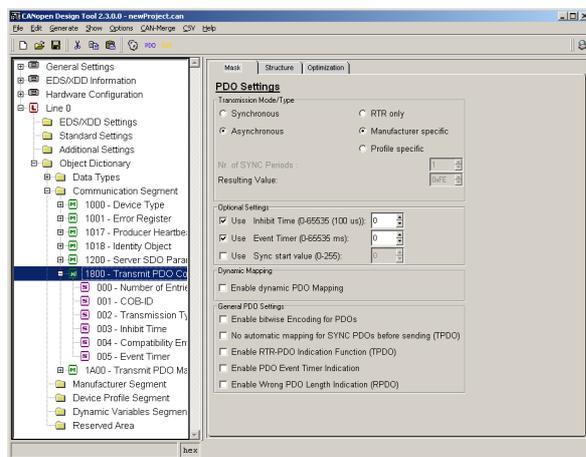# CANopen Design Tool

Overview

The *CANopen Design Tool* is a tool for rapid and cost-saving development of CANopen applications (devices). It generates an object dictionary and an initialization function in C-code, an Electronic Data Sheet and the documentation of the project automatically. Furthermore it simplifies the configuration of the *CANopen Library* and of the *CANopen Driver Packages*.

Description

With the *CANopen Design Tool* a powerful tool is available, which frees the developer from error-prone and repetitive tasks. It guarantees the consistency of the implemented functionality, device documentation and Electronic Data Sheet (EDS). By default the CANopen communication profiles CiA 301 and CiA 302 are delivered with the tool.

In addition to the CiA 301 database databases are provided for a large number of CANopen device profiles and for the CANopen communication profile CiA 304. The object dictionary produced by the *CANopen Design Tool* supports numerous options of the *CANopen Library* from **port**, e.g. several CAN lines and segmented structuring. A tree representation of all implemented parameters and data facilitates the maintenance of the device software. The *CANopen Design Tool* eases the first step into the CANopen protocol and device development is accelerated.

It is a tool with which device databases can be produced and processed. These databases contain information, which describe the interface for the CANopen network of the device. These are all parameters, control and status information that are accessible over CAN. The CANopen protocol stores these values in the so-called object dictionary of CANopen devices.

The major task of the *CANopen Design Tool* is to administer and create these data in an object database and to create code for the *CANopen Library* from it. Furthermore the *CANopen Design Tool* is used to configure the *CANopen Driver Packages*. Within one project several hardware configurations can be managed. This allows a quick change between different targets during development.

CANopen Object dictionary

The generated file, which contains the object dictionary is included into the user modules. This ensures that each user variable can be accessed directly via its variable name as well as with its index and sub index. The produced object dictionary represents the data interface between library and user application.

CANopen Library Configuration

To configure the *CANopen Library* a header file is created which contains the hardware settings and the configuration of the used CANopen services. These services are derived automatically from the object dictionary. By including this file into the project only the necessary parts of the *CANopen Library* are compiled in order to save RAM and ROM resources.

CANopen Initialization

Likewise, the generated initialization file with initialization functions for the CANopen services is included into the application, too. So the individual services defined in the object dictionary are initialized in the application.

EDS File

A fourth result of the tool is the Electronic Data Sheet. The EDS belongs to the standard documents supplied with a CANopen device. It is an ASCII text file, which contains all relevant information about the application (device). These files are used by configuration tools and control devices, in order to install CANopen devices into networks and configure them. In the future these files will be replaced by XML device descriptions according to ISO 15745. The *CANopen Design Tool* generates XML device description files already.

Device Documentation

The fifth output is a documentation of the implemented objects and of the device parameters. Each device parameter is tabular listed in html-format or as a text file. This documentation can serve as specification at the beginning of development and be brought into the user documentation, as well as into the marketing documents. Therefore writing twice is not necessary and the contents are always up to date.

Easy to Use

The objects of the application can be created by a few clicks. For the communication parameters input masks facilitate the creation of the CANopen service objects and the configuration of partially bit-coded values like e.g. PDO settings. Standardized objects based on CANopen device profiles can be added from pre-defined profile data bases. Additionally, object descriptions can be imported from external sources via CSV files.
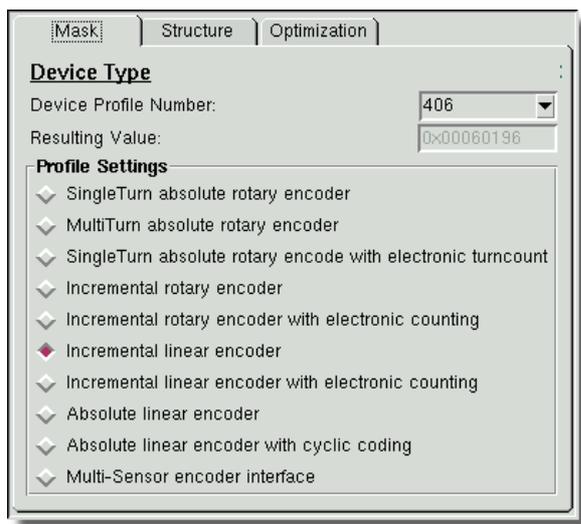
Configuration mask for the object 0x1000

Generation

After an automatic check of the data for inconsistencies, missing entries or incompatible data types the following files are created:

- the object dictionary (**objects.h**),
- the initialization file (**co_init.c**),
- the configuration file (**cal_conf.h**),
- the EDS files as EDS and XML file,
- and documentation files as HTML and text.

If the check fails, errors and warnings are written into the log file **generate.err**.

The results can be viewed with the internal file viewer with syntax highlighting.

Profile Databases

The profile databases contain the objects of the corresponding profile. Each object is configured according to the standard and is explained in detail. For every kind of object in a profile a prototype is included and this object can be cloned by copying or duplicating.
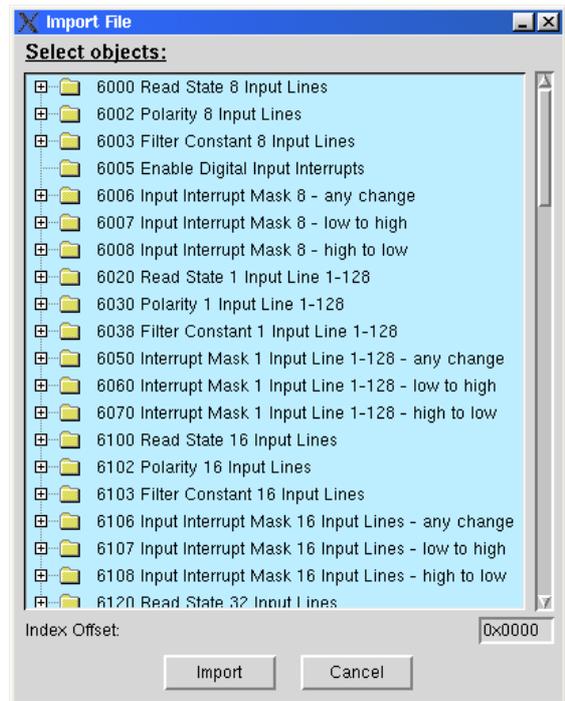
*Import mask for a profile database*

By importing these objects into the own project the development time can be reduced and the risks of a manual implementation are minimized.

The following profile databases currently available:

- CiA 304 - Framework for Safety-Relevant Communication
- CiA 401 - Device Profile for Generic I/O Devices
- CiA 402 - Device Profile for Drives and Motion Control
- CiA 404 - Device Profile for Measuring Devices and Closed- Loop Controllers
- CiA 405 - Device Profile for IEC1131-3 Programmable Devices
- CiA 406 - Device Profile for Encoders
- CiA 410 - Device Profile for Incliometer
- CiA 417 - Application Profile for Lift Control Systems
- CiA 418 - Device Profile for Battery Modules
- CiA 419 - Device Profile for Battery Charger
- CiA 443 - Device Profile for SIIS Level-2 Devices
- CiA 447 - Application Profile for Special-Purposes CAR Add-on Devices
- CiA 452 - Application Profile for PLCopen Motion Control

CAN-Merge

The optionally available CAN-Merge PlugIn is a tool to compare and to merge *CANopen Design Tool* projects. A detailed presentation of each attribute of indices and sub indices and comfortable editing facilities simplify the handling of multiple projects. The integrated diff report generator generates expressive diff reports in XML.
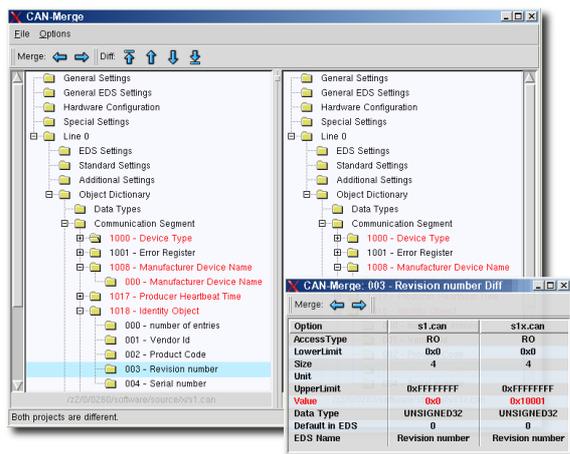
CAN-Merge shows its strength especially when dealing with large projects or with large development teams.

Advantages

- acceleration of the development by avoidance of double work
- error prevention during creation of the object dictionary and EDS
- consistent documentation and EDS file to the respective device version
- reuse of data for similar devices
- supply of data for standardized CANopen device profiles
- optimized configuration of the *CANopen Library* according to the implemented CANopen services
- optional CSV Import PlugIn available

System Environment

The *CANopen Design Tool* runs on PC's with
- Operating System: Windows™ Win7 and LINUX™
- Processor: Pentium III or later
- RAM: 256 MByte
- Harddisk Space: 20 MByte

Ordering Information

0640/05	CANopen-DT-W-Light (Light Version Windows™)
0640/06	CANopen-DT-L-Light (Light Version LINUX™)
0640/10	CANopen-DT-W (Full Version Windows™)
0640/20	CANopen-DT-L (Full Version LINUX™)
0640/11	CANopen-DT-P401 profile database for CiA 401
0640/12	CANopen-DT-P402 profile database for CiA 402
0640/13	CANopen-DT-P406 profile database for CiA 406
0640/17	CANopen-DT-P304 profile database for CiA 304
0640/21	CANopen-DT-P417 profile database for CiA 417
0640/23	CANopen DT-P404 profile database for CiA 404
0640/24	CANopen DT-P405 profile database for CiA 405
0640/26	CANopen DT-P410 profile database for CiA 410
0640/28	CANopen DT-P418 profile database for CiA 418
0640/29	CANopen DT-P419 profile database for CiA 419
0640/30	CANopen DT-P422 profile database for CiA 422
0640/31	CANopen DT-P443 profile database for CiA 443
0640/32	CANopen DT-P447 profile database for CiA 447
0640/33	CANopen DT-P452 profile database for CiA 452
0640/50	CANopen-EDS2XML-W EDS-to-XML converter Windows™
0640/51	CANopen-EDS2XML-L EDS-to-XML converter LINUX™
0640/49	CANopen-DT-CAN-Merge CAN-Merge PlugIn
0640/52	CANopen-DT-CSV CSV-Import PlugIn

Functional demo versions of the software tools are available for download on *www.port.de/shop*.

Engineering Services

port is providing engineering services and trainings for our business activities:

- CAN and CAN-based protocols: CANopen, J1939
- Industrial Ethernet Protocols: POWERLINK, Ether-Net/IP, EtherCAT PROFINET
- Implementation of devices according to CANopen device profiles
- VHDL based solutions for industrial applications
- application specific implementations or enhancements
- embedded LINUX projects

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