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Road traffic informatics – Open protocols for interfacing Vehicle Location Subsystems (OVLS)

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Road Traffic informatics - Open protocols for interfacing Vehicle Location Subsystems (OVLS)

Vägtrafikinformatik - OVLS

This Swedish standard is a basic standard for designing an automatic vehicle location system (AVLS). It has emerged from the industry standard OVLS developed in Sweden during 1991 and revised in 1994. The standard is presented in English only.

Denna svenska standard är en grundläggande standard för konstruktion av automatiska fordonslokaliseringssystem. Den har framtagits med utgångspunkt från industristandarden OVLS som togs fram i Sverige under 1991 och reviderades 1994. Standarden presenteras endast med engelsk text.

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Prisgrupp R

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Foreword

OVLS (Open protocols for interfacing Vehicle Location Subsystems) is a public standard for designing an automatic vehicle location system (AVLS). This national standard has emerged from the industry standard OVLS (Open Vehicle Location Standard) developed in Sweden during 1991, revised in 1994.

The original group of 1991 had the objective to build AVLSs in a standardised and easy way. Therefore, this standard takes advantage of existing infrastructure and industry standard components. In 1994, a thorough revision of the industry standard was accomplished.

This national standard is essentially based on the former industry standard, but the protocols have been refined and new functions have been added. To make OVLS general, the Mobitex specific parts have been moved to the normative Annex B, OVLS for Mobitex. Additionally, OVLS for GSM, has been added in Annex C (normative).

Annexes A, D, E, F and G to this standard are informative. They contain information to facilitate the understanding and implementation of OVLS. Annexes B and C are normative.

1 Scope

This Swedish standard specifies OVLS (Open protocols for interfacing Vehicle Location Subsystems), a solution for interfacing and adapting commercially available AVL-subsystems in order to build an AVLS (Automatic Vehicle Location System). OVLS consists of three independent modules (see figure 1).

- Communication Module;
- Emergency Module;
- Map Module.

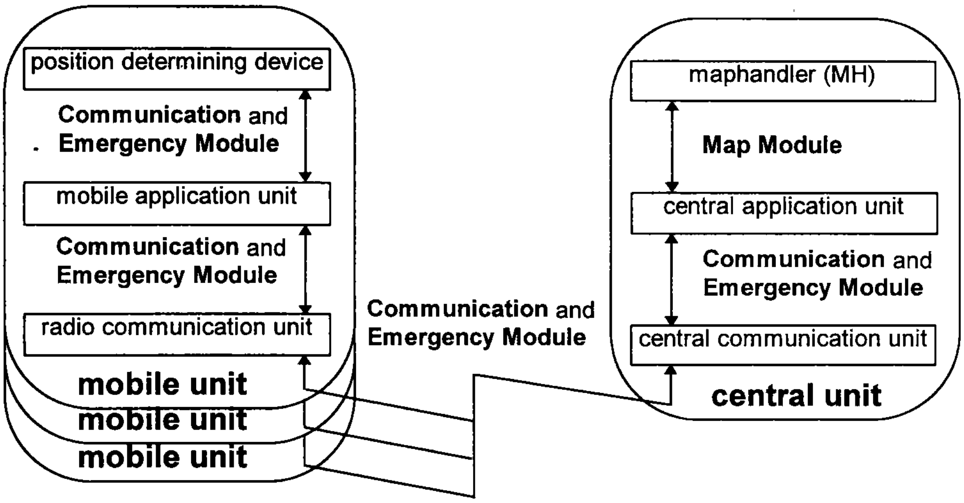

Figure 1 – OVLS subsystem block diagram - general layout

2 Normative references

The following documents contain provisions which, through reference in this text, consitute provisions of this standard.

NMEA 0183, Standard for interfacing marine electronic navigational devices, Version 2.1, Nov. 1994

Mobitex terminal specification, handled by MOA (Mobitex Operators Association)

3 Definitions and abbreviations

For the purposes of this Swedish standard, the following definitions and abbreviations apply:

3.1 application: computer program on the fixed or the mobile side handling the communication with the mobile or the central unit and the MH (Maphandler) via the OVLS modules

NOTE — User functions are implemented in an application.

3.2 AVL: Automatic Vehicle Location

***3.3* AVLS:** Automatic Vehicle Location System

3.4 CCIR: International Radio Consultative Committee, CCIR has changed name to ITU-R

3.5 EIA: Electronic Industries Association

3.6 icon: graphical marker representing an object in the MH

3.7 ID: identity, name for a specific object

3.8 ITU-R: International Telecommunication Union – Radiocommunication sector

3.9 LMV: LantMäteriVerket, National Land Survey of Sweden

3.10 MH: MapHandler, graphical tool for displaying objects on a map

3.11 object: well-defined unit, such as a car (mobile unit), a zone (area) or a house (fixed unit)

NOTE — Zones, mobile and fixed units may be related to as object groups.

3.12 NMEA: National Marine Electronics Association

3.13 OSI: Open Systems Interconnection

3.14 OVLS: Open protocols for interfacing Vehicle Location Subsystems

3.15 PDOP: Position Dilution Of Precision, geometric contribution (3-D) to the uncertainty of a position

NOTE — HDOP = Horizontal DOP (2-D).

3.16 RS-232: physical layer interface standard for the interconnection of equipment, established by EIA

NOTE — Four revisions (A-D) of RS-232 exist.

3.17 RT 90: Swedish planar coordinate system

NOTE — RT 38 is an older Swedish planar coordinate system.

3.18 SN: Subscription Number

3.19 SPDC: Short Position Data Command

3.20 status: macro-coded description of the current state of an object

3.21 SWEREF 93: Swedish reference system which replaces WGS 84 (SCANDOC)

3.22 WGS 84: World Geodetic System 84

4 General description

This clause provides an overview of OVLS and specifies the requirements on how OVLS should be implemented. For further details referring to automatic vehicle location systems (AVLS), see Annex A, AVLS - general.

4.1 Overview

OVLS is an open AVL-subsystem interface standard, composed of generalised macro-language protocols. OVLS makes it possible to adapt commercially available industry standard components to build an AVLS. Three modules specify the interconnection of the AVL components and contain the protocols to set up and exchange the AVL primitives.

OVLS facilitates for an end-user to change and mix products from different suppliers. The advantage for an equipment supplier is that a standardised solution is available to adopt. OVLS is not an ideal solution, since trade-offs have been made in order to support available industry standard products, but it is a proven, standardised solution that supports a variety of AVL functions.

Figure 2 shows the AVL-subsystems between which the different modules operate and the two different implementations, *central* and *distributed implementation.*

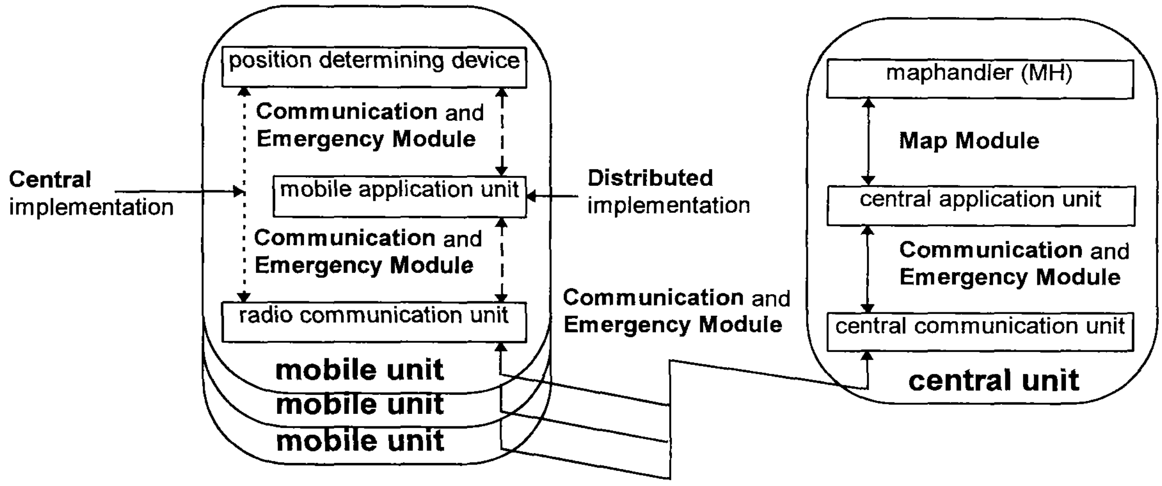

Figure 2 – OVLS subsystem block diagram - central and distributed implementation

OVLS identifies three logical entities in a mobile unit

- a position determining device;
- a radio communication unit; and
- an application unit.

The navigational data from the position determining device is processed and handled either direct by the Communication and/or the Emergency Module, or by an application that uses the OVLS modules. The OVLS primitives are transmitted via the radio communication unit to a central unit. A data exchange is initiated by the user (e.g. alarm), by the set-up parameters obtained from the central unit or by a polling procedure at the central unit.

Further, OVLS identifies three logical units at the central unit;

- a central communication unit;
- an application unit; and
- a maphandler.

The central application unit communicates AVL primitives via the central communication unit to and from the mobile entities. The AVL primitives and geographical data can be displayed by a maphandler using a digital map.

Outline of OVLS modules:

Communication Module (clause 5)

The Communication Module specifies an application protocol (according to the OSI model) to communicate navigational data over a mobile communication network. The Communication Module demands that a position sensor provides navigational data to the mobile terminal according to NMEA 0183. GGA, GLL and VTG sentences are primarily used.

The Communication Module specifies how the NMEA 0183 navigational data is set up, possibly reformatted and, encapsulated to form an OVLS message in a *distributed implementation.* The OVLS messages are transmitted by the communication unit. A simplified *central implementation* is also specified, which can be appropriate in certain contexts. The *central implementation* involves relaying of NMEA 0183 data to the central unit, which masters the operation and formats the NMEA data to OVLS messages.

The Communication Module specifies a compulsory basic functionality level giving AVL-functionality as polling and periodic position reporting. Furthermore, several optional functions enable a variety of additional options.

Emergency Module (clause 6)

The Emergency Module is an application protocol describing the format of locally initiated alarms and test alarms, which optionally can be acknowledged. The emergency message format, including position and coded alarm information is described.

Map Module (clause 7)

The Map Module specifies a protocol to exchange positions and position related data between an application and a maphandler (MH) to be displayed on an electronic chart. The Map Module is a transport and application protocol.

4.2 Implementation requirements

An OVLS module can be implemented independently of another OVLS module. Nevertheless, the Communication Module and the Emergency Module benefit from being implemented in parallel, since they are similarly structured and offer complementary functionality.

It is recommended to implement OVLS software in a way that makes it easy to upgrade e.g. in RAM memory, as an application protocol is expected to be subject to changes quite frequently, due to updated user demands.

When an agreement is signed between a purchaser and a vendor, it is recommended to accurately describe the extent of the OVLS-implementation in a contract to avoid controversy.

AVLS components with less functionality than described below for the different modules as minimum requirements, cannot be stated as OVLS implementations.

4.2.1 Communication Module requirements

A component in an AVLS fulfils the Communication Module only when the specified basic functionality level is handled completely. Different equipment and communication systems can have quite different natures, which has led to the specification of two different implementations of the Communication Module (see figure 2):

– *distributed implementation;*

– *central implementation.*

It shall be transparent for a central unit application whether OVLS messages are received from, or transmitted to, a *distributed* or a *central implementation* for the basic level functionality. A *central implementation* cannot give any additional functionality, besides the basic level functions.

In a *distributed implementation,* the Communication Module is implemented at both sides of the communication system, i.e. in the central and in the mobile units. A mobile unit formats the OVLS messages according to the Communication Module. This gives total control over what is transmitted between the mobile units and the central unit. A *distributed implementation* is suitable for intelligent communication terminals. If an intelligent terminal is not at hand, a computer can be used to host the Communication Module to control the message transfer.

In a *central implementation,* the Communication Module is implemented only at the central unit, where the formatting of the OVLS messages are carried out. The mobile equipment is pre-set for continuous transmission of a set of navigational data. When the central unit requests some specific navigational data, the central unit calls the mobile unit and polls the available navigational data. The session is terminated when the central unit has received the adequate information, or if the requested data have not arrived within a certain time limit. For networks with "unintelligent" terminals (with limited processing capacity), a *central implementation* is an alternative to a *distributed implementation.*

4.2.2 Emergency Module requirements

A mobile unit fulfils the Emergency Module when the transmitted message strictly follows the Emergency Module specification. An alarm central (operator) which claims to be a general OVLS Emergency Module alarm operator shall be able to interpret all the alarm and test alarm formats. Note that if alarms are to be transmitted to an external alarm operator, an agreement has to be established.

The Emergency Module cannot exist as a *central implementation,* because the mobile is required to have the processing power to initiate and format an alarm message. The Emergency Module has to be implemented with elaborate care. The alarm is not supposed to be used very often, but in the case of an alarm, it is required to function, due to the severity of lost or failed alarms. An agreement between an alarm transmitting part and an alarm operator should specify handling, action plans and the detailed interpretation of the received message.

Another limitation of the alarm function is the coverage of the communication network chosen. It is recommended to use the maximum power level for the transmission of an alarm and to examine whether there exists a suitable alarm network service.

4.2.3 Map Module requirements

A Map Module implementation does not need to be generally exchangeable with another implementation. The designer is free to choose commands from the Map Module, but should not define or use other messages than Map Module messages to exchange position data.

5 Communication Module

5.1 Introduction

In order to report the position of a vehicle to a central unit, the following equipment is needed:

- a position determining device; and
- a communication link.

In order to connect a position sensor and a communication terminal in a simple way, the interface has to be adapted and a communication program has to be implemented in the mobile unit. The central unit also needs a system for presentation, to present the positions of vehicles in a way that is easy to grasp.

For different position sensors to be easily connected to the communication terminal, a standard protocol accepted by different types of position sensors is needed. NMEA 0183 is a standard describing the data format protocol for position sensors, and many sensors support this standard. Therefore, the protocol between the communication terminal and the position sensors is founded on this existing standard.

The size of a Communication Module message cannot exceed the maximum supported message size in the communication network, and should not be transmitted more frequently than the communication network, terminals and other equipment can handle.

5.2 Levels of specification

The Communication Module specification is divided into a mandatory basic level and a set of optional functions. Both a *central* and a *distributed implementation* shall meet all the specified basic level functionalities.

Mandatory functions (basic level) are:

- periodic position transmissions;
- polling;
- handling of one central unit;
- interpretation of the NMEA 0183 sentences GGA, GLL and VTG;
- handling of optional commands;
- handling of set-up parameters;
- fault handling;
- version identification.

Optional functions are:

- monitor units;
- password;
- handling of more than one central unit;
- distance interval transmissions;
- proximity transmission;
- short position data commands, SPDCS;
- transparent data exchange between central and mobile applications;
- Mobile unit initiated command transmissions via keyboard or external unit;