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Inteligentni transportni sistemi - Javni prevoz - Potovalne informacije za slabovidne (TI-VIP)

Intelligent transport systems - Public transport - Traveller Information for Visually Impaired People (TI-VIP)

Intelligente Transportsysteme - Öffentlicher Verkehr- Reiseinformationen für sehbehinderte Menschen (TI-VIP)

Systèmes intelligents de transport - Transport public - Informations des voyageurs pour les personnes en situation de handicap visuel (TI-VIP)

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Intelligent transport systems - Public transport - Traveller Information for Visually Impaired People (TI-VIP)

Systèmes intelligents de transport - Transport public - Informations des voyageurs pour les personnes en situation de handicap visuel (TI-VIP)

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Foreword

This document (CEN/TR 16427:2013) has been prepared by Technical Committee CEN/TC 278 “Road transport and traffic telematics”, the secretariat of which is held by NEN.

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0 Introduction

0.1 General

Advanced societies try to make life easier for their physically and mentally handicapped citizens so that they can participate in daily life without the help of others as far as their disability allows. Most European countries have adopted or are adopting laws that ensure that almost all disabled people have equality in the accessibility of the specific transport information that they need. Operators will have to meet specific requirements and recommendations according to particular deadlines set for each country. Whilst it is important to establish a Technical Specification as soon as possible to achieve harmonisation and to avoid the development of several incompatible solutions, this document is a Technical Report of the preliminary work undertaken by a sub-group of TC 278 WG3 towards that goal. It should form an input to the preparation of a Technical Specification when resources become available for that work to take place.

Passenger information facilities which provide all the useful information needed for visually unimpaired passengers during a journey (arrival and departure time, waiting time, changing stop/station, terminus or line number and destination of the vehicle which is actually at the stop, etc.) should also make this information available to VIPs in a suitable form. However, it should be recognised that Visually Impaired People (VIP) will require some device to effect communication with fixed and mobile elements of the public transport system (stops, buses, trams etc). The target is that unimpaired and impaired people should have the same level of information.

Journey Planners, which provide the information system for self-reliant passengers, were not included in the work for this Technical Report.

“Design for all” should take into consideration visually impaired people (VIP) and their specific needs. For these people it is a question of conveying meaning through sounds, speech and touch, since auditory and tactile channels are often their only means of gaining information.

Particular concerns of VIP are:

— Accessibility: To have easy access to, and to be able to visit, familiar and unfamiliar places by themselves;

— Relevance: To be able to locate themselves (know precisely where they are) in the environment and to discover nearby stops, stop names, available lines, their next journeys with an indication of departure time and arrival time, etc.;

— Reliability: To be able accurately to reflect the current situation so that their mental “picture” matches with reality;

— Safety and security: To be able to avoid falls and collisions (safety during boarding and alighting is a special concern), as well as feeling secure in taking a certain path.

For VIP, entering an unfamiliar environment or making a new journey is especially difficult. It is important to recognise that improved information systems will not solve all of the challenges and it is important also to make plans for assistance and support services. Standards for best practice within such services may also be helpful.

Modern electronic technologies can provide VIP with better information. Services for VIPs, whenever possible, should be an additional or specialised form of MMI (Man Machine Interface) from services which are also available for unimpaired travellers. It will be necessary to be clear which aspects are included in each existing standard or Technical Specification and which are not:

— The first issue to consider is which end-to-end sequence of technologies will have to be used to deliver such systems, including information about existing systems, devices, standards and Technical

Specifications. The following classification of devices, together with their communication characteristics, are suggested as the basis for a Technical Specification.

— Different classes of end-user devices offer different levels of services. Current technologies offer many possible solutions with different levels of ease of use. Three different classes of devices can be considered:

1) One way communication device: The VIP is equipped with a simple command transmitter with a small and ergonomic embedded tactile keypad. The command receiver connects either to the on-vehicle device (e.g. vehicle controller, which incorporates the necessary passenger information), or to an infrastructure controller, to get an appropriate announcement, typically in the local language, or to trigger some other action.

2) Two way communication device with integrated text to speech: The device is equipped with a small and ergonomic tactile keypad, usable by left and right handed people, and equipped to offer an acknowledgement signal (vibration, tone within a given time, etc.) and with a small loudspeaker and/or is able to connect to ear-phones. The audible information is output by the personal device using text to speech (TTS). The device receives the information as structured data (for example XML). The keywords (for example stop, direction, etc) are output in the user's mother tongue whilst the data (for example stop names) are received as text in the local language and output (not translated) by the device in the local language. This system should be able to import the trip information from a travel information system, so that the user gets appropriate current information on request during a journey.

3) More sophisticated systems which use standard devices such as smart phones. Such devices should be equipped with a special MMI for VIP: The keypad shall be tactile, usable for left and right handed people and equipped to offer an acknowledgement signal. (Vibration, tone within a given time, etc.) This device should be able to communicate with a centralised travel information system to make an online rerouting in case of problems arising during the trip. It also should be possible to get travel information from the user's current position to a personally-defined destination (address and/or stop/station). It should be able to provide absolute or relative positioning, for instance GPS (when far away from a stop and outside) and audible or other indoor navigation functions near the public transport stop points.

A device of class b should also support the functionality of a device of class a, and devices of class c should also support the functionality of a device of classes a and b.

The devices in class c may need to be considered in a subsequent part of a Technical Specification, following collaborative work with the International GDF Standards Group to allow the description of geographic paths (for guidance through the pedestrian network) which is expected to be included in the part 2 of the IFOPT Technical Specification. The devices should be able to communicate with a travel information system if the infrastructure has implemented interfaces and protocols for the relevant end-user devices.

— The fixed infrastructure objects (ticket machines, passenger information facilities, stops, and some other objects defined in the IFOPT Technical Specification) and on-board audio systems provide audible guidance to the VIP (advising which direction in which the VIP has to walk). Communication between the end-user device and the "vehicle control and information system" should allow the VIP system user to remotely control the following :

1) Open unblocked doors and, for slowly moving people, prevent the doors from closing too early.

2) Inside the vehicle, request a stop at the next stop point.

3) Outside the vehicle, request line and destination information from the "vehicle control and information system".

4) Inside the vehicle, get information about the next stops and complementary information (for example "terminus"; "stops only on request"; "change to underground"; "change of tariff zone").

— Short-range wireless communication using Short Range Command Radio or Wireless LAN or similar protocols should exist between the VIP's device and the vehicle or infrastructure.

— Communication between the back office systems and at-stop systems is not considered in this report.

— Communication between the back-office systems and the on-board systems depend on the radio network type that is in use. The messages used in AVMS (Automatic Vehicle Monitoring Systems) can be used. The work on standards and Technical Specifications for VIP may identify additional information elements that usefully can be added to the existing messages. The information on-board the vehicle comes from the databases in the on-board computer and the AVMS. Transmission of the data to the passenger information device is achieved by means of the vehicle data bus, for example CAN Open, World FIP or Industrial Ethernet. The older vehicle data bus IBIS, which operates in many countries, can also be used with certain restrictions for these purposes.

— The requirement for an additional interface between the on-board VIP communication device and the on-board computer is determined by the specific vehicle data bus and the specific on-board VIP communication device that are used. When the vehicle data bus and VIP communication device have the same interface an additional interface is not needed. The same applies to the stop/station passenger information systems. In new vehicles the VIP communication device may be part of the on-board computer or passenger information system, and the same will apply to any new stop/station passenger information systems.

Any Technical Specification in this area should be an open formulation that allows different technologies to be used for specific components, for example short-range Radio, Wi-Fi, Bluetooth, RFID etc, could all be used for short-range wireless communication as long as they meet the requirements. The Specification should not be constrained to specific implementation technologies.

There are some aspects for standardisation that are abstract and apply across different layers and use cases. For example:

— Ergonomic presentation standards for communication with the VIP. There are well known considerations for auditory usability such as pitch, attack, volume of signal, duration, reaction time, the required response time for safety (for example, communication ideally needs to happen in less than three seconds). These requirements are independent of specific technologies and are derived from human perceptual psychology. Relevant standards in this area should be taken into account in systems designs. The user functions that should be supported are, for example: to help a user to locate a stop; to discover the stop name; to obtain information about next stop; to learn about next departures, to make a request to board the vehicle. Certain of these functions are essential and should be mandatory.

— The information content and data elements that need to be transmitted. For example: the line name, stop name, direction/destination (end of the trip) etc. These correspond to elements already defined in public transport information models, such as Transmodel (Reference Data Model for Public Transport). Different formats may be needed to transmit elements in short-range wireless communication, and the work on Standards for VIP may identify additional information elements that can usefully be added to the existing models.

0.2 Short definition of relevant Technical Specifications and standards

— The basic one is Transmodel along with its related Technical Specifications for implementation and enhanced modelling. EN 12896 is the Reference Data Model for Public Transport (called also Transmodel) that defines a conceptual data model for the main domains of public transport (network topology, scheduling, rostering, operations control, passenger information, fare collection, management information & statistics). The current standard is Transmodel v5.1;

— IFOPT (Identification of Fixed Objects for Public Transport) is a complementary data model to Transmodel V5.1. It describes in particular stop places and their components (entrances, equipment, path links, etc.) in detail together with their accessibility properties and constraints. It complements and extends Transmodel;

— As regards data exchange messages, the set of SIRI Technical Specifications provides a set for some basic services (real time timetables, interchanges, etc). This specification relies on the concepts defined by Transmodel V5.1 and is dedicated to data exchange between systems;

— The NeTEx (Network and Timetable Exchange) Technical Specification currently under development will also be relevant;

— All systems should be designed for multi-lingual support of different Natural Languages.

— A Technical Specification should consider existing best practices for assisting, training and guiding VIP.

— The VIP will need to be made aware of available travel information systems in unfamiliar environments.

A Technical Specification should set out use cases and scenarios for interaction between VIP users and at-stop and on-board systems. These should take into account the differences between transport modes, for example buses, trams, local trains, intercity trains, etc. They should also consider the use of training and support services. These use cases should be developed in consultation with organisations for the blind and visually impaired, e.g. European Blind Union.

Acceptability of the VIP information system by other passengers and its potential for disturbance of other passengers should be checked and evaluated.

The approach should be system-oriented, expressed in terms of information layers, interfaces and models and allowing alternative implementations.

The Technical Specification should allow for inevitable differences in the use of radio frequencies in different countries.

The Specification should seek to identify the critical interfaces and harmonisation of technologies that will allow the same device to be used in as many different regions and countries as possible. This would enable the VIP to ‘roam’ with a single device in different regions. To achieve this may require collaboration with ETSI, and/or other CEN or ISO groups.

The capture of the necessary information about the physical environment represents a major practical challenge since there are hundreds of thousands of bus stops in a typical European country and an even larger amount of data about the detailed environment and journeys. It will be important to identify sources and processes for capturing and maintaining this data in order to make it economically viable to provide travel information systems with the capabilities needed for VIPs.

This Technical Report is based on work undertaken mainly between 2006 and 2009 which was seeking to establish the basis for a Technical Specification for work in this area. Whilst it was not possible to secure the support needed across CEN to take the Technical Specification forward in 2009, it was felt to be important that the work undertaken to date should be captured in this Technical Report. It is hoped that this Report will influence developments in this area so that they work well with established standards and specifications for public transport information systems. At some time in the future, when circumstances permit, it is still anticipated that a Technical Specification will need to be created. When that time comes, it should be possible for that work to take advantage of the work to date, as reflected in this Report.

1 Scope

This Technical Report is based on work undertaken to define the scope for a possible Technical Specification that would specify the information needed by blind and visually impaired people (VIP) when they are travelling. This information is primarily intended for users of road-based transport like buses, trolleybuses and trams, but it can also be used for subway, regional and inter-city trains.

The Technical Specification that is suggested would aim to define the contents of the information required at an urban or regional level. Its goal would be to make consistent information for VIP who are travelling anywhere in Europe. It would define the nature and the structure of the information for VIP using public transport to make it familiar, homogeneous and consistent.

The Technical Specification would be applicable to organisations and operators of facilities for Public Transport and related services, either urban or regional, who want to guarantee “accessibility for all” and comply with local laws and recommendations in that field. The suggested Technical Specification should comply with relevant laws and recommendations throughout European countries.

Such a Technical Specification should define the information and remotely controlled functions that should be available for VIPs at stops, platforms, access areas and inside/outside vehicles. The provision and the updating of the available information would be undertaken by the Public Transport operators or their partners. It would have to be linked with existing information and management systems.

A Technical Specification would identify the contents of the information, the events, the validity time periods and the information which should be offered by different classes of end-user devices.

The Technical Specification would state which information is to be provided by each one of the different classes of end-user devices.

“Traveller information for Visually Impaired People” is defined in a three layer top-down framework:

1. “Contents of the information”: this should be in accordance with relevant standards and other Technical Specifications (Transmodel, IFOPT, SIRI, TPEG, etc.) to achieve consistency of end-user information. All information has to be defined (including events for triggering, devices on which the information is presented and validity time periods). This will be based on use-cases;

2. “Messaging and Dialogues”: this part of the processing would have to comply with existing standards and Technical Specifications SIRI, TPEG, etc. to allow interoperability;

3. “Hardware or physical media”: this would define how to implement the messaging system specified above with different technical solutions to assure delivery of traveller information to the end-user. This could include collaboration with ETSI (layer for radio-communication).

The work to develop such a Technical Specification may identify additional information elements that need to be added to existing standards and Technical Specifications.

It is suggested that the first part of the Technical Specification should encompass only the first upper layer “Contents of the information” – and it is on this layer that this report concentrates.

A trip from one location to another location, often described as “door to door” (PLACE to PLACE), of a VIP involves going through several steps and phases (using various transport modes). The Technical Specification would define the information linked to each step and area crossed during a trip of a VIP. It would also define the information supply-chain for the VIP’s traveller information and the updates needed. It would have to be based on the elements and objects which are described in Transmodel and/or IFOPT.

The Technical Specification would need to take into account:

— the various transport modes used during a PLACE to PLACE trip,

— the information needed at each step in the PLACE to PLACE trip,

— the different classes of end-user devices,

— the constraints on the information layer imposed by the messaging layer,

— the constraints on the information layer imposed by the hardware or physical media layer, and

— glossary with all reference keywords needed for multilanguage support (XML tags).

The Technical Specification would need mainly to define:

— use-cases for end-users which will demonstrate the information needed (as line number, destination, name of next stop, etc.) and the associated real-time constraints,

— the nature of the information needed at each step of the PLACE to PLACE trip which may depend on the type of transport used,

— the real-time constraints of the information which depend on its nature and its usage,

— the different kinds of information available (different levels of service) which depend on the different classes of end-user devices, and

— the relationships between this information framework (intended for VIP travellers on public transport), and other information systems for VIP (traffic light, indoor navigation, etc) will have to be clarified.

The first part of the suggested Technical Specification would not define the two lower layers of the framework (Messaging and Hardware/physical media) that would need to be considered in a subsequent part of a Technical Specification, as

— acoustic announcement system;

— acoustic passenger and driver information system;

— automatic vehicle monitoring system;

— digital acoustic announcer;

— Integrated Board Information System (IBIS);

— the technical means which are specified for communication between the information system and the user;

— the information needed by VIP in fields other than public transport usage;

but it would have to take into consideration the developments which are being undertaken to meet other needs of VIP.

2 Use cases - Scenarios

2.1 General

A use case is a collection of possible sequences of interactions between the system under discussion (Traveller information for Visually Impaired People) and its actors (VIP, Public transport Information and Control System), relating to a particular goal. The collection of Use Cases defines all system behaviours relevant to the actors to ensure that their goals will be carried out properly. Any system behaviour that is irrelevant to the actors shall not be included in the use cases.

It is necessary to complete the description of use cases with the following parameters:

a) goal – specifies what the goal of the use case is;

b) actor – specifies who or what initiates the actions;

c) triggering – specifies how the information providing is initiated;

d) information source / expected action;

e) mandatory / optional – specifies if processing of this use case is:

— mandatory, or

— optional.

2.2 Journey preparation

2.2.1 Set the limiting conditions of the journey (A)

The VIP shall be able to set restrictions which need to be considered in searching for the ideal journey pattern. This Use Case is not considered for the first part of the suggested TS but would be required in a subsequent part.

2.2.2 Searching for the optimum journey (B)

The traveller wishes to get from a start PLACE (address or point of interest POI) to a destination PLACE (address or POI). The A.3.4 Intermodal **Journey Planner** (IJP) shall find the ideal trip on the basis of the given conditions. The IJP shall be accessible on both a stationary and a mobile basis. The methods of selecting a trip proposal in response to a trip optimisation query use a combination of criteria, often expressed as a part of the query to Passenger Information Systems and A.3.4 Intermodal **Journey Planner** Systems, for instance:

— minimise the duration or distance of the whole trip;

— prefer one transport mode (bus, metro…);

— minimise the walking distance;

— minimise the number of interchanges;

— minimise the fare;

— prefer a particular OPERATOR;

— apply constraints relevant to the needs of the VIP.

The TRIP PATTERN from a PLACE to a PLACE (so door to door) is the answer to the PASSENGER QUERY (type TRIP OPTIMIZATION QUERY). All the components are there to describe this TRIP PATTERN (ACCESS LINK, PT TRIP which is a sequence of RIDEs and CONNECTION LINKs, etc)

Not yet described are the geographic paths (for guidance through the road network) which will be based on the concepts in IFOPT.

This Use Case is also not proposed for the first part of the suggested Technical Specification but would be included in a subsequent part.

2.2.3 TRIP details (C/C1)

An A.3.4 Intermodal **Journey Planner** supplies a detailed description of the journey from the start PLACE to the destination PLACE, preferably in the form of a NAVIGATION PATH to the boarding stop, parts of SERVICE JOURNEY PATTERN, NAVIGATION PATHs for the interchanges and from the disembarkation PT stop (PLACE) to the destination PLACE (address or POINT OF INTEREST).

2.2.4 Buying a ticket (D)

This function has not been considered at this stage.

2.2.5 On-trip information (E)

On the basis of the data of the planned trip, the “on-trip information” has to be reduced to the information that is relevant to the specific part of the trip.

2.3 Guidance to the access point of PT

2.3.1 Walking to the access point (F)

The pedestrian navigation function informs the VIP in cases of a direction or route path that cannot be followed. In such cases (such as a barrier) the device will calculate a rerouting (it will typically request this information from an IJP). If the new NAVIGATION PATH to the boarding STOP POINT (BOARDING POSITION) takes more time then the available time to reach the PT the device will ask the IJP for a new proposal to reach the destination PLACE (address or POI).

2.3.2 Finding the access point (G)

The access point (STOP PLACE ENTRANCE or BOARDING POSITION) shall be easy to find. Local detail is necessary for precise navigation.

Stops may be of various types from the simplest one which is only a stop post with a static timetable and static sign (or even one without any sign or timetable), through a stop with a shelter and a dynamic stop information system, or a stop in a bus station with several stop places, through to a railway station with one or more entrances.

2.3.3 Confirming that the VIP is at the correct access point (H)

Name of the stop (COMMON NAME) and the access point (STOP PLACE ENTRANCE or BOARDING POSITION), the platforms/stop points (QUAYS) that can be accessed from here and possibly the mode of transport (TRANSPORT MODE), served routes (LINES) and direction (DESTINATION DISPLAY), if both directions are not served. This geographical information may also include details of the location of toilets, kiosks, info points, meeting points etc. (STOP PLACE COMPONENTS)

2.3.4 Topology information for the stop/station (I)

At the access point the VIP shall be provided with the necessary geographic description of the stop or interchange (STOP PATH LINKS), if this has not already been included in the trip planning. If it has already been included in the trip planning, any temporary or valid additions or corrections could be supplied at this point (updates to the STOP PATH LINKS and the STOP PLACE COMPONENTS: lift out of order, freshly painted, access blocked etc.)

This geographical information could also include details of the location of toilets, kiosks, info points, meeting points etc. (STOP PLACE COMPONENTS)

2.3.5 Information about the services provided at the current interchange (J)

Which platform (QUAY or BOARDING POSITION) does my train/bus/tram (VEHICLE) depart from? Information on the transport services (SERVICE JOURNEYS) provided at this stop/interchange shall be available. There shall be a means of clearly communicating any changes to the designated stop point (BOARDING POSITION or STOP POINT) or breakdown of a vehicle (a SERVICE JOURNEY which is not operating).

2.4 Selection of the desired route/direction and path to the departure stop point/platform

2.4.1 Selection of route and direction in the case of a spontaneous journey (K)

The way in which a VIP acquires transport information will differ for different stop/station types.

The VIP shall have an access to current information, such as that available on some of the systems providing Non-interactive Dynamic Passenger Information on Ground. This passenger information device indicates which platform (QUAY) or stop point (BOARDING POSITION or STOP POINT) the desired VEHICLE is departing from.

This poses the question of how a trip can be identified. Today there are various solutions, including planned departure time, route identifier (number) (if provided) and direction, but in this there are various concepts and many routes with more than two destinations as well as the problem of different routes with the same destination.

2.4.2 Information on trains that are split on route (L)

The VIP needs to be informed at some of the displays of Non interactive Dynamic Passenger Information on Ground, and also via the platform displays, that his train splits on route and then ensure he is sitting in the right section of the train. This may be a functionality of the IJP and of the VEHICLE VIP information system.

2.4.3 Walking from the ENTRANCE to the BOARDING POSITION (M)

The VIP shall be guided from the ENTRANCE (e.g. STOP PLACE ENTRANCE) to the departure point (BOARDING POSITION). The system takes into consideration the information from the IJP or the selection at the ENTRANCE (e.g. STOP PLACE ENTRANCE). There will be various decision points along this path (NAVIGATION PATH): junctions (PATH JUNCTIONS), lifts, escalators, ramps, stairs etc. (CHECKPOINTS) at which he shall choose the right path. However the possibility of the VIP making a mistake or unforeseen obstacles blocking the planned route (NAVIGATION PATH) to the departure platform/stop point cannot be avoided. This means that rerouting shall also be possible.

By way of example, in the walking part of the trip a “class a” user device can be used only for orientation by finding, for example, the entrance, correct escalator and stop point with an audible information system.