

**ADASIS v2.0 data dictionary clarification**

**Revision .99**

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**Change Control**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Revision** | **Revision Date** | **Author / Modifier** | **Description / Modifications** | **Sections Affected** |
| 0.5 | 2 Aug 2011 | Dtoropov | Initial Pre-release for supplier review. | All |
| 0.6 | 16Aug 2011 | Aking6 | Removed CAN ID, messaging paragraph as its covered in the ADAS horizon spec. Position prob and confidence changed to TBD. | 3.1, 3.4 |
| 0.7 | 29 Aug 2011 | Aking6 | Moved some information from ADAS Horizon Spec, "Additional ADASIS Configuration" section, into this document.. | 2.1, 2.3, 3.5.3 |
| 0.8 | 11 Oct 2011 | dtoropov | Merged section 2.3 “Horizon Reset” and section 4.1 “Reset STUB”, added section 5 “Usages” |  |
| 0.81 | 06 Dec 2011 | Aking6 | Updated Conditional speed limit to add prioritization | 5.3.2.2 |
| 0.9 | 11 Jan 2012 | dtoropov | Added section 4.7 Sending profile messages of different interpolation types | 4.7 |
| 0.95 | 15 May 2012 | dtoropov | SharePoint ID 11: Outgoing Road Significance Factor updated  SharePoint ID 21: Sending PROFILE SHORT messages | 3.5.10, 4.4 4.6, 4.7, 5.2 |
| 0.96 | 28 June 2012 | Qhuang20 | Implicit/posted speed limit profile updated. No more “guessing” with country profile. Send “unknown” if speed limit is not avaiable | 5.3.1 |
| 0.97 | 4 July 2012 | dtoropov | Slightly changed wording in 5.3.1, added Roundabout case for calculating Road Significance Factor | 5.3.1, 3.5.10 |
| 0.98 | 12 July 2012 | Qhuang20 | Modify 5.3.2.2 conditional speed limit. Add an example for road links with more than three conditional speed limits. | 5.3.2.2 |
| 0.981 | 26 July 2012 | dtoropov | Updated section 5.3.2.2 wording | 5.3.2.2 |
| 0.99 | 17 Dec 2013 | Dherman/ Aking6 | Add support for sub-path expansion |  |

# Configuration

The Main path with Stubs configuration shall be used (see [1], section 3.3). In addition the ADASIS Mini protocol shall be implemented ([1], section 5.9).

# Paths and offsets

## Path Index

As defined in [1], the path index is a value 0-63, whereas values 0-7 have special meaning.

Regular path index values must be changed every time a new path is started. The formula to calculate a regular path index is (counter % 56) + 8 (% is a C modulo-division operator). The counter is incremented every time a new path is started.

## Offset

The Provider shall use the cyclic offset configuration ([1], section 3.4.2). The valid offsets window is 500 meters behind the vehicle and 7500 meters ahead of the vehicle. For example, if the last POSITION message had an offset 150, then offset values 151-7650 refer to positions ahead of the vehicle, whereas offset values 7841-8190 and 0-149 refer to positions behind the vehicle. The value range 7500 meters ahead of the vehicle and 500 meters behind the vehicle does not use the complete 8190 meters addressable offset range to eliminate the risk of misinterpretation of cyclic offsets ([1] section 6.4 recommendation 4).

## Horizon length and backwards horizon

The horizon length (forward horizon length) shall be configurable (e.g. using a configuration file). Both fixed length horizon (as described in [2]) and dynamic length horizon ([3]) shall be supported.

Furthermore, it shall be configurable if the Provider sends information behind the vehicle ([1] section 5.5.1, section 6.1 recommendation 5). If configured, the information behind the vehicle shall be sent when the Provider just starts or after recovering after GPS loss or off-road conditions (a POSITION message with path index 1-3 has been sent). The backwards horizon always has a fixed length; this length is not included into the forward horizon length (i.e. if forward horizon length is set to 2000 meters and backwards horizon length is set to 100 meters the Provider shall send information for 2100 meters when starting).

# Messages

## Message timings

The POSITION message is sent every time a new map matched position is obtained or map matching failed (event-based). SEGMENT, STUB, PROFILE SHORT and PROFILE LONG messages sent in scope of the “Main path with Stubs” configuration are sent according to the ADASIS specification as soon as new information is available (event-based). Message retransmission is not supported (except for subpath expansion cases with divergence from the MPP to a subpath). METADATA message is sent cyclically (event-based triggered by an internal timer), cycle time shall be configurable; the default value is 5 seconds. In addition, METADATA message can be sent out-of-order in case if some of the attributes are changed (event-based), e.g. in case if a country border is crossed. SEGMENT message sent in scope of the ADASIS Mini protocol is sent cyclically (event-based triggered by an internal timer), cycle time shall be configurable; the default value is 1 second.

## General Fields

### Cyclic Counter

Cyclic Counter is a message field used to detect missing messages. Cyclic counter is independent for each message type. For each message type it cyclically loops trough values 0-3, the value is incremented for each new message of that type. SEGMENT messages sent in scope of the ADASIS Mini protocol use cyclic counter independent from regular SEGMENT messages.

### Retransmission

Shall always be 0 on the MPP with stubs configuration. It shall be supported for subpath expansion cases with divergence from the MPP to a subpath. Given the divergence, we need to retransmit from the point of convergence to the prior expanded horizon.

### Update

Not used. Shall always be 0.

## POSITION

### Path Index

If a map matched position could successfully be obtained, a regular path index shall be used as described in [1] and section 2.1. Otherwise special Path Index value shall be used: 1 – if the position lies outside of the available map coverage, 2 – if the position lies inside of a mapped area, but cannot be associated to a street. Path index values 0 and 3 are not used.

### Offset

The Offset field changes cyclically as described in [1] and in section 2.2. It can increase (the vehicle moving forward) as well as decrease (the vehicle moving backwards), see [1] section 5.5. The distance between two succeeding POSITION messages is not allowed to exceed 7500 meters (with offset cyclic rollover if needed) for moving forward and 500 meters (with offset cyclic rollover if needed) backwards. If the position change exceeds those values a new path shall be started.

### Position Index

Always 0. Position candidates are unsupported.

### Position Age

An end-to-end delay required for the system to process the message. The delay is used to estimate the offset change between the offset value provided in the message and the position where the vehicle is located at when the application receives the message.

### Speed

The vehicle speed value projected to the path (i.e. the relative heading is considered). The formula is the , where is the vehicle speed as reported by the vehicle bus and is the vehicle’s relative heading.

### Relative Heading

The angle between the vehicle’s real heading as it is positioned on the street and the street heading as stored in the map. Please note that though the vehicle is in most cases drives along the street, the angle is in most cases not zero: it shows the difference between the physical street and its map representation.

### Position Probability

TBD

### Position Confidence

TBD

### Current Lane

Use 0 – unknown.

## SEGMENT

A SEGMENT message is considered as a bundled group of most important profiles. Each of these profiles has the interpolation type “step” ([1] Figure 23 on page 96).

SEGMENTS are similar, but not the same as map links. One SEGMENT can correspond to multiple map links if the attributes that are part of the SEGMENT message do not change across those links. Furthermore, one very long link may need to be split into 2 SEGMENTS if the repeat distance is exceeded (see section 4.5) or attributes are changed inside of a link (section 3.4.7).

### Path Index

For regular SEGMENT messages the path index shall correspond to the path index provided in the last sent STUB message (in the sub-path index field). For SEGMENT messages sent in scope of the ADASIS Mini protocol path index shall always be 4.

### Offset

The offset referring to the start position of the SEGMENT. A SEGMENT in contrast to a link of a digital map has a definite start position, but no explicit end position. The end position of a SEGMENT is implicitly defined by the start of a next SEGMENT. Offset is relative to a path’s start position and doesn’t change as vehicle moves.

### Functional Road Class

The functional road class of the links constituting the SEGMENT.

### Form of Way

Form of Way of the links constituting the SEGMENT.

|  |  |  |  |
| --- | --- | --- | --- |
| ADASIS Value | ADASIS name | GDF value | GDF name |
| 0 | Unknown |  |  |
| 1 | Freeway or Controlled Access road that is not a slip road/ramp | - | Use attributes: Controlled Access(28) = 1 & Ramp(@6) = 0 |
| 2 | Multiple Carriageway or Multiply Digitized Road | 2 | Multiply Digitised(@5) = 1 |
| 3 | Single Carriageway (default) | 3 | Speed Category(@I) = 1-8 and Multiply Digitised(@5) = 0 |
| 4 | Roundabout Circle | 4 | Roundabout |
| 5 | Traffic Square/Special Traffic Figure | 5 or 9 | Special Traffic Figure or Undefined Traffic Square Internal |
| 6 | Reserved |  |  |
| 7 | Reserved |  |  |
| 8 | Parallel Road (as special type of a slip road/ramp) | - | N/A for Navteq map (used for Teleatlas maps) |
| 9 | Slip Road/Ramp on a Freeway or Controlled Access road | - | Use attributes: Ramp(@6)=1 & Controlled Access (28) = 1 |
| 10 | Slip Road/Ramp (not on a Freeway or Controlled Access road) | 10 | Ramp(@6)=1 & Controlled Access (28) = 0 |
| 11 | Service Road or Frontage Road | 11 | Frontage Road |
| 12 | Entrance to or exit of a Car Park | 12 | Service Access and link to a Service of facility types of Open Parking Area(7369), Parking Garage(7313), and Park & Ride(7387) |
| 13 | Entrance to or exit to Service | 13 | Service Access and link to a Service without an associated parking facility type |
| 14 | Pedestrian Zone | 15 | Pedestrians Only |
| 15 | N/A |  |  |

### Effective Speed Limit

Effective Speed Limit value is calculated by the provider based on available map data and sensor input. It is the currently valid speed limit value valid on the road considering the current situation. For example, if map data provides two speed limits, e.g. 100kph posted speed limit and 80kph time-dependent speed limit, and the current time lies inside of the time interval provided by the time-dependent speed limit, the latter shall be used as the effective speed limit.

It may happen that the provider does not have access to all sensor data required to calculate effective speed limit value (e.g. rain sensor). In this case it shall not include in consideration those speed limits which validity it cannot recognize reliably (e.g. for the previous example those restricted “by wet”).

Effective Speed Limit reflects only values explicitly provided (posted) by the map. If map data does not provide any speed limit for a given road segment the value “31 – N/A” shall be used.

### Effective Speed Limit Type

Effective speed limit type provides the type of the effective speed limit calculated by the provider. E.g. for a time-dependent speed limit the speed limit type can be: “2 – by night”, “3 – by day” or “4 – time of day”, whichever corresponds the best to the map data. The value “0 – implicit” is not used. Effective Speed Limit value “31 – N/A” shall be accompanied by the effective speed limit type “7 – unknown”.

### Number of lanes in driving direction

If at an intersection, the number of lanes shall consider both lanes going through and turn lanes (GDF “NL” attribute does not consider turn lanes). If number of (turn) lanes changes within a single link, the link shall be split into multiple segments to reflect the number of lanes change.

### Number of lanes in opposite direction

For lanes going in the opposite direction only lanes going through shall be counted (as reported by the GDF “NL” attribute).

### Tunnel

The SEGMENT is a part of a tunnel.

### Bridge

The SEGMENT is a part of a bridge.

### Divided Road

Road segments with divider type physical.

### Build-up area

Urban road segments (GDF attribute 29).

### Complex intersection

Road segment is a part of a plural junction (GDF attribute PJ).

### Relative probability

Relative probability corresponds to link weight as defined in [2] section 5.

### Part of Calculated Route

Yes if route guidance is switched on and the starting link of a segment is a part of the calculated route. Otherwise no.

## STUB

A STUB message indicates that there is an intersection on a given path, and provides description for a first link of a path behind the intersection. One STUB message is sent for each of the links at the intersection, except for the link from which the intersection is approached if the U-turn is prohibited. In case the link is not accessible (turn prohibited) the STUB is sent nevertheless, in this case the number of lanes attribute shall be set to 0.

### Path Index

The path index for the path from which a new sub-path is branching. Only path indices 0 (reset) and regular path indices 8-63 are allowed.

### Offset

Offset for the middle point of the intersection.

### Sub-path index

For the *MPP + STUBS* configuration, STUBs sent along the MPP (path index != 0) only sub-path indices 5 (stub only) and 6 (continuation stub) are allowed. The horizon provider shall send, at each intersection, stub information for all possible paths. This includes the most probable path, as well as those with zero probability or representing illegal turns. Stubs with sub-paths index 5 shall be used for describing paths different from MPP, and a stub with sub-path index 6 for the MPP. Continuation STUBs must be sent if Turn Angle attribute (section 3.5.4) is supported. For reset STUBs (path index == 0) only regular sub-path indices (8-63) are allowed.

For the *MPP + First Level Sub-Path* configuration, only regular sub-path indices (8-63) and 6 (continuation stub) are allowed.

### Turn angle

Turn angle is calculated by the provider based on the map geometry. It is the angle between the tangents to the circle arcs going through the 3 shape points of the link adjacent to the intersection. If a link only has 2 shape points, the corresponding arc is degenerate – it is a straight line coinciding with the link itself.

Macintosh HD:Users:dt:Documents:ADASIS_STUB_TurnAngle.pdf

On the example image above the intersection incoming link is degenerate, it consists of 2 (end-) shape points and is used directly. The intersection-outgoing link has 3 or more shape points, a circle arc has to be constructed and its tangent is used. In this example the turn angle is the angle between the continuation of the intersection-incoming link and the tangent to the circle arc for the first 3 shape points of the intersection-outgoing link.

### Relative probability

The relative probability of a segment behind the intersection (see section 3.4.14).

### Form of way

Form of way of the segment behind the intersection (see section 3.4.4).

### Number of lanes in driving direction

Number of lanes in driving direction for the segment behind the intersection (see section 3.4.7). 0 if the turn is prohibited.

### Number of lanes in opposite direction

Number of lanes in opposite direction for the segment behind the intersection (see section 3.4.8).

### Complex intersection

Complex intersection attribute for the segment behind the intersection (see section 3.4.13).

### Right of Way

If traffic signs package available use information provided by traffic sign types 35-37 and 42 (right-of-way, give-way, etc.) to calculate whether for the given intersection the vehicle has the right of way.

If no traffic sign is available at the intersection use empiric approach: if the intersection-incoming link has lower priority than the intersection-outgoing link, which is represented by the STUB, use the Right-Of-Way value 0 (have right-of-way), if the intersection-outgoing link has lower priority use value 1 (give way), otherwise use value 2 (unknown). The link importance is calculated using the following approach:

|  |  |  |
| --- | --- | --- |
| Form of Way | Route Number Type | Importance |
| 4 (Roundabout) | (ignored) | 1.0 |
| 8,9,10 (Ramp) | (ignored) | (29-FC)/100 |
| 11,13 (Service) | (ignored) | (19-FC)/100 |
| 12 (Parking) | (ignored) | (09-FC)/100 |
| All other | RT1 – RT6; In Europe (except Ireland) RT1 – European street has to be ignored, otherwise always use the highest set bit in the Route Number Types bit field. | (39 + n\*10 – FC)/100, where n is the sequential number of the route type counting reversely: n=7-RT (e.g. 1 is RT6 and 6 is RT1) |
| 0 (Street with no route number) | (39-FC)/100 |

Here FC is the link’s functional class and the street type is obtained from the corresponding link attributes (calculated from top to bottom of the table).

### Functional Road class

Functional class of the segment behind the intersection (see section 3.4.3).

### Part of calculated route

Return YES if navigation system has a route guidance switched on and the first link of the segment is part of the route, otherwise NO.

### Last stub at offset

Marks the last STUB message sent for a given offset. Since messages are sent in offset ascending order (see section 4.3), it is possible to mark the last STUB message sent for given offset (all later STUB messages must have a greater offset). This enables the application to recognize that the intersection is transmitted completely and can be handled as a whole.

## PROFILE SHORT

PROFILE SHORT message allows to send two 10-bit profiles of the same profile type that are up to 1023 meters away. If needed due to some reason (e.g. the current electronic horizon contains odd number of profiles of a given type) PROFILE SHORT is capable to contain just one profile. In this case the distance attribute (see section 3.6.6) shall be set to 0.

### Path Index

Only regular path indices (8-63) are allowed.

### Offset

Offset of the first profile value.

### Profile Type

Supported profile types are described in [5].

### Control Point

Control points are used for higher-order interpolation types. For profiles with interpolation types Spot, Step and Linear shall be 0.

### Value 0

First profile value (at Offset).

### Distance 1

Distance between the profile value 0 and the profile value 1. If 0, profile value 1 is not defined in this message. This definition also assumes that only one value of a given profile type can be defined at given offset.

### Value 1

Profile value at offset+distance1.

### Accuracy

Use 3-unknown.

## PROFILE LONG

PROFILE LONG message allows to send one 32 bit profile value.

### Path Index

Only regular path indexes (8-63) are allowed.

### Offset

Offset of the profile value.

### Profile Type

Supported profile types are defined in [5].

### Control Point

Control points are used for higher-order interpolation types. For profiles with interpolation types Spot, Step and Linear shall be 0.

### Value

Value of the profile.

## METADATA

METADATA message provides information about the current semi-permanent environment attributes. Since applications can start and end at arbitrary times and attributes provided by the METADATA message change only infrequently, the METADATA message is sent regularly to minimize the time when an application has no information about its environment. In addition, if some of the attributes inside of the METADATA message need to be updated, e.g. due to crossing of a country border, additional METADATA message shall be sent event-based, independently of the current time (see [1] section 6.8).

### Country Code

ISO 3166-1 numeric country code. Country codes shall be defined at map compilation time and stored for all map links.

### Region Code

ISO 3166-2 region code. The mapping from 3 alphanumeric characters to a single 15 bits value is described in [1] section 9.4.

### Driving Side

As defined in [1].

### Speed Units

As defined in [1].

### Major Protocol Version

As defined in [1].

### Minor Protocol Version

As defined in [1].

### Minor Protocol Sub-Version

As defined in [1].

### Hardware Version

Not used. Use 0.

### Map Provider

As defined in [1].

### Map Version (Year)

As defined in [1].

### Map Version (Year Quarter)

As defined in [1].

# Message sequences

## Horizon Reset

A “reset” STUB (see [1] section 5.4 on page 86) shall be sent when starting a new MPP. A new MPP may be started e.g. at each engine start or after suspend/resume, after a GPS recovery preceded by a GPS loss, after leaving an MPP (e.g. making a turn) or if the position jumps more than 7500 meters ahead or more than 500 meters backwards. A “reset” STUB contains path index 0 (unknown), offset 8191 (invalid) and sub-path index is the index of the new path.

## STUB precedence

A STUB message defining a new path index (in the sub-path index field) shall be sent before any of the SEGMENT, PROFILE SHORT or PROFILE LONG messages referring to the same path index.

## Offset ascending order

STUB, SEGMENT, PROFILE SHORT and PROFILE LONG messages, for each message type independently, shall be sent in offset ascending order. I.e. if the provider sends a new message, its offset field shall be greater or equal than offset fields of all messages of the given message type sent earlier for this path.

To conform to this requirement, if needed, the provider shall sort the messages before sending them.

## Repeating the last SEGMENT message at the end of MPP

As described in [3] to enable the application to identify the current MPP length the last SEGMENT message shall be repeated with the offset corresponding to the last offset of the MPP, in case if no SEGMENT messages for offsets greater than that have been sent previously (this could happen e.g. if vehicle decelerates). See [3], section 3 for the detailed description of the procedure.

## Message repeat

If for a SEGMENT or a PROFILE message with interpolation type “step” there is no change in the map data for longer than a predefined distance, a new SEGMENT of PROFILE message shall be sent with the same data as in the previous message but for the new offset ([1] section 6.1 recommendation 6). The repeat distance lies in the range 0–7500m; the default value is 1000m.

## Sending PROFILE SHORT messages

Since PROFILE SHORT messages provide place for two values in one message a clarification is needed on how to pack the values at different offsets into the PROFILE SHORT messages depending on current MPP length. The following procedure is to be used:

1. Fill couples of values of the same profile type into the PROFILE SHORT messages until the end of MPP.
2. Stop if at the end of MPP the number of values is even (the last PROFILE SHORT message completely filled).
3. Otherwise try to find another value of the same profile type until either of the following fulfilled:
   1. The end of the last link in the MPP reached. In this case (no second value found) set distance1 to invalid and value1 to 1023 (N/A).
   2. The distance between the previous value (value0) and current search point reached 1km and profile interpolation type is step. In this case repeat the previous profile value (see section 4.5 Message Repeat) with the new offset.
   3. The distance between the previous value (value0) and current search point reached 1022 meter and profile interpolation type is NOT step. In this case set distance1 to invalid and value1 to 1023 (N/A).
   4. Second value found. Put the value as value1 in the last PROFILE SHORT message.

## Sending profile values for different interpolation types

The profile values are extracted from the map and sent differently for different interpolation types. Theoretically it is valid for all messages that may contain profile values: SEGMENT, PROFILE SHORT and PROFILE LONG. However currently not all kinds of profiles for different interpolation types are defined for each message. E.g. the SEGMENT message contains only profiles of interpolation type step, and the profiles currently defined for the PROFILE LONG message are either of interpolation types spot or linear.

### Step

For profile values with interpolation type step only value changes are transmitted: that is no new message needs to be sent when an attribute enters the MPP (shape point or a starting node of a map link starts belonging to MPP due to vehicle movement) if no change in the value is happened compared to already sent profile value.

Please note however, that due to the requirements defined in sections 4.4 and 4.5, in certain situations, profile values may need to be send more often than the corresponding attribute changes.

One special case of profile values with interpolation type step are link-based map attributes (the attributes that are valid for the whole map link). Messages containing profile values corresponding to link-based map attributes always have offsets corresponding the starting node of that map link. But not each map link will cause sending profile values for all of its attributes: only the changed values need to be sent. As SEGMENT message is a bundled collection of profile values with interpolation type step, a new SEGMENT message needs to be sent every time any of its corresponding attributes has changed.

### Spot and Linear

Profile values with interpolation types spot and linear are transmitted as provided by the map without any further aggregation (see also section 4.6 for packaging of profile values into PROFILE SHORT messages).

# Usages

## ADASIS Mini

ADASISv2 Mini is a separate protocol that can be used in conjunction with the regular ADASISv2 protocol. It is designed as a periodic protocol in contrast to ADASIS, which is event-based, and is capable of providing map information for the current road segment (link) where the vehicle is located.

The ADASISv2 SEGMENT message is re-used for the ADASISv2 Mini protocol, whereas several signals have special meaning (see below). The ADASISv2 SEMENT message is sent independently whether the map-matched position is available or not. In case no map-matched position is available all data fields of the SEGMENT message, except for those with special meaning defined below, shall be set to N/A.

### Cyclic counter

ADASIS mini uses cyclic counter values independent from those used by regular SEGMENT messages.

### Path Index

Always 4.

### Offset

Use 8191 – Invalid

### Relative Probability

Use 31 – N/A. If the current Position Probability as reported in the POSITION message of the regular ADASISv2 protocol is too low (the boundary value TBD) the provider shall handle this situation as if no map matching position is available.

## Route Number Type

Route Number Type PROFILE SHORT messages reflects the GDF Name Route Type (@7) attribute, the bit-field must contain 1 for each Name Route Type value associated with the link. In GDF each link may have assigned multiple Route Numbers with associated Name Route Types.

The Route Number Types PROFILE SHORT message has interpolation type STEP and shall be sent only when the corresponding bit-field value changes as described in section 4.7.1.

## Handling of Speed Limits

In addition to the Effective Speed Limit signal in the SEGMENT message there are 5 custom PROFILE SHORT message types defined in [5]. This section explains how the GDF data is to be mapped to these messages.

GDF defines 5 speed limit related attributes: Speed Restriction (SP), Speed Limit Source (80), Special Speed Limit (+S), Special Speed Type (+T) and Dependent Special Speed Type (+D).

### Implicit Speed Limit and Posted Speed Limit

PROFLE SHORT profile types 16 and 17 are used to transmit the implicit and posted speed limit values. They are sent when Speed Restriction or Speed Limit Source GDF attributes for the driving direction (consider the +N GDF attribute) change.

The Speed Restriction GDF attribute is used to code both posted and implicit speed limits, whereas an implicit (derived) speed limit is provided if no posted speed limit exists thus ensuring that a Speed Restriction value is provided for each link in each driving direction (if the link satisfies the requirements for the SP attribute). The Speed Limit Source attribute allows distinguishing the situations where a posted speed limit was available from those when a derived speed limit was used.

#### Speed Limit Source – Posted

If a link possesses a Speed Restriction attribute with Speed Limit Source “posted” that means that this link is located in scope of a validity region of a physical speed limit sign installed on the street. A new PROFILE SHORT Posted Speed Limit message shall be sent in case one of the following conditions is fulfilled:

* The value of the Speed Limit Source attribute for the link preceding the current in the MPP is equal to “derived”.
* Or the value of the Speed Limit Source attribute for the link preceding the current in the MPP is equal to “posted”, but the values of the Speed Restriction attribute for these links are not equal.

If a link has “posted” as the value for the Speed Limit Source Attribute the value of the implicit speed limit is not available. The “unknown” must be used as the value for implicit speed limit. The Implicit Speed Limit PROFILE SHORT message is sent if the value has changed compared to the previously sent value.

#### Speed Limit Source – Derived

If only derived speed limit is available for a map link then this link does not belong to a validity region of any speed limit sign.

If the value of the Speed Limit Source attribute for the link preceding the current in the MPP is equal to “posted” a Posted Speed Limit PROFILE SHORT message shall be sent with speed limit value “unlimited” (there is no traffic sign limiting the speed). If the value of the Speed Limit Source attribute for the link preceding the current in the MPP is equal to “derived” no Posted Speed Limit PROFILE SHORT message need to be sent.

In addition to that an Implicit Speed Limit PROFILE SHORT message shall be sent with the speed limit value provided by the Speed Restriction attribute if one of the following conditions is fulfilled:

* The value of the Speed Limit Source attribute for the link preceding the current in the MPP is equal to “posted”.
* The value of the Speed Limit Source attribute for the link preceding the current in the MPP is equal to “derived”, but the values of the Speed Restriction attribute for these links are not equal.

#### No speed limit

If there is no speed limit or speed limit source available for a map link (e.g. non-ADAS road links), both the posted speed limit and the implicit speed limit are unknown.

A Posted Speed Limit PROFILE SHORT message shall be sent if the link preceding the current in the MPP does contain both Speed Limit Source and Speed Restriction attributes.

An Implicit Speed Limit PROFILE SHORT message shall be sent if the value of the Speed Limit Source attribute for the link preceding the current in the MPP is equal to “derived”.

### Conditional Speed Limits

Since the ADASISv2 does not allow multiple PROFILE SHORT messages with the same profile type to be sent for the same offset, [5] defines 3 profile types to support up to 3 conditional speed limits simultaneously.

#### Conditional Speed Limit Usage

These profile types are used independently from each other. If one of these profile types was used to transmit a conditional speed limit, it may not be re-used as long as the original speed limit stays valid. This is illustrated on the following example:



Here two conditional speed limits are started at offset 100, they are transmitted using Conditional Speed Limit 1 and Conditional Speed Limit 2 PROFILE SHORT messages. Both messages have 2 values; first value is the corresponding speed limit value, whereas the second value is unlimited (in some situations it may happen that a new conditional speed limit starts *exactly* at the point where the old one gets expired, in this case the second value in the PROFILE SHORT message shall be the value for the new conditional speed limit rather then unlimited). At offset 200 a third conditional speed limit is started. Since both previous conditional speed limits are still valid the Conditional Speed Limit 3 PROFILE SHORT message must be used.

Conversely, if two conditional speed limits do not overlap, the same profile type may be re-used. On the example below the first speed limit is started at offset 100 and ends at offset 200, the second speed limit starts at offset 250 and ends at offset 400. To transmit these speed limits 2 Conditional Speed Limit 1 PROFILE SHORT messages are sent. The first one at offset 100 with the first value corresponding the to the speed limit value and the second value “unlimited” at distance 100. The second message is sent at offset 250, the first value is the speed limit value and the second value at distance 150 is “unlimited”.



Whenever an “unlimited” value for a conditional speed limit is sent, it must have the same conditional speed limit type as the original conditional speed limit, which this unlimited value invalidates.

In the GDF conditional speed limits are coded using the Special Speed Limit (+S), Special Speed Type (+T) – only the value “dependent”, and Dependent Special Speed Type (+D) attributes. Similar to posted and implicit speed limits a new PROFILE SHORT message containing a conditional speed limit is sent for the speed limit changes, i.e. when a new value of the Special Speed Limit with Special Speed Type “dependent” appears, disappears, or changes for the same Dependent Special Speed Type compared to the previous link in the MPP. The conditional speed limit type values exactly correspond to the values of the Dependent Special Speed Type (+D) GDF attribute values, value 0 – “unknown” is added for future extensibility in case other maps will need to be used. For conditional speed limit types “Time Dependent” and “Approximate Seasonal Time” the active status of a conditional speed limit value must be calculated based on the Validity Period (VP) GDF attribute. For other conditional speed limit types an “unknown” activity status may be provided.

#### Conditional Speed Limit Prioritization

Should the map at the same offset contain more than three conditions speed limits, the horizon provider should prioritize the output of conditional speed limits according to the list below:

|  |  |  |
| --- | --- | --- |
| Priority | Code | Description |
| 1 (highest) | 0x4 | Time Dependent |
| 2 | 0x1 | School |
| 3 | 0x7 | Fog |
| 4 | 0x5 | Approximate Seasonal Time |
| 5 | 0x6 | Lane Dependent |
| 6 | 0x2 | Rain |
| 7 | 0x3 | Snow |
| 8 (lowest) | 0x0 | Unknown |

If for certain link more than 3 conditional speed limits exist, three of them with the highest priorities shall be selected in the first step. Transmission of these selected speed limits shall be performed as described in section 5.3.2.1. The following table shows an example:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Edge | start/end [m] | Type + SP | Type + SP | Type + SP | Type + SP | Type + SP |
| Link 1 | 0-200 | time + 60 |  |  |  |  |
| Link 2 | 200-400 | time + 60 | school + 40 |  |  | lane + 55 |
| Link 3 | 400-600 | time + 60 | school + 40 | fog + 35 |  | lane + 55 |
| Link 4 | 600-800 | time + 60 |  | fog + 35 | rain + 45 | lane + 55 |
| Link 5 | 800-1000 | time + 60 |  |  |  | lane + 55 |

For the road links 3 and 4 there are four conditional speed limits. In the first step only up to three speed limits with highest priorities are selected for each link. Please note that speed limits are assigned to profile slots greedily to reduce the number of messages needed to send the speed limits but without looking ahead.

|  |  |  |  |
| --- | --- | --- | --- |
| Offset [m] | Profile - 18 | Profile - 19 | Profile - 20 |
| 0-200 | time + 60 |  |  |
| 200-400 | time + 60 | school + 40 | lane + 55 |
| 400-600 | time + 60 | school + 40 | fog + 35 |
| 600-800 | time + 60 | rain + 45 | fog + 35 |
| 800-1000 | time + 60 | lane + 55 |  |

The following table provides an example of sending the profiles presented in previous table for sample horizon expansion behavior.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| MPP ending point [m] | number of messages | Profile Type | offset | value0 | distance1 | value1 |
| 150 m | 1msg | 18 | 0 | time+60 | 0 | invalid |
| 210 m | 2msgs | 19 | 200 | school + 40 | 0 | invalid |
|  |  | 20 | 200 | lane + 55 | 0 | invalid |
| 350 m | no msg |  |  |  |  |  |
| 450 m | no msg | 20 | 400 | fog + 35 | 0 | invalid |
| 550 m | no msg |  |  |  |  |  |
| 650 m | 1msg | 19 | 600 | rain + 45 | 0 | invalid |
| 850 m | 2msg | 19 | 800 | lane + 55 | 0 | invalid |
|  |  | 20 | 800 | Unlimited | 0 | invalid |

# References

1. ADASIS v2.0.1
2. Implementing an Electronic Horizon Engine Using Most Probable Path and Stubs Only
3. Dynamic Computation of Electronic Horizon Length
4. ADAS Horizon Sensor Requirements
5. EH Data Dictionary
6. All CP by Country.xls