

EtherNet/IP

Protocol Stacks
 Industrial Ethernet Module
 Software Integration Services
 Consulting and Seminars



The EtherNet/IP™ protocol was introduced in 2001 and is today the most proven, developed and complete industrial Ethernet network standard for manufacturing automation solutions.

EtherNet/IP belongs to a family of network protocols which implement the Common Industrial Protocol CIP™ at its upper layers.

Factory Automation with EtherNet/IP

CIP over Ethernet

The Common Industrial Protocol as it is used for DeviceNet, ControlNet and EtherNet/IP provides the device manufacturer and the end user a common object model and device profiles as well as a common com-

munication model and configuration methods.

Based on TCP/IP protocol suite
EtherNet/IP as the implementation of CIP on Ethernet not only uses standard Ethernet technology. It

rather uses TCP/IP, known as the standard for Internet and Intranet communication. A thin layer, the so called "Encapsulation Protocol", is used to connect EtherNet/IP to standard TCP/IP protocol suite.

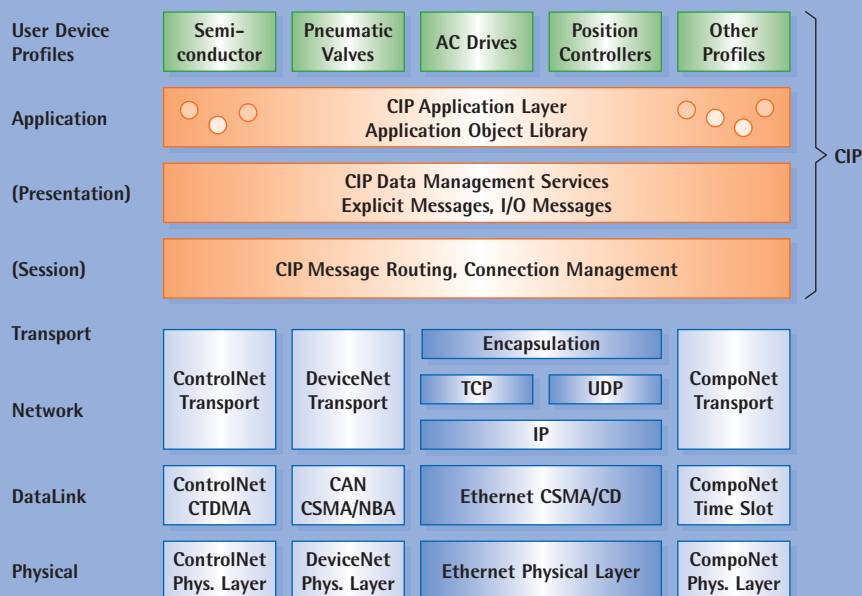
Explicit and Implicit Messaging

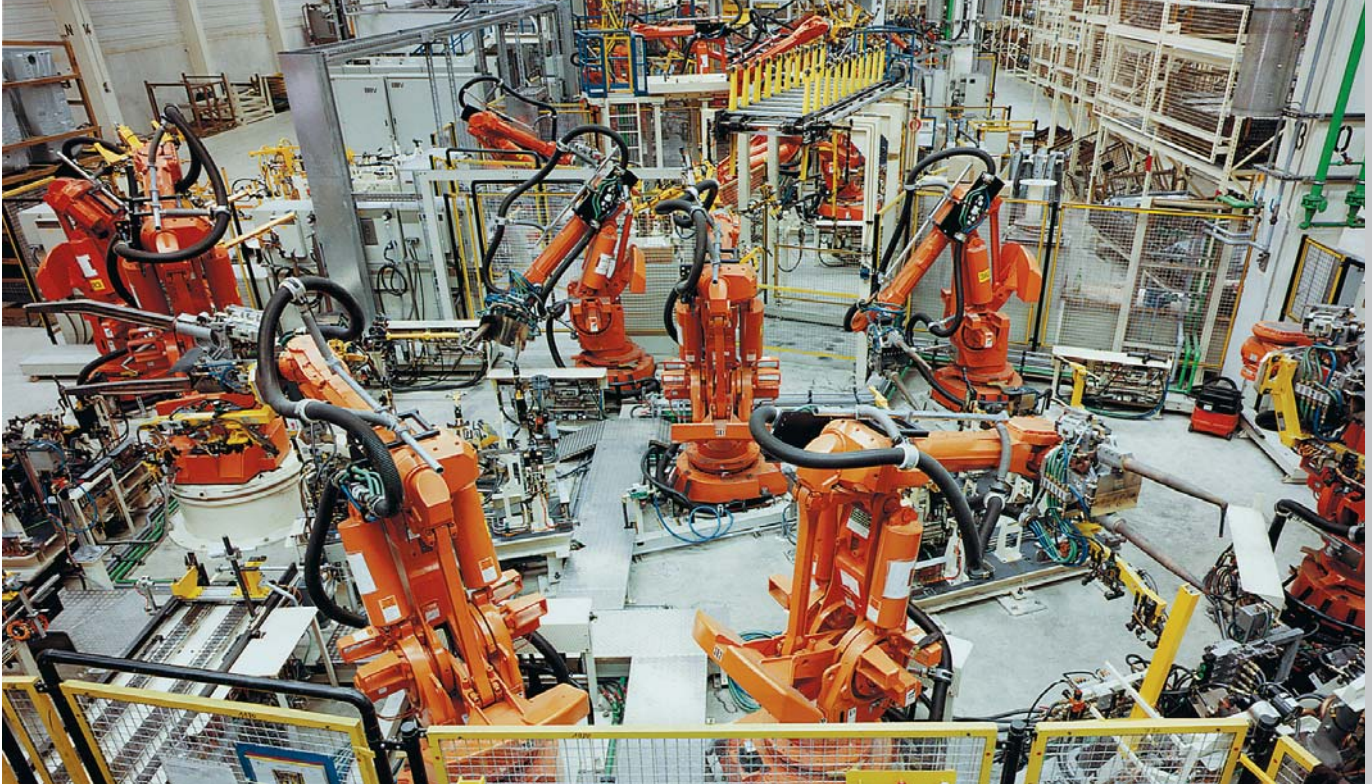
The CIP defines two methods to exchange data over a network – Explicit Messaging and Implicit Messaging. With Explicit Messaging, a Point-to-Point communication is used to exchange parameters, status and diagnostics data. With Implicit Messaging, better known as I/O Messaging, real-time I/O data between one producing endpoint and one or several consuming endpoints is exchanged in the network. With the implementation of CIP over Ethernet, the transport layer for Explicit Messaging is TCP/IP while the transport layer for Implicit (I/O) Messaging is UDP/IP.

Easy to integrate

The usage of standard Internet technology makes the integration of EtherNet/IP into products very easy. Commercial off-the-shelf hardware comprising standard TCP/IP protocol suites can be used. EtherNet/IP protocol stacks are available for different kind of applications.

Layer model according to ISO/OSI





Object Model and Device Profiles

The device application is modelled within CIP using objects. For common applications used in factory automation, a comprehensive object library to support various device profiles are already specified by ODVA (see orange box).

Adapter and Scanner devices

For the implementation of different application architectures, two main product categories are defined for EtherNet/IP – Adapters and Scanners. With an adapter a product like a slave device as known from DeviceNet is built. Typical adapter products are sensors, I/O modules, valves and drives. Scanners on the other hand are products like master devices as known from DeviceNet. A scanner therefore is usually integrated in or part of a PLC (Programmable Logic Controller). The scanner initiates and configures the data exchange in the network.

CIP Sync™ and CIP Motion™ – the next steps

With the integration of the common IEEE-1588 standard for precision time synchronization, ODVA has set the foundation stone for high performance real-time applications

as we know them from drive and motion control. The integration of IEEE-1588 into devices is scalable, depending on the requirements on the precision and the jitter of the time synchronization in the network.

EtherNet/IP Safety™ – ready for future

EtherNet/IP Safety is the future implementation of the CIP Safety™ technology on Ethernet. It is expected to deliver high performance peer-to-peer communication and to support a wide variety of safety devices. EtherNet/IP Safety devices are devices implementing the CIP Safety extensions over an EtherNet/IP network.

EtherNet/IP™
conformance tested

Conformance Tested

All EtherNet/IP products have to be conformance tested by one of the ODVA Test Service Providers (TSP). The conformance test guarantees that the implementation of EtherNet/IP is according to the specifications. It also gives the device manufacturer as well as the end user more confidence that a product will properly work in an EtherNet/IP network together with products from various vendors.

ODVA

is an international association comprised of members from the world's leading automation companies. Collectively, ODVA and its members support network technologies based on the Common Industrial Protocol (CIP™). These currently include DeviceNet™, ControlNet™, CompoNet™ and EtherNet/IP™ along with major extensions to CIP – CIP Safety™, CIP Sync™ and CIP Motion™. ODVA manages the development of these open technologies, and assists manufacturers and users of CIP technologies through tools, training and promotional activities. In addition, ODVA offers conformance testing to help ensure that products built to its specifications operate in multi-vendor systems. ODVA also is active in other standards development organizations and industry consortia to drive the growth of open communication standards. For more information, visit the ODVA web site at: www.odva.org.

IXXAT EtherNet/IP Products

IXXAT provides a variety of EtherNet/IP hardware and software products suitable for the implementation of EtherNet/IP in customers' devices.

EtherNet/IP Adapter Module

The EtherNet/IP Adapter module represents a powerful solution for implementing the EtherNet/IP functionality in devices such as drives, I/O modules or encoders. For connection to the application CPU, a serial interface or a shared memory interface is available.

A Host-API is supplied together with the EtherNet/IP Adapter module, which allows the module to be controlled via its interface. The access and the configuration to the local objects of the EtherNet/IP Adapter module is supported by the Host-API. It is also possible to save configurations on the EtherNet/IP Adapter module.

For simple applications it is possible to run the application together with the EtherNet/IP Adapter software on the module. Device vendors can also integrate the hardware design instead of the add-on module directly in their own circuit.

Source code for EtherNet/IP Adapter or Scanner development

For the development of EtherNet/IP adapter or scanner devices, IXXAT offers protocol stacks which include the main functionality of the EtherNet/IP protocol as well as basics of the CIP Object Model. The device manufacturer can fully concentrate on the implementation of his application to the product.

The software packages provide a common interface to the operating system, the TCP/IP protocol suite and the hardware. For an easy start with the development of an EtherNet/IP product, the software is delivered as a basic license to instantly run on Microsoft Windows™ Operating Systems with Microsoft

Visual C++ as software development tool. The customer receives the full source code written in ANSI-C.

IEEE1588 and CIP Sync™

With the IEEE1588 stack offered as an add-on by IXXAT, the customer can make his product capable to meet ODVA CIP Sync™ standard.

Specific target adaptations

The customer has the possibility to adapt the EtherNet/IP software to his own target system. However, one main focus of IXXAT is to support the customer with this task. Therefore IXXAT can offer adaptations of the EtherNet/IP software packages to various platforms.

Runtime-Driver for Adapter or Scanner on Microsoft Windows

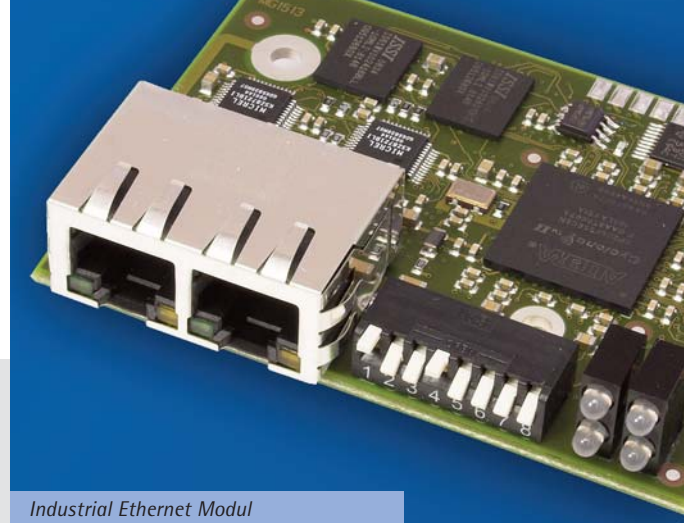
For the development of PC-based EtherNet/IP adapter or scanner devices, IXXAT offers the EtherNet/IP protocol stack as runtime-driver for Microsoft Windows Operating System. The customer uses a Dynamic Link Library (DLL) to implement EtherNet/IP either with Microsoft Visual C++ or Visual Basic.

High software quality

All software packages for adapter and scanner, the source code and the runtime-driver share the same code repository, thus bugfixes, improvements and enhancements due to the EtherNet/IP specification are transparent to all products.

Services

IXXAT offers a 2-day seminar on EtherNet/IP which helps the participants to evaluate the potential of EtherNet/IP. The seminar illustrates



Industrial Ethernet Modul

various approaches for implementing the protocol in an automation device. It is intended in particular for developers and system designers who want a solid introduction into this technology.

The seminar is offered at IXXAT in Weingarten in German language or as in-house seminar in English language.

Training

Customer specific development

IXXAT offers the customer specific development of hardware and software for EtherNet/IP as well as seminars and consultation services.

EtherNet/IP Know-how

We support our customers in the specification of EtherNet/IP devices or systems. Here the customer benefits from our comprehensive EtherNet/IP know-how, our long-term membership with ODVA and our fruitful partnership with Rockwell Automation, so that premium solutions have been developed within a shorter period of time.

Testequipment

For the extensive testing of our EtherNet/IP products as well as customer specific implementations, IXXAT has set up a full-featured EtherNet/IP testbench comprising various EtherNet/IP scanners, adapters, ODVA EtherNet/IP Conformance Testsoftware, configuration software and semi-automatic testprograms.