International Telecommunication Union

# ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

# G.998.4

**Amendment 3**

(01/2014)

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

Digital sections and digital line system – Metallic access networks

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## Improved impulse noise protection for DSL transceivers

## Amendment 3: Extended memory for enhanced bit rates with retransmission

Recommendation ITU-T G.998.4 (2010) – Amendment 3

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# Recommendation ITU-T G.998.4

## Improved impulse noise protection for DSL transceivers

## Amendment 3

## Extended memory for enhanced bit rates with retransmission


**Summary**

Amendment 3 to Recommendation ITU-T G.998.4 (2010) covers the following functionality:

- extended memory for enhanced bit rates with retransmission when operating in ITU-T G.993.2 with ITU-T G.993.5 not enabled (new functionality).


**History**

| Edition | Recommendation | Approval | Study Group | Unique ID* |
|---|---|---|---|---|
| 1.0 | ITU-T G.998.4 | 2010-06-11 | 15 | 11.1002/1000/10418-en |
| 1.1 | ITU-T G.998.4 (2010) Cor. 1 | 2010-11-29 | 15 | 11.1002/1000/11017-en |
| 1.2 | ITU-T G.998.4 (2010) Cor. 2 | 2011-04-13 | 15 | 11.1002/1000/11132-en |
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| 1.4 | ITU-T G.998.4 (2010) Cor. 3 | 2011-12-16 | 15 | 11.1002/1000/11399-en |
| 1.5 | ITU-T G.998.4 (2010) Amd. 2 | 2012-04-06 | 15 | 11.1002/1000/11505-en |
| 1.6 | ITU-T G.998.4 (2010) Cor. 4 | 2012-06-13 | 15 | 11.1002/1000/11646-en |
| 1.7 | ITU-T G.998.4 (2010) Cor. 5 | 2013-03-16 | 15 | 11.1002/1000/11894-en |
| 1.8 | ITU-T G.998.4 (2010) Amd. 3 | 2014-01-13 | 15 | 11.1002/1000/12092-en |

* 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.

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# Recommendation ITU-T G.998.4

## Improved impulse noise protection for DSL transceivers

## Amendment 3

## Extended memory for enhanced bit rates with retransmission

### 1) Extended memory for enhanced bit rates with retransmission when operating in ITU-T G.993.2 with ITU-T G.993.5 not enabled (new functionality)

*Change clause C.2 as follows:*

### C.2 Initialization

Support of ITU-T G.998.4 in VDSL2 is realized through the "ITU-T G.998.4 extensions" codepoints in ITU-T G.994.1 and the "ITU-T G.998.4 parameter field" in the various VDSL2 initialization messages, as specified in ITU-T G.993.2 Amendment 5 [4]. This clause defines the "ITU-T G.998.4 extensions" codepoints in ITU-T G.994.1 and the contents of the ITU-T G.998.4 parameter field for the relevant initialization messages. When an initialization message is not included in the subsections below, the ITU-T G.998.4 parameter field for that message shall be a single byte with value $00_{16}$.

### C.2.0 ITU-T G.994.1 handshake phase

The initialization procedure starts with the ITU-T G.994.1 handshake phase. During this phase, the VTU-O and the VTU-R shall exchange their ITU-T G.998.4 extensions capabilities in addition to the parameters communicated in a regular handshake phase, as defined in [ITU-T G.993.2]. Based on these capabilities, the final set of ITU-T G.998.4 extensions is determined during the ITU-T G.994.1 handshake phase of initialization (see Table 11.68.0.1 and Table 11.68.11 of [ITU-T G.994.1] and Tables C.1.1, C.1.2, C.1.3, and C.1.4).

**Table C.1.1 – VTU-O CL message Npar(3) bit definitions**

| ITU-T G.994.1 Npar(3) Bit | Definition of Npar(3) bits |
|---|---|
| ITU-T G.998.4 Annex D support | If set to ONE, this bit indicates that the VTU-O supports ITU-T G.998.4 Annex D.<br>This bit may only be set to ONE if the VTU-O transceiver is ITU-T G.993.5 capable, but the bit "ITU-T G.993.5" is set to ZERO in the Spar(2) octet 2 of ITU-T G.993.2; otherwise this bit shall be set to ZERO.<br>NOTE – In earlier versions of ITU-T G.998.4, support of Annex D was indicated implicitly by support of ITU-T G.993.5 (i.e., the bit "ITU-T G.993.5" is set to ONE in the Spar(2) octet 2 of ITU-T G.993.2). |

**Table C.1.2 – VTU-O MS message Npar(3) bit definitions**

| ITU-T G.994.1 Npar(3) Bit | Definition of Npar(3) bits |
|---|---|
| ITU-T G.998.4 Annex D support | This bit shall be set to ONE, if and only if, set to ONE in both the last previous CL message and the last previous CLR message.<br>If set to ONE, this bit indicates that operation in ITU-T G.998.4 Annex D is selected, even if this MS message does not indicate the selection of ITU-T G.993.5. If set to ZERO, this bit indicates that operation in ITU-T G.998.4 Annex D is not selected. |

**Table C.1.3 – VTU-R CLR message Npar(3) bit definitions**

| ITU-T G.994.1 Npar(3) Bit | Definition of Npar(3) bits |
|---|---|
| ITU-T G.998.4 Annex D support | If set to ONE, this bit indicates that the VTU-R supports ITU-T G.998.4 Annex D.<br>This bit may only be set to ONE if the bit "ITU-T G.993.5" is also set to ONE in the Spar(2) octet 2 of ITU-T G.993.2; otherwise this bit shall be set to ZERO.<br>NOTE – In earlier versions of ITU-T G.998.4, support of Annex D was indicated implicitly by support of ITU-T G.993.5 (i.e., the bit "ITU-T G.993.5" is set to ONE in the Spar(2) octet 2 of ITU-T G.993.2). |

**Table C.1.4 – VTU-R MS message Npar(3) bit definitions**

| ITU-T G.994.1 Npar(3) Bit | Definition of Npar(3) bits |
|---|---|
| ITU-T G.998.4 Annex D support | This bit shall be set to ONE if and only if set to ONE in both the last previous CL message and the last previous CLR message.<br>If set to ONE, this bit indicates that operation in ITU-T G.998.4 Annex D is selected, even if this MS message does not indicate selection of ITU-T G.993.5. If set to ZERO, this bit indicates that operation in ITU-T G.998.4 Annex D is not selected. |

### C.2.1 VTU-O messages

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### C.2.2 VTU-R messages

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**2) Changes to Annex D**

*Change Annex D as follows:*

# Annex D

# Support of ITU-T G.998.4 with ITU-T G.993.5

Operation according to this Annex D can be activated in 2 ways:

- If ITU-T G.993.5 vectoring is selected ~~in at least one direction~~ (as indicated in the ITU-T G.994.1 MS message), then operation of ITU-T G.998.4 shall comply with this Annex D.
- If the ITU-T G.998.4 extension "G.998.4 Annex D support" NPar(3) is set to ONE (see Table 11.68.11 of ITU-T G.994.1), then operation of ITU-T G.998.4 shall comply with this Annex D.

Annex D is defined relative to Annex C. All requirements of Annex C apply, with the replacements and supplements as identified in this Annex D.

## D.1.1 Memory (replaces clause C.1.1)

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