

ITU xDSL Recommendations

The ITU-T xDSL standards have been "determined" which means they are stable & will then undergo a 9 month review before being "approved". For all practical purposes, determination is approval - changes are mainly editorial & clean-up after that.

The g.hdsl standard (G.991.1) was determined in February and was approved this October.

The numbers of the set are:

- G.991.1 (ex-G.hdsl) High Speed Digital Subscriber Line (HDSL)
- G.992.1 (ex-G.dmt) Asymmetrical Digital Subscriber Line (ADSL) transceivers (this is the ITU-T's version of full-rate ADSL)
- G.992.2 (ex-G.lite) Splitterless Asymmetrical Digital Subscriber Line (ADSL) transceivers
- G.994.1 (ex-G.hs) Handshake procedures for Digital Subscriber Line (DSL) Recommendations
- G.995.1 (ex-G.ref) Overview of Digital Subscriber Line (DSL) Recommendations (a collection of reference diagrams)
- G.996.1 (ex-G.test) Test procedures for Digital Subscriber Line (DSL) transceivers (gives noise models, loop models, POTS models, and some test procedures. Performance requirements are in the respective specs (e.g., G.992.2), and not in G.test)
- G.997.1 (ex-G.ploam) Physical layer management for Digital Subscriber Line (DSL) transceivers - this gives MIBs and management interfaces for the various xDSL interfaces

G.992.1 (ADSL) has several annexes, defining operating modes. The principle ones are:

- Annex A - Specific requirements for an ADSL system operating in the frequency band above POTS
- Annex B - Specific requirements for an ADSL system operating in the frequency band above ISDN (European)
- Annex C - Specific requirements for an ADSL system operating in the same cable as TCM-ISDN (Japanese).

G.992.2 (G.lite) also has annexes:

- Annex A - Non overlapped spectrum operation (normal mode - FDM)
- Annex B - Overlapped spectrum operation (this defines "echo-cancelled mode").
- Annex C - Operational in the same cable as TCM-ISDN (Japanese)

It is expected that Annex A will be specified by ANSI for US operation.

There is no "G.lite over ISDN" similar to Annex B of G.992.1

Key features of G.992.2 (lite) are:

- Power management (allows for an optional low-power, low-bit rate operation, as well as defines the transition into an IDLE mode (which is equivalent to the transceiver being off.)
- Fast Retrain capability (Allows for .5 to 2.2 second startups using (vendor-discretionary) line probing selection of a known stored line profile. This was originally only for recovery from phone off-hook events but now includes transition out of the various power management states.
- There are a number of technical simplifications in lite. It allows bit rates up to 1.5 Mbps downstream and 512 kbps upstream. It has no standard option for trellis coding and bit swap is optional. It uses tones up to 128 in the downstream direction (halving the bandwidth of full rate). Generally, changes relative to T1.413 issue 2 have been minimized, which is good for Falcon. There were several proposals for different operating modes and modified framing, but these were not adopted.

One key difference of the G.xDSL recommendations from T1.413 is the new G.994.1 handshake. This allows for multi-mode modems, so it should be possible to support both G.lite and G.dmt from the same (future) Falcon transceiver and negotiate which mode is used via the data exchanged in G.hs.

The work goes on. The group also agreed to start work on VDSL and HDSL2/SDSL (SDSL is Europe's name for HDSL2, which is focused more like a continuum of rate adaptation steps between ISDN and HDSL). They are called G.shdsl and G.vdsl. Also beginning are the 2nd generations of G.lite and G.dmt which are scheduled to be done in April 2000. Finally, review of the current documents for errors is beginning and will be the major subject of the next meeting which is in January.

G.993 is reserved for VDSL, and G.991.2 is expected to be used for HDSL2.

George Zimmerman
Chief Scientist
PairGain Technologies
December 4, 1998