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Florida

Crash Data System Mapping Phase II

Final Report

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National Highway Traffic Safety Administration

Technical Assistance Team

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Introduction

Background

In 2017, the Florida Department of Transportation (FDOT) and the Department of Highway Safety and Motor Vehicles (FLHSMV) requested GO Teams from the National Highway Traffic Safety Administration (NHTSA) to provide technical assistance in the development of a crash data system document. The initial phase of this project produced a report that provided the State with a high-level inventory of the data systems. These data systems are used to collect, store, and analyze data related to Florida's motor vehicle crashes.

The goal of Phase II of the GO Team project is to provide the State with a clear understanding of the capabilities and uses for each crash data system and the data that is being requested by users of each of the data systems. Where appropriate, additional insight would be provided that would help to improve the timeliness, accuracy, completeness, uniformity, accessibility, and integration of the State's crash data.

Specifically, the second phase of the project builds on the initial effort by documenting where each data system stands with respect to:

- What users need and expect;
- What data is being used / requested;
- How the systems compare with each other;
- How these systems support the integration of crash data and other sources of traffic records/safety data; and
- Data sharing agreements and opportunities.

To complete this project, the GO Team used crash system documentation provided by FDOT and FLHSMV, interviews with stakeholders, and discussion sessions with key staff from State agencies and their consultant partners. This report provides a brief review of the existing crash data systems and processes and provides a series of considerations that may help to improve the collection, analysis, and integration of the crash data with other traffic records system components. Improvements made in these areas will enhance the ability of the FDOT and FLHSMV to provide timely problem identification of existing and emerging highway safety problems. Such improvements will also allow for data-driven evaluations of education programs, enforcement campaigns, and engineering improvements designed to reduce crashes, injuries, and fatalities, on Florida's roadways. Considerations provided in this document are intended for review and implementation by the State only at their discretion. They are not binding and there is no requirement for them to be included in any plans or applications submitted to NHTSA.

Organization of the Final Report

The GO Team organized this report into the following three sections:

- Introduction
- Existing Systems
- GO Team Conclusions

Introduction, which provides the State with background information on the project.

Existing Systems, which provides the State with a review of Florida's five systems: CRSCAN; Florida Integrated Report Exchange System (FIRES); Department of Highway Safety and Motor Vehicles Analytics Warehouse; Crash Analysis Reporting (CAR) System; and Signal Four (Signal 4) Analytics. This section also includes an analysis of data integration, data sharing, and data users in the State of Florida.

The GO Team Conclusions closes the report with suggestions for how the State can use this report to integrate crash data with other data related to highway safety.

Existing Crash Data Systems

Florida maintains five crash data systems:

- CRSCAN;
- Florida Integrated Report Exchange System (FIRES);
- Department of Highway Safety and Motor Vehicles Analytics Warehouse;
- Crash Analysis Reporting (CAR) System; and
- Signal Four Analytics.

Each system contains a considerable amount of the crash data that is collected by law enforcement agencies throughout the State. CRSCAN serves as the primary data set with each of the additional data systems containing data provided through CRSCAN. With some exceptions, there is little difference among systems in the data elements and values. However, these exceptions do allow the individual databases to better serve the needs of their client subset of crash data users.

Systems Review and Evaluation

There are many positive aspects of the several crash systems in Florida. The Information Technology (IT) architecture supports the crash system well and provides excellent opportunities to build on what is already available. The systems allow the State to identify and reduce some redundant data efforts, consolidate some systems, and streamline the overall analysis and distribution of Florida's crash data. One notable development is the FLHSMV Analytics Warehouse. The warehouse incorporates many of the State's Traffic Record's data sets and can support data governance efforts and data integration projects.

The Phase I GO Team produced a high-level inventory of the State's five crash data systems. That inventory is supplemented here with information collected from the system survey, documentation provided by FDOT and FLHSMV, interviews with stakeholders, and discussion sessions with key staff from State agencies and their consultant partners. The inventory gave information related to each system such as contact information, system description, database tables, when available, standards used for development, user information, data inputs, quality control processes, data exchanges with other systems, available reports, strengths, and identified challenges. A summary of those descriptions was incorporated into this report for reference and consistency. The GO Team was able to verify and update most of the information as part of the Phase II effort. Still, readers are invited to pay close attention to the newly added considerations at the end of each system description.

In Phase II, the GO Team added considerations for each system that may help to improve the data collection, management, efficiency, analysis, and integration of the crash data with other traffic records system components. The Phase II considerations are based on the GO Team's experience, review and research of national best practices, observations from NHTSA traffic

records assessments, and other NHTSA GO Teams. Many of the considerations come from the data custodians and their colleagues in the TRCC. As discussed in the onsite meeting, this is one of the noteworthy principals of data management—that the people involved (data collectors, those managing the data, and those using the data) are the best source of ideas. They know what needs to be accomplished in order for the data to be meaningful and useful for data-driven decision-making.

The considerations for improvement describe actions the TRCC can support and the individual system custodial agencies can implement. These are suggestions only; there is no requirement that they be implemented nor is there a need to be accountable to NHTSA or progress reporting to anyone other than the possibility of discussion at the State's TRCC meetings.

CRSCAN

System Description

CRSCAN is the official statewide repository for all crash reports submitted by all law enforcement agencies in the State. The law enforcement agency investigating a reportable crash must provide the data to FLHSMV. FLHSMV stores the data in CRSCAN, which serves as Florida's central crash data repository in accordance with Florida Statute 316.066. The Florida Traffic Crash Report (FTCR) has two methodologies for completing the form. Florida Statute 316.066 prescribes that a law enforcement agency may provide either a long- or short-form version of the crash report. Florida Statute 316.066 requires the long form FTCR for any crash meeting one or more the following criteria:

1. Resulted in death of, personal injury to, or any indication of complaints of pain or discomfort by any of the parties or passengers involved in the crash;
2. Involved a violation of s. 316.061(1) or s. 316.193;
3. Rendered a vehicle inoperable to a degree that required a wrecker to remove it from the scene of the crash; and/or
4. Involved a commercial motor vehicle.

For all other crashes, agencies must submit the short form FTCR or provide a driver exchange-of-information form. The short form does not require the narrative and diagram portions of the FTCR. Some law enforcement agencies have internal policies the require them to complete all crashes on the long form FTCR format and FLHSMV does accept these submissions. Driver exchange-of-information forms are not reported to FLHSMV and driver self-reports are not loaded into the CRSCAN database. The short form must include the following items.

- o The date, time, and location of the crash;
- o A description of the vehicles involved;
- o The names and addresses of the parties involved, including all drivers and passengers, and the identification of the vehicle in which each was a driver or a passenger;
- o The names and addresses of witnesses;
- o The name, badge number, and law enforcement agency of the officer investigating the crash; and
- o The names of the insurance companies for the respective parties involved in the crash.

CRSCAN's data export structure includes the following ten data tables, shown in Table 1.

Table 1. CRSCAN Database Tables

Data Table Name	Description
Events	Parent file for relational database; Contains data specific to the crash event (date, time, harmful event, etc.).
Drivers	Contains data regarding each driver in the crash.
Passengers	Contains data regarding each passenger involved in the crash.
Non-Motorists	Contains data regarding non-motorists involved in the crash.
Property	Contains data regarding non-vehicle property.
Vehicles	Contains data regarding vehicles involved in the crash.
Violations	Contains data regarding citations issued at the scene.
Motor Carrier	Contains data on commercial motor vehicles and carriers involved in the crash.
Witness	Contains data on persons that witnessed the crash.
Trailer	Contains data on trailers involved in the crash.

Funding Source

CRSCAN is a State-funded system and is part of the FLHSMV operations budget.

Standards Used

The State of Florida uses the following standards for defining the crash system:

- Model Minimum Uniform Crash Criteria Guideline (MMUCC).
- American National Standards Institute (ANSI) D.16 and D.20.

Users

The data tables and crash report images are provided to the other crash data system repositories. The driver, vehicle, and financial responsibility sections of FLHSMV use the exports from CRSCAN in the analytics warehouse for internal reporting.

Data Inputs

During calendar year 2018, law enforcement agencies submitted approximately 95% percent of all crash reports electronically to CRSCAN, with the remainder submitted on paper. Paper forms are picked up by LexisNexis, FLSHMV's crash report vendor, and are scanned and sent through an electronic data exchange to the LexisNexis keying team for data entry.

Quality Control

CRSCAN has 226 different business rules associated with the data imports. The crash data validation spreadsheet includes a reference number for each field name on the FTCR. The spreadsheet lists the business rules providing the following information:

- The acceptable input values for the field (data type such as DATETIME, VARCHAR, NUMBER, etc.);
- Required field;
- Valid values for the field; and
- Any additional validation rules (including cross-field validations for logical agreement).

CRSCAN generates a load report for the agency submitting the crash data electronically. This information is provided back to the submitting agency to confirm the receipt of data and error messages for data that was not loaded. Agencies that use electronic field data collection software may catch some of the errors prior to submitting the report. Through electronic submission and data validation edits, error rates will be reduced.

Data Exchanges

CRSCAN provides the crash report image (TIFF file), which includes the diagram, narrative, and the 10 database tables shown in Table 1, which relate directly to the following systems. More information on these systems are available later in this report.

- FIRES.
- CAR System.
- Signal Four Analytics.

These three systems receive the tables in comma separated value (CSV) file format. Each of these systems are one of the core data systems that contribute to the State crash data system. CRSCAN does not receive any of the updates made to the crash dataset in other systems following the export.

CRSCAN also supports the Federal Motor Carrier Safety Administration's SAFETYNET system as one of its data exchanges. The SAFETYNET system collects crash data on commercial motor vehicle crashes. This data exchange provides crash data to SAFETYNET that meet the reportable crash guidelines for that system. It is not described in this report, as it is a federal database which is not generally used for safety analysis by the State.

Strengths

- Provides a flexible transaction processing environment.
- Secure File Transfer Protocol (SFTP) process in place to receive electronic crash reports from statewide law enforcement agencies.
- Currently, 95% percent of statewide crash reports submitted to CRSCAN electronically.

- Technical Support staff in place at FLHSMV.
- CRSCAN is a State-funded system and is part of the FLHSMV operations budget.

Challenges

- CRSCAN is designed to maintain the integrity of the data provided by the law enforcement agencies on the crash report and therefore has a one-way exchange. If other crash systems through their quality assurance programs makes improvements to the data, it is not transferred back to the source system.
- Crash Report images and data sent to multiple State systems (data collected once – stored many times).
- Limited Quality Control/Quality Assurance (QC/QA) processes in place, CRSCAN currently supports the original crash record. This process represents 5% of the total volume of crash data received.
- No formal process in place to certify and evaluate the quality of crash data received from vendors and law enforcement agencies beyond system edits.
  - The GO Team acknowledges that the State has plans to share data quality reports with local agencies later in 2019.

Considerations

- Expand the CRSCAN functionality to be the State's crash data management system.
- Establish the CRSCAN database as the transaction-based data environment (collect data once read many times).
- Store the original crash report image/data and flag as the original report submitted by law enforcement.
- Allow other crash systems to read CRSCAN data where appropriate after data use agreements are in place.
- Develop QC/QA processes preferably in CRSCAN.
  - Track all crash data updates made through the QC/QA processes based on what, who, when, and why modifications were made. Use the tracking process to be able to report on the crash report history.
  - Read and update privileges to other crash systems. This might be necessary to support crash locating either through Signal 4 or CAR.
  - Review the QC/QA procedures that are supported in other Florida crash systems (CAR, Signal Four, and FIRES) and add the functionality to CRSCAN.
  - Improve the crash report rejection process to track their rejection and return.
  - Develop a TRCC endorsed workgroup (possibly the crash data users' group) to review and improve/add data edits.

- o Use the QC/QA processes to develop crash data quality performance measures to report on the timeliness, accuracy, completeness, and uniformity of the State crash data.
- Develop a redacted/sanitized version of the crash report for access by those who do not need crash report personal identifiers.
- Develop and implement a formal crash diagramming tool beyond the existing XML process with capabilities similar to commercial products. ™.
- Develop formal Extract, Transfer, and Load (ETL) data protocols with State Safety data stakeholders to coordinate the transfer and possible creation of derived data elements, attributes, and indicators on the FLHSMV Analytics Warehouse to be used for crash reporting.
- Develop a CRSCAN process to host crash data in the transaction database until all required changes to the crash report are processed (possibly three years plus the current processing year).
- Develop a process of data triggers that will identify whenever changes are made to CRSCAN crash data. The trigger will execute the previously suggested ETL process to move updated crash data to the FLHSMV Analytics Warehouse for crash reporting. This process could be a database process that runs nightly (off peak).

Florida Integrated Report Exchange System (FIRES)

System Description

A vendor, on behalf of the Florida Department of Highway Safety and Motor Vehicles, developed and now maintains FIRES. It serves as a portal into the State of Florida's repository for traffic crash reports completed by Florida law enforcement agencies. This system also serves as an analysis portal for the State crash data. Through the online web portal, the general public, highway safety practitioners, engineers, law enforcement, and other traffic safety stakeholders have access to reports using the crash data. FIRES is intended as a tool to aid in decision making. FLHSMV controls access to the more sophisticated functions of the application, but FIRES' public reporting function allows anyone to generate predefined reports or view "Quick Stats" directly from the public website. Authorized users can build custom queries and generate more detailed reports than those using the publicly accessible webpage. FIRES allow for users to query all short or long form crashes and all other driver self-reported crashes. The FIRES database is a separate database in addition to the CRSCAN, Signal Four, CAR, and FLHSMV Analytics Warehouse datasets.

Funding Source

The Florida Department of Highway Safety and Motor Vehicles provides the portal through a no-cost vendor contract that uses the revenue generated from the online sales of crash reports to sustain operations.

Standards Used

This system receives the crash data from CRSCAN. The dataset follows the same standards as that of CRSCAN.

Users

FIRES is the public facing portal used to generate reports and statistical information relating to crashes in Florida and to exchange data with other users. The web portal receives roughly 400,000 visits per year. These reports are often used for—but not limited to—law enforcement challenge campaigns, engineering studies, performance measurement, and reporting to the legislature. The list of FIRES users includes, but not limited to:

- FLHSMV.
- LEAs.
- FDOT.
- Traffic safety stakeholders.
- General public.

FIRES has 3,078 active users, which includes US DOT, US Department of Labor, Air Force Legal Operations Agency, circuit courts, Florida Department of Health, and medical examiners.

Data Inputs

FIRES receives crash data from CRSCAN and also updated geolocation information from Signal Four Analytics (described later in this section). The system receives a file containing the crash data locations retrieved during the automated process.

Quality Control

FIRES relies on the data validation edits used in CRSCAN to maintain a level of data accuracy and completeness with the data collection. FIRES performs a reconciliation between the data entered and what is sent back through CRSCAN. The report totals match with 99.5-percent accuracy. FLHSMV provides a daily report with 10 fields, which FIRES uses to match their totals to CRSCAN, this process is being enhanced to provide 41 total fields.

Data Exchanges

FIRES supports the following systems through electronic data exchanges:

- BuyCrash.com – An online portal that the public can use to purchase crash reports;
- NHTSA Electronic Data Transfer (EDT)– Supports the submission of crash reports to NHTSA;
- Crash Report Sampling Service (CRSS) – Provides a random sample of crash reports to NHTSA. These crashes involve at least one motor vehicle traveling on a roadway. The crash must result in property damage, injury, or death; and
- Signal Four Geolocated Crash Data Update – A file is provided by Signal 4 with updated geo-location data reports generated from FIRES.

Table 2 shows the reports generated from FIRES.

Table 2. FIRES Reports

Report Name	Description
Annual Crash Facts	A publicly available report that provides summary statistics on crash data for all crashes available within FIRES.
Law Enforcement Challenge Reports	A report used by LEAs that provides statistics paired to a specific enforcement campaign.
Safety Campaign Reports	A report used by traffic safety stakeholders that provides statistics on State and federal campaigns for improving roadway safety behaviors.
Monthly Timeliness Report	A report used to provide a measurement of timeliness for the State crash data.

Ad-Hoc reports for authorized users	Reports that users can generate using the query features built into the FIRES portal.
Traffic Fatality Report by County	A report to provide data for the Annual Crash Facts.

Strengths

- A user can easily generate reports through the FIRES portal.
- The system receives updated geolocation data from Signal Four Analytics.
- FIRES has a more complete inventory of crash forms than all of the other systems, as it contains long, short, and motorist submitted crash forms.
- The general public can purchase copies of the crash report through the BuyCrash portal.

Challenges

- Some report results differ from those produced from other crash systems and require considerable FLHSMV resources and support to reconcile differences.
- Vendor does not always provide timely responses to FIRES data issues or Technical Support questions.
- The FIRES database model is different than the CRSCAN model and the FLHSMV Analytics Warehouse model and can cause issues when developing reports. FIRES is a vendor developed system, and as a result, the database model was developed independently from other Florida crash systems. The difference in models and the way the database queries are developed can contribute to some of those crash count differences and the report result differences.
- FIRES is currently the responsible vendor for data entry of all crash data collected and submitted on paper crash reports and a small number of law enforcement agencies submitting electronic () crash reports, through the FIRES crash data collection software application, which is one of ten approved electronic crash vendors in Florida. FIRES processed crash reports do not use the same set of data edits as other Florida crash data collection vendors. Also, the current data exchange with CRSCAN is two way (FIRES data collection software crash reports and the collected data is sent to CRSCAN and, once it has passed the FLHSMV edit checks, it is then returned to be loaded into the FIRES database) to support reporting through the FIRES web portal. The responsibility for processing paper crash reports is planned to be returned to Prison Rehabilitative Industries and Diversified Enterprises (PRIDE) in July 2019. The multiple data exchanges and conversions to comply to different data models contributes to some inefficiencies and reporting problems.

Considerations

- Review the value and benefit of the FIRES contractual arrangement:

    o Especially since the State has decided to return the paper crash report data entry process back to PRIDE (prison industries);
    o There continue to be problems with query results when using the FIRES public facing web site;
    o FIRES has not implemented the standard set of data edits and validation rules for the small number of law enforcement agencies using their electronic field data collection solution; and
    o FIRES uses a different data model than FLHSMV for all their analytics.

- Require FIRES functionality, such as, the BuyCrash crash reports sale system to use crash data hosted by FLHSMV's CRSCAN and the Analytics Warehouse.

FLHSMV Analytics Warehouse

System Description

The Analytics Warehouse is where FLHSMV performs the majority of the internal analytics of the crash data files. This system is linked to the vehicle, driver, and citation databases for reporting purposes. This system allows for FLHSMV to have a reporting location for all data.

Funding Source

The FLHSMV Analytics Warehouse is a State-funded effort.

Standards Used

This system receives the crash data from CRSCAN. The dataset follows the same standards as that of CRSCAN.

Users

Users are FLHSMV staff only.

Data Input

The Analytics Warehouse receives data through an ETL process leveraging SQL Server Integration Services (SSIS).

Quality Control

The FLHSMV did not list any validation edits within the Analytics Warehouse documentation. The system leverages the validation edits used in CRSCAN.

The Analytics Warehouse receives a fresh image of CRSCAN on a nightly basis. .

Data Exchanges

The only data exchange within this system is the input from CRSCAN.

FLHSMV has implemented a new exchange from Signal Four to the Analytics Warehouse, which would provide updated location information to this system.

Strengths

- Uses the same validation rules as the crash data repository.
- Can generate reports using integrated driver, vehicle, and citation data.
- Location information received from Signal Four.

Challenges

- Documentation describing this system is not on par with the documentation for other FLHSMV systems.
- Can only be accessed by authorized FLHSMV staff. This access must be controlled as personal information in driver and vehicle data, unlike crash data, is subject to the provisions of the Federal Driver Privacy Protection Act.

Considerations

- Establish the Analytics Warehouse as the data source for all Florida's crash reporting systems CRSCAN, Signal Four, CAR, and FIRES.
- Develop a Formal Traffic Records Inventory and host it in the Warehouse.
  - Promote data Integration efforts and data sharing among the State's Highway Safety Partners.
- Expand the data user base of the Analytics Warehouse. This may require reviewing individual agency data use agreements and expanding them to include the warehouse.
- Develop and coordinate formal Extract, Transfer, and Load (ETL) rules with safety data stakeholders for all warehouse loads.
- Load the Florida Department of Transportation roadway inventory to the warehouse using the FDOT data use policies and procedures.
- Load EMS data to the warehouse.
- Develop a marketing plan to use the warehouse as a means to promote data use and evaluation of highway safety programs.

Crash Analysis Reporting (CAR) System

System Description

The FDOT CAR system is the primary crash data system and repository for FDOT. The CAR system provides crash-specific data and aggregate reporting for most of the fields on the crash report. The system integrates the roadway data with all long-form crashes that occur on the State Highway System (SHS). The CAR does not include short-form crash reports. The system appends the following data elements to the CRSCAN data.

- Roadway functional class.
- Posted speed limit.
- Route type.
- National Highway System (NHS) indicator.
- Route number (i.e., for interstates, US routes, etc.).
- Number of lanes.

FDOT manually verifies the crash locations. The FDOT Crash Locator System (CLS) generates the locations of all crashes that are not on the SHS based on the lat/ long.

The CAR System has reporting capabilities that allow for queries on any long-form crash occurring on the SHS. The results can be exported as a PDF or the raw data can be exported as a CSV file.

FDOT sends a data file containing updated crash report locations to the FARS unit. This file is sent manually at least once per year.

Funding Source

The CAR system is a State-funded system.

Standards Used

The data elements collected within the CAR system adhere to the same data elements collected on the crash form. FDOT appends data from the roadway characteristics inventory (RCI) to the crash records.

Users

The CAR system application is limited to FDOT users and FDOT's authorized contractors and consultants.

Data Inputs

The CAR system receives nine (i.e., all but the witness table) CRSCAN tables in CSV format. TIFF image files of the crash reports are also stored as part of a document management system that CAR accesses through the crash records.

Quality Control

The CAR system has quality control processes associated with the data that is imported into the system. The system performs a check for duplicate reports as the data is brought into CAR to assure the records are consistent with the data from CRSCAN. There is an automated location process that verifies all crash report locations. If the location is not found on the SHS, the FDOT Crash Records and Research section staff uses the crash form and diagram with the mapping tool to pinpoint the crash to either the SHS or local roadway system. Once verified, these locations are placed into the analysis dataset within CAR.

Data Exchanges

The CAR system data exchanges are primarily internal to the FDOT. CAR has the following data exchanges:

- CRSCAN data files (import).
- Traffic Safety Web Portal (export).
- CLS.
- FARS Data File.

Reports Generated from CAR System

Table 3 shows the reports generated by the CAR system.

Table 3. CAR Reports

Report Name	Description
Crash Detail Listing	This report provides summary tables for various crashes types.
Annual Matrix Report	A summary count of fatalities and serious injuries on the SHS. The ranking contained within the report is by county and then city/town.
Reports from Ad-hoc Queries	Custom reports that users can generate using the query feature within CAR. This includes requests made to from the media for crash data.

Strengths

- FDOT's Roadway Characteristics Inventory (RCI) is integrated with the crash data.
- The system uses a combination of manual and automated location coding processes to generate and validate the crash location.
- CAR includes a public facing web portal.
- CAR includes a number of QC/QA processes, especially to support locating crashes involving damage to public property (guardrail, traffic signs and signals).

Challenges

- CAR only contains long-form crash reports. However, plans are in place to include short-form crash reports within the next year.
- There is a considerable backlog of unlocated crash reports which may increase when FDOT includes processing of the short crash form.
- CAR is a legacy system which is difficult to update, make improvements and interface with newer technology.
- .
- FDOT does not receive the reportable crash flag from CRSCAN, and therefore cannot distinguish between reportable and non-reportable crashes.
- Manual location data processing is time consuming so, at this time, FDOT is only able to provide this processing for crashes reported with the long-form format.
- Because of differences in the data supported for specific time periods, CAR supports two databases, one for crash reports for 2010 and previous years, and one for 2011 and after. This can be problematic in coordinating data queries, report formats, and system support.
- User surveys noted ongoing difficulties with CAR functionality because of differences in supported data sets, issues with some internet browsers and out dated technology.

Considerations

- Continue the QC/QA processes and procedures in CAR, build on them and communicate their results back to CRSCAN.
- Consider adopting Signal Four as the FDOT crash analysis tool.

Signal Four Analytics

System Description

Signal Four Analytics is a web-based GIS and analysis application that provides users with tools to perform crash data analysis. The tools rely on the data elements included on Florida's crash reports and on the geolocation of traffic crashes to provide users the ability to identify problems in a variety of highway safety emphasis areas and locations. The application is accessible online, but only available to authorized users approved by FLHSMV.

Signal Four Analytics has an automated extract-transform-load (ETL) process to geo-locate the crash using up to 15 location-related fields from the crash report. The system geocodes these locations using the Florida Geographic Data Library and the Florida Unified Roadway Base map. From the Signal Four Analytics dataset, users can build queries that can be filtered by the data types within the crash data. Plans are for all users to be able to see the queries built by any user of the system.

Funding Source

The Florida TRCC funds Signal Four Analytics annually through a 23 USC 405(c) grant. The system also receives funding from MetroPlan Orlando and Brevard County to perform geolocation services in those regions.

Standards Used

This system receives the crash data from CRSCAN. The dataset follows the same standards as that of CRSCAN.

Users

Signal Four users consist primarily of planners and engineers. The users of this system include:

- Transportation planners.
- Metropolitan planning organizations.
- FDOT.
- University researchers.
- LEAs.
- FLHSMV

Data Inputs

Signal Four imports data from CRSCAN. Crash records are geolocated by an automated geolocation process. In the cases where an LEA is using the interactive mapping services in

Signal Four, the application does not have to geo-code the report. The location mapping data sources are:

- Florida Unified Roadway Base map.
- Florida Geographic Data Library.
- Local maps from counties that provide contractual services.

Quality Control

Signal Four has validation edits built into the ETL process. If there is a violation, the system generates a report that an analyst reviews and the analyst will adjust the location data manually as needed.

Data Exchanges

Signal Four Analytics has two primary outputs. First, the system provides FIRES with a nightly file of crash location coordinates. FLHSMV updates the crash records within FIRES with the locations verified during the automated process. The second output is the geolocation service itself for law enforcement agencies mapping crashes using Signal Four. This map, integrated in electronic crash data collection software, allows officers to select where the crash occurred on the roadway and populates the corresponding location data elements on the crash report record. Law enforcement agencies may use this mapping utility free of charge.

Strengths

- Completely web-based.
- Up to date technology supports flexibility for system improvements, updating and interfaces to other systems.
- The system uses reportable (i.e., long- and short-form crashes) as part of the analysis;
- Multiple map layers are used with the location service provided.
- Free access for LEAs using the crash locator tool.
- As mentioned above and in the CAR section Signal Four includes two 'smart mapping' modules that is free to the LEAs that supports the collection of accurate crash locations at the crash scene and also assists in the crash locating process at FDOT.

Challenges

- Location verification is an automated process with only limited manual correction for some jurisdictions.
- Signal Four relies on annual grant funding for updates and maintenance.

Considerations

- Consider adopting Signal Four as the FDOT crash analysis tool.
  - The user surveys supported that many local and engineering jurisdictions already use Signal Four and noted their satisfaction with Signal Four capabilities.
  - There are some FDOT analysis procedures Signal Four may not provide (annual analysis of high crash locations, areas where certain crash types have a higher than average concentration night-time crashes, wet weather crashes, SHSP crash analysis reports). The process to consider Signal Four as the FDOT crash analysis tool should include a gap analysis to identify those analytics that may not be available in CAR and not included in Signal Four.
  - Signal Four provides two 'smart mapping' techniques. One is used in electronic field data collection systems. The process allows the investigating officer to point and click on the crash location, and the system auto-populates many of the locating data elements/attributes required on the crash report form. The other can be used in the central office to assist in developing an accurate crash location from data already available on the crash report. FDOT is considering adopting the use of these tools to assist in their crash locating process. The GO Team supports this process and believes it provides the ability to reduce the current crash locating backlog, collect an accurate crash location at the crash scene, streamline the FDOT crash locating process, and provide the ability to support crash locating on long and short crash reports on all Florida public roads. As part of the process, a review of the tools should be conducted to assure FDOT locating processes are supported.
- Conduct the necessary gap analyses to identify those processes required by FDOT that may not currently be available in Signal Four.
- Develop the necessary business plan, phased projects and/or strategic projects to develop the expanded Signal Four functionality.
- Establish database connections to read/update CRSCAN, the FLHSMV Analytics Warehouse, and FIRES, if necessary, rather than receive a Signal Four crash database from CRSCAN. This would support the concept supported by the GO Team of maintaining a single FLHSMV CRSCAN transaction environment and a centralized Analytics Traffic Records Reporting Warehouse that is created and maintained once and read many times as needed to support Florida's traffic safety analysis.
- Review Signal Four funding and resources to support the expanded functionality.
- Consider updating the Signal Four QC/QA processes to conform to the process as described in the CRSCAN section. This could be done by conducting the processes in

CRSCAN or support them in Signal Four or other applications, but control and update the necessary crash data through database routines and connections.

- Consider funding Signal Four activities through multi-year contract to ensure stability within the program.

Integration

For a State to develop successful linkages between its traffic records data systems, data governance processes can be put in place through legislative action and/or individual agency policy that provide guidelines related to data release and availability. Overall, the State has been very successful using crash data, and other traffic records data, to support their highway safety efforts. Through their Analytics Warehouse and Signal 4 projects, their partners have on-line access to crash and citation data and they also have the ability to produce maps of crash locations, by type and contributing circumstances, that can be used to direct enforcement activities and engineering improvements. Data agreements have been established that allow the use of crash data and other data systems under the governance of FDOT and FLHSMV.

Other key components of a successful traffic records linkage program include:

- Data from traffic records component systems integrated for specific analytical purposes; and
- Decision-makers have access to resources—skilled personnel and user-friendly access tools—for the use and analysis of datasets and timely access to data analyses and interpretation is available upon request.

The ability of their Traffic Records Coordinating Committee (TRCC) to bring together the data owners and facilitate the development of a data warehouse is a key component to continuing the development of integrated data sets.

Inclusion of the injury surveillance data (i.e. EMS, hospital, and trauma registry data) into the Analytics Warehouse has not been completed. The majority of the larger EMS agencies provide data to the State through multiple vendors and the State EMS agency has supported preliminary linkage between the EMS data and the crash reports for use in their Biospatial project. There is support to include the EMS data in the State's data warehouse.

Strengths

- Florida's Traffic Records Coordinating Committee includes representatives from most, if not all, of the core data systems.
- Successful linkages between various component of the traffic records system have been conducted. Notably between crash, driver, vehicle, citation, and roadway data through both Signal 4 and the FLHSMV Analytics Warehouse.
- The development of the Signal 4 website provides crash data access to users and analysts that can provide guidance on the use and interpretation of the data.

Challenges

- Statewide hospital data has not been included as a traffic records data system.
- A key component of a successful data linkage program is that the public have access to resources—skilled personnel and user-friendly access tools—for the use and analysis of datasets. Currently, the online analytical resources are limited to 'approved' partners and are not available to the general public.
- Personnel resources are limited to support integration of the traffic records data systems and subsequent analysis of the integrated data.
- Data are integrated on a project level. Standalone databases of integrated data have not been developed.
- Not all data owners relative to the State's injury surveillance system participate in the TRCC.

Considerations

- Continue expansion of the data warehouse to include data sets from all traffic records components. Specifically, data from the injury surveillance system.
- Market and promote the use of Signal Four and the Analytics Warehouse for use by highway safety partners.
- Provide resources, through new or existing partnerships, to conduct routine and ad hoc data linkages between the data systems included in the Analytics Warehouse. Add tables to enhance the individual agency reports and add robustness to the data set.
- Provide partners, and ultimately the public, access to linked data to support evaluations of highway safety projects.
- Invite participation by the Florida Hospital Association to the State's TRCC.
- Pursue geo-location of EMS run reports to facilitate linkage with the associated crash data.

Data Sharing

Police reported crash data is used extensively by FDOT, FLHSMV, and other partners to support problem identification and program evaluation for Florida's highway safety activities.

Several user agreements were provided for review:

- Florida's Integrated Report Exchange System (FIRES) Web Portal (no expiration).
  - Provides access to crash data included in FIRES (FLHSMV).

- Memorandum of Agreement between FLHSMV and University of Florida (expires June 2019).
  - o Provides crash and uniform citation data to the University of Florida which allows the University to provide statistics related to both data sets and for inclusion in Signal 4.
- Administrative Access Agreement and User Access Agreement for Signal 4 Analytics (no expiration).
  - o Covers access, use, and confidentiality of data provide by FLHSMV for use in Signal 4.

Strengths

- Data use agreement have been established for access to FIRES data and for use of crash and citation data by the University of Florida.
- Data sharing agreement with the University of Florida has an expiration date that allows the ability to conduct periodic reviews of the data that is provided and allows for modifications of its use.
- The FLHSMV Analytics Warehouse includes information from the crash, driver, vehicle, and citation data systems.
- The Analytics Warehouse includes non-conventional data that can be used to support highway safety programs including information on dealerships and insurance coverage.
- The Analytics Warehouse has the capacity to decode the vehicle identification numbers (VIN) from motor vehicles and motorcycles allowing more precise analysis of crashes by make and model of vehicle.

Considerations

- Expand the use of Signal 4 to support QC/QA activities as appropriate.
- Provide the data warehouse with a public facing portal, either separately or through partnership with the University of Florida.

Data Users

As part of the Phase II GO Team effort, FDOT and FLHSMV conducted a survey among over 900 users of Florida's crash data to determine if the current systems met their needs with regards to data quality, accessibility, and usability. The respondents represented a variety of fields including law enforcement, education, engineering, and emergency response. The respondents included a variety of job titles, including analysts, managers, programmers, engineers, and data users.

The majority of respondents reported they need access to crash data or individual crash reports as part of their routine job duties. Users accessed the crash data primarily through Signal Four Analytics (45 percent) followed by FIRES (28 percent), and CAR (12 percent). Crash data meets the majority of users' needs through the use of standardized reports, online queries, and interactive dashboards. Signal Four Analytics and FIRES both rated well with regard to timeliness and the user tools that are associated with each of the two systems.

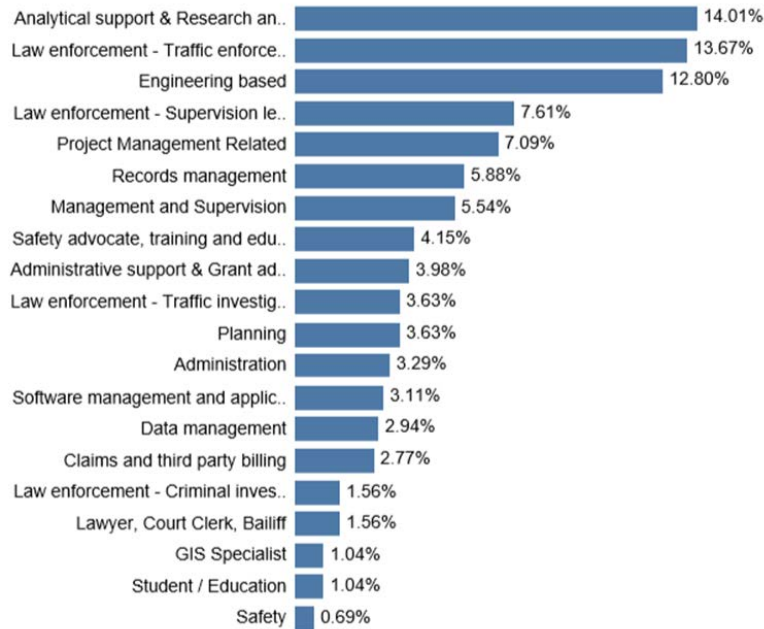Selected results from the user survey as described below.

Figure 1. Respondent's Job Role

The majority of respondents were from law enforcement, engineering, and analytical backgrounds (Figure 1 and Figure 2).
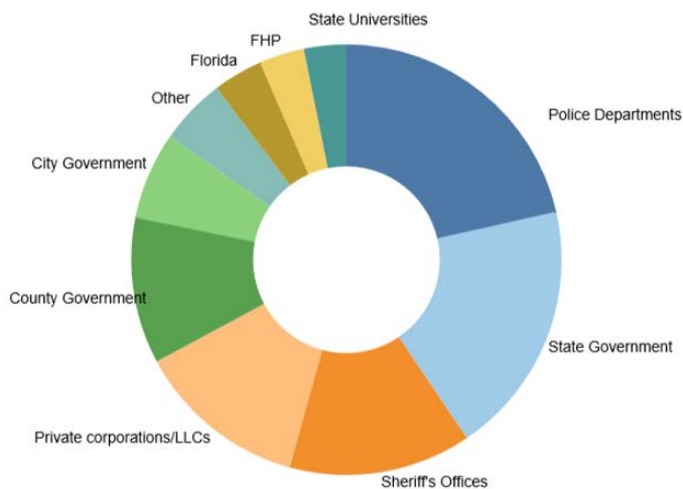
Figure 2. Respondent's Organization Type

	Daily	2-3 times per week	1-2 times a month	Few times a year	Null
CAR	16	25	45	43	565
CRSCAN	6	8	3	6	671
DHSMV Analytical Warehouse	10	10	10	14	650
FIRES	40	40	79	148	387
Other	29	13	11	9	632
Signal Four Analytics	50	118	157	157	212
SSOGIS Query Tool	2	6	16	17	653

Figure 3. Frequency in which Respondents Use Data Systems

As shown in Figure 3, the most used system is Signal Four Analytics which is frequently accessed by users more than two or three times per week. FIRES was reported to be the second most used system, followed by CAR.

Figure 4 shows the respondents' impression of the accuracy of each data system. While CRSCAN received the highest marks for accuracy, each data system scored over 90 percent.
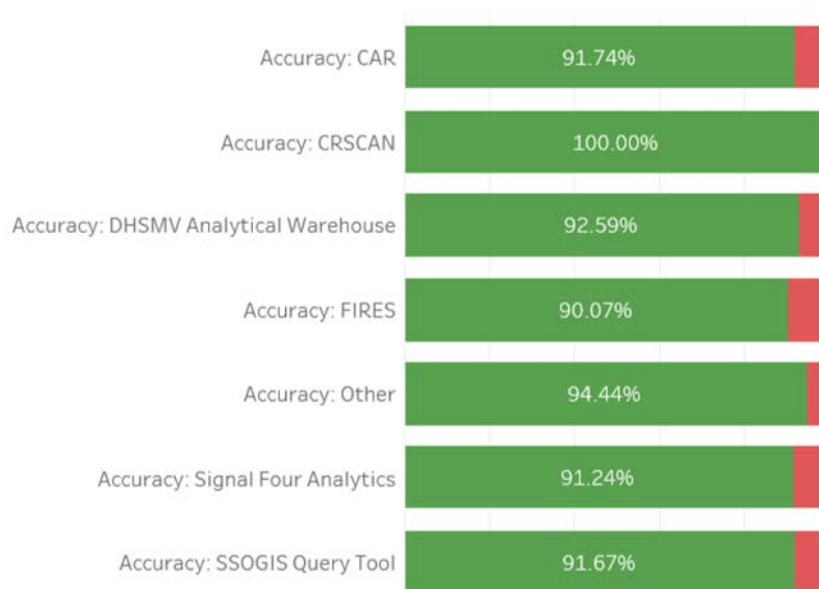
Figure 4. System Accuracy

Ratings of each system's technical support and system tools are displayed in Figure 5. Signal Four's system tools were ranked highest and the FLHSMV Analytics Warehouse was rated best by survey respondents with regard to the system's technical support.
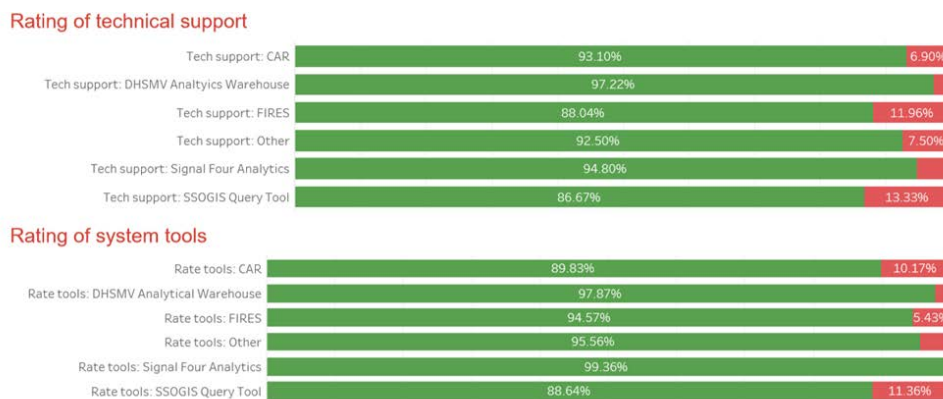

Figure 5. Chart Displaying Rating of Technical Support and Rating of System Tools

Strengths

- The primary crash data systems have a large cohort of users who use the data extensively to support a variety of highway safety projects.
- Signal Four Analytics and FIRES provide users with basic tools needed to analyze the State's crash data.
- Signal Four Analytics and FIRES provide basic training tutorials to assist new users.

Challenges

- There are several systems available to access and analyze Florida crash data. Each system has different capabilities and user groups.
- There are multiple users of the crash data across the State. These users come from a variety of agencies and experience levels.
- State agencies have different needs with regard to crash data that currently necessitate the maintenance of multiple systems.
- Data use agreements provided do not cover all traffic records system components.
- Multiple versions of the crash data are shared among highway safety partners. The original data, collected by the law enforcement agencies in the State, should be maintained as the primary record of the motor vehicle crash. Additions and corrections to this data that are not made by the investigating agency or officer should be maintained in a separate table.
- Signal 4 Analytics are supported by annual grant funding making it difficult to develop a three to five-year strategic plan for the expansion of the database and its functionality.
- The FLHSMV Analytics Warehouse has no public facing component.
- Historical crash data only dates back to 2011.

Considerations

- Improve and standardize the training available for each system. Consider providing different levels of training for users with different needs.
- Use survey feedback to refine mapping and query tools in Signal Four and FIRES.
- Add additional traffic records data to the query systems through an interface with the FLHSMV Analytics Warehouse.
- Consolidate the number of data systems users can access to obtain the crash data needed for the problem identification and program evaluation activities.

Cost Considerations

Specific program and ancillary costs were not available for each component system included as part of this review so specific savings and recommendations cannot be calculated. However, the recommendations to reduce the number of redundant systems and consolidate crash reporting and analysis through the use of CRSCAN, Signal Four, and the FLHSMV Analytics Warehouse, while maintaining only the technical support from the other data systems and not the associated storage, programming, and maintenance costs will result in an overall savings to the Florida Department of Transportation.

The GO Team suggests that there is sufficient information from the user surveys and review of system capabilities to support this decision even in the absence of clear, comparable cost data. Our efforts for developing comparable cost data for all systems were not completely successful; however, this outcome is not unexpected given the mix of government-operated and consultant-based systems, each with its own financial reporting requirements. Again, as a result of the lack of comparable cost data (and the level of effort that would be required to create such data) the GO Team suggests that the decision on future support for systems largely ignore this criterion and that the State consider the two-tier path of consolidation coupled with limiting the other systems to technical-support-only.

GO Team Conclusions

Summary

Overall, Florida has a very robust traffic records system and a well-functioning TRCC that is working to advance the State's use of highway safety data to provide timely, quality data to meet the needs of a variety of users both in the governmental and public sectors. This report outlines the strengths and challenges that the GO Team identified in the data systems and processes. A total of 41 considerations has been provided for the crash data systems, the analytical data warehouse, the State's data integration activities, and for the State's data users. As stated earlier, the considerations provided in this document are intended for review and implementation by the State only at their discretion. They are not binding and there is no requirement for them to be included in any plans or applications submitted to NHTSA. The reviewers believe that the adoption of any single or set of considerations will further strengthen the ability of the Florida Department of Transportation and their partners to use crash and other traffic records data systems to improve their ability to identify location and behavioral problems and to evaluate the success of their highway safety programs. However, when taken in their entirety, the State should strongly consider reducing the number of data systems related to the collection and analysis of crash report data by consolidating their activities and data exchanges through the use of CRSCAN, Signal Four Analytics, and the FLHSMV Analytics Warehouse. Opportunities should be explored to incorporate the processes associated with CAR and FIRES into these three systems. As a result, Florida's traffic records system will be strengthened by the resultant increase in access, functionality, and the ability to integrate the crash data with other data related to highway safety.

Ongoing Support

The Florida TRCC has excellent support from within Florida DOT, FLHSMV and DOH, from the NHTSA Regional Office, and the FMCSA and FHWA Division Offices. Further, the GO Team members are available to answer questions via email or phone call should the State feel the need for further explanation.