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Telecontrol equipment and systems - Part 6: Telecontrol protocols compatible with ISO standards and ITU-T recommendations - Section1: Application context and organization of standards

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Matériels et systèmes de téléconduite - Partie 6: Protocoles de téléconduite compatibles avec les normes ISO et les recommandations de l'UIT-T - Section 1: Contexte applicatif et organisation des normes

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Part 6:
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

TELECONTROL EQUIPMENT AND SYSTEMS –

Part 6: Telecontrol protocols compatible with ISO standards and ITU-T recommendations – Section 1: Application context and organization of standards

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international cooperation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of the IEC on technical matters, prepared by technical committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

3) They have the form of recommendations for international use published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical report of one of the following types:

– type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

– type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an International Standard;

– type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

Technical reports of types 1 and 2 are subject to review within three years of publication to decide whether they can be transformed into International Standards. Technical reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

IEC 870-6-1 which is a technical report of type 3, has been prepared by IEC technical committee 57: Power system control and associated communications.

The text of this technical report is based on the following documents:

Committee draft	Report on voting
57(Sec)146	57(Sec)179

Full information on the approval of this technical report can be found in the report on voting indicated in the above table.

The objective of this report is to define the application context and the organization of standards in the field of telecontrol protocols compatible with ISO and ITU-T publications.

The chapter "Introduction" of this report gives an overall presentation of the documents.

This report is a Technical Report of type 3 and is of a purely informative nature. It is not to be regarded as an International Standard.

INTRODUCTION

This introduction shows the place of part 6 within IEC 870 and gives an overview of its organization and contents.

The IEC 870 "Telecontrol Equipment and Systems" series is composed of six major parts, of which part 6 (IEC 870-6), is concerned with "Telecontrol Protocols Compatible with ISO and ITU-T Standards". The aim of part 6 is the standardization of Functional Profiles for electric power systems. These FPs are to provide the means for specifying complete, coherent, working systems for end-to-end communication and interworking.

General organization

Part 6 consists of three major components, as follows:

- *Section 6.1*: This first document establishes the overall context of part 6, describing exactly what part 6 is to contain, what format it will take, and the application and communication context to which it applies. This includes document structure, domain of application, requirements, reference communication network configurations, and the form in which the standards will be developed.
- *Sections 6.2-6.4*: Description of the OSI Layers, base standards, and network management; guidelines and directions for the use of base standards within the context of part 6.
- *Section 6.5 onwards*: Functional Profiles; the description of how to use standards from the different layers to implement a well-defined function. It is the Functional Profiles which will become standards.

As it is not possible to predict the evolution of application needs and/or communication network technology which may take place, the structure of part 6 is open to allow the addition of FPs as necessary. For this reason, the FPs appear as individual Sections at the end. They can thus be developed and voted on individually as needed.

Detailed organization

Section 6.1

This section sets the application context and presents the requirements which are to be met. It gives the functional and performance framework within which the protocols exist.

It describes the basic reference configurations for which Functional Profiles are to be defined. This includes the configurations of End Systems and Intermediate Systems. The configurations are shown in the telecommunications environment to which they apply.

Finally, this section contains the definition of the Functional Profiles (FP). It describes the classification scheme, the manner of defining a FP, and the list of the FPs to be developed.

This section is thus an introduction and guide to the overall planned content of part 6 which describes:

- the application context to which the standards of part 6 apply,
- the reference communications configurations to be considered,
- the form in which the standards are to be developed (FPs), and
- the set of FPs to be developed.

This is a report, not a standard.

Sections 6.2 - 6.4

The following three sections (6.2 - 6.4) are organized following the 7-layer OSI Reference Model. Because there is a strong interdependance in the choice of protocols in the three lowest layers, these layers are grouped in a clause of section 6.2. Within this clause, the organization is according to the type of Transmission Network.

Sections 6.2 - 6.3 are organized according to the layers of the OSI model. Each contains the following elements:

- Introduction – briefly describing the layer's function and role in the overall communication process.
- Reference Documents
- Services:
  - list of services and QOS parameters included in the standards,
  - specification of which of these services and parameters must/may be provided.
- Protocol:
  - list of protocol classes, subsets, etc. included in the relevant standards,
  - specification of those classes, subsets,etc, which must/may be provided.

Section 6.3 includes a description of the manner in which application software interacts with the application layer and management function to implement interworking with one or more other End Systems.

Section 6.4, concerning network management, specifies the operation of this function which monitors and reports on the function, activity, and operational structure of each layer. It:

- communicates this information to the application software, and
- provides the means for the application software to control the functioning of the different layers as a network manager (as opposed to a network user).

Section 6.5 onwards

These sections contain specific Application Layer standards as well as the actual Functional Profiles developed as standards within the framework of IEC 870-6. The numbering plan of these sections is as follows:

Sections	6.500 - 6.599:	Specific Application Layer standards
	6.600 - 6.699:	Transport Profiles
	6.700 - 6.799:	Application Profiles
	6.800 - 6.899:	Interchange Format and Representation Profiles
	6.900 - 6.999:	Relay Profiles

The concept of a *Functional Profile* is presented briefly in the following paragraphs. A more detailed description, including the breakdown into the four classes (Transport, Application, Interchange Format and Representation, Relay) is given in clause 3 of this document.

The concept of Functional Profiles

While the basic family of OSI services and protocols provides a flexible set of alternatives for use in a wide variety of applications, individual areas of an application require specifically tailored sets and subsets of the standards. The approach to the definition of these specific sets and subsets, used by numerous standards-setting and client bodies, is that of Functional Profiles.

Their purpose is to make a recommendation as to when and how certain information technology standards should be used to meet an identified need. An FP does not alter the standards to which it refers, but makes explicit the relationships among a set of standards used together for a specific domain of activity. It may also specify particular details of the standards involved.

The FP approach subdivides the overall work into sub-units which are, individually, functionally complete, testable, and useable. This facilitates the finalizing and voting on useable individual standards on a shorter time scale.

The specification and application of conformance testing procedures are also simplified in this way.

The resulting standards can then be progressively integrated into the overall communication needs of telecontrol, automation, and administration of electrical networks.

GLOSSARY

This Glossary contains terms specific to IEC 870-6-1 and which are not contained in IEC 870-1-3[1].

– Profile (see ISO 10000-1): A Set of one or more base standards, and, where applicable, the identification of chosen classes, subsets, options and parameters of those base standards, necessary for accomplishing a particular function.

– Protocol Implementation Conformance Statement (PICS) (see ISO/IEC 9646-1): A statement made by the supplier of an OSI implementation or system, stating which capabilities and options have been implemented, for a given OSI protocol.

– PICS Proforma (see ISO/IEC 9646-1): A document, in the form of a questionnaire, designed by the protocol specifier or conformance test suite specifier, which when completed for an OSI implementation or system becomes the PICS.

– STATIC conformance requirements (see ISO/IEC 9646-1): Constraints which are specified in OSI standards to facilitate interworking by defining the requirements for the capabilities of an implementation.

– Dynamic conformance requirements (see ISO/IEC 9646-1): All those requirements (and options) which determine what observable behavior is permitted by the relevant OSI standard(s) in instances of communication.

– Base standard (see ISO 10000-1): A published Standard (International Standard, ITU-T Recommendation) which is used in the definition of a profile.

[1] References are listed in "Reference documents".

ABBREVIATIONS

The following abbreviations apply within IEC 870-6-1.

ASE	Application Service Element (see ISO 7498-1) [2]
CLNS	Connectionless-mode Network Service (see ISO 10000-2)
CLTS	Connectionless-mode Transport Service (see ISO 10000-2)
CONS	Connection-mode Network Service (see ISO 10000-2)
COTS	Connection-mode Transport Service (see ISO 10000-2)
FP	Functional Profile
GOSIP	Government Open Systems Interconnection Profile [used both for US and UK profiles]
ISP	International Standardized Profile (see ISO 10000-2)
PAS	Power Application Software
PICS	Protocol Implementation Conformance Statement (see ISO/IEC 9646-1)
SCADA	Supervisory Control and Data Acquisition
QOS	Quality of Service

[2] References are listed in "Reference documents".

REFERENCE DOCUMENTS

IEC 870-1-3: 1990, *Telecontrol equipment and systems – Part 1: General considerations – Section 3: Glossary*

IEC 870-4: 1990, *Telecontrol equipment and systems – Part 4: Performance requirements*

IEC 870-5, *Telecontrol equipment and systems – Part 5: Transmission protocols*

IEC 870-6, *Telecontrol equipment and systems – Part 6: Telecontrol protocols compatible with ISO and ITU-T standards*

ISO 7498: 1984, *Information processing systems – Open Systems Interconnection – Basic Reference Model*

ISO 7498-2: 1989, *Information processing systems – Open Systems Interconnection – Basic Reference Model – Part 2: Security Architecture*

ISO/IEC 7498-4: 1989, *Information processing systems – Open Systems Interconnection – Basic Reference Model – Part 4: Management framework*

ISO/IEC 8073: 1992, *Information technology – Telecommunications and information exchange between systems – Open Systems Interconnection – Protocol for providing the connection-mode transport service*

ISO/IEC 8208: 1990, *Information technology – Data communications – X.25 Packet Layer Protocol for Data Terminal Equipment*

ISO 8326: 1987, *Information processing systems – Open Systems Interconnection – Basic connection oriented session service definition*

ISO 8327: 1987, *Information processing systems – Open Systems Interconnection – Basic connection oriented session protocol specification*

ISO 8473: 1988, *Information processing systems – Data communications – Protocol for providing the connectionless-mode network service*

ISO 8649: 1988, *Information processing systems – Open Systems Interconnection – Service definition for the Association Control Service Element*

ISO 8650: 1988, *Information processing systems – Open Systems Interconnection – Protocol specification for the Association Control Service Element*

ISO/IEC 8802-3: 1993, *Information technology – Local and metropolitan area networks – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

ISO 8822: 1988, *Information processing systems – Open Systems Interconnection – Connection oriented presentation service definition*

ISO 8823: 1988, *Information processing systems – Open Systems Interconnection – Connection oriented presentation protocol specification*

ISO 8878: 1992, *Information technology – Telecommunications and information exchange between systems – Use of X.25 to provide the OSI Connection-mode Network Service*

ISO 9040: 1990, *Information technology – Open Systems Interconnection – Virtual Terminal Basic Class Service*

ISO 9041, *Information technology – Open Systems Interconnection – Virtual Terminal Basic Class Protocol*

ISO/IEC 9506-1: 1990, *Industrial automation systems – Manufacturing Message Specification – Part 1: Service definition*

ISO/IEC 9506-2: 1990, *Industrial automation systems – Manufacturing Message Specification – Part 2: Protocol specification*

ISO/IEC 9594, *Information technology – Open Systems Interconnection – The Directory – Parts 1-8*

ISO/IEC 9646-1: 1991, *Information technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 1: General concepts*

ISO/IEC 9646-2: 1991, *Information technology – Open Systems Interconnection – Conformance testing methodology and framework – Part 2: Abstract test suite specification*

ISO/IEC TR 10000-1: 1992, *Information technology – Framework and taxonomy of International Standardized Profiles – Part 1: Framework*

ISO/IEC TR 10000-2: 1992, *Information technology – Framework and taxonomy of International Standardized Profiles – Part 2: Taxonomy of OSI Profiles*

ISO/IEC 10021-1: 1990, *Information technology – Text Communication – Message-Oriented Text Interchange Systems (MOTIS) – Part 1: System and Service Overview*

ITU-T*) X.25: *Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to PDNs by dedicated circuit (1984 version) (Fascicule VIII.2)*

ITU-T*) X.400: 1993, *Message handling system: Message handling system and service overview*

ITU-T*) X.500: 1993, *The directory – Overview of concepts, models and services*

*) Formerly CCITT.

TELECONTROL EQUIPMENT AND SYSTEMS –

Part 6: Telecontrol protocols compatible with ISO standards and ITU-T recommendations – Section 1: Application context and organization of standards

1 Statement of requirements

A clear distinction needs to be made between two different considerations.

First, the needs of the application functions and, second, the resulting communication functional and performance requirements to meet these needs.

Subclause 1.1 describes the application functions and their associated data transmission requirements.

Subclause 1.2 presents the communication functional requirements.

Subclause 1.3 details the communication performance requirements.

1.1 *Application functional requirements*

Telecontrol systems are structured hierarchically as shown in figure 1. The representation in the figure is independent of actual system implementation and shows only logical links between stations and control centres. Besides vertical process data communication there is also horizontal communication between control centres of the power utility and between control centres of different power utilities. Note that the figure shows the base reference configuration, it does not pretend to show all possible solutions. In actual systems some control centres may be missing or have combined functions.

Table 1 shows typical control functions allocations to control centres. Not all functions may be implemented. Table 2 provides an example of the basic timing, data and processing characteristics for these functions.

The application functions, with their associated data communication needs, imply a certain number of requirements to be fulfilled by the communication system. These include, for example:

- ability to establish communication with one or several other applications;
- data throughput, maximum transmission delay;
- data integrity;
- security, availability, and reliability;
- provision of building-block communication services such as file transfer, messaging, etc.

Subclauses 1.2 and 1.3 describe, respectively, communication functional and performance requirements which derive from these needs.

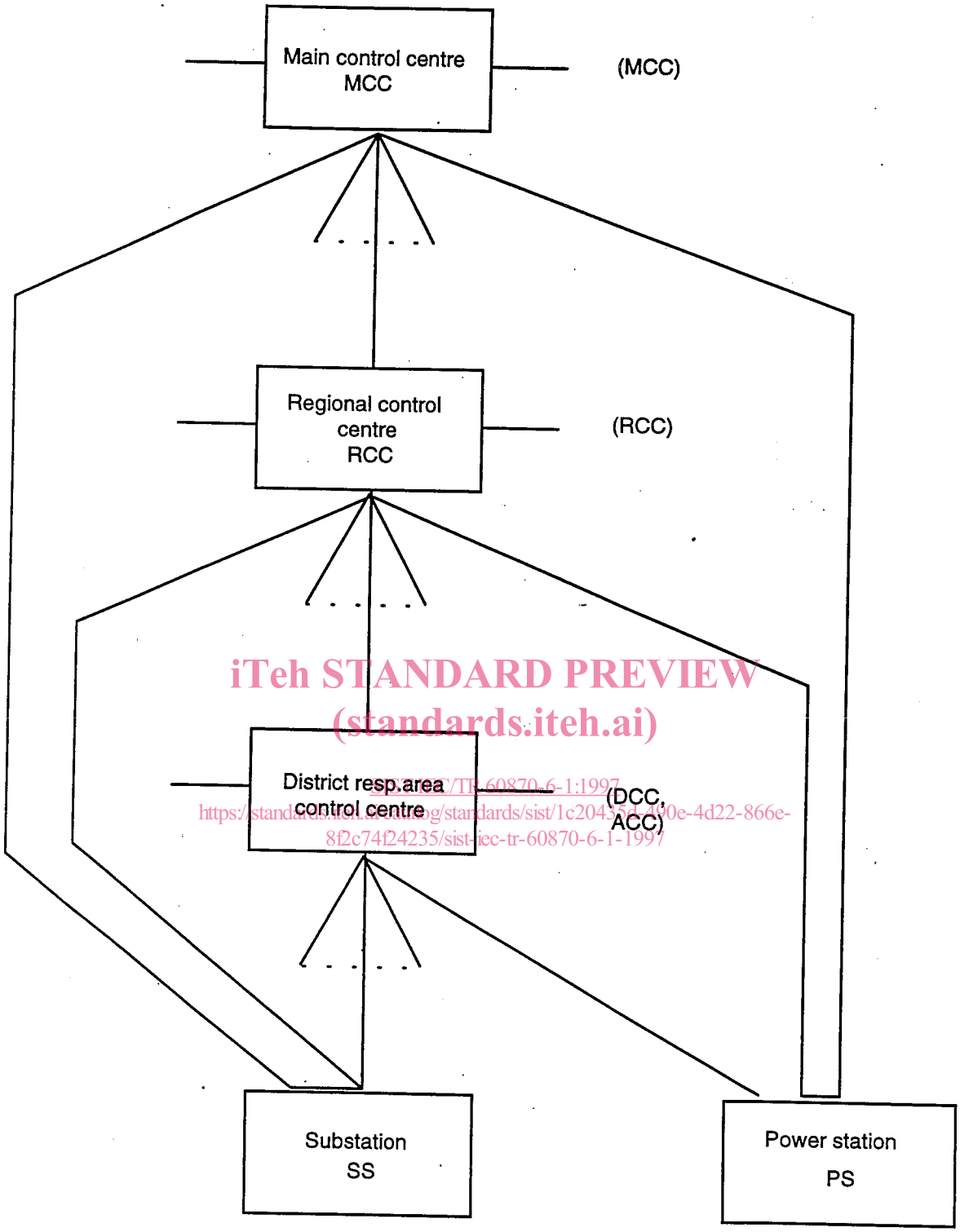

Figure 1 – Control system basic reference configuration