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## XDD editor from *port* allows users to easily generate POWERLINK device description files

Every electronic device in an automation network requires a device description file. While CANopen-based EDS files were sufficient for previous generations of POWERLINK devices, XDD (XML Device Description) has become the current standard. Conventional XML editors, however, less than ideal tools to generate these device description files. *port*, a CAN- and Ethernet-based fieldbus systems specialist, now provides a dedicated configuration tool designed for Windows and Linux operating systems which greatly facilitates the generation of XDD files.

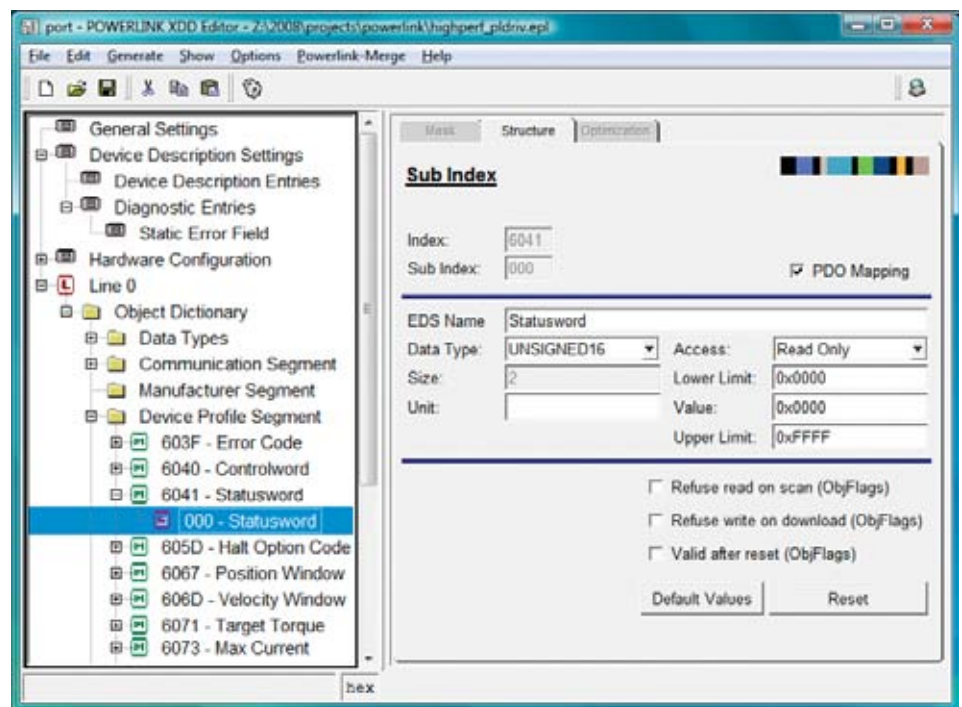


Figure: POWERLINK XDD editor

In addition to the device description file, the POWERLINK XDD editor generates a consistent HTML documentation. Import options for communication and device profiles relieve users from repetitive and error-prone tasks. The required objects can be added and parameterized with a few clicks. Easy-to-use templates prompt users for further settings, such as Device Description Entries or Diagnostic Entries. A consistency check prior to file generation ensures the validity of the data entered. Existing CANopen EDS files in the Windows INI format or XDD files in the XML format can be easily imported.

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## POWERLINK test board from STMicroelectronics with software from *port* GmbH

An evaluation system from STMicroelectronics allows users to quickly and flexibly test Controlled Nodes for POWERLINK networks and slaves for other Ethernet-based real-time networks.



Figure: STEVAL-IFW001V1 board with plugged-in FPGA extension

The system's basis is a STEVAL-IFW001V1 board. A dual Ethernet port and an integrated hub from *port* enable users to line up several boards if needed. Several slots allow for optional I/O and control card extensions. An STR912FAW44 serves as the board's MCU and operates with a POWERLINK stack supplied by *port*.

A Xilinx Spartan-3E FPGA XC3S500E extension (STEVAL-IFW001V2), which is plugged into the board, also enables users to implement and evaluate customized applications. The FPGA module connects to the base board via Medium Independent Interface (MII), External Memory Interface (EMI) or Serial Peripheral Interface (SPI). The FPGA connects and processes signals and displays status information via eight LEDs. The device address can be configured via an 8 Bit DIP switch.

A complete starter kit based on the board (including Managing Node, power supply, cables and software) is available from *port*.

For further information, please go to [www.st.com/evalboards](http://www.st.com/evalboards)

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## Fieldbus over POWERLINK

POWERLINK networks also accommodate devices and plant sections based on and confined to other fieldbus systems. Such devices can connect to a POWERLINK node via a suitable gateway that passes on the external fieldbus data during the asynchronous part of the POWERLINK cycle.

This “fieldbus over POWERLINK” approach offers users the option to integrate legacy devices into modern automation solutions. CANopen devices or networks, in particular, can be easily integrated into POWERLINK environments, since the specification of the real-time protocol defines the application layer as the carrier of CANopen mechanisms. These mechanisms include object dictionary, process data objects (PDO), service data objects (SDO) and network management (NMT) functionality. POWERLINK and CANopen object dictionaries have the same structure, which enables users to run CANopen applications and use CANopen device profiles straightaway in POWERLINK environments.

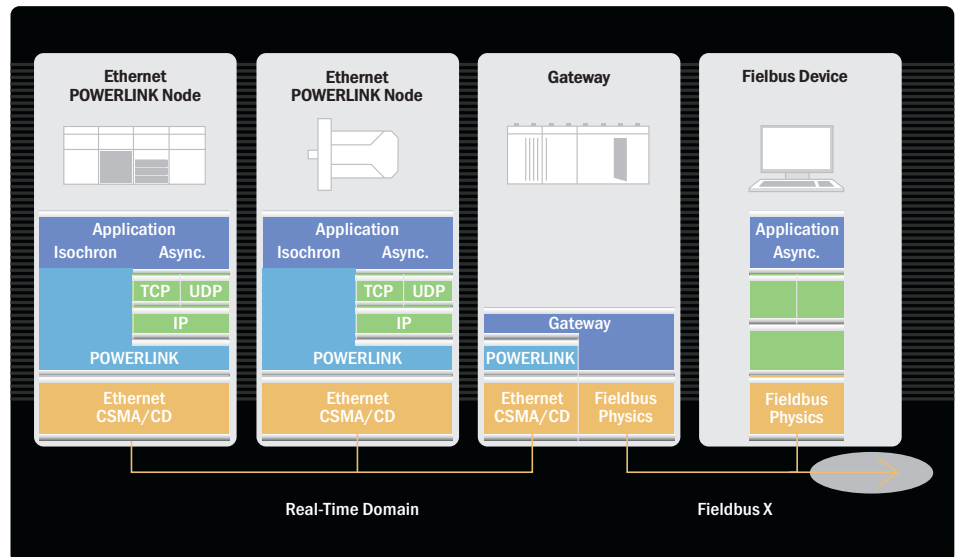


Figure: POWERLINK nodes transfer data from foreign fieldbus devices during the asynchronous part of the POWERLINK cycle

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## Application performance

### Central control? Decentral control? In control in any way.

An automation concept can follow a central or a decentral approach. The choice either way is determined by the degree to which the network needs to enable control of deterministic process timing. As demands on deterministic time behavior increase, decentral layouts are preferred over central control schemes. However, there is no clear-cut differentiation between centralized and decentral-style automation concepts: any centralization concept also includes decentral structures, and all decentral concepts also have centralized portions. The basic difference lies in the extent of the tasks the control system will assign. In a centralized installation, the controller only doles out “snippets of work” to the components involved, whereas a decentral concept will have these same components taking care of tasks as a whole. Decentralization therefore means that central controllers are relieved of some load as jobs are outsourced to and processed by locally installed, intelligent components. However, that requires different communication routes than those found in a centrally organized automation solution.

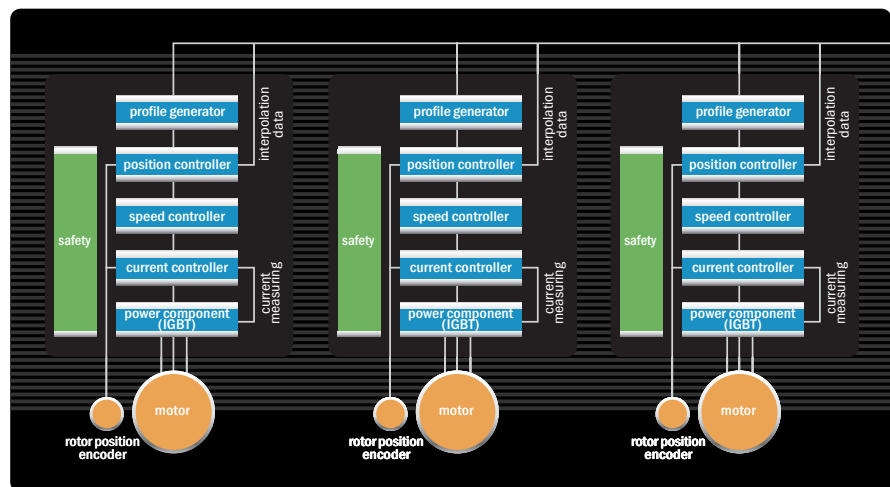


Figure 1: Diagram of a decentral automation concept: drive-integrated drive controllers

Networks in process industry applications often mainly cater to the task of registering all values reported by measuring units and sensors and to forward them to a central computer. Actuators and valves have to be addressed by the controller within hundredths of a second. While the controller unit does have to handle a lot of data traffic in this case, computing power requirements and demands on network transfer speed remain moderate nonetheless. For requirements like this, users mainly choose automation solutions with a centralized structure. In machine building applications, on the other hand, where time-critical, hard real-time drive functions – i.e. those with intervals in the microsecond range – have to be controlled and coordinated, decentral control concepts based on “distributed intelligence” lend themselves as the preferable alternative.

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*continued:***Application performance****Modular machine concepts**

Centralized structures tend to be inflexible in terms of modifications of existing units, replacements and additions, since any peripheral expansions necessitate changes to the core of the structure itself. In contrast, modular machines are designed for functional extensions through autonomous components, with no need for modifications to the machine core. Design engineers have therefore integrated drive controllers into drives. Drive controllers have to handle a whole range of tasks: a profile generator has to calculate the axis acceleration for every cycle, a rotor position controller registers and adjusts the axis position, another controller regulates the rotational frequency and therefore the speed of a movement, and a current controller determines the torque of the motion performed.

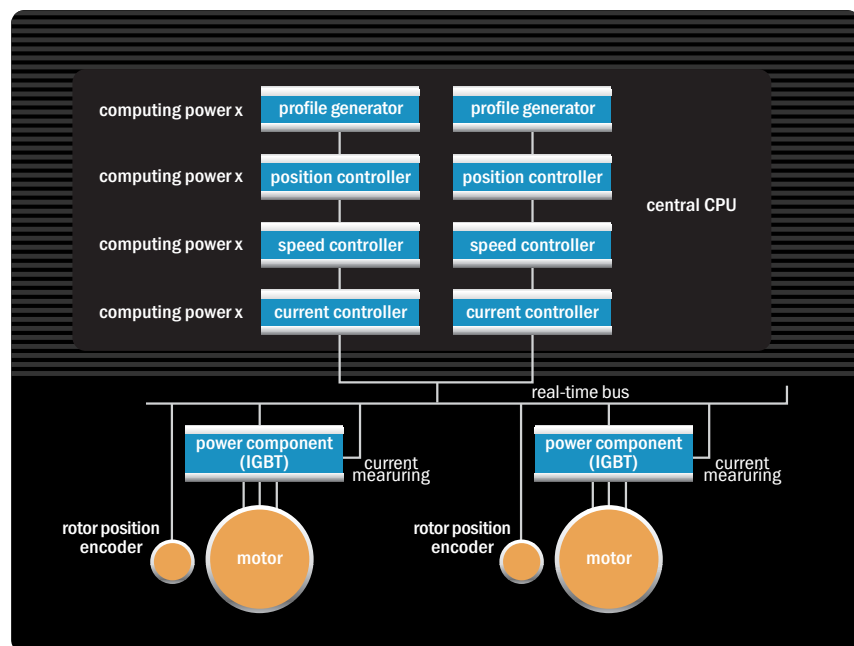


Figure 2: Diagram of a centralized automation concept: the control loop is closed via the bus

Basically, these calculations can be made in one of two places – either within the drive itself, given that it has sufficient integrated computing power, or in a central controller that takes on these tasks. Calculations on the part of a central controller obviously require great bus bandwidth, and, if several axes have to be controlled, enormous computing power in the controller. Even for a small number of axes there is a large amount of data that has to be processed, which takes its toll on speed if the controller capacity is too small. The control loop being closed via the bus in this case would make the application's functionality more likely to be compromised. While central control solutions are capable of executing speed, position

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and acceleration control tasks, current control of modern servo axes (which are clocked at 16,000 Hz) is practically impossible in an external unit. Therefore, these axes already feature an internal control unit, which benefits a decentral machine and plant layout. However, the benefits of distributed intelligence can only be applied to the handling of distributed tasks in hard real-time if the fieldbus in use provides a proper communication infrastructure to this end.

**POWERLINK – ideally suited for decentral structures**

Centralized structures require a high-speed bus, whereas decentral structures need maximum flexibility. POWERLINK provides both.

On the one hand, the real-time protocol has proven its speed in centralized structures, e.g. networks with hydraulic systems, where measured values such as pressure, position or speed are recorded by decentral components and processed by a central master (PLC). The correcting variable is then transferred to the actuators (e.g. servo valves) via the bus, and the control loop is closed via POWERLINK. On the other hand, POWERLINK has three features which make the protocol an ideal infrastructure choice for modular machines and plants: its specific way of organizing data traffic, cross-traffic capability, and the free choice of topology users have to establish networks.

Cross-traffic enables direct crosscommunications between components that bypass the Master. In synchronized production segments, for example, the rotary encoders on all drives can thus be synchronized with a master encoder in a simple way. Benefits lie in the time saved, the simplification of the system, and the reduction of control tasks, permitting a use of more economical controllers in many areas.

A free choice of topology is almost indispensable for modular system extensions. Machine upgrades, plant expansions and ongoing additions of new machinery to an installation are hardly possible at all, or only at a great expense, in systems with fixed topologies. POWERLINK, on the other hand, places no limits on system extensions with no negative effects on the network's real-time performance. Due to its great scalability POWERLINK is now widely used around the world for real-time capable, central and decentral automation in various areas. These include applications from drive synchronization to robotics, to CNC axis control, to control tasks in the world's fastest printing machine, or to process industry plants, where e.g. one major French user has connected 20,000 I/O components in a high availability POWERLINK fieldbus network.

**Masthead:**

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