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**SERIES Z: LANGUAGES AND GENERAL SOFTWARE
ASPECTS FOR TELECOMMUNICATION SYSTEMS**

Man-machine language – Human-machine interfaces for
the management of telecommunications networks

Graphic information for telecommunication management objects

ITU-T Recommendation Z.371



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ITU-T Recommendation Z.371

Graphic Information for telecommunication management objects

Summary

This Recommendation provides information about the way in which telecommunications resources are displayed at end-user workstations. In particular, it deals with graphical user interfaces and the information requirements for displaying telecommunications objects such as links and nodes.

Source

ITU-T Recommendation Z.371 was approved on 13 April 2005 by ITU-T Study Group 4 (2005-2008) under the ITU-T Recommendation A.8 procedure.

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Keywords

Graphic objects, human computer interface, human machine interface, user interface.

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Introduction

Telecommunications networks operators manage their infrastructure and services via user interfaces (UIs) to operating systems (OSs) and management applications. In the ITU-T M.3000 series Recommendations, this user interface is identified as the "G" interface. Work on standardizing various aspects of this vital interface has been undertaken by various standards bodies. Examples include ANSI T1.232, ISO 9241, and ITU-T Rec. Z.361. The "G" interface is critically important in the management of modern telecommunications networks. It is the primary view of the system available to the operator and the organization. Improper or inadequate design at this interface can result in significant problems in the network in terms of reliability and operational efficiency. This interface is referred to as a Human Machine Interface (HMI).

As telecommunications network technology becomes increasingly diverse, management issues have become more complex. This complexity requires improved and standardized network management system interfaces to increase the quality of service and reduce response times to customers.

This Recommendation provides information about the way in which real telecommunications network management objects are represented to the user on workstation screens, and the information that is made available to the operators.

ITU-T Rec. Z.371 (04/2005)

ITU-T Recommendation Z.371

Graphic information for telecommunication management objects

1 Scope

This Recommendation describes requirements for the "G" interface of the telecom operations environment. This "G" interface, identified in the ITU-T M.3000 series of requirements, specifically ITU-T Rec. M.3010 defines the interface between the user and the workstation often referred to as a Human Machine Interface (HMI). ITU-T Rec. M.3100, the Generic Information Model, specifies the objects and object classes that are relevant to information exchanged across standard interfaces in the architecture. In the model, objects at the "F" interface are translated into user management objects, and it is this subset that is relevant at the "G" interface. The objects in this Recommendation are the subset of M.3100 objects that are likely to be presented graphically on operators work station screens.

These HMI requirements are based on standard available information technology. They strive to maximize usability and interoperability of applications or products from different vendors.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [1] ITU-T Recommendation M.3100 (2005), *Generic network information model*.
- [2] ITU-T Recommendation M.3010 (2000), *Principles for a telecommunications management network*.
- [3] ITU-T Recommendation M.3300 (1998), *TMN F interface requirements*.
- [4] ITU-T Recommendation G.805 (2000), *Generic functional architecture of transport networks*.
- [5] ITU-T Recommendation G.7042/Y.1305 (2004), *Link capacity adjustment scheme (LCAS) for virtual concatenated signals*.
- [6] ISO/IEC 10164-2:1993, *Information technology – Open Systems Interconnection – Systems Management: State Management Function*.

3 Definitions

The following definitions are imported from other ITU-T Recommendations.

3.1 link (ITU-T Rec. G.7042/Y.1305 (2004)): A link can also be described as an entity that defines a topological relationship including available transport capacity between two nodes in different subnetworks. In a graphic screen picture, these links show up as the connections between nodes or network elements.

3.2 network element/managed element (ITU-T Rec. M.3100 (2005)): In this Recommendation, the term "Network Element" is used in a generic sense to represent managed elements.

3.3 trail (ITU-T Rec. G.805 (2000))

The following definitions are particular to this Recommendation.

3.4 domain: An administrative domain is a collection of managed entities grouped for administrative reasons.

3.5 management system: An entity that manages a set of managed systems, which can be either NEs, subnetworks, or other management systems.

3.6 visual presentation: Visual presentation includes the visual attributes: fill colour, pattern, shape, font, border colour and style, and drawing order.

3.7 alarm collection: Includes an indication of highest severity unacknowledged alarms and other alarms either acknowledged or of lesser severity. An alarm collection should be visible with no user action, or accessible by secondary mouse click and menu selection.

3.8 zoom: The increase or decrees of a geographic or network view while maintaining the same data context. In a network view, the user might be presented with a view of the network that expands to show more nodes across a larger area. Each step does not change the context of the data presented.

3.9 drill-down (expand, collapse): The change of levels of data and change in the data context. A graphical display changing from a province map, to a city view, to a building, a floor, an aisle, rack, and then the NE itself, is an example of a drill-down. Each step changes the context of the data presented. Double clicking an object is a form of drilling down.

4 Abbreviations

This Recommendation uses the following abbreviations:

2D	Two Dimensional
3D	Three Dimensional
ADM	Add, Drop Multiplexer
GUI	Graphical User Interface
HCI	Human Computer Interface
HMI	Human Machine Interface
ID	Identifier
LED	Light Emitting Diode
OC	Optical Connection
PVC	Permanent Virtual Connection
SVC	Shared Virtual Connection
TMF	Telemanagement Forum
UI	User Interface

5 Conventions

This Recommendation uses two specific markers which designate requirements and optionality.

(R) Designates those aspects which must be present if the application is to be considered compliant with this Recommendation.

(O) Designates optional aspects of this Recommendation. However, it should be noted that where appropriate, given the context, it is desirable for the HMI to use these aspects as well. Also note that there are cases where a component or area of a template may be optional, but if it is included, then there are required aspects to the included component.

6 HMI architecture

The "G" interface can be divided into the conceptual components shown in Figure 1. This architectural description provides an improved means of specifying and understanding the complex relationship between the system and the user. Figure 1 shows three different classes of user interface presentation elements, namely, task managers, generic elements, and telecommunications elements.

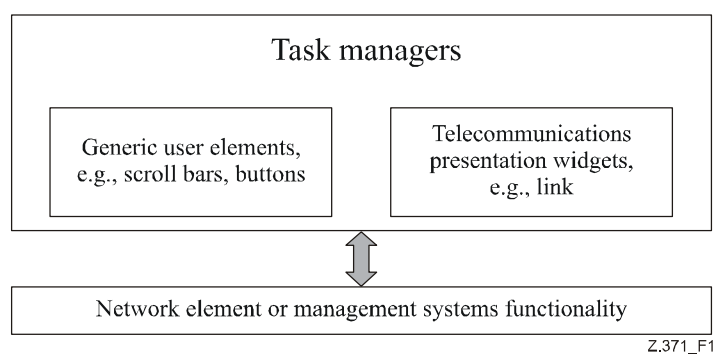


Figure 1/Z.371 – HMI components illustration

This Recommendation provides requirements for the telecommunications presentation elements in Figure 1. Task managers are created when user interface designers and system developers assemble the various data displays and controls required for the management of a particular piece of technology such as a SONET ring. These are very specific to the technology and are where many companies see competitive advantage. However, the presentation of telecommunications objects should have a degree of standardization in order that operators quickly and accurately recognize the nature of the resource, its state or condition, and its relationship to other resources.

6.1 Network element and service management system

The network element and service management component represent the software that makes up the management system and also the data about the network elements and their interconnection. This data is typically specified in the underlying information models, for example, ITU-T Rec. M.3000, *Overview of TMN Recommendations*.

6.2 Generic user interface objects

These are a set of elements such as buttons, windows, and scroll bars. These are defined by the specific user interface style or toolkit supported at the workstation (OSF Motif, Windows, JAVA Swing, etc.) and are aptly described in style guides provided by the manufacturer. These HMI elements are stable and common across the range of systems or products currently available in the

market place. This Recommendation is not a style guide and provides no information about these generic elements.

6.3 Telecommunications presentation objects

These are the set of telecommunications-specific objects such as network element symbols, link or connection graphics, and shelf level graphics. This Recommendation deals with the required information elements of these objects. There is a mapping between the system objects and the objects presented to the user. ITU-T Rec. M.3300 describes these objects as User Management Objects (UMOs) which are created in the workstation and which are then represented to the user via the "G" interface.

It is the role of the Presentation object to change the management objects and models into user objects and models suited to the people who have to operate the network. Users will require access to the complete set of information available about a network object that may be made accessible via an operating system or application. There will be a relationship, or binding, between the graphic object which appears on the screen, the UMO, and the managed object.

This Recommendation deals with the minimum subset of the information that is generic. This subset should be displayed on the screen when any particular object is visible. For example, when an operator views a network with a number of regions with different vendors' equipment, the regions should have a standard set of attributes and behaviours. Further when the region is opened, the contained network elements should appear with a standard set of information. In human factors terms, the user benefits are:

- Easy to learn and remember.
- Less likely to produce errors.
- More efficient in accomplishing goals.
- More pleasing to use.

These are universal objectives for user interface designers and are at the root of the justification for this Recommendation.

7 Telecom presentation views

7.1 Background

All network management systems rely on some level of human intervention, whether for difficult fault isolation and repair, or for complex configuration tasks. The types of displays that are appropriate to bring the information to the network operator are of various sorts. For instance, regular entry forms and table-based displays are common, though they are not specific to the telecommunications industry. On the other hand, network management applications will require network representations, interactions and navigation paradigms that are very specific to the industry. The definitions of those displays, or views, as well as the various types of objects that populate those displays are the concern of the following clauses.

A view is a rectangular space on a computer screen reserved for a coherent set of user interactions. In the old days, computer screens could only display a single, full screen view. However, with the advent of graphical user interfaces, the concept of an application window has been introduced, and one can generally conceive that a window contains a view. It is also possible to define several views coexisting inside a single window. For instance, one could imagine a window with an entry form to the left and a table to the right.