



# NETBRICKS

## FAX-BRICKS

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### INTRODUCTION

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NETBRICKS *FAX-BRICKS* is a portable protocol stack implementing protocols used by Fax group 3 devices for connection to PSTN or ISDN.

*FAX-BRICKS* is fully compliant with ITU-T recommendations: T.30 with Error Correction Mode (ECM), T.4, and T.6.

*FAX-BRICKS* is designed to work with PSTN (ACU-BRICKS) and ISDN (ISDN-BRICKS) signaling provided by Netbricks and with Netbricks Modem and ISDN Terminal Adapter architecture (AT commands driven).

Netbricks provided a drivers for modem chipsets (Conexant) and a driver for supporting fax modulations: V.21, V.27ter, V.29, V.17 as well as V.34 (HDX) using SOFTMODEM-BRICKS and also Audio processing for PSTN signaling (DTMF, CNG, CED).

Netbricks provided also "Fax-toolkit" a set of functions for image conversions:

- ❑ Bitmap <-> T4 (mono and bi-dimensional)
- ❑ T4 <->T6 (MMR)
- ❑ ASCII coded text (two fonts) to T4

*FAX-BRICKS* architecture is based on NETBRICKS architecture using object oriented design and a message passing mechanism for inter-entity communication. *FAX-BRICKS* is designed to process a rough synchronous byte stream or to support HDLC controller. Interfaces to most of commercial RTOS are provided: AMX, Nucleus, OSE, Precise/MQX, PSOS+, RTC, VRTX, WxWorks,...

*FAX-BRICKS* is addressed to the OEM market. Netbricks can develop any custom product based on *FAX-BRICKS* technology according Customer's specifications.

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## FEATURES

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**FAX-BRICKS** consists of the following main software entities:

- ❑ CF: Control Function
- ❑ T30: Fax Group 3 T.30 Finite state Machine and T.4 checking
- ❑ FAXMOD: a convergence entity for mapping to the modem driver

And companion entities:

- ❑ MPH-GSTN layer 1 modem driver,
- ❑ DTE-INT DTE Interface (Serial Port) and AT commands parser,
- ❑ CC: ISDN Call Control,
- ❑ ACU: PSTN call control,
- ❑ DLM: V.42 error correction,
- ❑ MNP4: V.42 annex A error correction,
- ❑ DC: Data Compression according to V.42bis and MNP5.

**PH-GSTN** implements layer 1:

- ❑ Communication with Adjacent entities (SM, FAX-MOD)
- ❑ Driving of modulations, tones and DTMF through a modem chipset or calling SOFTMODEM-BRICKS functions,
- ❑ Frame delimitation (HDLC frame),
- ❑ HDLC bit stuffing and un-stuffing,
- ❑ CRC16 calculation and error detection,
- ❑ Alarm reporting,
- ❑ Statistics reporting,
- ❑ Provisioning and re-provisioning,
- ❑ Support of the following modem chipsets
  - ◆ Conexant (Rockwell) : RC96 DFX, RC96 EFX, RC144 EFX, RC144, RC144DPI, RC288DPI, R336DPM, RC336 DDP/DPFL, RC56 DDP/DPFL, FM336.
- ❑ Standard: V.21, V.22, V.27ter, V.29, V.17, V.34 hdx, ISO HDLC 3309

**FAXMOD** implements the following functions :

- ❑ Convergence function between T30 and PH-GSTN
- ❑ Provisioning and Re-provisioning,

**T30** implements the following functions :

- ❑ T.30 Finite State Machine (FSM),
- ❑ Error Correction Mode (ECM) Finite State Machine (FSM),
- ❑ T.4 checking,
- ❑ Page management,
- ❑ Provisioning and Re-provisioning,
- ❑ Error reporting,
- ❑ Standards: ITU-T T.30, T.4

**CF** implements the following functions:

- ❑ Internal API to the upper layers,
- ❑ Coordination between the Modem functions and the Fax functions,
- ❑ Flow control coordination,

- ❑ Provisioning and Re-provisioning,
- ❑ Error reporting,
- ❑ Standards: ITU-T V.42

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## FAX-BRICKS SOFTWARE ARCHITECTURE

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The software architecture is based on the *NETBRICKS* architecture that is close to the ISO/CCITT X.200 model.

All the protocol entities are managed as isolated objects communicating through a Datagram message passing. 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 an RTOS 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 for RTOS scheduling, when the two entities are in different processes the message passing is done using RTOS message exchange management.

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

- . System management SM.
  
- . Signaling stack :
  - . ACU : PSTN signaling  
or ISDN signaling :
  - . MPH-D physical layer management,
  - . PH-D physical HDLC D channel protocol,
  - . MDL data link layer management,
  - . DL data link protocol (LAPD)
  - . MNS network signaling management,
  - . NS network signaling protocol,
  - . CC call control protocol with extension for multiple calls management,
  
  - . DTE-INT DTE interface with "AT" command set parser.
  
- . Fax and Modem stack:
  - . PH-GSTN Physical modem protocol,
  - . FAXMOD fax modem protocol,
  - . T30 T.30 protocol with Error Correction Mode (ECM),
  - . LAPM and MNP4 Error correction protocol (V.42 and MNP4 (V.42 annex A)),
  - . CF control function,
  - . DC data compression (V.42<sup>bis</sup>, MNP5),
  - . DTE-INT DTE interface with TR29 class 2 and "AT" modem protocols.

FAX-BRICKS CLIENT SOFTWARE ARCHITECTURE

