Real-Time Ethernet Solutions for Field Devices
Portable Protocol Software and FPGA-based Hardware Integration
Softing’s portable protocol stacks for PROFINET IO, EtherNet/IP, and Modbus/TCP enhance any field device with an existing Ethernet interface with Real-Time (RT) Ethernet capabilities. The extremely flexible porting layer guarantees a rapid integration of Softing’s high-performance solutions into any target device. The well-documented porting layer is developed in ANSI-C to ensure compatibility with any target hardware. From a functional point of view, the porting layer handles memory allocation, task and thread management, and access to the Ethernet peripheral. The flexible, yet high performance capabilities of the porting layer have been demonstrated with VxWorks, Linux, Windows, eCos, µC/OSII, and NetOS. A simple checklist serves as an easy tool to quickly estimate the implementation effort. The Simple-Device-Application-Interface (SDAI) is an extremely efficient protocol abstraction layer that is designed to offer a single application interface for all RT Ethernet protocols, helping to significantly speed-up device integration and time-to-market, while simplifying support and maintenance. This design approach also effectively supports conformance to communication profiles, where necessary (safety, motion, etc.).

The protocol software is complemented by an extensive user manual that includes the complete application interface documentation and step-by-step instructions on how to port the software. This manual is available on request for your convenience.

**Benefits of Our Portable Offer**

**Time-to-Market**
The use of our portable protocol software effectively reduces the development effort to the time frame allocated for the hardware design.

**Reliable**
Today, many device vendors already depend on Softing’s industry-hardened protocol stacks. At the same time, Softing is committed to continually improving its implementations.

**Economical**
Significantly reduces R&D costs in reference to protocol software development. Maintenance cost estimation is straightforward because the software license includes maintenance, updates, and upgrades.
The main advantage of FPGA technology is that it combines flexible adaptation to specific application requirements with economical considerations. At the same time, it offers protection of your intellectual property. FPGA technology enables device manufacturers to enhance existing devices with additional communication protocols. It also enables them to design new devices with a flexible communications interface based on a powerful, yet economical platform. Today, Softing offers protocol software for PROFINET IO, EtherNet/IP, and Modbus/TCP that is already optimized for various operating systems that run within Altera’s NIOS-II-Kernel.

**Design Alternative 1:**
**System-on-a-Chip – Altera Cyclone III**
Softing’s RT Ethernet protocol software integrated with the Altera Cyclone III FPGA represents the most economical solution for high volume products. This FPGA is a cost-effective, yet high performance Ethernet controller that, together with Softing’s protocol stacks, represents an ideal choice for designing a robust RT Ethernet device. In addition, Softing’s RT Ethernet stacks offer support for the integrated switch-core of the FPGA, thus eliminating the need for external switching components.

**Design Alternative 2:**
**RT Ethernet Communications Module**
Field device manufacturers take pride in designing modular products with built-in flexibility to support the multitude of communication protocols used in today’s automation systems. One key element of a product design is the availability of a cost-effective communication module. Softing’s RT Ethernet communication module is a complete board-level solution that is an excellent alternative for use in low volume products or when a device manufacturer does not have the necessary R&D bandwidth to design a demanding RT Ethernet interface. There are two benefits to this approach. The first is that the device manufacturer will have a standardized hardware and software interface that enables support for multiple RT Ethernet protocols. The second is the low cost of such a module when compared against the full development costs of a proprietary communication interface. Softing’s communication module design for field devices incorporates the advantages offered by Altera’s Cyclone III FPGA.
RT Ethernet Solutions for Field Devices
FPGA Feature Set

Key Features
- FPGA with integrated switch
- Multiple Real-Time Ethernet protocols
- Standardized application interface

Hardware

FPGA
- Altera Cyclone III
- NIOS II (50Mhz, 4 KB I-Cache, 2 KB D-Cache) for protocol or application execution
- 20,000 LE (2 NIOS II, Switch, MAC)
- License key in security-EEPROM

Communication Module (board-level solution)
- 80 x 50 mm
- 2 RJ45 Ethernet interfaces
- LED for status information
- 50-Pin connector for memory access
- 10-Pin connector for serial interface
- Interface for BDM-Debugger
- License key in security-EEPROM
- 4 MB Flash
- 16 MB SDRAM

Software

Operating System and Development Environment
- eCos or embOS
- NIOS II IDE by Altera

Protocols

PROFINET IO
- Conformance Class B
- Response time up to 1 ms
- Internal 2-port-switch

EtherNet/IP
- Compatible with Rockwell offer
- Supports up to 255 Clients
- Standard generic device support for CIP

Modbus/TCP
- Compatible with Modbus-Clients
- Supports all standard Modbus/TCP function codes
- Up-to 32 simultaneous client connections

Single application interface for all RT Ethernet protocols
RT Ethernet Solutions for Field Devices
Engineering Services by Softing

Consulting
Softing has extensive experience in developing devices for fieldbus systems on various hardware and operating system platforms. Softing’s team of consultants can provide a concept for integrating the RT Ethernet device stack and identify the necessary device requirements.

Specification
Softing can develop the product specification based on the product requirements of the device manufacturer. The product specification will define product functionality, application interfaces, hardware and software requirements, test scenarios, and other device-specific requirements.

Hardware Development
Softing can design the RT Ethernet hardware based on FPGA technology. All new designs are based on field-proven schematics. On request, Softing can carry-out the final hardware production in quantities.

Protocol Stack Porting/Implementing
Softing can port the RT Ethernet device stack to the customer-specific target hardware and operating system. Softing’s protocol software includes hardware abstraction layers to allow quick integration into the target environment.

Parameterization
Softing can develop a Device Description file (GSDML or similar) that is used to parameterize a RT Ethernet device with the according configuration tool.

System Test
Softing can commission the hardware and perform all initial testing. The next step of ensuring the interoperability of the product with all major providers of RT Ethernet components can be performed within Softing’s extensive test lab.

Certification
Softing can execute all required certification tests prior to the actual product certification. Softing will work with the appropriate certification labs to ensure the successful completion of the certification process.

OEM Products
Softing can develop and manufactures RT Ethernet products based on Softing-technology. All components of the RT Ethernet product can be placed into a customer specific/brand-labeled housing. The finished goods will be delivered to the device manufacturer for final sales.
Softing’s Comprehensive Real-Time Ethernet Offer