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Mobility Application Development & Testing – U.S. Update

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SIS22: International challenges to solutions for sustainable mobility

TOWARDS INTELLIGENT MOBILITY
Better use of space

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Dynamic Mobility Applications Program

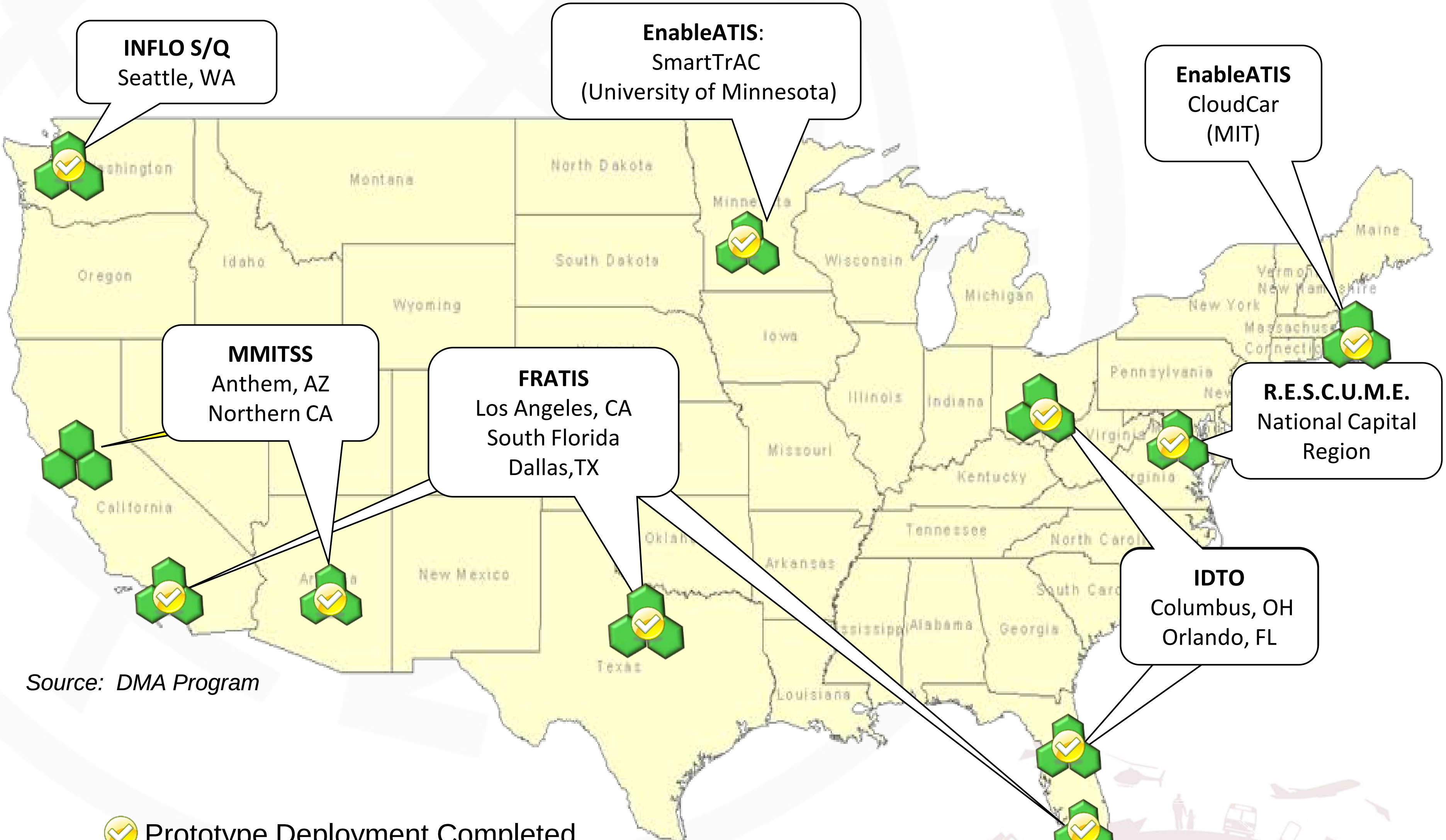
- **Vision**
  - Expedite development, testing, commercialization, and deployment of innovative mobility application
    - maximize system productivity
    - enhance mobility of individuals within the system
- **Objectives**
  - Create applications using frequently collected and rapidly disseminated multi-source data from connected travelers, vehicles and infrastructure
  - Develop and assess applications showing potential to improve nature, accuracy, precision and/or speed of dynamic decision
  - Demonstrate promising applications predicted to significantly improve capability of transportation system
  - Determine required infrastructure for transformative applications implementation, along with associated costs and benefits
- **Project Partners**
  - Strong internal and external participation

DMA Program Approach To Overcoming Two Key Challenges To Application Deployment

- **Challenge 1 (Technical Soundness)**
  Are the DMA bundles technically sound and deployment-ready?
  – Create a series of systems engineering documents (e.g., ConOps, SyRs)
  – Share code from open source bundle prototype development (OSADP website: http://www.itsforge.net/)
  – Demonstrate bundle prototypes (in isolation)
  – Field test integrated deployment concepts from across CV programs

- **Challenge 2 (Transformative Impact)**
  Are DMA bundle-related benefits big enough to warrant deployment?
  – Engage stakeholders to set transformative impact measures and goals
  – Assess whether prototypes show impact when demonstrated
  – Estimate benefits associated with broader deployment
  – Utilize analytic testbeds to identify synergistic bundle combinations

DMA Prototype Development Activity



Source: DMA Program

Prototype Deployment Completed

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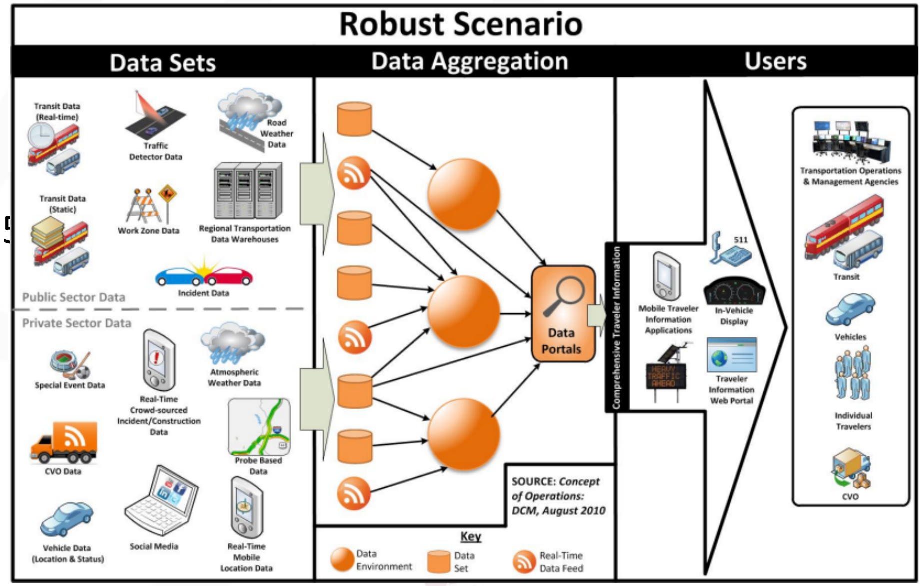
ENABLEATIS DESCRIPTION

- **Objective** - To provide support to the marketplace for application development, i.e., enabling development of Advanced Traveler Information Systems. EnableATIS is not developing a specific application or system, but is rather seeking to formalize a framework whereby multiple activities are envisioned to interact to support a diverse traveler information environment.

- **Projects/Status**
  - SmarTrAC from UMN
    - Demonstrated in December 2014
    - Submitted final report in February 2015
  - CloudCar by MIT
    - Began testing in June 2014
    - Concluded in June 2015
  - ATIS 2.0 Precursor System
    - In preliminary stages

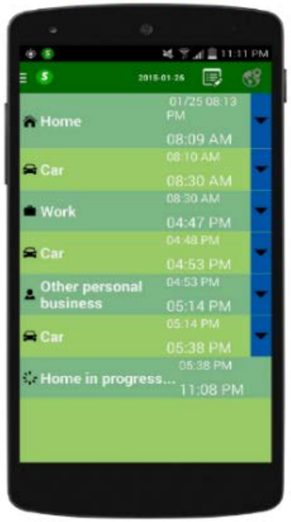


Source: EnableATIS Operational Concept

EnableATIS Key Findings

- **SmarTrAC**
  - Test data indicates acceptable performance of SmarTrAC, with the project team observing a reasonable battery consumption rate, a moderate data storage/transmission requirement, a high accuracy in identifying activity vs. trip episodes, etc.

Calendar



Map

Source: DMA Program

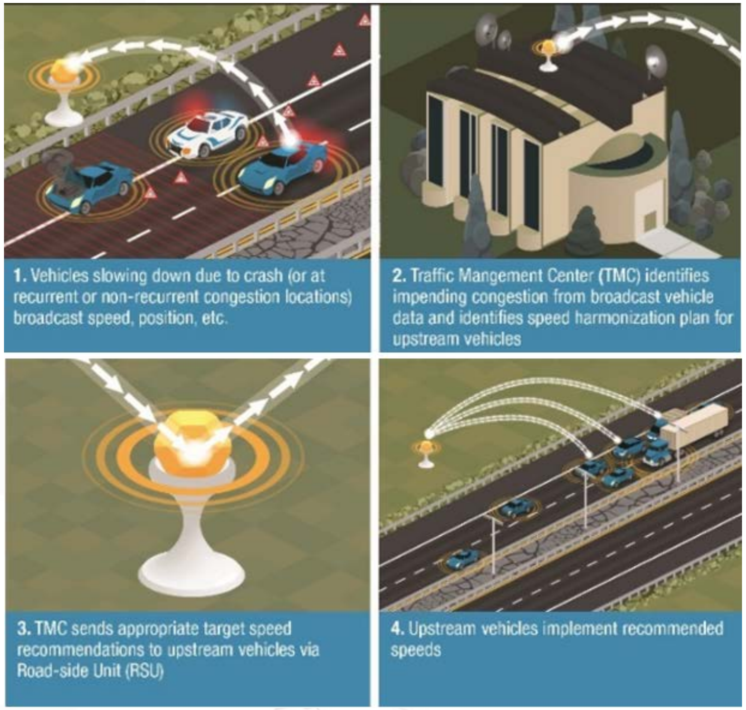
- **CloudCar**
  - The report from CloudCar project indicated that for the current scope of the CloudThink and Mobility as a Service project, MySQL is sufficient. For larger scale deployment of CloudThink and MaaS, a framework better suited for large data should be used, such as Hadoop.

INFLO Description

- **Objective** – To collect and disseminate multi-source data drawn from connected vehicles, infrastructure, and travelers to increase roadway throughput, reduce crashes, emissions and fuel consumption.
- **Prototype**
  - Site: Seattle, WS
  - Applications: SPD-HARM and Q-WARN
- **Status**
  - SPD-HARM and Q-WARN were demonstrated in January 2015.
  - All the final reports are available on the DMA website.
  - CAMP completed technical feasibility study of prototyping CACC in March 2015.

ConOps	SyRs	Prototype	Field Test	IA

Completed In progress Not started

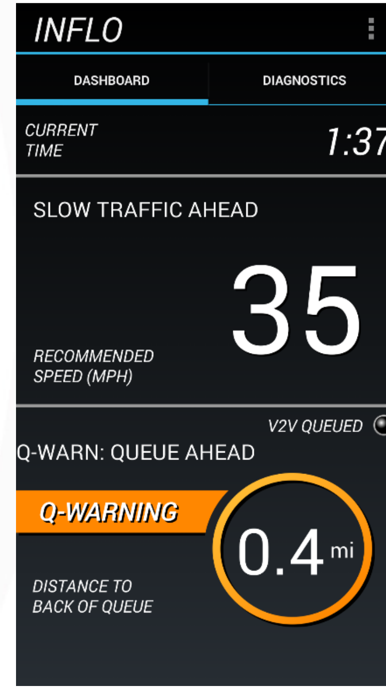


Source: USDOT

INFLO Key Findings

- Results from the simulation analysis found that the prototype significantly reduced the magnitudes of the speed drops (shockwaves) between vehicles, even at the 10% market penetration level.
  - SPD-HARM resulted in reduction in speed variations between freeway segments by 18-58% and within freeway segments by 10-47%, resulting in fewer rear-end crashes
- The trade-off for the improved safety is that the prototype increases the geographic impact of existing bottlenecks on freeway speeds by expanding the upstream distance that is affected by congestion.

Source: WSDOT



Source: Battelle

DMA-ATDM AMS Testbeds Description

- **Objectives** - To develop multiple AMS Testbeds to evaluate the system wide impacts of individual and logical combinations of DMA bundles/ATDM strategies, and identify conflicts and synergies in order to maximize benefits.
- **AMS Testbeds**
  - San Mateo (CA) Tactical AMS Testbed
  - Pasadena (CA) Multi-Scale AMS Testbed
  - Phoenix (AZ) Strategic AMS Testbed
  - Dallas (TX) and San Diego (CA) Multi-Modal Corridor AMS Testbeds
  - Chicago (IL) Road-Weather AMS Testbed

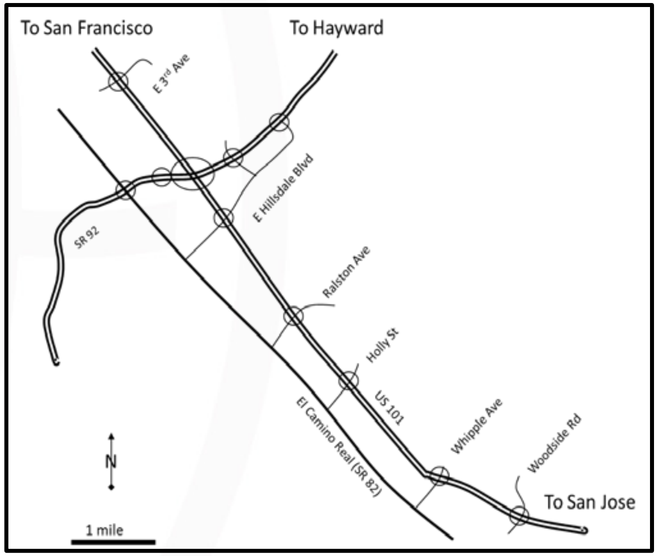
Geographical View of AMS Testbeds

- **Status**
  - Completed testbed specific data collection and isolation of confounding factors through cluster analysis
  - Performing testbed specific calibration and developing evaluation plan
  - Preliminary results are available from San Mateo Testbed on the DMA website: http://www.its.dot.gov/dma/pdf/DMA_ATDM_AMS_Testbed_Preliminary_March2015.pdf

DMA-ATDM AMS Preliminary Findings

- **Applications Tested**
  - SPD-HARM, INC-ZONE, MMITSS, and SPD-HARM + INC-ZONE
- **Preliminary Findings**
  - Benefit of implementing applications in isolation or in combination differs from one operational condition to another:
    - On dry weather days, delay reduced by 4% with SPD-HARM+INC-ZONE, compared to 2.5% reduction with only SPD-HARM and 0.8% reduction with only INC-ZONE
    - On days with rain and low demand, SPD-HARM+INC-ZONE increased delay.
  - BSM frequency is not always critical for the effectiveness of DMA applications – difference in impacts of 1s and 3s frequencies is minimal (less than 0.5%).
  - Effectiveness of DMA applications reduces with increase in latency - most of the benefits of the system disappear beyond 1s-latency.
  - Level of penetration of technology is an essential factor in the DMA application effectiveness – MMITSS results in 13% reduction in vehicle delay at 100% market penetration compared to the base case vs. 6% reduction at 25% penetration.

San Mateo Testbed



Source: USDOT