UNITED STATES
DEPARTMENT OF TRANSPORTATION

Dynamic Mobility Applications Bundles Overview

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Mobility Workshop 2012
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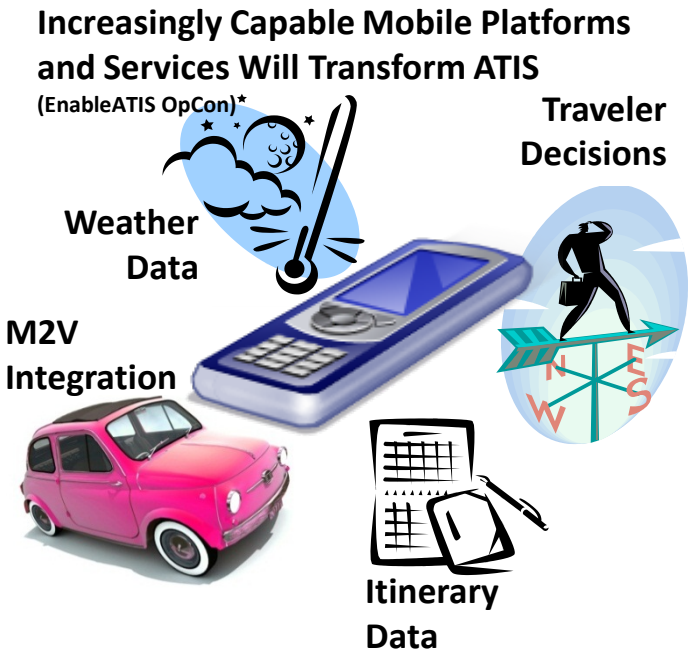
EnableATIS

Bob Rupert

FHWA Office of Operations

Enable Advanced Traveler Information System (EnableATIS)

- Enable ATIS is a transformative concept of the traveler information community:
  - Improve transportation system mobility and safety by better informing agencies and individuals
  - Foster multi-source data integration and delivery, transforming the user experience
  - Advance research with new forms of data about traveler behavior and response to transportation operations
  - Promote development of dynamic and transformative applications for real-time, multi-modal traveler information



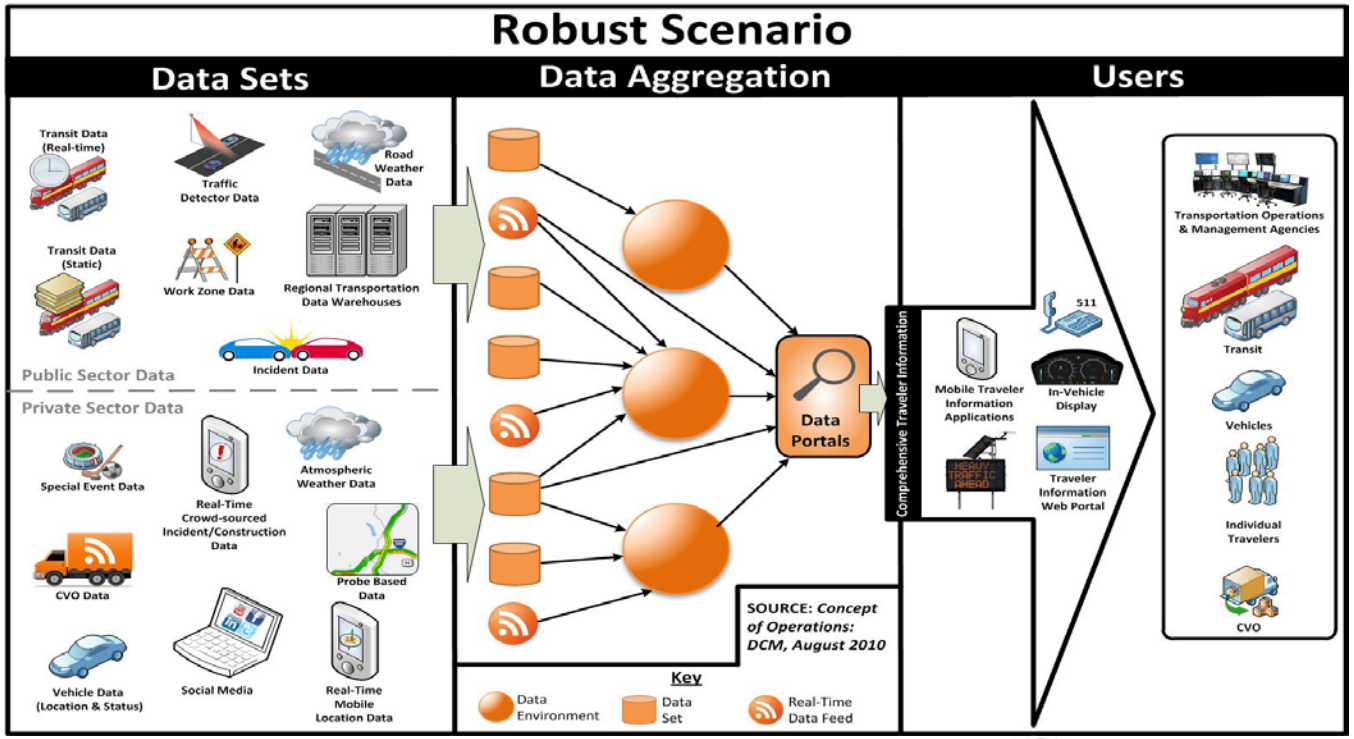
- **EnableATIS Operational Concept identified high-value federal roles and activities**
  - Not applications, as in other bundles
- **Nomadic Platform Concept**

EnableATIS Transformative Goals

- Transform the user experience on the transportation network
  - Information will be transmitted through various personal devices to multiple vehicles to improve travel times, safety, provide route and trip information, and provide travelers with options
- Transportation networks will experience measurable gains in performance, including mobility, safety and efficiency
  - Balancing system demand across transportation networks and modes, while providing better informed long range system management strategies will create significant gains in efficiency
- A suite of capabilities will be enabled through a rich and multisource data environment that leverages public sector system and operations data, transportation network operations and user data from privately operated systems
  - Stakeholder Engagement will be crucial to establishing a successful, sustaining, and expanding data sharing relationship, leveraging connected vehicle research and initiatives

Federal Role

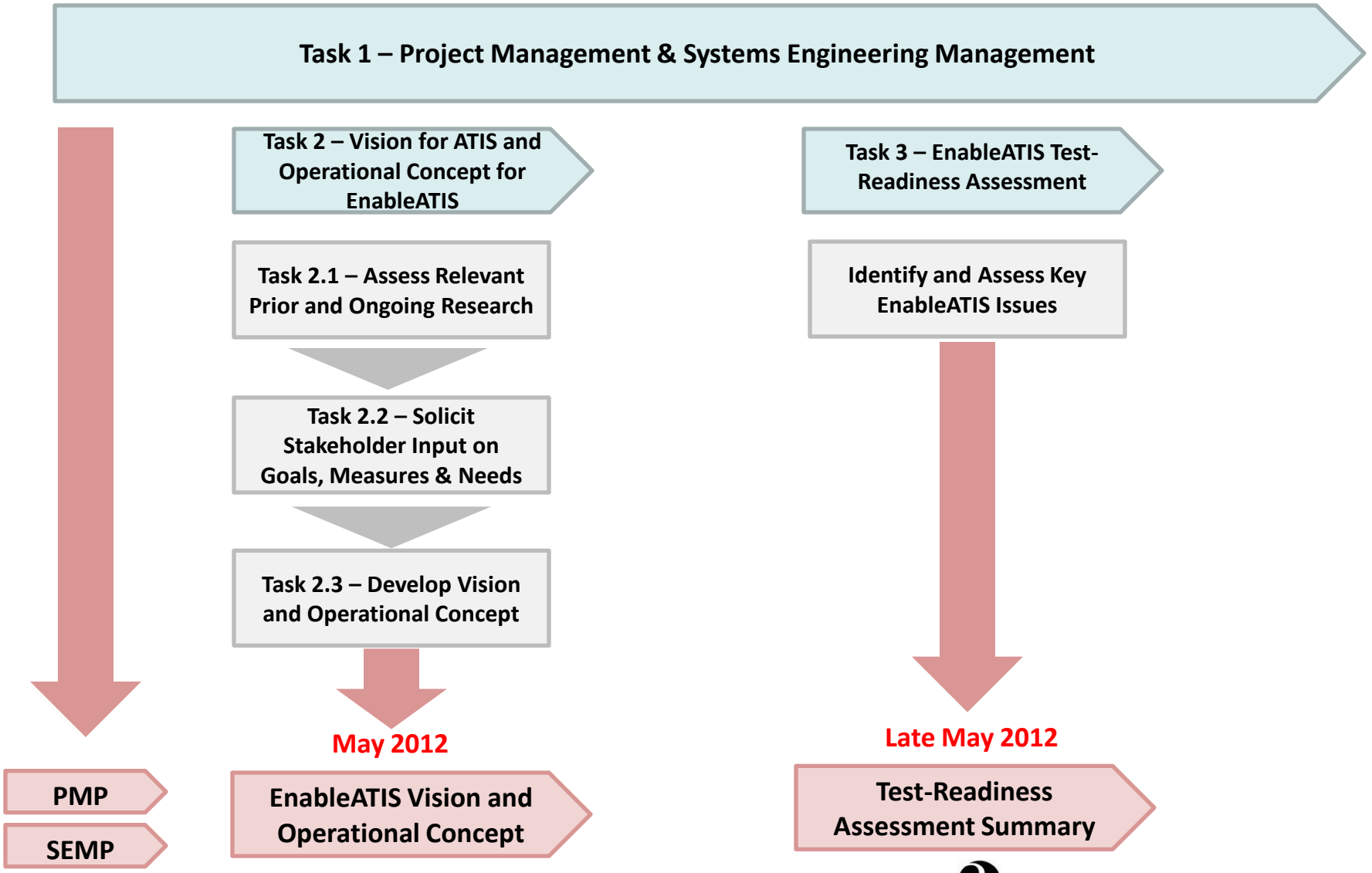
- Facilitate vision and coalition building
- Lead and support for public/private partnering
- Sponsor fundamental research and research initiatives
- Encourage and demonstrate technology innovation and implementation



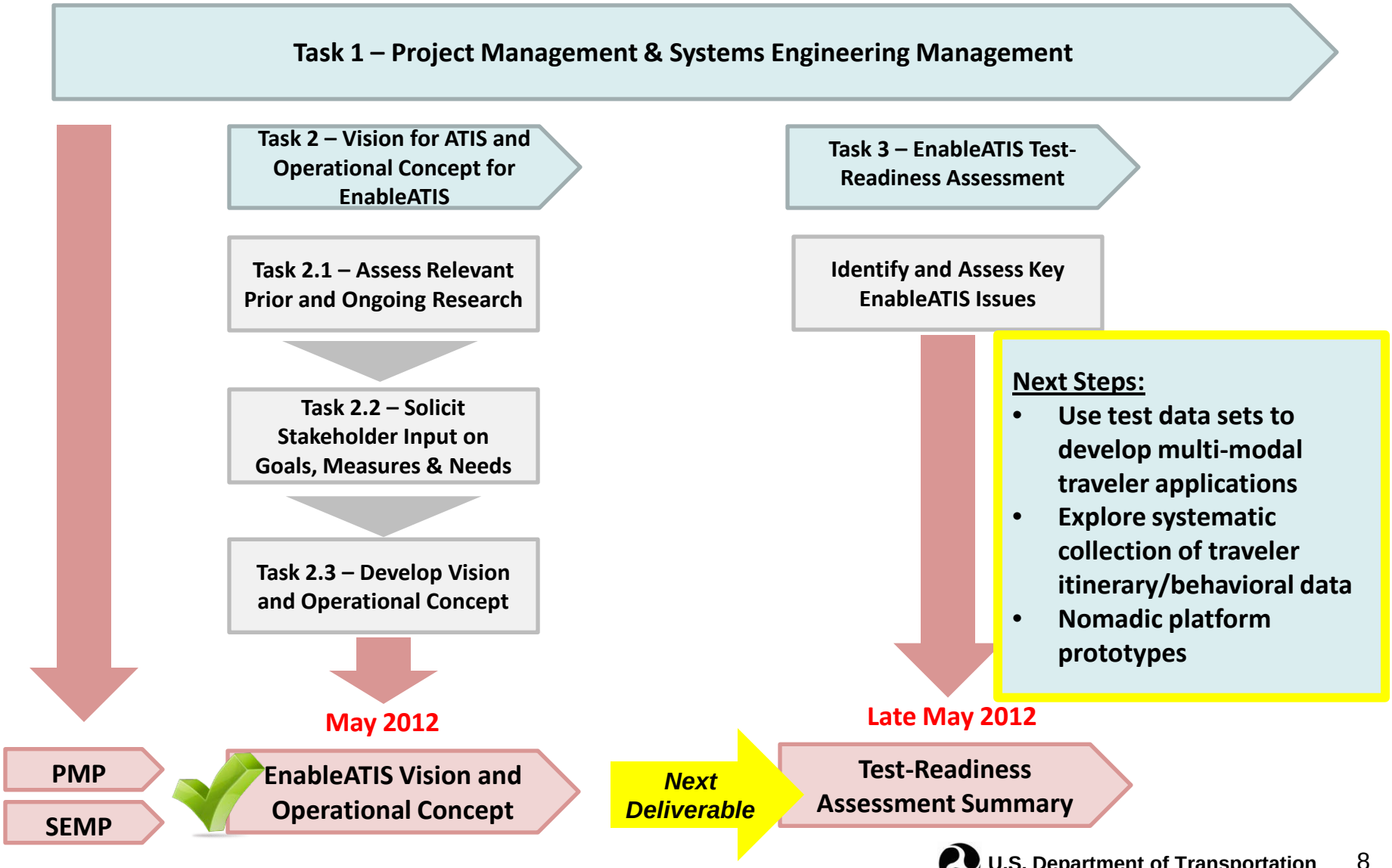
EnableATIS Performance Measures and Transformative Target

Performance Measure	10-Year Target
Multi-modal end-to-end trip planning information (time of departure, cost, mode, route, parking) integrated with search results	Common for major metropolitan areas
Corridor or regional transportation management systems utilizing systematically obtained traveler trip data	Emerging state-of-practice (one or more)
Predictability and reliability of travel	Total unanticipated late arrivals reduced by 50%

Project Tasks and Stakeholder Involvement



Project Tasks and Stakeholder Involvement



FRATIS

Randy Butler

FHWA Freight Operations and Technology

Freight Advanced Traveler Information System (FRATIS)

- Freight traveler information system that provides freight-specific route guidance and optimizes drayage operations so that load movements are coordinated between freight facilities to reduce empty-load trips:
  - Freight-Specific Dynamic Travel Planning and Performance

    Note: combines the two formerly separate DMA program areas of:
    - Freight Dynamic Route Guidance (F-DRG)
    - Freight Real-Time Traveler Information with Performance Monitoring (F-ATIS)
  - Drayage Optimization (DR-OPT)

Freight-Specific Dynamic Travel Planning and Performance

- Enhances traveler information systems to address specific freight needs
- Provides route guidance to freight facilities, incident alerts, road closures, work zones, routing restrictions (hazmat, oversize/overweight), and performance monitoring
- Builds on the Cross-Town Improvement Project (C-TIP) Real Time Traffic Monitoring (RTTM) and Dynamic Route Guidance (DRG) applications for best route between freight facilities.
- Provides intermodal connection information, container disposition and schedule
- Leverages existing data in the public domain, as well as emerging private sector applications to provide benefits to both sectors.

Drayage Optimization (DR-OPT)

- Reduces freight delays at key facilities that overbook their capacity to ensure uninterrupted operations within the terminal/warehouse
- Optimize drayage operations so that load movements are coordinated between freight facilities
- Individual trucks are assigned time windows within which they will be expected to arrive at a pickup or drop-off location

- Early or late arrivals to the facility are dynamically balanced
- Web-based forum for load matching provided to reduce empty moves

FRATIS Goals

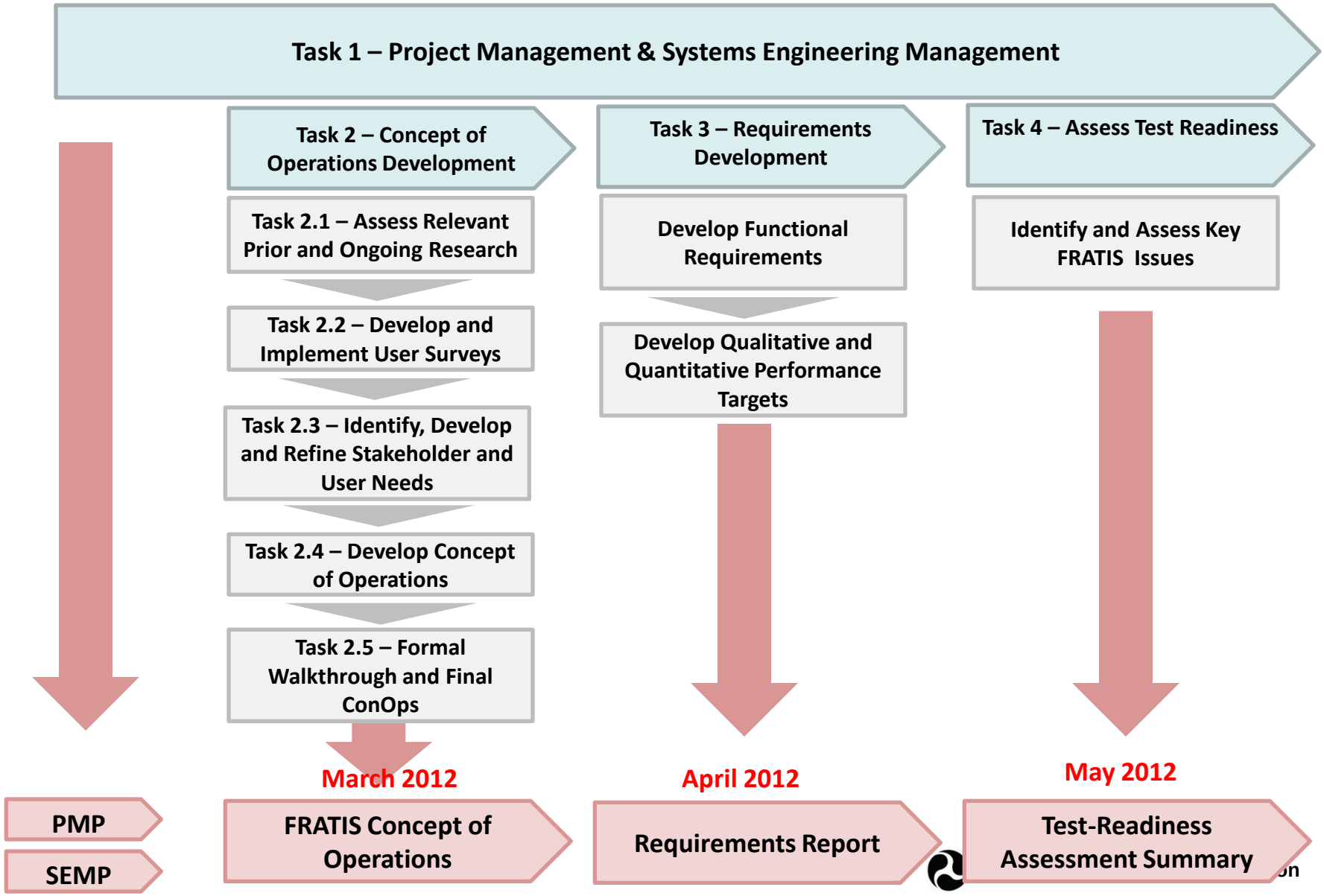
- Leverage existing data in the public domain and emerging industry applications; partner with these industries to ensure inclusion of specialized freight operations information and performance monitoring
- Integrate container load matching and freight information exchange systems into an integrated application that could fully optimize drayage information
- Provide benefits to public and private sectors

FRATIS Performance Measures and Transformative Target

Near-term: next 5 years
Mid-term: 5-10 years out
Long-term: >10 years

Performance Measure	Target
Number of bobtail trips	Reduce by: 10% (near), 15% (mid), 20% (long)
Terminal queue time	Reduce by: 20% (near), 35% (mid), 50% (long)
Travel time	Reduce by: 15% (near), 17.5% (mid), 20% (long)
Number of freight-involved incidents	Reduce by: 30% (near), 35% (mid), 40% (long)
Number of weight-compliance infractions	Reduce by: 10% (near), 20% (mid), 30% (long)
Fuel consumption	Reduce by: 5% (near), 10% (mid), 15% (long)
Level of criteria pollutants and greenhouse gas equivalents	Reduce criteria pollutants by: 5% (near), 10% (mid), 15% (long) Reduce GHG by: 5% (near), 10% (mid), 15% (long)

Project Tasks and Stakeholder Involvement



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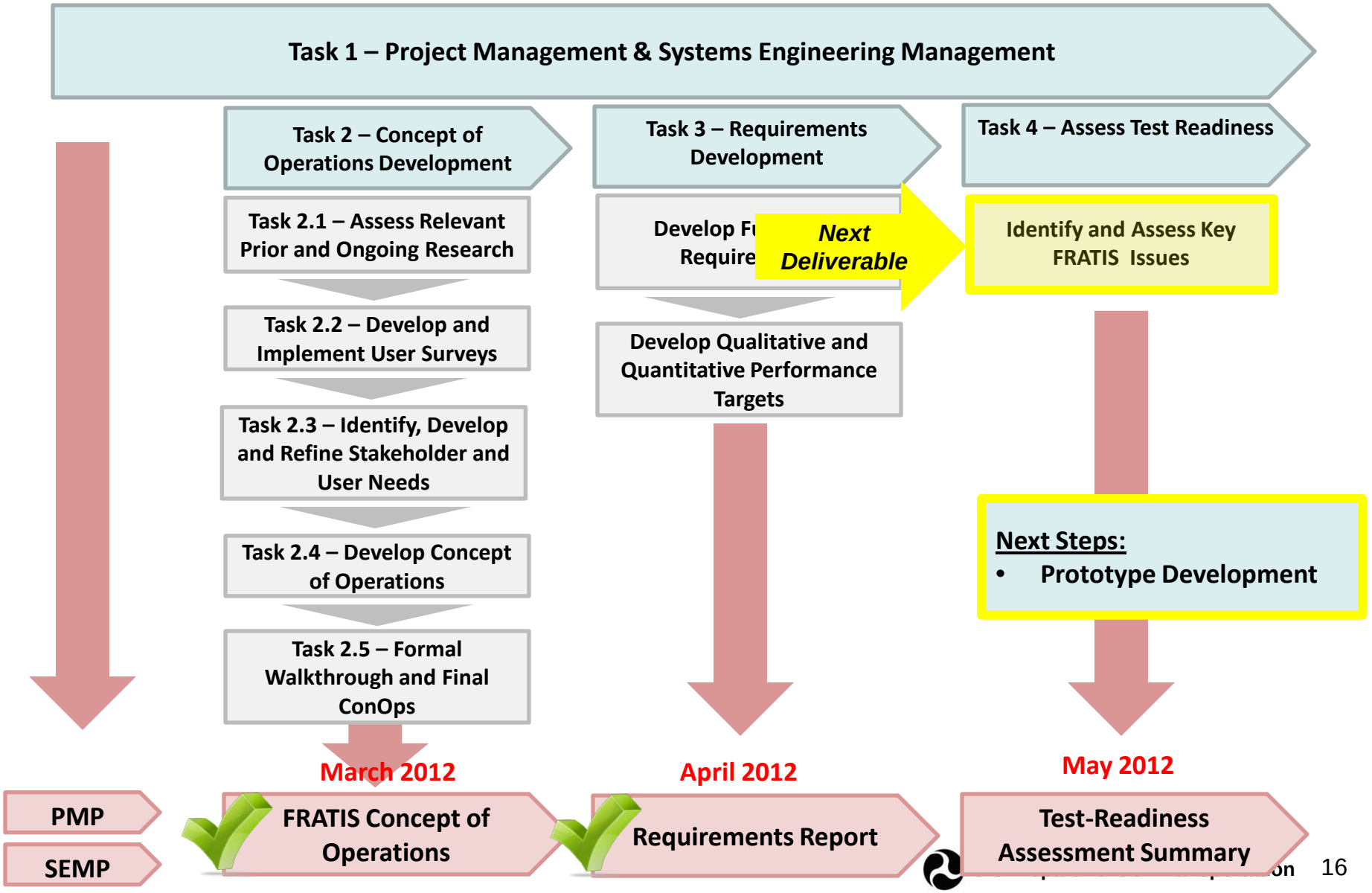


IDTO

Ron Boenau

FTA Office of Mobility Innovation

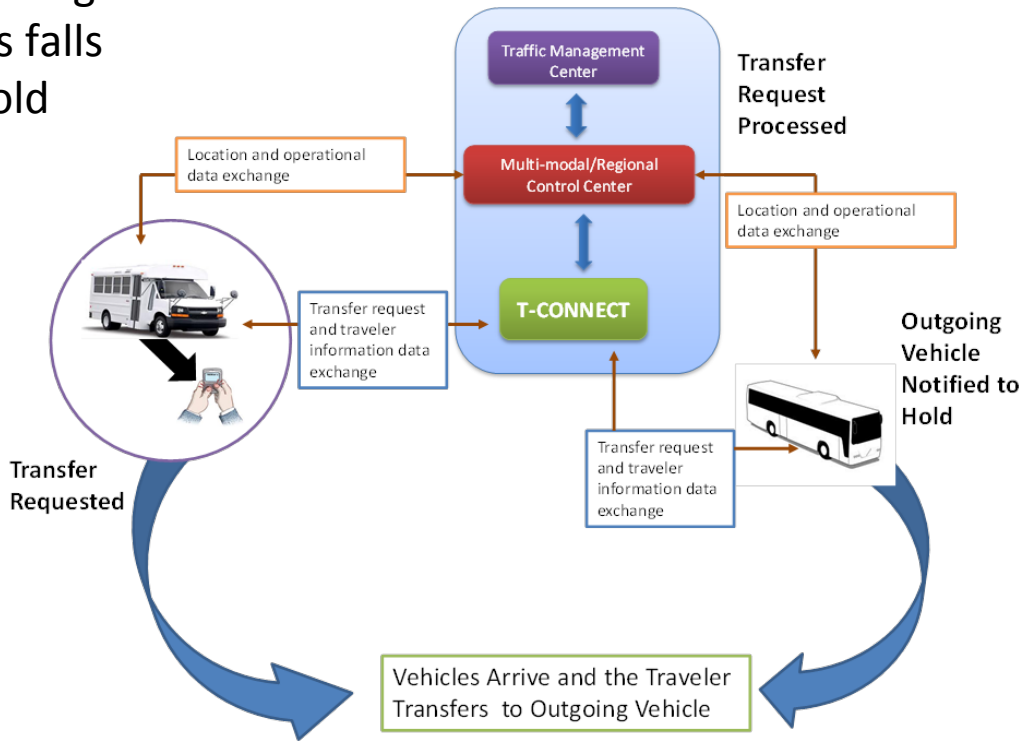
Integrated Dynamic Transit Operations (IDTO)

- Integrated transit operations that:
  - Facilitate passenger connection protection,
  - Provide dynamic scheduling, dispatching, and routing of transit vehicles, and
  - Facilitate dynamic ridesharing

- Identifying phrases:
  - Connection Protection (T-CONNECT)
  - Dynamic Transit Operations (T-DISP)
  - Dynamic Ridesharing (D-RIDE)

Connection Protection (T-CONNECT)

- Enable public transportation providers and travelers to communicate in order to improve the probability of successful transit transfers
  - Requires transit inter-modal and inter-agency coordination
  - Uses real-time and historical data to examine the arrival status of a transit vehicle and transmit a “hold” message to another vehicle if the lateness falls within a pre-determined threshold
  - Transfer requests may be initiated by transit riders
  - Monitors the situation and provides connection protection status to travelers



Dynamic Transit Operations (T-DISP)

- Links available transportation service resources with travelers through dynamic transit vehicle scheduling, dispatching and routing capabilities
  - Dynamic scheduling, dispatching and routing of a vehicle by matching compatible trips
  - Traveler provides desired destination & departure time tagged with their current location through personal mobile devices
  - Considers various modal options, including demand responsive service, fixed-route service and private service, such as taxi
  - Considers real-time traffic conditions and vehicle capacity
  - May replace some late night or mid-day fixed-route service

Dynamic Ridesharing

- Makes use of in-vehicle (drivers) and hand-held devices (riders) to dynamically identify and accept potential ridesharing opportunities along the travel route.
  - Uses dynamic ridesharing technology, personal mobile devices, and voice activated on-board equipment to match riders and drivers along their route
  - Allows trip-by-trip ridesharing (dynamic as opposed to preset carpooling).
  - Can take into account individual ridesharing preferences and constraints
  - May include technology to verify the number of people in a vehicle for HOV enforcement and toll discounts

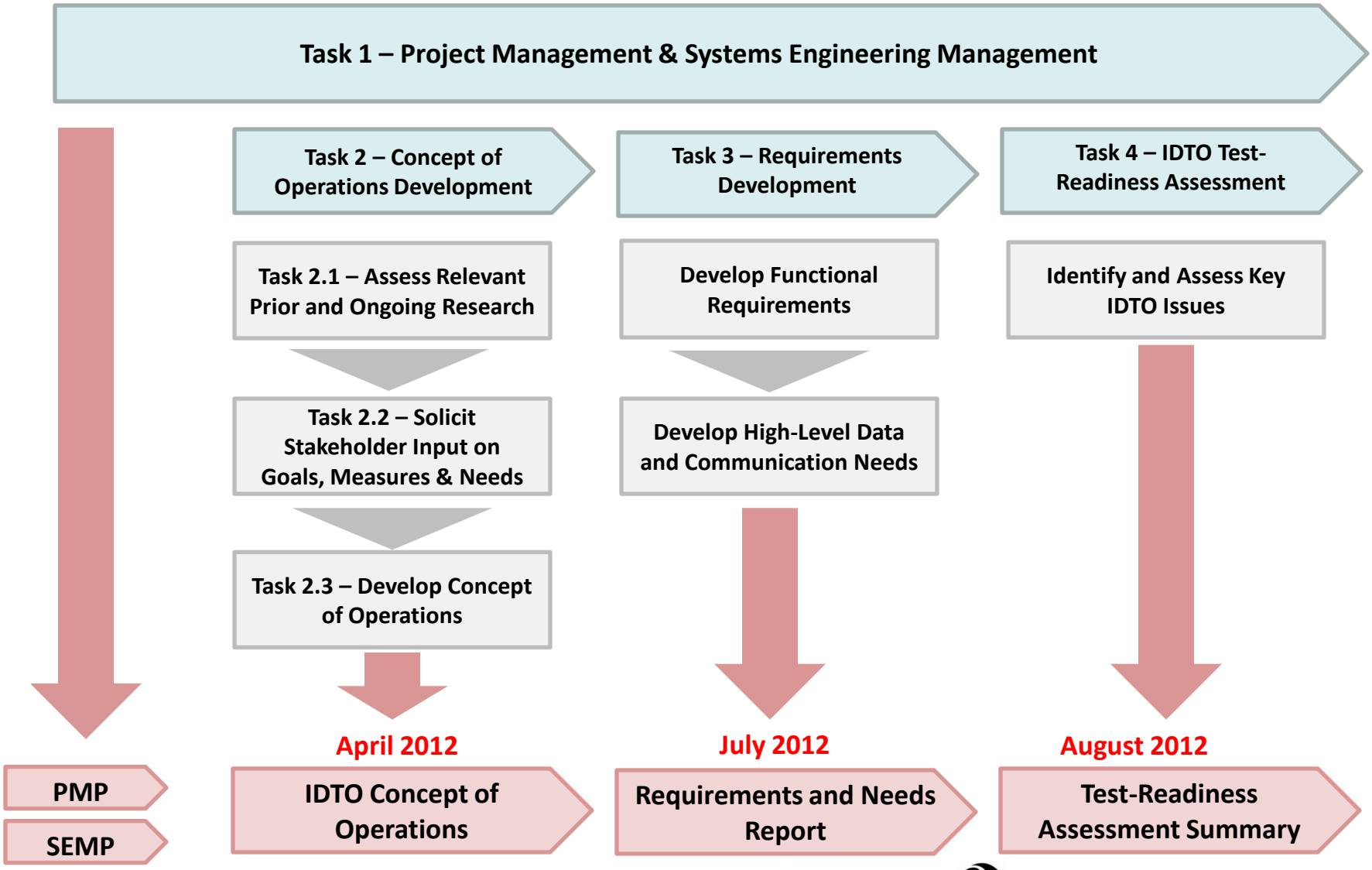
IDTO Goals/Key Research Questions

- What technologies can help people effortlessly transfer from one mode of travel (car, bus, train, etc.) to another for the fastest and most environmentally friendly trip?
- How can technology help make cross-modal travel truly possible?
- How can agencies and companies manage their systems in light of the fact that people may be changing modes often?

IDTO Sample Performance Measures

Application	Performance Measure	Target
T-Connect	Percentage of successful connections involving more than one agency	Increase to 95%
	Percentage of successful connections involving more than one mode	Increase to 95%
	Percentage of successful connections involving fixed and flexible modes	Increase to 90%
T-DISP	Duration of time from making a request to receiving a trip confirmation	Approximately 45 seconds
	Duration of time between passenger pickup and trip confirmation	
	Percentage of no shows and cancellations	
D-RIDE	Passenger waiting time	Reduce to 10 minutes of less
	Percentage of ride matches to requests	
	Number of riders per vehicle	

Project Tasks and Stakeholder Involvement



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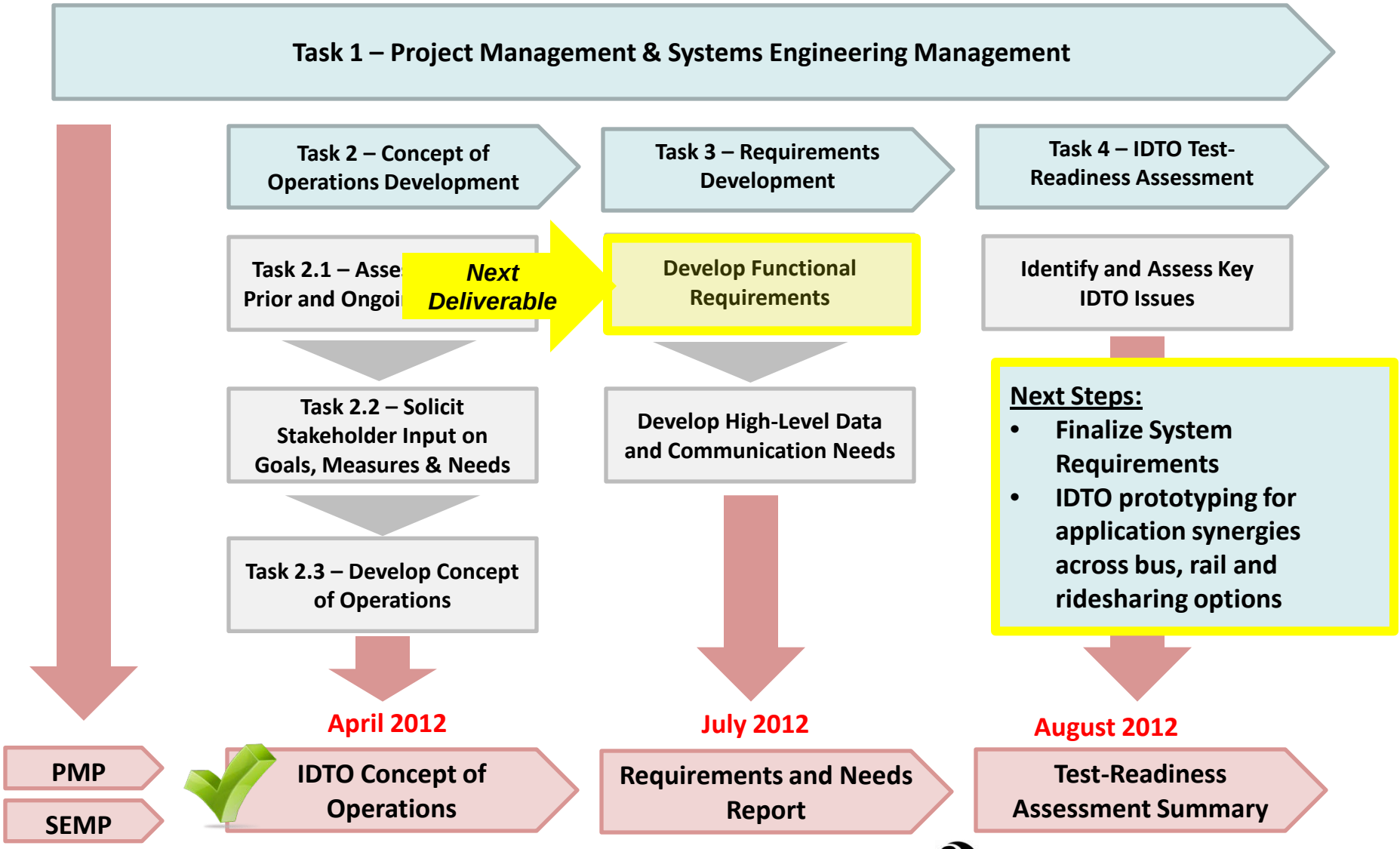
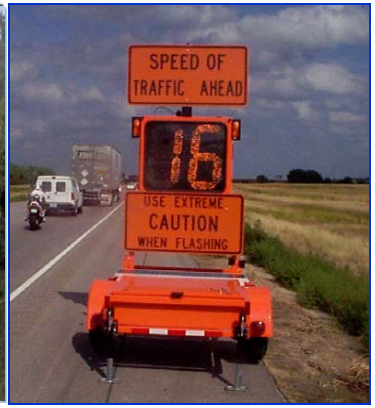


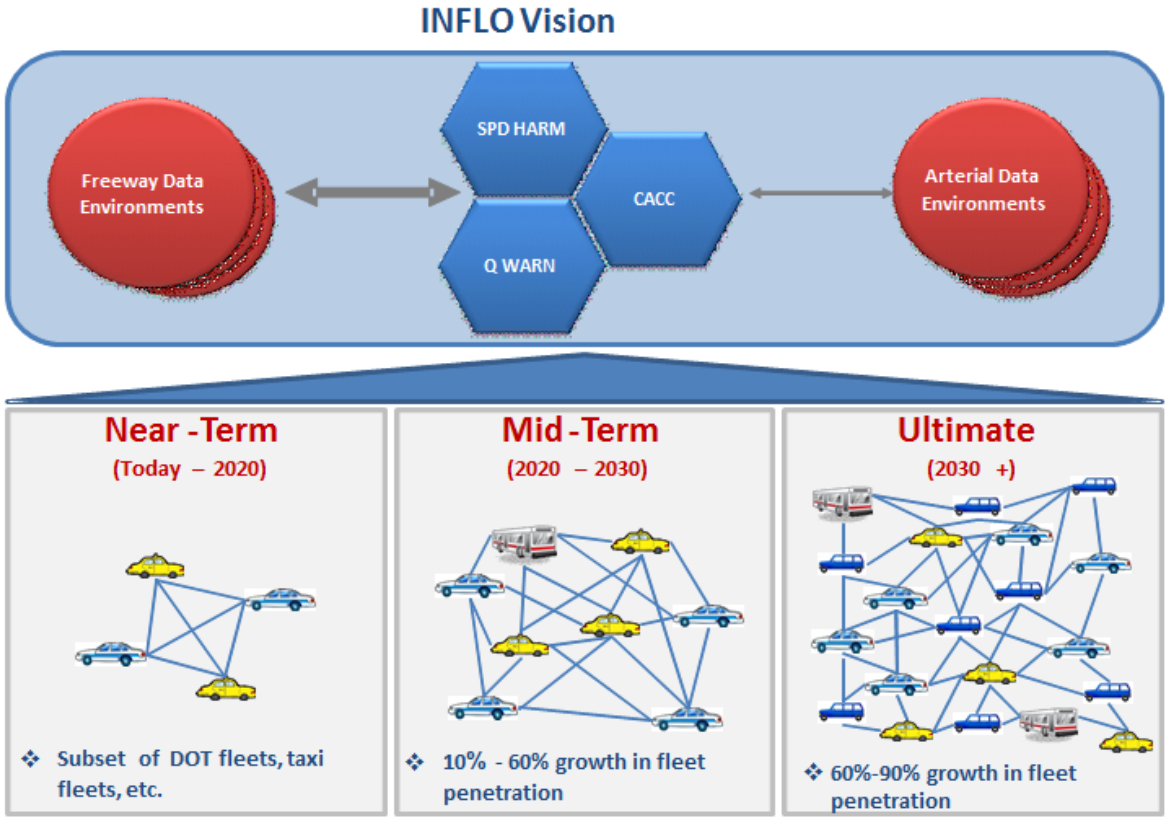


INFLO

Mohammed Yousuf
FHWA Office of Operations (R&D)

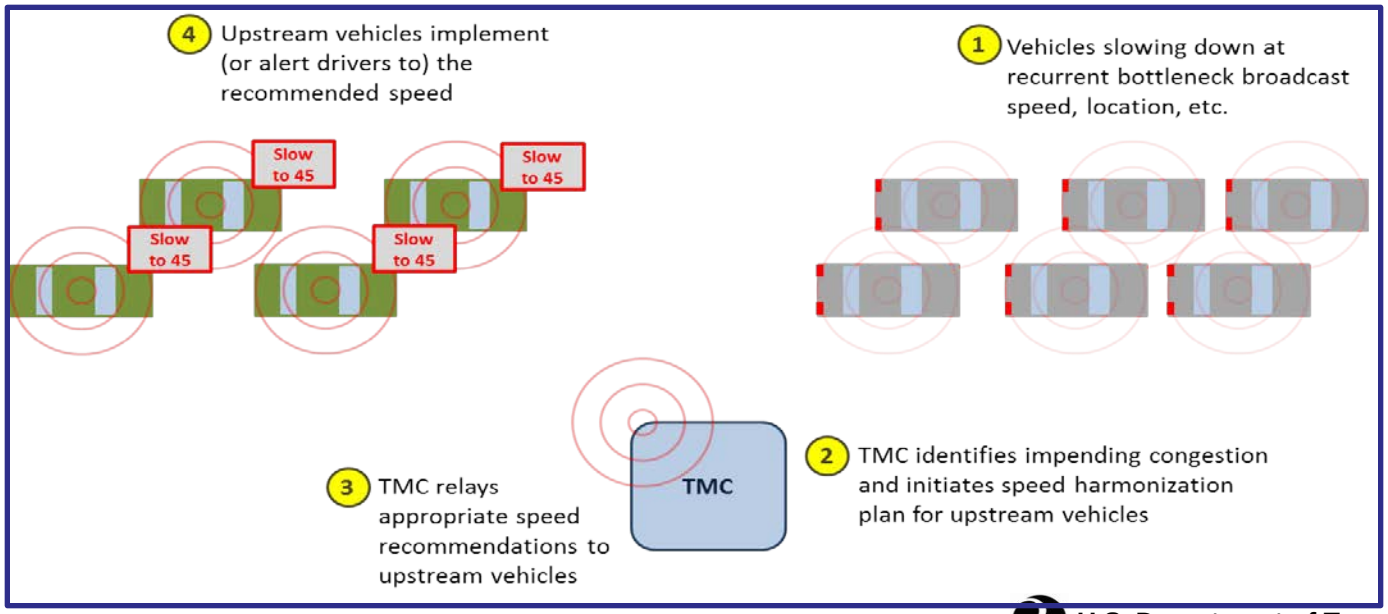
Intelligent Network Flow Optimization (INFLO)

- Intelligent Network Flow Optimization (INFLO) bundle of applications:
  - Dynamic Speed harmonization (SPD-HARM)
  - Queue Warning (Q-WARN)
  - Cooperative Adaptive Cruise Control (CACC)



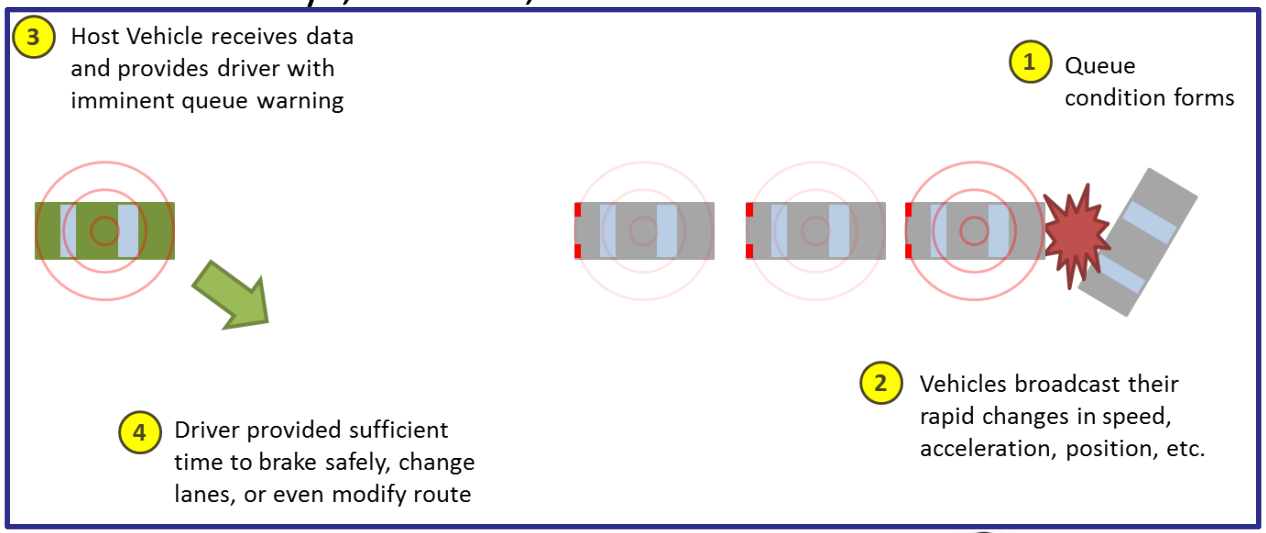
Dynamic Speed Harmonization (SPD-HARM)

- Dynamic Speed Harmonization (SPD-HARM) aims to dynamically adjust and coordinate vehicle speeds in response to congestion, incidents, and road conditions to maximize throughput and reduce crashes.
  - Reducing speed variability among vehicles improves traffic flow and minimizes or delays flow breakdown formation
  - Utilize V2V and V2I communication to coordinate vehicle speeds
  - Provide recommendations directly to drivers in-vehicle
  - Recommend speeds by lane, by vehicle weight and size, by pavement traction



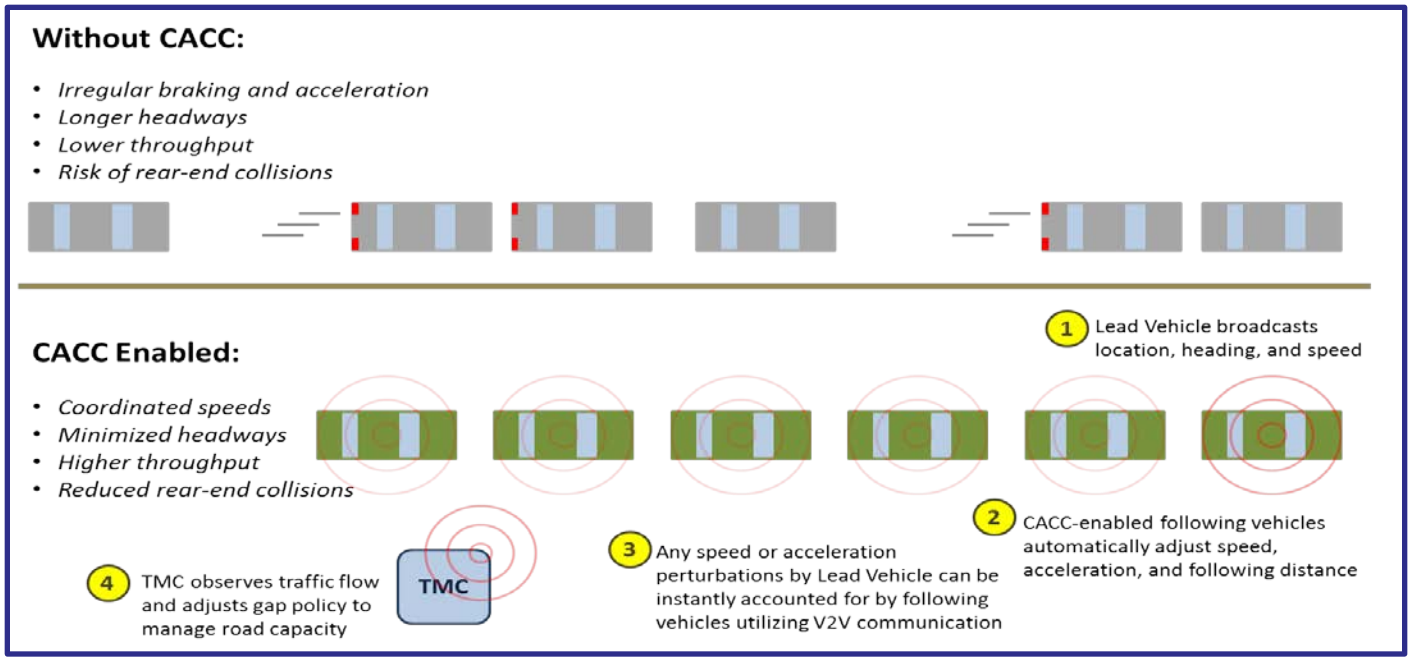
Queue Warning (Q-WARN)

- Queue warning (Q-WARN) aims to provide drivers timely warnings and alerts of impending queue backup.
  - To reduce shockwaves and prevent collisions and other secondary crashes
  - Predict location, duration and length of queue propagation
  - Utilize V2V and I2V communication for rapid dissemination and sharing of vehicle information
    - E.g., position, velocity, heading, and acceleration of vehicles in the vicinity
  - Allows drivers to take alternate routes or change lanes
  - Applicable to freeways, arterials, and rural roads



Cooperative Adaptive Cruise Control (CACC)

- Cooperative adaptive cruise control (CACC) aims to dynamically adjust and coordinate cruise control speeds among platooning vehicles to improve traffic flow stability and increase throughput.
  - Closely linked with SPD-HARM to reduce stop-and-go waves
  - Utilizes V2V and/or V2I communication to coordinate vehicle speeds and implement gap policy



Goals of INFLO

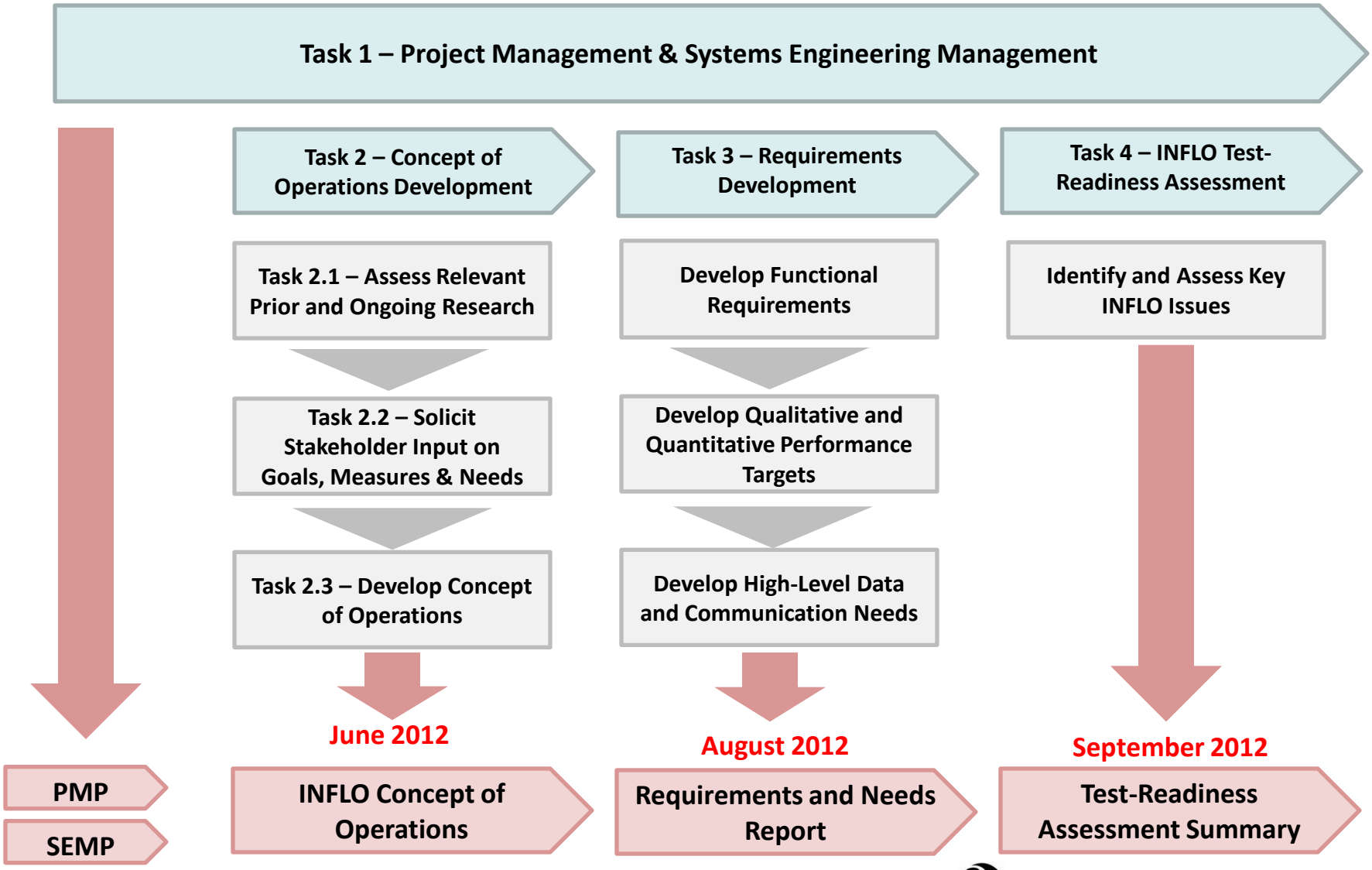
- Utilize frequently collected and rapidly disseminated multi-source data drawn from connected travelers, vehicles, and infrastructure to:
  - Improve roadway throughput through speed limit compliance
  - Reduce transition zones between two traffic states that move through a traffic environment
  - Improve safety through a reduction in the number of primary crashes
  - Reduce emissions and fuel consumption through environmental improvements to roadways

INFLO Performance Measures and Transformative Target

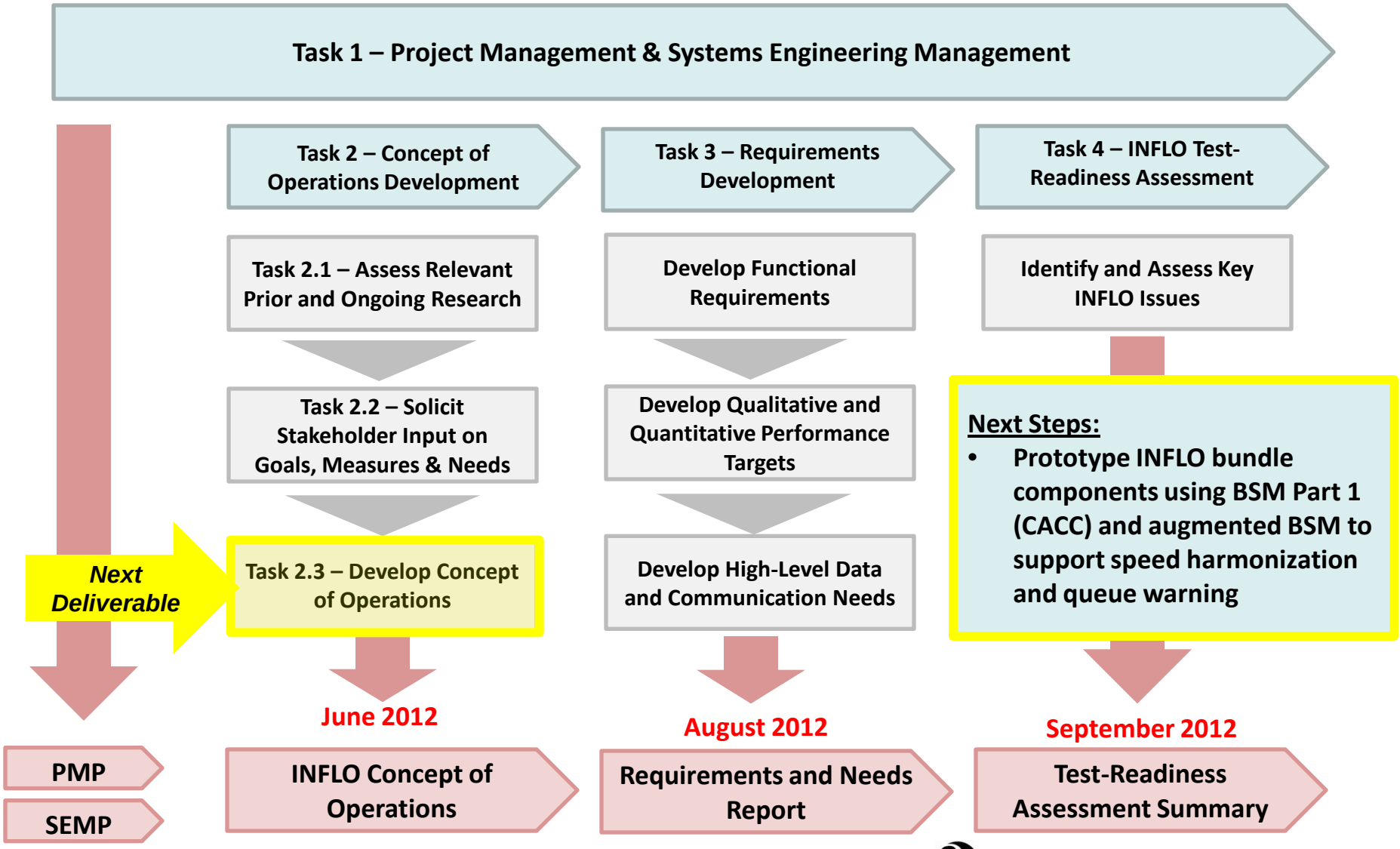
- Near-term: today -2020
- Mid-term: 2020-2030
- Long-Term: Beyond 2030

Performance Measure	Target
Throughput (vehicles per hour for the CACC lane)	Increase by: 50% (near), 100% (mid), 100% (long)
Number of primary crashes	Reduce by: 25% (near), 50% (mid), 50% (long)
Number of secondary crashes	Reduce by: 50% (near), 75% (mid); Zero secondary crashes (long)
Severity of crashes	Reduce by 25% (near), 50% (mid), 75% (long)
Travel time reliability (buffer or planning time index)	Reduce by 25% (near), 55% (mid), 75% (long)
Total emissions	Reduce by 25% (near), 33% (mid), 50% (long)
Fuel consumption	Reduce by 25% (near), 50% (mid), 75% (long)

Project Tasks and Stakeholder Involvement



Project Tasks and Stakeholder Involvement



M-ISIG

Ben McKeever
FHWA Office of Operations R&D

Multi-Modal Intelligent Traffic Signal System (M-ISIG Bundle)

- Comprehensive traffic signal system for complex arterial networks:
  - Intelligent Traffic Signal System (I-SIG)
  - Transit Signal Priority (TSP)
  - Mobile Accessible Pedestrian Signal System (PED-SIG)
  - Freight Signal Priority (FSP)
  - Emergency Vehicle Preemption (PREEMPT)

- Jointly funded by Cooperative Transportation System Pooled Fund Study (CTS PFS) and the DMA Program

Intelligent Traffic Signal System (I-SIG)

- Integrates data collected through wireless communications and other sources to improve traffic signal operations

- Overarching system optimization application accommodating transit and freight signal priority, preemption and pedestrian movements maximize overall arterial network performance

Transit Signal Priority (TSP)

- Enables earlier, more accurate and continuous monitoring of transit vehicles as they approach and progress through the intersection, and potentially down an entire corridor
- Selects the most appropriate priority strategy based on knowledge of up-to-the second location and multiple conditionality criteria
- Enables TSP on a network of arterials

Mobile Accessible Pedestrian Signal System (PED-SIG)

- Allows "Automated pedestrian call" from smart phones for visually impaired pedestrians
- Communicates wirelessly with the traffic signal controller to obtain real-time SPAT information
- Informs the visually impaired pedestrian as to when to cross and how to remain aligned with the crosswalk.

Leverage Non-Federal Research Activity

PFS funded Activities:

- **Freight Signal Priority (FSP)**
  - Provides signal priority along an arterial corridor near a freight facility based upon current and projected freight movements into and out of the freight facility.
  - Reduces delays, increases travel time reliability for freight traffic.
  - Enhances safety at intersections around the freight facility.

- **Emergency Vehicle Preemption (PREEMPT)**
  - Adjusts preemption and signal recovery cycles to account for non-linear effects of multiple emergency responses through the same traffic network.
  - Replacement of optical, 900 MHz, and other technologies used for signal preemption with integrated V2V and V2I communication systems.

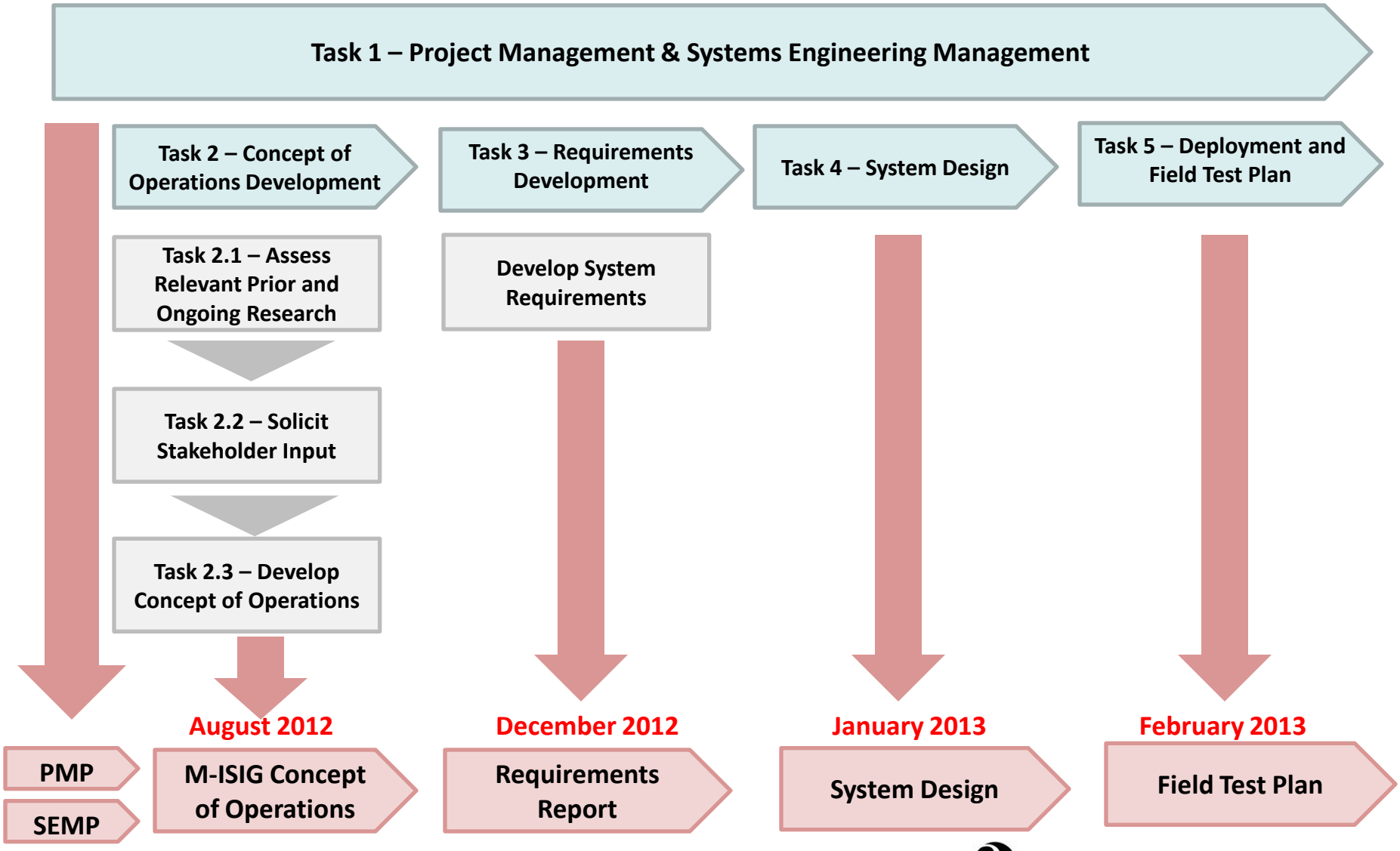
M-ISIG Goals

- Field-test/demonstrate a Multi-Modal Intelligent Traffic Signal System
- Use data via V2I wireless communications to maximize flows in real-time to improve traffic signal operations
- Utilize Transit Signal Priority, Freight Signal Priority and Emergency Vehicle Preemption strategies
- Support the accommodation of safe and efficient pedestrian movement of a more general nature.

M-ISIG Performance Measures and Transformative Target

Performance Measure	10-Year Target
Overall Vehicle Delay	Reduce by 25%
Throughput	Increase by 15%
Queue Length	Reduce by 15%
Average Pedestrian Wait Time	Reduce by 20%
Average Transit Delay	Reduce by 35%
Average Commercial Vehicle Delay	Reduce by 15%
Average Emergency Vehicle Delay	Reduce by 40%
Extent of System-Wide Congestion (i.e., failure to clear queue in a cycle)	Reduce by 25%
Duration of System-Wide Congestion	Reduce by 40%

Project Tasks and Stakeholder Involvement



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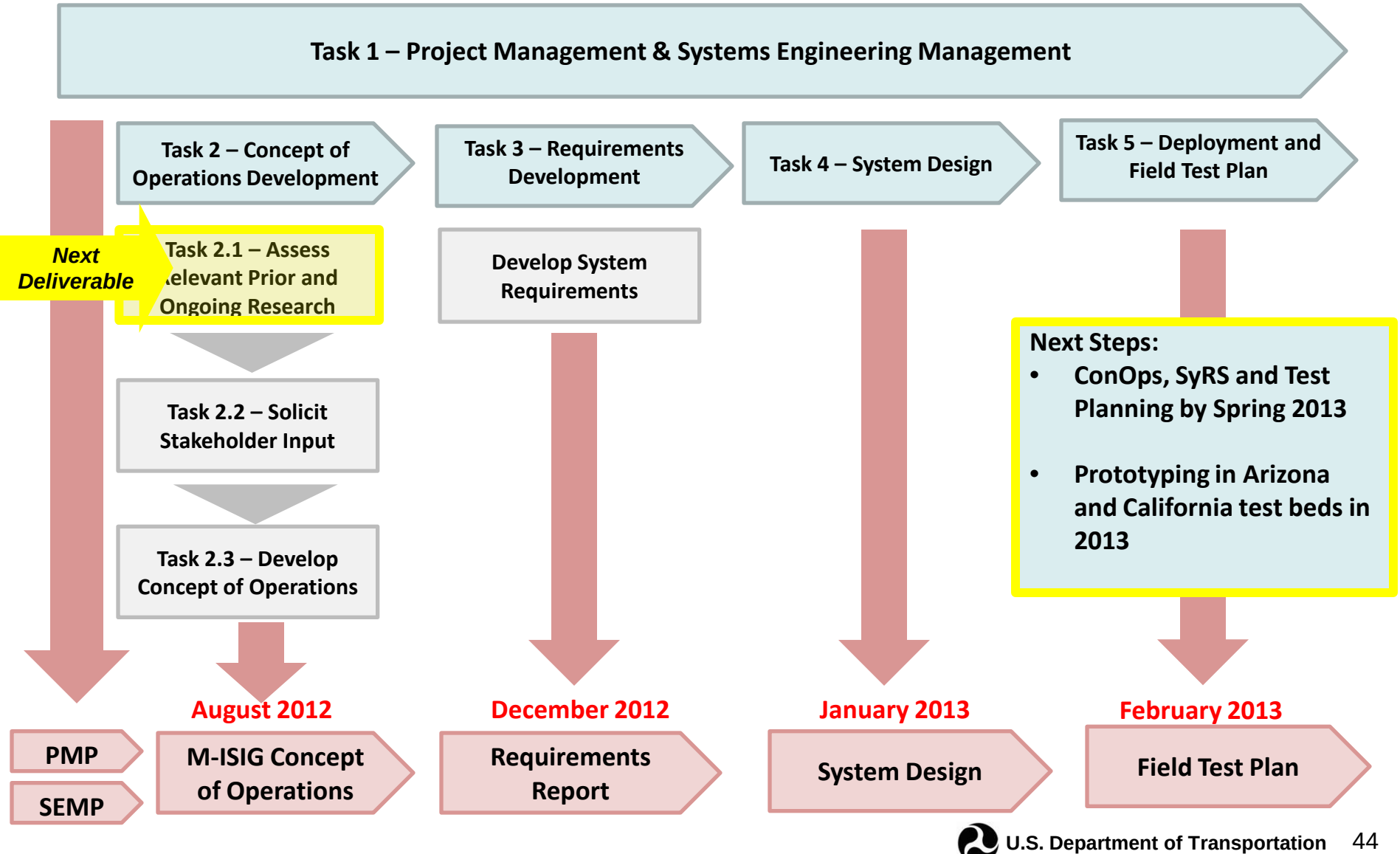


R.E.S.C.U.M.E.

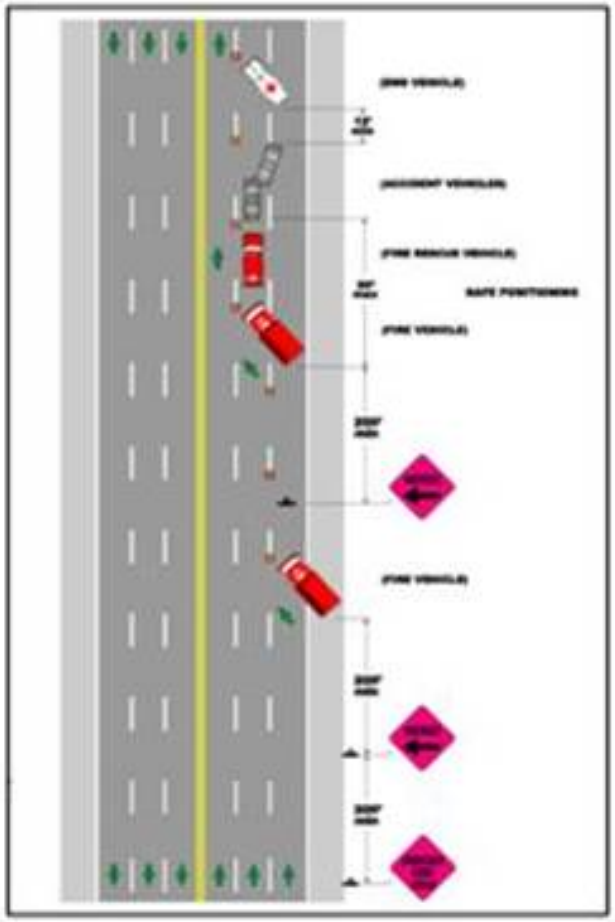
Linda Dodge
Joint Program Office (JPO)

Response, Emergency Staging and Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.)

- Advanced vehicle-to-vehicle safety messaging over DSRC to improve safety of emergency responders and travelers:
  - Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)
  - Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)
  - Emergency Communications and Evacuation (EVAC)
  - Mayday Relay (MAYDAY)

Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)

- Situational awareness information to responders while en route
- Input to responder vehicle routing, staging and secondary dispatch decisions
  - Staging plans
  - Satellite imagery
  - GIS data
  - Current weather data
  - Real-time modeling outputs



Source: Oconto County, WI

Incident Scene Work Zone Alerts for Drivers and Workers (INC–ZONE)

- Comprised of two components:

1. Alerts drivers of lane closings and unsafe speeds for temporary work zones
   - Could be augmented with merging and speed guidance to drivers
2. Warns on-scene workers of vehicles with trajectories or speeds that pose a high risk to their safety

Mayday Relay (MAYDAY)

- Sends a crash notification message a roadside DSRC hot spot, likely relayed via a properly-equipped passing vehicle
- This information is then forwarded to the appropriate PSAP based on the crash location.

Source: Greg Carter Herald Sun

Emergency Comm and Evacuation (EVAC)

- Addresses the needs of two different evacuee groups:

1. Those using their own transportation
   - Dynamic route guidance information
   - Current traffic and road conditions
   - Location of available lodging
   - Location of fuel, food, water, cash machines and other necessitates
2. Those requiring assistance
   - Identify and locate people who are more likely to require guidance and assistance
   - Identify existing service providers and other available resources

R.E.S.C.U.M.E. Objectives

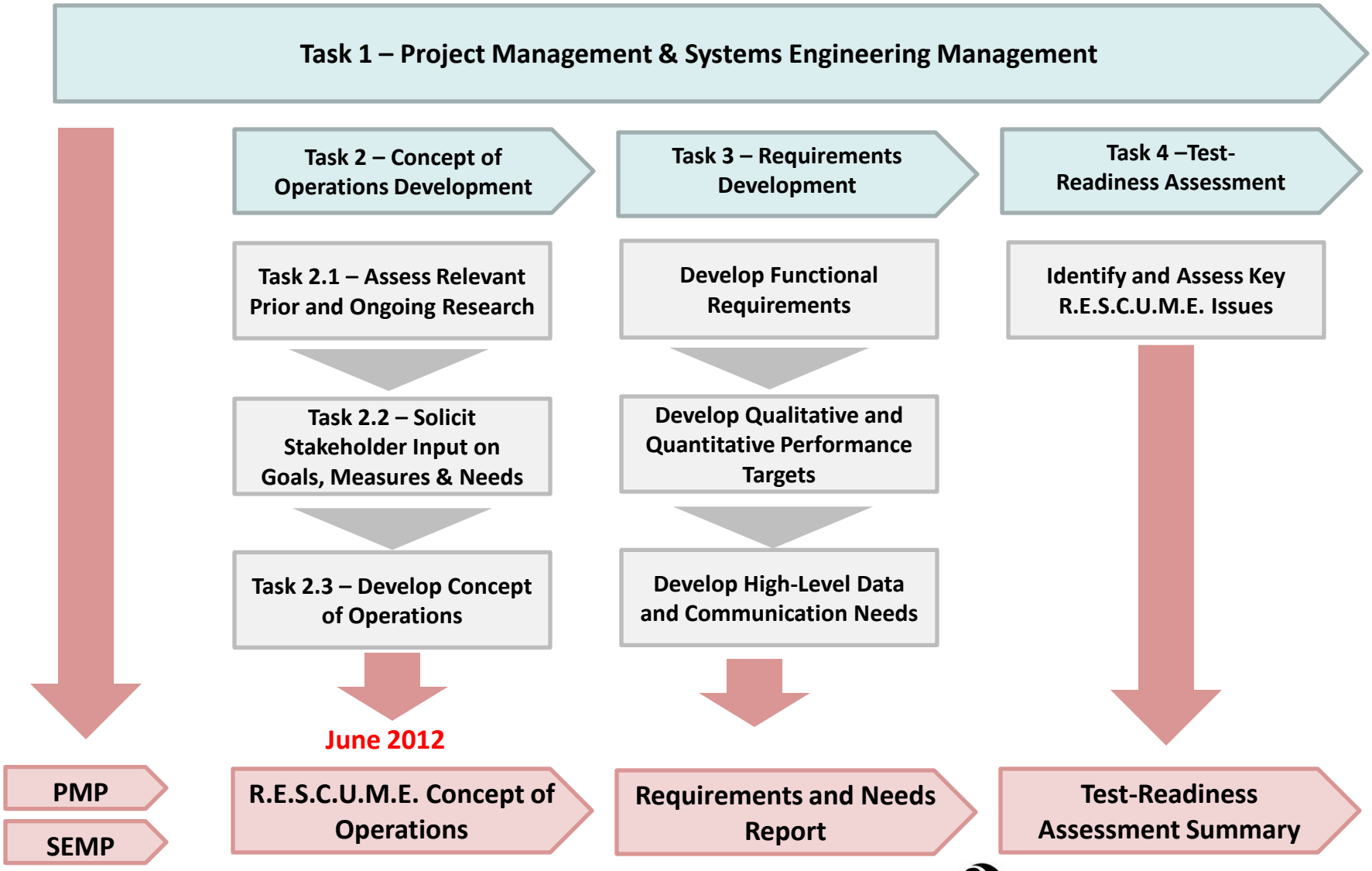
- Positively impact travelers, emergency responders, vehicles, and infrastructure.

- Promotes innovative use of wireless connectivity, center-to-center communications, and center-to-field communications to solve problems faced by emergency management agencies, emergency medical services (EMS), public agencies, and emergency care givers as well as persons requiring assistance

R.E.S.C.U.M.E. Performance Measures and Transformative Target

Performance Measure	10-Year Target
Responders to vehicle incidents will be provided with comprehensive information regarding the incident prior to dispatch (incident dynamics, condition of the victims, materials involved, etc.) reducing total response time	Reduce Total Response Time by 30%
Equipment staging impact on travel conditions (e.g., throughput, delay) throughout the entire transportation system	Reduce congestion as measured by throughput and delay times by 20%
En-route time for responders during congested conditions	Improve En-Route travel times by 10%
Number of secondary incidents	Secondary incidents will be reduced by 15%
Ability to employ dynamic dispatching and routing of available resources (e.g., vehicles) across agencies during an evacuation	Use of mixed agency vehicles for evacuation of special needs population will be widespread

Project Tasks and Stakeholder Involvement



Project Tasks and Stakeholder Involvement