Standards Requirements Package 6:

Traffic Management Subsystem to other Centers

Prepared by the
Architecture Development Team

Lockheed Martin
Odetics Intelligent Transportation Systems Division

Prepared for:

Federal Highway Administration
US Department of Transportation
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1. Introduction to Standards Requirements Documentation

The Standards Requirements Packages are intended to be used in conjunction with the other architecture documents. In particular, the introductory chapters of the Standards Requirements Document provide contextual material and explanations/justifications of some of the methods used to evaluate and rate architecture flows. However, it is recognized that many people may initially only receive a given Standards Requirements Package, without the associated supporting material. To aid these individuals, we offer some generic introductory material to promote understanding of the context and approach used to create a Standards Requirements Package. Ultimately, any standards development organization pursuing an ITS-related standard should ensure that they have access to a complete set of the architecture documents as a reference source.

1.1. Standards Requirements Document Executive Summary

The executive summary of the Standards Requirements Document is reproduced here, to provide a sense of the overall goals and content of the document.

The Standards Requirements Document ("SRD") collects information from the other National ITS Architecture program documents and reorganizes it in a manner intended to support the development of critical ITS standards. The key results in the SRD are a reference model for the National ITS Architecture, a rating scheme for evaluating the standardization issues associated with individual data flows that make up the architecture interfaces, and then a set of priority groupings of interfaces into standards requirements "packages". These results and the major conclusions are summarized below.

The introductory section explains the structure of the SRD and its intended usage. The strategy is that the reference model provides the overall context for a standards development organization ("SDO"). A given SDO can pull a particular package of standards requirements out of the document and then use the reference model as a quick reference to the overall architecture. More detailed needs will require going to the original source documents, such as the Logical or Physical Architectures.

The next section provides the rationale for several different ratings schemes applied to the architecture interconnects and flows. These include interoperability requirements, technology maturity assessments, stakeholder interest. All architecture interconnects were examined with respect to these measures. The stakeholder interest and interoperability requirements in particular were then used as the basis for selecting the standards requirements packages. In general, interfaces associated with mobile systems had both the greatest stakeholder interest and the most stringent interoperability requirements. Following close behind were interfaces associated with Traffic Management and Information Service Provider subsystems.

The Architecture Reference Model is provided next as a high level definition of the components that form the National ITS Architecture. It depicts the interconnectivity of the subsystems and terminators, their definitions, and suitable types of communications strategies. This reference model is an important tool for communicating the full breadth of the architecture at an abstracted level. In the SRD it is intended as a contextual reference, but, as a separate document, the reference model has received international circulation through the International Standards Organization (ISO) as a basis for documenting and comparing ITS architectures.

The "meat" of the SRD is the set of standards requirements packages. Each package is a special grouping of standards requirements and contextual information intended to be used in a nearly standalone fashion by an SDO. Thus, packages have been selected that cover the key ITS priorities, maintain the integrity and vision of the National ITS Architecture, and also are perceived as having an interested stakeholder constituency that will help drive standardization. This is a difficult balancing act, but the following 13 packages were identified as covering the high priority standardization needs for the architecture program:

1. Dedicated Short Range Communications (DSRC, formerly "VRC")
2. Digital Map Data Exchange and Location Referencing Formats
3. Information Service Provider Wireless Interfaces
4. Inter-Center Data Exchange for Commercial Vehicle Operations
5. Personal, Transit, and HAZMAT Maydays
6. Traffic Management Subsystem to Other Centers (except EMS)
7. Traffic Management Subsystem to Roadside Devices and Emissions Monitoring
8. Signal Priority for Transit and Emergency Vehicles
9. Emergency Management Subsystem to Other Centers
10. Information Service Provider Subsystem to Other Centers (except EMS and TMS)
11. Transit Management Subsystem Interfaces
12. Highway Rail Intersections (HRI)
13. Archived Data Management Subsystem Interfaces

These 13 areas cover much of the National ITS Architecture and represent the distillation of stakeholder interests and architecture interoperability requirements. If standardization can be achieved in the near term for all or most of these packages, then ITS will be a long ways towards achieving the original vision captured in the user service requirements.

1.2. Constructing a Standards Requirements Package

The intent of creating a Standards Requirements Package is to facilitate efforts to standardize some subset of the National ITS Architecture. The "packaging" process involves abstracting and reorganizing information from other documents, primarily the Logical and Physical Architectures. We have gone through a number of iterations to try and achieve a format that is understandable and useful for SDO's; in the end, while there is not a universal consensus, we have tried to address the substance of most of the comments received.

This Standards Requirements Package has the following main components:

- General introduction to the scope and intent of this package
- Message transaction sets
- Decomposition of the interfaces
- Communications Considerations
- Constraints
- Leveled Data Item definitions

The general introduction is self-explanatory, but the other items require some explanation. We will address them one at a time:

Message Transaction Sets: In order to accomplish a given activity, a series of messages usually have to be exchanged between two or more subsystems. These messages, as a group, constitute a message transaction set. The sequencing of the messages is shown via an ISO-style message sequence chart. Typically the physical architecture flow or highest level logical architecture data flows represent individual messages.

Interface Decomposition: This is the hierarchy of items that constitute an interface. It starts with the interface between two subsystems itself, which is then decomposed into physical architecture flows. Each of the physical architecture flows is then decomposed into a set of Leveled Architecture Flows. These sets of flows have been created in order to capture the essential information described by the National ITS Architecture on each Subsystem interface of interest. The Leveled Architecture Flows can be thought of as a simplified view of the logical architecture information, removing aggregation of data which does not add value to describing the essential information on the interface, and removing some of the lower level details in the existing data flows. These leveled architecture flows are traceable to flows in the logical architecture. The physical architecture data flows are labeled with the type of communications technology appropriate for that flow. Figure 1 shows an example of an interface decomposition. The leveled data items represent a simplification of the logical architecture information to focus on the essential data on each subsystem interface. They have been developed in order to provide traceability between the ITS standards being developed and the National ITS Architecture. Once a draft standard has been developed, the question that must be addressed is whether the standard addresses completely all elements of the National ITS Architecture interface. Due to the complex hierarchical nature of the Logical Architecture data flows, comparison with standards outputs is very difficult. By creating a simplified view of each interface, it is possible to more effectively trace the standards outputs to the National ITS Architecture.

Communications Considerations provides a discussion of the basic nature of the communications modalities that are suitable for supporting the interfaces in the particular standards requirements package. This section identifies some high level requirements, but the primary focus is to provide information that is viewed as useful to the initiation of the standardization process.

Constraints lists the architecture flows and any constraints placed upon them.

Leveled Data Items: This section provides a set of definitions for each of the leveled data elements included in the Interface Decomposition section. These definitions are simplified versions of the definitions contained in the Logical Architecture Data Dictionary, providing just the essential information to define the key elements of a subsystem interface.

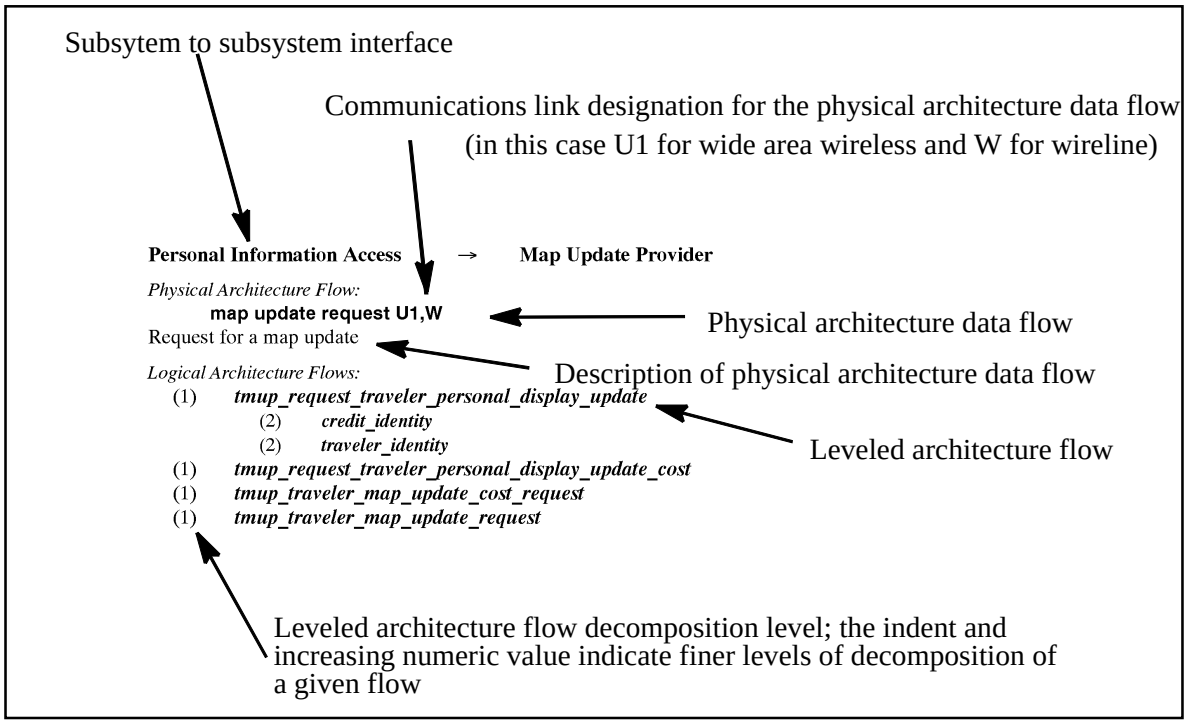

Figure 1 - Example of the Parts of an Interface Decomposition

As a final clarification, it is useful to remind readers of the distinction between the layers in the ISO OSI communications reference model and the layers in the National ITS Architecture. For purposes of analysis and discussion, the National ITS Architecture has been portrayed as having three layers: *the transportation, the communications, and the institutional layer*. The first two are of concern here. The transportation layer contains all the functionality of the National ITS Architecture. As a consequence, any discussion of interfaces, messages, data dictionary entries, etc., is drawn from the information in the transportation layer. The communications layer describes the technology required to support the information exchange needs of the transportation layer. These National ITS Architecture layers can be roughly mapped to the ISO OSI reference model; the transportation layer is typically at or above the application layer and the communications layer is most often concerned with the lowest four layers of the ISO OSI reference model. The interested reader is directed to the Communications Analysis Document for a more substantial explanation of this relationship.

This explanation of the layers is offered here because the terminology can be confusing. Every effort has been made to clarify when the “layered model” is the National ITS Architecture and when it is the OSI reference model. In general, when the term “communications layer” is used in the Standards Requirements Document, it refers to the National ITS Architecture ”layer”.

2. Introduction to Traffic Management Subsystem to Other Centers

Many of the key services and efficiencies associated with ITS accrue through the actions of the Traffic Management Subsystem (TMS). Part of this comes from coordination of the TMS with other TMSs and other centers. This package is intended to capture the interfaces and interactions necessary to achieve the level of coordination and integration envisioned by the national architecture.

These are anticipated to typically be wireline interfaces (probably WAN or MAN-based). Excluded from this package is the TMS to Roadside interface and the TMS to Emissions Management Subsystem (EMMS), which have are covered in Package 7: Traffic Management Subsystem to Roadside Devices and Emissions Monitoring. Also excluded is the TMS to Emergency Management interface, which is covered in Package 9: Emergency Management to Other Centers. Coordination with standardization of these packages is clearly necessary. Figure 2 shows the key interfaces described in this standards package.

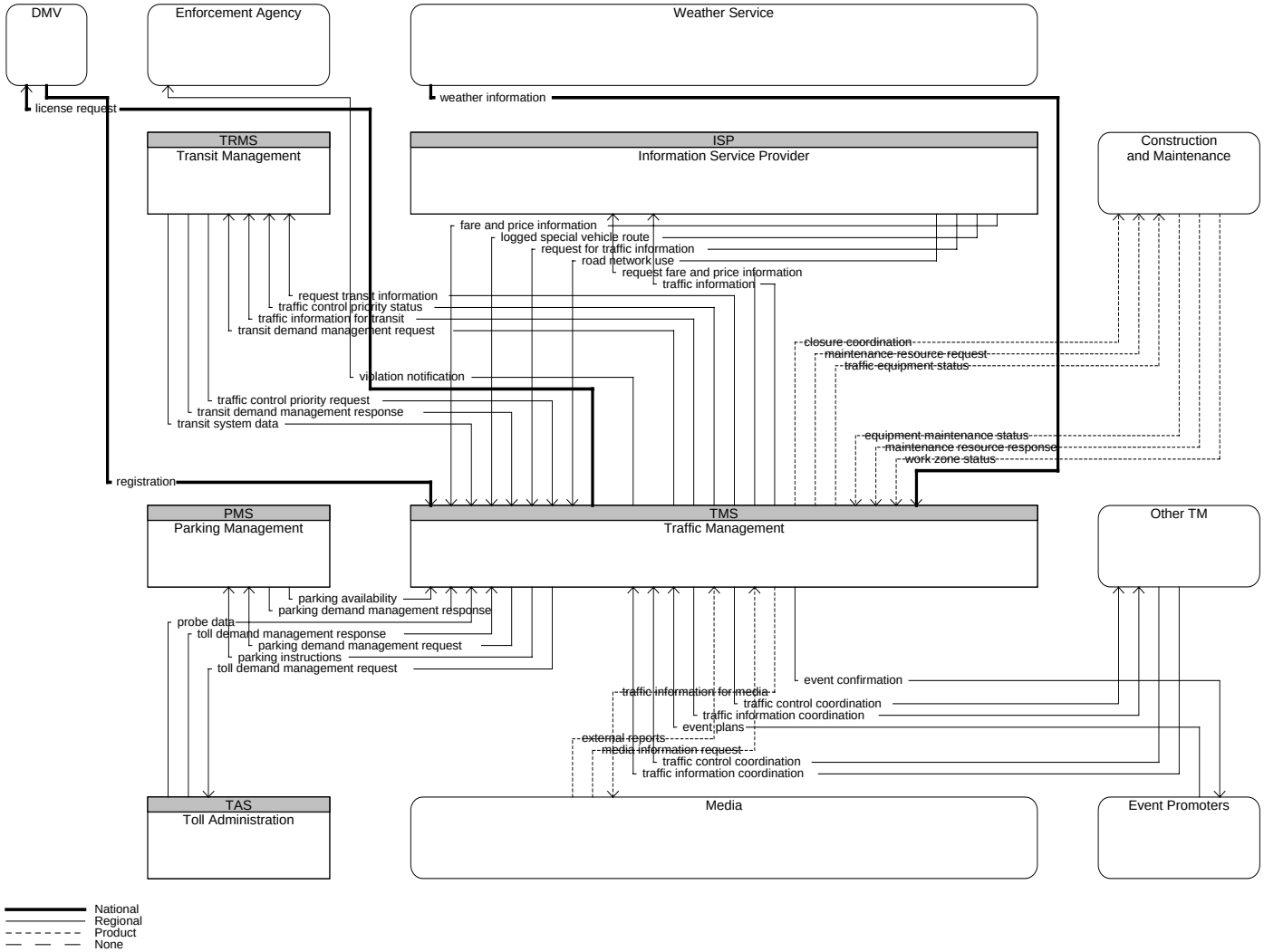

Figure 2 - Traffic Management Subsystem to Other Centers Architecture Flows

3 Transaction Sets for the TMS Interfaces to Other Centers

In this section we define the transaction sets needed to accomplish the key interfaces to the TMS. A message sequence chart format along the lines of those defined under ISO standardization is used for clarity of presentation. The following subsections discuss the interactions between the TMS and the subsystems or terminators.

The transaction set figures used in this chapter identify the messages that go between the TMS and the subsystems or terminators which interface with it. Where messages follow each other top to bottom, they represent a transaction sequence or protocol. Where messages are separated by a horizontal dotted line, the messages are distinct, and not related in any particular sequence. Notes to the right of the messages or in some cases groups of messages amplify on details of the message protocols and sometimes a number in a circle identifies a following numbered section in the text which also describes the particular message or message sequence function . Most of the messages shown are physical architecture flows. Occasionally , in order to better explain the functionality the logical architecture dataflows are used. These will be printed in italics to distinguish them from the physical flows.

3.1. Construction and Maintenance (C and M)

One of the function of the TMS is to monitor the current status of field equipment, work zones, and maintenance resources. The architecture acknowledges the need to maintain status of equipment or work zones by requesting resource information and receiving status information. The data exchanged in this interface provides useful information on faulty indicators or sensors that need repairs, incidents caused by road maintenance, or the need for resources at the scene of an incident.

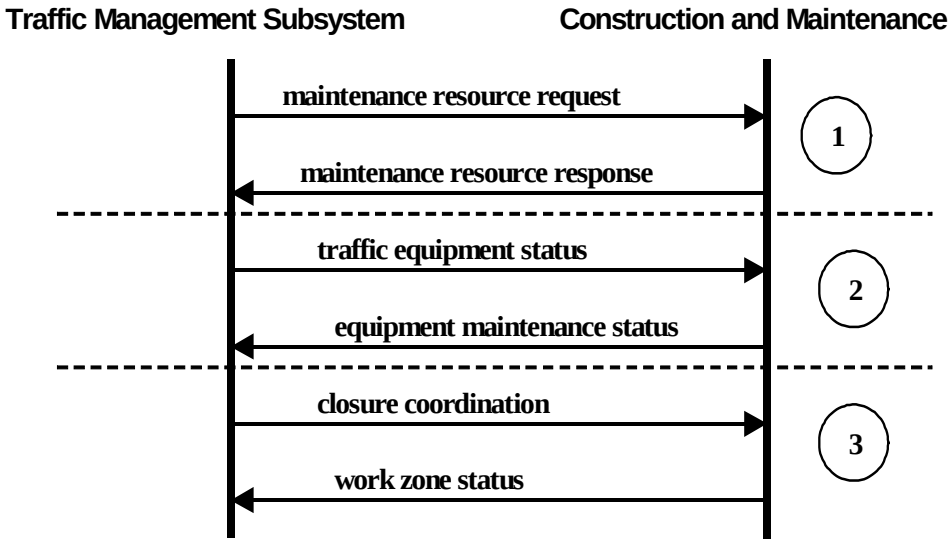

Figure 3 - TMS to Construction and Maintenance Transaction Set

The architecture describes the following transaction sets for this interface.

1. The TMS makes a request for resources (either based on its own needs for incident response, or based upon request from Emergency Management). Such resources may include tow trucks, clean up crew, signs, cones, and other assets that can be used to diver traffic at a work zone or at the scene of an incident. The C and M terminator will respond with the status of its ability to meet the resource request.
2. The TMS will provide equipment status information to C and M to indicate equipment maintenance actions required. The C and M will provide status back to the TMS on the status of equipment maintenance actions.
3. One of the primary traffic impacts of C and M is partial or complete road closures. There is need for the TMS to coordinate with C and M on closure times and length of closures. C and M will provide workzone status back to the TMS.

3.2. Department of Motor Vehicles (DMV)

One of the functions of the TMS is to monitor High Occupancy Vehicle Lanes (HOV) for proper usage. A standard practice with current HOV lane usage is to have enforcement personnel monitor the lane for proper usage. The architecture supports an implementation where the TMS identifies violators (through some unspecified technology- e.g. video processing) and then interacts with the DMV to determine the owner of the violating vehicle.

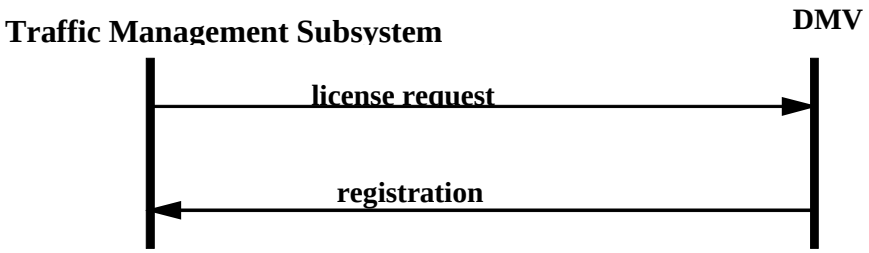

Figure 4 - TMS to DMV Transaction Set

The transactions associated with the DMV are for the TMS to send a license request and the DMV to provide registration information. This exchange of information involves personal data, so the flows have a special constraint of privacy protection (see Section 6).

3.3. Enforcement Agency

The architecture supports the possibility of the TMS sending information to an Enforcement Agency. In the current architecture definition this is defined as information about violations of HOV usage or of other traffic rules.

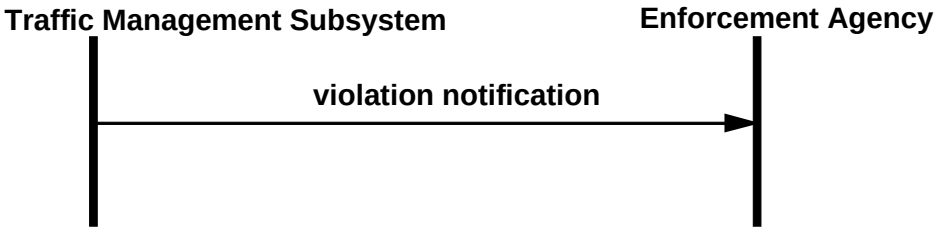

Figure 5 - TMS to Enforcement Agency Transaction

There is a one way flow of information (violation notification) from the TMS to the Enforcement Agency. This flow anticipates a TMS capability to monitor HOV or other road network usage through video or other technologies, identify information about the vehicle violating a traffic rule, and pass that information directly to the appropriate enforcement agency.

3.4. Event Promoters

Special events can cause significant impact on the transportation network. From a transportation management standpoint these events can be identified beforehand and management strategies put into place to minimize the impact on the transportation system. In current implementations the information is conveyed to the TMS in a non automated fashion- often by phone, fax, letter, etc. In future ITS implementations this information can be provided automatically through data transfer. As shown in Figure 6, the event promoter sends event plans to the TMS, which can add the information to its database of planned ”incidents” and put traffic or demand management strategies into place. The TMS responds to the input with an event confirmation back to the Event Promoter indicating that the special event requirements have been received and processed.

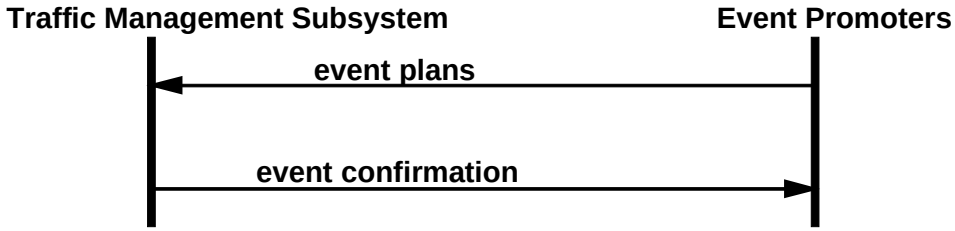

Figure 6 - TMS to Event Promoters Transaction Set

3.5. Information Service Provider Subsystem

The ISP is the primary creator of traveler information in the ITS architecture, and the TMS is the agent of traffic control and network monitoring. Therefore their interface is a very important one for ITS deployment and represents an important area for standardization. The message transaction sets for this interface are shown in Figure 7.

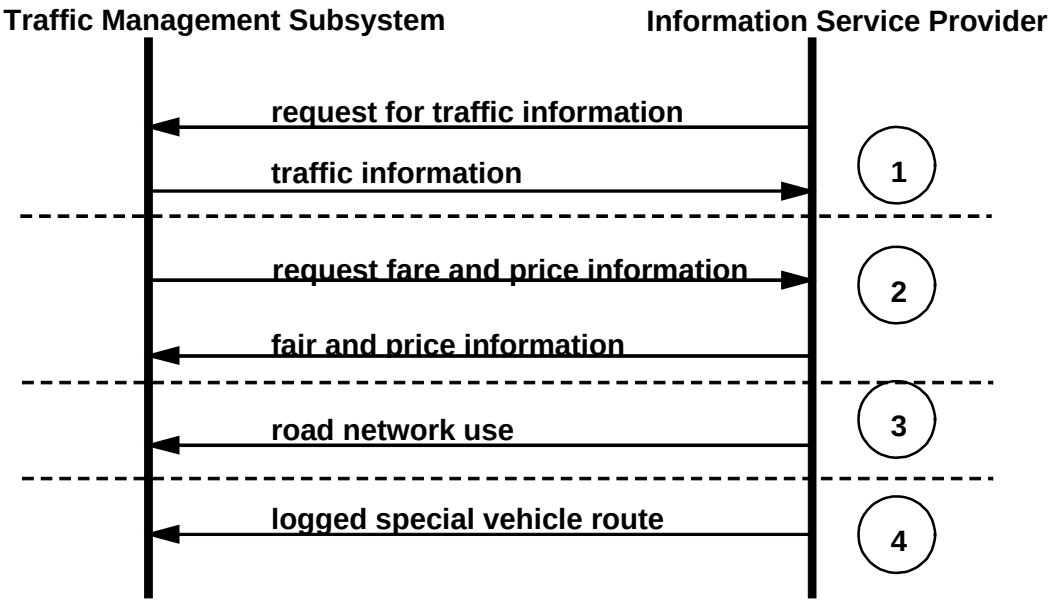

Figure 7 - TMS to ISP Transaction Sets

The architecture describes the following transaction sets for this interface.

14. 1. The ISP makes a request for traffic information and the TMS provides traffic information. This request can be a transactional type message, or a subscription type request. This information can include current network state, predicted network state, or specific incident information. It is also possible for the TMS to send traffic information on a periodic basis (or even a continuous basis) to the ISP (as a response to a subscription type of request).

3. The TMS can request fare and price data of the ISP who as a central collection point of information for travelers, will be collecting this information from transit, toll, and parking facilities. The ISP will respond with the requested data.

4. In more advanced implementations, the ISP will have significant information on the road network and the travelers on the network (not about any specific traveler, but about levels of usage of the various parts of the network). This can include results of independent ISP network surveillance through information gathered by vehicles acting as probes. The ISP can provide this to the TMS as part of the road network use flow.

5. In recognition of advanced coordinated traffic management concepts, the National ITS Architecture includes the capability for the ISP to pass individual routes to the TMS for information (in the case of HAZMAT routes) or for priority treatment in the system. This information includes special routes for oversized, overweight, and special vehicles (e.g. the governors motorcade).

3.6. Media Terminator

One of the function of the TMS is the report of current traffic conditions, incidents, maintenance activities, and other traffic related information. The Media is one of the recipients of this information. In addition, the media may have information of its own to provide to the TMS. This information may be collected by sources such as air surveillance and cellular phone call in.

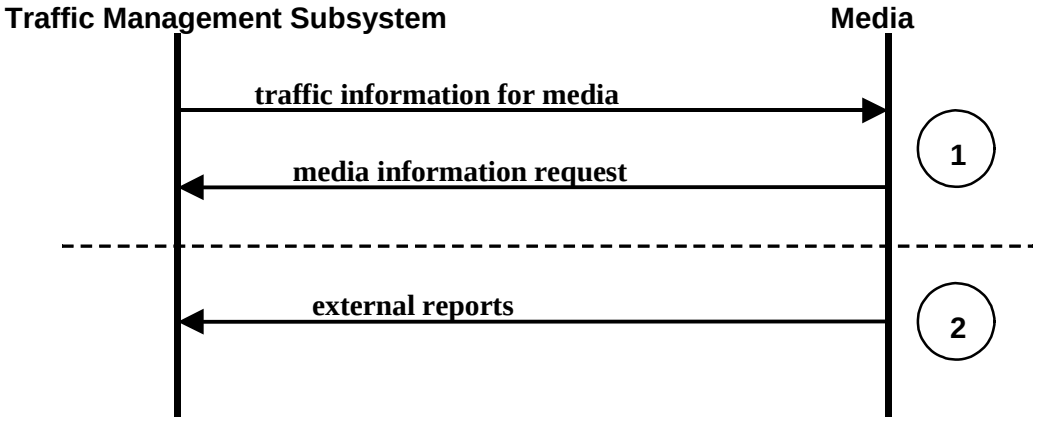

Figure 8 - TMS to Media Transaction Set

1. The Media can request traffic or incident information (via a transaction or subscription type of request). The TMS will provide traffic and incident information which has (possibly) been modified for external distribution.
2. The Media may independently sent traffic or incident information (via the external reports flow) to the TMS.

3.7. Other Traffic Management Subsystems

Transfer of data from one TMS to another is a very important feature of the architecture. For the following discussion of transactions the Leveled Data Item names are utilized, because the full range of functionality is not adequately expressed by the Physical Architecture flows.

The basic transaction in this interface involves the request for information along with the identity of the TMS requesting the information. The transactions are discussed in two separate sections, traffic control and traffic information (See Figure 9 and Figure 10).

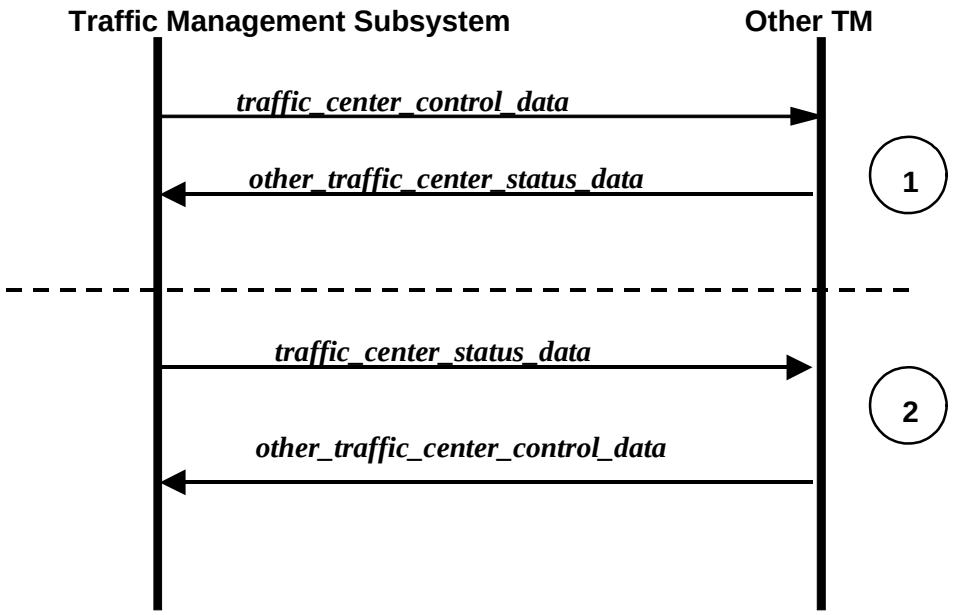

Figure 9 - TMS to Other TM Traffic Control Transaction Sets

The data flow for control data contains the following types of information

1. The architecture supports the implementation of one TMS exercising real time control of devices at another TMS. The transfer of real time data from one TMS to another includes control data sent to the Other TM and status data returning from the Other TM (other_traffic_center_status_data). The basic transactions in this set includes DMS (dynamic message sign), HAR (highway advisory radio), and indicator data for roads and highways.

2. The reverse operation is supported as well (Other TM controlling the devices of the TMS).

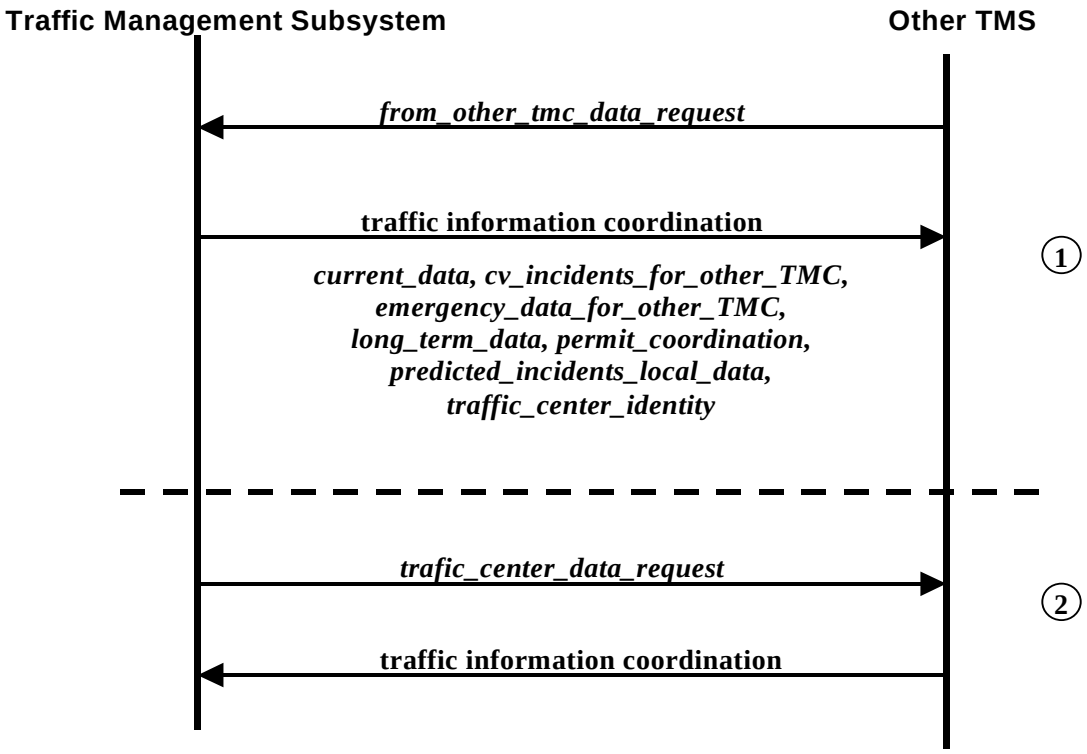

Figure 10 - TMS to Other TMS Traffic Coordination Information Transaction Sets

3. The Other TM can request data of the TMS (or can receive data in a push mode). The data flow for traffic coordination information contains the following types of information:

   a. Incident data both current and predicted (data flows *current_data, cv_incidents_for_other_TMC, predicted_incidents_local_data).*

   b. Traffic data containing both current and historical traffic on the road and highway (data flows *current_data* and *long_term_data).* Coordination data for emergency vehicle movement, either in real time (e.g. green waves) or as a strategy (data flow *emergency_data_for_other_TMC).*

   c. Commonly used information between the TMS and other TMS includes coordination data for commercial vehicle or HAZMAT travel through the TMS region (data flow *permit_coordination*)

   d. Finally the flow will contain a traffic center identifier (data flow *traffic_center_identity*).

4. The architecture has a symmetric set of request/response flows for going from Other TM to TMS.

3.8. Parking Management Subsystem

The TMS interfaces with the Parking Management system for two basic functions. The first, as shown in Figure 11 is for operations of the parking system. In this set the TMS sends parking instructions, which include lot control strategies, static data (such as sensor and VMS related parameter) and any real time information relating to TMS sensors used to count vehicles into and out of the parking lot. This flow would primarily be applicable in the case where the parking lot is owned by a public agency and is working in close coordination with the TMS. The flow from the PMS to the TMS called parking availability would be applicable to public or private lots and provides information on occupancy when the PMS has its own sensor system.

The second set of flows in Figure 11 is for the implementation of demand management changes. Specifically to alter price structure at the parking lot in response to demand management strategies implemented by the TMS. This type of transaction is far more likely when the PMS is owned by the public sector, rather than for privately owned systems.

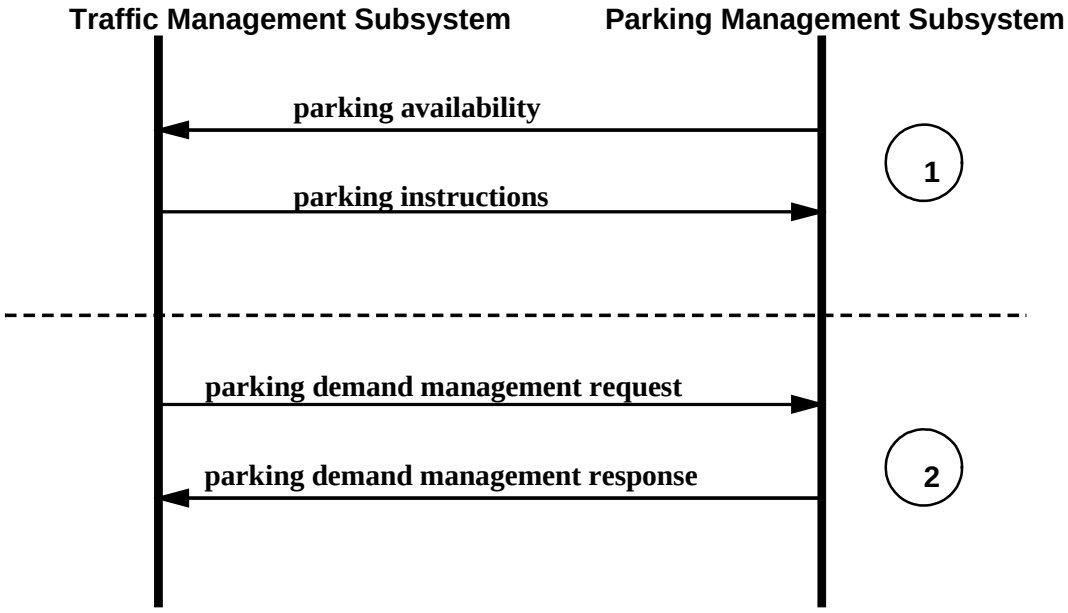

Figure 11 - TMS to Parking Management Subsystem Transaction Sets

3.9. Toll Administration Subsystem

The Toll Administration Subsystem interfaces with the TMS for two functions. The first is for the implementation of demand management changes. Specifically to alter price structure of the toll system in response to demand management strategies implemented by the TMS. This is not a current practice, but is one of the possible future implementations supported by the architecture. The second function is a provision for the toll system to provide probe data to the TMS. Because of the electronic tags used in toll systems there is the possibility of the toll system developing probe data for their roads either with separate reader network, or in conjunction with at speed electronic toll operation. This probe data if collected would be of significant value to the TMS in understanding the status of the toll road.

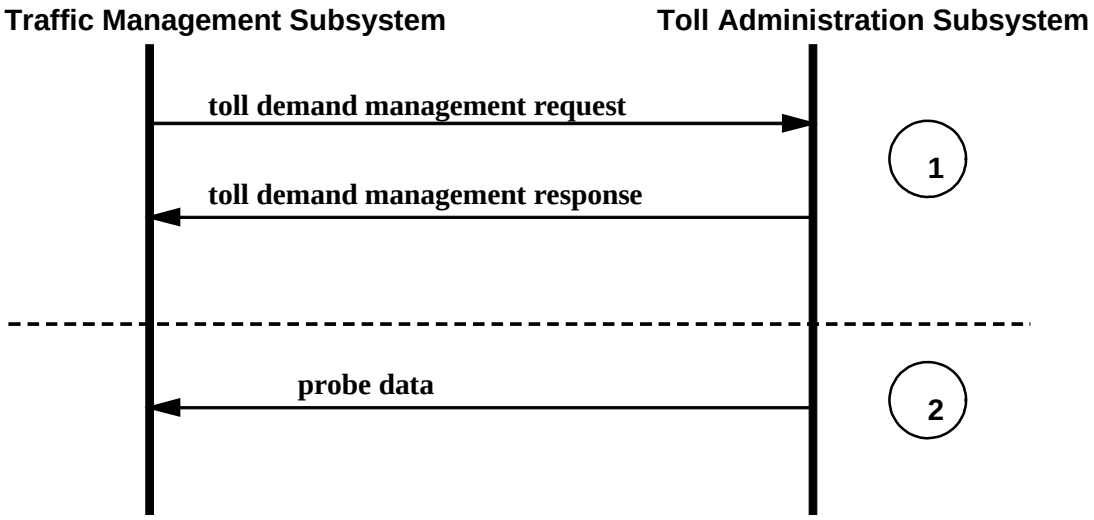

Figure 12 - TMS to Toll Administration Subsystem Transaction Sets

3.10.Transit Management Subsystem

Close coordination between the TMS and the Transit Management Subsystem (TRMS) is an important element of the National Architecture. There are four basic transaction sets for the TMS to TRMS interface as shown in Figure 13.

15. 1. The TMS requests transit information and the TRMS sends the information (in the flow transit system data). This could include static information like routes and fares (for use in demand management activities). It could also encompass more advanced concepts like real time transit locations for use in system wide optimization.

16. 2. Signal priority request from the TRMS and status of the request from the TMS. This functionality is covered more completely in Standards Requirements Package 8- Signal Preemption for Transit and Emergency Vehicles.

17. 3. The TMS can send traffic information (including incident information) to the TRMS .

18. 4. Finally, as part of an advanced demand management implementation, the TMS could make requests for changes in the fares or schedules of the transit system, with the TRMS responding to these requests.

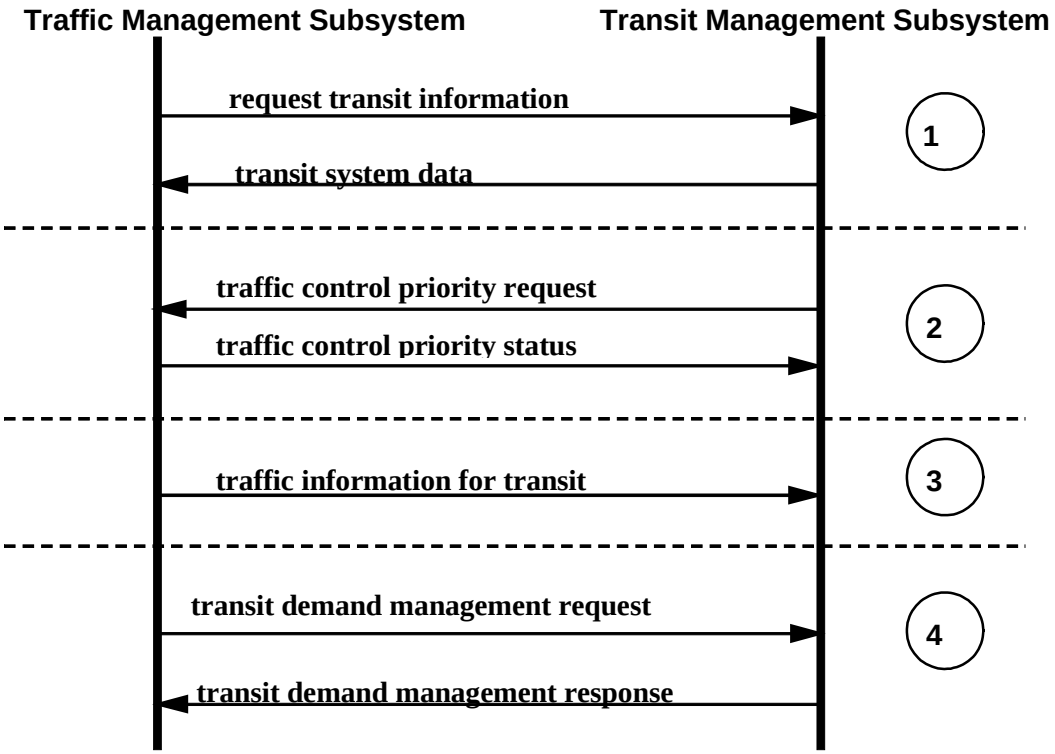

Figure 13 - TMS to Transit Management Subsystem Transaction Sets

3.11.Weather Service

The Weather Service maintains current and predicted weather information for the region. Direct data communications to weather services are already quite common, although most often the data is viewed as part of a standalone system. In future implementations this information could be integrated into other TMS processes.

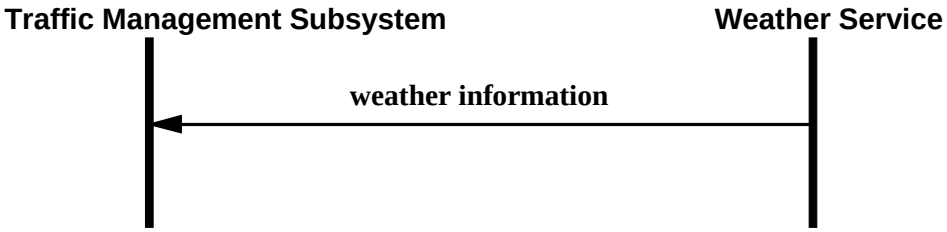

Figure 14 - TMS to Weather Service Transaction

4. Interface Decomposition

This section shows the interface decomposition for the interfaces covered in this package. The format shows the interface followed by the first physical architecture data flow in the interface and its description. Each of the physical architecture flows is then decomposed into its constituent leveled data items, which in turn are decomposed hierarchically into more basic leveled architecture flows. The leveled data items are numbered and indented to indicate which are top level flows (1) and which are constituent data flows (numbered 2 and lower). The description of the top level leveled data item is given. The full leveled data item definition for the top level flows and for all the constituent flows is given in Section 7. That section contains the leveled data item entries, listed in alphabetical order, for all of the leveled data items contained in this package. The leveled data items represent a simplification of the logical architecture information to focus on the essential data on each subsystem interface. They are traceable to the original logical architecture data elements, and have been developed in order to provide traceability between the ITS standards being developed and the National ITS Architecture. Once a draft standard has been developed the question that must be addressed is whether the standard completely addresses all elements of the National ITS Architecture interface. Due to the complex hierarchical nature of the Logical Architecture data flows, comparison with standards outputs is very difficult. By creating a simplified view of each interface, it is possible to more effectively trace the standards outputs to the National ITS Architecture.

4.1 Traffic Management -> Construction and Maintenance

Physical Architecture Flow: closure coordination W
Coordination between subsystems regarding construction and maintenance closure times and durations.

Logical Architecture Flows:
(1) ***to_cm_incident_confirmation***
This data item is sent to the construction and maintenance terminator from the Manage Traffic function to provide confirmation that work by the Construction and Maintenance terminator which has been recorded as a possible incident can take place at the requested time.

(1) ***to_cm_request_incident_change***
This data item is sent to the construction and maintenance terminator from the Manage Traffic function to request changes to the timing of work requested by the construction and maintenance terminator. This will have been provided as input to the function and been recorded as a possible incident.

Physical Architecture Flow: maintenance resource request W
Request for road maintenance resources that can be used in the diversion of traffic (cones, portable signs), clearance of an incident, and repair of ancillary damage.

Logical Architecture Flows:
(1) ***to_cm_resource_request***
This data item is used to request traffic management resources to include temporary signs, cones, and other assets that can be used to divert traffic, create detours, and otherwise mange traffic at the incident scene. It also includes requests for any other assets that may be needed to support incident clearance.

Physical Architecture Flow: traffic equipment status W
Identification of field equipment requiring repair and known information about the associated faults.

Logical Architecture Flows:
(1) ***to_cm_fault_data***
This data item is sent to the construction and maintenance terminator from the Manage Traffic function. It contains a report showing that a particular fault has been found in an indicator be either a local or a roadside process. This report acts as a request for the construction and maintenance terminator to effect repairs to restore the indicator to normal operation as soon as possible.

(1) ***to_cm_sensor_fault_data***
This data item is sent to the construction and maintenance terminator from the Manage Traffic function. It contains a report showing that a particular fault has been found in a sensor be either a local or a roadside process. This report acts as a request for the construction and maintenance terminator to effect repairs to restore the sensor to normal operation as soon as possible.

4.2 Traffic Management -> DMV

Physical Architecture Flow: license request W
Request supporting registration data based on license plate read during violation.

Logical Architecture Flows:
(1) ***to_dmv_traffic_violation_identity_code***
This data item contains the identity code of the ITS that is requesting the vehicle registration data so that a traffic violation can be processed.

(1) ***to_dmv_traffic_violation_vehicle_license***
This data item contains the vehicle license for which the corresponding registration data is required so that a traffic violation can be processed.

4.3 Traffic Management -> Enforcement Agency

Physical Architecture Flow: violation notification W
Notification to enforcement agency of violation or regulations.

Logical Architecture Flows:
(1) ***to_enforcement_agency_traffic_violation_data***
This data item contains information about high occupancy vehicle (HOV) lane use and pollution violations that have been detected by processes within the Manage Traffic function. The data in this item will enable the notified enforcement agency to take the appropriate action against those committing the violations.

4.4 Traffic Management -> Event Promoters

Physical Architecture Flow: event confirmation W
Confirmation that special event details have been received and processed.

Logical Architecture Flows:
(1) ***to_ep_event_confirmation***
This data item is the confirmation that the previously submitted details of an event have been accepted as a possible incident.

4.5 Traffic Management -> Information Service Provider

Physical Architecture Flow: request fare and price information W
Requests for current fare and price information from a service provider that can be used to augment the traffic manager's overall view of current transportation network status.

Logical Architecture Flows:
(1) ***parking_lot_charge_request***
This data item contains a request for the current prices being charged for parking lot spaces.
(1) ***toll_price_request***
This data item is sent from the Manage Traffic function to the Provide Electronic Payment Services function and contains a request for the current prices being charged for toll segments on the road and highway network.

(1) ***transit_fare_request***
This data item is sent from the Manage Traffic function to the Provide Electronic Payment Services function and contains a request for the current prices being charged for transit fares.

Physical Architecture Flow: traffic information W
Current and forecasted traffic information, road and weather conditions, incident information, and pricing data. Either raw data, processed data, or some combination of both may be provided by this architecture flow.

Logical Architecture Flows:
(1) ***current_highway_network_state***
This data item contains data about traffic conditions on links in the road network served by the function. The data is used by the route selection and guidance processes in determining the best vehicle routes.

(2) ***link_delay***

(2) ***link_status***
(3) ***lane_closure***

(3) ***lane_open***

(2) ***link_travel_time***

(1) ***link_ownership***
This data item contains data for use in determining which other ISP('s) must be contacted to obtain data about roads and highways in geographic area(s) outside that served by the local function.

(2) ***link_attributes***

(2) ***link_ISP_identity***

(1) ***sensor_data_for_distribution***
This data item contains raw and processed sensor data.

(2) ***environment_sensor_data***
(3) ***environment_sensor_output***
(3) ***sensor_identity***
(3) ***station_id***

(2) ***roadway_environment_conditions***
(3) ***link_environment_conditions***
(3) ***link_list_identities***

(2) ***traffic_sensor_data***
(3) ***sensor_identity***
(3) ***station_id***
(3) ***traffic_sensor_output***

(2) ***traffic_video_image***

(1) ***traffic_data_for_distribution***
This data item contains the response to a request for particular data to be retrieved from the stores of current, long term and predictive model data. This data will be used as the basis for traffic information data that is provided to other ITS functions.

(2) ***current_data_for_retrieval***
(3) ***current_other_routes_use***
(4) ***route_segment_guided_travelers***
(4) ***route_segment_identity***
(4) ***route_segment_journey_time***
(4) ***route_segment_total_number***
(3) ***current_road_network_use***
(4) ***route_segment_identity***
(4) ***route_segment_journey_time***
(4) ***route_segment_total_number***
(4) ***route_segment_use_prediction***
(5) ***route_segment_guided_vehicles***
(3) ***hov_lane_data***
(4) ***hov_lane_vehicle_count***
(4) ***hov_lane_violation_count***
(3) ***incident_data***
(4) ***incident_description***
(4) ***incident_duration***
(4) ***incident_location***
(4) ***incident_number***
(4) ***incident_severity***
(4) ***incident_start_time***
(4) ***incident_traffic_impact***

(4) ***incident_type***

(4) ***incident_vehicles_involved***

(3) ***link_data_from_avl_list***

(4) ***link_queue_time***

(4) ***link_speed***

(4) ***link_travel_time***

(3) ***link_data_from_tags_list***

(4) ***link_queue_time***

(4) ***link_travel_time***

(3) ***link_state_data***

(4) ***link_list***

(4) ***vehicle_count***

(4) ***vehicle_headway***

(4) ***vehicle_occupancy***

(4) ***vehicle_queue_length***

(4) ***vehicle_speed***

(3) ***parking_lot_storage_data_list***

(4) ***parking_lot_current_occupancy***

(5) ***parking_lot_calculated_occupancy***

(5) ***parking_lot_identity***

(4) ***parking_lot_identity***

(4) ***parking_lot_state***

(3) ***ramp_signal_state_list***

(4) ***ramp_controls***

(4) ***ramp_identity_list***

(3) ***vehicle_smart_probe_data_for_storage***

(4) ***vehicle_smart_probe_data_indication***

(4) ***vehicle_smart_probe_data_source***

(5) ***vehicle_smart_probe_data_source_identity***

(5) ***vehicle_smart_probe_data_source_location***

(3) ***wide_area_pollution_data***

(4) ***pollution_state_area_collection***

(5) ***area_air_quality_index***

(5) ***current_pollution_data***

(5) ***current_pollution_location***

(4) ***pollution_state_roadside_collection***

(5) ***current_pollution_data***

(5) ***current_roadside_pollution_location***

(2) ***long_term_data_for_retrieval***

(3) ***current_other_routes_use***

(4) ***route_segment_guided_travelers***

(4) ***route_segment_identity***

(4) ***route_segment_journey_time***

(4) ***route_segment_total_number***

(3) ***current_road_network_use***

(4) ***route_segment_identity***

(4) ***route_segment_journey_time***

(4) ***route_segment_total_number***

(4) ***route_segment_use_prediction***

(5) ***route_segment_guided_vehicles***

(3) ***hov_lane_data***

(4) ***hov_lane_vehicle_count***

(4) ***hov_lane_violation_count***

(3) ***incident_data***

(4) ***incident_description***

(4) ***incident_duration***

(4) ***incident_location***

(4) ***incident_number***

(4) ***incident_severity***

(4) ***incident_start_time***

(4) ***incident_traffic_impact***

(4) ***incident_type***

(4) ***incident_vehicles_involved***

(3) ***link_data_from_avl_list***

(4) ***link_queue_time***

(4) ***link_speed***

(4) ***link_travel_time***

(3) ***link_data_from_tags_list***

(4) ***link_queue_time***

(4) ***link_travel_time***

(3) ***link_state_data***

(4) ***link_list***

(4) ***vehicle_count***

(4) ***vehicle_headway***

(4) ***vehicle_occupancy***

(4) ***vehicle_queue_length***

(4) ***vehicle_speed***

(3) ***parking_lot_storage_data_list***

(4) ***parking_lot_current_occupancy***

(5) ***parking_lot_calculated_occupancy***

(5) ***parking_lot_identity***

(4) ***parking_lot_identity***

(4) ***parking_lot_state***

(3) ***ramp_signal_state_list***

(4) ***ramp_controls***

(4) ***ramp_identity_list***

(3) ***vehicle_smart_probe_stored_data***

(3) ***wide_area_pollution_data***

(4) ***pollution_state_area_collection***

(5) ***area_air_quality_index***

(5) ***current_pollution_data***
(5) ***current_pollution_location***
(4) ***pollution_state_roadside_collection***
(5) ***current_pollution_data***
(5) ***current_roadside_pollution_location***
(2) ***predictive_data***
(3) ***planned_events***
(4) ***incident_description***
(4) ***incident_location***
(4) ***incident_severity***
(4) ***incident_traffic_impact***
(4) ***incident_type***
(3) ***predicted_highway_network_data***
(4) ***link_delay***
(4) ***link_list_for_highways***
(4) ***link_occupancy***
(4) ***link_speed***
(4) ***link_travel_time***
(3) ***predicted_hov_lane_data***
(4) ***hov_lane_vehicle_count***
(4) ***hov_lane_violation_count***
(3) ***predicted_other_routes_use***
(4) ***route_segment_guided_travelers***
(4) ***route_segment_identity***
(4) ***route_segment_journey_time***
(4) ***route_segment_total_number***
(3) ***predicted_parking_lot_data***
(4) ***parking_lot_identity***
(4) ***parking_lot_occupancy***
(4) ***parking_lot_state***
(3) ***predicted_road_network_data***
(4) ***link_delay***
(4) ***link_list_for_roads***
(4) ***link_occupancy***
(4) ***link_speed***
(4) ***link_travel_time***
(3) ***predicted_road_network_use***
(4) ***route_segment_guided_vehicles***
(4) ***route_segment_identity***
(4) ***route_segment_journey_time***
(4) ***route_segment_total_number***

4.6 Traffic Management -> Media

Physical Architecture Flow: traffic information for media W
Report of current traffic conditions, incidents, maintenance activities and other traffic-related information prepared for public dissemination through the media.

Logical Architecture Flows:
(1) ***to_media_incident_data***
This data item contains data on current incidents and/or planned events in a form which will be readily understood by the Media. The data is sent in response to a request for information from the media.

(1) ***to_media_traffic_data***
This data item contains data on current incidents and/or planned events in a form which will be readily understood by the Media. The data is sent in response to a request for information from the media.

4.7 Traffic Management -> Other TM

Physical Architecture Flow: traffic control coordination W
Information transfers that enable remote monitoring and control of traffic management devices. This flow is intended to allow cooperative access to, and control of, field equipment during incidents and special events and during day-to-day operations. This flow also allows 24-hour centers to monitor and control assets of other centers during off-hours, allows system redundancies and fail-over capabilities to be established, and otherwise enables integrated traffic control strategies in a region.

Logical Architecture Flows:
(1) ***traffic_center_control_data***
This data item contains traffic control data which is being transferred from one Traffic Management Center (TMC) to one or more others.

(2) ***dms_data_for_highways***
(3) ***indicator_sign_control_data_for_highways***
(4) ***indicator_identity_list***
(4) ***indicator_sign_control_data***
(5) ***dms_advisory_text***
(5) ***hri_sign_control_data***
(5) ***lane_dms_controls***
(5) ***parking_lot_dms_controls***
(5) ***pollution_output_message***
(2) ***dms_data_for_roads***
(3) ***indicator_sign_control_data_for_roads***
(4) ***indicator_identity_list***
(4) ***indicator_sign_control_data***
(5) ***dms_advisory_text***
(5) ***hri_sign_control_data***
(5) ***lane_dms_controls***
(5) ***parking_lot_dms_controls***
(5) ***pollution_output_message***
(2) ***har_data_for_highways***

(3) ***har_identity***

(3) ***har_management_data***

(4) ***har_mode***

(4) ***har_schedule***

(3) ***har_program***

(2) ***har_data_for_roads***

(3) ***har_identity***

(3) ***har_management_data***

(4) ***har_mode***

(4) ***har_schedule***

(3) ***har_program***

(2) ***indicator_control_data_for_highways***

(3) ***indicator_crossing_control_data_for_highways***

(4) ***indicator_crossing_controls***

(4) ***indicator_identity_list***

(3) ***indicator_ramp_control_data***

(4) ***indicator_identity_list***

(4) ***ramp_controls***

(2) ***indicator_control_data_for_roads***

(3) ***indicator_crossing_control_data_for_roads***

(4) ***indicator_crossing_controls***

(4) ***indicator_identity_list***

(3) ***indicator_junction_control_data***

(4) ***indicator_identity_list***

(4) ***indicator_junction_controls***

(3) ***indicator_pedestrian_control_data***

(4) ***indicator_identity_list***

(4) ***indicator_pedestrian_controls***

(1) ***traffic_center_identity***

This data item defines the logical identifier of an interfacing peer Traffic Management Center (TMC) to share traffic data and system status. Other centers may be on-line to coordinate wide area traffic operations to promote traffic mobility and coordination.

(1) ***traffic_center_status_data***

This data item contains traffic status data which is being transferred from one Traffic Management Center (TMC) to one or more others.

(2) ***dms_status_for_highways***

(2) ***dms_status_for_roads***

(2) ***har_status_data***

(3) ***har_identity***

(3) ***har_status***

(2) ***indicator_input_data_from_highways***
(3) ***indicator_identity_list***
(3) ***indicator_response_state***
(2) ***indicator_input_state_for_roads***
(3) ***indicator_data***
(3) ***indicator_type***

Physical Architecture Flow: traffic information coordination W
Traffic information exchanged between TMC's. Normally would include incidents, congestion data, traffic data, signal timing plans, and real-time signal control information.

Logical Architecture Flows:
(1) ***commercial_vehicle_incidents_for_other_TMC***
This data item contains data about the route for a commercial vehicle that is carrying an abnormal load where that route goes outside the road and highway network covered by the local TMC. An abnormal load is defined as being one for which some kind of movement permit is needed. It may be that it is either over dimensioned (width, height, weight, etc.) or contains hazardous material (HAZMAT). The data will be sent to the TMC('s) serving the links that are not controlled by the local TMC to enable it(them) to set up any special traffic control strategies to minimize the disruption to traffic as the load passes through the network.

(2) ***permit_route_plan***
(3) ***link_identity_list***
(3) ***load_description***
(2) ***permit_traffic_controls***
(3) ***selected_highway_control_strategy***
(4) ***highway_sign_plan_number***
(4) ***indicator_identity_list***
(4) ***selected_strategy_type***
(3) ***selected_ramp_control_strategy***
(4) ***ramp_identity_list***
(4) ***selected_ramp_strategy_type***
(3) ***selected_road_control_strategy***
(4) ***indicator_identity_list***
(4) ***indicator_road_adaptive_plan_number***
(4) ***indicator_road_fixed_plan_number***
(4) ***selected_strategy_type***
(2) ***permit_type***

(1) ***current_data***
This data item holds data about the current state of traffic on the road (surface street) and freeway network served by the function. It is a sample of the traffic at a single instant in time and is updated periodically from data collected by other processes within both this and other ITS functions.
(2) ***current_other_routes_use***
(3) ***route_segment_guided_travelers***
(3) ***route_segment_identity***

(3) ***route_segment_journey_time***

(3) ***route_segment_total_number***

(2) ***current_road_network_use***

(3) ***route_segment_identity***

(3) ***route_segment_journey_time***

(3) ***route_segment_total_number***

(3) ***route_segment_use_prediction***

(4) ***route_segment_guided_vehicles***

(2) ***parking_lot_storage_data_list***

(3) ***parking_lot_current_occupancy***

(4) ***parking_lot_calculated_occupancy***

(4) ***parking_lot_identity***

(3) ***parking_lot_identity***

(3) ***parking_lot_state***

(2) ***processed_data***

(3) ***crossing_data_list***

(4) ***crossing_close_duration***

(4) ***crossing_close_time***

(3) ***hov_priority***

(4) ***hov_lane_data***

(5) ***hov_lane_vehicle_count***

(5) ***hov_lane_violation_count***

(4) ***hov_lane_identity_list***

(3) ***hri_state_data***

(3) ***link_data_from_avl_list***

(4) ***link_queue_time***

(4) ***link_speed***

(4) ***link_travel_time***

(3) ***link_data_from_tags_list***

(4) ***link_queue_time***

(4) ***link_travel_time***

(3) ***link_state_data***

(4) ***link_list***

(4) ***vehicle_count***

(4) ***vehicle_headway***

(4) ***vehicle_occupancy***

(4) ***vehicle_queue_length***

(4) ***vehicle_speed***

(3) ***o_d_matrix***

(3) ***parking_lot_input_data***

(4) ***parking_lot_identity_list***

(4) ***vehicle_count***

(4) ***vehicle_queue_length***

(3) ***pedestrian_data***

(4) ***indicator_identity_list***

(4) ***pedestrian_demand***

(3) ***ramp_data***

(4) ***private_vehicle_occupants***

(4) ***ramp_identity_list***

(4) ***vehicle_headway***

(4) ***vehicle_occupancy***

(4) ***vehicle_speed***

(3) ***roadway_environment_conditions***

(4) ***link_environment_conditions***

(4) ***link_list_identities***

(3) ***roadway_traffic_conditions***

(4) ***link_list***

(4) ***link_traffic_conditions***

(3) ***vehicle_smart_probe_data_for_storage***

(4) ***vehicle_smart_probe_data_indication***

(4) ***vehicle_smart_probe_data_source***

(5) ***vehicle_smart_probe_data_source_identity***

(5) ***vehicle_smart_probe_data_source_location***

(2) ***sensor_output_data***

(3) ***environment_sensor_data***

(4) ***environment_sensor_output***

(4) ***sensor_identity***

(4) ***station_id***

(3) ***hri_sensor_data***

(4) ***closure_event_data***

(4) ***hri_closure_data_response***

(4) ***hri_state***

(4) ***intersection_blocked***

(4) ***rail_schedules_data***

(3) ***traffic_sensor_data***

(4) ***sensor_identity***

(4) ***station_id***

(4) ***traffic_sensor_output***

(2) ***stored_incident_data***

(3) ***current_incident_data_list***

(4) ***incident_description***

(4) ***incident_duration***

(4) ***incident_location***

(4) ***incident_number***

(4) ***incident_severity***

(4) ***incident_start_time***

(4) ***incident_traffic_impact***

(4) ***incident_type***

(4) ***incident_vehicles_involved***

(3) ***planned_event_data_list***

(4) ***incident_duration***

(4) ***incident_location***

(4) ***incident_number***

(4) ***incident_severity***

(4) ***incident_start_time***

(4) ***incident_traffic_impact***

(4) ***incident_type***

(2) ***traffic_management_storage_data***

(3) ***indicator_control_data_for_highways***

(4) ***indicator_crossing_control_data_for_highways***

(5) ***indicator_crossing_controls***

(5) ***indicator_identity_list***

(4) ***indicator_ramp_control_data***

(5) ***indicator_identity_list***

(5) ***ramp_controls***

(3) ***indicator_control_data_for_roads***

(4) ***indicator_crossing_control_data_for_roads***

(5) ***indicator_crossing_controls***

(5) ***indicator_identity_list***

(4) ***indicator_junction_control_data***

(5) ***indicator_identity_list***

(5) ***indicator_junction_controls***

(4) ***indicator_pedestrian_control_data***

(5) ***indicator_identity_list***

(5) ***indicator_pedestrian_controls***

(3) ***indicator_input_storage_data***

(4) ***indicator_input_storage_data_for_highways***

(5) ***indicator_response_state***

(5) ***indicator_type***

(4) ***indicator_input_storage_data_for_roads***

(5) ***indicator_response_state***

(5) ***indicator_type***

(3) ***selected_strategy***

(4) ***selected_emergency_vehicle_strategy***

(5) ***indicator_identity_list***

(5) ***ramp_identity_list***

(5) ***selected_emergency_strategy***

(4) ***selected_highway_control_strategy***

(5) ***highway_sign_plan_number***

(5) ***indicator_identity_list***

(5) ***selected_strategy_type***

(4) ***selected_parking_lot_control_strategy***

(5) ***parking_lot_identity_list***

(5) ***selected_parking_lot_strategy_type***

(4) ***selected_ramp_control_strategy***
(5) ***ramp_identity_list***
(5) ***selected_ramp_strategy_type***
(4) ***selected_road_control_strategy***
(5) ***indicator_identity_list***
(5) ***indicator_road_adaptive_plan_number***
(5) ***indicator_road_fixed_plan_number***
(5) ***selected_strategy_type***

(2) ***traffic_video_image_data***
(3) ***traffic_video_camera_number***
(3) ***traffic_video_image***

(2) ***wide_area_pollution_data***
(3) ***pollution_state_area_collection***
(4) ***area_air_quality_index***
(4) ***current_pollution_data***
(4) ***current_pollution_location***
(3) ***pollution_state_roadside_collection***
(4) ***current_pollution_data***
(4) ***current_roadside_pollution_location***

(1) ***emergency_data_for_other_TMC***
This data item contains the portion of a strategy that gives priority to emergency vehicles that relates to roads (surface streets) and highways that are outside the area served by the local TMC. This data will be sent to the appropriate other TMC's so that they can implement the requested priority measures to give the emergency vehicles priority throughout their route.

(2) ***emergency_traffic_control_request_list***
(3) ***date***
(3) ***route_segment_estimated_arrival_time***
(3) ***route_segment_identity***
(3) ***time***

(2) ***selected_emergency_strategy***

(2) ***selected_emergency_vehicle_strategy***
(3) ***indicator_identity_list***
(3) ***ramp_identity_list***
(3) ***selected_emergency_strategy***

(1) ***long_term_data***
This data item contains data about the previous (historical) state of traffic on the road (surface street) and highway network served by the function. The data is accumulated in real time at periodic time intervals from other processes within both this and other ITS functions. The traffic flow, other routes use, o-d matrix, parking lot, processed and wide area pollution data is stored in hourly time intervals for each day over a rolling two week period, after which it is consolidated into a single smoothed or average set of data for normal weekday flows. The traffic management data is stored in fifteen minute intervals daily for a long period of time as a record of the indicator state.

(2) ***current_road_network_use***
(3) ***route_segment_identity***

(3) ***route_segment_journey_time***

(3) ***route_segment_total_number***

(3) ***route_segment_use_prediction***

(4) ***route_segment_guided_vehicles***

(2) ***historical_other_routes_use***

(3) ***route_segment_guided_travelers***

(3) ***route_segment_identity***

(3) ***route_segment_journey_time***

(3) ***route_segment_total_number***

(2) ***historical_parking_lot_storage_data_list***

(3) ***parking_lot_current_occupancy***

(4) ***parking_lot_calculated_occupancy***

(4) ***parking_lot_identity***

(3) ***parking_lot_identity***

(3) ***parking_lot_state***

(2) ***historical_processed_data***

(3) ***crossing_data_list***

(4) ***crossing_close_duration***

(4) ***crossing_close_time***

(3) ***hov_priority***

(4) ***hov_lane_data***

(5) ***hov_lane_vehicle_count***

(5) ***hov_lane_violation_count***

(4) ***hov_lane_identity_list***

(3) ***hri_state_data***

(3) ***link_data_from_tags_list***

(4) ***link_queue_time***

(4) ***link_travel_time***

(3) ***link_state_data***

(4) ***link_list***

(4) ***vehicle_count***

(4) ***vehicle_headway***

(4) ***vehicle_occupancy***

(4) ***vehicle_queue_length***

(4) ***vehicle_speed***

(3) ***o_d_matrix***

(3) ***parking_lot_input_data***

(4) ***parking_lot_identity_list***

(4) ***vehicle_count***

(4) ***vehicle_queue_length***

(3) ***pedestrian_data***

(4) ***indicator_identity_list***

(4) ***pedestrian_demand***

(3) ***ramp_data***
(4) ***private_vehicle_occupants***
(4) ***ramp_identity_list***
(4) ***vehicle_headway***
(4) ***vehicle_occupancy***
(4) ***vehicle_speed***
(3) ***roadway_environment_conditions***
(4) ***link_environment_conditions***
(4) ***link_list_identities***
(2) ***historical_stored_incident_data***
(3) ***incident_description***
(3) ***incident_duration***
(3) ***incident_location***
(3) ***incident_number***
(3) ***incident_severity***
(3) ***incident_start_time***
(3) ***incident_traffic_impact***
(3) ***incident_type***
(2) ***historical_traffic_management_storage_data***
(3) ***indicator_control_data_for_highways***
(4) ***indicator_crossing_control_data_for_highways***
(5) ***indicator_crossing_controls***
(5) ***indicator_identity_list***
(4) ***indicator_ramp_control_data***
(5) ***indicator_identity_list***
(5) ***ramp_controls***
(3) ***indicator_control_data_for_roads***
(4) ***indicator_crossing_control_data_for_roads***
(5) ***indicator_crossing_controls***
(5) ***indicator_identity_list***
(4) ***indicator_junction_control_data***
(5) ***indicator_identity_list***
(5) ***indicator_junction_controls***
(4) ***indicator_pedestrian_control_data***
(5) ***indicator_identity_list***
(5) ***indicator_pedestrian_controls***
(3) ***indicator_input_storage_data***
(4) ***indicator_input_storage_data_for_highways***
(5) ***indicator_response_state***
(5) ***indicator_type***
(4) ***indicator_input_storage_data_for_roads***
(5) ***indicator_response_state***
(5) ***indicator_type***
(3) ***selected_strategy***
(4) ***selected_emergency_vehicle_strategy***
(5) ***indicator_identity_list***

(5) ***ramp_identity_list***
(5) ***selected_emergency_strategy***
(4) ***selected_highway_control_strategy***
(5) ***highway_sign_plan_number***
(5) ***indicator_identity_list***
(5) ***selected_strategy_type***
(4) ***selected_parking_lot_control_strategy***
(5) ***parking_lot_identity_list***
(5) ***selected_parking_lot_strategy_type***
(4) ***selected_ramp_control_strategy***
(5) ***ramp_identity_list***
(5) ***selected_ramp_strategy_type***
(4) ***selected_road_control_strategy***
(5) ***indicator_identity_list***
(5) ***indicator_road_adaptive_plan_number***
(5) ***indicator_road_fixed_plan_number***
(5) ***selected_strategy_type***
(2) ***historical_vehicle_smart_probe_stored_data***
(3) ***vehicle_smart_probe_data_indication***
(3) ***vehicle_smart_probe_data_source***
(4) ***vehicle_smart_probe_data_source_identity***
(4) ***vehicle_smart_probe_data_source_location***
(2) ***historical_wide_area_pollution_data***
(3) ***historical_pollution_state_area_collection***
(4) ***area_air_quality_index***
(4) ***current_pollution_data***
(4) ***current_pollution_location***
(3) ***historical_pollution_state_roadside_collection***
(4) ***current_pollution_data***
(4) ***current_roadside_pollution_location***

(1) ***permit_coordination***
This data item contains information used in the coordination of permits for special travel requirements which involve different agencies and jurisdictions. This information provides the Manage Traffic function with schedule and route information to prepare special travel and traffic controls for the transport of non-typical loads or roadway activities that require permits.

(2) ***permit_traffic_controls***
(3) ***selected_highway_control_strategy***
(4) ***highway_sign_plan_number***
(4) ***indicator_identity_list***
(4) ***selected_strategy_type***
(3) ***selected_ramp_control_strategy***
(4) ***ramp_identity_list***
(4) ***selected_ramp_strategy_type***
(3) ***selected_road_control_strategy***
(4) ***indicator_identity_list***
(4) ***indicator_road_adaptive_plan_number***

(4) ***indicator_road_fixed_plan_number***

(4) ***selected_strategy_type***

(1) ***planned_events_local_data***
This data item contains a copy of the contents of the store of planned events. This has been requested by the same function in another traffic management center (TMC) to which it will be sent by another process.

(2) ***tmc_identity***

(1) ***traffic_center_data_request***
This data item contains a request for data to be sent from another Traffic Management Center (TMC) to the local TMC.

(2) ***other_TMC_data_request***

(2) ***other_TMC_incidents_request***

(3) ***request_other_current_incidents_data***

(3) ***request_other_planned_events_data***

(1) ***traffic_center_identity***
This data item defines the logical identifier of an interfacing peer Traffic Management Center (TMC) to share traffic data and system status. Other centers may be on-line to coordinate wide area traffic operations to promote traffic mobility and coordination.

4.8 Traffic Management -> Parking Management

Physical Architecture Flow: parking demand management request W
Request to change the demand for parking facility use through pricing or other mechanisms.

Logical Architecture Flows:
(1) ***parking_lot_charge_change_request***
This data item contains a request for a change to the current parking lot charging structure that will help to influence a change in modal split of journeys currently being undertaken by travelers of all types, i.e. including drivers and transit users, by encouraging then to use certain parking lots, e.g. those near park and ride sites on the edge of an urban area.

(2) ***parking_lot_charge_application_time***

(2) ***parking_lot_identity_list***

(2) ***parking_lot_price***

(2) ***vehicle_type_for_charges***

(1) ***parking_lot_charge_request***
This data item contains a request for the current prices being charged for parking lot spaces.

Physical Architecture Flow: parking instructions W
Information that allows local parking facilities to be managed to support regional traffic management objectives.

Logical Architecture Flows:
(1) ***parking_lot_input_data***
This data item contains data that is used to calculate the occupancy of parking lots.

(2) ***parking_lot_identity_list***

(2) ***vehicle_count***

(2) ***vehicle_queue_length***

(1) ***selected_parking_lot_control_strategy***
This data item contains the strategy which has been selected for implementation at parking lots to control their use. The strategy will be designed to promote or discourage the use of a parking lot by directing vehicles to or away from it through the use of dynamic message signs (dms). The decision on which strategy to employ will depend upon such things as the overall traffic management strategy, the need to restrict vehicle use because of a number of factors e.g. congestion, pollution, and the desire to encourage travelers to make use of alternative modes of transport by using park and ride (P+R) facilities. The strategy may be applied to some or all of the parking lots in the geographic area served by the TMC.

(2) ***parking_lot_identity_list***

(2) ***selected_parking_lot_strategy_type***

(1) ***static_data_for_parking_lots***
This data item contains data that relates vehicle sensors, queue counting sensors and signs to individual parking lots, and the lot occupancy(ies) at which states such as 'almost full' and 'full' will apply. The data is sent to each parking lot for its own use.

(2) ***parking_lot_dms_allocation***

(2) ***parking_lot_identity_list***

(2) ***parking_lot_sensor_allocation***
  (3) ***parking_lot_sensor_type***

(2) ***parking_lot_state_thresholds***
  (3) ***parking_lot_decreasing_threshold***

  (3) ***parking_lot_increasing_threshold***

4.9 Traffic Management -> Toll Administration

Physical Architecture Flow: toll demand management request W
Request to change the demand for toll road facility use through pricing or other mechanisms.

Logical Architecture Flows:
(1) ***toll_price_changes_request***
This data item contains a request for a change to the current toll pricing structure that will help to influence a change in modal split of journeys currently being undertaken by travelers of all types, i.e. including drivers and transit users.

(2) ***toll_price***

(2) ***toll_price_application_time***

(2) ***toll_segments***

(2) ***vehicle_type_for_tolls***
- (3) ***commercial_carrier_information***
- (3) ***commercial_driver_information***
- (3) ***commercial_vehicle_characteristics***
  - (4) ***commercial_vehicle_configuration***
  - (4) ***commercial_vehicle_size***
  - (4) ***commercial_vehicle_weight***
- (3) ***commercial_vehicle_information***
- (3) ***vehicle_identity***
- (3) ***vehicle_type***

(1) ***toll_price_request***
This data item is sent from the Manage Traffic function to the Provide Electronic Payment Services function and contains a request for the current prices being charged for toll segments on the road and highway network.

4.10 Construction and Maintenance -> Traffic Management

Physical Architecture Flow: equipment maintenance status W
Current status of field equipment maintenance actions.

Logical Architecture Flows:
(1) ***from_cm_fault_clearance***
This data item contains a report showing that a particular fault in an indicator has been cleared and that it has been restored to normal operation.

(1) ***from_cm_sensor_fault_data***
This data item contains a report showing that a particular fault in a sensor has been cleared and that it has been restored to normal operation.

Physical Architecture Flow: maintenance resource response W
Current status of maintenance resources included availability and deployment status.

Logical Architecture Flows:
(1) ***from_cm_resource_response***
This data item provides the status of the requested resources by the Construction and Maintenance terminator .

Physical Architecture Flow: work zone status W
Status of maintenance work zone.

Logical Architecture Flows:
(1) ***from_cm_incident_information***
This data item contains information about an incident that is about to be created by the proposed start of road maintenance activity which will affect the item of traffic on one or more lanes of a road or highway. Information contained is location, number of lanes closed, and duration of closure.

4.11 DMV -> Traffic Management

Physical Architecture Flow: registration W
Registered owner of vehicle and associated vehicle information.

Logical Architecture Flows:

(1) ***traffic_violation_state_identity***
This data item contains the identity of the state that is supplying the requested vehicle registration data to enable traffic violation to be processed.

(1) ***traffic_violation_vehicle_registration***
This data item contains the requested vehicle registration data to enable traffic violation to be processed.

4.12 Event Promoters -> Traffic Management

Physical Architecture Flow: event plans W
Plans for major events possibly impacting traffic.

Logical Architecture Flows:
(1) ***from_ep_event_information***
This data item is sent from the event promoters terminator to the Manage Traffic function and contains details of a special event that may become a possible incident due to its impact on the traffic flowing on one or more lanes of a road or highway.

4.13 Information Service Provider -> Traffic Management

Physical Architecture Flow: fare and price information W
Current transit, parking, and toll fee schedule information.

Logical Architecture Flows:
(1) ***parking_lot_charge_details***
This data item contains the prices being charged by each parking lot for each of its spaces, together with the time and date for which they apply.

(2) ***parking_lot_charge_application_time***

(2) ***parking_lot_identity_list***

(2) ***parking_lot_price***

(2) ***vehicle_type_for_charges***

(1) ***toll_price_details***

This data item contains the price for each road segment to which a toll applies, with the time and date for when it applies. This data will be used by the Manage Travel Demand facility in its efforts to re-distribute travel demand to the more efficient providers.

(2) ***toll_price***

(2) ***toll_price_application_time***

(2) ***toll_segments***

(2) ***vehicle_type_for_tolls***

(3) ***commercial_carrier_information***

(3) ***commercial_driver_information***

(3) ***commercial_vehicle_characteristics***

(4) ***commercial_vehicle_configuration***

(4) ***commercial_vehicle_size***

(4) ***commercial_vehicle_weight***

(3) ***commercial_vehicle_information***

(3) ***vehicle_identity***

(3) ***vehicle_type***

(1) ***transit_fare_details***

This data item contains details of the fares being currently charged for transit services.

(2) ***transit_route_number***

(2) ***transit_route_segment_list***

(3) ***link_identity_list***

(3) ***transit_route_segment_cost***

(3) ***transit_route_segment_number***

(2) ***transit_route_use_time***

(2) ***transit_user_category***

Physical Architecture Flow: logged special vehicle route W

Anticipated route information for special vehicles (e.g., oversize vehicles) or groups of vehicles (e.g., governer's motorcade) that may require changes in traffic control strategy.

Logical Architecture Flows:

(1) ***logged_special_vehicle_route***

This data contains details about a route that has been requested by a special vehicle. This could be a commercial vehicle that is carrying cargo which could be viewed as being liable to cause a potential incident. Loads falling into this category are those containing hazardous (HAZMAT) material, or those which are outsize, e.g. wide, heavy, or fragile and hence slow moving. This could also include vehicles which must be specially routed (e.g.. the governors motorcade).

(2) ***hazmat_load_data***

(2) ***route_segment_end_point***

(2) ***route_segment_estimated_arrival_time***

(2) ***route_segment_estimated_travel_time***

(2) ***route_segment_identity***

(2) ***route_segment_start_point***

(1) ***special_vehicle_priority_routing***
This data item is a special form of route similar to an emergency vehicle route, but for use by other vehicle types which may be given special priority routing (e.g. traffic control preemption routing). This could be applied to HOV vehicles, special HAZMAT, priority vehicles (e.g. governors motorcade), or even to regular vehicles under a low traffic volume period (e.g. in the early hours of the morning).

(2) ***route***

(2) ***vehicle_identity***

Physical Architecture Flow: request for traffic information W
Request for traffic information that specifies the region/route of interest, the desired effective time period, and other parameters that allow preparation of a tailored response. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.

Logical Architecture Flows:
(1) ***traffic_data_distribution_request***
This data item contains a request for particular data to be retrieved from the stores of long term, current, and predicted traffic data. The request is in response to a variety of requests received from ITS Users.

Physical Architecture Flow: road network use W
Aggregated route usage and associated travel data from clients for planning and analysis.

Logical Architecture Flows:
(1) ***current_other_routes_use***
This data item contains data about the non-vehicle portion(s) of routes that have been requested by travelers.

(2) ***route_segment_guided_travelers***

(2) ***route_segment_identity***

(2) ***route_segment_journey_time***

(2) ***route_segment_total_number***

(1) ***current_road_network_use***
This data item contains information about how many vehicles are being guided down each route segment and the average journey time for each route segment provided by guided vehicles.

(2) ***route_segment_identity***

(2) ***route_segment_journey_time***

(2) ***route_segment_total_number***

(2) ***route_segment_use_prediction***

(3) ***route_segment_guided_vehicles***

4.14 Media -> Traffic Management

Physical Architecture Flow: external reports W
Traffic and incident information that is collected by the media through a variety of mechanisms (e.g., radio station call-in programs, air surveillance).

Logical Architecture Flows:
(1) ***incident_information_from_media***
This data item contains data about an incident that has been reported by a member of the traveling public to the media by mechanisms that are outside of ITS, e.g. car phone.

(2) ***incident_duration***

(2) ***incident_location***

(2) ***incident_severity***

(2) ***incident_start_time***

(2) ***incident_type***

(2) ***media_identity***

Physical Architecture Flow: media information request W
Request from the media for current transportation information.

Logical Architecture Flows:
(1) ***incident_data_request***
This data item contains a request for data on incidents to be sent to the Media. The request must specify whether all, current incidents or planned events are required, in the latter case state the time period by date and hour range, and the geographic area(s) to which it should relate.

(1) ***traffic_data_request_from_media***
This data item is contains a request from the Media for traffic information. The request must specify the type of information required (flow/congestion) and the geographic area(s) to which it should relate.

4.15 Other TM -> Traffic Management

Physical Architecture Flow: traffic control coordination W
Information transfers that enable remote monitoring and control of traffic management devices. This flow is intended to allow cooperative access to, and control of, field equipment during incidents and special events and during day-to-day operations. This flow also allows 24-hour centers to monitor and control assets of other centers during off-hours, allows system redundancies and fail-over capabilities to be established, and otherwise enables integrated traffic control strategies in a region.

Logical Architecture Flows:

(1) ***other_traffic_center_control_data***
This data item contains traffic control data which is being transferred from one (remote) Traffic Management Center (TMC) to another, in this case the local TMC.

(2) ***other_dms_data_for_highways***

(3) ***indicator_sign_control_data_for_highways***
(4) ***indicator_identity_list***
(4) ***indicator_sign_control_data***
(5) ***dms_advisory_text***
(5) ***hri_sign_control_data***
(5) ***lane_dms_controls***
(5) ***parking_lot_dms_controls***
(5) ***pollution_output_message***
(2) ***other_dms_data_for_roads***
(3) ***indicator_sign_control_data_for_roads***
(4) ***indicator_identity_list***
(4) ***indicator_sign_control_data***
(5) ***dms_advisory_text***
(5) ***hri_sign_control_data***
(5) ***lane_dms_controls***
(5) ***parking_lot_dms_controls***
(5) ***pollution_output_message***
(2) ***other_har_data_for_highways***
(3) ***har_identity***
(3) ***har_management_data***
(4) ***har_mode***
(4) ***har_schedule***
(3) ***har_program***
(2) ***other_har_data_for_roads***
(3) ***har_identity***
(3) ***har_management_data***
(4) ***har_mode***
(4) ***har_schedule***
(3) ***har_program***
(2) ***other_indicator_control_data_for_highways***
(3) ***indicator_crossing_control_data_for_highways***
(4) ***indicator_crossing_controls***
(4) ***indicator_identity_list***
(3) ***indicator_ramp_control_data***
(4) ***indicator_identity_list***
(4) ***ramp_controls***
(2) ***other_indicator_control_data_for_roads***
(3) ***indicator_crossing_control_data_for_roads***
(4) ***indicator_crossing_controls***
(4) ***indicator_identity_list***
(3) ***indicator_junction_control_data***
(4) ***indicator_identity_list***
(4) ***indicator_junction_controls***
(3) ***indicator_pedestrian_control_data***
(4) ***indicator_identity_list***
(4) ***indicator_pedestrian_controls***

(1) ***other_traffic_center_status_data***
This data item contains traffic status data which is being transferred from one (remote) Traffic Management Center (TMC) to another, in this case the local TMC.

(2) ***other_dms_status_for_highways***
(3) ***dms_updates_for_highways***
(4) ***dms_advisory_text***
(5) ***dms_highway_open_close***
(5) ***dms_incident_warning***
(5) ***dms_weather_warning***
(4) ***indicator_identity_list***

(2) ***other_dms_status_for_roads***
(3) ***dms_advisory_text***
(4) ***dms_highway_open_close***
(4) ***dms_incident_warning***
(4) ***dms_weather_warning***
(3) ***indicator_identity_list***

(2) ***other_har_status_for_highways***
(3) ***har_identity***
(3) ***har_status***

(2) ***other_har_status_for_roads***
(3) ***har_identity***
(3) ***har_status***

(2) ***other_indicator_input_data_from_highways***
(3) ***indicator_data***
(3) ***indicator_type***
(3) ***list_size***

(2) ***other_indicator_input_state_for_roads***
(3) ***indicator_data***
(3) ***indicator_type***
(3) ***list_size***

(1) ***traffic_center_identity***
This data item defines the logical identifier of an interfacing peer Traffic Management Center (TMC) to share traffic data and system status. Other centers may be on-line to coordinate wide area traffic operations to promote traffic mobility and coordination.

Physical Architecture Flow: traffic information coordination W
Traffic information exchanged between TMC's. Normally would include incidents, congestion data, traffic data, signal timing plans, and real-time signal control information.

Logical Architecture Flows:
(1) ***from_other_tmc_data_request***
This data item contains a request for data to be sent to another Traffic Management Center (TMC) from the local TMC.

(2) ***local_TMC_incidents_request***

(3) ***request_local_current_incidents_data***

(3) ***request_local_planned_events_data***

(2) ***other_TMC_data_request***

(1) ***other_current_data***
This data item contains data about the current state of traffic on the road (surface street) and freeway network served by the function. It is a sample of the traffic at a single instant in time and is updated periodically from data collected by other processes within both this and other ITS functions.

(2) ***current_other_routes_use***

(3) ***route_segment_guided_travelers***

(3) ***route_segment_identity***

(3) ***route_segment_journey_time***

(3) ***route_segment_total_number***

(2) ***current_road_network_use***

(3) ***route_segment_identity***

(3) ***route_segment_journey_time***

(3) ***route_segment_total_number***

(3) ***route_segment_use_prediction***

(4) ***route_segment_guided_vehicles***

(2) ***parking_lot_storage_data_list***

(3) ***parking_lot_current_occupancy***

(4) ***parking_lot_calculated_occupancy***

(4) ***parking_lot_identity***

(3) ***parking_lot_identity***

(3) ***parking_lot_state***

(2) ***processed_data***

(3) ***crossing_data_list***

(4) ***crossing_close_duration***

(4) ***crossing_close_time***

(3) ***hov_priority***

(4) ***hov_lane_data***

(5) ***hov_lane_vehicle_count***

(5) ***hov_lane_violation_count***

(4) ***hov_lane_identity_list***

(3) ***hri_state_data***

(3) ***link_data_from_avl_list***

(4) ***link_queue_time***

(4) ***link_speed***

(4) ***link_travel_time***

(3) ***link_data_from_tags_list***

(4) ***link_queue_time***

(4) ***link_travel_time***

(3) ***link_state_data***

(4) ***link_list***

(4) ***vehicle_count***

(4) ***vehicle_headway***

(4) ***vehicle_occupancy***

(4) ***vehicle_queue_length***

(4) ***vehicle_speed***

(3) ***o_d_matrix***

(3) ***parking_lot_input_data***

(4) ***parking_lot_identity_list***

(4) ***vehicle_count***

(4) ***vehicle_queue_length***

(3) ***pedestrian_data***

(4) ***indicator_identity_list***

(4) ***pedestrian_demand***

(3) ***ramp_data***

(4) ***private_vehicle_occupants***

(4) ***ramp_identity_list***

(4) ***vehicle_headway***

(4) ***vehicle_occupancy***

(4) ***vehicle_speed***

(3) ***roadway_environment_conditions***

(4) ***link_environment_conditions***

(4) ***link_list_identities***

(3) ***roadway_traffic_conditions***

(4) ***link_list***

(4) ***link_traffic_conditions***

(3) ***vehicle_smart_probe_data_for_storage***

(4) ***vehicle_smart_probe_data_indication***

(4) ***vehicle_smart_probe_data_source***

(5) ***vehicle_smart_probe_data_source_identity***

(5) ***vehicle_smart_probe_data_source_location***

(2) ***sensor_output_data***

(3) ***environment_sensor_data***

(4) ***environment_sensor_output***

(4) ***sensor_identity***

(4) ***station_id***

(3) ***hri_sensor_data***

(4) ***closure_event_data***

(4) ***hri_closure_data_response***

(4) ***hri_state***

(4) ***intersection_blocked***

(4) ***rail_schedules_data***

(3) ***traffic_sensor_data***

(4) ***sensor_identity***

(4) ***station_id***

(4) ***traffic_sensor_output***

(2) ***stored_incident_data***

(3) ***current_incident_data_list***

(4) ***incident_description***

(4) ***incident_duration***

(4) ***incident_location***

(4) ***incident_number***

(4) ***incident_severity***

(4) ***incident_start_time***

(4) ***incident_traffic_impact***

(4) ***incident_type***

(4) ***incident_vehicles_involved***

(3) ***planned_event_data_list***

(4) ***incident_duration***

(4) ***incident_location***

(4) ***incident_number***

(4) ***incident_severity***

(4) ***incident_start_time***

(4) ***incident_traffic_impact***

(4) ***incident_type***

(2) ***traffic_management_storage_data***

(3) ***indicator_control_data_for_highways***

(4) ***indicator_crossing_control_data_for_highways***

(5) ***indicator_crossing_controls***

(5) ***indicator_identity_list***

(4) ***indicator_ramp_control_data***

(5) ***indicator_identity_list***

(5) ***ramp_controls***

(3) ***indicator_control_data_for_roads***

(4) ***indicator_crossing_control_data_for_roads***

(5) ***indicator_crossing_controls***

(5) ***indicator_identity_list***

(4) ***indicator_junction_control_data***

(5) ***indicator_identity_list***

(5) ***indicator_junction_controls***

(4) ***indicator_pedestrian_control_data***

(5) ***indicator_identity_list***

(5) ***indicator_pedestrian_controls***

(3) ***indicator_input_storage_data***

(4) ***indicator_input_storage_data_for_highways***

(5) ***indicator_response_state***

(5) ***indicator_type***

(4) ***indicator_input_storage_data_for_roads***

(5) ***indicator_response_state***

(5) ***indicator_type***
(3) ***selected_strategy***
(4) ***selected_emergency_vehicle_strategy***
(5) ***indicator_identity_list***
(5) ***ramp_identity_list***
(5) ***selected_emergency_strategy***
(4) ***selected_highway_control_strategy***
(5) ***highway_sign_plan_number***
(5) ***indicator_identity_list***
(5) ***selected_strategy_type***
(4) ***selected_parking_lot_control_strategy***
(5) ***parking_lot_identity_list***
(5) ***selected_parking_lot_strategy_type***
(4) ***selected_ramp_control_strategy***
(5) ***ramp_identity_list***
(5) ***selected_ramp_strategy_type***
(4) ***selected_road_control_strategy***
(5) ***indicator_identity_list***
(5) ***indicator_road_adaptive_plan_number***
(5) ***indicator_road_fixed_plan_number***
(5) ***selected_strategy_type***
(2) ***wide_area_pollution_data***
(3) ***pollution_state_area_collection***
(4) ***area_air_quality_index***
(4) ***current_pollution_data***
(4) ***current_pollution_location***
(3) ***pollution_state_roadside_collection***
(4) ***current_pollution_data***
(4) ***current_roadside_pollution_location***

(1) ***other_long_term_data***
This data item contains historic traffic data for links in the road (surface street) and highway network which are served by other traffic management centers (TMC's). The size estimate is based on data being accumulated at periodic time intervals. The traffic flow, other routes use, o-d matrix, parking lot, processed and wide area pollution data is stored in hourly time intervals for each day over a rolling two week period, after which it is consolidated into a single smoothed or average set of data for normal weekday flows. The traffic management data is stored in periodic intervals throughout the day for a specified amount of time as a record of the indicator state.
(2) ***current_road_network_use***
(3) ***route_segment_identity***
(3) ***route_segment_journey_time***
(3) ***route_segment_total_number***
(3) ***route_segment_use_prediction***
(4) ***route_segment_guided_vehicles***
(2) ***historical_other_routes_use***
(3) ***route_segment_guided_travelers***
(3) ***route_segment_identity***

(3) ***route_segment_journey_time***

(3) ***route_segment_total_number***

(2) ***historical_parking_lot_storage_data_list***

(3) ***parking_lot_current_occupancy***

(4) ***parking_lot_calculated_occupancy***

(4) ***parking_lot_identity***

(3) ***parking_lot_identity***

(3) ***parking_lot_state***

(2) ***historical_processed_data***

(3) ***crossing_data_list***

(4) ***crossing_close_duration***

(4) ***crossing_close_time***

(3) ***hov_priority***

(4) ***hov_lane_data***

(5) ***hov_lane_vehicle_count***

(5) ***hov_lane_violation_count***

(4) ***hov_lane_identity_list***

(3) ***hri_state_data***

(3) ***link_data_from_tags_list***

(4) ***link_queue_time***

(4) ***link_travel_time***

(3) ***link_state_data***

(4) ***link_list***

(4) ***vehicle_count***

(4) ***vehicle_headway***

(4) ***vehicle_occupancy***

(4) ***vehicle_queue_length***

(4) ***vehicle_speed***

(3) ***o_d_matrix***

(3) ***parking_lot_input_data***

(4) ***parking_lot_identity_list***

(4) ***vehicle_count***

(4) ***vehicle_queue_length***

(3) ***pedestrian_data***

(4) ***indicator_identity_list***

(4) ***pedestrian_demand***

(3) ***ramp_data***

(4) ***private_vehicle_occupants***

(4) ***ramp_identity_list***

(4) ***vehicle_headway***

(4) ***vehicle_occupancy***

(4) ***vehicle_speed***

(3) ***roadway_environment_conditions***

(4) ***link_environment_conditions***

(4) ***link_list_identities***

(2) ***historical_stored_incident_data***

(3) ***incident_description***

(3) ***incident_duration***

(3) ***incident_location***

(3) ***incident_number***

(3) ***incident_severity***

(3) ***incident_start_time***

(3) ***incident_traffic_impact***

(3) ***incident_type***

(2) ***historical_traffic_management_storage_data***

(3) ***indicator_control_data_for_highways***

(4) ***indicator_crossing_control_data_for_highways***

(5) ***indicator_crossing_controls***

(5) ***indicator_identity_list***

(4) ***indicator_ramp_control_data***

(5) ***indicator_identity_list***

(5) ***ramp_controls***

(3) ***indicator_control_data_for_roads***

(4) ***indicator_crossing_control_data_for_roads***

(5) ***indicator_crossing_controls***

(5) ***indicator_identity_list***

(4) ***indicator_junction_control_data***

(5) ***indicator_identity_list***

(5) ***indicator_junction_controls***

(4) ***indicator_pedestrian_control_data***

(5) ***indicator_identity_list***

(5) ***indicator_pedestrian_controls***

(3) ***indicator_input_storage_data***

(4) ***indicator_input_storage_data_for_highways***

(5) ***indicator_response_state***

(5) ***indicator_type***

(4) ***indicator_input_storage_data_for_roads***

(5) ***indicator_response_state***

(5) ***indicator_type***

(3) ***selected_strategy***

(4) ***selected_emergency_vehicle_strategy***

(5) ***indicator_identity_list***

(5) ***ramp_identity_list***

(5) ***selected_emergency_strategy***

(4) ***selected_highway_control_strategy***

(5) ***highway_sign_plan_number***

(5) ***indicator_identity_list***

(5) ***selected_strategy_type***

(4) ***selected_parking_lot_control_strategy***

(5) ***parking_lot_identity_list***

(5) ***selected_parking_lot_strategy_type***
(4) ***selected_ramp_control_strategy***
(5) ***ramp_identity_list***
(5) ***selected_ramp_strategy_type***
(4) ***selected_road_control_strategy***
(5) ***indicator_identity_list***
(5) ***indicator_road_adaptive_plan_number***
(5) ***indicator_road_fixed_plan_number***
(5) ***selected_strategy_type***
(2) ***historical_wide_area_pollution_data***
(3) ***historical_pollution_state_area_collection***
(4) ***area_air_quality_index***
(4) ***current_pollution_data***
(4) ***current_pollution_location***
(3) ***historical_pollution_state_roadside_collection***
(4) ***current_pollution_data***
(4) ***current_roadside_pollution_location***

(1) ***other_TMC_commercial_vehicle_incidents***
This data item contains data about the route for a commercial vehicle that is carrying an abnormal load where that route originates outside the road and highway network covered by the local TMC. An abnormal load is defined as being one for which some kind of movement permit is needed. It may be that it is either over dimensioned (width, height, weight, etc.) or contains hazardous material (HAZMAT). The data has been received from another TMC (not necessarily that serving the area from which the route originated) and will enable the local TMC to set up any special traffic control strategies to minimize the disruption to traffic as the load passes through the network.

(2) ***permit_route_plan***
(3) ***link_identity_list***
(3) ***load_description***
(2) ***permit_traffic_controls***
(3) ***selected_highway_control_strategy***
(4) ***highway_sign_plan_number***
(4) ***indicator_identity_list***
(4) ***selected_strategy_type***
(3) ***selected_ramp_control_strategy***
(4) ***ramp_identity_list***
(4) ***selected_ramp_strategy_type***
(3) ***selected_road_control_strategy***
(4) ***indicator_identity_list***
(4) ***indicator_road_adaptive_plan_number***
(4) ***indicator_road_fixed_plan_number***
(4) ***selected_strategy_type***
(2) ***permit_type***

(1) ***other_TMC_emergency_data***
This data item contains the portion of a strategy that gives priority to emergency vehicles that relates to roads (surface streets) and highways that are outside the area served by the local TMC. This data has been received from other TMC's so the local TMC can implement the requested priority measures to give the emergency vehicles priority throughout their route.

(2) ***emergency_traffic_control_request_list***
(3) ***date***
(3) ***route_segment_estimated_arrival_time***
(3) ***route_segment_identity***
(3) ***time***

(2) ***selected_emergency_vehicle_strategy***
(3) ***indicator_identity_list***
(3) ***ramp_identity_list***
(3) ***selected_emergency_strategy***

(1) ***permit_coordination***
This data item contains information used in the coordination of permits for special travel requirements which involve different agencies and jurisdictions. This information provides the Manage Traffic function with schedule and route information to prepare special travel and traffic controls for the transport of non-typical loads or roadway activities that require permits.

(2) ***permit_traffic_controls***
(3) ***selected_highway_control_strategy***
(4) ***highway_sign_plan_number***
(4) ***indicator_identity_list***
(4) ***selected_strategy_type***
(3) ***selected_ramp_control_strategy***
(4) ***ramp_identity_list***
(4) ***selected_ramp_strategy_type***
(3) ***selected_road_control_strategy***
(4) ***indicator_identity_list***
(4) ***indicator_road_adaptive_plan_number***
(4) ***indicator_road_fixed_plan_number***
(4) ***selected_strategy_type***

(1) ***planned_events_local_data***
This data item contains a copy of the contents of the store of planned events. This has been requested by the same function in another traffic management center (TMC) to which it will be sent by another process.

(2) ***tmc_identity***

(1) ***traffic_center_identity***
This data item defines the logical identifier of an interfacing peer Traffic Management Center (TMC) to share traffic data and system status. Other centers may be on-line to coordinate wide area traffic operations to promote traffic mobility and coordination.

4.16 Parking Management -> Traffic Management

Physical Architecture Flow: parking availability W
Current parking lot occupancy, parking availability, and cost information.

Logical Architecture Flows:
(1) ***parking_guidance_for_dms***
This data item contains the dynamic message sign (dms) states that will be used to implement the desired traffic control strategy at the parking lots served by the function. This data may be used to guide vehicles towards those parking lots where spaces are currently available or to show which lots have been closed, i.e. are not currently in use.

(2) ***indicator_identity_list***

(2) ***parking_lot_dms_controls***

(1) ***parking_lot_current_state***
This data item contains the identity of the parking lot plus its current status and occupancy.

(2) ***parking_lot_current_occupancy***
(3) ***parking_lot_calculated_occupancy***

(3) ***parking_lot_identity***

(2) ***parking_lot_identity_list***

(2) ***parking_lot_state***

Physical Architecture Flow: parking demand management response W
Response to parking demand management change requests indicating level of compliance with request.

Logical Architecture Flows:
(1) ***parking_lot_charge_change_response***
This data item contains the response to a previous request for the current parking lot charges to be changed to help produce a change in the current modal split of trips being undertaken by all types of travelers.

(1) ***parking_lot_charge_direct_details***
This data item is contains the prices being charged by each parking lot for each of its spaces, together with
the time and date for which they apply.

(2) ***parking_lot_charge_application_time***

(2) ***parking_lot_identity_list***

(2) ***parking_lot_price***

(2) ***vehicle_type_for_charges***

4.17 Toll Administration -> Traffic Management

Physical Architecture Flow: probe data W

Aggregate data from probe vehicles including location, speed for a given link or collection of links.

Logical Architecture Flows:
(1) ***probe_data_for_traffic***
This data item is sent from the Provide Electronic Payment Services function to the Manage Traffic function and contains journey times between toll collection points for those vehicles equipped for electronic toll collection. It is used to calculate link journey times for use in adaptive traffic control techniques and route selection and guidance.

(2) ***route_segment_journey_time_from_tolls***

Physical Architecture Flow: toll demand management response W
Response to toll demand management change requests indicating level of compliance with request.

Logical Architecture Flows:
(1) ***toll_price_changes_response***
This data item is sent from the Provide Electronic Payment Services function to the Manage Traffic function. It contains the response to a previous request for the current toll prices to be changed to help produce a change in the current modal split of trips being undertaken by all types of travelers. If sent to one (1) the change was accepted and if set to zero (0), the change was rejected.

(1) ***toll_price_details***
This data item contains the price for each road segment to which a toll applies, with the time and date for when it applies. This data will be used by the Manage Travel Demand facility in its efforts to re-distribute travel demand to the more efficient providers.

(2) ***toll_price***

(2) ***toll_price_application_time***

(2) ***toll_segments***

(2) ***vehicle_type_for_tolls***
- (3) ***commercial_carrier_information***
- (3) ***commercial_driver_information***
- (3) ***commercial_vehicle_characteristics***
  - (4) ***commercial_vehicle_configuration***
  - (4) ***commercial_vehicle_size***
  - (4) ***commercial_vehicle_weight***
- (3) ***commercial_vehicle_information***
- (3) ***vehicle_identity***
- (3) ***vehicle_type***

4.18 Transit Management -> Traffic Management

Physical Architecture Flow: traffic control priority request W
Request for signal priority at one or more intersections along a particular route.

Logical Architecture Flows:

(1) ***transit_highway_overall_priority***
This data item contains requests and information about the overall priority which should be given to one or more transit vehicles at all points in the freeway network served by the function, as opposed to priority requests from individual vehicles at specific locations. This priority will apply at an individual junction, or along a selected transit route if that is specified.

(1) ***transit_ramp_overall_priority***
This data item contains requests and information on the overall priority which should be given to one or more transit vehicles over a wide area as opposed to priority requests from individual vehicles at a particular set of ramp signals.

(1) ***transit_road_overall_priority***
This data item contains requests and information about the overall priority which should be given to one or more transit vehicles at all junctions and/or pedestrian crossings in the road network served by the function, as opposed to priority requests for individual vehicles at specific locations. As this is a 'blanket' application of priority, no list of indicators is needed.

Physical Architecture Flow: transit demand management response W
Response to transit demand management change requests indicating level of compliance with request.

Logical Architecture Flows:
(1) ***transit_services_changes_response***
This data item is the response to the previous request for changes in the transit services.

Physical Architecture Flow: transit system data W
Current transit system operations information indicating current transit routes, the level of service on each route, and the progress of individual vehicles along their routes for use in forecasting demand and estimating current transportation network performance.

Logical Architecture Flows:
(1) ***map_transit_data***
This data item forms part of the store of digitized map data. It contains data which enables maps of the transit route network to be produced. These will be produced to suit the geometry of the actual display unit on which the data will be shown in either visual or hardcopy format.

(1) ***transit_fare_direct_details_list***
This data item contains details of the fares being currently charged for transit services.

(2) ***transit_route_number***

(2) ***transit_route_segment_list***
(3) ***link_identity_list***

(3) ***transit_route_segment_cost***

(3) ***transit_route_segment_number***

(2) ***transit_route_use_time***

(2) ***transit_user_category***

(1) ***transit_probe_data_list***
This data item contains the location of the transit vehicle on each part of its route, i.e., each transit route segment. This data will be used along with other probe data to calculate the link speed or travel time.

(2) ***transit_route_number***

(2) ***transit_route_segment_number***

(2) ***transit_vehicle_location_for_store***
(3) ***transit_vehicle_identity***

(3) ***transit_vehicle_location_data***

(2) ***transit_vehicle_time***

(1) ***transit_routes_data_list***
This data item contains a list of the details of the routes being provided by the transit operation. The list of route segments contains the identity of each link in the road and freeway network associated with the segment to enable them to be output on top of a display of digitized map data.

(2) ***transit_route_number***

(2) ***transit_route_segment_list***
(3) ***link_identity_list***

(3) ***transit_route_segment_cost***

(3) ***transit_route_segment_number***

(2) ***transit_route_stop_number***

(1) ***transit_schedule_data_list***
This data item contains a list of the schedule of services on each transit vehicle route and the cost to the transit user of the use of each route segment.

(2) ***transit_route_number***

(2) ***transit_route_segment_list***
(3) ***link_identity_list***

(3) ***transit_route_segment_cost***
(3) ***transit_route_segment_number***

(2) ***transit_route_stop_list***
(3) ***transit_route_stop_data_list***
(4) ***transit_route_schedule_number***

(4) ***transit_stop_scheduled_time***

(3) ***transit_route_stop_number***

(2) ***transit_schedule_identity***

(1) ***transit_vehicle_deviation_update_list***
This data item contains the estimated time of arrival of several transit vehicles at stop(s) along their route(s) plus the route and service number on which they are operating. It is used for multiple transit vehicle deviations where one or more routes are affected.

(2) ***transit_route_number***

(2) ***transit_route_segment_number***

(2) ***transit_vehicle_identity***

(2) ***transit_vehicle_time***

(1) ***transit_vehicle_eta***
This data item contains the estimated time of arrival of a transit vehicle at the end of a transit route segment, which is usually a stop, plus the route and service number on which it is operating.

(2) ***transit_route_number***

(2) ***transit_vehicle_identity***

(2) ***transit_vehicle_time***

(1) ***transit_vehicle_passenger_loading_list***
This data item contains the number of passengers (transit users) carried by a transit vehicle on each part of its route, i.e. each transit route segment.

(2) ***transit_route_number***

(2) ***transit_route_segment_number***

(2) ***transit_vehicle_identity***

(2) ***transit_vehicle_passengers***

(1) ***transit_vehicle_running_times_list***
This data item contains a list of the times at which it is expected that a transit vehicle will reach the end of each transit route segment on its route and is used to determine any schedule deviations. The end of a transit route segment is usually a transit stop and the data is thus the expected arrival time of a transit vehicle at each of the transit stop(s) along the transit route.

(2) ***transit_route_number***
(2) ***transit_route_segment_number***

(2) ***transit_stop_scheduled_time***

(1) ***transit_vehicle_schedule_deviations_list***
This data item contains a list of the deviations of transit vehicles from their published routes and schedules at transit route segments that have already been completed, i.e. at transit stops that have been passed by the vehicle. The data is used to provide information about the current state of the transit service operation to a traveler.

(2) ***transit_route_number***

(2) ***transit_route_segment_number***

(2) ***transit_vehicle_achieved_time***

(2) ***transit_vehicle_identity***

4.19 Weather Service -> Traffic Management

Physical Architecture Flow: weather information W
Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).

Logical Architecture Flows:
(1) ***current_weather_from_weather_service***

This data item contains details of the current weather conditions, e.g. temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.

(1) ***predicted_weather_from_weather_service***
This data item contains details of the predicted weather conditions, e.g. temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.

4.20 Traffic Management -> Transit Management

Physical Architecture Flow: request transit information W
Request for transit service information and current transit status.

Logical Architecture Flows:
(1) ***transit_conditions_demand_request***
This data item is used to request details of the current state of transit vehicle operations for use in demand forecasting calculations carried out by the Manage Demand facility.

(1) ***transit_fare_direct_request***
This data item contains a request for the current prices being charged for transit fares.

(1) ***transit_services_demand_request***
This data item is a request for supply of details of the transit services and will be used in the preparation of demand forecasts by the Manage Demand facility.

(2) ***tmc_identity***

(2) ***transit_services_request***

Physical Architecture Flow: traffic control priority status W
Status of signal priority request functions at the roadside (e.g. enabled or disabled).

Logical Architecture Flows:
(1) ***transit_highway_priority_given***
This data item contains confirmation that the requested priority has been given to transit vehicles throughout the freeway network served by the function.

(1) ***transit_ramp_priority_given***
This data item contains confirmation that the overall priority request for one or more transit vehicles over the ramp signals in a wide area as opposed to priority requests from individual vehicles at a particular set of ramp signals has been given.

(1) ***transit_road_priority_given***
This data item contains confirmation that the requested priority has been given to transit vehicles throughout the road network served by the function.

Physical Architecture Flow: traffic information for transit W
Current and forecasted traffic information and incident information.

Logical Architecture Flows:

(1) ***prediction_data_list***

This data item contains output from the predictive model process showing predictions of traffic data for route segments on the road and highway network.

(2) ***route_segment_identity***

(2) ***route_segment_occupancy_predictions***

(2) ***route_segment_queue_delay_predictions***

(2) ***route_segment_speed_predictions***

(2) ***route_segment_volume_delay_predictions***

(1) ***traffic_data_for_transit_list***

This data item contains information about environmental conditions, current incidents on the road, traffic flow state, and air quality data.

(2) ***area_air_quality_index***

(2) ***current_incidents_data***

(3) ***incident_duration***

(3) ***incident_location***

(3) ***incident_number***

(3) ***incident_severity***

(3) ***incident_start_time***

(3) ***incident_traffic_impact***

(3) ***incident_type***

(2) ***roadway_environment_conditions***

(3) ***link_environment_conditions***

(3) ***link_list_identities***

(2) ***traffic_flow_state_for_transit***

(3) ***current_road_network_use_for_transit***

(4) ***route_segment_guided_vehicles***

(4) ***route_segment_identity***

(4) ***route_segment_journey_time***

(4) ***route_segment_total_number***

(3) ***hov_lane_data***

(4) ***hov_lane_vehicle_count***

(4) ***hov_lane_violation_count***

(3) ***link_data_from_avl_list***

(4) ***link_queue_time***

(4) ***link_speed***

(4) ***link_travel_time***

(3) ***link_data_from_tags_list***

(4) ***link_queue_time***

(4) ***link_travel_time***

(3) ***link_state_data_list***
(4) ***link_list_identities***
(4) ***vehicle_count***
(4) ***vehicle_headway***
(4) ***vehicle_occupancy***
(4) ***vehicle_queue_length***
(4) ***vehicle_speed***
(3) ***ramp_signal_state_list***
(4) ***ramp_controls***
(4) ***ramp_identity_list***

Physical Architecture Flow: transit demand management request W
Request to change the demand for transit facility use through pricing or other mechanisms.

Logical Architecture Flows:
(1) ***transit_services_changes_request***
This data item is a request to change the current transit services in response to changes in demand, or a desire to change the modal split currently being used by travelers.

5. Communications Layer Requirements

This chapter describes relevant requirements on the Communications Layer for the portion of the ITS National Architecture covered by this package. In general the Communications Layer supports the four lower layers of the OSI model (transport, network, data link and physical layer). A complete description of the Communications Layer is contained in the ITS National Architecture Communications Analysis Document. In addition to actual requirements the section contains some informational notes which are included in brackets.

5.1. Communications Services: Wireline and Wireless

The communication services define the exchange of information between two points and are independent of media and application (i.e., ITS user service). In essence, they are a specified set of user-information transfer capabilities provided by the communication layer to a user in the transportation layer.

Communication services consist of two broad categories, *interactive* and *distribution*. Interactive services allow the user to exchange data with other users or providers in real or near real time, asking for service or information and receiving it in the time it takes to communicate or look up the information. Distribution services allow the user to send the same message to multiple other users.

Interactive services may be either ***conversational*** or ***messaging***. Conversational implies the use of a two-way connection established before information exchange begins and terminated when the exchange is completed. Messaging, on the other hand, works more like electronic mail being exchanged between users. The messages are exchanged without establishing a dedicated path between the two sites. Each message is addressed and placed on the network for transmission, intermixed with messages from other users. The communications community labels this mode of communication a “datagram” service.

Distribution services may be either ***broadcast*** or ***multicast*** and may be used over wireline and/or wireless communication links. Broadcast messages are those sent to all users while multicast messages are sent only to a subset of users. Multicast differs from broadcast in its use of a designated address for all users and user groups. Examples of broadcast information might include current weather or road conditions, whereas multicast information might be information sent to all drivers working for a specific company. A changing group membership could be the set of users traveling between two locations or with a certain destination, for which unique information must be transmitted. The services that can be supported using circuit or packet connection mode include voice, video, image and data. (see Appendix A-1 of the communication document for a complete description.)

An additional class of communications services is location services. These fall in two categories: (1) the services that do not use the communication network (i.e., GPS, and stand alone terrestrial systems); (2) location services that use the network for providing the service (e.g., cellular based systems). In the latter case, the location services fall under the interactive services. The service will be rendered by a service provider in response to a request for information or help.

The class of communications service for each Architecture Flow in this standards package is defined in a table in the following section.

5.2. Wireline Communication Elements (w)

The interfaces of this standards package are entirely wireline interfaces. The primary requirements on the wireline communications layers are that open standards be utilized for the communications protocols. The following paragraphs provide a discussion of wireline considerations for ITS.

The wireline links represent wide area network communications elements, which can take a number of forms Typically it will be a data network of some kind. Physically the network can be fiber, coaxial, twisted pair, or even microwave. It can be an ITS dedicated network, such as a communication system installed by a public agency to pass messages between a Traffic Management subsystem and associated Roadway subsystems distributed across a region. Alternatively it can be a privately deployed network owned and operated by a communication service provider, where operators of ITS subsystems pay a service fee for connection to and use of the network for ITS functions. More than one network used for ITS may coexist in a region, and these networks will be connected (or internetworked) to support ITS message communication between subsystems that are attached to different networks.

It is expected that the current trend toward ubiquitous internetworking of public and private data networks, as currently embodied in for example the ‘‘Internet”, will continue. This will enable inter-subsystem messaging across local, regional and national distances. What the Internet is rapidly evolving to (as security and reliability issues of today’s Internet are addressed) has been referred to as the ‘‘National Information Infrastructure”or ‘‘NII”.

In the near term, we expect that many communication elements will be dedicated, as they primarily are today. As commercial data networks are deployed, interconnected, and mature, and the cost of access and use of these private data networks drops, we expect more and more wireline networks for ITS to be supplied from Communication Service Providers (CSPs). The time when the transition from private data networks to commercial data networks becomes practical and economical will vary by region. We expect this transition to be analogous to the transition that was made early in this century from private phone networks to the Public Switched Telephone Network (PSTN). Our expectation is that in the 20-year timeframe most ITS communication will be provided by CSPs.

For the links to the TMS the evolving ITS standard is the National Transportation Communications for ITS Protocol (NTCIP). This standard is being developed for the transmission of data and messages between ITS elements. The NTCIP constitues a set of standards define common methods of physically interconnecting ITS control equipment, establishes the protocol and procedures for establishing communications between the components and, defines procedures to develop and register common sets of manageable objects related to controlling and managing the components. The standards are being developed by National Electrical Manufacturers Association (NEMA) with support from the US DOT. NTCIP contains a suite of communications protocols, divided into several class profiles, for integrating the various components that may be included in an ITS. The standard defines the elements that allow manufacturer inter-changeability of transportation control equipment. Also, a complete end-to-end data handling procedure is defined allowing devices to perform tasks associated with communications between traffic management centers and other field equipment.The initial version of the NTCIP is being developed to support the interface from the TMS to traffic controllers and VMS signs. Work is underway to extend this to other roadside equipment. Plans are also in place to extend the protocol for center to center communications. In the area of center to center communications there are several existing and developing communications standards to choose from for the physical (and data link) layers. These include ATM, Frame Relay, MAN (IEEE 803.6), and FDDI. At the network layers TCP/IP is a widespread standardized protocol (and is being used in the NTCIP efforts). The key is that by using standard communication protocol suites the regional integration of the wireline data will most readily be accomplished.

6. Constraints

This chapter identifies Physical Architecture intersubsystem message performance requirements below the application layer.

6.1. Assessment Categories

The following categories have been used in rating the constraints that exist on the physical data flows.

1. Performance

    a. Emergency Priority (E)
    Essentially ”real-time” requirements. Emergency data that is time critical must be received by a certain absolute time, or it is useless. For these flows the communication channel may require priority in emergencies. The data channels require must be operational even when there is an emergency which might place other loads on the interface. A private communication channel or frequency may be required to satisfy the requirement.

    b. Reliability(R)
    This category encompasses both the concepts of reliability and availability. Data must be delivered reliably. Loss can not be tolerated. The communcations link must also have high availabiltiy. Failure of the communication medium may result in severe accident. This communication channel may require redundant paths or extra attention paid to potential failure modes. For wireline cases, this may indicate alternate phone or other connections are required. For wireless cases (e.g. for AHS applications), special attention will be paid to the transmitters, receivers, and potential interference for these connections.

    c. Timing (T)
    The timing constraints are critical. If communication does not occur within set limits system failures can occur. Timing for most ITS communication services is based on the response to a request for data. Because of this, common communication media designed to handle voice data will likely support these requirements. The beacon interface has special requirements of identifying the vehicle as well as exchanging information before the vehicle gets out of range. This is more of a problem with vehicles travelling at speed. The architecture constrains such time critical access to data such that the data is available at the beacon site. This obviates the need for explicit specification of other timing information to support data transfer over a short range beacon.

    This timing constraint is related to (but not the same as) another attribute often discussed in specifying systems: latency. Latency is used to quantify end-to-end processing and transmission time (round trip delays). Data with a latency requirement must be handled within a certain time interval. This differs from ”time criticality” in that it is a relative rather than absolute time requirement (i.e. latency: interface screen must update every 2 seconds; time criticality: route instructions must be received 30 seconds prior to first turning action). Because latency requirements are greatly affected by the implementation of the subsystem elements, it can not be specified directly when discussing only the interface between two subsystems.

2. Data Sensitivity

a. Security (S)
Access to the data must be restricted. Data itself must be secure during transmission. This is typically used for financial information.

b. Privacy(P)
Anonymity of the data source or recipient must be protected. This is typically used for personal information.

6.2. Architecture Flow Constraints

Table 1. Architecture Flow Constraints

Source	Destination	Architecture Flow	Interconnects	Communication Service	Special Constraints
DMV	Traffic Management	registration	W	Messaging data	P
Information Service Provider	Traffic Management	logged special vehicle route	W	Conversational data, Messaging data	P

7. Data Dictionary Elements

This section contains the leveled data item (LDI) definitions for all the leveled data item elements listed in this standards requirements package.

The LDI's are given in alphabetical order.

area_air_quality_index
This data item contains a code for the area wide air quality level.

closure_event_data
This data item contains data to be used by traffic management to coordinate its overall operations with the HRI closures.

commercial_carrier_information
This data item contains information describing the commercial vehicle carrier.

commercial_driver_information
This data item contains information describing the commercial vehicle driver.

commercial_vehicle_characteristics
This data item contains the characteristics of a commercial vehicle as determined from data provided by roadside sensors.

commercial_vehicle_configuration
This data item contains a character code that defines the commercial vehicle configuration.

commercial_vehicle_incidents_for_other_TMC
This data item contains data about the route for a commercial vehicle that is carrying an abnormal load where that route goes outside the road and highway network covered by the local TMC. An abnormal load is defined as being one for which some kind of movement permit is needed. It may be that it is either over dimensioned (width, height, weight, etc.) or contains hazardous material (HAZMAT). The data will be sent to the TMC('s) serving the links that are not controlled by the local TMC to enable it(them) to set up any special traffic control strategies to minimize the disruption to traffic as the load passes through the network.

commercial_vehicle_information
This data item contains information that will provide the identity of the commercial vehicle.

commercial_vehicle_size
This data item contains the commercial vehicle size as measured by roadside sensors. The data will include details such as the length, width and height of the vehicle.

commercial_vehicle_weight
This data item contains the commercial vehicle weight as measured by roadside sensors, such as weigh-in-motion detectors.

crossing_close_duration
This data item contains the time duration for which a crossing must close to vehicular (roads and highway) traffic to permit the passage of the alternate item, e.g. railroad, river traffic, aircraft, etc. and is used to influence the control of signalized traffic intersections provided by the Provide Device Control facility.

crossing_close_time
This data item contains the time period before a crossing must close to vehicular (road and highway) traffic to permit the passage of the alternate item, e.g. railroad, river traffic, aircraft, etc. and is used to influence the control of signalized traffic intersections provided by the Provide Device Control facility.

crossing_data_list
This data item contains a list of information from multimodal crossings about when they are going to

close and how long the closure will last.

current_data
This data item holds data about the current state of traffic on the road (surface street) and freeway network served by the function. It is a sample of the traffic at a single instant in time and is updated periodically from data collected by other processes within both this and other ITS functions.

current_data_for_retrieval
This data item contains a subset of the current data stored by the function which will be used as the basis for traffic data that is sent to other functions.

current_highway_network_state
This data item contains data about traffic conditions on links in the road network served by the function. The data is used by the route selection and guidance processes in determining the best vehicle routes.

current_incident_data_list
This data item contains data about current incidents.

current_incidents_data
This data item contains data about current incidents.

current_other_routes_use
This data item contains data about the non-vehicle portion(s) of routes that have been requested by travelers.

current_pollution_data
This data item contains the current pollution data detected. The pollution data includes ozone pollution, nitrous oxide pollution, sulfur dioxide pollution, hydrocarbon pollution, carbon monoxide pollution, particulate pollution, and roadside pollution.

current_pollution_location
This data item gives the location coordinates from which a set of current pollution levels have been obtained.

current_road_network_use
This data item contains information about how many vehicles are being guided down each route segment and the average journey time for each route segment provided by guided vehicles.

current_road_network_use_for_transit
This data item contains information about how many vehicles are being guided down each route segment and the average journey time for each route segment provided by guided vehicles.

current_roadside_pollution_location
This data item contains the location at which an associated set of current roadside atmospheric pollution values have been obtained from sensors.

current_weather_from_weather_service
This data item contains details of the current weather conditions, e.g. temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.

date
This data item specifies a calendar date that is normally used to indicate currency or effectivity of other data.

dms_advisory_text
This data item contains details of the actual advisory text strings that are to be output to drivers and pedestrians using indicators that are dynamic message signs (dms). The advisory text string may be one of three types depending on the type of incident about which advice is being provided.

dms_data_for_highways
This data item is used within the Manage Traffic function and contains DMS data about text strings of information to be output to drivers on freeways in the geographic and/or jurisdictional area(s) served by the function.

dms_data_for_roads
This data item contains the actual data from which instructions to the driver and traveler can be produced by indicators at dynamic message (dms) and other types of signs on the roads.

dms_highway_open_close
This data item is a DMS state which advises drivers that some or all of the highway(s) ahead is(are) closed. If the highway(s) are open no indication will be given as this is the normal state .

dms_incident_warning
This data item is the DMS state which gives warning of an incident to travelers .

dms_pollution_message
This data item is a DMS state which advises drivers that a particular vehicle is producing abnormal pollution, or that the general pollution levels are too high. If the pollution levels are not out of the ordinary, i.e. within limits, no indication will be given as this is the normal state .

dms_status_for_highways
This data item contains data about the text strings of information to be output to drivers on freeways in the geographic and/or jurisdictional area(s) served by the function.

dms_status_for_roads
This data item contains the Dynamic Message Sign status for sign control data, operating at the roadside on roads (surface streets) in the geographic and/or jurisdictional area(s) served by the function.

dms_updates_for_highways
This data item contains data about the text strings of information concerning incidents that are to be output to drivers on freeways in the geographic and/or jurisdictional area(s) served by the function.

dms_weather_warning
This data item is the DMS state which gives warning of weather conditions which are likely to be hazardous to driving.

emergency_data_for_other_TMC
This data item contains the portion of a strategy that gives priority to emergency vehicles that relates to roads (surface streets) and highways that are outside the area served by the local TMC. This data will be sent to the appropriate other TMC's so that they can implement the requested priority measures to give the emergency vehicles priority throughout their route.

emergency_traffic_control_request_list
This data item contains a list of the route segments that have been provided for use by an emergency vehicle, together with the arrival time at each segment. The data will be used to generate changes to the current traffic management strategy to give the emergency vehicle priority.

environment_sensor_data
This data item contains a set of outputs from individual environment sensors.

environment_sensor_output
This data item contains the raw data collected from a single sensor. This data item could include data pertaining to wind, temperature, humidity, precipitation, radiation (sun), visibility, and pavement sensor information .

from_cm_fault_clearance
This data item contains a report showing that a particular fault in an indicator has been cleared and that it has been restored to normal operation.

from_cm_incident_information
This data item contains information about an incident that is about to be created by the proposed start of road maintenance activity which will affect the item of traffic on one or more lanes of a road or highway. Information contained is location, number of lanes closed, and duration of closure.

from_cm_resource_response
This data item provides the status of the requested resources by the Construction and Maintenance

terminator .

from_cm_sensor_fault_data
This data item contains a report showing that a particular fault in a sensor has been cleared and that it has been restored to normal operation.

from_ep_event_information
This data item is sent from the event promoters terminator to the Manage Traffic function and contains details of a special event that may become a possible incident due to its impact on the traffic flowing on one or more lanes of a road or highway.

from_other_tmc_data_request
This data item contains a request for data to be sent to another Traffic Management Center (TMC) from the local TMC.

har_data_for_highways
This data item contains the HAR data, both program and management, used to define the output of a Highway Advisory Radio (HAR) operating at the roadside on highways in the geographic and/or jurisdictional area(s) served by the function.

har_data_for_roads
This data item contains the HAR data, both program and management, used to define the output of a Highway Advisory Radio (HAR) operating at the roadside on roads (surface streets) in the geographic and/or jurisdictional area(s) served by the function.

har_identity
This data item contains a numerical identifier of an individual Highway Advisory Radio device.

har_management_data
This data item contains the definition of a Highway Advisory Radio mode and program schedule.

har_mode
This data item contains the definition of the mode of the Highway Advisory Radio. The possible modes are idle, override current schedule with this program, run schedule, or play through.

har_program
This data item contains the definition of a Highway Advisory Radio program to be broadcast within a local area. The program can be defined by a program number or id, or by a sequence of messages (or sound bites).

har_schedule
This data item contains the definition of a Highway Advisory Radio program schedule. This schedule defines a sequence of programs and start times for the programs.

har_status
This data item contains the current status of the Highway Advisory Radio. This status included an indication of the current program being broadcast and an indication of the space available for storing messages/ programs on the device.

har_status_data
This data item contains the Highway Advisory Radio status for Harris, operating at the roadside on highways or arterials in the geographic and/or jurisdictional area(s) served by the function.

hazmat_load_data
This data item contains the manifest data plus the chemical characteristics of a HAZMAT load being carried by a commercial vehicle. This data is used by the emergency services to plan their responses if the vehicle on which the load is traveling is involved in an incident.

highway_sign_plan_number
This data item contains the number of an adaptive plan for the road network controlled by the function. A plan is a set of data that enables a set of sign sequences to be applied to highway indicators to achieve a desired traffic control strategy.

historical_other_routes_use

This data item contains historical data about the non-vehicle portion(s) of routes that have been requested by travelers. These route portions will involve the use of modes such as cycling, walking, etc.

historical_parking_lot_storage_data_list
This data item contains a list of occupancy and state data for all the parking lots in the geographic area served by the function.

historical_pollution_state_area_collection
This data item contains the historical states of the various types of pollution within the atmosphere in the geographic area served by the function. It also contains a summary indication of the area air quality.

historical_pollution_state_roadside_collection
This data item contains the digitized values of pollution levels obtained from roadside sensors in the geographic area served by the function.

historical_processed_data
This data item contains traffic sensor data that has been processed ready for storage in both the current and historical data stores.

historical_stored_incident_data
This data item is used to transfer data about historical incidents.

historical_traffic_management_storage_data
This data item contains the indicator control and response states plus the selected traffic control strategy(ies) for the road (surface street) and highway network served by the function. The data is a subset of that in the current and historical data stores.

historical_vehicle_smart_probe_stored_data
This data item contains the historical processed vehicle smart probe data collected from roadside units.

historical_wide_area_pollution_data
This data item contains data about the historical levels of pollution obtained from the store of pollution data in the area covered by the Traffic Management Center (TMC)

hov_lane_data
This data item contains the data obtained from processing the inputs from traffic sensors located on High Occupancy Vehicle (HOV) lanes around the road network.

hov_lane_identity_list
This data item contains a list of high occupancy vehicle (HOV) lanes to which the accompanying data applies.

hov_lane_vehicle_count
This data item contains a count of the number of vehicles legitimately using High Occupancy Vehicle (HOV) lanes in the road and highway network.

hov_lane_violation_count
This data item contains the count of the number of vehicle illegally using High Occupancy Vehicle (HOV) lanes in the road and highway network.

hov_priority
This data item contains data about the number of vehicles using high occupancy vehicle (HOV) lanes. Data is included about vehicles that are both legal and illegal users.

hri_closure_data_response
This data item represents an historical log of HRI closure data.

hri_sensor_data
This data item provides sensor data, acquired by HRI at grade crossings, that is relevant to the overall traffic surveillance functions of ITS (e.g. grade crossing rail traffic). It contains HRI closure data, status data, and other HRI information.

hri_sign_control_data
This data item contains the actual data for use by indicators that are dynamic message (dms) and other types of signs or indicators at railroad grade crossings served by the function.

hri_state
This data item represents the complete state of an HRI as determined by monitoring the status of the track, traffic and equipment.

hri_state_data
This data item contains data about the state of the highway rail intersections as determined by processing the HRI sensor data.

incident_data
This data item contains current incident information.

incident_data_request
This data item contains a request for data on incidents to be sent to the Media. The request must specify whether all, current incidents or planned events are required, in the latter case state the time period by date and hour range, and the geographic area(s) to which it should relate.

incident_description
This data item contains the description and other free form information associated with an incident.

incident_duration
This data item contains the expected duration of an incident from its start time until the time at which it is expected that it will have no further effect on traffic conditions.

incident_information_from_media
This data item contains data about an incident that has been reported by a member of the traveling public to the media by mechanisms that are outside of ITS, e.g. car phone.

incident_location
This data item contains the location at which an incident will take place (for planned events) or is taking place (for current incidents).

incident_number
This data item identifies a specific incident.

incident_severity
This data item identifies the severity of an incident.

incident_start_time
This data item contains the incident start time.

incident_traffic_impact
This data item contains details of the impact that a particular incident will have on traffic flows.

incident_type
This data item uniquely defines the type of incident.

incident_vehicles_involved
This data item defines the number of vehicles involved in an incident at the time of the report.

indicator_control_data_for_highways
This data item contains the actual data from which instructions to the driver and traveler can be produced by indicators at the roadside on freeways in the geographic and/or jurisdictional area(s) served by the function.

indicator_control_data_for_roads
This data item contains the actual data from which instructions to the driver and traveler can be produced by indicators at the roadside on roads (surface streets) in the geographic and/or jurisdictional area(s) served by the function.

indicator_crossing_control_data_for_highways
This data item contains the actual data from which instructions to the driver and traveler can be produced by indicators at multimodal crossings on freeways served by the function.

indicator_crossing_control_data_for_roads

This data item contains the actual data from which instructions to the driver and traveler can be produced by indicators at multimodal crossings on roads (surface streets) served by the function.

indicator_crossing_controls

This data item contains the actual control data to be passed to an indicator that is a multimodal crossing. This will be either the actual indication to be seen by the driver, or a set of these instructions with duration times put together to form a fixed time signal plan, or an instruction to run using the controller's local intelligence.

indicator_data

This data item contains the data from which a roadside indicator can create the message for output to drivers and travelers.

indicator_identity_list

This data item contains a list of indicators to which a particular traffic control strategy is to be applied. The indicators may be intersection traffic signal controllers, pedestrian signal controllers and/or dynamic message signs (dms), the latter being used for lane control or advisory message output purposes.

indicator_input_data_from_highways

This data item contains the actual state of operation of the roadside indicators used to pass instructions to drivers and travelers on freeways within the geographic and/or jurisdictional area(s) served by the function. It is used for centralized monitoring the operation of the indicators.

indicator_input_state_for_roads

This data item contains the state of response to control data of indicators on the freeways in the geographic and/or jurisdictional area(s) served by the function.

indicator_input_storage_data

This data item is used within the Manage Traffic function to transfer indicator response data from the Provide Device Control facility to the Provide Traffic Surveillance facility. The latter facility will load the data into the current and long term data stores.

indicator_input_storage_data_for_highways

This data item contains the response to control data that has been made by indicators on the freeways in the geographic and/or jurisdictional area(s) served by the function.

indicator_input_storage_data_for_roads

This data item contains the response to control data that has been made by indicators on the roads (surface streets) in the geographic and/or jurisdictional area(s) served by the function.

indicator_junction_control_data

This data item contains the actual data from which instructions to the driver and traveler can be produced by indicators at junctions on roads served by the function.

indicator_junction_controls

This data item contains the actual control data to be passed to an indicator at a road junction. This will be either the actual indication to be seen by the driver, e.g. red for stop vehicle or green for proceed, or a set of these instructions with duration times put together to form a fixed time signal plan, or an instruction to run using the controller's local intelligence.

indicator_pedestrian_control_data

This data item contains the actual data from which instructions to the driver and traveler can be produced by indicators at pedestrian crossings on roads served by the function.

indicator_pedestrian_controls

This data item contains the actual control data to be passed to an indicator at a pedestrian crossing. This will be either the actual indication to be seen by the driver and the traveler, e.g. red for stop vehicle or cross now indication, or a set of these instructions with duration times put together to form a fixed time signal plan, or an instruction to run using the controller's local intelligence.

indicator_ramp_control_data

This data item contains the actual data from which instructions to the driver and traveler can be produced by indicators at entry ramps to highways served by the function.

indicator_response_state

This data item contains the current state of an indicator that is being used to control traffic on the roads (surface streets) and highways. It is used to check that the indicator is performing as requested and may form the basis for a fault report if it is not.

indicator_road_adaptive_plan_number

This data item contains the number of an adaptive plan for the road network controlled by the function. A plan is a set of data that enables adaptive control to be applied to some or all of the indicators in a particular way. For example at one or more intersections, certain phases may be added or omitted, etc.

indicator_road_fixed_plan_number

This data item contains the number of an adaptive plan for the road network controlled by the function. A plan is a set of data that enables fixed time control to be applied to some or all of the indicators in a particular way. Thus each set of plan data will specify particular cycle times, off-sets and phase timings for indicators. There may also be special instructions which may require certain phases may be added or omitted, demand responsive operation may be prohibited, local operation may be enabled, etc.

indicator_sign_control_data

This data item contains the actual data for use by indicators that are dynamic message (dms) and other types of signs on roads and freeways served by the function.

indicator_sign_control_data_for_highways

This data item contains the actual data from which instructions to the driver and traveler can be produced by indicators at dynamic message (dms) and other types of signs on the freeways in the geographic and/or jurisdictional area(s) served by the function.

indicator_sign_control_data_for_roads

This data item contains the actual data from which instructions to the driver and traveler can be produced by indicators at dynamic message (dms) and other types of signs on the roads (surface streets) in the geographic and/or jurisdictional area(s) served by the function.

indicator_type

This data item contains the type of indicator to which the accompanying output or input data applies. The type may be either intersection signal controller, pedestrian signal controller, dynamic message sign (dms) or multimodal crossing.

intersection_blocked

This data item contains information, obtained from sensors in the intersection, regarding blockage of the HRI by a vehicle or other object. This data will be used by the traffic management functions to begin incident management procedures.

lane_closure

This data item contains the unique identity of each link and the lowest number at any point of lanes closed on a link.

lane_dms_controls

This data item contains the actual control data to be passed to an indicator that is a lane control sign. This will be the actual indication that the lane is or is not to be used.

lane_open

This data item contains the unique identity of each link and the lowest number at any point of lanes open on a link.

link_attributes

This data item contains details of the type of road data stored for the link by a TMC or ISP.

link_data_from_avl_list

This data item contains the link journey and queue times calculated by processing the times at which AVL data was collected from vehicles on the road (surface street) and highway network served by the function.

link_data_from_tags_list

This data item contains the link journey and queue times calculated by processing the times at which tag data was collected from vehicles on the road (surface street) and highway network served by the function.

link_delay

This data item contains the calculated delay for vehicles driving along a particular link in the road and highway network served by the function.

link_environment_conditions

This data item contains environment conditions (e.g. rain, wind, sun, etc) computed for a single link .

link_identity_list

This data item contains a list of the links in the road and freeway network that are covered by a transit route segment. The data may contain up to four (4) links to be part of a segment in all three scenarios (urban, inter-urban and rural).

link_ISP_identity

This data item contains the identity of other ISP's with which road links outside the local ITS geographic area are associated.

link_list

This data item contains a list of links for which data is being provided.

link_list_for_highways

This data item contains a list of links for which data is being provided. These links will comprise all of those on the highway network served by the function.

link_list_for_roads

This data item contains a list of links for which data is being provided.

link_list_identities

This data item contains a list of links for which data is being provided. These links will comprise all of those on both the road (surface street) and highway network served by the function. It contains the unique identity of each link, which is a short segment typically less than one mile, e.g. a segment of freeway between off-ramps or a street segment between two intersections.

link_occupancy

This data item contains predictions of the occupancy for route segments on the road and highway network served by the Manage Traffic function.

link_ownership

This data item contains data for use in determining which other ISP('s) must be contacted to obtain data about roads and highways in geographic area(s) outside that served by the local function.

link_queue_time

This data item contains the current queuing time for vehicles on a particular link.

link_speed

This data item contains the calculated average speed of vehicles traveling on the link.

link_state_data

This data item contains data about traffic conditions on each link within the road (surface street) and highway network in the geographic area served by the TMC.

link_state_data_list

This data item contains data about traffic conditions on each link within the road (surface street) and highway network in the geographic area served by the TMC. The data will apply to all links regardless of whether it is used for other purposes such as strategy selection, parking lot

management, etc.

link_status

This data item contains the data for the status of lanes on each link which is stored by a particular TMC or ISP. The lane on the link can either be closed or open.

link_traffic_conditions

This data item contains processed sensor data providing traffic conditions for a single link.

link_travel_time

This data item contains the current journey time for vehicles on a particular link.

list_size

This data item is a general parameter used throughout ITS functions to specify the number of data items included in a data item.

load_description

This data item summarizes the contents and size of the load to be conveyed by a commercial vehicle along its permitted route plan. This data may include special load characteristics (dimensions, weight, hazardous material designation etc.) to ensure that the links in the road (surface street) and highway network on the planned route can accommodate its passage.

local_TMC_incidents_request

This data item is exchanged with the other traffic centers (TMC's) terminator by the Manage Traffic function. It is used to request data about both current incidents and planned events from the local TMC. They will be entered into the other TMC's store of predicted and current incidents for use in determining responses to incidents that although outside its geographic or jurisdictional area(s) may affect its local traffic conditions.

logged_special_vehicle_route

This data contains details about a route that has been requested by a special vehicle. This could be a commercial vehicle that is carrying cargo which could be viewed as being liable to cause a potential incident. Loads falling into this category are those containing hazardous (HAZMAT) material, or those which are outsize, e.g. wide, heavy, or fragile and hence slow moving. This could also include vehicles which must be specially routed (e.g.. the governors motorcade).

long_term_data

This data item contains data about the previous (historical) state of traffic on the road (surface street) and highway network served by the function. The data is accumulated in real time at periodic time intervals from other processes within both this and other ITS functions. The traffic flow, other routes use, o-d matrix, parking lot, processed and wide area pollution data is stored in hourly time intervals for each day over a rolling two week period, after which it is consolidated into a single smoothed or average set of data for normal weekday flows. The traffic management data is stored in fifteen minute intervals daily for a long period of time as a record of the indicator state.

long_term_data_for_retrieval

This data item contains a subset of the long data stored by the function which will be used as the basis for traffic data that is sent to other functions. This subset shows the traffic conditions for the last six hours plus the smoothed or average flow over a weekday, giving a total of 31 entries or sets of data.

map_transit_data

This data item forms part of the store of digitized map data. It contains data which enables maps of the transit route network to be produced. These will be produced to suit the geometry of the actual display unit on which the data will be shown in either visual or hardcopy format.

media_identity

This data item contains the identity of the media that is reporting an incident.

o_d_matrix

This data item contains an origin-destination (o-d) matrix that has been derived from the other traffic data, such as that obtained from video images of traffic. It will apply to the road (surface street) and

highway network in the geographic area served by the function. The data will comprise a list of o-d pairs and the traffic flow between them, where the pairs will be identified by link identities.

other_current_data

This data item contains data about the current state of traffic on the road (surface street) and freeway network served by the function. It is a sample of the traffic at a single instant in time and is updated periodically from data collected by other processes within both this and other ITS functions.

other_dms_data_for_highways

This data item contains DMS data about text strings of information to be output to drivers on freeways in the geographic and/or jurisdictional area(s) served by other traffic management functions.

other_dms_data_for_roads

This data item contains the actual data from which instructions to the driver and traveler can be produced by indicators through the use of dynamic message (dms) and other types of signs on the roads.

other_dms_status_for_highways

This data item contains data about the text strings of information to be output to drivers on freeways in the geographic and/or jurisdictional area(s) served by the other traffic management functions.

other_dms_status_for_roads

This data item contains data for sign control data, operating at the roadside on roads (surface streets) in the geographic and/or jurisdictional area(s) served by the function.

other_har_data_for_highways

This data item contains the HAR data, both program and management, used to define the output of a Highway Advisory Radio (HAR) operating at the roadside on highways in the geographic and/or jurisdictional area(s) served by other traffic management functions.

other_har_data_for_roads

This data item contains the HAR data, both program and management, used to define the output of a Highway Advisory Radio (HAR) operating at the roadside on roads (surface streets) in the geographic and/or jurisdictional area(s) served by the function.

other_har_status_for_highways

This data item contains the Highway Advisory Radio status for HARs, operating on highways in the geographic and/or jurisdictional area(s) served by the function.

other_har_status_for_roads

This data item contains the Highway Advisory Radio status for HARs, operating at the roadside on roads (surface streets) in the geographic and/or jurisdictional area(s) served by the function.

other_indicator_control_data_for_highways

This data item contains the actual data from which instructions to the driver and traveler can be produced by indicators at the roadside on freeways in the geographic and/or jurisdictional area(s) served by the function.

other_indicator_control_data_for_roads

This data item contains the actual data from which instructions to the driver and traveler can be produced by indicators at the roadside on roads (surface streets) in the geographic area(s) served by the function.

other_indicator_input_data_from_highways

This data item contains the actual state of operation of the roadside indicators used to pass instructions to drivers and travelers on freeways within the geographic and/or jurisdictional area(s) served by othertraffic management functions. It is used for centralized monitoring the operation of the indicators.

other_indicator_input_state_for_roads

This data item contains the state of response to control data of indicators on the freeways in the

geographic and/orjurisdictional area(s) served by the function.

other_long_term_data

This data item contains historic traffic data for links in the road (surface street) and highway network which are served by other traffic management centers (TMC's). The size estimate is based on data being accumulated at periodic time intervals. The traffic flow, other routes use, o-d matrix, parking lot, processed and wide area pollution data is stored in hourly time intervals for each day over a rolling two week period, after which it is consolidated into a single smoothed or average set of data for normal weekday flows. The traffic management data is stored in periodic intervals throughout the day for a specified amount of time as a record of the indicator state.

other_TMC_commercial_vehicle_incidents

This data item contains data about the route for a commercial vehicle that is carrying an abnormal load where that route originates outside the road and highway network covered by the local TMC. An abnormal load is defined as being one for which some kind of movement permit is needed. It may be that it is either over dimensioned (width, height, weight, etc.) or contains hazardous material (HAZMAT). The data has been received from another TMC (not necessarily that serving the area from which the route originated) and will enable the local TMC to set up any special traffic control strategies to minimize the disruption to traffic as the load passes through the network.

other_TMC_data_request

This data item is exchanged with the other traffic centers (TMC's) terminator by the Manage Traffic function. It is used to request traffic data from another TMC for use by the local TMC is determining its traffic control strategies.

other_TMC_emergency_data

This data item contains the portion of a strategy that gives priority to emergency vehicles that relates to roads (surface streets) and highways that are outside the area served by the local TMC. This data has been received from other TMC's so the local TMC can implement the requested priority measures to give the emergency vehicles priority throughout their route.

other_TMC_incidents_request

This data item is used to request data about both current incidents and planned events from another TMC. They will be entered into the local TMC's store of predicted and current incidents for use in determining responses to incidents that although outside its geographic or jurisdictional area(s) may affect local traffic conditions.

other_traffic_center_control_data

This data item contains traffic control data which is being transferred from one (remote) Traffic Management Center (TMC) to another, in this case the local TMC.

other_traffic_center_status_data

This data item contains traffic status data which is being transferred from one (remote) Traffic Management Center (TMC) to another, in this case the local TMC.

parking_guidance_for_dms

This data item contains the dynamic message sign (dms) states that will be used to implement the desired traffic control strategy at the parking lots served by the function. This data may be used to guide vehicles towards those parking lots where spaces are currently available or to show which lots have been closed, i.e. are not currently in use.

parking_lot_calculated_occupancy

This data item contains the current occupancy of a parking lot, i.e. the number of vehicles present, calculated from traffic sensors located at its entrance(s) and exit(s).

parking_lot_charge_application_time

This data item contains the time at which a parking lot charge applies for a particular toll segment.

parking_lot_charge_change_request

This data item contains a request for a change to the current parking lot charging structure that will

help to influence a change in modal split of journeys currently being undertaken by travelers of all types, i.e. including drivers and transit users, by encouraging then to use certain parking lots, e.g. those near park and ride sites on the edge of an urban area.

parking_lot_charge_change_response
This data item contains the response to a previous request for the current parking lot charges to be changed to help produce a change in the current modal split of trips being undertaken by all types of travelers.

parking_lot_charge_details
This data item contains the prices being charged by each parking lot for each of its spaces, together with the time and date for which they apply.

parking_lot_charge_direct_details
This data item is contains the prices being charged by each parking lot for each of its spaces, together with the time and date for which they apply.

parking_lot_charge_request
This data item contains a request for the current prices being charged for parking lot spaces.

parking_lot_current_occupancy
This data item contains the parking lot identity and current occupancy.

parking_lot_current_state
This data item contains the identity of the parking lot plus its current status and occupancy.

parking_lot_decreasing_threshold
This data item contains data provided by the Plan System Deployment function. It contains the threshold at which the parking lot state will change, e.g. from 'spaces' to 'almost full', etc., as the number of vehicles in the parking lot decreases.

parking_lot_dms_allocation
This data item contains the identity(ies) of dynamic message signs that are allocated to parking lots to show the state of the parking lot, and (possibly) give alternate parking information.

parking_lot_dms_controls
This data item contains data about the text strings of information about parking lot states that are to be output to drivers using a form of indicators called dynamic message signs (dms). The output data may be a direction indication towards a parking lot where spaces exist, a state indication (open/closed), or a number of spaces currently available depending on the type of indicator and the selected strategy.

parking_lot_identity
This data item contains the identity of an individual parking lot so that its charges can be defined and a control strategy applied to its use.

parking_lot_identity_list
This data item contains a list of parking lots to which a particular strategy is to be applied. The strategy will either promote or discourage the use of the parking lots to generally improve traffic flow conditions in the geographic area controlled by the TMC.

parking_lot_increasing_threshold
This data item contains data provided by the Plan System Deployment function. It contains the threshold at which the parking lot state will change, e.g. from 'spaces' to 'almost full', etc., as the number of vehicles in the parking lot increases.

parking_lot_input_data
This data item contains data that is used to calculate the occupancy of parking lots.

parking_lot_occupancy
This data item contains the current occupancy of a parking lot, i.e. the number of vehicles present.

parking_lot_price
This data item is data about the prices to be charged for parking lot spaces.

parking_lot_sensor_allocation

This data item contains the identity(ies) of the traffic sensors that are used to determine the number of spaces in the parking lot that are currently occupied. There are two types of sensor, those measuring
input flow (vehicles entering the lot) and those measuring output flow (vehicles leaving the lot).

parking_lot_sensor_type

This data item contains a character that indicates the type of parking lot lane to which a traffic sensor has been applied to count the number of vehicles that pass. The following two types are provided: N for sensors on entry lanes, X - for sensors on exit lanes.

parking_lot_state

This data item contains the current state of a parking lot. It indicates whether the parking lot is open and has spaces available.

parking_lot_state_thresholds

This data item contains the thresholds at which the parking lot states will change, e.g. from 'spaces' to 'almost full', etc. There are two sets of three thresholds, one set for use when the parking lot occupancy is increasing and the other set for use when the occupancy is decreasing.

parking_lot_storage_data_list

This data item contains a list of occupancy and state data for one or more parking lots in a local geographic area.

pedestrian_data

This data item contains a list of indicators for which pedestrian demands have been found to be present. These indicators are in fact traffic signal controllers that are capable of servicing the pedestrian demand and enabling pedestrians to cross the road or highway is a safe and coordinated manner. This data is used to determine the traffic control strategy for signalized traffic intersections.

pedestrian_demand

This data item contains processed pedestrian surveillance data obtained from sensors within the road (surface street) and highway network served by the TMC. The data is used to determine the traffic control strategy for signalized traffic intersections.

permit_coordination

This data item contains information used in the coordination of permits for special travel requirements which involve different agencies and jurisdictions. This information provides the Manage Traffic function with schedule and route information to prepare special travel and traffic controls for the transport of non-typical loads or roadway activities that require permits.

permit_route_plan

This data item defines the links in the road (surface street) and highway network to be traversed by a commercial vehicle carrying a special load. It is derived from the route produced for the commercial vehicle carrying the load and requires special traffic control strategies to enable the vehicle to pass through the network with the minimum of interruption to other traffic. This may involve coordination between multiple agencies due to inter-jurisdiction travel or travel outside the geographic area served by the local TMC and so may require that the data be sent to other TMC's.

permit_traffic_controls

This data item defines the special traffic control strategy needed to enable the passage of a commercial vehicle containing a special permitted load through the road (surface street) and highway network included in the vehicle's route. The control strategy may affect both intersection signal controllers and/or dynamic message signs (dms) used for lane control, and/or ramp metering controllers used to regulate the entry of vehicles onto highways.

permit_type

This data item defines the type of transport permit associated with major transport of special loads. A special load is defined as being one that either contains hazardous material (HAZMAT load) and/or is over size or over weight.

planned_event_data_list
This data item is a list of planned events due to take place in the future.

planned_events
This data item contains details of known events due to take place in the future.

planned_events_local_data
This data item contains a copy of the contents of the store of planned events. This has been requested by the same function in another traffic management center (TMC) to which it will be sent by another process.

pollution_output_message
This data item contains the data which the Manage Emissions facility wants output to alert a driver to the fact that the vehicle is generating pollution outside of the standard limits.

pollution_state_area_collection
This data item contains the current states of the various types of pollution within the atmosphere in the geographic area served by the function. It also contains a summary indication of the area air quality.

pollution_state_roadside_collection
This data item contains the digitized values of pollution levels obtained from roadside sensors in the geographic area served by the function.

predicted_highway_network_data
This data item contains data about predicted traffic conditions on links in the highway network served by the function.

predicted_hov_lane_data
This data item contains prediction of the numbers of both legal and illegal vehicles using High Occupancy Vehicle (HOV) lanes in the road and highway network served by the function.

predicted_other_routes_use
This data item contains information about how many travelers it is predicted will be guided down each non-vehicle and non-transit route segment and the average journey time for each route segment.

predicted_parking_lot_data
This data item contains predicted parking lot states produced by the predictive model process.

predicted_road_network_data
This data item contains data about predicted traffic conditions on links in the road network served by the function.

predicted_road_network_use
This data item contains information about how many vehicles it is predicted will be guided down each route segment and the average journey time for each route segment.

predicted_weather_from_weather_service
This data item contains details of the predicted weather conditions, e.g. temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.

prediction_data_list
This data item contains output from the predictive model process showing predictions of traffic data for route segments on the road and highway network.

predictive_data
This data item contains a subset of the predictive model data stored by the function which will be used as the basis for traffic data that is sent to other functions.

private_vehicle_occupants
This data item contains a count of the number of occupants in a vehicle as measured by a detector located on, or near to the highway, as the vehicles pass by its sensor.

probe_data_for_traffic
This data item is sent from the Provide Electronic Payment Services function to the Manage Traffic

function and contains journey times between toll collection points for those vehicles equipped for electronic toll collection. It is used to calculate link journey times for use in adaptive traffic control techniques and route selection and guidance.

processed_data

This data item contains traffic sensor data that has been processed ready for storage in both the current and historical data stores.

rail_schedules_data

This data item contains information about scheduled rail operations for a specific locality and time frame. It includes train and maintenance schedules that may have an impact on traffic management.

ramp_controls

This data item contains the actual control data to be passed to a ramp meter controller.

ramp_data

This data item contains data which is used to control access to freeways etc. from ramps.

ramp_identity_list

This data item contains a list of the ramps (ramp metering equipment) to which a particular traffic control strategy is to be applied.

ramp_signal_state_list

This data item is used to indicate the state of the ramp meter controllers at the entrance to the highway ramps controlled by the TMC.

request_local_current_incidents_data

This data item is used within the Manage Traffic function to request data about current incidents for use by another TMC. They will be entered into the local TMC's store of current incidents for use in determining responses. Only details of those incidents that are likely to have an impact outside the local TMC's geographic or jurisdictional area(s) will be sent to the other TMC.

request_local_planned_events_data

This data item requests data about planned events for use by another TMC. They will be entered into the other TMC's store of planned events for use in determining responses. Only details of those events that are likely to have an impact outside the local TMC's geographic or jurisdictional area(s) will be sent to the other TMC.

request_other_current_incidents_data

This data item will be entered into the local TMC's store of current incidents for use in determining responses. Although the location of these incidents is outside the TMC's geographic or jurisdictional area(s) they may affect local traffic conditions.

request_other_planned_events_data

This data item will be entered into the local TMC's store of planned events for use in determining responses. Although the location of these events is outside the TMC's geographic or jurisdictional area(s) they may affect local traffic conditions.

roadway_environment_conditions

This data item contains processed environment sensor information which provides a summary of environment conditions referenced to a link.

roadway_traffic_conditions

This data item contains sensor information which has been processed to provide traffic conditions for a link.

route

This data item contains details of a route. This will have been produced to fit the origin, destination, preferences and constraints requirements provided by a traveler through the trip request data. The route segment(s) will be in sets, one for a primary route (the nearest fit to the traveler's requirements), plus one or more alternates that may give a better modal split, or improved journey time, etc. There may be one or many

route segments depending on the length of the route.

route_segment_end_point
This data item contains the location of the end of a route segment.

route_segment_estimated_arrival_time
This data item contains the estimated time at which the route segment end point will be reached.

route_segment_estimated_travel_time
This data item contains the estimated time it will take a vehicle to travel the route segment taking account of the expected conditions defined in other data.

route_segment_guided_travelers
This data item contains the number of travelers being guided along a route segment in one minute of real time.

route_segment_guided_vehicles
This data item contains the number of vehicles being guided along a route segment in one minute of real time.

route_segment_identity
This data item identifies a route segment by name, location, or other standard location reference.

route_segment_journey_time
This data item contains the average route segment journey time calculated from data being provided by guided vehicles.

route_segment_journey_time_from_tolls
This data item contains the smoothed average vehicle journey times for the route segment between two toll collection points, obtained from the passing times of those vehicles equipped for electronic toll collection.

route_segment_occupancy_predictions
This data item contains output from the predictive model process showing predictions of the occupancy for route segments on the road and highway network served by the Manage Traffic function.

route_segment_queue_delay_predictions
This data item contains output from the predictive model process showing predictions of the delay(s) due to traffic queues for route segments on the road and highway network.

route_segment_speed_predictions
This data item contains output from the predictive model process showing predictions of the vehicle speed for route segments on the road and highway network.

route_segment_start_point
This data item contains the location of the start of a route segment.

route_segment_total_number
This data item defines the total number of route segments in the road (surface street) and highway network in an area of responsibility.

route_segment_use_prediction
This data item contains data about the number of guided vehicles that will be using a route segment over a set of time periods.

route_segment_volume_delay_predictions
This data item contains output from the predictive model process showing predictions of the delay(s) due to traffic volume for route segments on the road and highway network. This delay is the additional time that a vehicle will take to move from the start of a route segment to its end, above that which it would need in free flow conditions.

selected_emergency_strategy
This data item specifies the type of traffic control strategy to be applied to some or all of the road (surface streets) and highway traffic control units controlled by a TMC. It will give priority to the emergency vehicle(s) by ensuring that they are given the proceed indication (green signal) as they

approach each individual intersection, pedestrian and ramp meter control unit along the emergency vehicle route. Another feature of the strategy may be the direction of other vehicles to use particular lanes on a surface street or highway so that the emergency vehicle(s) have a lane for the sole use.

selected_emergency_vehicle_strategy

This data item contains the strategy which has been selected to enable priority to be given to emergency vehicles through the road (surface street) and highway network controlled by the TMC.

selected_highway_control_strategy

This data item contains the strategy which has been selected for implementation at some or all of the indicators on the highways in the geographic and jurisdictional area(s) served by the function. The strategy may be one of several depending on that which is best suited to control of traffic on the highways.

selected_parking_lot_control_strategy

This data item contains the strategy which has been selected for implementation at parking lots to control their use. The strategy will be designed to promote or discourage the use of a parking lot by directing vehicles to or away from it through the use of dynamic message signs (dms). The decision on which strategy to employ will depend upon such things as the overall traffic management strategy, the need to restrict vehicle use because of a number of factors e.g. congestion, pollution, and the desire to encourage travelers to make use of alternative modes of transport by using park and ride (P+R) facilities. The strategy may be applied to some or all of the parking lots in the geographic area served by the TMC.

selected_parking_lot_strategy_type

This data item specifies the type of strategy to be applied to some or all of the parking lots controlled by a TMC. The strategy type will be designed to promote or discourage the use of a particular parking lot and thus may either 'open' or 'close' the lot, indicate the state of the lot, i.e. the number of spaces remaining, or give priority to vehicles that are part of car or van pools.

selected_ramp_control_strategy

This data item contains the strategy which has been selected for implementation at highway entry ramps by the local ramp metering equipment. The strategy may be either 'open', 'closed' or 'admit vehicles when not congested' and may be applied to some or all of the ramps in the geographic area served by the TMC.

selected_ramp_strategy_type

This data item contains the strategy which has been selected for implementation by ramp metering equipment. The strategy may typically be one which either permanently opens or closes the ramp, or enables traffic to join the highway under certain conditions. These would be things such as low congestion on the highway, or situations where additional traffic entering the highway will not increase the level of congestion such that free flow conditions break down. An override will be provided to enable the ramp to be opened if closing it will cause unacceptable congestion to the surrounding surface streets.

selected_road_control_strategy

This data item contains the strategy which has been selected for implementation at some or all of the indicators on the roads in the geographic and jurisdictional area(s) served by the function. The strategy may be one of several depending on that which is best suited to control of traffic on the roads.

selected_strategy

This data item is used within the Manage Traffic function to transfer the current traffic control strategies being implemented on highways and roads (surface streets) from the Provide Device Control facility to the Provide Traffic Surveillance facility for loading into the store of long term data.

selected_strategy_type

This data item contains data provided by the Plan System Deployment function. It specifies the type of traffic control strategy to be applied to some or all of the road (surface street) and highway indicators controlled by a TMC. The strategy type is defined as a character string. The string codes may describe but will not be limited to types of data such as centralized adaptive control, distributed adaptive control, adaptive control with some local autonomy, automatic plan selection using fixed time or adaptive control data, centralized fixed time control, distributed fixed time control using local controller intelligence, and local using only the controller's intelligence.

sensor_data_for_distribution

This data item contains raw and processed sensor data.

sensor_identity

This data item contains an identifier of the sensor managed by a sensor station. The identifier would be a code which describes the type of the sensor (e.g. wind, temperature, precipitation, etc.).

sensor_output_data

This data item contains information obtained from data analyzed by traffic sensors. It is sent to the process traffic data store for current and long term data.

special_vehicle_priority_routing

This data item is a special form of route similar to an emergency vehicle route, but for use by other vehicle types which may be given special priority routing (e.g. traffic control preemption routing). This could be applied to HOV vehicles, special HAZMAT, priority vehicles (e.g. governors motorcade), or even to regular vehicles under a low traffic volume period (e.g. in the early hours of the morning).

static_data_for_parking_lots

This data item contains data that relates vehicle sensors, queue counting sensors and signs to individual parking lots, and the lot occupancy(ies) at which states such as 'almost full' and 'full' will apply. The data is sent to each parking lot for its own use.

station_id

This data item contains the identifier of the sensor station. A sensor station may control a single sensor (environmental or traffic), or may control a number of sensors.

stored_incident_data

This data item contains the current incidents and planned events at a single point in time.

time

This data item contains the current time of day and will be associated with other data items and (possibly) a date.

tmc_identity

This data item defines the logical identifier of an interfacing peer Traffic Management Center (TMC) to share traffic data and system status. Other centers may be on-line to coordinate wide area traffic operations to promote traffic mobility and coordination.

to_cm_fault_data

This data item is sent to the construction and maintenance terminator from the Manage Traffic function. It contains a report showing that a particular fault has been found in an indicator be either a local or a roadside process. This report acts as a request for the construction and maintenance terminator to effect repairs to restore the indicator to normal operation as soon as possible.

to_cm_incident_confirmation

This data item is sent to the construction and maintenance terminator from the Manage Traffic function to provide confirmation that work by the Construction and Maintenance terminator which has been recorded as a possible incident can take place at the requested time.

to_cm_request_incident_change

This data item is sent to the construction and maintenance terminator from the Manage Traffic function to request changes to the timing of work requested by the construction and maintenance

terminator. This will have been provided as input to the function and been recorded as a possible incident.

to_cm_resource_request
This data item is used to request traffic management resources to include temporary signs, cones, and other assets that can be used to divert traffic, create detours, and otherwise mange traffic at the incident scene. It also includes requests for any other assets that may be needed to support incident clearance.

to_cm_sensor_fault_data
This data item is sent to the construction and maintenance terminator from the Manage Traffic function. It contains a report showing that a particular fault has been found in a sensor be either a local or a roadside process. This report acts as a request for the construction and maintenance terminator to effect repairs to restore the sensor to normal operation as soon as possible.

to_dmv_traffic_violation_identity_code
This data item contains the identity code of the ITS that is requesting the vehicle registration data so that a traffic violation can be processed.

to_dmv_traffic_violation_vehicle_license
This data item contains the vehicle license for which the corresponding registration data is required so that a traffic violation can be processed.

to_enforcement_agency_traffic_violation_data
This data item contains information about high occupancy vehicle (HOV) lane use and pollution violations that have been detected by processes within the Manage Traffic function. The data in this item will enable the notified enforcement agency to take the appropriate action against those committing the violations.

to_ep_event_confirmation
This data item is the confirmation that the previously submitted details of an event have been accepted as a possible incident.

to_media_incident_data
This data item contains data on current incidents and/or planned events in a form which will be readily understood by the Media. The data is sent in response to a request for information from the media.

to_media_traffic_data
This data item contains data on current incidents and/or planned events in a form which will be readily understood by the Media. The data is sent in response to a request for information from the media.

toll_price
This data item contains the price (cents) for each road segment to which a toll can be applied.

toll_price_application_time
This data item contains the time at which a toll price applies for a particular toll segment. The time is held as the number of seconds since a fixed reference point, from which the actual time and date can be easily computed.

toll_price_changes_request
This data item contains a request for a change to the current toll pricing structure that will help to influence a change in modal split of journeys currently being undertaken by travelers of all types, i.e. including drivers and transit users.

toll_price_changes_response
This data item is sent from the Provide Electronic Payment Services function to the Manage Traffic function. It contains the response to a previous request for the current toll prices to be changed to help produce a change in the current modal split of trips being undertaken by all types of travelers. If sent to one (1) the change was accepted and if set to zero (0), the change was rejected.

toll_price_details

This data item contains the price for each road segment to which a toll applies, with the time and date for when it applies. This data will be used by the Manage Travel Demand facility in its efforts to re-distribute travel demand to the more efficient providers.

toll_price_request

This data item is sent from the Manage Traffic function to the Provide Electronic Payment Services function and contains a request for the current prices being charged for toll segments on the road and highway network.

toll_segments

This data item contains the identity of the toll segment for which toll payment is being provided or requested, or for which toll price data is stored.

traffic_center_control_data

This data item contains traffic control data which is being transferred from one Traffic Management Center (TMC) to one or more others.

traffic_center_data_request

This data item contains a request for data to be sent from another Traffic Management Center (TMC) to the local TMC.

traffic_center_identity

This data item defines the logical identifier of an interfacing peer Traffic Management Center (TMC) to share traffic data and system status. Other centers may be on-line to coordinate wide area traffic operations to promote traffic mobility and coordination.

traffic_center_status_data

This data item contains traffic status data which is being transferred from one Traffic Management Center (TMC) to one or more others.

traffic_data_distribution_request

This data item contains a request for particular data to be retrieved from the stores of long term, current, and predicted traffic data. The request is in response to a variety of requests received from ITS Users.

traffic_data_for_distribution

This data item contains the response to a request for particular data to be retrieved from the stores of current, long term and predictive model data. This data will be used as the basis for traffic information
data that is provided to other ITS functions.

traffic_data_for_transit_list

This data item contains information about environmental conditions, current incidents on the road, traffic flow state, and air quality data.

traffic_data_request_from_media

This data item is contains a request from the Media for traffic information. The request must specify the type of information required (flow/congestion) and the geographic area(s) to which it should relate.

traffic_flow_state_for_transit

This data item contains data showing the current traffic flow conditions on roads (surface streets), freeways and ramps served by the function. It also includes flows in high occupancy vehicle (HOV) lanes from the same area, which may be used by transit (TRMC) to determine available bus routes.

traffic_management_storage_data

This data item contains the indicator control and response states plus the selected traffic control strategy(ies) for the road (surface street) and highway network served by the function. The data is a subset of that in the current and historical data stores.

traffic_sensor_data

This data item contains the data obtained from processing the inputs from sensors around the road network.

traffic_sensor_output
This data item is the output of a single sensor. The output is either raw or aggregated data calculated over a period of time from that sensor.

traffic_video_camera_number
This data item is used within the Manage Traffic function. It contains the identity of a high resolution video camera used for traffic surveillance.

traffic_video_image
This data item contains a video image of sufficient fidelity to support operator monitoring applications. This image can be a by-product of a machine vision application or the end-product of a system dedicated to traffic surveillance.

traffic_video_image_data
This data item contains the video image which is used by a roadside device to measure traffic flow measures.

traffic_violation_state_identity
This data item contains the identity of the state that is supplying the requested vehicle registration data to enable traffic violation to be processed.

traffic_violation_vehicle_registration
This data item contains the requested vehicle registration data to enable traffic violation to be processed.

transit_conditions_demand_request
This data item is used to request details of the current state of transit vehicle operations for use in demand forecasting calculations carried out by the Manage Demand facility.

transit_fare_details
This data item contains details of the fares being currently charged for transit services.

transit_fare_direct_details_list
This data item contains details of the fares being currently charged for transit services.

transit_fare_direct_request
This data item contains a request for the current prices being charged for transit fares.

transit_fare_request
This data item is sent from the Manage Traffic function to the Provide Electronic Payment Services function and contains a request for the current prices being charged for transit fares.

transit_highway_overall_priority
This data item contains requests and information about the overall priority which should be given to one or more transit vehicles at all points in the freeway network served by the function, as opposed to priority requests from individual vehicles at specific locations. This priority will apply at an individual junction, or along a selected transit route if that is specified.

transit_highway_priority_given
This data item contains confirmation that the requested priority has been given to transit vehicles throughout the freeway network served by the function.

transit_probe_data_list
This data item contains the location of the transit vehicle on each part of its route, i.e., each transit route segment. This data will be used along with other probe data to calculate the link speed or travel time.

transit_ramp_overall_priority
This data item contains requests and information on the overall priority which should be given to one or more transit vehicles over a wide area as opposed to priority requests from individual vehicles at a particular set of ramp signals.

transit_ramp_priority_given
This data item contains confirmation that the overall priority request for one or more transit vehicles over the ramp signals in a wide area as opposed to priority requests from individual vehicles at a particular set of ramp signals has been given.

transit_road_overall_priority
This data item contains requests and information about the overall priority which should be given to one or more transit vehicles at all junctions and/or pedestrian crossings in the road network served by the function, as opposed to priority requests for individual vehicles at specific locations. As this is a 'blanket' application of priority, no list of indicators is needed.

transit_road_priority_given
This data item contains confirmation that the requested priority has been given to transit vehicles throughout the road network served by the function.

transit_route_number
This data item identifies a regular transit route.

transit_route_schedule_number
This data item contains the number of the transit service that is operating on a particular route.

transit_route_segment_cost
This data item contains the cost of the use of a particular transit route segment. It can only be used in association with the segment number, the category of the transit user and the time at which the route is used.

transit_route_segment_list
This data item contains a list of the transit route segments that make up a particular transit route, plus the cost to a transit user for using each segment and the identity of the road or freeway link(s) over which the route segment runs.

transit_route_segment_number
This data item identifies a transit route segment within the transit route on which it lies.

transit_route_stop_data_list
This data item contains a list of data for each of the transit stops that make up a particular transit route.

transit_route_stop_list
This data item contains a list of the transit stops that make up a particular transit route and the time at which services on the route will arrive at each stop.

transit_route_stop_number
This data item contains the identity number of a transit stop on a transit route.

transit_route_use_time
This data item contains the time at which the associated transit fare will apply, e.g. weekday morning peak, Sunday, public holiday, etc.

transit_routes_data_list
This data item contains a list of the details of the routes being provided by the transit operation. The list of route segments contains the identity of each link in the road and freeway network associated with the segment to enable them to be output on top of a display of digitized map data.

transit_schedule_data_list
This data item contains a list of the schedule of services on each transit vehicle route and the cost to the transit user of the use of each route segment.

transit_schedule_identity
This data item contains the identity of a particular set of transit schedules. This identity may include a short description of when (day and/or period) the schedule is expected to apply.

transit_services_changes_request
This data item is a request to change the current transit services in response to changes in demand, or

a desire to change the modal split currently being used by travelers.

transit_services_changes_response
This data item is the response to the previous request for changes in the transit services.

transit_services_demand_request
This data item is a request for supply of details of the transit services and will be used in the preparation of demand forecasts by the Manage Demand facility.

transit_services_request
This data item contains a request for details of the regular transit services being currently provided by the transit fleet.

transit_stop_scheduled_time
This data item contains the time at which a transit vehicle is scheduled to reach each stop on a transit route. This will thus be the scheduled time of arrival at the end of a transit route segment.

transit_user_category
This data item contains the category of transit user to which the associated transit fare applies, e.g. adult, child, senior citizen, disabled, etc.

transit_vehicle_achieved_time
This data item contains the time at which a transit vehicle actually reached the end of a transit route segment. This point is usually a transit stop and the data is thus the arrival time of a transit vehicle at each of the transit stop(s) along the transit route.

transit_vehicle_deviation_update_list
This data item contains the estimated time of arrival of several transit vehicles at stop(s) along their route(s) plus the route and service number on which they are operating. It is used for multiple transit vehicle deviations where one or more routes are affected.

transit_vehicle_eta
This data item contains the estimated time of arrival of a transit vehicle at the end of a transit route segment, which is usually a stop, plus the route and service number on which it is operating.

transit_vehicle_identity
This data item contains the identity of an individual transit vehicle. This data is used to identify the source and/or ownership of other data.

transit_vehicle_location_data
This data item provides the exact location of the transit vehicle. It is based on the standard vehicle location data supplemented with additional data that is only relevant to transit vehicles.

transit_vehicle_location_for_store
This data item provides the exact location of the transit vehicle for storage so that it can be used by other facilities and functions within ITS. It contains the transit vehicle location plus its identity.

transit_vehicle_passenger_loading_list
This data item contains the number of passengers (transit users) carried by a transit vehicle on each part of its route, i.e. each transit route segment.

transit_vehicle_passengers
This data item contains a count of the number of passengers (transit users) that were on-board a transit vehicle on a particular transit route segment.

transit_vehicle_running_times_list
This data item contains a list of the times at which it is expected that a transit vehicle will reach the end of each transit route segment on its route and is used to determine any schedule deviations. The end of a transit route segment is usually a transit stop and the data is thus the expected arrival time of a transit vehicle at each of the transit stop(s) along the transit route.

transit_vehicle_schedule_deviations_list
This data item contains a list of the deviations of transit vehicles from their published routes and schedules at transit route segments that have already been completed, i.e. at transit stops that have

been passed by the vehicle. The data is used to provide information about the current state of the transit service operation to a traveler.

transit_vehicle_time

This data item contains the estimated time of arrival of a transit vehicle at the end of the next transit route segment not so far reached during its journey along the transit route.

vehicle_count

This data item contains a count of the number of vehicles which have been detected at a point location over unit time.

vehicle_headway

This data item contains the measure of time between two successive vehicles in a traffic lane as they pass a point on the roadway. Measurements are taken from front bumper of vehicle to front bumper of other vehicle in seconds.

vehicle_identity

This data item contains the identity of a vehicle.

vehicle_occupancy

This data item contains a count of the time for which a vehicle occupied the point in the surface street or highway at which a detector is located.

vehicle_queue_length

This data item contains a measure of the length of queue as measured by a traffic sensor.

vehicle_smart_probe_data_for_storage

This data item contains the processed vehicle smart probe data collected from a roadside unit, which in turn have received data output by suitably equipped vehicles as they pass by.

vehicle_smart_probe_data_indication

This data item contains the data from a vehicle smart probe, processed to provide an indication of the type of hazard that the vehicle found on the road or freeway.

vehicle_smart_probe_data_source

This data item contains the identity and location of the roadside unit that has collected a particular vehicle smart probe data.

vehicle_smart_probe_data_source_identity

This data item contains the identity of the roadside unit that has collected a particular vehicle smart probe data.

vehicle_smart_probe_data_source_location

This data item contains the location of the roadside unit that has collected a particular vehicle smart probe data.

vehicle_smart_probe_stored_data

This data item contains the processed vehicle smart probe data collected from roadside units.

vehicle_speed

This data item contains the speed of a vehicle which has been detected by a detector located on the highway, as the vehicle flowed over its sensor.

vehicle_type

This data item contains an identifier for the type of vehicle for which pollution violations have been detected.

vehicle_type_for_charges

This data item contains the vehicle type as determined from processing of the vehicle's characteristics for the purpose of paying for parking lot charges.

vehicle_type_for_tolls

This data item contains the vehicle type and identity as determined from processing of the vehicle's characteristics for the purpose of charging for tolls.

wide_area_pollution_data

This data item contains data about the current levels of pollution obtained from the store of pollution data in the area covered by the Traffic Management Center (TMC).