SunGuide®:

Implementation Plan for FDOT Sarasota/Manatee County Satellite TMC Integration Project

SunGuide-IP-S&MInt-1.0.0 (Working Final)

Prepared for:

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

February 24, 2011

Document Control Panel			
File Name:	SunGuide-IP-SMSatellite-1.0.0(WorkingFinal).docx		
File Location:	SunGuide CM Repository		
CDRL:	N/A		
Name		**Initial**	**Date**
Created By:	Mary Thornton, SwRI	MKT	08/18/2009
Reviewed By:	Chris Birosak	CRB	08/25/2009
	Katherine L Duval	KLD	08/25/2009
	Robert W. Heller	RWH	02/24/2011
Modified By:	Mary Thornton, SwRI	MKT	10/06/2009
	Mary Thornton, SwRI	MKT	12/02/2010
Completed By:			

Table of Contents

List of Acronyms

C2C.....Center-to-Center
CCTV .....Closed Circuit Television
ConOps.....Concept of Operations
CSE.....Computer Sizing Estimates
DMS .....Dynamic Message Sign
EH.....Executive Handler
EM .....Event Management
FDOT.....Florida Department of Transportation
GUI.....Graphical User Interface
IDS.....Incident Detection System
IIS .....Internet Information Server
IP .....Implementation Plan
ITS .....Intelligent Transportation Systems
IV&V.....Independent Verification and Validation
MCP.....Manual Control Panel
NTCIP .....National Transportation Communications for ITS Protocol
RMS.....Ramp Metering Subsystem
RPG .....Response Plan Generator
RS .....Reporting Subsystem
RTMC.....Regional Traffic Management Center
RWIS .....Roadway Weather Information System
SB .....Safety Barrier
SDD .....Software Design Document
SICP.....Software Integration Case Procedures
SIP .....Software Integration Plan
SRS.....Software Requirements Specification
SUM .....Software User's Manual
SwRI.....Southwest Research Institute
TCP/IP .....Transmission Control Protocol/Internet Protocol
TMC .....Transportation Management Center
TSS .....Transportation Sensor Subsystem
TvT .....Travel Time
VDD .....Version Description Document
VPN .....Virtual Private Network

REVISION HISTORY

Revision	Date	Changes
1.0.0-Draft	August 18, 2009	Initial Draft Release for Review
1.0.1-Draft	October 7, 2009	Modifications from CRB Review
1.0.0 (Working Final)	February 24, 2011	Modifications from CRB Review and update for new SunGuide version

1. Scope

1.1 Document Identification

This document serves as the Implementation Plan (IP) for the SunGuide® software specific to the Florida Department of Transportation (FDOT) Satellite TMC Integration Project for Sarasota and Manatee Counties; herein after referred to as FDOT Satellite TMC. FDOT staff has expressed the intent to run a single installation of SunGuide software with operations staff at two locations. This FDOT Satellite TMC is intended to control of the I-75 Freeway Management System (FMS) devices in Sarasota and Manatee counties during weekdays for approximately 16 hours per day and then transfer control to the SWIFT SunGuide Center in Fort Myers after hours and on weekends. The FDOT Satellite TMC will operate primarily as a remote workstation to the SWIFT SunGuide Center but will be equipped with all the necessary servers and equipment to run independently as a redundant back-up to the SWIFT SunGuide Center in Fort Myers. When describing this redundancy, the term primary site will indicate the SWIFT SunGuide Center, and the backup site will describe the Satellite TMC.

This plan is tentatively scheduled to be implemented in 2013. Therefore, all of the version numbers used in this document, for operating system, software dependencies, and SunGuide software, should be reevaluated closer to the time of implementation and conform to the latest approved version compatible with the SunGuide application.

1.2 Project Overview

The FDOT is conducting a program that develops and maintains SunGuide software. The SunGuide software is a set of 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 program is to have a common software base that can be deployed throughout the state of Florida. The SunGuide software development effort was based on ITS software available from the state of Texas. In addition to the reuse of software (along with customization of this software), a number of new software modules have been developed specifically for the Florida Department of Transportation. Figure 1.1 provides a graphical view of the software.

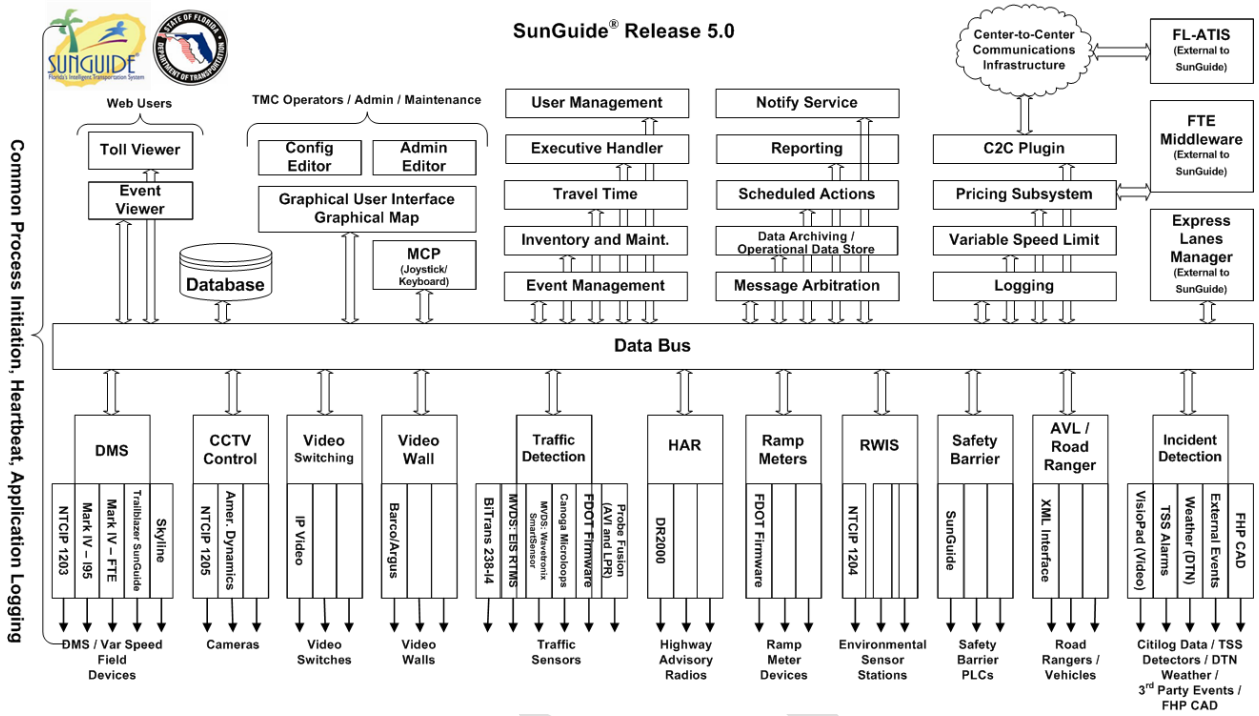


Figure 1.1 - High-Level Architectural Concept

1.3 Related Documents

A number of documents that describe the SunGuide software are available on the project web site. Many of these documents were used to produce this document. The "Reading Room" of the project web site should be reviewed:

http://sunguide.datasys.swri.edu

1.4 Contacts

The following are primary contact persons for the SunGuide software project:

- Elizabeth Birriel, ITS Section, Traffic Engineering and Operations Office, Elizabeth.Birriel@dot.state.fl.us, 850-410-5606
- Arun Krishnamurthy, FDOT SunGuide Project Manager, Arun.Krishnamurthy@dot.state.fl.us, 850-410-5615
- Clay Packard, PBS&J Project Manager, Clay.Packard@dot.state.fl.us, (850) 410-5623.
- David Chang, PBS&J Project Advisor, David.Chang@dot.state.fl.us, 850-410-5622
- Robert Heller, SwRI Project Manager, rheller@swri.org, 210-522-3824
- Tucker Brown, SwRI Software Project Manager, tbrown@swri.org, 210-522-3035

The following are contacts for other organizations that are expected to be involved with this deployment:

- Chris R. Birosak, District ITS Program Manager, Chris.Birosak@dot.state.fl.us, 863-519-2507
- Mark A. Roberts, Senior ITS Project Manager, Mark.Roberts@dot.state.fl.us, 863-519-2591
- Katherine L. Duvall, ITS Project Manager, katherine.duvall@dot.state.fl.us, 863-519-2726

2. Deployment Details

The following documents should be available to FDOT Satellite TMC staff as they prepare for a SunGuide deployment (the most recent versions are available on the project web site):

- Computer Sizing Estimates (CSE)
- Software Requirements Specification (SRS)
- Software Design Document (SDD)
- Version Description Document (VDD)
- Software User's Manual (SUM)
- Software Integration Plan (SIP)
- Software Integration Case Procedures (SICP)
- Administrator Training Slides
- Operator Training Slides
- Installation Notes
- FL-ATIS Style Guide

2.1 Version To Be Installed

The SunGuide version planned for this installation must be the same version operating in the SWIFT Center. At this time, that version is assumed to be SunGuide Version 5.0.3 with all available patches. Should the deployment schedule be extended in such a way that a newer version of SunGuide is being used at SWIFT, this deployment plan will need to be revised accordingly to match the specifications described in the appropriate Version Description Document.

2.2 Subsystems To Be Installed

The following SunGuide subsystems will be installed for the initial deployment at FDOT Satellite TMC:

- Administrative Editor (AE)
- Center-to-Center (C2C)
- Closed Circuit Television (CCTV)
- Data Bus (DB)
- Data Archive (DA)
- Dynamic Message Sign (DMS)
- Event Management (EM)
- Executive Handler (EH)
- Graphical User Interface/Map (GUI)
- Highway Advisory Radio (HAR)
- Incident Detection (IDS)
- Message Arbitration (MAS)
- Notify Manager
- Reporting Subsystem (RS)
- Response Plan Generator (RPG)
- Roadway Weather Information System (RWIS)

- Safety Barrier Cable System (SB)
- Scheduled Actions (SAS)
- Status Logger (SL)
- Transportation Sensor Subsystem (TSS)
- Travel Time (TvT)
- Video Switching (VS)
- Video Wall (VW)

2.3 Disaster Tolerant

The FDOT Satellite TMC deployment has been requested to be disaster tolerant. The server configuration has been chosen with the intent that it is intended to be a fully redundant system from the primary site to the secondary site. Should the primary site fail, the secondary site will need to be available within a few moments to resume operations and data collection.

Oracle Data Guard, a software solution available with the Oracle Enterprise Edition license, provides a comprehensive set of services that create, maintain, manage, and monitor one or more standby databases to enable production Oracle databases to survive disasters and data corruptions. Data Guard maintains these standby databases as copies of the production database. Then, if the production database becomes unavailable because of a planned or an unplanned outage, Data Guard can switch any standby database to the production role, minimizing the downtime associated with the outage. To meet the needs of the FDOT Satellite TMC, Data Guard will be installed in such a way that the production database is at the primary site at the SWIFT Center, and the standby database is located in the Satellite TMC.

Data Guard will be installed and configured to run in Maximum Performance mode. While there may be some minimal data loss involved with this mode, it is the least disruptive to operations.

2.4 Sarasota/Manatee County: Before Software Installation

The following sections describe the activities that FDOT staff (or their consultants) needs to perform prior to the SunGuide software deployment. To assist in installation planning, the SunGuide *Computer Sizing Estimate (CSE)* document should be referenced. This document can be found at the project web site: http://sunguide.datasys.swri.edu. The document is loaded in the "Various Documents" section of the "Reading Room". Note that if funding allows, workstation performance can be enhanced if the fastest possible workstations can be procured.

2.4.1 Servers

2.4.1.1 Recommended Server Configuration

This section discusses the SwRI recommended installation of the SunGuide software on dedicated SunGuide servers.

The contents of the following tables are based on information furnished to SwRI by representatives of FDOT Satellite TMC and provide device counts for the phases currently planned. (Note: A spreadsheet for providing a detailed listing of current devices is included in Appendix A).

SunGuide Device Types	Deployment
DMS TCP/IP connected signs	62
DMS Dialup connected signs	0
CCTV Cameras	175
Video Decoders	50
TSS Detectors	244
RWIS TCP/IP Stations	5
Highway Advisory Radio Controllers	14
TSS "Tag readers"	0
Safety Barrier Cable System ITS Devices (beacons/master radios)	265/24

SunGuide User Activities	Deployment
Active Simultaneous SunGuide Users	15
CCTV Users Simultaneously Controlling Cameras	10
CCTV Users Simultaneously Switching Video	10
Simultaneous Active Events	40

The following table is extracted from the SunGuide *Computer Sizing Estimates* document and is used to quantify the number of SunGuide application servers required based on the subsystems to be installed.

SunGuide Subsystem	Number of Servers Required	FDOT Satellite Deployment
Status Logger	0.1	**0.1**
Data Bus		
Base system up to 500 ITS devices	0.5	**0.5**
Over 500 devices	0.5	**0.5**
User Interface		
For every 10 users simultaneously logged in	0.5	**1.0**
DMS (includes MAS)		
Base subsystem	0.5	**0.5**
For every 100 TCP/IP connected signs	0.5	**0.5**
For every 50 dialup signs (assumes 5 modems)	0.5	
CCTV Control (includes Manual Control Panel [MCP])		
Base subsystem	0.25	**0.25**
For every 10 users simultaneously controlling cameras	0.25	**0.25**
Video Switching		
Base subsystem	0.5	**0.5**
For every 10 users simultaneously switching video	0.1	**0.1**

SunGuide Subsystem	Number of Servers Required	FDOT Satellite Deployment
Video Wall		
Base subsystem	0	**0**
For each Barco/Argus Controller	0	**0**
TSS		
Base subsystem	0.25	**0.25**
For every 300 detectors	0.5	**0.5**
Event Management		
Base subsystem for up to 20 concurrent events	0.25	**0.25**
For each 20 concurrent events over the base amount	0.25	**0.25**
Ramp Metering		
Base subsystem	0.5	
For every 20 ramps	0.25	
Roadway Weather Information System (RWIS)		
Base subsystem	0.25	**0.25**
For every 50 TCP/IP connected sensors	0.25	**0.25**
Highway Advisory Radio (HAR)		
Base subsystem	0.25	**0.25**
For every 50 HARs	0.1	**0.1**
Archive		
Base subsystem	0.5	**0.5**
Safety Barrier		
Base Subsystem	0.1	**0.1**
For every 50 Barriers	0.1	**5.3**
Travel Time (TvT)		
Base Subsystem	0.5	**0.5**
Web Servers (should be protected with a firewall)		
General Web server	1	**1**
Center-to-Center interface server	0.5	**0.5**
Emergency Evacuation	0.5	
Maintenance Management Systems	0.5	
Total SunGuide Application Servers Needed		**9.5**

The above analysis suggests that ten servers would be needed to support the SunGuide installation. The sizing estimates in the *Computer Sizing Estimates* were based on best engineering judgment. After several installations it is clear that the estimates were conservative, so there is no reason to believe that the planned number of servers will not suffice.

2.4.1.2 Planned Server Configuration

At the FDOT Satellite TMC, the SunGuide Oracle database will be installed on an HP Proliant DL 180 G5 server with 4 GB RAM. Four other HP Proliant DL 180 G5 servers with 4 GB

RAM each will host the SunGuide application services. Additional servers may be added to Ft. Myers before the time of this installation, and if this is the case, then this plan may be revised.

The SunGuide software will be installed and configured on the following machines (the recommendations are based on the current number of devices:

	Application Server			
Subsystem	**1**	**2**	**3**	**4**
Administrative Editor (AE)	✓			
Center-to-Center (C2C) Web Services	✓			
C2C SunGuide Publisher & Subscriber (Plugins)			✓	
Closed Circuit Television (CCTV)				✓
Data Bus (DB)	✓			
Data Archive (DA)		✓		
Dynamic Message Sign (DMS)		✓		
Event Management (EM)			✓	
Executive Handler (EH)	✓	✓	✓	✓
Graph.User Interface/Map (GUI)	✓			
Highway Advisory Radio (HAR)			✓	
Incident Detection (IDS)				✓
Message Arbitration (MAS)		✓		
Notify Manager	✓			
Reporting Subsystem (RS)	✓			
Response Plan Generator (RPG)			✓	
Roadway Weather Information System (RWIS)		✓		
Scheduled Actions (SAS)				✓
Safety Barrier Cable System (SB)			✓	
Status Logger (SL)	✓			
Transportation Sensor Subsystem (TSS)			✓	
TSS RTMS Driver				✓
TSS-2 (Probe Fusion Driver)				✓
Travel Time (TvT)		✓		
Video Switching (VS)				✓
Video Wall (VW)				✓

The proposed distribution of SunGuide "application subsystems" across servers is preliminary. During operations, the subsystems and driver performance should be carefully monitored for CPU, IO, paging performance or saturation.

During the installation activities, a VPN (Virtual Private Network) connection should be configured that will allow SwRI staff to access the FDOT Satellite TMC computers from remote locations. This will facilitate any troubleshooting (the VPN can only be provided with Sarasota/Manatee County Satellite TMC approval). A VPN connection is already available at Ft. Myers for the purposes of troubleshooting, and SwRI will be provided access to that VPN.

2.4.2 Server Preparation

The software installation team assumes that FDOT will have licenses and installation media available for the following products:

- Microsoft Windows Standard Server 2003
- Microsoft Standard Server 2003 (for all servers)
- Oracle 11G Enterprise Edition, version 11.1.0.7

The following operating system software needs to be installed on all of the servers before the software installation team arrives on-site:

- Microsoft Windows Standard Server 2003 with all current updates from Microsoft

The following software needs to be installed on the servers before the software installation team arrives on-site:

- One server be configured as the Oracle server:
  - Oracle 11g server, version 11.1.0.7
- Four servers will be configured as application servers:
  - Oracle 11g Client, version 11.1.0.7
  - IIS (Microsoft installation disk)
  - ASP.NET (this installed as part of Microsoft IIS)

Should antivirus software be installed on the servers, there are no requirements to exclude any SunGuide directories from antivirus scanning. However, Satellite TMC staff may want to consider excluding Oracle data files, as it can slow things down considerably.

2.4.3 User Accounts

Because of the nature of the configuration planned for the Satellite TMC systems, some user accounts will need to be created on the domain. These accounts and their passwords must be made available to the installation team upon arrival. These are the recommended users:

Account User	Access Required	Purpose
sunguidesvc	Domain user account that is a member of the Local Administrators group on each of the SunGuide application servers	Runs the SunGuide application services
oraclesvc	Domain user account that is a member of the Local Administrators group on each of the SunGuide database servers.	Runs the Oracle applications, including Oracle Fail Safe

Additional accounts should be created or made available to provide access to the SwRI installation team members while they are deploying the application. These can be named according to whatever convention FDOT Satellite Staff would prefer.

2.4.4 Workstations

The following software must be installed on each workstation that will access the SunGuide software:

- Microsoft Windows 7
- Microsoft Internet Explorer 8.0

2.4.5 Center to Center Preparation

Because Center to Center communication will be used to communicate information to the FL511 website during periods when the SWIFT SunGuide Center is unavailable, some coordination is required with the website developers to help with data integration and connectivity with the website. FDOT Satellite TMC staff will need to decide upon an appropriate Center ID for the installation and communicate that ID to the FL-ATIS developers. Also, network connectivity will need to be established between the FDOT Satellite TMC and the FL-ATIS Center to Center server. After installation and configuration are complete, FL-ATIS developers will need to be provided data from the SunGuide database at the FDOT Satellite TMC in order to allow for communication with FL-511 website and phone system during the periods when the Satellite TMC is operating as the primary site. The specific data will be requested by FL-ATIS developers, and can be provided by Satellite TMC staff or the SwRI team.

2.4.6 Network Infrastructure

The following sections described the network infrastructure that must be in place prior to installation of the SunGuide software.

2.4.6.1 Network Communications

Due to the client/server nature of the SunGuide software, TCP/IP is used to exchange data between application servers. Due to the web based implementation of the SunGuide user interface, each SunGuide workstation requires TCP/IP access to the SunGuide application servers. FDOT Satellite TMC staff needs to verify that TCP/IP connectivity exists between all SunGuide application servers and SunGuide workstations and that they are on the same or a trusted domain.

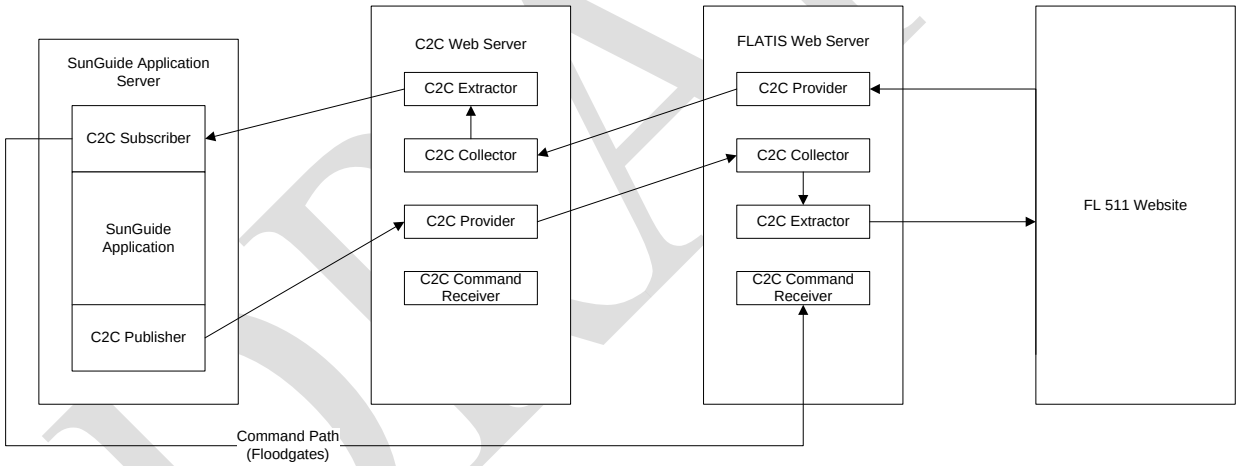
Early in the development of requirements for SunGuide, FDOT made the decision that the devices should be connected via TCP/IP to the SunGuide application servers. There are a number of techniques to connect traditional serial ITS devices so that they can be accessed via TCP/IP, these techniques include the use of a terminal server (a box that has a TCP/IP connection and has multiple serial ports) or a port server (a box that has a TCP/IP connection and a single serial port). The only exception to the use of TCP/IP access is that DMS devices can be accessed via a modem or directly through a serial port if the connection is made through a Windows "COM" port on the SunGuide application server running the DMS device driver.

2.4.6.2 Center to Center

During the SunGuide software configuration, the Center-to-Center (C2C) interfaces need to be configured so that the FDOT Satellite TMC deployment can exchange information and command requests (assuming operators have the appropriate permissions) with other control centers, including District5, and FL-ATIS, when necessary. To achieve this exchange of data a TCP/IP path must be established between the cooperating centers, this requires agencies to make appropriate modifications to firewall and other network appliances that may restrict this type of data flow.

At this time, it is expected that the FDOT Satellite TMC will need to be able to communicate with the FL-ATIS system in order to provide traffic and event information to the FL-511 website and phone system during times when the SWIFT Center is unavailable. Therefore, network communications will need to be opened up between the FL-ATIS C2C Collector and the FL-ATIS C2C Command Receiver (addresses provided by FL-ATIS) and the FDOT Satellite TMC servers that will host the Satellite TMC C2C Provider and the Satellite TMC C2C Subscriber (SunGuide C2C Plugins). The addresses of the Satellite TMC C2C components will be provided by SwRI to the FL-ATIS team at the time of installation.

The diagram below shows the need for this connectivity:



2.4.6.3 Network Resources

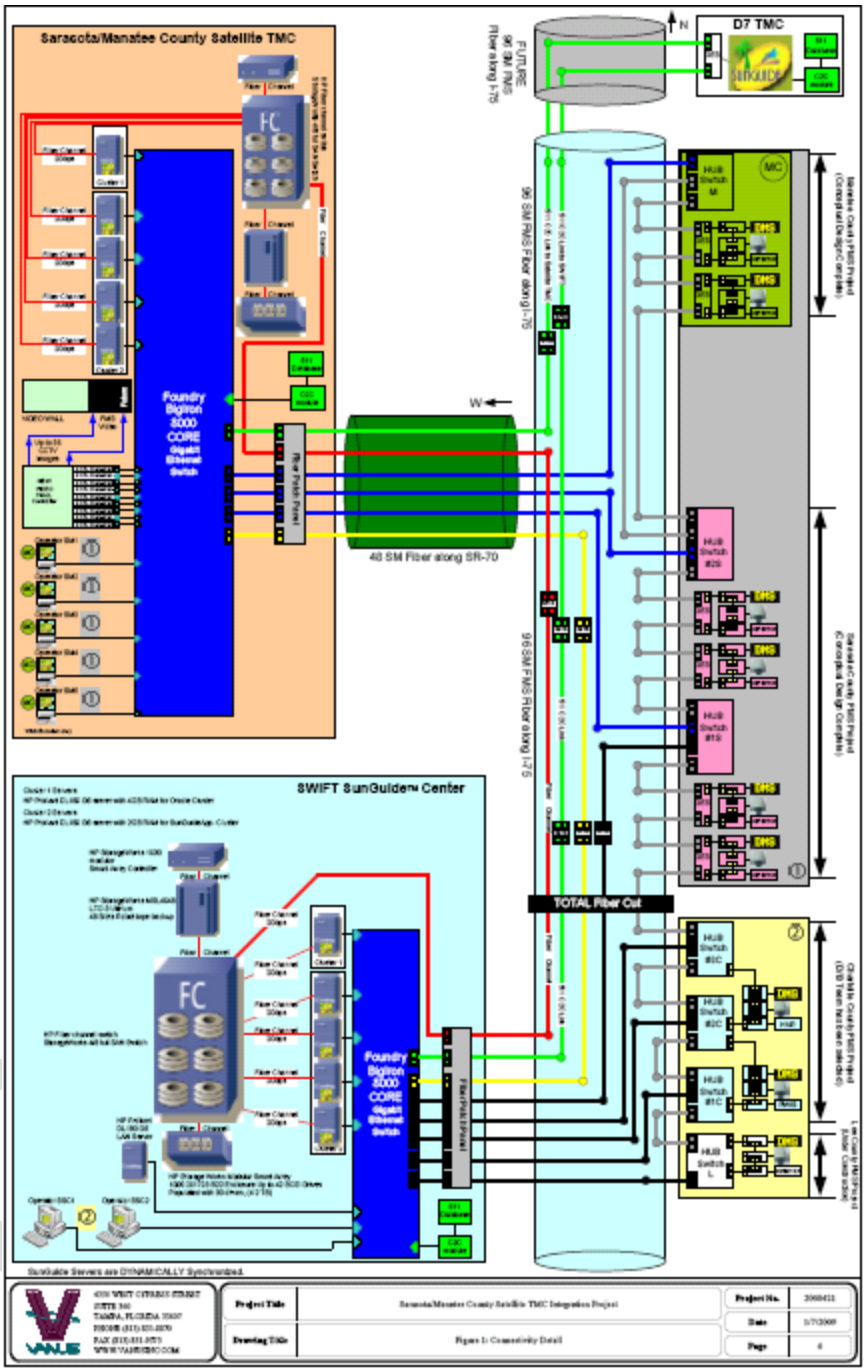
As the SunGuide software is configured, it will need access to various "standard" servers (e.g. a time server) that may be installed as part of the SunGuide installation or may be available as part of the greater FDOT network. The following network services need to be available and the details (e.g., host names, addresses) need to be available during the SunGuide software configuration:

- SMTP Mail Server (strongly recommended): The SunGuide Notify Manager needs to be able to send emails on major system events so SMTP mail server access is required.
- DNS Server (strongly recommended): The SunGuide applications utilize TCP/IP to exchange data and the applications can use either IP addresses or host names in their configuration files. Note that the use of DNS is preferred because using explicit IP addresses is less flexible than using hostnames.

- Time Server (strongly recommended): It is recommended that all SunGuide computers (workstations and servers) be synchronized to a common time source as it is desirable during diagnostics to have the same time on all SunGuide systems.

It is expected that a primary domain controller (PDC) and a gateway (G/W) will be in place. A heartbeat should be configured to support the clustered database servers. Where and how the heartbeat is configured is left to FDOT Satellite TMC discretion.

The following high level network diagram extracted from the Conceptual Plan for the FDOT Sarasota/Manatee County Satellite TMC Integration Project depicts the expected ITS network layout at the FDOT Satellite TMC.



2.4.7 Database Preparation

Because the FDOT Satellite TMC will function as a redundant system for the SWIFT SunGuide system, the initial database created and prepared for this project will be a current copy of the Ft. Myers SunGuide database. Creation of this copy (the replication of the SWIFT SunGuide database at the FDOT Satellite TMC) will need to be done as a part of the process of setting up Oracle Data Guard between the two sites during the actual deployment of SunGuide to the FDOT Satellite TMC.

In addition, there is currently an issue with Oracle data streaming using Oracle Data Guard for the SunGuide database that is currently in the process of being resolved. The SunGuide Event Management portion of the database defines nested tables as user-defined types. User-defined types are not supported by Oracle Data Guard. Therefore, the nested tables must be 'unnested' for transport to the duplicate database. This issue is currently under investigation and is expected to be resolved before the FDOT Satellite TMC deployment.

2.4.8 Configuration Files

Because the FDOT Satellite TMC SunGuide will essentially be a duplicate of the SWIFT SunGuide system, some configuration files will need to be obtained from the SWIFT system and provided to the SwRI deployment team prior to installation. These files will be modified as appropriate and used in the FDOT Satellite TMC. These files include:

- The SunGuide configuration file (config.xml)
- The IP Video switching and Snapshot devices configuration files (IpVideoDevices.xml, SnapshotDevices.xml)
- The SAS configuration files (sequences.xml, schedules.xml)
- The Operator Map configuration file (OMInterface.dll.config)

2.4.9 Devices

This section contains information on device data and integration into SunGuide.

2.4.9.1 Protocol Compliance

For the devices being deployed, FDOT Satellite TMC staff needs to verify that the protocol used by the devices to be controlled by the SunGuide software is compliant to the protocols on the SunGuide project website. At this time, this includes the following protocols:

Subsystem	Protocol Reference
CCTV Control	NTCIP 1205 v01.08 Amendment 1 v01.08 (August 2004)
CCTV Control	American Dynamics SD Ultra VII camera firmware version 2.03, dated January 24, 2006
CCTV Control	American Dynamics SD Ultra 8 camera firmware version 1.09, FPGA version 2006/10/31 15:18
DMS	NTCIP 1203, FDOT MIB (Sep 2001)
DMS	Mark IV - I95: Document Number A316111-102 REV. A8 (June 26, 2001)
DMS	SunGuide Trailblazer
HAR	Highway Information Systems DR2000
RWIS	NTCIP 1204 v02.18 (April 2004)
Traffic Detection	EIS RTMS, Issue 2 (April 2003)
Traffic Detection	Wavetronix RTMS: SS105 SmartSensor Data Protocol V2.02
Traffic Detection (AVI)	SIRIT Identity Flex Title 21
Traffic Detection (AVI)	TransCore Allegro IT2020
Traffic Detection (LPR)	PIPS P357 Video Processor
Traffic Detection (LPR)	Inex Zamir
Video Switching: IP Video	VBrick 4200/5200

Subsystem	Protocol Reference
Video Switching: IP Video	Teleste IDP301/IDE301
Video Switching: IP Video	Coretec VCX2400D/VCX2400E
Video Switching: IP Video	iMpath i1000/i4100
Video Switching: IP Video	Cornet Technology iVDO Streamer 2/4D / iVDO Streamer 2/4E
Video Wall	Barco/Argus Apollo

In addition to verifying the protocols are compliant, the FDOT Satellite TMC staff needs to verify the TCP/IP connectivity to the field devices prior to the on-site installation activities being performed. This can most simply be accomplished by using "ping" to verify that the device is accessible from the server room using the network that the SunGuide servers will be utilizing.

Past history from previous new SunGuide installations indicates that approximately 80% of deployment efforts are spent on device connectivity (future upgrades do not take this level of effort). In new deployments wiring issues, device configuration issues and network issues have been shown to take a lot of time to resolve. Any effort prior to the deployment using "test software" (often provided by the vendors) to communicate to the devices from computers in the control center can reduce the installation efforts.

2.4.9.2 Device Worksheets

The following sections describe the information that must be collected about each device that is to be utilized by the SunGuide software.

Notes:

- When entering latitude/longitude values, a full 8 digits of precision must be entered, as coordinates are stored in micro degrees which require 8 digits. SunGuide has a 30 character limit for device short names and descriptions are limited to 256 characters.
- Appendix A of this document has a worksheet to provide device information, the information requested in the following tables is best presented in an Excel worksheet format. Note that the data already provided is not all the information required to perform the SunGuide installation.

2.4.9.2.1 CCTV Worksheet

The following data needs to be collected for each CCTV to be configured:

Camera Name	Unique name of camera
Center Id	Unique name of center where camera resides, same as the one used for C2C communication
Protocol	Specifies the protocol (values: SNMP, SNMP(PMPP)) for camera
Poll Process	Name of driver for camera
Manufacturer	Manufacturer of camera
Location Description	Description of where camera resides
Roadway	Roadway of where camera resides
Direction	Direction of roadway where camera is installed
Latitude	Latitude of where camera resides
Longitude	Longitude of where camera resides
Op Status	Operational status (values: Active, Error, Failed, OutOfService) of camera
Address Type1	Address type (values: pmppAddress, commAddress) for camera, if pmppAddress then camera uses SNMP (PMPP); if commAddress then camera uses SNMP
Address Type2	Specific address type (values: portServerAddress) of Address Type 1
Address	Device address of camera
Port Server IP	IP address for the port server where camera resides
Port Server Port Number	Port number for the port server where camera resides
Community Name	Community name for camera (SNMP)
Attach to Video Device	If selected, additional IP video parameters for attached encoder must be supplied.

The following data need to be provided for IP video (both encoders and decoders):

Video Device IP Address	IP address for encoder
Restricted	Applicable only for decoders
Workstation	Applicable only for decoders, select if a workstation is configured for this video destination.
Video Device Type	Type (IP video device) of video device, encoder or decoder
IP Streaming Driver ID	Unique IP video switch driver name, determined at the time of installation.
Card Number	Card number for VBrick encoder
Manufacturer	Manufacturer (values: Coretec, iMpath, Teleste, VBrick) of encoder
Model	Model of encoder or decoder
Streaming Type	Streaming type (values: ES, transport, program, mpeg)
Secondary Interface	Secondary interface for VBrick which enables users to maximize number of inputs
Snapshot Requested	Determines if snapshots are generated for encoder

2.4.9.2.2 DMS Worksheet

The following data needs to be collected for each DMS to be configured:

Sign Name	Unique name of DMS
Center Id	Unique name of center where DMS resides
Protocol	Specifies the protocol (values: SNMP, SNMP(PMPP), MarkIV, SunGuide (for Trailblazers)) for DMS
Connection Type	Specifies how the DMS is connected to the network (values: Direct, Modem, Long Distance Modem)
Poll Process	Name of driver for DMS
Packet Timeout	Amount of time the driver will wait on a response from a DMS before timing out (recommended time is 5 seconds)
Packet Retry Limit	How many times a packet is attempted before it errors out, for most signs the recommended number is 2, for signs prone to errors, this can be increased
Command Retry Limit	How many times a command is attempted before it errors out, a command consists of multiple packets. Recommended number is 1
Op Status	Operational status (values: Active, OutOfService) of DMS
Type	Values: Fiber Optic, LED, Flip-Disk, Shutter
Manufacturer	Values: FDS, IDI, MarkIV, Telespot, Skyline
Number of Lines	Number of displayable lines
Beacons	Whether the sign has beacons, if so, specify the beacon address
Day Brightness Level	The numeric value for brightness setting in the daytime
Night Brightness Level	The numeric value for brightness setting in the nighttime
Font	The font configured on the sign.
Sign Type	Type of sign. The possible values are: Char, LineMatrix, or FullMatrix.
Sign Use	How the sign is used: General, VSL, Toll Rate, Toll Lane Status, or Trailblazer
Location Description	A text field describing the location of the DMS
Roadway	Roadway on which this DMS resides
Direction	The direction of the roadway on which this DMS resides
Latitude	Latitude of where this DMS resides
Longitude	Longitude of where this DMS resides
Number of Columns	Number of characters that can be displayed using a normal font
Beacon Address	The address on which the sign receives activate/deactivate beacon requests
Address Type 1	Address type (values: PMPP, SunGuide, MarkIV) for DMS, if PMPP then DMS protocol should be SNMP (PMPP); if SunGuide or MarkIV, then DMS uses same protocol name
Address Type 2	Specific address type (values: Direct, PortServer, Dialup, UDP Port Server) of Address Type 1
Address	Device address of DMS (drop address)

The following data need to be provided for DMSs connected via a TCP/IP connection (Port Server):

IP Address	IP address for the port server where DMS resides
Port Number	Port number for the port server where DMS resides
Community Name	Community name for DMS (SNMP)

The following data need to be provided for DMSs connected via a UDP Port Server:

IP Address	IP address for the port server where DMS resides
Port Number	Port number for the port server where DMS resides
Read Community Name	Read community name for DMS (SNMP)
Write Community Name	Write community name for DMS (SNMP)

The following data need to be provided for DMSs connected directly via a serial port (Direct):

Communications port	Communications port to which the DMS is connected
Baud Rate	This should match the baud rate of the DMS
Data Bits	This should match the data bits the DMS is expecting
Stop Bits	This should match the stop bits the DMS is expecting
Parity	This should match the parity the DMS is expecting

The following data need to be provided for DMSs connected via a modem:

Phone Number	Phone number for the DMS, should include any prefix needed for dialing
Baud Rate	This should match the baud rate of the DMS

2.4.9.2.3 HAR Worksheet

The following data need to be provided for HAR radios:

Name	Unique name of radio
Manufacturer	Manufacturer of the radio
Control Number	Phone number of the device
Access Code	Required device # for the HAR
Header Slot	If there is some "header message" you want preceding each of the actual messages we play, you would put its message number here. The actual message is configured within the HAR.
Footer Slot	If there is some "footer message" you want trailing each of the actual messages we play, you would put its message number here. The actual message is configured within the HAR.
Default Message Slot	Default Message is what plays when you 'terminate' the message from within SunGuide (would still be wrapped by the header/footer if set).
Roadway	Roadway of where radio resides.
Direction	Direction of roadway where radio is installed
Location Description	Description of where radio resides
Latitude	Latitude of where radio resides
Longitude	Longitude of where radio resides

2.4.9.2.4 RWIS Worksheet

The following data needs to be collected for each RWIS to be configured:

Sign Name	Unique name of RWIS
Protocol	Should be NTCIP (only version supported)
Connection Type	Specifies how the device is connected to the network (values: Direct, Modem, Long Distance Modem)
Op Status	Operational status (values: Active, OutOfService) of device
Manufacturer	Name of manufacturer
Location Description	A text field describing the location of the device
Roadway	Roadway on which this device resides
Direction	The direction of the roadway on which this device resides
Latitude	Latitude of where this device resides
Longitude	Longitude of where this DEVICE resides
Address Type 1	Address type (values: PMPP) for device, if PMPP then device protocol should be SNMP (PMPP)
Address Type 2	Specific address type (values: Direct, PortServer, Dialup) of Address Type 1
Address	Device address of device
Port Server IP	IP address for the port server where device resides
Port Server Port Number	Port number for the port server where device resides
Community Name	Community name for device (SNMP)

2.4.9.2.5 Route Worksheet

The following data need to be provided for each Highway (Route) to be in the deployment:

Roadway Description	Textual description of the roadway (route)
Short Name	Short text name that will be seen by the operators
Directions	The directions that the roadway runs (can be multiple directions)
Cross Streets (multiple entries)	Textual descriptions of cross streets (that intersect the roadway); typically a roadway will have multiple cross streets
Latitude	Latitude of the intersection between the roadway and the cross street
Longitude	Longitude of the intersection between the roadway and the cross street

2.4.9.2.6 Safety Barrier Cable Worksheet

The following data needs to be collected for each SB station:

Station Name	Unique name of the station
Driver Name	Determined at the time of SunGuide installation
Roadway	The roadway on which the station resides

Direction	The direction of the roadway on which the station resides
Location Description	A text field describing the location of the station
Latitude	Latitude of where the station resides
Longitude	Longitude of where the station resides
PLC ID	PLC ID consistent with the value configured in the Safety Barrier device when the device was activated in the field.
Unit ID	Unit ID consistent with the value configured in the Safety Barrier device when the device was activated in the field.
Op Status	Operational status (values: Active, OutOfService) of station
Lamp State	State of the lamp
Switch State	State of the switch
Address	Address of the station
Port Server IP	IP address for the port server where the station resides
Port Server Port	Port number for the port server where the station resides

2.4.9.2.7 TSS Worksheet

The following data needs to be collected for each TSS detector to be configured:

Detector Name	Unique name of detector
Center Id	Unique name of center where detector resides
Driver Name	Name of driver for the detector (e.g., BiTrans, RTMS)
Poll Cycle	Time in seconds between device polls
Type	Type of detector (e.g., Loop, Radar, AVI or LPR)
Protocol	Specifies the protocol (see the protocols supported on the projecyt web site)
Op Status	Operational status (values: Available or Offline)
Location Description	Description of where detector resides
Roadway	Roadway of where detector resides
Direction	Direction of roadway where detector is installed
Latitude	Latitude of where detector resides
Longitude	Longitude of where detector resides
Address	Device address of detector
Port Server IP	IP address for the port server where detector resides
Port Server Port Number	Port number for the port server where detector resides

The following data needs to be collected for each lane that is to be configured:

TSS Link Name	A link should be created to represent the traffic segment corresponding to the detector in each direction for non-probe detectors, and from from upstream detector to downstream detector for probe detectors.
TSS Lanes (non-probe detectors)	For each link, the name of each lane associated with the link; for each lane the zone number and description needs to be identified (e.g., which detection zone is associated with a lane).
Length (probe detectors)	The length of the link in miles
Number of Lanes (probe detectors	For each link, the number of lanes to be displayed
Zones	The zones associated with the detector for this link.
Downstream Detector	The downstream detector for tag matches along this link. Downstream zones must be specified as well
Speed Limit	The speed limit of the link
Publish Link	If the link is to be published to the FL 511 website

The following data needs to be collected for each link that will have an alarm threshold to be configured:

TSS Link	The name of the links that will be defined in the system.
Threshold Value(s)	What the speed and occupancy values should be for each threshold (this includes a start and end time) value to be defined.

2.5 SwRI: Software Installation

The following sections describe the activities that SwRI staff will perform to install the SunGuide software. This document assumes that SwRI staff will be replicating the SWIFT database and setting up the Oracle Data Guard streaming between the two sites. This description is applicable to non-virtualized environments. It is possible that a single application servers can be configured following the described process, then they can be cloned and edited (host name, etc.) to reflect its final configuration. FDOT Satellite TMC staff should be available to monitor and observe the software installation process.

2.5.1 Installation Approach

Because the FDOT Satellite TMC must be available and used a redundant backup site for SWIFT, the following approach is suggested to install, exercise, and test the Satellite TMC operations with minimal disruption to the SWIFT Center operations:

- Configure any new devices (as a result of the Satellite TMC project) into the SWIFT SunGuide system.
- Install SunGuide as specified in the next section, but using a static copy (export) of the SWIFT SunGuide database from a time AFTER the new devices were added. Do NOT set up Data Guard at this time. Provide the Center to Center configuration information to the FL-ATIS developers.

- Test using Satellite TMC client workstations to access and direct operation of devices in the SWIFT SunGuide system.
- Bring up the Satellite TMC SunGuide. This should be done by first starting only subsystems. Then, set all the Satellite TMC devices out of service. Then, start the drivers in the Satellite TMC SunGuide system. This process will help avoid any communication conflicts with devices used by SWIFT operations.
- Test the FDOT Satellite TMC SunGuide deployment and communication with existing devices by taking selected devices out of service at SWIFT and bringing them into service at the Satellite TMC.
- Recreate the FDOT Satellite TMC database in preparation for Oracle Data Guard replication and streaming.
- Set up Oracle Data Guard replication and streaming.
- Perform a switchover of operations to the FDOT Satellite TMC and test that the system operates as expected. This should include Center to Center communications with FL-ATIS.
- Perform a switchover of operations back to the SWIFT SunGuide system and test that the changes made while operating against the FDOT Satellite TMC were applied and that the system operates as expected.

2.5.2 Software Installation

In order to install the SunGuide application software at the FDOT Satellite TMC, the following steps will be performed by the software installation team:

- In a common directory with a share point accessible to all of the SunGuide application servers the following files will be installed:
    - Install master configuration file which is named config.xml and edit the contents to match the TMC network configuration.
    - Install XML schemas used by the SunGuide applications.
- Execute the database creation scripts to prepare the database for installation of the SunGuide applications.
- Replicate the SWIFT SunGuide database and instantiate a duplicate database in preparation for Oracle Data Guard.
- Configure Oracle Data Guard to stream data from the SWIFT SunGuide database to the FDOT Satellite TMC database.
- Using the installation instructions in the SunGuide *Version Description Document* (VDD) and installation notes install the SunGuide applications. Any patches released subsequent to the release of the full installation CD need to be installed (in order) after the installation CD is executed.

Two SunGuide system administration applications do not execute in a browser environment. These applications should be installed on workstations that may be used to diagnose the health and status of the system; details of the application are contained in the SUM. SwRI will install the following applications on workstations as directed by FDOT Satellite TMC staff:

- Executive Handler viewer: provides an overview of currently operating SunGuide applications.
- Status Logger viewer: provides the ability to review the SunGuide application log files.

2.5.3 Software Configuration

After the SunGuide software is installed, various configuration activities need to occur; the software installation team will perform the following configurations:

- Install and configure Status Logger on a single SunGuide application server (the SunGuide applications will log to this one instance of Status Logger).
- Install and configure Executive Handler server on all SunGuide application servers
- Modify the IIS to restrict access to the SunGuide Admin utility to users as requested by FDOT Satellite TMC Staff.

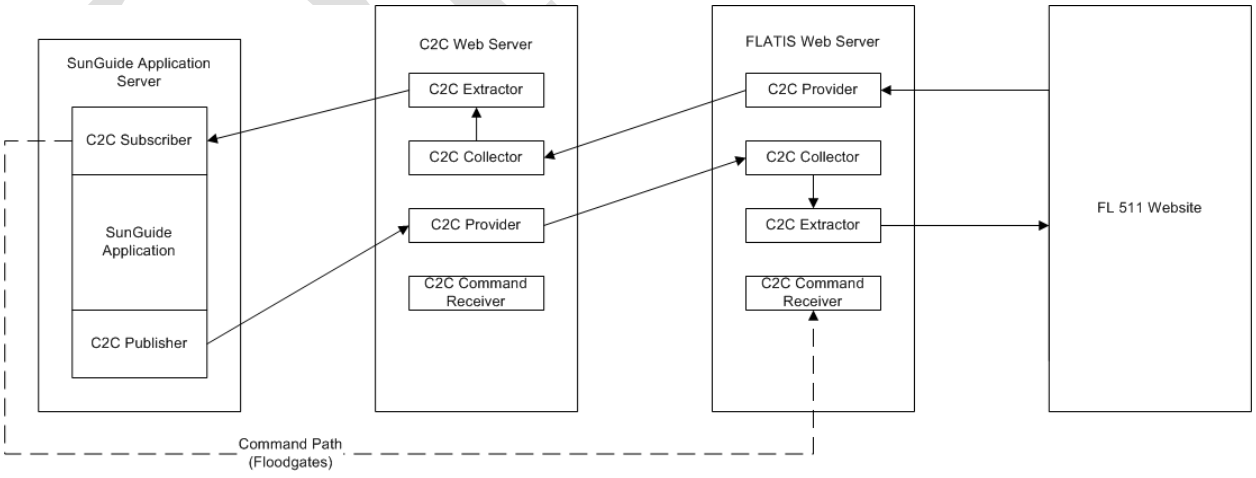
The SunGuide GUI is designed to load GUI components for the SunGuide applications. The loading (and overall performance) of the GUI can be improved if the GUI components associated with subsystems not installed is removed. The software installation team will remove the GUI components for the subsystems that were not installed; this is done because when the GUI is installed it includes the components for ALL SunGuide subsystems, this removal is done so that users do not see menu options for subsystems which are not installed and configured.

2.5.4 C2C Configuration

During the SunGuide software configuration, the Center-to-Center (C2C) interfaces need to be configured so that the FDOT Satellite TMC deployment can exchange information and command requests (assuming operators have the appropriate permissions) with other control centers and FL-ATIS, when necessary. The following C2C web components will be installed on the Sarasota/Manatee County Satellite TMC servers:

- C2C Extractor
- C2C Provider
- C2C Collector
- C2C Command Receiver (if necessary)

The diagram below indicates the proposed installation of C2C services at the FDOT Satellite TMC. Note that the C2C Web Server and the SunGuide Application Server can be the same server in the FDOT Satellite TMC.



The address of the C2C Provider and the Center ID of the installation will be communicated to FL-ATIS developers at the time of installation. Any other information that the FL-ATIS team requires for communication with the FDOT Satellite TMC will be provided upon request.

2.6 SwRI / FDOT Satellite TMC: Testing

Once the configuration is complete and equipment is made available, a series of ad hoc tests will be performed to verify software operation. If FDOT Satellite TMC staff wishes, the formal test cases from the SunGuide *Software Integration Case Procedures (SICP)* can be executed but this activity has not been performed in recent SunGuide deployments. Areas that will be tested / exercised include:

- CCTV:
  - Control of CCTV devices
- DMS:
  - Devices being polled
  - Control of DMS devices
  - DMS devices showing on map with status information
- RWIS Devices:
  - Devices being polled
  - RIWS data showing up on map
- Safety Barrier Devices:
  - Devices being polled
  - SB data showing up on map
- TSS Devices:
  - Devices being polled
  - TSS data showing up on map
- Video Wall Devices:
  - Switching videos to different viewers on the wal
  - Creating and changing video wall layouts
- Event Management:
  - Event Creation
  - Event Management
  - Response Plan Generation
- Reporting Subsystem:
  - Generate reports
- Various:
  - Test C2C plugin using XML tester to receive data
  - Verify Data Archive is configured to store TSS data (note that this subsystem will not be used in the short term but will be configured for future use)

2.7 Training

Training will be conducted in the FDOT Satellite TMC control center as the installation is performed; the training will be both a hands-on that occurs during the installation and configuration activities as well as formal class. The following training will be provided to the operations personnel during the installation and configuration:

- Administrator Training - the intent of the System Administration/Deployment training is to prepare personnel to install/configure the SunGuide software and administer the SunGuide system on a daily basis. The following topics will be addressed during the hands-on training:
    - Installation procedures
    - Backup procedures
    - Recovery procedures
    - Modifying hardware configurations
    - Tailoring of the system environment
    - Starting/stopping/restarting the system
    - Troubleshooting:
        - Executive Handler
        - Status Logger
    - Workstation installation
    - Disaster Recovery procedures for the SunGuide application using Oracle Data Guard

- Operator Training - the intent of the Operator/User Interface course is to prepare personnel to use the SunGuide™ system on a daily basis in a typical operational mode. The course will include the following topics:
    - ATIS
    - Center-to-Center (C2C)
    - Closed Circuit Television (CCTV)
    - Data Bus (DB)
    - Data Archive (DA)
    - Dynamic Message Sign (DMS)
    - Event Management (EM)
    - Executive Handler (EH)
    - Graphical User Interface/Map (GUI)
    - Highway Advisory Radio (HAR)
    - Incident Detection (IDS)
    - Message Arbitration (MAS)
    - Notify Manager
    - Performance Measures
    - Reporting Subsystem (RS)
    - Response Plan Generator (RPG)
    - Roadway Weather Information System (RWIS)
    - Scheduled Actions (SAS)
    - Safety Barrier Subsystem (SB)

- Status Logger (SL)
- Transportation Sensor Subsystem (TSS)
- Travel Time (TvT)
- Video Switching (VS)
- Video Wall (VW)

The training format consists of:

- Classroom instruction using PowerPoint presentation (8 hours)
- Hands-on instruction using Sarasota/Manatee County Satellite TMC SunGuide System (4 hours)

The operator training will be conducted at the FDOT Satellite TMC during non-operational hours, if necessary.

2.8 Deployment Schedule

The following schedule is proposed for the deployment. The SunGuide installation is scheduled to occur in 2013. The installation team will need access to hardware devices throughout the implementation process. Note that if activities complete early then with agreement between all parties (Sarasota/Manatee County Satellite TMC, FDOT Central Office and SwRI) the timing for the following events may be modified to shorten the overall deployment schedule.

(TBD)

3. Notes

None.

Appendix A

Device Listing Worksheets

Device listings are contained and maintained in spreadsheets distributed by Sarasota/Manatee County Satellite TMC staff. They are not reproduced herein.