

Technical Memorandum

Southwest Florida Advanced Traveler Information System (ATIS) Data Fusion Support Project

System Test Plan for the Southwest Florida 511 Advanced Traveler Information System Data Fusion Subsystem

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*Technical Memorandum – Southwest Florida ATIS Data Fusion Project
System Test Plan for the Southwest Florida 511 ATIS DFS*

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List of Acronyms

ASCII	American Standard Code for Information Interchange
ATIS	Advanced Traveler Information System
CSV	Comma-separated Value
DFS	Data Fusion Subsystem
F	Fahrenheit
FDOT	Florida Department of Transportation
GUI	Graphical User Interface
HTTP	Hypertext Transfer Protocol
ID	Identification
IP	Internet Protocol
ISP	Internet Service Provider
IVR	Interactive Voice Response
Lat / Long	Latitude / Longitude
LOS	Level of Service
mph	Miles per Hour
OS	Operating System
POI	Point of Interest
RAID	Redundant Array of Independent Disks
SLA	Service Level Agreement
SQL	Structured Query Language
TCP/IP	Transmission Control Protocol / Internet Protocol
TI	Traveler Information
TIC	Traffic Information Center
WAP	Wireless Application Protocol
XML	Extensible Markup Language

1. Introduction

This document is a test plan for the southwest Florida 511 advanced traveler information system (ATIS) being developed jointly by PBS&J, LogicTree, and Traffic.com®.^{1,2} Currently, the existing Tampa Bay 511 system covers some roadways that will be a part of the southwest Florida 511 system, but that coverage is only incidental and not the primary focus for the Tampa Bay 511 operators.

An integrated statewide 511 system is being developed for deployment in 2008. Until that system is operational, the Florida Department of Transportation (FDOT) is implementing a short-term solution for the three counties that make up the southwest Florida region, including Charlotte, Lee, and Collier counties. A data fusion subsystem (DFS), an interactive voice response (IVR) subsystem, and an accompanying Web site are being developed to disseminate traveler information specifically for the three counties of southwest Florida.

The southwest Florida 511 system will be deployed in Charlotte, Lee, and Collier counties, as a stand-alone southwest Florida system, linked to and part of the existing statewide system.

1.1 Purpose

This document presents a detailed plan for setting up and conducting an independent verification that the southwest Florida 511 system meets the system requirements and that the requirements are operationally valid. Test procedures based on this test plan will be developed to guide the testing of the system. The test procedures should be developed only after the FDOT approves the test plan.

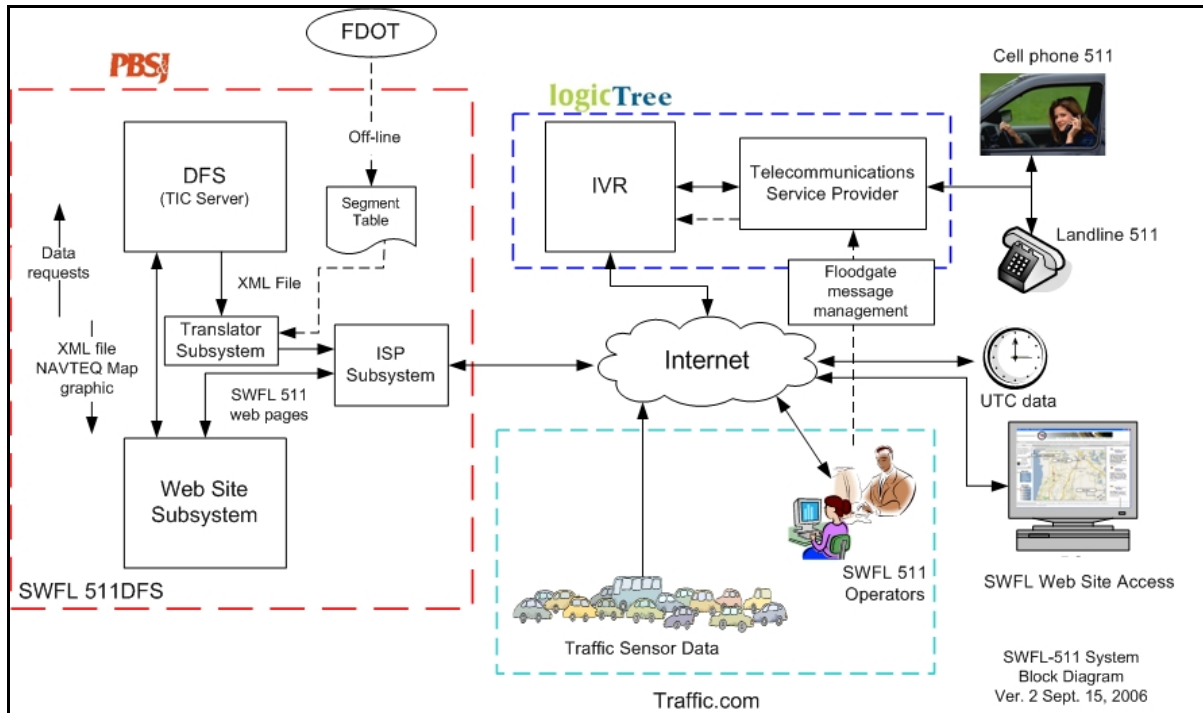
1.2 Overview

The southwest Florida 511 system is comprised of three separate contract entities as shown in Figure 1.1. These entities include the PBS&J-developed southwest Florida 511 DFS, the LogicTree-developed IVR subsystem, and Traffic.com's traffic sensor data subsystem. Traffic.com is also responsible for the overall system operation.

¹ More information regarding LogicTree is available online at <http://www.logictree.com/>.

² Traffic.com is a registered trademark of Traffic.com, Inc. More information regarding Traffic.com, previously known as Mobility Technologies, is available online at <http://www.traffic.com/>.

Figure 1.1 – Overall High-level System Architecture



The southwest Florida 511 DFS is made up of the DFS, the Internet service provider (ISP) subsystem, the translator subsystem and the Web site subsystem. The IVR subsystem includes the interface to the telecommunications service provider and floodgate message management subsystem that Traffic.com operators use to enter floodgate messages into the IVR subsystem.

System testing will focus on end-to-end testing so the complete system is verified to meet the requirements. Further, detailed subsystem performance and functional testing will be performed on the DFS. Internal testing of the IVR portion of the system is outside the scope of this test plan due to contractual limitations. LogicTree, PBS&J, and Traffic.com are separately contracted to the FDOT, and are equal team members on the project.

There will be four test cases used to verify that requirements are satisfied by the system. Three will focus on the southwest Florida 511 DFS, and the fourth will be end-to-end system testing that will include the Traffic.com and LogicTree elements of the system.

1.2.1 Data Fusion Test Cases

The requirements for the system's data fusion engine will be verified by data fusion test cases. These test cases will be identified as TCDF-01, TCDF-02, et cetera.

1.2.2 Web Site Test Cases

The system's Web site requirements will be verified by Web site test cases. These test cases will be identified as TCWS-01, TCWS-02, et cetera.

1.2.3 Internet Service Provider Test Cases

The system requirements for accessing the Internet will be verified by ISP test cases. These test cases will be identified as TCSP-01, TCSP-02, et cetera.

1.2.4 System End-to-End Test Cases

The system level requirements, which are identified by the letter S and three numbers, will be tested in operational scenarios as much as possible, and will include the IVR subsystem's output and traffic data sensor input. These test cases will be identified as TCS-01, TCS-02, et cetera.

1.3 Milestone Demonstrations

There are two functional threads through the system. One is the path from caller request through the IVR subsystem to the traveler information input into the DFS. The other is the path through the Web site. A milestone demonstration is done to build confidence in the system's progress and is not graded — that is, there are no pass/fail criteria for a milestone demonstration. The milestone demonstration is an end-to-end demonstration from the user's viewpoint so the Web or the telephone will be the primary way the functionality will be demonstrated. Milestone Demonstrations will be completed before the system is deployed and ready for acceptance testing.

1.3.1 Milestone Demonstration 1

The first functional demonstration of the southwest Florida 511 system can occur as soon as the Web site is operational and able to process data from the DFS. This demonstration of Web site functionality will be done as soon as the DFS filters are finalized and reliable output is demonstrated by the DFS. A test scenario will be used for testing and demonstration.

1.3.1.1 Milestone Demonstration 1 System Configuration

Milestone Demonstration 1 requires a fully functional DFS, an operator interface that is fully functional, the Web site being available through the Internet, and a test scenario as described in the *System/Software Design Document* being input to the DFS.³

1.3.2 Milestone Demonstration 2

The second functional demonstration involves the IVR subsystem's functionality, and is dependent on successfully sending the extensible markup language (XML) output file to the IVR subsystem and having the IVR subsystem correctly interpret it and make the information responsive to caller selections on the IVR subsystem's menu. Milestone Demonstration 2 will follow Milestone Demonstration 1 and use the same test scenario so the output of both the Web site and IVR subsystem can be compared.

1.3.2.1 Milestone Demonstration 2 System Configuration

Milestone Demonstration 2 requires a fully functional DFS, an operator interface that is fully functional, the translator subsystem fully functional, the IVR subsystem being fully functional, an Internet connection, and a test scenario as described in the *System/Software Design Document* being input to the DFS.

1.3.3 Milestone Demonstration 3

This will demonstrate the functionality and accuracy of the automated traffic sensor feed provided by Traffic.com. This demonstration will take place after Milestone Demonstration 1 and depends on the installation of traffic sensors, the definition of reporting segment links, and the creation of data fields in the output to the IVR subsystem if the demonstration takes place after Milestone Demonstration 2.

1.3.3.1 Milestone Demonstration 3 System Configuration

Milestone Demonstration 3 requires a fully functional DFS, an operator interface that is fully functional, the translator subsystem fully functional, the IVR subsystem being fully functional, the Web site being fully functional, an Internet connection, and live data being provided by the Traffic.com traffic sensor data feed.

³ Florida Department of Transportation, *Technical Memorandum – Southwest Florida Advanced Traveler Information System (ATIS) Project – System / Software Design Document for the Southwest Florida 511 ATIS Data Fusion System* (Version 2, June 2006). Available online at <http://floridaitis.com/091820/Assn33.htm>.

1.4 Definitions

Incident — Incidents may have an expected end time, but will never have an “activate time.” They can have a start time and an update time.

Construction — Construction events may have an activate time, an expiration time, an update time, and a start time.

Event — Other events include sporting events and civil events, such as ground breakings, bridge openings, parades, et cetera, that impact traffic. These events can have all the times associated with construction.

Detour — This term identifies the recommended diversion around an event or incident.

Current Weather — This term identifies the weather affecting traffic on a particular segment or set of segments.

1.5 Waivers or Deviations

The design specified in the *System/Software Design Document* requires that a request be made to the FDOT for some waivers and deviations to the requirements stated in the system specifications documented in the *Functional Requirements for the Southwest Florida 511 ATIS Data Fusion System*.⁴ In some isolated cases, the proposed solution does not meet the system requirement and a waiver not to meet the requirement was requested. In a few cases, the design proposes an alternative interpretation to the system requirement and a deviation was requested. The design trade-offs that were made in reaching the proposed solution are discussed in the design document and offer a cost-effective solution that will satisfy the FDOT’s needs for a three-county 511 system in southwest Florida.. This *Test Plan* assumes the requested waivers and deviations were approved by the FDOT.

1.5.1 Waivers

W001 WS019 — Compliance with the FDOT’s *INFONET Internet Guidelines*.⁵

Request a waiver to exceed the pixel width of 600. Template 4c. Requirement of the FDOT’s *INFONET Internet Guidelines*.

⁴ Florida Department of Transportation, *Southwest Florida Advanced Traveler Information System (ATIS) Project – Functional Requirements for the Southwest Florida 511 ATIS Data Fusion System* (Version 2, April 2006). Available online at <http://floridait.com/091820/Assn33.htm>.

⁵ The FDOT’s *INFONET Internet Guidelines* is available online at <http://infonet/InternetGuidelines.htm>.

W002 WS001 — Redundant Web server.

Request a waiver to use only one Web site server with redundant disk drives.

1.5.2 Deviations

D001 S014 — Context sensitive help information.

Request a deviation to provide a separate help page on the Web site that is not context sensitive. Context sensitive help on the IVR is the responsibility of LogicTree.

D002 DF003E — Generate reports on system performance and statistics on its use for both the phone and Web systems.

Request deviation to report only on the Web site and DFS subsystem performance because the phone system is outside PBS&J's responsibility (i.e., LogicTree has a contract with the FDOT).

D003 WS014 — Speed correlation to color bands.

Request a deviation to align the color bands to FDOT-specified speeds, which will be determined by District 1, rather than the speeds specified in the requirement.

D004 S025 — Training topics.

Request a deviation to provide the FDOT contractor with hands-on training in normal operations and abnormal system operation. PBS&J will provide system activation, system configuration, and system administration, so no training is required.

2. References

The following documents are referenced in or were used in preparation of this document to the extent specified herein. If a referenced document conflicts with this document, this document shall take precedence.

<i>DOCUMENT</i>	<i>AUTHOR</i>
<i>Technical Memorandum – Southwest Florida Advanced Traveler Information System (ATIS) Project – Functional Requirements for the Southwest Florida 511 ATIS Data Fusion System Version 2.4 February 10, 2006 FDOT Contract No. C-7772</i>	Florida Department of Transportation Traffic Engineering and Operations Office Intelligent Transportation Systems Section 650 Apalachee Parkway, M.S. 90 Tallahassee, Florida 32399-0450 (850) 410-5600
<i>SWFL 511 Traveler Information Website Requirements Specification February 7, 2006</i>	PBS&J 482 South Keller Road Orlando, Florida 32810 (407) 647-7275
<i>Technical Memorandum – Southwest Florida Advanced Traveler Information System (ATIS) Project – System/Software Design Document for the Southwest Florida 511 ATIS Data Fusion System Version 2 June 22, 2006 FDOT Contract No. C-7772</i>	Florida Department of Transportation Traffic Engineering and Operations Office Intelligent Transportation Systems Section 650 Apalachee Parkway, M.S. 90 Tallahassee, Florida 32399-0450 (850) 410-5600

3. Integration and Test

The requirements that will be verified by each test case are listed in this section. In the development of test procedures, the test cases may be broken out into separate subtest cases that are more efficient to execute.

3.1 Data Fusion Test Cases

The requirements that will be verified are listed in Table 3.1.

Table 3.1 – Requirements Tested in the Data Fusion Test Cases

SYSTEM SPECIFICATION PARAGRAPH	REQUIREMENT IDENTIFICATION (ID)	REQUIREMENT
3.7.1.3	DF001	The DFS subsystem shall fuse traveler and traffic data from different sources to provide traveler information for the southwest Florida region, which is defined as Charlotte, Lee, and Collier counties through an interactive voice response telephone system and a web page accessed through the Internet.
3.7.1.3.2	DF001E	The Traveler Information Editor component shall use NAVTEQ North America map for the map-based graphical user interface.
3.7.1.3.2	DF002E	The Traveler Information Editor subsystem shall view and create points of interest (POI) data against the NAVTEQ North American map.
3.7.1.3	DF002	The system shall be a scalable design that can support expanded annual call volume by 300% (of existing call volume).
3.7.1.3	DF003	The DFS Subsystem availability shall be 99.9% measured against continuous operation over a 24-hour period starting at midnight.
3.7.1.3	DF001R	The DFS Subsystem shall employ a fully redundant server such that the DFS Subsystem shall fail over to the backup server within 5 minutes of a failure in the primary server or provide 99.9% availability through networked servers. The DFS shall be returned to full operation within 3 business days.
3.7.1.3.3	DF002A	The Data Archive Component shall employ RAID technology to provide a backup for the data archives.
3.7.1.3.3	DF004	The Data Fusion Subsystem data archive component shall archive traveler information input and output data in a relational SQL database.
3.7.1.3.3	DF001A	The Data Archive subsystem shall store sensor data and traveler information in a relational database that supports SQL queries.
3.7.1.3.3	DF005	The DFS Subsystem shall update the DFS database whenever new data is available.

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TABLE 3.1
(CONTINUED)

SYSTEM SPECIFICATION PARAGRAPH	REQUIREMENT IDENTIFICATION (ID)	REQUIREMENT
3.7.1.3.1	DF006	DFS subsystem shall accept the following sensor data types: <ul style="list-style-type: none"> - Speed (per lane and per vehicle class) - Flow (per lane and per vehicle class) - Density (per lane and per vehicle class) - Travel time - Delay time - LOS (Level of Service) - Occupancy - Congestion
3.7.1.3.1	DF001S	Sensor data shall be referenced to a location using a predefined table containing the following information about each sensor: <ul style="list-style-type: none"> - Name - Lane - Direction - External reference ID or IP address - Nominal values, can be time-dependent - Maximum values - Chaining - Reference to other location referencing system - Lat/long
3.7.1.3.1	DF002S	The Data Input component shall have sufficient capacity to provide highway coverage on major primary routes and interstate highways to a maximum of 100 traffic sensors.
3.7.1.3.1	DF007	DFS subsystem shall accept automated sensor input.
3.7.1.3.1	DF003S	Sensor Input component shall accept automated sensor input in comma separated values (CSV) ASCII text or XML format.
3.7.1.3.1	DF004S	The Sensor Input component shall check the automatically input sensor data for correctness (checking for data that is much different from the others - outliers and data that is inconsistent with previous data).
3.7.1.3.1	DF005S	Sensor Input component shall smooth the data as appropriate (correct outliers by either deleting or redefining and smooth the sensor data).
3.7.1.3.1	DF006S	Sensor Input component shall compute density, travel time, delay time, LOS, occupancy, congestion.
3.7.1.3.1	DF007S	Sensor Input component shall be able to create events based on the automated sensor input data and based on operator defined threshold values.
3.7.1.3.6	DF001I	The Traveler Information Output component shall provide a file that can be interpreted by the Interactive Voice Response system.
3.7.1.3.5	DF001W	The Web Data output component shall provide the same traveler information for the area as does the IVR.

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TABLE 3.1
(CONTINUED)

SYSTEM SPECIFICATION PARAGRAPH	REQUIREMENT IDENTIFICATION (ID)	REQUIREMENT
3.7.1.3.5	DF002W	The Web Data Output component shall produce data files that can be processed into traveler information web pages by the Web Site Subsystem.
3.7.1.3	DF009	The SWFL-511 DFS shall provide road weather conditions and forecasted weather conditions using manual operator input through a graphical user interface.
3.7.1.3.4	DF003F	The DF component shall fuse information from multiple automated and manual sources into a single report for each Data Collection Link that includes weather.
3.7.1.3.4	DF004F	The Data Fusion component of the DFS shall fuse information from multiple automated and manual sources into a single report for each Data Collection Link, including predictive traffic information for the Southwest Florida oriented reports.
3.7.1.3.7	DF012	The SWFL-511DFS system shall provide the capability to generate reports on system performance and statistics on its use (both phone and web systems).
3.7.1.3.7	DF001P	Reports shall at a minimum include: <ul style="list-style-type: none"> - Number of event data processed - Number of event data processed by error status - Number of event data processed by event - Number of event data by event type - Number of event data processed by length - Number of event data processed by location format - Number of event data processed by organization - Number of event data processed by priority - Number of event data processed by road class - Number of event data processed by road number
3.7.1.3.2	DF003E	The Traveler information Editor component shall provide the user with the ability to generate reports on system performance and statistics on its use (both phone and web systems) as well as reports on the traveler information provided over a user specified time period.
3.7.1.3	DF013	The DFS subsystem shall provide information on public transportation in the region covered by the system.
3.7.1.3.2	DF006E	The Traveler Information Editor component shall provide the means to enter public transportation information.
3.7.1.3.2	DF014	The GUI shall support the viewing and managing of the data stored in the SWFL-511DFS database: <ul style="list-style-type: none"> - Remote access using the GUI shall be possible provided sufficient bandwidth is provided. - Additional copies of the GUI can be installed on-site for operation, monitoring and viewing.

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TABLE 3.1
(CONTINUED)

SYSTEM SPECIFICATION PARAGRAPH	REQUIREMENT IDENTIFICATION (ID)	REQUIREMENT
3.7.1.3.2	DF007E	The DFS Subsystem shall provide a graphical user interface that allows an operator to input traveler information, to edit traveler information or to monitor traveler information being output by the system.
3.7.1.3	DF015	The SWFL-511DFS shall provide information on points of interest and general information regarding each point of interest.
3.7.1.3.4	DF001F	The 511 DFS data fusion component shall fuse and divide information into Data Collection Links to provide the basis for Data Collection Link Reports
3.7.1.3.4	DF001F1	<p>There shall be three types of segments in the system:</p> <p>(1) Roadway segments - The logical segments between two points on a map between which it would be useful for a traveler to have information.</p> <p>(2) Other IVR segments - An area or service from which a user may select information, though this area or service may include a wider geographic or service area within it (but the user cannot select those smaller portions).</p> <p>(3) Number of road segments that contain traffic sensors that are linked by the software to provide travel times (i.e. data collection links).</p>
3.7.1.3.4	DF002F	The fused data shall be derived from the various sources during concurrent time periods, having no duplicative information within a single Data Collection Link Report.
3.7.1.3	DF017	The DFS subsystem shall use an externally provided Master Clock data utilizing a Network Time Protocol Version 4 or later to synchronize the 511DFS system clock to a system accuracy of at least 1/10th of a second.
3.7.1.3	DF018	The DFS subsystem software shall operate in the Microsoft Windows Server 2003 operating system.
3.7.1.3	DF019	PBS&J shall have computer-based access to the DFS subsystem.

3.2 Web Site Test Cases

The requirements that will be verified are listed in Table 3.2.

Table 3.2 – Requirements Tested in the Web Site Test Cases

SYSTEM SPECIFICATION PARAGRAPH	REQUIREMENT ID	REQUIREMENT
3.7.2.3	WS001	The Web Site Subsystem shall employ a fully redundant server such that the WS Subsystem shall fail over to the backup server within 5 minutes of a failure in the primary server or provide 99.9% availability through networked servers.
3.7.2.3	WS001R	A failed WS application server shall be returned to full operation no later than the third business day.
3.7.2.3	WS002	The web site shall be able to support access by 1,000 simultaneous users.
3.7.2.3	WS003	WS Subsystem shall be a scalable design that can support expanded simultaneous access by 3000 users.
3.7.2.3	WS004	The Web Site subsystem software shall operate in the Microsoft Windows Server 2003 operating system.
3.7.2.3	WS006	The Web Site subsystem shall provide context sensitive help information to the user.
3.7.2.1	WS007	Web site subsystem shall have the capability of disseminating information to Internet-enabled data devices.
3.7.2.3	WS008	The Web site subsystem shall use an externally provided Master Clock data utilizing a Network Time Protocol Version 4 or later to synchronize the 511DFS system clock to a system accuracy of at least 1/10th of a second.
3.7.2.3	WS009	PBS&J shall have computer based access to the web site subsystem.
3.7.2.3	WS010	The website will provide information on roadways, public transportation and airports.
3.7.2.3	WS005	The Web site shall provide a connection to public transportation information that includes but is not limited to Transit and Airport information.
3.7.2.3	WS011	Roadway information will be displayed using icons to represent accidents, construction, and special events
3.7.2.1	WS012	The website will provide links to the statewide and other Florida regional 511 systems.
3.7.2.1	WS013	The website will provide links to other transportation agencies in the region.
3.7.2.3	WS014	Speed data, where available, shall be represented by red, yellow, and green bands.

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TABLE 3.2
(CONTINUED)

SYSTEM SPECIFICATION PARAGRAPH	REQUIREMENT IDENTIFICATION (ID)	REQUIREMENT
3.7.2.3	WS014S	Speed bands that determine the color to be used shall be configurable by the system administrator with default speed bands are where red indicates stopped or speeds less than 15 mph, yellow indicates speeds between 15 mph and 45 mph and green indicates speeds greater than 45 mph.
3.7.2.3	WS015	The website shall be publicly available.
3.7.2.3	WS016	The website shall disseminate all information gathered for Charlotte, Lee and Collier counties.
3.7.2.3	WS017	The website will be available 99.9% of the time measured over a 24-hur period starting at midnight
3.7.2.1	WS018	The website will be driven by the DFS Subsystem.
3.7.2.3	WS019	The web site shall comply with the Florida DOT Internet Guidelines as specified in the Florida DOT INFONET Internet Guidelines document available through http://infonet/InternetGuidelines.net dated 7/8/2004.
3.7.2.1	WS020	The web site subsystem shall provide web pages to the public through the Internet Service Provider Subsystem.

3.3 Internet Service Provider Test Cases

The requirements that will be verified are listed in Table 3.3.

Table 3.3 – Requirements Tested in the Service Provider Test Cases

SYSTEM SPECIFICATION PARAGRAPH	REQUIREMENT ID	REQUIREMENT
3.7.3.3	SP001	The ISP availability shall be 99.999% measured against continuous operation over a 24-hour period starting at midnight.
3.7.3.3	SP001R	The ISP shall have 100% power availability,
3.7.3.3	SP002R	A failed application server shall be returned to full operation no later than the third business day.
3.7.3.3	SP003R	The ISP shall provide redundant servers and alert an operator if there is a failure with a primary server so the operator can activate the backup within 5 minutes.
3.7.3.1	SP002	The Internet Service Provider subsystem and network shall use Master Clock data available from the Internet utilizing a Network Time Protocol Version 4 or later to synchronize the 511DFS system clock to a system accuracy of at least 1/10th of a second.
3.7.3.3	SP003	The ISP shall be housed in a facility that has environmental controls to provide a consistent operating environment that protects the equipment and data.
3.7.3.3	SP003S	Environmental controls that provide a consistent operating environment to protect the equipment and data include extensive early-warning fire detection, smoke management, and fire suppression systems.
3.7.3.3	SP004	The ISP shall be housed in a secure facility.
3.7.3.3	SP001S	A secure facility shall provide at a minimum physical security controlled via surveillance cameras, card readers and man-traps
3.7.3.3	SP002S	The ISP shall be housed in a facility that has 24x7 staffing and management.
3.7.3.3	SP005	The network that supports the SWFL-511DFS shall provide 100% network availability SLA.
3.7.3.3	SP006	PBS&J shall have computer based access to the Internet Service Provider and network subsystem.
3.7.3.1	SP007	The ISP Subsystem shall provide access to the Internet using a hardware/software firewall.

3.4 System End-to-End Test Cases

The requirements that will be verified are listed in Table 3.4.

Table 3.4 – Requirements Tested in the System End-to-End Test Cases

SYSTEM SPECIFICATION PARAGRAPH	REQUIREMENT ID	REQUIREMENT
3.2.1	S001	The SWFL-511 DFS shall provide traveler information for the southwest Florida region, which is defined as Charlotte, Lee, and Collier counties through an interactive voice response telephone system, using automatic speech recognition and touch-tone tones, and the Internet.
3.2.1	S002	The SWFL-511 DFS shall provide traveler information consisting of: <ul style="list-style-type: none"> - Unplanned traffic events (crashes), - Planned incidents (construction), - Special events, - Slow downs and delays (congestion), - public transportation - points of interest; and - Weather information
3.2.3	S003	System availability shall be 99.79% measured against continuous operation over a 24-hour period starting at midnight.
3.2.1	S004	The SWFL-511DFS shall provide travel information from operator input data.
3.2.1	S005	The system shall support an initial call volume of 350,000 calls per year.
3.2.2	S006	The SWFL-511 DFS shall operate on the Microsoft Windows Server 2003 operating system.
3.2.1	S007	The SWFL-511DFS shall use traffic sensor data in addition to other sources of manual input to derive traveler information.
3.2.4	S008	PBS&J shall have remote computer based access to the servers and control of the system software for upgrading.
3.2.1	S009	The SWFL-511DFS shall support data fusion, which is a process that combines two or more different data sources to provide an accurate report of traveler information.
3.2.1	S010	The SWFL-511DFS shall archive Traveler Information and supporting data in a relational SQL database.
3.2.1	S011	The SWFL-511 DFS shall provide road weather conditions using manual operator input through a graphical user interface.
3.2.1	S012	The SWFL-511 DFS shall provide a consistent level of traveler information for the region.
3.2.2	S013	The SWFL-511DFS shall be network-based using TCP/IP connectivity, HTTP protocol and XML data format.
3.4	S014	The SWFL-511DFS shall provide context sensitive help information.

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TABLE 3.4
(CONTINUED)

SYSTEM SPECIFICATION PARAGRAPH	REQUIREMENT IDENTIFICATION (ID)	REQUIREMENT
3.2.1	S015	The SWFL-511DFS system shall provide the capability to generate reports on system performance and statistics on its use (including web subsystem) as well as on the traveler information that was provided.
3.2.1	S016	The SWFL-511DFS shall have the capability of disseminating information to Internet-enabled data devices such as personal computers, WAP enabled cell phones, and personal digital assistants.
3.2.1	S017	The SWFL-511DFS shall support the planning of trips within the southwest region, which is defined as Charlotte, Lee, and Collier counties.
3.2.1	S018	The SWFL-511DFS shall use externally provided Master Clock data available from the Internet.
3.2.5	S019	The SWFL-511DFS shall operate normally in a sheltered environment with a controlled temperature range from 60 degrees F to 90 degrees F and a non-condensing humidity from 30% to 80%.
3.2.2	S020	The SWFL-511DFS shall consist of servers that are rack mountable in a standard 19 inch rack and network cables and routers and switches that do not require more than 400 square feet of space.
3.2.2	S021	The SWFL-511DFS shall provide a minimum of two operator workstations.
3.3.1	S022	The SWFL-511DFS shall provide data files compatible with the Interactive Voice Response System.
3.3.2	S023	The SWFL-511DFS shall be housed in a secure facility staffed 24 hours a day, 7 days a week. A secure facility is defined as having controlled access both electronically and physically.
3.5	S024	The SWFL-511DFS shall be provided with documentation that at a minimum consists of: - Operator's Guide - Maintenance and trouble shooting guide
3.6	S025	The SWFL-511DFS shall be provided with training in the operation and maintenance of the system that includes at a minimum: - system activation - system configuration - normal system operation - abnormal system operation - system administration

4. Requirement Testing

This section describes the testing that will be done to verify that the requirements are met by the system.

4.1 Test Methods

The following subsections provide an explanation of the four test methods that will be used to test the southwest Florida 511 system.

4.1.1 Inspection

The acceptance test procedures review and/or inspect the end item, including its drawings and characteristics, during the actual performance of the acceptance test.

4.1.2 Analysis

Analysis is an element of verification in the form of a statistical study of previously collected data resulting in calculated data intended to verify a requirement when an examination, test, or demonstration cannot feasibly be used to verify the requirement. Such data, collected during a tightly controlled test setup, may be composed of a compilation of acceptance test data, design solutions, or data derived from lower-level tests. Satisfaction of the requirement is performed by statistical analysis of the test data.

4.1.3 Demonstration

Demonstration is an element of verification that differs from a test in that it verifies only the specific situation demonstrated but not the total requirement. Demonstration is used in lieu of a Test where system parameters are not sufficiently controllable to provide a test that verifies the stated requirement explicitly. In such cases, performance within the stated requirements will be demonstrated for the specific case or cases. The capability to conform to the requirement must be inferred from the successful completion of the specific demonstration. The bulk of system testing should be demonstration tests because they are relatively easy to set up and execute. The data requirements for a demonstration test are minimal compared to a test type method.

4.1.4 Test

Test is an element of verification denoting the determination of the properties and characteristics of equipment or components by technical means, including functional operation and the application of established test principles and procedures. The analysis of data derived from a test is an integral part of this verification element and should not be confused with Analysis.

5. Requirements Traceability Verification Matrix

Table 5.1 lists the requirement IDs, the parent-child relationship, the test method, and the test case that will be used to test the requirement. The document that details the test procedures will provide the information to fill in the column labeled Test Procedure No.

Table 5.1 – Requirements Traceability Verification Matrix for the Southwest Florida 511 Independent Verification and Validation Testing

REQUIREMENT ID	REQUIREMENT SUMMARY	TEST METHOD	TEST CASE	TEST PROCEDURE No.	REQUIREMENT TRACEABILITY			
					SYSTEM	SUBSYSTEM	COMPONENT	UNIT
S001	The DFS will provide traveler information.	Demonstration	TCS-01		S001			
DF001	The DFS will provide traveler information for southwest Florida.	Demonstration	TCDF		S001	DF001		
DF001E	The traffic information center (TIC) editor will use NAVTEQ™ for the map interface. ⁶	Demonstration	TCDF		S001	DF001	DF001E	
DF002E	The TIC editor will use NAVTEQ's map for point-of-interest (POI) data.	Demonstration	TCDF		S001	DF001	DF002E	
WS011	Roadway information will be displayed using icons.	Demonstration	TCWS		S001	WS011		
WS016	The Web site will provide all information gathered for Charlotte, Lee, and Collier counties.	Demonstration	TCWS		S001	WS016		
WS019	The Web site will comply with the FDOT's <i>INFONET Internet Guidelines</i> .	Demonstration	TCWS		S001	WS019		
WS020	The Web site will provide Web pages to the public through the ISP.	Demonstration	TCWS		S001	WS020		
S002	Traveler information will consist of unplanned traffic events (i.e., crashes); planned incidents (e.g., construction); special events; slow downs and delays (i.e., congestion); public transportation; POIs; and weather information.	Demonstration	TCS-01		S002			
S003	System availability will be 99.9 percent.	Analysis	TCS-01		S003			
DF003	The availability of the DFS will be 99.9 percent over a 24-hour period.	Analysis	TCDF		S003	DF003		
DF001R	The DFS will have redundant servers.	Inspection	TCDF		S003	DF003	DF001R	

⁶ NAVTEQ is a trademark of NAVTEQ.

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TABLE 5.1
(CONTINUED)

REQUIREMENT ID	REQUIREMENT SUMMARY	TEST METHOD	TEST CASE	TEST PROCEDURE No.	REQUIREMENT TRACEABILITY			
					SYSTEM	SUBSYSTEM	COMPONENT	UNIT
DF002A	The data archive component will employ a RAID.	Inspection	TCDF		S003	DF003	DF002A	
SP001	The ISP will be available 99.999 percent in 24 hours.	Analysis	TCSP		S003	SP001		
SP001R	The ISP will have 100 percent power availability.	Analysis	TCSP		S003	SP001	SP001R	
SP002R	A failed application server will be returned to full operations by the third business day.	Test	TCSP		S003	SP001	SP002R	
SP003R	The ISP will provide redundant servers.	Inspection	TCSP		S003	SP001	SP003R	
SP005	The host network will provide 100 percent network availability.	Analysis	TCSP		S003	SP005		
WS001	The Web site subsystem will employ a fully redundant server.	Inspection	TCWS		S003	WS001		
WS001R	A failed Web site application server will be returned to operation by the third business day.	Test	TCWS		S003	WS001	WS001R	
WS017	The Web site will be available 99.9 percent of 24 hours.	Analysis	TCWS		S003	WS017		
S004	The system will provide travel information from operational input data.	Demonstration	TCS-01		S004			
DF014	The graphical user interface (GUI) will support the viewing and managing of data in the DFS database.	Demonstration	TCDF		S004	DF014		
DF007E	The DFS will provide a GUI for operator input.	Demonstration	TCDF		S004	DF014	DF007E	
WS018	The Web site will be driven by the DFS.	Demonstration	TCWS		S004	WS018		
S005	The system will support 350,000 calls per year.	Analysis	TCS-01		S005			
DF002	The DFS will be a scalable design that can support an increased call volume by 300 percent.	Analysis	TCDF		S005	DF002		
WS002	The Web site will support access by 1,000 simultaneous users.	Test	TCWS		S005	WS002		

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TABLE 5.1
(CONTINUED)

REQUIREMENT ID	REQUIREMENT SUMMARY	TEST METHOD	TEST CASE	TEST PROCEDURE No.	REQUIREMENT TRACEABILITY			
					SYSTEM	SUBSYSTEM	COMPONENT	UNIT
WS003	The Web site will support expanded simultaneous access by 300 percent.	Analysis	TCWS		S005	WS003		
S006	The southwest Florida 511 DFS will operate on the Microsoft® Windows® 2003 operating system (OS). ⁷	Inspection	TCS-01		S006			
DF018	The DFS will operate on the Microsoft Windows 2003 OS.	Inspection	TCDF		S006	DF018		
WS004	The Web site subsystem will operate on the Microsoft Windows 2003 OS.	Inspection	TCWS		S006	WS004		
S007	The DFS will use traffic sensor data.	Demonstration	TCS-01		S007			
DF006	The DFS will accept the following sensor data types: speed (per lane and per vehicle class), flow (per lane and per vehicle class), travel time, delay time, level of service (LOS), occupancy, and congestion.	Demonstration	TCDF		S007	DF006		
DF001S	Sensor data will be referenced to a predefined location table that contains the following information about each sensor: name, lane, direction, external reference identification (ID) or Internet Protocol (IP) address, nominal values that can be time dependent, maximum values, chaining, a reference to another location referencing system, and latitude/longitude (lat/long) information.	Demonstration	TCDF		S007	DF006	DF001S	
DF002S	The DFS will have the capacity to provide coverage of a maximum of 100 traffic sensors.	Analysis	TCDF		S007	DF006	DF002S	
DF007	The DFS will accept automated sensor input.	Demonstration	TCDF		S007	DF007		

⁷ Microsoft and Windows are registered trademarks of Microsoft Corporation in the United States and other countries.

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TABLE 5.1
(CONTINUED)

REQUIREMENT ID	REQUIREMENT SUMMARY	TEST METHOD	TEST CASE	TEST PROCEDURE No.	REQUIREMENT TRACEABILITY			
					SYSTEM	SUBSYSTEM	COMPONENT	UNIT
DF003S	The sensor input will accept input in American Standard Code for Information Interchange (ASCII) text, comma-separated values (CSVs), or XML formats.	Demonstration	TCDF		S007	DF007	DF003S	
DF004S	The sensor Input will check sensor data for correctness.	Demonstration	TCDF		S007	DF007	DF004S	
DF005S	The sensor input component will smooth the data.	Demonstration	TCDF		S007	DF007	DF005S	
DF006S	The sensor input component will compute density, travel time, delay time, LOS, occupancy, and congestion.	Demonstration	TCDF		S007	DF007	DF006S	
DF007S	The sensor input component will create events.	Demonstration	TCDF		S007	DF007	DF007S	
S008	The DFS host facility will provide remote access.	Demonstration	TCS-01		S008			
DF019	The DFS will provide physical access.	Demonstration	TCDF		S008	DF019		
WS009	The Web site subsystem will provide physical access.	Demonstration	TCWS		S008	WS009		
S009	The southwest Florida 511 DFS will support data fusion.	Demonstration	TCS-01		S009			
DF001F	The DFS will fuse and divide information into data links.	Demonstration	TCDF		S009	DF016	DF001F	
DF001F1	The data collection links are defined as segments.	Demonstration	TCDF		S009	DF016	DF001F	DF001F1
DF002F	The fused data will be derived from various sources.	Demonstration	TCDF		S009	DF016	DF002F	
S010	The DFS will archive travel information in a relational structured query language (SQL) database.	Demonstration	TCS-01		S010			
DF004	The DFS will archive 511 data in a relational SQL database.	Inspection	TCDF		S010	DF004		

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REQUIREMENT ID	REQUIREMENT SUMMARY	TEST METHOD	TEST CASE	TEST PROCEDURE No.	REQUIREMENT TRACEABILITY			
					SYSTEM	SUBSYSTEM	COMPONENT	UNIT
DF001A	The data archive subsystem will store sensor data and traveler information in a relational SQL database.	Inspection	TCDF		S010	DF004	DF001A	
DF005	The DFS will update the database as new data is made available.	Demonstration	TCDF		S010	DF005		
S011	The DFS will provide road weather conditions information.	Demonstration	TCS-01		S011			
DF009	The DFS will provide road weather conditions and forecasted weather conditions.	Demonstration	TCDF		S011	DF009		
DF003F	The DFS will provide a report for each data collection link that includes weather information.	Demonstration	TCDF		S011	DF009	DF003F	
DF004F	The DFS will provide predictive traffic information.	Demonstration	TCDF		S011	DF009	DF004F	
S012	The DFS will provide a consistent level of traveler information.	Demonstration	TCS-01		S012			
DF001I	The traveler information (TI) output component will provide a file that can be interpreted by the IVR subsystem.	Demonstration	TCDF		S012	DF008	DF001I	
DF001W	The Web data output component will provide consistent traveler information.	Demonstration	TCDF		S012	DF008	DF001W	
DF002W	The Web data output component will produce data files that can be processed into traveler information Web pages by the Web site subsystem.	Demonstration	TCDF		S012	DF008	DF002W	
WS012	The Web site will provide links to the statewide Web site.	Demonstration	TCWS		S012	WS012		
WS013	The Web site will provide links to other transportation Agencies.	Demonstration	TCWS		S012	WS013		

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TABLE 5.1
(CONTINUED)

REQUIREMENT ID	REQUIREMENT SUMMARY	TEST METHOD	TEST CASE	TEST PROCEDURE No.	REQUIREMENT TRACEABILITY			
					SYSTEM	SUBSYSTEM	COMPONENT	UNIT
S013	The DFS will use Transmission Control Protocol/Internet Protocol (TCP/IP) connectivity, the hypertext transfer protocol (HTTP), and/or the XML data format.	Analysis	TCS-01		S013			
S014	The DFS will provide context sensitive help information.	Demonstration	TCS-01		S014			
WS006	The Web site will provide context sensitive help information.	Demonstration	TCWS		S014	WS006		
S015	The DFS will generate reports on system performance.	Demonstration	TCS-01		S015			
DF012	The DFS will generate reports on system performance, including statistics on the use of the telephone and Web site subsystems.	Demonstration	TCDF		S015	DF012		
DF001P	The DFS reports will include a minimum of the following information: number of event data processed, number of event data processed by error status, number of event data processed by event type, number of event data processed by length, number of event data processed by location format, number of event data processed by organization, number of event data processed by priority, number of event data processed by road class, and number of event data processed by road number.	Demonstration	TCDF		S015	DF012	DF001P	
DF003E	The TI editor will generate reports on system performance .	Demonstration	TCDF		S015	DF012	DF003E	
S016	The DFS will send information to Internet-enabled data devices.	Demonstration	TCS-01		S016			
WS007	The Web site will disseminate information to data devices.	Demonstration	TCWS		S016	WS007		

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TABLE 5.1
(CONTINUED)

REQUIREMENT ID	REQUIREMENT SUMMARY	TEST METHOD	TEST CASE	TEST PROCEDURE No.	REQUIREMENT TRACEABILITY			
					SYSTEM	SUBSYSTEM	COMPONENT	UNIT
S017	The DFS will support trip-planning functions.	Demonstration	TCS-01		S017			
DF013	The DFS will provide regional public transportation information.	Demonstration	TCDF		S017	DF013		
DF006E	The TE editor will provide the means to enter public transportation information.	Demonstration	TCDF		S017	DF013	DF006E	
DF015	The DFS will contain POIs and general information regarding each POI.	Demonstration	TCDF		S017	DF015		
WS010	The Web site will provide information on roads, public transportation, and airports.	Demonstration	TCWS		S017	WS010		
WS005	The Web site will provide access to public transportation information.	Demonstration	TCWS		S017	WS010	WS0011	
WS014	Speed data will be represented by red, yellow, and green bands.	Demonstration	TCWS		S017	WS014		
WS015	The Web site will be publicly available.	Demonstration	TCWS		S017	WS015		
S018	The southwest Florida 511 DFS will use Master Clock data.	Demonstration	TCS-01		S018			
DF017	The DFS will use Master Clock data to synchronize the southwest Florida 511 system.	Demonstration	TCDF		S018	DF017		
SP002	The ISP will use Master Clock data to synchronize the southwest Florida 511 system.	Demonstration	TCSP		S018	SP002		
SP007	The ISP subsystem will use a firewall.	Demonstration	TCSP		S018	SP007		
WS008	The Web site will use Master Clock data to synchronize the southwest Florida 511 system.	Demonstration	TCWS		S018	WS008		
S019	The DFS will operate in a sheltered environment.	Inspection	TCS-01		S019			
SP003	The ISP will be housed in a facility that provides a consistent operational environment.	Inspection	TCSP		S019	SP003		

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TABLE 5.1
(CONTINUED)

REQUIREMENT ID	REQUIREMENT SUMMARY	TEST METHOD	TEST CASE	TEST PROCEDURE No.	REQUIREMENT TRACEABILITY			
					SYSTEM	SUBSYSTEM	COMPONENT	UNIT
SP003S	Environmental controls shall include early-warning fire detection, smoke management, and fire suppression systems.	Inspection	TCSP		S019	SP003	SP003S	
SP006	The ISP subsystem will provide computer-based access.	Demonstration	TCSP		S019	SP006		
S020	The DFS will consist of servers that are rack mountable.	Inspection	TCS-01		S020			
S021	The DFS will provide a minimum of two operator workstations.	Inspection	TCS-01		S021			
S022	The DFS will provide data files that are compatible with the IVR subsystem.	Demonstration	TCS-01		S022			
S023	The DFS will be housed in a secure facility.	Inspection	TCS-01		S023			
SP004	The ISP will be housed in a secure facility.	Inspection	TCSP		S023	SP004		
SP001S	The secure facility will provide physical security.	Inspection	TCSP		S023	SP004	SP001S	
SP002S	The ISP will be housed in a facility with 24 hours a day, 7day a week human monitoring.	Inspection	TCSP		S023	SP004	SP002S	
S024	The DFS will be provided with system documentation.	Inspection	TCS-01		S024			
S025	The DFS will be provided with training.	Demonstration	TCS-01		S025			