SunGuide®:

Implementation Plan for Orlando-Orange County Expressway Authority (OOCEA) SunGuide Deployment

SunGuide-IP-OOCEA-1.0.0 (Draft)

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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 Systen
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	November 1, 2010	Initial Draft Release for Review

1. Scope

1.1 Document Identification

This document serves as the Implementation Plan (IP) for the SunGuide® software specific to the Orlando – Orange County Expressway Authority; herein after referred to as OOCEA. OOCEA staff consultants have expressed the intent to run a fully redundant installation of SunGuide software with the primary system located at the OOCEA main offices and a backup, secondary installation at the Hiawassee Toll Plaza location. In addition, OOCEA intends to have no dedicated SunGuide operations staff on location most of the time. Control and observation of OOCEA devices will be primarily through remote SunGuide installations (primarily by operators at the District 5 Traffic Management Center.) Rather than have District 5 operators run two distinct SunGuide applications (District 5 and OOCEA) on the same workstation at the same time, the intent is for operators to access OOCEA devices remotely through the District 5 SunGuide installation and Center to Center.

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.

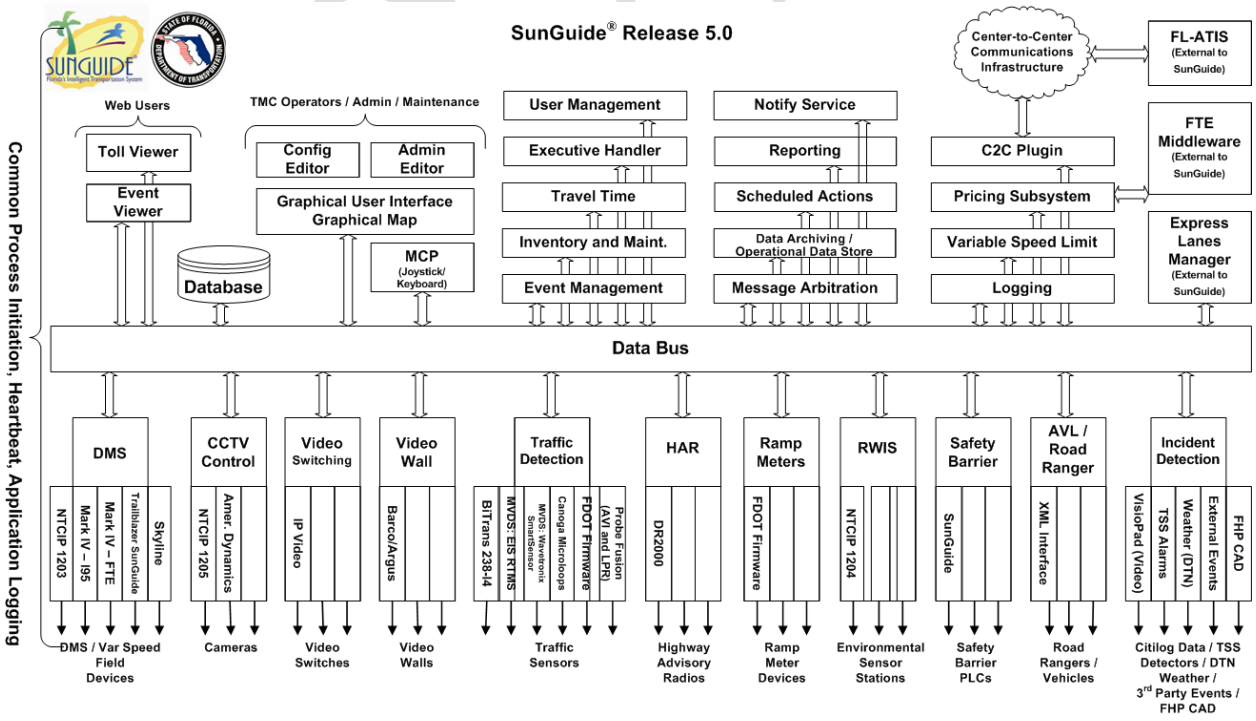


Figure 1.1 - High-Level Architectural Concept

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
- Khue Ngo, PBS&J Project Manager, khue.ngo@dot.state.fl.us, 850-410-5579.
- 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.com, 210-522-3035

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

- L.A. Griffin, OOCEA Manager Expressway Operations, GriffinL@oocea.com, (407) 690-5332
- John Hope, PBS&J ITS Specialist, johnhope@pbsj.com, (407) 806-4147

2. Deployment Details

The following documents should be available to OOCEA staff and their consultants 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 version planned for this installation is 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 available, 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 OOCEA:

- Administrative Editor (AE)
- Center-to-Center (C2C)
- Closed Circuit Television (CCTV)
- Data Bus (DB)
- Data Archive (DA)
- Dynamic Message Sign (DMS)
- Executive Handler (EH)
- Graphical User Interface/Map (GUI)
- Message Arbitration (MAS)
- Reporting Subsystem (RS)
- Status Logger (SL)
- Transportation Sensor Subsystem (TSS)
- Travel Time (TvT)
- Video Switching (VS)

2.3 High Availability and Disaster Tolerance

The Microsoft Windows clustering solution will be used to provide high availability in the case of server failure within the application servers available at the primary or secondary site. The

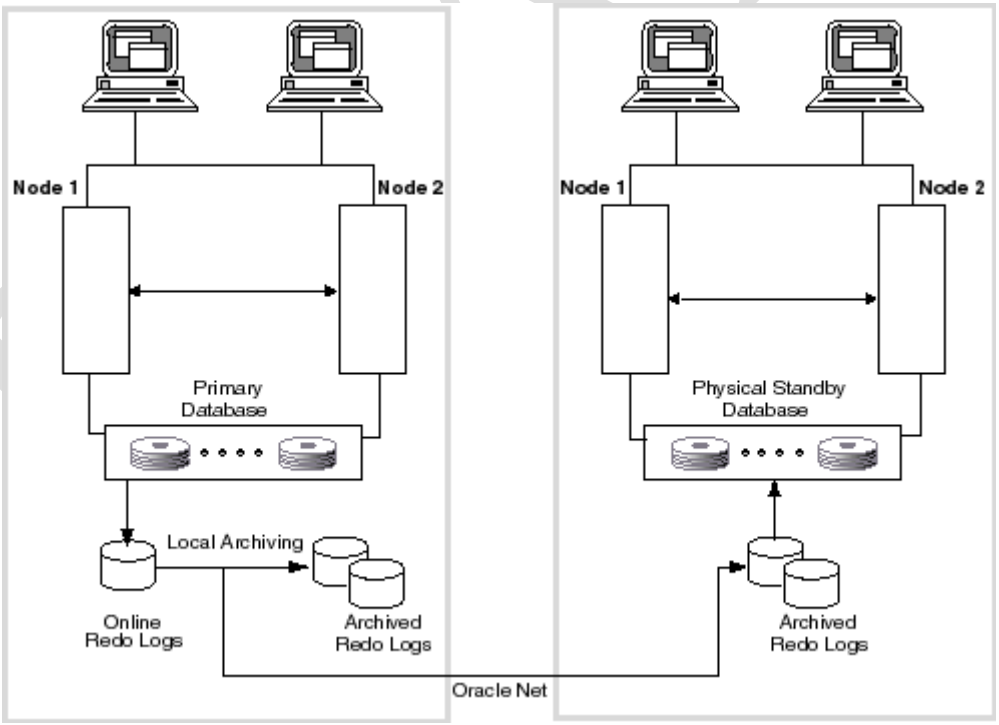
same solution, paired with Oracle Fail Safe, provides high availability in the event the active database server fails. Oracle Fail Safe can ensure nearly continuous high availability for a given system, but does not protect against a disaster that incapacitates the site where that system resides.

The OOCEA SunGuide deployment has been requested to be disaster tolerant, as well. 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.

Data Guard 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 OOCEA, Data Guard will be installed in such a way that the production database is at the primary site at the main OOCEA offices, and the standby database is located at the secondary site at Hiawassee Plaza.

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.

The diagram below depicts the recommended configuration:



2.4 Before Software Installation

The following sections describe the activities that OOCEA 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

This section describes the server configuration for the deployment of SunGuide, including the number of servers and disk space allocation and required preparation.

2.4.1.1 Recommended Software Distribution

This section discusses the SwRI recommended installation and distribution of SunGuide services on dedicated SunGuide servers.

The contents of the following tables are based on information furnished to SwRI by John Hope of PBS&J 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	36
DMS Dialup connected signs	0
CCTV Cameras	50
Video Decoders	0
TSS Detectors	210
RWIS TCP/IP Stations	0
Highway Advisory Radio Controllers	0
TSS "Tag readers"	0
Safety Barrier Cable System ITS Devices (beacons/master radios)	0

SunGuide User Activities	Deployment
Active Simultaneous SunGuide Users	0
CCTV Users Simultaneously Controlling Cameras	0
CCTV Users Simultaneously Switching Video	0
Simultaneous Active Events	0

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	OOCEA 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	
User Interface		
For every 10 users simultaneously logged in	0.5	**0.5**
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	
Video Switching		
Base subsystem	0.5	**0**
For every 10 users simultaneously switching video	0.1	
Video Wall		
Base subsystem	0	**0**
For each Barco/Argus Controller	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**
For each 20 concurrent events over the base amount	0.25	
Ramp Metering		
Base subsystem	0.5	**0**
For every 20 ramps	0.25	
Roadway Weather Information System (RWIS)		
Base subsystem	0.25	**0**
For every 50 TCP/IP connected sensors	0.25	
Highway Advisory Radio (HAR)		
Base subsystem	0.25	**0**
For every 50 HARs	0.1	
Archive		
Base subsystem	0.5	**0.5**
Safety Barrier		
Base Subsystem	0.1	**0**
For every 50 Barriers	0.1	
Travel Time (TvT)		

SunGuide Subsystem	Number of Servers Required	OOCEA Deployment
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		**5.6**

The above analysis suggests that six 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 Recommended Drives and Disk Space

SwRI recommends that 100 GB of disk space be reserved for the SunGuide application common storage. An additional 200 GB of disk space is recommended for the Oracle database files, based on a three-year projection of database growth. OOCEA staff and their consultants may wish for additional disk storage to be allocated for other related storage needs, including backups and other database data maintenance.

Below is the recommended configuration of the virtual drives on each of the SANs:

Virtual Drive	Name	Size	Purpose
Q	Quorum	1 GB	Storage of clustering resource files
O	Oracle	200 GB	Oracle database files
S	SunGuide	100 GB	Storage of application common files and logs

2.4.1.3 Server Infrastructure Configuration

Based on specifications provided for the hardware available for this deployment, SwRI recommends the following configuration. The actual configuration of servers and network is left to OOCEA discretion, as long as the requirements laid out elsewhere in this document are met.

The storage array is recommended to be RAID 5 or RAID 6. RAID 6 is preferred if a minimum of five hard drives are available. The SunGuide database and application servers are recommended to be RAID 10.

Identical server installations will be performed on both the primary and secondary site resources. The following describes the configuration at each site. At each site, the servers will be served by a HP P2000 G3 SAS MSA Dual Control LFF Array. The SunGuide Oracle database instance at each site will be clustered using Microsoft Windows clustering and Oracle Fail Safe to run on two HP DL 360 GS 3.0 GHz 4 GB Dual Core servers. Each server will have one Host Bus

Adapter (HBA) with dual SAS ports installed. This cluster will be attached to the SAN for database disk storage.

Three HP DL 360 GS 3.0 GHz 4 GB Dual Core servers will be set up in a Microsoft Windows Cluster environment. Two of the servers will have a physical connection to the HP P2000 G3 SAS MSA and the other will have the SunGuide share (S:\) mapped as a network drive. The servers physically connected to the SAN will run all of the SunGuide web services, the other will only run SunGuide application services. As shown in the diagram below, the two sites each include two database servers and three application servers. The two database servers and two SunGuide Application Servers at each site, DB1, DB2, AS1 and AS2 would be physically connected to SAN via HBAs. The remaining application server, AS3, would require a connection to the network shares established on the SAN. In the diagram, servers installed at the primary location begin with a P, and those at the secondary location begin with an S. For example, the databases at the primary site are named PDB1 and PDB2, while the ones at the secondary site are named SDB1 and SDB2.

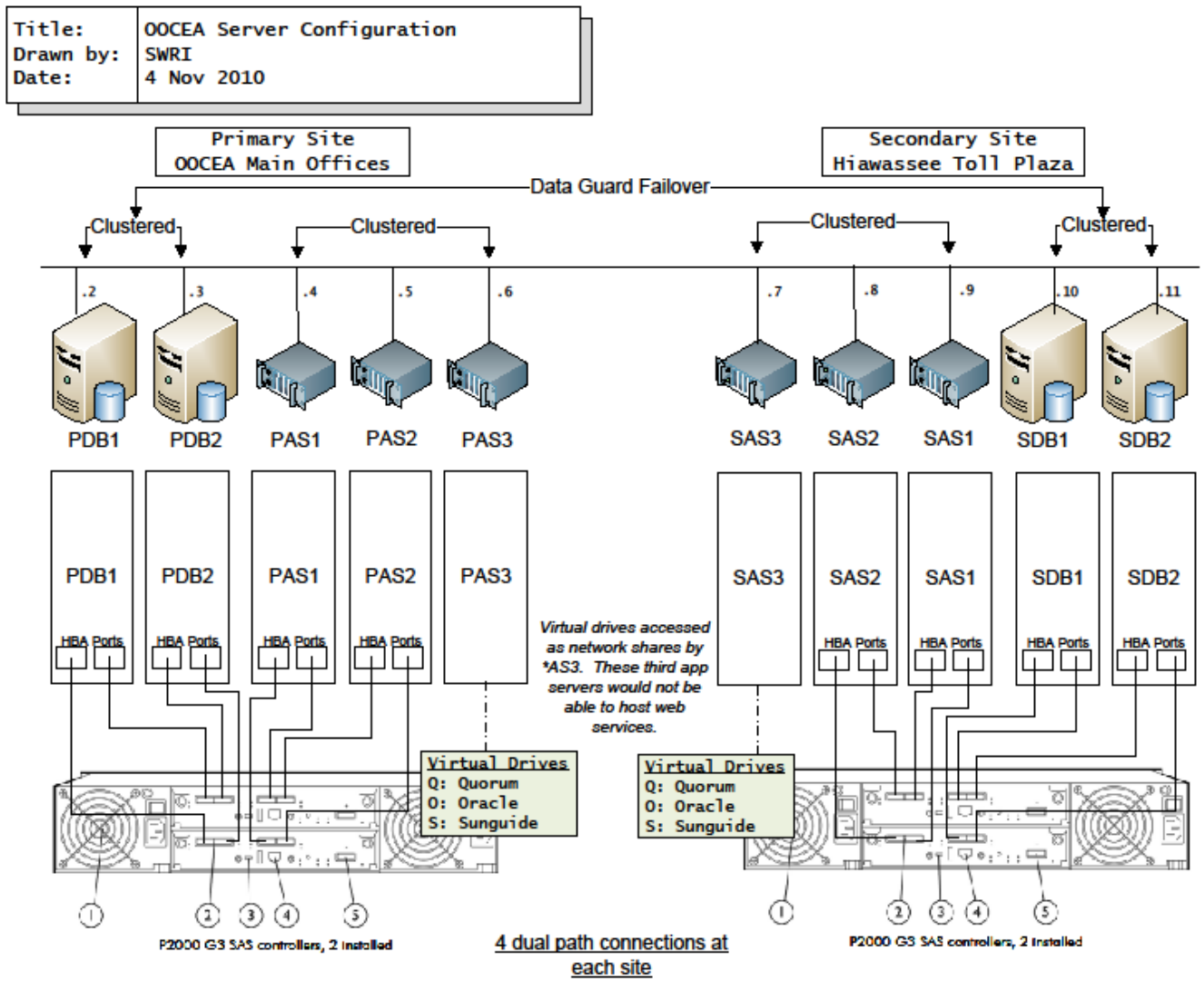


Figure 2.1 – Hardware & Network Configuration

2.4.1.4 Planned Software Distribution

The SunGuide software will be installed and configured to run optimally 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)	✓			
Closed Circuit Television (CCTV)				✓
Data Bus (DB)	✓			
Data Archive (DA)		✓		
Dynamic Message Sign (DMS)		✓		
Executive Handler (EH)	✓	✓	✓	✓
Graphical User Interface/Map (GUI)	✓			
Message Arbitration (MAS)		✓		
Reporting Subsystem (RS)	✓			
Status Logger (SL)	✓			
Transportation Sensor Subsystem (TSS)			✓	
TSS RTMS Driver			✓	
TSS-2 (Probe Fusion Driver)			✓	
Travel Time (TvT)		✓		
Video Switching (VS)				✓

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. Of specific concern are the DMS and TSS subsystems and corresponding drivers. If the performance of these subsystems and corresponding drivers is less than desirable, additional drivers can be introduced to spread the processing loads.

2.4.1.5 Server Preparation

The software installation team assumes that OOCEA will have licenses available for the following products:

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

The following software is required to be installed on the four SunGuide database servers before the software installation team arrives on-site:

- Microsoft Enterprise Server 2003 with all current updates from Microsoft
- Oracle 11g Server, version 11.1.0.7, Administrator option
- Oracle Fail Safe, version 3.4.2

All of the remaining SunGuide application servers should have the following software installed before the software installation team arrives on site:

- ASP .NET 4.0
- IIS (Microsoft installation disk)
- Oracle 11g Client, version 11.1.0.7

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

2.4.2 Workstations

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

- Microsoft Windows 7
- Microsoft Internet Explorer 8.0

Additionally, workstations will need to have "Buffer Overflow Protection" disabled on their antivirus software to ensure that the map will load correctly. Not all antivirus software provides this option; please check with the software vendor.

At least one workstation should be prepared and available for testing the OOCEA installation before the deployment team arrives on site.

2.4.3 Center to Center Preparation

Center to Center (C2C) communications will be the primary means of access to OOCEA devices. The intent is to have staff at the District 5 Traffic Management Center (TMC) both control and monitor device information through the District 5 SunGuide installation as a result of C2C communication. In addition, because Center to Center (C2C) communication will be used to communicate information to the FL511 website, some coordination is required with the website administrators to help with data integration and connectivity with the website. OOCEA staff will need to work with FL-ATIS developers to decide upon an appropriate Center ID for the installation. Also, network connectivity will need to be established between the FDOT Satellite TMC and the FL-ATIS Center to Center server.

2.4.4 Network Infrastructure

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

2.4.4.1 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.

2.4.4.2 Center to Center

During the SunGuide software configuration, the Center-to-Center (C2C) interfaces need to be configured so that the OOCEA 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.

2.4.4.3 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 OOCEA discretion.

During the installation activities, a VPN (Virtual Private Network) connection should be configured that will allow SwRI staff to access the OOCEA computers from remote locations. This will facilitate any troubleshooting (the VPN can only be provided with OOCEA approval).

2.4.5 Database Preparation

SwRI will provide the initial database for this installation in the format of an Oracle datapump export .dmp file. It will be based on the District 5 SunGuide database. If necessary, it will be updated and patched to the appropriate SunGuide version for this deployment. The database will be cleaned of event history information, device configuration data, and archived data.

2.4.6 Devices

2.4.6.1 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
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.

2.4.6.2 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.

2.4.6.2.1 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

2.4.6.2.2 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

2.4.6.2.3 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

2.4.6.2.4 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)

2.4.6.3 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

2.4.6.4 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

2.4.6.4.1 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 SunGuide Software Installation

The following sections describe the activities that SwRI staff will perform to install the SunGuide software. This description is applicable to non-virtualized environments. It is possible that a single application servers can be configured following the described process, then it can be cloned and edited (host name, etc.) to reflect its final configuration. OOCEA staff or their consultants should be available to monitor and observe the software installation process.

2.5.1 Software Installation

In order to install the SunGuide application software, the following steps will be performed by the software installation team at each site:

- 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.
- Set up the SunGuide database by importing the provided database from SwRI.
- Instantiate a duplicate database using Oracle Data Guard.
- Cluster the two databases using Oracle Fail Safe.
- 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 OOCEA staff or their consultants:

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

2.5.2 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 OOCEA 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, and this removal is done so that users do not see menu options for subsystems which are not installed and configured.

2.5.3 C2C Configuration

During the SunGuide software configuration, the Center-to-Center (C2C) interfaces need to be configured so that the OOCEA deployment can exchange information and command requests (assuming operators have the appropriate permissions) with other control centers, including District5, and FL-ATIS, when necessary. Therefore, the SunGuide application will be configured to present DMS information and control remotely, and the C2C services will be configured to route information and control to the appropriate locations. This may take some coordination with the District 5 TMC during the configuration and testing process. The following SunGuide C2C components will be installed on the OOCEA servers:

- C2C Plug-in Publisher
- C2C Plug-in Subscriber

- C2C Extractor
- C2C Provider
- C2C Command Receiver (in case it becomes necessary)

The C2C components should be configured according to section 3.7 of the VDD and the diagram below. The C2C interface should then be tested to assure that the software is properly configured; this testing is described in the Testing section of this document.

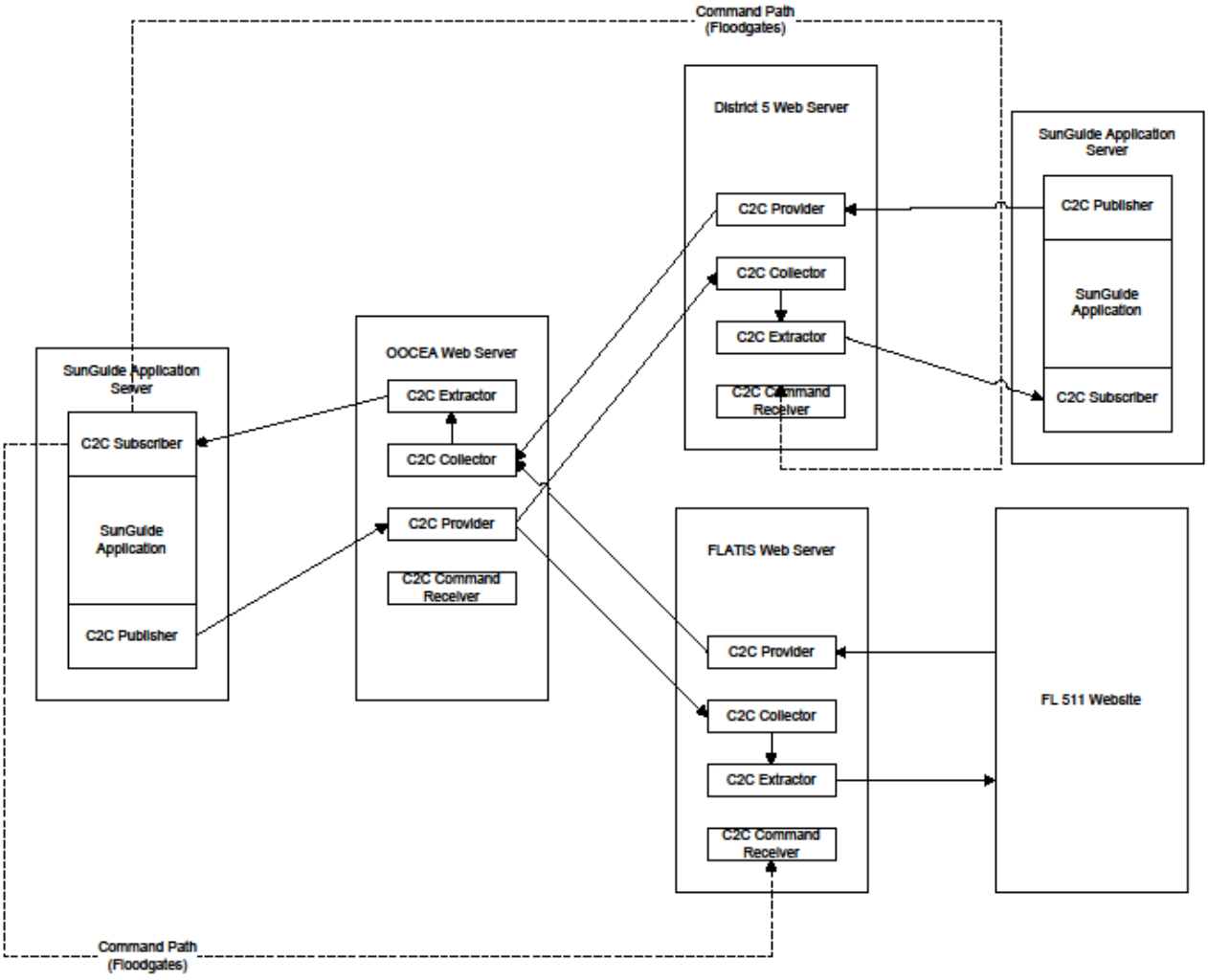


Figure 2.2 – Proposed Center to Center Configuration

2.6 SunGuide Software Configuration

The following sections describe the activities that need to be performed after the SunGuide software deployment. SwRI and PBS&J (ITS GC) staff will be available to assist and work with

the OOCEA staff to accomplish these activities. SwRI recommends that at least one representative of OOCEA be present during this process.

The SunGuide *Software User's Manual* (SUM) and Administrator Training slides should be consulted on use of these editors.

2.6.1 Populate Tables

Initially, only DMS information is planned to be populated in the OOCEA SunGuide system. Below is the list of tables that will eventually be populated for this system.

- User Management:
  - Users
  - Groups
  - Workstations
- CCTV:
  - Device Tables
- DMS:
  - Device Tables
  - Approved Words
- TSS:
  - Alarm Thresholds
  - Device Tables
  - Detector Maps
  - Poll Cycles
- Reporting Subsystem:
  - Reports
  - Reporting Groups
- Data Archive: Properties
- Miscellaneous: Centers

To aid in future configuration, for any device that does not have an entry at least one entry for every possible device will be added; this will help illustrate how future entries should be structured (naming, option selection, etc.) and also verify that the Admin editor can read and write information to the appropriate tables.

2.6.2 Create Map Links

Each implementation of SunGuide should have a Map Link layer created; this layer is used by the Operator Map to display instrumented sections of roadway as well as highway shields. This layer is displayed in conjunction with the DynaMap shape file data to provide a complete looking map on the operator workstation. The SUM has a section titled "Map Administration with Link Editor" that explains the use of this software. Additionally, the Map Link Editor mode of the Operator Map should be used to create the shields that should be displayed.

2.7 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 OOCEA staff wishes, the applicable 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.

Testing of camera

Areas that will be tested / exercised include:

- DMS:
    - Devices being polled by OOCEA SunGuide system
    - Control of DMS devices from an OOCEA workstation
    - Control of DMS devices from a District 5 workstation
    - DMS data showing on FL-ATIS website as appropriate.
    - DMS devices showing on map with status information
- Reporting Subsystem:
    - Generate DMS reports
- Various:
    - 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)

2.8 Training

Training will be conducted as the installation is performed; the training will be only hands-on refresher training on SunGuide administration provided to the OOCEA representatives that are present during deployment.

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

2.9 Deployment Schedule

The following schedule is proposed for the deployment. 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 (OOCEA, PBS&J, FDOT Central Office and SwRI) the timing for the following events may be modified to shorten the overall deployment schedule.

Day	Tasks	Documentation	Resources Needed
1	• Planning meeting • Verification of pre-installation • Oracle software and database installation • SunGuide database installation • Crystal Reports installation	VDD 3.3: Preparing SunGuide Servers VDD 3.4: SunGuide Database Installation VDD 3.5: Crystal Reports Run-time Installation	• Internet access • Network access • User accounts to access network and servers.
2	• IIS Configuration • SunGuide application installation • Center to Center application installation • Application service clustering	VDD 3.6: Application Installation VDD 3.7: Center-to-Center Installation and Setup	• Internet access • Network access
3	• Database replication • DataGuard setup • Database clustering		• Internet access • Network access
4	• SunGuide application configuration • Import of devices into SunGuide • Installation verification through test procedures • Verification of training environment and client workstation setup	VDD 3.8: Configuration Software Users Manual (SUM) Installation Notes	• Internet access • Network access
5	• Issue troubleshooting and resolution • Center to Center configuration and testing • Wrap-Up Meeting	VDD 3.7: Center-to-Center Installation and Setup	• Internet access • Access to District 5 workstation

3. Notes

None.

Appendix A

Device Listing Worksheets

Device listings are contained and maintained in spreadsheets distributed by OOCEA staff. They are not reproduced herein.