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DIRECTORY SERVICES

GUIDELINES FOR PROGRAMMING COMMUNICATION INTERFACES (PCIs) DEFINITION: SERVICE RECOMMENDATION

ITU-T Recommendation F.581

(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 F.581 was prepared by the ITU-T Study Group I (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 Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.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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GUIDELINES FOR PROGRAMMING COMMUNICATION INTERFACES (PCIs) DEFINITION: SERVICE RECOMMENDATION

(Helsinki, 1993)

1 Introduction

1.1 Today, telecommunication needs in the microcomputer world are quickly increasing.

ITU-T services are defined to meet these needs, but due to the technical and commercial context of the microcomputer world some concrete problems may arise.

a) *Technical aspects*

In some implementations communication equipment may be composed of hardware and software modules which come from various manufacturers. These modules must exchange information to provide the user with access to ITU-T services, but manufacturers may use different working methods and vocabularies.

Therefore, adding new software and hardware to existing configurations involves very detailed knowledge of different areas: telecommunication aspects, computer aspects, hardware and software aspects.

Setting up such equipment requires the help of experts, whereas using ITU-T services only requires a very basic knowledge of the technical aspects.

The consequence of such a situation is often a lack of integration of the communication dialogue with the local software dialogue.

b) *Commercial aspects*

Using hardware and software modules without standardized interfaces may mean buying software and hardware pieces designed to fit together well.

The definition of a public universal interface for a specific communication application (such as facsimile, Teletex, telex, etc.) gives to the user more freedom in the choice of the products.

Most of these difficulties regarding softwares may be solved by the standardization of public inter-application interfaces.

1.2 Interfaces allowing access to software providing a ITU-T communication service are called PCIs for "Programming Communication Interfaces*".

Two levels of PCIs are defined:

a) Application related interfaces which allow any local Application* (LA) to access any Communication Application* (CA). One example of an application related interface is the APPLI/COM, which is described in Recommendation T.611.

b) Network/Protocol related interfaces, which allow any LA or Communication Management Entity* (CME) to access any Lower Layer Module* (LLM). Network/Protocol related interfaces are under study.

NOTE – The definition of new terms indicated with (*) may be found in Annex A.

Examples are shown in Appendix I.

1.3 The information to be exchanged through the interfaces and the way to exchange them is subject to the PCIs technical Recommendations.

The exchange method describes the procedures that are performed to convey the information between software modules on each side of the interfaces.

2 Scope

2.1 General

2.1.1 This Recommendation gives guidelines from a service point of view for the definition of PCIs.

The applicability of PCIs requires the definition of:

a) the information to be exchanged through the interface. These messages are defined Operating System and programming language independent, but ITU-T service definition dependent. Therefore, they are defined in technical ITU-T Recommendations;

b) the way to convey (Exchange method) this information through the interface.

2.1.2 The main objective of this Recommendation is to define:

– the possible benefits of these PCIs;

– a common vocabulary for all PCIs definitions;

– a general functional model allowing all PCIs to work together if required;

– general rules to be taken into account in the definition of PCIs.

2.1.3 Technical definitions of PCIs are defined in related Recommendation(s):

T.611: Programming Communication Interface (PCI) APPLI/COM for Facsimile Group 3, Facsimile Group 4, Teletex and telex services.

NOTE – Other Recommendations are under study.

2.2 Applicability

The provision of Programming Communication Interfaces is not mandatory for participating in a ITU-T service.

The intention is to help developers by giving them general guidelines for the integration of ITU-T services in their products.

It must be kept in mind that PCIs leave a certain freedom to manufacturers, who may implement one or more of the possible PCIs and may extend them for private needs.

3 Possible benefits of the PCIs

Possible benefits which could be expected from the definition of the PCIs concern implementors, users and carriers. They are:

3.1 For implementors

a) PCIs help developers by providing them with common standardized interfaces. Implementors of Communication Applications* (CA) will find in PCIs Recommendations practical details concerning the implementation of standardized ITU-T services.

b) On the other hand, implementors of Local Applications (LA) will no longer need to become experts of telecommunication protocols.

c) For both categories, time taken to develop the implementation may be shortened and developments may become cheaper because developers will no longer need to adapt their products to many other products, whose features change frequently.

d) As another expected result, the PCIs might shorten the development of new applications as these applications could benefit from existing communication applications that comply with ITU-T service rules (provided these existing applications also conform to PCI).

NOTE – The definition of new terms indicated with (*) may be found in Annex A.

3.2 For users

a) The main expected result of using the PCIs is gaining uniformity in the use of ITU-T services. Thanks to the Programming Communication Interfaces, users will be able, for instance, to send a document using the facsimile service, telex service or the Teletex service without noticeable differences. However, service constraints described in related Recommendations are still applying.

b) PCIs are designed to provide the end user with the ability to set up, extend and use any type of machine configuration (i.e. stand-alone machines, LANs, etc.) in order to send and receive files using various ITU-T services in a very simple and uniform way.

NOTE – PCIs are not in competition with LANs standards.

PCIs provide the means to hide system, software and hardware variations from end-users, thus facilitating the use of ITU-T services.

3.3 For carriers

Traffic should increase as more equipment would offer communication features resulting from the universal interfaces, and users should be encouraged to communicate due to better dialogue ergonomics.

4 PCIs requirements

4.1 Independence

The functional definition of a PCI is independent of:

– the computer type, the operating systems and programming languages;

– the system configuration. It may be implemented in every case of machine configuration, e.g. stand-alone machines, LAN, etc.

Furthermore, the choice of a presentation of information, independent of operating systems and programming languages should allow PCIs to be easily portable from one operating system to another. The possible choices of programming languages are defined in the technical Recommendations.

4.2 Dependency

The functional definition of a PCI depends on the ITU-T services provided by the communication module to be accessed.

4.3 Flexibility

PCIs allow flexibility in implementations, for the sake of product differentiation. PCIs definition may include a submission mechanism which allows an application to request another for processing a specific function. In this case, PCIs technical Recommendations define the functions which should normally be performed by each application.

4.4 Extensibility

Private extensions are possible without jeopardizing the overall performance of the PCIs. Implementation documentation will specify how these extensions may be used by other application softwares. Technical Recommendations should provide for such extensions.

4.5 Multiple applications

Multiple software modules located above an interface may access one or multiple software modules located below the same interface. Since this requirement is operating systems dependant, it is completely managed by the PCI exchange method.

Procedures allowing a correct transfer of requests and responses between two applications should be independent of the physical location of these applications.

Multiple local applications may be interfaced to one or several communication applications.

4.6 Easy implementation and testing

The implementation of a PCI should be easy in order to gain a widespread acceptance.

It should give additional information for a better implementation of the concerned applications, in order to avoid errors. The testing of a PCI should be simple.

NOTE – Technical Recommendations should point out how a "real" implementation has to behave, and should give guidelines for implementors (in Appendix I).

5 General guidelines for defining PCIs

5.1 Location of the interface

As already stated in the introduction two general scopes of PCIs are defined, the Application related interfaces (located at the higher layers of the OSI model) and the Network/Protocol related interfaces (located at the network and protocol dependent layers). Non-OSI applications should be incorporated depending on the individual PCIs.

In order to avoid any misunderstanding, the ITU-T services, protocols, networks which are covered by the PCI must be clearly identified.

5.2 Functional description

The functions which can fulfill the interface should be described. The description of functionality shall be completely independent of the equipment.

5.3 Formal description

Messages interchanged through the interface should be described.

At this step, the interface definition is required to be equipment independent.

5.4 Presentation of the information

For application related interfaces the presentation of information (coding scheme) independent of operating systems and languages should be chosen. The description of this may form a part of technical Recommendations.

The description of the presentation of the information concerning network/protocol related interfaces is not necessarily independent of operating systems and languages. The description may be a part of the technical Recommendation, if it is operating and languages systems dependent. Otherwise, it may form an appendix. Technical Recommendations give more details on this aspect.

6 General functional model

The concept of Programming Communication interfaces covers two different levels of interfaces:

- application related interfaces, one example is the APPLI/COM interface T.611;
- network/protocol related interfaces, which are under study for the time being.

The interfaces are independent of each other and one may be specified/implemented on its own. Furthermore, one level may contain more than one interface, which may coexist independently of each other.

The location of each interface level relative to the other is given in Figure 1 "PCIs general model".

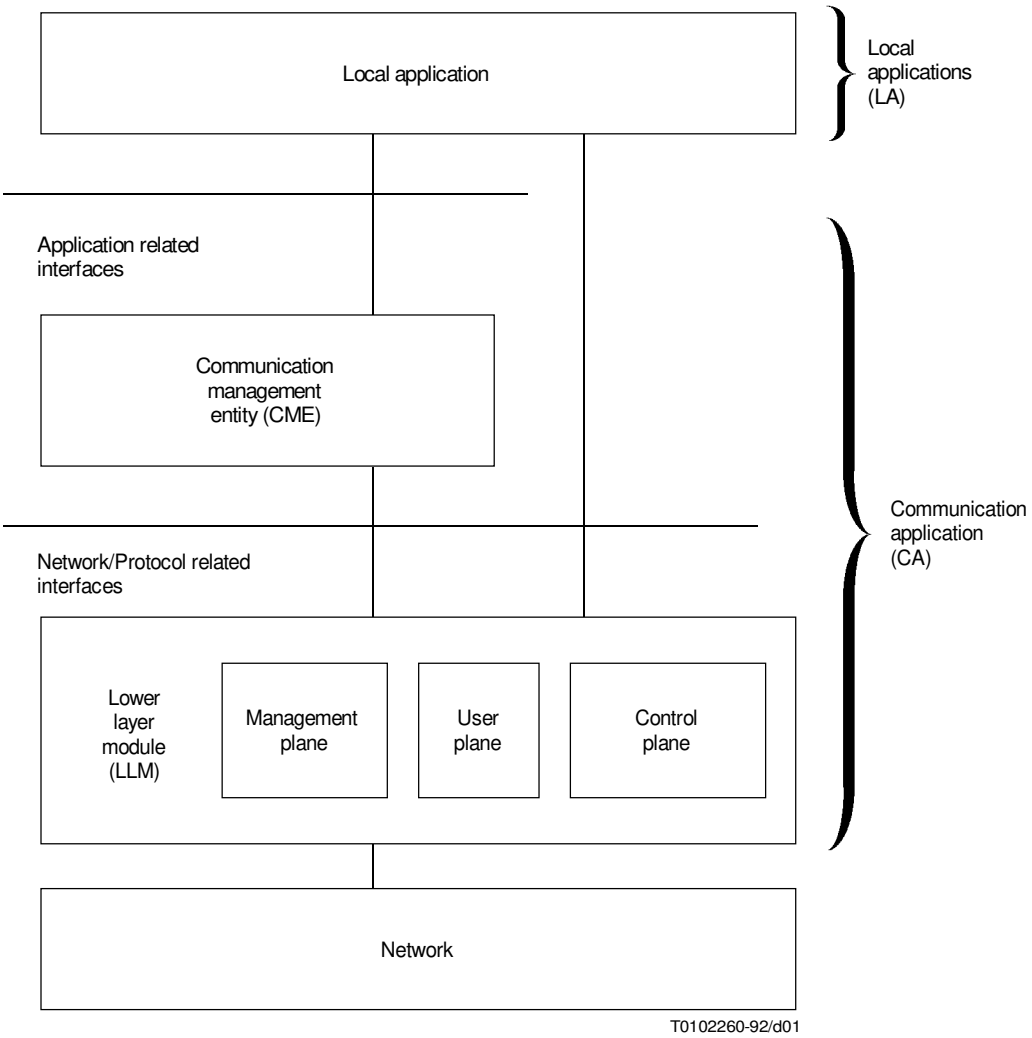


FIGURE 1/F.581

PCIs general model

7 Application related interfaces

7.1 Definitions

application related PCIs: Provide interfaces to access one or more ITU-T services. The interfaces are provided by the Communication Management Entity* (CME). The CME may use Network/Protocol related PCIs for ITU-T network and protocol access.

The functionality and behaviour of the interface shall effectively uncouple an application from ITU-T service properties.

NOTE – The definition of new terms indicated with (*) may be found in Annex A.

7.2 General features

Functionality and presentation of messages and the exchange method shall be designed independent of hardware and systems software whenever possible.

Application related interfaces may provide error handling capabilities and shall be able to be tested.

The functionality of application related PCIs may be task submission oriented.

8 Network/Protocol related interfaces

8.1 Definition

network/Protocol related PCIs: Provide interfaces to access one or more ITU-T Protocol and network. The software modules providing the interfaces are called Lower layer Modules* (LLM).

Network/Protocol related PCIs shall be designed most efficiently in terms of speed and size.

Protocol availability may be identified by Network/Protocol related PCIs.

NOTE – The definition of new terms indicated with (*) may be found in Annex A.

8.2 General features

The messages shall be designed to be independent of hardware and system software as far as the functionality is concerned. However, the presentation of the messages and the exchange method may depend to a large degree on the hardware and systems software.

The functionality of Network/Protocol related PCIs may be real-time oriented. It may be grouped into three planes:

a) management plane, presenting functionality regarding management of message exchange;

b) user plane, presenting functionality for accessing protocol stacks and management of the communications data stream;

c) control plane, presenting functionality for network control and signalling. In the case of in-band-signalling this plane is empty.

Annex A

Definitions

(This annex forms an integral part of this Recommendation)

For the purpose of this Recommendation the following definitions apply.

A.1 programming Communication Interfaces: Interfaces allowing access to a software providing a ITU-T communication service are called PCIs for "Programming Communication Interfaces".

A.2 application related interface: Application related PCIs provide access to one or more ITU-T services.

A.3 network/Protocol related interfaces: Network/Protocol related PCIs provide access to one or more ITU-T protocols and networks.

A.4 local Application (LA): A Local Application is a logical entity capable of generating documents or files and providing the user with a communication dialogue. Concretely, it may be composed either of one software (editor and integrated communication dialogue) or of two softwares (editor and separated software for communication dialogue).

A.5 communication Application (CA): A CA is a virtual entity located below the local application. It is a fictive item, covering all modules (either hard or software) providing telecommunication means to the LA.

A.6 communication Management Entity (CME): A Communication Management Entity is a logical entity capable of storing and performing the communication request coming from the LA. It is also capable of providing the user with communication management functions (logs, etc.). This entity is located within the CA. A CME may handle one or more ITU-T services.

A.7 lower Layer Module (LLM): The Lower Layer Module is an entity providing the Network/Protocol related PCIs.

Appendix I

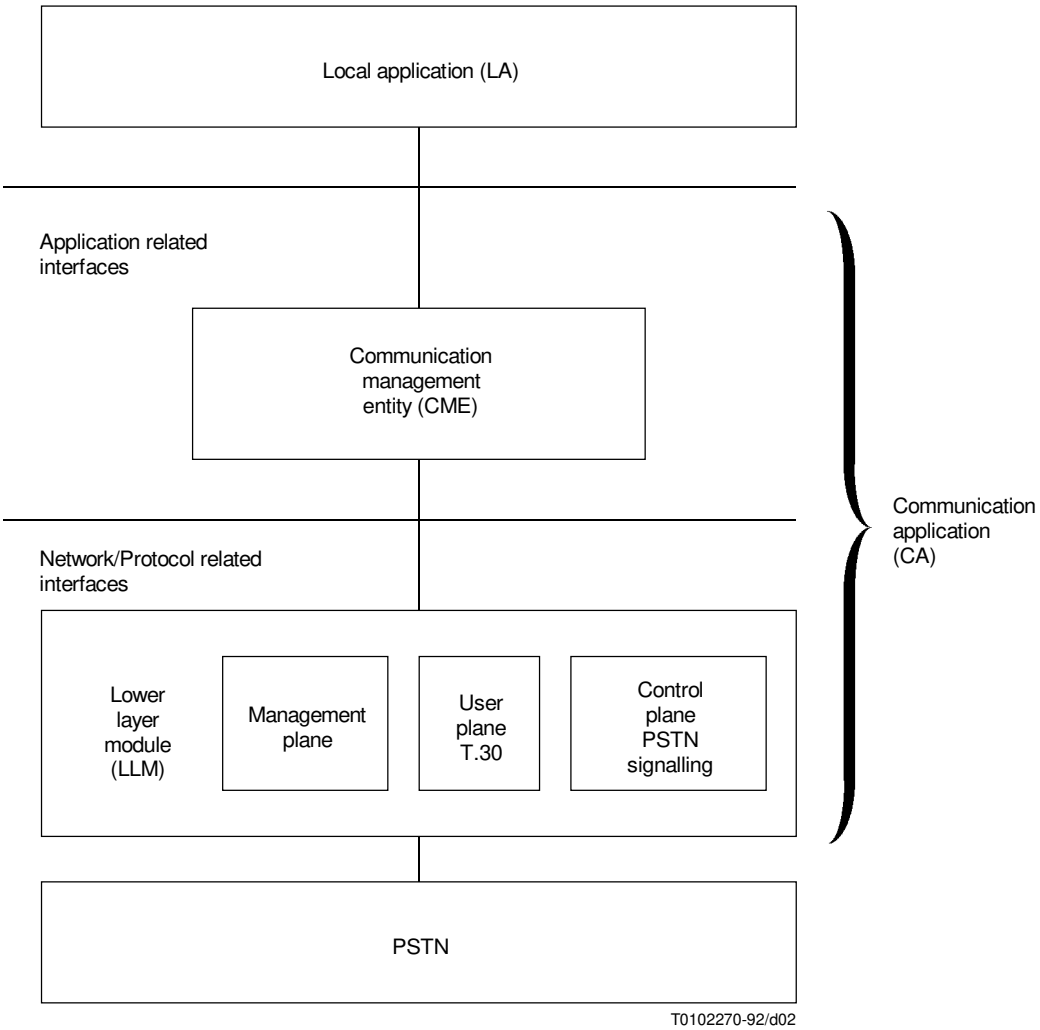
Examples

(This appendix does not form an integral part of this Recommendation)

NOTE – The figures of this appendix are only provisional and given for information. Technical Recommendations are under study. They may be changed depending on the results of the relevant technical Recommendations.

I.1 Telefax 3 on PSTN

Figure I.1 presents the case where the two PCI levels are used in equipment providing the access to the Telefax 3 service on the Public Switched Telephone Network.



NOTE – One interface may be implemented without the other interface.

FIGURE I.1/F.581

Telefax 3 on PSTN

I.2 ISDN Lower Layer Module

Figure I.2 presents the case where the Lower layer Module is used in an equipment providing the access to ISDN.

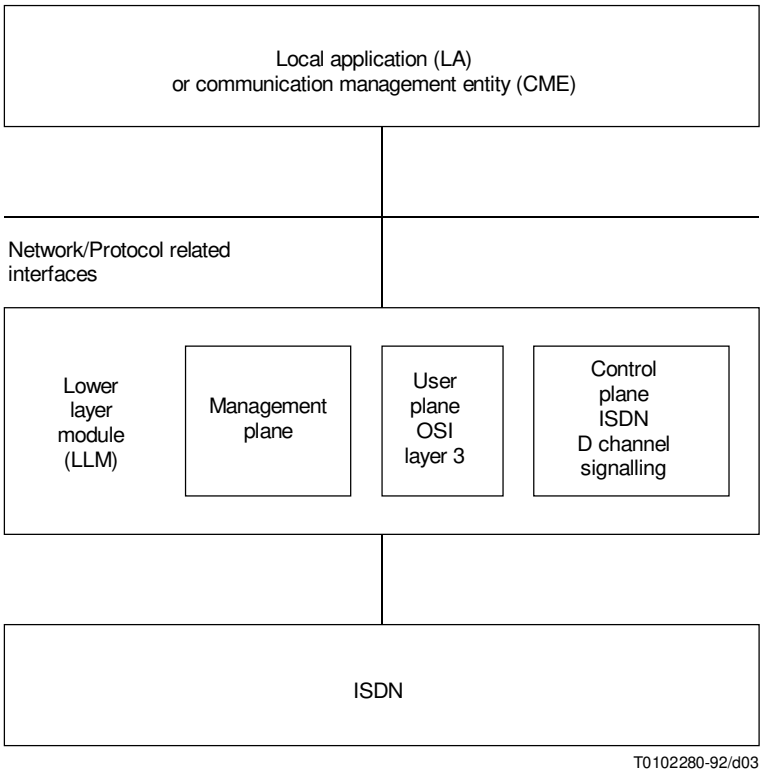


FIGURE I.2/F.581

ISDN lower layer module