EU-US Standards Harmonization Task Group Report: Feedback to ITS Standards Development Organizations—Communications

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16. Abstract

Harmonization Task Group 3 (HTG3) was established by the EU-US International Standards Harmonization Working Group to attempt to harmonize standards (including ISO, CEN, ETSI, IEEE) on communications protocols to promote cooperative ITS interoperability. HTG3 worked in close coordination with HTG1 whose focus is on harmonization of security. In collaboration, the two HTGs developed an integrated set of technical reports which includes this report. This report should be read in conjunction with HTG3-1— Status of ITS Communications Standards, which summarizes the analysis conducted to identify the necessary subset of available standards to provide assurance of interoperable communications in Cooperative ITS (C-ITS). This report provides feedback for Standards Development Organizations (SDOs) in terms of recommended actions for each interoperability issue identified in HTG3-1; and where appropriate identifies the most likely candidate SDO to address the recommended action.

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1 References

This list of references is not intended to be a complete list of all HTG-related standards but reflects a snap-shot used by HTG3. This list does not indicate any preference for an SDO.

References without a date in their titles are currently under development and may not be publicly available. For non-specific references (i.e., undated or no specific version number), the latest edition of the referenced document (including any amendments) applies.

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[2] ISO 16788, Intelligent transport systems—Communications access for land mobiles (CALM)—IPv6 networking security

[3] ISO 16789, Intelligent transport systems—Communications access for land mobiles (CALM)—IPv6 optimization

[4] ISO 21210:2012, Intelligent transport systems—Communications access for land mobiles (CALM)—IPv6 Networking

[5] ISO 21215:2010, Intelligent transport systems—Communications access for land mobiles (CALM)—M5

[6] ISO 21217:2010, Intelligent transport systems—Communications access for land mobiles (CALM)—Architecture

[7] ISO 21217, Intelligent transport systems—Communications access for land mobiles (CALM)—Architecture

[8] ISO 21218:2008, Intelligent transport systems—Communications access for land mobiles (CALM)—Medium service access points

[9] DIS 21218:2012, Intelligent transport systems—Communications access for land mobiles (CALM)—Access technology support

[10] ISO 24102:2011, Intelligent transport systems—Communications access for land mobiles (CALM)—Management

[11] DIS 24102-1:2012, Intelligent transport systems—Communications access for land mobiles (CALM)—Station management—Part 1: ITS station management

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Part 2: Scenarios (2010-03)
Part 3: Network architecture (2010-03)
Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications
- Sub-part 1: Media-Independent Functionality (2011-06)
- Sub-part 2: Media dependent functionalities for ITS-G5A media (draft)
Part 5: Transport Protocols; Sub-part 1: Basic Transport Protocol (2011-02)
Part 6: Internet Integration; Sub-part 1: Transmission of IPv6 Packets over GeoNetworking Protocols (2011-03)

[25] ETSI EN 302 637-2, Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service

[26] ETSI TS 102 637-3 V1.1.1 (2010-09), Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 3: Specifications of Decentralized Environmental Notification Basic Service

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[30] ETSI TS 102 724 V1.1.1 (2012-10), Intelligent Transport Systems (ITS); Harmonized Channel Specifications for Intelligent Transport Systems operating in the 5 GHz frequency band, Channel specifications 5 GHz

[31] ETSI TS 102 731, Intelligent Transport Systems (ITS); Security Architecture and Services

[32] ETSI EG 202 798 V1.1.1 (2011-01), Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing

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[58] FCC 47 CFR 15 Telecommunications, Radio frequency devices

[59] ETSI EN 302 571 V1.2.1: 2008, Intelligent Transport Systems (ITS); Radio communications equipment operating in the 5 855 MHz to 5 925 MHz frequency band; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive

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1.6 Testing

[61] ETSI EG 202 798 V1.1.1 (2011-01), Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing

[62] ETSI TS 102 985-1 V1.1.1 (2012-07), Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102)
Part 1: Protocol implementation conformance statement (PICS) proforma
Part 2: Test Suite Structure and Test Purposes (TSS&TP)
Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma

[63] ETSI TS 102 797-1 V1.1.1 (2012-08), Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for non-IP networking (ISO 29281)
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Part 2: Test Suite Structure and Test Purposes (TSS&TP)
Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma

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2 Introduction

2.1 Scope

This document promotes the goals of the project methodology described in document [66]. It is based on the interoperability topics identified and described in [67], which identifies differences among, and gaps in, ITS standards developed in ETSI, ISO/CEN and IEEE. For some of these topics, a potential for increased harmonization has been identified. This document suggests technical topics for consideration by the various SDOs toward the goal of completeness of and increasing harmonization among the relevant standards.

2.2 Structure of the document

This document has the following structure:

- Section 1 contains a list of references.
- This section (2) provides an introduction and a summary.
- Section 3 defines terminology.
- Section 4 lists topics in interoperability between the current standards, as introduced in [67].

For each topic in section 4, the document identifies a high-level objective for harmonization in this area, followed by a brief discussion of the subject. The full coverage of the topic is found in [67]. Where appropriate, suggestions are offered to the appropriate SDOs, including an identification of needed coordination among SDOs, followed by an estimate of the priority (high, medium, low) of the topic. The priority is a subjective estimate of the impact that the issue has to interoperability. A high priority issue is considered critical to harmonization; a low priority issue is considered to have little or no impact (e.g., because it relates to an optional or little-used feature).

The name of the topic includes a reference string for the specific topic from [67] (e.g., “HTG3-AL-01: Physical Channels”) with the topic groups:

- AL: indicating a topic in the ITS-S access layer.
- NT: indicating a topic in the ITS-S networking and transport layer.
- FL: indicating a topic in the ITS-S facilities layer.
- ME: indicating a topic in the ITS-S management entity.
- GE: indicating a general or cross-layer topic not related to any one of the other topic groups.

Actions are also given sequential labels, in this case of the form Action-HTG3-n.

2.3 Summary

Table 1 summarizes the content of section 4 of this document. Table 1 lists the issues described in [70] and provides links to the sections in this document where the feedback to SDOs is documented. The priority assigned in the linked section is repeated in the final column of Table 1.

Of 39 issues, 4 are identified as High (H) priority; 18 are Medium (M) priority; 17 are Low (L) priority. The rationale and background of each of the high-priority issues is explained below.

HTG3-GE-03: Registries. There are identifiers used within standards domains, and also across domains (e.g., ITS-AID, PSID), that should be formally managed. We recommend that SDO members continue coordinated management of the ITS-AID/PSID numbering space while working toward a global registration authority. The high priority was assigned because the current fragmented administration approach to the common number space opens the possibility of error and mismatch of numeric assignments among SDOs.

HTG3-GE-07: Testing. A comprehensive test strategy is under development in CEN/ISO and ETSI. Test documentation may be out of scope of IEEE. Operation of a certification program may be out of scope of any SDO. We recommend that comprehensive conformance test suites should be developed for the various core standards. The high priority was assigned because we feel that testing is a critical component of fielding a successful ITS.

HTG3-AL-01: Physical channels. Regulated use of 20MHz and 30MHz channels for ITS is not consistent across regulatory domains; nor are emissions requirements. Regulatory domain is identified over the air in the IEEE service advertisement, but not in other standards. We recommend that ISO extend channel identification fields (e.g., the Service Advertisement Message) to include IEEE Std 802.11 dot11CountryString to allow device to adapt to the local regulations. The high priority was assigned because regulations differ across geographic domains, and we feel devices must be able to automatically adapt to local operational settings to provide full ITS functionality.

HTG3-AL-02: Mapping of logical channels onto physical channels. An ITS logical channel (e.g., control channel) may be mapped to a different physical channel (e.g., channel 5/178 or channel 6/180) by different regulatory bodies. This area is partly in the realm of regulatory agencies (e.g., US FCC, and outside the direct influence of SDOs). We recommend that SDOs coordinate to agree on a common logical-physical channel mapping. We further recommend that where an SDO has direct influence in the mapping of logical to physical channel (e.g., harmonized ENs from ETSI), the SDO may proceed to propose the changes directly. Specifically, harmonized use of specific physical channels for control and safety functions is desirable. The high priority was assigned because harmonized channel usage reduces implementation complexity, simplifies deployment, and reduces the chance of service disruption at regulatory boundaries.

Table 1: Topics and priorities

Section	Topic	SDO	Priority
4.1	HTG3-GE-01: Concept of bounded secured managed domain (BSMD)	ETSI, IEEE	L
4.2	HTG3-GE-02: Concept of logical channels	ETSI, IEEE	M
4.3	HTG3-GE-03: Registries	All	H
4.4	HTG3-GE-04: Timing Advertisement broadcast	ISO	L
4.5	HTG3-GE-05: Management Information Bases (MIBs)	ETSI, ISO	L
4.6	HTG3-GE-06: Releases	ISO, all	M
4.7	HTG3-GE-07: Testing	All	H
4.8	HTG3-GE-08: Data objects of general usage	All	M
4.9	HTG3-GE-09: Multi-roadside-station sessions	All	M
4.10	HTG3-AL-01: Physical channels	ISO	H
4.11	HTG3-AL-02: Mapping of logical channels onto physical channels	All	H
4.12	HTG3-AL-03: Time domain multi-channel (TDMC) switching	None	L
4.13	HTG3-AL-04: Multiple radio technologies	ETSI, ISO	M
4.14	HTG3-AL-05: Channel congestion control mechanisms	ETSI, all	M
4.15	HTG3-AL-06: To DS/From DS	IEEE	L
4.16	HTG3-AL-07: EDCA parameter values	ISO	L
4.17	HTG3-AL-08: Management of optional CIPs	ISO	M
4.18	HTG3-AL-09: 802.2 LLC header for Type 1 operation	ISO	M
4.19	HTG3-AL-10: 802.2 LLC types of operation	All	L
4.20	HTG3-AL-11: 802.2 DSAP and SSAP usage	All	L
4.21	HTG3-AL-12: Ethertype values	ISO, All	M
4.22	HTG3-NT-01: Networking protocols	ETSI, ISO	M

Section	Topic	SDO	Priority
4.23	HTG3-NT-02: Transport protocols	ETSI, IEEE, all	M
4.24	HTG3-NT-03: Identification of endpoints	IEEE, all	M
4.25	HTG3-NT-04: IPv6 support	ETSI, IEEE	M
4.26	HTG3-FL-01: Facility layer functions and services	All	M
4.27	HTG3-FL-02: Facilities layer API	All	L
4.28	HTG3-ME-01: Service advertisement	All	M
4.29	HTG3-ME-02: SAM and CTX	IEEE, ISO	L
4.30	HTG3-ME-03: Delivery mechanism for service advertisement	ETSI, ISO, all	M
4.31	HTG3-ME-04: Identification of region of operation for service advertisements	ISO	M
4.32	HTG3-ME-05: Application identifiers	All	M
4.33	HTG3-ME-06: Router advertisement	ISO	M
4.34	HTG3-ME-07: Features of service advertisement	IEEE	L
4.35	HTG3-ME-08: TX power indication	ISO	L
4.36	HTG3-ME-09: SAM/WSA repetition rate	ISO	L
4.37	HTG3-ME-10: Location of service provider antenna	ISO	L
4.38	HTG3-ME-11: Station ID of service advertiser station	IEEE, ISO	M[1]
4.39	HTG3-ME-12: Delivery of generic management data	ISO	L

[1] Medium (but with time criticality because of ongoing implementation of Station ID).

3 Acronyms

Table 2 below lists acronyms used in documents produced by HTG 1 and HTG 3.

Table 2: Acronyms

Acronym	Meaning	Reference
API	Application Programming Interface	[7]
BRAN	Broadband Radio Access Networks	[60]
BSMD	Bounded Secured Managed Domain	[7]
BSS	Basic Service Set	[49]
BTP	Basic Transport Protocol	[24]
CCH	Control Channel	[21, 27, 52]
CEN	Comité Européen de Normalisation	http://www.cen.eu
CI	Communication Interface	[9]
CIP	Communication Interface Parameter	[16]
C-ITS	Cooperative ITS	[7, 19]
CTX	Context message	[14]
DCC	Distributed Congestion Control	[29]
DIS	Draft International Standard	ISO
DSAP	Destination SAP address	[46]
EDCA	Enhanced Distributed Channel Access	[49]
EN	European Norm	ETSI
ETSI	European Telecommunications Standards Institute	http://www.etsi.org
EU	European Union	general
FCC	Federal Communications Commission	http://www.fcc.gov/
FNTP	Fast Networking & Transport layer Protocol	[16]
From DS	Field in the IEEE Std 802.11 MAC header	[49]
FSAP	Fast Service Advertisement Protocol	[14]
GeoNet	Name of an EU research project	www.geonet-project.eu
GeoNetworking	Name of a protocol developed at ETSI based on the	[24]

Acronym	Meaning	Reference
	results from GeoNet	
HTG	Harmonization Task Group	-
IANA	Internet Assigned Numbers Authority	http://www.iana.org
IEEE	Institute of Electrical and Electronics Engineers	http://www.ieee.org
IETF	Internet Engineering Task Force	http://www.ietf.org
IP	Internet Protocol	IETF
IPv6	Version 6 of the Internet Protocol	IETF
ISO	International Standards Organization	http://www.iso.org
ITS	Intelligent Transport Systems (CEN, ETSI, ISO) Intelligent Transportation Systems (US)	[7]
ITS-AID	ITS Application Identifier	[33]
ITS-S	ITS Station	[7]
LLC	Logical Link Control	[45]
MAC	Medium Access Control	[45]
MIB	Management Information Base	[45]
OSI	Open Systems Interconnection	[20]
PDU	Protocol Data Unit	[45]
PSID	Provider Service Identifier	[52]
SACH	Service Advertisement Channel	[21]
SAE	Society of Automotive Engineers	http://www.sae.org/
SAM	Service Advertisement Message	[14]
SAP	Service Access Point	[13]
SCH	Service Channel	[21, 52, 27]
SCHx	Service Channel number x	[27]
SDO	Standards Development Organization	general
SDU	Service Data Unit	[45]
SfCH	Safety Channel	[21]
SNAP	Sub-Network Access Protocol	[45]

Acronym	Meaning	Reference
SNMP	Simple Network Management Protocol	IETF, [45]
SSAP	Source SAP address	[46]
SSP	Service specific permissions	[51]
Std	Standard	IEEE
TDMC	Time Domain Multiple Channel switching	-
To DS	Bit field in the IEEE Std 802.11 MAC header	[49]
TS	Technical Specification	ETSI/ISO
U-NII	Unlicensed National Information Infrastructure	[58]
US	United States	general
VCI	Virtual Communication Interface	[9]
VSA	Vendor Specific Action	[49]
WAVE	Wireless Access in Vehicular Environments	[50, 51, 52, 53, 54, 55]
WG	Working Group	general
WSA	WAVE Service Advertisement	[52]
WSMP	WAVE Short Message Protocol	[52]
XID	eXchange IDentification IEEE Std 802.2 LLC service	[46]

4 Technical topics

4.1 HTG3-GE-01: Concept of bounded secured managed domain (BSMD)

4.1.1 Objective

A common ITS architecture that uses common terminology.

4.1.2 Discussion

ISO is developing the concept of a BSMD in recent drafts of [6, 7].

4.1.3 Suggested Actions

Action-HTG3-1. Once complete, IEEE and ETSI consider adoption of the BSMD concept currently under development.

4.1.4 Priority

Low.

4.2 HTG3-GE-02: Concept of logical channels

4.2.1 Objective

A common ITS architecture that uses common terminology.

Portability of ITS applications.

4.2.2 Discussion

CEN/ISO are formalizing the concept of logical channels [28, 33] in recent drafts of [7, 21, 22].

4.2.3 Suggested Actions

Action-HTG3-2. Once complete, IEEE and ETSI consider adoption of the logical channel concept and related details currently under development.

4.2.4 Priority

Medium.

4.3 HTG3-GE-03: Registries

4.3.1 Objective

A common set of ITS identifiers to facilitate interoperability.

4.3.2 Discussion

There are identifiers used within standards domains, and also across domains (e.g., ITS-AID, PSID; see 4.32), that should be formally managed.

4.3.3 Suggested Actions

Action-HTG3-3. SDO members continue coordinated management of the ITS-AID/PSID numbering space while working toward a global registration authority [21]. See 4.32.

4.3.4 Priority

High.

4.4 HTG3-GE-04: Timing Advertisement broadcast

4.4.1 Objective

Common inter-station management features available throughout ITS.

4.4.2 Discussion

IEEE Std 1609.3 [52] includes a feature for periodic broadcast of time information using IEEE 802.11 frames.

4.4.3 Suggested Actions

Action-HTG3-4. ISO consider whether the delivery of the IEEE Std 802.11 timing advertisement [49] is beneficial, and if so, consider incorporating the periodic broadcast mechanism specified in [52] and [53].

4.4.4 Priority

Low.

4.5 HTG3-GE-05: Management Information Bases (MIBs)

4.5.1 Objective

Common management features available throughout ITS.

4.5.2 Discussion

IEEE standards include ASN.1 management information bases.

4.5.3 Suggested Actions

Action-HTG3-5. ISO/ETSI consider whether the specification of formal MIBs is beneficial and if so, consider incorporating them.

4.5.4 Priority

Low.

4.6 HTG3-GE-06: Releases

4.6.1 Objective

Predicable development, test, and fielding cycles, with predicable forward and backward compatibility behavior in the field.

4.6.2 Discussion

Compatible groups of standards versions (i.e., releases) should be developed and managed through their lifecycles.

4.6.3 Suggested Actions

Action-HTG3-6. ISO continue development of “conformance requirements” [18]. Other SDOs participate so that the results of that effort are applicable to each SDO domain.

4.6.4 Priority

Medium.

4.7 HTG3-GE-07: Testing

4.7.1 Objective

System performance; interoperability among devices. Streamlined and predictable development cycles. Confidence in device selection and purchase.

4.7.2 Discussion

A comprehensive test strategy is under development in CEN/ISO and ETSI. Test documentation may be out of scope of IEEE. Operation of a certification program may be out of scope of any SDO.

4.7.3 Suggested Actions

Action-HTG3-7. Comprehensive conformance test suites should be developed for the various core standards, including those identified in [18].

4.7.4 Priority

High.

4.8 HTG3-GE-08: Data objects of general usage

4.8.1 Objective

Harmonize control data encoding to facilitate implementation, interoperability, testability, and maintenance.

4.8.2 Discussion

Instances have been identified where identical or similar data is encoded differently in control fields of different communication protocol standards.

4.8.3 Suggested Actions

Action-HTG3-8. SDOs attempt to identify and align the encodings of similar fields across different standards, including, for example, time and location.

Action-HTG3-9. Specifically, SDOs align to the extent possible with time encoding, recently agreed for IEEE P1609.2 [51], as time since 00:00:00 UTC, 1 January, 2004, using International Atomic Time. ([51] uses a 64-bit integer, giving the number of International Atomic Time microseconds since 1 January, 2004, but other standards could require more or less precision, for example.)

4.8.4 Priority

Medium.

4.9 HTG3-GE-09: Multi-roadside-station sessions

4.9.1 Objective

Robust ITS operation, not limited to communication sessions within a single radio coverage zone.

4.9.2 Discussion

This is a feature area yet to be standardized for ITS.

4.9.3 Suggested Actions

Action-HTG3-10. SDOs continue research in this area, leveraging suitable existing technology where available, and consider incorporating, by reference, methods standardized by other organizations.

4.9.4 Priority

Medium.

4.10 HTG3-AL-01: Physical channels

4.10.1 Objective

Radio equipment is consistent across regulatory domains. There is a reduced chance of communication failures due to improper configuration with transiting domains.

4.10.2 Discussion

Regulated use of 20MHz and 30MHz channels for ITS is not consistent across regulatory domains; nor are emissions requirements. Regulatory domain is identified over the air in the IEEE service advertisement [52], but not in other standards.

4.10.3 Suggested Actions

Action-HTG3-11. ISO consider extension of channel identification fields in (e.g., SAM [14]) to include IEEE Std 802.11 dot11CountryString to allow device to adapt to the local regulations.

4.10.4 Priority

High.

4.11 HTG3-AL-02: Mapping of logical channels onto physical channels

4.11.1 Objective

Consistent designation of control and safety channels across regulatory/standards domains to minimize geography-specific device configuration and promote interoperability.

4.11.2 Discussion

An ITS logical channel (e.g., control channel) may be mapped to different physical channels (e.g., channel 5/178 or channel 6/180) by different regulatory bodies. This area is partly in the realm of regulatory agencies (e.g., US FCC, and outside the direct influence of SDOs).

4.11.3 Suggested Actions

Action-HTG3-12. Where the SDO has direct influence in the mapping of logical to physical channel (e.g., harmonized ENs from ETSI, the SDO may proceed to propose the changes directly). Specifically, harmonized use of specific physical channels for control and safety functions is desirable.

4.11.4 Priority

High.

4.12 HTG3-AL-03: Time domain multi-channel (TDMC) switching

4.12.1 Objective

Interoperable channel access in the time domain across standards.

4.12.2 Discussion

For reasons described in [70], harmonization of this channel switching feature specified in IEEE [53] is not considered essential.

4.12.3 Suggested Actions

No action identified.

4.12.4 Priority

Low.

4.13 HTG3-AL-04: Multiple radio technologies

4.13.1 Objective

A common ITS architecture that makes use of all suitable communications technologies.

4.13.2 Discussion

The scope of IEEE 1609 is generally limited to lower layer protocols running over IEEE Std 802.11 (G5/M5 in ETSI/ISO nomenclature). ETSI/CEN/ISO consider a more complete system (higher layers, other media) in their standards.

4.13.3 Suggested Actions

Action-HTG3-13. ISO and ESTI consider explicit incorporation of IEEE 1609 WAVE communications as part of the ITS station architecture.

4.13.4 Priority

Medium.

4.14 HTG3-AL-05: Channel congestion control mechanisms

4.14.1 Objective

Effective, mature, globally accepted congestion control methods.

4.14.2 Discussion

To our knowledge, ETSI leads in this area, but algorithms are still in development.

4.14.3 Suggested Actions

Action-HTG3-14. Continue development in ETSI. ISO and IEEE (1609 or 802.11) and consider contribution to and adoption of ETSI approach when appropriate. Since the ETSI work is candidate for worldwide adoption, ETSI should coordinate with worldwide stakeholders in the algorithm development.

4.14.4 Priority

Medium.

4.15 HTG3-AL-06: To DS/From DS

4.15.1 Objective

Consistent, efficient, and robust use of communications protocols.

4.15.2 Discussion

Standards are currently harmonized, but limit some features of IEEE Std 802.11.

4.15.3 Suggested Actions

Action-HTG3-15. IEEE 802.11 consider the value of relaxing To DS/From DS constraints (when operating outside the context of a BSS) to allow MAC bridging in operation outside the context of a BSS.

4.15.4 Priority

Low.

4.16 HTG3-AL-07: EDCA parameter values

4.16.1 Objective

Consistent, efficient, and robust use of communications protocols.

4.16.2 Discussion

EDCA default values are specified in IEEE Std 802.11. IEEE WSA includes the ability to modify those parameters, if needed for more efficient operation in a local area.

4.16.3 Suggested Actions

Action-HTG3-16. ISO consider the inclusion of over-the-air updates to EDCA parameter values as medium-specific information in its service advertisement message [14].

4.16.4 Priority

Low.

4.17 HTG3-AL-08: Management of optional CIPs

4.17.1 Objective

Reduce redundant communications management options to facilitate implementation, interoperability, testability, and maintenance.

4.17.2 Discussion

ISO includes Communication Interface Parameters (CIP) [5] in a non-standard version of the IEEE Std 802.2 [45] LLC header – see 4.18. IEEE [52] carries similar information in the WSMP header. ISO recently has added an optional field in the FNTP message [16] to indicate presence of CIPs.

4.17.3 Suggested Actions

Action-HTG3-17. ISO consider removing the non-standard usage of LLC in [5].

4.17.4 Priority

Medium.

4.18 HTG3-AL-09: 802.2 LLC header for Type 1 operation

4.18.1 Objective

Use consistent, standard versions of core technologies, in order to facilitate implementation, interoperability, testability, and maintenance.

4.18.2 Discussion

ISO has modified the formats specified in IEEE Std 802.2 [46]. See 4.17.

4.18.3 Suggested Actions

Action-HTG3-18. ISO consider update of [5] to use standard LLC features/formats per [46] with no modifications. See 4.17.

4.18.4 Priority

Medium.

4.19 HTG3-AL-10: 802.2 LLC types of operation

4.19.1 Objective

An application can get the lower layer communications services (e.g., LLC Type 1/2/3) it needs when using any communications stack.

4.19.2 Discussion

Use of LLC communications types (see [46]) are specified differently across the standards.

4.19.3 Suggested Actions

Action-HTG3-19. SDOs consider benefits of alternate types (2 and 3) of LLC communication, and clarify requirements in this area. Ensure that at least one common LLC mode (Type 1) is available in all stations. Documents affected include [52], [27], and [5].

4.19.4 Priority

Low.

4.20 HTG3-AL-11: 802.2 DSAP and SSAP usage

4.20.1 Objective

Efficient use of communications resources.

4.20.2 Discussion

Existing standards use a consistent method (SNAP) for indicating the network layer protocol, but more efficient methods might be available.

4.20.3 Suggested Actions

Action-HTG3-20. For the future, SDOs consider whether a more efficient method for identifying higher layers (similar to the Type method used in IEEE Std 802.3) might be applicable.

4.20.4 Priority

Low.

4.21 HTG3-AL-12: Ethertype values

4.21.1 Objective

Use consistent, standard versions of core technologies, in order to facilitate implementation, interoperability, testability, and maintenance.

4.21.2 Discussion

Where Ethertype is used, values should be in the official registry.

4.21.3 Suggested Actions

Action-HTG3-21. In general, SDOs to obtain Ethertype value for any network layer protocol. Specifically, ISO to obtain Ethertype for FNTP [16] from the IEEE Registration Authority.[2.]

4.21.4 Priority

Medium.

[2] http://standards.ieee.org/develop/regauth/ethertype/public.html.

4.22 HTG3-NT-01: Networking protocols

4.22.1 Objective

Robust communications services, including GeoNet features where needed, are available to ITS.

4.22.2 Discussion

The GeoNet feature is currently under development in ETSI [24].

4.22.3 Suggested Actions

Action-HTG3-22. ISO and ETSI coordinate to produce a single robust approach to make GeoNet functionality available in an ITS station, considering HTG observations in [73]. IEEE considers incorporation of mature GeoNet functionality by reference, when available.

4.22.4 Priority

Medium.

4.23 HTG3-NT-02: Transport protocols

4.23.1 Objective

Reduce redundant communications options to facilitate implementation, interoperability, testability, and maintenance.

4.23.2 Discussion

We currently have multiple non-interoperable ITS messaging protocols, including BTP, FNTP and WSMP.

4.23.3 Suggested Actions

Action-HTG3-23. ETSI consider replacement of BTP [24] with FNTP [16]. IEEE consider incorporation of a port mapper function for WSMP [52] to provide consistent capability with FNTP. SDOs continue to coordinate for ongoing harmonization of features, formats, and protocols toward eventual common protocol.

4.23.4 Priority

Medium.

4.24 HTG3-NT-03: Identification of endpoints

4.24.1 Objective

Reduce redundant communications options to facilitate implementation, interoperability, testability, and maintenance.

4.24.2 Discussion

FNTP [16] and BTP [24] use port numbers for identification of the higher layer; WSMP [52] uses PSID.

4.24.3 Suggested Actions

Action-HTG3-24. Coordinating with stakeholders and each other, SDOs develop appropriate means (e.g., adaptation layers or protocols, to provide common services across protocol families). For example, lacking a single messaging protocol, IEEE 1609 consider a port number extension to WSMP [52].

4.24.4 Priority

Medium.

4.25 HTG3-NT-04: IPv6 support

4.25.1 Objective

Reduce redundant communications options to facilitate implementation, interoperability, testability, and maintenance.

4.25.2 Discussion

IPv6-related features are specified differently in the different standards families.

4.25.3 Suggested Actions

Action-HTG3-25. IEEE 1609 consider more explicit specification of IP features/RFCs employed.

Action-HTG3-26. ETSI and IEEE consider incorporation by reference the ISO IPv6 mobility features, once they are mature.

Action-HTG3-27. ETSI consider removing dependencies of IPv6 on GeoNetworking.

Action-HTG3-28. IEEE and ETSI consider use of and reference to the IP profiles specified by ISO [2, 3, 4].

4.25.4 Priority

Medium.

4.26 HTG3-FL-01: Facility layer functions and services

4.26.1 Objective

Applications receive consistent services from similar protocols to facilitate implementation, interoperability, testability, and maintenance.

4.26.2 Discussion

IEEE does not address any facilities layer functions specified by ISO.

4.26.3 Suggested Actions

Action-HTG3-29. Coordinating with stakeholders and each other, SDOs develop common facilities services across protocol families. This could be accomplished by ISO and ESTI by explicit incorporation of IEEE 1609 WAVE communications as part of the ITS station architecture (see 4.13), or IEEE 1609 incorporation of ISO facilities-layer features by reference.

4.26.4 Priority

Medium.

4.27 HTG3-FL-02: Facilities layer API

4.27.1 Objective

Applications receive consistent services from similar protocols, to facilitate implementation, interoperability, testability, and maintenance.

4.27.2 Discussion

No standard has defined APIs.

4.27.3 Suggested Actions

Action-HTG3-30. SDOs consider whether API specifications are needed.

4.27.4 Priority

Low.

4.28 HTG3-ME-01: Service advertisement

4.28.1 Objective

Reduce redundant communications management options to facilitate implementation, interoperability, testability, and maintenance.

4.28.2 Discussion

There are currently two similar service advertisement messages and protocols from IEEE [52] and ISO [14]. ETSI adopted the ISO approach [35].

4.28.3 Suggested Actions

Action-HTG3-31. SDOs coordinate on service advertisement specifications for service advertisement capabilities, protocols, delivery mechanisms, and formats. More details in following topics. More specific actions are suggested in 4.29 through 4.38.

4.28.4 Priority

Medium.

4.29 HTG3-ME-02: SAM and CTX

4.29.1 Objective

Reduce redundant communications management options to facilitate implementation, interoperability, testability, and maintenance.

4.29.2 Discussion

There are currently two similar service advertisement messages and protocols from IEEE [52] and ISO [14]. ETSI adopted the ISO approach [35]. Specifically, an acknowledgement option is not found in IEEE.

4.29.3 Suggested Actions

Action-HTG3-32. In general, SDOs coordinate on standards for a single, generalized service advertisement protocol to accommodate (as options) the requirements from each SDO domain. Specifically, ISO provide IEEE 1609 working group rationale for a CTX protocol and IEEE consider incorporating the CTX feature [14] in a suitable way in the WSA protocol [52].

4.29.4 Priority

Low.

4.30 HTG3-ME-03: Delivery mechanism for service advertisement

4.30.1 Objective

Reduce redundant communications management options to facilitate implementation, interoperability, testability, and maintenance.

4.30.2 Discussion

We currently have two advertisement delivery mechanisms, specifically 802.11 data frames and 802.11 management frames.

4.30.3 Suggested Actions

Action-HTG3-33. SDOs continue to coordinate on consolidated minimal requirements for service delivery mechanisms. Specifically, ETSI/ISO consider whether the SAM-over-802.11 data frames option is essential to service advertisement in [14], and if so, propose a similar feature to the IEEE 1609 working group for incorporation in [52].

4.30.4 Priority

Medium.

4.31 HTG3-ME-04: Identification of region of operation for service advertisements

4.31.1 Objective

ITS migrate toward common service advertisement capabilities; effective operation at the border of regulatory domains.

4.31.2 Discussion

The ISO Service Advertisement Message does not contain information identifying the local regulatory domain affecting RF operation. (The IEEE WAVE Service Advertisement does include this information.)

4.31.3 Suggested Actions

Action-HTG3-34. ISO consider updating the SAM format [14] to include information comparable to the WSA Country String [52] (whose format details are specified in IEEE Std 802.11 [49]).

4.31.4 Priority

Medium.

4.32 HTG3-ME-05: Application identifiers

4.32.1 Objective

Applications receive consistent services from similar protocols to facilitate implementation, interoperability, testability, and maintenance.

4.32.2 Discussion

The use of the similar identifiers ITS-AID (by ISO and ETSI) and PSID (by IEEE), though using values from the same number space, is not aligned.

4.32.3 Suggested Actions

Action-HTG3-35. SDO members continue coordinated management of the ITS-AID/PSID numbering space while working toward a global registration authority [21]. Coordinating with stakeholders and each other, SDOs work toward a common usage of the ITS-AID/PSID within the respective standards.

4.32.4 Priority

Medium.

4.33 HTG3-ME-06: Router advertisement

4.33.1 Objective

ITS use common or compatible IPv6 approaches for router advertisement, host discovery, mobility, etc. ITS migrate toward common service advertisement capabilities, protocols, delivery mechanisms, and formats.

4.33.2 Discussion

IEEE 1609 has developed a streamlined approach for router discovery using the service advertisement procedure in IEEE Std 1609.3 [52].

4.33.3 Suggested Actions

Action-HTG3-36. ISO consider adopting IEEE 1609 [52] router advertisement approach for FSAP [14].

4.33.4 Priority

Medium.

4.34 HTG3-ME-07: Features of service advertisement

4.34.1 Objective

Applications receive consistent services from similar protocols to facilitate implementation, interoperability, testability, and maintenance.

4.34.2 Discussion

ISO optionally includes dynamic port numbers in its broadcast service advertisement, which can be used by applications in subsequent sessions.

4.34.3 Suggested Actions

Action-HTG3-37. IEEE consider whether the session support feature is beneficial to service advertisement in [52] and if so, consider incorporating the mechanism specified in [14].

4.34.4 Priority

Low.

4.35 HTG3-ME-08: TX power indication

4.35.1 Objective

ITS migrate toward common service advertisement capabilities, protocols, delivery mechanisms, and formats.

4.35.2 Discussion

IEEE Std 1609.3 [52] includes a feature for delivery of service advertisement transmit power.

4.35.3 Suggested Actions

Action-HTG3-38. ISO evaluate the compatibility of this feature with the station reference architecture, and its optional inclusion in the FSAP [14] for specific access technologies.

4.35.4 Priority

Low.

4.36 HTG3-ME-09: SAM/WSA repetition rate

4.36.1 Objective

ITS migrate toward common service advertisement capabilities, protocols, delivery mechanisms, and formats.

4.36.2 Discussion

IEEE Std 1609.3 [52] includes a feature for delivery of service advertisement transmit repetition rate indication in the WSA itself.

4.36.3 Suggested Actions

Action-HTG3-39. ISO consider inclusion of this feature in the FSAP [14], e.g., as an optional feature for specific access technologies.

4.36.4 Priority

Low.

4.37 HTG3-ME-10: Location of service provider antenna

4.37.1 Objective

ITS migrate toward common service advertisement capabilities, protocols, delivery mechanisms, and formats.

4.37.2 Discussion

IEEE Std 1609.3 [52] includes a feature for delivery of transmitter location in the service advertisement.

4.37.3 Suggested Actions

Action-HTG3-40. ISO consider inclusion of this feature in the FSAP [14], e.g., as an optional feature for specific access technologies.

4.37.4 Priority

Low.

4.38 HTG3-ME-11: Station ID of service advertiser station

4.38.1 Objective

ITS migrate toward common service advertisement capabilities, protocols, delivery mechanisms, and formats.

4.38.2 Discussion

The identification of the transmit station differs between SAM Station ID [14] and WSA Advertiser Identifier [52].

4.38.3 Suggested Actions

Action-HTG3-41. ISO and IEEE educate each other on the intended usage of Station ID (ISO) and Advertiser Identifier (IEEE) and coordinate to agree on one (or more) common format for advertiser station identifier.

4.38.4 Priority

Medium (but with time criticality because of ongoing implementation of Station ID).

4.39 HTG3-ME-12: Delivery of generic management data

4.39.1 Objective

Common management features available throughout ITS.

4.39.2 Discussion

IEEE Std 1609.3 [52] includes a feature for delivery of generic management data using IEEE 802.11 frames.

4.39.3 Suggested Actions

Action-HTG3-42. ISO consider whether the delivery of generic management data is beneficial, and if so, consider incorporating the mechanism specified in [52].

4.39.4 Priority

Low.

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