ITU - Telecommunication Standardization Sector Temporary Document WH-024

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Question: 4/15

SOURCE[1]: Matsushita Electric Industrial Co. Ltd. (Japan)

TITLE: G.hs: More protocol refinement.

ABSTRACT

Technical discussion and proposed working text for the protocol aspects of G.hs. This material is based on the agreements from Nice (NF-016R3) that do not currently have working text. Extensions are also proposed.

1. Introduction:

This contribution provides position, text, and technical proposals for the structure and content of G.hs.

Specifically, the following open issues from the *G.hs Issues list* are addressed:

		WH-024 section
5.8 (open)	Which sub-parameters of the xDSL Recommendations should be negotiated in G.hs?	2.1.3
4.7 (open)	Should G.hs (optionally) perform preliminary line characterization to assess the suitability of the various modulation schemes and/or to determine whether splitters are in the circuit?	2.2

This contribution discusses and provides working text for the following newly agreed items:

5.11	Agreed (5/98)	to adopt, as a starting point, 4 classifications of information: service parameters, channel capabilities, modulations available, and protocols available. It was also agreed to assume dependence between these classifications and to therefore define a single tree structure rather than 4 independent trees.
5.12	Agreed (5/98)	that G.hs shall include modulation bits in the SPAR(1) field to indicate support for G.lite and G.dmt (Annex A, B, and C).

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Text in section 3 is proposed to supplement missing areas in the current G.hs draft.

2. Discussion of Areas that need to be modified or extended

This sections discusses the motivation for areas in G.hs that could not be copied directly from V.8bis. The specific technical proposals are contained in Section 3.

2.1 Discussion of G.hs Information Content

2.1.1 General Organizational Structure

As agreed in the G.hs issues:

5.11	Agreed (5/98)	to adopt, as a starting point, 4 classifications of information: service parameters, channel capabilities, modulations available, and protocols available. It was also agreed to assume dependence between these classifications and to therefore define a single tree structure rather than 4 independent trees.

G.hs will contain several different types of information compared to V.8bis.

At the Nice meeting, it was discussed that the modulation dependent and the modulation independent parameters should be separated. The modulation dependent information should be included in "Standard Information" field and the modulation independent information should be in the "Identification" field. It was further discussed that the names of the "standard information" and "identification" fields may need to be changed in order to reflect their new content.

In general, we consider the service parameters and channel capabilities information to be independent of the various xDSL modulations.

We propose the following general structure for G.hs

- Identification (Service Parameters/ Channel Capabilities) NPar(1) (No sub-parameters)
- Identification (Service Parameters/ Channel Capabilities) SPar(1) (sub-parameters)
  - Message Type and version
  - Vendor Identification
  - Amount/type of bandwidth
  - probe request parameters
  - known splitter information

- Standard Information (Modulations/protocols) NPar(1)
- Standard Information (Modulations/protocols) SPar(1)
  - Which type of xDSL etc.
  - Regional considerations (i.e., use of a specific Annex in a Recommendation)
  - error correction, data compression etc.?

- Non-standard Information (section 8.5)

Note: Please see section 4.1.1 of NF-044.rtf for a discussion concerning the motivation for the 4 types of information (Service Parameters, Channel Capabilities, Modulation, Protocols).

2.1.2 Message Composition

Comments on Messages:

- Although CL, CLR, and MS were the only messages to have parameters in V.8bis, we propose that CR also has parameters in G.hs. The CR parameters would be used to specify channel probing or other tests to be performed during CL. See section 2.2 for details.
- For CLR messages two messages will be transmitted, the first for the "list" and the second for the "request". A bit should be set in the SPar frame to indicate capability list (CL) or capability request (CR) content.
- The MR message probably is not needed.

Table 1. Overall Message Composition

	Identification	Standard Information	Non Standard

Messages	Message Type & Version 1 octet	Country Code Provider Length Provider Code 1+1+L octets	Service parameters ? octets	Channel capabilities ? octets	Modulations available ? octets	Protocols available ? octets	Information 3+M+L octets
CR	Y	Y	Y	Y			as necessary
CL	Y	Y	Y	Y	Y	Y	as necessary
MS	Y	Y	Y	Y	Y	Y	as necessary
ACK	Y	Y					
NACK	Y	Y	? *	? *	? *	? *	

Notes:
* Should the NACK include the reason for the NACK by setting the bits of the offending parameters?
Country Code et al information in the Identification field is per agreement 5.3 in CI-082.
CLR is formed by concatenating a full CR frame followed by a full CL frame

2.1.3 Detailed Organizational Structure

The section attempts to address some of the organizational details within each category. Most of these topics are introduced in the multi-company contribution NF-011.

2.1.3.1 Location of Documentation

We propose the following in order to close G.hs issue 4.11:

- Layer 1 SPars and NPars should be documented in G.hs
- Layer 2 and 3 SPars and NPars for the identification (Service parameters and Channel capabilities) field should be defined in G.hs since they are modulation independent.
- Layer 2 and 3 SPars and NPars for the Standard Information (modulations and protocol) field should be defined separately. Most likely in the actual xDSL Recommendation

2.1.3.2 Classification of (Modulation) Parameters

Parameters specific to a given xDSL modulation should always appear under the appropriate modulations category. Of those modulation parameters some of them might be more general than others and can have higher positions in the NPars/SPars tree.

Many of the modulations will have common or similar parameters amongst themselves, but we propose they be coded separately. For example, some of the G.lite modulation parameters are going to be very similar to some of the G.dmt modulation parameters. However since there will be differences, it is proposed that we keep them separate for each modulation. Also, other xDSL modulation such as VDSL will probably have some very different parameters making it very difficult to have one large list of parameters trying to satisfy all of the xDSL requirements. and capabilities. Obviously, that implies there will be some redundancy in the modulation parameters... but that is the same way V.8bis is now. Many of the parameters under the various applications are identical.

It is important for G.hs to negotiate so that a compatible set of options are selected and that interoperation is possible prior to the start of initialization. It has been suggested that there are three types of parameters/options: manufacturing, provisioning or negotiated.

- Manufacturing Options:
  - Definition: Optional portions of a specification that a manufacturer included/chose in the product design.
  - Example: EC vs. FDM
  - Comment: These must be disclosed and acknowledged in G.hs since communication would be impossible without commonality.
- Provisioning Options:
  - Definition: Required optional capabilities in recommendation that are in some way fixed a priori
  - Example: Loop timing at the CO for G.dmt is required to be mastered by either CO or CP. However, the CO capability is normally fixed by some a priori decision prior to the negotiation.
  - Comment: This category could be merged into either manufacturing or negotiated options. There appear to be very few options remaining in this category.
- Negotiated Options:
  - Definition: One item must be selected from a list of (mandatory available) options.
  - Example: Data rate

- Comment: The intention here is that the negotiation should be made peer to peer

2.1.3.3 Secondary properties for a modulation (AKA: Options of Options)

This topic is how to deal with options to be negotiated that are dependent upon the selection of higher level options.

First some examples will be identified followed by a short discussion of where and how they should be negotiated.

For purposes of discussion, we divide the types of options into primary properties and secondary properties. Primary properties include: the service parameters, channel capabilities, general regional modulation considerations (such as use of Annex A vs. Annex B of G.dmt) and general manufacturing options (EC vs. FDM, etc.) Secondary properties are the details of the modulation or protocol needed to support the primary parameters. Examples of secondary parameters and their dependencies:

Secondary Parameter	Dependency
Allocation to latency paths	latency type selected in G.hs
Max bits/bin	depends on what? (Is this a primary option?)
Max SNR	QoS selected in G.hs
R/S parameters	depend on lots of things, including: data rate possible, QoS & latency types selected in G.hs
Interleaving	QoS and latency types selected in G.hs

Once the primary properties are negotiated, we can negotiate the secondary parameters. However, the options available may need to be pared down at each end in order to make sure that this negotiation respects the primary parameters. In order to do this, we need to deliver this information to some intelligence in the terminal that derive the specification parameters. These smarts will then turn the primary properties into acceptable secondary parameters. In other words, if the user terminal requests low latency, the smarts will attempt to negotiate a small latency from the RS coder.

From a "purist" viewpoint, the secondary properties probably should be negotiated directly by the G.xDSL modem. However, practically speaking, it is an option to utilize the G.hs mechanism for these also.

One proposal for G.hs/G.dmt is to negotiate the primary properties in G.hs. G.dmt would then receive certain defined property values from G.hs that would in turn guide the existing CMSG-1 and RMSG-1 values. The standard would not say how the smarts work and would define only the input property values (the primary properties above) and the output (RMSG-1 and CMSG-1 bits).

The is similar to the existing relationship between V.8/V.8bis and V.series modems such as V.34 or V.90. V.34 does establish some primary properties in V.8 besides it's selection as the modulation of choice. However, V.34 further negotiates some modulation specific detailed parameters in it's INFO frames and then later in MP frames after training.

Thus we propose that all primary properties be negotiated in G.hs and some of secondary properties remain in the individual xDSL Recommendation. Obviously, if lack of a given capability/option can result in a failed connection attempt, this option should be negotiated in G.hs. Clarification of a parameters types as discussed in section 2.1.3.2 will help decide where a given parameter should be negotiated.

Thus secondary parameters should only be indicated during G.hs while the others can be negotiated during G.hs

Table 2. G.DMT Parameters Indicated/Negotiated during G.hs

Description	Mnemonic	Type	Capability Indication during G.hs	Negotiated during G.hs	# of bits	xPar
Annex A, B or C		Negotiated		Y	3	SPar(1)
ATM or STM		Negotiated		Y	1	
Number of ASx/LSx channels				Y	7	
Allocation of ASx/LSx sub-channels to latency paths		Secondary	Y	N		
Transport/Support for NTR	NTR			Y		
Framing Mode						
Trellis coding capability			Y	N		
Echo Cancellation capability		Manufacturing		Y		
Maximum number of bits pers sub-carrier supported by the transmitter			Y			
Minimum required SNR margin						
R-S parameters (both those required per Table 6.1 and extended capabilities)		Secondary	Y	N		
Interleaving parameters		Secondary	Y	N		
Support for extended bit rates						

2.2 Inclusion of methods for channel probing

2.2.1 Discussion

As proposed in Delayed Document D.204, a method to assess the characteristics of the communication channel should be included as part of the G.hs initial handshake. In V.8bis there is a signal Capabilities Request (CR) that is intended to query the other terminal about it's modulation capabilities. The CR signal can be extended to include an explicit request for communication channel capabilities.

For connection situations were the terminals and channel capabilities are considered stable, transactions that do not use CR/CL would allow a very quick start up.

For a terminal that desires to know the channel capabilities, the terminal would issue a CR message that would specify the parts of the communication channel that it wants tested. This would be implemented with some additional octets in the CR signal as shown in Table 17. The terminal responding to the CR signal shall indicate which probing tone ranges it is transmitting in its CL message and concurrently transmit the signals.

If both terminals each desire to have their own private channel capabilities information, transactions with two capabilities requests (including CLR), such as 3, 9, 12, and 13, can be used.

Splitter Information, if known, can also be transmitted.

The setting of the probing bits in the CL message indicate which probing signals that the responder is actually transmitting. Thus it provides a primitive form of negotiation of the channel probe tones.

Bits in the Identification field would be used to indicate different ranges of the spectrum. An initiating terminal, typically an ATU-R, would send a CR message with bits appropriately set to indicate in which portions of the spectrum the responding device should transmit channel probing tones. Typically an initiating terminal would only request channel probing tones in the PSDs of the xDSL modulation that were supported in the initiating terminal. The responding terminal would transmit a CL message with bits indicating the spectrum it is transmitting and simultaneously transmit the channel probing tones. This typical example is shown in Figure 1.

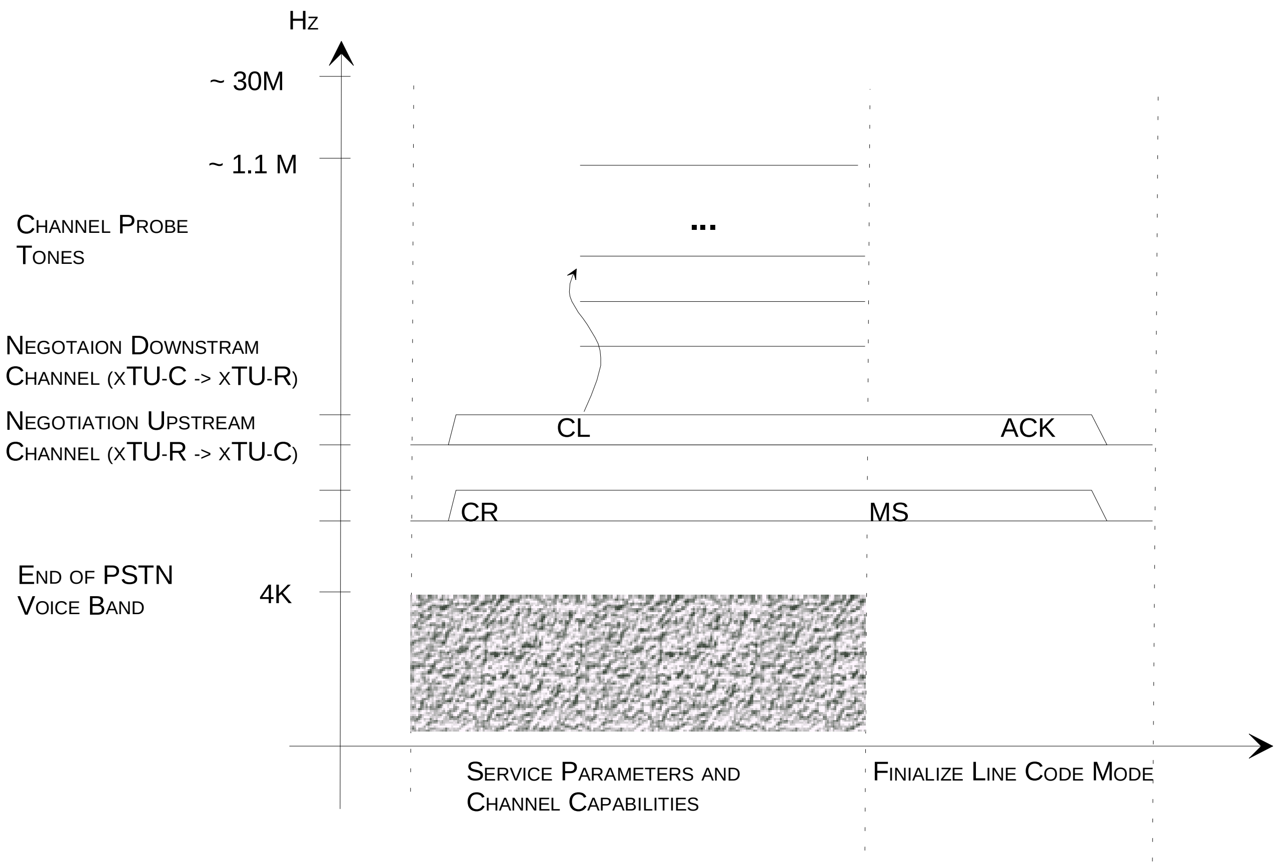

Figure 1. Channel Probing Scenario

2.2.2 Description of the Channel Probing Tones

- Simple cosigns with an initial phase of 0 degrees can be used
- The duration of the tones only needs to be on the order of 100-200 ms.
- The precision of the channel probing is not meant to be precise, it is merely to obtain a rough estimate of the SNR in the channel.
- The power of the tones should comply with the PSD in the applicable range. (Or we can specify the power explicitly for each band)
- The frequencies of the tones should be selected after the frequencies of the negotiation channel modulation are selected. The tone frequencies could be multiples of the base frequency used for the modulation.
- Although several methods of tone generation are possible, we envision that they will be generated by the same mechanism that generates the negotiation modulations. For example, FFTs in a DMT based system.

2.3 Escape to Regional Standards

see WH-026.

2.4 Escape to Voice band Procedures

The capability of falling back can be expressed in the Identification field NPar(1) (Table 5). Using voiceband procedures can be negotiated as the selected mode in Standard Information field NPar(1) (Table 21). If V.8 or V.8bis were indicated, those voiceband modulation initialization procedures would be initiated immediately after the completion of G.hs. See Delayed Document D.204 for uses of voiceband procedures on an xDSL line.

3. Proposals for Areas that need to be modified or extended

3.1 Identification Field

The Identification field is composed of several octets of NPar(1)s, SPar(1)s, and NPar(2). NPar(1) and SPar(1) octets are always transmitted. NPar(2) octets are transmitted only if the corresponding bit in the Spar(1) is a "1". Octets are transmitted in the order shown in Table 3.

Table 3. Identification Field - Order of Octets

Name		N/S Type	Table #
Message type field format and version field		-	Table 4
Country code		-	
Provider Length		-	
Provider code (L octets)		-	
Identification field - {NPar(1)} coding		NPar (1)	Table 5
Identification field - {SPar(1)} coding - Octet 1 (Service Parameters 1)		SPar(1)	Table 6
Identification field - {SPar(1)} coding - Octet 2 (Service Parameters 2)		SPar(1)	Table 7
Identification field - {SPar(1)} coding - Octet 3 (Channel Capabilities 1)			Table 15
Identification field – (SP) Datarate Amount {NPar(2)} coding - Octet 1	Downstream	NPar(2)	Table 8
Identification field – (SP) Datarate Amount {NPar(2)} coding - Octet 2	Downstream	NPar(2)	Table 9
Identification field – (SP) Datarate Amount {NPar(2)} coding - Octet 3	Downstream	NPar(2)	Table 10
Identification field – (SP) Datarate Amount {NPar(2)} coding - Octet 1	Upstream	NPar(2)	Table 8
Identification field – (SP) Datarate Amount {NPar(2)} coding - Octet 2	Upstream	NPar(2)	Table 9
Identification field – (SP) Datarate Amount {NPar(2)} coding - Octet 3	Upstream	NPar(2)	Table 10
Identification field – (SP) Datarate type {NPar(2)} coding	Downstream	NPar(2)	Table 11
Identification field – (SP) Datarate type {NPar(2)} coding	Upstream	NPar(2)	Table 11
Spectrum min/max ????			
Identification Field – (CC) Network type {NPar(2)} coding ???		NPar(2)	Table 16
Identification Field – (CC) Channel Probe {NPar(2)} coding - Octet 1		NPar(2)	Table 17
Identification Field – (CC) Channel Probe {NPar(2)} coding - Octet 2		NPar(2)	Table 18
Identification Field – (CC) Splitter Information {NPar(2)} coding - Octet 1		NPar(2)	Table 19
Identification Field – (CC) Splitter Information {NPar(2)} coding - Octet 2		NPar(2)	Table 20

3.1.1 Message Type and Version

Codepoints for the MR, CR and ES message types are needed. Codepoint 1111 should be marked as reserved.

Table 4. Message type field format

TABLE 3/V.8 *bis* → *G.hs*

Message type	Bit numbers			
	4	3	2	1
MS	0	0	0	1
CL	0	0	1	0
CLR	0	0	1	1
ACK(1)	0	1	0	0
ACK(2)	0	1	0	1
NAK(1)	1	0	0	0
NAK(2)	1	0	0	1
NAK(3)	1	0	1	0
NAK(4)	1	0	1	1
MR	1	1	0	0
CR	1	1	0	1
ES ??	1	1	1	0
Reserved for ITU-T	1	1	1	1

3.1.2 Service Parameters (SP)

These new tables emphasize service requirements instead of "application groups".. These tables are merely examples of the types and methodology of parameter exchange.

Table 5. Identification field - {NPar(1)} coding

SPar(1)s	8	7	6	5	4	3	2	1
This message contains the CL data in a CLR or CL-MS message	x	x	x	x	x	x	x	1
Rec. V.8 (see *XXXXXX*)	x	x	x	x	x	x	1	x
Rec. V.8bis (see *XXXXXX*)	x	x	x	x	x	1	x	x
Additional information available (see 9.10)	x	x	x	x	1	x	x	x
Transmit ACK(1) (see 9.7)	x	x	x	1	x	x	x	x
Reserved for ITU-T	x	x	1	x	x	x	x	x
Non-standard field	x	1	x	x	x	x	x	x
No parameters in this octet	x	0	0	0	0	0	0	0
NOTE – .Rec. V.8 and Rec. V.8bis availability can be identified to allow escape into voiceband modulation procedures.								

Table 6. Identification field - {SPar(1)} coding - Octet 1 (Service Parameters 1)

SPar(1)s	8	7	6	5	4	3	2	1
Datarate Amount Downstream	x	x	x	x	x	x	x	1
Datarate Amount Upstream	x	x	x	x	x	x	1	x
Datarate Type Downstream	x	x	x	x	x	1	x	x
Datarate Type Upstream	x	x	x	x	1	x	x	x
Reserved for ITU-T	x	x	x	1	x	x	x	x
Reserved for ITU-T	x	x	1	x	x	x	x	x
non standard service requirement	x	1	x	x	x	x	x	x
No parameters in this octet	x	0	0	0	0	0	0	0
NOTE – .								

Table 7. Identification field - {SPar(1)} coding - Octet 2 (Service Parameters 2)

SPar(1)s	8	7	6	5	4	3	2	1
Spectrum first usable frequency	x	x	x	x	x	x	x	1
Spectrum maximum frequency - upstream	x	x	x	x	x	x	1	x
Spectrum maximum frequency - downstream	x	x	x	x	x	1	x	x
Reserved for ITU-T	x	x	x	x	1	x	x	x
Reserved for ITU-T	x	x	x	1	x	x	x	x
Reserved for ITU-T	x	x	1	x	x	x	x	x
non standard frequency usage	x	1	x	x	x	x	x	x
No parameters in this octet	x	0	0	0	0	0	0	0
NOTE – .								

Table 8. Identification field – (SP) Datarate Amount {NPar(2)} coding - Octet 1

NPar(2)s	8	7	6	5	4	3	2	1
Reserved for ITU-T	x	x	1	1	1	1	1	1
Unspecified by terminal	x	x	0	0	0	0	0	0
Average bandwidth (bits 6-1 x 512kbps)	x	x	x	x	x	x	x	x

Table 9. Identification field – (SP) Datarate Amount {NPar(2)} coding - Octet 2

NPar(2)s	8	7	6	5	4	3	2	1
Reserved for ITU-T	x	x	1	1	1	1	1	1
Unspecified by terminal	x	x	0	0	0	0	0	0
Maximum bandwidth (bits 6-1 x 512kbps)	x	x	x	x	x	x	x	x

Table 10. Identification field – (SP) Datarate Amount {NPar(2)} coding - Octet 3

NPar(2)s	8	7	6	5	4	3	2	1
Reserved for ITU-T	x	x	1	1	1	1	1	1
Unspecified by terminal	x	x	0	0	0	0	0	0
Minimum bandwidth (bits 6-1 x 512kbps)	x	x	x	x	x	x	x	x

Table 11. Identification field – (SP) Datarate type {NPar(2)} coding

NPar(2)s	8	7	6	5	4	3	2	1
Low latency	x	x	x	x	x	x	x	1
Constant latency	x	x	x	x	x	x	1	x
Bursty	x	x	x	x	x	1	x	x
etc	x	x	x	x	1	x	x	x
	x	x	x	1	x	x	x	x
	x	x	1	x	x	x	x	x
No parameters in this octet	x	x	0	0	0	0	0	0

Table 12. Identification field – (SP) Spectrum first usable frequency {NPar(2)} coding

NPar(2)s	8	7	6	5	4	3	2	1
Reserved for ITU-T	x	x	1	1	1	1	1	1
Unspecified by terminal	x	x	0	0	0	0	0	0
spectrum first usable frequency (bits 6-1 x 5KHz)	x	x	x	x	x	x	x	x

Table 13. Identification field – (SP) Spectrum maximum frequency - upstream {NPar(2)} coding

NPar(2)s	8	7	6	5	4	3	2	1
Reserved for ITU-T	x	x	1	1	1	1	1	1
Unspecified by terminal	x	x	0	0	0	0	0	0
spectrum maximum frequency - upstream(bits 5-1 x 1MHz)	x	x	1	x	x	x	x	x
spectrum maximum frequency - upstream(bits 5-1 x 10KHz)	x	x	0	x	x	x	x	x

Table 14. Identification field – (SP) Spectrum maximum frequency - downstream {NPar(2)} coding

NPar(2)s	8	7	6	5	4	3	2	1
Reserved for ITU-T	x	x	1	1	1	1	1	1
Unspecified by terminal	x	x	0	0	0	0	0	0
spectrum maximum frequency - downstream(bits 5-1 x 1MHz)	x	x	1	x	x	x	x	x
spectrum maximum frequency - downstream(bits 5-1 x 10KHz)	x	x	0	x	x	x	x	x

3.1.3 Channel Capabilities (CC)

Table 15. Identification field - {SPar(1)} coding - Octet 3 (Channel Capabilities 1)

SPar(1)s	8	7	6	5	4	3	2	1
Network type (Note)	x	x	x	x	x	x	x	1
Channel Probe	x	x	x	x	x	x	1	x
Splitter Information- CO	x	x	x	x	x	1	x	x
Splitter Information - Remote	x	x	x	x	1	x	x	x
Reserved for allocation by the ITU-T	x	x	x	1	x	x	x	x
Reserved for allocation by the ITU-T	x	x	1	x	x	x	x	x
Reserved for allocation by the ITU-T	x	1	x	x	x	x	x	x
No parameters set in this octet	x	0	0	0	0	0	0	0
NOTE – The use of this bit is under study.								

Table 16. Identification Field – (CC) Network type {NPar(2)} coding ???

Network Type NPar(2)s	8	7	6	5	4	3	2	1
Cellular access (Note)	x	x	x	x	x	x	x	1
ISDN access (Note)	x	x	x	x	x	x	1	x
xDSL access	x	x	x	x	x	1	x	x
Reserved for allocation by the ITU-T	x	x	x	x	1	x	x	x
Reserved for allocation by the ITU-T	x	x	x	1	x	x	x	x
Non-standard network (Note)	x	x	1	x	x	x	x	x
No parameters set in this octet	x	x	0	0	0	0	0	0

NOTE – The assignment of the codepoints for ISDN access and non-standard network is provisional. The use of these codepoints is the subject of further study.

Table 17. Identification Field – (CC) Channel Probe {NPar(2)} coding - Octet 1

Access Channel Probe NPar(2)s	8	7	6	5	4	3	2	1
Probe in band 0 -4kHz (Voice) (psuedo random noise)	x	x	x	x	x	x	x	1
Probe in band 4 kHz - 90 kHz	x	x	x	x	x	x	1	x
Probe in Band 90 kHz - 150 kHz	x	x	x	x	x	1	x	x
Probe in Band 150 kHz - 550 kHz	x	x	x	x	1	x	x	x
Probe in Band 550 kHz - 1,100 kHz	x	x	x	1	x	x	x	x
Non-standard probe	x	x	1	x	x	x	x	x
No parameters in this octet	x	x	0	0	0	0	0	0

NOTE – Probing tones shall not be transmitted in the ranges assigned for the G.hs modulations in use.

Table 18. Identification Field – (CC) Channel Probe {NPar(2)} coding - Octet 2

Access Channel Probe NPar(2)s	8	7	6	5	4	3	2	1
Probe in band 1,100 kHz - 10,000 kHz	x	x	x	x	x	x	x	1
Probe in band 10,000 kHz - 20,000 kHz	x	x	x	x	x	x	1	x
Probe in Band 20,000 kHz - 30,000 kHz	x	x	x	x	x	1	x	x
Reserved for allocation by the ITU-T	x	x	x	x	1	x	x	x
Reserved for allocation by the ITU-T	x	x	x	1	x	x	x	x
Reserved for allocation by the ITU-Te	x	x	1	x	x	x	x	x
No parameters in this octet	x	x	0	0	0	0	0	0

NOTE – Probing tones shall not be transmitted in the ranges assigned for the G.hs modulations in use.

Table 19. Identification Field – (CC) Splitter Information {NPar(2)} coding - Octet 1

Access Channel Probe NPar(2)s	8	7	6	5	4	3	2	1
LPF is voice	x	x	x	x	x	x	x	1
LPF is USA ISDN	x	x	x	x	x	x	1	x
LPF is German ISDN	x	x	x	x	x	1	x	x
Reserved for ITU-T	x	x	x	x	1	x	x	x
Reserved for ITU-T	x	x	x	1	x	x	x	x
Non-standard LPF	x	x	1	x	x	x	x	x
No parameters in this octet	x	x	0	0	0	0	0	0

Table 20. Identification Field – (CC) Splitter Information {NPar(2)} coding - Octet 2

Access Channel Probe NPar(2)s	8	7	6	5	4	3	2	1
HPF is 25 kHz (voice)	x	x	x	x	x	x	x	1
HPF is 90kHz USA ISDN	x	x	x	x	x	x	1	x
HPF is 150kHz (ADSL with European ISDN)	x	x	x	x	x	1	x	x
HPF is 300 kHz (VDSL)	x	x	x	x	1	x	x	x
Reserved for ITU-T	x	x	x	1	x	x	x	x
Non-standard HPF	x	x	1	x	x	x	x	x
No parameters in this octet	x	x	0	0	0	0	0	0

3.2 Standard Information Field

The Standard Information field is composed of several octets of NPar(1)s, SPar(1)s, and possibly NPar(2), SPar(2), and SPar(3). NPar(1) and SPar(1) octets are specified in this Recommendation and are always transmitted.

The contents of the NPar(2) SPar(2), and SPar(3)octets are specified in their respective Recommendations and are transmitted only if the corresponding bit in the SPar(1) is a "1". In general, the contents are regarding modulation and protocol details specific to the respective recommendation.

3.2.1 Standard Information Field Spar(1) and NPar(1) encoding

Table 21. Standard Information field - {NPar(1)} coding

SPar(1)s	8	7	6	5	4	3	2	1
Voiceband (Rec. V.8 or V.8bis)	x	x	x	x	x	x	x	1
Reserved for ITU-T	x	x	x	x	x	x	1	x
Reserved for ITU-T	x	x	x	x	x	1	x	x
Reserved for ITU-T	x	x	x	x	1	x	x	x
Reserved for ITU-T	x	x	x	1	x	x	x	x
Reserved for ITU-T	x	x	1	x	x	x	x	x
Reserved for ITU-T	x	1	x	x	x	x	x	x
No parameters in this octet	x	0	0	0	0	0	0	0
NOTE – .								

Table 22. Standard Information field - {SPar(1)} coding - Octet 1

SPar(1)s	8	7	6	5	4	3	2	1
G.dmt - Annex A	x	x	x	x	x	x	x	1
G.dmt - Annex B	x	x	x	x	x	x	1	x
G.dmt - Annex C	x	x	x	x	x	1	x	x
G.hdsl	x	x	x	x	1	x	x	x
G.lite	x	x	x	1	x	x	x	x
G.lite - (in TCM-ISDN environment)	x	x	1	x	x	x	x	x
Non-standard capabilities (modulations)	x	1	x	x	x	x	x	x
No parameters in this octet	x	0	0	0	0	0	0	0
NOTE – .								

Table 23. Standard Information field - {SPar(1)} coding - Octet 2

SPar(1)s	8	7	6	5	4	3	2	1
ANSI HDSL2 / G.hdsl2	x	x	x	x	x	x	x	1
ANSI VDSL A / G.vdsl Annex A	x	x	x	x	x	x	1	x
ANSI VDSL B / G.vdsl Annex B	x	x	x	x	x	1	x	x
ANSI T1.413 Issue 2	x	x	x	x	1	x	x	x
Reserved for ITU-T	x	x	x	1	x	x	x	x
Reserved for ITU-T	x	x	1	x	x	x	x	x
Reserved for ITU-T	x	1	x	x	x	x	x	x
No parameters in this octet	x	0	0	0	0	0	0	0
NOTE – .								

3.2.2 Examples of coding for Standard Information Field NPar(2)

The section contains some example methods for negotiating non-bit parameters. The actual location and definition of the modulation specific parameters has yet to be decided as discussed in 2.1.3.

Table 24. Modulation – G.dmt Annex A {NPar(2)} coding - Octet 1

NPar(2)s	8	7	6	5	4	3	2	1
Specify parameters or profiles for G.dmt Annex A	x	x	x	x	x	x	x	1
	x	x	x	x	x	x	1	x
STM=0, ATM=1	x	x	x	x	x	1	x	x
NTR	x	x	x	x	1	x	x	x
etc	x	x	x	1	x	x	x	x
	x	x	1	x	x	x	x	x
No parameters in this octet	x	x	0	0	0	0	0	0

Table 25. Modulation – G.dmt Annex A {NPar(2)} coding - Octet 2

NPar(2)s	8	7	6	5	4	3	2	1
AS1 / ATM1 downstream	x	x	x	x	x	x	x	1
AS2 downstream	x	x	x	x	x	x	1	x
AS3 downstream	x	x	x	x	x	1	x	x
LS1 downstream	x	x	x	x	1	x	x	x
LS2 downstream	x	x	x	1	x	x	x	x
LS1 / ATM1 upstream	x	x	1	x	x	x	x	x
No parameters in this octet	x	x	0	0	0	0	0	0

Note: All STM equipment must at least support AS0 and LS0 downstream and ATM equipment must support at least ATM0 downstream, so they are not indicated.

Table 26. Modulation – G.dmt Annex A {NPar(2)} coding - Octet 3

NPar(2)s	8	7	6	5	4	3	2	1
LS2 upstream	x	x	x	x	x	x	x	1
	x	x	x	x	x	x	1	x
	x	x	x	x	x	1	x	x
	x	x	x	x	1	x	x	x
	x	x	x	1	x	x	x	x
	x	x	1	x	x	x	x	x
No parameters in this octet	x	x	0	0	0	0	0	0

Table 27. Modulation – G.dmt Annex B {NPar(2)} coding - Octet 1

NPar(2)s	8	7	6	5	4	3	2	1
Specify parameters or profiles for G.dmt Annex B	x	x	x	x	x	x	x	1
	x	x	x	x	x	x	1	x
	x	x	x	x	x	1	x	x
etc	x	x	x	x	1	x	x	x
	x	x	x	1	x	x	x	x
	x	x	1	x	x	x	x	x
No parameters in this octet	x	x	0	0	0	0	0	0

Table 28. Modulation – G.dmt Annex C {NPar(2)} coding - Octet 1

NPar(2)s	8	7	6	5	4	3	2	1
Specify parameters or profiles for G.dmt Annex C	x	x	x	x	x	x	x	1
	x	x	x	x	x	x	1	x
	x	x	x	x	x	1	x	x
etc	x	x	x	x	1	x	x	x
	x	x	x	1	x	x	x	x
	x	x	1	x	x	x	x	x
No parameters in this octet	x	x	0	0	0	0	0	0

Table 29. Modulation – G.hdsl {NPar(2)} coding

NPar(2)s	8	7	6	5	4	3	2	1
Use G.hdsl Annex B	x	x	x	x	x	x	x	1
	x	x	x	x	x	x	1	x
	x	x	x	x	x	1	x	x
etc	x	x	x	x	1	x	x	x
	x	x	x	1	x	x	x	x
	x	x	1	x	x	x	x	x
No parameters in this octet	x	x	0	0	0	0	0	0

Table 30. Modulation – G.lite {NPar(2)} coding - Octet 1

NPar(2)s	8	7	6	5	4	3	2	1
Specify parameters or profiles for G.lite	x	x	x	x	x	x	x	1
	x	x	x	x	x	x	1	x
	x	x	x	x	x	1	x	x
etc	x	x	x	x	1	x	x	x
	x	x	x	1	x	x	x	x
	x	x	1	x	x	x	x	x
No parameters in this octet	x	x	0	0	0	0	0	0

4. G.hs complexity Reduction

The following suggestions may help reduce the complexity of G.hs transaction compared to V.8bis.

1. After the negotiation modulation channels have been established, the remote terminal assumes the role of the initiating station and the central office terminal assumes the role of the responding station in the exchange of messages.
   Or, it can defined that only certain messages can be initiated by each end. For example, xTU-R could only initiate with MS or CR. xTU-C could only initiate with CL (transaction #5 only).

2. While G.hs should incorporate a variety of the transaction types allowed in V.8bis, not all of the currently specified transactions may be needed.

   The various types of transactions allow for very short transactions for simple situations and detailed negotiations for remote or complex situations.
   For example, V.8bis transactions #4 and #5 are suitable for fixed equipment and environment situations. In two or three message transfers, pre-established modes of operation can be quickly acknowledged for a quick entry into the modulation startup.
   Transaction #4 would probably be the most popular for an initializing xTU-R after the initial installation.
   Transaction #5 would probably be popular for fixed systems when the xTU-C initiates.

   For mobile equipment or changing environment situations, transactions such as #2, #3, #12, and #13 allow for a full disclosure of the channel capabilities and both terminal's capabilities before selecting and acknowledging a mode of operation.
   Transaction #2 would probably be the most popular for first time installation of fixed systems and the common transaction for mobile systems or modem pooling.
   Transaction #12 would probably be popular for mobile systems when the xTU-C initiates.

Thus it seems that all of the transactions with MR can be deleted to help reduce complexity. The only advantage of using MR instead of CR/CL is that the transaction could be of slightly shorter duration, however with the full duplex modulation at the current speeds, the difference would be negligible. Also, all MR transaction involve "back-to-back" requests which seems redundant.

Transaction #6 might be problematic with channel probing.

Table 31. G.hs transactions (Table 7/V.8bis)

Transaction number	Initiating station	Responding station	Initiating station	Responding station	Initiating station	Responding station
~~1~~	~~MR→~~	~~MS→~~	~~ACK/NAK~~			
2	CR→	CL→	MS→	ACK/NAK		
3	CR→	CLR→	CL-MS→	ACK/NAK		
4	MS→	ACK/NAK				
5	CL→	MS→	ACK/NAK			
6	CLR→	CL→	MS→	ACK/NAK		
~~7~~	~~MR→~~	~~MR→~~	~~MS→~~	~~ACK/NAK~~		
~~8~~	~~MR→~~	~~MR→~~	~~CR_d→~~	~~CL→~~	~~MS→~~	~~ACK/NAK~~
~~9~~	~~MR→~~	~~MR→~~	~~CR_d→~~	~~CLR→~~	~~CL-MS→~~	~~ACK/NAK~~
~~10~~	~~MR→~~	~~CR→~~	~~CL→~~	~~MS→~~	~~ACK/NAK~~	
~~11~~	~~MR→~~	~~CR→~~	~~CLR→~~	~~CL-MS→~~	~~ACK/NAK~~	
12	CR→	CR→	CL→	MS→	ACK/NAK	
13	CR→	CR→	CLR→	CL-MS→	ACK/NAK	

5. Summary:

1. Agenda Item: G.hs (Information Content)

2. Expectations
   - The committee accept as a whole or in part the text suggested in Section 3 as working text for G.hs
   - Interested parties filling in Table 2. G.DMT Parameters Indicated/Negotiated during G.hs

3. Proposed resolutions for some of the open issues i

		NF-044 section
4.16 (open)	Should some of the V.8bis transactions be eliminated for G.hs?	Yes: 4
5.8 (open)	Which sub-parameters of the xDSL Recommendations should be negotiated in G.hs?	2.1.3
4.7 (open)	Should G.hs (optionally) perform preliminary line characterization to assess the suitability of the various modulation schemes and/or to determine whether splitters are in the circuit?	Yes : 2.2