CROCODILE 2

A common agreement on how to implement a common DATEX II solution related to priority actions b, c and e

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Setting of the CROCODILE 2 DATEX II WG

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Background

Based on the Delegated Regulation 2015/962 (dealing with the provision of real-time traveller information), this CROCODILE 2 working group aims at developing a DATEX II based reference minimum set of required data elements which are conform with the data categories described in the Annex of 2015/962. The preliminary work done in CROCODILE phase 1 on the DATEX II profiling on priority action c (Road safety-related minimum traffic information, based on Delegated Regulation 2013/886) and sction d (Intelligent truck parking, based on Delegated regulation 2013/885) data elements, is considered as a reference approach for developing the corresponding profile specification fulfilling priority action b requirements as well.

As a basis within CROCODILE phase 1 a so-called 'middleware' reference profile guide was developed, specifying minimum requirements for developing DATEX II profiles being conform with priority action c- and e- based data categories. Based on that specification -harmonizing priority action c and e deployments- bilateral exchange of safety-related data within DATEX II between different transport organisations, administrations and/or road authorities is able to be achieved. The accessibility and exchange of **dynamic road status** and **traffic data in this DATEX II working group** between (these data categories are defined in priority action b, within the Delegated Regulation 2015/962) road authorities and administrations, road operators, or any other organisation producing, maintaining or making available national road data (like traffic information service providers) is the major use case within CROCODILE 2. The process of exchanging data between different transport organisations having DATEX II nodes implemented and are willing to exchange data elements within DATEX II and staying conform with Delegated regulations, is shown in figure 1 below (exemplary shown for Delegated Regulation c conform data exchange, based on the middleware approach). Further information on the middleware specification can be found in the respective document (CROCODILE phase 1 – Definition of traffic data availability and data exchange in CROCODILE (based on DATEX II)).

Assumptions

- CROCODILE middleware specification is still valid and is interpreted as a data content specification (more details within the further assumption)
- Since there might occur overlaps between static and dynamic traffic information as defined within priority action b, a clear differentiation between both is needed and discussed at the technical workshops.
- CROCODILE exchange specification: Generally there is a 2-step approach for deploying a DATEX II respectively INSPIRE conform data exchange specification.
    - **Development of data content specifications:** The first step is a major one CROCODILE is mainly focusing. This step deals with the identification of a common reference profile, also referred to as a 'data content specification' which defines minimum required data content set based on the data modelling requirements of DATEX II respectively INSPIRE (or any other agreed standards). The minium required data content set describes in this case a subset the provided data elements within the standard. Finally there will be so-called 'minimum reference profiles' resulting enabling compliancy with the delegated regulations and being agreed on by the CRODODILE Member States.
    - **Provision of the exchange specification model:** The exchange specification model defines the procedures on how to exchange predefined data content specifications. At this step, exchange rules and routines, like definition of push-/pull services or Server-/Client communication procedures are defined in more detail. Since these second step is strongly related to the IT-environment of the respective Member States (participants who are willing to share data) there will be different solutions bilateral possible. However, CROCODILE is aiming at the provision of main harmonized data content specifications as main basis for defining national exchange specification models.

Focus of DATEX II WG activities

In order to fulfil priority action b requirements - providing EU-wide real-time traffic information - this working group focused especially on the development of a reference-guidance for developing harmonized DATEX II profiles covering dynamic road status (2.) and traffic data (3.) as described in Delegated Regulation 2015/962 within the Annex. With this respect, a DATEX II based profiling-guidance describing minimum set of DATEX II data elements required for implementing priority action b categories was the main scope of this working group. In order to provide a simple deployment, reference data content specifications, covering both priority action 'c' and 'b' related data categories were elaborated and made available in order to demonstrate the profiling-process and fulfilling Delegated Regulation requirements as well. Therefore in the first step, there was an interpretation of respective data categories required in order to gain a common understanding of the meaning of dynamic and road traffic status data.

General Approach finding priority action b compliant DATEX II data content specification

In order to achieve a commonly agreed guidance for providing Delegated Regulation b conform DATEX II profiles, **a working document** enabling the translation between 2015/962-related data categories and DATEX II based data elements was set up in this working group. This document presents, similar to the 'middleware specification', a reference guide on how to implement minimum DATEX II based data sets covering priority action b requirements. In the next step an implemented reference schema/conform profile was developed based on the main data match- findings. In detail the procedure for elaborating this specification is described in the following:

1. Conduct a data availability survey in order to identify current state-of-the-art of applied priority action b data categories within Member States.
2. Analyse data categories of Delegated Regulation, 2015/92, parts **2.) dynamic road data**, and **3.) traffic status data**, and elaborate corresponding **user stories** in order to provide a common understanding of the data categories
3. Further identify corresponding DATEX II (version v2.3) publication types and data elements (classes/attributes/enumeration types) being used to establish a conform profile. Therefore an **Excel-table together with a guidance document** will be created to be used as a data dictionary for both DATEX II and Delegated Regulation adequate data elements, supporting especially the process of finding a common data matching structure. (September – beginning of October)
4. The **development of the Excel-file (data dictionary)** serves as a main basis for generating DATEX II-conform profiles fulfilling minimum requirements on real-time traffic information provision.
5. Establish adequate DATEX II reference schemas/profiles, fulfilling found priority action b data requirements. Besides, the profiling approach on priority action c elements fulfilling found middleware-specification requirements as well is applied.

Dynamic Road status data (2015/962)		DATEX II class	DATEX II enumerated value	
a.) road closures	1 : 1	RoadOrCarriagewayOrLaneManagementTypeEnum	roadClosed	OK
b.) lane closures	1 : 1	RoadOrCarriagewayOrLaneManagementTypeEnum	laneClosures	OK
…		…	…	
e.) road works	1 : n	"Roadworks" package classes	ConstructionWorks/MaintenanceWorks/…	?
…		…	…	
j.) temporary traffic management measures	1 : ?	NA	NA	?

Figure 1: Demonstration of the Priority Action b conform data exchange specification (matching issues between DATEX II data elements and priority action b relevant data categories)

Identification of potential transferability issues

Compared to the process of matching priority action c (safety related) data categories to DATEX II data elements, where quite homogenous matching capabilities were achieved with the support of the TISA matching document, additional matching issues for priority action b elements might arise and be considered as high important deployment issues, which have to be discussed when developing the Excel and profiling guidance document. Based on a matching example between DATEX II elements and priority action b data categories the following matching issues might come up further as shown in figure 2:

- Multiplicity: “1 : n“ options for translate-ability sometimes undisclosed (e.g. „poor of road conditions“ = e.g. „temporary slippery road“ !?)
- Development of DATEX II profile extensions required: still missing appropriate date elements in DATEX II, v. 2.3, might cause transferability issues. Open question: Development of a DATEX II level b or c extension required?
- Too high level of detail in DATEX II → commitment needed!

Therefore the working group as agreed on defining common user stories, describing the meaning of the data categories within priority action b itself and finding adequate publication types in the beginning in order to gain an arrange finally the identification of agreed data content specifcations.

Data availability survey results

Following the discussions and outcomes of the working group a questionnaire was created with the purpose to draw a clear and detailed picture of the data availability related to priority action b in the CROCODILE Member States. Predominantly, data availability was enquired against the background of the specifications for priority action b of the EU ITS Directive, incorporating also qualitative criteria like network coverage, conditions of use or availability in DATEX II format. All in all the results of the questionnaire revealed that a lot of data are already available in the CROCODILE Member States.

Country: ALLL Data Availability: All Parnters Overview				Available in Austria (Pusblished as DATEX II profiles)	Available in Slovenija	Available in Czechia	Available in Greece
Priority Action b data categories (see Annex, parts 2 and 3)							
Annex Parts (1,2,3)	Category		Definition				
Part 2.) Dynamic road status Data	(a)	road closures		Traffic Messages	DATEX	Internal standard DDR nationwide/DATEX II in Prague	System specific
	(b)	lane closures		Traffic Messages	Internal standard	Internal standard DDR nationwide/DATEX II in Prague	System specific
	(c)	bridge closures		Traffic Messages	Internal standard	Internal standard DDR nationwide/DATEX II in Prague	n/a
	(d)	overtaking bans on heavy goods vehicles		Traffic Signs	Internal standard	-	-
	(e)	roadworks		Roadworks	DATEX	Internal standard DDR nationwide/DATEX II in Prague	System specific
	(f)	accidents and incidents		Traffic Messages	DATEX	Internal standard DDR nationwide/DATEX II in Prague	System specific
	(g)	dynamic speed limits		Traffic Signs	Internal standard	-	System specific
	(h)	direction of travel on reversible lanes		-		-	n/a
	(i)	poor road conditions		Traffic Signs		-	System specific
	(j)	temporary traffic management measures				nationwide/DATEX II in Prague	System specific
	(k)	variable road user charges and available payment methods		-		-	-
	(l)	availability of parking places		Rest Areas		Internal standard DDR nationwide/DATEX II in Prague	-
	(m)	availability of delivery areas		-		-	n/a
	(n)	cost of parking		-		-	-
	(o)	availability of charging points for electric vehicles		-		-	-
	(p)	weather conditions affecting road surface and visibility		-	Internal standard	Internal standard DDR nationwide/DATEX II in Prague	System specific
Part 3.) Traffic Data	(a)	traffic volume		-	Internal standard	graphics	System specific
	(b)	speed		Can be calculated from Traffic data!	Internal standard	graphics	System specific
	(c)	location and lenght of traffic queues		Traffic Data		Internal standard DDR nationwide/DATEX II in Prague	System specific
	(d)	travel times		Traffic Messages		graphics	System specific
	(e)	waiting time at border crossings to non-EU Member States		Traffic Messages		-	-

Development of User stories

Purpose of the user stories is to clarify requirements of expected applications using given data.

Usage: User stories shall be proposed by few people, discussed in CROCODILE meeting. Then it will serve as a tool which will make decisions what characteristics of the data are really needed and which are rather special and might be omitted.

Visibility of this document: for all members of CROCODILE project. There is no problem, if the document is available in read-only mode to anyone.

Why bother with user stories

User stories serve two purposes:

1. Discover relevant uses of the data
2. Clarify priorities to know when to stop elaborating further details

In both cases it allows better scope management.

User stories is a tool, not the aim

The stories shall support the work on finding an agreement on common and relevant data structures. There is no need to elaborate on user stories deeper than for this purpose. As soon as we recognize possible data uses and related requirements, the user story served enough and there is no need to go deeper.

Discovering relevant uses of the data

A user story shall reveal potential of the data which shall exhibit it's value via an application serving someone.

Each story shall tell:

- Whom it shall serve
- What kind of service it shall provide
- Why is a user interested in using such a service

It helps in following ways:

1. Find relevant use of data
2. Know, that we shall **elaborate** on related requirements
3. Know, when to **stop elaborating** (as soon as the purpose is fulfilled)

User story template and how to use it

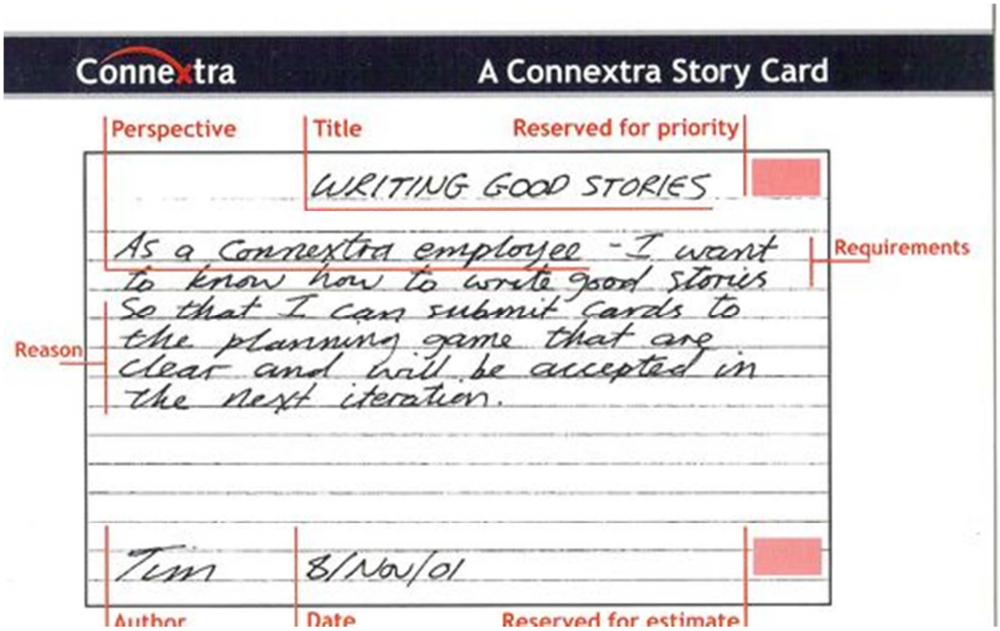

Figure 2: Traditional user story template ConnectraStoryCard has following form.

In this case, we may skip some details (author, date, estimation) and express it as follows:

- <title>
    - "As a *<user>,* I want *<function>* so that *<motivation>*"

Example:

- Blocked road notifications
    - As a driver, I want to be notified about blocked roads, so that my navigation system can reroute my trip and avoid getting blocked at the problem.

Explanations:

- <title>: short descriptive title to simplify referencing.
- <user>: fictional name (a role) of a user whom shall the story serve
- <function>: what sort of service is to be delivered to the <user>
- <motivation>: why the <user> asks for the service.

Hints:

- The aim is to discover relevant functional requirements (<function>).
- <title> is just a reference name.

  Do not try to put all requirements into the <title>, keep it short.

- <user> shall deliver some <function> requirements with relevant <motivation>. There is no need to create exhaustive list of user roles.
- <motivation> shall justify the required <function>. It helps in moments, we are in doubt about relevancy of some requirements.
- <function> shall provide enough details to justify requirements to particular data structures.
- If in difficulties, record it as an open issue (into list of issues) and move on. You may resolve open issue later on.

Proposed workflow for creating user stories

1. Quick start
    a. Brain dump - quickly record anything you have in mind. Best done before diving into the problem.
    b. List possible <user> names.
    c. List possible user stories. Postpone creation of <title>
2. Elaborate on stories:
    a. Elaborate required <function> and <motivation>. Try to be quick, you may iterate into deeper details later on, if needed.
    b. Create a <title> as the last step. Just keep it short and unique, do not try to squeeze all requirements into it.
3. Review and reiterate
    a. Review the work.
        i. Did you discover some new type of user?
        ii. Did you cover all users in all relevant cases?
        iii. Can you generalize or merge some users or stories?
        iv. Unify terms, names and phrases where appropriate.
    b. If you feel some parts are clearly incomplete, elaborate on those pieces.
    c. Publish the stories. Aim at “good enough” quality, do not overshoot.

Hints for creating 962/2015 data category requirements

- Prioritize user stories first. This can narrow task scope significantly.

- One data category may have multiple rather different user stories with very different requirements to data content. Do not force all requirements into one big set, split per use. You may use it a subcategory.
- Checklist for good (sub) category data requirements
    - It covers all <function> requirements
    - It skips all other requirements not being justified by <motivation>.
- If you got stuck with data requirements - go to user story:
    - Story is on higher abstraction level and shall provide higher level answers
    - In some cases, you may modify the user story

User stories

Part 2: Dynamic road status data

(a) road closures

Driver routing around closed road

As a driver, I want to know in advance what parts of road network are closed so that I can reroute a trip.

(b) lane closures

Driver aware of risky lane closures

As a driver, I want to know in advance what lanes in front of me are closed so that I can drive more carefully as lane closures may cause risky situations and congestions.

Trucks avoiding some lane closures

As a truck driver, I want to know about lane closures, which may make driving with my truck more difficult or impossible so that I can avoid given route.

(c) bridge closures

Driver routing around closed bridge

As a driver, I want to know in advance what bridges are closed so that I can reroute a trip.

Driver avoiding scheduled bridge closure

As a driver, I want to know scheduled bridge closures to be able scheduling my trip.

(d) overtaking bans on heavy goods vehicles

Heavy goods vehicle aware of overtaking bans

As a driver of heavy goods vehicle, I want to know about time and location of overtaking bans to prevent breaking the restriction when in place or to be able rescheduling and rerouting the trip.

(e) roadworks

Driver aware of roadworks

As a driver, I want to be informed about schedule and location of roadworks in advance to be able driving more carefully in these areas or rerouting the trip.

(f) accidents and incidents

Driver notified about accidents and incidents

As a driver, I want to be informed about accidents and incidents in front of me as soon as possible to either avoid given location or to drive more carefully.

(g) dynamic speed limits

Scheduling with dynamic speed limits

As a driver, I want to be informed about dynamic speed limits so that I can plan my trip schedule more precisely.

Adjust speed with dynamic speed limits

As a driver, I want to be informed about dynamic speed limit on the place I drive and 500 m in advance to be able to adjust my speed.

(h) direction of travel on reversible lanes

Driver aware of reversible lanes schedule

As a driver, I want to know schedule of reversible lanes usage so that I can better plan my route and schedule which are strongly affected by it.

Issues

- Is anybody using reversible lanes?
- Do the lanes operate on fixed schedule, or they change?
- Shall we split the information to scheduled and current status?

(i) poor road conditions

Driver aware of poor road conditions

As a driver, I want to know in advance poor road conditions so that I can avoid them if possible and have more precise route schedule, as it affects travel time.

Issues

- Is this rather static or dynamic type of information?

(j) temporary traffic management measures

Route scheduling according to temporary traffic management measures

As a driver, I want to be notified and aware of temporary traffic management measures so that I can better schedule my trips (in regards to when I travel and how long it takes).

Driver aware of temporary traffic management measure details

As a driver, I want to be informed about whole scale of traffic management measures (when it applies, what roads are affected, how it operates) so that I can better understand it and use it for planning my route.

Issues

- Is this category somehow special for neighbouring road operators?

(k) variable road user charges and available payment methods

Driver scheduling according to variable road user charges

As a driver, I want to be informed about variable road user charges so that I can better schedule my route and possibly optimize my costs.

Driver aware of charges and payment methods

As a driver, i want to be informed about variable road user charge and available payment methods so that I can be prepared to pay the charge with appropriate tools and amount.

(l) availability of parking places

Available parking places around target location

As a driver traveling to some target location, I want to be aware of current availability of parking places around the target location so that I can safely decide a parking facility to use and really find parking place there.

Available parking places for trucks

As a truck driver I want to be informed about availability of parking places (meeting my expectations) around my planned route so that I can safely decide which facility to use, really find parking place there and have a rest as required by regulations.

Issues

- Is existence of parking places covered in some other category? If not, we must cover it here. Btw, it is requirement for this category anyway.

- Reservation of parking places is legal requirement, but is probably out of scope of this data category.

- This topic (parking for trucks) is covered by another directive 885/2013. Is it out of scope then? Or we should include it and take care, related data are provided in expected formats?

(m) availability of delivery areas

Current availability of delivery areas

As a driver of goods delivery van, I want to know current availability (currently free, occupied since, or expected availability at..) of parking places at known locations so that I can reroute and avoid excessive waiting.

Typical availability of delivery areas in time

As a driver of goods delivery van, I want to learn about typical availability of delivery areas in specific locations (e.g. probability of finding at least one parking place during measured per 15 minutes or hours) so that I can schedule my delivery to less busy hours.

Demand for delivery areas for city planning

As a city planner, I want to know occupancy of delivery area so that I can properly increase or decrease number of places in given areas according to real needs.

Issues

- What is really meant by “delivery area”? I assume, it is special parking place reserved only to goods delivery in city centres.

- Reservation of delivery areas might be a requirement, but it is probably out of scope of our task.

- How to express typical availability of delivery area? Proposal: for given time period (e.g. 15, 30 or 60 minutes) measure duration when at least one parking place is available.

(n) cost of parking

Search for cost effective parking

As a driver, I want to know, what are parking charges in the area I am going to visit so that I can plan my expenses and possibly adjust my travel plan and route.

Show city parking intentions

As a city policy maker, I want to provide drivers with clear view of parking costs in whole city (showing it geographically as well as in time) to express at what time and locations are the drivers welcome and not welcome.

Issues

- What type of parking shall we cover? On-street, parking facilities, truck parking facilities?
- Shall we take into account variable parking charges? In some cities they use variable parking charges to control where people are parking (and increase revenue for some parking facilities).
- What about payment methods? Not being able to pay means no parking. But this might be out of scope.

(o) availability of charging points for electric vehicles

Driver developing recharging strategy

As a drive of an electric vehicle, I want to get an overview of charging point locations, their parameters (voltage, types of connectors, whatever may prevent usage for my car) and usage conditions (costs, operational hours, payment methods) so that I can develop my own recharging strategy.

Currently available recharging points

As a driver of an electric vehicle, I want to be notified about current availability of charging points suitable for my type of vehicle so that I can easily find it and recharge my vehicle.

Issues

- Current DATEX II Publication may lack some required attributes. Developing an extension may be needed. Such an extension may be complex task.

(p) weather conditions affecting road surface and visibility

Plan to avoid adverse driving conditions

As a driver, I want to be informed about current road surface conditions and visibility on my route to avoid risky area (by rerouting or rescheduling).

Alert before entering adverse driving conditions

As a driver, I want to get alerted (not too soon but not too late) when driving into area with risky road conditions or poor visibility to adjust driving style in advance and prevent dangerous problems.

Issues

- Alerting a driver must use precise enough location. Too soon alert will have no effect (“mist may occur in next 100 km”).

Part 3: Traffic Data

(a) traffic volume

Learn about road network dynamics

As a policy maker, I want to collect traffic volume data to learn from it about real demand and dynamics of the traffic on the road network and use that knowledge for further development of the network.

Issues

- Traffic volume is probably worthless for drivers, who in fact care about speed.

(b) speed

Speed based route planning

As a driver, I want to know about average speeds at given moment on different parts of road network to be able planning my route properly and to estimate my arrival time.

(c) location and length of traffic queues

Queue based traffic management

As a route operator, I want to know about location and length of traffic queues to be efficiently managing the traffic where needed.

Queue based routing

As a driver, I want to know about current location and length of traffic queues to be route my trip properly.

(d) travel times

Travel time based routing

As a driver, I want to know current travel times to be plan my trip properly.

(e) waiting time at border crossings to non-EU Member States

Choose less busy border crossing

As a driver, I want to know current waiting times at borders crossing to non-EU Member States to be able efficiently planning my trip and possibly using less busy crossing.

Users and related priorities of user stories

Elaborating on user stories shows, we have three different types of users and uses. This chapter proposes priorities going from the simplest, but most important ones to the most complex ones.

The concept is:

1. Find minimal set of information which allows a driver to efficiently drive through
2. Support efficient cooperation of traffic management centres
3. Where feasible, provide traffic information for internal use like planning maintenance etc.

As we can see, it goes from widest scope (any drive) over smaller scope (neighbour TMC) to smallest scope (internal use).

At the same time, the complexity of data structures grows from minimal one (needed for drivers) to most complex ones (e.g. for planning maintenance at specific road operator).

Driver planning a journey

The driver shall get enough information to:

1. Plan a journey efficiently
2. Change the plan properly as soon as problem arises

For this purpose, only basic information is sufficient:

- Geometry and topology of road network with rudimentary static characteristics
- Changes affecting ability to drive through

The later can be very simple (“blocked, partially blocked, free”), there is no need to provide too many details.

Neighbour TMC cooperatively managing traffic

Traffic Management Centre (TMC) has requirements extending those of a driver. Geographical scope of interest is for it’s own area plus neighbouring network, which may directly or indirectly be affected by internal traffic and vice versa.

There are two main topics:

1. Driving conditions and problems
2. Intentions and traffic management plans

Road operator fulfilling internal duties

Road operators have to perform many activities where detailed traffic information may help. Anyway, such data are often rather complex and vary operator by operator. At the same time, the road operator has such data under control and may customize the structures as

DATEX II Publication Type selection

Basically CROCODILE relies on the DATEX II modelling approach of using the so-called 'Layer A' model when developing the middleware specification. The 'Layer A' model in DATEX II represents a deployment approach where no further extensions and new data elements have to be defined in order to exchange in this case safety related data. Applications that have no content requirements beyond what this substantial model already has to offer do not need to consider interoperability problems. Since the main idea of this middleware specification is to provide a common approach on which data will be exchanged, the middleware aims at using predefined DATEX II specifications, instead of redefining available specfications.

DATEX II data modelling structure

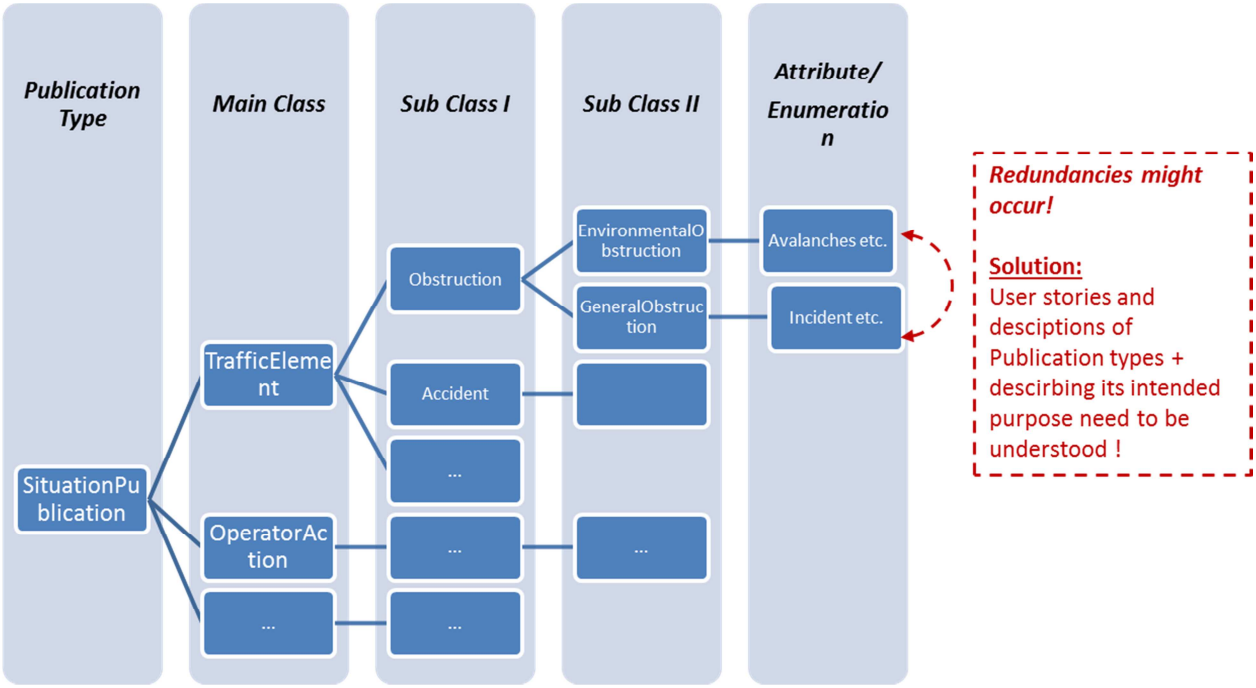

Figure 3: Hierarchical DATEX II data model structure (Publication types as high priority decision elements).

Identification of required priority action b related Publication types

Priority Action b data categories (see Annex, parts 2 and 3)			Publication		
Annex Parts (1,2,3)	Category	Definition	static	dynamic	
Part 2.) Dynamic road status Data	(a)	road closures	PredefinedLocations	Situation	
	(b)	lane closures		Situation	
	(c)	bridge closures		Situation	
	(d)	overtaking bans on heavy goods vehicles		Situation	??
	(e)	roadworks		Situation	
	(f)	accidents and incidents		Situation	
	(g)	dynamic speed limits		Situation	??Measured/Elaborated?
	(h)	direction of travel on reversible lanes		Situation	Are there structures for reversible lanes? Do we need them?
	(i)	poor road conditions		Situation	
	(j)	temporary traffic management measures		Situation	express all deteails
	(k)	variable road user charges and available payment methods		Situation	??Are there all terms present in the model?
	(l)	availability of parking places		ParkingStatus	Even though delivery area is not explicitly mentioned, it can be considered special type of parking facility.
	(m)	availability of delivery areas		ParkingStatus	Check, if both publications allow expressing costs.
	(n)	cost of parking		ParkingStatus	Consider charging point a parking facility
	(o)	availability of charging points for electric vehicles		ParkingStatus	Here are three options: MeasuredData, ElaboratedData, Situation. Consider all possiblitities. Must include the MeasuredData.
	(p)	weather conditions affecting road surface and visibility		MeasuredData	
Part 3.) Traffic Data	(a)	traffic volume		ElaboratedData	
	(b)	speed		ElaboratedData	
	(c)	location and lenght of traffic queues		Situation	
	(d)	travel times		ElaboratedData	??Possibly Situation
	(e)	waiting time at border crossings to non-EU Member States			

Figure 4: Assignment of DATEX II Publication types to priority action b data categories.

Selection of required DATEX II elements based on user story findings

Based on the results of the user stories and data selections, the following data types are chosen as master types being used for exchanging RTTI dynamic data on a web service interface that supports subscriptions between different Publisher and Client sites (between different road operators).

Priority Action b data categories (see Annex,			DATEX II Selection				
Annex Parts (1,2,3)	**Category**	**Definition**	**DATEX II Publication type**	**DATEX II main class**	**DATEX II subclass**	**Attribute/Enumeration name**	**Enumeration litteral**
Part 2.) Dynamic road status Data	**(a)**	**road closures**	SituationPublication --> SituationRecord	OperatorAction--> NetworkManagement	RoadOrCarriagewayOrLaneManagement	'RoadOrCarrigewayOrLaneManagementTypeEnum'	**roadclosed**
	(b)	**lane closures**	SituationPublication --> SituationRecord	OperatorAction--> NetworkManagement	RoadOrCarriagewayOrLaneManagement	'RoadOrCarrigewayOrLaneManagementTypeEnum'	**laneClosures**
	(c)	**bridge closures**	VMSPublication--> VMS	VmsMessage--> VMSPictorgramDisplayArea	VMSPictogram-->PictogramDescription	VmsDatexPictogramEnum'	**bridgeClosed**
	(d)	**overtaking bans on heavy goods vehicles**	SituationPublication --> SituationRecord	OperatorAction--> NetworkManagement	GeneralObstructionOrMessageToRoadUsers	GeneralObstructionOrMessageToRoadUsersTypeEnum'	**noOvertaking**
	(e)	**roadworks**	SituationPublication --> SituationRecord	OperatorAction--> Roadworks	ConstructionWorks MaintenanceWorks	ConstructionWorkTypeEnum RoadMaintenanceTypeEnum	**constructionWoirk maintenanceWork**
	(f)	**accidents and incidents**	SituationPublication --> SituationRecord	TrafficElement--> Accident	AccidentType	AccidentTypeEnum	**accident**
	(g)	**dynamic speed limits**	SituationPublication --> SituationRecord	OperatorAction--> NetworkManagement	SpeedManagement --> SpeedManagementType	SpeedManagementTypeEnum	**SpeedRestrictionInOperation**
	(h)	**direction of travel on reversible lanes**	SituationPublication --> SituationRecord	OperatorAction--> NetworkManagement	RoadOrCarriagewayOrLaneManagement	RoadOrCarrigewayOrLaneManagementTypeEnum	**tidalFlowLaneInOperation**
	(i)	**poor road conditions**	SituationPublication --> SituationRecord	TrafficElement--> RoadConditions	Road Conditions--> nonWeatherRelatedRoadConditionType	NonWeatherRelatedRoadConditionTypeEnum	**roadSurfaceInPoorCondition**
	(j)	**temporary traffic management measures**	SituationPublication --> SituationRecord	NetworkManagement--> RoadOrCarriagewayOrLaneManagement	NetworkManagement--> roadOrCarriagewayOrLaneManagementType	RoadOrCarriagewayOrLaneManagementTypeEnum	**hardShoulderRunningInOperation AND/OR rushHourLaneInOperation**
	(k)_1	**variable road user charges and available payment methods**	GenericPublication	Charge--> charge	charge	-	**AmountOfMoney**
	(k)_2	**variable road user charges and available payment methods**	GenericPublication	ParkingVehiclesPublication--> IndividualCharge	IndividualCharge-->usedMeansOfPayment	MeansOfPaymentEnum	**cash cashCoinsOnly directCashTransfer electronicSettlement mobileApp mobilePhone other payBySMS paymentCard rfid unknown**

Figure 5: Derived DATEX II based data content specification required for final profile development (1/2)

Priority Action b data categories (see Annex,			DATEX II Selection				
Annex Parts (1,2,3)	Category	Definition	DATEX II Publication type	DATEX II main class	DATEX II subclass	Attribute/Enumeration name	Enumeration litteral
Part 2.) Dynamic road status Data	(l)	availability of parking places	GenericPublication	ParkingRecordStatus	ParkingOccupancy	parkingNumberOfVacantSpaces	NonNegativeInteger
	(m)	availability of delivery areas	GenericPublication	ParkingSite	ParkingUsageScenario-->parkingUsageScenario	ParkingUsageScenarioEnum	loadingBay
	(n)	cost of parking	GenericPublication	TariffsAndPayment-> TariffsAndPayment	TariffsAndPayment-> TariffsAndPayment	Attribute: acceptedMeansOfPayment freeOfCharge lastUpdated paymentAdditionalDescription paymentMode reservationFee urlLinkAddress	
	(o)	availability of charging points for electric vehicles	GenericPublication	ParkingEquipmentOrServiceFacility	Equipment-->ElectricCharging	Attribute: chargingStationConnectorType chargingStationModelType chargingStationUsageType maximumCurrent numberOfChargingPoints voltage	
	(p)	weather conditions affecting road surface and visibility	see Safety-related!!!	Conditions--> PoorEnvironmentConditions	PoorEnvironmentType	PoorEnvironmentTypeEnum	All
Part 3.) Traffic Data	(a)	traffic volume	ElaboratedData	TrafficFlow--> VehicleFlow	VehicleFlow-->VehicleFlowValue	vehicleFlowRate	VehiclesPerHour
	(b)	speed	ElaboratedData	TrafficSpeed --> TrafficSpeed	averageVehicleSpeed-->SpeedValue	Speed	KilometresPerHour
	(c)	location and lenght of traffic queues	SituationPublication --> SituationRecord	TrafficElement	AbnormalTraffic	queueLength	MetresAsNonNegativeInteger
	(d)_1	travel times	ElaboratedData	DurationValue	DurationValue	duration	Seconds
	(d)_2	travel times	ElaboratedData	TraveltimeData	TravelTimeData-->travelTimeType	TravelTimeTypeEnum	best estimated instantaneous reconstituted
	(e)	waiting time at border crossings to non-EU Member States	SituationPublication --> SituationRecord	SituationRecord--> NonManagedCause	causeType	CauseTypeEnum	problemsAtBorderPost

Figure 6: Derived DATEX II based data content specification required for final profile development (2/2)