BradCommunications™ development kits allow easy integration of the EtherNet/IP™ protocol into your industrial controller and field devices.

EtherNet/IP™ Development Kits

Development package for EtherNet/IP Master/Scanner and Adapter

Overview

The BradCommunications™ EtherNet/IP™ software stack allows third parties to implement **Scanner and/or Adapter** functionality for EtherNet/IP on various hardware platforms. The stack performs all communication functions, implicit and explicit messaging behaviors via interfaces. Application objects in the host system may be accessed from the network via explicit messaging.

Overview of Typical System

EtherNet/IP Stacks are composed of 3 major components:

- The stack core
- ········· The interface
- The sources of the user layer. They should be adapted depending on the hardware and OS

When used in scanner mode, the stack allows EtherNet/IP master features to be implemented into controller devices including PLC modules, interface cards, IPC, and robot controllers. When adapter mode is used, the stack enables EtherNet/IP slave devices such as, but not limited, to I/O modules, robots, instruments, regulators.

The EtherNet/IP stack supports any hardware platform (little or big endian memory format) and is compatible with operating systems (real-time or not) like Windows or LinuxRT implemented in mono and multithread user applications. The deliverable stack package includes: ANSI C source code, electronic documentation, and examples of implementation in various operating systems.

Stack functionality

Scanner capabilities: I/O data Scanner & EM Client
- Supports Application, Change-of-State and/or Cyclic I/O messaging
- Automatic verification of device identity
- Automatic reconnection of timed-out or faulted Adapters

Adapter capabilities: I/O data Adapter & EM Server
- Supports Application, Change-of-State and/or Cyclic I/O messaging
- Supports explicit messaging

Explicit messages
- Unconnected
- Connected

Implicit messages (I/O data)
- Types: point-to-point, multicast, null
- Modes: Exclusive owner (EO), Input only (IO), Listen only (LO)
- Real-time Format: Modeless, Zero length, Heartbeat, 32-bit header

Features
- **Software stack:**
  - ☐ Adapter only
  - ☐ Scanner
  - ☐ Scanner and Adapter
- **Multi-platform stack**
- **Independent of the operating system**
- **Support of Intel® and Motorola® data format**
- **Data access**
  - ☐ Shared memory fully configurable
  - ☐ Messaging access

Typical applications
- **Scanner integration**
  - ✓ PLC
  - ✓ Industrial PC
  - ✓ Robot controller
  - ✓ OEM system controller
- **Adapter integration**
  - ✓ IO modules
  - ✓ Encoders
  - ✓ Valves
  - ✓ Drives / Robots
  - ✓ Instruments

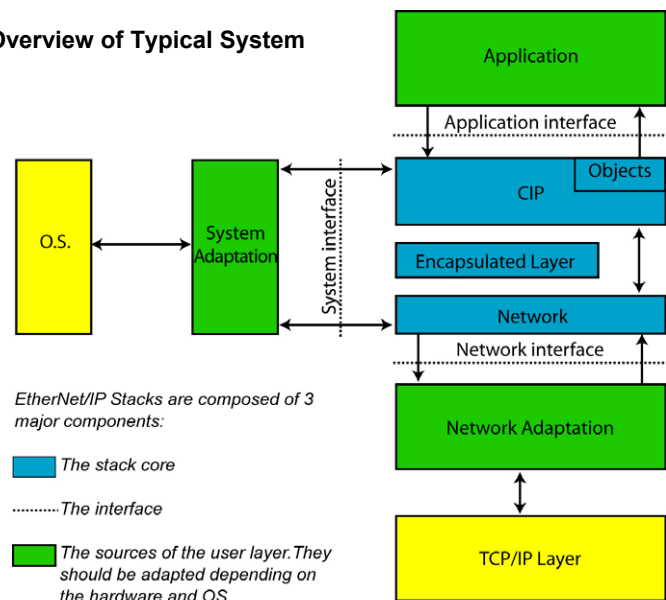*Active member of the ODVA and interoperability plug fest and working groups.*

Woodhead

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EtherNet/IP™ Development Kits

Specifications

EtherNet/IP-specific Specifications

Common Stack Features	
Hardware Compatibility	Supports Motorola® and Intel® memory systems
Operating System	Portable on any operating system
Stack Implementation	Oriented as a single threaded application
Stack Resolution	Timing resolution in microseconds
Supported Objects according to CIP Standard	• Identity Object • Message Router Object • Assembly Object • Connection Manager Object • Connection Configuration Object • TCP/IP Interface Object • Ethernet Link Object

EtherNet/IP Scanner Stack	
Scanner Class Functionality	• UCMM (unconnected) Message Server and Client • Class 3 (connected) Message Server and Client • Class 1 (connected) I/O Server and Client
Connection Configuration Object	• Allows remote configuration of devices through explicit messages
I/O Connection Types (O➡T)	• Multicast • Unicast (Point to Point) • Null
I/O Connection Modes	• Exclusive owner (EO) • Input only (IO) • Listen only (LO)
I/O Connection Formats	• Modeless • Zero length • Heartbeat • 32-bit header
User Settable Identity Definitions	Vendor ID, Device ID, Product Code, Major and Minor revisions, Product Name etc.
Application Watchdog	Yes, to monitor link between stack and application
Content of Delivery	• A firmware stack in source code (ANSI C) • Comprehensive implementation reference guide • Sample programs including source code for Windows and Linux platforms

EtherNet/IP Adapter Stack	
Adapter Class Functionality	• UCMM (unconnected) Message Server • Class 3 (connected) Message Server • Class 1 (connected) I/O Server
Device Description	Generic EDS-File for configuration
Content of delivery	• A firmware stack in source code (ANSI C) • Comprehensive implementation manual • Sample programs including source code for a Windows® and Linux® platforms

Stack Requirements

EtherNet/IP Stack	

Processor	• The hardware platform requires a 32-bit processor
	• The stack has been validated on the following architecture
	  o Intel (Pentium)
	  o PowerPC
	  o ARM9

Operating System	• Task
	  o Stack is designed as a single task
	  o A timer is needed to schedule the EIP task Timer precision defines the producer capability of the device.
	• Protection
	  o The user implementation may need additional protection for:
	    ▪ Global variables
	    ▪ Input & Output access

EtherNet/IP Specifications

EtherNet/IP Stack	

Memory	• Little endian / big endian format
	• All allocated memory is done at initialization of the stack
	• Estimate :
	   o 100 kB for adapter
	   o 400 kB for scanner

Footprint	• The footprint is very platform dependent
	   o Adapter : 200 kB on VxWorks 6.4/ARM
	   o Scanner : 400 kB on VxWorks 6.4/ARM

Network	• To implement Ethernet network interfaces you need to provide interfaces such as TCP/UDP connection, data exchange with multicast capabilities. The EtherNet/IP sample application demonstrates how to implement required interfaces using Berkley sockets although you can provide your proprietary TCP/UDP interfaces
	   o Adapter shall support a minimum of 6 sockets
	   o Number of sockets for scanner will depend on number of attached devices
	• Adapter stack will need to be able to transmit multicast IP packet
	• Scanner stack will need to be able to receive multicast IP packet and support IGMP V2.
	• Device shall support a minimum of 6 sockets
	• Samples are provided for Win32, Linux and VxWorks platforms

User implementation consists of:
1. **Stack portage on to target platform**
2. **Implement user API (I/O, explicit messaging, TCP/IP, Ethernet and user specific objects management)**
3. **Conformance testing (EtherNet/IP per ODVA)**

Ordering information

Part Number	SAP Number	Description
SDK-EIP-SCA	1121065003	EtherNet/IP Scanner and Adapter SDK
SDK-EIP-SCA-UDP	1121065004	EtherNet/IP Scanner and Adapter SDK annual maintenance update
SDK-EIP-SCA-L	1121065009	EtherNet/IP Scanner and Adapter SDK License fee
SDK-EIP-SCA-CNF-U	1121065011	EtherNet/IP OEM Engineering Configuration Console for Scanner SDK
SDK-EIP-ADP	1121060000	EtherNet/IP Adapter only SDK
SDK-EIP-ADP-UDP	1121065000	EtherNet/IP Adapter only SDK annual maintenance update
SDK-EIP-EDS	8600000141	Engineering Support for EtherNet/IP SDK
SDK-EIP-TRN	8600000143	EtherNet/IP SDK training

Stacks also available:
- PROFINET IO-Controller
- PROFINET IO-Device
- PROFINET IO OEM Engineering configuration console
- PROFINET MRP
- PROFINET Services (training and Engineering support)

Network Interface

Brad from molex

To contact us: www.woodhead.com

North America: US: +1 (630) 969-4550 – Canada: +1 519 725 5136
Europe: France: +33 2 32 96 04 20 – Germany: +49 7252 94 96 0 – Italy: +39 (02) 950551 – UK: +44 (1252) 720720
Asia: China: +86 21-5048-0889 Singapore: +65 6-268-6868 – Japan: +81 46-265-2325 – Korea: +82 31-492-9000