SunGuide^{TM}:

Dynamic Message Sign Interface Control Document

SunGuide-DMS-ICD-6.2

Prepared for:

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Table of Contents

List of Figures

List of Acronyms

ATMS	Advanced Traffic Management System
DMS	Dynamic Message Sign
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
XML	Extensible Markup Language

REVISION HISTORY

Revision	Date	Changes
1.0.0	November 4, 2004	Initial Release
1.0.2	November 17, 2005	Updated for Release 2 software.
1.1.0	April 19, 2007	Updated for font information.
3.0.0	October 16, 2007	Updated for Release 3 software.
3.0.1	November 14, 2007	Added "how to use this document" section
6.2	March 14, 2016	Updated for Release 6.2

1. Scope

1.1 Document Identification

This Interface Control Document (ICD) describes the interface between the individual SunGuide^TM clients and the Dynamic Message Sign (DMS) subsystem and between the DMS subsystem and the associated drivers. This ICD defines eXtensible Markup Language (XML) schemas upon which XML requests shall be based in communicating amongst various DMS 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:
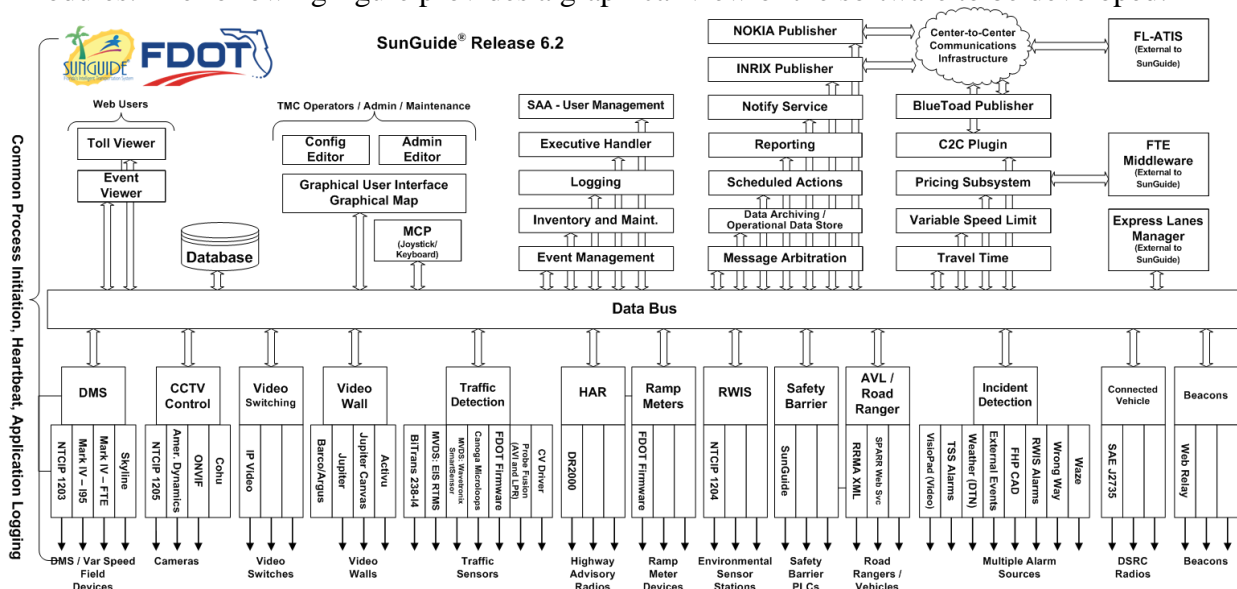

Figure 1-1 - High-Level Architectural Concept

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.
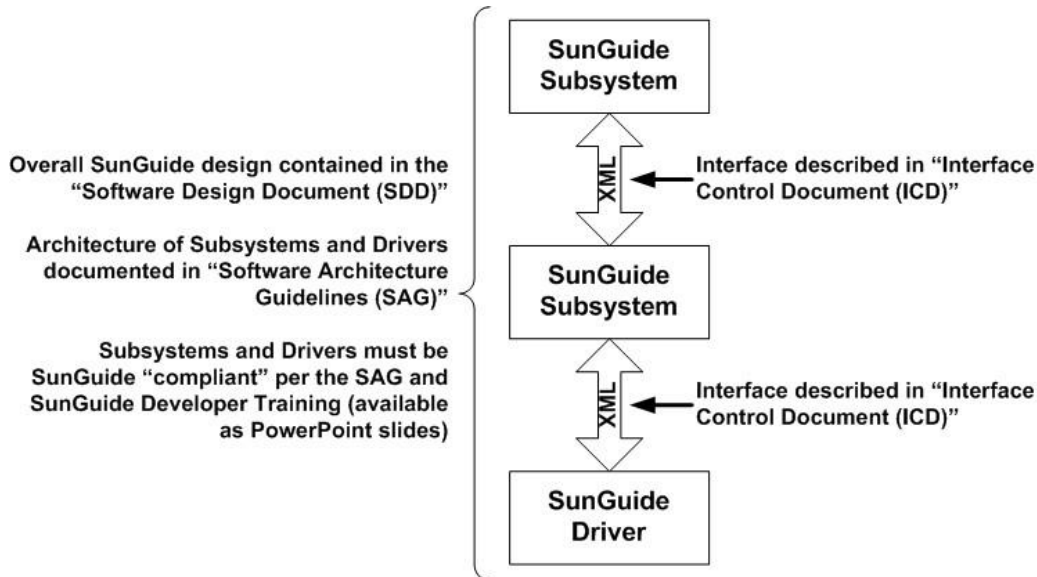

Figure 1-2 - SunGuide Developer Documentation

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:

- 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

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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 request/messages/responses. Schemas are organized in the following tree structure:

dms
- messages
  - conflictNotificationMsg.xsd
  - msgConflictResolutionMsg.xsd
  - requestMsgConflictResolutionMsg.xsd
  - requestSpellResolutionMsg.xsd
  - resolveMsgConflictMsg.xsd
  - resolveSpellConflictMsg.xsd
  - spellConflictResolutionMsg.xsd
  - statusTimesUpdateMsg.xsd
- objects
  - atmsData.xsd
  - dms.xsd
  - dmsAddress.xsd
  - dmsComm.xsd
  - dmsConfig.xsd
  - fanStatus.xsd
  - graphic.xsd
  - lampStatus.xsd
  - library.xsd
  - multiMessage.xsd
  - pixelStatus.xsd
  - status.xsd
  - system.xsd
  - user.xsd
- requests
  - addDmsGroupReq.xsd
  - addDmsReq.xsd
  - addFontReq.xsd
  - addGraphicReq.xsd
  - addMsgLibReq.xsd
  - addMsgReq.xsd
  - addWordReq.xsd
  - checkForMsgConflictReq.xsd
  - checkForSpellConflictReq.xsd
  - copyMsgLibReq.xsd
  - copyMsgReq.xsd
  - deleteDmsGroupReq.xsd

- o deleteDmsReq.xsd
- o deleteFontReq.xsd
- o deleteGraphicReq.xsd
- o deleteMsgLibReq.xsd
- o deleteMsgReq.xsd
- o deleteWordReq.xsd
- o echoMsgReq.xsd
- o exerciseShuttersReq.xsd
- o fanStatusReq.xsd
- o lampStatusReq.xsd
- o modifyDmsGroupReq.xsd
- o modifyDmsReq.xsd
- o modifyFontReq.xsd
- o modifyGraphicReq.xsd
- o modifyMsgReq.xsd
- o modifySysConfigReq.xsd
- o moveMsgReq.xsd
- o pixelStatusReq.xsd
- o powerSupplyStatusReq.xsd
- o renameMsgLibReq.xsd
- o resetControllerReq.xsd
- o retrieveDataReq.xsd
- o retrieveDmsInfoReq.xsd
- o sendMsgReq.xsd
- o setBrightnessReq.xsd
- o setControlModeReq.xsd
- o setOpStatusReq.xsd
- o statusReq.xsd
- o subscribeReq.xsd
- o synchronizeClockReq.xsd
- o tempStatusReq.xsd
- o terminateMsgReq.xsd
- responses
  - o addDmsGroupResp.xsd
  - o addDmsResp.xsd

- o addFontResp.xsd
- o addGraphicResp.xsd
- o addMsgLibResp.xsd
- o addMsgResp.xsd
- o addUserResp.xsd
- o addWordResp.xsd
- o changePasswordResp.xsd
- o checkForMsgConflictResp.xsd
- o checkForSpellConflictResp.xsd
- o cloneUserResp.xsd
- o commStatusResp.xsd
- o copyMsgLibResp.xsd
- o copyMsgResp.xsd
- o copyUserResp.xsd
- o deleteDmsGroupResp.xsd
- o deleteDmsResp.xsd
- o deleteFontResp.xsd
- o deleteGraphicResp.xsd
- o deleteMsgLibResp.xsd
- o deleteMsgResp.xsd
- o deleteUserResp.xsd
- o deleteWordResp.xsd
- o echoMsgResp.xsd
- o exerciseShuttersResp.xsd
- o fanStatusResp.xsd
- o lampStatusResp.xsd
- o modifyDmsGroupResp.xsd
- o modifyDmsResp.xsd
- o modifyFontResp.xsd
- o modifyGraphicResp.xsd
- o modifyMsgResp.xsd
- o modifySysConfigResp.xsd
- o modifyUserResp.xsd
- o moveMsgResp.xsd
- o msgRespData.xsd
- o pixelStatusResp.xsd
- o powerSupplyStatusResp.xsd
- o renameMsgLibResp.xsd
- o resetControllerResp.xsd
- o retrieveDataResp.xsd
- o retrieveDmsInfoResp.xsd
- o sendMsgResp.xsd
- o setBrightnessResp.xsd
- o setControlModeResp.xsd

- ○ setOpStatusResp.xsd
- ○ statusResp.xsd
- ○ subscribeResp.xsd
- ○ synchronizeClockResp.xsd
- ○ tempStatusResp.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. The DMSs are retrieved from the database on startup, including sequences. Once a client has initiated the connection to DMS subsystem, additional DMSs may be added, existing DMSs may be modified, deleted, request current status, display messages, create/modify sequences, or create/modify messages in message libraries.

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
dmsStatus	Receive updates to DMS status information.	statusResp, tempStatusResp, powerSupplyStatusResp
dmsMessage	Receive updates to DMS message information.	sendMsgResp
dmsOpStatus	Receive updates to DMS operational status information.	setOpStatusResp
dmsData	Receive updates to DMS configuration information.	addDmsResp, modifyDmsResp, deleteDmsResp
dmsGroupData	Receive updates to DMS group information.	addDmsGroupResp, modifyDmsGroupResp, deleteDmsGroupResp
messageData	Receive updates to message and library information.	addMsgLib,modifyMsgLib,deleteMsgLib, addMsgResp, modifyMsgResp, deleteMsgResp
sequenceData	Receive updates to sequence and library information.	addSeqResp, modifySeqResp, deleteSeqResp,addSeqLibResp, modifySeqLibResp, deleteSeqLibResp

Subscription	Description	Updates Received
configurationData	Receive updates to system configuration data.	modifySysConfigResp
activeSequencesData	Receive updates to active sequences information.	retrieveDataResp
userPrivData	Receive updates to user information.	addUserResp,modifyUserResp ,deleteUserResp
approvedWordsData	Receive updates to the list of approved words.	addWordResp, deleteWordResp
conflicts	Receive updates to spelling and message conflicts for conflict resolution.	conflictNotificationMsg, requestSpellConflictMsg, requestMsgConflictResolution Msg, msgConflictResolutionMsg, resolveMsgConflictMsg, resolveSpellConflictMsg, spellConflictResolutionMsg
commStatusResponses	Receive updates to communications status responses (e.g. request was queued, retrying command)	commStatusResp
fontData	Receive updates for font information (new, modified or deleted)	addFontResp, modifyFontResp, deleteFontResp

2.1.2   Driver communication

The driver has a Java serialized object interface. After a XML request is received by the DMS Interface it is then converted to a Java serialized request object. The Java request is then sent to Polling and then the driver. As a result there is no ICD for the driver. For example, as shown in the figure below, a client adds a DMS to the subsystem.
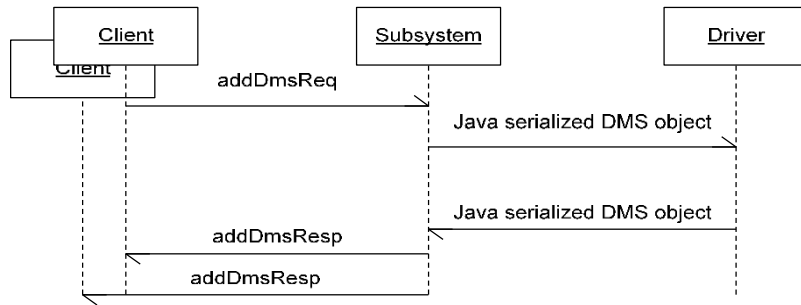
Figure 2-1 - Sample Transaction

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.

2.2 Subsystem Schemas

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

Usage Description	Requests	FC	TD	Responses	FD	TC	Messages	TD	FD	TC
Used for a client to activate a sequence.	activateSeqReq	X		activateSeqResp		X	seqStartedResp			X
Used for a client to add a new DMS group.	addDmsGroupReq	X		addDmsGroupResp		X				
Used for a client to add a new DMS.	addDmsReq	X	X	addDmsResp	X	X				
Used for a client to add a new font.	addFontReq	X		addFontResp		X				
Used for a client to create a new message library.	addMsgLibReq	X		addMsgLibResp		X				
Used for a client to add a new message into a message library.	addMsgReq	X		addMsgResp		X				
Used for a client to create a new sequence library.	addSeqLibReq	X		addSeqLibResp		X				
Used for a client to add a new sequence into a sequence library.	addSeqReq	X		addSeqResp		X				

Usage Description	Requests	FC	TD	Responses	FD	TC	Messages	TD	FD	TC
Used to add a new word into the approved words list in the subsystem.	addWordReq	X		addWordResp		X				
Used for a client to check if a particular message will cause a conflict.	checkForMsgConflictReq	X		checkForMsgConflictResp		X				
Used for a client to check if a particular message will cause a seplling conflict.	checkForSpellConflictReq	X		checkForSpellConflictResp		X				
This is an informational response letting the client know the status of a request (e.g. the request has been queued, or is being retried).							commStatusResp		X	X
This is a response to a save/send message request notifying the client that either a spelling or message conflict has occurred.							conflictNotificationMsg			X

Usage Description	Requests	FC	TD	Responses	FD	TC	Messages	TD	FD	TC
Used for a client to copy an existing DMS group with all associated DMSs to a new DMS group name.	copyDmsGroupReq	X		copyDmsGroupResp		X				
Used for a client to copy an existing library with all associated messages and sublibraries to a new library name.	copyMsgLibReq	X		copyMsgLibResp		X				
Used for a client to copy an existing message to a new name.	copyMsgReq	X		copyMsgResp		X				
Used for a client to copy an existing sequence library with all associated sequences and sublibraries to a new library name..	copySeqLibReq	X		copySeqLibResp		X				
Used for a client to copy an existing sequence to a new library name and sequence name.	copySeqReq	X		copySeqResp		X				

Usage Description	Requests	FC	TD	Responses	FD	TC	Messages	TD	FD	TC
Used for a client to delete a DMS group from the subsystem.	deleteDmsGroupReq	X		deleteDmsGroupResp		X				
Used for a client to delete a DMS from the subsystem.	deleteDmsReq	X		deleteDmsResp		X				
Used for a client to delete a font from the subsystem.	deleteFontReq	X		deleteFontResp		X				
Used for a client to delete a message library from the subsystem.	deleteMsgLibReq	X		deleteMsgLibResp		X				
Used for a client to delete a message contained in a message library from the subsystem.	deleteMsgReq	X		deleteMsgResp		X				
Used for a client to delete a sequence library from the subsystem.	deleteSeqLibReq	X		deleteSeqLibResp		X				
Used for a client to delete a sequence contained in a message library from the subsystem.	deleteSeqReq	X		deleteSeqResp		X				

Usage Description	Requests	FC	TD	Responses	FD	TC	Messages	TD	FD	TC
Used for a client to remove a word or words from the approved words list.	deleteWordReq	X		deleteWordResp		X				
Used for a client to retrieve the current displayed message and its attributes.	echoMsgReq	X	X	echoMsgResp	X	X				
Used for a client to exercise the shutters on a DMS.	exerciseShuttersReq	X	X	exerciseShuttersResp	X	X				
Used for a client to query a DMS for the state of the fans.	fanStatusReq	X	X	fanStatusResp	X	X				
Used for a client to query a DMS for the state of the lamps.	lampStatusReq	X	X	lampStatusResp	X	X				
Used for a client to modify the DMSs contained in a dms group.	modifyDmsGroupReq	X		modifyDmsGroupResp		X				
Used for a client to modify a DMS contained in the dms subsystem.	modifyDmsReq	X	X	modifyDmsResp	X	X				
Used for a client to modify a font in the subsystem.	modifyFontReq	X		modifyFontResp		X				

Usage Description	Requests	FC	TD	Responses	FD	TC	Messages	TD	FD	TC
Used for a client to modify a message contained in a message library from the subsystem.	modifyMsgReq	X		modifyMsgResp		X				
Used for a client to modify a sequence contained in a sequence libray from the subsystem.	modifySeqReq	X		modifySeqResp		X				
Used for a client to modify configuration settings for the DMS subsystem.	modifySysConfigReq	X		modifySysConfigResp		X				
Used for a client to move an existing message to a different library than its current location.	moveMsgReq	X		moveMsgResp		X				
Used for a client to move an existing sequence to a different library that its current location.	moveSeqReq	X		moveSeqResp		X				
This is a response to a client informing them whether the message that they attempted to send was approved.							msgConflictResolutionMsg			X

Usage Description	Requests	FC	TD	Responses	FD	TC	Messages	TD	FD	TC
Used for a client to query a DMS for the state of the pixels.	pixelStatusReq	X	X	pixelStatusReq	X	X				
Used for a client to retrieve power supply status from a DMS.	powerSupplyStatusReq	X	X	powerSupplyStatusResp	X	X				
Used for a client to rename an existing dms group.	renameDmsGroupReq	X		renameDmsGroupResp		X				
Used for a client to rename an existing message library.	renameMsgLibReq	X		renameMsgLibResp		X				
Used for a client to rename an existing sequence library.	renameSeqLibReq	X		renameSeqLibResp		X				
This is sent to a client requesting that a message conflict be resolved.							requestMsgConflictResolutionMsg			X
This is sent to a client requesting that a spelling conflict be resolved.							requestSpellResolutionMsg			X
Used for a client to reset the DMS controller.	resetControllerReq	X	X	resetControllerResp	X	X				

Usage Description	Requests	FC	TD	Responses	FD	TC	Messages	TD	FD	TC
This is a response from a manager containing the resolution to a message conflict. It will generate a response to the original client to let them know that their message was either approved or denied. Additionally, the message that caused the message conflict will be sent to the DMS(s).							resolveMsgConflictMsg			X

Usage Description	Requests	FC	TD	Responses	FD	TC	Messages	TD	FD	TC
This is a response from a manager containing the resolution to a spelling conflict. If the message was approved, it will generate addWordRequests for each of the unapproved words that were in the message. It will also generate a response to the original client to let them know that their message was either approved or denied.							resolveSpellConflict Msg			X
Used for a client to to retrieve data from the system.	retrieveDataReq	X		retrieveDataResp		X				
Used for a client to retrieve DMS info from the system.	retrieveDmsInfoReq	X		retrieveDmsInfoResp		X				
Used for a client to display a message on a DMS.	sendMsgReq	X	X	sendMsgResp	X	X				

Usage Description	Requests	FC	TD	Responses	FD	TC	Messages	TD	FD	TC
Used for a client to change the brightness setting on a DMS.	setBrightnessReq	X	X	setBrightnessResp	X	X				
Used for a client to change the control mode of a DMS.	setControlModeReq	X	X	setControlModeResp	X	X				
Used for a client to change the operational status of a DMS.	setOpStatusReq	X	X	setOpStatusResp	X	X				
This is a response to a client informing them whether the message with unapproved words that they attempted to save/send was approved.							spellConflictResoltionMsg			X
Used for a client to retrieve the current status of a DMS.	statusReq	X	X	statusReq	X	X				
Used for a client to subscribe to data updates from the system.	subscribeReq	X	X	subscribeResp	X	X				
Used for a client to set the DMS controller clock.	synchronizeClockReq	X	X	synchronizeClockResp	X	X				

Usage Description	Requests	FC	TD	Responses	FD	TC	Messages	TD	FD	TC
Used for a client to query a DMS for its extended temperature status.	tempStatusReq	X	X	tempStatusResp	X	X				
Used for a client to terminate the current displayed message on a DMS.	terminateMsgReq	X	X	sendMsgResp	X	X				
Used for a client to terminate a sequence that is currently active.	terminateSeqReq	X		terminateSeqReq	X					

2.3 Driver Schemas

There are no driver schemas since the driver uses a Java interface with the DMS subsystem.

3. Notes

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