Modeling and Simulation of an ADSL transmitter

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Preview

- ADSL and its application
- Discrete Multitone Modulation
- Architecture of an ADSL transmitter
- Blocks of an ADSL Transmitter
- Implementation plan
- References

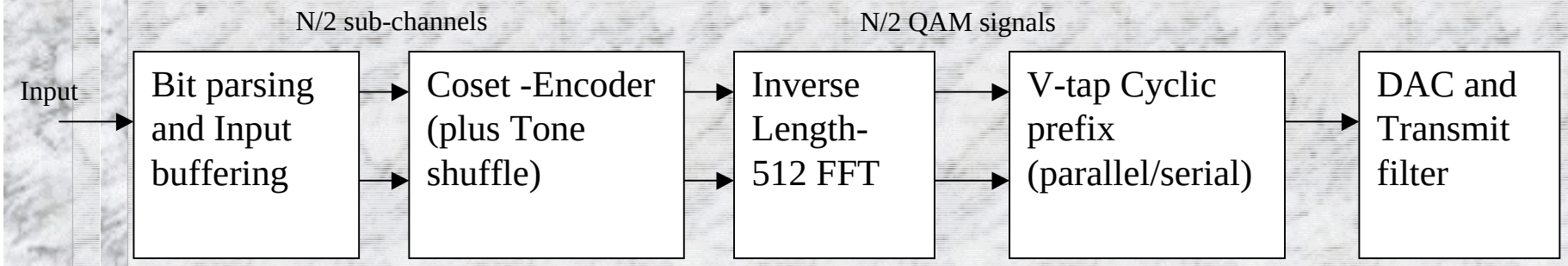
ADSL and its applications

- Asymmetric Digital Subscriber lines (ADSL) deliver high-rate digital data over existing ordinary telephone lines
- Facilitates simultaneous high-speed data transmission and normal telephone services
- Data transmission upto 6Mbps downstream and 640Kbps upstream
- Allows optimal usage of channel
- Bandwidth on demand

Discrete Multitone Modulation

- Partitions the data transmission channel into 256 (ideally) independent, (ideally)flat response sub-channels
- Set of orthogonal carriers, one for each channel
- Quadrature Amplitude Modulation in each sub-channel
- DMT implemented as 512 - IFFT(transmitter)/FFT(receiver)
- Made realizable because of efficient DSPs.

Architecture of an ADSL transmitter



Blocks of an ADSL Transmitter

- Bit rate per sub-channel decided according to the SNR of the channel
- Framing
- Scrambler and Forward error correction using Reed-Solomon coding
- Constellation Encoder and Discrete Multitone Modulation
- Cyclic prefix and Parallel/Serial converter
- Digital to Analog Converter and Line filters

Implementation plan

- G.Lite Standard
- HP EEsof as the modeling tool
- Representation of the various blocks as data-flow models
- Challenge would be to represent variable data rate input blocks of the ADSL transmitter as SDF graphs that can be optimally scheduled
- Integrated testing along with other two teams working on channel model, initialization and receiver model

References

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- 3. Jacky S. Chow etc, A Discrete Multi-tone Transceiver System for HDSL Applications. IEEE Transaction on Selected Areas in Communications, Vol. 9, No.6, August 1991
- 4. J. M. Cioffi , “A Multicarrier Primer ”, Stanford University/Amati T1E1 contribution, I1E1.4/91-157(November 1991)