CTS SIRI-VM 2.0

Service Interface for Real Time Information Vehicle Monitoring (VM)

CONSAT Telematics

Table of Contents

Terms, Acronyms and Abbreviations

Abbreviation	Description
SIRI	Service Interface for Real Time Information, CEN/TS 15531.
Transmodel	An abstract general purpose model for public transport information (CEN TC278, Reference Data Model For Public Transport, ENV12896 revised, June 2001).
I4M	ITS4Mobility
HTTP	Hypertext Transfer Protocol.
Service	The program (process) that implements one or more of the SIRI functions.
Subscriber	A client that receives data from a Service using HTTP.
Client	A subscriber that receives data from a Service using HTTP.
Server	A computer that hosts one or more Services.
VM	Vehicle Monitoring, a SIRI functional service interface.
APC	Automatic Passenger Counting
CTS	Consat Telematics Solution

1. Introduction

This document contains a description of the CTS SIRI Vehicle Monitoring (VM) version 2.0o implementation. The SIRI/VM implementation is an open API that provides access to data from the CTS system.

The primary intended use of the CTS SIRI/VM implementation is for integration with external systems (machine-to-machine).

2. Scope and Purpose

SIRI as a standard has a large number of features and several optional capabilities. This document is intended to give developers the information needed to use the SIRI/VM functional service supplied with CTS. The capabilities and features of the CTS implementation are specified in detail.

3. SIRI Vehicle Monitoring (VM)

3.1 VehicleMonitoringSubscriptionRequest

These are the elements of the VehicleMonitoringSubscriptionRequest that are used in the CTS implementation. Please refer to the appendix for an example document.

Element	Description
SubscriberRef	A client reference, which can be any string. Will be returned in the SituationExchangeDelivery.
SubscriptionIdentifier	An identifier that will be returned as SubscriptionRef in the SituationExchangeDelivery.
InitialTerminationTime	How long this subscription will last before it is terminated by the server. For continuous operation this value should be far away.
VehicleMonitoringRequest	See below.

The VehicleMonitoringRequest element contains the following elements.

Element	Description
RequestTimestamp	The date and time that the client posted this request. The value is not used by the server.

3.2 VehicleMonitoringDelivery

These are the elements of the VehicleMonitoringDelivery that are used in the CTS implementation. Please refer to the appendix for an example document.

Element	Description
ResponseTimestamp	The date and time that the server sent this document.
VehicleActivity	One or more VehicleActivity elements. See below.

The VehicleActivity element contains the following elements.

Element	Description
RecordedAtTime	The date and time the activity was created, which is the date and time that the vehicle reported the data.
ValidUntilTime	See 4.6
ProgressBetweenStops	See below.

MonitoredVehicleJourney	See below.
Extensions	See below.

The ProgressBetweenStops element contains the following elements.

Element	Description
LinkDistance	The total distance in meters of the link that the vehicle is currently at.
Percentage	The percentage of the link that the vehicle has moved so far.

The MonitoredVehicleJourney element contains the following elements.

Element	Description
LineRef	The line of the journey.
FramedVehicleJourneyRef	See below.
VehicleMode	The type of vehicle operating this journey.
OperatorRef	The vehicle operator.
VehicleFeatureRef	Vehicle properties. See list of available values below.
OriginRef	The first stop point of this journey.
DestinationRef	The destination stop point of this journey.
Monitored	Whether real time data is available from the vehicle.
InCongestion	Whether the vehicle is in congestion or not.
DataSource	Configurable value. See 4.11
VehicleLocation	See below.
Bearing	The current bearing of the vehicle from the onboard GPS receiver. The *Bearing* element is only present if the vehicle has a valid and known position.
Delay	The delay of the vehicle as compared to the timetable.
VehicleStatus	Status of the journey.
VehicleRef	Id of the vehicle running this journey.

MonitoredCall	See below.
IsCompleteStopSequence	Always false.

A *FramedVehicleJourneyRef* contains the following elements.

Element	Description
DataFrameRef	The calendar day of the journey.
DatedVehicleJourneyRef	The external journey id.

List of supported VehicleFeatureRef values.

Value	Description
SignageModeAutomatic	Vehicle signage is done automatically.
SignageModeManual	Vehicle signage is done manually by the driver.
SignageModeExternal	Vehicle signare is done by another system.

A *VehicleLocation* contains the following elements. The *VehicleLocation* element is only present if the vehicle has a valid and known position.

Element	Description
Longitude	The longitude of the vehicle position.
Latitude	The latitude of the vehicle position.

A *MonitoredCall* is the call currently being made by the vehicle. It contains the following elements.

Element	Description
StopPointRef	The stop point that the call is for.
Order	The order of the call within the journey.
VehicleAtStop	Value indicating if the vehicle is currently at the stop or not.
VehicleLocationAtStop	Location of the vehicle when at a stop.

3.3 Extensions

The CTS SIRI VM 2.0 server can publish additional data in the form of an extension to the VehicleActivity element. See 8.1 for the XML schema.

The VehicleActivityExtension element contains.

Element	Description
BlockRef	The block that contains the current journey. See also 4.9
PassengerCount	See below and 4.10 for configuration.

The PassengerCount element contains.

Element	Description
FramedVehicleJourneyRef	See earlier definition.
StopPointRef	The stop point which this passenger count data refers to.
VisitNumber	The index in the journeys stop points.
Capacity	Seated and standing capacity of this vehicle.
OnBoardCount	Total on board passengers.
OnBoardCountDetails	Total on board passengers broken down into categories. This is depending on the functionality of the APC system used.
OccupancyPercent	Percent occupancy on the vehicle. **Values range between 0 and 200.** The range 0 to 100 is for seated and 100 to 200 for standing.
OccupancyChange	Amount of alighting and boarding passengers for this stop.
OccupancyChangeDetails	The amount of alighting and boarding passengers for this stop broken down per category and door combination. This is depending on the functionality of the APC system used. See more below.

The OccupancyChangeDetail element contains.

Element	Description
CategoryRef	The passenger category. Can be empty.
DoorRef	The door id. Can be empty.
OccupancyChange	The amount of passengers alighting and boarding for this combination of category and door.

Depending on the APC system used the CategoryRef and DoorRef values can be empty. For example a system that doesn't handle categories will only count passengers per door and not provide category data.

4. Server Configurations

Some settings that are configurable on the server will affect the output from the server:

4.1 PublishIntervalInSeconds

The minimum number of seconds between posts of the ServiceDelivery documents. If set to 5, vehicle reports will be cached and sent every 5 seconds.

4.2 MaxSubscriptionQueueSize

The number of outgoing documents that can be queued for delivery. If the queue exceeds this size, the subscription will be terminated.

4.3 PublishVehicleRef

If set to “true”, the MonitoredVehicleJourney.VehicleRef element will be published. If set to “false”, the vehicle identity will not be published.

4.4 PublishOccupancy

If set to ”true”, the MonitoredVehicleJourney.Occupancy element will be published. If set to “false”, the occupancy will not be published.

4.5 PublishOccupancyExtension

If set to ”true”, the VehicleActivity.Extensions.ITS4mobility.Vehicle element will be published. The Vehicle element contains detailed occupancy data. If set to “false”, the extension data will not be published. Not used with the CTS profile (used in the TfNSW profile).

4.6 ValidUntil_sec

If value set to 0, <ValidUntilTime> will be set to ‘9999-12-31T23:59:59’. If value set to >0, <ValidUntilTime> will be set to current time plus the value as number of seconds.

4.7 Profile

What profile to use. This document describes the ‘CTS’ profile.

4.8 PublishNotAssignedVehicles

If set to “true”, vehicles not assigned to a block but has a GPS position will be published. If set to “false” only vehicles assigned to a block will be published.

4.9 PublishExtenstionBlockRef

If set to ”true”, the Extension.CTS.VehicleActivityExtension.BlockRef element will be published. If set to “false”, the BlockRef will not be published.

4.10 PublishExtenstionPassengerCounter

If set to ”true”, the Extension.CTS.VehicleActivityExtension.PassengerCount element will be published. If set to “false”, the PassengerCount will not be published.

4.11 DataSource

What value to use for the MonitoredVehicleJourney.DataSource. Used in Entur (see codespace). If set to empty string the element MonitoredVehicleJourney.DataSource will not be published.

4.12 PublishInvalidData

If set to “true”, vehicles providing invalid data will be published.

4.13 PublishVehicleRefAs

What value to use for MonitoredVehicleJourney.VehicleRef. Possible values are ‘SystemAddress’ and ‘ExternalId’.

5. Filtering of data

URL parameters can be used to filter what VehicleAcivity will be included in the ServiceDelivery. When starting a subscription or requsting a ServiceDelivery a filter can be added to filter what vehicles or operators will be included in the ServiceDelivery.

- **For filtering on vehicles use the following parameter:**

  One vehicle

  http:// consatTest.se /siri/server/2.0/vm/?vehicleRefs=3350249994

  Two vehicles

  http:// consatTest.se /siri/server/2.0/vm/?vehicleRefs=3350249994,3350249995

- **For filtering on operators use the following parameter:**

  One operator

  http:// consatTest.se /siri/server/2.0/vm/?operatorRefs=33

  Two operators

  http:// consatTest.se /siri/server/2.0/vm/?operatorRefs=33,7

6. References

CEN/TS 15531-1:2007 Service interface for real-time information relating to public transport operations: Context and framework.

CEN/TS 15531-2:2007 Service interface for real-time information relating to public transport operations: Communications infrastructure.

CEN/TS 15531-3:2007 Service interface for real-time information relating to public transport operations: Functional service interfaces.

CEN/TS 15531-4:2011 Service interface for real-time information relating to public transport operations: Functional service interfaces - Facility Monitoring

CEN/TS 15531-5:2011 Service interface for real-time information relating to public transport operations: Functional service interfaces - Situation Exchange

7. Document history

Revision	Date
1	2020-02-19

8. Appendix

8.1 The CTS VM extension schema

8.1.1. cts-vm.xsd

```
<?xml version="1.0" encoding="utf-8" ?>
<xsd:schema xmlns:ctsCommon="http://consat.se/cts/siri/Common"
            xmlns="http://consat.se/cts/siri/VehicleActivityExtension"
            xmlns:siri="http://www.siri.org.uk/siri"
            attributeFormDefault="unqualified"
            elementFormDefault="qualified"
            id="VehicleActivityExtension"
            targetNamespace="http://consat.se/cts/siri/VehicleActivityExtension"
            version="1.0"
            xmlns:xsd="http://www.w3.org/2001/XMLSchema">
    <xsd:import schemaLocation="siri.xsd"
                namespace="http://www.siri.org.uk/siri" />
    <xsd:import schemaLocation="cts-common.xsd"
                namespace="http://consat.se/cts/siri/Common" />
    <xsd:element name="CTS">
        <xsd:complexType>
            <xsd:sequence>
                <xsd:element name="VehicleActivityExtension">
                    <xsd:complexType>
                        <xsd:sequence>
                            <xsd:element name="BlockRef"
                                         type="siri:BlockRefStructure"
                                         minOccurs="0">
                                <xsd:annotation>
                                    <xsd:documentation>BLOCK which journey runs. +SIRI
2.0</xsd:documentation>
                                </xsd:annotation>
                            </xsd:element>
                            <xsd:element ref="ctsCommon:PassengerCount" minOccurs="0" />
                        </xsd:sequence>
                    </xsd:complexType>
                </xsd:element>
            </xsd:sequence>
        </xsd:complexType>
    </xsd:element>
</xsd:schema>
```

8.1.2. cts-common.xsd

```
<?xml version="1.0" encoding="utf-8" ?>
<xsd:schema xmlns="http://consat.se/cts/siri/Common"
            xmlns:siri="http://www.siri.org.uk/siri"
            attributeFormDefault="unqualified"
```

```
            elementFormDefault="qualified"
            id="Common"
            targetNamespace="http://consat.se/cts/siri/Common"
            version="1.0"
            xmlns:xsd="http://www.w3.org/2001/XMLSchema">
    <xsd:import schemaLocation="siri.xsd"
                namespace="http://www.siri.org.uk/siri" />
    <xsd:element name="PassengerCount">
        <xsd:complexType>
            <xsd:sequence>
                <xsd:element name="FramedVehicleJourneyRef"
                             type="siri:FramedVehicleJourneyRefStructure"
                             minOccurs="0">
                    <xsd:annotation>
                        <xsd:documentation>A reference to the DATED VEHICLE JOURNEY that
the VEHICLE is making, unique with the data horizon of the service.</xsd:documentation>
                    </xsd:annotation>
                </xsd:element>
                <xsd:group ref="siri:ContextualisedStopPointInSequenceGroup" />
                <xsd:element name="Capacity"
                             minOccurs="0">
                    <xsd:complexType>
                        <xsd:sequence>
                            <xsd:element name="Seats"
                                         type="xsd:unsignedInt"
                                         minOccurs="0">
                                <xsd:annotation>
                                    <xsd:documentation>Total number of available seats.
If AvailableStands exists, it is for seated passengers, otherwise it is the number of
passengers the vehicle has room for.</xsd:documentation>
                                </xsd:annotation>
                            </xsd:element>
                            <xsd:element name="Stands"
                                         type="xsd:unsignedInt"
                                         minOccurs="0">
                                <xsd:annotation>
                                    <xsd:documentation>Total number of available places
for standing passengers.</xsd:documentation>
                                </xsd:annotation>
                            </xsd:element>
                        </xsd:sequence>
                    </xsd:complexType>
                </xsd:element>
                <xsd:element name="OnBoardCount"
                             type="xsd:int"
                             minOccurs="0">
                    <xsd:annotation>
                        <xsd:documentation>Current number of passengers on the
vehicle.</xsd:documentation>
```

```
                </xsd:annotation>
            </xsd:element>
            <xsd:element name="OnBoardCountDetails"
                         minOccurs="0">
                <xsd:annotation>
                    <xsd:documentation>Current numbers of passengers on the vehicle
per category.</xsd:documentation>
                </xsd:annotation>
                <xsd:complexType>
                    <xsd:sequence maxOccurs="unbounded">
                        <xsd:element name="OnBoardCountDetail">
                            <xsd:complexType>
                                <xsd:sequence>
                                    <xsd:element name="CategoryRef"
                                                 type="xsd:string" />
                                    <xsd:element name="PassengerCount"
                                                 type="xsd:int" />
                                </xsd:sequence>
                            </xsd:complexType>
                        </xsd:element>
                    </xsd:sequence>
                </xsd:complexType>
            </xsd:element>
            <xsd:element name="OccupancyPercent"
                         type="xsd:unsignedInt"
                         minOccurs="0">
                <xsd:annotation>
                    <xsd:documentation>Percent occupancy on the vehicle. Values range
between 0 and 200. The range 0 to 100 is for seated and 100 to 200 for
standing.</xsd:documentation>
                </xsd:annotation>
            </xsd:element>
            <xsd:element xmlns:q1="http://consat.se/cts/siri/Common"
                         name="OccupancyChange"
                         type="OccupancyChangeType"
                         minOccurs="0">
            </xsd:element>
            <xsd:element name="OccupancyChangeDetails"
                         minOccurs="0">
                <xsd:complexType>
                    <xsd:sequence maxOccurs="unbounded">
                        <xsd:element name="OccupancyChangeDetail">
                            <xsd:complexType>
                                <xsd:sequence>
                                    <xsd:element name="CategoryRef"
                                                 type="xsd:string"
                                                 minOccurs="0" />
                                    <xsd:element name="DoorRef"
```

```
                                                    type="xsd:string"
                                                    minOccurs="0" />
                                        <xsd:element
xmlns:q2="http://consat.se/cts/siri/Common"
                                                    name="OccupancyChange"
                                                    type="OccupancyChangeType" />
                                    </xsd:sequence>
                                </xsd:complexType>
                            </xsd:element>
                        </xsd:sequence>
                    </xsd:complexType>
                </xsd:element>
            </xsd:sequence>
        </xsd:complexType>
    </xsd:element>
    <xsd:complexType name="OccupancyChangeType">
        <xsd:sequence>
            <xsd:element name="AlightingCount"
                         type="xsd:unsignedInt">
                <xsd:annotation>
                    <xsd:documentation>Number of passengers that left the
vehicle.</xsd:documentation>
                </xsd:annotation>
            </xsd:element>
            <xsd:element name="BoardingCount"
                         type="xsd:unsignedInt">
                <xsd:annotation>
                    <xsd:documentation>Number of passengers that boarded the
vehicle.</xsd:documentation>
                </xsd:annotation>
            </xsd:element>
        </xsd:sequence>
    </xsd:complexType>
</xsd:schema>
```

8.2 Example VehicleMonitoringSubscriptionRequest

```
<?xml version="1.0"?><AA:Siri xmlns:AA="http://www.siri.org.uk/siri" version="1.4">
  <AA:SubscriptionRequest>
    <AA:RequestTimestamp>2014-02-17T22:05:32</AA:RequestTimestamp>
    <AA:RequestorRef>ITS4mobilityTestClient</AA:RequestorRef>
    <AA:MessageIdentifier>MessageIdentifier</AA:MessageIdentifier>
    <AA:ConsumerAddress>http://192.168.4.15:80/siri/client/</AA:ConsumerAddress>
    <AA:SubscriptionContext>
      <AA:HeartbeatInterval>PT1M</AA:HeartbeatInterval>
    </AA:SubscriptionContext>
    <AA:VehicleMonitoringSubscriptionRequest>
```

```
      <AA:SubscriberRef>ITS4mobilityTestClient</AA:SubscriberRef>
      <AA:SubscriptionIdentifier>ITS4mobilityTestClient</AA:SubscriptionIdentifier>
      <AA:InitialTerminationTime>9999-12-31T23:59:59.999</AA:InitialTerminationTime>
      <AA:VehicleMonitoringRequest version="1.4">
        <AA:RequestTimestamp>2014-02-17T22:05:32</AA:RequestTimestamp>
      </AA:VehicleMonitoringRequest>
    </AA:VehicleMonitoringSubscriptionRequest>
  </AA:SubscriptionRequest>
</AA:Siri>
```

8.3 Example VehicleActivity

```
<?xml version="1.0"?>
<AA:Siri xmlns:AA="http://www.siri.org.uk/siri" xmlns:AD="http://www.ifopt.org.uk/acsb"
xmlns:AC="http://datex2.eu/schema/1_0/1_0" xmlns:AB="http://www.ifopt.org.uk/ifopt"
xmlns:xs="http://www.w3.org/2001/XMLSchema-instance" version="2.0">
   <AA:ServiceDelivery>
      <AA:ResponseTimestamp>2021-09-01T08:50:45</AA:ResponseTimestamp>
      <AA:ProducerRef>ConsatTelematics-VM</AA:ProducerRef>
      <AA:VehicleMonitoringDelivery version="2.0">
         <AA:ResponseTimestamp>2021-09-01T08:50:45</AA:ResponseTimestamp>
         <AA:SubscriptionRef>CTS-SIRI-TestTool-637660830300867162</AA:SubscriptionRef>
         <AA:VehicleActivity>
            <AA:RecordedAtTime>2021-09-01T08:50:47</AA:RecordedAtTime>
            <AA:ValidUntilTime>9999-12-31T23:59:59</AA:ValidUntilTime>
            <AA:ProgressBetweenStops>
               <AA:LinkDistance>202</AA:LinkDistance>
               <AA:Percentage>40.89</AA:Percentage>
            </AA:ProgressBetweenStops>
            <AA:MonitoredVehicleJourney>
               <AA:LineRef>2008</AA:LineRef>
               <AA:FramedVehicleJourneyRef>
                  <AA:DataFrameRef>2021-09-01T04:00:00</AA:DataFrameRef>

<AA:DatedVehicleJourneyRef>9015014200800033</AA:DatedVehicleJourneyRef>
               </AA:FramedVehicleJourneyRef>
               <AA:VehicleMode>bus</AA:VehicleMode>
               <AA:OperatorRef>22</AA:OperatorRef>
               <AA:OriginRef>82935001</AA:OriginRef>
               <AA:DestinationRef>2859</AA:DestinationRef>
               <AA:Monitored>true</AA:Monitored>
               <AA:InCongestion>false</AA:InCongestion>
               <AA:DataSource>CTS</AA:DataSource>
               <AA:VehicleLocation>
                  <AA:Longitude>12.9355348460376</AA:Longitude>
                  <AA:Latitude>57.7187336515635</AA:Latitude>
               </AA:VehicleLocation>
               <AA:Bearing>145.49</AA:Bearing>
               <AA:Delay>PT58S</AA:Delay>
               <AA:VehicleStatus>inProgress</AA:VehicleStatus>
               <AA:VehicleRef>2161003710</AA:VehicleRef>
               <AA:MonitoredCall>
                  <AA:StopPointRef>82072002</AA:StopPointRef>
                  <AA:VehicleAtStop>false</AA:VehicleAtStop>
               </AA:MonitoredCall>
               <AA:IsCompleteStopSequence>false</AA:IsCompleteStopSequence>
```

```
                </AA:MonitoredVehicleJourney>
                <AA:Extensions>
                    <AB:CTS xmlns:AB="http://consat.se/cts/siri/VehicleActivityExtension"
xmlns:ctsCommon="http://consat.se/cts/siri/Common">
                        <AB:VehicleActivityExtension>
                          <AB:BlockRef>B0045</AB:BlockRef>
                           <AB:PassengerCount>
                             <AB:FramedVehicleJourneyRef>
                               <AA:DataFrameRef>2021-09-01T04:00:00</AA:DataFrameRef>

<AA:DatedVehicleJourneyRef>9015014200800033</AA:DatedVehicleJourneyRef>
                             </AB:FramedVehicleJourneyRef>
                             <AA:StopPointRef>82935002</AA:StopPointRef>
                             <AA:VisitNumber>2</AA:VisitNumber>
                             <AB:Capacity>
                               <AB:Seats>50</AB:Seats>
                               <AB:Stands>25</AB:Stands>
                             </AB:Capacity>
                             <AB:OnBoardCount>30</AB:OnBoardCount>
                             <AB:OnBoardCountDetails>
                               <AB:OnBoardCountDetail>
                                <AB:CategoryRef>Children</AB:CategoryRef>
                                <AB:PassengerCount>20</AB:PassengerCount>
                               </AB:OnBoardCountDetail>
                               <AB:OnBoardCountDetail>
                                <AB:CategoryRef>Adult</AB:CategoryRef>
                                <AB:PassengerCount>10</AB:PassengerCount>
                               </AB:OnBoardCountDetail>
                             </AB:OnBoardCountDetails>
                             <AB:OccupancyPercent>60</AB:OccupancyPercent>
                             <AB:OccupancyChange>
                               <AB:AlightingCount>10</AB:AlightingCount>
                               <AB:BoardingCount>15</AB:BoardingCount>
                             </AB:OccupancyChange>
                             <AB:OccupancyChangeDetails>
                               <AB:OccupancyChangeDetail>
                                <AB:CategoryRef>Children</AB:CategoryRef>
                                <AB:DoorRef>1</AB:DoorRef>
                                <AB:OccupancyChange>
                                  <AB:AlightingCount>3</AB:AlightingCount>
                                  <AB:BoardingCount>4</AB:BoardingCount>
                                </AB:OccupancyChange>
                               </AB:OccupancyChangeDetail>
                               <AB:OccupancyChangeDetail>
                                <AB:CategoryRef>Adult</AB:CategoryRef>
                                <AB:DoorRef>1</AB:DoorRef>
                                <AB:OccupancyChange>
                                  <AB:AlightingCount>1</AB:AlightingCount>
                                  <AB:BoardingCount>3</AB:BoardingCount>
                                </AB:OccupancyChange>
                               </AB:OccupancyChangeDetail>
                               <AB:OccupancyChangeDetail>
                                <AB:CategoryRef>Children</AB:CategoryRef>
                                <AB:DoorRef>2</AB:DoorRef>
                                <AB:OccupancyChange>
                                  <AB:AlightingCount>4</AB:AlightingCount>
                                  <AB:BoardingCount>2</AB:BoardingCount>
                                </AB:OccupancyChange>
                               </AB:OccupancyChangeDetail>
                               <AB:OccupancyChangeDetail>
                                <AB:CategoryRef>Adult</AB:CategoryRef>
```

```
                                <AB:DoorRef>2</AB:DoorRef>
                                <AB:OccupancyChange>
                                  <AB:AlightingCount>2</AB:AlightingCount>
                                  <AB:BoardingCount>6</AB:BoardingCount>
                                </AB:OccupancyChange>
                              </AB:OccupancyChangeDetail>
                            </AB:OccupancyChangeDetails>
                          </AB:PassengerCount>
                        </AB:VehicleActivityExtension>
                      </AB:CTS>
                    </AA:Extensions>
                  </AA:VehicleActivity>
                </AA:VehicleMonitoringDelivery>
              </AA:ServiceDelivery>
            </AA:Siri>
```