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MAN-MACHINE LANGUAGE

DATA ORIENTED HUMAN-MACHINE INTERFACE SPECIFICATION TECHNIQUE – INTRODUCTION

ITU-T Recommendation Z.351

(Previously “CCITT Recommendation”)

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation Z.351 was revised by the ITU-T Study Group X (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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SUMMARY

The Z.350-Series Recommendations provide a specification technique for the human-machine interface. This interface is known as the G- interface of the Telecommunications management network functional architecture. The scope of the G-interface is defined to include the human readable specification of the common terminology and grammar and of each external presentation, as well as the external presentations themselves. See Recommendation Z.352. The centralization of a common terminology and grammar ensures a harmonized human-machine interface across every external presentation.

The Z.350-Series Recommendations are provided to resolve problems which are encountered when using the specification technique recommended in Recommendations Z.331 to Z.333. The main deficiency was lack of means to provide consistent and precise definitions of all the data encountered at the human-machine interface (HMI). The Z.350-Series Recommendations supersedes the specification technique provided in Recommendations Z.331 to Z.333 and should be used for all future development of specifications.

This new specification technique is expected to provide a powerful framework for the development of future HMIs.

DATA ORIENTED HUMAN-MACHINE INTERFACE SPECIFICATION TECHNIQUE – INTRODUCTION

(Helsinki, 1993)

1 Scope

This Recommendation introduces the Z.350-Series Recommendations, which defines the data oriented human-machine interface (HMI) specification technique.

This specification technique supersedes the specification technique provided Recommendations Z.331 to Z.333 and should be used for all future development of specifications.

2 Purpose

Objectives of the data oriented human-machine interface specification technique are as follows:

- to help develop unambiguous standards (for administrations and vendors);
- to facilitate specification of human–machine interfaces (HMIs);
- to expedite agreements on areas of standardization;
- to assist in the development of consistent HMI standards;
- to provide a basis for specifying compliance testing;
- to permit the development of automated design tools;
- to allow effective and more concise specifications.

3 Organization of the Z.350-Series Recommendations

The Z.350-Series consists of the following Recommendations:

- Z.351 *Data oriented human-machine interface specification technique – introduction*
- Z.352 *Data oriented human-machine interface specification technique – scope, approach and usage*

Recommendation Z.351 introduces the specification technique, defines its purpose and users, explains the structure of the associated Recommendations and provides abbreviations and glossary.

Recommendation Z.352 defines the scope and approach of the technique. These aspects are fundamental to the understanding and application of the technique. This Recommendation also introduces a three-layer reference model for HMI. These layers are known as the HMI external layer, HMI application layer and HMI internal layer. The external layer is concerned with both the contents and presentation of actual HMIs. The application layer is concerned with the specification of the terminology and grammar at the HMI; the contents of a specific external presentation is derived from the application layer. The internal layer is concerned with the storage and management of data. A method and guidelines for data design are provided in Annex A/Z.352.

4 Users of the Z.350-Series Recommendations

The ultimate beneficiary of these Recommendations will be the end users at the VDT. It was the needs of this user that provided the requirements used by the specification developers. The end user may need to understand some of the notions of the reference model and formalism. However, it is unlikely that the end user will read the exact text of this series or even know of its existence.

The users of these Recommendations are

- standards developers;
- system specifiers;
- system implementors.

The system specifiers, who may belong to either vendor or purchaser organizations, should be familiar with all sections of the Recommendations, whereas readers of the specifications need not be aware of the appendices.

5 Abbreviations

For the purpose of this Recommendation, the following abbreviations apply

AS	Application schema
CS	Contents schema
EDP	Electronic data processing
ES	External schema
HMI	Human-machine interface
IS	Internal schema
LS	Layout schema
OAM	Operation, administration and maintenance
TMN	Telecommunications management network
VDT	Visual display terminal

6 Glossary

For the purpose of this Recommendation, the following defintions apply.

application area

F: domaine d'application
S: area de aplicación

An application area is a collection of resources which are closely related from the perspective of management. It is specified precisely by the associated application schema.

application layer

F: couche application
S: capa de aplicación

The application layer is that layer of the HMI reference model which is concerned with the definition of data and their behaviour.

application population

F: population d'application
S: población de aplicación

The application population contains the instances whose consistency is enforced by the application process according to the rules expressed in the corresponding application schema.

application process

F: processus d'application
S: proceso de aplicación

The application process implements the enforcement of the rules found in an application schema on the data instances in a corresponding population. Also, the application process communicates data between the application layer and external and internal layers.

application schema

F: schéma d'application
S: esquema de aplicación

The application schema contains the data definitions, including constraints and derivation rules for corresponding population data of the application area. An application schema prescribes the terminology and grammar for an application area.

attribute

F: attribut
S: atributo

The subordinate data to object classes which are not themselves object classes are attribute classes. All instantiated data of an attribute class are attributes. Subordinate data to attributes may themselves be attributes.

behaviour

F: comportement
S: comportamiento

Behaviour comprises constraints on data and rules for deriving new data from existing data. Functions are provided to state the constraints and derivation rules.

class

F: classe
S: clase

The data in the schema are referred to as classes relative to their instances in the population.

contents schema

F: schéma de contenu
S: esquema de contenido

The contents schema specifies the structure of the selected data and their relationships for a specific presentation. Each contents schema is contained in one external schema. The contents schema can contain specifications of permissible manipulations of the data in this presentation.

data

F: données
S: datos

The contents of all schemata and populations are data.

external layer

F: couche externe
S: capa externa

The external layer handles the presentation and manipulation of data. It also handles mapping to and subsetting of the application data. The external layer can contain several external schemata of one application schema, the corresponding external populations, and external processes enforcing the appropriate external schema specifications for the instances of the actual external population.

external population

F: population externe
S: población externa

This is the selected population data, headings, icons and other presentations at the HMI. See also external schema.

external process

F: processus externe
S: proceso externo

The external processes implement the enforcement of the rules found in an external schema on the data instances in the corresponding external population. Also, the external processes take care of data in and out of this layer to the human user and the application layer.

external schema

F: schéma externe
S: esquema externo

The external schema contains the data definitions for the contents and layout of the corresponding population data at an actual human-machine interface. The data definitions can include constraints and derivation rules from the application schema. One external schema can contain data from one application schema only.

human-machine interface

F: interface homme-machine
S: interfaz hombre-máquina

The human-machine interface is defined to consist of the presentation and manipulation of the HMI population data, the HMI external schemata and the HMI application schema for an application.

identifier attribute

F: identificateur
S: atributo identificador

Some of the attributes of an object can be defined to be identifiers. More than one identifier can exist for a given object. The values of each of these alternative identifiers of an object, together with the values of one identifier from each recursively superior object, uniquely identifies the object within its object class. Instead of the full term identifier attribute, the term identifier can be used.

instance

F: instance
S: instancia

Data in a schema can be instantiated into becoming instances of the corresponding population.

instantiation

F: instanciation
S: instanciación

Instantiation derives and enforces instances according to rules in the corresponding schema by a process of copying.

internal layer

F: couche interne
S: capa interna

The internal layer is outside the scope of HMI. The layer is supposed to take care of the internal storage, accessing, implementation and communication of data and their behaviour.

layer

F: couche
S: capa

Each layer of the layered architecture is partitioned into schemata, processes and populations. Data of each layer are mapped to data of adjacent layers only.

layout schema

F: schéma de présentation
S: esquema de disposición, esquema de layout

The layout schema specifies the way in which the data are to be presented to the human user. Each layout schema is contained in an external schema.

object

F: objet
S: objeto

An object class can either be the root of a schema or be immediately subordinate to some object class in that schema. All instantiated data of an object class are objects. If something is an object, then its superior node is an object. Subordinate data to objects may themselves be objects.

population

F: population
S: población

A population contains the data instances according to the rules expressed in a corresponding schema.

population reference

F: référence de population
S: referencia de población

A reference from a certain schema node pointing out a population node. One schema can have several populations.

process

F: processus
S: proceso

A process implements the enforcement of the rules found in a schema on the data instances in a corresponding population.

reference

F: référence
S: referencia

A reference can be either one-way or two-way.

referenced object

F: objet référencé
S: objeto referenciado

The existence of an object can be made dependent on the existence of another object. This other object is called a referenced object.

schema

F: schéma
S: esquema

A schema contains the data definitions, including constraints and derivation rules for the corresponding population data.

schema reference

F: référence de schéma
S: referencia de esquema

A reference from a certain population node pointing out a schema node. One population can have several schemata, however each instance is populated from one class (of one schema) only. Hence, only single inheritance is instantiated.

schema-population reference

F: référence de schéma-population
S: referencia de esquema-población

Two-way reference pointing out a population and its corresponding schema.

single valuedness

F: valorisation simple
S: univalencia, unicidad de valor

Some attribute classes can be single valued. This means that each of the attributes of the attribute class can have only one value out of the subordinate alternative value classes of the attribute class.

specification

F: spécification
S: especificación

The schema data are collectively called specifications relative to the population data.

two-way reference

F: référence bidirectionnelle
S: referencia bidireccional

A two-way reference consists of two corresponding one-way references in opposite directions. If a two-way reference is defined in the schema, then the existence of one of the one-way references in a population will imply an automatic derivation of the other by an enforcement process.

value

F: valeur
S: valor

The data which are subordinate to an attribute class and which are not attribute classes are called value classes. All instantiated data of value classes are values.