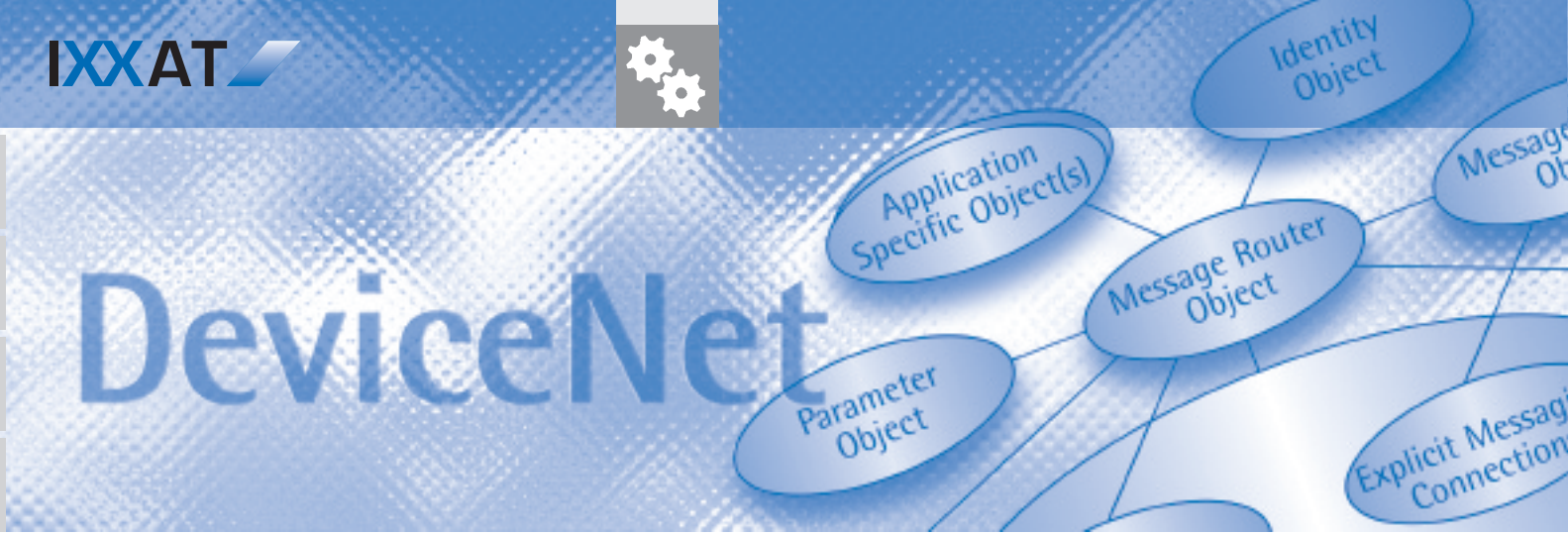
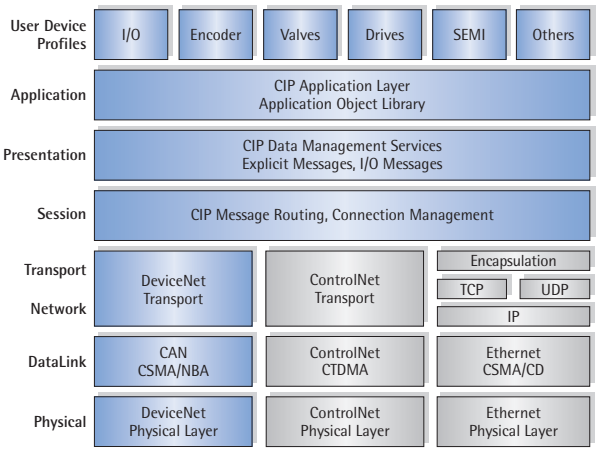


DeviceNet Introduction

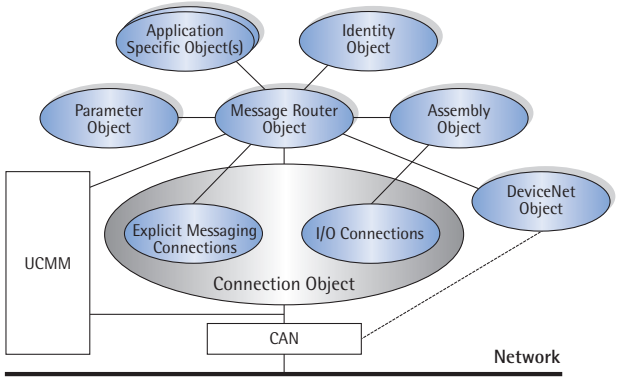
DeviceNet is one of three open network standards (DeviceNet™, ControlNet™ and EtherNet/IP™), all of which use a common application layer, the "Common Industrial Protocol" (CIP™). This common application layer and open software and hardware interfaces allow for a universal connection of automation components from the fieldbus level over the control level to the enterprise level.
The Family of CIP Networks is specified and published by ODVA (Open DeviceNet Vendor Association – www.odva.org) and CI (ControlNet International – www.controlnet.org).
The Common Industrial Protocol presents communication and application in the object model. Predefined objects facilitate the data exchange between different devices and manufacturers. By creating various device profiles, additional standardization benefiting the user was achieved.
CIP is a connection based protocol. It defines the exchange of I/O data using I/O Messaging (or Implicit Messaging) as well as the exchange of general data for configuration, diagnostic and management via Explicit Messaging. CIP thus provides 4 essential functions to the user:

- Common object model for application
- Common communication model for data exchange in the network
- Common configuration methods
- Common device profiles



DeviceNet is the implementation of CIP over CAN (Controller Area Network).

The DeviceNet specification standardizes the physical connection of DeviceNet nodes by defining Layer 4, Layer 3 (DeviceNet Transport), Layer 2 (Usage of CAN), Layer 1 and Layer 0 (Physical Layer and Transmission Media). Along with specifying connectors, cable types and cable lengths, communication-based displays, operating elements and the corresponding housing labelling are also defined. A DeviceNet network can run up to 64 nodes with baud rates of 125, 250 or 500 kBaud. The maximum length of a DeviceNet network can be up to 500 m (at 125 kBaud and usage of suitable cables). The devices can either be supplied via the DeviceNet network (nominal 24 V) or have their own power supply.



The main field of application of DeviceNet is factory automation with I/O-modules, valves, encoders, simple drives and controls (PLC). Within the Family of CIP Networks DeviceNet covers the main part of the applications where small to medium amount of data with short to medium cycle times (1 ms to 500 ms) can be exchanged in the network.
Classic Master/Slave applications are supported by the Predefined Master/Slave Connection Set.
The Unconnected Message Manager Port (UCMM) and the dynamic creation of connections for Explicit Messages and I/O Messages were specified for more complex slave devices and the support of Peer-to-Peer networking.

Product Overview DeviceNet Software and Tools

IXXAT offers protocol software to develop DeviceNet devices as well as tools and drivers for testing and analyzing DeviceNet devices and networks.

DeviceNet Products from IXXAT

DeviceNet Slave Protocol Software
The DeviceNet Slave Protocol Software contains all important functions required to implement a DeviceNet slave device in accordance with the current DeviceNet specification from ODVA.

DeviceNet Client API
The DeviceNet Client API is a software package that allows the simple development of DeviceNet client applications, such as service and test programs, under Microsoft Windows.

DeviceNet Module
The DeviceNet Module is an extension of the canAnalyser allowing the user to record, interpret and analyse DeviceNet messages.

ODVA DeviceNet Conformance Test Driver
This is a driver for the ODVA DeviceNet Protocol Conformance Test Software.

DeviceNet Seminar
The basics of DeviceNet are taught in a 2-day seminar. The target groups of the DeviceNet seminar are developers who implement their own solutions based on DeviceNet and want a comprehensive introduction to the technology.

Products that IXXAT sells as a partner of Rockwell Automation:

DeviceNet Master & I/O Scanner Toolkit
With the DeviceNet Master & I/O Scanner Toolkit we provide the customer with a powerful software package in order to implement DeviceNet masters resp. I/O scanners and connect controls (PLC) to DeviceNet.

Third Party Products that IXXAT recommends, but does not sell:

ODVA DeviceNet Protocol Conformance Test Software
(www.odva.org)
The ODVA DeviceNet Protocol Conformance Test Software is recommended for all companies that develop DeviceNet products themselves in preparation for certification by the ODVA. The software can be operated on IXXAT PC/CAN interfaces in conjunction with the ODVA DeviceNet Conformance Test Driver.

RSNetWorx for DeviceNet
(www.software.rockwell.com/rsnetworx)
RSNetWorx for DeviceNet is a powerful tool for both the configuration and management of DeviceNet devices and networks.

DeviceNet Slave Protocol Software

Software Package for the Development of DeviceNet Slave Devices

FUNCTION OVERVIEW

The DeviceNet Slave Protocol Software allows an easy and quick development of DeviceNet devices. All communication mechanisms defined in the DeviceNet Specification are supported, allowing the developer to concentrate entirely on the actual application.

The modular structure of the protocol software allows an optimum implementation into the target system. The software package can be adjusted to the application requirements through the use of a configuration file. The available DeviceNet objects and functions can be extended individually, new user-defined objects can be created and specific device profiles can be developed.

A separate module contains all the CAN interface functions required to access the CAN controller, allowing the user simple adaptation to CAN controllers that are currently not supported by the software. The data transfer to and from the CAN controller is managed through the use of queues in order to separate the interrupt level from the program level.

The DeviceNet Slave Protocol software is delivered as C source code. Each version is tested for compliance by using the most current ODVA DeviceNet Protocol Conformance Test Software.

The comprehensive documentation and sample program provided allow users to quickly become comfortable utilizing the DeviceNet software. The sample program will immediately run on a reference platform (i.e. CPU manufacturer evaluation board or IXXAT PC/CAN interface). By referencing the sample program, any adjustment of the code to meet the requirements of the target hardware can usually be achieved within a few days.

FEATURES

The DeviceNet Slave Protocol Software supports the development of Group-2-Only Servers and Group-2 Servers according to the ODVA DeviceNet Standard.

Classes
- Identity Object Class
- Message Router Object Class
- DeviceNet Object Class
- Assembly Object Class
- Connection Object Class
- Acknowledge Handler Object Class

DeviceNet Message Body Format
- 8/8 (8-bit Class ID and 8-bit Instance ID)

Fragmentation Protocol
- Support of the Fragmentation Protocol for all Explicit Messages and I/O Messages

Predefined Master/Slave Connection Set
- Explicit Messages
- I/O Messages
  - Poll
  - Bit-Strobe
  - Change of State/Cyclic (unacknowledged/acknowledged)

Unconnected Message Manager Port (UCMM Server)
- Dynamic Explicit Messages in Message Group 1 and 3

Peer to Peer I/O Messages
- Dynamic I/O Messages in Message Group 1

Further Message Types
- Device Heartbeat Message (Producer)
- Device Shutdown Message (Producer)
- Offline Connection Set

User-specific Hardware Interfaces
- Switches for MAC ID and baud rate
- Module Status LED, Network Status LED or combined MN Status LED as well as I/O LED

The resources of the target hardware must include a timer interrupt for the protocol timing as well as a CAN controller interrupt.

SUPPORTED TARGET SYSTEMS

The DeviceNet slave protocol software is available for various microcontrollers from Infineon, Intel, Philips, Atmel, Freescale and others.

A list of the currently supported microcontrollers and development tool chains can be found under www.ixxat.de/devicenet_stack_available_versions_en.html

An adaptation of the DeviceNet software to other target systems can be done by using the standard C code within a few days. This adaptation can also be done by IXXAT.

CONTENTS OF DELIVERY

- Source Code
- Company license (limited to company location or business units)
- Extensive manual
- Sample program
- Technical support

FURTHER INFORMATION

Please request our expanded "DeviceNet Software Description".

ADDITIONAL SERVICES

(not part of the contents of delivery)

Service Contract

In addition to the software package IXXAT offers a service contract. During the contract period IXXAT provides the following services:

- Free updates and bug elimination
- Technical support via telephone, including answering all questions regarding general DeviceNet issues

Code Introduction

One or two days of detailed introduction to the code. Interfaces, flow charts and data exchange inside the DeviceNet software will be explained. In addition, any questions addressing possible adaptation issues will be answered and, if necessary, code will be modified accordingly.

Supporting the Conformance-Test

We will conduct preliminary DeviceNet Protocol Conformance Test using the official ODVA software within IXXAT. Potential errors can be detected and corrected prior to the official test at the ODVA test labs.

Technical Consulting

Support during the specification of the DeviceNet device or system prior to the actual development. Our clients benefit from our applied expertise in regard to DeviceNet, helping them to avoid errors and achieve superior solutions in a shorter period of time.

Implementation Support

IXXAT offers adaptation, implementation and testing of DeviceNet software to meet the requirements of both your hardware and application.

Seminars

IXXAT offers a DeviceNet-Seminar. If requested, the seminar can also be held on-site.

ORDER NUMBER

1.02.0118.TTDDC	DeviceNet Slave Protocol Software (Variants on request)

DeviceNet Master & I/O Scanner Toolkit

▶ Software Package for the Development of DeviceNet Master and I/O Scanner Devices

FUNCTION OVERVIEW

The DeviceNet Master & I/O Scanner Toolkit is a software package offered by IXXAT as a Value Added Design Partner (VADP) of Allen-Bradley/Rockwell Automation.
The software facilitates the development of DeviceNet Master and I/O Scanner devices used in industrial controls for DeviceNet. The configuration of the scanner with RSNetWorx for DeviceNet is supported.
The modular structure of the protocol software allows an optimum implementation into the target system. A separate module contains all CAN interface functions in order to access the CAN controller, thus providing the user easy adaptation to CAN controllers that are currently not supported by the software.
The DeviceNet Master & I/O Scanner Toolkit is delivered as source code. The documentation allows a quick start using the software.

FUNCTIONALITY

Master/Scanner-Functions

- Simultaneous Operation of Master and Slave
- Background Polling for low-priority nodes
- Flexible Bit-Mapping of I/O Data on up to 4 Memory Segments
- Shared Inputs between several scanners allows shared access to the input data of a node without additional I/O connections.
- Supports multiple Identity Object Instances and Applications Objects on the host side

User-specific Hardware Interface

- Prepared interface for various CAN controllers

Configuration and Diagnosis

- Supports Generic Scanners
- Configuration with RSNetWorx for DeviceNet by means of EDS File
- Access to internal data structures possible from both the host and network side
- Firmware Upload and Download

CONTENTS OF DELIVERY

- Software package in source code
- Original Allen-Bradley documentation
- Company license
- Technical support

ORDER NUMBER

1.04.9240.00001	DeviceNet Master & I/O Scanner Toolkit

ODVA DeviceNet Conformance Test Driver

Driver for ODVA DeviceNet Protocol Conformance Test Software

FUNCTION OVERVIEW

The driver enables the use of the ODVA DeviceNet Protocol Conformance Test Software on the IXXAT PC/CAN interfaces. It is supplied as an add-on to the universal IXXAT CAN driver VCI (Virtual CAN Interface). A list of the supported IXXAT PC/CAN interfaces can be located at
www.ixxat.de/overview_software_support_en.html

SYSTEM REQUIREMENTS

- Windows 98 SE, NT 4 (SP 6), 2000 (SP 2) or XP. The CANdy-lite and the USB-to-CAN compact are not supported under Windows NT.
- IXXAT VCI driver version 2.16 or higher
- ODVA DeviceNet Protocol Conformance Test Software (available at the ODVA www.odva.org)

CONTENTS OF DELIVERY

- Driver software on CD-ROM

ORDER NUMBER

1.02.0260.00000	Driver for the ODVA DeviceNet Protocol Conformance Test Software

DeviceNet Client API

The DeviceNet Client API is a software package which facilitates the development of DeviceNet Client applications such as service and test programs under Microsoft Windows.

FUNCTION OVERVIEW

DeviceNet Client Functionality
- UCMM Client for up to 63 explicit connections in Message Group 3
- Group 2 Client for up to 63 explicit connections in Message Group 2
- Supports all 4 DeviceNet Message Body Formats 8/8, 8/16, 16/8 und 16/16
- Device Heartbeat Message (Consumer)
- Device Shutdown Message (Consumer)
- Offline Connection Set (Client)

DeviceNet Server Functionality
- UCMM Server for up to 2 explicit connections in Message Group 3
- Supports DeviceNet Message Body Format 8/8

CIP Communications Adapter Profile with
- Identity Object Class
- Message Router Object Class
- DeviceNet Object Class
- Connection Object Class

Additional Interfaces
- Functions for MAC ID and Baudrate
- Functions for Module Status and Network Status

Platform Compatibility
- DeviceNet Client API supports Microsoft Windows 2000/XP using IXXAT CAN-Interfaces

CONTENTS OF DELIVERY

- DeviceNet Client include files, DLLs and Runtime components for Microsoft Windows
- Client demo application with source code for Microsoft Visual Studio
- User manual
- EDS-File for configuration with Rockwell Automation RSNetWorx for DeviceNet

ORDER NUMBER

1.02.0320.00000	DeviceNet Client API