ADSL Receiver

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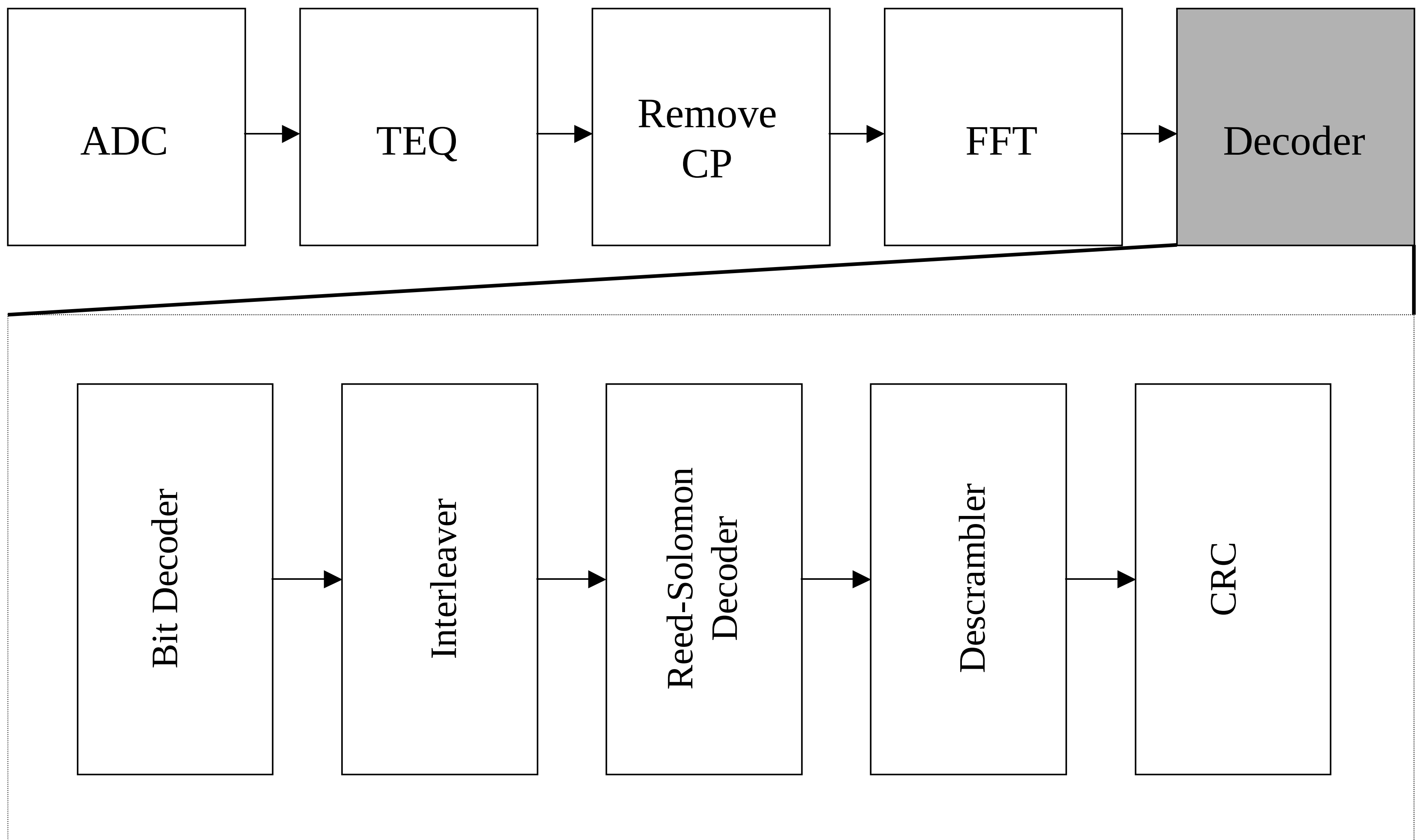
Problem Statement

- Model the receiver part of an ADSL modem as per the G.Lite standard
- Take parameters from the channel model
  - Bit loading
  - Parameters for Reed-Solomon Code
  - TEQ coefficients

Methodology

- Use SDF domain in Ptolemy
- Pass parameters from initialization as parameters of the SDF blocks
- Bitloading read from file generated during intialization
- Leverage existing SDF blocks for TEQ, FFT and Descrambler

Block Diagram



Description of Blocks

- Decoder
  - Input 256 samples (complex nos. from output of FFT)
  - Do constellation decoding.
    - This is basically a bit interleaving/reordering operation.
  - At the end of this preocess we have x_i useful bits from channel n_i (i = 1- 127, i != 64)
  - Append all bits together and interpret data as a byte stream.
  - Output bytes=(K+R/S)
- Interleaver
  - ith byte in frame is delayed by (D-1)*i bytes
  - Reduce impact of burst errors

Description of Blocks (contd.)

- Reed Solomon Decode
  - Belongs to the general class of BCH error correcting codes.
    - n has to be $2^x - 1$
  - Error correcting codes are expressed as (n,k) code
    - k - input bytes (data), n-k "parity" bytes, n codewords
  - If a Reed Solomon code exists for a (n,k) code, then it is the "optimal" code. Here optimal means maximum error correcting capability with minimum parity bytes
  - An (n,k) RS code can correct (n-k)/2 errors
  - Number of parity bytes and data bytes determined during initialization
- CRC (8-bit)
  - The CRC is able to detect all single error bursts up to the number of bits in the CRC and most random errors

Evaluation of Our Solution

- Constructed entire ADSL modem by hooking up transmitter, channel model and receiver as a single SDF
- Parameters supported:
  - R = 0,4,8,16
  - S = 1,2,4,8,16
  - D = 1,2,4,8,16
- Maximum buffer requirement on a arc - 17664

Conclusions

- **Ptolemy** based SDF model of the receiver
- Along with the channel and transmitter, complete ADSL system
- Not one integrated model
  - initialization is stand-alone