

INFORMATION SOCIETY TECHNOLOGIES (IST) PROGRAMME



D4.1 Part 1 System Architecture

Annex A - Information Model

IST 13036

PRIME

Prediction Of Congestion And Incidents In **R**eal Time, For **I**ntelligent Incident **M**anagement And **E**mergency Traffic Management

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1 Introduction

This document describes the Information Architecture, which defines the data specified in the Functional Architecture, and is comprised of a Data Dictionary and an Information Model. Each part of the information model is described in a separate section which, in the case of the Data Dictionary, contains an entry for each data flow and store which is required to provide the PRIME System Services specified in the Function Architecture.

The section describing the Information Model takes the form of entity relationship diagrams which show the relationships between the logical data entities which are used by the PRIME System during its operation. The notation used for the Information Architecture is shown in section 2.

2 Notation

Each entry in the data dictionary consists of two sections which, first, provide a description of the data and, second, specify the constituent data for the entry. The second section names each component of the data and specifies the Data Type, Instance Type and Relationship. The data type describes the format of the data which will take one of the following values:

Cont - This is control data. It is an event which triggers an action but it does not convey any information. Other flows are also trigger flows but, in addition to initiating an action, they also contain information.

Numb - A number. The precision and maximum value will be implementation dependent

Text - A variable length text string which supports the set of characters required for all the natural languages supported by PRIME.

Set - The components which comprise the data dictionary entry are themselves formed from components of variable data types.

The Instance Type defines the relationship of the data to the incident lifecycle and takes one of the following values:

Entity - This is data which has persistence and a life-cycle during which its value will change.

Dynam - This is data which has no persistence and only exists to convey information between processes.

Attri - These are attributes which define the Entities.

The relationship defines whether the information must be included and will take one of the following values;

mand - the data must be defined.

or(x) - Exclusively one of the values in the set indicated by x must be defined

opt(x) - All the component in the data set indicated by x are optional and any of them may be defined.

Names with a capitalised first letter followed by lower case are aggregate flows which can be dissected into constituent data but names which are all in upper case indicate a value for a data item.

The information model represents the data entities in the system as boxes which also show the attributes which define the entity. The relationships between entities are shown by dashed lines which also indicate the cardinality between entities. The information model is an alternative view of the data shown in the Functional Architecture; therefore, the entities and their attributes can all be found in the data dictionary.

3 Data Dictionary

Abandon incident response

Data Description

The Operator will select this option if either the proposed strategies or the alternatives are not considered acceptable or because the implementation of the deployed strategy failed and it is not possible to rectify it manually.

DD Entry Components

Name	Data Type	Instance Type
Abandon_incident_response	Cont	Dynam
Attributes	Relationship	
TRUE	mand	

Acknowledge reports alerts and warning

Data Description

The Operator will be required to respond to all warnings or alerts by either acknowledging them for immediate action or deferring them until later.

DD Entry Components

Name	Data Type	Instance Type
Acknowledge_reports_alerts_and_warning	Set	Dynam
Attributes	Relationship	
Dismiss_report	or(1)	
Warning_response_option	or(1)	
Alert_response_option	or(1)	

Adaptive control plan

Data Description

Part of the incident management strategy could re-route traffic along a particular link or region and this may affect Urban Traffic Control Systems running fixed time plans or adaptive traffic control systems such as SCOOT. To ensure that the Urban Traffic Control System is able to manage changes in traffic demand resulting from a incident management strategy the PRIME System will notify the UTC system of the proposed route in terms of the affected links.

DD Entry Components

Name	Data Type	Instance Type
Adaptive_control_plan	Numb	Attri
Attributes	Relationship	
Link_id	mand	

Adjacent upstream rule

Data Description

This information specifies if the PRIME System can verify an incident on the basis of a number of upstream detections. The rule will either be deactivated or specify the id of the upstream surveillance devices which can be used to corroborate an incident detection.

DD Entry Components

Name	Data Type	Instance Type
Adjacent_upstream_rule	Numb	Attri
Attributes	Relationship	
Road_side_device_id	or(1)	
DEACTIVATED	or(1)	

Advise operator incident management strategy deployed

Data Description

This data flow will be true when the operator has confirmed the proposed strategy however the strategy deployment will not be complete until the Strategy_implementation result is received.

DD Entry Components

Name	Data Type	Instance Type
Advise_operator_incident_management_strategy_deployed	Cont	Dynam
Attributes	Relationship	
TRUE	opt(1)	

Advise operator incident management strategy proposed

Data Description

This information is true when an incident management strategy has been selected, by the system or the operator, and proposed. The operator interface will prompt the operator to confirm or reject the strategy.

DD Entry Components

Name	Data Type	Instance Type
Advise_operator_incident_management_strategy_proposed	Cont	Dynam
Attributes	Relationship	
TRUE	opt(1)	

Alert response option

Data Description

The operator will be able to acknowledge alerts in which case immediate action will be taken or defer them for later action,

DD Entry Components

Name	Data Type	Instance Type
-------------	------------------	----------------------

Alert_response_option	Numb	Attri
Attributes	Relationship	
DEFER	or(1)	
ACKNOWLEDGE	or(1)	

Alert status

Data Description

The Alert_status defines whether the Operator is aware of the alert and the Incident_status.

DD Entry Components

Name	Data Type	Instance	Type
Alert_status	Numb		Attri
Attributes	Relationship		
DEFERED	or(1)		
REMOVED	or(1)		
ACKNOWLEDGED	or(1)		
RAISED	or(1)		

Animation effect

Data Description

The PRIME System will be capable of incorporating at least the following animation effects into its display however it is anticipated that a wider range of effects will be available on different platforms.

DD Entry Components

Name	Data Type	Instance	Type
Animation_effect	Numb		Attri
Attributes	Relationship		
NOT_DISPLAYED	or(1)		
STEADY	or(1)		
FLASHING	or(1)		

Approved schedule of planned events

Data Description

The PRIME System assess the dates, location and route for events and activities organised by External Service Providers and either approve them without change or approve a modified schedule.

DD Entry Components

Name	Data Type	Instance	Type
Approved_schedule_of_planned_events	Set		Dynam
Attributes	Relationship		
Location_of_event	mand		
Route_of_event	mand		
Type_of_event	mand		
End_date_and_time_of_event	mand		
Start_date_and_time_of_event	mand		
PRIME_System_id	mand		

Authorised maintenance proposal

Data Description

The maintenance schedule proposed by the maintenance contractor will either be accepted without changes or revised and returned to the maintenance contractor.

DD Entry Components

Name	Data Type	Instance Type
Authorised_maintenance_proposal	Set	Dynam
Attributes		Relationship
Source_of_routine_maintenance_proposal	mand	
Approved_maintenance_schedule	mand	
PRIME_System_id	mand	

Average headway time per vehicle per lane

Data Description

This information which is derived from the incoming Traffic_flow data is used by the incident detection algorithms.

DD Entry Components

Name	Data Type	Instance Type
Average_headway_time_per_vehicle_per_lane	Numb	Attri
Attributes		Relationship
METRES	mand	

Average period of occupancy per vehicle per lane

Data Description

This information which is derived from the incoming Traffic_flow data is used by the incident detection algorithms.

DD Entry Components

Name	Data Type	Instance Type
Average_period_of_occupancy_per_vehicle_per_lane	Numb	Attri
Attributes		Relationship
NUMBER	mand	

Average speed

Data Description

The average speed, which is derived from the Traffic_flow will be used by the incident detection algorithms.

DD Entry Components

Name	Data Type	Instance Type
Average_speed	Numb	Attri

Attributes
KM_PER_HOUR

Relationship
mand

Average speed per lane by type of vehicle

Data Description

This information, which is derived from the Traffic_flow, is used for estimating incidents.

DD Entry Components

Name	Data Type	Instance Type
Average_speed_per_lane_by_type_of_vehicle	Set	Attri

Attributes	Relationship
Vehicle_type	mand
Average_speed	mand

Call code id

Data Description

Each call received by the PRIME System will be assigned a unique identifier.

DD Entry Components

Name	Data Type	Instance Type
Call_code_id	Numb	Attri

Attributes	Relationship
UNIQUE_IDENTFIER	mand

Call date and time

Data Description

The system will record the date and time when each incoming call was received.

DD Entry Components

Name	Data Type	Instance Type
Call_date_and_time	Set	Attri

Attributes	Relationship
Date_and_time	mand

Call duration

Data Description

The time between the acceptance of a call by the Operator and the completion of a call shall be recorded by the PRIME System.

DD Entry Components

Name	Data Type	Instance Type
Call_duration	Numb	Attri

Attributes	Relationship
SECONDS	mand

Call response time

Data Description

The PRIME System will record the time between the receipt of a verbal call and the response by the Operator.

DD Entry Components

Name	Data Type	Instance	Type
Call_response_time	Numb		Attri
Attributes	Relationship		
SECONDS	mand		

Call type

Data Description

The system will record whether an incoming call was received verbally or through an electronic device.

DD Entry Components

Name	Data Type	Instance	Type
Call_type	Numb		Attri
Attributes	Relationship		
VERBAL_CALL	or(1)		

Caller id

Data Description

This information will specify the identity of a caller to the System. The PRIME System will use this information to decide if the caller is a trusted source. If the caller is unable to supply a TRUSTED_SOURCE_CODE the system will record the number of the incoming call.

DD Entry Components

Name	Data Type	Instance	Type
Caller_id	Numb		Attri
Attributes	Relationship		
Telephone_number	or(1)		
TRUSTED_SOURCE_CODE	or(1)		

Caller location

Data Description

If an incoming call is received from a road-side emergency telephone the caller's location will be specified by the Geographic_location of the device. If the call is received from another device the caller will be encouraged to provide their location in the same format however as they may be unfamiliar with this or no longer at an adjacent location the information may be vague.

DD Entry Components

Name	Data Type	Instance	Type
Caller_location	Set		Attri

Attributes	Relationship
General_location_description	or(1)
Geographic_location	or(1)

Carriageway identifier

Data Description

This information will describe a carriage within the PRIME Systems Road Network. It is anticipated that this will be a single alphacharacter to distinguish it from the Lane_identifier however this will not restrict the PRIME Systems ability to be comply with alternative schema if required.

DD Entry Components

Name	Data Type	Instance	Type
Carriageway_identifier	Text		Attri

Attributes	Relationship
CARRIAGEWAY_IDENTIFIER	mand

Changes in the number of lanes

Data Description

This is the number of times the number of lanes on the road either decreases or increases and it will be a fixed point number. This could be a temporary change due to road works or a permanent configuration of the road.

DD Entry Components

Clear implemented strategy

Data Description

This option is selected by the Incident Manager when an incident has been either prevented or cleared and the traffic control can be removed. When this option is selected the system will display a list of implemented strategies to be cleared.

DD Entry Components

Name	Data Type	Instance	Type
Clear_implemented_strategy	Cont		Dynam

Attributes	Relationship
TRUE	mand

Cloud cover

Data Description

The amount of cloud cover at the time an incident was detected will be recorded.

DD Entry Components

Name	Data Type	Instance	Type
Cloud_cover	Numb		Attri

Attributes	Relationship

OVERCAST	or(1)
MODERATE	or(1)
CLEAR	or(1)

Complete verification information

Data Description

This is the information required to determine a response to an incident; however, the availability of this information does not necessary verify the occurrence or location of an incident. It is not possible to verify the details of an incident which has been estimated; however, this information is required to select and deploy a response. If an Operator decides that the probability and reliability of an incident estimate justify a response this information will be provided in an Incident_predicted_report.

DD Entry Components

Name	Data Type	Instance Type
Complete_verification_information	Set	Attri
Attributes		Relationship
Verification_date_and_time	mand	
Incident_type	mand	
Vehicles_involved_in_incident	mand	
Verification_code	mand	
Estimated_travel_time_impact	mand	
Mandatory_detection_informati on	mand	

Condition of hazardous goods

Data Description

If a hazardous load is involved in an incident the incoming incident data will specify if the load is still secured to or in the vehicle or if has been shed on the road surface.

DD Entry Components

Name	Data Type	Instance Type
Condition_of_hazardous_goods	text	Attri
Attributes		Relationship
VARIABLE_TEXT_STRING	mand	

Control device setting

Data Description

This information specifies the setting required for a specific control device to implement an Incident Management Strategy.

DD Entry Components

Name	Data Type	Instance Type
Control_device_setting	Set	Entity
Attributes		Relationship
Permitted_device_settings	mand	

Attributes
Incident_id

Relationship
mand

Crossing request

Data Description

Managers of other transport modes will inform the PRIME System of dates and times when their activities will affect the road network.

DD Entry Components

Name	Data Type	Instance	Type
Crossing_request	Set		
Attributes	Relationship		
Date_and_time_of_requested_crossing	mand		
Location_of_requested_crossing	mand		
Source_of_crossing_request	mand		

Current reading

Data Description

The PRIME System will use a variety of devices to monitor the traffic flow on the road network however it is anticipated that they can all provide the volume, occupancy and speed information specified in section 2.2 of D4.1/001. The set of equipment included in the classification of surveillance devices includes CCTV Cameras used by the Operator. This information flows directly from the CCTV System to the Operator without intervention from the PRIME System so it is not included as a reading from the equipment.

DD Entry Components

Name	Data Type	Instance	Type
Current_reading	Set	Attri	
Attributes	Relationship		
Traffic_flow	mand		

Current setting

Data Description

This information will define the component of an incident management strategy as it is implemented on a specific road-side device.

DD Entry Components

Name	Data Type	Instance	Type
Current_setting	Set	Attri	
Attributes	Relationship		
Driver_advisory_message	opt(1)		
Mandatory_driving_restriction	opt(1)		

Data required for verification

Data Description

If the system automatically verifies the occurrence of an incident but is unable to obtain the data needed to determine a response the missing information will be requested in the Missing_data_warning.

DD Entry Components

Name	Data Type Instance Type
Data_required_for_verification	Numb Attri
Attributes	
INCIDENT_WEATHER_CONDITIONS_MISSING	opt(1)
INCIDENT_TYPE_MISSING	opt(1)

Date and time

Data Description

The format of the date and time will be implementation specific and the system will be capable of automatically adjusting the timezone for the region specified. The date and times of stored data will also be santised to acount for changes from and to summer time.

DD Entry Components

Name	Data Type Instance Type
Date_and_time	Set Entity
Attributes	
Timezone	mand
MINUTE	mand
HOUR	mand
YEAR	mand
MONTH	mand
DAY	mand

Date and time of traffic flow record

Data Description

Each record of the traffic flow from the road network will be date and time stamped. The readings will be taken every 30 or 60 seconds depending on the infrastructure installed at a site.

DD Entry Components

Name	Data Type Instance Type
Date_and_time_of_traffic_flow_record	Set Attri
Attributes	
Date_and_time	mand

Deploy proposed strategy

Data Description

The Operator will select this option to deploy the strategy proposed at the Operator Interface.

DD Entry Components

Name	Data Type	Instance Type
Deploy_proposed_strategy	Cont	Entity
Attributes	Relationship	
TRUE	mand	

Deployed incident management strategy

Data Description

This record identifies which strategy was used for a specific incident.

DD Entry Components

Name	Data Type	Instance Type
Deployed_incident_management_strategy	Set	Entity
Attributes	Relationship	
Surveillance_device_setting	or(1)	
Device_control_setting	or(1)	
Incident_management_strategy_id	mand	
Incident_id	mand	
Implementation_request_id	mand	
Incident_management_strategy_id	mand	

Deployed strategy expired

Data Description

This information indicates that the ground conditions for the specified incident have changed and the deployed response is no longer optimum.

DD Entry Components

Name	Data Type	Instance Type
Deployed_strategy_expired	Numb	Dynam
Attributes	Relationship	
Incident_management_strategy_id	mand	
Incident_id	mand	

Deployed strategy expired warning

Data Description

The Deployed_strategy_expired_warning will be raised when the system detects that the status of an incident has changed on the ground and the deployed strategy is no longer valid. This may also occur if a strategy has been scheduled for a planned activity but the activity has been modified without updating the strategy. The warning will be presented to the Operator visually by an animated symbol

together with the information below which will allow the operator to decide if the incident requires an immediate response or if it can be deferred until later. The warning will remain on the display until it is either acknowledged or deferred. The Incident_management_strategy refers to the expired strategy and the Incident_id refers to the subject of the deployed strategy.

DD Entry Components

Deployment number

Data Description

This is a fixed point number which allows each deployment of a strategy to be uniquely identified. It is globally unique not unique to each strategy.

DD Entry Components

Deployment of un validated strategy confirmed

Data Description

This information will specify if the Operator has decided to deploy an un-validated incident management strategy.

DD Entry Components

Name	Data Type	Instance	Type
Deployment_of_un_validated_strategy_confirmed	Bool		Dynam
Attributes			
FALSE			opt(1)
TRUE			opt(1)
Relationship			

Description of hazardous goods

Data Description

It may only be possible to identify hazardous goods at an incident scene by the vehicle hazard markings however if the exact details of the material are known they will be specified in this field.

DD Entry Components

Name	Data Type	Instance	Type
Description_of_hazardous_goods	text		Attri
Attributes			
VARIABLE_TEXT_STRING			mand
Relationship			

Detection code

Data Description

The Detection_code will specify the method which gave rise to an incident detection and the source of the detection. The detection code will also be used to specify if an incident was estimated.

DD Entry Components

Name	Data Type	Instance	Type
------	-----------	----------	------

Detection_code	Set	Attri
Attributes	Relationship	
Detection_source	mand	
Detection_method	mand	

Detection date and time

Data Description

This will be the time at which the system first becomes aware of an incident either through a detection or an estimate. Ideally the time will be within 2 minutes of the incident; however, this will depend on the source of detection

DD Entry Components

Name	Data Type	Instance	Type
Detection_date_and_time	Dat		Attri
Attributes	Relationship		
Date_and_time	mand		

Detection method

Data Description

The detection method will identify whether an incident detection was raised manually by the operator, or automatically by road-side monitoring equipment or by an estimate.

DD Entry Components

Name	Data Type	Instance	Type
Detection_method	Num		Attri
Attributes	Relationship		
TRAFFIC_SURVEILLANCE_DE VICE	or(1)		
INCIDENT_ESTIMATE	or(1)		
INCIDENT_CALL	or(1)		
OPERATOR_SURVEILLANCE	or(1)		

Detection source

Data Description

The system will record the source of the information which gave rise to an incident detection. If an incident was reported by the operator through CCTV surveillance the identity of the Incident_detected_report will be recorded. If an incident is detected automatically the device, the identity of the road side equipment will be recorded.

DD Entry Components

Name	Data Type	Instance	Type
Detection_source	Set		Attri
Attributes	Relationship		
Incident_estimate_id	or(1)		

Incident_call_id	or(1)
Incident_report_id	or(1)
Road_side_device_id	or(1)

Detector location

Data Description

The location of road-side surveillance equipment will be specified by its Geographic_location.

DD Entry Components

Name	Data Type	Instance	Type
Detector_location	Set		Attri
Attributes			
Geographic_location			Relationship
			mand

Device animation effect

Data Description

It will be possible to configure the PRIME System to use different animation effects to represent information about traffic control and surveillance devices.

DD Entry Components

Name	Data Type	Instance	Type
Device_animation_effect	Set		Attri
Attributes			
Animation_effect			Relationship
			mand

Device display rule

Data Description

The PRIME System will define different colours and effects for rendering devices to the Operator.

DD Entry Components

Name	Data Type	Instance	Type
Device_display_rule	Set		Attri
Attributes			
Equipment_status			Relationship
			mand
Device_colour			Relationship
			mand
Device_animation_effect			Relationship
			mand

Display rule

Data Description

The Display_rule will specify the colours the system will use to display different incident states and traffic flows.

DD Entry Components

Name	Data Type	Instance	Type
Display_rule	Set		Entity

Attributes	Relationship
Incident_display_rule	mand
Traffic_flow_display_rule	mand
Device_display_rule	mand

Disruptions to scheduled services

Data Description

This flow represents information about disruptions to Public Transport Services caused by strikes, problems with the infrastructure such as leaves on rail tracks or accidents. Disruptions to mass transport services into major cities will increase road demand and will require preventative action to avoid congestion and associated incidents.

DD Entry Components

Name	Data Type	Instance Type
Disruptions_to_scheduled_services	Set	Dynam

Attributes	Relationship
Extent_of_service_interruption	mand
Region_affected_by_service_disruption	mand
Reason_for_service_disruption	mand
Projected_end_date_and_time_of_service_interruption	mand
Start_date_and_time_of_service_interruption	mand

Distance identifier

Data Description

This information will specify the distance in the direction of traffic flow from distance marker posts on a road carriageway.

DD Entry Components

Name	Data Type	Instance Type
Distance_identifier	Numb	Attri

Attributes	Relationship
METRES	mand

Downstream traffic control device

Data Description

The information recorded for each item of road side equipment which can be uniquely identified and which has a geographic location in the road network will specify the id and location of the adjacent downstream device. This information will be used both for verifying incidents and for determining the best response.

DD Entry Components

Name	Data Type	Instance Type
Downstream_traffic_control_device	Set	Attri

Attributes	Relationship
Geographic_location	mand
Road_side_device_id	mand

Driver advisory message

Data Description

This information defines messages which warn approaching traffic of incidents or conditions which may give rise to incidents. These messages will be advisory and it is not anticipated that they will be legally enforced. The message will consist of static text which conveys the main meaning and dynamic text which provides information relevant to the incident such as a junction number. The format of the data will depend on the device which implements the message therefore the message definition includes formatting instructions.

DD Entry Components

Name	Data Type	Instance	Type
Driver_advisory_message	Set		Attri
Attributes			
Format_for_driver_advisory_message			mand
Dynamic_text			mand
Static_text			mand
Relationship			
			mand

Driver warning plan

Data Description

This information specifies the devices which are required to implement the driver warning component of a traffic control plan. The device settings are determined by the incident management rules.

DD Entry Components

Name	Data Type	Instance	Type
Driver_warning_plan	Num		Attri
Attributes			
Road_side_device_id			mand
Relationship			
			mand

Dynamic text

Data Description

Dynamic_text will be used to add context to static text; so if, for example, the system displays a message to instructing drivers to travel at a particular speed the actual speed will be defined by the Dynamic_text.

DD Entry Components

Name	Data Type	Instance	Type
Dynamic_text	Text		Attri
Attributes			
VARIABLE_TEXT_STRING			mand
Relationship			
			mand

Emergency services incident notification

Data Description

The PRIME System will notify the Emergency Services of Incidents which have been verified and at the discretion of the Operator incidents which require an immediate ground response.

DD Entry Components

Name	Data Type	Instance Type
Emergency_services_incident_notification	Set	Dynam
Attributes		Relationship
Weather_conditions		mand
Incident_type		mand
Incident_location		mand
PRIME_system_id		mand

Emergency services notification time

Data Description

When the system sends an Emergency_services_incident_notification the date and time will be recorded.

DD Entry Components

Name	Data Type	Instance Type
Emergency_services_notification_time	Set	Dynam
Attributes		Relationship
Date_and_time		mand

Emergency vehicle corridor demand

Data Description

Corridors for non-law enforcement emergency vehicles have a pre-determined route. The deployment of a green wave only affects each junction for a few seconds and will be cleared before congestion occurs; however, the combination of a change in the junction phasing and the high speed of the Emergency Vehicle increases the probability of an incident

DD Entry Components

Name	Data Type	Instance Type
Emergency_vehicle_corridor_demand	Numb	Dynam
Attributes		Relationship
Link_id		mand

End date and time of event

Data Description

The date and time of the request or approval for a planned event.

DD Entry Components

Name	Data Type	Instance Type
End_date_and_time_of_event	Set	Dynam
Attributes		Relationship

Equipment_status	Numb	Attri
Attributes	Relationship	
EQUIPMENT_OPERATIONAL	or(1)	
INTERMITTENT_FAULT	or(1)	
FAULTY	or(1)	

Equipment type

Data Description

The PRIME System will be capable of interfacing to a range of traffic monitoring and control devices in existing and future infrastructures. The equipment type for each device will be identified by a unique code. The information will be split into a set for surveillance equipment and a set for control devices and it is anticipated that within each set the interfaces will be common to several equipment types. This is mainly controlled by the equipment manufactures although it is anticipated that regional or national authorities may be able provide some influence.

DD Entry Components

Name	Data Type	Instance	Type
Equipment_type	Set		Attri
Attributes	Relationship		
Control_equipment_type	or(1)		
Surveillance_equipment_type	or(1)		

Estimated corroboration rule

Data Description

This information specifies whether the PRIME System will verify a detected incident if an incident estimate has been made for the same location.

DD Entry Components

Name	Data Type	Instance	Type
Estimated_corroboration_rule	Numb		Attri
Attributes	Relationship		
DEACTIVATED	or(1)		
ACTIVE	or(1)		

Estimated travel time impact

Data Description

This information will specify the estimated journey time delay on a link resulting from an incident. The estimate will be made at the time of the incident and updated throughout the incident lifecycle. The journey time delay will be provided to potential and actual road-users as it is updated.

DD Entry Components

Name	Data Type	Instance	Type
Estimated_travel_time_impact	Numb		Attri

Attributes
HOURS

Relationship
mand

Expired strategies indicator

Data Description

This information which is permanently displayed at the Operator Interface specifies the number of strategies which need to be removed or replaced because of conditions on the ground.

DD Entry Components

Name	Data Type	Instance Type
Expired_strategies_indicator	Numb	Dynam
Attributes		
NUMBER_OF_EXPIRED_STRATEGIES	mand	
NUMBER OF EXPIRED STRATEGIES IS	mand	

Freight operator incident notification

Data Description

The PRIME System will advise Road Haulage operators of verified incidents in the Road Network.

DD Entry Components

Name	Data Type	Instance Type
Freight_operator_incident_notification	Set	Dynam
Attributes		
Complete_verification_information	or(1)	
Mandatory_detection_information	or(1)	
Id_of_notifying_source	mand	

Freight vehicle incident warning

Data Description

The Operators of Freight Vehicles travelling through the Road Network will inform the PRIME System of any incidents involving their vehicles. It will be expected that the informant will provide at least enough information to attempt to verify the incident.

DD Entry Components

Name	Data Type	Instance Type
Freight_vehicle_incident_warning	Set	Dynam
Attributes		
Travel_time_impact	mand	
Incident_type	mand	
Incident_location	mand	
Incident_id	mand	

General wind direction

Data Description

If the wind direction is provided manually it shall be recorded in manual terms and it may be necessary for the Operator to translate the description provided into a meaningful direction.

DD Entry Components

Name	Data Type	Instance	Type
General_wind_direction	Numb		Attri
Attributes			
WEST	or(1)		
EAST	or(1)		
SOUTH	or(1)		
NORTH	or(1)		

General wind measurement

Data Description

If the wind measurement associated with an incident is provided manually by a bystander it will be provided as a range. The ranges will be; LIGHT, MODERATE, STRONG, GALE, STORM, HURRICANE.

DD Entry Components

Name	Data Type	Instance	Type
General_wind_measurement	Numb		Attri
Attributes			
HURRICANE	or(1)		
STORM	or(1)		
GALE	or(1)		
STRONG	or(1)		
MODERATE	or(1)		
LIGHT	or(1)		

Geographic location

Data Description

The location of an incident or a device on the road network will be specified in terms of the road geometry.

DD Entry Components

Name	Data Type	Instance	Type
Geographic_location	Numb		
Attributes			
Link_id	mand		
Lane_idenitfier	mand		
Distance_identifier	mand		
Carriageway_identifier	mand		
Road_identifier	mand		

Hazardous load warning

Data Description

This information is transmitted by the Operator of a freight line when a hazardous load enters the road network managed by the PRIME System. If these loads will have an impact on the road capacity because they are slow moving, unusually wide or require an escort, the hazardous_load_warning should be preceded by a Special_road_freight_load_request. Some loads, such as the transport of nuclear fuel for re-processing, may require special security arrangements.

DD Entry Components

Name	Data Type	Instance	Type
Hazardous_load_warning	Set		Dynam
Attributes		Relationship	
Special_road_freight_needs		mand	
Route_of_hazardous_load_journey		mand	
Date_and_time_of_hazardous_load_journey		mand	
Date_and_time_of_hazardous_load_warning		mand	
Source_of_hazardous_load_warning		mand	

High winds alert

Data Description

Meteorological detectors positioned around the road network will inform the PRIME system of the measured wind direction and speed if it exceeds a specified threshold.

DD Entry Components

Name	Data Type	Instance	Type
High_winds_alert	Set		Attri
Attributes		Relationship	
Precise_wind_direction		mand	
Precise_wind_measurement		mand	

Implemented strategy

Data Description

An implemented strategy is compiled by the incident. The system will maintain a record of the implemented status of deployed strategies including failed implementations. The record of the strategies implementation will be deleted when the incident is cleared or prevented.

DD Entry Components

Name	Data Type	Instance	Type
Implemented_strategy	Set		Attri
Attributes		Relationship	
Driver_advisory_message		opt(1)	
Mandatory_driving_restriction		opt(1)	

Traffic_control_device	mand
Strategy_deployment_status	mand
Incident_id	mand
Incident_management_strategy _id	mand

Incident alert

Data Description

An Incident_alert will be raised when an incident is detected or estimated. The alert will be presented to the Operator visually by an animated symbol together with the information below which will allow the operator to decide if the incident requires an immediate response or if it can be deferred until later. The alert will remain on the display until it is either acknowledged or deferred.

DD Entry Components

Name	Data Type	Instance	Type
Incident_alert	Set		Entity
Attributes		Relationship	
Alert_response_option	mand		
Incident_type	mand		
Incident_location	mand		
Verification_rule	mand		
Alert_status	mand		
Incident_id	mand		

Incident call

Data Description

An incident call event will be raised whenever the PRIME System receives a call from a road-user either verbally or using an electronic interface. The call will record the incoming event and the response and completion of the call.

DD Entry Components

Name	Data Type	Instance	Type
Incident_call	Set		Entity
Attributes		Relationship	
ELECTRONIC_CALL	or(1)		
Call_type	mand		
Call_date_and_time	mand		
Incident_location	mand		
Caller_location	mand		
Incident_call_id	mand		
Caller_id	mand		

Incident call id

Data Description

A unique identifier will be assigned to all incoming calls.

DD Entry Components

Name	Data Type	Instance	Type
Incident_call_id	Numb	Attri	
Attributes	Relationship		
UNIQUE_NUMBER	mand		

Incident call warning

Data Description

The Incident_call_warning will be raised to make the Operator aware that a response is required to an incoming telephone call. The warning will be displayed as an animated symbol with the following information which will be removed from the display until the call is either answered or put on hold

DD Entry Components

Name	Data Type	Instance	Type
Incident_call_warning	Set	Entity	
Attributes	Relationship		
Call_date_and_time	mand		
Caller_location	mand		
Incident_call_id	mand		
Caller_id	mand		

Incident cleared report

Data Description

The Operator will complete this type of report when the traffic incident and any associated wreckage and debris have been removed and the traffic flow has been restored to normal.

DD Entry Components

Name	Data Type	Instance	Type
Incident_cleared_report	Set	Entity	
Attributes	Relationship		
Report_date_and_time	mand		
Reason_for_clearance	mand		
Incident_id	mand		
Operator_id	mand		

Incident data entry instruction

Data Description

This information will be provided by the Operator in response to a verbal call from a road-user to assist the caller to provide the information necessary to take action in response to the incident

DD Entry Components

Name	Data Type	Instance	Type
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Incident_data_entry_instruction	Set	Dynam
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Attributes

Complete_verification_informati
on

Mandatory_detection_informati
on

Relationship

or(1)

or(1)

Incident detected

Data Description

This data flow is raised make the operator aware of a new Incident_detection and it specifies the id of the new incident.

DD Entry Components

Name

Incident_detected

Data Type Instance Type

Numb Dynam

Attributes

Incident_detection_id

Relationship

mand

Incident detected report

Data Description

An incident detection report will be completed if the Operator receives incident information from a non-trusted source. If the information is from a trusted source the Operator will complete an Incident_verification_report. If the source of the information is non-trusted an Incident_detection_report will be used even if the caller provides complete incident details. The system shall automatically record the Detection_date_and_time at the point when the report is submitted. The Operator_id shall also be automatically recorded.

DD Entry Components

Name

Incident_detected_report

Data Type Instance Type

Set Entity

Attributes

Incident_report_id

Operator_id

Complete_verification_informati
on

Mandatory_detection_informati
on

Relationship

mand

mand

or(1)

or(1)

Incident detection

Data Description

An incident detection is raised either by an incoming call from a road user or the detection of an abnormality in the monitored traffic flow or the completion of an Incident_detected_report. The incident detection contains the minimum information required to pursue the verification of an incident.

DD Entry Components

Name	Data Type	Instance	Type
Incident_detection	Set		Entity
Attributes			
Detection_date_and_time	mand		
Incident_detection_Id	mand		
Incident_location	mand		
Detection_source	mand		
Detection_method	mand		

Incident detection id

Data Description

Each incident detection event will be assigned a unique identifier.

DD Entry Components

Name	Data Type	Instance	Type
Incident_detection_id	Numb		Attri
Attributes			
UNIQUE_NUMBER	mand		

Incident display rule

Data Description

This information will define how the PRIME System displays the incident status to the Operator.

DD Entry Components

Name	Data Type	Instance	Type
Incident_display_rule	Set		Attri
Attributes			
Incident_status	mand		
Incident_display_colour	mand		
Incident_animation_effect	mand		

Incident estimate

Data Description

An incident estimate occurs when the PRIME System has detected a change in the prevailing traffic or weather conditions which have raised the probability of an incident above a configurable threshold. An incident warning will be raised as a result of an Incident_estimate.

DD Entry Components

Name	Data Type	Instance	Type
Incident_estimate	Set		Entity
Attributes			
Road_surface_conditions	mand		
Visibility	mand		
Incident_location	mand		
Weather_conditions	mand		

UNIQUE_NUMBER	mand
Detection_date_and_time	mand

Incident location

Data Description

The incident location will be specified in terms of the link in the road network where the incident took place and the geographic location.

DD Entry Components

Name	Data Type	Instance Type
Incident_location	Set	Attri
Attributes		
Geographic_location	mand	
Link_id	mand	
Relationship		

Incident management rule

Data Description

The incident management rules which will be used to determine the most appropriate response to an incident will be developed as part of the Integrated Incident Reponse work in the Project. The precise definition of the rules will not be available until this activity is complete; however, it is possible to identify the data which will be required by the rules. The information required by the rules will be:

- incident location
- impact of incident on the road network capacity
- strategies and associated devices available for roads carrying traffic towards the incident
- availability of diversion routes away from and around the incident
- conditions on the possible diversion routes
- device settings for implementing the strategy.

Most of these data are defined in the PRIME System Architecture; however, the association of the information to define a safe and consistent incident management strategy will be defined during the development of the Integrated Incident Response.

DD Entry Components

Name	Data Type	Instance Type
Incident_management_rule	Set	Entity
Attributes		
Control_device_setting	mand	
Traffic_flow	mand	
Road_network	mand	
Incident_management_strategy_id	mand	
Road_capacity_impact	mand	
Incident_location	mand	
Relationship		

Incident management strategy

Data Description

Incident management consists of 2 parts which are a Traffic_control_plan and an Information_dissemination_plan. The first of these will mitigate the immediate effects of verified or predicted incidents on the road capacity and local traffic flow and the second part will reduce demand

by informing potential road users of long terms delays and reduction in capacity. It is not mandatory to use both

DD Entry Components

Name	Data Type	Instance Type
Incident_management_strategy	Set	Entity
Attributes		Relationship
Surveillance_plan	mand	
Strategy_deployment_history	mand	
Strategy_deployment_status	mand	
Traffic_control_plan	mand	
Information_dissemination_plan	mand	
Strategy_validation_status	mand	
Incident_management_strategy_deployment_mode	mand	
Incident_management_strategy_id	mand	

Incident management strategy deployment failure warning

Data Description

The System shall inform the Operator if a strategy fails to be successfully deployed by displaying an animated symbol and a message which also explains whether the Traffic Strategy or Information Dissemination Strategy or both failed. If the deployment failed because it was not implemented by the roadside equipment the faulty equipment shall be indicated on the displayed map of the road network. The Operator shall also be informed of whether the strategy was manually selected and deployed or automatically selected and deployed by the System and the Operator.

DD Entry Components

Name	Data Type	Instance Type
Incident_management_strategy_deployment_failure_warning	Set	Dynam
Attributes		Relationship
Reason_for_failure	mand	
Incident_id	mand	
Reason_for_deployment_warning	mand	
Incident_management_strategy_id	mand	
Warning_status	mand	

Incident management strategy deployment mode

Data Description

A strategy may be configured for automatic or manual deployment.

DD Entry Components

Name	Data Type	Instance Type
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Incident_management_strategy_deployment_mode	Numb	Dynam
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Attributes	Relationship
MANUAL_DEPLOYMENT	or(1)
AUTOMATIC_DEPLOYMENT	or(1)

Incident management strategy id

Data Description

Each Incident_management_strategy will be identified by a unique number.

DD Entry Components

Name	Data Type	Instance Type
Incident_management_strategy_id	Numb	Attri
Attributes	Relationship	
UNIQUE_NUMBER	mand	

Incident management strategy modification

Data Description

The information in this input defines the changes made, during an edit session, to a proposed or deployed strategy. The Operator will be able to change the settings for road-side traffic control devices, remove devices from the strategy or include additional devices. If the modifications are saved a new strategy will be created in the Incident_management_strategy store

DD Entry Components

Name	Data Type	Instance Type
Incident_management_strategy_modification	Set	Dynam
Attributes	Relationship	
Traffic_control_device	mand	

Incident management strategy requirements

Data Description

The Incident Management Strategies required by the PRIME System will require functions provided by other systems such as positioning of CCTV cameras and setting of traffic control equipment.

DD Entry Components

Name	Data Type	Instance Type
Incident_management_strategy_requirements	Set	Dynam
Attributes	Relationship	
Implementation_request_id	mand	
Traffic_monitoring_device	mand	
Traffic_control_device	mand	
PRIME_System_id	mand	

Incident manager option for deployed state

Data Description

This flow defines the options which are available to the Incident Manager User in the deployed state.

DD Entry Components

Name	Data Type	Instance Type
Incident_manager_option_for_deployed_state	Numb	Dynam

Attributes	Relationship
REGISTER_INCIDENT_STATUS	or(1)
OPERATOR_ABANDONS_STRATEGY_CHANGES	or(1)
OPERATOR_CONFIRMS_STRATEGY_CHANGES	or(1)
END_EDIT_SESSION	or(1)
START_EDIT_SESSION	or(1)
CANCEL_UNVALIDATED_STRATEGY	or(1)
CONFIRM_DEPLOYMENT_OF_UNVALIDATED_STRATEGY	or(1)
NEW_USER_MODE	or(1)
RETRIEVE_OPERATIONAL_DATA	or(1)

Incident manager option for monitor state

Data Description

This flow defines the options which are available to the Incident Manager User in the different operating states.

DD Entry Components

Name	Data Type	Instance Type
Incident_manager_option_for_monitor_state	Numb	Dynam

Attributes	Relationship
CLEAR_IMPLEMENTED_STRATEGY	or(1)
NEW_USER_MODE	or(1)
RETRIEVE_OPERATIONAL_DATA	or(1)
REGISTER_INCIDENT_STATUS	or(1)

Incident manager option for proposed state

Data Description

This flow defines the options which are available to the Incident Manager User in the proposed state.

DD Entry Components

Name	Data Type	Instance Type
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Incident_manager_option_for_proposed_state	Numb	Dynam
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Attributes	Relationship
SELECT_ALTERNATIVE_STR ATEGY	or(1)
REGISTER_INCIDENT_STATUS	or(1)
SELECT_IMPLEMENTED_STR ATEGY_FOR_CLEARANCE	or(1)
OPERATOR_ABANDONS_STR ATEGY_CHANGES	or(1)
OPERATOR_CONFIRMS_STR ATEGY_CHANGES	or(1)
END_EDIT_SESSION	or(1)
START_EDIT_SESSION	or(1)
ABANDON_INCIDENT_RESPO NSE	or(1)
REJECT_PROPOSED_STRATEGY	or(1)
DEPLOY_PROPOSED_STRATEGY	or(1)
NEW_USER_MODE	or(1)
RETRIEVE_OPERATIONAL_DATA	or(1)

Incident manager option for warned state

Data Description

This flow defines the options which are available to the Incident Manager User in the different warned state.

DD Entry Components

Name	Data Type	Instance Type
Incident_manager_option_for_warned_state	Numb	Dynam
Attributes		
Relationship		
CLEAR_IMPLEMENTED_STR ATEGY	or(1)	
NEW_USER_MODE	or(1)	
RETRIEVE_OPERATIONAL_DATA	or(1)	
REGISTER_INCIDENT_STATUS	or(1)	

Incident manager user option

Data Description

This flow defines the options which are available to the Incident Manager User in the different operating states.

DD Entry Components

Name	Data Type	Instance Type
Incident_manager_user_option	Numb	Dynam
Attributes		
Relationship		

Incident_manager_option_for_deployed_state	or(1)
Incident_manager_option_for_proposed_state	or(1)
Incident_manager_option_for_warned_stated	or(1)
Incident_manager_option_for_monitor_state	or(1)

Incident predicted report

Data Description

The Operator will complete this type of report if the it is decided through observation of prevailing conditions or some other mechanism that the likelihood of an estimated incident is high enough to warrant preventative action. The Operator_id will be automatically entered by the system.

DD Entry Components

Name	Data Type	Instance Type
Incident_predicted_report	Set	Entity
Attributes		
Reason_for_prediction	mand	
Associated_incident_estimate	mand	
Complete_verification_information	mand	
Operator_id	mand	
Relationship		

Incident prediction

Data Description

An incident prediction event occurs when the Operator completes an Incident_predicted_report. An Incident_alert will be raised as a result of an Incident_predicted_report. The incident prediction will include the id of the associated incident estimate, the id of the report, the id of the estimated incident and the probability of the incident estimate.

DD Entry Components

Name	Data Type	Instance Type
Incident_prediction	Set	Entity
Attributes		
Verification_source	mand	
Verification_method	mand	
Incident_id	mand	
Incident_probability	mand	
Incident_report_id	mand	
Incident_estimate_id	mand	
Relationship		

Incident prevented report

Data Description

The Operator will complete this type of report if it decided that the conditions which caused an Incident_estimate have been removed or reduced to an extent which allows the Incident Management Strategy to be removed.

DD Entry Components

Name	Data Type	Instance Type
Incident_prevented_report	Set	Entity
Attributes		
Report_date_and_time	mand	
Reason_for_prevention	mand	
Incident_id	mand	
Operator_id	mand	
Relationship		

Incident probability

Data Description

The probability of an incident will be specified as a percentage although it will be presented to the operator as a range of values.

DD Entry Components

Name	Data Type	Instance Type
Incident_probability	Numb	Attri
Attributes		
PERCENTAGE	mand	
Relationship		

Incident rehearsal frame

Data Description

The PRIME System will provide off-line facilities to rehearse effectiveness of new strategies using either historical incidents or invented incidents. The information presented at the display will replicate the information presented for a real time incident

DD Entry Components

Name	Data Type	Instance Type
Incident_rehearsal_frame	Set	Dynam
Attributes		
Traffic_control_device	mand	
Road_network_link	mand	
Relationship		

Incident rejected report

Data Description

The Operator will complete this type of report if the it is decided through observation of prevailing traffic conditions or by notification from a trusted source that an incident detection or estimate was a false alarm.

DD Entry Components

Name	Data Type	Instance Type
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Incident_rejected_report	Set	Entity
Attributes		Relationship
Reason_for_incident_rejection	mand	
Report_date_and_time	mand	
Incident_location	mand	
Detection_code	mand	
Incident_id	mand	
Operator_id	mand	

Incident report

Data Description

The operator will manually change the status of an incident by completing an incident report. If the manually entered status conflicts with the information held by the system the status entered by the Operator will take precedence.

DD Entry Components

Name	Data Type	Instance	Type
Incident_report	Set		Entity
Attributes		Relationship	
Incident_rejected_report	or(1)		
Incident_evaluated_report	or(1)		
Incident_prevented_report	or(1)		
Incident_cleared_report	or(1)		
Incident_predicted_report	or(1)		
Incident_verified_report	or(1)		
Incident_detected_report	or(1)		

Incident selected for response

Data Description

If the system contains more than one verified or predicted incident the operator may elect to respond to an earlier incident if it is considered more critical.

DD Entry Components

Name	Data Type	Instance	Type
Incident_selected_for_response	Num		Dynam
Attributes		Relationship	
Incident_id	opt(1)		

Incident selected for strategy redeployment

Data Description

This information specifies an incident which has been selected for strategy redeployment because the conditions on the ground have changed.

DD Entry Components

Name	Data Type	Instance Type
Incident_selected_for_strategy_redeployment	Numb	Dynam

Attributes	Relationship
Incident_id	opt(1)

Incident severity

Data Description

The severity of the incident will be defined in terms of the number of vehicles involved, casualties and the presence or spillage of hazardous goods.

DD Entry Components

Name	Data Type	Instance Type
Incident_severity	Set	Attri

Attributes	Relationship
Presence_of_hazardous_goods	mand
Number_of_casualties	mand
Vehicles_involved_in_incident	mand

Incident status

Data Description

Usually when the incident status is reported as Incident_detected a corroborating detection will be required to verify that an incident has occurred. However when the Incident_detected status comes from a trusted source such as the Emergency Services, the Operator or a civilian patrol authorised by the local authority, the detection of an incident can also be taken as a verification. The Incident Status can be changed either by the system or the Operator, for example the System may detect an incident through roadside equipment or the Operator may detect an incident by observation using a CCTV camera which has not been detected by the roadside. A conflict could arise between the System and the Operator if, for example, a detector, which the Operator knows is faulty, repeatedly generates initial and corroborating detections and verifies an incident which the Operator registers as a false alarm. In all cases of conflict between the System and Operator the Operator setting of the Incident Status will take precedence.

DD Entry Components

Name	Data Type	Instance Type
Incident_status	Set	Attri

Attributes	Relationship
Incident_type	mand
Incident_location	mand
Incident_id	mand
INCIDENT_EVALUATED	or(1)
INCIDENT_PREDICTED	or(1)
INCIDENT_VERIFIED	or(1)
INCIDENT_REJECTED	or(1)
INCIDENT_ESTIMATED	or(1)
INCIDENT_DETECTED	or(1)

Incident status request

Data Description

The incident status is requested to either verify a detected incident and obtain further details or to obtain an update on an incident which has been verified.

DD Entry Components

Name	Data Type	Instance Type
Incident_status_request	Numb	Dynam
Attributes		
Incident_id	mand	
PRIME_System_id	mand	

Incident type

Data Description

The Incident_type will specify the severity in terms of number vehicles, casualties and the incident impact on the road capacity.

DD Entry Components

Name	Data Type	Instance Type
Incident_type	Set	Attri
Attributes		
Road_capacity_impact	mand	
Incident_severity	mand	

Incident verification

Data Description

An Incident_verification event will occur if the incoming incident data satisfies the Incident_verification_rule or the operator completes an Incident_verified_report.

DD Entry Components

Incident verification rule

Data Description

The verification rule defines whether and how the the system will confirm the occurrence of incidents. If all the rules are active they must all be satisfied, otherwise only the active rule(s) need to be satisfied.

DD Entry Components

Name	Data Type	Instance Type
Incident_verification_rule	Set	Entity
Attributes		
Estimated_corroboration_rule	mand	
Adjacent_upstream_rule	mand	
Corroborating_detection_rule	mand	
Trusted_source_rule	mand	

Incident verified or predicted

Data Description

This information indicates that the specified incident has been verified or predicted and that the details are available in the Traffic_incident store.

DD Entry Components

Name	Data Type	Instance Type
Incident_verified_or_predicted	Numb	Dynam
Attributes		Relationship
Incident_id		mand

Incident verified report

Data Description

An Incident_verified_report will be completed if the Operator detects an incident through observation of the Road_network or through information provided by a trusted source. The Operator_id will automatically be recorded when the report is completed.

DD Entry Components

Name	Data Type	Instance Type
Incident_verified_report	Set	Entity
Attributes		Relationship
Incident_report_id		mand
Complete_verification_information		mand
Operator_id		mand

Incident warning

Data Description

An Incident_warning will be raised when an incident is detected or estimated. The warning will be presented to the Operator visually by an animated symbol together with the information below which will allow the operator to decide if the incident requires an immediate response or if it can be deferred until later. The warning will remain on the display until it is either acknowledged or deferred.

DD Entry Components

Name	Data Type	Instance Type
Incident_warning	Set	Entity
Attributes		Relationship
Warning_response_option		mand
Incident_probability		mand
Incident_type		mand
Incident_location		mand
Detection_code		mand
Incident_id		mand
Warning_status		mand

Incident warnings from remote systems

Data Description

This information is received from other systems which may be geographically distant but in a bordering regional road network. Events in bordering road networks under different regional control may have an impact on the region controlled by the PRIME System. For example, an incident which may cause a traffic queue across regional boundaries, or a speeding vehicle which is heading for a neighbouring region and may raise the probability of incidents occurring.

DD Entry Components

Name	Data Type	Instance Type
Incident_warnings_from_remote_systems	Set	Dynam
Attributes	Relationship	
Events_which_may_affect_capacity_or_demand_in_neighbouring_region	mand	
PRIME_System_id	mand	
Events_in_neighbouring_regions_which_may_affect_demand_or_capacity	mand	
Source_of_remote_incident_warnings	mand	

Incident warnings to remote systems

Data Description

This information is sent to other Road Network Management Systems which may be geographically distant but in a bordering regional road network. The PRIME System will advise these systems of incidents which may have secondary effects or increase the probability of incidents in the neighbouring region.

DD Entry Components

Name	Data Type	Instance Type
Incident_warnings_to_remote_systems	Set	Dynam
Attributes	Relationship	
Travel_time_impact	mand	
Incident_type	mand	
Incident_location	mand	
Detection_date_and_time	mand	
Incident_id	mand	

Information dissemination plan

Data Description

The information dissemination plan shall identify the information will be broadcast to potential road users by the service provider.

DD Entry Components

Name	Data Type	Instance Type
Information_dissemination_plan	Set	Attri
Attributes	Relationship	

Vehicles_involved_in_incident	mand
Incident_status	mand
Estimated_travel_time_impact	mand
Detection_date_and_time	mand
Incident_type	mand
Incident_id	mand
Information_dissemination_service_provider	mand

International hazard rating

Data Description

This information denotes the international symbols used for the transportation of hazardous goods. This is an orange symbol indicating the hazard and the handling requirements. The hazard rating will be identified by a unique code.

DD Entry Components

Name	Data Type	Instance Type
International_hazard_rating	Set	Attri
Attributes	Relationship	
NUMBER	mand	

Lane identifier

Data Description

This information will specify a single lane in the road network. The format of this information will depend on the standards used by a particular region or country. It is anticipated that on multi-lane highways the roads will be numbered from the hard shoulder in towards the hard shoulder out; however, the PRIME System will be capable to applying whichever format is required.

DD Entry Components

Name	Data Type	Instance Type
Lane_identifier	Numb	Attri
Attributes	Relationship	
LANE_IDENTIFIER	mand	

Law enforcement vehicle corridor demand

Data Description

A law enforcement vehicle in pursuit of a suspect will demand priority at junctions. This alone is not an incident as the demand will return to normal in seconds before any congestion builds up however the probability of an incident increases in this situation so this flow is included as an input to the Estimate incident probability function

DD Entry Components

Name	Data Type	Instance Type
Law_enforcement_vehicle_corridor_demand	Set	Dynam

Attributes

Link_id

Relationship

mand

Light conditions***Data Description***

The PRIME system uses the prevailing light conditions as a general measure of visibility which is related to either the time of day or environmental factors such as the angle and position of the sun. The measurement is expressed as a numeric code.

DD Entry Components**Name**

Light_conditions

Data Type Instance Type

SUN_BLI Attr

Attributes

LOW

Relationship

or(1)

DARK

or(1)

DUSK

or(1)

LIGHT

or(1)

Link id***Data Description***

Each link on the Road_network will have a unique identifier.

DD Entry Components**Name**

Link_id

Data Type Instance Type

Numb Attr

Attributes

UNIQUE_NUMBER

Relationship

mand

Link incident state***Data Description***

This information defines the state of any detected, estimated, verified or predicted incidents which have occurred on the road network link.

DD Entry Components**Name**

Link_incident_state

Data Type Instance Type

Numb Attr

Attributes

INCIDENT_PREDICTED

Relationship

or(1)

INCIDENT_VERIFIED

or(1)

INCIDENT_ESTIMATED

or(1)

INCIDENT_DETECTED

or(1)

NO_INCIDENT

or(1)

Link traffic state***Data Description***

This information defines the state of the Traffic_flow on a link.

DD Entry Components

Name	Data Type	Instance Type
Link_traffic_state	Numb	Attri
Attributes	Relationship	
FREE_FLOWING	or(1)	
AT_CAPACITY	or(1)	
STOPPED	or(1)	

List of historical traffic incidents

Data Description

This information will be displayed when the system is used for strategy development and the Operator wants to rehearse a strategy using data from an historic incident.

DD Entry Components

Name	Data Type	Instance Type
List_of_historical_traffic_incidents	Set	Entity
Attributes	Relationship	
Weather_conditions	mand	
Vehicles_involved_in_incident	mand	
Deployed_incident_management_strategy	mand	
Deployed_incident_management_statusgy	mand	
Incident_id	mand	

List of incident management strategies

Data Description

This information will be displayed when the Operator has either rejected a proposed strategy or decided to clear an implemented strategy. Each entry in the list will consist of the following. If the strategy is deployed at more than one incident there will be an entry associated with each deployment.

DD Entry Components

Name	Data Type	Instance Type
List_of_incident_management_strategies	Set	Entity
Attributes	Relationship	
Incident_id	mand	
Incident_management_strategy_deployment_mode	mand	
Strategy_validation_status	mand	
Strategy_deployment_status	mand	
Incident_management_strategy_id	mand	

Local weather and visibility alert

Data Description

The PRIME System will receive data on local weather conditions from sensors situated at strategic points on the Road Network.

DD Entry Components

Name	Data Type	Instance Type
Local_weather_and_visibility_alert	Set	Attri
Attributes	Relationship	
Abnormal_temperature_alert	mand	
Low_visibility_warning	mand	
High_winds_alert	mand	
Location_of_detector	mand	

Location of event

Data Description

This information will specify the location of leisure events such as sporting and cultural activities.

DD Entry Components

Name	Data Type	Instance Type
Location_of_event	Text	Dynam
Attributes	Relationship	
CONCERT_VENUE	or(1)	
STADIUM_NAME	or(1)	

Low visibility warning

Data Description

Meteorological detectors positioned around the road network will inform the PRIME system of the measured visibility if it falls below a specified threshold.

DD Entry Components

Name	Data Type	Instance Type
Low_visibility_warning	Numb	Attri
Attributes	Relationship	
Visibility	mand	

Mandatory detection information

Data Description

This is the minimum amount of information required to identify that an incident has occurred and then to proceed to verify the incident.

DD Entry Components

Name	Data Type	Instance Type
Mandatory_detection_information	Set	Attri
Attributes	Relationship	
Detection_date_and_time	mand	

Incident_location	mand
Detection_code	mand

Mandatory driver control plan

Data Description

This information shall specify the road side devices which are required to implement the mandatory component of a traffic control strategy. The device settings are determined by the incident management rules.

DD Entry Components

Name	Data Type	Instance	Type
Mandatory_driver_control_plan	Numb	Attri	
Attributes		Relationship	
Road_side_device_id		mand	

Mandatory driving restriction

Data Description

This information defines traffic control instructions, such as speed restrictions, which will be legally enforced. The specific instructions and the penalty for violation will depend on the location of the PRIME System. The restriction will be defined by a code which is recognised by the equipment which implements the restriction.

DD Entry Components

Name	Data Type	Instance	Type
Mandatory_driving_restriction	Numb	Attri	
Attributes		Relationship	
DRIVING_RESTRICTION_CODE		mand	

Mechanical conditions on road surface

Data Description

The mechanical condition of the road surface will be specified as either clear (indicating no damage), in need of repair (indicating that the road surface requires maintenance but does not provide a safety hazard) or critical, in which case the surface condition could compromise the safety of road users.

DD Entry Components

Name	Data Type	Instance	Type
Mechanical_conditions_on_road_surface	or(1)	Attri	
Attributes		Relationship	
CRITICAL_DAMAGE		mand	
IN_NEED_OF_REPAIR		or(1)	
CLEAR		or(1)	

Missing data warning

Data Description

The Missing_data_warning will be raised when the system detects an incident which according to the

Verification_rule confirms a detected or estimated incident but the information recorded with either the original or corroborating data is not sufficient to select an incident management strategy. The warning will be presented to the Operator visually by an animated symbol together with the information below which will allow the operator to decide if the incident requires an immediate response or if it can be deferred until later. The warning will remain on the display until it is either acknowledged or deferred

DD Entry Components

Name	Data Type	Instance Type
Missing_data_warning	Set	Entity
Attributes		
Data_required_for_verification	mand	
Corroborating_incident_id	mand	
Original_incident_id	mand	
Warning_status	mand	

Navigation option for road network display

Data Description

This represents the instructions for moving around the road network as it appears at the Operator Display. The actual mechanism used to achieve this will depend on the technology used for the display and the input devices; however, it will be possible with a single operation of the input device to move around one level of detail or also with a single operation change the level of detail displayed.

DD Entry Components

Name	Data Type	Instance Type
Navigation_option_for_road_network_display	Numb	Dynam
Attributes		
OPERATOR_ACTION	mand	

Number of casualties

Data Description

The total number of casualties may not be known immediately after an incident but it is critical that all known injuries are reported. Even if the Number_of_casualties is initially reported as zero secondary or latent injuries may manifest themselves minutes, hours or even days later. It is the responsibility of the ground team to report the number of injuries and insure that everyone who leaves the scene of an incident is medically fit.

DD Entry Components

Name	Data Type	Instance Type
Number_of_casualties	Numb	Attri
Attributes		
NUMBER	mand	

Number of lanes over test section

Data Description

This is the assigned number of lanes for the road link in question regardless of temporary changes due

to maintenance work or narrowing of the road due to environmental or geographic considerations. For example in the UK motorways are assigned as 3 lane roads but may be reduced to two lanes if the road runs through an area which would be environmentally damaged by a wider road the number of lanes may for a short distance be reduced to 2.

DD Entry Components

Off line traffic incident display

Data Description

This input represents an incident as it is played back to the operator for the purposes of strategy development or evaluation. The information will appear on the display as if it were an incident occurring in real time.

DD Entry Components

Name	Data Type	Instance	Type
Off_line_traffic_incident_display	Set		Dynam
Attributes		Relationship	
Strategy_rehearsal_frame		or(1)	
Incident_playback_frame		or(1)	

Operational report

Data Description

The information in this flow is presented by the system in response to the Operator request defined by Retrieve_operational_data.

DD Entry Components

Name	Data Type	Instance	Type
Operational_report	Set		Dynam
Attributes		Relationship	
Strategy_deployment_history		or(1)	
Implemented_strategy		or(1)	
Non_active_incident_report		or(1)	
Active_incident_report		or(1)	

Operator display

Data Description

The PRIME System shall support 4 User modes and within each mode the operational status will be determined by the existence of incidents on the road network and the actions of the Operator. The Interface will display the user mode and the operational status to the Operator together with a representation of the road network showing the traffic flow and incident status on specific links. The road network display will also show the status of traffic control devices and the location and readings from traffic monitoring equipment: Provide_incident_management_operator_interface. The display context of the Operator_display will be defined by the User_mode_indicator, the Operational_status_indicator and the Road_network_display.

DD Entry Components

Operator_id

Data Description

Each Operator of the PRIME System will be known to the system by a unique alphanumeric identifier.

DD Entry Components

Name	Data Type	Instance Type
Operator_id	Set	Attri
Attributes	Relationship	
User_name	mand	

Operator_session

Data Description

The PRIME System will record the start and end of each Operator session.

DD Entry Components

Name	Data Type	Instance Type
Operator_session	Set	Entity
Attributes	Relationship	
Operator_session_end	mand	
Operator_session_start	mand	
User_mode	mand	
Operator_id	mand	

Operator_status_indicator

Data Description

This data which is permanently displayed at the Operator Interface defines the Operational Status of the system in relation to the management of an incident.

DD Entry Components

Name	Data Type	Instance Type
Operator_status_indicator	Numb	Entity
Attributes	Relationship	
DEPLOYED	or(1)	
PROPOSED	or(1)	
ALERTED	or(1)	
MONITOR	or(1)	

Original_incident_id

Data Description

This information identifies the incident which has been corroborated by a later incident.

DD Entry Components

Name	Data Type	Instance Type
Original_incident_id	Numb	Attri
Attributes	Relationship	
Incident_id	mand	

Permitted device settings

Data Description

This information defines the mandatory and advisory traffic controls which can be implemented by a specific type of road-side equipment. The data depend on both the capabilities of the equipment and the legislation of the region or country where the PRIME System is installed.

DD Entry Components

Name	Data Type	Instance Type
Permitted_device_settings	Set	Attri
Attributes	Relationship	
Driver_advisory_message	opt(1)	
Mandatory_driving_restriction	opt(1)	

Planned activity warning

Data Description

An Planned_activity_warning will be raised when the system receives a request to use the road network for a special event or activity such as a protest rally or maintenance. The warning will be presented to the Operator visually by an animated symbol together with the information below which will allow the operator to decide if the incident requires an immediate response or if it can be deferred until later. The warning will remain on the display until it is either acknowledged or deferred.

DD Entry Components

Name	Data Type	Instance Type
Planned_activity_warning	Set	Entity
Attributes	Relationship	
Warning_response_option	mand	
Activity_program	mand	
Activity_type	mand	
Source_of_activity_request	mand	
Warning_status	mand	

Precipitation

Data Description

The amount of rain, fog or snow at the time of an incident will be detected.

DD Entry Components

Name	Data Type	Instance Type
Precipitation	Numb	Attri
Attributes	Relationship	

FOG	or(1)
HEAVY_SNOW	or(1)
LIGHT_SNOW	or(1)
HEAVY_RAIN	or(1)
LIGHT_RAIN	or(1)
CLEAR	or(1)

Precise wind direction

Data Description

If road-side weather monitoring equipment is available the wind direction will be measured in degrees.

DD Entry Components

Name	Data Type	Instance	Type
Precise_wind_direction	Numb		Attri
Attributes	Relationship		
DEGREES			mand

Precise wind measurement

Data Description

If an incident occurs in the locality of road-side weather sensing equipment it will be measured in m/s.

DD Entry Components

Name	Data Type	Instance	Type
Precise_wind_measurement	Numb		Attri
Attributes	Relationship		
METRES_PER_SECOND			mand

Presence of hazardous goods

Data Description

The system will record information about the presence of hazardous goods at an incident site, including the hazard rating according to the vehicle marking, the specific identification of the material or goods if known and whether the goods are in place or spilled on the road.

DD Entry Components

Name	Data Type	Instance	Type
Presence_of_hazardous_goods	Set		Attri
Attributes	Relationship		
Condition_of_hazardous_goods			mand
Description_of_hazardous_goods			mand
International_hazard_rating			mand

PRIME System id

Data Description

The PRIME System will have a unique identifier which will be unique to all installations world wide.

DD Entry Components

Name	Data Type	Instance	Type
PRIME_System_id	Numb		Attri
Attributes	Relationship		
UNIQUE_NUMBER			mand

Prompt for operator action

Data Description

A prompt will be displayed when the system requires the operator to either make a decision or provide information. The prompt will consist of Static_text which is common to all uses of the prompt and Dynamic_text which will be updated with information from the system which is relevant to the context in which the prompt is used. The Static_text will be configurable so that it can be translated and used for different natural languages. The Prompt_id will allow the different natural language translations to be associated with one prompt

DD Entry Components

Name	Data Type	Instance	Type
Prompt_for_operator_action	Set		Dynam
Attributes	Relationship		
Dynamic_text			mand
Static_text			mand
Prompt_id			mand

Proposed incident management strategy

Data Description

This information specifies the incident management strategy which has been proposed for deployment. The proposed strategy will include device settings which have been determined by the incident management rules. The proposed strategy will be deleted when the operator confirms or rejects it.

DD Entry Components

Name	Data Type	Instance	Type
Proposed_incident_management_strategy		Set	Entity
Attributes	Relationship		
Control_device_setting			mand
Incident_management_strategy			mand

Public transport incident notification

Data Description

The PRIME System will advise operators of Public Transport Fleets of verified incidents in the Road Network.

DD Entry Components

Name	Data Type	Instance	Type
Public_transport_incident_notification	Set		Dynam

Attributes	Relationship
Travel_time_impact	mand
Incident_type	mand
Incident_location	mand
Incident_id	mand

Public transport road vehicle incident warning

Data Description

The Operators of Public Transport Vehicles travelling through the Road Network will inform the PRIME System of any incidents involving their vehicles. It will be expected that the informant will provide at least enough information to attempt to verify the incident.

DD Entry Components

Name	Data Type	Instance Type
Public_transport_road_vehicle_incident_warning	Set	Dynam

Attributes	Relationship
Complete_verification_information	or(1)
Mandatory_detection_information	or(1)
Id_of_notifying_source	mand

Queue length

Data Description

This value will record the upstream queue length from a verified incident and it will be updated throughout the lifecycle of the incident.

DD Entry Components

Name	Data Type	Instance Type
Queue_length	Numb	Attri

Attributes	Relationship
METRES	mand

Re routing plan

Data Description

This information will specify the devices which are required to implement the re-routing component of a traffic control plan. The device settings are determined by the incident management rules.

DD Entry Components

Name	Data Type	Instance Type
Re_routing_plan	Numb	Attri

Attributes	Relationship
Road_side_device_id	mand

Real travel time impact

Data Description

This value will record the worst case travel time impact which occurred during the course of the incident.

DD Entry Components

Name	Data Type Instance Type
Real_travel_time_impact	Numb Attri
Attributes	Relationship
HOURS	mand

Reason for failure

Data Description

The Reason_for_failure shall specify why the implementation of an Incident_management_strategy failed and if it is due to faulty equipment it will be identified.

DD Entry Components

Name	Data Type Instance Type
Reason_for_failure	Set Dynam
Attributes	Relationship
(Traffic_control_device)	opt(1)
NO_RESPONSE_FROM_IMPLEMENTATION_SYSTEM	mand
EQUIPMENT_FAILURE	or(1)

Reason for prediction

Data Description

The Incident_prediction_report will include a mandatory field which will be used to record the reasons for confirming the estimated incident as a prediction. The information will be a description provided by the Operator.

DD Entry Components

Name	Data Type Instance Type
Reason_for_prediction	Text Attri
Attributes	Relationship
VARIABLE_TEXT	mand

Reason for service disruption

Data Description

This information will specify why a transport service will be disrupted. The reason could be industrial action, failure of equipment however because there is a wide range of possibilities the reason will be described as free text rather than a fixed code.

DD Entry Components

Name	Data Type Instance Type
Reason_for_service_disruption	Text Attri
Attributes	Relationship

VARIABLE_TEXT_STRING mand

Region affected by service disruption

Data Description

This information will specify the area or region affected by the disruption of a transport service. The transport service provider may not share the same notation as the PRIME System for describing the geographical area affected so the information will be in free text.

DD Entry Components

Name	Data Type	Instance Type
Region_affected_by_service_disruption	Text	Attri
Attributes	Relationship	
VARIABLE_TEXT_STRING	mand	

Report date and time

Data Description

All reports completed by the Operator will be automatically date and time stamped.

DD Entry Components

Name	Data Type	Instance Type
Report_date_and_time	Set	Attri
Attributes	Relationship	
Date_and_time	mand	

Request for ad hoc weather report

Data Description

Scheduled weather reports will be provided by the weather systems terminator but the PRIME System may also require unscheduled updates to evaluate requests for a journey by a load which is vulnerable to high winds.

DD Entry Components

Name	Data Type	Instance Type
Request_for_ad_hoc_weather_report	Set	Dynam
Attributes	Relationship	
Period_to_be_covered_by_forecast	mand	
Date_and_time_request_made	mand	
Region_to_be_covered_by_forecast	mand	
Source_of_request_for_ad_hoc_weather_forecast	mand	

Request incident location correction

Data Description

If the PRIME System detects an inconsistency in the incident data received from a road-user it will

identify the error and request the user to try again. The information shall consist of Static_text which will be common to all instances of the flow and Dynamic_text which will be set to the value of the data which are in error.

DD Entry Components

Name	Data Type	Instance Type
Request_incident_location_correction	Set	Dynam
Attributes	Relationship	
Dynamic_text	mand	
Static_text	mand	

Requested schedule of planned events

Data Description

The service provider will submit schedules fo planned activities and events to the PRIME System for approval.

DD Entry Components

Name	Data Type	Instance Type
Requested_schedule_of_planned_events	Set	Dynam
Attributes	Relationship	
End_date_and_time_of_event	mand	
Location_of_event	mand	
Start_date_and_time_of_event	mand	
Route_of_event	mand	
Source_of_activity_request	mand	

Results of incident management strategy

Data Description

The remote systems will advise the PRIME System of whether the actual settings on the devices specified by the strategy implementation request and this information will be used to determine if the strategy was successfully implemented.

DD Entry Components

Name	Data Type	Instance Type
Results_of_incident_management_strategy	Set	Dynam
Attributes	Relationship	
Implementation_request_id	mand	
Traffic_surveillance_device	or(1)	
Traffic_control_device	or(1)	
Device_owner	mand	

Road block demand

Data Description

It may be necessary for Law Enforcement Agencies to set up temporary road blocks. Usually this will be required with immediate effect and the ground team will ensure that the effects in the immediate vicinity do not cause a danger to other road users however it will be necessary for PRIME System to

warn road users of the restriction.

DD Entry Components

Name	Data Type	Instance Type
Road_block_demand	Set	Dynam
Attributes		
Date_and_time_of_demand	mand	
Location_of_road_block	mand	
Relationship		

Road capacity impact

Data Description

The impact of an incident on the road capacity will be defined as the ration of lanes available to traffic after the incident and the number of lanes normally available to traffic, expressed as a percentage. The hard shoulder is excluded from this figure; so, if an incident blocks all traffic lanes but leaves the hard shoulder open the road capacity impact is 100% closed.

DD Entry Components

Name	Data Type	Instance Type
Road_capacity_impact	numb	Attri
Attributes		
PERCENTAGE	mand	
Relationship		

Road capacity restored to normal date and time

Data Description

This will be the date and time when the ground team report that the traffic flow has been restored to normal and the ground conditions have been made safe. At this point the System will remove the incident response. The difference between this time and the Dectation_date_and_time will be the incident duration.

DD Entry Components

Name	Data Type	Instance Type
Road_capacity_restored_to_normal_date_and_time	Set	Dynam
Attributes		
Date_and_time	mand	
Relationship		

Road direction

Data Description

The Road_direction will specify the general direction of a carriageway or road in terms of it's geographic location. This will by it's nature be an approximation but it may be the best information available.

DD Entry Components

Name	Data Type	Instance Type
Road_direction	Text	Attri

Attributes	Relationship
EAST_BOUND	mand
WEST_BOUND	mand
SOUTH_BOUND	mand
NORTH_BOUND	mand

Road identifier

Data Description

This information will uniquely identify a road within the PRIME Systems Road Network. It is anticipated that a road identifier will specify the type of road and a unique number however the PRIME System will be capable of application in regions and countries where different schema are used.

DD Entry Components

Name	Data Type	Instance Type
Road_identifier	Numb	Attri

Attributes	Relationship
ROAD_NUMBER	mand
ROAD_TYPE	mand
ROAD_NAME_AND_NUMBER	mand

Road network

Data Description

This store is the internal representation of the road network which is used to define the geometry used by the Estimate_incident_probability process and to define the data at the Operator Display.

DD Entry Components

Name	Data Type	Instance Type
Road_network	Set	Entity

Attributes	Relationship
Link_incident_state	mand
Link_traffic_state	mand
Road_network_link	mand

Road network display

Data Description

This flow represents the Road Network and the associated traffic control and surveillance devices as they are displayed to the Operator. The information may represent the whole network, a single link or any amount of detail between. The road network display will include information which defines the region of the road network which is visible to the Operator. The system will provide controls which allow the operator to move the window around the network.

DD Entry Components

Name	Data Type	Instance Type
Road_network_display	Set	Dynam

Attributes	Relationship
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Traffic_surveillance_device	mand
Traffic_control_device	mand
Road_network	mand

Road network link

Data Description

This information defines the geometry of a Road_network link.

DD Entry Components

Name	Data Type	Instance Type
Road_network_link	Numb	
Attributes		
Upstream_link_id	mand	
Presence_of_visual_barriers	mand	
Presence_of_viaduct	mand	
Presence_of_emergency_phone	mand	
Width_of_hard_shoulders	mand	
Presence_of_sharp_curves	mand	
Presence_of_weaving_sections	mand	
Presence_of_on_off_ramps	mand	
Changes_in_the_number_of_lanes	mand	
Number_of_lanes_over_test_section	mand	
Link_id	mand	

Road planner user options

Data Description

This flow defines the options which are available to the Road Planner User in the different Operating states.

DD Entry Components

Name	Data Type	Instance Type
Road_planner_user_options	Numb	Dynam
Attributes		
TBA	mand	

Road side device id

Data Description

Each detection or control device will be identified to the PRIME System by a value which is unique within the equipment type.

DD Entry Components

Name	Data Type	Instance Type
Road_side_device_id	Numb	Attri
Attributes		
UNIQUE_NUMBER	mand	

Road surface conditions

Data Description

The PRIME System will receive information on the condition of the road surface from strategically positioned sensors.

DD Entry Components

Name	Data Type	Instance Type
Road_surface_conditions	Set	Entity
Attributes		Relationship
Mechanical_conditions_on_road_surface	mand	
Environmental_conditions_on_road_surface	mand	
Location_of_measurement	mand	

Road user data entry instructions

Data Description

These will either be transmitted verbally via a telephone call or electronically through the screen of a mobile computing device such as a WAP telephone. The information will consist of static text which provides the instructions and Dynamic_text which is specific to the current instruction.

DD Entry Components

Name	Data Type	Instance Type
Road_user_data_entry_instructions	Text	Dynam
Attributes		Relationship
Dynamic_text	mand	
Static_text	mand	

Road user incident notification

Data Description

This is the information received either verbally from a road-user or through a mobile communications devices. Ideally these data would provide all the information required to implement an Incident Management Strategy; however, it may only be possible to acquire enough information to attempt to verify the incident. The Operator will use the information provided to complete an Incident_detected_report. The minimum information required from a caller to at least be able to attempt to verify an incident is as follows.

DD Entry Components

Route of event

Data Description

The route for a planned activity for event will be defined in terms of the roads used and the direction the event will be taking. Not all planned activities will involve a route as for example recreational events will take place at one location and it will be the responsibility of the PRIME System to determine the best approach and exit routes.

DD Entry Components

Name	Data Type	Instance Type
Route_of_event	Text	Dynam
Attributes		Relationship
Road_identifier		mand

Routine maintenance proposals

Data Description

The organisations responsible for maintaining the Road Network Infrastructure will advise the PRIME System of the proposed maintenance schedule which will be evaluated for conflicts with other events which affect the road network capacity/demand, such as but not limited to the start and end of the working day or organised events and either confirmed or revised on this basis.

DD Entry Components

Selected incident management strategy

Data Description

When a list of incident management strategies are presented to the Operator the id of the strategy selected will be written to this store. It will be possible to change the selection indefinitely until the user options

Select_alternative_strategy or Select_implemented_strategy_for_clearance are selected

DD Entry Components

Name	Data Type	Instance Type
Selected_incident_management_strategy	Numb	Dynam
Attributes		Relationship
Incident_management_strategy_id		mand

Selected traffic incident

Data Description

This option will be selected when the Operator has decided which traffic incident to use for strategy rehearsal.

DD Entry Components

Name	Data Type	Instance Type
Selected_traffic_incident	Numb	Dynam
Attributes		Relationship
Incident_id		mand

Sentinel option for alerted state

Data Description

This flow defines the options which are available for the alerted state in the Sentinel User Mode.

DD Entry Components

Name	Data Type	Instance Type
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Sentinel_option_for_alerted_state	Numb	Dynam
Attributes	Relationship	
NEW_USER_MODE	or(1)	
RETRIEVE_OPERATIONAL_D	or(1)	
ATA		
REGISTER_INCIDENT_STATE	or(1)	

Sentinel option for monitor state

Data Description

This flow defines the options which are available for the monitor state in the Sentinel User Mode.

DD Entry Components

Name	Data Type	Instance Type
Sentinel_option_for_monitor_state	Numb	Dynam
Attributes	Relationship	
NEW_USER_MODE	or(1)	
RETRIEVE_OPERATIONAL_D	or(1)	
ATA		
REGISTER_INCIDENT_STATE	or(1)	

Sentinel option for warned state

Data Description

This flow defines the options which are available for the warned state in the Sentinel User Mode.

DD Entry Components

Name	Data Type	Instance Type
Sentinel_option_for_warned_state	Numb	Dynam
Attributes	Relationship	
NEW_USER_MODE	or(1)	
RETRIEVE_OPERATIONAL_DATA	or(1)	
REGISTER_INCIDENT_STATE	or(1)	

Sentinel user option

Data Description

This flow defines the options which are available for the different Operational States in the Sentinel User Mode.

DD Entry Components

Name	Data Type	Instance Type
Sentinel_user_option	Numb	Dynam
Attributes	Relationship	
Sentinel_option_for_alerted_state	or(1)	
Sentinel_option_for_warned_state	or(1)	
Sentinel_option_for_monitor_state	or(1)	

Service provider incident notification

Data Description

The Information_dissemination_plan component of the Incident_management_strategy will be implemented by External Service Providers. They will determine the most appropriate medium for broadcasting the information to the target audience. The External Service Provider will be informed when the incident is verified and when it is cleared.

DD Entry Components

Name	Data Type	Instance Type
Service_provider_incident_notification	Set	Dynam
Attributes	Relationship	
Estimated_travel_time_impact	mand	
Vehicles_involved_in_incident	mand	
Incident_type	mand	
Detection_date_and_time	mand	
Incident_status	mand	
Incident_id	mand	
PRIME_System_id	mand	

Severe weather warning

Data Description

Predictions of severe weather will be provided by the Weather Systems which cover the road network region.

DD Entry Components

Name	Data Type	Instance Type
Severe_weather_warning	Set	Dynam
Attributes	Relationship	
High_precipitation_weather_warning	mand	
Temperature_weather_warning	opt(1)	
High_winds_weather_warning	opt(1)	
Period_covered_by_weather_warning	opt(1)	
Date_and_time_severe_weather_warning_made	mand	
Region_covered_by_weather_warning	mand	

Source for verification rule

Data Description

The system will be configured so that incidents can be automatically verified if the incoming incident data satisfies a set of verification rules. The flow specified the sources of the events which satisfied one or more of these rules.

DD Entry Components

Name	Data Type	Instance	Type
Source_for_verification_rule	Numb		Attri
Attributes		Relationship	
Incident_estimate_id	opt(1)		
Upstream_incident_id	opt(1)		
Corroborating_incident_id	opt(1)		
TRUSTED_SOURCE_CODE	opt(1)		

Special road freight load confirmation

Data Description

The PRIME System will output this information when the impact of a Special_road_freight_request has been assessed and the journey has been authorised.

DD Entry Components

Name	Data Type	Instance	Type
Special_road_freight_load_confirmation	Set		Dynam
Attributes		Relationship	
Special_road_freight_needs	mand		
Route_of_special_road_freight_journey	mand		
Date_and_time_of_special_road_freight_journey	mand		
Date_and_time_special_road_freight_request_confirmed	mand		
Source_of_road_freight_journey_request	mand		
PRIME_System_id	mand		

Special road freight load request

Data Description

These are requests to transport loads which will impact road capacity because they are either slow moving or wide and may require escort through the network in question. The request will be evaluated for conflicts with other events which affect the road network capacity/demand, such as but not limited to, the start and end of the working day, organised events or road maintenance, and either confirmed or rejected on this basis.

DD Entry Components

Name	Data Type	Instance	Type
Special_road_freight_load_request	Set		Dynam
Attributes		Relationship	
Special_road_freight_needs	mand		
Route_of_special_road_freight_journey	mand		
Date_and_time_of_special_road	mand		

_freight_journey	
Date_and_time_of_special_road _freight_request_made	mand
Source_of_special_road_freight _request	mand

Standard deviation of vehicle speeds per lane and vehicle type

Data Description

This information, which is derived from the Traffic_flow data, is used for estimating incidents.

DD Entry Components

Name	Data Type	Instance	Type
Standard_deviation_of_vehicle_speeds_per_lane_and_vehicle_type	Set	Attri	
Attributes		Relationship	
Vehicle_type		mand	
Standard_deviation_of_vehicle_speeds		mand	

Start date and time of event

Data Description

The date and time of the request or approval for a planned event.

DD Entry Components

Name	Data Type	Instance	Type
Start_date_and_time_of_event	Set	Dynam	
Attributes		Relationship	
Date_and_time		mand	

Static text

Data Description

Information displayed to the operator, displayed at the road-side or transitted to other users of the PRIME System will consist of static text which conveys the general meaning. The specific application of the information for a particular incident or action will be defined by associated dynamic text. The PRIME System will display the Static_text in the language specified by the Operator.

DD Entry Components

Name	Data Type	Instance	Type
Static_text	Text	Attri	
Attributes		Relationship	
VARIABLE_LENGTH_TEXT_STRING		mand	

Strategy deployment history

Data Description

The system will record all instances of an Incident Management strategies deployment to allow for

later evaluation and improvement.

DD Entry Components

Name	Data Type	Instance	Type
Strategy_deployment_history	Set		Attri
Attributes			
Deployment_result	mand		
Strategy_proposed_by_the_system	mand		
Strategy_validation_status	mand		
Method_of_deployment	mand		
Deployment_end_date_and_time	mand		
Deployment_start_date_and_time	mand		
Incident_id	mand		
Deployment_number	mand		
Relationship			

Strategy deployment status

Data Description

This information will specify the status of a strategy in terms of its current use.

DD Entry Components

Name	Data Type	Instance	Type
Strategy_deployment_status	Numb		Attri
Attributes			
STRATEGY_FAILED	or(1)		
STRATEGY_EXPIRED	or(1)		
STRATEGY_IMPLEMENTED	or(1)		
STRATEGY_EXPIRED	or(1)		
STRATEGY_PROPOSED	or(1)		
STRATEGY_DEPLOYED	or(1)		
Relationship			

Strategy developer user options

Data Description

These data define the options which are available to the Strategy Developer in the different Operating States.

DD Entry Components

Name	Data Type	Instance	Type
Strategy_developer_user_options	Numb		Dynam
Attributes			
TBA	mand		
Relationship			

Strategy implementation result

Data Description

This information will define whether a strategy was successfully deployed. The details of the implemented strategy will be defined in the Implemented_strategy store. The Operator Interface will raise a warning in response to these data.

DD Entry Components

Name	Data Type	Instance Type
Strategy_implementation_result	Set	Dynam
Attributes	Relationship	
Strategy_deployment_status	mand	
Incident_management_strategy_id	mand	

Strategy is not validated

Data Description

This data flow will be true if the Operator has attempted to deploy an un-validated strategy and confirmation will be required before this operation can proceed. A strategy is validated by testing it off-line and authorising it for deployment.

DD Entry Components

Name	Data Type	Instance Type
Strategy_is_not_validated	Cont	Dynam
Attributes	Relationship	
TRUE	opt(1)	

Strategy proposal abandoned

Data Description

If the Operator decides to abandon the incident response this data will be true otherwise it will be set to false indicating that the Operator will attempt to find a suitable strategy.

DD Entry Components

Name	Data Type	Instance Type
Strategy_proposal_abandoned	Bool	Dynam
Attributes	Relationship	
FALSE	opt(1)	
TRUE	opt(1)	

Strategy proposal confirmed

Data Description

If the Operator decides to deploy the proposed strategy these data will be true; otherwise they will be false indicating that the Operator wishes to select from a list of alternative strategies.

DD Entry Components

Name	Data Type	Instance Type
Strategy_proposal_confirmed	Bool	Dynam
Attributes	Relationship	

FALSE	opt(1)
TRUE	opt(1)

Strategy selected by operator

Data Description

This information will specify an alternative strategy selected by the Operator for proposal.

DD Entry Components

Name	Data Type	Instance	Type
Strategy_selected_by_operator	Numb		Dynam
Attributes			
Incident_management_strategy_id	opt(1)		
Relationship			

Strategy validation

Data Description

This option will be selected when the Incident Manager has decided to validate a strategy which has been created by the strategy developer.

DD Entry Components

Name	Data Type	Instance	Type
Strategy_validation	Numb		Dynam
Attributes			
Incident_management_strategy_id	mand		
Relationship			

Strategy validation status

Data Description

This information specifies if the strategy has been validated off-line.

DD Entry Components

Name	Data Type	Instance	Type
Strategy_validation_status	Numb		Attri
Attributes			
STRATEGY_UN_VALIDATED	or(1)		
STRATEGY_VALIDATED	or(1)		
Relationship			

Surveillance device setting

Data Description

This information will define the pan, tilt and zoom co-ordinates for a CCTV Camera.

DD Entry Components

Name	Data Type	Instance	Type
Surveillance_device_setting	Numb		Attri
Attributes			
ZOOM_VALUE	mand		
Relationship			

TILT_VALUE	mand
PAN_VALUE	mand

Surveillance plan

Data Description

This defines the component of an incident management strategy which is used to focus CCTV on the area of a detected incident. The information will specify the devices to use and the required co-ordinates.

DD Entry Components

Name	Data Type	Instance	Type
Surveillance_plan	Set		Attri
Attributes			
Surveillance_device_setting	mand		
Road_side_device_id	mand		
Relationship			

Systems strategy deployment mode

Data Description

It will be possible to configure the PRIME System so that incident management strategies can be automatically deployed.

DD Entry Components

Traffic control device

Data Description

This information represents any road-side device which can be used to modify driver behaviour by displaying information or mandatory driving instructions.

DD Entry Components

Name	Data Type	Instance	Type
Traffic_control_device	Set		Attri
Attributes			
Downstream_traffic_control_device	mand		
Upstream_traffic_control_device	mand		
Road_side_device_id	mand		
Current_setting	mand		
Equipment_status	mand		
Permitted_device_settings	or(1)		
Equipment_location	mand		
Equipment_owner	mand		
Equipment_type	mand		
Relationship			

Traffic control plan

Data Description

There are three incident management options which may be used separately or combined. Driver must be warned of all incidents so the Driver_warning_plan is mandatory and if there are CCTV Camera's in appropriate locations these will be positioned according to the Surveillance_plan. The Driver_warning_plan may also include mandatory restrictions to reduce speed or stop. There may be occasions when it is viable to re-route traffic around the incident either by diverting it onto other roads or, on multi-lane inter-urban roads, by closing the affected lane and directing traffic around the problem.

DD Entry Components

Name	Data Type	Instance Type
Traffic_control_plan	Set	Attri
Attributes		Relationship
Mandatory_driver_control_plan	opt(1)	
Adaptive_control_plan	opt(1)	
Surveillance_plan	opt(1)	
Re_routing_plan	opt(1)	
Driver_warning_plan	opt(1)	

Traffic flow

Data Description

This flow represents the raw data which define the relationship between the road capacity and the road demand in the area under observation at the time of the observation. This information, which is used for both incident detection and estimating the probability of incidents is abstract and does not imply any detection method. Traffic flow may be detected automatically by machine vision detectors, loop detectors, microwave or any of the other technologies described in Deliverable 3.2. Traffic flow may also be detected manually by an operator monitoring a CCTV Camera although the Operator will not be able to assign exact figures to these parameters but will be able to ascertain that road capacity, for whatever reason, is not sufficient to meet demand. The logical data flow also does not have a time restriction so it is assumed that it is constantly available for collection at whatever interval is required.

DD Entry Components

Name	Data Type	Instance Type
Traffic_flow	Set	Dynam
Attributes		Relationship
Traffic_volume_per_entry_exit_ramp	mand	
Vehicle_occupancy_per_lane	opt(1)	
Traffic_speed_per_entry_exit_ramp	mand	
Traffic_speed_per_lane	mand	
Vehicle_occupancy_per_entry_exit_ramp	mand	
Traffic_volume_per_lane	mand	

Traffic flow display rule

Data Description

This information will define how the PRIME System displays the state of the Traffic_flow on a link.

DD Entry Components

Name	Data Type	Instance Type
Traffic_flow_display_rule	Set	Attri
Attributes	Relationship	
Traffic_flow_colour	or(1)	
Traffic_flow_animation	mand	
Traffic_flow_status	mand	
Traffic_flow_colour	mand	
Traffic_flow_animation	mand	

Traffic flow parameters for estimating incident probability

Data Description

This flow represents the parameters which have been extracted from the Traffic_flow information for use estimating the probability of incidents. For each lane of each test section the probability estimating algorithm requires traffic volumes and average speeds per vehicle type. It is anticipated that any section will have at most 6 lanes and the vehicles will be classified into 3 types. The standard deviation of the individual vehicle speeds is also required.

DD Entry Components

Name	Data Type	Instance Type
Traffic_flow_parameters_for_estimating_incident_probability	Set	Attri
Attributes	Relationship	
Date_and_time_of_traffic_flow_record	mand	
Detector_location	mand	
Standard_deviation_of_vehicle_speeds_per_lane_by_vehicle_type	mand	
Average_speed_per_lane_by_type_of_vehicle	mand	
Traffic_speed_per_entry_exit_ramp	mand	
Traffic_volume_per_entry_exit_ramp	mand	
Vehicle_occupancy_per_entry_exit_ramp	mand	
Traffic_volume_per_lane_by_vehicle_type	mand	
Vehicle_headway_per_lane_by_vehicle_type	mand	

Traffic flow parameters for incident detection

Data Description

This is the information which is extracted from the Traffic_flow for use by the incident detection algorithms.

DD Entry Components

Name	Data Type	Instance Type
Traffic_flow_parameters_for_incident_detection	Set	Attri

Attributes	Relationship
Date_and_time_of_traffic_flow_record	mand
Detector_location	mand
Average_speed	mand
Average_headway_time_per_vehicle_per_lane	mand
Average_period_of_occupancy_per_vehicle_per_lane	mand

Traffic flow status

Data Description

The PRIME System will present the status of the Traffic_flow on a specific link at the Operator display.

DD Entry Components

Name	Data Type	Instance Type
Traffic_flow_status	Numb	Attri

Attributes	Relationship
STOPPED	or(1)
AT_CAPACITY	or(1)
FREE_FLOWING	or(1)

Traffic incident

Data Description

This store records all the information associated with the Traffic_incident lifecycle, from the point at which the system first becomes aware of the incident until it is evaluated. If the incident has been estimated the Detection_date_and_time will define the estimation date and the Verification_date_and_time will represent the time the Operator entered the Incident_predicted_report. The Verification_code will specify if the incident was predicted or the source of the verification.

DD Entry Components

Name	Data Type	Instance Type
Traffic_incident	Set	Entity

Attributes	Relationship
Verification_code	mand
Detection_code	mand
Incident_status	mand
Detection_date_and_time	mand
Incident_type	mand
Vehicles_involved_in_incident	mand

Weather_conditions	mand
Road_surface_conditions	mand
Incident_id	mand
Verification_date_and_time	mand
Incident_location	mand
Emergency_services_notification_time	mand
Estimated_travel_time_impact	mand
Real_travel_time_impact	mand
Blockage_moved_to_hard_shoulders_date_and_time	mand
Road_capacity_restored_to_normal_date_and_time	mand
Deployed_incident_management_strategy	mand
Queue_length	mand
Visibility	mand

Traffic incident specification

Data Description

This input represents an artificial incident created by the operator for use in the development of strategies.

DD Entry Components

Name	Data Type	Instance	Type
Traffic_incident_specification	Set		Dynam
Attributes	Relationship		
Traffic_incident	mand		

Traffic speed per entry exit ramp

Data Description

The system will record the speed per entry/exit ramp every 30 or 60 seconds depending on the equipment installed at each site.

DD Entry Components

Name	Data Type	Instance	Type
Traffic_speed_per_entry_exit_ramp	Numb		Attri
Attributes	Relationship		
KM_PER_HOUR	mand		

Traffic speed per lane

Data Description

The average speed per lane will be measured every 30 or 60 seconds depending on the equipment installed at each site.

DD Entry Components

Name	Data Type	Instance Type
Traffic_speed_per_lane	Numb	Attri
Attributes	Relationship	
KM_PER_HOUR	mand	

Traffic surveillance device

Data Description

This information represents any road-side device which can be used to monitor the traffic flow on the road network. This includes manual devices such as CCTV cameras used by the Operator and automatic devices such as magnetic loops, infrared or machine vision. If the device is a CCTV camera the information will include values for the pan, tilt and zoom settings.

DD Entry Components

Name	Data Type	Instance Type
Traffic_surveillance_device	Set	Entity
Attributes	Relationship	
Surveillance_device_setting	opt(1)	
Upstream_device_id	mand	
Equipment_status	mand	
Current_reading	mand	
Equipment_location	mand	
Equipment_owner	mand	
Equipment_type	mand	
Road_side_device_id	mand	

Traffic violation

Data Description

Law Enforcement Agencies will inform the PRIME System of any known traffic violations such as an illegally parked car, which could affect the Road Network Capacity.

DD Entry Components

Name	Data Type	Instance Type
Traffic_violation	Set	Dynam
Attributes	Relationship	
Stationary_traffic_offence	or(1)	
Moving_traffic_offence	or(1)	

Traffic volume per entry exit ramp

Data Description

The volume per entry/exit ramp will be provided every 30 or 60 seconds depending on the installed infrastructure at each site.

DD Entry Components

Name	Data Type	Instance Type
Traffic_volume_per_entry_exit_ramp	Numb	Attri

Attributes
VEH_PER_HOUR

Relationship
mand

Traffic volume per lane

Data Description

The vehicle volume per lane will be provided either every 30 seconds or every 60 seconds depending on the installed infrastructure at each site.

DD Entry Components

Name	Data Type	Instance	Type
Traffic_volume_per_lane	Numb		Attri

Attributes
VEH_PER_HOUR

Relationship
mand

Traffic volume per lane by vehicle type

Data Description

This information, which is derived from the Traffic_flow, is used for estimating incidents.

DD Entry Components

Name	Data Type	Instance	Type
Traffic_volume_per_lane_by_vehicle_type		Attri	Attri

Attributes
Traffic_volume_per_lane
Vehicle_type

Relationship
mand
mand

Trusted source rule

Data Description

This information defines which source of incoming incident data are registered as trusted and can therefore be used to verify incidents.

DD Entry Components

Name	Data Type	Instance	Type
Trusted_source_rule	Numb		Attri

Attributes
TRUSTED_SOURCE_CODE

Relationship
mand

Type of event

Data Description

This information will specify if a planned event is a recreational activity such as a sporting event, or a protest or demonstration.

DD Entry Components

Name	Data Type	Instance	Type
Type_of_event	Numb		Dynam

Attributes
CULTURAL_EVENT

Relationship
or(1)

PROTEST or(1)
SPORTING_EVENT or(1)

Un validated incident management strategy warning

Data Description

This warning is raised if the Operator attempts to deploy a strategy which has not been validated off-line. The warning will be animated and will continue to be displayed until the Operator confirms or cancels the deployment.

DD Entry Components

Name	Data Type	Instance Type
Un_validated_incident_management_strategy_warning	Set	Dynam
Attributes		Relationship
Un_validated_strategy_response_option		mand
Incident_management_strategy_id		mand

Un validated strategy response option

Data Description

When the Operator is presented with an Un_validated_incident_management_strategy_warning they will be provided with an option to confirm deployment or cancel.

DD Entry Components

Name	Data Type	Instance Type
Un_validated_strategy_response_option	Num	Dynam
Attributes		Relationship
CANCEL_UN_VALIDATED_STRATEGY		or(1)
CONFIRM_UN_VALIDATED_STRATEGY		or(1)

Unresolved incidents indicator

Data Description

This information which is permanently displayed at the Operator Interface will specify the number of detected, estimated, verified and predicted incidents in the Traffic_incident store.

DD Entry Components

Name	Data Type	Instance Type
Unresolved_incidents_indicator	Set	Dynam
Attributes		Relationship
Number_of_predicted_incidents		mand
Number_of_verified_incidents		mand
Number_of_detected_incidents		mand
Number_of_estimated_incidents		mand

Upstream device id

Data Description

Each traffic surveillance device definition will include the identifier of the device immediately upstream which is used for the verification of incidents.

DD Entry Components

Name	Data Type	Instance Type
Upstream_device_id	Numb	
Attributes	Relationship	
Road_side_device_id	mand	

Upstream link id

Data Description

Each definition of a road network link will include an identifier for the road network link which is immediately upstream.

DD Entry Components

Upstream traffic control device

Data Description

The information recorded for each item of road side equipment which can be uniquely identified and which has a geographic location in the road network will specify the id and location of the adjacent downstream device. This information will be used both for verifying incidents and for determining the best response.

DD Entry Components

Name	Data Type	Instance Type
Upstream_traffic_control_device	Set	Attri
Attributes	Relationship	
Geographic_location	mand	
Road_side_device_id	mand	

Urgent maintenance request

Data Description

A maintenance contractor may require immediate access to equipment on the Road Network to conduct emergency repairs. This may involve an unsafe structure by the road side or repairs to damaged equipment. The PRIME System will have to take into account the effects of the maintenance work on the road capacity and respond accordingly.

DD Entry Components

Name	Data Type	Instance Type
Urgent_maintenance_request	Set	Dynam
Attributes	Relationship	
Impact_on_road_capacity	mand	
Reason_for_urgency	mand	
End_date_and_time_of_mainten	mand	

ance_work	
Start_date_and_time_of_maintenance_work	mand
Type_of_maintenance_required	mand
Location_of_maintenance_work	mand

User authorisation

Data Description

This input will identify the Operator to the System and define the level of access to the facilities provided by the system. It will be possible to restrict the a Operator to one level of access or provide access to all levels.

DD Entry Components

Name	Data Type	Instance	Type
User_authorisation	Set		Dynam
Attributes			
Password	mand		
User_name	mand		
Relationship			

User mode

Data Description

This information which is permanently displayed at the Operator Interface will define the current User Mode for the PRIME System.

DD Entry Components

Name	Data Type	Instance	Type
User_mode	Numb		Attri
Attributes			
STRATEGY DEVELOPER	or(1)		
ROAD NETWORK PLANNER	or(1)		
INCIDENT MANAGER	or(1)		
SENTINEL	or(1)		
Relationship			

User mode display

Data Description

This flow defines the information which is provided for the user modes supported by the system. The information defined by this flow does not include the representation of the Road Network which is defined in Road_network_display.

DD Entry Components

Name	Data Type	Instance	Type
User_mode_display	Set		Dynam
Attributes			
Expired_strategies_indicator	mand		
User_mode_options	mand		
Relationship			

Unresolved_incidents_indicator	mand
Operator_status_indicator	mand
User_mode	mand

User mode option

Data Description

This flow defines the options which are available in the different PRIME System User Modes.

DD Entry Components

Name	Data Type	Instance	Type
User_mode_option	Set		Dynam
Attributes		Relationship	
Strategy_developer_user_optio	or(1)		
Road_planner_user_option	or(1)		
Incident_manager_user_option	or(1)		
Sentinel_user_option	or(1)		

Vehicle headway by lane

Data Description

This information which is derived from the Traffic_flow data is used for estimating incidents.

DD Entry Components

Name	Data Type	Instance	Type
Vehicle_headway_by_lane	Numb		Attri
Attributes		Relationship	
METRES	mand		

Vehicle headway per lane by vehicle type

Data Description

This information, which is derived from the Traffic_flow, is used for estimating incidents.

DD Entry Components

Name	Data Type	Instance	Type
Vehicle_headway_per_lane_by_vehicle_type		Attri	Attri
Attributes		Relationship	
Vehicle_headway_per_lane	mand		
Vehicle_type	mand		

Vehicle mayday call

Data Description

Mayday calls from vehicles will be forwarded to the PRIME System by the External Service Provider.

DD Entry Components

Name	Data Type	Instance	Type
Vehicle_mayday_call	Set		Dynam
Attributes		Relationship	

Mayday_service_provider_id	mand
Incident_vehicle_status	mand
Incident_location	mand

Vehicle occupancy per entry exit ramp

Data Description

The % occupancy per entry/exit will be provided either every 30 seconds or every 60 seconds depending on the installed infrastructure at each site.

DD Entry Components

Name	Data Type	Instance	Type
Vehicle_occupancy_per_entry_exit_ramp	Numb	Attri	
Attributes		Relationship	
PERCENTAGE		mand	
PERCENTAGE		mand	

Vehicle occupancy per lane

Data Description

The % occupancy per lane will be provided either every 30 seconds or every 60 seconds depending on the installed infrastructure at each site.

DD Entry Components

Name	Data Type	Instance	Type
Vehicle_occupancy_per_lane	Numb	Attri	
Attributes		Relationship	
PERCENTAGE		mand	
PERCENTAGE		mand	

Vehicle type

Data Description

The vehicle type is used when estimating the probability of incidents. The algorithm requires that vehicle types are classified into at most three categories. The ranges selected are private and social vehicles (which covers cars, people carriers and minibuses), light goods vehicles and heavy goods vehicles. The later two categories have standard definitions in most countries.

DD Entry Components

Name	Data Type	Instance	Type
Vehicle_type	Numb	Attri	
Attributes		Relationship	
HEAVY_GOODS_VEHICLE		or(1)	
LIGHT_GOODS_VEHICLE		or(1)	
PRIVATE_OR_SOCIAL_CARRIER		or(1)	

Vehicles involved in incident

Data Description

The number of vehicles involved in the cause of the incident will be recorded.

DD Entry Components

Name	Data Type	Instance Type
Vehicles_involved_in_incident	Numb	Attri
Attributes	Relationship	
NUMBER	mand	

Verification method

Data Description

The system will record whether an incident was verified by the Operator, a trusted source or the verification rules. The verification method will also be used to specify if the incident was predicted.

DD Entry Components

Verification code

Data Description

This information will specify the method which was used to verify an incident and the source of the verification.

DD Entry Components

Name	Data Type	Instance Type
Verification_code	Set	Attri
Attributes	Relationship	
Verification_source	mand	
Verification_method	mand	

Verification date and time

Data Description

This will be the date and time that an incident was either manually verified by an Incident_verified_report or when one or more incidents satisfies the Verification_rule.

DD Entry Components

Name	Data Type	Instance Type
Verification_date_and_time	Set	Attri
Attributes	Relationship	
Date_and_time	mand	

Verification source

Data Description

The system will record the source of a verification according to the whether the incident was verified by the automatically or by the Operator.

DD Entry Components

Name	Data Type	Instance Type
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Verification_source	Set	Attri
Attributes	Relationship	
Source_for_verification_rule	or(1)	
Incident_report_id	or(1)	

Verified by rule

Data Description

This information will specify the rule which was complied with to verify an incident.

DD Entry Components

Name	Data Type	Instance	Type
Verified_by_rule	Numb		Attri
Attributes	Relationship		
ESTIMATED_CORROBORATI ON_RULE	opt(1)		
UPSTREAM_DETECTION_RULE	opt(1)		
CORROBORATING_INCIDENT _RULE	opt(1)		
TRUSTED_SOURCE_RULE	opt(1)		

Visibility

Data Description

The visibility at the time an incident is detected will be recorded in metres.

DD Entry Components

Name	Data Type	Instance	Type
Visibility	Numb		Attri
Attributes	Relationship		
METRES	mand		

Warning response option

Data Description

Warnings will either be acknowledged, in which case the operator will be prompted to verify the incident or deferred for later action.

DD Entry Components

Name	Data Type	Instance	Type
Warning_response_option	Numb		Attri
Attributes	Relationship		
DEFER	or(1)		
ACKNOWLEDGE	or(1)		

Warning status

Data Description

The Warning_status defines whether the Operator is aware of the warning and the Incident_status.

DD Entry Components

Name	Data Type	Instance Type
Warning_status	Numb	Attri
Attributes	Relationship	
DEFERED	or(1)	
REMOVED	or(1)	
ACKNOWLEDGED	or(1)	
RAISED	or(1)	

Weather conditions

Data Description

This information will define the weather conditions at the time an incident was detected.

DD Entry Components

Name	Data Type	Instance Type
Weather_conditions	Set	Entity
Attributes	Relationship	
Wind_direction	mand	
Precipitation	mand	
Cloud_cover	mand	
Wind_strength	mand	

Weather forecast

Data Description

Scheduled weather reports will be provided by the weather systems terminator but the PRIME Operator will also be able to request ad-hoc reports as required.

DD Entry Components

Name	Data Type	Instance Type
Weather_forecast	Set	Dynam
Attributes	Relationship	
Forecast_visibility	mand	
Forecast_temperatures	mand	
Forecast_precipitation	mand	
Forecast_cloud_cover	mand	
Forecast_wind_speed	mand	
Forecast_wind_direction	mand	
Period_covered_by_forecast	mand	
Date_and_time_forecast_made	mand	
Region_covered_by_forecast	mand	

Wind direction

Data Description

If an incident occurs in the locality of a road-side weather sensor the Wind_direction will be recorded in degrees of latitude. If the information is provided manually it shall be recorded as a general

measurement.

DD Entry Components

Name	Data Type	Instance Type
Wind_direction	Set	Attri
Attributes		
General_wind_direction	or(1)	
Precise_wind_direction	or(1)	
Relationship		

Wind strength

Data Description

Ideally the wind strength would be measured in m/s; however, if it reported manually it will be necessary to classify it in general terms.

DD Entry Components

Name	Data Type	Instance Type
Wind_strength	Set	Attri
Attributes		
General_wind_measurement	or(1)	
Precise_wind_measurement	or(1)	
Relationship		

4 Information Model

4.1 Introduction

The information model shows the data entities associated with each stage of the incident management life-cycle. Many data entities are common to more than one phase of the life-cycle but the information available will vary and this is reflected by the attributes shown. The complete definition of the data entities and their attributes is provided by the data dictionary in section 3, and for a complete description of the incident life-cycle refer to section 2 of the System Architecture.

4.2 Incident Detection Entities

This view of the incident life-cycle shows entities which can give rise to an Incident_detection and the subsequent creation of a Traffic_incident within the system. The attributes of the Traffic_incident entity show the information which is available at this stage of the life-cycle however the amount and accuracy of the information will depend on the source and the method of the Incident_detection. The Incident_detection is created by an anomaly in the Traffic_flow_parameters_for_incident_detection or by an Incident_detected_report raised during an Operator_session or by an Incident_call. An Incident_detection will give rise to an Incident_warning and create a new Traffic_incident with a status of INCIDENT_DETECTED.

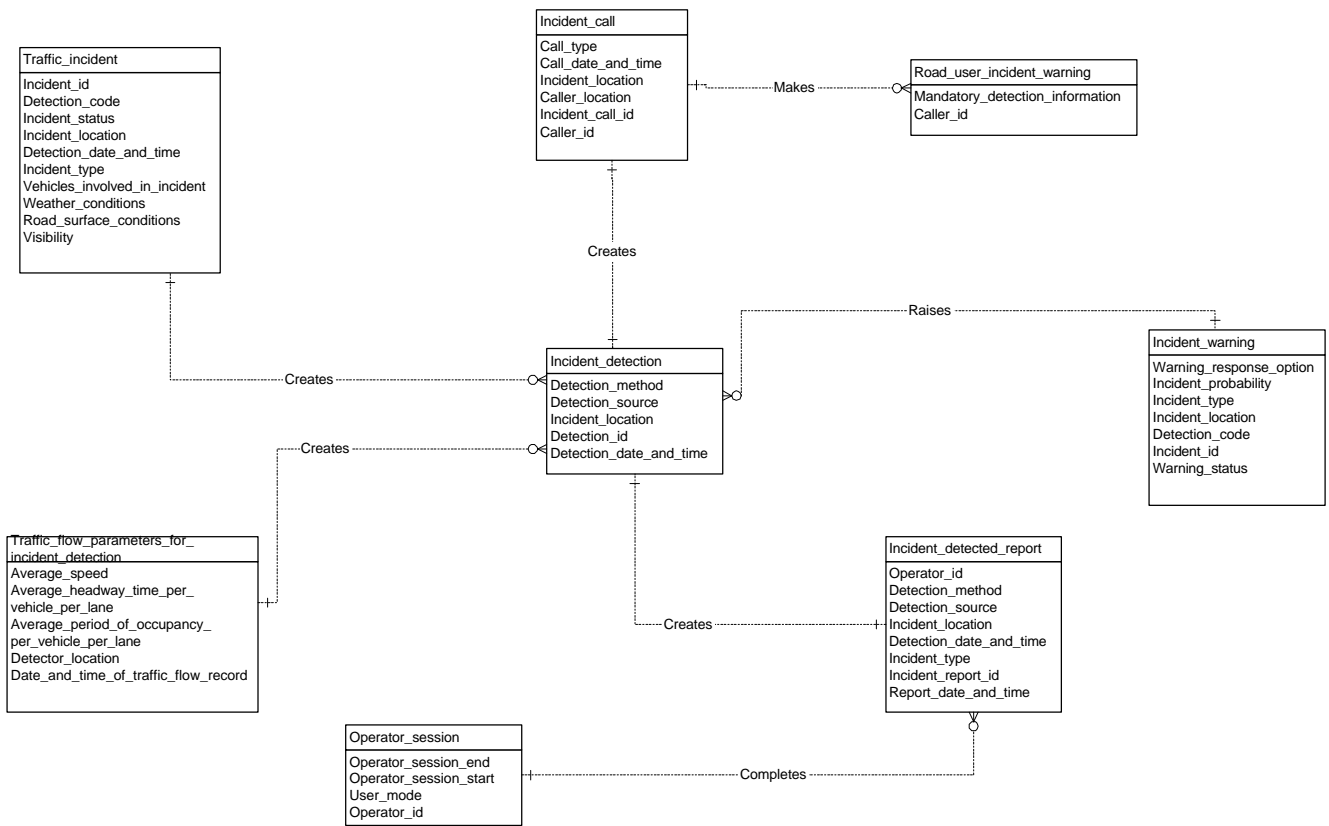


Figure 4.2-1 Incident Detection Entities

4.3 Incident Estimation Entities

The entities associated with Incident_estimation are shown below. An Incident_estimate can only be created if the Weather_conditions, Road_surface_conditions, Traffic_flow_parameters_for_estimating_incident_probability or a combination of all three raise the probability of an incident. An Incident_estimate gives raises an Incident_warning and creates a Traffic_incident with the status of INCIDENT_ESTIMATED.

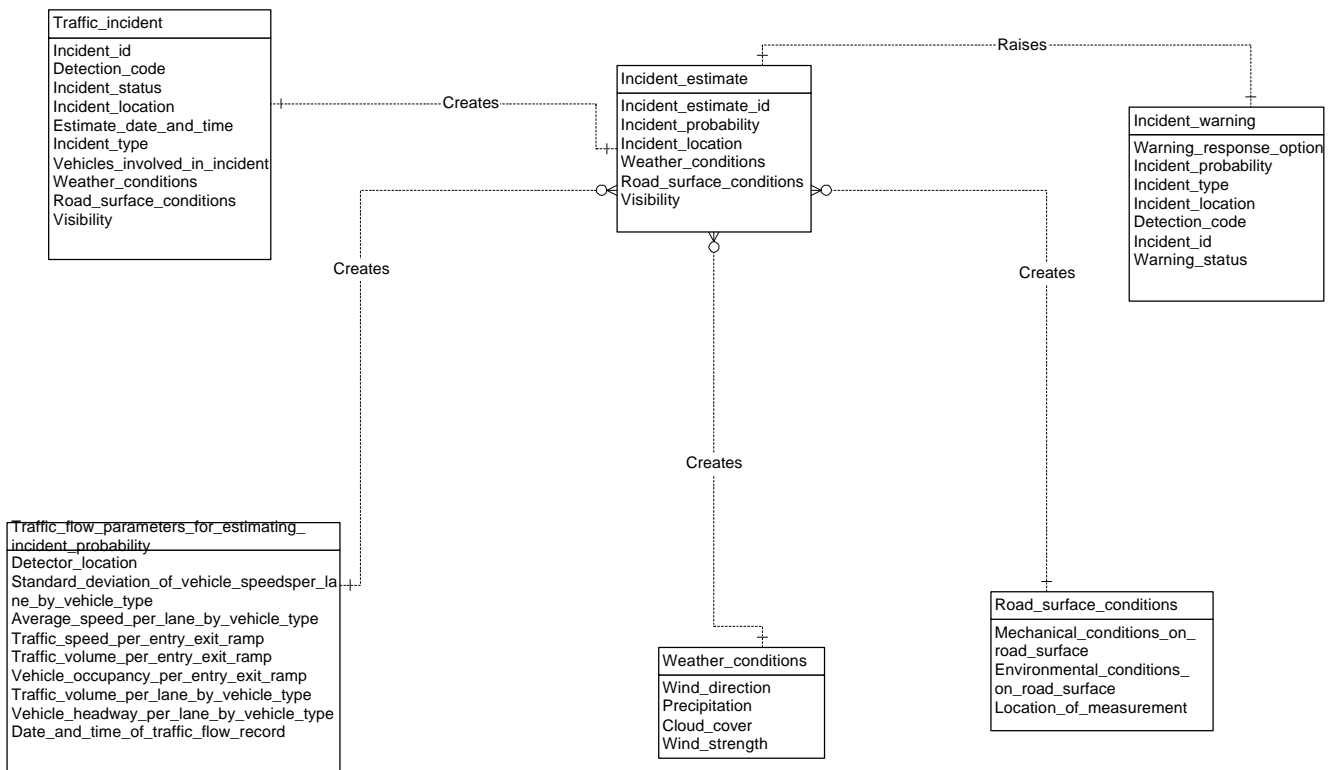


Figure 4.3-1 Incident Estimation Entities

4.4 Incident Verification Entities

An Incident_verification can be created by an Operator_session or by the Incident_verification_rule. The Incident_verification will raise an Incident_alert, update the status of the Traffic_incident and raise an Emergency_services_incident_notification.

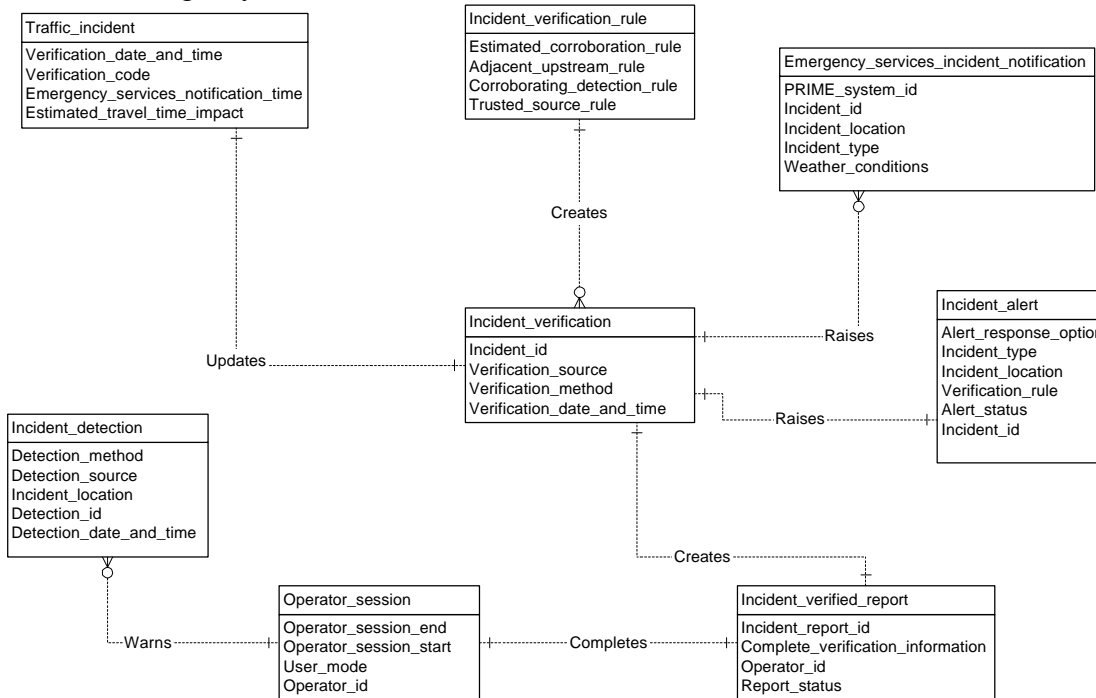


Figure 4.4-1 Incident Verification Entities

4.5 Incident Prediction Entities

An Incident_prediction can only be created when an Incident_prediction_report is completed during an Operator_session. The Incident_prediction will raise an Incident_alert and change the status of the estimated Traffic_incident to INCIDENT_PREDICTED.

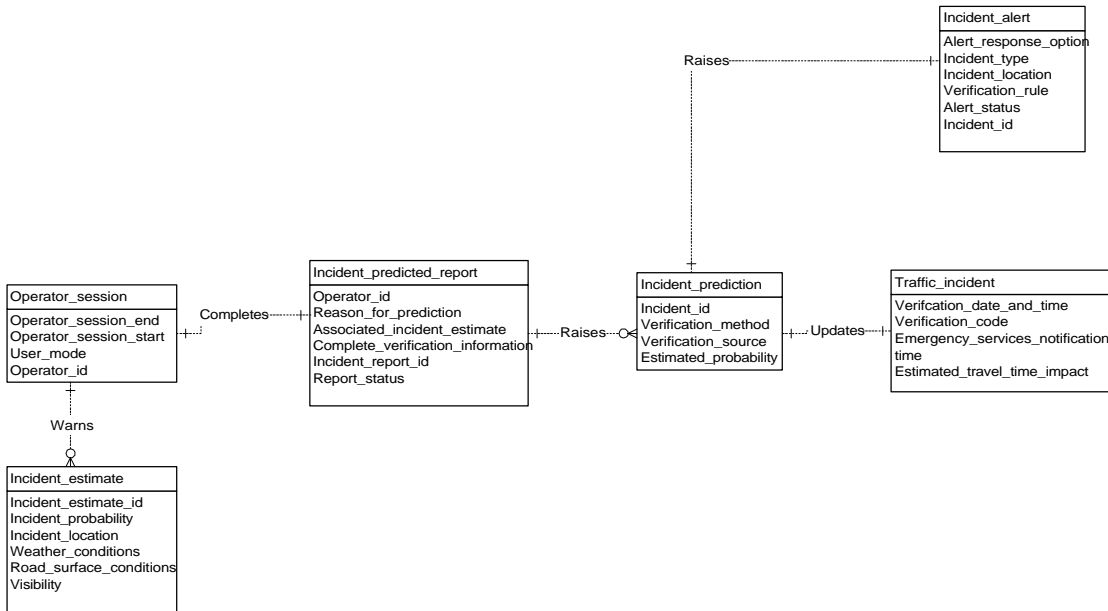


Figure 4.5-1 Incident Predicted Entities

4.6 Incident Response Entities

An incident response in the form of a Deployed_incident_management_strategy is compiled by the Incident_management_rule which selects an Incident_management_strategy and the associated Control_device_setting according to the location of the incident within the Road_network. The Deployed_incident_management_strategy is either deployed manually by the Operator_session or automatically by the Strategy_deployment_rule. The response is implemented by the Related_road_system which owns the Traffic_control_device specified in the strategy.

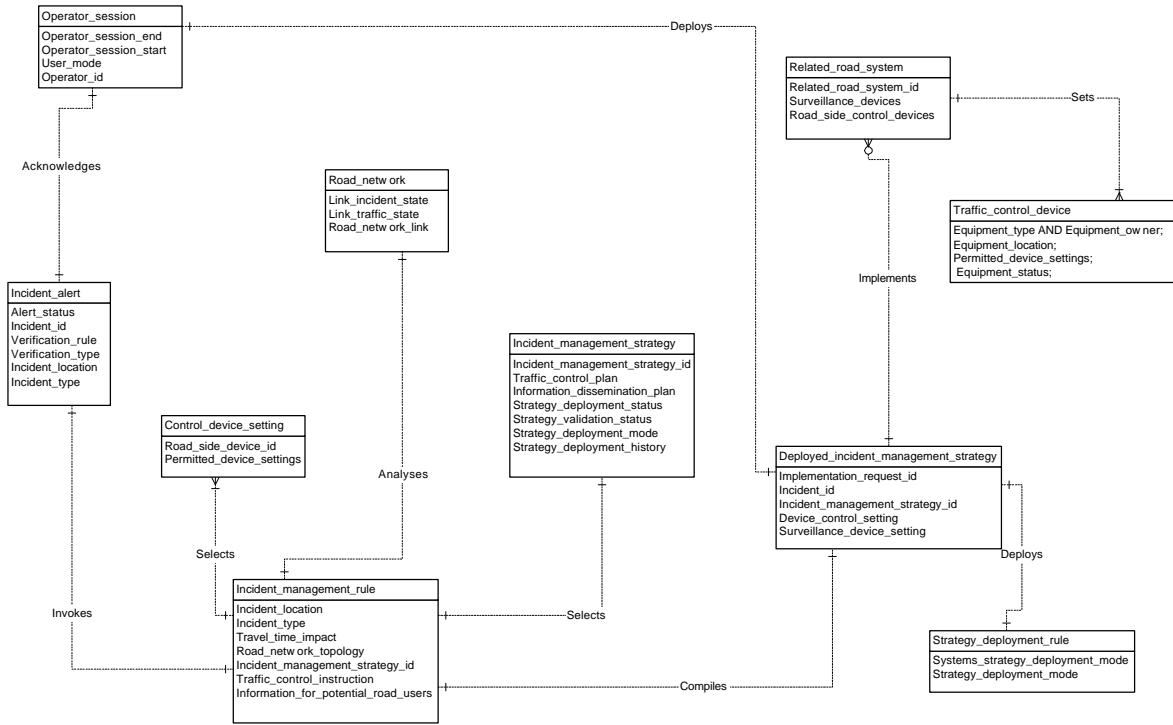


Figure 4.6-1 Integrated Incident Response

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