

# ENEAA<sup>®</sup> SOFTMODEM-BRICKS



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## For General Switched Telephone Network (GSTN)

Enea's Softmodem-Bricks is a family of software components implementing the algorithms necessary for building modem pumps for data and Fax group 3. This software is written in portable ANSI C and implemented for fixed point, 32/16-bit CPUs. Optimized assembly code for specific critical functions is provided for following CPUs: ARM7, ARM9, MIPS32, Pentium<sup>®</sup> MMX, PowerPC, AltiVec, DSP TI C54x, and DSP TI C64x.

Enea<sup>®</sup> Softmodem-Bricks products are designed to be connected to General Switched Telephone Network (GSTN) through ISDN or PSTN interfaces.

The Enea Softmodem-Bricks products are:

- Low-speed data modulations (LSM): ITU-T V.21, V.22/V.22bis, V.23, V.23 reverse, Bell 103, Bell 202, Bell212A
- Medium-speed modulations (MSM): ITU V.32bis, V.32 modem and low speed data modulations
- High-speed modulations (HSM): ITU V.8, V.34, V.90 and medium-speed data modulations

- FAX-Group 3 low-speed (Fax): ITU V.17, V.29, V.27ter, and V.21 for fax group 3 modem
- FAX-Group 3 high-speed (Fax): ITU V.8, V.34 hdx, V.17, V.29, V.27ter, and V.21 for fax group 3 modem
- Point of Sales modulations (POS): V.22/V.22bis & V.29 fast connect mode with a very short training time
- Security Alarm Systems (SAS): Modulations compliant to CESA and SIA standards

Enea Softmodem-Bricks is designed for single client modems and single-chip modem pools for large servers.

Enea Softmodem-Bricks can be used in conjunction with Enea's modem protocols (V42-Bricks), fax group 3 protocols (FAX-Bricks), Enea's "AT" commands and PSTN signaling for designing single-chip modem solutions with class 2 group 3 fax.

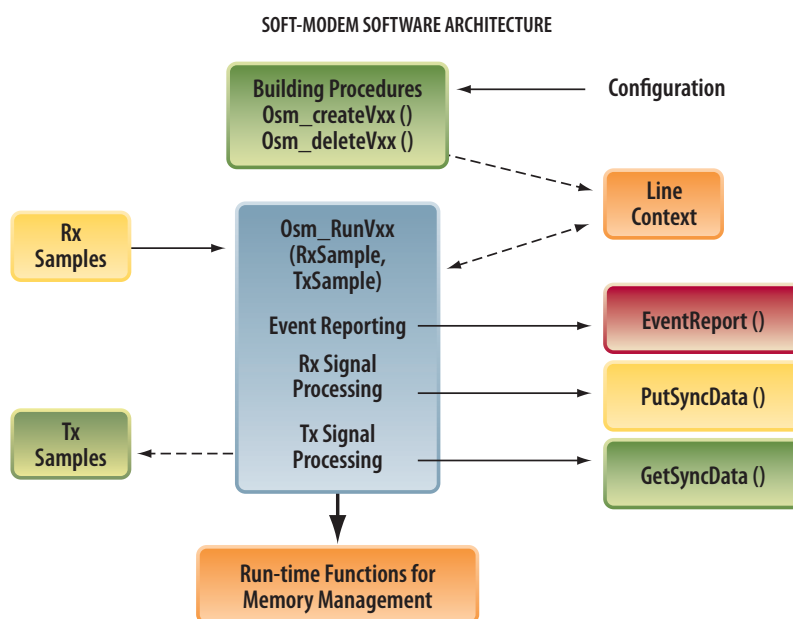
Enea Softmodem-Bricks can be used in conjunction with Enea's modem protocols (V42-Bricks) and fax protocols (FAX-Bricks) for building embedded modem and fax functions for most any equipment.

Enea Softmodem-Bricks can be used in conjunction with Enea's modem protocols (V42-Bricks) and Fax protocols (FAX-Bricks) for building embedded multi-modem and multi-fax functions inside large servers.

Enea Softmodem-Bricks is designed for the OEM and technology transfer markets.

### Features

Enea Softmodem-Bricks is a set of black box functions, which process PCM samples (8-bit A-Law/Mu-Law and 14/16-bit linear sampled at 8KHz or 7.2KHz) and data according to the



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Modem ITU standards. A simple but very comprehensive API significantly reduces the integration effort with existing applications.

Enea Softmodem-Bricks callable functions are run to completion oriented (pseudo-reentrant) and fully independent of the software architecture. Each function uses a per-channel context for running simultaneous multiple channels.

## Low Speed Modulation

- Support of the following modem modulations
  - ITU V.22 (1200bps)
  - ITU V.22bis (2400bps)
  - ITU V.23 with reverse (75/1200 bps) and (1200/75 bps)
  - Bell 212A (1200bps)
  - ITU V.21 (300bps)
  - Bell 103 (300bps)
- Training stage, full duplex
- CNG / CED generation and detection
- DTMF detection
- Support of V.42/V.42bis and MNP4/MNP5 through V42-Bricks
- Support of Modem AT commands through AT-Bricks
- Support of ISDN signaling through ISDN-Bricks
- Support of PTSN signaling through DAA
- Physical entity for support of softmodem functions

## FAX-Group 3

- Full implementation of ITU V.17 group 3 fax support of the following modem modulation
  - ITU V.17 (7200, 9600, 12000, 14400 bps)
  - ITU V.29 (7200, 9600 bps)
  - ITU V.27ter (2400, 4800 bps)
  - ITU V.21 (300 bps)

- CNG / CED (2100Hz) generation and detection
- DTMF detection
- Support of T.30 Fax protocol through FAX-Bricks (T4 multi-dimensional, ECM)
- Support of TR29 class 2 through AT-Bricks
- Support of ISDN signaling through ISDN-Bricks
- Support of PTSN signaling through DAA, black list feature
- Physical entity for support of softmodem functions

## Medium speed

- Support of the following ITU modem modulation
  - ITU V.32bis
  - ITU V.32
  - ITU V.22bis (2400bps)
  - ITU V.23 with reverse (75/1200 bps) and (1200/75 bps)
  - ITU V.22 (1200bps)
  - Bell 212A (1200bps)
  - ITU V.21 (300bps)
  - Bell 103 (300bps)
- Training stage, full duplex, echo cancellation
- CNG / CED generation and detection
- DTMF detection
- Support of V.42/V.42bis and MNP4/MNP5 through V42-Bricks
- Support of Modem AT commands through AT-Bricks
- Support of ISDN signaling through Enea ISDN-Bricks
- Support of V.120, PPP, ML PPP, AO/DI through Enea Netbricks products
- Support of PTSN signaling through DAA
- Physical entity for support of softmodem functions

## High speed

- ITU V.34/V.90 data and fax modem
- Full implementation of ITU V.17 group 3 fax support of the following modem modulation
  - V.17, V.29, V.27ter, V.21
- Support for T.30 Fax protocol through FAXBRICKS (T4 multi-dimensional, ECM)
- Support for TR29 class 2 through AT-Bricks
- Support for V.42/V.42bis and MNP4/MNP5 through V42-Bricks
- Support for V.42/V.42bis and MNP4/MNP5 through V42-Bricks
- Support for ISDN signaling through Enea ISDN-Bricks
- Support for PTSN signaling through DAA, black list feature
- Physical entity for support of softmodem functions

## Softmodem Software Architecture

The Softmodem software architecture is a library of functions.

The building of a Softmodem instance is done dynamically allowing the user to run as many instances as the CPU can support. The calling of the main function is driven by the reception of a buffer of samples coming from the line which will return back buffer samples of the same size. This call is also used as a tick for the time management.

## Memory and CPU requirements

In order to estimate the Memory and CPU requirements here after a case based on RISC 32bits ARM7TDMI platform, memory 32 bits wide, zero wait state:

CPU requirement is given as the minimum clock speed (in MHz) to run the software modem in real time, while in the worst case (in terms of bit rate and handshake phase).

## Client Modem Software Architecture

The software architecture is based on Enea's Netbricks architecture, which is similar to the ISO/CCITT X.200 model.

## MEMORY AND CPU REQUIREMENTS

Configuration	ROM size (code+constants)	RAM size	Clock speed (mhz)
V23 (tx 75/rx 1200)	23Kb	2	6
V22/V22bis	42Kb	4	6i
V32/V32bis +V22/V22bis	80Kb	7	34
Fax V21, V27ter, V29, V17	67KB	2	4 (Tx V17) 22 (Rx V17)

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All the protocol entities are managed as isolated objects communicating through a datagram message-passing schema. The message passing is based on FIFO queue communications.

The entities of the system are housed in processes (one or several entities in one process) managed by a real-time multi-tasking kernel. When the origination and destination entities are in the same process the message passing is done through an internal FIFO without need of RTOS scheduling. When the two entities are in different processes the message passing is done using RTOS message exchange management.

The code is downloaded through the serial port to EPROM Flash memories. The product management (configuration, audit, and log) is currently handled through the UART with plans to support Ethernet in the future.

The "protocol entity architecture" figure describes the different protocol stacks and the communication between the entities of the system. The following stacks, entities and components are included in the system:

- System Management (SM)
- ISDN/PSTN Signaling stack
  - ACU PSTN or ISDN signaling stack
  - DTE-INT DTE interface with "AT" command se
  - PDTE UART driver
- Optional Modem and fax
  - CF control function
  - DC V.42bis and MNP5
  - T.30 fax group 3
- FAXMOD fax modem interface
- MDL data link layer manager
- DLM V.42
- MNP4 MNP4
- MPH physical layer manager
- PH-GSTN modem driver
- Enea Softmodem-Bricks: Enea Softmodem-Bricks components

CLIENT MODEM SOFTWARE ARCHITECTURE

