DOCKETED

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High Accuracy Mapping for Excavation Damage Prevention and Emergency Response (PIR-15-014)

Gas Technology Institute (GTI)

LocusView (LVS)

Natural Gas Infrastructure Safety and Integrity Research Program Workshop
CALIFORNIA ENERGY COMMISSION
July 7, 2017

WHO WE ARE

GTI is a not-for-profit organization providing R&D services for the natural gas industry through collaborative programs

LocusView is a GTI subsidiary providing commercial-scale technology and services for advanced geospatial and mobile solutions

PROJECT STRUCTURE

- Funding from California Energy Commission

- GTI is the prime contractor

- LVS is sub-contractor to GTI

- Pacific Gas and Electric (PG&E) is utility partner and potential technology end-user

BACKGROUND

- Significant portion of natural gas infrastructure in the US is reaching the end of its design life and many states aggressively implementing infrastructure and replacement programs

    - Replacement programs present a unique opportunity to create high accuracy maps and records for routine operations and emergency response

- Advances in mobile technology (smartphones and tablets), geospatial systems Geographical Information Systems (GIS) and Global Positioning Systems (GPS) and computing infrastructure (cloud and web) provide the tools to support highly accurate mapping system and situational awareness tools for routine and emergency response

- GTI developed a proof-of-concept system funded by Operations Technology Development NFP (OTD) and tested in the PG&E territory in 2015

    - PG&E end-users collected 111 features and 1373 feet pipe with the average accuracy of 7-inches, with 90% features with better than 4-inch accuracy

PROJECT GOALS - SUMMARY

- To support implementation of technology to create and display asset maps for situational awareness during routine and emergency events using recent advances in mobile, GIS, and GPS technologies

- Project plan includes implementation of the system in the PG&E service territory

PROJECT OBJECTIVES

1. Deploy 20 high accuracy mapping systems in the PG&E service territory to support enterprise adoption by developing workflows to support business processes and identifying barriers to full deployment.
   - Performance metric – time required to get map data from the field to the enterprise GIS.

2. Deploy a situational awareness tool to present asset maps to 20 field crews based on their location and permission levels.
   - Performance metric – accuracy and completeness of the map data presented to each user group.

BENEFITS

- Improve public safety and system integrity by reducing excavation damage

- Improve public safety by promoting situational awareness through the visualization of high accuracy maps and related information during emergencies

- Increase operational efficiencies by reducing the amount of time required to locate assets for engineering, operations, and one-call activities

- Reduce methane emissions by preventing pipe damage and reducing leaks

TECHNOLOGY SUMMARY

- Technology to create spatially accurate maps populated with traceability data

    – Mobile GIS applications

    – High accuracy GPS

    – Barcode scanning

    – Sensor based data collection

- Data captured in field during construction, repairs, other operations

- Traceability data for:

    – Materials

    – Joints

    – Operator Qualifications (OQ) Status

    – Pressure Tests

MATERIAL TRACKING & TRACEABILITY

- Reads and decodes ASTM F2897 (or other) barcodes
- Creates GIS features and populates attribute information
- Performs real-time validations of material properties (recalls, UV exposure)
- Maps assets with high-accuracy GPS

Source: LVS

Source: LVS
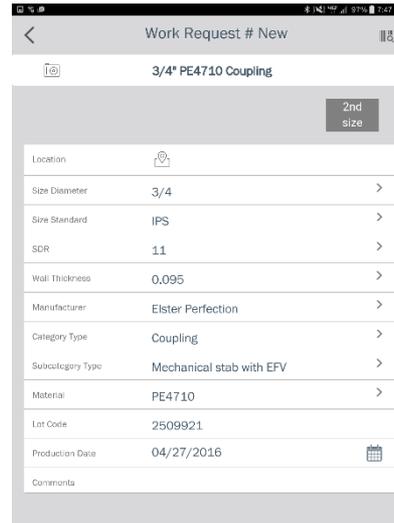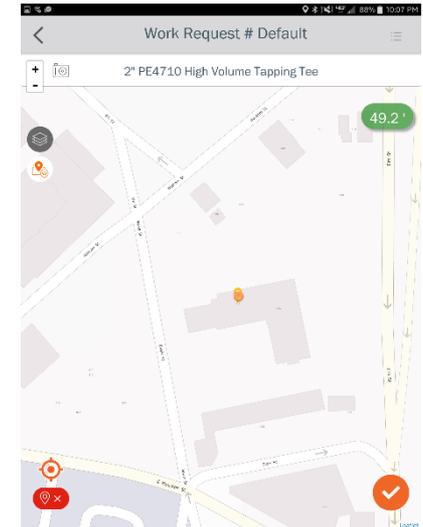
Source: LVS

Source: LVS

JOINT TRACEABILITY

- Creates joint (weld, fusion, or mechanical fitting) traceability barcode
- Captures machine make, model, and calibration date
- Captures parameter data from fusion machines

Source: LVS

Source: LVS
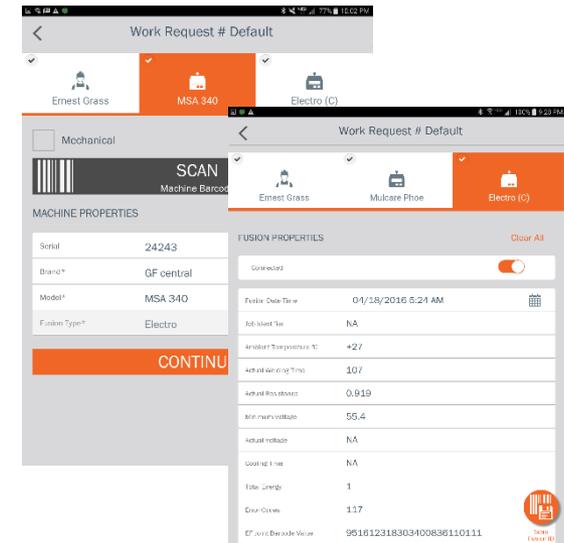
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OQ TRACEABILITY

- Uses third-party or custom OQ cards
- Performs real-time validations of OQ status
- Records OQ status for various field activities
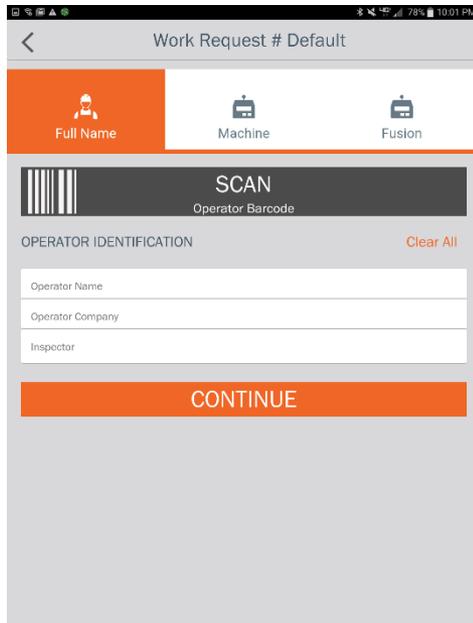
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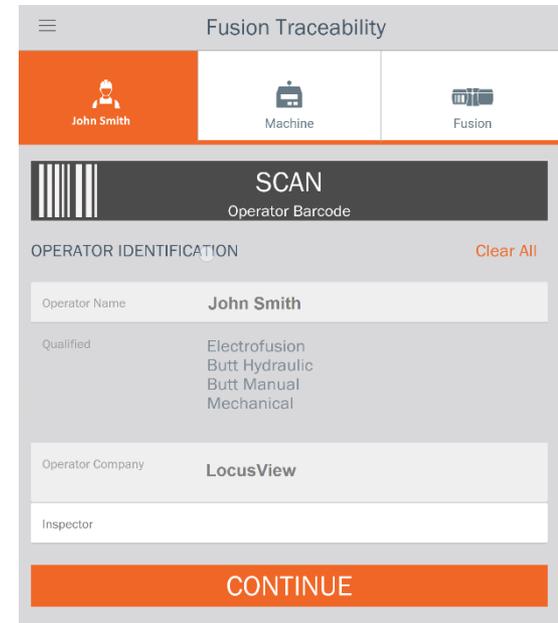
Source: LVS

PRESSURE TEST TRACEABILITY

- Creates a verifiable pressure test record that is associated with specific assets or project numbers
- Monitors tests against pre-defined requirements
- Provides real-time monitoring and alerts

Source: LVS
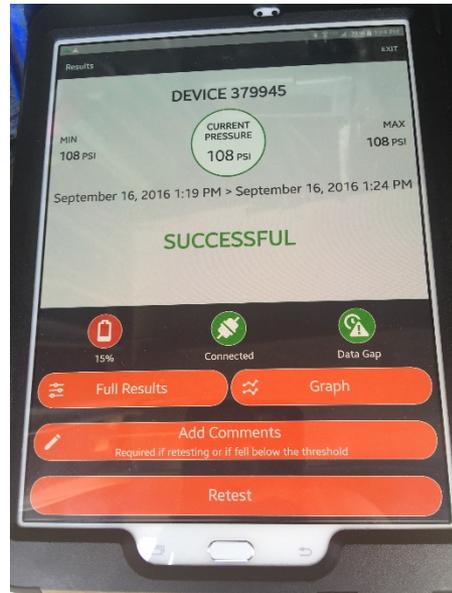
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Source: LVS

HIGH ACCURACY MAPPING

Completed

- Procured tablets, GPS Units, Real Time Kinematic (RTK) base station materials and accessories for pilot project
- Prepared detailed design document together with PG&E
- Completed design and configuration for the data collection software
- Held weekly stakeholder conference call with PG&E
- Completed User Acceptance Test Plans with PG&E input
- Completed User Acceptance Testing and Test Report
- Provided training and deployed 18 of 20 target units
- Installed 8 RTK base stations in PG&E service territory

On-going/Next Steps

- Continue weekly status/feedback calls with PG&E
- Monthly software updates
- Train/deploy final 2 units, addition of Joint and Pressure Test Module

HIGH ACCURACY MAPPING SYSTEM

Mapping Hardware/Equipment

- Tablet: iPAD mini
- Barcode Scanner: Zebra
- GPS: EOS Arrow Gold GNSS Receiver
- Survey Pole
- Charging cables & accessories
- Carrying case

Software Configuration

- Data model customization
- Materials list
- Workflow/User Interface customization and improvements

Source: LVS

BASE STATIONS FOR IMPROVING ACCURACY

Hardware/Equipment

- EOS Arrow Gold GNSS Receiver
- Hemisphere A45 GNSS Antenna
- Intel NUC Mini PC
- Low-Loss Antennae Cable
- Web power switch
- 4G/LTE Router
- Lightning protector
- Miscellaneous Peripherals

Software

- Windows 10 Professional
- EOS Utility Desktop
- AGG Software TCP COM Bridge

Source: LVS

TRAINING VIDEO
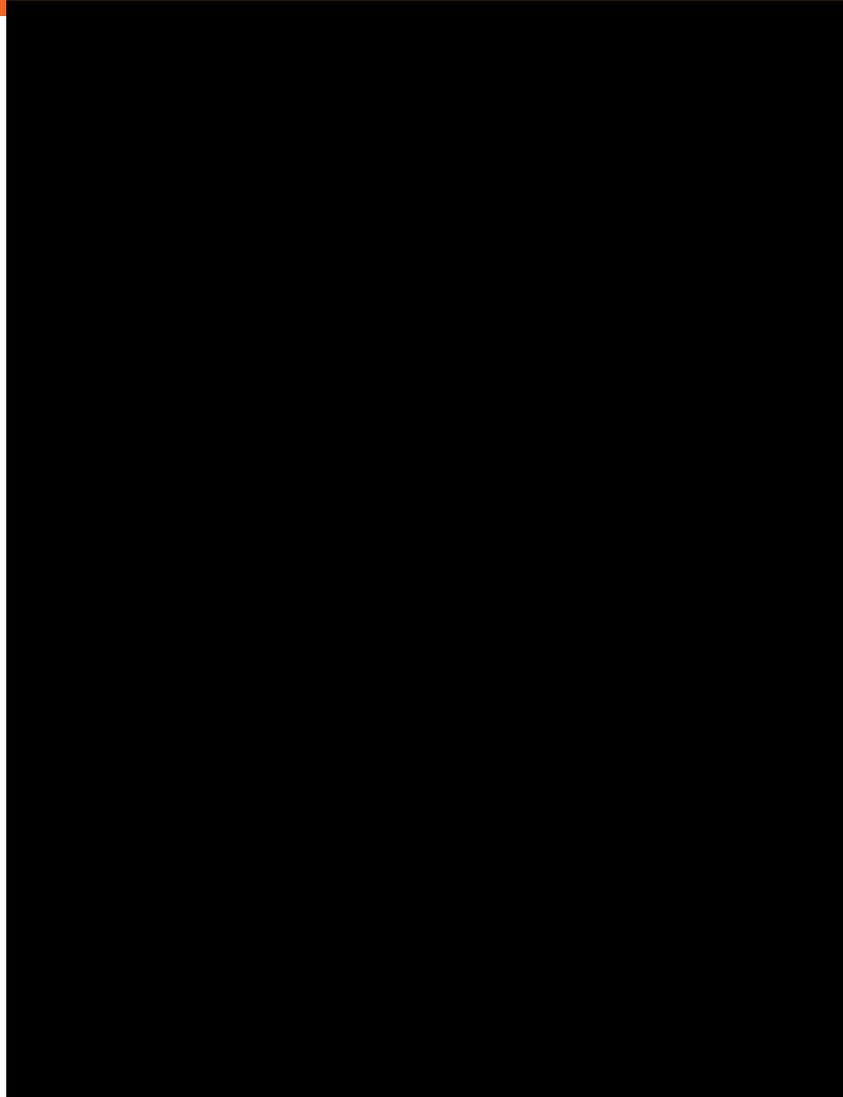
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PILOT DEPLOYMENTS
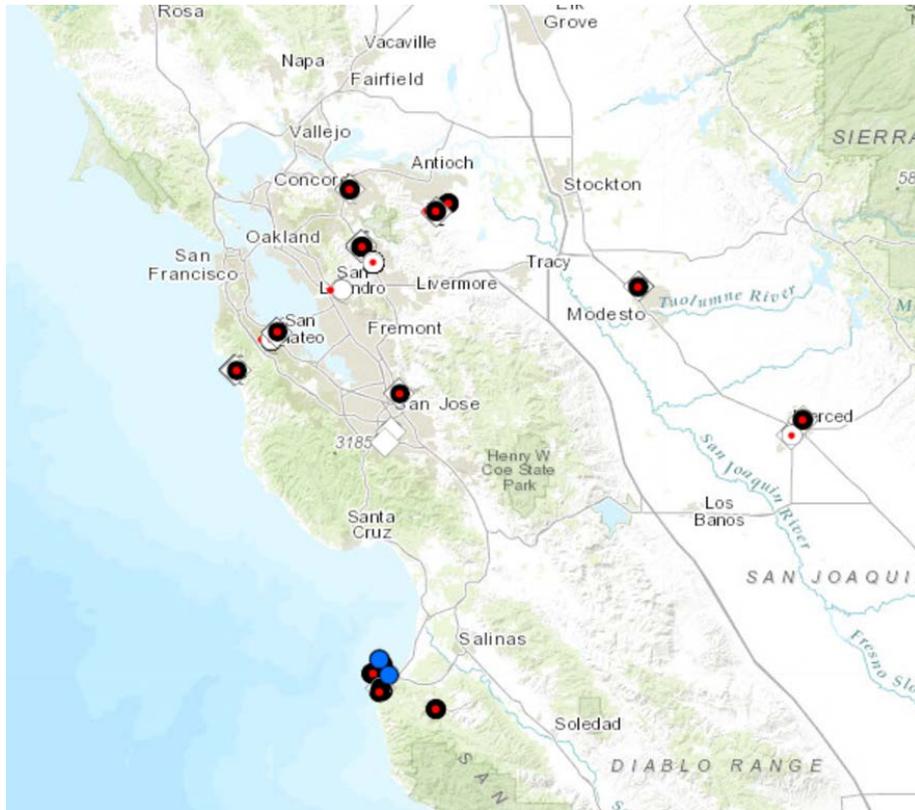
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CURRENT MAPPING ACCURACY
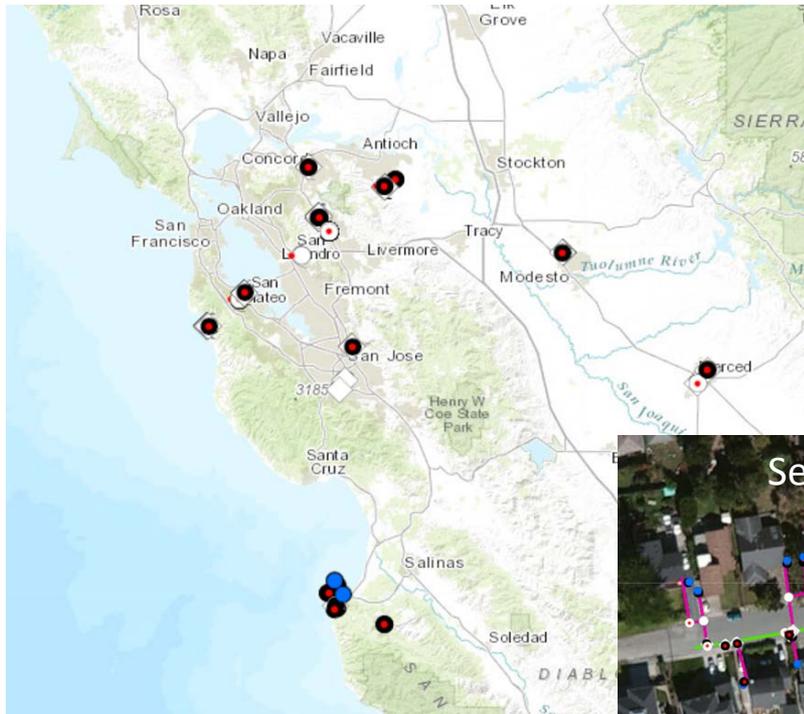
Source: LVS

- Data Collection Summary (to date):
  - >500 fittings
  - >9,000 ft pipe
  - Avg. GPS Accuracy: 10.58 in
  - Median GPS Accuracy: 1.73 in

Service

Main

Fittings

Half Moon Bay

Source: LVS

CHALLENGES & LESSONS LEARNED

GPS/RTK Connectivity Bug
- Mapping application had difficulties maintaining a fixed connection
- LVS made software improvements to fix problem including better on-screen messaging for GPS accuracy

iOS Application Updates
- Unknown complexities between iOS and LVS technology resulted in LVS needing to manually push updates to each tablet
- LVS working on implementing mobile device management (MDM) solution for iPads

SITUATIONAL AWARENESS TOOL

- Developed Use Cases and documented the required functionality
- Developed Process and Workflow diagrams
- Developed draft of User Acceptance Test Plan
- Sent User Acceptance Test Plan to PG&E for comments
- Reviewed current platforms and assessed requirements for the situational awareness process
- Identified Esri-based web application for configuration and use in pilot on iOS devices
- Currently configuring functionality for situational awareness use case/app
- Identified integration points for PG&E's TAMI (Tactical Awareness Mapping Integration) system

STRATEGIC GOALS & PROCESS

- Identified goals of Situational Awareness related to the Gas Industry
- Developed an Inter-Agency Coordination Use Case Model
- Compiled a taxonomy of datasets appropriate for Situational Awareness
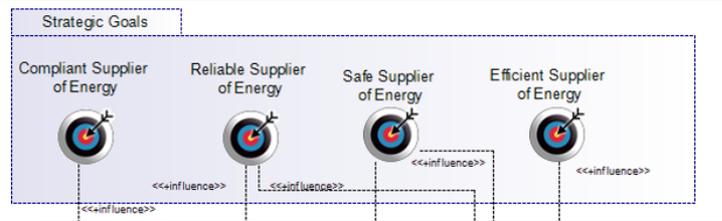

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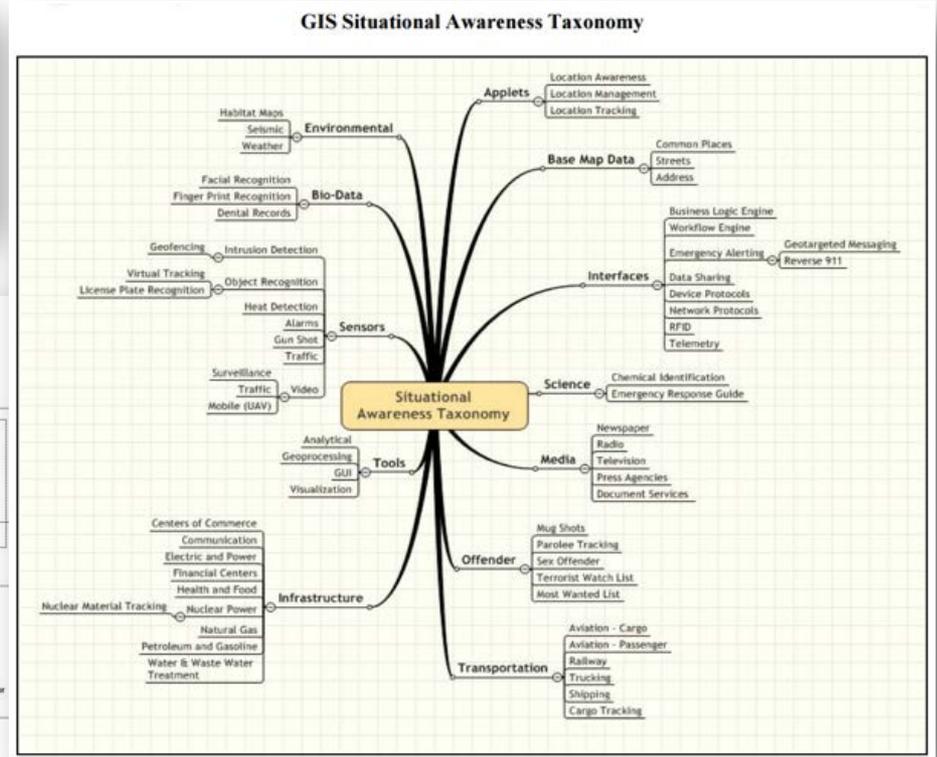
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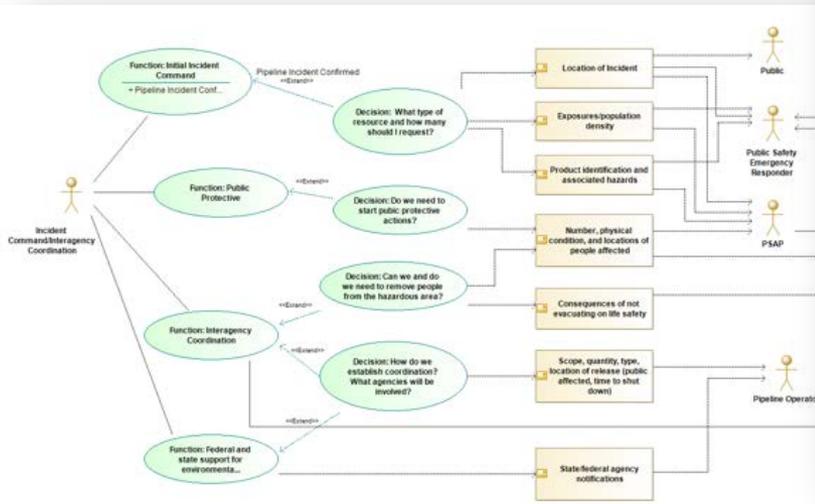
Source: GTI

TOOL CONFIGURATION

- Gathering requirements and defining PG&E-specific Situational Awareness stakeholders
- Technology configuration will incorporate PG&E feedback to incorporate real-time GIS data

Source: GTI
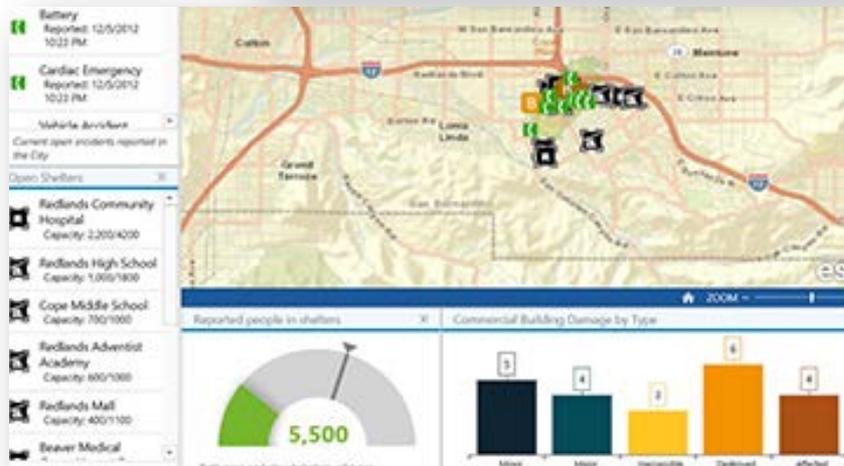
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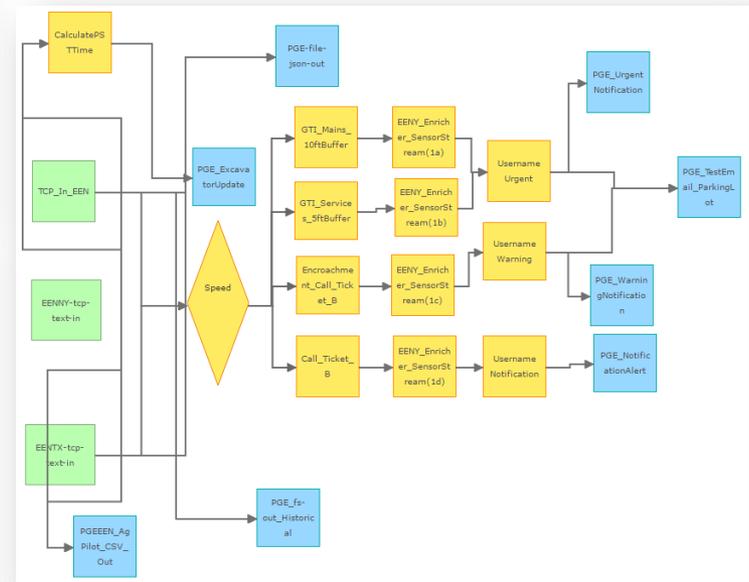
Source: GTI

NEXT STEPS

Activity	Target Completion Date
SA Configuration	7/14/2017
SA Training & Deployment	7/31/2017
HAM Pilot Project Success Metric Data	8/30/2017
SA Pilot Project Success Metric Data	9/30/2017
Pilot Projects Completion	11/28/2017

Questions