ICS 03.220.20
CCS R04

group standard

T/ITS 0293.3-2025

Autonomous Transportation System Traffic Semantic Representation Language
Part 3: Semantic Information Interaction

Released on 2025-11-26 Implementation on 2025-11-26

China Intelligent Transportation Industry Alliance released

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preface

This document is drafted in accordance with GB/T 1.1—2020 "Guidelines for Standardization Work Part 1: Structure and Drafting Rules of Standardization Documents".

Please note that some content in this document may involve patents. The publisher of this document is not responsible for identifying patents.

This document is proposed and overseen by the China Intelligent Transportation Industry Alliance (C-ITS).

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Autonomous Transportation System Traffic Semantic Representation Language Part 3: Semantic Information Interchange

1 scope

This document defines the semantic information exchange of traffic semantic representation language, including semantic information exchange framework, semantic information exchange process, semantic information exchange message and traffic semantic exchange behavior.

This document applies to semantic interaction scenarios between traffic entities using traffic semantic representation language, including but not limited to human, transport equipment, infrastructure, and traffic control centers.

2 Normative reference documents

The content of the following documents forms the essential terms of this document through their normative references. For dated references, only the version corresponding to that date applies to this document; for undated references, their latest version (including all amendments) applies to this document.

T/CSAE 53—2020 Cooperative Intelligent Transportation Systems Application Layer and Application Data Interaction Standard for Vehicle Communication Systems (Phase 1)

T/ITS 0098-2017 Cooperative Intelligent Transport System Communication Architecture

T/ITS 0292-2025 Model of Interoperability Mechanism for Autonomous Transport System

T/ITS 0293.1-2025 Autonomous Traffic Systems Traffic Semantic Representation Language Part 1: General Definition

T/ITS 0293.2-2025 Autonomous Traffic System Traffic Semantic Representation Language Part 2: Grammar Specification

3 Terms and Definitions

The following terms and definitions defined in T/ITS 0292-2025 and T/ITS 0293.1-2025 apply to this document.

3.1

autonomous transportation system

It is a highly intelligent and highly autonomous traffic system characterized by autonomous perception, autonomous decision-making and autonomous execution.

[Source: T/ITS 0292-2025]

3.2

Autonomous traffic agent

Autonomous traffic agent is a traffic intelligent agent which can realize the closed loop of perception, cognition, decision-making and control in the complex traffic environment and achieve the predetermined traffic tasks.

[Source: T/ITS 0293.1-2025]

3.3

Traffic Semantic Representation Language

Traffic semantic representation language is a language that accurately describes traffic content in a formal way, and has the abilities of semantic representation, semantic understanding, semantic interaction, logical reasoning and interoperability.

[Source: T/ITS 0293.1-2025]

3.4

Semantic information interaction

The four types of traffic subjects, namely people, transport equipment, infrastructure and traffic control center, can exchange semantic information through the interactive framework to realize the understandable information exchange.

4 abbreviation

RSU: Road Side Unit

RLRL: Traffic Semantic Representation Language

5 Traffic Semantic Information Interaction Framework

This document focuses on the traffic semantic information interaction framework, interaction flow, hierarchical structure of interaction messages, and semantic interaction behaviors in transportation. The traffic semantic information interaction framework is illustrated in Figure 1. The interaction flow and message structure correspond to the basic semantic information exchange process and message format at the message layer, capable of carrying semantic representation content compliant with the specifications of Part 1 and Part 2. This document does not specify the underlying communication method and can be applied to various network layer and access layer technologies, facilitating unified semantic information interaction among heterogeneous transportation entities across different regions.

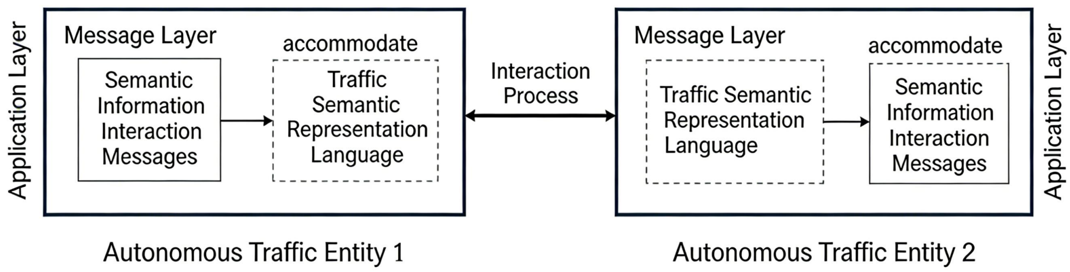

Figure 1 Traffic semantic information interaction framework

The interaction message is designed according to the logic of "message frame-message body-message parameter" nested.

6 Basic flow of semantic information interaction

Figure 2 illustrates the fundamental workflow for semantic information exchange among multiple traffic entities. The diagram depicts two entities: Traffic Entity A (the initiator) and Traffic Entity B. When Entity A initiates the conversation by sending a message, it forms a specific intent (I1) to achieve its goal (G1). This leads to semantic interaction act1, where the message (M) is encoded to comply with underlying communication protocols and services before transmission. If Entity B rejects the message, it responds with a rejection message. Upon acceptance, Entity B performs semantic interaction act2 based on predefined specifications and its own goal (G2) and intent (I2), potentially executing additional operations (O) before deciding whether to respond with a message (N). This iterative process continues through subsequent interactions.

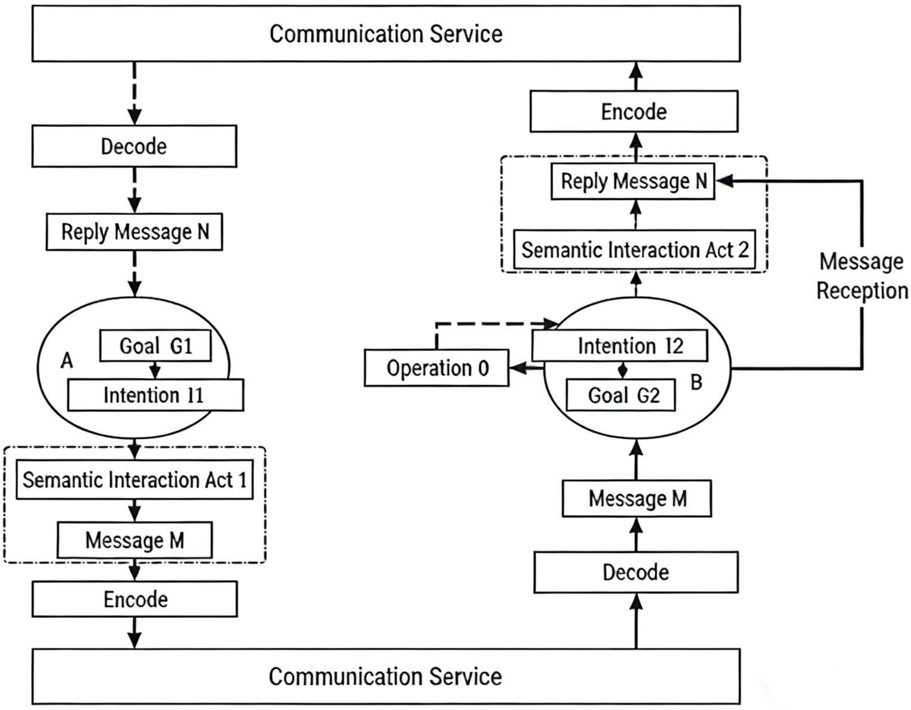

Figure 2 Basic flow of semantic information interaction among multiple traffic entities

7 semantic message

7.1 interactive message hierarchy

The hierarchy of semantic information exchange message frame, message body and message para meters is defined in this document, as shown in Figure 3.

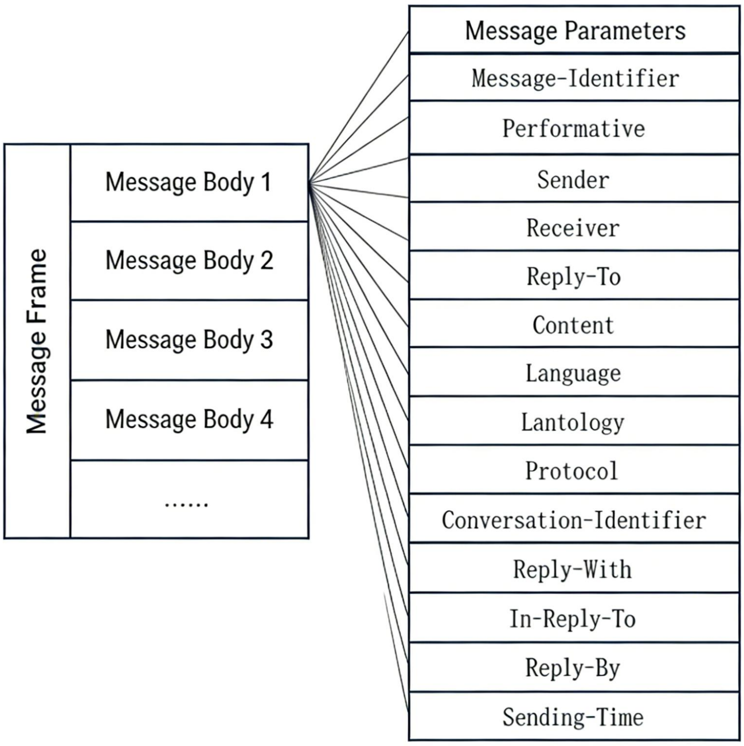

Figure 3 Schematic diagram of semantic information interaction message hierarchy

7.2 message frame

A message frame can hold one or more message bodies. The structure of a message frame is shown in Table 1. The message body contains a series of parameters, as shown in Table 2. The specific implementation of the message content (Content) in the message parameters is not covered in this document.

Table 1 Message frame structure

type	representation form	explain

message frame	MessageFrame ::= SEQUENCE {
	Message1
	Message2
	Message3
	...
	}
		MessageFrame is the message frame name; SEQUENCE indicates the sequence of subsequent content, and {} contains the message body; Message1 and others are message body names; the content of the message body is omitted here.

7.3 message body

The message body is used to transmit semantic messages, with its structural specifications as shown in Table 2.

Table 2: Message Body Structure Specifications

type	Specify the standard	explain

message body	MessageName ::= SEQUENCE{
	Message- Identifier (<number>)
	Performative (<performative>)
	: Sender (<subject>)
	: Receiver (<subject>)
	: Reply-To (<subject>)
	: Content
	“<expression>”
	: Language (<languagename>)
	: Ontology (<ontology>)
	: Protocol (<protocol>)
	: Conversation- Identifier (<number>)
	: Reply-With (<expression>)
	: In-Reply-To (<expression>)
	: Reply-By (<time>)
	: Sending-Time(<timestamp>)
	}
		MessageName is the message body name, and {} contains message parameters, whose content is represented by objects in <>.

The message body must contain one or more message parameters, as shown in Table 2. The message body's category, along with the types and quantities of required parameters, is determined by the' Performative' parameter, which essentially defines the semantic interaction behavior type.

Message body parameters support extension. In addition to the message parameters specified in Table 3, users can freely define message body parameters when implementing. These non-standard additional parameters must be prefixed with "X-".

Table 3 Message Body Parameter Table

Parameter category	parameter	explain
Message body name	Message-Identifier	Indicates the message body identifier.
Type of interactive behavior	Performative	Indicates the message type, corresponding to the behavior type of semantic message interaction.
Participants in the interaction	Sender	Indicates the message sender.
	Receiver	Indicates the expected recipient of the message.
	Reply-To	Indicates the recipient for follow-up messages.
Message content	Content	The message content is an interactive statement.
Content Description	Language	Specifies the message language for the "Content" message.
	Ontology	An ontology that assigns symbolic meaning to the content of a message

		with the parameter "Content".
interaction control	Protocol	communication protocol
	Conversation-Identifier	Indicates the session identifier.

Table 3 Message Body Parameter Table (continued)

Parameter category	parameter	explain
interaction control	Reply-With	Represents the response identifier.
	In-Reply-To	Indicates the reply identifier.
	Reply-By	Indicates the maximum acceptable time interval between sending a message and receiving a reply.
	Sending-Time	Indicates when the sender sent the message.

The specific descriptions of each parameter are as follows:

a) Message Identifier. The identifier for the message body in a message frame. It can be a number or a specific code. "Message-Identifier" is a required parameter for all interactive messages.

b) Performative. A verb that indicates the type of message interaction and also reflects the message type. "Performative" is a mandatory parameter for all interactive messages. Additionally, different verbs determine the number and type of parameters in the message body.

c) Sender. The identity of the message sender. The "sender" parameter is used for most messages. However, if the sender wishes to remain anonymous, the sender parameter can be omitted.

d) Receiver. The intended recipient of a message. The Receiver parameter can be a single traffic entity or a non-empty set of entities. The latter corresponds to message multicast.

e) Reply-To. Message reply recipient. This parameter directs subsequent messages in this conversation to the subject specified in the Reply-To parameter, rather than to the subject specified in the Sender parameter.

f) Content. Message content. Represents the message's content, including statements in the traffic semantic representation language or other data formats that represent traffic semantics. The recipient of any message parses the content meaning.

g) Language. Message language. Indicates the language used to express the content of the "Content" message. If the recipient knows the language used to express the message content, this field can be omitted.

h) Ontology. An ontology is a framework that assigns symbolic meanings to parameters in "Content" messages. It may be omitted when both sender and receiver are aware of the parameter value. In transportation, "Ontology" refers to the symbolic systems and their definitions across different modes. For example, the RoadTraffic Ontology governs road traffic, the RailTransit Ontology governs rail transit, and the Water Transport Ontology governs water transport, each defining the symbols and their meanings within their respective domains.

i) Protocol. Communication protocol. Indicates the underlying communication protocol used by the sending agent in the message.

j) Conversation ID. This identifier specifies the session to which a message belongs. Traffic entities can use it to tag messages and manage their communication policies and activities. It enables a traffic entity to establish separate sessions with multiple other traffic entities. The Conversation-id parameter must use a globally unique value to distinguish between concurrent sessions.

k) Reply-With. A response identifier. It indicates that the responding entity will use this expression to identify the message. The "Reply-With" parameter is designed to track conversation threads when multiple conversations occur simultaneously. For example, if entity i sends a message to entity j containing:

Reply-With <expression>

Subject J will reply with a message containing:

In-Reply-To <expression>;

l) In-Reply-To. Reply identifier. Indicates that this message is a reply to an earlier message. Usage is as above.

m) Reply-By. Maximum reply interval. Indicates the maximum acceptable time between sending a message and receiving a reply, in milliseconds.

n) Sending-Time. Message sending time. Indicates when the sender sent the message, expressed as milliseconds since 1970 using timestamps.

8 Traffic semantic interaction behavior

8.1 Semantic interaction behavior types

Traffic scenarios vary significantly across different modes of transportation, yet most require coordinated efforts among human operators, transport vehicles, infrastructure, and traffic control centers. By analyzing information exchange scenarios among these entities, we identify three core interaction types: information exchange, collaborative control, and error handling. These encompass actions such as notification, inquiry, request, repeat execution, acceptance, rejection, and failure, corresponding to semantic messages including notification, inquiry, request, repeat execution, acceptance, rejection, failure, and confusion messages, as detailed in Table 4.

Table 4 Semantic Message Classification Table

Semantic message type	behavior type	Interaction type
Notify	inform	information exchange
Check messages	query	
request message	ask	collaborative control

Repeat message	repetitive execution	
Receive message	accept	
Reject message	refuse	
Failed message	be defeated	error handling
Confusion message	perplexed	

8.2 corresponding semantic message structure

This paper provides structural grammatical definitions for three semantic interaction types: information exchange, collaborative control, and error handling. These interaction behaviors correspond to the value of the message parameter "Performative" and determine the message body's structure, including the required parameter types and quantities. Appendix A details the message body structures corresponding to each interaction behavior type. Appendix B elaborates on the application of this method for semantic information exchange among traffic entities across three transportation modes: road, rail, and water transport.

Appendix A

(informative annex)

Corresponding Message Body Structure of Traffic Semantic Interaction Behavior

A.1 information exchange

a) Inform. The act of informing. This action indicates that the sender informs the receiver of certain information. The message body structure is as follows:

```
MessageName {
    Message-Identifier (<number>)
    Performative (Inform)
    : Sender (<subject>)
    : Receiver (<subject>)
    : Content
      “<expression>”
    : Conversation-Identifier (<number>)
    : In-Reply-To (<expression>)
    : Sending-Time (<timestamp>)
  }
```

b) Query. An inquiry action. This action indicates that the sender expects the recipient to respond to certain information. The message body structure is as follows:

```
MessageName {
    Message-Identifier (<number>)
    Performative (Query)
    : Sender (<subject>)
    : Receiver (<subject>)
    : Reply-To (<subject>)
    : Content
      “<expression>”
    : Conversation-Identifier (<number >)
    : Reply-With (<expression>)
    : Reply-By (<time>)
    : Sending-Time (<timestamp>)
```

}

A.2 collaborative control

a） Request. A request action that indicates the sender asks the receiver to perform certain actions. The message body structure is as follows:

MessageName {
Message-Identifier (<number>)
Performative (Request)
: Sender (<subject>)
: Receiver (<subject>)
: Content
“<expression>”
: Conversation-Identifier (<number >)
: Reply-With (<expression>)
: Reply-By (<time>)
: Sending-Time (<timestamp>)
}

b） Request-Whenever. Repeated execution. Indicates that the sender wants the receiver to perform an action immediately when a proposition becomes true, and to repeat the same action each time the proposition becomes true again. The message body structure is as follows:

MessageName {
Message-Identifier (<number>)
Performative (Request-whenever)
: Sender (<subject>)
: Receiver (<subject>)
: Content
“<expression>”
: Conversation-Identifier (<number >)
: Reply-With (<expression>)
: Reply-By (<time>)
: Sending-Time (<timestamp>)
}

c） Accept. Accepts an action, indicating that the sender has accepted a previously received request and successfully executed the related operation. The message body structure is as follows:

```
MessageName {
    Message-Identifier (<number>)
    Performative (Accept)
    : Sender (<subject>)
    : Receiver (<subject>)
    : Content
      ″<expression>″
    : Conversation-Identifier (<number >)
    : In-Reply-To (<expression>)
    : Sending-Time (<timestamp>)
    }
```

d) Refuse. A refusal action that indicates the sender declines to perform a specific action and provides a reason. The message body structure is as follows:

```
MessageName {
    Message-Identifier (<number>)
    Performative (Refuse)
    : Sender (<subject>)
    : Receiver (<subject>)
    : Content
      ″<expression>″
    : Conversation-Identifier (<number >)
    : In-Reply-To (<expression>)
    : Sending-Time (<timestamp>)
}
```

A.3 exception handling

a) Failure. Failed action. Indicates the sender informs the recipient that an attempt to perform an operation failed. The message body structure is as follows:

```
MessageName {
    Message-Identifier (<number>)
    Performative (Failure)
    : Sender (<subject>)
```

: Receiver (<subject>)

: Content

"<expression>"

: Conversation-Identifier (<number >)

: In-Reply-To (<expression>)

: Sending-Time (<timestamp>)

}

b) Confuse. Confused behavior. Indicates the sender cannot understand the content of the received message. The message body structure is as follows:

MessageName {

Message- Identifier (<number>)

Performative (Confuse)

: Sender (<subject>)

: Receiver (<subject>)

: Content

"<expression>"

: Conversation-Identifier (<number >)

: In-Reply-To (<expression>)

: Sending-Time (<timestamp>)

}

Appendix B

(informative annex)

Example of semantic information exchange in traffic scenarios

B.1 Example of semantic information interaction in road traffic scenarios

B.1.1 Description of road traffic scenarios

Vehicles traveling on highways may need to change lanes to meet various driving requirements, such as overtaking, exiting the highway, or yielding to slower-moving vehicles. When changing lanes, drivers must consider the position and speed of surrounding vehicles to ensure safe passage. Additionally, lane changes may be influenced by factors like minimum and maximum speed limits and the location of road exits, requiring drivers to adopt appropriate strategies based on specific conditions. This information can be obtained through semantic information exchange between vehicles and roadside facilities.

Since this document does not specify a specific underlying communication protocol or the message sending time, the parameters "Protocol" and "Sending-Time" are omitted.

The reference standards for information definition and scenario knowledge representation in road scenarios are "Autonomous Transportation Systems-Traffic Semantic Representation Language-Part 1: General Terms" and "Autonomous Transportation Systems-Traffic Semantic Representation Language-Part 2: Grammar Specification". The parameter "Language" refers to the Traffic Semantic Representation Language (TSRL), while "Ontology" denotes the road traffic ontology library defined in Part 1 of the series, denoted as RoadTraffic.

B.1.2 Specific Implementation of Semantic Information Interaction of Road Traffic Subject

a) Car to car interaction.

Vehicle1 queries Vehicle2 for its location, speed, and distance to the highway exit.

```
QueryMessageV2V {
    Message- Identifier (1)
    Performative (Query)
    : Sender (Vehicle1)
    : Receiver (Vehicle2)
    : Content
     "InLane(Vehicle2, Data),
```

HasSpeed(Vehicle2, Data),
DistanceToExit(Vehicle2, Data),
...″
: Language (TSRL)
: Ontology (RoadTraffic)
: Conversation-Identifier (1)
: Reply-With (VehicleInfo01)
: Reply-By (1000ms)}

Vehicle2 responds to Vehicle1 with its location, speed, and distance from the highway exit.

InformMessageV2V {
Message- Identifier (2)
Performative (Inform)
: Sender (Vehicle2)
: Receiver (Vehicle1)
: Content
″InLane(Vehicle2, Data),
HasSpeed(Vehicle2, Data),
DistanceToExit(Vehicle2, Data),
...″
: Language (TSRL)
: Ontology (RoadTraffic)
: Conversation-Identifier (1)
: In-Reply-To (VehicleInfo01)
: Reply-By (1000ms)
}

Vehicle1 requests Vehicle2 to slow down.

RequestMessage{
Message-id (3)
Performative (Request)
: Sender (Vehicle1)
: Receiver (Vehicle2)
: Content
″Let(Vehicle2, SpeedDown)″
: Conversation-id (1)

: Reply-With (VehicleQuest01)

: Reply-By (1000ms)

}

Vehicle2 accepts the deceleration request from Vehicle 1.

AcceptMessage {

Message-id (4)

Performative (Accept)

: Sender (Vehicle2)

: Receiver (Vehicle1)

: Content

"Let(Vehicle2, SpeedDown)"

: Conversation-id(1)

: In-Reply-To (VehicleQuest01)

}

b) vehicle-road interaction

The roadside unit (RSU) transmits traffic environment data—including road conditions, weath er status, and visibility—to surrounding vehicles such as Vehicle1, Vehicle2, and Vehicle3.

InformMessageV2R {

Message-Identifier (3)

Performative (Inform)

: Sender (RSU)

: Receiver (Vehicle1, Vehicle2, Vehicle3, ...)

: Content

"HasRoadCondition(Road, Condition),

WeatherCondition(Weather),

Visibility(Visibility),

..."

: Language (TSRL)

: Ontology (RoadTraffic)

: Conversation-Identifier (2)

: Reply-With (RoadCondition01)

: Reply-By (1000ms)

}

The vehicle queries the Road Side Unit (RSU) for real-time road data, including speed limit s and other relevant information.

QueryMessageV2R {

Message-Identifier (4)

```
        Performative (Query)
        : Sender (Vehicle)
        : Receiver (RSU)
        : Content
          "MaxSpeed (Road, Data),
           MinSpeed (Road, Data),
           ..."
        : Language (TSRL)
        : Ontology (RoadTraffic)
        : Conversation-Identifier (2)
        : Reply-With (RoadData01)
        : Reply-By (1000ms)
        }
```

The roadside unit (RSU) sends road data to the vehicle, including speed limits and other relevant information.

```
    InformMessageR2V {
        Message-Identifier (5)
        Performative (Inform)
        : Sender (RSU)
        : Receiver (Vehicle)
        : Content
          "MaxSpeed (Road, Data),
           MinSpeed (Road, Data),
           ..."
        : Language (TSRL)
        : Ontology (RoadTraffic)
        : Conversation-Identifier (2)
        : In-Reply-To (RoadData01)
        : Reply-By (1000ms)
        }
```

B.2 Example of semantic information interaction in rail transit scenarios

B.2.1 Rail transit scenario description

This scenario examines conflict resolution mechanisms in urban rail transit systems using turnouts. At a specific turnout, two trains A and B approach and attempt to pass through. The track control center's dispatch system detects imminent path conflict between the trains in the turnout section. In this scenario, the control center grants priority passage to Train A while instructing Train B to stop and wait before proceeding. The system translates this decision into concrete control commands: locking the turnout to Train A's required position, disabling Train B's approach signal, and issuing a stop recommendation or command to Train B. The system continuously monitors Train B's deceleration and stopping status, as well as Train A's smooth passage status, until the conflict risk is fully resolved.

Since this document does not specify a particular underlying communication protocol or the message sending time, 'Protocol' and 'Sending-Time' are omitted here.

The information definition for rail transit scenarios and the reference standards for scene knowledge representation are "Autonomous Transportation Systems-Traffic Semantic Representation Language-Part 1: General Terms" and "Autonomous Transportation Systems-Traffic Semantic Representation Language-Part 2: Grammar Specification". The parameter "Language" refers to the language defined in these standards, designated as TSRL (Traffic Semantic Representation Language). The parameter "Ontology" denotes the ontology library for rail transit defined in these standards, designated as RoadTransit.

B. 2. 2 Specific Implementation of Subject Semantic Information Interaction in Rail Transit

a) The control center interacts with the switch machine.

The control center instructed the switch machine to adjust the turnout position to allow Train A to pass first.

```
QuestMessageControlCenter2Switch {
    Message-Identifier (1)
    Performative (Quest)
    : Sender (ControlCenter)
    : Receiver (Switch)
    : Content
     "Let(Switch, State1),
      ..."
    : Language (TSRL)
    : Ontology (RailTransit)
    : Conversation-Identifier (1)
    : Reply-With (ControlCenterQuest01)
    : Reply-By (1000ms)
```

}

b) The control center interacts with the signal equipment.

The control center requires the train B approach signal to be set to prohibited.

QuestMessageControlCenter2Signal {

Message-Identifier (2)

Performative (Inform)

: Sender (ControlCenter)

: Receiver (Signal)

: Content

"LetSignalState(Signal, State2),

..."

: Language (TSRL)

: Ontology (ControlCenterTransit)

: Conversation-Identifier (2)

: Reply-With (TrainQuest02)

: Reply-By (1000ms)

}

c) The control center interacts with the train.

The control center sends the stop suggestion or instruction to train B.

QuestMessageControlCenter2Train {

Message-Identifier (4)

Performative (Quest)

: Sender (ControlCenter)

: Receiver (TrainB)

: Content

"Let(TrainB, Stop),

..."

: Language (TSRL)

: Ontology (RailTransit)

: Conversation-Identifier (3)

: Reply-With (ControlCenterQuest03)

: Reply-By (1000ms)

}

The train B sends its status information to the control center.

```
InformMessageST2DC {
    Message-id (5)
    Performative (Inform)
    : Sender (TrainB)
    : Receiver (ControlCenter)
    : Content
      "HasSpeed (TrainB, Speed),
       ..."
    : Conversation-id(3)
    : In-Reply-To (DispatchCenterQuest01)
    }
```

B.3 Semantic Information Interaction Example in Waterway Transportation Scenarios

B.3.1 Description of water transportation scenarios

In maritime traffic scenarios, consider the encounter between two vessels navigating designated ch annels in oceans, rivers, or other waterways. Vessels A and B, following their respective routes, may intersect at certain points due to limited channel space, potentially leading to collision risks. To ensu re safe passage, appropriate navigation rules and safety measures must be implemented during such en counters. Throughout this process, vessels' speed, heading, and position dynamically change, with their distance also varying over time. Navigation decisions during encounters require comprehensive consid eration of factors including traffic regulations, vessel dynamics, and maritime conditions, aiming to mi nimize collision risks while maintaining the safety and efficiency of waterway transportation.

Since this document does not specify a specific underlying communication protocol or the messa ge sending time, the parameters "Protocol" and "Sending-Time" are omitted.

For the information definition and scenario knowledge representation in water transport scenarios, the reference standards are "Autonomous Transportation Systems-Traffic Semantic Representation Lan guage-Part 1: General Terms" and "Autonomous Transportation Systems-Traffic Semantic Representatio n Language-Part 2: Grammar Specification". The parameter "Language" refers to the language defined in these standards, designated as TSRL (Traffic Semantic Representation Language). The parameter " Ontology" denotes the ontology library for water transport traffic defined in these standards, labeled a s WaterTransportation.

B.3.2 The Specific Realization of Semantic Information Interaction of Water Transport Subject

a) Ship-to-ship interaction.

Ship1 queries Ship2 for its position, speed, and other data.

```
QueryMessageS2S {
        Message-Identifier (1)
        Performative (Query)
        : Sender (Ship1)
        : Receiver (Ship2)
        : Content
          ″HasPosition (Ship2, Data),
           HasSpeed(Ship2, Data),
           ...″
        : Language (TSRL)
        : Ontology (WaterTransportation)
        : Conversation-Identifier (1)
        : Reply-With (ShipQuery01)
        : Reply-By (1000ms)
        }
```

Ship2 sends its position, speed, and other information to Ship1.

```
InformMessageS2S {
        Message-Identifier (2)
        Performative (Inform)
        : Sender (Ship2)
        : Receiver (Ship1)
        : Content
          ″HasPosition(Ship2, Data),
           HasSpeed(Ship2, Data),
           ...″
        : Language (TSRL)
        : Ontology (WaterTransportation)
        : Conversation-Identifier (1)
        : In-Reply-To (ShipQuery01)
        : Reply-By (1000ms)
        }
```

b) The ship interacts with the sensing devices in the waterway.

The sensing device broadcasts channel length, width, weather conditions, and other information to ships such as Ship1 and Ship2.

```
InformMessageSD2S {
    Message-Identifier (3)
    Performative (Inform)
    : Sender (SensingDevice)
    : Receiver (Ship1, Ship2, ...)
    : Content
     "HasChannelLength(Channel, Data),
      HasChannelWidth(Channel, Data),
      WeatherCondition(Data),
      ..."
    : Language (TSRL)
    : Ontology (WaterTransportation)
    : Conversation-Identifier (2)
    : In-Reply-To(ChannelInfo01)
    : Reply-By (1000ms)
    }
```

reference

[1] FIPA SC00061G Intelligent Agent Communication Language (ACL) Message Structure Specification

T/ITS 0293-2025

China Intelligent Transportation Industry Alliance
Standard
Self-organizing traffic system Traffic semantics representation languagePart 3: Semantic Information Interaction
T/ITS 0293.3-2025

8 Xitucheng Road, Haidian District, Beijing (100088)
China Intelligent Transportation Industry Alliance Printing
Website: http://www.c-its.org.cn

2025 11 First edition 2025 11 First printing