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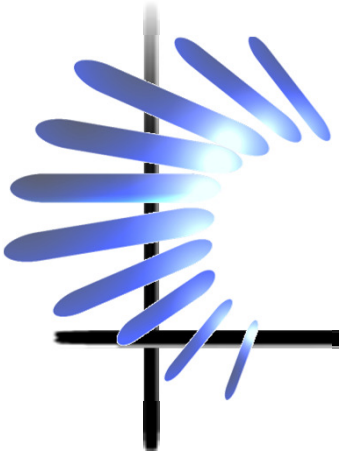

Access CANopen-Devices using the CANwizard®

Introducing the CANwizard® made by BÖHNKE + PARTNER.
A tool for analyzing and configuring of CANopen networks.

Roy Schneider
BÖHNKE + PARTNER
GmbH Steuerungssysteme

(State 07.08.2013)

www.boehnkepartner.de

CANwizard®

Basic Information

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- CANopen – the base of the CANwizard®

- Bus systems are necessary for modern industrial machines.
- Safety, real-time capability and multi-master capability are specific characteristics of the CAN-bus.
- For the CAN-bus exists different higher protocols.
  We successfully use CANopen!

CANwizard®

Basic Information

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Application

- The application profile for lifts CiA DSP-417 was developed by a group of lift component vendors.
- The CANwizard® was originally developed to provide the technicians a powerful tools.
- The components used in a CANopen lift should be accessible and configurable without special CANopen know-how.

Basic Information

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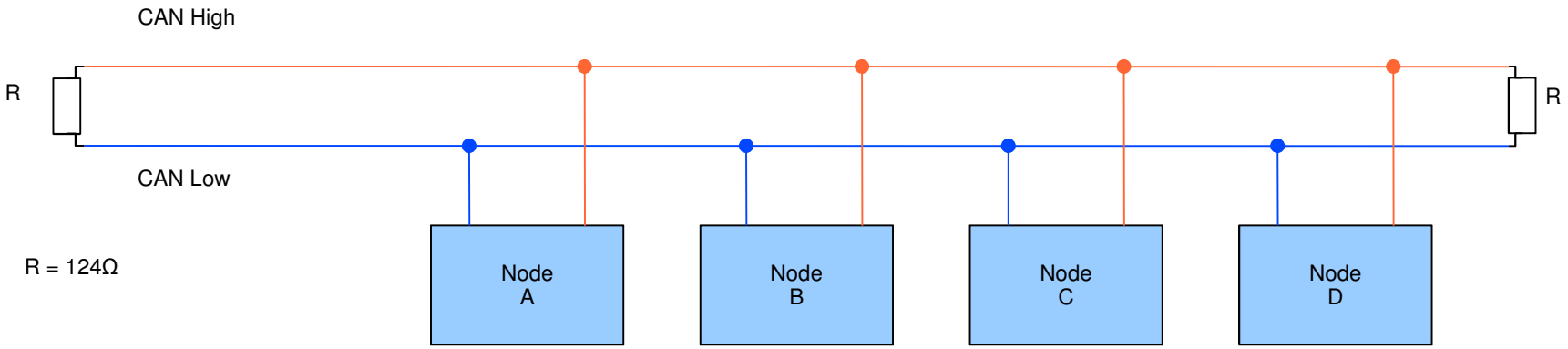
- Basics of the CAN-Bus

- Every communication bus has to be terminated.

- All nodes access the bus using simple common rules.



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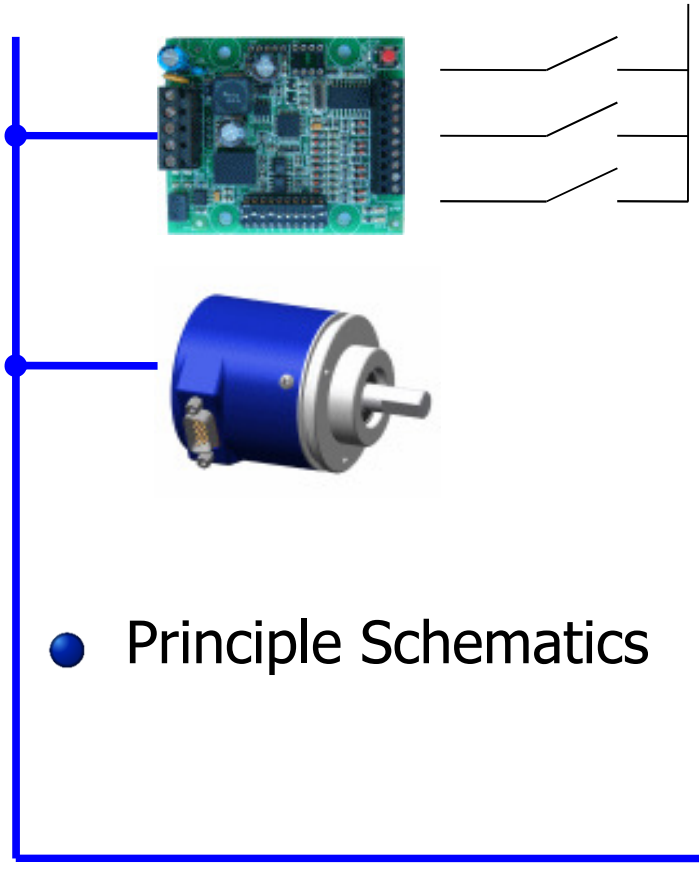
- Basics of the CAN-Bus



- Principle Schematics

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Installation Schematics

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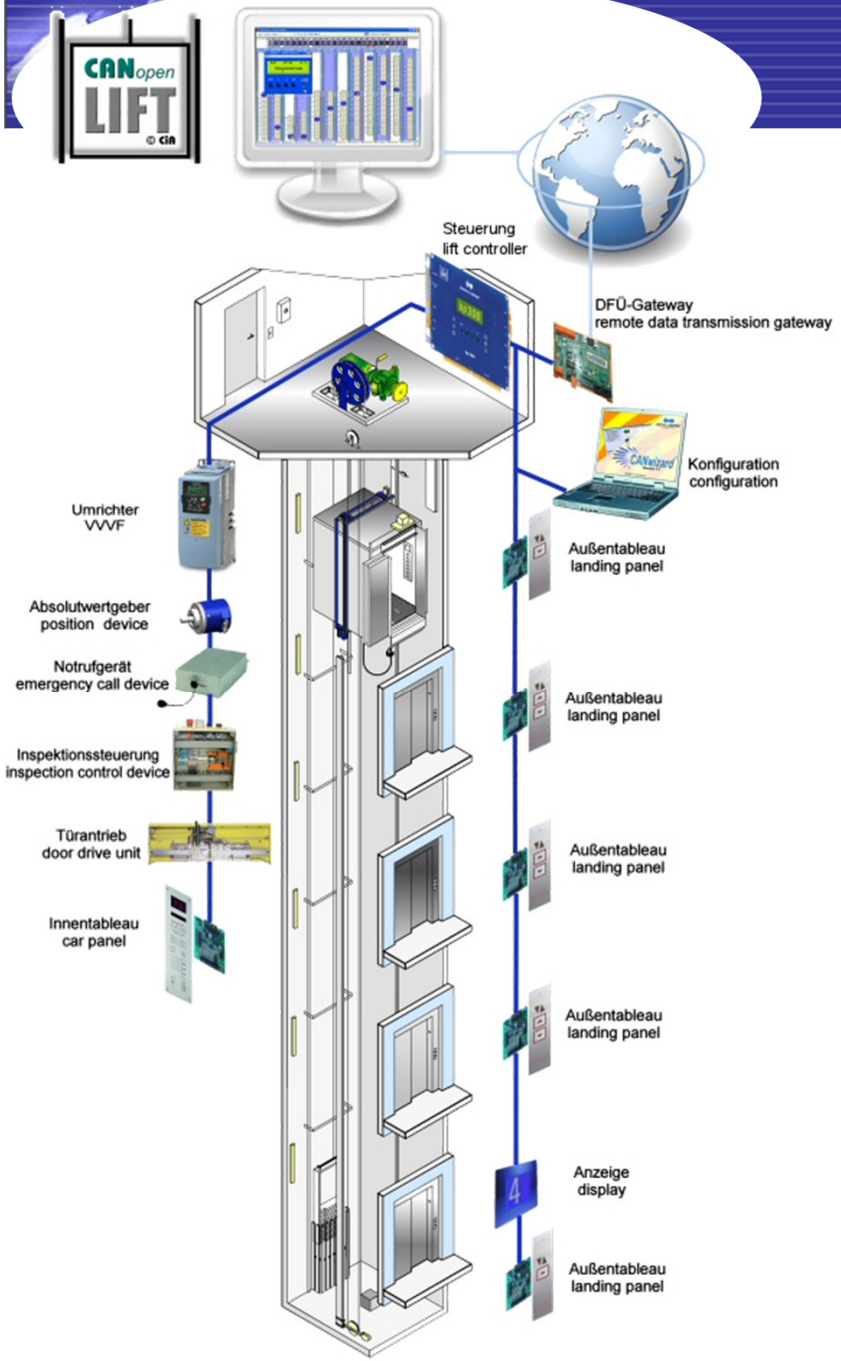
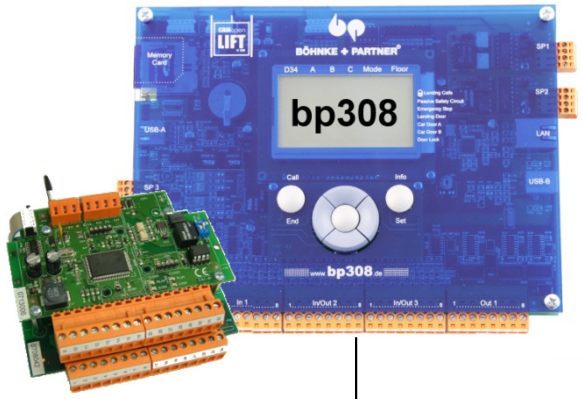
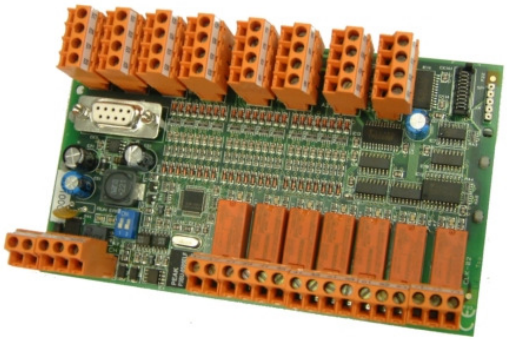


Machine Room



Car/Cabin



Shaft

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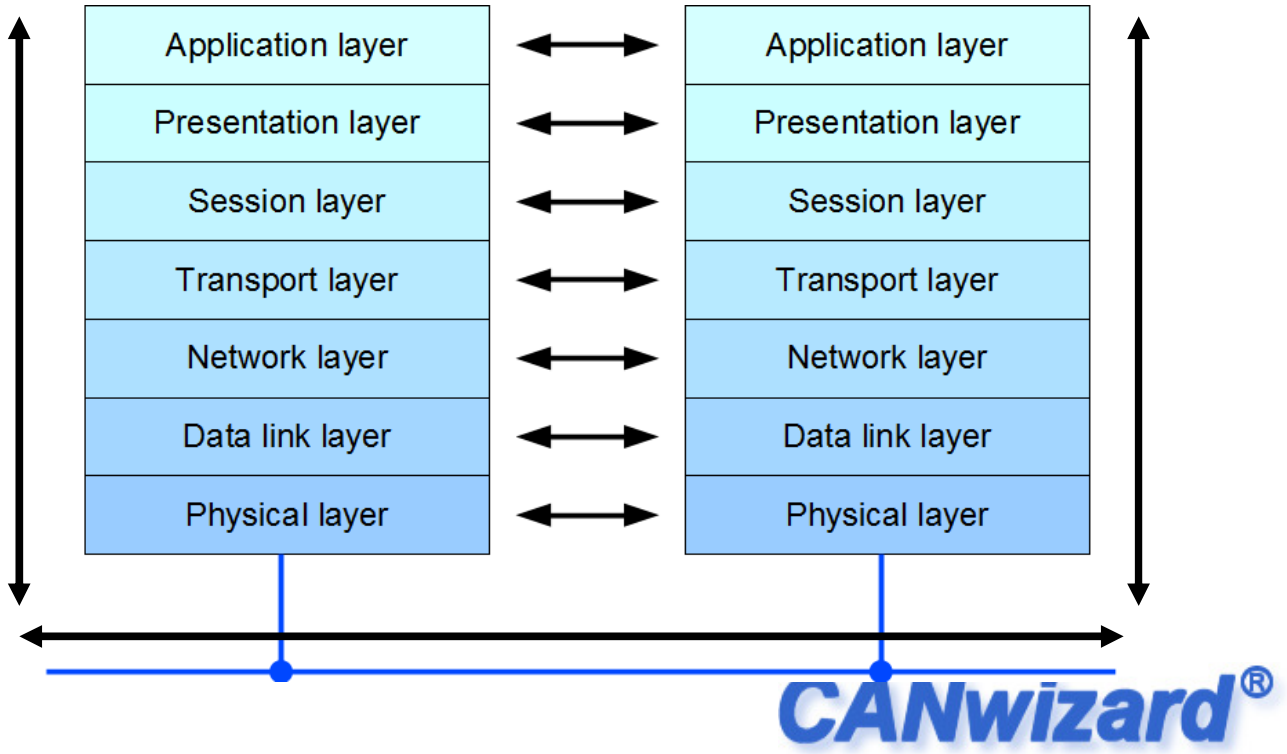
- Basics of the CAN-Bus

- The OSI model is a prescription of characterizing the functions of a communications system in terms of abstraction layers.



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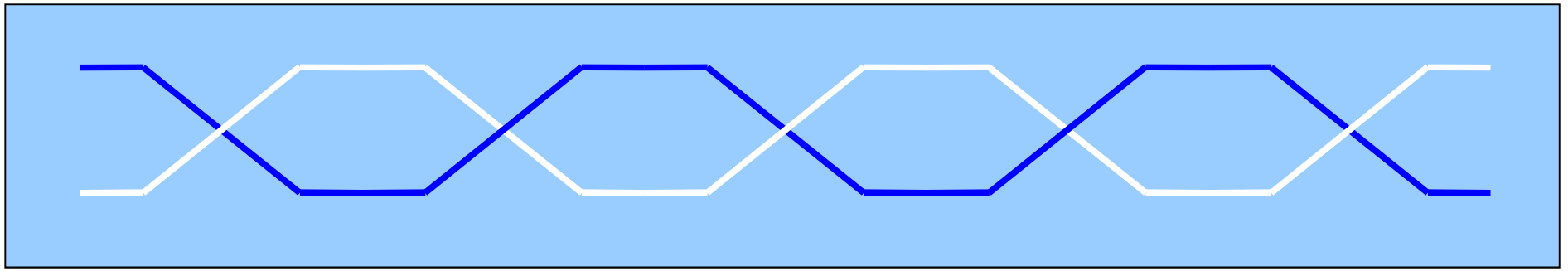
- Physical Layer

- The CAN bus uses a difference signal, i.e. the actual data signal is transferred via two lines inverted to each other.



- Using twisted pair cabling to make sure, that possible interference affect both cable in the same way. So that the difference of voltage stays the same.

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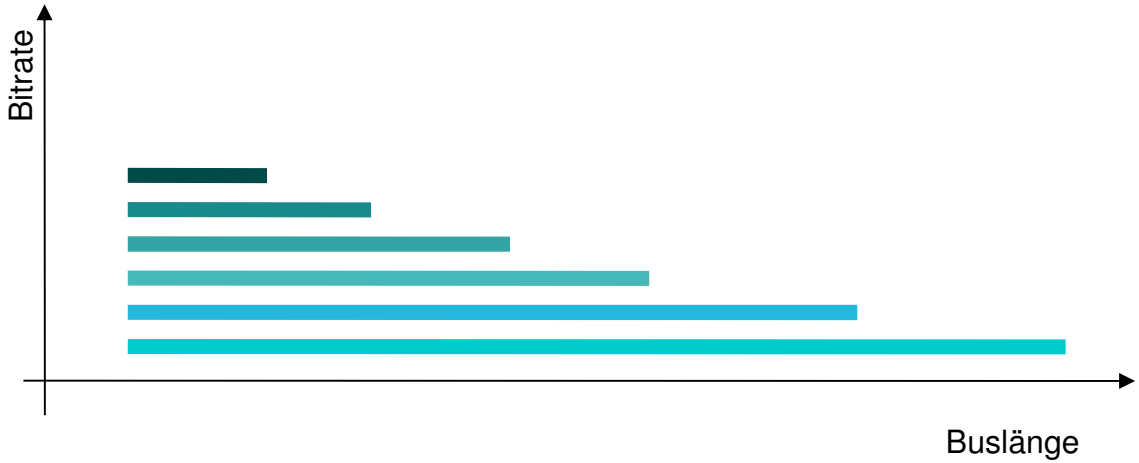
Physical Layer

- The maximum transmission speed is related to the length of the bus cable.

Bitrate [kBit/s]	Bus cable length [m]
10	6700
20	3300
50	1300
125	530
250	250 (real etwa 200m)
500	130
1000	40



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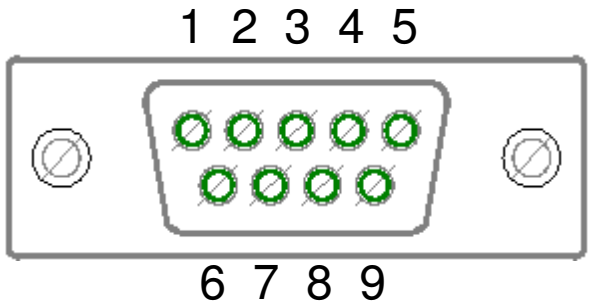
Physical Layer

- The 9-pin SUB-D connector is widely used.



Pin	Signal
1	unused
2	Bus CAN Low
3	External Power 0V
4	unused
5	Shield
6	External Power GND
7	Bus CAN High
8	unused
9	External Power +24V
Case	Shield

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Physical Layer

- The logical state 0 corresponds to the electrical state „high“ and is dominant to the logical state 1 corresponding to the electrical state „low“.

Logical Signal	CAN-High	CAN-Low
0 – dominant ΔU > 1,5V	Output is turned on and the electrical level is set to VCC.	Output is turned on and the electrical level is set to GND.
1 – recessive, high resistance, ΔU < 1V	Output disabled.	Output disabled.

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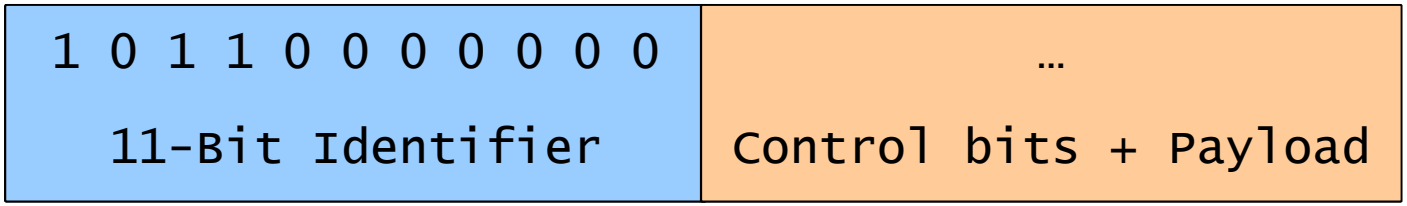
- Network layer

- Determinist rules for accessing the bus by using an identifier as prefix of every message sent.



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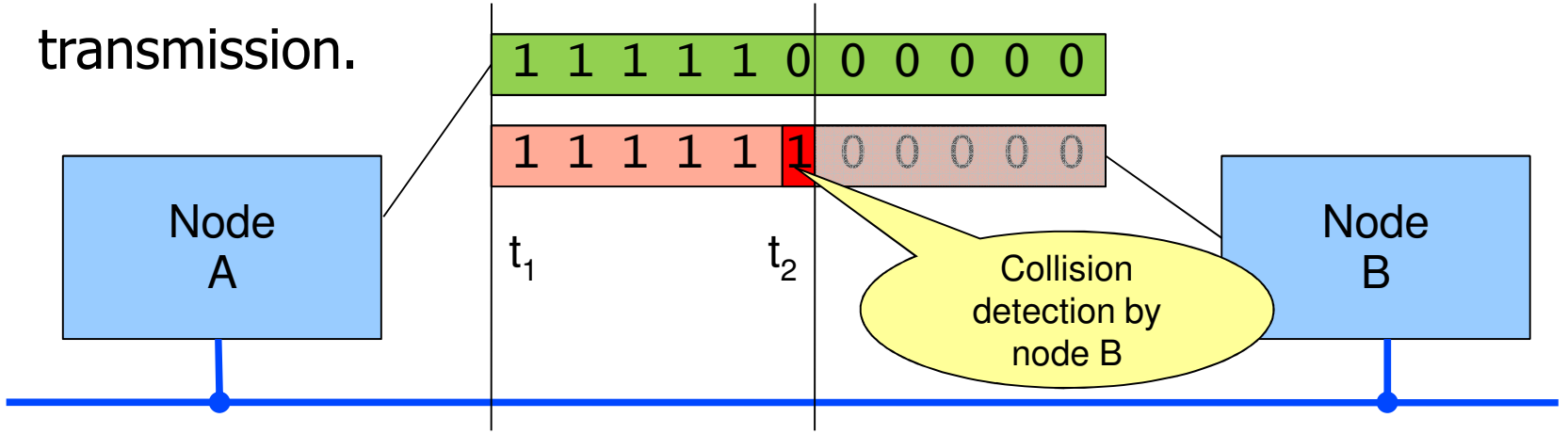
- Network layer

- The identifier containing the first trailing zero overwrites electrically the other identifier. Each identifier bit is read back (verified) after writing. Using this method the node using a lower priority identifier can detect the higher one and stops transmission.



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Basic Information

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- Upper layers

- Implementation of higher and specialized protocols, like CANopen.
- Providing services for configuring and parameterizing (SDO – „Service Data Objects“)
- Proving services for network management (NMT – „Network Management“)
- Providing services for process data objects (PDO – „Process Data Objects“)

Using the Software

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CANwizard®

- The software CANwizard® is a tool for configuring and parameterizing of CANopen-networks.
- The program contains special features regarding the application profile CiA-417 (Lift Control).
- It is a tool for the assembly fitter, the technician and the developer as well.
- Web site: http://www.canwizard.de

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Using the Software

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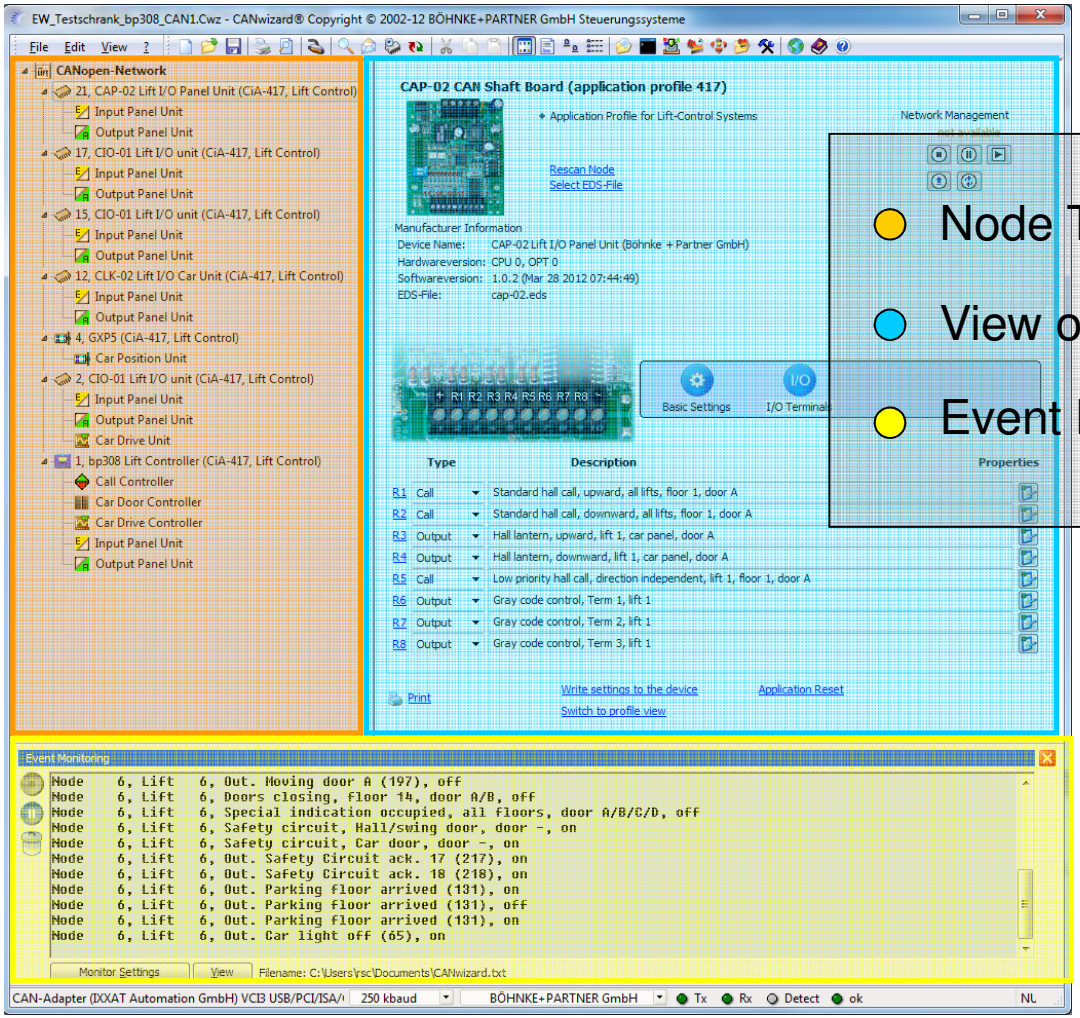

- Node Tree
- View of the node selected
- Event Monitor

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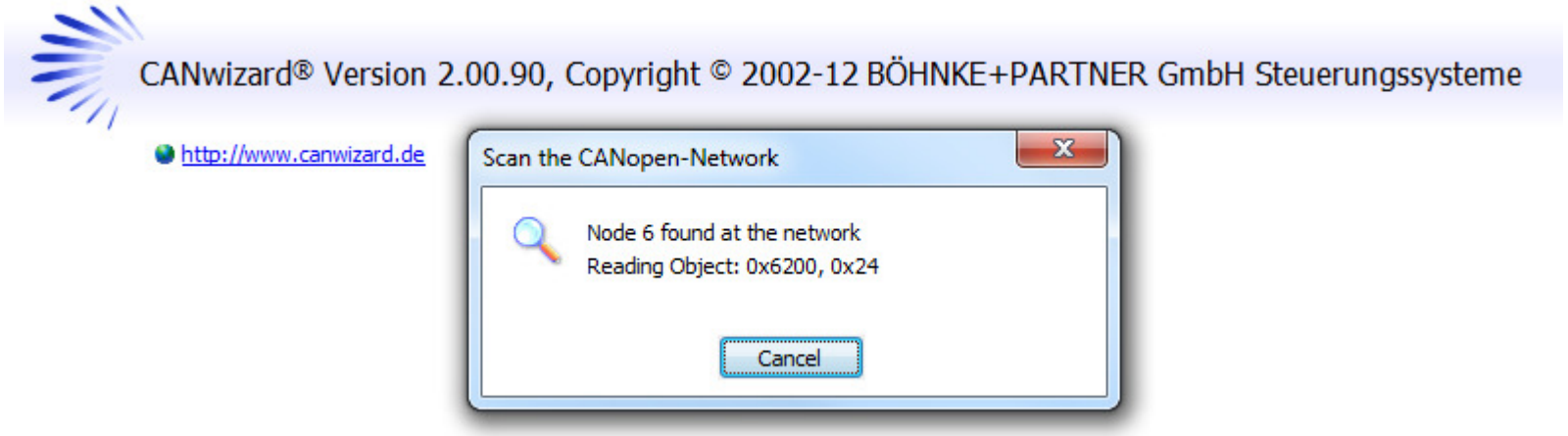
Scanning a Network - SDO

Browses the bus for installed and active CANopen nodes.



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Using the Software

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- Scanning a Network - SDO

- The objects containing the vendor id, the product code and the used device or profile number is read out of the object dictionary first.
- The program then automatically searches for the best fitting eds (Electronic Data Sheet) file that can be found at the EDS-library.
- If the correct EDS file was found, the whole object dicionary using the content of the found EDS file is read out and locally stored at the program.

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- Electronic Datasheet - EDS

- Contains all the objects and it's description, really supported by the device (mandatory and optional objects).
- Contains information about the vendor, the product, the revision and the author, including time/date of the last modification.
- Describes the data types of the objects and the minimum and maximum and default values. It also contains information about the access mode (read only, read/write or write only).

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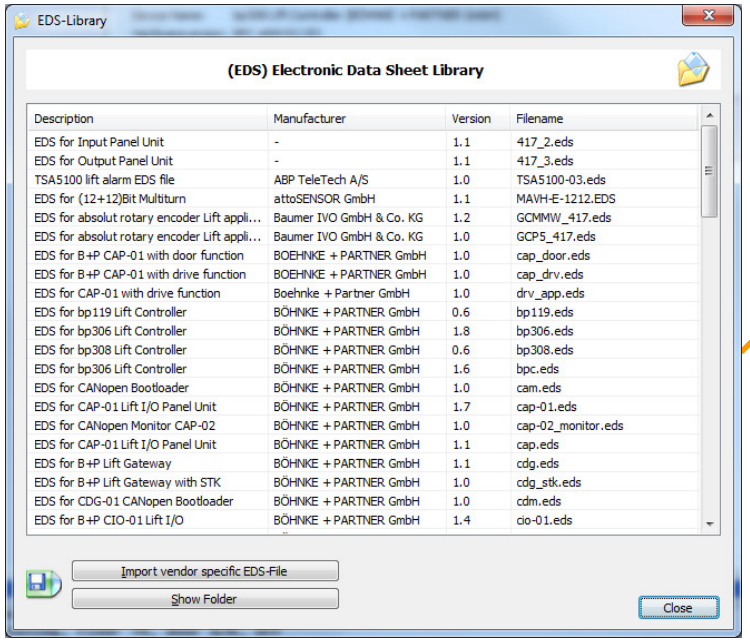
Electronic Datasheet - EDS

Shows a list of eds-files that are locally stored in the installation.




```
[1000]
ParameterName=Device type
ObjectType=0x7
DataType=0x7
AccessType=ro
DefaultValue=417
LowLimit=
HighLimit=
PDOMapping=0

[1001]
ParameterName=Error register
ObjectType=0x7
DataType=0x5
AccessType=ro
DefaultValue=
LowLimit=
HighLimit=
PDOMapping=0
```

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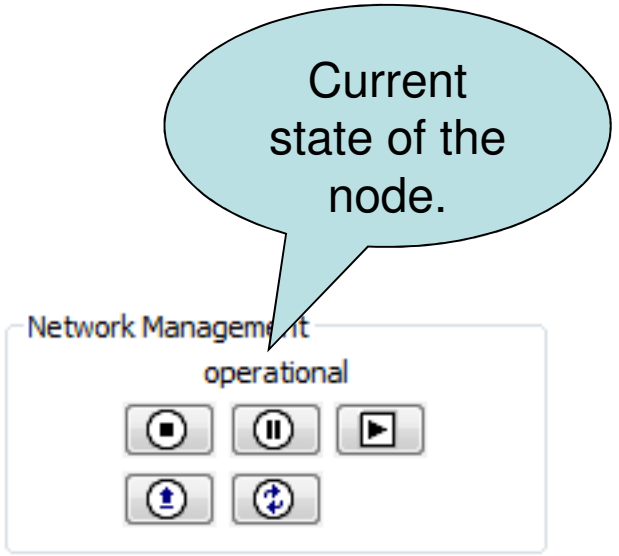
- Network Management - NMT

- Every CANopen node at the bus has it's own internal state.



CANopen State (Green LED)	Description
boot up (LED short flash)	The device starts up. No SDO or PDO communication is available.
stopped (LED is off)	No SDO or PDO communication is available. The device reacts on NMT-commands.
preoperational (LED is blinking)	The device can be accessed by SDO but will not send (produce) any PDO messages.
operational (LED constant on)	The device sends (produces) PDO data and can be accessed by SDO communication.

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- Network Management - NMT

- Every CANopen node at the bus has it‘s own error state.

CANopen Error (red LED)	Description
LED short flashing	The error counter have reached the «Warning» level. Please check bus termination!
LED is flickering	Auto baud-Mode. If this hold on, please check that the node is connected to the bus.
Constantly turned on	The node is «bus off». Please check if CAN low and CAN high is not mixed up and make sure the bus is not short-circuited.

Using the Software

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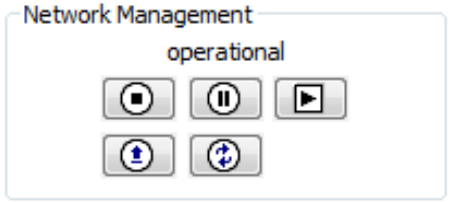
Network Management - NMT



- „Stop Remote Node" – Requests the node to enter the „stopped" state. No SDO or PDO communication is available after this.

- „Enter Preoperational" – Requests the node to enter the „preoperational" state. No more PDO's will be send.

- „Start Remote Node" – Requests the node to enter the „operational" state. The node can be accessed by SDO and is allowed to produce PDO's.

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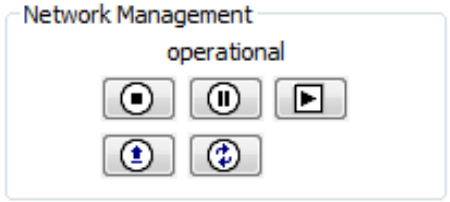
- Network Management - NMT



„Reset Node" – Triggers an application reset.

This may cause the firmware to restart as well.

„Reset Communication" – Node will reset it's communication and resets the error counters related, as well.

Using the Software

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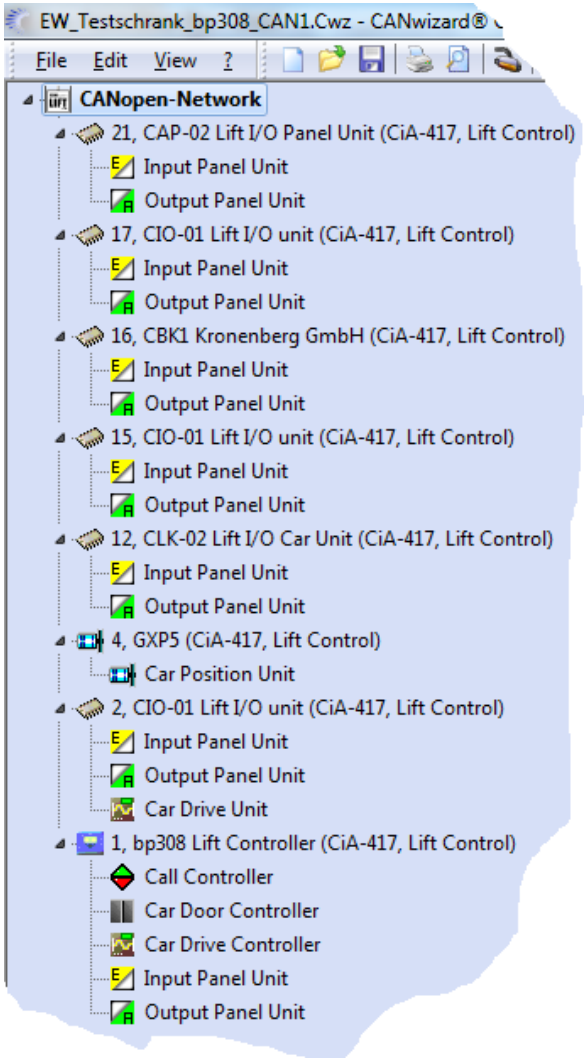
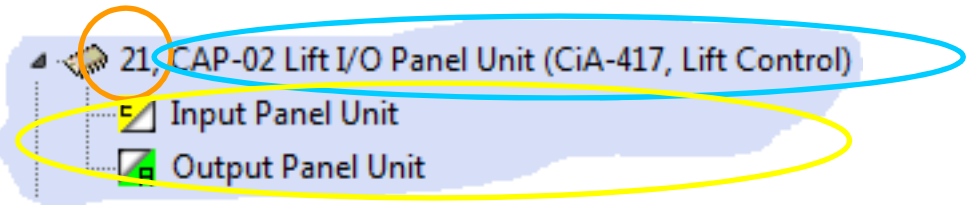
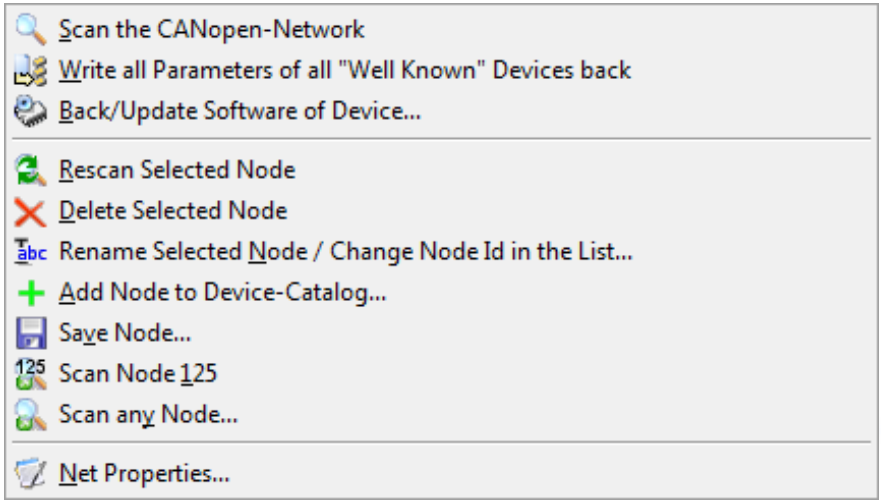
Node List





- Node Id
- Name of the node (and profile)
- Implemented virtual devices
  Role (Function), that the node implements.



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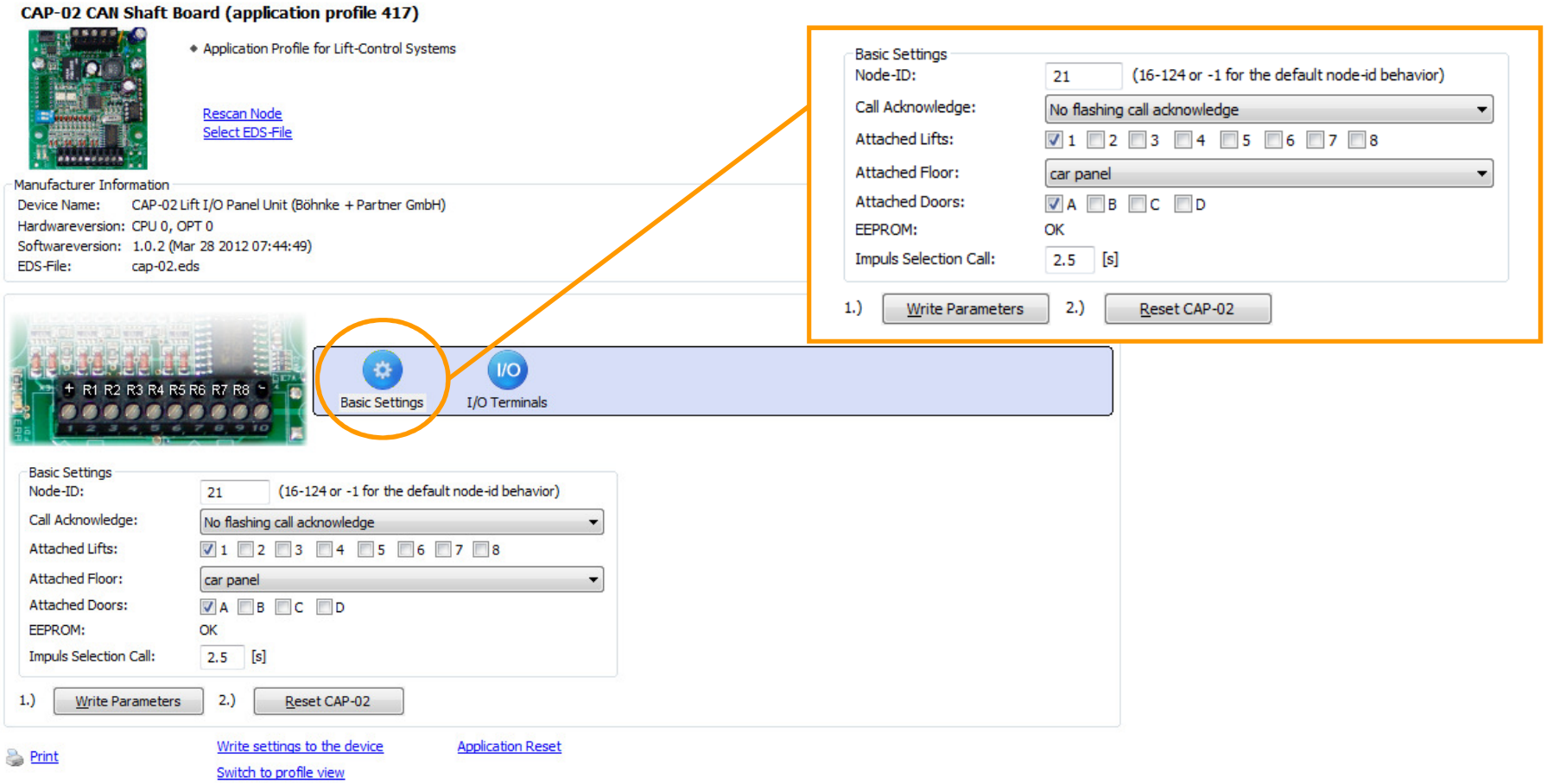
Node view (Dialog view)



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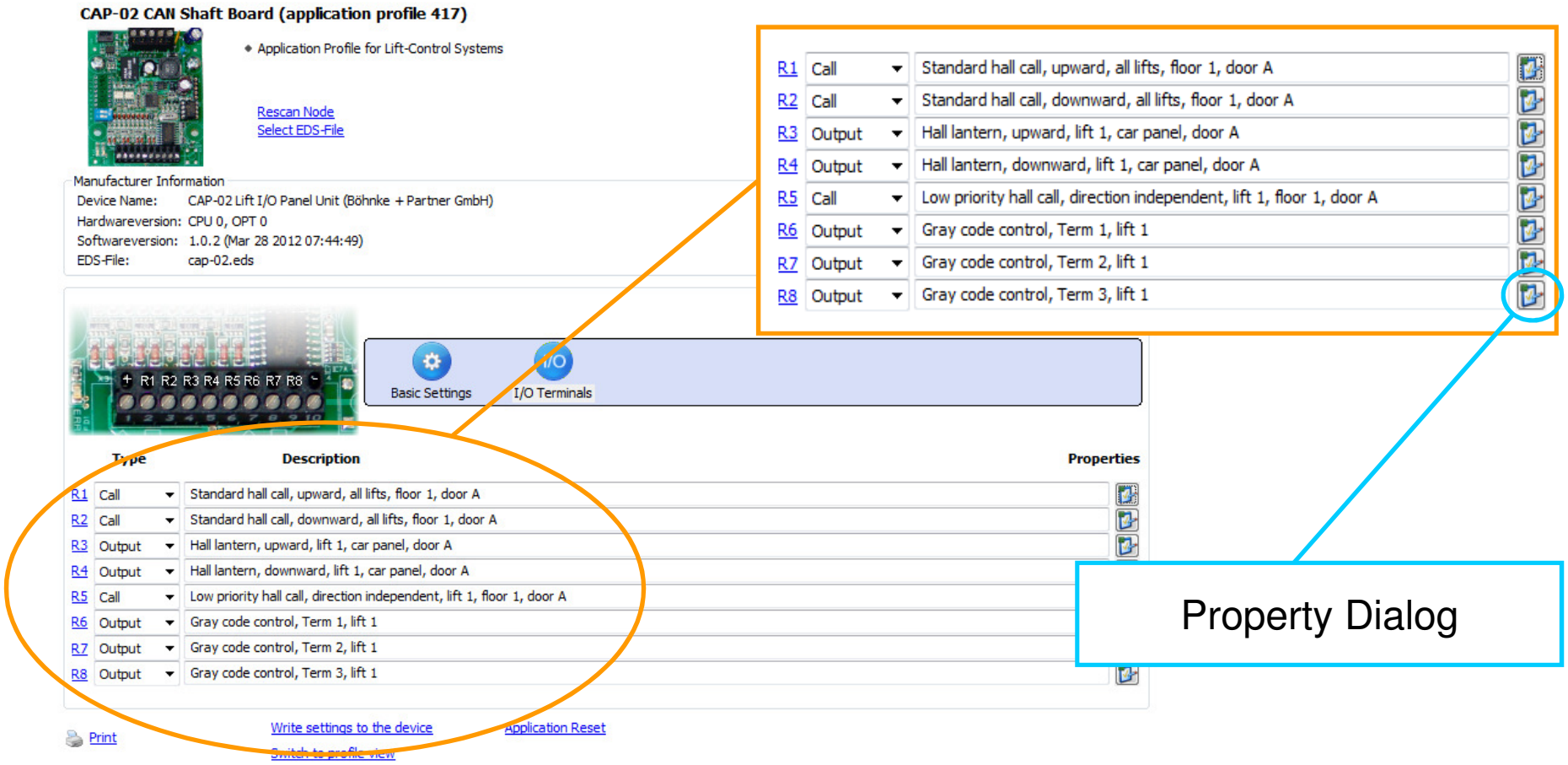
Node view (Dialog view)



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Using the Software

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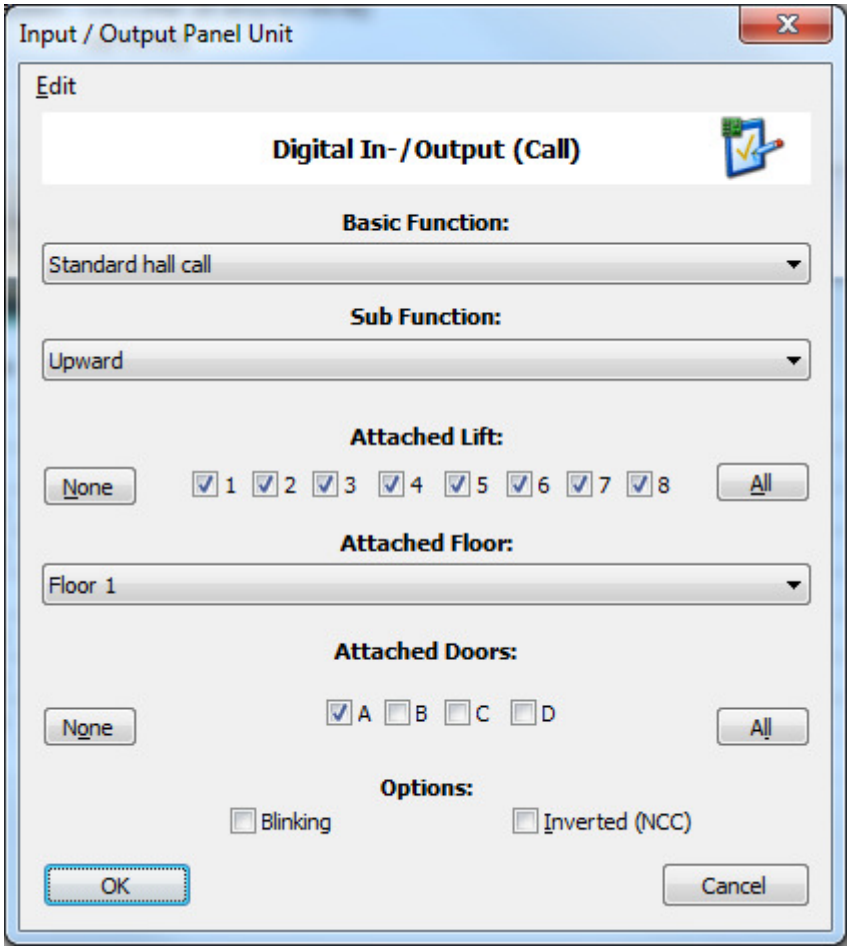
- Node view (Dialog view) – Property Dialog

- In-/Output codes are standardized
- Vendor independent.

- That is CiA-417!



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More node views (Profile View)

CAP-02 CAN Shaft Board (application profile 417)

- Application Profile for Lift-Control Systems

Rescan Node
Select EDS-File

Network Management
not available

Manufacturer Information
Device Name: CAP-02 Lift I/O Panel Unit (Böhnke + Partner GmbH)
Hardwareversion: CPU 0, OPT 0
Softwareversion: 1.0.2 (Mar 28 2012 07:44:49)
EDS-File: cap-02.eds

Mapped Virtual Devices:

Virtual Device	Number	Name
Virtual device type 1	2	Input Panel Unit
Virtual device type 2	3	Output Panel Un

Communication Profile Area

Object	Attribut	Content	Description
Device type	read only	0x000001A1	
Error register	read only	0x00	
Identity Object	**read only**	**4**	
Vendor ID	read only	0x000000F8	
Product code	read only	0x00000111	
Revision number	read only	0x00000001	
Serial number	read only	0x01133003	
Status register	read, write	0x00000002	
Device name	read only (constant)	CAP-02 Lift I/O Panel Unit	
Hardware version	read only (constant)	CPU 0, OPT 0	
Software version	read only (constant)	1.0.2 (Mar 28 2012 07:44:49)	

Identity Object	read only	4
Vendor ID	read only	0x000000F8
Product code	read only	0x00000111
Revision number	read only	0x00000001
Serial number	read only	0x01133003

Print
Write objects to the object dictionary
Store all parameters to non-volatile memory
Switch to object view
Application Reset

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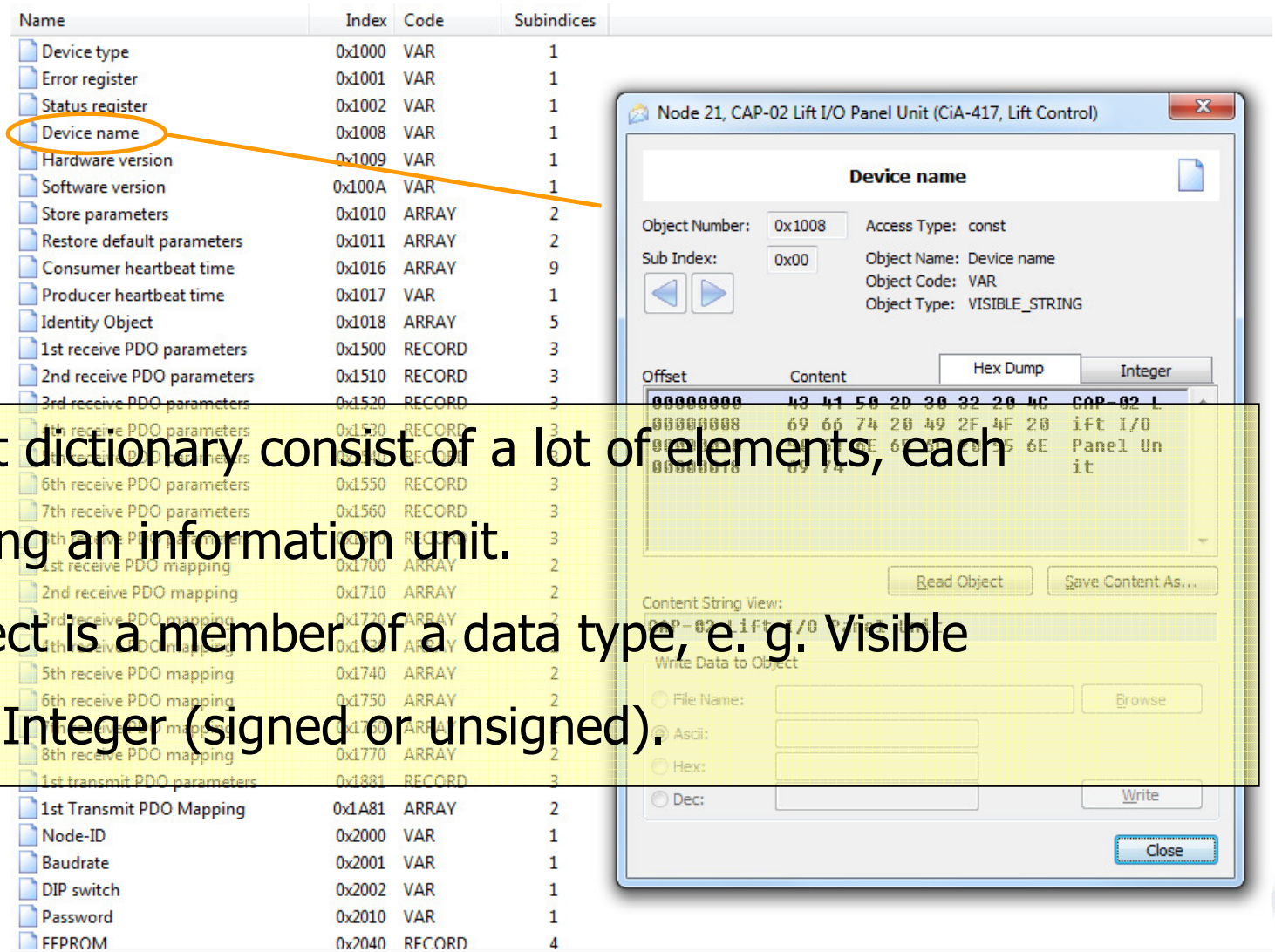
Using the Software

- More node views (Object View)

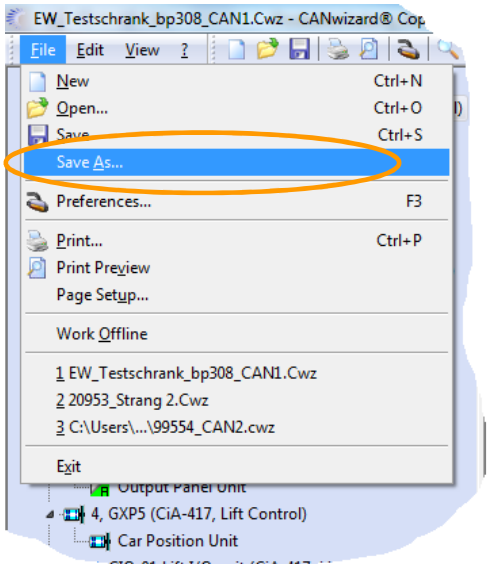


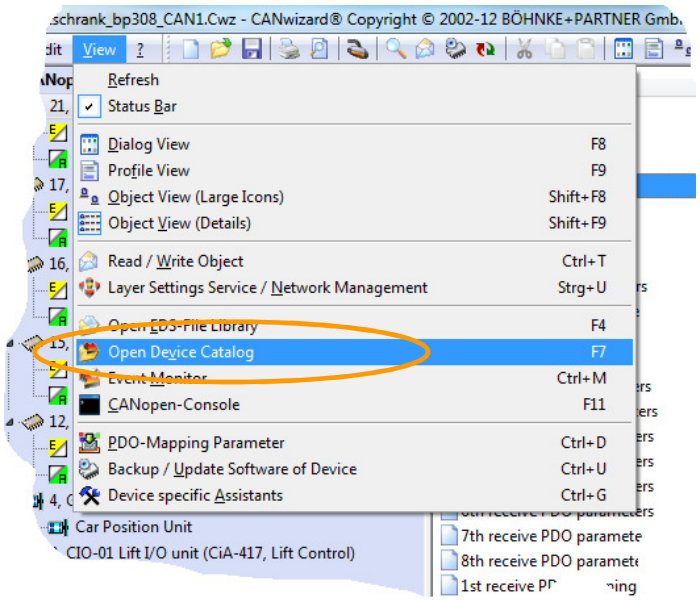
- The object dictionary consist of a lot of elements, each representing an information unit.
- Every object is a member of a data type, e. g. Visible Strings or Integer (signed or unsigned).

Using the Software

- More node views (Object View)
- The CANwizard® stores the object dictionary for each node, when creating or writing a ".cwz"-file.

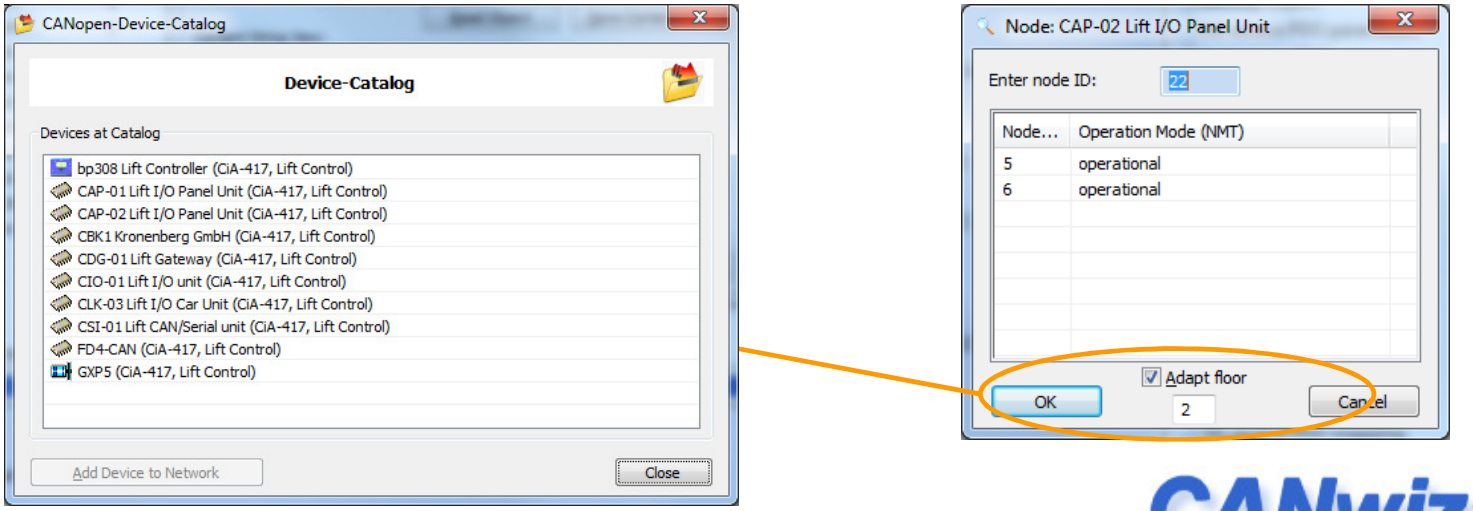
  This is the same, if a node is stored at the Device Catalog.





Using the Software

- Device Catalog
- The device catalog can be used to store „ready to use“ parameterized node templates.
- If a node is “drag’n’dropped” from the catalog to the node tree, the CANwizard® automatically adapt floor depended signals, by using the common node-id schemata.



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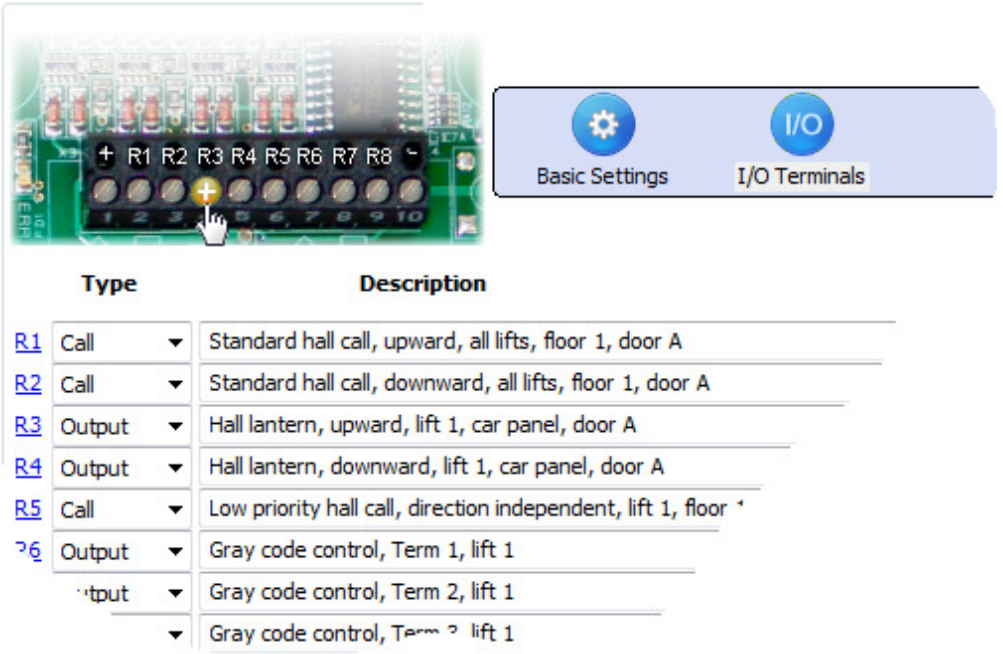
Using the Software

- Setting Inputs/Outputs manually
- For testing purposes, inputs and outputs can directly be manipulated with some mouse clicks, if supported by the node.
- This functionality can be used for testing display outputs for example.



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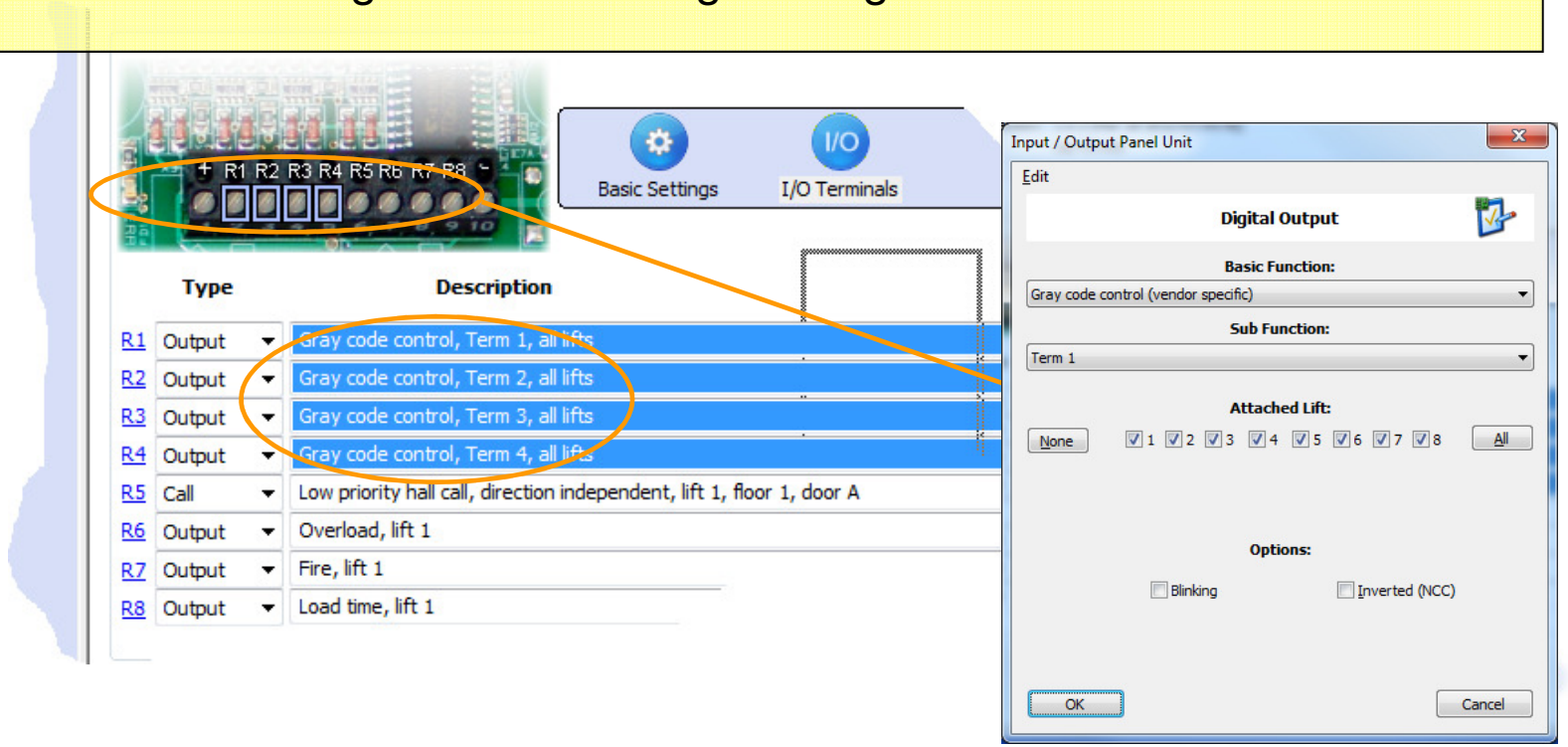
Multi-Selection of Signals

- Using mouse input one or more signals can be accessed together (multi selection). This can be done by holding down the “SHIFT” or “CTRL” key and clicking on the terminal labels, e. g. „R1“. Alternatively a “Tracker-Rectangle” can be used for selecting one or more signals together.



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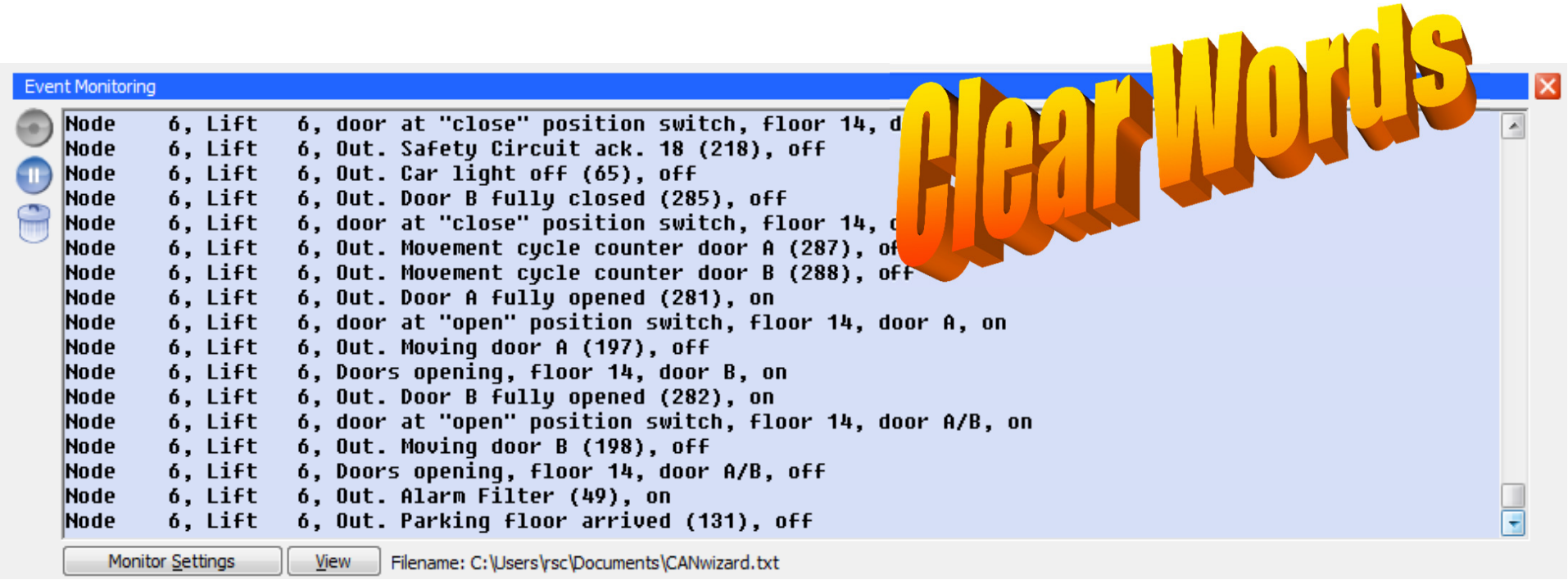
CANopen-Tool CANwizard®

- All events can be logged in clear words.
- The log-file has an time stamp for each event.



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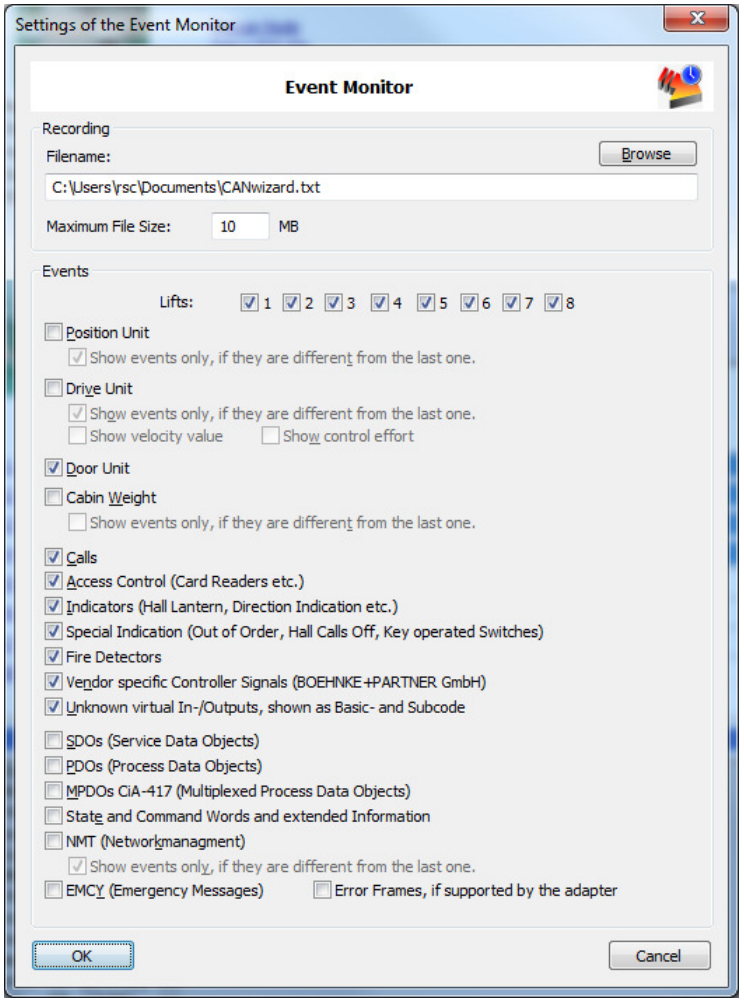
CANopen-Tool CANwizard®

- For error diagnostics, the data and the corresponding lifts can be setup, that will be logged.

Lifts: ☑ 1 ☑ 2 ☑ 3 ☑ 4 ☑ 5 ☑ 6 ☑ 7 ☑ 8

- ☑ Calls
- ☑ Access Control (Card Readers etc.)
- ☑ Indicators (Hall Lantern, Direction Indication etc.)
- ☑ Special Indication (Out of Order, Hall Calls Off, Key operated Switches)
- ☑ Fire Detectors
- ☑ Vendor specific Controller Signals (BOEHNKE+PARTNER GmbH)
- ☑ Unknown virtual In-/Outputs, shown as Basic- and Subcode



CANwizard®

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PC-CAN-Adapter

State of the technology

Windows® Vista®
Seven® kompatibel

z. B. IXXAT, PEAK, SYSTec, Vector

CANwizard®

Additional requests/suggestions

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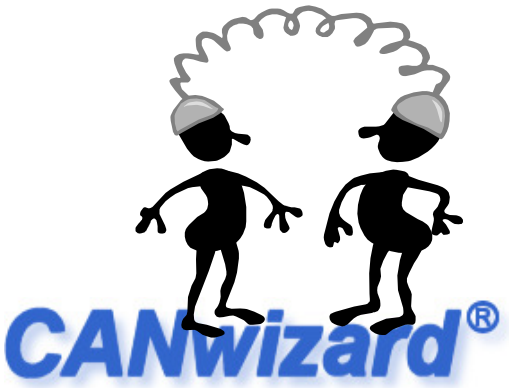
- It would be nice, if...
- It is absolutely necessary, that ...
- Please consider, this ...



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Thank you for listening.