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Part 4: IP communication

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Partie 4: Communication IP

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Contents

Figures

Tables

Foreword

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The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

ISO/IEC 14908-4 was prepared by CEN/TC 247 and was adopted, under a special “fast-track procedure”, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by the national bodies of ISO and IEC.

ISO/IEC 14908 consists of the following parts, under the general title *Information technology — Control network protocol*:

— *Part 1: Protocol stack*

— *Part 2: Twisted pair communication*

— *Part 3: Power line channel specification*

Part 4: IP communication

Introduction

This International Standard has been prepared to provide mechanisms through which various vendors of local area control networks may exchange information in a standardised way. It defines communication capabilities.

This International Standard is used by all involved in design, manufacture, engineering, installation and commissioning activities.

The International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) draw attention to the fact that it is claimed that compliance with this International Standard may involve the use of patents held by Echelon Corporation

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INFORMATION TECHNOLOGY – CONTROL NETWORK PROTOCOL –

Part 4: IP communication

1 Scope

This International Standard specifies the transporting of the Control Network Protocol (CNP) packets for commercial local area control networks over Internet Protocol (IP) networks using a tunnelling mechanism wherein the CNP packets are encapsulated within IP packets. It applies to both CNP nodes and CNP routers.

The purpose of this International Standard is to insure interoperability between various CNP devices that wish to use IP networks to communicate using the CNP protocol.

The main body of this International Standard is independent of the CNP protocol being transported over the IP network. The reader is directed to Annex A and Annex B for the normative and informative, respectively, aspects of this specification that are specific to ISO/IEC 14908-1.

Figure 1 shows a possible configuration of such CNP devices and networks connected to an IP network.

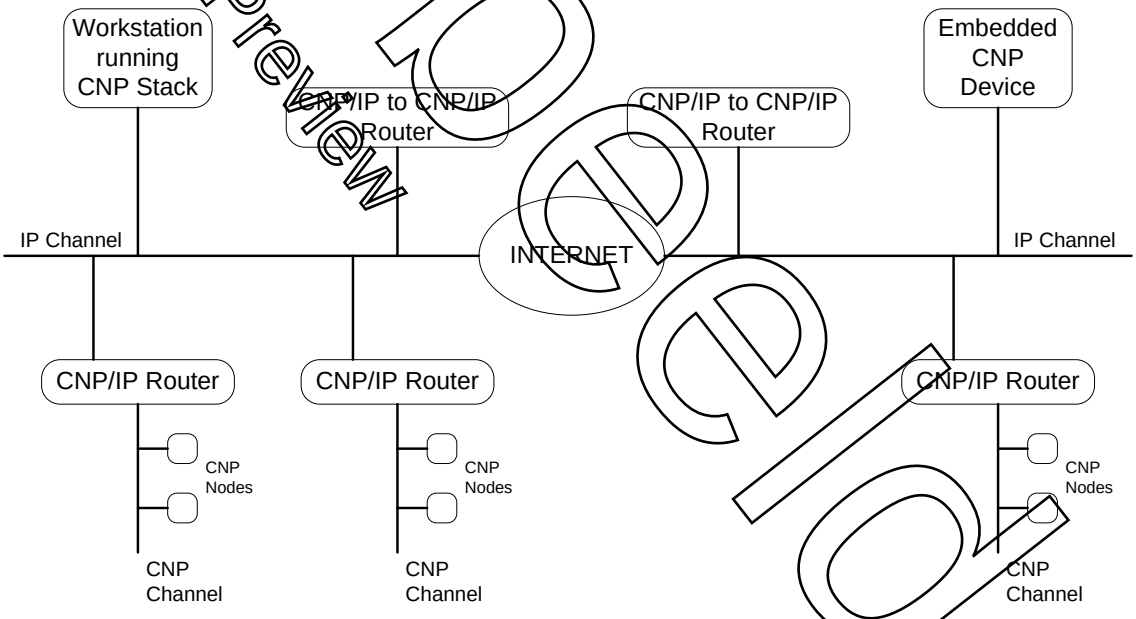

Figure 1 — Typical CNP/IP application

Figure 1 depicts two types of CNP devices: CNP nodes and CNP routers. It should be noted that the routers shown can route packets between typical CNP channels (such as twisted pair or power line) and an IP channel or it can route CNP packets between two IP channels. In this International Standard the IP channel will be defined in such a way to allow it to be used like any other CNP channel.

In the above diagram the IP network can be considered to be one or more IP channels. This International Standard covers only how CNP packets are transported over IP channels. It does not cover how CNP packets are routed between standard CNP channels and IP channels. This specification is not intended to cover the lower layers (physical, MAC and link layers) of either standard CNP or IP channels.

2 Normative references

None.

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
tunneling
encapsulation of one protocol's packet within the payload of another protocol's packets

3.1.2
channel
common communications transport mechanism that a specific collection of CNP devices share and communicate over without the use of a router

NOTE 1 Channels are used to transport CNP packets below the link layer of the CNP protocol stack.

NOTE 2 Typically this refers to some type of physical media such as power line, RF, or twisted pair, but in the case of IP networks this channel is not physical, but a protocol tunnel.

3.1.3
CNP device
device that uses the CNP protocol to communicate with other CNP devices

NOTE Specifically a CNP/IP device is a CNP device that communicates with other CNP devices over an IP channel.

3.1.4
CNP router
special type of CNP device that routes CNP protocol packets between two or more channels

NOTE Specifically a CNP/IP router is a CNP router in which at least one of the channels it routes packets over is an IP channel.

3.1.5
CNP node
special type of CNP device that can send or receive CNP protocol packets, but does not route them between channels

NOTE 1 Specifically a CNP/IP node is a CNP node in which at least one of the channels it sends and receives packets over is an IP channel.

NOTE 2 All CNP devices are either routers, nodes or both.

3.1.6
CNP group
collection of CNP devices that share a common multicast address

3.1.7
node ID
logical network address that differentiates nodes within the same subnet or domain

3.1.8
Must Be Zero (MBZ)
reserved field that may be used in the following versions of the protocol

NOTE Such fields shall be sent as zero and ignored by the receiver in implementations conforming to the current version of the specification.

3.2 Abbreviations

CTP Channel Timeout Period

CNP Control Network Protocol

LFS Last Forwarded Sequence

MBZ Must Be Zero

NTP Network Time Protocol

PSN Packet Sequence Number

SA/DA Source Address / Destination Address

SID Session Identifier

SNTP Simple Network Time Protocol

UDP User Datagram Protocol

4 Requirements

The following is a set of general requirements for the transporting of CNP packets over IP channels:

— be as efficient as possible to allow quasi real-time operation;

— be independent of the application level interface used to receive the packets. For example the tunnelling protocol should not rely on the existence of a socket interface or how that interface may be used;

— insure that CNP packet ordering is preserved;

— insure that CNP packets that are “stale” (outside the maximum timeout characteristics of the IP channel) are not forwarded;

— detect packets that get duplicated in the IP network;

— support IP routing devices that prioritise IP packets;

— optional security measures to prevent malicious users from tampering with devices;

— scalable;

— allow status information to be extracted from CNP/IP devices;

— support the exchange of configuration information between CNP/IP devices and configuration servers.

5 CNP/IP device specification

5.1 IP Related device specifications

A CNP/IP device shall behave like any standard IP host capable of exchanging IP packets with any other IP host either on the same IP subnet or anywhere else in the Internet cloud. A CNP/IP device shall have a single unicast IP address and may be capable belonging to as many as 32 multi-cast groups. It is optional that a CNP/IP device support multi-casting. This document does not address the routing of IP packets between subnets or through the Internet. The CNP/IP devices shall be compatible with whatever standard mechanisms (IP routers, switches etc.) are required to perform the IP routing functions.

5.2 CNP related device specifications

5.2.1 Packet formats

The general format of CNP packets which are tunnelled over the IP channel are those packets that are received from or sent to the Link layer (layer 2) of the CNP protocol stack. Refer to Annex A for a precise specification of the packet formats corresponding to the CNP protocol.

5.2.2 Addressing schemes

Different CNP protocols generally use different addressing schemes to exchange packets. Although it is generally not necessary to understand the contents of a CNP packet or its addresses in order to tunnel CNP packets over IP, some aspects of the CNP addressing scheme are reflected in the process of configuration. This is especially true when it comes to setting up the IP channels that are used for tunnelling. Since CNP protocols use different addressing schemes the terminology used in the main body of this specification for describing addresses are meant to be general and rich enough to describe the superset of addressing schemes used in all CNP protocols. The following CNP addressing terms are used in this specification.

— Unique ID. This refers to an ID that is globally unique to all devices within a specific protocol. Unique ID's are generally fixed in nature in that they never change through the life of a device.

— Domain. This is the highest level of a three level hierarchical addressing scheme. Domain ID's should be unique within a particular network. This means that in a particular network where Domains are used if two devices have the same Domain ID they belong to the same Domain. Domain ID's are generally logical in nature and can be changed and configured.

— Subnet. This is the middle level of a three level hierarchical addressing scheme. Subnet ID's should be unique within a particular domain. This means that in a particular network where subnet ID's are used if two devices have the same Domain ID and the same Subnet ID then they belong to the same Subnet. Some CNP's do not use Domains in which case the Subnet may be the highest level of address for a device. Subnet ID's are generally logical in nature and can be changed and configured.

— Node. This is the lowest level of any hierarchical addressing scheme. Node ID's should be unique within a particular Subnet. No two devices within the same subset should have the same Node ID. Node ID's are generally logical in nature and can be changed and configured.

— Group. Groups are an orthogonal addressing scheme to the hierarchical Domain/Subnet/Node triplet just described. Groups are used to allow multi-casting of messages. Some CNP's may not support group addresses and even those that do will have different rules for how they relate to the other addressing schemes. These considerations are not relevant to this specification.

The definitions above are fairly general and are provided as a guideline for how to map the CNP protocol to these terms. In general how the various addressing schemes work within a CNP protocol are not relevant to this specification. It is only necessary to know what the various addressing terms refer to.

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