Trend of Standardizing xDSL Technologies in ITU-T

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Abstract

Various digital subscriber line (xDSL) technologies that allow high-speed data transmission over metallic pair cable are being discussed for standardization in International Telecommunication Union Telecommunication Standardization Sector (ITU-T) Study Group 15 (SG15) Working Party 1 (WP1) Question 4 (Q4). This article reports the results and future issues for ADSL and VDSL, upon which NTT's FLET'S-ADSL and B-FLET'S services are based, from among items on the agenda of the January 2003 meeting.

1. Trend of standardizing ADSL technologies

1.1 G.992.1 (G.dmt)

At the January 2003 meeting, SG15 (Fig. 1, Table 1) achieved consent[*1] as G.992.1 (G.dmt) Amendment 1 (Table 2). This amendment consists of a revised Annex C which contains additional specifications that support a maximum downstream rate of 12 Mbit/s and specifications that extend the loop reach by approximately 1 km longer than the current one by applying G.992.3 (G.dmt.bis) technologies to the current G.992.1 Annex C (describing maximum 8-Mbit/s ADSL[*2] specifications under a TCM-ISDN[*3] environment), Annex I (new) which supports 24-Mbit/s service by expanding the bandwidth to 2.2 MHz (double spectrum), and Appendix V (new) which exemplifies the power spectrum density (PSD) for the revised Annex C. The enhancement of G.992.1 ended with this Amendment 1 and any fur-

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*1 consent: The study group allows the draft text onto the Alternative Approval Process (AAP). The consented draft text can be regarded as one for which all technical issues have been resolved.
*2 ADSL: Asynchronous digital subscriber line.
*3 TCM-ISDN: Time compressed multiplexed integrated services digital network.

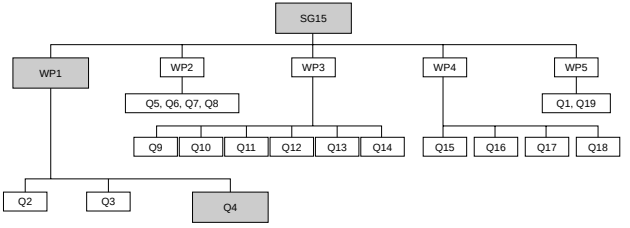

Fig. 1. Structure of SG15.

Table 1. Structure of WP1.

WP1 Network Access	
Q2	Optical systems for access networks
Q3	Support for recommendations specifying systems based on ISDN physical layers
Q4	Transceivers for customer access and in-premises phone line networking systems on metallic pairs

Table 2. Recommendations having reached consent at Jan. 2003 meeting.

Rec. no.	Outline	Key words
G.992.1 (G.dmt) Amendment 1	Revised Annex C added specs. for 12-Mbit/s ADSL and extended ADSL (1 km longer), Appendix V, and Annex I (bandwidth: 2.2 MHz)	1.1-MHz ADSL Annex C (12 Mbit/s) 2.2-MHz ADSL Annex C (24 Mbit/s)
G.992.2 (G.lite) Amendment 1	Revised Annex C for which G.992.1 revised Annex C modified to adapt to G.992.2 (bandwidth: up to 552 kHz)	552-kHz ADSL Annex C
G.992.3 (G.dmt.bis) Amendment 1	Corrigendum and addition of specifications	1.1-MHz ADSL2 Annexes A&B (8 Mbit/s)
G.992.5 (G.adslplus)	Expanded bandwidth mode of G.992.3	2.2-MHz ADSL2 Annexes A&B (24Mbit/s)
G.993.1 (G.vdsl.f) Amendment 1	Addition of Annex F defining Bandplan, PSD, ISDN/POTS splitter, test loop models, and disturber models under TCM-ISDN environment	VDSL under TCM-ISDN environment
G.994.1 (G.hs)	Addition of Hand Shake Procedure accompanying the above modifications and additions	
G.996.1 (G.test) Amendment 1	Addition of Annex B defining test loop models and disturber models for ADSL (band expanded mode up to 2.2 or 3.75 MHz) under TCM-ISDN environment	2.2-MHz (3.75-MHz) ADSL test specs.

ther enhancements will be applied to G.992.3 or G.992.5 (G.adslplus).

1.2 G.992.3 (G.dmt.bis)

G.992.3 (G.dmt.bis) Amendment 1 also reached consent (Table 2). This amendment corrects editorial errors and adds some specifications to G.992.3, which was approved[*4] in July 2002. G.992.3 is called ADSL2. Its specifications, which are refined from G.992.1. Annex A (for North America) and Annex B (for Europe) can extend the loop reach by about 1 km in both cases. The frame structure of G.992.3 is different from that of G.992.1, so G.992.1 ADSL and G.993.2 ADSL (ADSL2) are not compatible with each other. Annex C (TCM-ISDN environment mode) and Annex L (reach extended mode) are scheduled to reach consent at the next SG15 meeting. Annex L is called Reach Extended ADSL (RE-ADSL), which is defined to extend the loop reach (up to the maximum reach for POTS[*5] service: e.g., loops up to 1500 ohms DC resistance) and has minimum target downstream/upstream data rates of 192/128 kbit/s.

1.3 G.992.5 (G.adslplus)

G.992.5 (G.adslplus), which extends the bandwidth of G.992.3 to the 2.2-MHz. band achieved consent (Table 2). Annex A (for North America) and Annex B (for Europe: EC-ISDN) have already been standardized. Annex C (TCM-ISDN environment mode), Annex J (all-digital mode with improved spectrum compatibility with ADSL over EC-ISDN) and Annex L (extended upstream mode) are scheduled to reach consent at the next SG15 meeting.

1.4 G.996.1 (G.test)

A delayed contribution[*6] submitted by NTT was adopted as a Draft text G.996.1 (G.test) Annex B. The draft achieved consent as G.996.1 Amendment 1

*4 approve: AAP for the consented draft text has finished and the procedure for publishing is in progress.
*5 POTS: Plain old telephone service.
*6 delayed contribution: Contributions fall into types, "white contributions" and "delayed contributions". The former are posted to the Study Group website by not less than two months before the date set for the opening of the meeting, the latter are posted by not less than seven working days.

(Table 2). This Annex B defines test loop models and crosstalk disturber models for G.992.1 Annex I ADSL and G.992.5 Annex C ADSL and is specified to be applicable even when the bandwidth of G.992.5 Annex C is extended up to 3.75 MHz.

2. Trend of standardizing VDSL technologies

A delayed contribution submitted by NTT was adopted as a Draft text G.993.1(G.vdsl.f) Annex F. The draft was approved as G.993.1 Amendment 1 (Table 2). This Annex F consists of F.1. (bandplan and PSD masks), F.2. (test loop models and crosstalk disturber models), and F.3. (ISDN/POTS splitter and electrical characteristics), which are specified under TCM-ISDN environment. It was agreed that the G.vdsl project should, as a goal, make a decision on line code at the July 2003 Rapporteur Meeting. It is possible and foreseeable that this decision will be influenced by decisions of the American National Standards Institute (ANSI) June meeting concerning VDSL*7 line code (DMT*8 or QAM*9). This Annex F is specified to be applicable to both DMT and QAM without any changes.

3. Status as of July 2003

G.992.1 Amendment 1, G.993.1 Amendment 1, and G.996.1 Amendment 1 have already been approved and are in pre-publication [1], which means they are currently in force. G.992.3 Amendment 1 and G.992.5 are undergoing additional review [2] in the alternative approval process [3].

4. Next meeting

The next SG15 meeting was scheduled to be held Oct. 21st to 31st 2003 in Geneva, Switzerland.

References

[1] http://www.itu.int/publications/main_publ/itut.html
[2] http://www.itu.int/ITU-T/studygroups/com15/aap/table-sg15aap.html
[3] ITU-T Recommendation A.8 Alternative approval process for new and revised Recommendations.

*7 VDSL: very high-speed digital subscriber line.
*8 DMT: discrete multitone.
*9 QAM: quadrature amplitude modulation.

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