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User Manual

Industrial Protocols
Embedded Ethernet Switch (HiOS-2E EES)

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Contents

Safety instructions

WARNING

UNCONTROLLED MACHINE ACTIONS
To avoid uncontrolled machine actions caused by data loss, configure all the data transmission devices individually.
Before you start any machine which is controlled via data transmission, be sure to complete the configuration of all data transmission devices.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

1 Industry Protocols

For a long time, automation communication and office communication were on different paths. The requirements and the communication properties were too different.

Office communication moves large quantities of data with low demands with respect to the transfer time. Automation communication moves small quantities of data with high demands with respect to the transfer time and availability.

While the transmission devices in the office are usually kept in temperature-controlled, relatively clean rooms, the transmission devices used in automation are exposed to wider temperature ranges. Dirty, dusty and damp ambient conditions make additional demands on the quality of the transmission devices.

With the continued development of communication technology, the demands and the communication properties have moved closer together. The high bandwidths now available in Ethernet technology and the protocols they support enable large quantities to be transferred and exact transfer times to be defined.

With the creation of the first optical LAN to be active worldwide, at the University of Stuttgart in 1984, Hirschmann laid the foundation for industry-compatible office communication devices. Thanks to Hirschmann's initiative with the world's first rail hub in the 1990s, Ethernet transmission devices such as switches, routers and firewalls are now available for the toughest automation conditions.

The desire for uniform, continuous communication structures encouraged many manufacturers of automation devices to come together and use standards to aid the progress of communication technology in the automation sector. This is why we now have protocols that enable us to communicate via Ethernet from the office right down to the field level.

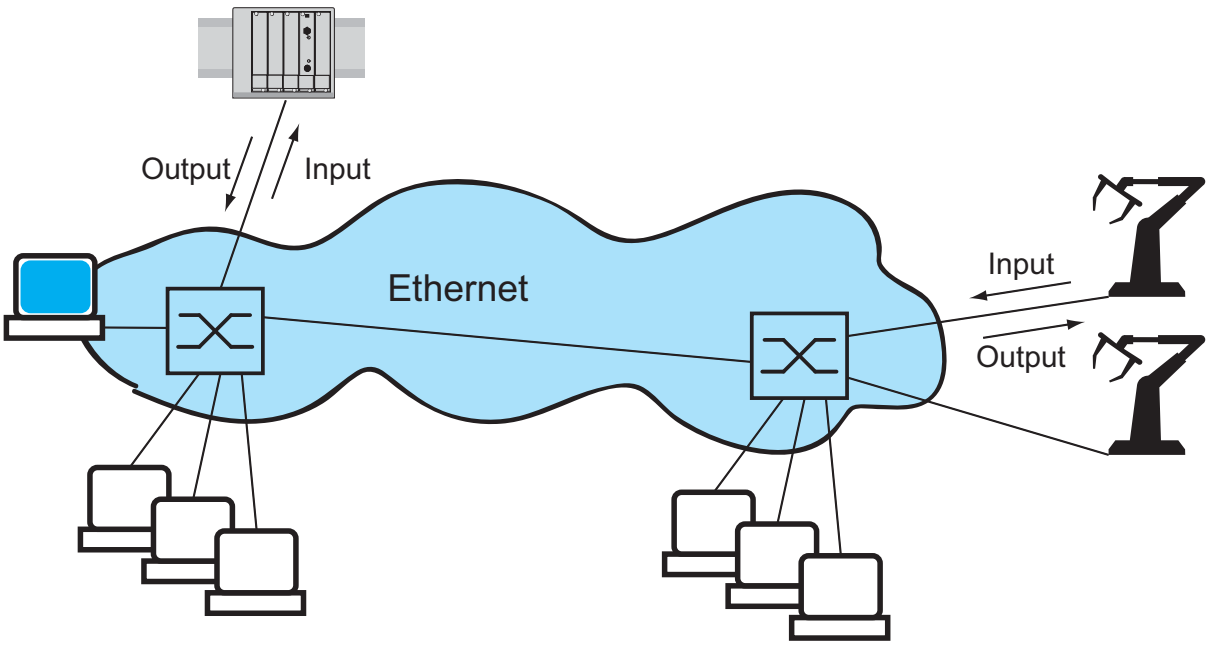

Figure 1: Example of communication.

2 IEC 61850/MMS

IEC 61850/MMS is an industrial communication protocol standardized by the International Electrotechnical Commission (IEC). The protocol is to be found in substation automation, e.g. in the control technology of energy suppliers.

This protocol, which works in a packet-oriented way, is based on the TCP/IP transport protocol and uses the Manufacturing Messaging Specification (MMS) for the client-server communication. The protocol is object-oriented and defines a standardized configuration language that comprises, among other things, functions for SCADA, Intelligent Electronic Devices (IED) and for the network control technology.

Part 6 of the IEC 61850 standard defines the configuration language SCL (Substation Configuration Language). SCL describes the properties of the device and the system structure in an automatically processable form. The properties of the device described with SCL are stored in the ICD file on the device.

2.1 Switch model for IEC 61850

The Technical Report, IEC 61850 90-4, specifies a bridge model. The bridge model represents the functions of a switch as objects of an Intelligent Electronic Device (IED). An MMS client (e.g. the control room software) uses these objects to monitor and configure the device.

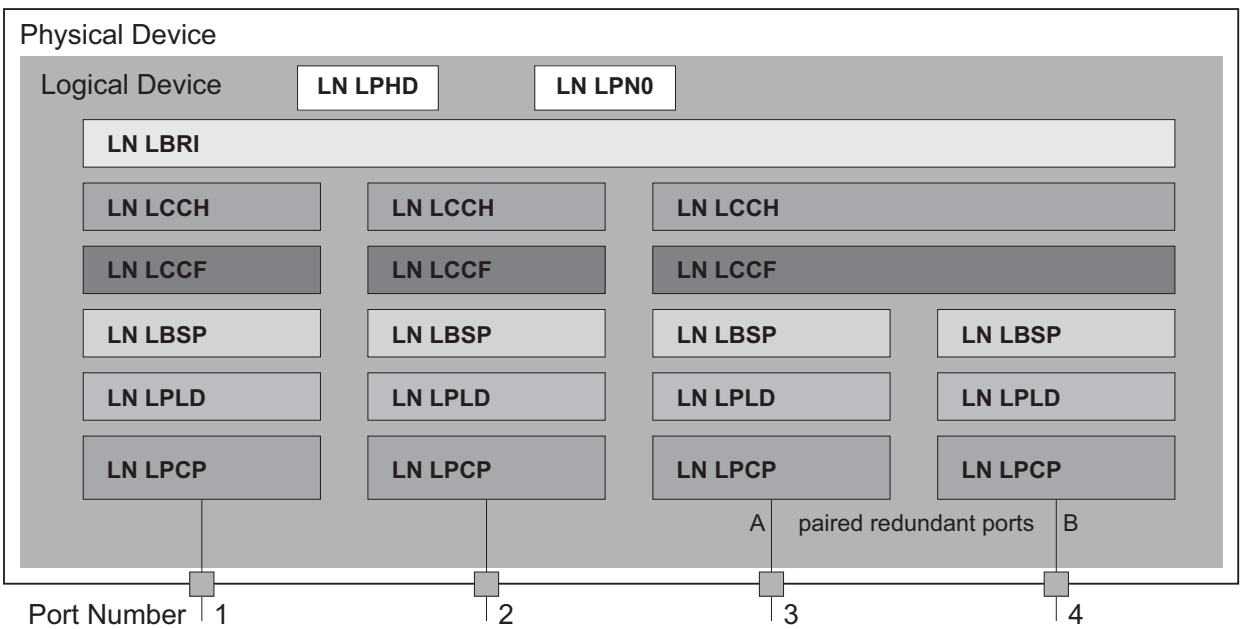

Figure 2: Bridge model based on Technical Report IEC 61850 90-4

Class	Description
LN LLN0	“Zero” logical node of the “Bridge” IED: Defines the logical properties of the device.
LN LPHD	“Physical Device” logical node of the “Bridge” IED: Defines the physical properties of the device.
LN LBRI	“Bridge” logical node: Represents general settings of the bridge functions of the device.
LN LCCH	“Communication Channel” logical node: Defines the logical “Communication Channel” that consists of one or more physical device ports.

Table 1: Classes of the bridge model based on TR IEC61850 90-4

Class	Description
LN LCCF	“Channel Communication Filtering” logical node: Defines the VLAN and Multicast settings for the higher-level “Communication Channel”.
LN LBSP	“Port Spanning Tree Protocol” logical node: Defines the Spanning Tree statuses and settings for the respective physical device port.
LN LPLD	“Port Layer Discovery” logical node: Defines the LLDP statuses and settings for the respective physical device port.
LN LPCP	“Physical Communication Port” logical node: Represents the respective physical device port.

Table 1: Classes of the bridge model based on TR IEC61850 90-4 (cont.)

2.2 Integration into a Control System

2.2.1 Preparation of the device.

After installing and connecting the device, configure it according to the 'Basic Configuration' user manual:

☐ Check that the device has an IP address assigned.

☐ Open the `Advanced > Industrial Protocols > IEC61850-MMS` dialog.

☐ To start the MMS server, select in the "Operation" frame the "On" option, and click "Set" button.

Afterwards, an MMS client is able to connect to the device and to read and monitor the objects defined in the bridge model.

NOTICE
RISK OF UNAUTHORIZED ACCESS TO THE DEVICE IEC61850/MMS does not provide any authentication mechanisms. If the write access for IEC61850/MMS is activated, every client that can access the device using TCP/IP is capable of changing the settings of the device. This in turn can result in an incorrect configuration of the device and to failures in the network. Only activate the write access if you have taken additional measures (e.g. Firewall, VPN, etc.) to eliminate the risk of unauthorized access. **Failure to follow these instructions can result in equipment damage.**

☐ To enable the MMS client to change the settings, mark the "Write Access" checkbox, and click the "Set" button.

2.2.2 Offline configuration

The device allows you to download the ICD file using the graphical user interface. This file contains the properties of the device described with SCL and enables you to configure the substation without directly connecting to the device.

☐ Open the `Advanced > Industrial Protocols > IEC61850-MMS` dialog.

☐ To load the ICD file to your PC, click in the "ICD File" frame the "Download" button.

2.2.3 Monitoring the device

The IEC61850/MMS server integrated into the device allows you to monitor multiple statuses of the device by means of the Report Control Block (RCB). Up to 5 MMS clients can register for a Report Control Block at the same time.

The device allows the following statuses to be monitored:

Class	RCB object	Description
LN LBRI	RstpRoot	Changes when the device takes over or relinquishes the role of the root bridge.
	RstpTopoCnt	Changes when the topology changes due to a change of the root bridge.
LN LCCH	ChLiv	Changes when the link status of the physical port changes.
LN LPCP	PhyHealth	Changes when the link status of the physical port changes.

Table 2: Statuses of the device that can be monitored with IEC 61850/MMS

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What is your opinion of this manual? We are constantly striving to provide as comprehensive a description of our product as possible, as well as important information to assist you in the operation of this product. Your comments and suggestions help us to further improve the quality of our documentation.

Your assessment of this manual:

	Very Good	Good	Satisfactory	Mediocre	Poor
Precise description	O	O	O	O	O
Readability	O	O	O	O	O
Understandability	O	O	O	O	O
Examples	O	O	O	O	O
Structure	O	O	O	O	O
Comprehensive	O	O	O	O	O
Graphics	O	O	O	O	O
Drawings	O	O	O	O	O
Tables	O	O	O	O	O

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Technical Questions

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