ibaPDA-Interface-Raw-Ethernet

Data Interface for ibaPDA

Manual

Issue 3.0

Measurement Systems for Industry and Energy

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Version	Date	Revision	Author	Version SW
3.0	11-2023	New version ibaPDA v8	RM	8.5.0

Contents

1 About this documentation

This documentation describes the function and application of the software interface

ibaPDA-Interface-Raw-Ethernet.

This documentation is a supplement to the *ibaPDA* manual. Information about all the other characteristics and functions of *ibaPDA* can be found in the *ibaPDA* manual or in the online help.

1.1 Target group and previous knowledge

This documentation is aimed at qualified professionals who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded as professional if he/she is capable of assessing safety and recognizing possible consequences and risks on the basis of his/her specialist training, knowledge and experience and knowledge of the standard regulations.

This documentation in particular addresses persons, who are concerned with the configuration, test, commissioning or maintenance of Programmable Logic Controllers of the supported products. For the handling *ibaPDA-Interface-Raw-Ethernet* the following basic knowledge is required and/or useful:

- Windows operating system
- Basic knowledge of *ibaPDA*
- Knowledge of configuration and operation of the relevant measuring device/system

1.2 Notations

In this manual, the following notations are used:

Action	Notation
Menu command	Menu *Logic diagram*
Calling the menu command	*Step 1 – Step 2 – Step 3 – Step x* Example: Select the menu *Logic diagram – Add – New function block*.
Keys	<Key name> Example: <Alt>; <F1>
Press the keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Key name> Example: <OK>; <Cancel>
Filenames, paths	`Filename`, `Path` Example: `Test.docx`

1.3 Used symbols

If safety instructions or other notes are used in this manual, they mean:

Danger!

The non-observance of this safety information may result in an imminent risk of death or severe injury:

- Observe the specified measures.

Warning!

The non-observance of this safety information may result in a potential risk of death or severe injury!

- Observe the specified measures.

Caution!

The non-observance of this safety information may result in a potential risk of injury or material damage!

- Observe the specified measures

Note

A note specifies special requirements or actions to be observed.

Tip

Tip or example as a helpful note or insider tip to make the work a little bit easier.

Other documentation

Reference to additional documentation or further reading.

2 System requirements

The following system requirements are necessary for the use of the Raw Ethernet data interface:

- *ibaPDA* v8.0.0 or higher
- License for *ibaPDA-Interface-Raw-Ethernet*
- Network connection 10/100 Mbits

For further requirements for the used computer hardware and the supported operating systems, refer to the *ibaPDA* documentation.

Note

It is recommended carrying out the TCP/IP communication on a separate network segment to exclude a mutual influence by other network components.

Licenses

Order No.	Product name	Description
31.001030	ibaPDA-Interface-RAW-Ethernet	Reads data from up to 4 links. The links can be defined on different network interface cards (NICs).

3 Introduction

The Raw Ethernet communication uses IEEE 802.3 Multicast Frames. Up to 4 links are supported for data acquisition. Each link can be defined on a different NIC (network interface card). On each link the data sent must have a fixed layout.

If 2 links are defined on the same NIC the multicast address must be different.

Up to 1024 modules are supported per interface.

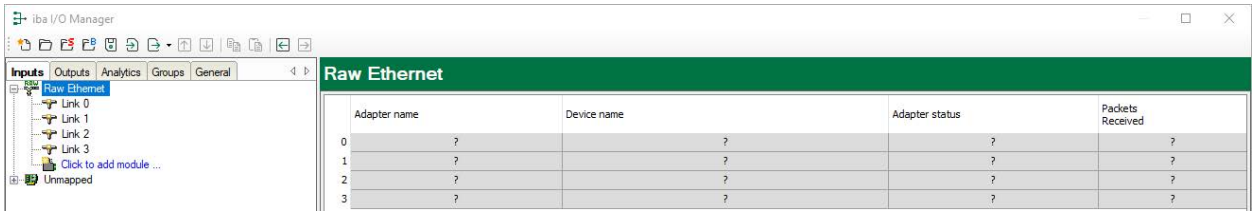
The Raw Ethernet interface is visible in the tree of the I/O manager when a license container (dongle or soft-license) with the corresponding license is attached.

4 Configuration and engineering ibaPDA

The engineering for *ibaPDA* is described in the following. If all system requirements are fulfilled, *ibaPDA* displays the *Raw Ethernet* interface in the interface tree of the I/O Manager.

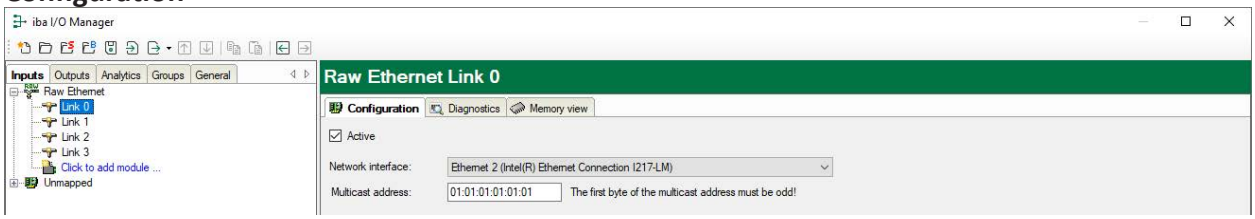
4.1 General interface settings

The interface provides a connection overview with information on adapter and device names, adapter status and the number of packets received.



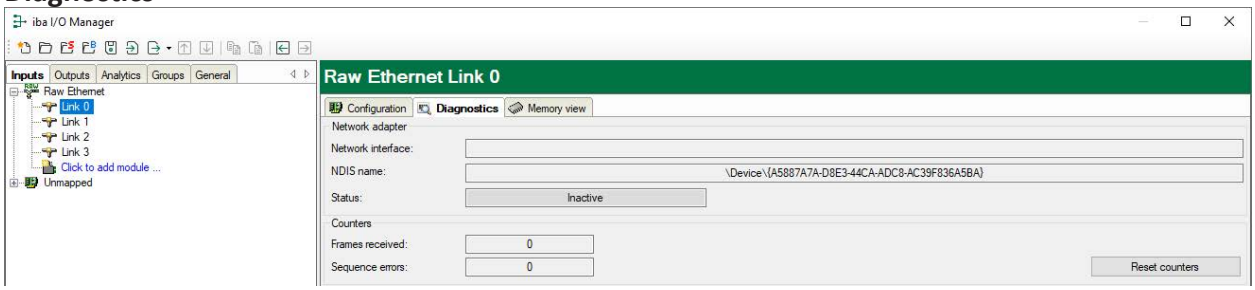
The following functions and configuration options are available for each link:

Configuration



Under *Network interface* select the network interface card (NIC) which is used for Raw Ethernet communication for each link. Under *Multicast address*, you can enter different multicast addresses for different links if they use the same network interface card (NIC).

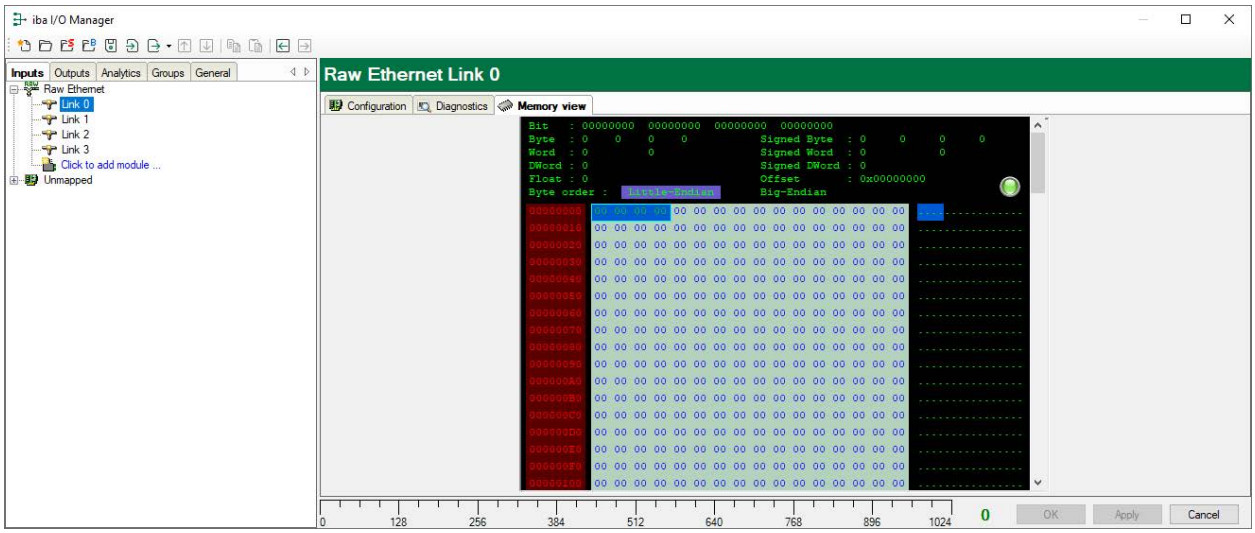
Diagnostics



Under *Network adapter*, you will find information on the network interface, the NDIS name and status. Under *Counters*, you can view the number of sequence errors and frames received or reset the counters.

Memory view

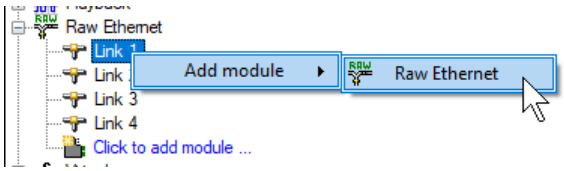
There is also a hex view of the memory content for each link.



4.2 Add module

The *Raw Ethernet* module is a generic Ethernet module which can be freely configured by the user.

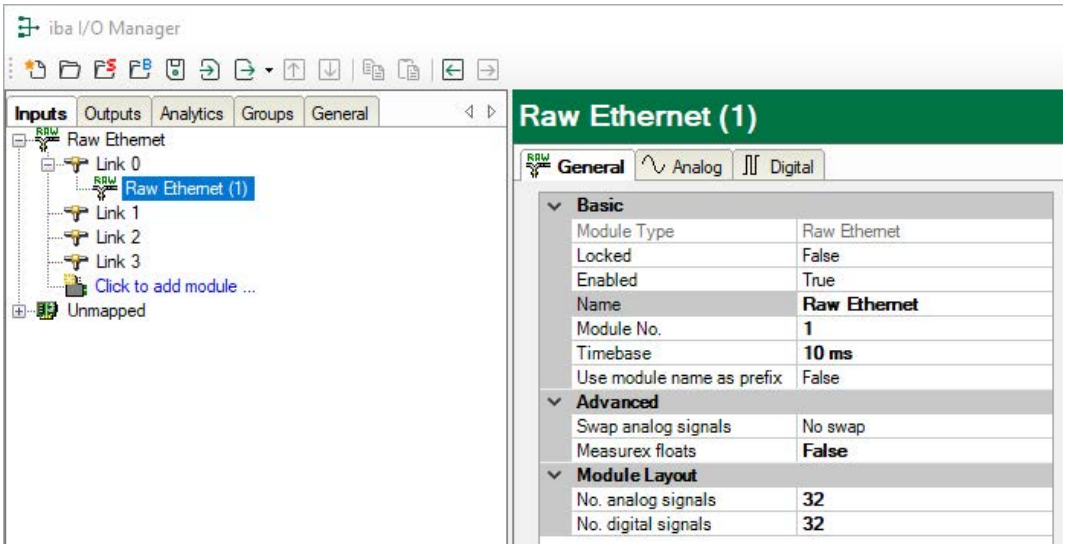
In the tree structure, select the link of the *Raw Ethernet* interface you want to use and add a *Raw Ethernet* module.



4.3 General module settings

To configure a module, select it in the tree structure.

All modules have the following setting options.



Basic settings

Module Type (information only)
Indicates the type of the current module.

Locked
You can lock a module to avoid unintentional or unauthorized changing of the module settings.

Enabled
Enable the module to record signals.

Name
You can enter a name for the module here.

Module No.
This internal reference number of the module determines the order of the modules in the signal tree of *ibaPDA* client and *ibaAnalyzer*.

Timebase
All signals of the module are sampled on this timebase.

Use module name as prefix
This option puts the module name in front of the signal names.

Advanced

Swap analog signals
Set the swap mode according to the signal source. You can choose between 4 options:

Mode	16 bit	32 bit
No swap	AB	ABCD
Depending on data type	BA	DCBA
Swap 16 bit	AB	CDAB
Swap 8 bit	BA	BADC

Table 1: Swap modes

Which swap mode is the correct one depends on the swap mode of the signal source.

Measurex floats
If this option is enabled (TRUE) floating point values will be considered as Measurex floats instead of IEEE 754 floats.

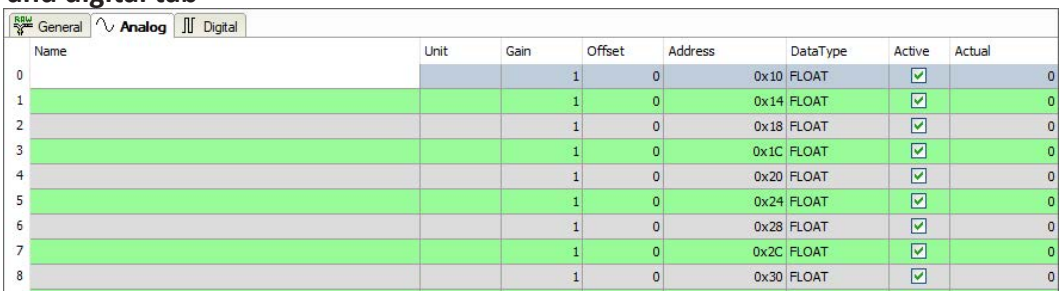
Module Layout

No. of analog signals/digital signals
Define the number of configurable analog and digital signals in the signal tables. The default value is 32 for each. The maximum value is 1000. The signal tables are adjusted accordingly.

4.4 Signal configuration

In the *Analog* or *Digital* tab you configure the signals to be measured. In the *General* tab under *Module Layout* you define the length of the signal tables or the number of signals per table.

Analog and digital tab



	Name	Unit	Gain	Offset	Address	DataType	Active	Actual
0			1	0	0x10	FLOAT	☑	0
1			1	0	0x14	FLOAT	☑	0
2			1	0	0x18	FLOAT	☑	0
3			1	0	0x1C	FLOAT	☑	0
4			1	0	0x20	FLOAT	☑	0
5			1	0	0x24	FLOAT	☑	0
6			1	0	0x28	FLOAT	☑	0
7			1	0	0x2C	FLOAT	☑	0
8			1	0	0x30	FLOAT	☑	0

You can assign name, unit, scale factor and address to the analog and digital signals. Moreover, you can enable or disable the signals.

For digital signals you have the possibility to get 32 single bits out of a DINT or DWORD.

Other documentation

For a description of the columns, please see the *ibaPDA* manual.

Address

In this column you specify the offset of the first byte of the value (for analog signals) and the offset of the first byte of the value carrying binary signals (for digital signals) within the raw data stream. The offset can be entered as hexadecimal or decimal values by selecting the desired setting in the context menu. In order to get some default values just click on the column header. The offset values are filled in automatically starting with the value in the first row, respectively in the field the cursor is currently in, downwards in address steps according to the selected data types.

Data Type (analog signals only)

In the fields of this column you can select the data type of each signal. Just click in the corresponding field and select the data type from the drop-down list. The address space is depending on the data type. Hence, an adjustment of address entries may be necessary after change of data types.

Data type	Description	Value range
BYTE	8 Bit without positive or negative sign	0 … 255
INT	16 Bit with positive or negative sign	-32768 … 32767
WORD	16 Bit without positive or negative sign	0 … 65535

Data type	Description	Value range
DINT	32 Bit with positive or negative sign	-2147483648 … 2147483647
DWORD	32 Bit without positive or negative sign	0 … 4294967295
FLOAT	IEEE754; Single Precision; 32 Bit floating point	$1.175 \cdot 10^{-38}$ …$3.403 \cdot 10^{38}$

Table 2: Available data types

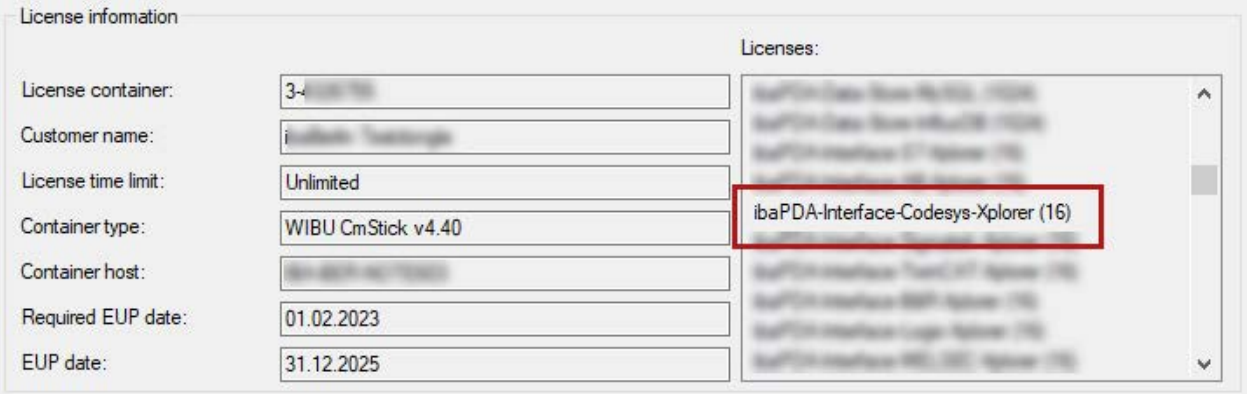
Bit no. (digital signals only)
The number 0...31, specifies the position of the digital signal in a 32-bit block in the data stream with reference to the address entry (offset). Increment of bit no. by 1 up to 31, then increase address by 4.

5 Diagnostics

5.1 License

If the interface is not displayed in the signal tree, you can either check in *ibaPDA* in the I/O Manager under *General – Settings* or in the *ibaPDA* service status application whether your license for this interface has been properly recognized. The number of licensed connections is shown in brackets.

The figure below shows the license for the *Codesys Xplorer* interface as an example.



5.2 Visibility of the interface

If the interface is not visible despite a valid license, it may be hidden.

Check the settings in the *General* tab in the *Interfaces* node.

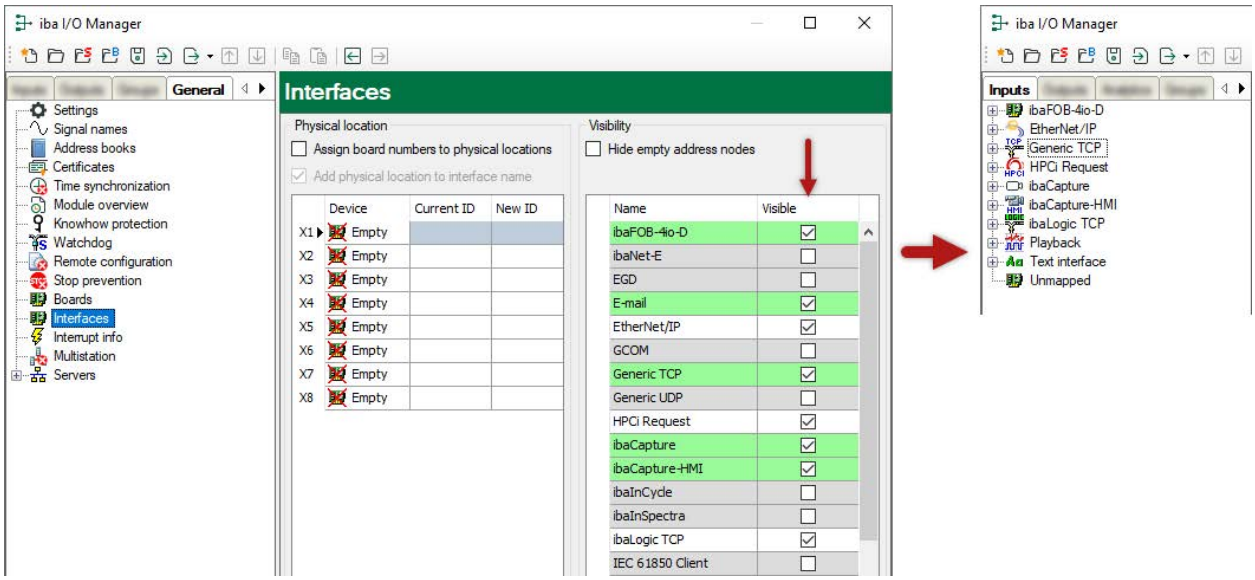
Visibility

The table *Visibility* lists all the interfaces that are available either through licenses or installed cards. These interfaces can also be viewed in the interface tree.

You can hide or display the interfaces not required in the interface tree by using the checkbox in the *Visible* column.

Interfaces with configured modules are highlighted in green and cannot be hidden.

Selected interfaces are visible, the others are hidden:



5.3 Log files

If connections to target platforms or clients have been established, all connection-specific actions are logged in a text file. You can open this (current) file and, e.g., scan it for indications of possible connection problems.

You can open the log file via the button <Open log file>. The button is available in the I/O Manager:

- for many interfaces in the respective interface overview
- for integrated servers (e.g. OPC UA server) in the *Diagnostics* tab.

In the file system on the hard drive, you can find the log files of the *ibaPDA* server (...\ProgramData\iba\ibaPDA\Log). The file names of the log files include the name or abbreviation of the interface type.

Files named `interface.txt` are always the current log files. Files named `Interface_yyyy_mm_dd_hh_mm_ss.txt` are archived log files.

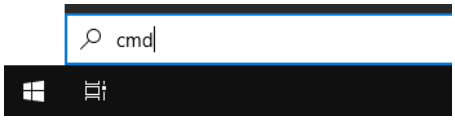
Examples:

- `ethernetipLog.txt` (log of EtherNet/IP connections)
- `AbEthLog.txt` (log of Allen-Bradley Ethernet connections)
- `OpcUAServerLog.txt` (log of OPC UA server connections)

5.4 Connection diagnostics with PING

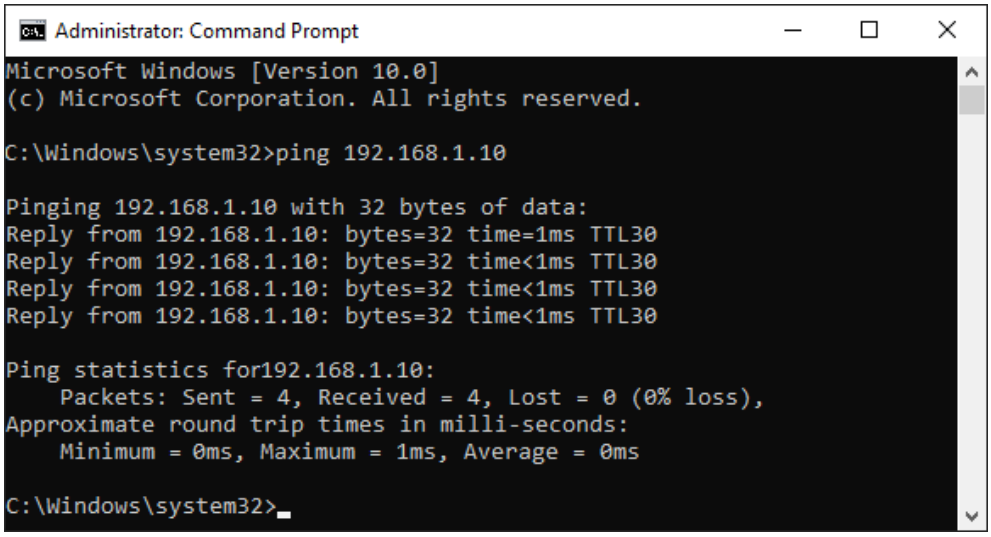
PING is a system command with which you can check if a certain communication partner can be reached in an IP network.

1. Open a Windows command prompt.

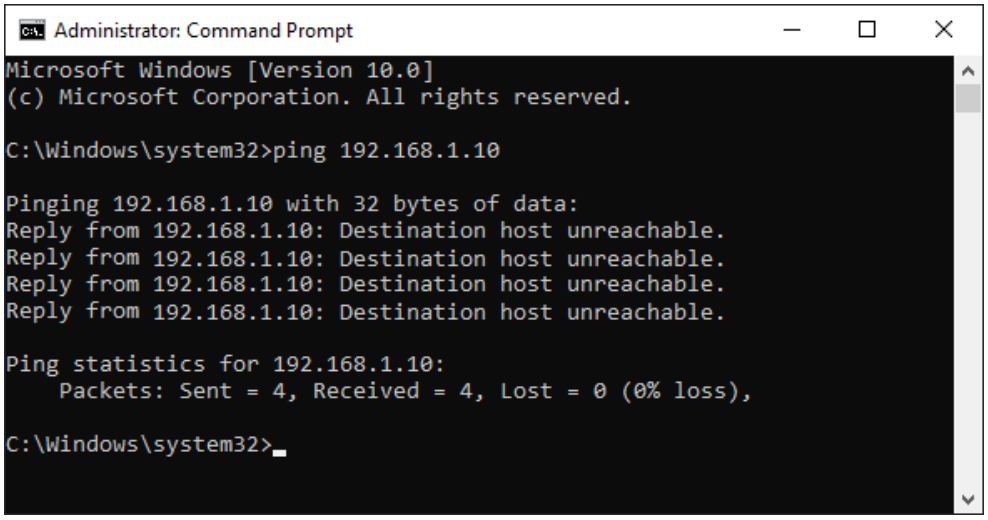


2. Enter the command "ping" followed by the IP address of the communication partner and press <ENTER>.

→ With an existing connection you receive several replies.



→ With no existing connection you receive error messages.



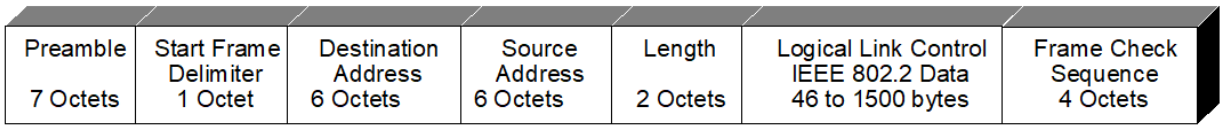
6 IEEE 802.3

This chapter gives a short overview of the IEEE 802.3 Ethernet frame. Following OSI Model Conceptual View shows that the IEEE 802.3 frames are situated on the datalink layer (layer 29).

<table>
<tr><th colspan="2">LAYER</th><th>USER APPLICATION</th><th colspan="2"></th><th>DATA FORMAT</th><th>ENABLING TECHNOLOGY</th><th></th></tr>
<tr><td colspan="2">7 APPLICATION</td><td>Provides common services to user applications.
➨X.400 E-MAIL interoperability specification
➨X.500 E-MAIL directory synchronization specification
➨Strictly speaking, does not include user applications</td><td rowspan="5">Higher layer protocols - independant of underlying communications network</td><td></td><td></td><td></td><td rowspan="5">SOFTWARE</td></tr>
<tr><td colspan="2">6 PRESENTATION</td><td>Provides presentation services for network communications.
➨Encryption
➨Code translation (ASCII to EBCDIC)
➨Text compression
Not to be confused with
➨Graphical User Interfaces(GUIs)</td><td rowspan="3">Node-to-node sessions</td><td></td><td></td></tr>
<tr><td colspan="2">5 SESSION</td><td>Establishes, maintains, terminates node-to-node interactive sessions.</td><td>sessions
Interactive, real-time dialogue between 2 user nodes</td><td>Distributed applications, middleware, or network operating systems.</td></tr>
<tr><td colspan="2">4 TRANSPORT</td><td>Assures reliability of end-to-end network connections.</td><td>messages
Asembles packets into messages.</td><td>Network Operating Systems</td></tr>
<tr><td colspan="2">3 NETWORK</td><td>Establishes, maintains, and terminates end-to-end network connections.</td><td>Network</td><td>End-to-end user network connection.</td><td>packets
Embedded within frames.</td><td>Network Operating Systems.</td></tr>
<tr><td colspan="5">HARDWARE/SOFTWARE INTERFACE</td><td>NIC DRIVERS</td><td></td></tr>
<tr><td colspan="2">2 DATA LINK</td><td>Logical Link control sub-layer.
Media access control sub-layer.
Specified by 802.X protocols.
➨Assures reliability of point-to-point data links.</td><td rowspan="2">Communications</td><td rowspan="2">Point-to-point data link</td><td>frames
Recognizable as data.</td><td>Network Interface Cards.</td><td rowspan="2">HARDWARE</td></tr>
<tr><td colspan="2">1 PHYSICAL</td><td>Establishes, maintains, and terminates point-to-point data links.</td><td>bits
Unrecognizable as data</td><td>Media</td></tr>
</table>

In the following graphic you can see the layout of the IEEE802.3 frame:

IEEE 802.3 Frame Layout



The overall frame length varies from 64 to 1518 Octets

NOTE: 1 Octet = 8 bits

The data received in *ibaPDA* includes the destination address, source address, length and the IEEE 802.2 data. The length field is ignored in *ibaPDA*. The first 2 bytes of the IEEE 802.2 data have to be a 16 bit sequence counter.

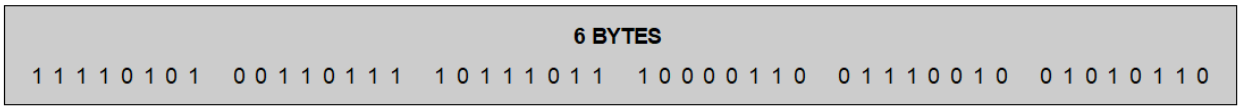
7 Multicast Frames

Multicast Ethernet frames are distinguished from directed packets by having the Individual/ Group (I/G) bit of the destination address set to 1 (Group).

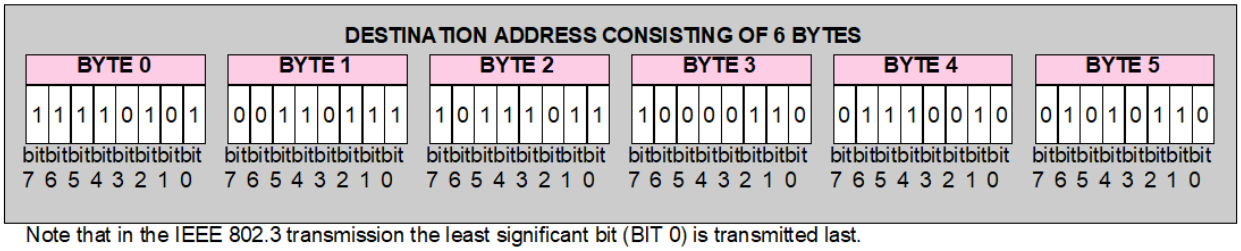
Multicast is like broadcast, but specific multicast addresses must be set up to receive it. Multicast Ethernet addresses have bit 0 in byte 0 set (i.e. it is odd): For instance, Windows network software uses multicast address 03:00:00:00:00:01 to send and receive "find name" packets. Without this use of multicast addresses, network browsing would not work.

As shown in the following figure, first Byte 0 is transmitted over the network:

Original Data Stream of 6 bytes



IEEE 802.3 Transmission



Note that in the IEEE 802.3 transmission the least significant bit (BIT 0) is transmitted last.

Multicasting is like networking, where one computer sends a single copy of data over the network and many computers receive this data.

When streaming frames over the network, the advantage to unicast is that only a single copy of the data is sent across the network. This ensures that network bandwidth is maintained without losses. In large companies the bandwidth savings can be substantial. The disadvantage is that it is connectionless. The clients have no control over the streams they receive and therefore cannot pause or skip forward or backward in the frame stream.

8 Support and contact

Support

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Note

If you need support for software products, please state the number of the license container. For hardware products, please have the serial number of the device ready.

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