IEEE Std 1609.3-2016 guidance to OmniAir PlugFest 2017

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Contents

Introduction

- This presentation identifies areas in IEEE Std 1609.3-2016 that have been reported as potentially misleading or ambiguous and gives guidance on recommended interpretations of the standard.
- The issues addressed in this presentation have been found by implementers of devices and testing facilities.

Disclaimer

- The contents of this presentation do not necessarily reflect the views of the 1609 Working Group membership.
- This information has been provided by Kevin Smith in cooperation with Certification Operating Council (COC) members.
- Any recommendations or solutions presented herein are proposed, and must go through the standards development process before there is confidence that they are stable.

General note on frame formats, ASN.1, and UPER

- The frame formats in the main body of IEEE Std 1609.3-2016 are normative.
- Over-the-air frames that match those formats are conformant to the standard, regardless of how they are created.
- One way to create the frames is by using the informative ASN.1 in the Annexes, and encoding using UPER.
- If there were to be a conflict (though none has been found) the frame formats in the normative text take precedence unless some guidance is issued that explicitly states otherwise.
- The frame formats in the document are harmonized with ISO ITS standards.
- Examples in the informative Annex G are consistent with normative frame formats and UPER.

Elevation subfield of 3DLocation WAVE Information Element

- Issue - The description of *Elevation* found in 1609.3-2016 does not match the description found in SAE J2735 MAR2016 (i.e., the current version).
- Background
  - The description of *Elevation* used in 1609.3-2016 was taken from the description found in SAE J2735 MAR2015 (i.e., an older version), and contains errors.
  - In a subsequent revision of SAE J2735, the description of DE_Elevation was updated.
- Recommended interpretation
  - Use the DE_Elevation description found in SAE J2735 MAR2016 (see next slide).
  - Note: The ASN.1 specification for DE_Elevation in J2735 and the ASN.1 specification for *Elevation* in Annex J of 1609.3-2016 are the identical. The example for *Elevation* in Annex G is correct.

Elevation subfield of 3DLocation WAVE Information Element (continued)

- Text in IEEE Std 1609.3-2016, reflects old J2735 description, and contains errors:

  Elevation represents the geographic position above or below the reference ellipsoid (typically WGS-84). The 16-bit number has a resolution of 1 m and represents an asymmetric range of positive and negative values. The encoding is as follows: the range 0x0000 to 0xEFFF (0 to 61 439 decimal) are positive numbers representing elevations from 0 to +6143.9 m (i.e., above the reference ellipsoid). The range 0xF001 to 0xFFFF includes negative numbers representing elevations from –409.5 m to –0.1 m (i.e., below the reference ellipsoid). An elevation higher than +6143.9 m is represented 0xEFFF. An elevation lower than –409.5 m is represented 0xF001. If the sending device does not know its elevation, it shall encode the Elevation data element with 0xF000. See SAE J2735 for additional information.

  Examples of this encoding are as follows: The elevation 0 m is encoded as 0x0000, the elevation –0.1 m is encoded as 0xFFFF, and the elevation +100.0 m is encoded as 0x03E8. [Note: These encoding examples are incorrect]

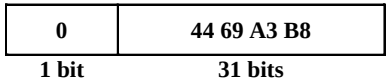
- Text in SAE J2735 MAR2016 clause 7.44, new and improved description for DE_Elevation:

  The DE_Elevation data element represents the geographic position above or below the reference ellipsoid (typically WGS-84). The number has a resolution of 1 decimeter and represents an asymmetric range of positive and negative values. Any elevation higher than +6143.9 meters is represented as +61439. Any elevation lower than -409.5 meters is represented as -4095. If the sending device does not know its elevation, it shall encode the Elevation data element with -4096.

- Recommendation
  - Use the text from J2735 MAR2016. See example in 1609.3-2016 Annex G.
  - Reminder: UPER is not able to represent negative numbers directly. Negative values are encoded as offsets to a base value of 0.

Latitude subfield of 2DLocation and 3DLocation WAVE Information Elements

- Issue – There is confusion about how to encode the *Latitude* subfield in the WAVE Info Elements 2DLocation and 3DLocation.
- Background
  - The value representing latitude is intended to be encoded compatible with SAE J2735. (longitude and elevation also)
  - 1609.3-2016 Figure 20 illustrates how the *2DLocation WAVE Information Element* is formatted. *Latitude*, as shown in Figure 20, is a subfield of the information element.
  - The *Latitude* subfield occupies 4 octets (32 bits).
  - Clarification: The *Latitude* subfield consists of a fill bit (MSB, set to 0) followed by a 31 bit value representing latitude that is consistent with J2735 DE_Latitude, encoded using UPER. The fill bit is not clearly illustrated in the text or Figure 20.
  - The format of the 32 bit *Latitude* subfield should look like this example:



  - Note: SAE J2735 is a normative reference to IEEE Std 1609.3-2016. J2735 clause 4.4 states “The encoding style required to be used to conform with this Standard when used with the WSMP method of sending shall be UPER.”
  - Reminder: UPER is not able to represent negative numbers directly. Negative values are encoded as offsets to a base value of 0. Suppliers not using UPER encoders should ensure negative values are encoded properly per UPER.
- Recommended interpretation
  - Use the frame formats in the normative text, with the added clarification provided above. The ASN.1 in Annex J exactly matches this when encoded with UPER.

Channel Access optional WAVE Information Element of Channel Info extension

- Issue - The ASN.1 specified for Channel Access does not match the normative text in 1609.3-2016 clause 8.2.4.8.2 and normative Table 21.
- Background
  - The ASN.1 for the MIB and for WSA frames retained the old terminology of “control channel interval” and “service channel interval”. These should have been updated using the new terminology “time slot 0” and “time slot 1”.
- Recommended interpretation
  - Use the value meanings found in normative Table 21.
- Notes
  - Proposed changes to a future 1609.3 draft may include correcting the values found in the ASN.1 MIB and WAVE Information Element schemas, and the value in the example in Annex G, to match Table 21.

1609.2 security header clarifications – for WSMs transporting WSAs

- WSMs that transport WSAs are required by 1609.3-2016 to include a 1609.2 security header. They are not required to be secured. These are two separate questions.
- From 1609.3-2016 clause 8.1: "WSA information passed over the air shall be formatted as an *Ieee1609Dot2Data* specified in IEEE Std 1609.2 and shown in Figure 16 and Figure 17. A WSA may be sent within a *Secured WSA* or an *Unsecured WSA*." (emphasis added)
- Recommended interpretation
  - WSMs that encapsulate WSAs must have a 1609.2 security header. However the WSA itself may be sent secured (e.g., signed) or unsecured (e.g., unsigned).

1609.2 security header clarifications – for WSMs transporting application data (i.e., not WSAs)

- 1609.3-2016 does not require WSMs transporting application data to be secured in any way. This is completely left up to the higher layers, e.g., applications.
- For example:
  - Application **abc** may specify that 1609.2 security headers are used. In this case, application **abc** can inspect the security header in received WSMs to determine if the WSM data is secured or unsecured.
  - Application **xyz** may specify that 1609.2 security headers are not used. It may specify some other security mechanisms, or none at all. For example, the Electronic Fee Collection (EFC) application specified in IEEE Std 1609.11 uses WSMP and has a non-1609.2 security mechanism based on symmetric cryptography.
  - Applications **abc** and **xyz** may operate on the same system, i.e., there is no "bleed-through" between applications with regards to their respective security requirements.
- Recommended interpretation: PlugFest participants testing interoperable applications should agree to either include, or not include the 1609.2 security header and implement accordingly. Generally, it is recommended that 1609.2 security headers be used during PlugFest for applications that will use 1609.2 security in real deployments.