Dynamic Mobility Application Policy Analysis

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

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Notice

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7. Author(s) Caitlin Bettisworth, Josh Hassol, Cynthia Maloney, Amy Sheridan, and Suzanne Sloan		8. Performing Organization Report No.
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16. Abstract
This report documents policy considerations for Response, Emergency Staging and Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.). R.E.S.C.U.M.E. comprises a "bundle" of mobility applications that use existing and new connected vehicle data sets and other data to provide first-responders, emergency management centers, and road crews with enhanced information, allowing them to respond faster and more effectively to incidents and emergencies than they can today.
The policy team has documented four potential policy issues for R.E.S.C.U.M.E.:

1. Multi-Agency Coordination for Information Broker Function: Because the Information Broker functions in R.E.S.C.U.M.E will, in many cases, be distributed among multiple entities it will be important for participating agencies to determine roles and responsibilities when implementing R.E.S.C.U.M.E.

2. Compliance with HIPAA Privacy Requirements: R.E.S.C.U.M.E. applications – in particular, EVAC – may handle personal health information (PHI), and must be certain to be consistent with the privacy requirements of the Health Insurance Portability and Accountability Act of 1996 (HIPAA).

3. Data and Message Standards for Emergency Communication: The RESP-STG application must be able to integrate data from multiple sources and immediately disseminate appropriate messages and warnings to multiple agencies. The EVAC application will need to integrate medical records and other data from a variety of sources. Consequently, the need for data and messaging standards to facilitate inter-agency and inter-jurisdictional emergency information sharing is apparent.

4. INC-ZONE Implementation: The INC-ZONE application will require small but important changes to the procedures that response crews follow when they arrive at incident scenes, and also may have implications for incident/work zone signage design standards.

Recommendations for addressing these policy issues include development of guidance materials for state and local agencies, and completion of planned cost-benefit studies and privacy impact assessments.

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Executive Summary

Dynamic Mobility Applications Program

The Dynamic Mobility Applications (DMA) Program is prototyping applications that are anticipated to be transformative to public sector transportation system management and modal integration. This technical research is a part of the U.S. Department of Transportation's (USDOT) research into new technologies supporting the emergence of an intelligent and connected vehicle (CV) environment[1].

The objective of the DMA research is to foster the release of high-value, open-source applications that use synthesized, multisource Intelligent Transportation Systems (ITS) data to transform surface transportation management and information. The DMA Program research is also focused on developing tools (for instance, an open source portal), metrics, and concepts to support additional application development.

The Intelligent Transportation Systems Program's role within the USDOT is to facilitate high-risk/high-reward research in cooperation with industry and academia to meet transportation needs. Investments in new research are based on policy analysis that determines that the technology concepts meet the following threshold criteria:

- They advance the state-of-the-practice and, if successful, will deliver transformational transportation benefits to the Nation.

- They are unlikely to be pursued in industry given the nature of the risks compared to the required investment.

- The advancements are desired by stakeholders, who will champion the transfer of results into use.

- The advancements are significant enough to take precedence over other investment choices.

A decision to pursue research is followed by the development of prototypes and demonstration and testing under real-world conditions. Successful results advance the process of transferring new technologies into market adoption and use. They set the stage for planning and preparing for technology implementation, operations and maintenance, and, eventually, upgrades and evolution. Throughout this technology life cycle, policy and institutional issues can often become the major stumbling blocks to realizing success.

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[1] A Connected Vehicle Environment is defined as: "A connected, data-rich travel environment. The network captures real-time data from equipment located on-board vehicles (automobiles, trucks, and buses) and within the infrastructure. The data are transmitted wirelessly and are used by transportation managers in a wide range of dynamic, multi-modal applications to manage the transportation system for optimum performance." http://www.its.dot.gov/connected_vehicle/connected_vehicle.htm accessed June 01, 2014.

Thus, identification of, and research into, the policy issues and practical options and solutions is an important step that raises the assurance that the Federal investment will result in adoption and use by agencies, organizations, the private sector, and travelers. It is an iterative process with the technical research teams—identification of policy challenges early in the development stage can change the nature of technical decisions; envisioning and addressing policy challenges throughout the life cycle supports preparation for robust technology transfer to the market.

Purpose of this Report: Document R.E.S.C.U.M.E. Policy Issues

The Connected Vehicle Mobility Policy team (herein, policy team) developed this report to document policy considerations for the Response, Emergency Staging and Communications, Uniform Management, and Evacuation, or R.E.S.C.U.M.E. applications. R.E.S.C.U.M.E. comprises a "bundle" of mobility applications that leverage existing and new connected vehicle data sets and other data to provide first-responders, emergency management centers, and road crews with groundbreaking capabilities and enhanced levels of safety, allowing them to respond faster and more effectively to incidents and emergencies than they can today.

The analysis is based on the policy team's review of a wide range of materials including:

- The R.E.S.C.U.M.E. Concept of Operations (ConOps)

- The Connected Vehicle Reference Implementation Architecture (CVRIA) diagrams for R.E.S.C.U.M.E.[2]

- Discussions with the technical team overseeing development of the prototype applications within the R.E.S.C.U.M.E. bundle and a review of the prototype documents

- Industry best practices and standards in information technology, security and privacy, and data exchange

- Existing regulatory and legal regimes that apply to emergency response

As policy or institutional issues emerged during the review, they were categorized into one of four categories (not every bundle had issues in all four categories) and were further paired with recommended actions for resolution, if options were available. Where they were not available, additional research is recommended. The four issue categories are:

1. *High priority* issues need immediate attention and resolution as they may challenge deployment.

2. *Medium priority* issues have potentially serious consequences but clear, if challenging, paths to resolution, which should be accomplished prior to technology transfer.

3. *Low priority issues* have policy implications but also have solutions underway or represent current best practices that can be implemented before R.E.S.C.U.M.E. applications are introduced to the marketplace.

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[2] See Appendix A, reference 7.

4. *Emerging* issues have some probability of challenging deployment over time, as R.E.S.C.U.M.E. implementations grow in complexity or geographic coverage.

Policy Issues Unique to R.E.S.C.U.M.E.

The policy team documented four issues unique to R.E.S.C.U.M.E.

High Priority Issues

- Multi-Agency Coordination for Information Broker Function: R.E.S.C.U.M.E., as defined, relies on an Information Broker to collect, process, and disseminate data among the R.E.S.C.U.M.E. applications. Because the Information Broker functions will in many cases be distributed among multiple entities (e.g., Traffic Management Centers, Medical Care Facilities, Emergency Operations Centers, Federal Emergency Management Agency, state and local governments), it will be imperative for participating agencies to determine roles and responsibilities when implementing R.E.S.C.U.M.E. Of particular importance will be the establishment of multi-agency data sharing agreements and operational responsibilities, so that all participants know which information each is expected to provide.

- Compliance with HIPAA Privacy Requirements: R.E.S.C.U.M.E. applications – in particular, Emergency Communications and Evacuation (EVAC) – may handle personal health information (PHI), and must be certain to be consistent with the privacy requirements of the Health Insurance Portability and Accountability Act of 1996 (HIPAA). HIPAA allows hospitals and health care facilities to release PHI without an individual's authorization if the information is to be used "for treatment…and health care operations[3]," and includes specific requirements for the handling, sharing and use of PHI.

  Like all of the dynamic mobility application bundles, R.E.S.C.U.M.E. will undergo additional analysis related to privacy issues and risks, including those related to HIPAA compliance. In addition, each R.E.S.C.U.M.E. deployment should carefully consider privacy issues, including HIPAA compliance, during design, implementation, and operations.

Low Priority/Resolved Issues

The analysis identified two potential policy issues that, while important, appear to have clear paths to resolution.

- Data and Message Standards for Emergency Communication[4]: The Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG) application will draw on data from multiple public and private-sector sources (transportation, medical, and emergency centers and possibly others), and must be able to integrate all data and immediately disseminate appropriate information, messages, and warnings to multiple agencies using a variety of communications platforms and alerting technologies. In addition, the EVAC application may need to integrate medical records data from a variety

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[3] http://www.hhs.gov/ocr/privacy/hipaa/understanding/summary/
[4] This is also a multi-application issue. It is discussed in this section because, in the view of the policy analysis team, it is being resolved and therefore is not an open policy issue.

of sources, as well as Geographic Information Systems (GIS), Global Positioning Systems (GPS), traffic, weather and other data from a variety of sources. Consequently, the need for data and messaging standards to facilitate inter-agency and inter-jurisdictional emergency information sharing is apparent.

- INC-ZONE Implementation: The Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE) application will require small but important changes to the procedures response crews follow when they arrive at incident scenes, and also may have implications for incident/work zone signage design standards. Accordingly, agencies implementing INC-ZONE would benefit from guidance describing how INC-ZONE and related equipment can be incorporated into existing incident zone and work zone set up procedures.

Conclusions and Next Steps

Based on the results of this analysis, the policy team does not foresee a need for any new policies to be enacted or any major issues that will stand in the way of successful market adoption and use by industry.

In summary, recommendations that emerged from the analysis for addressing the potential high-priority R.E.S.C.U.M.E. policy issues are:

- Multi-Agency Coordination for Information Broker Function: Conduct an organizational analysis and use it to develop policy and functional guidelines. These could include documenting technological and institutional success factors for inter-agency coordination and data sharing; reviewing FEMA continuity Guidance Circulars regarding inter-jurisdictional data sharing; and developing templates on multi-jurisdictional data sharing.

- Compliance with HIPAA Privacy Requirements: Conduct further privacy impact analyses, including determining whether providing PHI to "emergency management centers" will qualify for HIPAA exclusions. Also research whether an "opt-in" policy for providing one's PHI to emergency response agencies would address HIPAA privacy requirements. In addition, determine whether entities handling PHI via R.E.S.C.U.M.E. will be required to conduct privacy risk assessments per HIPAA.

The mobility application development process is responsive to numerous considerations; some of these are purely technical in nature, while others are policy-related. The final versions of the applications in each bundle will represent the optimal solutions to address all the issues. This report represents an important step in documenting the decisions that have been made throughout the application development process, so that stakeholders will be able to understand the history of how and why particular choices were made regarding application functionality, data sources, and other important factors.

The policy issues identified in this report as having identified solutions will not be pursued further. They are documented herein in case stakeholders raise them in the future and need to know how the DMA program has addressed them.

With the documentation of policy issues and decisions that have been made throughout USDOT's R.E.S.C.U.M.E. application development process, stakeholders will have the ability to comment on whether:

- There are additional policy or institutional issues that may present challenges to the successful market adoption and use of R.E.S.C.U.M.E. and that are not documented but for which new or additional research and analysis is recommended.

- The policy options identified for resolution of the issues are appropriate.

Finally, it should be noted that data privacy and security have been raised as key policy concerns for all of the dynamic mobility applications. Privacy has been highlighted as a high concern for R.E.S.C.U.M.E. USDOT research is ongoing in this area to develop options to address these new DMA applications as well as to standardize security for future applications that have yet to emerge. To develop optional approaches for security and privacy, analysis using National Institute of Standards and Technology (NIST) standards (Special Publication 800-53[5] Rev 4) is underway to assess any policy or institutional challenges[6]. This analysis explores the minimal data set that is necessary for R.E.S.C.U.M.E. functionality, and assesses any public concerns or policy challenges associated with the data set. Where R.E.S.C.U.M.E. is transferred to market adopters, the private sector is expected to play a major role in setting privacy and data access policies. Each R.E.S.C.U.M.E. deployment should carefully consider privacy issues, including HIPAA compliance during design, implementation and operations.

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[5] http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-53r4.pdf
[6] USDOT research and analysis results are made available through the ITS Joint Programs Office website at www.its.dot.gov.

Chapter 1 Introduction

This report documents policy considerations for the Response, Emergency Staging and Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.) bundle of connected vehicle applications.

R.E.S.C.U.M.E is one of several connected vehicle applications that the Intelligent Transportation Systems Joint Program Office (ITS JPO) of the U.S. Department of Transportation and its partners are prototyping as part of its Connected Vehicle Program. The ITS JPO is advancing new Connected Vehicle technologies through innovative research.

Dynamic Mobility Applications

In the future, cars, trucks, buses, roads, and smartphones will talk to each other. They will share valuable safety, mobility, and environmental information over a wireless communications network that is already transforming our transportation system as we know it. This system of connected vehicles, mobile devices, and roads will provide a wealth of transportation data, from which innovative applications will be built. These applications will make travel not only safer, but more efficient and greener.

The USDOT's Dynamic Mobility Applications program is exploring these possibilities, specifically focusing on reducing delays and congestion and thus significantly improving mobility. The following six mobility application bundles are being prototyped to make this possible:

- *Enabling Advanced Traveler Information Systems (EnableATIS)* provides a framework to develop multisource, multimodal data into new advanced traveler information applications and strategies.

- *Freight Advanced Traveler Information System (FRATIS)* provides freight-specific route guidance and optimizes drayage operations so that load movements are coordinated between freight facilities to reduce empty-load trips.

- *Integrated Dynamic Transit Operations (IDTO)* facilitates passenger connection protection, provides dynamic scheduling, dispatching, and routing of transit vehicles, and promotes dynamic ridesharing.

- *Intelligent Network Flow Optimization (INFLO)* aims to optimize network flow on freeway and arterials by: informing motorists of existing and impending queues and bottlenecks; providing target speeds by location and lane; and allowing the capability to form ad hoc vehicle platoons of uniform speed.

- *Multi-Modal Intelligent Traffic Signal Systems (MMITSS)* is a comprehensive traffic signal system for use on complex arterial networks that include passenger vehicles, transit, freight, and emergency vehicles, as well as pedestrians.

- *Response, Emergency Staging and Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.)* involves advanced vehicle-to-vehicle safety messaging over dedicated short-range communications (DSRC) to improve the safety of emergency responders and travelers.

The USDOT's Connected Vehicle Mobility Policy team is performing the analysis needed to document policy and institutional issues and recommend options for resolution for each of these bundles in separate reports.

Policy Considerations for New Connected Vehicle Technologies

Throughout the process of developing new connected vehicle technology, various policy or institutional issues can become stumbling blocks. Examples include changes brought about by the application and its operations that could possibly affect established norms for data usage; liability; governance; funding; interoperability of hardware, software, and data; employee requirements; or other issues that may preclude adoption and use by industry.

Policy analysis is an iterative process that proceeds in concert with research and development. Hence, identification of policy challenges early in the development stage can change the nature of technical decisions. Envisioning policy challenges throughout the life cycle enables smooth technology transfer and system deployment.

This report is structured as follows:

- Chapter 1   Introduction
- Chapter 2   Description of R.E.S.C.U.M.E.
- Chapter 3   Policy Analysis Approach for Analyzing New Connected Vehicle Applications
- Chapter 4   Policy Analysis Results on R.E.S.C.U.M.E. Applications
- Chapter 5   Conclusion
- Appendix A   Source Materials
- Appendix B   List of Acronyms

Chapter 2 Description of R.E.S.C.U.M.E.

The R.E.S.C.U.M.E. bundle comprises three applications, as well as important data integration and communication functions known collectively as the Information Broker [7]. These elements are described below[8].

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

The RESP-STG application is designed to provide emergency responders with improved information about incidents upon dispatch and while en route to an incident scene. Such information includes dynamic routing to the scene to avoid road closures and roads impassable due to weather, details regarding the potential hazardous content of involved vehicles, placement of emergency vehicles already at the incident, and victim injury severity predictions. Awareness of this information in advance enables responders to make time-saving and potentially life-saving decisions prior to arrival on scene. The RESP-STG application will be deployed on existing Mobile Data Terminals within responder vehicles.

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

INC-ZONE will improve protection of responders at incident sites where there have been crashes or other events impacting traffic such as stalled vehicles or vehicles pulled over for moving violations. These temporary incident zones often change during the course of the incident (e.g., the number of lanes closed) and without prior notification. Consequently, such zones can be confusing for drivers, and can create safety risks for responders.

The INC-ZONE application will provide responders with information about events occurring in the incident zone. In particular, one component of the INC-ZONE application will provide responders with real-time alerts of oncoming vehicles that have trajectories or speeds that pose a high risk to their safety. Additional information such as arrival of additional responders would also be provided to assist in staging decisions and response to the incident.

A second aspect of the INC-ZONE application will involve an in-vehicle messaging system that provides merging and speed guidance around an incident to oncoming vehicles. For example,

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[7] Information brokering requirements vary among the R.E.S.C.U.M.E. applications
[8] These descriptions are taken from the R.E.S.C.U.M.E. Concept of Operations (11/19/2012, FHWA-JPO-13-063)

speed data will be acquired from connected vehicles approaching an incident [9]. Those vehicles that pose a risk to themselves or to the incident zone responders will receive a message generated by the INC-ZONE application notifying them of the dangerous speed and advising a speed reduction.

Emergency Communications and Evacuation (EVAC)

An emergency evacuation may involve a large region with days of advance notice, such as with an approaching hurricane. It can also be rapid and local, such as in response to a hazardous materials leak or a potential explosion. Evacuation involves coordination of many agencies and functions including emergency management, public safety responders, public and private transportation providers, and DOTs. Evacuations involve not only people who are able to evacuate themselves but also those who cannot. The planning and execution of an evacuation must consider all categories of functional needs. Use of the EVAC application is intended to coordinate evacuation of all evacuees.

During an incident, the Emergency Management Agency will have the ability to push information such as evacuation orders by zone through the EVAC application to registered users (either those that have pre-registered, or via registration during the event). The Transportation Management Center working with the Emergency Operations Center would use EVAC to coordinate the listing of available transportation resources to assist with evacuation. The EVAC application will dispatch and route the transportation resources to the appropriate location, while providing updates to evacuees in need of assistance.

For evacuees not requiring special assistance, EVAC will provide evacuation route guidance that accounts for road conditions, traffic conditions, and final destination. If an evacuee intends to go to a shelter or hotel, EVAC will provide a shelter matching function to help the evacuee determine where he or she should go based upon shelter availability and capability (e.g., does the shelter accept pets?). Should the evacuee need a resource such as food or fuel along the evacuation route, EVAC will provide recommended stops and will incorporate user input to provide information (though not necessarily validated information) on the availability of the needed resource.

Additionally, EVAC will provide a Return of Evacuees Function to provide evacuees with information regarding when they can return home and provide recommended routes taking into consideration road conditions. All of these functions will support an overall reduction in the amount of time it takes to evacuate a jurisdiction, promote the use of all available evacuation routes to help minimize traffic congestion, and mitigate secondary incidents such as a car running out of fuel along an evacuation route, or too many people arriving at a shelter that is full and staying on the roads longer (adding to the congestion).

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[9] Portable sensors (e.g. radar) are being considered for near-term deployment giving immediately safety benefits as CV saturation increases.

Information Broker

At the heart of R.E.S.C.U.M.E. is an Information Broker entity whose role is to collect, process, and disseminate data among the applications. As envisioned in the R.E.S.C.U.M.E. bundle, the Information Broker would incorporate the functions currently provided by entities such as Emergency Call Centers/Public Safety Answering Points, Transportation Management Centers, and Emergency Operation Centers. The specific entities serving as Information Brokers are likely to vary with each R.E.S.C.U.M.E. deployment and in addition to those listed above, could also include State and Local authorities, hospitals, or the Federal Emergency Management Agency (FEMA), among other entities.

Chapter 3 Policy Analysis Approach for Analyzing New Connected Vehicle Applications

The policy analysis for this report was conducted in several steps, illustrated in Figure 3-1 and described in this section.
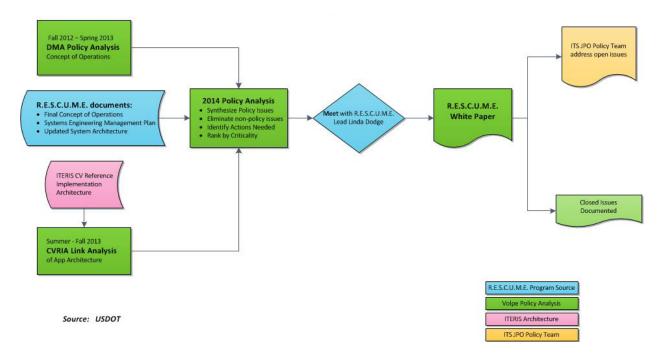
Figure 3-1. R.E.S.C.U.M.E. Policy Analysis Process

Source: USDOT

1. <u>Review Operational Concept</u>: The Volpe Center policy team reviewed the Operational Concept for R.E.S.C.U.M.E. The team documented potential policy issues at each stage of the development and deployment process, identified known policy options and solutions, and recommended areas for further investigation.

2. <u>Review Connected Vehicle Reference Implementation Architecture</u>: The policy team conducted a detailed analysis of the Connected Vehicle Reference Implementation Architecture[10]. The CVRIA provides a set of system architecture viewpoints that describe the functional, physical, and logical interfaces; enterprise relationships; and

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[10] http://www.standards.its.dot.gov/DevelopmentActivities/CVReference accessed April 2014.

communications dependencies for each technology and application within the connected vehicle environment. These viewpoints serve as a common reference to help identify and prioritize standards development and to support policy considerations for the connected vehicle environment.

The policy team used the CVRIA viewpoints to identify both the entities sharing data in each application, and the specific data elements being transmitted. By doing so, the team was able to surface potential issues for R.E.S.C.U.M.E.

3. Integrate Results: Having completed the Operational Concepts analysis and the CVRIA analysis, the policy team undertook a process of integrating the results of those two efforts. This was important because the Operational Concepts analysis tended to focus on broader issues, while the CVRIA analysis in many cases identified issues that related to specific types of data being exchanged between specific entities within a given application. Integrating the results from both analyses enabled the policy team to develop a complete picture of all the potential issues for the R.E.S.C.U.M.E. bundle.

4. Review New Materials: Additional materials for R.E.S.C.U.M.E. were reviewed and assessed against the results of the first level analysis. Recognizing that the work to define prototypes added detail (and in some cases modified) the existing Operational Concept and System Requirements documents, the team incorporated a review of newly produced materials on the prototype demonstrations.

5. Eliminate Non-Policy Challenges: After integrating the results of the two efforts, the policy team identified and eliminated any issue that was purely technical or logistical in nature and therefore did not have direct policy impacts. For example, the issue of malicious hacking of hardware or software is not included in the analysis as it is currently being addressed through technical development and will apply, overall, to connected vehicle environments. Separate technical working groups are identifying the security policies that will be needed in support of the technical solutions; this policy team will, in the future, identify whether R.E.S.C.U.M.E. may require any further tailoring of those policies to support operations.

6. Prioritize Policy Issues: The team assigned a priority to each of the remaining issues on the following basis:

    a. *High priority* issues need immediate attention and resolution as they may obstruct deployment.

    b. *Medium priority* issues have potentially serious consequences but clear, if challenging, paths to resolution. These should be resolved prior to technology transfer.

    c. *Low priority* issues have policy implications but also have solutions underway. These solutions can likely be implemented before ATIS applications are introduced to the marketplace.

    d. *Emerging* issues have some probability of obstructing deployment over time, as ATIS implementations grow in complexity or geographic coverage.

7. Identify Issues Common to Other DMA Bundles: The team differentiated between policy issues that were unique to a single DMA bundle, and issues common to multiple DMA bundles. Issues common to multiple DMA bundles may need to be resolved at the level of the DMA program or the Connected Vehicle program (e.g., privacy policy), rather than within the individual bundle development efforts.

8. <u>Meet with Technical Team</u>: After completing the preceding steps, the policy team summarized the policy issues and discussed them with the R.E.S.C.U.M.E. technical lead. This provided the technical lead the opportunity to agree or disagree about the veracity and priority of each issue, and to provide more information on each issue—information the policy team used to refine the policy analysis and conclusions.

9. <u>Stakeholder Outreach</u>: Once the results were discussed with the technical team, the draft report was shared with external stakeholders for validation. All comments were incorporated into this final draft.

10. <u>Document Results</u>: This report includes the results of that analysis and identifies issues that have been resolved and concerns that are recommended for additional USDOT research.

Chapter 4 Policy Analysis Results on R.E.S.C.U.M.E. Applications

This chapter describes the policy and institutional issues identified during the R.E.S.C.U.M.E. policy analysis. Issues are characterized as "high priority" if they could impede the development, implementation, or market adoption of the R.E.S.C.U.M.E. applications if left unresolved and also if there do not appear to be clear paths to resolving them. Issues characterized as "low priority" have policy implications but also have solutions underway or are relatively straightforward as they represent best practices in use today and are available to implement prior to application deployment. The following table provides an inventory of the R.E.S.C.U.M.E. policy issues.

Table 4-1. R.E.S.C.U.M.E. Policy Issues

Issue	Priority	Common to Other DMA Bundles?
Multi-Agency Coordination for Information Broker Function	High	No
Compliance with HIPAA Privacy Requirements	High	No
Data and Message Standards for Emergency Communication	Low	No
INC-ZONE Implementation	Low	No

Policy Issues Unique to R.E.S.C.U.M.E.

The analysis has identified four potential policy issues – two deemed high priority and two deemed low priority; all are unique to the R.E.S.C.U.M.E. bundle.

High Priority Policy Issues Unique to R.E.S.C.U.M.E.

The analysis identified two potentially high priority policy issues that are unique to R.E.S.C.U.M.E.:

- Multi-Agency Coordination for Information Broker Function: The proposed Information Broker functions will collect, process, and disseminate data among the R.E.S.C.U.M.E. applications. Because the Information Broker functions will in many cases be distributed among multiple entities (e.g., Traffic Management Centers, Medical Care Facilities, Emergency Operations Centers, FEMA, state and local governments), it will be imperative for participating agencies to determine roles and responsibilities when

implementing R.E.S.C.U.M.E. Of particular importance will be the establishment of multi-agency data sharing agreements and operational responsibilities, so that all participants know which information each is expected to provide. Multi-Agency Coordination regarding the role of Information Brokers may want to consider to cover technical and policy aspects for data collection, data sharing, and data retention among others. Further, it is envisioned that any information coming into the vehicle will be sent from trusted sources as identified by set security credentials.

Guidance from FEMA, issued in response to National Security Presidential Directive-51/Homeland Security Presidential Directive-20 (HSPD-20), highlights the necessity for multi-agency coordination for emergency response. Initial review of these documents indicates that state and local agencies are required to coordinate efforts and communication for all emergency response activities[11].

Examples of effective multi-agency emergency coordination exist, and can serve as best-practice models for the Information Broker. One such example is the Capital Wireless Information Net (CapWIN), a program located within the University of Maryland's Center for Advanced Transportation Technology. A coalition of law enforcement, fire/Emergency Medical Services, and transportation agencies in Maryland, Virginia, and the District of Columbia created CapWIN, and provide ongoing oversight of the program. CapWIN offers a variety of products and services that enable emergency communication and data exchange among the various agencies in all three jurisdictions. CapWIN products include the following[12]:

o *Global View + Geographic Information Systems (GIS)*: This system integrates information from transportation, transit, public safety, and emergency management agencies to give first-responders immediate access to incident data from across jurisdictions and disciplines. Global View+GIS displays geo-located incidents on an interactive map display, and enables users with standard Global Positioning Systems (GPS)-enabled mobile devices to view and track their position relative to incidents.

o *Comm-Link*: This product provides direct, real-time data communications to all CapWIN participants regardless of discipline or jurisdiction. Providing robust and secure messaging tools, CapWIN participants can communicate instantly one-to-one or in public or private groups supporting specific incidents or activities taking place in CapWIN. CapWIN Comm-Link includes a robust and searchable skill-based directory of all CapWIN user profiles enabling easy access to contact information for on- or off-line users.

Comm-Link also provides robust incident coordination tools, including file and photo sharing, live field updating, and incident event logging capabilities. These tools are accessible to all CapWIN users, enabling multiple jurisdictions and disciplines to share information and to coordinate their response to different types of incidents. In addition, CapWIN Comm-Link supports agency-specific and system-wide "Message Alerts" allowing Agency Leaders/Administrators to instantly disseminate critical information to their users or to all online CapWIN participants.

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[11] Federal Emergency Management Agency, Continuity Guidance Circular 1 and Continuity Guidance Circular 2. See sources section of this report for full citations.
[12] The following descriptions are taken from the CapWIN website: http://www.capwin.org

- ○ *InfoShare*: This networking infrastructure enables real-time data access and exchange across multiple public safety, transportation, and emergency management databases. CapWIN InfoShare automatically integrates data from external systems into its GlobalView+GIS interface, providing a common display of multiple incidents to CapWIN users. InfoShare currently provides participating jurisdictions with access to a range of data sources, including multiple criminal justice databases, and multiple transportation incident information sources.

In addition to its products, CapWIN offers a variety of data, operational support, training, and information technology consulting services to first-responder organizations – all in support of improving inter-agency and cross-jurisdictional coordination and data sharing.

Another potential source of Information Broker best-practice examples is the Mobility Services for All Americans (MSAA) initiative. The ITS Joint Program Office launched MSAA in 2005, with the goal of improving transportation services and access to employment, healthcare, education and other community activities through coordination enabled by ITS technologies and applications. MSAA built upon existing efforts, including the USDOT's United We Ride Program, to increase mobility and accessibility for the transportation disadvantaged and the general public, and achieve more efficient use of federal transportation funding resources through technology integration and service coordination.

The MSAA initiative focused on identifying the key success factors (both technological and institutional) for integrating ITS technologies into physical or virtual Travel Management Coordination Centers (TMCC). These integration strategies that networked all parties together are analogous to the way the R.E.S.C.U.M.E. Information Broker is envisioned to function. Successful TMCCs use proven ITS technologies, including fleet scheduling, dispatching, and routing systems; integrated fare payment and management systems; and traveler information and trip planning systems.

With the Information Broker concept introducing new ways to disseminate data, R.E.S.C.U.M.E. market adoption may benefit from an organizational analysis and development of policy and functional guidelines, similar to those being performed for security organizations. Such analysis would form the basis for local decision-making and implementation. Accordingly, to help ensure successful implementation of the Information Broker function within R.E.S.C.U.M.E, the policy team recommends the development of Information Broker guidelines for implementation and operations to assist jurisdictions that wish to deploy R.E.S.C.U.M.E. Guidance might include:

- ○ Case studies and documented lessons learned (potentially from the CapWIN program and similar initiatives) that document specific technological and institutional success factors for inter-agency coordination and data sharing.

- ○ Identification of the key guidance from FEMA Continuity Guidance Circulars regarding inter-jurisdictional data sharing.

- ○ Recommendations on appropriate technologies and (possibly) templates for crafting multi-agency agreements on data-sharing, privacy, or definitions of roles and responsibilities (checklists), among other useful tools.

- • Compliance with HIPAA Privacy Requirements: R.E.S.C.U.M.E. applications – in particular, EVAC – may handle personal health information (PHI), and must be certain to do so in ways that are consistent with the privacy requirements of the Health Insurance Portability and Accountability Act of 1996 (HIPAA). HIPAA allows hospitals and health

care facilities to release PHI without an individual's authorization if the information is to be used "for treatment…and health care operations," and includes specific requirements for the handling, sharing, and use of PHI.

Like all of the dynamic mobility application bundles, R.E.S.C.U.M.E. will undergo additional analyses related to privacy issues and risks, including those related to HIPAA compliance. In addition, each R.E.S.C.U.M.E. deployment should carefully consider privacy issues, including HIPAA compliance, during design, implementation, and operations. For these privacy analyses to achieve their stated purposes, they should, at minimum, determine the following:

o   Whether providing PHI to "emergency management centers" will qualify for HIPAA exclusions. As defined in the R.E.S.C.U.M.E. architecture (per the CVRIA), emergency management centers can include facilities without obvious medical roles. Clarification may be needed to specify which emergency management centers will be allowed access to PHI, and under what circumstances.

o   Whether an "opt-in" policy for providing one's PHI to emergency response agencies would help address HIPAA privacy requirements. This would be particularly relevant for the EVAC application, in which individuals with special medical and/or mobility needs could choose to provide that information to emergency response agencies so that first responders would know which individuals to focus on in the event of a natural disaster or evacuation.

o   Whether entities handling PHI via R.E.S.C.U.M.E. will be required to conduct privacy risk assessments per HIPAA.

Because compliance with HIPAA privacy requirements is so important, the ITS JPO may want to work with USDOT legal staff to conduct a complete analysis of how HIPAA requirements – including but not limited to privacy – apply to R.E.S.C.U.M.E. applications. Should such an analysis indicate that special PHI handling requirements are needed, a second action would be to develop guidance for R.E.S.C.U.M.E. implementers regarding their responsibilities as well as to document examples for how to produce an appropriate analysis (if this step is needed, it may ultimately be linked with the processes associated with incorporating R.E.S.C.U.M.E. into Statewide or Regional ITS Architectures).

Low Priority/ Resolved Policy Issues Unique to R.E.S.C.U.M.E.

The analysis identified two potential policy issues that, while important, appear to have clear paths to resolution.

•   Data and Message Standards for Emergency Communication[13]: The RESP-STG application will draw on data from multiple public and private-sector sources (transportation, medical, and emergency centers and possibly others), and must be able to integrate all data and immediately disseminate appropriate information, messages and warnings to multiple agencies using a variety of communications platforms and alerting technologies. In addition, the EVAC application will need to integrate medical records

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[13] This is also a multi-application issue. It is discussed in this section because, in the view of the policy analysis team, it is being resolved and therefore is not an open policy issue.

data from a variety of sources, as well as GIS, GPS, traffic, weather and other data. Consequently, the need for data and messaging standards to facilitate inter-agency and inter-jurisdictional emergency information sharing is apparent.

Work has been underway for more than a decade on the development of standards for interoperable (i.e., platform "agnostic") emergency information exchange. Two prominent examples of this work are particularly relevant to R.E.S.C.U.M.E.:

o *EDXL*: An emergency management technical committee formed in 2003 under the auspices of the Organization for the Advancement of Structured Information Standards[14] to develop standards for emergency management and incident preparedness and response. Since then, the committee has worked to develop the Emergency Data Exchange Language (EDXL), a suite of XML-based messaging standards that "enable data exchange between public and private institutions on diverse platforms and applications[15]." The EDXL suite includes several standards, all of which are directly relevant to R.E.S.C.U.M.E.[16]:

- Emergency Data Exchange Language Distribution Element (EDXL-DE): The Distribution Element is a header, or "wrapper" for XML emergency messages that facilitates flexible message distribution. It provides the information needed to route messages by specific recipients, by geographic area, by incident type and by other criteria.

- Emergency Data Exchange Language Resource Message (EDXL-RM): The Resource Message provides a set of standard formats for XML emergency response messages to share data among information systems that coordinate request for emergency equipment, supplies and personnel. EDXL-RM messages are sent with EDXL-DE headers to direct their routing.

- Emergency Data Exchange Language Hospital Availability Exchange (EDXL-HAVE): This standard specifies an XML document format that allows a hospital to communicate its status – including available beds, Emergency Room status, and other important factors – across jurisdictions and to share the information with emergency responders who may be using different communication networks and applications.

- Emergency Data Exchange Language Situation Reporting (EDXL-SitRep): This standard, which is in the development process, will enable the sharing across various computer systems of information about incidents, emergencies or other events.

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[14] https://www.oasis-open.org/org

[15] Organization for the Advancement of Structure Information Standards Emergency Management Technical Committee Press release: https://www.oasis-open.org/news/pr/oasis-members-form-emergency-management-technical-committee

[16] The following descriptions are taken, with minimal re-writing, from: http://en.wikipedia.org/wiki/EDXL#Background

- EDXL-TEP (Tracking of Emergency Patients): This message standard permits first responders, hospitals, emergency management entities and other affiliated organizations to exchange information about individual patients along the entire chain of patient care, from initial encounter to hospital admission (or, in the event of patient transfers to different hospitals for routine reasons or because of a hospital evacuation).

By applying EDXL standards and, potentially, other standards, R.E.S.C.U.M.E. participants can ensure that vital information can be exchanged across agencies and jurisdictions; and that emergency responders and coordinators can access information from different sources quickly and seamlessly.

o *IEEE 1512*: Another important resource for the development of interoperable emergency communications and data exchange are emergency message standards documented in the National Incident Management System (NIMS). The Department of Homeland Security (DHS) developed NIMS beginning in 2003, in response to a Presidential Directive (HSPD-5). NIMS is designed to provide:

> " . . . a consistent nationwide template to enable Federal, State, tribal, and local governments, nongovernmental organizations, and the private sector to work together to prevent, protect against, respond to, recover from, and mitigate the effects of incidents, regardless of cause, size, location, or complexity[17]."

NIMS includes a Recommended Standards List (RSL) describing voluntary consensus standards (from groups of subject matter experts) that support implementation of NIMS and, by direct extension, effective incident response and management. Included in the RSL is the *Institute of Electrical and Electronics Engineers (IEEE) 1512-2006: Standards for Common Incident Message Sets for Use by Emergency Management Centers.* These standards provide definitions, specific messages, data frames, and data elements for communicating information that Emergency Operations Centers can use immediately in responding to multi-agency transportation-related incidents. IEEE 1512 is the baseline document for a set of standards – 1512.1, 1512.2, and 1512.3 – that relate, respectively, to traffic incidents, public safety, and hazardous cargo. Importantly, IEEE 1512 provides guidelines for operations, communication, and relationships between Emergency Operations Centers and other emergency response organizations involved in transportation-related incidents[18,19].

With robust emergency data exchange and messaging standards already available and others in development, resolution of the R.E.S.C.U.M.E. data and message standardization issues seems certain. An important first step in the process of applying standards to the R.E.S.C.U.M.E. application will be the determination of which communications interfaces and data sets in each of the R.E.S.C.U.M.E.

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[17] http://www.fema.gov/pdf/emergency/nims/NIMS_core.pdf
[18] https://www.fema.gov/pdf/emergency/nims/FY09_Recommend_Standards_List_121708.pdf pg. 2-3
[19] Another national standards-development initiative, The National Information Exchange Model has borrowed the EDXL concepts and methods for the development of its Emergency Management domain, which is independent of EDXL.

applications are recommended for standardization. The USDOT's CVRIA initiative is producing a set of system architecture viewpoints covering all the mobility applications. The viewpoints describe "the functions, physical and logical interfaces, enterprise relationships, and application dependencies within the connected vehicle environment[20]." The viewpoints will allow identification of the specific data elements and ITS system interfaces for each application, and will form the basis for a connected vehicle standardization plan that will prioritize standards research and development activities.

- INC-ZONE Implementation: The INC-ZONE application requires small but important changes to the procedures response crews follow when they arrive at incident scenes, and also may have implications for incident/work zone signage design standards. Accordingly, the policy team notes two potential issues related to INC-ZONE implementation.

  First, agencies implementing INC-ZONE would benefit from guidance describing how the use of the INC-ZONE application and related equipment can be incorporated into existing incident zone and work zone set up procedures, including the additional steps needed to activate, test, and deploy the personal warning devices and other INC-ZONE equipment. The policy team views this as a "low priority" issue, because the development of such guidance is likely to be derived from the results of the technical documentation of the applications. It is noted that because incident and work zone procedures are largely consistent nationally, a single set of guidelines would most likely be applicable to the vast majority of states and cities.

  The second potential INC-ZONE policy issue relates to consistency with the Manual of Uniform Traffic Control Devices (MUTCD)—a document that provides standards and guidelines for the management of traffic at emergency incident scenes and work zones. In-vehicle warnings that the INC-ZONE application will send to connected vehicles approaching an incident or work zone must not conflict with MUTCD standards (although, at present, in-vehicle warnings are not within the scope of the MUTCD). The Policy Team views this as a "low priority" issue, because MUTCD compliance, if needed, will involve modifying message content and format, but is unlikely to require changing the underlying INC-ZONE application. The in-vehicle warning messages developed for the INC-ZONE prototype were based as closely as possible on MUTCD warning signs. Additionally, the INC-ZONE prototype has been implemented using three message sets defined by existing protocols (J2735: Basic Safety Message, Emergency Vehicle Alert, and a la carte). No additional message formats were required.

  As this application matures, additional research may be required to facilitate the seamless integration of the application with in-vehicle information and security.   It is also acknowledged that other technologies such as radar should be considered for use in tandem with INC-ZONE deployments in the near term to address low penetration rates of DSRC equipped vehicles.

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[20] http://www.standards.its.dot.gov/DevelopmentActivities/CVReference

Chapter 5 Conclusion

Based on the results of this analysis, the policy team does not foresee a need for any new policies to be enacted or any major issues that will stand in the way of successful market adoption and use by industry. Ultimately, guidance on installation, integration, operations, and maintenance will be produced by the technical teams when completing their technology transfer to the marketplace. And, appropriate standards are expected to emerge to support interoperability, as needed.

R.E.S.C.U.M.E. faces just two potential high priority policy issues: multi-agency coordination for the Information Broker function, and compliance with HIPAA privacy requirements. Specific recommendations that emerged from the analysis for addressing these high-priority R.E.S.C.U.M.E. policy issues are:

- Multi-Agency Coordination for Information Broker Function: Conduct an organizational analysis and use it to develop policy and functional guidelines. These could include:

  - Case studies and documented lessons learned that identify specific technological and institutional success factors for inter-agency coordination and data sharing.

  - Identification of the key guidance from FEMA Continuity Guidance Circulars regarding inter-jurisdictional data sharing.

  - Recommendations on appropriate technologies and (possibly) templates for crafting multi-agency agreements on data-sharing, privacy, or definitions of roles and responsibilities (checklists), among other useful tools.

- Compliance with HIPAA Privacy Requirements: Conduct additional privacy impact analyses determining the following:

  - Whether providing PHI to "emergency management centers" will qualify for HIPAA exclusions.

  - Whether an "opt-in" policy for providing one's PHI to emergency response agencies would address HIPAA privacy requirements.

  - Whether entities handling PHI via R.E.S.C.U.M.E. will be required to conduct privacy risk assessments per HIPAA.

  Ultimately it may be necessary to work with USDOT legal staff to conduct a complete analysis of how HIPAA requirements apply to R.E.S.C.U.M.E. applications.

The mobility application development process is responsive to numerous considerations; some of these are purely technical in nature, while others are policy-related. The final versions of the applications in each bundle will represent the optimal solutions to address all the issues. This report represents an important step in documenting the decisions that have been made throughout the application development process, so that stakeholders will be able to understand the history of how and why particular choices were made regarding application functionality, data sources, and other important factors.

The policy issues identified in this report as having identified solutions will not be pursued further. They are documented herein in case stakeholders raise them in the future and need to know how the DMA program has addressed them.

Next Steps

With the documentation of policy issues and decisions that have been made throughout USDOT's R.E.S.C.U.M.E application development process, stakeholders will have the ability to comment on whether:

- There are additional policy or institutional issues that may present challenges to the successful market adoption and use of R.E.S.C.U.M.E. and that are not documented but for which new or additional research and analysis is recommended.

- The policy options identified for resolution of the issues are appropriate.

APPENDIX A.   Source Materials

In conducting this analysis, the policy team used the following documents and information sources about R.E.S.C.U.M.E.:

1. *Prototype Development and Demonstration for Response, Emergency Staging, Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.): Final Functional and Performance Requirements.* January 10, 2014

     Prepared for the United States Department of Transportation, Research and Innovative Technology Administration, Intelligent Transportation Systems Joint Program Office. Prepared by Battelle Memorial Institute.

2. *Prototype Development and Demonstration for Response, Emergency Staging, Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.): Prototype System Architecture.* January 17, 2104

     Prepared for the United States Department of Transportation, Research and Innovative Technology Administration, Intelligent Transportation Systems Joint Program Office. Prepared by Battelle Memorial Institute.

3. *Response, Emergency Staging, Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.): Concept of Operations.* November 19, 2012

     Prepared for the United States Department of Transportation, Research and Innovative Technology Administration, Intelligent Transportation Systems Joint Program Office. Report FHWA-JPO-13-063. Prepared by Battelle Memorial Institute.

4. *Response, Emergency Staging, Communications, Uniform Management, and Evacuation (R.E.S.C.U.M.E.) Report on Functional and Performance Requirements, and High-Level Data and Communication Needs.* February 7, 2013

     Prepared for the United States Department of Transportation, Research and Innovative Technology Administration, Intelligent Transportation Systems Joint Program Office. Report FHWA-JPO-13-064. Prepared by Battelle Memorial Institute.

5. *Continuity Guidance Circular 1 (CGC 2).* July 2013
     Prepared by the United States Department of Homeland Security, Federal Emergency Management Agency.

6. *Continuity Guidance Circular 2 (CGC 1).* October 2013
     Prepared by the United States Department of Homeland Security, Federal Emergency Management Agency. Report FEMA P-789.

7. *Connected Vehicle Reference Implementation Architecture. http://www.iteris.com/cvria/*
     Prepared for the United States Department of transportation, Intelligent Transportation Systems Joint Program Office. Prepared by Iteris.

APPENDIX B.   List of Acronyms

CapWin	Capital Wireless Information Network
ConOps	Operational Concept
CV	Connected Vehicles
CVRIA	Connected Vehicle Reference Implementation Architecture
DMA	Dynamic Mobility Applications
DSRC	Dedicated Short-Range Communications
EnableATIS	Enabling Advanced Traveler Information Systems
EVAC	Emergency Communications and Evacuation
EDXL	Emergency Data Exchange Language
EDXL-DE	Emergency Data Exchange Language Distribution Element
EDXL-HAVE	Emergency Data Exchange Language Hospital Availability Exchange
EDXL-RM	Emergency Data Exchange Language Resource Message
EDXL-SitRep	Emergency Data Exchange Language Situation Reporting
EDXL-TEP	Emergency Data Exchange Language Tracking of Emergency Patients
EMS	Emergency Medical Services
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
HIPAA	Health Insurance Portability and Accountability Act
FRATIS	Freight Advanced Traveler Information System
GIS	Geographic Information Systems
GPS	Global Positioning System
HSPD	Homeland Security Presidential Directive
IDTO	Integrated Dynamic Transit Operations
IEEE	Institute of Electrical and Electronics Engineers
INC-ZONE	Incident Scene Work Zone Alerts for Drivers and Workers
INFLO	Intelligent Network Flow Optimization
ITS	Intelligent Transportation Systems
JPO	Joint Program Office
MMITSS	Multi-Modal Intelligent Traffic Signal Systems
MSAA	Mobility Services for All Americans

MUTCD	Manual of Uniform Traffic Control Devices
NIMS	National Incident Management System
PHI	Personal Health Information
R.E.S.C.U.M.E	Response, Emergency Staging and Communications, Uniform Management, and Evacuation
RESP-STG	Incident Scene Pre-Arrival Staging Guidance for Emergency Responders
RSL	Recommended Standards List
TMCC	Travel Management Coordination Centers
USDOT	United States Department of Transportation

U.S. Department of Transportation