ITU - Telecommunication Standardization Sector Temporary Document 09XC-119

STUDY GROUP 15 Original: English

Xi'an China – 27 – 31 July 2009

Question: 4/15

SOURCE[1]: Intellon Corporation

TITLE: **G.hn: Extended PHY frame header**

ABSTRACT

This contribution proposes to add an option for supporting extended PHY frame headers that contain 2 x PHY_H information bits in order to allow for expansion of the ACKI field and to allow additional header bits for future enhancements to G.9960.

| Introduction | First Heading | Second Heading | Summary |

1. Introduction

The G.9960 draft in §7.1.2.1 alludes to PHY frame headers that contain more than one symbol (although the reference does not make it clear if this is for PHY frame header symbol repetition or to support additional PHY frame header information bits), and support for extended PHY frame headers with additional information bits that are encoded with double the symbols used for the non-extended PHY frame header has been discussed in the G.hn group. However, currently, the current text (G.9960 draft, G.9960 Amendment I, or G.hn draft) does not describe support for more than PHY_H information bits in the PHY frame header.

This contribution proposes to add an option for supporting an extended PHY frame header with 2 x PHY_H information bits in order to allow for expansion of the ACKI field and to allow additional header bits for future enhancements to G.9960. A larger ACKI field allows more frames to be acknowledged, and is especially useful for bi-directional transmissions, which is proposed in separate contribution.

Proposed is to define two one-bit fields which are assigned to bits in the PHY frame header that are currently reserved. The extended header indication (EHI) is set to indicate that the PHY header contains 2 x PHY_H information bits, allowing receivers to determine how to decode the PHY header.

The immediate response frame extended header indication (IREHI) tells receivers if they should respond with a header than contains PHY_H or 2 x PHY_H information bits when transmitting immediate response frames. This allows receivers to know if sufficient time has been allocated for a immediate response frame and for nodes tracking durations to know the duration of a frame transmission sequence. If at some point the definition of the duration field is modified so that it includes immediate response frames (ACK frame), then it may be possible to eliminate the IREHI bit.

This contribution proposes two HCS fields to independently protect the content of each set of PHY_H information bits in the PHY header. Two independent HCS fields results more robust protection of the header contents. It also eliminates ambiguity for receivers when determining how to decode the PHY frame header. If a single HCS field were to be defined that protected 2 x PHY_H information bits then the IREHI bit would need to be interpreted and acted on before the bit is verified with the HCS.

[1]Contacts: Sid Schrum, Intellon Corporation sid.schrum@intellon.com

DELL-1019
10,291,449

2. Proposed Text Updates

<<Start Text – G.9960 Amendment I>>

7.1.2.3 PHY-frame header

The PHY-frame header contains is PHY_H information bits if the extended header information (EHI) bit is set to zero and 2 x PHY_H information bits if the EHI bit is set to one. ~~It is~~ 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 is protected by the 16-bit header check sequences (HCS, and E_HCS in the case of the extended PHY header).

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

Table 7-1/G.9960 – 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	
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 PHY frame header indication.	
IREHI	3	1	Immediate response frame extended PHY frame header indication.	
Reserved	3	~~4~~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
	21-39 [1]			Variable part 2 (present for extended PHY frame header only)
E_HCS	40- 41 [1]	16	Extended PHY header - header check sequence	Common part (present for extended PHY frame header only)
Notes [1] These fields are present only if the EHI bit is set.				

7.1.2.3.1.8 Extended header indication (EHI)

The EHI field when set indicates that the PHY frame header contains 2 x PHY_H information bits. If the EHI field is zero then the header of the PHY frame contains PHY_H information bits. The EHI field shall be set to zero for all frames types except the ACK frame. In ACK frames this bit may be set to zero or one.

7.1.2.3.1.9 Immediate response frame extended header indication (IREHI)

The IREHI field when set indicates that receivers shall use for immediate response frames (ACK for example) extended PHY-frame headers. If the IREHI field is zero then immediate response frames shall use standard (non-extended) PHY-frame headers.

7.1.2.3.1.810 Header check sequence and Extended header check sequence (HCS and E_HCS)

The HCS and E_HCS fields are~~is~~ intended for PHY-frame header verification. The HCS is a 16-bit cyclic redundancy check (CRC) and shall be computed over all the fields of the first PHY_H information bits of the PHY-frame header in the order they are transmitted, starting with the MSB of the frame type (FT) field and ending with the LSB of the last field in the first PHY_H information bits of the PHY Frame. The E_HCS is present only for extended PHY header frames and shall be computed over all the fields of the second set of PHY_H PHY-frame header information bits in the order they are transmitted, starting with the MSB of the first field in the second set of PHY_H information bits of the PHY-frame header and ending with the LSB of the last field in the second set of PHY_H information bits.

The HCS and E_HCS shall be computed using the following generator polynomial of degree 16:

$G(x) = x^{16} + x^{12} + x^5 + 1$.

The value of the HCS and E_HCS shall be the remainder after the contents (treated as a polynomial where the first input bit is associated with the highest degree, $X^{PHYH-17}$, where PHY_H is the number of header information ~~length in bits~~ bits over which the HCS or E_HCS is computed, and the last input bit is associated with X^0) of the calculation fields is multiplied by x^{16} and then divided by $G(x)$.

The HCS and E_HCS field~~s~~ shall be transmitted starting with the coefficient of the highest order term (MSB).

7.1.2.3.2.2 ACK PHY-frame type specific fields (working text)

Table 7-11.1 lists the ACK PHY frame type specific fields.

Table 7-11.1/G.hn – ACK PHY Frame Type Specific Fields

Field	Size in bits
FACK	3
FLCTRLT	1
FLCTRL	3
LSSNP	1
RXRST_DATA	1
RXRST_MNGMT	1
ACKI/LSSN	16
ACKI	64
~~RXRST_DATA~~	~~1~~
~~RXRST_MNGMT~~	~~1~~
Pad	padding until PHY_H
ACKI [1]	136
Pad [1]	padding until 2 x PHY_H
Notes [1] These fields are present for the extended PHY-frame header only.	

<<End Text - G.9960 Amendment I>>

3. Summary:

This contribution is intended to be discussed at the G.hn meeting to be held in Xi'an China – 27 – 31 July 2009.

This contribution proposes changes to working text.

Specifically proposed are the following new agreements:

5.0.1.2.1.0.2 .1.5		New	should the PHY frame header number of information bits be optionally expandable to 2 x PHYH bits as described in contribution 09XC-119?	09XC-119
5.0.1.2.1.0.2 .1.6		New	should the text proposed in §2 of 09XC-119 that adds fields and description for supporting extended PHY-frame headers be incorporated as a revision of working text for §7.1.2.3 "PHY-frame header" and the sub-clauses for §7.1.2.3 in G.9960 Amendment 1?	09XC-119