

**Real-Time Information Program:  
Information Sharing Specifications  
and  
Data Exchange Format  
Reference Document**

Prepared for  
**U.S. Department of Transportation**  
Federal Highway Administration (FHWA)  
&  
Research and Innovative Technology Administration (RITA)

By  
National ITS Architecture Team

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## **BACKGROUND**

Section 1201 of SAFTEA-LU establishes the Real-Time System Management Information Program. The goals of this program are to improve security of the surface transportation system, address congestion problems, support improved response to weather events and surface transportation incidents, and facilitate national and regional highway traveler information. The desired outcomes are to make Traffic and Travel Conditions Information available to the traveling public and to ease the sharing of Traffic and Travel Conditions Information among public agencies and private enterprise.

The types of information considered for the Real-time Information Program (RTIP) include but are not limited to

- Congestion information,
- Traffic incidents that block the roadway,
- Roadway weather conditions,
- Public transportation service disruptions,
- Construction activities affecting travel conditions, and
- Travel times on roadway links.

The information needed for RTIP are not necessarily available everywhere, but the interface will be established with the data that is available. The RTIP is not concerned with developing the sources of information but with providing a standard interface to obtain the information when it does exist. Therefore, the RTIP specifications will not address data collection. They will focus on center-to-center exchanges and information that should be made available to travelers. In addition, these specifications will address information exchanges only and will not include device control.

There are two efforts described in Section 1201. One is the establishment of the RTIP in each State per the requirements of Section 1201. This information system is to be created in concert with the updates of regional ITS architectures as they are maintained. Two is the establishment of data exchange formats to facilitate the exchange of information. These data exchange formats will leverage existing ITS standards to the greatest extent possible.

This document establishes three components to ease the exchange of Traffic and Travel Conditions Information:

- A Concept of Operations to define the entire RTIP scope,
- A set of functional specifications to describe a full RTIP, based upon the functional specifications set forth in the National ITS Architecture,
- An ITS Standards reference that draws the association between the RTIP functional specifications and particular ITS standards.

## **CONCEPT OF OPERATIONS**

### **SCOPE**

The RTIP is intended to establish a standard data format to exchange traffic and travel conditions on major highways among State and local government systems and the traveling public. The real-time traffic and travel information to be exchanged with this format includes

- Basic information for managing and operating the surface transportation system, excluding control
- Statewide incident reporting system information
- Surface transportation system security information
- Congestion information
- Weather conditions
- Surface transportation incidents
- Traveler information

A RTIP may be established in each State to leverage the current and future capabilities of monitoring the traffic and travel conditions of the major highways. The data exchange formats will be used for standardized, interoperable communication among transportation management systems and the information service providers that collect that information to disseminate to the traveling public. The transportation management systems could encompass traffic management, transit management, maintenance and construction management, and emergency management organizations.

ITS America's Interoperability Subcommittee adopted the following, in accord with ISO TC 204, as the definition of interoperability: "Interoperability is the ability of systems to provide services and to accept services from other systems and to use the services so exchanged to enable them to operate effectively together." In examining systems for interoperability, it is useful to distinguish two degrees of interoperability, "pair-wise" and "end-to-end" interoperability. Pair-wise interoperability involves verifying that two systems are able to exchange data and that the data has the same meaning to each system and leads to the expected functionality. "End-to-end" interoperability involves verifying that the flow and use of data are consistent from initial input to final outcome. The RTIP is primarily focused on the "pair-wise" interoperability with the specification of common data formats.

The scope of this program will reach all States. While not all State or local organizations collect and disseminate the same types of information, standardized formats will be mapped to the types of information in use. Standard data exchange formats will aid in the deployment of standard interfaces among surface transportation systems and information services. The RTIP is focused on center-to-center interfaces and the current conditions of the surface transportation system.

The RTIP is really about implementing interface standards consistently across the country and facilitating the implementation of data collection and dissemination systems to provide more of the information needed by the transportation management community and the traveling public. The standardized common data exchange formats reside above the traditional 7-Layer ISO OSI

communications stack. The OSI layers below the Application Layer can vary depending on the ITS deployment and will most likely be Internet (TCP/IP) based.

## **CURRENT SYSTEM OR SITUATION**

Over the past decade, ITS standards have been developed or are in the latter stages of development. Traffic management, transit management, and emergency management systems have been deployed or are being developed that use different standardized interfaces, different versions of the standards, or custom (i.e., non-standardized) interfaces. This leads to potential difficulties in data exchange from one system to another. Transportation management systems are increasingly producing congestion-related information but the impact of that information to address congestion is diminished because of inefficient data sharing practices.

Transportation system operators need information about incidents, the current state of the roadway conditions, and events that are planned in the area of operation. Current conditions or issues in a neighboring geographic area may affect the local transportation system in ways both subtle and pronounced. The transit operator needs many of the same pieces of information to provide the best service to their riders. Information service providers collect the same kind of information, integrate, and provide it to the public to aid better travel decision making.

Information is available everywhere in the surface transportation system, however, it is not always accessible to transportation system operators or the traveling public due to the lack of standard interfaces. The key to unlocking this information is to establish standard data exchange formats that are implemented consistently in every State. This would allow a transportation system utilizing the standard data exchange formats to develop an interface to the outside world to gather external information and make their own information available to others who need it without building multiple interfaces for each external system.

## **JUSTIFICATION**

The RTIP is established in SAFETEA-LU in Section 1201. However, the justification for this program goes beyond the legislation. The premise of Intelligent Transportation Systems is to connect the islands of information in the surface transportation system. Data collected by one agency's system is often beneficial to a neighboring system or to a traveler information system. This does not mean that every system has to be physically connected to all others. Establishing data exchange formats make data collected by a system available to any organization that wishes to retrieve it in that same data exchange format.

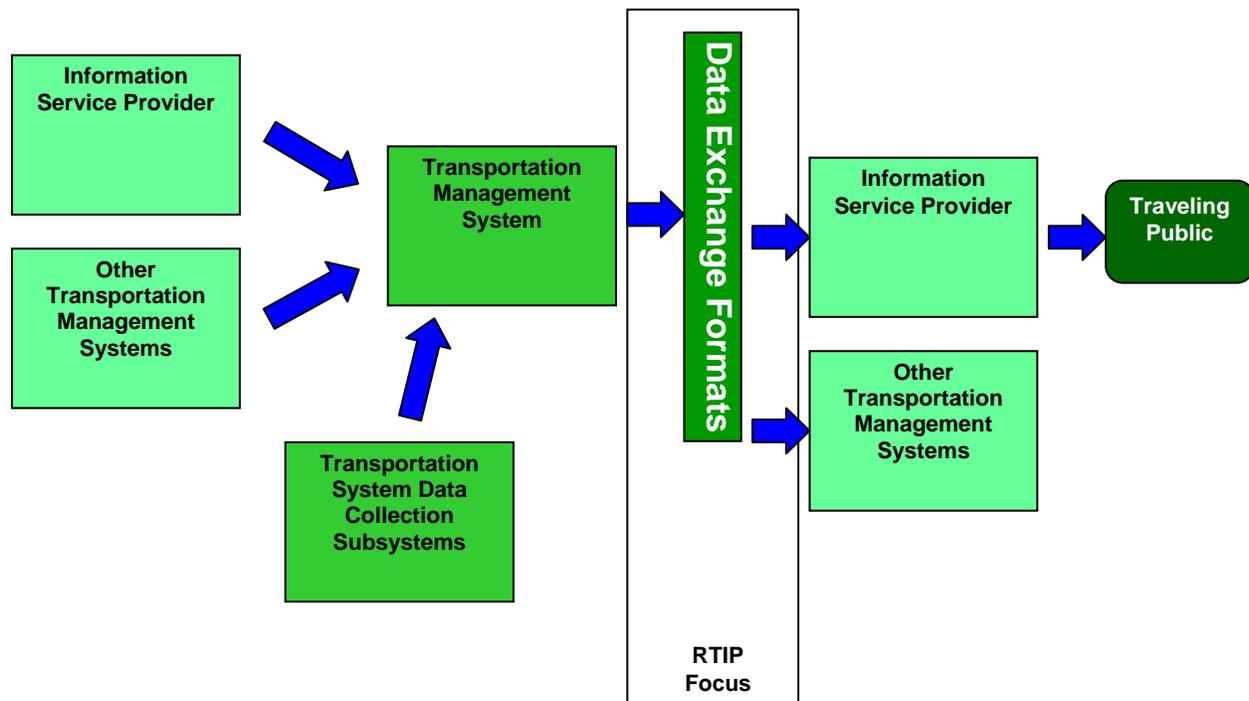
Establishment of real-time information will not happen all at once. It needs to be planned by each State and each transportation system in each State that operates the major highways. Information service providers may choose to apply these same data exchange formats to retrieve the information available from the surface transportation systems, process the information, and send it along to the traveling public.

## **PROPOSED CONCEPT**

On May 4, 2006, the FHWA published a notice in the Federal Register (71 FR 26399) outlining some proposed preliminary program parameters and seeking public comments on the proposed description of the Real-time System Management Information Program, including its outcome goals, definitions for various program parameters, and the current status of related activities in the States. The proposed concept described here is based upon the proposed preliminary program parameters.

The RTIP is built around standard data exchange formats based on existing ITS standards. The RTIP will establish a reference of data exchange formats that can be used by State and local agencies as well as information service providers to build interfaces in their systems to exchange the real-time traffic and traveler information. An organization would examine the referenced data exchange formats and implement an interface to their system that supports the formats.

The system would provide the information it has to this interface, not a specific system, in the standard data exchange format. No processing of the information is required, although some manipulation may occur to make the information item compatible with the data exchange format. Figure 1 illustrates the concept of the RTIP. The primary focus of the RTIP is the establishment of data exchange formats to facilitate the exchange of traffic and travel conditions.



**Figure 1 RTIP Concept**

Not all systems will have all the data identified by the data exchange formats. That is understood and accepted. The important point of the RTIP is that the data that made available in a manner that minimizes misinterpretation. This will enable another system to retrieve the available information without customizing a format for the data. The RTIP is not requiring the implementation of new data collection systems to meet all of the data exchange formats identified, but it is assumed that over time, more data will become available and it should be provided in the formats established.

Further, the RTIP is concerned with real-time information. It is essentially a stream of data made available to other systems over a center-to-center interface. Even though there are no proposed storage requirements within the scope of the RTIP, it is good practice. Transportation Management Systems, ISPs and the Planning Community will likely gain from applications that make use of the archives of the real-time information.

The information will address real-time traffic and travel conditions that facilitate management, operations, and decision making on the part of transportation system operators and the traveling public. This information should improve the security of the surface transportation system, address congestion problems, support improved response to weather events and surface transportation incidents, and facilitate national and regional highway traveler information.

## **OPERATIONAL SCENARIOS**

From a Traffic Management Center Operator's perspective, the RTIP will provide more comprehensive information on the operator's console. Information collected from neighboring systems, in other jurisdictions, such as a freeway management system, may inform the operator that there is an incident in the outbound lanes from the neighboring system. The operator can use this incident information from the neighboring agency to inform freeway service patrols of the issue and to take appropriate response, to place information on Dynamic Message Signs (DMS) to inform travelers on the outbound facilities of the incident, or to implement diversion plans to diffuse the impact.

The Traffic Management Center software interface may be configured to accept and process this external information but the information would be received in a standard data exchange format making it possible to design the interface once for that information no matter where it originated.

From the traveler's perspective, they receive their transportation information from an Information Service Provider (ISP) who collects traffic and travel conditions information from their own as well as external sources such as traffic management centers and transit management centers. The ISP processes the information and makes it available as a service or product to the traveler. The ISP would collect the information from the various sources over an interface using the standard data exchange formats established under the RTIP.

In these instances, the data exchange formats are the constant. This enables agencies to collect from other systems and provide information externally without establishing a different data exchange format with each system interface. This reduces the complexity of each system

involved regarding interface definition, implementation, and maintenance. Each organization involved in this scenario can anticipate the types of information that will be received.

The data is real-time and not stored by the source system. It is essentially a data feed. It is likely the a subscribing organization would establish the connection to the source, retrieve the information needed, and store any information required for other purposes such as transportation planning or research. In addition, these are information exchanges only. No device control is facilitated or addressed by the RTIP.

## **SUMMARY OF IMPACTS**

The impacts of the RTIP will be the planning for existing system upgrades for the standard data exchange formats, the update of regional architectures to reflect the data exchange formats and interfaces, and the deployment of those formats for data exchange and the interface they are made available on.

This document contains the high-level specifications for the data exchange formats to support the RTIP. These high-level specifications have been used to identify standards elements that satisfy the needs of the RTIP based on these specifications. The high-level specifications defined in this document bound the scope of the RTIP.

## ***SPECIFICATIONS***

The National ITS Architecture was used as a source of information for the Concept of Operations and the functional specifications. The RTIP concept was mapped to the National ITS Architecture definition. The ATIS01-Broadcast Traveler Information Market Package was used to start the mapping process. The interfaces identified were tailored based on the following interface criteria:

- Focus on Center-to-center interfaces
- Remove request flows
- Remove control flows
- Include system operation and conditions information
- Include information of operational use to other systems
- Include information of use to travelers
- Remove duplicate flows

The interfaces presented by the National ITS Architecture mapping include:

### Traffic Management Information

- Road network conditions
- Road weather information
- Traffic information coordination
- Road Network Probe Information
- Traffic incidents

- Air Quality data

#### Maintenance and Construction Management

- Maintenance and construction work plans
- Roadway maintenance status
- Work zone information

#### Transit Management Information

- Emergency transit schedule information
- Road network probe information
- Transit and fare schedules
- Transit incident information
- Transit system data

#### Information Service Provider Information

- Broadcast information
- Road network probe information
- Traveler information
- Emergency Traveler Information

#### Parking Information

- Parking locations
- Parking availability

#### Emergency Management Information

- Evacuation information
- Disaster information

Given the Concept of Operations and the interfaces from the National ITS Architecture as a starting point, the functional specifications associated with each information flow in the National ITS Architecture were examined along with the related process specifications and data flows to generate a tailored set of high-level specifications. These high-level specifications were refined and those refined specifications were used to identify the data exchange formats within the existing ITS Standards that apply to the RTIP. The resulting specifications are provided in the first 3 columns of the Table in Appendix A. In the specifications, the subject system is referred to as the Real-Time Information Program (RTIP). The RTIP can be any system that would be satisfying Section 1201.

## ***STANDARDS REFERENCE***

The ultimate goal of this document is to provide a reference between the specifications of the RTIP defined in Section 1201 and the data exchange formats established in the ITS Standards. The table in Appendix A maps the specifications to the messages required to provide the functions in the Real Time Information Program (RTIP). The functional specifications are grouped under broad functionalities of RTIP. The specifications described under the “General

Specifications” category articulates the methods by which the logical traffic network information in a center-to-center (C2C) communications environment would convey traffic, incident and other information based on the node (a geographic point) and links (road segment between two nodes) in the area.

The messages in the referenced standards (SAE J2354, TMDD, IEEE 1512) are defined in such a way that several different submessages are packaged in a wrapper message. All of the submessages in the wrapper message are defined as an optional element so that a local implementer can use only the submessage(s) which are necessary to support its system’s specification. The mapped messages for the specification(s) also indicate which submessage(s) needs to be used.

As an example for implementation, consider the specification and subspecifications of 1.4. A RTIP implementer will need to use the MSG\_Public incident description (PID) message from IEEE 1512 Base Standards populated with detour and closures information for sending it to the intended target center. This PID message has the wrapper message named DF\_IDX\_Wrapper which wraps detour and closure submessage (impactReports) as well as most of the other submessages from IEEE 1512 Base, IEEE 1512.1, IEEE 1512.2 and IEEE 1512.3 standards. But for sending detour and closures information the DF\_IDX\_Wrapper needs to have only the value of impactReports entry which has detour and closures information while all other submessages can be omitted as they are defined as optional and do not need to be included.

Most of the specifications have messages mapped to them taken from existing standards. A list of specifications for which there is no related message in the existing standards are provided below.

- 3.4 The RTIP shall provide information about the changes to transit services during an evacuation.
- 3.6 The RTIP shall provide transit alerts and advisories pertaining to major emergencies or disasters.

The ITS standards referenced in Appendix A feature the following versions. Please note that ITS standards evolve over time, and that there may be a revision to this table in the future:

**TMDD** - Standards for Traffic Management Center to Center Communications, ITE/AASHTO, Version 2.1, June 1, 2005.

**IEEE 1512 Base Standards** - IEEE Standard for Common Incident Management Message Sets for Use by Emergency Management Centers, IEEE, Version IEEE Std 1512-2006, June 8, 2006.

**IEEE 1512.1 – 2006** - IEEE Standard for Common Incident Management Message Sets for Use by Emergency Management Centers, IEEE, Version IEEE Std 1512.1-2006, November 2, 2006.

**SAE J2354** - Message Sets for Advanced Traveler Information System (ATIS), SAE, Version SAE J2354, February 2004.

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**Appendix A: RTIP Specifications mapped to Standards Dialogs and Messages**

**RTIP Specifications mapped to Standards Dialogs and Messages**

Req. No	Functional Specification Description	Source	Dialog(s)/Message(s)
<b>0 General Specifications</b>			
0.1	The RTIP may provide a list of points and segments between any two points that comprise the traffic network( i.e. network topology).	TMDD	Standard:TMDD Message: 1.14.2 -TrafficNetworkInventory
0.1.1	The RTIP may provide unique identification for all points in the traffic network.	TMDD	
0.1.2	The RTIP may provide unique identification of all road segments between any two points in the traffic network.	TMDD	
0.2	The RTIP may provide any change to the traffic network.	TMDD	
0.2.1	The RTIP may provide any change to the identification of any point in the traffic network.	TMDD	
0.2.2	The RTIP may provide any change to the identification of any road segment in the traffic network.	TMDD	
0.3	The RTIP may receive and process information about the network topology.	TMDD	Standard:TMDD Message: 1.14.1 -TrafficNetworkRequest Message: 1.14.2 -TrafficNetworkInventory
0.3.1	The RTIP may request information about the network topology upon initialization.	TMDD	
0.3.2	The RTIP may provide information about the network topology upon request.	TMDD	
<b>1 Traveler Information</b>			
1.1	The RTIP may provide route segment travel times.	National ITS Architecture	Standard:TMDD Message: 1.14.9 -LinkData
1.2	The RTIP may provide route segment speeds.	National ITS Architecture	Standard:TMDD Message: 1.14.9 -LinkData

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<b>Req. No</b>	<b>Functional Specification Description</b>	<b>Source</b>	<b>Dialog(s)/Message(s)</b>
1.3	The RTIP may provide roadway incident information.	National ITS Architecture	Standard: SAE J2354 Dialog: One-way Traveler Information Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for incidents.
1.4	The RTIP may provide roadway detours and closures information.	National ITS Architecture	Standard: IEEE 1512 Base Standards
1.4.1	The RTIP may provide list of road segments as detour information.	National ITS Architecture	Message: 6.3—MSG_Public incident description (PID) where DF_IDX_Wrapper has value of impactReports entry.
1.4.2	The RTIP may provide list of road segments that are closed.	National ITS Architecture	
1.4.3	The RTIP may provide information about the effective time frame as a part of detours and closures information.	National ITS Architecture	
1.5	The RTIP may provide event information.	National ITS Architecture	Standard: SAE J2354 Dialog: One-way Traveler Information Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has suitable entries for the event being described, and the header information and appropriate ITIS codes used to indicate the type of update, as needed. Standard:TMDD Message ID: 1.3.1—BasicEventUpdate and 1.3.2-- FullEventUpdate Standard: IEEE 1512 Base Standards Message: 6.3—MSG_Public incident description (PID) using the DF_IDX_Wrapper and the Header/IssueTime information and appropriate ITIS codes used to indicate the type of update, as needed.
1.5.1	The RTIP may provide current roadway event information.	National ITS Architecture	Standard: SAE J2354

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1.5.1.1	The RTIP may provide current roadway event information upon request.	National ITS Architecture	<b>Dialog: One-way Traveler Information</b> <b>Message: 5.4 – MSG_AdvisoryInformation</b> where ResponseGroup has suitable entries for the event being described, and the header information and appropriate ITIS codes used to indicate the type of update, as needed. <b>Standard: TMDD</b> <b>Message ID: 1.3.1—BasicEventUpdate and 1.3.2-- FullEventUpdate</b> <b>Standard: IEEE 1512 Base Standards</b> <b>Message: 6.3—MSG_Public incident description (PID) using the DF_IDX_Wrapper and the Header/IssueTime information and appropriate ITIS codes used to indicate the type of update, as needed.</b>
1.5.1.2	The RTIP may provide updates to the current roadway event information.	National ITS Architecture	
1.5.1.3	The RTIP may provide the status of the current event information.	National ITS Architecture	

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<b>Req. No</b>	<b>Functional Specification Description</b>	<b>Source</b>	<b>Dialog(s)/Message(s)</b>
1.5.2	The RTIP may provide planned event information.	National ITS Architecture	Standard: SAE J2354
1.5.2.1	The RTIP may provide planned event information upon request.	National ITS Architecture	Dialog: One-way Traveler Information
1.5.2.2	The RTIP may provide updates to the planned event information.	National ITS Architecture	Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has suitable entries for the event being described, and the header information and appropriate ITIS codes used to indicate the type of update, as needed.
1.5.2.3	The RTIP may provide the status of the planned event information.	National ITS Architecture	Standard:TMDD Message ID: 1.3.1—BasicEventUpdate and 1.3.2-- FullEventUpdate Standard: IEEE 1512 Base Standards Message: 6.3—MSG_Public incident description (PID) using the DF_IDX_Wrapper and the Header/IssueTime information and appropriate ITIS codes used to indicate the type of update, as needed.
1.6	The RTIP may provide alternate routes.	National ITS Architecture	Standard: IEEE 1512 Base Standards
1.6.1	The RTIP may provide a list of road segments as alternate route.	National ITS Architecture	Message: 6.3—MSG_Public incident description (PID) where DF_IDX_Wrapper has value of impactReports entry.
1.7	The RTIP may provide work zone information.	National ITS Architecture	Standard: IEEE 1512 Base Standards
1.7.1	The RTIP may provide list of road segments as work zone.	National ITS Architecture	Message: 6.3—MSG_Public incident description (PID) where DF_IDX_Wrapper has value of workZoneDataReports entry.
1.7.2	The RTIP may provide the information about the effective time frame when work will be performed in the work zone.	National ITS Architecture	

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<b>Req. No</b>	<b>Functional Specification Description</b>	<b>Source</b>	<b>Dialog(s)/Message(s)</b>
1.8	The RTIP may provide information about real-time transit schedule adherence.	National ITS Architecture	Standard: SAE J2354 Dialog: One-way Traveler Information Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for itineraries. Comment: DF_Itinerary contains DF_TransitInstructions which has data related to transit schedule time and also the data related to how many minutes a transit vehicle will be delayed at a stop point or time point in transit system. so from these data we can assume real-time transit schedule adherence.
1.9	The RTIP may provide parking information.	National ITS Architecture	Standard: SAE J2354
1.9.1	The RTIP may provide the location of the parking.	National ITS Architecture	Dialog: One-way Traveler Information
1.9.2	The RTIP may provide information about parking availability.	National ITS Architecture	Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for parkingLots.
1.9.3	The RTIP may provide the information about the location of available parking.	National ITS Architecture	
1.10	The RTIP may provide weather information.	National ITS Architecture	Standard: SAE J2354
1.11	The RTIP may provide environmental conditions information.	National ITS Architecture	Dialog: One-way Traveler Information
1.12	The RTIP may provide air quality information.	National ITS Architecture	Message : 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for weatherReports.
1.13	The RTIP may provide emergency evacuation information.	National ITS Architecture	Standard: IEEE 1512 Base Standard Message: 6.3—MSG_Public incident description (PID) where DF_IDX_Wrapper
1.13.1	The RTIP may provide information about evacuation zones.	National ITS Architecture	

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<b>Req. No</b>	<b>Functional Specification Description</b>	<b>Source</b>	<b>Dialog(s)/Message(s)</b>
1.13.2	The RTIP may provide information about the routes to be used for evacuation.	National ITS Architecture	has value of evacuationReports entry.
1.13.3	The RTIP may provide information about the effective time frame of the evacuation.	National ITS Architecture	
1.13.4	The RTIP may provide shelter information during an evacuation.	National ITS Architecture	Standard: IEEE 1512 Base standard Message: 6.3—MSG_Public incident description(PID) where DF_IDX_Wrapper has value of facilitiesReports entry.
1.13.4.1	The RTIP may provide information about the location of shelter during an evacuation.	National ITS Architecture	
1.13.4.2	The RTIP may provide information about the availability of shelter during an evacuation.	National ITS Architecture	
1.13.4.3	The RTIP may provide information about the location of available shelter during an evacuation.	National ITS Architecture	
1.13.5	The RTIP may provide available transportation modes during an evacuation.	National ITS Architecture	Standard: IEEE 1512 Base Standard Message: 6.3—MSG_Public incident description (PID) where DF_IDX_Wrapper has value of evacuationReports entry.
1.13.6	The RTIP may provide information about the changes to transit services during an evacuation.	National ITS Architecture	It is expected that this specifications will be met in the next version of SAE J2354.
1.13.6.1	The RTIP may provide deviations from the route of regular transit services during an evacuation.	National ITS Architecture	
1.13.6.2	The RTIP may provide deviations from the schedule of regular transit services during an evacuation.	National ITS Architecture	
1.13.7	The RTIP may provide traffic conditions information during an evacuation.	National ITS Architecture	Standard: SAE J2354 Dialog: One-way Traveler Information Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for links.

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<b>1.13.8</b>	<b>The RTIP may provide road condition information during an evacuation.</b>	<b>National ITS Architecture</b>	<b>Standard: SAE J2354</b> <b>Dialog: One-way Traveler Information</b> <b>Message: 5.4 – MSG_AdvisoryInformation</b> <b>where ResponseGroup has entry for weatherReports.</b>
<b>1.13.8.1</b>	<b>The RTIP may provide information about pavement condition during an evacuation.</b>	<b>National ITS Architecture</b>	
<b>1.13.8.2</b>	<b>The RTIP may provide roadway temperature information during an evacuation.</b>	<b>National ITS Architecture</b>	
<b>1.13.8.3</b>	<b>The RTIP may provide information about the precipitation during an evacuation.</b>	<b>National ITS Architecture</b>	
<b>1.13.8.4</b>	<b>The RTIP may provide information about the treatment or plowing of snow during an evacuation.</b>	<b>National ITS Architecture</b>	
<b>1.14</b>	<b>The RTIP may provide disaster (e.g. natural, man-made) information.</b>	<b>National ITS Architecture</b>	<b>Standard: SAE J2354</b> <b>Dialog: One-way Traveler Information</b> <b>Message: 5.4 – MSG_AdvisoryInformation</b> <b>where ResponseGroup has entry for events.</b>
<b>1.14.1</b>	<b>The RTIP may provide information about the type (natural, man-made) of disaster.</b>	<b>National ITS Architecture</b>	
<b>1.14.2</b>	<b>The RTIP may provide information about the originator of the disaster.</b>	<b>National ITS Architecture</b>	
<b>1.14.3</b>	<b>The RTIP may provide information about the geographical area affected by the disaster.</b>	<b>National ITS Architecture</b>	
<b>1.14.4</b>	<b>The RTIP may provide information about the effective time frame of the disaster.</b>	<b>National ITS Architecture</b>	
<b>1.14.5</b>	<b>The RTIP may provide the information and instructions necessary for the public to respond to the disaster.</b>	<b>National ITS Architecture</b>	

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Req. No	Functional Specification Description	Source	Dialog(s)/Message(s)
<b>2 Traffic Management</b>			
2.1	The RTIP may distribute road network conditions data (raw or processed) based on collected and analyzed traffic data.	National ITS Architecture	<p><b>Standard: SAE J2354</b></p> <p><b>Dialog: One-way Traveler Information</b></p> <p><b>Message: 5.4 – MSG_AdvisoryInformation</b> where ResponseGroup has entries for links, weatherReports, incidents and events.</p> <p><b>Standards: IEEE 1512 Base Standards</b></p> <p><b>Message: 6.3—MSG_Public incident description (PID)</b> where DF_IDX_Wrapper has value of workZoneDataReports entry.</p> <p><b>Standard: IEEE 1512.1 – 2006</b></p> <p><b>Message Name:</b></p> <p><b>6.2 – MSG_ClearOrRepairPlan[IM],</b></p> <p><b>6.4—MSG_InfrastructureReport[IM]</b></p>
2.1.1	The RTIP may provide current traffic conditions.	National ITS Architecture	<p><b>Standard: SAE J2354</b></p> <p><b>Dialog: One-way Traveler Information</b></p> <p><b>Message: 5.4 – MSG_AdvisoryInformation</b> where ResponseGroup has entry for links.</p>

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<b>Req. No</b>	<b>Functional Specification Description</b>	<b>Source</b>	<b>Dialog(s)/Message(s)</b>
2.1.2	The RTIP may provide current road conditions.	National ITS Architecture	Standard: SAE J2354
2.1.2.1	The RTIP may provide current pavement condition information.	National ITS Architecture	Dialog: One-way Traveler Information
2.1.2.2	The RTIP may provide roadway temperature information.	National ITS Architecture	Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for weatherReports.
2.1.2.3	The RTIP may provide current precipitation information.	National ITS Architecture	
2.1.2.4	The RTIP may provide current roadway treatment or snow removal operations.	National ITS Architecture	
2.1.3	The RTIP may provide forecasted traffic conditions.	National ITS Architecture	Standard: SAE J2354 Dialog: One-way Traveler Information Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for links.
2.1.4	The RTIP may provide forecasted road conditions.	National ITS Architecture	Standard: SAE J2354
2.1.4.1	The RTIP may provide forecasted pavement condition information.	National ITS Architecture	Dialog: One-way Traveler Information
2.1.4.2	The RTIP may provide forecasted roadway temperature information.	National ITS Architecture	Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for weatherReports.
2.1.4.3	The RTIP may provide forecasted precipitation information.	National ITS Architecture	
2.1.4.4	The RTIP may provide forecasted roadway treatment or snow removal operations.	National ITS Architecture	
2.1.5	The RTIP may provide incident information.	National ITS Architecture	Standard: SAE J2354 Dialog: One-way Traveler Information Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for incidents.

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<b>Req. No</b>	<b>Functional Specification Description</b>	<b>Source</b>	<b>Dialog(s)/Message(s)</b>
2.1.6	The RTIP may provide information about a disaster (e.g. natural, man-made).	National ITS Architecture	Standard: SAE J2354 Dialog: One-way Traveler Information
2.1.6.1	The RTIP may provide information about the type(natural, man-made) of disaster.	National ITS Architecture	Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for events.
2.1.6.2	The RTIP may provide information about the originator of the disaster information.	National ITS Architecture	
2.1.6.3	The RTIP may provide information about the geographical area affected by the disaster.	National ITS Architecture	
2.1.6.4	The RTIP may provide information about the effective time frame of the disaster.	National ITS Architecture	
2.1.6.5	The RTIP may provide the information and instructions necessary for the public to respond to the disaster.	National ITS Architecture	
2.1.7	The RTIP may provide information about damage to the road network.	National ITS Architecture	Standards: IEEE 1512 Base Standards Message: 6.3—MSG_Public incident description (PID) where DF_IDX_Wrapper has value of workZoneDataReports entry.
2.1.7.1	The RTIP may provide information about the severity of road network damage.	National ITS Architecture	Standard: IEEE 1512.1 – 2006 Message Name: 6.2 – MSG_ClearOrRepairPlan[IM], 6.4—MSG_InfrastructureReport[IM]
2.1.7.2	The RTIP may provide information about the remaining capacity of a damaged road network.	National ITS Architecture	
2.1.7.3	The RTIP may provide information about the required closures of a damaged road network.	National ITS Architecture	
2.1.7.4	The RTIP may provide information about alternate routes in case of a damaged road network.	National ITS Architecture	
2.1.7.5	The RTIP may provide information about the necessary restrictions of a damaged road network.	National ITS Architecture	
2.1.7.6	The RTIP may provide information about the time frame for repair and recovery of a damaged road network.	National ITS Architecture	

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<b>Req. No</b>	<b>Functional Specification Description</b>	<b>Source</b>	<b>Dialog(s)/Message(s)</b>
2.1.8	The RTIP may provide road weather information.	National ITS Architecture	Standard: SAE J2354 Dialog: One-way Traveler Information Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for weatherReports.
2.1.9	The RTIP may provide environmental conditions information.	National ITS Architecture	Standard: SAE J2354 Dialog: One-way Traveler Information Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for weatherReports.
2.2	The RTIP may provide information about the execution of an evacuation strategy.	National ITS Architecture	Standard: IEEE 1512 Base Standard Message: 6.3—MSG_Public incident description (PID) where DF_IDX_Wrapper has value of evacuationReports entry.
2.2.1	The RTIP may provide information on the zones to be evacuated.	National ITS Architecture	
2.2.2	The RTIP may provide information on the setting of the closures and detours of routes.	National ITS Architecture	
2.2.2.1	The RTIP may provide information on the routes that will be closed during the evacuation.	National ITS Architecture	
2.2.2.2	The RTIP may provide information on the routes that will be used as detour during the evacuation.	National ITS Architecture	
2.2.3	The RTIP may provide information on the effective time frame for the evacuation.	National ITS Architecture	
<b>3 Transit Management</b>			
3.1	The RTIP may provide transit incident information along with other service data.	National ITS Architecture	Standard: IEEE 1512 Base Standard Message: 6.3—MSG_Public incident description (PID) where DF_IDX_Wrapper has values of transitEventSourceReports and transitVehicleInvolvedReports entries.

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**RTIP Specifications mapped to Standards Dialogs and Messages**

<b>Req. No</b>	<b>Functional Specification Description</b>	<b>Source</b>	<b>Dialog(s)/Message(s)</b>
3.2	The RTIP may provide information about real-time transit schedule adherence.	National ITS Architecture	Standard: SAE J2354 Dialog: One-way Traveler Information Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for itineraries.
3.3	The RTIP may provide information about weather conditions observed within the transit system.	National ITS Architecture	Standard: SAE J2354 Dialog: One-way Traveler Information Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for weatherReports.
3.4	The RTIP may provide information about changes to transit service due to special events.	National ITS Architecture	It is expected that this specifications will be met in the next version of SAE J2354.
3.4.1	The RTIP may provide deviations from the schedule of regular transit services due to special events.	National ITS Architecture	
3.4.2	The RTIP may provide deviations from the routes of regular transit services due to special events.	National ITS Architecture	
3.5	The RTIP may provide real-time arrival information.	National ITS Architecture	Standard: SAE J2354 Dialog: One-way Traveler Information Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for itineraries.  Comment: DF_Itinerary contains DF_TransitInstructions which has data related to transit schedule time and also the data related to how many minutes a transit vehicle will be delayed at a stop point or time point in transit system. so from these data we can assume real-time transit arrival information.

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<b>Req. No</b>	<b>Functional Specification Description</b>	<b>Source</b>	<b>Dialog(s)/Message(s)</b>
3.6	The RTIP may provide transit alerts and advisories pertaining to major emergencies or disasters.	National ITS Architecture	It is expected that this specifications will be met in the next version of SAE J2354.
<b>4 Maintenance and Construction Management</b>			
4.1	The RTIP may provide work zone information.	National ITS Architecture	Standards: IEEE 1512 Base Standards
4.1.1	The RTIP may provide list of road segments as work zone.	National ITS Architecture	Message: 6.3—MSG_Public incident description (PID) where DF_IDX_Wrapper has value of workZoneDataReports entry.
4.1.2	The RTIP may provide the information about the effective time frame when work will be performed in the work zone.	National ITS Architecture	
4.2	The RTIP may provide information about damage to the road network.	National ITS Architecture	Standards: IEEE 1512 Base Standards
4.2.1	The RTIP may provide information about the severity of road network damage.	National ITS Architecture	Message: 6.3—MSG_Public incident description (PID) where DF_IDX_Wrapper has value of workZoneDataReports entry.
4.2.2	The RTIP may provide information about the remaining capacity of a damaged road network.	National ITS Architecture	Standard: IEEE 1512.1 – 2006
4.2.3	The RTIP may provide information about the required closures of a damaged road network.	National ITS Architecture	Message Name:
4.2.4	The RTIP may provide information about alternate routes in case of a damaged road network.	National ITS Architecture	6.2 – MSG_ClearOrRepairPlan[IM]
4.2.5	The RTIP may provide information about the necessary restrictions of a damaged road network.	National ITS Architecture	6.4—MSG_InfrastructureReport[IM],
4.2.6	The RTIP may provide information about the time frame for repair and recovery of a damaged road network.	National ITS Architecture	

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<b>Req. No</b>	<b>Functional Specification Description</b>	<b>Source</b>	<b>Dialog(s)/Message(s)</b>
<b>5 Parking Management</b>			
<b>5.1</b>	<b>The RTIP may provide parking information.</b>	<b>National ITS Architecture</b>	<b>Standard: SAE J2354</b>
<b>5.1.1</b>	<b>The RTIP may provide the location of the parking.</b>	<b>National ITS Architecture</b>	<b>Dialog: One-way Traveler Information</b>
<b>5.1.2</b>	<b>The RTIP may provide information about parking availability.</b>	<b>National ITS Architecture</b>	<b>Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for parkingLots.</b>
<b>5.1.3</b>	<b>The RTIP may provide the information about the location of available parking.</b>	<b>National ITS Architecture</b>	
<b>6 Emergency Management</b>			
<b>6.1</b>	<b>The RTIP may provide emergency evacuation information.</b>	<b>National ITS Architecture</b>	<b>Standard: IEEE 1512 Base Standard</b> <b>Message: 6.3—MSG_Public incident description (PID) where DF_IDX_Wrapper has values of evacuationReports and facilitiesReports entries.</b>  <b>Standard: SAE J2354</b> <b>Dialog: One-way Traveler Information</b> <b>Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entries for links, weatherReports and events.</b>
<b>6.1.1</b>	<b>The RTIP may provide information about evacuation zones.</b>	<b>National ITS Architecture</b>	<b>Standard: IEEE 1512 Base Standard</b>
<b>6.1.2</b>	<b>The RTIP may provide information about the routes to be used for evacuation.</b>	<b>National ITS Architecture</b>	<b>Message: 6.3—MSG_Public incident description (PID) where DF_IDX_Wrapper has value of evacuationReports entry.</b>
<b>6.1.3</b>	<b>The RTIP may provide information about the effective time frame of the evacuation.</b>	<b>National ITS Architecture</b>	
<b>6.1.4</b>	<b>The RTIP may provide shelter information during an evacuation.</b>	<b>National ITS Architecture</b>	<b>Standard: IEEE 1512 Base standard</b>

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<b>Req. No</b>	<b>Functional Specification Description</b>	<b>Source</b>	<b>Dialog(s)/Message(s)</b>
6.1.4.1	The RTIP may provide information about the location of shelter during an evacuation.	National ITS Architecture	Message: 6.3—MSG_Public incident description(PID) where DF_IDX_Wrapper has value of facilitiesReports entry.
6.1.4.2	The RTIP may provide information about the availability of shelter during an evacuation.	National ITS Architecture	
6.1.4.3	The RTIP may provide information about the location of available shelter during an evacuation.	National ITS Architecture	
6.1.5	The RTIP may provide available transportation modes during an evacuation.	National ITS Architecture	Standard: IEEE 1512 Base Standard Message: 6.3—MSG_Public incident description (PID) where DF_IDX_Wrapper has value of evacuationReports entry.
6.1.6	The RTIP may provide information about the changes to transit services during an evacuation.	National ITS Architecture	It is expected that this specifications will be met in the next version of SAE J2354.
6.1.6.1	The RTIP may provide deviations from the route of regular transit services during an evacuation.	National ITS Architecture	
6.1.6.2	The RTIP may provide deviations from the schedule of regular transit services during an evacuation.	National ITS Architecture	
6.1.7	The RTIP may provide traffic conditions information during an evacuation.	National ITS Architecture	Standard: SAE J2354 Dialog: One-way Traveler Information Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for links.

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<b>Req. No</b>	<b>Functional Specification Description</b>	<b>Source</b>	<b>Dialog(s)/Message(s)</b>
<b>6.1.8</b>	<b>The RTIP may provide road condition information during an evacuation.</b>	<b>National ITS Architecture</b>	<b>Standard: SAE J2354</b> <b>Dialog: One-way Traveler Information</b> <b>Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for weatherReports.</b>
<b>6.1.8.1</b>	<b>The RTIP may provide information about pavement condition during an evacuation.</b>	<b>National ITS Architecture</b>	
<b>6.1.8.2</b>	<b>The RTIP may provide roadway temperature information during an evacuation.</b>	<b>National ITS Architecture</b>	
<b>6.1.8.3</b>	<b>The RTIP may provide information about the precipitation during an evacuation.</b>	<b>National ITS Architecture</b>	
<b>6.1.8.4</b>	<b>The RTIP may provide information about the treatment or plowing of snow during an evacuation.</b>	<b>National ITS Architecture</b>	
<b>6.2</b>	<b>The RTIP may provide disaster (e.g. natural, man-made) information.</b>	<b>National ITS Architecture</b>	<b>Standard: SAE J2354</b> <b>Dialog: One-way Traveler Information</b> <b>Message: 5.4 – MSG_AdvisoryInformation where ResponseGroup has entry for events.</b>
<b>6.2.1</b>	<b>The RTIP may provide information about the type(natural, man-made) of disaster.</b>	<b>National ITS Architecture</b>	
<b>6.2.2</b>	<b>The RTIP may provide information about the originator of the disaster.</b>	<b>National ITS Architecture</b>	
<b>6.2.3</b>	<b>The RTIP may provide information about the geographical area affected by the disaster.</b>	<b>National ITS Architecture</b>	
<b>6.2.4</b>	<b>The RTIP may provide information about the effective time frame of the disaster.</b>	<b>National ITS Architecture</b>	
<b>6.2.5</b>	<b>The RTIP may provide the information and instructions necessary for the public to respond to the disaster.</b>	<b>National ITS Architecture</b>	