

Dolphin EVK with LON extension

Tools provided

- Megachips BCPM suite
- EPOS XIF2C generator
- EPOS API for Cortex M0
- Easylon IP driver for ISO/IEC 14908-8

Tools needed

- STM32 C-compiler and IDE
- ST-Link USB debugger
- LON installation tool, e.g. LonMaker for Windows

Pinout 26 pin connector

#	Row-A	Row-B	Comment
1	DAC_OUT1	DAC_OUT2	analog out
2	ADC_IN6	ADC_IN7	analog in
3	GND-A	VCC-A	analog supply
4	PA0	PA1	digital
5	PA2	PA3	digital
6	PB8	PB9	digital
7	PB10	PB11	digital
8	PB12	PB13	digital
9	PB14	PB15	digital
10	GND	VCC	digital supply
11	SWDIO	SWCLK	ARM Debug
12	GND	Reset	ARM Debug
13	UART5_TX	UART5_RX	diagnostics

With the Dolphin LON EVK, a pre-development of HD-PLC LON nodes becomes easy and effective.

ISO/IEC 14908-8 defines the LON protocol using HD-PLC and makes this type of LON communication open and vendor independent.

Providing a new CPU board for the standard Dolphin EVK extends the kit for digital, analog and communication I/O. A Cortex M0 host CPU, connected to the HD-PLC CPU enables users implement their own application without interfering with the HD-PLC and LON stack, running on the HD-PLC CPU itself.

With the EPOS® LON stack, the Dolphin EVK acts as a standard LON device. It can be managed by standard LON tools as LonMaker for Windows from Echelon or any other 3rd party software.

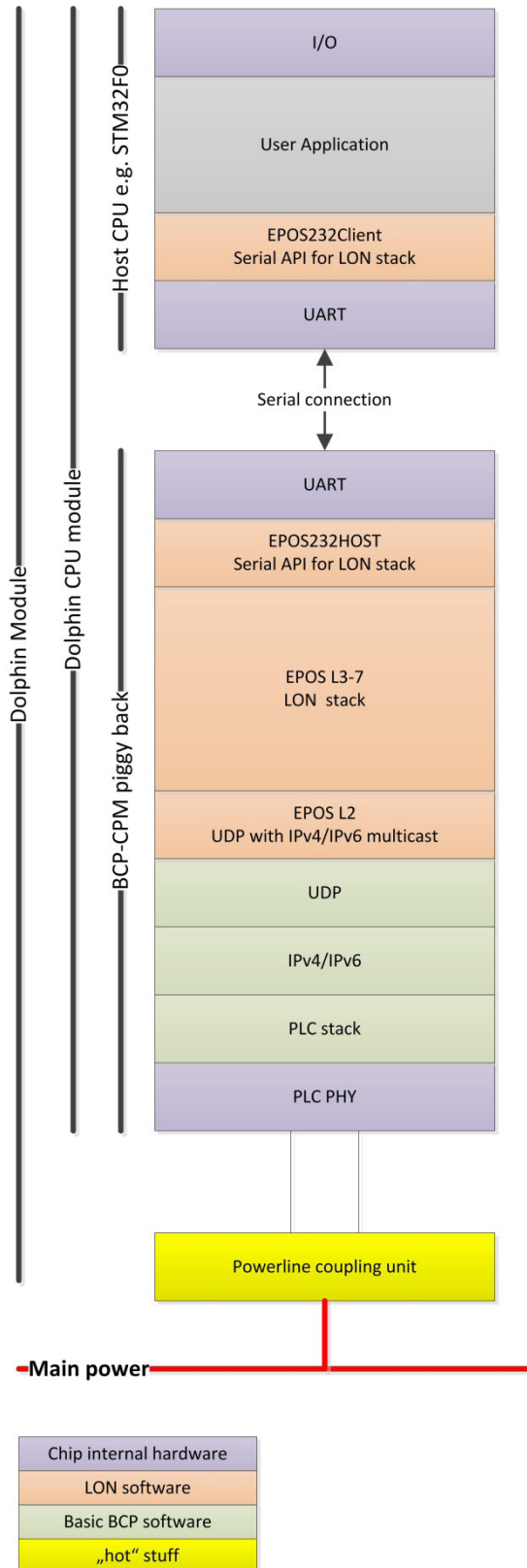
With the EPOS® XIF2C generator the LON device interface can be designed easy and a C framework for the host CPU is exported. Using the EPOS API for the host CPU the user just adds the code to operate the IO. For diagnostics a separate UART is available and a ST-Link debugger can be connected.

The EVK comes with a license for the Easylon® IP driver for ISO/IEC 14908-8, to connect a Windows PC to the Dolphin EVK, using its Ethernet port. Other HD-PLC devices, running a LON application can be accessed over HD-PLC too.

Using the Easylon® IP driver enables standard LON tools to run all operations on the application that runs on the Dolphin LON EVK.

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EPOS®: The LON protocol stack for MegaChips HD-PLC



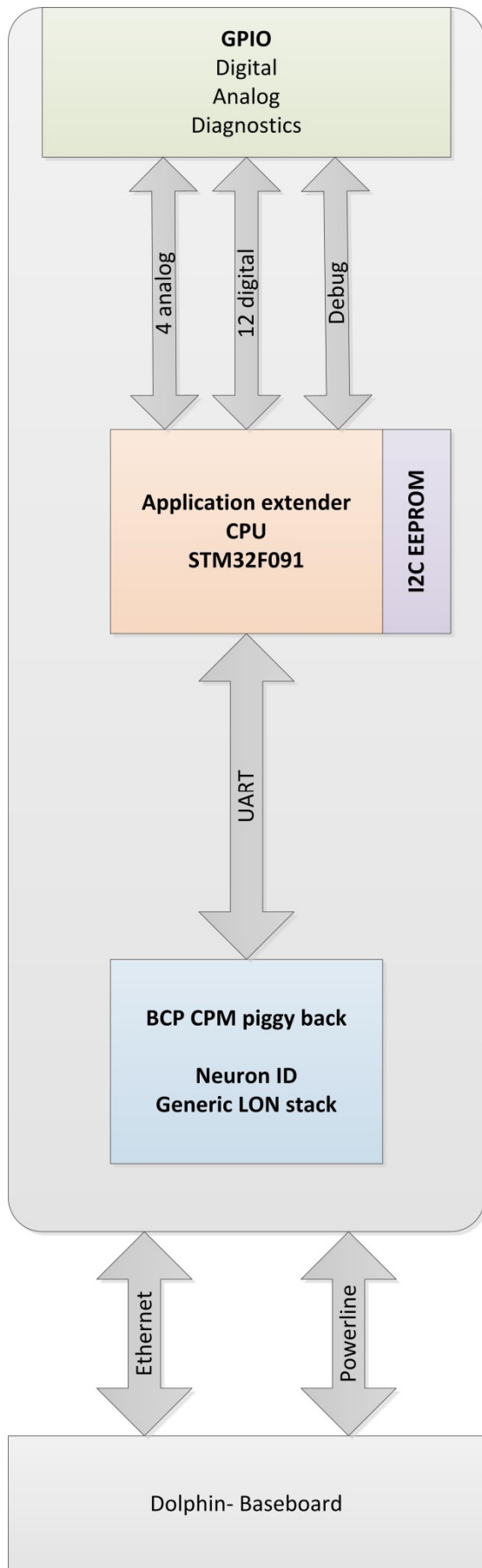
With **EPOS®** an HD-PLC CPU becomes a full featured LON device, being fully compliant with ISO/IEC 14908 international standard. **EPOS®**, the **Easylon® Protocol Stack** from Gesytec is a proven in various applications and devices since 10 years.

HD-PLC LON is using IP based communication. Using IPv4 or IPv6 multicasting, LON messages are encapsulated in UDP messages. The new ISO/IEC 14908-8 standard makes HD-PLC a standard LON physical channel like the well-known TP/FT-10 for twisted pair or the old and slow powerline PLT-10.

To simplify development and to ensure resilience of your product, the HD-PLC CPU is running a generic **EPOS®** LON stack which is remote controlled by a UART connection.

The HD-PLC CPU is accompanied by a tiny and low-cost host CPU, in this case a Cortex M0, which is running the users application and driving the I/O. This gives the users the opportunity to choose a host CPU with exactly matching I/O, memory and performance features, reflecting the need for optimum pricing.

Separating the complex LON and HD-PLC stacks from the user application environment in the host CPU and connecting both worlds using a simple UART connection protects the software running in the HD-PLC CPU from unexpected influences. On the other hand the application in the host CPU is not affected by any complex algorithms, needed for the LON or HD-PLC communication. Furthermore resource requirements for the host CPU become low, allowing to run the application in a bare metal environment.



The LON Evaluation Kit was designed to give the end user as much options as possible to test with various digital, analog and communication models.

It comes with a preloaded EPOS® LON stack on the HD-PLC CPU, additionally equipped with a unique Neuron ID. A service push button and LED are implemented. Furthermore a status LED for the application extender CPU is present.

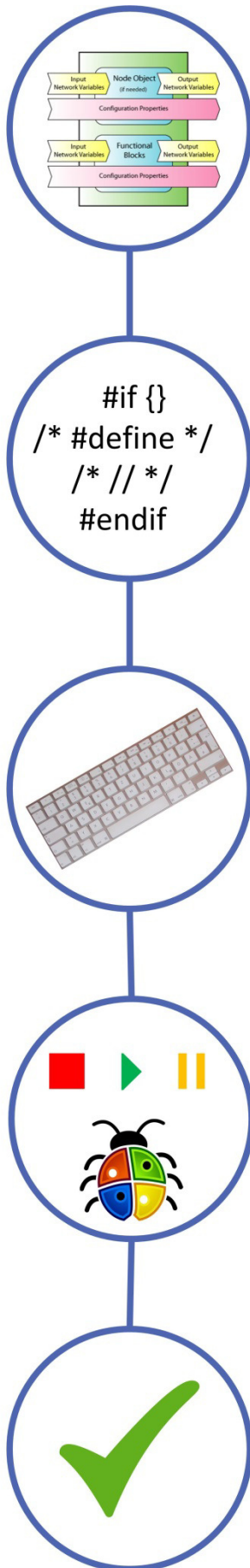
A STM32F901 CPU, running at 48 MHz, having 32 Kbyte SRAM and 256 Kbyte is used for the application extender CPU. Flexible IO is accessible on a 26 pin double row header for a ribbon cable. A break out board is provided.

STs IO mapping allows using digital inputs and outputs, alternatively serial communication protocols like UART, I2C, SPI and CAN can be defined. Two analog inputs and outputs can be used.

Diagnostic features are provided by the connection for the ST-Link debugger and with a separate UART just to use standard `printf(...)` notifications.



The Dolphin LON EVK is not designed to run in end users applications. It is for development and lab usage only. Especially take care on the high voltage connection. Don't open the Dolphin kit, when it is under operation. Please refer to the standard Dolphin EVK documentation for safety rules.



Define Device Interface

► EPOS® XIF-Generator to define

- Program ID
- Network variables
- Functional Blocks
- Self Documentation

Generate C-frame

► EPOS® XIF-Generator export to C

- Generates C framework
- Definitions for network variables and functional blocks
- Callback events

Make your application

► do the application specific stuff

- Use IDE
- Add handling I/O
- Connect I/O with network variables
- Callback events

Download and Debug

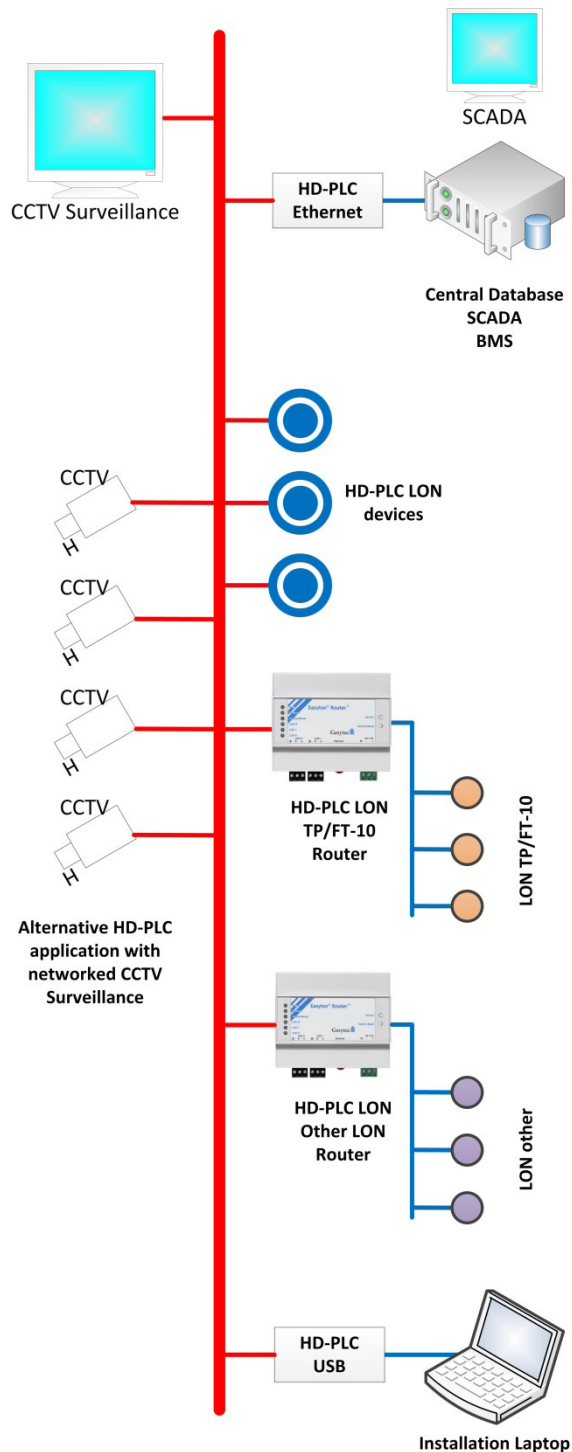
► Make it to run

- Use ST-Link debugger
- download
- fix bugs
- test

Set it free

► Make a Release

- final version
- source control
- release to production



On the right side the drawing shows a typical LON building automation scenario.

There are **HD-PLC LON nodes** directly attached to the main power line, acting as a standard LON device like any other known LON devices up to now.

Connected with a **HD-PLC/Ethernet adapter** there is a server, running the central LON network database, the LNS server. As clients for the LNS database SCADA and BMS are connected. Yet another client might be LonMaker for Windows as installation and maintenance software.

Of course existing standard LON components can be connected. Using an **Easylon® Router Plus for HD-PLC** from Gesytec allows translation from HD-PLC LON to other LonWorks channels like the twisted pair TP/FT-10 or other physical layers for LON. HD-PLC substitutes the existing LON/IP backbones, using separated Ethernet cabling by utilizing the already existing power distribution of a building. HD-PLC saves cabling cost and improves reliability of the backbone, because the backbone becomes independent of additional IT equipment as Ethernet switches.

An installation laptop can be connected with a **HD-PLC/USB adapter**. While walking around, the laptop can be easily connected to the building automation network by plugging the HD-PLC/USB adapter into any power outlet.

Further infrastructure devices of a HD-PLC adaptor are phase couplers and range extenders, being available as off the shelf devices from Gesytec and various other suppliers.

HD-PLC allows sharing the media with multiple applications.

The drawing shows on the left side a standard CCTV surveillance application with HD-PLC CCTV-IP cameras, using main power to supply the cameras and transferring the video frames over IP to a central surveillance station.