
- The VSL plan recommendations for a VSL group can be enabled or disabled.
- The client may subscribe for updates to configuration information for the VSL groups, VSL plans, VSL zone settings, and/or speed adjustment recommendations.
- Current configuration information for the VSL groups, VSL plans, and/or VSL zone settings may be retrieved.

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
vslGroupData	Receive notification of changes to the VSL group configuration	addVslGroupConfigurationResp modifyVslGroupConfigurationResp deleteVslGroupConfigurationResp
vslPlanData	Receive notification of changes to the VSL plan configuration	addVslPlanConfigurationResp modifyVslPlanConfigurationResp deleteVslPlanConfigurationResp setVslPlanResp
vslZoneSettingsData	Receive notification of changes to the VSL zone traffic settings.	setVslZoneSettingsResp
adjustmentRecommendations	Receive notification of adjustments to the speed recommendations	toggleVslRecommendationsResp
userData	Receive notification that user permissions have been modified.	updateSystemDataMsg

2.1.2 Driver Communication

Initial communication from a subsystem to a driver is described in the general ICD. For VSL, the Data Bus is analogous to a driver. VSL sends a subscribeReq for link and device status to Data Bus. Once subscribed, VSL receives link updates.

2.2 Examples

For example, if a client wishes to set VSL zone settings for the system, the client sends a setVslZoneSettingsReq to the subsystem. The subsystem configures the zone settings as specified and sends a setVslZoneSettingsResp to the client and to any clients who have subscribed to vslZoneSettingsData. The diagram below shows this example of setting VSL zone settings.

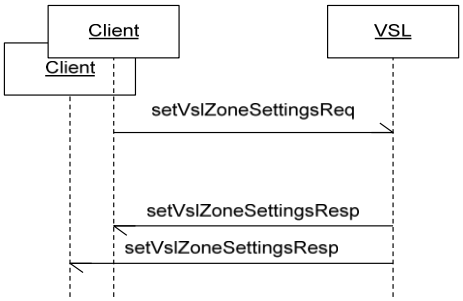

Figure 2.1 – Sample Transaction

The tables below show which requests can be sent from client to subsystem. Requests and responses that are sent to and received from other subsystems for device control will depend upon the other subsystems. The responses sent from subsystem to client are also specified. Messages are sent instead of requests 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	Responses	TC	Messages	FC	TC
Used to add a new VSL group to the system.	addVslGroupConfigurationReq	X	addVslGroupConfigurationResp	X			
Used to add a new VSL plan to the system.	addVslPlanConfigurationReq	X	addVslPlanConfigurationResp	X			
Used to modify an existing VSL group.	modifyVslGroupConfigurationReq	X	modifyVslGroupConfigurationResp	X			
Used to modify an existing VSL plan.	modifyVslPlanConfigurationReq	X	modifyVslPlanConfigurationResp	X			
Used to remove an existing VSL group from the system.	deleteVslGroupConfigurationReq	X	deleteVslGroupConfigurationResp	X			
Used to remove an existing VSL plan from the system.	deleteVslPlanConfigurationReq	X	deleteVslPlanConfigurationResp	X			
Used to set a particular plan into effect for a group of VSLs, regardless of current traffic conditions.	setVslPlanReq	X	setVslPlanResp	X	planResolutionMsg		X

Usage Description	Requests	FC	Responses	TC	Messages	FC	TC
Used to set the zone traffic condition configuration for the system.	setVslZoneSettingsReq	X	setVslZoneSettingsResp	X			
Used to enable/disable VSL plan recommendations for a VSL group.	toggleVslRecommendationsReq	X	toggleVslRecommendationsResp	X			
Used to get current data from the system. Data includes: VSL groups, VSL plans, VSL zone settings, status data, and users.	retrieveDataReq	X	retrieveDataResp	X			
Used to subscribe to updates from the system.	subscribeReq	X	subscribeResp	X			
Used to recommend a given VSL plan for a group to the client.					recommendPlanMsg		X
Used by the client to approve/deny a recommended plan.					approvePlanMsg	X	

Usage Description	Requests	FC	Responses	TC	Messages	FC	TC
Used by the subsystem to show that a VSL plan has been approved and is in affect , has been denied by the client, or has timedout.					planResolutionMsg		X

3. Notes

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