Transportation System Network Replacement Project (TSNR)

Overview

11/22/2019

Agenda

- TSN Background
- Why Replace TSN?
- TSNR Roadmap
- S2AA Update
- Existing/Baseline Process (As-Is)
- Mid-Level Solution Requirements
- Market Research Summary
- Recommended Solutions
- Staffing Plan
- Financial Analysis Worksheet
Agenda

- Project Description
- Current TSN System
- Business Problems/Challenges in Current TSN system
- Project Objectives
- Project Organization
- Project Efforts
- Project Status
- Project Roadmap
- Lessons Learned – CMS
- Summary
- Appendix

Project Scope

Replace the Transportation System Network to meet federal Moving Ahead for Progress in the 21st Century Act (MAP-21) and Fixing America’s Surface Transportation (FAST) Act which will add temporal, geospatial capability, and enhance safety analysis to the system.

This helps improve roadway safety, reduce fatalities and injuries for all road users on all public roads; and support the “Toward Zero Deaths” goal.
Here’s Why

- Safety
- Moving Ahead for Progress in the 21st Century Act (MAP-21)
- Fixing America’s Surface Transportation (FAST) Act
- TSN outdated system
- State Highway System data only

Business Problems/Challenges

I. Inability to Meet Federal Mandates:

**MAP-21 & FAST Act** (23 U.S.C. 119(e)(1))

- Development of a safety data system that can:
  - Link collision, roadway and traffic data by geolocation
  - Identify fatalities and serious injuries on all public roads
  - Retain temporal and historical data
  - Support Performance Measures (PM)
    - PM 1: HSIP and Safety Performance Management
    - PM 2: Pavement and Bridge Condition
    - PM 3: System performance/Freight/CMAG
  - Report on MIRE FDE data

**Existing TSN**

- No geolocation
- No collision, roadway and traffic data on local roads.
- No bike/ped data

Required by 2026
Business Problems/Challenges

II. Inefficiencies in Current Program Operations:

- No Geo-Spatial Enabled Capability
- Obsolete User Interface
- No Ad-hoc Reporting Capability
- Not a Centralized System of Record for Data
- Inefficient Linear Referencing Data Exchange
- Inefficient Traffic and Collision Data Exchange
- Lacking Bike and Pedestrian Data
- Slow Updates
- Complex Data Governance

Project Objectives

- Geolocation
- Store temporal and historical safety data
- Data exchange capability with external agencies
- Centralized repository of inventory, traffic, collision data, and ped/bike data on all public roads
- Fully integrate postmile system
**Project Roadmap**

<table>
<thead>
<tr>
<th>Phase A</th>
<th>Phase B</th>
<th>Phase C</th>
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<tr>
<td><strong>Pre-Phase</strong></td>
<td><strong>Phase 1</strong></td>
<td><strong>Phase 2</strong></td>
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<tr>
<td>Project Approval</td>
<td>Project Roadmap</td>
<td>Roadmap Project Approval</td>
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<tr>
<td><strong>1. TSNR Contingent on R&amp;H Implementation</strong></td>
<td>Safety Analysis &amp; Development</td>
<td>Safety Analysis 2.0 &amp; Development</td>
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<td><strong>Roadmap</strong></td>
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**Progress to Date**

- **Stage 1:** Business Analysis
  - Identify Problems/Opportunities
  - Develop Strategic Alignment
  - Assess Organizational Readiness

- **Stage 2:** Alternatives Analysis
  - Assess Existing Business Processes
  - Market Research
  - Alternative Analysis

- **Stage 3:** Solution Development
  - Procurement and Staffing Strategy
  - Procurement Profile

- **Stage 4:** Project Readiness
  - Solicitation Package
  - Schedule
  - Project Readiness

- **Approved:**
  - Starting 2017
  - 2018
  - 2019
  - 2020

**Executing Stage 3**

- **S1BA:** Project Funding Approval
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### Stage 3: Solution Development Timeline

#### TSNR S3SD Roadmap

<table>
<thead>
<tr>
<th>MAJOR ITEMS</th>
<th>Year 2019</th>
<th>Year 2020</th>
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<tr>
<td></td>
<td>Jun Jul</td>
<td>Aug Sep</td>
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<tr>
<td>3.7.4 To Be Business Process Workflows</td>
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<td>Nov Dec</td>
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<td>3.7.4 Detailed Solution Requirements</td>
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<td>3.8.1 Scope of Work</td>
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<td>Jan Feb</td>
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<tr>
<td>3.18.0 Project Management Planning</td>
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<td>Mar Apr</td>
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<td>3.20.0 Solicitation Package</td>
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<td>May Jun</td>
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<td>Jul Mid-Aug</td>
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- **Step 1: To-Be Workflows**
  - Prepare for and conduct Work Sessions related to Traffic Volume; Safety/Investigation; TASAS; Collision Coding; IT (Security, Network, & Application); LRS / GIS; Legal; TAMS; PaveM; HPMS; MIRE; Local Agency Data Portal
  - Build / Revise / Update Workflow Diagrams
  - Review and Iterate with Stakeholders
  - Finalize workflow diagrams

- **Step 2: Detailed Requirements**
  - Prepare for and conduct Work Sessions related to Traffic Volume; Safety/Investigation; TASAS; Collision Coding; IT (Security, Network, & Application); LRS / GIS; Legal; TAMS; PaveM; HPMS; MIRE; Local Agency Data Portal
  - Develop Detailed Requirements
  - Review and Iterate with Stakeholders
  - Detailed Requirements

- **Step 3: Statement of Work**
  - Define Major Scope of Work Elements
  - Develop Scope of Work Sections: SOW Security Attributes; Planning and Development Dates; Risk Assessments; Evaluation Scorecard
  - Develop draft SOW for review and submission

- **Step 4: Solicitation Package**
  - Develop draft Solicitation Package for review
  - Develop Project Management Plans (Change Control, Configuration, Quality, Testing)
  - Caltrans Review
  - CalSTA Review
  - CDT Review
Current System

TSN Supported by Four Groups

**Division of Research, Innovation and System Information (DRISI)**

- **Collision Coding:** Data from CHP, each collision located on network, information about each collision encoded. 300,000 to 400,000 per year (all roads)
- **Highway Inventory:** Attributes of state highways, authoritative postmile reference. >16,000 centerline miles, >394,000 lane miles are tracked (number of lanes, medians, surface types, barrier types, etc.)

**Division of Traffic Operations (DTO)**

- **Traffic Volume and Census:** Traffic counts and types on all state highways
- **Safety:** Analysis to find statistically significant collision locations and types; Investigation to evaluate causes and engineer mitigation
Current TSN

- Accident
  - Locations
  - Sequence of Events
- Highway
  - Through Lanes
  - Median Types
  - Surface Types
  - Many More
- Volume
  - AADT
  - Truck AADT
  - Veh.Class Counts
- TIRTS
  - Traffic Investigation Reports

Reports:
- Table B
- Table C
- TSAR
- Highway Sequence
  - Listing/Postmile Log

Publications:
- Collision Data on State Highway
- Annual Traffic Volumes and Peak Hour Data

Sources of Data

- DRISI
  - TASAS Branch
    - Construction Plans
    - Permits
  - Collision Coding Unit
    - California Highway Patrol (CHP)
      - Statewide Integrated Traffic Records System (SWITRS) database
      - Traffic collision reports (TCRs)

- DTO
  - Traffic Data Branch
    - Data from the Districts
  - Traffic Investigations Branch
    - Information from the Districts
    - Traffic Investigation Reports (TIRs)
Reports

- DRISI Reports
  - TASAS Branch
    - Table A
    - Table B - Selective accident rate calculation
    - Table C - High accident concentration locations
    - Wet Table C - High accident concentrations under wet conditions
    - TSAR (TASAS Selective Accident Retrieval) - A detailed list of accidents and/or summary of types of accidents on any section of highway, ramp, or intersection in the SHS
    - Postmile Log
- Collision Coding Unit
  - Collision Data on California State Highways - Annual collision summaries on SHS

- DTO Reports
  - Traffic Data Branch
    - Annual Publications for Traffic Volumes and Truck Volumes
      - Traffic Volumes
      - Truck Traffic
    - Volumes and Peak Hour Volume Data
    - Monthly VMT
    - County VMT
    - Mobility Performance
  - Traffic Investigations Branch
    - Safety and monitoring reports for Office of Performance
    - Significantly high accident concentrations locations: Quarterly reports

Types of Usage

- A large number of users extract data (or receive data extracts) from TSN and manipulate the data for different purposes including:
  - GIS mapping (LRS tools)
    - Office of Data and Service Technology
  - Safety analysis
  - Inventory management
  - Strategic planning
  - HPMS Submittal (Highway Performance Monitoring System)
    - HPMS Branch
  - PaveM (Pavement Management System)
  - IMMS (Integrated Maintenance Management System)

- Tools used to transform TSN data
  - TOAD
  - FoxPro
  - MS Access
  - MS Excel
  - ArcMap
  - PeMS
- Transformed Data forms
  - Adobe PDF
  - Shapefiles
  - KML Files
  - Esri Geodatabase
Current TSN System

- Enterprise Oracle application
- Maintain and link traffic census, collision and highway inventory data
- Base information system for all traffic safety analysis
- Used by many functional areas across the Department
- Maintained by DRISI, Division of Traffic Operations, and IT
- The TSN is out of date
Business Problems, Current Inefficiencies

- No Geo-Spatial Enabled Capability
- Obsolete User Interface
- No Ad-hoc Reporting Capability
- No Centralized System of Record for Data
- Inefficient Linear Referencing Data Exchange
- Inefficient Traffic and Collision Data Exchange
- Lacking Bike and Pedestrian Data
- Slow Updates, Complex Data Governance

Risk of Not Implementing TSNR

- Non-compliance with MAP-21 and the FAST Act
- More than $200 million of federal funds
- Missed opportunity to achieve the department’s goal
  - Safety toward Zero Death
Proposed System

Vision For The New TSN

<table>
<thead>
<tr>
<th>Sub-Capability</th>
<th>Collision</th>
<th>Traffic Census</th>
<th>Highway Inventory</th>
<th>Safety</th>
<th>General</th>
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<tbody>
<tr>
<td>I. Location, Mapping, Geospatial</td>
<td>Synchronization</td>
<td>LRM Conversion</td>
<td>Segmentation</td>
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<td>II. Temporality</td>
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<td>III. Data Entry/ Edit</td>
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<td>IV. Data Management Workflows</td>
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<td>V. Query/ Report</td>
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<td>VI. Data Integration</td>
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New Functionality
Market Research Conclusions

- Marketplace contains suitable COTS applications
  - No single COTS application
  - Vendors are willing to be COTS application integrators
- Other DOTs
  - Separate systems for each type of data
  - Safety analysis “draws these together”
  - Data quality issues are common
- Recommendation: multiple COTS applications
  - Allows “best of breed” approach for different modules
  - Increases flexibility: replace modules instead of whole system in future
  - Downside: inherently more complicated solution
- Not Evaluated in Detail: Custom Coding
  - COTS is preferred orientation

TSNR Solution Approach and Benefits

Solution Approach

- Deploy modular components for user interface and transactional data.
- Proposed architecture simplifies data management.
- Utilize “best of breed” COTS solution(s) as a priority (some MOTS is likely when considering integration)
- Procurements for:
  - Assistance with the development of the Project Approval Lifecycle (PAL) vendors
  - System Integrator – Implementation of “best of breed”
  - Organizational Change Management
  - Independent Verification & Validation
  - Independent Project Oversight Consultant (CDT Billing)

Benefits

- Different modules for each business unit allows for a phased roll-out.
- An integrated system minimizes the existing redundancy of current system capabilities.
- Transfer risk to System integrator (SI) as the prime contractor.
- An integrated system that leverages the agency’s investment (LSR) in geospatial technology.
Possible Hosting Platforms

TSNR could be on multiple hosting platforms:

- **Inventory** (data in Roads and Highways)
  - On-Premise Server (Roads and Highways implementation)
- **Collision Coding**
  - On-Premise Application Server, On-Premise database (SQL Server)
- **Traffic Volume**
  - SaaS vendor, cloud-based server and database
- **Safety Analysis**
  - SaaS vendor, cloud-based server and database
- **Data Warehouse**
  - On-Premise database (SQL Server) and API server (manages API calls to database)
IT and the Recommended Solution

COTS Applications (All Tiers)

Authoritative Data Repository (Vendor Implements, IT Supports)

APIs (Vendor Implements, IT Supports and Extends)

Module Example - Collision Coding

TCR Info/Data

Network GIS / LRS
Highway Inventory

Collision Coding Application

Report Analysis
Ad Hoc Reports

Authoritative Data (Warehouse)

Passes QC

To Other Systems (TAMS, PeMS, etc.)

Transaction Collison Data

Quality Control Workflows

Passes QC

Fixes

QC Fixes
Collaboration and Oversight

Project Strategy

- Focus on Linear Referencing System (LRS), roadway, and crash data
- Provide the ability for data sharing among the Transportation departments
- Continued collaboration with traffic collision data from California Highway Patrol (CHP)
Project Organization, Oversight and Management

Executive Steering and Sponsorship

EXECUTIVE STEERING COMMITTEE

Dave Moore (Acting)
Planning and Modal Programs

Karl Kopper
IT Security Services Division

Chad Baker
Geospatial Data Officer

Rihui Zhang
Local Assistance Division

Steve Takigawa
Maintenance & Operations

Mike Nguyen
IT Infrastructure Management Division

Luc Soo
Project & Portfolio Management Unit

George Akiba
Chief Information Officer

Jesse Bhullar
Traffic Operations Division

Cara Wheeler
Division of Research, Innovation and Systems Information

Seed Bakhshi
Application Development and Support Division

PROJECT SPONSORS

Dave Moore (Acting)
Planning and Modal Programs
Deputy Director

Steve Takigawa
Maintenance & Operations
Deputy Director
Transportation System Network:
- The Transportation System Network (TSN) is an enterprise application shared across Caltrans Divisions and maintained by the Traffic Accident Surveillance and Analysis System (TASAS) Branch.
- Data included in the various modules; highway inventory, traffic volumes, and collision locations are analyzed within the system to generate quarterly and annual reports identifying highway locations for federal reporting and traffic safety investigations.
- Federal legislation requiring the enhancement and expansion of safety data and analysis include: Moving Ahead for Progress in the 21st Century (MAP-21), Fixing America’s Surface Transportation (FAST) Act, and Model Inventory of Roadway Elements (MIRE).

Problems:
- TSN lacks the ability to meet Safety Analysis Requirements, as mandated by the Federal Highway Administration.
- TSN lacks the ability to transfer data between TSN and other systems (i.e., Performance Measuring System, CHP Traffic Collision Reports, and Linear Referencing Data (Inventory)).
- TSN lacks the ability to collaborate with local agencies, which results in a lack of local streets and road data (inventory, volumes, and collisions) within the system, which is federally mandated.
- TSN lacks the ability to host pedestrian and bike data (inventory, volumes, and collisions), which is federally mandated.

Proposed Project Scope:
- Implementation of a safety data solution that can:
  1. Identify fatalities and serious injuries by geolocation
  2. Retain temporal and historical data, so reports can be created that identify at any point in time what the characteristics of the roadway are/were
  3. Identify fatalities and serious injuries on all state and local roads.
  4. Report on FHWA’s MIRE subset that directly supports Highway Safety Improvement Program (HSIP) implementation efforts, with the ability to accommodate future MRE requirements.

Consequences of Not Implementing TSNR:
- Federal Mandates require that MAP-21 and FAST Act requirements be implemented by 2026. The inability to meet these requirements will put the department at risk of losing federal funding.

Key Project Risks:
- If the Linear Referencing System Project (Esti Roads and Highways) is not implemented prior to TSNR go-live then project go-live will be delayed.
- If the implementation doesn’t deliver an integrated product that provides functionality to all TSN business areas, then key project objectives will not be attained.

Recommended Solution:
- Market research did not find one integrated solution. The recommended solution consists of a modular approach making it possible to select “best of breed” COTS modules with the least amount of modifications by the system integrator.
Questions?