

# Development of a Process for the Ameliorated Access of Road Data Needed for Maps Used in ITS

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## Executive Report

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# 1 Initial Situation and Motivation for the Project

The application of ITS (Intelligent Transport Systems) demonstrably leads to a reduction of traffic jam events and associated time losses. This in turn results in smoother traffic flow and higher transport safety by the reduction of traffic accidents. The foundation for the proper working, the efficacy and hence the success of ITS applications is the availability of basic data of high quality. This comprises not only dynamic data, but also static data. Road data are of particular importance, for example the road network description and data about technical equipment along the roads.

The Directive 2010/40/EU of the EU council and parliament and the Delegated Regulation (EU) 2015/962 based on the former require the member states to set up processes for the ameliorated access to road data for maps needed by ITS. This is in order to establish the technical requirements and organizational conditions to use data describing the road infrastructure free of discrimination.

The research project develops a concept for the provision of infrastructure data for ITS kept in the road information systems of the German federal and local authorities responsible for road infrastructure and transport. Hence, the goals of the R&D projects are

- the identification of requirements of ITS for road (network) data,
- the analysis of data pools for road (network) data being kept by the German federal and local authorities and the evaluation of these regarding their utility for ITS,
- the evaluation of existing technical standards and data models as foundation for a technical solution enabling federal and local authorities to provide road data,
- the development of a concept for the technical infrastructure and possible workflows and operating schemes to provide road data.

## 2 Methodology and Main Results of the Project

### Identification of prerequisites and organizational requirements

At first the EU prerequisites were analyzed, i.e. ITS Action Plan, EU Directive 2010/40/EU, Delegated Regulation (EU) 2015/962 – subsequently referred to as „specification“, as well as the corresponding national documents describing the implementation of the former (Intelligente Verkehrssysteme Gesetz, IVS-Aktionsplan Straße). The resulting requirements formed the basis for the further conception of the provision of road data for ITS services.

To identify the technical and organizational requirements of ITS services concerning road data, a workshop was held with stakeholders concerned with such services. The result of this workshop was a data catalogue listing the requirements as so-called themes, i.e. types of data needed by ITS. A priority was assigned to each theme, showing its importance for the operation of ITS. The data catalogue agreed upon formed the basis for the following evaluation of data transport standards and analysis of the availability of data in the data pools of the federal

and local authorities.

### **Evaluation of data transport standards and location referencing methods**

To assess the utility of potentially suitable data models and standards, the requirements of ITS documented in the data catalogue, trials were made to map the themes subsequently to the data models of OKSTRA® / ASB (including OKSTRA kommunal which is now part of OKSTRA®), DATEX II, INSPIRE as well as ROSATTE / TN-ITS. For each data model, the feasibility of a mapping was systematically evaluated and documented.

The data models of DATEX II, of INSPIRE and of TN-ITS/ROSATTE – each regarded alone – are not useful as a foundation for the transport of road data needed for ITS maps. This is because of many of the themes considered important for ITS cannot be mapped.

In principle suitable on one hand is OKSTRA® and on the other a potential combination of INSPIRE and TN-ITS/ROSATTE. Such a combination is envisaged by the project TN-ITS-INSPIRE-alignment driven by ERTICO. But a combined data model of this TN-ITS-INSPIRE alignment will seemingly not be available in the foreseeable future, so the further recommendations of the concept will focus on OKSTRA®.

The EU specification requires that location references be formed by using a dynamic referencing method. Therefore, the possibly applicable methods TPEG-Loc / TPEG2, TPEG2-ULR, AGORA-C and OpenLR were analyzed. As AGORA-C is only utilizable under license fees, it is not considered suitable for providing road data for ITS. Instead, OpenLR is widely used as an open and proven alternative. The older TPEG-Loc and the TPEG2 derived from it, both open as well, have been proved too unreliable. A possible alternative could be the method TPEG2-ULR, work on this by TISA and its partners has obviously not continued by now. The further recommendations therefore will concentrate on OpenLR.

### **Analysis of the availability of data from German federal and local authorities**

In the next step, the data pools being kept by the German federal and local authorities were assessed regarding their utility for ITS services. The goal of the analysis was an overview which data needed by ITS could be provided by the public road and transport authorities, and in what form and quality. The analysis was performed by a poll of the administrations in charge in the federal states and of selected municipal institutions. To perform digital evaluation, a spread sheet questionnaire was prepared for the poll. In addition, personal interviews were conducted with selected administrative units in federal states and local authorities.

Altogether it may be stated there are not yet coordinating or accompanying workflows for the acquisition and qualification of data for ITS themes. Suitable data are acquired and held up-to-date for quite different purposes in the first place, and a possible use by ITS is a side effect.

Nevertheless, it must be noted, that a lot of usable data are available, even if not with blanket coverage or without quality assessment or up-to-date on the same day. A potential user has therefore to decide how far the availability of data however fragmentary may be of advantage.

Because of split responsibilities and system environments it seems desirable for any user to find a single point of contact at each data provider. Its task is the gathering of the desired data

and transforming them into a standardized technical format. Considering the very differing availabilities at the providers a homogeneous level of data quality cannot be required. Anyway, the providers are to present metadata and quality attributes according to a standardized scheme. Thereby, the user can sensibly evaluate the data quality.

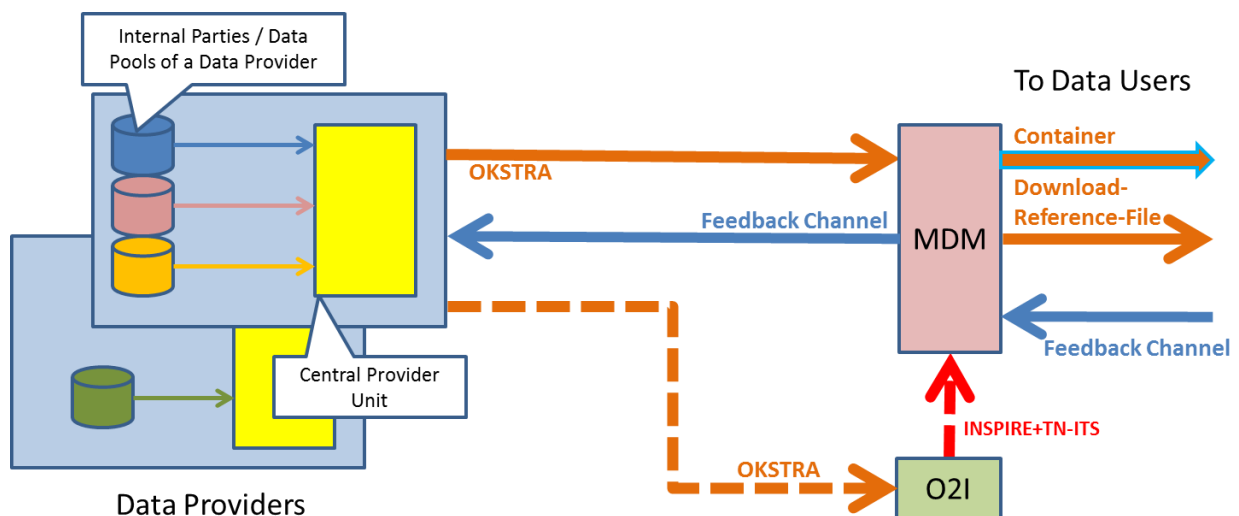
Many information of use for ITS come into existence by administrative actions of the transport authorities, e.g. traffic restrictions. Right after the physical implementation of these actions by the road operator the most up-to-date information would be available. The process of handling such regulations should be modified in that a structured digital documentation of type, position and temporal validity of them is introduced. The availability of ITS data would be significantly enhanced.

### Concept for the provision of road data for maps for ITS

The results of the previous analytical steps formed the base of a concept for providing road data for ITS services (fig. 1). Benefits and drawbacks of different technical variants for this task were discussed which finally led to a recommendation for an implementation.

Main issues of the recommendation:

The provided data will be encoded in the OKSTRA<sup>®</sup> format. In case a stable combined TN-ITS / INSPIRE data model will be available sometime in the future, this European format could also be served. To accomplish this, the OKSTRA-to-INSPIRE translator (O2I) in the making might be extended.



**Fig. 1:** Concept for the provision of road data for maps for ITS

The EU specification requires the use of dynamic location referencing. The method the most suitable at the time being is the open and popular OpenLR. The location references have to be computed and then attached to the data to be delivered. Usually this is performed by the source systems. Matching locations between different source systems of a provider or between source and target systems works best, when a homogenous network graph can be used. Therefore, it is recommended to compute the location references for the German long distance roads on the basis of the "Integrationsnetz Straße (INS)" which is currently being built up. Local

authorities may not participate in this because of license restrictions. It may however be possible to set up a central mechanism or service for the computations, operated by some German federal authority.

In a typical organization to act as a data provider, there will be several internal data pools that have to be tapped. It is therefore recommended that such organizations form a “central provider unit”. It will gather the requested data from the internal parties involved and brings them into the OKSTRA<sup>®</sup> format. It also acts as a single point of contact for all questions by map producers and ITS services.

The MDM fulfils the requirements of a national access point as formulated by the EU of keeping a metadata directory and offering a corresponding research facility. Moreover, the broker functionality of the MDM can be used as providing mechanism, or, alternatively, the static download facility of so-called reference files.

The concept also recommends a feedback channel to communicate information about deficiencies in the data to the road and transport authorities. It should be implemented as MDM feedback form. Thereby, them MDM operator can inspect and evaluate such messages.

### 3 Conclusion

The concept presented allows the implementation of the requirements of ITS services and EU concerning the provision of static road data and considering the actual situation of the federal and local road and transport authorities.

The road data important for ITS is to be encoded according to the German OKSTRA<sup>®</sup>. This is an established and continuously maintained national standard. Its practical application is facilitated by a number of freely available software tools. For the task of providing road data for ITS, some extensions are necessary the project has pointed out. The implementation of these will be transparent and without cost for both data providers and users.

Also necessary will be the use of a method for dynamic location referencing. This allows for the use of the road data in systems with differing network graphs. OpenLR has come up as a proven and open method of choice. The providers should use a homogenous road network to generate the location references, instead of their own. This will augment the matching quality of the location determination. The coming “Integrationsnetz Straße” will readily provide for this. Software to compute the network references needs to be centrally commissioned and operated by the federal bodies of Germany.

The German MDM service for road and traffic data is envisaged as national access point and has proved capable for this task. The technical infrastructure is operational and free of cost for providers and users. Aside from the facility to physically deliver the data it offers the research capability required. The recommended feedback channel to report data problems can also be implemented by a specially designed MDM feedback form.

The administrative bodies to provide data usable by ITS have quite different organizational and technical structures and also keep different subsets of types of data needed. There is,

however, available a quite large quantity of data of use. Every administrative provider of OKSTRA®-encoded data by means of the MDM shall create a coordinating organizational unit and a corresponding workflow for this task. To facilitate this, a support unit needs to be established within an organization apt for this. Support services should free of cost if possible.

As a final statement, the task of providing road data usable for ITS services is seen to be possible with manageable financial and organizational resources.