PROFINET controller based on FPGA technology

PROFINET controller implementation combines development expertise with the flexible possibilities of FPGA technology. Comprehensive out-of-the-box functionality is open to adaptation for specific customer applications.

THE FUNCTIONALITY OF FIELDBUSES such as PROFIBUS is defined in detail in the respective specification. In comparison, the Industrial Ethernet protocol PROFINET goes a step further by using standard Ethernet and the TCP/IP protocol as the basis.

Its implementation provides greater freedom in many aspects. If all these possibilities are used to the full, the resulting PROFINET implementation will have a high resource use. The opposite is possible as well; the definition of a device that is optimized to use minimum resources, but might fail certification.

New technology from Softing Industrial Automation creates a solution lies between these two extremes. While designed to meet the most diverse customer requirements, it still ensures great flexibility, supports individual functionality and can be implemented at affordable costs.

Optimal automation solutions

Against this background, the decision to implement a PROFINET device is not enough. There is also the question of what functionality the resulting product really needs and in which areas the implementation has to be scalable.

Softing's PROFINET implementation is based on the PROFINET protocol stack developed completely by its expertise in working with industrial communication solutions. The stack is scalable, and designed for quick portability to a wide variety of target platforms. In addition, it has already been certified in a number of devices and fulfills the requirements of the Net Load Test for Class III, which is the highest category and ensures maximum communication reliability and robustness even at very high network load.

PROFINET Device to Controller

A world leading manufacturer of handling systems was planning to implement a PROFINET Controller connection for a new control platform. For this, the manufacturer made a detailed list of all the requirements that the optimum solution was to fulfill.

The list included, for example, the support of a cycle time of 10ms for access to ten devices or the possibility to mutually monitor the PROFINET communication and the control application by using watchdogs. Comprehensive additional functionality was
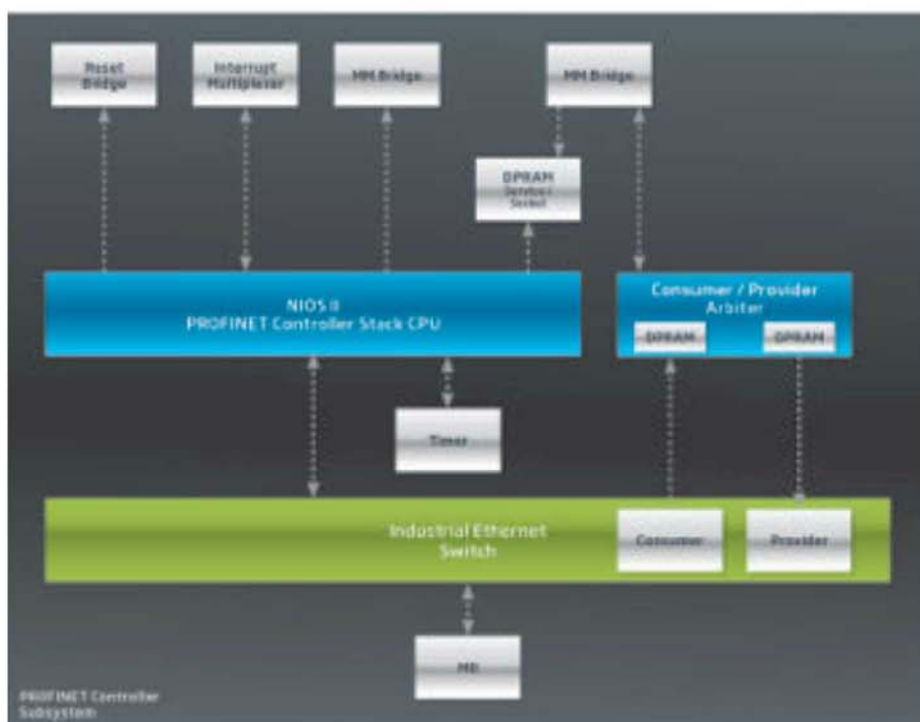
Implementation structure of the PROFINET Controller solution

also demanded, such as a transparent IT channel with up to 64 parallel connections and the support of client and server functions in the application.

After an extensive market survey, the machine manufacturer decided to use Softing's PROFINET Controller stack based on the existing Real-Time Ethernet Module hardware with an Altera Cyclone III FPGA with 40,000 logic elements, Nios II processor, 8MB flash memory and 32MB RAM. Key determining factors in the decision were the suitable size of the hardware and the fact that the integrated FPGA component of this hardware platform provided the necessary flexibility to meet all the specified requirements and to support a proprietary interface to the control.

As the solution makes use of a common code base, the PROFINET Controller could be quickly implemented based on the existing PROFINET Device implementation for the RTEM. Data is exchanged with the application over a DPRAM interface.

During development, Softing worked with the control manufacturer and provided support in resolving integration issues, such as porting

the application interface (API) to the target system, adapting the sample application or configuring the PROFINET communication.

PROFINET controller solution

The customer today has already released the PROFINET Controller functionality for production. At the same time, Softing has expanded its product portfolio with this implementation and now also offers an RTEM based integration package for PROFINET Controller functionality.

This product supports data exchange with up to 64 PROFINET field devices and achieves a cycle time of 1ms for access to twelve devices. The implemented IT channel is optionally available. In this way, device manufacturers can now also make use of out-of-the-box hardware and firmware for the integration of PROFINET Controller functionality in controls. The scalability of the solution and the flexibility of FPGAs make it possible to adapt the functionality to individual needs and requirements.

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