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ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.998.2

Amendment 2

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

Digital sections and digital line system – Access networks

Ethernet-based multi-pair bonding

Amendment 2

Recommendation ITU-T G.998.2 (2005) –
Amendment 2

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Recommendation ITU-T G.998.2

Ethernet-based multi-pair bonding

Amendment 2

Summary

Amendment 2 to Recommendation ITU-T G.998.2 includes new functionality for discovery/aggregation and pair management at the bonding layer.

Source

Amendment 2 to Recommendation ITU-T G.998.2 (2005) was approved on 7 December 2007 by ITU-T Study Group 15 (2005-2008) under Recommendation ITU-T A.8 procedure.

FOREWORD

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Recommendation ITU-T G.998.2

Ethernet-based multi-pair bonding

Amendment 2

This amendment includes new functionality for discovery/aggregation and pair management at the bonding layer. New Annex C describes a frame-based protocol (the bonding aggregation control protocol (BACP)) that exchanges information allowing two systems to seamlessly control mapping of physical media entities to physical medium attachment aggregation functions.

In clause 2, add the following reference to IEEE 802.3-2005, the standard that replaced IEEE 802.3 (2002) and IEEE 802.3ah (2004). Original references to IEEE 802.3 (2002) and IEEE 802.3ah (2004) have been retained and, when explicitly identifying the 2005 version, this amendment refers to IEEE 802.3-2005:

- [11] IEEE 802.3 (2005), *Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*.

NOTE – Original references to IEEE 802.3 (2002) and IEEE 802.3ah (2004) have been retained and, when explicitly identifying the 2005 version, this Recommendation refers to IEEE 802.3-2005.

Amend the definition of physical media entity:

3.10 physical media entity (PME): In IEEE 802.3-2005, a reference to an individual transceiver contained within an aggregate group where a transceiver carries only one packet stream. This Recommendation also supports operation over transceivers carrying multiple (at gamma interface logically separated) packet streams. In this Recommendation, a PME is a reference to one logical channel out of a set of one or more channels on the same individual transceiver. Each such PME carries a single packet stream and is contained within one aggregate group.

NOTE 1 – In case pre-emption is used on a bearer channel, two PMEs each reference one of the two logical channels on the same bearer channel. In case pre-emption is not used on a bearer channel, a PME defaults to a reference to the one bearer channel.

NOTE 2 – Although such a PME cannot be physically isolated within a transceiver carrying multiple packet streams, the naming PME is maintained for consistency with IEEE 802.3-2005 and for consistency in case the transceiver carries only one packet stream.

Add the following text to the end of clause 6.2.2:

The network side uses the PME_ID of each link in the bonding group to retrieve management data through Ethernet OAM (clause 30/57 of IEEE 802.3). Each G.994.1 CLR message shall include the 48-bit remote discovery register and the 32-bit PME aggregate register. The network side may derive the PME_IDs of each of the links in the bonding group by adding the links one-by-one to the bonding group during PME aggregation, and observing the change in the PME aggregate register with each addition. However, to allow parallel initialization of the links in the bonding group and, hence, to allow shortening of the bonding group initialization time, the remote side should also include the 5-bit PME_ID in each CLR message. Corresponding G.994.1 codepoints are defined for the PME_ID as a supplement to IEEE 802.3 clause 61.

Replace clause 8 with the following:

8 Handshake

Clause 61.4 of IEEE 802.3-2005 defines the handshake operation for the IEEE standards 2BASE-TL and 10PASS-TS. That clause defines handshake procedures for discovering which pairs

are provisioned in which aggregate groups using the PME aggregation and PME aggregation discovery codepoints of the IEEE handshake tree.

The procedures of that clause are followed in this Ethernet bonding Recommendation with the following exceptions.

- There is no "PAF enable" parameter as described in clause 61.4 of IEEE 802.3-2005 [11]. That parameter is used to define whether bonding is performed. As this Recommendation references bonded operation only, that parameter is not required.
- The "PME identification" Spar(2) bit indicates that PME identification is included in the CLR message. The corresponding Npar(3) field contains the five-bit value (0 to 31) of the PME ID.
- The "BACP support" NPar(2) bit indicates support for the BACP protocol specified in Annex C. If this bit is set to ZERO in the CLR or CL message, then the bit shall also be set to ZERO in the MS message. If this bit is set to ONE in both the CLR and CL message, then this bit shall also be set to ONE in the MS message.
- Table 2 describes the meaning of the "BACP support" bit in the MS message.

Table 2 – Interpretation of MS message bits for BACP

BACP support	Meaning
0	Use the G.994.1-based discovery/aggregation. Do not use BACP discovery/aggregation/management
1	Use BACP for discovery/aggregation/management. Do not use G.994.1-based discovery/aggregation

Unlike the handshake operations of IEEE 802.3-2005 [11], this Recommendation defines the bonding layer to operate independently of the TPS-TC. Each line may select its TPS-TC independently of the others, as long as the maximum differential latency of the pairs is maintained as specified in this Recommendation.

NOTE – This Ethernet bonding Recommendation uses the PME aggregation and PME aggregation discovery codepoints in ITU-T Rec. G.994.1. The definition of these variables is in clause 45.2.3.20 (PME aggregation) and 45.2.6.8 (PME aggregation discovery) of IEEE 802.3-2005. The transactions used to exchange these codepoints (e.g., "Get", "Set if Clear", "Clear if Same") are defined in clause 61.4 of IEEE 802.3-2005. Note that an example of the aggregation discovery procedure is contained in clause 61A of IEEE 802.3-2005.

Add the following new Annex C:

Annex C

Frame-based protocol for discovery/aggregation and link management

This annex describes a frame-based protocol, referred to as the bonding aggregation control protocol (BACP), that exchanges information allowing two systems to control which PMEs are mapped to which PAFs in a simple and seamless manner. In this annex, a "system" is defined as a piece of equipment, such as a DSLAM or a CPE device, associated with a set of PAFs and PMEs. This protocol is used in lieu of the G.994.1 discovery/aggregation process defined in clause 8.