Improving the Information and Decision Support system

Jesse Jay - Director of Transportation, GeoDecisions

IHEEP 2009 - September 2009

The opinions, findings, and conclusions in this publication are those of the author(s) and not necessarily those of the Mississippi Department of Transportation, the Mississippi Transportation Commission or the State of Mississippi.
SAMS Overview

- Goals
- Data
- Security

SAMS Web Application Overview
- Query
- Analysis
- Reports
- Administration

Architecture
What are the Goals?

NUMBER 1 Goal!!!
Help Reduce Fatal and Injury Producing Crashes!
What are the Goals for SAMS?

- Help Reduce Fatal and Injury Producing Crashes
- Quickly Identify Locations with Opportunity
- Identify Countermeasures for Individual Locations and for the entire Road Systems
- Evaluate Highway Safety Improvement Program and Projects
Data Layers and Sources

**MS Dept of Public Safety**
- Crash Data
- Narratives
- Crash Diagrams

**NC HRP Report 500 Series**
- Crash Reduction Factors

**NHTSA**
- FARS

**TeleAtlas**
- Local Roads (Line work and RWC)

**Planning Division - MDOT**
- Road Network
- Roadway Characteristics
- Traffic Volumes

**Traffic Eng Division - MDOT**
- Sign Data

**Research Division - MDOT**
- Pavement Data

**Bridge Division - MDOT**
- Bridge Data
<table>
<thead>
<tr>
<th>Collection*</th>
<th>Processing and Management*</th>
<th>Linkages for Reporting and Analysis*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto Crash Data Collection</td>
<td>SAFETY NET</td>
<td>Base Map Layers</td>
</tr>
<tr>
<td>Crash Records</td>
<td>FARS</td>
<td>Traffic Volumes</td>
</tr>
<tr>
<td>Crash Records</td>
<td>SAMS</td>
<td>Roadway Network/LRS</td>
</tr>
<tr>
<td>Crash Records</td>
<td>FTP to MDOT</td>
<td>Intersections</td>
</tr>
<tr>
<td>Data Entry</td>
<td></td>
<td>Roadway Characteristics</td>
</tr>
<tr>
<td>Paper MUGR</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data staging processes include:
- Validation Checks
- Aliasing
- Route Concurrencies
- Crash Snapping
- Assigning Attributes to Crash Data

Data is loaded and ready to query.

* Three areas that can define the success of a crash records system, adapted from NCHRP Synthesis 350: Crash Records Systems.
MDPS Crash Data Extraction and Transfer

**MDPS ReportBeam Crash Data**
- MS Access format
- Output nightly from ReportBeam system
- Incremental data from last 24 hours
- Uploaded to MDPS website

**SAMS Data Staging Service**
- Runs as windows service from webserver
- Utilizes Oracle DBMS Job scheduled nightly
- Download MDPS Access file
- Email notification of nightly completion
SAMS Data Loading

**Staging service core components**

- Oracle package
- Initial load into staging schema
- Aliasing (city, streets)
- Snapping
  - Locates data on state maintained system
  - 8 snapping methods utilized
  - Involves dynamic segmentation processes
- SAMS attribute population
- Promotion to SAMS warehouse
- Logging and Notification via email
SAMS Security Module

- Ties into MDOT Active Directory (AD)
- Relies on SAMS Group assignment in AD
  - Admin, Power User, User, Data Maintainer
- Geographic Restrictions set by State Safety Engineer
- Allows VPN access for local FHWA rep, etc.
- Controls application display to end user
- Site and User Tracking (future)
SAMS Web Application Overview

- Query
- Mapping
- Reports
- Data Grid
- Analysis
- Admin

About SAMS

- Contacts
- What's New
- User Feedback
- Help

What's New for SAMS

- To use SAMS you will need Microsoft Internet Explorer version 5.2 or higher. You will also need to load a plugin and make a few minor settings before. Please follow the instructions by clicking the "browser setup" on the bottom page or setup instruction page to setup your computer for use with SAMS. This process will need to be run through once on each new machine that you use to access SAMS.

© 2006 Mississippi Department of Transportation
Read the SAMS User Guide
Browser Settings
Select a query type and category from the menu to the left.
## MDOT Safety Analysis Management System (SAMS)

### Vehicle Related

**Vehicle Action:**
- Avoidance
- Backing
- Going Straight

**Vehicle Configuration:**
- ATV
- Commercial Bus
- Emergency Vehicle

**Pre-Crash Direction of Travel:**
- E (East)
- N (North)
- NE (Northeast)

**Initial Contact:**
- Left
- Right
- Top
- Bottom
- Under
- Overtake
- Overlap
- None
- Other

**Speed Zone:**
- min: __
- max: __

### Roadway/Control Related

**Divided:**
- Select option

**Device Functioning:**
- Select option

**Road Character:**
- Begin/End Divided Road
- Bridge
- Crossover

**Road Design:**
- 1 Lane
- 2 Lane
- 3 Lane

**Road Surface Type:**
- Asphalt
- Concrete
- Dirt

**Traffic Control Device:**
- Channel-Painted
- Channel-Physical
- Flag Person

**Bikeway Type:**
- None
- Signed
- Right Only

### Commercial Vehicle Related

**HAZMAT Released:**
- Select option

**Cargo Body Type:**
- Grain/Chips/Gravel
- Flatbed
- Polo/Log

### Output Options:
- Statistics Only
- Map
- Data

[Submit] [Reset]
Spatial Query
Use the following steps to create a polygon on the map:

1. Click **Capture Map Input** to begin.
2. Click on the map to indicate the beginning point of the polygonal area of interest.
3. Continue clicking points on the map to draw the polygonal area of interest.
4. Double-click the last point of the polygonal area of interest (the minimum number of points is 3). The polygon will automatically be closed and completed.
5. Is the shaded polygon the correct area of interest? If so, click “Populate List.” If not, click “Redigitize.”
6. Select the Route of interest from the list:

   ![Populate List]

7. Is the selected Route correct? If so, click “Save & Return.” If not, reselect the Route from the list.
8. Click “Cancel” to return to the Interactive Map Options menu.

![Save & Return]

![Redigitize]

![Cancel]
**Data Summary:**
- Total Crashes: 45
- Total Fatalities: 0
- Total Injuries: 19
- Injury Crashes: 13
- Daylight Crashes: 28
- DUI Crashes: 9
- Wet Conditions Crashes: 23
- Unmapped Crashes: 0

**Spatial Query:**
- [polygonlist]
  - Route Name: I-110

**Table:**
<table>
<thead>
<tr>
<th>SAMS Route ID</th>
<th>SAMS Intersection</th>
<th>Intersection Dist</th>
<th>Intersection Dir</th>
<th>Intersection Dir</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-110</td>
<td>US 90</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-110</td>
<td>DIVISION ST</td>
<td>250</td>
<td>F</td>
<td>N</td>
</tr>
<tr>
<td>I-110</td>
<td>DIVISION ST</td>
<td>0.25</td>
<td>M</td>
<td>N</td>
</tr>
<tr>
<td>I-110</td>
<td>DIVISION ST</td>
<td>250</td>
<td>F</td>
<td>N</td>
</tr>
<tr>
<td>I-110</td>
<td>DIVISION ST</td>
<td>500</td>
<td>F</td>
<td>N</td>
</tr>
<tr>
<td>I-110</td>
<td>DIVISION ST</td>
<td>0.5</td>
<td>F</td>
<td>N</td>
</tr>
<tr>
<td>I-110</td>
<td>BAY VIEW AVE</td>
<td>0.12</td>
<td>M</td>
<td>N</td>
</tr>
<tr>
<td>I-110</td>
<td>US 90</td>
<td>0.12</td>
<td>M</td>
<td>N</td>
</tr>
<tr>
<td>I-110</td>
<td>US 90</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-110</td>
<td>US 90</td>
<td>150</td>
<td>F</td>
<td>W</td>
</tr>
<tr>
<td>I-110</td>
<td>US 90</td>
<td>20</td>
<td>F</td>
<td>N</td>
</tr>
<tr>
<td>I-110</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-110</td>
<td>US 90</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-110</td>
<td>US 90</td>
<td>150</td>
<td>F</td>
<td>S</td>
</tr>
<tr>
<td>I-110</td>
<td>US 90</td>
<td>150</td>
<td>F</td>
<td>S</td>
</tr>
<tr>
<td>I-110</td>
<td>US 90</td>
<td>300</td>
<td>F</td>
<td>S</td>
</tr>
<tr>
<td>I-110</td>
<td>US 90</td>
<td>300</td>
<td>F</td>
<td>S</td>
</tr>
<tr>
<td>Reported Date</td>
<td>Reported Time</td>
<td>SAMS Crash Type</td>
<td>Vehicle Count</td>
<td>Road Condition</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------</td>
<td>-----------------</td>
<td>---------------</td>
<td>----------------</td>
</tr>
<tr>
<td>06/22/2007</td>
<td>11:56</td>
<td>Angle</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>11/27/2007</td>
<td>12:38</td>
<td>Sideswipe</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>07/10/2007</td>
<td>14:59</td>
<td>Angle</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>07/03/2007</td>
<td>17:28</td>
<td>Angle</td>
<td>2</td>
<td>Wet</td>
</tr>
<tr>
<td>09/21/2007</td>
<td>21:20</td>
<td>Angle</td>
<td>2</td>
<td>Wet</td>
</tr>
<tr>
<td>07/15/2007</td>
<td>16:08</td>
<td>Angle</td>
<td>2</td>
<td>Wet</td>
</tr>
<tr>
<td>11/08/2007</td>
<td>16:20</td>
<td>Angle</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>12/28/2007</td>
<td>10:46</td>
<td>Left turn cross traffic</td>
<td>2</td>
<td>Wet</td>
</tr>
<tr>
<td>04/09/2007</td>
<td>14:54</td>
<td>Left turn cross traffic</td>
<td>2</td>
<td>Wet</td>
</tr>
<tr>
<td>01/15/2007</td>
<td>07:42</td>
<td>Angle</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>02/24/2007</td>
<td>13:40</td>
<td>Angle</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>01/12/2007</td>
<td>11:06</td>
<td>Rear and slow or stop</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>08/05/2007</td>
<td>06:53</td>
<td>Rear and slow or stop</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>07/25/2007</td>
<td>12:53</td>
<td>Rear and slow or stop</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>08/28/2007</td>
<td>10:14</td>
<td>Angle</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>07/11/2007</td>
<td>11:39</td>
<td>Parked vehicle</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>06/02/2007</td>
<td>16:04</td>
<td>Hit and Run</td>
<td>3</td>
<td>Dry</td>
</tr>
<tr>
<td>10/08/2007</td>
<td>12:21</td>
<td>Hit and Run</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>09/12/2007</td>
<td>15:42</td>
<td>Hit and Run</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>09/13/2007</td>
<td>14:34</td>
<td>Fixed Object</td>
<td>1</td>
<td>Dry</td>
</tr>
<tr>
<td>09/04/2007</td>
<td>13:41</td>
<td>Rear and slow or stop</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>11/28/2007</td>
<td>07:31</td>
<td>Rear and turn</td>
<td>2</td>
<td>Dry</td>
</tr>
<tr>
<td>11/13/2007</td>
<td>14:14</td>
<td>Other Object</td>
<td>1</td>
<td>Dry</td>
</tr>
</tbody>
</table>
Column Selector for Data Grid

Available Categories:
- Crash
- Vehicle
- Person

Selected Columns:
- SAMS Crash ID
- County Name
- SAMS City Name
- SAMS Route ID
- SAMS Intersecting Route ID
- Street Name
- Intersecting Street Name
- HWY/County Road#
- Intersecting HWY/County Road #
- Intersection Indicator
- Intersection Distance
- Intersection Distance Unit of Measure
- Intersection Direction
- Traffic Flow Description
- Reported Date
- Reported Time
- SAMS Crash Type Description

Sort Order:
- SAMS Route ID
- Asc.
- Desc.
- Street Name
- Asc.
- Desc.
- HWY/County Road#
- Asc.
- Desc.

Records per Page: 25
Group Rows by Crash
Clear
Apply
### Data Grid Functions

#### MDOT Safety Analysis Management System (SAMS) - Microsoft Internet Explorer

**Data Summary:**
- Total Crashes: 99
- Total Fatalities: 0
- Total Injuries: 61
- Triplex Crashes: 40
- Daylight Crashes: 68
- DUI Crashes: 8
- Wet Conditions Crashes: 23
- Unmapped Crashes: 0

**Query Summary:**
- Start Date: 01/01/2007
- End Date: 01/01/2008
- Spatial Query: [rectangle]

#### Crash Data

<table>
<thead>
<tr>
<th>Reported Date</th>
<th>Reported Time</th>
<th>SAMS Crash Type</th>
<th>Vehicle Count</th>
<th>Road Condition</th>
<th>DUI Involved</th>
<th>Light Condition</th>
<th>Crash Location</th>
<th>Invest</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/22/2007</td>
<td>11:54</td>
<td>Angle</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>11/27/2007</td>
<td>12:38</td>
<td>Slip</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>07/13/2007</td>
<td>14:59</td>
<td>Angle</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>07/03/2007</td>
<td>17:28</td>
<td>Angle</td>
<td>2</td>
<td>Wet</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>09/21/2007</td>
<td>21:20</td>
<td>Angle</td>
<td>2</td>
<td>Wet</td>
<td>0</td>
<td>Dark-Lt</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>07/15/2007</td>
<td>16:08</td>
<td>Angle</td>
<td>2</td>
<td>Wet</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>11/08/2007</td>
<td>16:20</td>
<td>Angle</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>12/28/2007</td>
<td>10:46</td>
<td>Left turn cross traffic</td>
<td>2</td>
<td>Wet</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>04/04/2007</td>
<td>14:54</td>
<td>Left turn cross traffic</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>01/16/2007</td>
<td>07:42</td>
<td>Angle</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>02/24/2007</td>
<td>13:40</td>
<td>Angle</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>01/12/2007</td>
<td>11:06</td>
<td>Rear end or side of another vehicle</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>08/05/2007</td>
<td>06:53</td>
<td>Rear end or side of another vehicle</td>
<td>2</td>
<td>Dry</td>
<td>1</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>07/25/2007</td>
<td>12:53</td>
<td>Rear end or side of another vehicle</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>08/24/2007</td>
<td>10:14</td>
<td>Angle</td>
<td>2</td>
<td>Wet</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>07/11/2007</td>
<td>11:39</td>
<td>Parked vehicle</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Parking Lot</td>
<td>2401</td>
</tr>
<tr>
<td>09/02/2007</td>
<td>18:04</td>
<td>Hit and Run</td>
<td>3</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>10/08/2007</td>
<td>12:21</td>
<td>Hit and Run</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>09/12/2007</td>
<td>15:42</td>
<td>Hit and Run</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>09/13/2007</td>
<td>14:34</td>
<td>Fixed Object</td>
<td>1</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>09/04/2007</td>
<td>13:41</td>
<td>Rear end or side of another vehicle</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>11/28/2007</td>
<td>07:31</td>
<td>Rear end and turn</td>
<td>2</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Roadway</td>
<td>2401</td>
</tr>
<tr>
<td>11/13/2007</td>
<td>14:14</td>
<td>Other Object</td>
<td>1</td>
<td>Dry</td>
<td>0</td>
<td>Daylight</td>
<td>Parking Lot</td>
<td>2401</td>
</tr>
</tbody>
</table>
SAMS Data Grid Functions

- Promote Selection
- Invert Selection
- Multi-Column Sort
- Remove Rows
- Clear Selection
- Highlight Selection on Map
- Map All
- MUCR Crash diagram
- Collision diagram
- Export to Excel
- Export to CSV
- Report
- Save Result Set
- View Statistics
Narrative:
V1 was southbound on the I-110. V1 lost control when crossing the draw. Driver of V1 steered left and right trying to regain control of the vehicle. V1 struck the center concrete divider causing damage to the front of V1.
SAMS Analysis Functions

- Sliding Scale Analysis
- Cost-Benefit Analyses
- Rank High Crash Locations
- Severity Index
- Crash Rates and Critical Crash Rates
- Semi Automated Countermeasures

- Crash Rates for Homogenous Intersections and Highway Sections
- Identify Over-Representation of Crash Types at Intersections & Highway Sections
- Pre and Post Improvement Crash Rate Analyses

Note that many of the analysis functions listed here are currently under development, not in production yet.
What are the SAMS Reporting functions?

- Standard Reports
- Annual Crash Reports
- Customized Reports
- Maps and Printing
- Export from Data Grid
- Interactive Data Grid Reports
- User Reporting Classes (admin)
SAMS Administrator Functions

- User Management (security modules controls)
- Crash Data Loading
- Formula Edits (ie. crash cluster defaults)
- Alias Management
- Manage saved queries and result sets
- Define Collision Diagram templates
- Column Selector Defaults for Data Grid(s)
SAMS Architecture

- Modular, web-based architecture
- Active Directory
- .NET
- Oracle Spatial
- GMWM
- LDMx
- ActiveReports for .NET
- Infragistics Data Grid
- Adobe SVG Plug-in
- Visual Statement collision diagramming
Project Status

Phase I (complete)
- Project goals and objectives
- System requirements
- Preliminary data model

Phase II
- High level design (complete)
- Alpha release (complete)
- Beta release detailed design (complete)
- Beta release development (complete)
- Beta release deployment (complete)
- 1.0 release (development is underway)

Phase III
- Maintenance, technical support, and enhancements (begins at acceptance of 1.0 release).
Questions?

Jesse Jay - GeoDecisions
• Director of Transportation
• (941) 747-0729
• jjay@geodecisions.com

Jim C. Willis - Mississippi DOT
• State Safety Engineer
• (601) 359-1455
• jcwillis@mdot.state.ms.us