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ITU-T

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G.9960
Amendment 1
(01/2014)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Access networks – In premises networks

Unified high-speed wire-line based home networking transceivers – System architecture and physical layer specification

Amendment 1

Recommendation ITU-T G.9960 (2011) – Amendment 1

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Recommendation ITU-T G.9960

Unified high-speed wire-line based home networking transceivers – System architecture and physical layer specification

Amendment 1

Summary

Amendment 1 to Recommendation ITU-T G.9960 (2011) primarily contains changes to support an extended acknowledgement mechanism. It also contains changes to allow the transmitter to advise the receiver of the acknowledgment window size during connection establishment.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T G.9960	2009-10-09	15	11.1002/1000/9679
2.0	ITU-T G.9960	2010-06-11	15	11.1002/1000/10704
3.0	ITU-T G.9960	2011-12-16	15	11.1002/1000/11403
3.1	ITU-T G.9960 (2011) Amd.1	2014-01-13	15	11.1002/1000/12087

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* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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Unified high-speed wire-line based home networking transceivers – System architecture and physical layer specification

Amendment 1

1)   Clause 7.1.2.3.1.7

Revise the text of clause 7.1.2.3.1.7 "Extended header indication (EHI)" as follows:

7.1.2.3.1.7   Extended header indication (EHI)

If the EHI field is set to one, the PHY frame header shall contain $2 \times PHY_H$ information bits. The additional PHY_H information bits of the extended part of the PHY-frame header are specified in clause 7.1.2.3.3. If the EHI field is set to zero, the PHY-frame header shall contain PHY_H information bits. The EHI field shall be set according to the frame type as shown in Table 7-5.

Table 7-5 – Value of EHI for different frame types

Frame type	Value of EHI
MAP/RMAP	zero
MSG	zero
ACK	zero or one
RTS	zero
CTS	zero
PROBE	zero
ACKRQ	zero
BMSG	zero or one
BACK	zero or one
CTMG	zero or one
FTE	zero or one
ACTMG	zero

2)   Clause 7.1.2.3.2.2

Revise the text of clause 7.1.2.3.2.2 "MSG PHY-frame type specific fields" and its subclauses as follows:

7.1.2.3.2.2   MSG PHY-frame type specific fields

Table 7-11 lists the PHY-frame header fields specific to the MSG frame type.

Table 7-11 – MSG PHY-frame type specific fields

Field	Octet	Bits	Description	Reference
MSG_DUR	0 and 1	[15:0]	Duration for MSG frame	Clause 7.1.2.3.2.2.1
BLKSZ	2	[1:0]	Block size of FEC codeword for MSG frame payload	Clause 7.1.2.3.2.2.2
FEC_RATE		[4:2]	FEC coding rate for MSG frame payload	Clause 7.1.2.3.2.2.3
REP		[7:5]	Number of repetitions used for encoding the MSG frame payload	Clause 7.1.2.3.2.2.4
FCF	3	[2:0]	FEC concatenation factor	Clause 7.1.2.3.2.2.5
SI		[6:3]	Scrambler initialization	Clause 7.1.2.3.2.2.6
MDET		[7]	Master is detected	Clause 7.1.2.3.2.2.7
BAT_ID	4	[4:0]	Bit allocation table identifier	Clause 7.1.2.3.2.2.8
BNDPL/GRP_ID		[7:5]	Bandplan identifier/sub-carrier grouping identifier	Clause 7.1.2.3.2.2.9
GI_ID	5	[2:0]	Guard interval identifier	Clause 7.1.2.3.2.2.10
APSDC-M		[7:3]	Actual PSD ceiling of MSG frame	Clause 7.1.2.3.2.2.11
CONNECTION_ID	6	[7:0]	Connection identifier	Clause 7.1.2.3.2.2.12
RPRQ	7	[1:0]	Reply required	Clause 7.1.2.3.2.2.13
BRSTCnt		[3:2]	Burst frame count	Clause 7.1.2.3.2.2.14
BEF		[4]	Burst end flag	Clause 7.1.2.3.2.2.15
AIFG_IND		[5]	AIFG indication	Clause 7.1.2.3.2.2.16
Reserved		[6]	Reserved	Reserved for use by ITU-T G.9963 (Note 1)
Reserved		[7]	Reserved	Reserved by ITU-T (Note 1)
ACE_SYM	8	[2:0]	Number of ACE symbols	Clause 7.1.2.3.2.2.17
CNN_MNGMT		[6:3]	Connection management	Clause 7.1.2.3.2.2.18
Reserved		[7]	Reserved	Reserved by ITU-T (Note 1)
BRURQ	9 and 10	[15:0]	Bandwidth reservation update request	Clause 7.1.2.3.2.2.19 (Note 2)
START_SSN	9 and 10	[15:0]	Start segment sequence number	Clause 7.1.2.3.2.2.20 (Note 3)
CURRTS	11	[6:0]	Current TS	Clause 7.1.2.3.2.2.21
BTXRQ		[7]	Request for bidirectional transmission	Clause 7.1.2.3.2.2.22

Table 7-11 – MSG PHY-frame type specific fields

Field	Octet	Bits	Description	Reference
NUM_MCACK_SLOTS	12	[2:0]	Number of Mc-ACK slots	Clause 7.1.2.3.2.2.23
ADVISED_WIN_SIZE~~Reserved~~		[7:3]	In connection establishment this field may specify advised window size.~~Reserved~~	Clause 7.1.2.3.2.2.24 ~~Reserved by ITU-T~~ (Note 4~~1~~)
Reserved	13 and 14	[15:0]	Reserved	Reserved by ITU-T (Note 1)
NOTE 1 – Bits that are reserved by ITU-T shall be set to zero by the transmitter and ignored by the receiver.				
NOTE 2 – The BRURQ field is defined when the START_SSN field is not defined (see Note 3).				
NOTE 3 – The START_SSN field is defined only when CNN_MNGMT = 0001, CNN_MNGMT = 0011, CNN_MNGMT = 0101 or CNN_MNGMT = 0111. Otherwise, the meaning of this field is BRURQ.				
NOTE 4 – The ADVISED_WIN_SIZE field is defined only when CNN_MNGMT = 0101, otherwise these bits are reserved by ITU-T and shall be set to zero by the transmitter and ignored by the receiver.				

…

7.1.2.3.2.2.24 Advised window size (ADVISED_WIN_SIZE)

During establishment of a data connection with acknowledgement, the transmitter may use the ADVISED_WIN_SIZE field to advise the receiver for the needed RX window size. The advised size of the RX window is given in number of LPDUs that is represented by the value in ADVISED_WIN_SIZE multiplied by 32. If ADVISED_WIN_SIZE is set to $1F_{16}$ it means that window size is 1024 LPDUs. If ADVISED_WIN_SIZE is set to zero it means that the transmitter does not advise any value.

3) Clause 7.1.2.3.2.3

Revise the text of clause 7.1.2.3.2.3 "ACK PHY-frame type specific fields" and its subclauses as follows:

7.1.2.3.2.3 ACK PHY-frame type specific fields

Table 7-20 lists the PHY-frame header fields specific to the core part of the PHY-frame header of the ACK frame type.

Table 7-20 – ACK PHY frame type specific fields

Field	Octet	Bits	Description	Reference
FLCTRL_CONN	0	[0]	Flow control connection flag	Clause 7.1.2.3.2.3.1
FLCTRLT		[1]	Flow control type	Clause 7.1.2.3.2.3.2
FLCTRL		[6:2]	Flow control	Clause 7.1.2.3.2.3.3
FLCTRL_EXT~~Reserved~~		[7]	Flow control extension~~Reserved~~	Clause 7.1.2.3.2.3.11 ~~Reserved by ITU-T~~ ~~(Note 2)~~

Table 7-20 – ACK PHY frame type specific fields

Field	Octet	Bits	Description	Reference
RXRST_DATA	1	[0]	Data RX reset flag	Clause 7.1.2.3.2.3.5
RXRST_MNGMT		[1]	Management RX reset flag	Clause 7.1.2.3.2.3.6
BAD_BURST		[2]	Bad burst indication	Clause 7.1.2.3.2.3.7
BTXRQ		[3]	Request for bidirectional transmission	Clause 7.1.2.3.2.3.4
EXTACKRQ		[4]	Request for extended acknowledgement	Clause 7.1.2.3.2.3.10
Reserved		[7:54]	Reserved	Reserved by ITU-T (Note 2)
ACK_CE_CTRL/ RX_CONN_WIN_SIZE	2	[6:0]	ACK channel estimation control/Receiver window size for the connection. (Note 1)	Clause 7.1.2.3.2.3.8
Reserved		[7]	Reserved	Reserved for use by ITU-T G.9963 (Note 2)
ACKDATA/MCACK_D	3 to 14	[90:0]	Acknowledgement data and Mc-ACK descriptor	Clause 7.1.2.3.2.3.9
Reserved		[95:91]	Reserved	Reserved by ITU-T (Note 2)
NOTE 1 – This field is interpreted as RX_CONN_WIN_SIZE only when the ACK frame is sent as a reply for MSG frame requesting setup of either a data or a management connection (i.e., when CNN_MNGMT in the MSG frame for connection setup is 0101_2 or 0001_2). NOTE 2 – Bits that are reserved by ITU-T shall be set to zero by the transmitter and ignored by the receiver.				

…

7.1.2.3.2.3.9.1.7 ACK information (ACKI)

The reception status of data units consisting of one or more segments shall be indicated in the ACKI field by the receiver. The data unit corresponding to each indication in the ACKI field depends on the format of the ACKI field (see Table 7-30). The indication corresponding to a data unit shall be set to one if the data unit was not received correctly and shall be set to zero if the data unit was received correctly. For the cases of bit map encoding and group encoding, if there is no more information to encode, the remaining bits of this field (if any) shall be encoded by the receiver to indicate that the rest of the data units have been received with errors. For the case of run-length encoding, if there is no more information to encode, the remaining bits of this field (if any) shall be encoded to indicate that the rest of the groups in the field have a length of zero. The specific encoding for different formats of ACKI field is as explained in the following clauses.

If the number of bits in the ACKI field is not sufficient to indicate reception status of all the received segments, a receiver may choose to use compressed encoding or limit the indication to the number of available bits. Segments corresponding to data units for which the reception status was not reported shall be considered by the transmitter as either not received correctly by the receiver or in waiting-for-ack state.

If the number of bits in the ACKI field is not sufficient, the receiver may indicate to the transmitter that it would like to use the extended ACK in future frames by setting the EXTACKRQ bit as described in clause 7.1.2.3.2.3.10.

If the transmitter has already granted permission to the receiver to use extended ACK, the receiver may use extended ACK as described in clause 8.3.8 of [ITU-T G.9961]. The format of the ACK extension is as described in clause 7.1.2.3.3.1.4.

…

7.1.2.3.2.3.10   Extended ACK Requested (EXTACKRQ)

If the EXTACKRQ field is set to one, it shall indicate that the node transmitting the ACK frame would like to send extended ACKs and the source node should allocate time for an extended ACK in future frames as described in clause 8.3.8 of [ITU-T G.9961]. If the EXTACKRQ field is set to zero, it shall indicate that the node transmitting the ACK frame will not be using extended ACKs and does not require the extra resources.

7.1.2.3.2.3.11   Flow control extension (FLCTRL_EXT)

The FLCTRL_EXT field shall be used to indicate higher values of flow control between the transmitter and the receiver as described in clause 8.12.4 of [ITU-T G.9961], compared to those indicated by the field FLCTRL as described in clause 7.1.2.3.2.3.3. This field FLCTRL_EXT shall be set to one only if the field FLCTRLT is set to 0 (see clause 7.1.2.3.2.3.2). If FLCTRL_EXT is set to one, for connections with 540 byte LPDUs 408 is added and for connections with 120 byte LPDUs 612 is added to the value indicated by the FLCTRL (see 7.1.2.3.2.3.3) value to determine the actual number of LPDUs that the receiver can buffer for the flow. For example, for a connection with 540 byte LDPUs, if FLCTRL_EXT is set and FLCTRL is set to 00011_2 the receiver indicates that it can buffer $(408 + 16 = 424)$ LPDUs.

4)   **Clause 7.1.2.3.2.9**

Revise the text of clause 7.1.2.3.2.9 "BMSG PHY-frame type specific fields" and its subclauses as follows:

7.1.2.3.2.9   BMSG PHY-frame type specific fields

Table 7-47 lists the fields specific to the core part of the PHY-frame header of the BMSG frame type.

Table 7-47 – BMSG PHY-frame type specific fields – core part

Field	Octet	Bits	Description	Reference
BMSG_DUR	0 and 1	[15:0]	Duration for BMSG frame	Clause 7.1.2.3.2.9.1
BLKSZ	2	[1:0]	Block size of FEC codeword for BMSG frame payload	Clause 7.1.2.3.2.9.2
FEC_RATE		[4:2]	FEC coding rate for BMSG frame payload	Clause 7.1.2.3.2.9.3
REP		[7:5]	Number of repetitions used for encoding the BMSG frame payload	Clause 7.1.2.3.2.9.4
FCF	3	[2:0]	FEC concatenation factor	Clause 7.1.2.3.2.9.5
SI		[6:3]	Scrambler initialization	Clause 7.1.2.3.2.9.6
MDET		[7]	Master is detected	Clause 7.1.2.3.2.9.7

Table 7-47 – BMSG PHY-frame type specific fields – core part

Field	Octet	Bits	Description	Reference
BAT_ID	4	[4:0]	Bit allocation table identifier	Clause 7.1.2.3.2.9.8
BNDPL/GRP_ID		[7:5]	Bandplan identifier/sub-carrier grouping identifier	Clause 7.1.2.3.2.9.9
GI_ID	5	[2:0]	Guard interval identifier	Clause 7.1.2.3.2.9.10
APSDC-M		[7:3]	Actual PSD ceiling of BMSG frame	Clause 7.1.2.3.2.9.11
CONNECTION_ID	6	[7:0]	Connection identifier	Clause 7.1.2.3.2.9.12
RPRQ	7	[1:0]	Reply required	Clause 7.1.2.3.2.9.13
BRSTCnt		[3:2]	Burst frame count	Clause 7.1.2.3.2.9.14
BEF		[4]	Burst end flag	Clause 7.1.2.3.2.9.15
AIFG_IND		[5]	AIFG indication	Clause 7.1.2.3.2.9.16
Reserved		[6]	Reserved	Reserved for use by ITU-T G.9963 (Note 1)
EXTACKGR~~Reserved~~		[7]	Extended ACK granted~~Reserved~~	Clause 7.1.2.3.2.9.25~~Reserved by ITU-T (Note 1)~~
ACE_SYM	8	[2:0]	Number of ACE symbols	Clause 7.1.2.3.2.9.17
CNN_MNGMT		[6:3]	Connection management	Clause 7.1.2.3.2.9.18
Reserved		[7]	Reserved	Reserved by ITU-T (Note 1)
BRURQ	9 and 10	[15:0]	Bandwidth reservation update request	Clause 7.1.2.3.2.9.19 (Note 2)
START_SSN	9 and 10	[15:0]	Start segment sequence number	Clause 7.1.2.3.2.9.20 (Note 3)
CURRTS	11	[6:0]	Current TS	Clause 7.1.2.3.2.9.21
Reserved		[7]	Reserved	Reserved by ITU-T (Note 1)
Reserved	12 and 13	[0]	Reserved	Reserved by ITU-T (Note 1)
BTXGL		[8:1]	Bidirectional transmission grant length	Clause 7.1.2.3.2.9.22
BTXEF		[9]	Bidirectional transmission end flag	Clause 7.1.2.3.2.9.23
Reserved		[15:10]	Reserved	Reserved by ITU-T (Note 1)
ACK_CE_CTRL	14	[6:0]	ACK channel estimation control	Clause 7.1.2.3.2.9.24
Reserved		[7]	Reserved	Reserved by ITU-T (Note 1)

NOTE 1 – Bits that are reserved by ITU-T shall be set to zero by the transmitter and ignored by the receiver.

NOTE 2 – The BRURQ field is defined when the START_SSN field is not defined.

NOTE 3 – The START_SSN field is defined only when CNN_MNGMT = 0001, CNN_MNGMT = 0011, CNN_MNGMT = 0101 or CNN_MNGMT = 0111. Otherwise the meaning of this field is BRURQ.

The PHY-frame header fields specific to the extended part of the header of the BMSG frame type are listed in Table 7-53.

…

7.1.2.3.2.9.25   Extended ACK Granted (EXTACKGR)

If the EXTACKGR field is set to one, it shall indicate that this transmitter can process extended ACK and the receiver may use extended ACK as a response to the transmitted BMSG frame as described in clause 8.3.8 of [ITU-T G.9961].

5)   Clause 7.1.2.3.3.1.4

Insert text for new clause 7.1.2.3.3.1.4 "E_FTSF for ACK PHY-frame" and its subclauses as follows:

7.1.2.3.3.1.4   E_FTSF for ACK PHY-frame

Table 7-54.1 lists the E_FTSF for ACK PHY frame.

Table 7-54.1 – E_FTSF for ACK PHY frame type

Field	Octet	Bits	Description	Reference
ACKI_EXT	0 to 17	[143:0]	ACKI field extension	Clause 7.1.2.3.3.1.4.1
Reserved	18	[7:0]	Reserved	Reserved by ITU-T

7.1.2.3.3.1.4.1   ACKI field extension (ACKI_EXT)

This field is the extension of the ACKI field and shall be concatenated to the ACKI field of the core part of the PHY-frame header of the ACK frame before decoding the reception status of data units as described in clause 7.1.2.3.2.3.9.1.7.

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