ITU - Telecommunication Standardization Sector Temporary Document 09CC-046

STUDY GROUP 15 Original: English

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Question: 4/15

SOURCE[1]: Aware

TITLE: **G.hn: PHY-Frame Header Extension**

ABSTRACT

This contribution proposes a generic PHY-frame header extension scheme to incorporate larger than PHY_H bits in the header (Issue 5.0.1.2.1.0.13). It also proposes not to fix the number of header repetitions (*D*) unconditionally for any given medium since the wide range of bandplans shall be accommodated effectively in a single domain (Issue 5.0.1.2.1.2.0.1).

| Introduction | Proposal | Text Update | Summary |

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1 Introduction

The group has been discussing PHY-frame header extension in two different aspects, (1) increasing the number of information bits carried in the PHY-frame header, and (2) repeating the same header information over two OFDM symbols for enhanced diversity combination. We need to have a generic and consistent approach to accomplish these two goals.

In 09CV meeting the group agreed to specify a scheme to extend the PHY-frame header so that larger than PHY_H bits can be accommodated in the PHY-frame header (Issue 5.0.1.2.1.0.13). This contribution proposes a generic scheme to extend the PHY-frame header. The proposed scheme makes G.hn future-proof, and it can be immediately used to support bi-directional transmission proposed by [4].

Item Number	Status	Item Description	Reference(s)
5.0.1.2.1.0.13	Agreed 8-Apr-09	That G.hn shall specify means to extend the PHY-frame header.	09CV-042

In 09XC meeting the group provisionally agreed that the number of PHY-frame header repetitions (*D*) shall be set to 2 in the coax medium since the number of available sub-carriers in coax 50MHz bandplan (256) is not enough to guarantee the reliability of PHY-frame header (Issue 5.0.1.2.1.2.0.1).

Item Number	Status	Item Description	Reference(s)
5.0.1.2.1.2.0.1	Agreed 30-July-09	Provisionally, that the value of D shall be 2 for the coax medium (baseband and RF) subject to there not being any alternative proposal submitted by the upload deadline for the Q4/15 G.hn meeting August 2009.	09XC-100

2 Proposal

For extending the capability of carrying more than PHY_H bits in the PHY-frame header, we propose the followings:

- ❑ Add a bit (Extended Header Indication: EHI) in the original PHY-frame header fields (Table 7-1) to indicate whether or not the header extension is applied.

- ❑ Define a generic field description for the extended part of the header in §7.1.2.3.3 (new section), which is also PHY_H bits long, and contains the common part (e.g., E_HCS) and variable part (e.g., E_FTSF).

The text update is proposed in the following section.

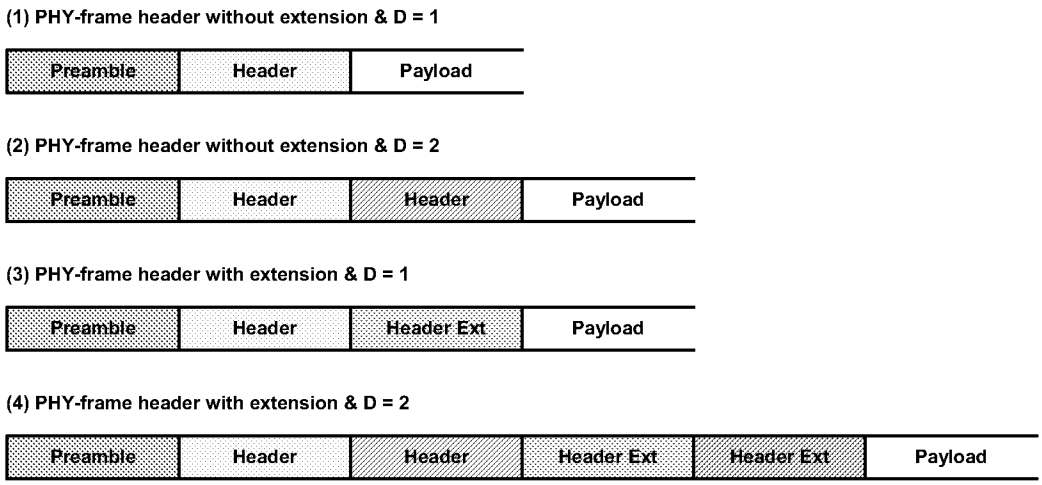
For specifying the number of PHY-frame header repetitions (*D*), we propose not to fix *D* per medium, rather to define a technique to use different values of *D*. Although it is understood that more repetitions may be necessary in coax, fixing *D* unconditionally for any given medium is neither a flexible nor an efficient solution because

- ❑ Even in the power line medium we may face the similar situation as narrower bandplans are added to support SmartGrid applications (Issue 1.90.10.1). In this case we need a flexible scheme to support narrow and wide bandplans at the same time.

Item Number	Status	Item Description	Reference(s)
1.90.10.1	Agreed 31-July-09	That G.hn shall specify: • Extensions to support the Smart Grid applications • A profile that is applicable to Smart Grid for devices that need to satisfy the requirements in terms of data rate, QoS, power consumption and device complexity.	09CX-104

- ❑ Applying $D = 2$ uniformly for all bandplans in coax makes G.hn less efficient for wide bandplans (e.g., 200MHz-CRF) as well as over the legacy system.

The possible cases of PHY-frame header transmissions are shown in the following figure.



3 Text Update

3.1 Existing text update for G.9960 Amendment 1

Text is updated based on [3] with all changes accepted.

<Start of text>

7.1.2.3 PHY-frame header

The core part of the PHY-frame header is PHY_H bits long and is composed of a common part and a variable part. The common part contains fields that are common for all PHY-frame types. The variable part contains fields according to the PHY-frame type. PHY-frame type is indicated by the FT field. The PAD fields fit the length of the header of different PHY frame-types to the standard values of PHY_H bits. The content of the ~~header~~ core part is protected by the 16-bit header check sequence (HCS).

The fields of the core part of the PHY-frame header are defined in Table 7-1.

Depending on the frame type, the PHY-frame header may be extended to $2 \times PHY_H$ bits long. If the extended header indication (EHI) bit is set, then additional PHY_H information bits of the extended part of the PHY-frame header are appended at the end of the core part of the PHY-frame header. The extended part of the PHY-frame header shall be encoded exactly the same way as the core part as described in §7.1.3.4.

Table 7-1/G.9960 – Core part of PHY-frame header fields

Field	Octet	Field Size [Bits]	Description	
FT	0	4	Frame type	Common part
DOD	0	4	Domain ID	
SID	1	8	The device ID of the source node	
DID	2	8	The device ID of the destination node(s)	
MI	3	1	Multicast indication identifies whether the DID is a multicast destination	
PHI	3	1	Post header indication identifies whether the first payload symbol after the header is a PRBS symbol or a data symbol	
EHI	3	1	Extended header indication	
Reserved	3	5~~6~~	Reserved by ITU-T	
Duration	4-5	16	The PHY frame transmission duration	
…	6-18			Variable part
HCS	19-20	16	Header check sequence	Common part

<End of text>

3.2 New text for G.9960 Amendment 1

Text is added based on [3] with all changes accepted.

<Start of text>

7.1.2.3.1.6 Post Header Indication (PHI)

The PHI bit, when set, shall indicate that the first payload symbol following the header is a PRBS symbol. Otherwise the first payload symbol shall be a data symbol.

7.1.2.3.1.7 Extended Header Indication (EHI)

The EHI field, when set, shall indicate that the PHY frame header contains $2\times PHY_H$ information bits. The additional PHY_H information bits of the extended part of the PHY-frame header are specified in §7.1.2.3.3. If the EHI field is zero, then the PHY-frame header shall contain PHY_H information bits. The EHI field shall be set according to the frame type.

<End of text>

<Start of text>

7.1.2.3.3 Extended header fields

The extended part of the PHY-frame header is PHY_H bits long and is composed of a common part and a variable part. The common part contains fields that are common for all PHY-frame types. The variable part contains fields according to the PHY-frame type. PHY-frame type is indicated by the FT field in the core part of the PHY-frame header. The PAD fields fit the length of the header of different PHY frame-types to the standard values of PHY_H bits. The content of the extended part is protected by the 16-bit header check sequence (E_HCS).

The fields of the extended part of the PHY-frame header are defined in Table 7-XY.

Table 7-XY/G.9960 – Extended part of PHY-frame header fields

Field	Octet	Field Size [Bits]	Description	
E_FTSF	0-18	152	Extended frame-type specific fields	Variable part
E_HCS	19-20	16	Extended header check sequence	Common part

7.1.2.3.3.1 Extended frame-type specific fields (E_FTSF)

This is for further study.

7.1.2.3.3.2 Extended header check sequence (E_HCS)

The E_HCS field is intended for verification of the extended part of the PHY-frame header. The E_HCS is a 16-bit cyclic redundancy check (CRC) and shall be computed over all the fields of the E_FTSF in the order they are transmitted, starting with the LSB of the first field and ending with the MSB of the last field of E_FTSF. The same polynomial described in §7.1.2.3.1.8 shall be used.

<End of text>

4 References

[1] Editor for G.hn, "G.hn: Draft Text for G.hn – version 4.1," *ITU-T SG15/Q4 09CC-R12*, Concord, California, Aug. 2009.

[2] Editor for G.hn, "G.hn: Updated Issues List for G.hn," *ITU-T SG15/Q4 09XC-U12R1*, Xian, China, Jul. 2009.

[3] Editor for G.hn, "ITU-T Recommendation G.9960 Unified high-speed wire-line based home networking transceivers - Foundation," *ITU-T SG15/Q4 G.9960 LC comment resolution draft text R8*, Concord, California, Aug. 2009.

[4] Intellon, "G.hn: Bi-directional transmissions," *ITU-T SG15/Q4 09XC-113R1*, Xian, China, Jul. 2009.

| Introduction | Proposal | Text Update | Summary |

5 Summary

1. This paper proposes to agree on the following new issues.

Item Number	Status	Item Description	Reference(s)
5.0.1.2.1.0.13.1 (New)	Open	Should the following sections of text be revised or added to G.9960 Amendment 1 as working text: • §7.1.2.3 "PHY-frame header", • §7.1.2.3.1.7 "Extended Header Indication (EHI)", • §7.1.2.3.3 "Extended header fields", • §7.1.2.3.3.1 "Extended frame-type specific fields (E_FTSF)", and • §7.1.2.3.3.2 "Extended header check sequence (E_HCS)"?	09CC-046
5.0.1.2.1.0.13.2 (New)	Open	Should G.hn adopt the PHY-frame header extension scheme proposed in 09CC-046?	09CC-046
5.0.1.2.1.2.0.1.1 (New)	Open	Should the G.hn define a technique to use different values of D for any given medium rather than use a fixed value (response to the provisional agreement in Issue 5.0.1.2.1.2.0.1)?	09CC-046