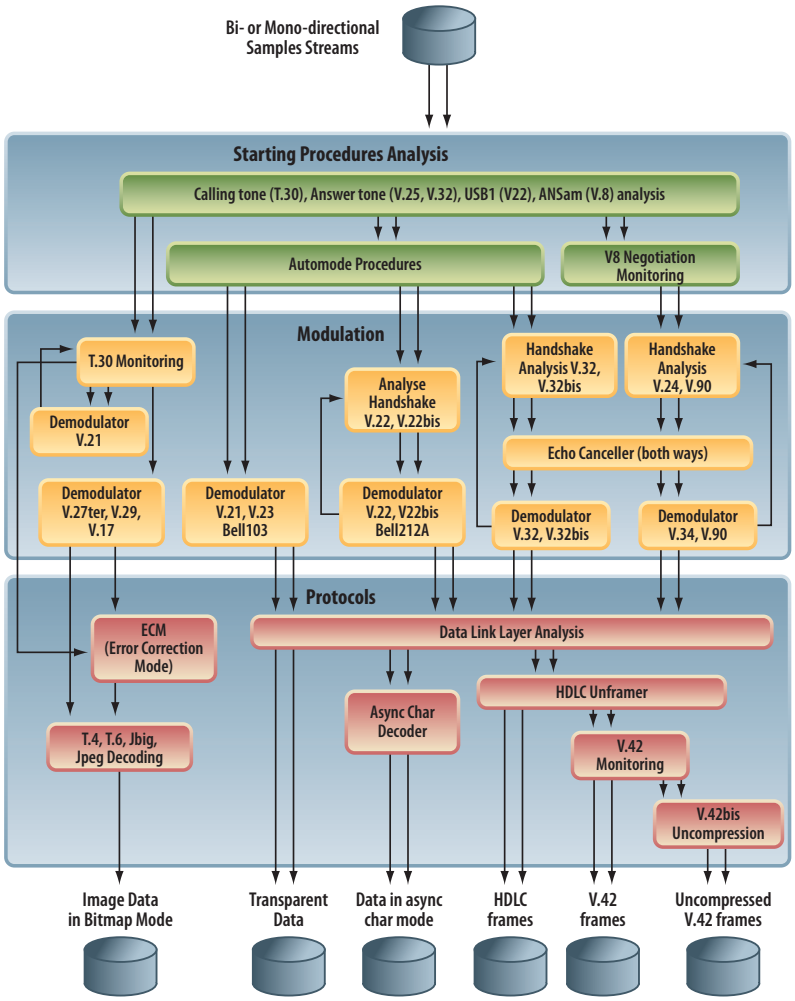
ENEA® DEMOD-BRICKS

Data and Fax demodulation for non intrusive analysis

Demod-Bricks from Enea® is a family of software components for efficient demodulation and decoding of data and group 3 fax communications. This software is written in ANSI C and implemented for fixed point operations on 64/32/16 bit CPU.

Enea® Demod-Bricks covers the following modulation packages:

- Low speed modulations (LSM): ITU-T V.21, V.23, V.22, V.22bis, Bell 103, Bell 212A
- FAX-Group 3 (Fax): ITU-T V.34 hdx, V.17, V.29, V.27ter, V.21 ch 2 for Fax group 3
- Medium speed modulations (MSM): ITU-T V.32, V.32bis
- High speed modulations (HSM): ITU-T V.8, V.34, V.90



Enea Demod-Bricks performs extraction of binary data exchanged by 2 modems (connected to PSTN through Z interface or to ISDN or T1/E1 for V.90 digital modems or any others media) during a communication, through analysis of sampled signals transmitted by both modems.

Enea Demod-Bricks is designed for off-line analysis but could also be used in on-line systems.

Features

Enea Demod-Bricks analysis software can be viewed as a data transformation engine converting two streams of samples from called and calling modems, into two streams of binary data (one only for the case of half duplex fax) as transmitted by called and calling modems, and vice versa. A data flow diagram is presented to the left.

The sampled signals to be processed are fed into the analysis software as two streams of samples, which are meant to be acquired through a 'probe' located on a digital or analog point of the PSTN circuit to be analyzed. Preferably, this probe should have access to both directions of communication. However, the analysis software can cope with some mono directional signals (including

fax and low speed data modulations up to V32bis). Sampled formats should follow G.711 (8 kHz, 8 bits per sample, A law or µ law) or 16 bits linear format. The analysis software can be executed in real-time or off-line on recorded samples streams. The start of streams should then coincide with the start of the communication so as not to miss the handshake.

Enea Demod-Bricks Software Architecture

As shown in the data flow diagram on page 1, the analysis software can be functionally divided into three main stages. The first two stages make use of signal processing algorithm, while the last one exclusively processes binary data.

The first stage (starting procedures analysis) analyzes signals exchanged at the beginning of the communication. It then allows routes the samples streams toward the relevant application – fax, or full duplex data modem. In the latter case, the software monitors for the V.8 or automode negotiation signals in order to switch between the right demodulator V.22, V.22bis, V.32, V.32bis, V.34, or V.90.

The second stage is composed of two distinct modules: fax (for demodulation of image data) and data (demodulation of full duplex signals).

Demodulation of fax pages involves T.30 monitoring (and for V.21 frames demodulation as well) to know which bit rate is employed for pages transmission. If used, Error Correction Mode (ECM) will be recognized and processed. The image data in transparent mode is then decoded T.4 or T.6 before being actually output by the software. Demodulation of full duplex signals involves handshake analysis (including the possibility of retraining or rate re-negotiation procedures), and support for echo cancellation from V.32 to V.90, in addition to the demodulator itself.

The third stage supports monitoring of the data link protocol used and the extraction of data as received by each modem. It will support the following modes of transmission:

- Transparent data
- Asynchronous characters
- HDLC frames
- V.42 frames
- V.42 frames with V.42bis data compression

In the case of an unknown data link layer protocol, the data will be extracted by the analysis software as transparent data (no other processing downstream from the demodulator).

In the case of frame extraction, the content of each frame will be time stamped in order to enable any later protocol monitoring.