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First edition  
2005-06

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**Real-time Ethernet Vnet/IP™ specification**

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**Real-time Ethernet Vnet/IP™ specification**

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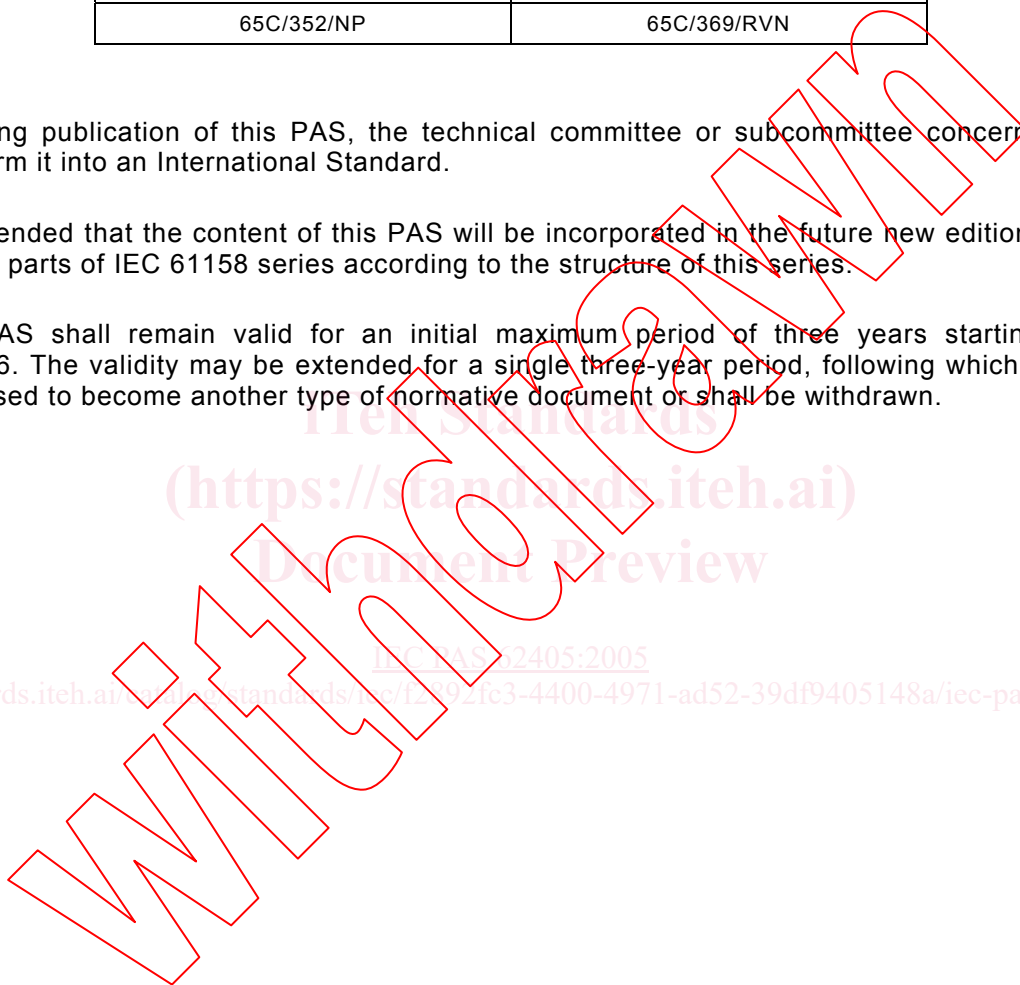
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# Real-time Ethernet Vnet/IP™ specification

## Section 1: Overview

This PAS has been divided into five sections.

Section 1: Overview

Section 2: Application Layer Service definition

Section 3: Application Layer protocol specification

Section 4: Data Link Layer Service definition

Section 5: Data Link Layer protocol specification

### 1 Introduction

The Vnet/IP is designed for highly reliable real-time communication, and applies to the operation of process control systems. The process control system consists of many controllers, human-machine interfaces, process monitors, and gateways to external networks which are connected to Ethernet-based IP networks. The data transfer between these devices is performed by peer-to-peer or multicast communication.

It is required that the process control system responds within a deterministic time. At the same time, it is also required that multi-vendor's multi-devices can be connected to the same IP network. For example, the process control system shall handle operational signals for the actuator within a determined time and needs to communicate with other devices connected to Ethernet-based IP networks to exchange non-realtime information such as files and images.

The Vnet/IP realizes these two conflicting requirements on the same network using a unique technology as described in this PAS.

### 2 Scope and objective

This PAS describes the communication profile of the whole Vnet/IP, services of each layer and the specifications of the protocols for each layer.

### 3 Structure of this document

Section 1 of this PAS presents an overview of and guidance for the Vnet/IP Specification. It also explains the structure and content of the Vnet/IP Specification and shows how to use each section of the document. In addition, it specifies the communication profile of the Vnet/IP.

Sections 2 and 3 present the Vnet/IP Specification for the Application Layer, and Sections 4 and 5 for the Data Link Layer. This PAS refers the appropriate international standards for the specifications of other layers.

The Data Link and Application Layers are described in complementary ways, in terms of the services offered and the protocol which provides those services.

Table 1 shows the differences between service and protocol viewpoints of the Data Link and Application Layers. The protocol parts show the layer implementer's view and the service parts show the layer user's view.

**Table 1 – Concept of DL/AL to separate service and protocol parts**

<b>Layer user Oriented view</b>	<b>Layer implementer Oriented view</b>
<b><u>AL Services (Section 2 of this PAS)</u></b> - Model and concepts - Data type definitions - Application objects - Service description - Communication endpoint management.	<b><u>AL Protocol (Section 3 of this PAS)</u></b> - Syntax definition and coding - Application relationships procedures - Protocol machines (state machines)
<b><u>DL Services (Section 4 of this PAS)</u></b> - Model and concepts - Service description - Management services	<b><u>DL Protocol (Section 5 of this PAS)</u></b> - Coding - Protocol machines (state machines)

The Application Layer structure is as follows:

- “What” is described by Application Service Elements (ASE); and
- “How” is described by Application Relationships (AR).

The Data Link Layer structure is as follows:

- “What” is described by Data Link services and models; and
- “How” is described by Data Link protocol machines and medium access principles.

#### 4 Normative reference

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For all other undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61158-1:2003, *Digital data communications for measurement and control – Fieldbus for use in industrial control systems – Part 1: Overview and guidance for the IEC 61158 series*

IEC 61158-3:2003, *Digital data communications for measurement and control – Fieldbus for use in industrial control systems – Part 3: Data link service definition*

IEC 61158-4:2003, *Digital data communications for measurement and control – Fieldbus for use in industrial control systems – Part 4: Data link protocol specification*

IEC 61158-5:2003, *Digital data communications for measurement and control – Fieldbus for use in industrial control systems – Part 5: Application layer service definition*

IEC 61158-6:2003, *Digital data communications for measurement and control – Fieldbus for use in industrial control systems – Part 6: Application layer protocol specification*

ISO/IEC 7498 (all parts), *Information technology – Open Systems Interconnection – Basic Reference Model*

ISO/IEC 10731, *Information technology – Open Systems Interconnection – Basic reference model – Conventions for the definition of OSI services*

ISO/IEC 9545:1994, *Information technology – Open Systems Interconnection – Application Layer structure*

ISO/IEC 8824-2:2002, *Information technology – Abstract Syntax Notation One (ASN.1): Information object specification*

ISO/IEC 8825-1:2002, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*